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SURFACE TRANSPORTATION BOARD

STB Docket No. 42058

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ARIZONA ELECTRIC POWER COOPERATIVE, INC.

v.

THE BURLINGTON NORTHERN AND SANTA FE RAILWAY COMPANY AND
UNION PACIFIC RAILROAD COMPANY

Joint Supplemental Reply Evidence and Argument of
The Burlington Northern and Santa Fe Railway Company
and Union Pacific Railroad Company

Volume I of I

NARRATIVE

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TABLE OF ABBREVIATIONS

AAR	Association of American Railroads
ABS	Automatic Block Signal System. A series of consecutive blocks of main track governed by block signals, cab signals, or both; actuated by the presence of a train or engine in a block, or by certain conditions affecting the use of a block such as a broken rail.
ACE	Apache, Cochise & Eastern Railroad
ACS	Automatic Cab Signal System. An electronic system that displays the wayside signal identification inside the cab of the locomotive. UP's version of ACS is a continuous cab signal system ("CCS") in that the cab signal indication can be updated at any location between two fixed signal locations. It also provides an audible alarm to further alert the crew to a restrictive signal location.
AEI	Automated Equipment Identification
AEPCO	Arizona Electric Power Cooperative, Inc.
Apache Station	Apache Generating Station
ATSF	Atchison Topeka & Santa Fe Railway Company
BN	Burlington Northern Railroad Company
BNSF	The Burlington Northern and Santa Fe Railway Company
CMS	Crew Management System
CN	Canadian National Railway
CNW	Former Chicago and NorthWestern Railway Company and its predecessors
CP	Canadian Pacific Railroad
CSX	CSX Transportation
CTC	Centralized Traffic Control. A block signal system under which train and engine movements are authorized by block signals, whose

indications supersede the superiority of trains for both opposing and following moves on the same track. A semi-automated means of ensuring the rapid and safe movement of trains.

DED	Dragging Equipment Detector
DP	Distributed Power. Placement of locomotives at two or more locations in a train with acceleration and braking of all locomotives controlled from the head locomotive unit.
DPU	Locomotive unit equipped to be part of a distributed power consist
EB	Eastbound
EOTD	End-of-Train Telemetry Device
FED	Failed Equipment Detector
FRA	Federal Railroad Administration
HBD	Hot Bearing Detector
HDC	UP's Harriman Dispatch Center in Omaha, Nebraska.
HP/TT	Horse power per trailing ton
IC	Illinois Central Railroad Company, including the former Chicago, Central & Pacific
IT	Information Technology
Jct.	Junction
KCS	Kansas City Southern Railway Company
Motion to Dismiss	Defendants' Motion to Dismiss on Reopening, STB Docket No. 42058 (filed Jan. 26, 2004)
MOW	Maintenance of Way
MYO	Manager - Yard Operations
NB	Northbound
NCSC	Union Pacific's National Customer Service Center in St. Louis, Missouri

NS	Norfolk Southern Railway Company
ROW	Right of Way
RVC	Revenue to Variable Cost
SAC	Stand-Alone Cost
SARR	Stand-Alone Railroad
SB	Southbound
SP	Southern Pacific system, including the former Southern Pacific Transportation Company, St. Louis Southwestern Railway Company, SPCSL and DRGW
SYO	Supervisor-Yard Operations
TCS	Transportation Control System. UP's computer system that supports the transportation product provided by the railroad.
=TL	Train Line up in CMS and TCS
TTD	Terminal Train Dispatcher
TWC	Track Warrant Control. Authority to operate over track controlled by written orders (track warrants) and verbal communication with the dispatcher.
UPC	Union Pacific Corporation
UP	The current Union Pacific rail system, including the former CNW and SP
UPRR	The Union Pacific rail system before the acquisition of CNW and SP
WB	Westbound
WC	Wisconsin Central Ltd.

CASE NAMES

<i>Amtrak</i>	<i>National Railroad Passenger Corp. & Consolidated Rail Corp. – Application Under Section 402(a) of the Rail Passenger Service Act for an Order Fixing Just Compensation, 10 I.C.C.2d 863 (1995)</i>
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<i>APS</i>	<i>Arizona Public Serv. Co. v. The Atchison, Topeka & Santa Fe Ry.</i> , 2 S.T.B. 367 (1997)
<i>CP&L or CP&L/NS</i>	<i>Carolina Power & Light v. Norfolk Southern</i> , STB Docket No. 42072, slip op. December 23, 2003
<i>Duke or Duke/NS</i>	<i>Duke Energy Corp. v. Norfolk So. Ry. Co.</i> , STB Docket No. 42069 (served Nov. 6, 2003)
<i>Guidelines</i>	<i>Coal Rate Guidelines, Nationwide</i> , 1 I.C.C.2d 520 (1985)
<i>FMC</i>	<i>FMC Wyoming Corp. v. Union Pacific R.R.</i> , STB Docket No. 42022 (STB served May 12, 2000)
<i>Georgia Power</i>	<i>Georgia Power Co., Southern Co. Servs., Inc., Oglethorpe Power Corp., Municipal Auth. of Georgia, & City of Dalton v. Southern Ry. Co. & Norfolk Southern Corp.</i> , ICC Docket No. 40581 (ICC served Nov. 8, 1993)
<i>McCarty</i>	<i>McCarty Farms, et. al. v. Burlington Northern Inc.</i> , ICC Docket No. 37809 (ICC served Feb. 5, 1988)
<i>Nevada Power I</i>	<i>Bituminous Coal—Hiawatha, Utah, to Moapa, Nevada</i> , 6 I.C.C.2d 1 (1989)
<i>Nevada Power II</i>	<i>Bituminous Coal—Hiawatha, Utah, to Moapa, Nevada</i> , 10 I.C.C.2d 259 (1994)
<i>November 19 Decision</i>	<i>Arizona Electric Power Cooperative, Inc. v. The Burlington Northern and Santa Fe Railway Company and Union Pacific Railroad Company</i> , STB Docket No. 42058 (served Nov. 19, 2003).
<i>OPPD</i>	<i>Omaha Public Power Dist. v. Burlington Northern R.R.</i> , 3 I.C.C.2d 853 (1987)
<i>PPL</i>	<i>PPL Montana, LLC v. The Burlington Northern & Santa Fe Ry.</i> , STB Docket No. 42054 (STB served Aug. 19, 2002)
<i>San Antonio</i>	<i>San Antonio, Texas, Acting By and Through Its City Public Service Board v. Burlington Northern R.R.</i> , 1 I.C.C.2d 561 (1986)
<i>WCTL</i>	<i>Western Coal Traffic League v. Union Pacific R.R.</i> , STB Finance Docket No. 33726 (STB served May 12, 2000)

WPL *Wisconsin Power & Light Co. v. Union Pacific R.R.*, STB Docket
No. 42051 (STB served Sept. 13, 2001)

WPL *Wisconsin Power & Light Co. v. Union Pacific R.R.*, STB Docket
Reconsi- No. 42051 (STB served May. 14, 2002)
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WTU *West Texas Utils. Co. v. Burlington Northern R.R.*, STB Docket No.
41191 (STB served May 3, 1996)

I. COUNSEL’S ARGUMENT AND SUMMARY OF THE EVIDENCE

Defendants The Burlington Northern and Santa Fe Railway Company (“BNSF”) and Union Pacific Railroad Company (“UP”) (jointly, the “Railroads”) submit this joint supplemental reply evidence and argument pursuant to the Board’s November 19, 2003 order in this proceeding, *Arizona Electric Power Cooperative, Inc. v. The Burlington Northern and Santa Fe Railway Company and Union Pacific Railroad Company*. This supplemental reply evidence and argument follows the format of the Board’s March 12, 2001 decision in STB Ex Parte No. 347 (Sub-No. 3), *General Procedures for Presenting Evidence in Stand Alone Rate Cases*.

A. INTRODUCTION

Defendants are submitting this supplemental reply evidence in response to the Board’s request for “responsive SAC evidence,” which the Board desires so that it will have “a fair and adequate record” upon which to “assess the reasonableness of the challenged rates.” November 19 Decision at 4, 6. Defendants’ SAC evidence confirms that defendants’ rates are reasonable and that AEPCO’s complaint must be rejected.

As the Board is aware, this is the second round of reply evidence that defendants have submitted in this proceeding. Defendants did not submit alternative SAC calculations in their first round of reply evidence, filed on May 27, 2003, because flaws in AEPCO’s case-in-chief made it impossible to conduct a full SAC analysis. In its November 19 Decision, the Board acknowledged two of those defects: (1) AEPCO had failed to designate a coherent traffic group for its hypothetical SARR and (2) its SARR impermissibly relied on trackage rights over one of the defendant’s lines instead of submitting evidence as to the full costs of providing transportation for the SARR’s shippers.

The Board, however, offered AEPCO an opportunity to correct these defects by submitting a new case-in-chief. November 19 Decision at 4, 6. AEPCO declined to do so,

opting instead to rely on its rebuttal evidence, filed on July 3, 2003.¹ That evidence accordingly now constitutes AEPCO's case-in-chief to which the defendants were entitled to submit this responsive SAC evidence. As a result, AEPCO has not offered any SAC evidence addressing the full costs of providing and maintaining the north-south line that the Board found the SARR would need to serve the issue traffic. Nor has AEPCO revised its SAC evidence – particularly its evidence concerning the share of cross-over revenues to which its SARR is entitled, which fails to take account of the Board's important ruling on revenue allocation in the *Duke/NS* case.

Defendants continue to believe that AEPCO's SAC case reflects an abuse of the Board's SAC methodology. Despite twice being instructed that its proposed SAC approach was not a permissible application of the SAC test,² AEPCO still relies on a SARR that is on its face incomplete and implausible: it does not build the rail lines needed to handle the issue traffic; it proposes a preposterously inefficient rerouting of the issue traffic 222 miles out of the way in a futile effort to capitalize on one defendant's (unused) trackage rights over the other; and it vastly overstates revenues that would be available to the SARR from the SARR traffic, which consists predominantly of movements that are exempt from Board regulation because their rates are highly competitive. A case with such fundamental flaws should not trigger the need for

¹ See Response of Complainant Arizona Electric Power Cooperative, Inc. to the Board's November 19, 2003 Order (filed November 26, 2003) ("AEPCO's Response to November Order"). On the issue of the SARR traffic group, the parties subsequently agreed – at the Board-sponsored technical conference held on December, 18, 2003 – that the "alternate" traffic case presented in AEPCO's rebuttal would be the basis for defendants' reply evidence.

² In addition to the Board's November 19, 2003 decision, the Board's August 20, 2002 decision in this case found fundamental flaws in AEPCO's proposed SAC evidence.

defendants to expend the extraordinary resources needed to prepare SAC evidence responding to the nuts and bolts of AEPCO's evidence on SAC costs and revenues.³

Beyond these conceptual flaws, AEPCO's implementation of its SAC analysis is riddled with errors and fails to carry AEPCO's burden of proving that defendants' rates are unreasonably high. In the short time available to defendants to respond to AEPCO's SAC case-in-chief,⁴ defendants have not been able to develop the exhaustive SAC evidence of the sort typically presented in these cases. Instead, defendants focused their efforts on the most significant SAC issues and accepted many of AEPCO's assumptions and approaches. Nevertheless, defendants show that AEPCO's contrived SARR still yields stand-alone costs substantially in excess of revenues, even excluding the costs associated with building the north-south line that the Board determined AEPCO could not avoid. With a proper accounting of the costs of building and operating the SARR's network and a proper cost-based apportionment of the revenues earned from the SARR's extensive cross-over traffic in accord with the Board's recent *Duke* decision, AEPCO's SARR cannot sustain itself. Accordingly, defendants' rates are reasonable and AEPCO's complaint must be rejected.⁵

³ As defendants explain in their Motion to Dismiss, also filed today, the Board should not allow this case to proceed in light of AEPCO's decision not to construct the north-south route that the Board found was required.

⁴ AEPCO did not finally confirm that it was relying on its previous rebuttal evidence until December 18, 2003, at the Board-sponsored technical conference.

⁵ BNSF pointed out in its reply evidence that AEPCO's settlement with UP created the possibility that AEPCO would receive no reparations even if it prevailed on SAC issues. This may have contributed to the poor quality of AEPCO's opening evidence. *See* BNSF Reply Nar. at I-32-37. This supplemental reply evidence does not address the potentially complex issues arising from that settlement, although those issues would need to be addressed if the Board does not dismiss AEPCO's claims based on the SAC analysis.

B. AEPCO'S CASE-IN-CHIEF CONTINUES TO BE
FUNDAMENTALLY FLAWED

The Board should not have allowed this case to proceed after it found in its November 19, 2003 decision that AEPCO had failed to posit evidence that could support a finding under the SAC test that the challenged rates exceed a reasonable maximum. Defendants should not have the burden (and great expense) of developing the record in a SAC case where the complainant has failed, despite repeated opportunities, to submit evidence that is credible or consistent with SAC principles. Defendants have nevertheless presented SAC evidence in this supplemental reply demonstrating that AEPCO is not entitled to relief. However, the Board need not carry out a detailed review of the SAC evidence to conclude that AEPCO's SAC evidence is fundamentally flawed.

1. The Complaint Must Be Dismissed Because AEPCO Has
Failed To Submit Competent SAC Evidence Regarding The
SARR's Vaughn-El Paso Segment

The Board should dismiss the complaint on the ground that AEPCO has failed to satisfy its evidentiary burden. Despite repeated opportunities to do so, AEPCO has declined to offer competent SAC evidence regarding the SARR's Vaughn-El Paso segment.

In its November 19 decision, the Board correctly concluded that AEPCO's reliance on trackage rights over the SARR's Vaughn-El Paso segment was inconsistent with the SAC test. The SAC test is designed to evaluate whether rates are reasonable by comparing the full costs of providing service to a SARR traffic group with the revenues available to cover those costs. In a case involving joint-rate defendants, a SAC analysis cannot be based on a fee that one defendant pays for trackage rights over the other, because such a fee would not reflect the full SAC costs of providing the service at issue. November 19 Decision at 6.

In its November 19 decision, the Board offered AEPCO an opportunity to correct this fundamental flaw in its evidence, but AEPCO chose not to do so.⁶ It continues to rely on evidence that includes trackage rights over a defendant's lines and argues that the Board's legal analysis was incorrect. *See* AEPCO's Response to November Order at 4-7. As a result, the record contains no evidence of the costs of constructing and maintaining the physical plant needed to provide service over nearly one-third of the SARR or the operating costs associated with that portion of the SARR. As discussed in defendants' Motion to Dismiss, filed simultaneously with this supplemental reply evidence, this fatal flaw in AEPCO's case-in-chief requires dismissal of the complaint.

Moreover, as defendants demonstrate in Section III.B.2.a.(2), the trackage rights fee AEPCO uses in its evidence would be inadequate to cover the full costs of providing service between Vaughn and El Paso. The traffic group selected by AEPCO would generate less than \$1.66 million in trackage rights fees annually, which would not even be enough to cover the annual capital carrying costs of 12 miles of single-track mainline between Vaughn and El Paso, even using AEPCO's understated construction cost assumptions. This straightforward comparison shows that the fee AEPCO posits is far too low to satisfy the objectives of the SAC test.

Although defendants can show that AEPCO's proposed trackage rights fee is plainly inadequate, they are unable to implement the Board's suggestion in the November 19 decision that they demonstrate what level of fee would satisfy a SAC test. If there were a shortcut approach to determining the level at which a trackage rights fee would satisfy the objectives of

⁶ AEPCO had previously declined to correct this error when it responded to the UP Petition to Require Submission of New Opening Evidence or, Alternatively, to Dismiss (filed April 18, 2003).

the SAC test, there would be no need for a SAC test. The only way to determine what amount of financial contribution – in the form of a trackage rights fee or otherwise – would be sufficient to ensure the recovery of the full costs of a particular line is to analyze the forward looking costs of constructing and operating the line and the revenues available to recover those costs from all of the traffic moving over it – *i.e.*, by conducting a SAC analysis. However, Board precedent precludes defendants from positing the configuration of a SARR or selecting the traffic to be included in a stand-alone traffic group. *See McCarty Farms, et. al. v. Burlington Northern R.R., Inc.*, ICC Docket No. 37809, at 7 (served Feb. 5, 1988). Moreover, imposing such a burden on defendants would be extremely unfair and impractical at this stage of this case. These issues are discussed further in defendants' Motion to Dismiss.

Nevertheless, defendants demonstrate in this supplemental reply evidence that the SAC costs of providing service for the traffic AEPCO selected for its SARR would exceed the revenues available to the SARR even using AEPCO's improper trackage rights assumptions. Defendants' analysis assumes a trackage rights fee of 9.05 mills per-GTM, which AEPCO proposed in its response to the November 19 decision. As discussed below, when other errors in AEPCO's SAC revenue and cost assumptions are corrected, it is clear that the challenged rates do not exceed a reasonable maximum.

2. AEPCO's Claim That SAC Revenues Exceed SAC Costs Is Implausible In Light Of The Fact That The Vast Majority Of SARR Traffic Is Highly Competitive And Exempt From Board Regulation

Over 99 percent of the traffic handled by AEPCO's SARR is cross-over traffic. In its initial reply evidence, BNSF explained how the use of cross-over traffic in SAC cases represents a giant step backward from the original purpose of the SAC test. The SAC test was designed to move away from reliance on arbitrary cost allocations and instead to test the reasonableness of a

challenged rate through a detailed comparison of the costs required to build and operate an efficient railroad and the actual revenues generated by the traffic that the hypothetical railroad is assumed to carry. *See* BNSF Reply Nar. at III.A-21-25. The use of cross-over traffic reintroduces the complex and inherently arbitrary allocation of through revenues to a movement that the SARR has broken into two or more pieces. Indeed, when SAC presentations rely heavily on cross-over traffic, as AEPCO's does, the revenue allocation factor used for cross-over traffic becomes the dispositive issue in the case, dwarfing other issues on both the revenue and cost side of the SAC analysis.

AEPCO's use of cross-over traffic in this case exemplifies the perils of conducting a SAC analysis that focuses almost exclusively on cross-over traffic and the distortions that can be produced through heavy reliance on cross-over traffic. In this case, the vast majority of cross-over traffic handled by the ACE is exempt from regulation by the Board (including rate regulation) because the rates charged on this traffic are constrained to reasonable levels by market forces. Yet, as defendants show in BNSF/UP Supplemental Reply Exhibit III.A-1, the revenues that AEPCO assumes are contributed to the SARR by cross-over segments of exempt traffic alone substantially exceed the full stand-alone costs of the SARR as calculated by AEPCO. Such a result is entirely implausible. If accepted by the Board, it would make a mockery of the SAC test.

The SAC test is designed to simulate the rates that would be charged in a contestable market where the prospect of competitive entry keeps the incumbent from charging rates that are unreasonably high. But there is already vigorous competition in the markets for transportation of intermodal and automotive traffic and the ICC and the Board have concluded that the presence of competition in these markets keeps rail rates at reasonable, competitive levels. AEPCO's

evidence purporting to show that the intermodal and automotive traffic included in its SARR generates revenues that exceed competitive levels — because they generate revenues substantially in excess of SAC costs — is simply not credible.⁷

C. A PROPERLY CONDUCTED SAC TEST SHOWS THAT SAC COSTS EXCEED SAC REVENUES EVEN WITHOUT CONSIDERING THE FULL COSTS TO CONSTRUCT AND OPERATE OVER THE VAUGHN-TO-EL PASO LINE.

AEPCO's stand-alone railroad consists of little more than a carved out portion of the defendants' east-west trunk lines running through New Mexico and southeastern Arizona connected between Vaughn, NM, and El Paso, TX, by UP's Tucumcari Line. The northern and southern lines of the SARR basically replicate the track configuration of the defendants' lines, and the traffic carried on those lines is largely the same traffic that defendants carry on those lines today. While AEPCO assumes that local traffic will be excluded from the SARR, the elimination of local traffic does not significantly affect the UP portion of the SARR lines since UP does not handle a significant amount of local traffic on the replicated lines. While BNSF does have significant local operations that would be affected by the SARR, the elimination of cars moving to and from local points would not affect the number of trains that would move over SARR lines or the frequency of those trains, and it does not significantly change the configuration of those trains.

Moreover, AEPCO assumes that its SARR will replace the incumbents as an overhead carrier, thus inserting itself into the middle of the defendants' provision of through transportation service. As a result, the SARR would be entirely dependent on the residual incumbents for the

⁷ In a related context, the Board has found that where a maximum rate methodology produced results that are not credible, the methodology would not be relied upon to determine maximum reasonable rates. *See Ex Parte No. 347 (Sub-No. 2), Rate Guidelines--Non Coal Proceedings*, 1 S.T.B. 1004, 1016 (1996).

traffic received at one end of the SARR and the traffic handed off at the other end. The SARR does little more than replace defendants for a short segment of the defendants' existing operations. Under these circumstances, it is possible to rely more heavily on operating data from the real world in assessing SAC costs than in many past SAC cases. AEPCO has not provided any valid basis for believing that its SARR would be able to achieve operating efficiencies that are not already reflected in the defendants' real world operations. Defendants' capacity and operating cost evidence therefore uses real world cost evidence as a starting point for assessing the ACE's operating costs, while making adjustments as appropriate to reflect efficiencies that could be achieved by a stand-alone railroad operating over the replicated line segments.

In contrast, the costs to construct and maintain the SARR had to be developed from the ground up as in other SAC cases because real world costs for the segments at issue do not exist. As defendants explain, AEPCO's evidence on these critical issues was especially simplistic and riddled with errors. Indeed, the sloppiness of AEPCO's cost evidence is exemplified by the fact that in many cases, AEPCO presented careless spreadsheet calculations that substantially overstated construction costs. In many other areas, AEPCO ignored entire categories of construction costs and understated other costs. Because of the short time for reply, much of which was spent untangling AEPCO's carelessly prepared evidence, defendants have not undertaken as thorough and complete an analysis as they would in other cases. Nonetheless, defendants' restatement of road property investment costs demonstrates that AEPCO substantially understated the costs to engineer and construct the ACE.

Defendants show in this supplemental reply evidence that the SAC costs for the ACE significantly exceed the revenues that would be available to the ACE. AEPCO has failed to

show that the challenged rates exceed a reasonable maximum rate. Defendants' evidence on specific SAC issues is summarized below.

1. Defendants Have Accepted AEPCO's Alternative Rebuttal Traffic Assumptions

In mid-December 2003, the parties participated in a technical conference convened by the Board. At that technical conference, the parties agreed to use the "alternate" traffic case submitted by AEPCO in its July 3, 2003 rebuttal filing as the basis for calculating total revenues of the stand-alone traffic group designated by AEPCO for through movements over the SARR.⁸ Defendants have therefore used this "alternate" traffic case as the basis for developing their supplemental reply evidence.

While defendants accepted the through revenue and traffic assumptions reflected in AEPCO's "alternate" case, defendants did not accept AEPCO's assumptions as to the specific amount of revenue from that traffic that would be available to the ACE. For example, as explained below in Section I.D.2, AEPCO's "alternate" traffic case vastly overstated the SARR's revenues, primarily because AEPCO assigned a disproportionate share of revenues from cross-over traffic to the SARR. Consequently, defendants have modified the division of revenues allocated between the SARR and the residual incumbents for cross-over traffic. AEPCO also overstated future revenues for the SARR by relying on an outdated DRI-WEFA forecast of railroad cost indices and by misapplying UP's internal forecasts in projecting revenue increases for non-coal cross-over traffic interchanged between ACE and UP. Defendants have corrected these errors.

⁸ See December 19, 2003 Letter to Mr. Konschnik from Messrs. Rosenberg, Sipe and Meyer.

In addition, AEPCO improperly assumed that the SARR could significantly change the service currently provided to one coal customer in the stand-alone traffic group and still expect to retain that business. AEPCO has not shown that its substantial change in service would be acceptable to the shipper -- indeed, it is not even clear that the shipper has the capacity to receive the shipments as scheduled by AEPCO. Consequently, pursuant to existing Board precedent, defendants have excluded the coal traffic to this shipper from the stand-alone traffic group. Defendants also correct an error in AEPCO's coal volume forecast, which wrongly assumes that more generating units operate at a particular power plant than exist at the plant. These changes, which do not affect a substantial volume of traffic, are described in more detail in Sections III.A.1 and III.A.2 of the Narrative.

2. AEPCO Vastly Overstated The Revenue That Would Be Available To The SARR From Cross-Over Traffic

AEPCO's implausible showing that a railroad dominated by highly competitive exempt intermodal and automotive traffic generates revenues substantially in excess of SAC is largely attributable to the grossly excessive share of cross-over revenues that AEPCO claims under the modified mileage-prorate ("MMP") revenue allocation approach. AEPCO's approach is inconsistent with controlling Board precedent and must be rejected.

In *Duke v. NS*, the Board concluded that cross-over traffic revenues should be allocated between the SARR and the residual defendant on the basis of the "defendant carrier's relative costs of providing service" over the segments replicated by the SARR and those left to the residual defendant. *Duke v. NS* at 20. On the record in that case -- and specifically "in the absence of a better supported method" -- the Board concluded that it was "left to continue to apply a mileage-based approach, which clearly bears some relationship to the relative total costs [the railroad] incurs to provide service over each segment." *Id.* at 22. However, the Board

rejected the MMP approach used in previous cases and substituted what it called the MSP approach because it would “better approximate the relative costs the defendant railroad incurs to haul this traffic over each of the segments, by applying the reasonable assumption that average total costs are a continuous function of distance.” *Id.* at 24-25. In *CP&L v. NS*, the Board also used the MSP approach for allocating cross-over revenues. *CP&L v. NS* at 21.

The *Duke v. NS* and *CP&L v. NS* decisions foreclose AEPCO’s reliance on the MMP approach to allocate cross-over revenues between ACE and the residual incumbents. The Board’s November 19 decision gave AEPCO an opportunity to modify its evidence on the proper allocation of revenue, but AEPCO chose not to submit any new evidence on this or any other issue. Having passed over the opportunity to correct the error in its revenue allocation assumptions, AEPCO should not be permitted to submit new evidence on this issue on rebuttal.

While the Board’s MSP approach yields revenue divisions for the ACE’s cross-over traffic that are lower than the divisions generated by AEPCO’s MMP approach, the Board’s MSP approach must be modified here to achieve the Board’s objective of accurately apportioning revenue in accord with relative costs of the cross-over traffic selected by AEPCO. An adjustment is needed because the generic MSP approach used by the Board in *Duke/NS* and *CP&L/NS* does not adequately reflect the relative costs of handling the on-SARR and off-SARR segments of cross-over movements at issue here. This is an unprecedented SAC case, in which ACE has replicated two short segments in the middle of UP’s and BNSF’s transcontinental mainlines. It proposes to conduct a purely “hook and haul” operation in which it will not originate or terminate any trains, but instead will run intact trains received from each residual incumbent across its mainline at high speed, performing no intermediate switching, and deliver those same trains to the residual incumbent at the other end of ACE’s short, high-speed mainline

segments. AEPCO has no doubt made the choice to replicate only these small portions of UP's and BNSF's systems to reduce the operating and investment costs of its SARR, but the reduced costs of the portions of the railroads' operations that ACE has chosen to replicate have significant implications for an allocation of total revenues between the SARR and the residual incumbents on the basis of relative cost.

Both the Board and AEPCO have acknowledged the appropriateness of modifying the revenue allocation methodology in order more accurately to apportion revenues in accord with relative costs of particular traffic. In *Duke v. NS*, for example, the Board emphasized that it was assigning the "equivalent of a 100-mile share of costs" to each origin and destination because that approach had been used in the past "as a surrogate for the costs of providing originating or terminating service" in the absence of any better evidence. *Id.* at 24 n.37. Similarly, in this case AEPCO urged the Board to continue apportioning revenue based on a methodology that used "distance as a first approximation for cost," but acknowledged that "MMP can be modified to reflect costs that are a function of other dimensions of rail service This can be achieved by altering the number of mileage block units allocated to the originating and terminating carriers." AEPCO Rebuttal Exh. III-A-11 (Borts) at 6 n.1.

As defendants explain in Section III.A.3.c below, they have modified the generic MSP approach applied by the Board in *Duke/NS* and *CP&L/NS* by taking account of the relative costs of on-SARR and off-SARR portions of cross-over movements.⁹

⁹ As explained in Section III.A.3.c, defendants are not proposing the use of a revenue allocation procedure here that takes account of relative density to allocate contribution in excess of attributable costs. BNSF advocates such an approach in other pending rate cases and defendants reserve their right to develop a record supporting such an approach in another case that might arise in the future.

For ACE's intermodal traffic – which accounts for 65 percent of ACE's traffic revenue – defendants demonstrate that the costs of originating and terminating the traffic (none of which ACE bears) are not adequately represented by a 100-mile block. A key feature of intermodal traffic is that it is characterized by relatively low line-haul costs and relatively high origination and termination costs. This is especially true of the intermodal traffic selected by ACE, which is long-haul transcontinental traffic, much of which moves in efficient double-stack equipment. William Berry, a consultant with extensive hands-on experience in railroad intermodal operations, describes in detail the costs that the incumbents must incur to handle intermodal traffic at origin and destination. Drawing on available empirical evidence and third-party analysis, he develops costs for an origination or termination event that are the equivalent of 500 miles of representative line-haul costs on intermodal movements.

In addition, the MSP approach as applied by the Board in *Duke/NS* would not account for the incumbents' activities (and resultant costs) associated with interchanging intermodal traffic with eastern and Canadian carriers at mid-continent gateways. Whether the interchange of intermodal units is carried out by rail (via so-called steel-wheel interchange) or by dray (so-called rubber-tire interchange), it typically entails significant costs that are not captured by the "line-haul" miles used in the MSP approach. Such interchange costs are the equivalent of 140 miles of line-haul costs on average. Defendants have substituted appropriate mileage blocks in their recalculation of ACE's MSP-based divisions, which reduces ACE's share of intermodal revenues relative to AEPCO's MMP approach.

For ACE's manifest traffic – which accounts for about 17.5 percent of ACE's revenue – the simple MSP approach does not fairly allocate revenues between ACE and the residual incumbents because it does not accurately reflect relative costs. ACE's manifest traffic is

“loose” carload traffic consisting of movements of one or a few cars that originate or terminate at thousands of points throughout North America. As defendants have shown, that traffic traverses much of the UP and BNSF systems,¹⁰ and must be classified and reclassified multiple times between origin and destination. The MSP approach assumes that these handling costs – which are in addition to the costs of originating and terminating the traffic – are spread evenly across all line-haul miles, and thus are incurred proportionately by the SARR and the incumbent. In ACE’s case, however, that is not what happens. None of the intermediate switching, classification and other costly activity is performed on ACE’s segments; all of it is performed by the residual incumbents. As described in Section III.A.3.c, defendants have adjusted the MSP approach to reflect more accurately the relative apportionment of line-haul costs between ACE and the incumbents, using URCS calculations performed by AEPCO’s consultant on a representative sampling of ACE’s manifest traffic. *See* AEPCO Rebuttal Exh. III-A-10 at 12-14 (describing witness Whitehurst’s costing of a sample of non-coal cross-over traffic).

As described in Section III.A.3.c below, defendants applied the same approach to allocating revenues on automotive traffic, which accounts for 6.5 percent of ACE’s revenues, that they applied to manifest traffic.¹¹

3. Defendants Have Accepted AEPCO’s Basic Mainline Track And Yard Capacity Assumptions With Relatively Minor Changes

Defendants did not need to carry out an extensive capacity analysis in this case because AEPCO essentially replicated the mainline configuration of the defendants’ existing lines between Defiance and Vaughn, NM, and El Paso, TX and Cochise, AZ. Since the traffic moving

¹⁰ *See* BNSF Reply Exh. I-3; UP Reply Map 2.

¹¹ Defendants applied the generic MSP approach to coal and grain traffic, which accounts for 11 percent of ACE’s revenues.

over the ACE lines is comparable to existing traffic over the incumbents' lines, defendants concluded that AEPCO's mainline track capacity assumptions were basically adequate. However, as discussed in Section III.C.2.c, AEPCO assumed that certain coal traffic, including the issue traffic, would be rerouted over high density lines to the east of Belen, NM, including an uphill single-track portion of the BNSF main line near Abo Canyon. To prevent the ACE's rerouted trains from interfering with higher priority traffic traveling at greater maximum speeds, defendants expanded a siding on the ACE at the west end of Abo Canyon.

AEPCO configured the ACE with several small yards for the purpose of facilitating the interchange of overhead traffic with the residual incumbents. Defendants have accepted most of AEPCO's assumptions as to the capacity and structure of those yards, but they have concluded that the ACE yards at Vaughn and El Paso require some modest additional capacity and structural changes to accommodate the operations assumed to be conducted at those yards. As discussed in Section III.B.3 below, both yards failed to provide adequate facilities for the fueling of ACE trains, including yard tracks and storage capacity. Defendants made a few other changes to the design and capacity of these two yards to permit the efficient handling of ACE trains, locomotives and cars. In addition, defendants concluded that additional mainline track was needed to access the Vaughn Yard. *See* Section III.B.3.a.(1).

4. AEPCO Understated SARR Operating Statistics And Operating Costs

In general, defendants accepted AEPCO's framework for the operations of the ACE. Defendants assumed, consistent with AEPCO's SAC evidence, that the ACE would operate in overhead service between the eastern and western ends of the SARR. Defendants assumed that the ACE would accept trains interchanged to it by the incumbents, move those trains over the ACE line segments and return them to the incumbents at the other end of the SARR line. Defendants assumed that the ACE would not change the equipment used on these trains but

instead would be responsible for a portion of the total equipment ownership costs for the through movement based on the relative time that the trains spent on SARR lines. Defendants accepted AEPCO's basic assumptions about the types of locomotives for which the ACE would be responsible and the servicing of that equipment. Defendants accepted AEPCO's basic crew operating assumptions.

However, AEPCO made numerous and obvious errors in translating these basic operating parameters into operating statistics and operating costs. In many cases, AEPCO's operating statistics were flawed and unreliable because they were derived from AEPCO's string program. As described in Section III.C.2 below, the string program does not accurately model train movement and fails to detect operating problems such as overloaded sidings. Since AEPCO assumes that it will operate virtually the same trains over virtually the same track configuration as the defendants, the differences in operating statistics (such as transit times) produced by AEPCO's string program as compared to the real world confirm the unreliability of that model. An additional layer of unreliability was introduced by AEPCO when it applied convoluted adjustments to the string program output to produce the specific operating statistics used to generate costs.

In light of the time constraints to prepare supplemental reply evidence, defendants did not attempt to model the SARR to identify alternative operating statistics. However, it was possible to derive accurate statistics by simply relying on the actual trains that AEPCO assumed would traverse the SARR and by deriving operating statistics for each train based on real world experience for such trains. Thus, defendants calculated ACE locomotive requirements using transit times achieved by defendants today over the replicated line segments. Defendants accepted AEPCO's car costs.

In many cases, AEPCO also relied on faulty unit costs, which defendants corrected. For example, defendants corrected AEPCO's salary assumption for train crews by using train crew salaries for real world train personnel that work the very high number of train starts that AEPCO assumes for ACE operations. *See* Section III.D.3.a. Defendants modified AEPCO's assumptions as to the amount of fuel that would be consumed on ACE trains to account for the specific characteristics of ACE trains, namely the high horsepower-to-trailing-ton ratios on those trains and the high speeds that those trains achieve. *See* Section III.D.1.d. In addition, defendants corrected AEPCO's mistaken calculation of lease rates for locomotives acquired by the ACE. *See* Section III.D.1.a.

In two areas, AEPCO ignored the costs that would result from its assumption that the ACE would handle *only* overhead traffic between Vaughn and Defiance on BNSF's replicated lines. This assumption allowed the ACE to achieve certain cost savings but only by imposing additional costs on the residual incumbents that the incumbents do not incur today. In the real world, the trains that would be handled by the ACE stop at Belen, NM, where they are serviced and fueled. Belen is an important fueling location for BNSF's cross-country movement of freight in the southwest. AEPCO assumes that these fueling operations will be carried out at Vaughn, NM, but it failed to consider the costs that would be incurred to ensure that an adequate source of fuel would be available at Vaughn. Defendants developed a basic operating plan that would allow the ACE to take over the fueling activities that BNSF performs today at Belen, consistent with AEPCO's underlying SAC assumptions, and defendants included in its SAC operating evidence the incremental costs associated with that operating plan.

A second problem arises from AEPCO's assumption that ACE trains would bypass Belen. As BNSF explained in its May 27, 2003 Reply Narrative, BNSF's Belen Yard supports

local operations in several areas of the southwest. Trains arrive at Belen with cars to be set out for local destinations and they pick up local cars for movement farther east and west. In the stand-alone world, the ACE does not stop at Belen, so BNSF's cross-country trains would have to stop at Vaughn or Defiance instead and remove cars destined for local deliveries in the southwest and pick up local cars for delivery elsewhere. The residual BNSF would still have to move these cars to Belen to form them into local trains. The residual BNSF would also have to perform switching for cars bound for Phoenix and for Phoenix-origin cars at Defiance and Vaughn. Defendants developed an operating plan that would allow the residual incumbent to maintain its local operations while allowing ACE trains to move in overhead service bypassing Belen. The costs associated with these new operations are the responsibility of the SARR, *see TMPA* at 22, and they are included in defendants' operating cost evidence. *See* Section III.C.1 below.

A substantial portion of ACE operating costs are associated with maintaining ACE's track. AEPCO's maintenance-of-way assumptions and calculations are fundamentally flawed and cannot even be used as the starting point for an assessment of MOW costs. The ACE is a high-density railroad. Its traffic consists primarily of high-speed, time-sensitive, heavy-axle intermodal freight trains. Maintenance outages on ACE's lines or at its facilities would create enormous disruptions in the operations of these trains. Indeed, operating failures on ACE lines could severely degrade the service that is provided today by the defendants for the competitive intermodal traffic that is the foundation of the ACE traffic group. To avoid such disruptions, the ACE must establish an MOW work plan that provides for a significant amount of daily work necessary to prevent outages from occurring and to respond quickly to unexpected problems that inevitably occur on a high-volume, high-density railroad.

In positing MOW costs, AEPCO's basic strategy was to understate costs by allocating MOW expenditures primarily to program maintenance, since program maintenance costs are generally capitalized and are therefore not captured in the Board's DCF analysis. AEPCO then provided only a skeletal and inadequately equipped internal MOW staff to perform inspections and respond to daily-unplanned outages. According to AEPCO, this staff would be extremely small because it would be cross-trained, which reduces ACE's total MOW personnel needs. In its most recent rate case decision, the Board rejected a similar MOW plan that relied on a small, cross-trained MOW work force. *See CP&L* at 71.

AEPCO allocated 10 percent of the estimated costs for program track replacement to MOW operating expenses, apparently based on an assumption that the unnamed contractors used for program maintenance would agree to perform some of the day-to-day maintenance that is part of the operating MOW budget. But AEPCO never specified the tasks that these contractors would perform or attempted to demonstrate that contractors could perform these critical and time-sensitive functions. AEPCO submitted absolutely no evidence that the amount to be paid to these contractors (an arbitrary 10 percent of the budget for normalized track maintenance) would be sufficient to deal with the kinds of severe maintenance problems that are commonly encountered on high-density railroads and that could bring the ACE to a grinding halt if not dealt with immediately. AEPCO's evidence on the issue of MOW costs is so thin that the Board should reject it out of hand.

AEPCO also claims that the use of steel ties would reduce MOW costs. To the contrary, defendants explain in the Narrative that the Railroads' documented experience with steel ties on mainline track and industry testing show that use of steel ties on a heavy tonnage railroad such as ACE would dramatically *increase* MOW costs and would cause massive operational disruptions.

As a result, the Railroads rejected use of steel ties on mainline track in the real world and defendants reject use of steel ties on the ACE.

To provide an alternative estimate of MOW costs for the ACE, the Railroads' witness Mr. Albin built from the ground up a MOW budget for both capital expenditures and operating expenditures. Rather than hide behind unsupported assertions about the amounts that outside contractors would require for unspecified tasks, Mr. Albin identified the specific tasks that the ACE would need to perform to ensure safe and reliable operations and the specific costs for those tasks. He determined the amounts for these tasks that would be capitalized and expensed using the criteria that railroads use for purposes of their regulatory reporting. His approach is transparent, thoroughly supported by reliable evidence, and is consistent with the experience of real-world railroads. The Board should accept his MOW calculations as the only competent evidence in the record on this subject.

5. AEPCO Understated The Cost To Design And Construct The SARR

AEPCO's evidence on the cost to design and construct a stand-alone railroad capable of handling the ACE traffic is simplistic, result-oriented and riddled with errors. AEPCO ignored a multitude of issues that would have to be addressed in assessing the cost to design and construct a railroad the size of the ACE. Where AEPCO provided factual support for its cost and engineering assumptions, that support is often erroneous or inappropriate. The sloppiness of its cost presentation is evident from the fact that many of its calculation errors substantially increased the supposed costs to construct the ACE. Despite the short time to prepare this reply submission, BNSF/UP have prepared as thorough and detailed evidence on the costs to construct the ACE as possible under the circumstances. Their evidence is the best evidence in the record of this case.

It is not possible to address all of the construction cost issues in dispute in this summary, but some of the most significant issues are summarized below.

Earthworks: An accurate assessment of roadbed preparation costs requires a detailed review of a multitude of details. For this reason, a superficial assessment, like that carried out by AEPCO's witnesses, is bound to understate costs by ignoring many of the individual cost items that drive actual costs in this area. Defendants demonstrate that AEPCO did, in fact, dramatically understate roadbed preparation costs by ignoring numerous roadbed preparation activities and their associated costs. Moreover, the specific costs sponsored by AEPCO generally lack any support and appear to have been chosen for the sole purpose of reducing construction costs without any consideration of feasibility or reasonableness.

One example illustrates the superficial and result-oriented approach that AEPCO took to the assessment of roadbed preparation. AEPCO consistently chose the lowest cost equipment but it failed even to consider whether the equipment was capable of performing the task for which it was selected. In many cases, the equipment chosen by AEPCO could not physically carry out the work expected of it. In other cases, the equipment would perform so poorly that the ACE could never meet its aggressive construction schedule. AEPCO cannot have it both ways: It cannot on the one hand avoid the enormous capital costs associated with a longer construction schedule and at the same time reduce construction costs by assuming the use of cheap and inappropriate equipment that would slow down the construction process.

Track Construction: A major error in AEPCO's estimate of track construction costs was its selection of steel ties for ACE's mainline track. AEPCO relies on a manufacturer's brochure claiming that steel ties had been used successfully on BNSF and UP. Steel ties would not be feasible. The comments quoted and items mentioned in the brochure were of limited scope and

did not reflect the ultimate experience of BNSF and UP with using steel ties. Both railroads found that the ties did not support heavy axle loads and in fact caused substantial problems leading to operational disruptions on lines where steel ties had been installed. Both railroads eventually removed the ties and adopted policies of not using steel ties on mainline track. Moreover, as discussed in Sections III.D.4 and III.F.3, the cost savings in ballast assumed by AEPCO in installing steel ties are illusory as the use of steel ties requires extraordinarily high maintenance costs stemming from the need for continual tamping and resurfacing. The Railroads rejected AEPCO's specification of steel ties and instead constructed the ACE with standard wood ties.

AEPCO also disregarded a number of items such as geotextiles under turnouts and crossings, transition ties, field welds, compromise joints, environmental mats, wheel stops and derails. In addition it substantially understated the costs for installation of subballast, No. 10 turnouts and rail. AEPCO's track construction costs were based on a "turnkey" quote from a company in Pennsylvania that grossly understated the costs of construction.

Bridges: AEPCO's bridge calculations and assumptions are equally superficial and replete with errors. In addition, AEPCO omitted some bridges from its inventory, and it failed to account for various aspects of railroad bridge design and construction, particularly in connection with construction of the bridge substructures.

AEPCO established four broad bridge classifications based on bridge lengths that were generally acceptable except that its Type II bridges included several very tall bridges that should not have been averaged in with much shorter bridges. The taller bridges must have taller piers which must be reinforced against the additional forces to which they are subjected. In addition, there were numerous errors in the design of AEPCO's piers and piles. Defendants' evidence

explains in detail the design characteristics, structural components, and construction practices that must be considered in developing a realistic estimate of ACE bridge costs.

Signals and Communications: AEPCO understated ACE costs for both the signals and communications systems. For signals, AEPCO included only the signals themselves (mast and ladder) but none of the equipment that goes with them. It excluded the costs for the circuitry and the additional equipment such as chargers, batteries and cable that must also be included in a signal system. For the dispatching equipment, it included only the software application, but none of the core hardware for a dispatching system.

With respect to communications costs, AEPCO posited a communications system that is totally inadequate to meet the standards required of a railroad communication system. AEPCO relied on the use of UHF band that is incompatible with the VHF channels used by all railroads and thus incompatible with ACE's interchange partners and with the equipment that is installed on locomotives. AEPCO also assumed the use of off-the-shelf equipment that lacks the necessary coverage and reliability for a railroad system. Railroads require a fully integrated system with wide coverage and virtually no downtime. Defendants show that AEPCO's proposed system cannot meet those standards. Moreover, as with its signal costs, AEPCO's costs for a microwave system are based on only the bare shell of a system – AEPCO provided only the costs for the towers but ignored costs for the equipment that is needed across the railroad to interface with the microwave system. AEPCO totally ignored the costs for installing data and radio equipment at control points and PBX telephone equipment at yards and offices, all of which must interface with the microwave system. Finally, AEPCO underestimated the number of microwave towers that would be needed for an all digital all wireless system across

the ACE route. In contrast, defendants provided a detailed, bottom up development of the costs of the communication system the ACE would need to support safe and reliable operations.

Mobilization: AEPCO's mobilization evidence also is a result-oriented attempt to reduce construction costs. AEPCO rehashes old arguments for using a low one percent factor for mobilization and for disregarding entirely the costs for performance bonds and demobilization. The Board's most recent decision in *CP&L* made it clear that much higher mobilization costs, as well as performance bond and demobilization costs, are appropriate in SAC cases.

Engineering and Contingency: To further reduce capital carrying costs, AEPCO, like other SAC complainants, assumed an extraordinarily fast construction schedule for the ACE, requiring construction of multiple units on a parallel time schedule. While theoretically feasible, this type of construction schedule for a project the size and complexity of a major railroad would require enormous engineering and construction management resources. Moreover, defendants show that the use of the Board's standard ten percent contingency factor makes sense *only* if that percentage is used in conjunction with the necessary engineering services that make such a low contingency factor reasonable. Here AEPCO argues for both eliminating the essential preliminary planning studies and construction management *and* reducing the already low contingency factor to only eight percent.

Industry sources agree that the level of contingency is directly related to the amount of engineering. A project that has been carefully and thoroughly designed may properly assume a low contingency of 10 percent. But it is clearly inappropriate to assume both an unprecedented low amount of engineering work and a low contingency, as AEPCO does here. Defendants present an estimate of the engineering costs based on percentages supported by RS Means and other well-established industry publications with respect to the reasonable engineering services

that would be required to construct a railroad with the aggressive construction schedule of the SARR. Defendants' evidence is the best evidence of record on this important cost item.

6. Results Of The SAC Analysis

Table I-1 below presents the results of defendants' SAC analysis. When the SAC test is properly implemented, it is clear that SAC costs exceed SAC revenues. Accordingly, the challenged rates do not exceed a reasonable maximum rate and AEPCO's complaint should be dismissed.

Table I-1
Summary of Stand-Alone Cost Results - ACE
(All Figures in Millions of Dollars)

Year	Annual Revenue	Stand-Alone Cost	Difference
2001	\$393.4	\$567.8	(\$174.4)
2002	392.4	553.8	(161.4)
2003	394.1	565.9	(171.8)
2004	394.6	581.8	(187.1)
2005	399.3	594.6	(195.3)
2006	403.1	608.9	(205.8)
2007	409.1	624.7	(215.5)
2008	416.7	638.6	(221.9)
2009	425.5	654.4	(228.9)
2010	428.6	670.3	(241.8)
2011	431.7	686.8	(255.1)
2012	434.9	703.7	(268.8)
2013	438.2	721.0	(282.8)
2014	441.5	738.8	(297.3)
2015	444.9	757.0	(312.1)
2016	448.3	775.7	(327.4)
2017	451.8	794.9	(343.1)
2018	455.4	814.6	(359.2)
2019	459.1	834.8	(375.7)
2020	462.7	855.5	(392.7)

Respectfully submitted,

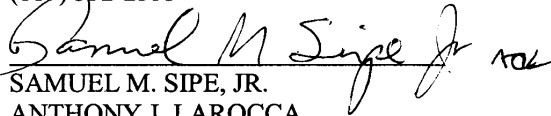
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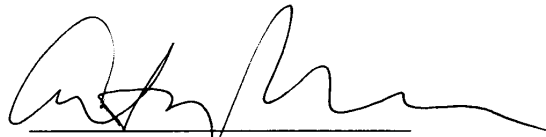
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January 26, 2004

CERTIFICATE OF SERVICE

I hereby certify that on January 26, 2004, I caused a copy of the foregoing Supplemental Reply Evidence of The Burlington Northern and Santa Fe Railway Company and Union Pacific Railroad Company to be served by hand upon the following counsel for Arizona Electric Power Cooperative, Inc.:

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III. STAND-ALONE COST

A. TRAFFIC GROUP

AEPCO vastly overstates the revenues available to its SARR, primarily by assigning ACE a disproportionate share of revenues from cross-over traffic and miscalculating the future revenues available from that traffic.

AEPCO's opening evidence failed to posit credible traffic assumptions for the SARR. AEPCO improperly "adjusted" defendants' traffic data to develop SARR revenues and tonnages that exceeded the actual revenue and tonnages moving over the lines replicated by the SARR. *November 19 Decision* at 3. However, at a Board-sponsored technical conference, the parties agreed to base the supplemental evidentiary submissions required by the Board's November 19 decision on the "alternate" traffic case proffered in AEPCO's July 3, 2003 rebuttal filing; they further agreed that defendants could contest AEPCO's calculation of ACE's revenues from that traffic universe.¹ Unlike AEPCO's opening evidence, the "alternate" traffic case did not incorporate large, unjustifiable adjustments to defendants' traffic data. Consequently, defendants were able to identify the SARR traffic group and develop meaningful reply evidence, although they do so under protest.

AEPCO based its SAC analysis on a SARR that will transport coal and non-coal traffic over its lines in New Mexico, Texas and Arizona from 2001 through 2020. ACE consists of three legs – a northern east/west leg that replicates portions of the former Atchison Topeka and Santa Fe Railway Company ("ATSF") (now BNSF) mainline in New Mexico, a southern

¹ This "alternate" traffic presentation is described in AEPCO's Rebuttal Nar. at I-3 and presented in AEPCO's Rebuttal electronic workpapers at "ACE Non-Coal Traffic and Revenue Forecast-Rebuttal.xls" worksheet "Exhibit III-A-15" and at "Match Results 2001(III-A-7 & III-A-9p1).xls" worksheet "Summary."

east/west leg that replicates the former Southern Pacific Railroad (“SPRR”) (now UP) mainline between El Paso, Texas, and Cochise, Arizona, and a former SPRR north/south leg that links Vaughn (at the eastern end of the northern leg) and El Paso (at the eastern end of the southern leg). ACE does not replicate the Vaughn to El Paso leg. Rather, it purports to use BNSF trackage rights over this segment of UP. AEPCO’s opening evidence contains a schematic of ACE in Exhibit III-A-1.

In base year 2001, AEPCO hypothesizes that ACE will transport over 84 million total tons of traffic, consisting of 13 million tons of coal traffic and over 71 million tons of non-coal traffic.² The vast majority of ACE’s traffic – about 99 percent of its total volume and 100 percent of its non-coal volume in 2001 – is cross-over traffic.³ For all of its non-coal traffic, ACE is strictly a bridge carrier – it neither originates nor terminates any of this cross-over traffic; nor does it perform any intermediate switching, other than bad-order switching.

The Board should not permit AEPCO to rely on cross-over traffic as the predominant source of revenue for its SARR. BNSF’s May 2003 reply evidence explained how reliance on cross-over traffic precludes a thorough comparison of revenues and costs, which is the essence of the SAC test.⁴ As defendants further explain in section I.B, use of cross-over traffic opens the door to significant manipulations of a SAC analysis. Such manipulations are manifest in this case. For example, most of ACE’s traffic – over 71 percent of total SARR revenue in 2001 as

² AEPCO Rebuttal electronic workpaper “ACE Non-Coal Traffic and Revenue Forecast-Rebuttal.xls” and Opening electronic workpaper “ACE Coal Traffic and Revenue Forecast.xls.”

³ “Cross-over traffic” is traffic currently handled in its entirety by the incumbent railroad or railroads (here BNSF and UP) that the complainant assumes would move in interline service between the SARR and the incumbents. See *PPL* at 7, n.13.

⁴ BNSF Reply Nar. at III.A-20 to III.A-38.

calculated by AEPCO – is intermodal and automotive traffic, which is exempt from Board regulation because it is subject to vigorous competition that constrains rates. BNSF/UP Supplemental Reply Exh. III.A-1.⁵ Nevertheless, as explained below, even under AEPCO’s “alternate” traffic case, the SAC revenues that AEPCO associates with this exempt traffic exceed the SAC costs that AEPCO developed. This outcome is nonsensical.

One significant explanation for AEPCO’s absurd result is that AEPCO vastly overstates the revenues available to its SARR by assigning ACE a disproportionate share of revenues from cross-over traffic and overstating projected revenues from that traffic.

As defendants show in section III.A.3.c, AEPCO assigns ACE a disproportionate share of cross-over revenues. AEPCO’s divisions are based on the MMP method of allocating cross-over revenues, which AEPCO viewed as a surrogate for market-based divisions. Despite the Board’s holding in *Duke/NS* that cross-over revenues ought to be allocated between the SARR and the incumbent based on relative costs, AEPCO opted not to revise its case-in-chief, and thus it ignored the issue of the relative costs to provide cross-over service on the on-SARR and off-SARR segments of cross-over movements. It made no effort to account for the apportionment between ACE and the residual defendants of the costs of originating, terminating, and otherwise handling cross-over traffic. In addition, AEPCO takes inappropriately large divisions from coal traffic it proposes to re-route via Vaughn and El Paso, and it overstates the number of line-haul miles that ACE will handle the overhead cross-over traffic it interchanges with UP.

In contrast to AEPCO, defendants in this supplemental reply evidence develop reasonable, cost-based allocations of revenue on cross-over movements. If the Board permits

⁵ More detail is provided in BNSF/UP Supplemental Reply electronic workpaper “ACE Traffic summary.xls.”

AEPCO to rely on cross-over traffic, it must adopt defendants' method of allocating revenue from that traffic, rather than AEPCO's distorted revenue divisions.

As defendants show in section III.A.3.d, AEPCO also overstates ACE's future revenue in several ways. AEPCO's most significant error is its reliance on an outdated DRI-WEFA forecast of railroad cost indices. AEPCO also misapplies UP's internal forecasts in projecting revenue increases for cross-over traffic interchanged between ACE and UP.

Defendants correct these and other errors in AEPCO's calculation of ACE's revenues in this supplemental reply.

Defendants' evidence in this section is supported by four witnesses – Benton V. Fisher, a Managing Director, and Julie Murphy, a Director, at FTI Consulting; William K. Berry, former Vice President-Intermodal for Canadian National Railway; and Richard A. Gray, General Director, Premium Operations, UP. The qualifications and verifications for these witnesses appear in Section IV.

1. Stand-Alone Railroad Traffic

As explained above, the parties agreed to base their supplemental evidentiary submissions on the "alternate" traffic case submitted by AEPCO in its July 3, 2003 rebuttal filing. Although defendants no longer contend that AEPCO's designation of its stand-alone traffic group is fundamentally flawed, they do not agree that all of the designated traffic is properly included in ACE's traffic group. Specifically, ACE's traffic group improperly includes California Portland Cement ("CPC") coal traffic moving from York Canyon, New Mexico, to Rillito, Arizona.⁶ Board precedent imposes limits on a complainant's right to select traffic for its SARR. In this case, AEPCO has exceeded those limits by substantially altering the service

⁶ AEPCO Opening Exh. III-A-6, row 14.

provided to this customer and failing to meet its burden of demonstrating that the affected customer would accept the change.

As the Board recently explained, “[a] core SAC principle is that the SARR must meet the transportation needs of the traffic it would serve. Thus, the proponent of a SARR may not assume a changed level of service to suit its proposed configuration and operating plan, unless it also presents evidence showing that the affected shippers, connecting carriers, and receivers would not object.” *CP&LNS* at 23. Under this standard, ACE’s traffic group improperly includes CPC’s traffic to Rillito. As AEPCO recognizes, that traffic currently moves in less-than-trainload shipments.⁷ In 2001, UP delivered {

}.⁸ However, AEPCO’s workpapers suggest that ACE will handle this traffic very differently: it will deliver coal far less frequently and in greater volume per delivery, using only { } unit trains containing an average of { } cars.⁹

AEPCO has not even attempted to meet its burden of showing that CPC would accept the change in service. It has not shown that CPC’s Rillito plant has the capacity to accept trains nearly 50 percent longer than the trains it has been receiving. Nor has it shown that CPC would accept a service schedule that included 40 percent fewer deliveries of larger quantities. AEPCO has thus “failed to demonstrate that the service [ACE] would provide would be acceptable to all

⁷ AEPCO Rebuttal Nar. at III-B-10 n.10; *see also* April 18 Petition, Salzman VS at 4 n. 3.

⁸ AEPCO Opening electronic workpaper “ACE Coal Traffic and Revenue Forecast.xls” worksheet “UP total 01-02 Coal.”

⁹ AEPCO Opening electronic workpaper “ACE Coal Traffic and Revenue Forecast.xls” worksheet “2001 Statistics” reports the same total net tons of this coal, but { } cars per train.

of the affected shippers and mines involved.” *CP&L/NS* at 26. Defendants should not be required to guess how AEPCO would modify the ACE’s operating plan to meet CPC’s transportation needs. Under these circumstances, the most appropriate remedy is to exclude CPC’s coal traffic from ACE’s traffic group.¹⁰

2. Stand-Alone Railroad Volumes

AEPCO includes both coal and non-coal volumes in its SARR traffic group. Defendants address coal and non-coal volumes separately.

a. Historical Volumes

(1) Coal

Defendants do not dispute ACE’s coal volumes for base year 2001, with the exception that they exclude from their SAC analysis the rerouted coal traffic described above in section III.A.1.

¹⁰ If the Board does not exclude this traffic from ACE’s traffic group, then, at the very least, it should not allow AEPCO to collect a division of CPC’s revenues based on its proposed routing. The traffic currently moves over BNSF’s line between Belen and Deming, where it is interchanged with UP. AEPCO proposes to reroute the traffic over a significantly longer route, using trackage rights over UP between Vaughn and El Paso. The Board should not permit AEPCO “to inappropriately shift a greater share of the revenues from the movement onto the SARR” by increasing its own length of haul. *CP&L/NS* at 21. Instead, the Board should ensure that defendants retain the revenues they would have received for their handling of the traffic if AEPCO had replicated the actual routing (*i.e.*, the share of revenues to which they would be entitled were the York Canyon-Belen and Cochise-Rillito segments 52 percent of total route miles, as they are when the traffic moves via BNSF’s Belen-Deming line). See III.A.3.c.(3), *infra*.

(2) Non-Coal

Defendants do not dispute ACE's approach to developing non-coal volumes for base year 2001, but correct an erroneous calculation in AEPCO's underlying work papers.¹¹ In its Rebuttal, AEPCO recognized that it had erroneously included certain local shipments that typically either originated or terminated in Albuquerque, Deming, or El Paso. AEPCO Rebuttal Narr. at III-A-21, n. 13. Although AEPCO identified about 17,000 such local units,¹² it erroneously failed to exclude most of these local shipments from its traffic group.¹³ Defendants correct this error in AEPCO's spreadsheet.¹⁴

b. Projected Volumes

(1) Projected Coal Volumes

AEPCO caps ACE's coal volumes for the years 2002 to 2020 at the 2001 coal tonnage level, though the volumes fluctuate in the first few years of the 20-year DCF period. Defendants correct one error in AEPCO's coal volume projections. AEPCO's coal volume forecast incorrectly assumes that five units operate at Arizona Public Service Company's ("APS") Cholla

¹¹ BNSF/UP.SUPPRP.WP.III.A-0053 and BNSF/UP Supplemental Reply electronic workpapers "ALB_TRAF_01-RR Revised.xls" and "Match Results 2001-RR Revised" worksheet "bngfsactrn01 - BNSF GF Loads."

¹² AEPCO Rebuttal electronic workpaper "ALB_TRAF_01.xls."

¹³ BNSF/UP.SUPPRP.WP.III.A-0053, showing an extract from AEPCO Rebuttal electronic workpaper "ALB_TRAF_01.xls."

¹⁴ BNSF/UP.SUPPRP.WP.III.A-0051 to 0054, BNSF/UP Supplemental Reply electronic workpapers "ALB_TRAF_01-RR Revised.xls" and "Match Results 2001-RR Revised." BNSF/UP Supplemental Reply Exh. III.A-6 shows the minor impact of this correction on the ACE's non-coal tonnage volumes.

plant.¹⁵ In fact, only four units operate at Cholla.¹⁶ Consequently, defendants exclude capacity associated with this non-existent unit. Defendants' correction of this error reduces the coal volumes projected to be delivered to Cholla beginning 2005.¹⁷ Defendants revised coal volume forecast is summarized in BNSF/UP Supplemental Reply Exh. III.A-2.

(2) Projected Non-Coal Volumes

Defendants do not dispute AEPCO's projected non-coal traffic volumes for 2002-2020. AEPCO holds ACE's non-coal traffic volumes for that period constant at 2001 tonnage levels in the aggregate and by commodity group.

3. Stand-Alone Railroad Revenues (Historical and Projected)

a. Single-Line Revenues

The single-line service in this case is limited to AEPCO's issue traffic – coal moving from the McKinley and Lee Ranch mines to AEPCO's Apache Station. This traffic, consisting of approximately 954,000 tons in 2001 and only 200,000 tons by 2004, accounts for less than one percent of the total ACE volume estimated by AEPCO.¹⁸ Defendants do not dispute

¹⁵ AEPCO Opening electronic workpaper "ACE Coal Traffic and Revenue Forecast.xls" worksheet "85% Plant Capacity Factors."

¹⁶ See EIA report Existing Electric Generating Units in the United States by State, Company and Plant, 2002. A copy of this EIA report is included in defendants' workpapers at BNSF/UP.SUPPRP.WP.III-A-003. This EIA report can also be located at <http://www.eia.doe.gov/cneaf/electricity/page/capacity/capacity.html>.

¹⁷ BNSF/UP Supplemental Reply electronic workpaper "ACE Coal Traffic and Revenue Forecast_BNSF&UP Revised.xls."

¹⁸ AEPCO Opening Exh. III-A-6, rows 1, 4. {
}

AEPCO's calculation of revenues for AEPCO's issue traffic in the years 2001 through 2003, which is based upon rates in the applicable tariffs in those years.¹⁹

However, defendants do not accept AEPCO's calculation of issue traffic revenues for the years 2004 to 2020. AEPCO develops revenues for the issue traffic in those years based upon the average annual rate increase in the applicable tariffs between 2001 and 2002.²⁰ Rather than using AEPCO's approach, defendants use the applicable 2004 tariff to calculate issue traffic revenues in 2004.²¹

For the years 2005 through 2020, defendants reject AEPCO's use of the annual rate increase charged by the carriers between 2001 and 2002 because it is not the best evidence of future revenues for the issue traffic. Under AEPCO's approach, issue traffic revenues increase at an average annual rate of one percent from 2005 through 2020.²² However, AEPCO's approach does not consider defendants' 2003 and 2004 tariffs for the issue traffic. The rate levels in the

¹⁹ AEPCO Opening Nar. at III-A-25.

²⁰ AEPCO Opening electronic workpaper "ACE Coal Traffic and Revenue Forecast.xls" worksheet "2001-2020 Traffic and Revenue." AEPCO incorrectly states in its opening narrative at III-A-25 that it projects rates for the issue traffic based upon the average annual increase in the tariff rates between 2001 and 2003. However, the cited electronic workpaper shows that AEPCO in fact projects issue traffic revenues based upon 2001 and 2002 tariff rates.

²¹ BNSF/UP Supplemental Reply electronic workpaper "ACE Coal Traffic and Revenue Forecast_BNSF&UP Revised.xls" worksheet "2001-2020 Traffic and Revenue." A copy of the 2004 common carrier pricing authority for the issue traffic is included in the Railroads Supplemental Reply workpapers at BNSF/UP.SUPPRP.WP.III-A-0018 to 0022.

²² AEPCO Opening electronic workpaper "ACE Coal Traffic and Revenue Forecast.xls" worksheet "2001-2020 Traffic and Revenue."

2004 tariff are 3.0 percent higher than the rate levels in the 2003 tariff.²³ Thus, AEPCO's approach will likely understate the future revenues for the issue traffic.

Rather than using AEPCO's approach, defendants project revenues for the issue traffic in the years 2005 to 2020 based upon the average annual change in the most current RCAF-U forecast of railroad costs.²⁴ The overall issue traffic rate increases from 2001 to 2003 closely tracked changes in the most current RCAF-U forecast in those years.²⁵ The overall issue traffic rate increases from 2001 to 2004 exceed changes in the RCAF-U forecast in those years.²⁶ Since escalation under the RCAF-U forecast has been consistent with or lower than the actual rate increases applied to the issue traffic under the tariffs to date, defendants use this published railroad index to calculate future revenues for the issue traffic from 2005 through 2020.²⁷

²³ BNSF/UP Supplemental Reply electronic workpaper "Summary of AEPCO Tariff Rate and Change in RCAF U.xls."

²⁴ The RCAF-U forecast is published quarterly by DRI-WEFA (now Global Insights). The most current RCAF-U forecast was published in December 2003. It is included in the Railroads Supplemental Reply workpapers at BNSF/UP.SUPPRP.WP. III-A-0005 to 0008.

²⁵ BNSF/UP Supplemental Reply electronic workpaper "Summary of AEPCO Tariff Rate and Change in RCAF U.xls." From 2001 through 2003, the most current RCAF-U forecast reflects a rate increase of 4.1 percent and the issue traffic tariffs show a rate increase of 4.0 percent.

²⁶ From 2001 through 2004, the most current RCAF-U forecast reflects a rate increase of 5.2 percent and the issue traffic tariffs reflect a rate increase of 7.1 percent. BNSF/UP Supplemental Reply electronic workpaper "Summary of AEPCO Tariff Rate and Change in RCAF U.xls."

²⁷ BNSF/UP Supplemental Reply electronic workpaper "ACE Coal Traffic and Revenue Forecast_BNSF&UP Revised.xls" worksheet "2001-2020 Traffic and Revenue."

b. Divisions of Revenue – Existing Interchanges

Division of revenues at existing interchanges is not an issue in this case. ACE will not interchange any rail traffic with carriers other than the residual BNSF and UP. Traffic that ACE interchanges with the residual defendants will be cross-over traffic moving via new interchanges.

c. Divisions of Revenue – Cross-Over Traffic

AEPCO has claimed grossly excessive divisions of revenue on cross-over traffic movements. Its SAC analysis produces the implausible result that ACE's revenues from exempt intermodal and automotive traffic alone exceed total SAC costs calculated by AEPCO.

BNSF/UP Supplemental Reply Exh. III.A-1. As defendants pointed out previously, evidence suggesting that rates on traffic that is by definition competitive are set at supracompetitive levels is irrational and cannot be relied upon by the Board. In fact, AEPCO claims a disproportional share of revenues in relation to the costs of moving this traffic over the portions of defendants' lines that are replicated by the SARR

AEPCO tries to justify its implausible result by claiming that "just because intermodal traffic may be 'marginal' and/or exempted from rate regulation in general does not mean that the particular traffic that passes over the ACE's route is, in fact, marginal." AEPCO Rebuttal Nar. at III-A-34. AEPCO's suggestion is that ACE only handles defendants' most profitable intermodal traffic or that ACE's exempt traffic is somehow different and more profitable than the bulk of defendants' exempt traffic. This is incorrect. AEPCO's SARR carves out segments of defendants' primary intermodal routes, and AEPCO selected for ACE all of the overhead traffic passing over those routes. AEPCO made no attempt to distinguish between high-margin and low-margin traffic in making its traffic selection.

Moreover, AEPCO's own analysis of a supposed random sample of ACE moves shows that the average R/VC ratios on the exempt intermodal and automotive traffic handled by the

ACE are well below the Board's jurisdictional threshold. AEPCO Rebuttal Table III-A-11.

Indeed, AEPCO's analysis shows that BNSF's intermodal traffic -- which constitutes the largest category of ACE traffic -- barely generates revenues in excess of variable costs. *Id.* How is it then that traffic carried at rates that are presumptively reasonable can yield an outcome showing stand-alone revenues vastly in excess of costs?

AEPCO's answer to this question is that, even if the exempt traffic generates only a small amount of contribution to unattributable costs, "such contributions may, in the aggregate, result in an enormous contribution, particularly where there is a large volume of traffic, as is the case on the BNSF and UP lines replaced by the ACE." AEPCO Rebuttal Nar. at III-A-35. It is indisputable that economies of density exist on defendants' lines. But AEPCO does not contend that the economies of density are such that the through revenues generated by defendants' exempt traffic over the relevant corridors - in this case, BNSF's and UP's transcontinental mainlines - exceed the full SAC costs of building those rail lines and operating over them. Indeed, such a conclusion would be directly inconsistent with the fact that rates on the exempt traffic moving over these corridors are constrained to reasonable levels by widespread competition.

Rather than contending that the rates on intermodal traffic would be found to be supracompetitive under a properly conducted SAC test, AEPCO focuses only on the economies of density on the particular segment of the SARR that the ACE replicates - the overhead segments between Defiance and Vaughn on the BNSF lines and between Cochise and El Paso on the UP lines. AEPCO's argument appears to be that the exempt overhead traffic on these lines is handled so efficiently and there is so much of this traffic that it is reasonable to expect that the

SAC revenues for this overhead service exceed SAC costs for construction of and operation over the segments in question.

In effect, AEPCO is arguing that the exempt traffic is generating excessive revenues for the overhead portion of service on the lines replicated by the SARR, even though it is not generating excessive revenues on the through, end-to-end movements. The obvious cause of this anomalous situation is that AEPCO has vastly over-allocated revenue to the on-SARR overhead portions of cross-over movements.

In *Duke/NS* and *CP&L/NS*, the Board concluded that cross-over traffic revenues should be allocated between the SARR and the residual defendant on the basis of the “defendant’s relative costs of providing service” over the segments replicated by the SARR and those left to the residual defendant. *Duke/NS* at 20. A significant reason why AEPCO’s analysis produces such implausible results is that it does not accurately reflect the relative on-SARR and off-SARR costs of handling cross-over traffic as required by *Duke/NS* and *CP&L/NS*. AEPCO made no effort to adjust its revenue divisions to address the implications of those decisions. In fact, AEPCO affirmatively declined the opportunity to file new evidence and chose instead to rely on its patently inaccurate and inadequate rebuttal evidence on divisions.

As defendants show below, AEPCO’s revenue divisions do not accurately reflect defendants’ costs of originating, terminating, interchanging and switching cross-over traffic on the residual defendants’ portions of the network. In addition, AEPCO credits ACE with an inappropriately large share of the revenue from rerouted coal traffic, and it overstates the on-SARR line haul miles and thus the associated on-SARR costs for a significant amount of cross-over traffic that AEPCO proposes to interchange between UP and ACE.

(1) MSP versus MMP

In its opening and rebuttal evidence, AEPCO relied on the MMP method of allocating cross-over revenue between the SARR and the residual defendants. However, in *Duke/NS*, the Board rejected the MMP approach used in previous cases and substituted the so-called MSP approach because it would “better approximate the relative costs the defendant railroad incurs to haul this traffic over each of the segments, by applying the reasonable assumption that average total costs are a continuous function of distance.” *Id.* at 24-25. The Board’s *Duke/NS* decision forecloses AEPCO’s reliance on the MMP approach to allocate cross-over revenues between ACE and the residual incumbents. As shown in BNSF/UP Supplemental Reply Exh. III.A-3, applying the MSP approach to the cross-over traffic in this case yields revenue divisions for ACE that are on average 12 percent lower than those generated by the MMP approach.²⁸

(2) Origination, Termination, Interchange and Switching Costs

The MSP approach is preferable to the MMP approach, but an application of the “generic” MSP approach that the Board used in *Duke/NS* still would not realistically apportion defendants’ costs between the on-SARR and off-SARR portion of their networks in this case.²⁹

²⁸ BNSF/UP.SUPPRP.WP.III-A-0055 to 0057; BNSF/UP Supplemental Reply electronic workpaper “Restated Traffic and Revenue Summary.xls” work sheet “MSP.”

²⁹ In other pending SAC cases involving predominantly large volumes of cross-over coal traffic, BNSF is advocating the use of a cost-based revenue allocation procedure that takes into account densities as well as length of haul as factors bearing on costs. BNSF’s proposed Density Adjusted Revenue Allocation (“DARA”) procedure allocates revenues sufficient to cover the attributable costs of on-SARR and off-SARR segments of cross-over movements by developing variable costs in accordance with the Board’s Ex Parte No. 399 costing procedures. Here, as discussed below, defendants have concluded that URCS costs do not provide a reliable basis for developing the attributable costs of intermodal movements. Moreover, the amount of contribution to be allocated on intermodal and automotive traffic under the second step of the DARA procedure that takes density into account is relatively modest in this case. For these

The Board's application of MSP in *Duke/NS* allocated revenue based on "the total mileage hauled by the SARR and the residual carrier, while retaining a 100-mile additive for originating and terminating the traffic" that it had used when applying the MMP approach. *Duke/NS* at 24. The Board continued to use the "equivalent of a 100-mile share of costs" because it had used that approach in the past "as a surrogate for the costs of providing originating or terminating service" and the parties had not provided any better evidence of those costs. *Id.* at 24 n.37.

In the circumstances of this case, the generic MSP approach, with its 100-mile additive for originating or terminating traffic, does not accurately apportion the residual incumbents' costs of originating, terminating, interchanging and switching the cross-over traffic handled by AEPCO's SARR. ACE replicates two short segments in the middle of UP's and BNSF's transcontinental mainlines that run through sparsely populated areas of New Mexico and Arizona. It does not operate in any of the high-cost urban areas in which UP and BNSF must own facilities and conduct operations in order to serve the cross-over traffic. It proposes to conduct a purely "hook and haul" operation in which it will not originate or terminate any trains, but instead will run intact trains received from each residual defendant across its mainline at high speed, performing no intermediate switching, and deliver those same trains to the residual railroad at the other end of ACE's short high-speed mainline segments.³⁰ AEPCO has no doubt made the choice to replicate only these small portions of UP's and BNSF's systems to reduce the operating and investment costs of its SARR. However, the relatively low costs of operating on the segments of defendants' lines that ACE replicates have significant implications for the

reasons, defendants have not attempted to incorporate a density adjustment into their revenue allocations on cross-over traffic in this proceeding.

³⁰ AEPCO Opening Nar. at III-A-3.

allocation of revenues from cross-over traffic between the SARR and the residual incumbents on the basis of relative cost.

There is compelling evidence in this case that ACE is entitled to much lower revenue divisions than those that would be produced by a rote application of the generic MSP approach.

(a) Intermodal Traffic

Intermodal traffic accounts for approximately 65 percent of the cross-over traffic selected by AEPCO by total revenue.³¹ AEPCO's evidence significantly overstates ACE's appropriate share of revenue from intermodal cross-over traffic.

Intermodal traffic is typically characterized by relatively low line-haul costs and relatively high origination and termination costs. According to Mr. Berry, who is familiar with all types of rail traffic, intermodal terminal operations are the most complex and costly operations in the railroad industry. The disparity between intermodal terminal costs and line-haul costs is especially pronounced in the case of the intermodal cross-over traffic that AEPCO selected for ACE, which is long-haul transcontinental traffic, much of which moves in efficient double-stack equipment. The costs of originating and terminating such traffic are, on average, equivalent to many more than the 100 miles of line-haul costs assumed by the generic MSP approach. As explained below, defendants' average costs of originating and terminating the intermodal traffic moving over AEPCO's SARR are equivalent to 500 miles of line-haul costs per unit for each origination or termination.³²

³¹ BNSF/UP Supplemental Reply electronic workpaper "ACE Traffic summary.xls."

³² BNSF/UP.SUPPRP.WP.III-A-0058 to 0067 and BNSF/UP Supplemental Reply electronic workpaper "Intermodal Cost Matrix."

In addition, as also explained below, defendants incur significant costs when they interchange intermodal traffic with connecting carriers, whether by rail (*i.e.*, steel-wheel interchanges) or by road (*i.e.*, rubber-tire interchanges). The defendants' interchange costs for the intermodal traffic moving on AEPCO's SARR are, on average, equivalent to 140 miles of line-haul costs per unit for traffic forwarded to or received from a connecting carrier.³³

Finally, the residual incumbents perform a significant amount of intratrain and intertrain switching on the intermodal cross-over traffic on the line-haul portion of their routes. ACE performs no comparable switching. As explained below, defendants' costs for switching the intermodal cross-over traffic are, on average, equivalent to 20 miles of line-haul costs for each intermodal unit.³⁴

i) Origination and Termination Costs

It is widely acknowledged that the Board's Uniform Rail Costing System does not produce satisfactory estimates of the costs associated with rail intermodal transportation, including terminal activities. *See Review of the General Purpose Costing System*, 2 S.T.B. 659, 662-63 (1997); AEPCO Rebuttal Exh. III-A-10 at 3-6. In order to establish a more accurate measure of the costs of originating and terminating the cross-over intermodal traffic, defendants retained William K. Berry to develop costs for the various activities involved in handling that traffic. Mr. Berry most recently served as Vice President-Intermodal for Canadian National Railway. Section IV contains a complete statement of Mr. Berry's qualifications.

Mr. Berry developed the costs incurred by defendants per intermodal unit (trailer or container) for intermodal originations and terminations. He did so by identifying the various

³³ *Id.*

³⁴ *Id.*

terminal activities required to originate or terminate intermodal traffic and determining the costs associated with those activities. He based his analysis on information in the public domain, his discussions with knowledgeable railroad personnel and review of railroad data, and his own accumulated knowledge and experience of intermodal operations and marketing.³⁵

In developing his analysis, Mr. Berry considered seven basic categories of terminal activities and their associated costs:

Lift Costs. Lift costs are the costs associated with loading a container or trailer onto a railcar or removing it from a railcar. These costs include the per unit ownership and operating costs for the lift equipment itself, ownership and operating costs of hostling tractors used to move loaded and empty trailers and containers in intermodal terminals, wages for terminal employees, clerical costs, and gate inspection costs. Mr. Berry concluded that, on average for the intermodal traffic that AEPCO selected for its SARR traffic group, lift costs amount to \$30 per unit for each origination or termination event.³⁶

Switching Costs. These are the costs of switching blocks of loaded and empty cars into and out of trains at origin or destination, as well as the costs of positioning cars during the loading and unloading process. Mr. Berry concluded that, on average for the intermodal traffic

³⁵ BNSF/UP.SUPPRP.WP.III-A-0068 to 0081.

³⁶ Mr. Berry relied on his personal knowledge and experience in developing per unit lift costs. He also reviewed a study prepared by the Foundation for Intermodal Research & Education, in association with the U.S. Department of Transportation and the Federal Railroad Administration (the "FIRE Study"). BNSF/UP.SUPPRP.WP.III-A-0082 to 0132. He discussed both the inputs and the results with the study's authors. BNSF/UP.SUPPRP.WP.III-A-0068 to 0076. Mr. Berry's lift costs are consistent with the FIRE Study's findings.

that AEPCO selected for its SARR traffic group, switching costs amount to \$9.38 per unit for each origination or termination event.³⁷

Sales, Billing, Claims, and Collections Costs. These are the customer-relations costs borne by the carriers that originate and terminate intermodal movements, who serve as the points of contact for intermodal customers. Mr. Berry concluded that, on average for the intermodal traffic that AEPCO selected for its SARR traffic group, these “back office” costs amount to \$10 per unit for each origination or termination event.³⁸

Terminal Car Costs. These are the car ownership costs for the time that intermodal cars spend in terminals during the loading and unloading process. Mr. Berry concluded that, on average for the intermodal traffic that AEPCO selected for its SARR traffic group, these costs amount to \$3.78 per unit for each origination or termination event.³⁹

Terminal Trailer & Container Costs for Rail Supplied Equipment. These are equipment ownership costs for the time that railroad-owned containers spend in terminals during the origination or termination process. Mr. Berry concluded that, on average for the intermodal traffic that AEPCO selected for its SARR traffic group, these costs amount to \$33 per unit for each origination or termination event when traffic moves in railroad-owned trailers or containers.

³⁷ Based on his personal knowledge and experience with intermodal operations, Mr. Berry concluded that the costs of switching and yard transfer activities amounted to \$4.17 per minute and 2.25 minutes per unit for each origination or termination event. BNSF/UP.SUPPRP.WP III-A-0059.

³⁸ Mr. Berry based these costs on his personal knowledge and experience with intermodal operations.

³⁹ BNSF/UP.SUPPRP.WP III-A-0059. Mr. Berry based the terminal car costs on TTX’s per diem charge for a five-unit double-stack car, as presented in the FIRE Study. BNSF/UP.SUPPRP.WP III-A-0082 to 0132. He conservatively assumed an 90-percent load factor and three-quarters of one day of terminal time for each origination or termination event.

(Although trailers are more expensive than containers, railroads incur significant additional costs associated with providing chassis for containerized traffic.) Of the intermodal traffic that AEPCO selected, approximately 20 percent moves in railroad-owned trailers or containers, which translates into an average trailer and container cost of \$6.60 per unit for each origination or termination event.⁴⁰

Rail Drayage Costs. These are the costs that railroads bear when they have responsibility for delivering units by truck to the final destination. Mr. Berry concluded that, on average for the intermodal traffic that AEPCO selected for its SARR traffic group, drayage costs amount to \$75 per dray.⁴¹ Of the intermodal traffic that AEPCO selected, approximately 4 percent is drayed at railroad expense,⁴² which translates into an average drayage cost of \$3 per unit for each origination or termination event.

Facility Capital Costs. These are the investment carrying costs associated with constructing an intermodal facility, including the costs of acquiring land for the terminal. Mr. Berry concluded that, on average for the locations handling intermodal traffic that AEPCO

⁴⁰ Mr. Berry based the trailer and container costs on information he obtained from companies that supply trailers and containers for intermodal transportation. BNSF/UP.SUPPRP.WP III-A-0068 to 0076. He used a daily cost of \$11 and assumed three days of terminal time for loading or unloading the equipment. BNSF/UP.SUPPRP.WP III-A-0059. Mr. Fisher of FTI supplied Mr. Berry with the approximate percentage of intermodal traffic in the SARR traffic group that moves in railroad-owned equipment. BNSF/UP Supplemental Reply electronic workpaper “bnrv2001 matchback route2.xls” work sheet “summary.”

⁴¹ Mr. Berry based the drayage costs on information obtained from companies serving the areas in which defendants terminate intermodal traffic selected for the SARR. BNSF/UP.SUPPRP.WP III-A-0068 to 0076.

⁴² BNSF/UP Supplemental Reply electronic workpaper “bnrv2001 matchback route2.xls” work sheet “summary.”

selected for its SARR traffic group, facility capital costs amount to \$16.50 per unit for each origination or termination event.⁴³

In sum, Mr. Berry calculates that, on average, defendants incur costs of \$79.26 per unit for each origination or termination event.⁴⁴ In AEPCO's cross-over world, these costs are borne entirely by the residual incumbents, and the revenue division that the residual incumbents receive should reflect these costs.

Mr. Berry's conclusions are conservative when compared with the most recent available evidence on intermodal terminal costs. By way of comparison, BNSF charges a fee of \$115 per unit for originating or terminating intermodal units at its Oakland International Gateway terminal.⁴⁵ This charge does not include switching costs or equipment costs for the time that loaded or empty trains remain in the terminal.⁴⁶

As another example, the recent FIRE Study estimated total costs of \$125.00 per unit for originating and terminating a unit, or \$62.50 per unit for each origination or termination event.⁴⁷ Mr. Berry learned from discussions with the authors of the FIRE Study that the study did not include certain costs that Mr. Berry included in his analysis.⁴⁸ For example, the FIRE Study's estimate of lift costs did not include capital costs associated with ownership of lift equipment or

⁴³ Mr. Berry based the facility capital costs on recent UP and BNSF experience in constructing intermodal facilities in the regions in which defendants originate and terminate intermodal traffic selected for the SARR. BNSF/UP.SUPPRP.WP.III-A-0060.

⁴⁴ BNSF/UP.SUPPRP.WP.III-A-0059.

⁴⁵ BNSF/UP.SUPPRP.WP.III-A-0077 to 0081.

⁴⁶ *Id.*

⁴⁷ BNSF/UP.SUPPRP.WP.III-A-0082 to 0132.

⁴⁸ BNSF/UP.SUPPRP.WP.III-A-0068 to 0076.

gate inspection costs. The study also used lower labor costs associated with terminal activities than defendants would incur in handling traffic in the SARR traffic group, because it assumed a drive-on/drive-off operation, in which non-railroad truck drivers, rather than railroad employees, would perform significant amounts of the terminal work. It also omitted from its calculation of total terminal costs any terminal switching costs; sales, billing, claims, and collections costs; and terminal trailer and container costs. The study included facility capital costs, but its estimate was not representative of defendants' facilities in this case, because the study was modeling intermodal operations that did not require crane pads or the acquisition of land for storage of trailers or containers.⁴⁹ Finally, the study addressed drayage costs in a separate calculation.

The costs that Mr. Berry developed can readily be converted into a conservative estimate of a line-haul mileage equivalent for originating or terminating intermodal traffic that is far more appropriate than the 100-mile block in the generic MSP approach.

To convert defendants' origination and termination costs into a mileage equivalent, it is also necessary to calculate defendants' line-haul cost per mile of handling intermodal traffic. Because URCS does not produce a satisfactory estimate of intermodal line-haul costs, defendants developed line-haul costs using a widely used, cost-based fee for the movement of intermodal units – TTX Company's current 62-cent per car-mile "Basic Mileage Rate" payment to railroad users of TTX equipment for movements of its empty intermodal cars.⁵⁰ This payment is intended to compensate the railroad for the directly attributable costs, including the variable

⁴⁹ BNSF/UP.SUPPRP.WP.III-A-0082 to 0132.

⁵⁰ BNSF/UP Supplemental Reply electronic workpaper "TTX Application Testimony.pdf."

portion of road property ownership that they incur in moving the TTX equipment.⁵¹ The TTX payment does not include certain costs that defendants incur in line-haul movements of loaded intermodal units, such as car usage charges and costs associated with railroad-owned trailers or containers, and thus defendants have adjusted the TTX base figure to incorporate those additional costs.⁵² Defendants have also translated the charge into a per-unit basis, using TTX's average of 4.9 intermodal platforms per intermodal car.⁵³ These adjustments produce line-haul costs of 15.8 cents per unit-mile.⁵⁴

Using the respective origin/termination and line-haul costs described above, Benton Fisher of FTI calculated the line-haul mileage-block equivalent of each origination and termination event. Dividing line-haul costs of 15.8 cents per unit-mile into defendants' average costs of \$79.26 per unit for each origination or termination event produces a mileage-block equivalent (rounded to the nearest five miles) of 500 miles for each origination or termination event.⁵⁵ Defendants thus restate AEPCO's revenue divisions for intermodal traffic by applying

⁵¹ BNSF/UP Supplemental Reply electronic workpaper "TTX Supplement 78.pdf."

⁵² BNSF/UP Supplemental Reply electronic workpaper "Intermodal Cost Matrix.xls" worksheet "costs & miles."

⁵³ BNSF/UP Supplemental Reply electronic workpaper "TTX Application Testimony.pdf."

⁵⁴ BNSF/UP Supplemental Reply electronic workpaper "Intermodal Cost Matrix.xls" worksheet "costs & miles." The line-haul costs produced by this methodology are quite close to those used in the FIRE Study. The line-haul costs estimates in the FIRE Study, which are almost certainly higher than the relevant line-haul costs in this case, since the FIRE Study was modeling operations between eastern cities rather than the western routes traversed by AEPCO's SARR, averaged approximately 17.5 cents per unit-mile for 200-unit trains and 21.3 cents per unit-mile for all trains in the study, including 100-unit trains. *Id.*; BNSF/UP.SUPPRP.WP.III-A-0062; III-A-0114 to 0116.

⁵⁵ \$79.26 per unit/\$0.158 per unit-mile = 501.6 miles. BNSF/UP Supplemental Reply electronic workpaper "Intermodal Cost Matrix.xls" worksheet "cost & miles."

this more appropriate mileage block for originating and terminating intermodal traffic. Of the { } units of cross-over intermodal traffic that AEPCO selected for its SARR traffic group, 65 percent were both originated and terminated by a single defendant,⁵⁶ which entitles defendants to two 500-mile credits for those units. In addition, 34 percent of the units were either originated by a defendant and forwarded to another carrier or received at interchange by a defendant and terminated,⁵⁷ which entitles defendants to a single 500-mile credit for those units, plus an interchange credit, as described below.

ii) Interchange Costs

Neither AEPCO's approach nor the generic MSP approach gives the residual incumbents any credit for the costs associated with interchanging intermodal traffic.⁵⁸ Both approaches assume that railroads incur no additional costs when they receive intermodal traffic from their connections or forward intermodal traffic to their connections. They effectively treat interchange operations as run-through movements of solid trains. However, much of the intermodal cross-over traffic in ACE's traffic group that UP and BNSF interchange with another carrier is not forwarded or received in run-through service. Instead, both railroads incur significant costs when they receive intermodal traffic from or forward it to their connections.

The types of costs associated with interchanging intermodal traffic are readily illustrated by considering UP's intermodal operations in Chicago. Of the approximately { } units of

⁵⁶ BNSF/UP Supplemental Reply electronic workpaper "bnrv2001 matchback route2" worksheet "OT & Interchange."

⁵⁷ *Id.*

⁵⁸ The discussion of the cost for interchanging intermodal traffic and the interchange factor defendants use to develop intermodal revenue for the SARR addresses only actual intermodal interchange costs incurred by the incumbents at mid-continent gateways. No interchange cost is assigned to the interchanges between the residual incumbents and ACE.

eastbound intermodal traffic to Chicago that AEPCO selected for the SARR traffic group, UP interchanged approximately { } units with another railroad – primarily NS or CSX.⁵⁹ Approximately { } percent of those units were interchanged in run-through service. The remainder required significant terminal activities, and thus significant costs, for which the generic MSP approach gives no credit to UP.⁶⁰

As explained by Richard Gray, UP's General Director, Premium Operations, UP's non-run-through operations for forwarding eastbound intermodal traffic can be divided into three categories:

First, UP must forward certain interchange traffic to its connections by truck. For example, UP does not conduct steel-wheel interchanges with CN, CP, or WC in Chicago. In addition, NS does not accept steel wheel interchange at its 63rd Street Yard. Thus, all of the intermodal units that UP forwards to CN, CP, WC, or NS's 63rd Street Yard must be lifted off a train and onto a truck, just as if UP terminated the units at its yard in Chicago, and then trucked to the connecting carrier. When UP delivers intermodal trailers or containers by rubber-tire interchange to its connections in Chicago, UP bears the drayage costs.⁶¹

Second, UP will often use steel-wheel interchange when it has a fully loaded car to one of its connections, but use rubber-tire interchange when it does not. For example, if UP has ten units for NS loaded in a five-unit (10-well) doublestack car, it typically delivers them with the

⁵⁹ BNSF/UP Supplemental Reply electronic workpaper "UP Intermodal Interchange Count.xls."

⁶⁰ *Id.*

⁶¹ As UP explained in response to AEPCO's discovery requests, UP treats these costs as expenses, not as deductions from revenue. See BNSF/UP Supplemental Reply electronic workpaper "UP Response to AEPCO Request No. 42.pdf."

car to NS. However, if UP has thirteen units for NS, and three of them are mixed in a car that also contains local traffic or traffic for another connecting carrier, UP typically delivers the NS-bound containers in the full car via steel-wheel interchange and trucks the remaining three units to NS. Again, those three units must be lifted off UP's train and onto a truck, just as if UP terminated them in Chicago. Again, UP bears the drayage costs of trucking the units to NS.

Third, even when UP uses steel-wheel interchange, the interchange process is more complicated, and thus more costly, than delivering a run-through train. When an intermodal train arrives at a UP yard in Chicago, UP switches out local traffic and interchange traffic. UP continues this process throughout the day as new trains arrive, building blocks of cars for interchange. It then provides a crew for a yard job that will move the interchange traffic to the designated interchange point. The yard job then traverses the congested Chicago terminal to the interchange point. Once it arrives, the crew drops off the interchange traffic and returns the locomotives to UP's yard. UP bears all of the costs of switching and blocking the traffic and transporting it to the designated interchange point.

UP also incurs significant costs when it receives intermodal traffic in Chicago. Of the approximately { } units of westbound intermodal traffic from Chicago that AEPCO selected for the SARR traffic group, UP interchanged approximately { } units with another railroad – again, primarily NS or CSX.⁶² UP rarely receives solid trains of westbound traffic from its connections at Chicago – approximately { } units were interchanged in run-through service.⁶³

⁶² BNSF/UP Supplemental Reply electronic workpaper "UP Intermodal Interchange Count.xls."

⁶³ *Id.*

Mr. Gray explains that, as with the traffic that UP forwards to other carriers in Chicago, traffic UP receives from other carriers may be interchanged by steel wheel or rubber tire.

First, as with eastbound traffic, certain westbound interchange traffic moves by truck according to plan. For example, as discussed above, UP does not routinely perform steel-wheel interchanges with CP, CN, or WC in Chicago. Any units UP receives from those carriers are drayed to UP's yard, and UP lifts them onto flat cars and then assembles its westbound trains. UP bears those lift and classification costs, just as if it had originated the units in Chicago.

Second, as with eastbound traffic, certain westbound interchange traffic typically moves by steel-wheel interchange when there is sufficient density, but by truck when there is not. For example, if NS has ten units for UP loaded in a five-unit doublestack car, it typically delivers a full car to UP. However, if it has thirteen units for UP, and three of those units are mixed with local traffic or traffic for another connecting carrier, NS typically delivers the full car via steel-wheel interchange and drays the remaining three units to UP. UP must lift those three units onto flat cars and then assembles its westbound trains. UP bears those lift costs, just as if it had originated the units in Chicago.

Third, as with eastbound traffic, even when UP receives westbound traffic by steel-wheel interchange, the interchange process is more complicated and thus more costly than delivering a run-through train. When UP receives westbound intermodal traffic from its connections in Chicago, it switches and blocks the cars it receives into unit trains. On occasion, UP must do more than switch and block the cars it receives. UP's connecting carriers sometimes deliver cars loaded with a mix of trailers or containers going to different destinations. When that happens, UP must remove these units from the car, stage them in the terminal, and then lift them onto an appropriate car to build solid cars to a single destination – a process that requires at least two

separate lifts. On those occasions, UP bears those costs, just as if it were both terminating an inbound unit and originating an outbound unit in Chicago.

Mr. Gray explains that UP incurs similar types of costs at other locations where it interchanges traffic that AEPCO selected for its SARR traffic group, including New Orleans, Louisiana; Marion, Arkansas (near Memphis); Memphis, Tennessee; Armourdale, Kansas (near Kansas City); and Mesquite, Texas (near Dallas). The circumstances differ somewhat by location. For example, UP's New Orleans interchanges have a relatively high percentage of eastbound and westbound run-through traffic. In the Memphis area, UP typically interchanges eastbound traffic with NS by switching onto a through train rather than a yard job. In Armourdale and Mesquite, almost all of the interchange is by rubber tire. However, at each location, UP incurs interchange costs that are not adequately considered by AEPCO's approach or the generic MSP approach to revenue division.

In order to better quantify UP's interchange costs, Mr. Gray identified on a train-by-train basis (based on AEPCO's traffic selection) the percentage of intermodal units that UP forwarded (i) on a run-through basis; (ii) by steel-wheel interchanging, requiring switching, blocking, and movement to an interchange point by a through train; (iii) by steel-wheel interchanging, requiring switching, blocking, and movement to an interchange point by a yard job; and (iv) by rubber-tire interchanging, thus requiring a lift and a dray at UP's expense.⁶⁴ Mr. Gray also identified the percentage of intermodal units that UP received (i) on a run-through basis; (ii) by steel-wheel interchanging, requiring switching and blocking, but no additional lifts; (iii) by steel-

⁶⁴ BNSF/UP Supplemental Reply electronic workpaper "UP Intermodal Interchange Count.xls" worksheet "Summary."

wheel interchanging, requiring switching and blocking, and at least two additional lifts; and (iv) by rubber-tire interchanging, requiring a lift at UP's expense.⁶⁵

On BNSF, there are four separate categories of interchange operations that occur regularly in Chicago.⁶⁶

1. Steel-wheel run-through. In this arrangement, the delivering carrier delivers an entire train to the connecting carrier. The power may or may not be run-through power. There is no terminal handling. Due to the length of the trip (hours on duty) for the road crew, a switch crew may deliver the train instead of the road crew, creating additional costs.

2. Steel-wheel being delivered with something other than a road crew. In this arrangement, cars arrive on a train, are switched into an interchange track and then delivered to the connecting carrier with a switch engine. Substantial switching costs are incurred, including the costs of a switch crew and the ownership and maintenance costs associated with switch engines.

3. Steel-wheel delivery after ramp re-work at delivering terminal. In this arrangement, cars arrive at a terminal on a train. Cars are then spotted onto a ramp track. The intermodal units are destined for mixed destination; therefore, they are deramped then reramped onto an interchange car. The car is switched into an interchange track, and then delivered to the connecting carrier with a switch engine. Substantial switching costs are incurred, as well as lift and facility ownership costs.

⁶⁵ *Id.*

⁶⁶ This information was conveyed to Mr. Fisher of FTI by BNSF intermodal personnel. *See, e.g.*, BNSF/UP.SUPPRP.WP.III-A-0063 to 0064.

4. Cross-town delivery by highway. Units arrive on a train, then are deramped and operated over a highway to the connecting carrier. Where the interchange is the responsibility of the forwarding railroad drayage costs are incurred, as well as switching costs, lift costs and facility ownership costs.

Together with Benton Fisher of FTI, Mr. Berry developed the costs associated with each type of interchange. BNSF/UP Supplemental Reply Exh. 4.⁶⁷ Mr. Berry used the same basic cost components that he calculated for originating and terminating intermodal units. However, he adjusted those components to reflect differences in handling interchange traffic as compared to originating or terminating traffic. For example, he did not include any costs for sales, billing, claims or collections. He did not include facility capital costs for interchanges that did not require a lift. He also reduced switching costs, car costs, and trailer and container costs as appropriate to the specific type of interchange to reflect the lower costs associated with less complicated interchange operations, such as those that required only set-outs and pick-ups by through trains.

Mr. Fisher then applied the costs developed by Mr. Berry to UP's and BNSF's quantifications of interchange types to produce a weighted average cost of \$22.50 per unit for forwarding or receiving intermodal traffic that AEPCO included in the SARR traffic group. BNSF/UP Supplemental Reply Exh. 4.⁶⁸ Dividing line-haul costs of 15.8 cents per unit-mile into defendants' weighted average costs of \$22.50 per unit for interchanging intermodal traffic produces a mileage equivalent (rounded to the nearest five miles) of 140 miles for each

⁶⁷ BNSF/UP Supplemental Reply electronic workpaper "Intermodal Cost Matrix.xls."

⁶⁸ *Id.*

interchange event.⁶⁹ Defendants thus restate AEPCO's revenue divisions for intermodal traffic by applying this mileage credit to each interchange event.

iii) Intrain and Intertrain ("I&I") Switching

Neither AEPCO's approach to calculating revenue divisions nor the MSP approach gives defendants appropriate credit for the costs of intratrain and intertrain switching of intermodal traffic that occurs en route. A significant amount of intermodal traffic that AEPCO selected for its SARR traffic group is switched between trains by the residual defendants at off-SARR locations.⁷⁰ For example, BNSF regularly performs substantial switching and block-swapping of intermodal cars at its yard in Clovis, New Mexico, located about 125 miles east of Vaughn near the Texas border. A westbound BNSF intermodal train destined from Alliance, Texas to northern California will also include traffic destined to Phoenix, Arizona and southern California. At Clovis, the blocks of cars destined for Phoenix and southern California will be switched out of the northern California train and switched into other intermodal trains destined for Phoenix and southern California. Other blocks of cars destined for northern California that originated at points other than Alliance will be switched into the northern California train. Similar intermediate switching occurs at Clovis on eastbound movements.

As another example, UP's intermodal traffic moving from Long Beach, California, to NS's Ashland Avenue Yard in Chicago begins its journey on a UP train to Kansas. That traffic is set out in Harrington, Kansas, and picked up by a train moving to UP's Global II Yard in Chicago. AEPCO's SARR is a "hook and haul" operation that performs none of these activities,

⁶⁹ \$22.50 per unit / \$0.158 cents per unit mile = 142.4 miles.

⁷⁰ BNSF/UP Supplemental Reply electronic workpaper "bnrv2001imdl blkswaploc.xls" worksheet "Swapping at Each Station."

so assigning line-haul costs on a mileage basis is not an appropriate proxy for allocating these costs between the on-SARR and off-SARR portions of the network.

Mr. Berry calculates that the costs associated with I&I switching activities, on average, amount to \$8.31 per switch event. BNSF/UP Supplemental Reply Exh. 4.⁷¹ Based on BNSF traffic records, Mr. Fisher determined that 34 percent of the intermodal units in ACE's traffic group were switched between trains.⁷² Applying the frequency of intermediate switch events (34 percent) to the cost (\$8.31) produces a cost per intermodal unit of \$2.82, which equates to a mileage credit (rounded to the nearest five miles) of 20 miles for each intermodal unit.⁷³ Defendants thus apply this mileage credit when they restate AEPCO's revenue divisions for intermodal traffic.

(b) Manifest Traffic

Manifest traffic accounts for approximately 17.5 percent of the cross-over traffic selected by AEPCO.⁷⁴ AEPCO's evidence also overstates ACE's appropriate division for cross-over manifest traffic.

The generic MSP approach does a poor job of allocating manifest traffic revenues between ACE and the residual incumbents for two reasons. *First*, the 100-mile block assigned by the generic MSP approach for originating or terminating traffic in the SARR traffic group understates by half the residual incumbents' relative costs of originating and terminating manifest traffic. As defendants demonstrate below using AEPCO's own evidence, they are

⁷¹ BNSF/UP Supplemental Reply electronic workpaper "Intermodal Cost Matrix.xls."

⁷² *Id.*

⁷³ \$2.82 per unit/\$0.158 per unit-mile = 17.9 miles.

⁷⁴ BNSF/UP Supplemental Reply Exh. III.A-1.

manifest traffic. As defendants demonstrate below using AEPCO's own evidence, they are entitled to almost twice the generic 100-mile mileage block for each carload of manifest traffic that they originate or terminate.⁷⁵ *Second*, the generic MSP approach assumes that line-haul costs are spread evenly across all line-haul miles and thus are incurred proportionately by the SARR and the residual incumbent. However, as defendants explain below, they incur significant costs for switching and classifying the manifest traffic that AEPCO selected for its SARR traffic group, whereas ACE incurs no such costs. Using AEPCO's own evidence, defendants show that they are entitled to a significant credit for performing all switching and classification activities for cross-over manifest traffic.⁷⁶

Defendants have therefore adjusted the MSP approach to more accurately reflect the relative apportionment of costs for handling manifest traffic between ACE and the incumbents.

i) Origination and Termination Costs

The generic MSP approach assigns a 100-mile credit to the carrier that originates or terminates traffic in the SARR traffic group. In order to develop a more accurate mileage block equivalent for originating and terminating manifest traffic, defendants rely upon the URCS cost calculations prepared by AEPCO's consultant as a "representative sampling" of ACE's manifest cross-over traffic.⁷⁷ AEPCO's consultant determined that the URCS costs for originating or terminating the manifest traffic in his sample each average \$193 per event for BNSF and \$211 per event for UP, while URCS line-costs average \$1.10 per mile for BNSF and \$1.05 per mile

⁷⁵ BNSF/UP Supplemental Reply electronic workpaper "Mileage credit summary.xls."

⁷⁶ *Id.*

⁷⁷ AEPCO Rebuttal Exh. III-A-10 at 12-14 (describing witness Whitehurst's costing of a random sample of non-coal cross-over traffic).

for UP.⁷⁸ Those figures together indicate that each origination or termination is equivalent to a mileage credit (rounded to the nearest five miles) of 180 miles for BNSF manifest traffic and 195 miles for UP manifest traffic, rather than the 100 miles used in the generic MSP approach.⁷⁹ Accordingly, defendants applied these mileage credits to each origination and termination of cross-over manifest traffic to reflect more accurately the relative on-SARR and off-SARR costs of handling that traffic.

ii) Intermediate Switching

The generic MSP approach assumes that line-haul costs are incurred proportionately by the SARR and the residual incumbent. In this case, however, the SARR operates strictly as an overhead carrier; it thus incurs none of the intermediate switching and classification costs involved in handling manifest traffic. These costs are substantial. ACE's manifest traffic is primarily "loose" carload traffic, consisting almost exclusively of movements of one or a few cars that originate or terminate at thousands of points throughout North America.⁸⁰ This traffic must be classified and reclassified multiple times between origin and destination.⁸¹ However,

⁷⁸ BNSF/UP.SUPPRP.WP.III-A-0134 to 0135; BNSF/UP Supplemental Reply electronic workpaper "Manifest Divisions, Costs and Mileage Credits.xls."

⁷⁹ For each sample move that AEPCO's consultant costed, Mr. Fisher calculated the average credit for each origination or termination by determining the average cost per terminal event for each move, dividing that cost by the respective defendant's line-haul costs to generate a mileage equivalent for each move, and then calculating a simple average across the sample moves. *Id.*

⁸⁰ BNSF Reply Exh., I-3; UP Reply Map 2; BNSF/UP Supplemental Reply electronic workpapers "wb summary" and "up waybill summary."

⁸¹ AEPCO's opening electronic workpapers "bnrv0401.dbf" for the BNSF traffic and "sac0lccflh.dbf" for the UP traffic.

ACE bears none of these costs. All of the intermediate switching and classification is performed on the off-SARR portions of the residual incumbents' networks.

In order to reflect the actual allocation of switching and classification costs between the on-SARR and off-SARR portions of the network, defendants again rely on AEPCO's representative sample of manifest traffic to develop a mileage block that reflects the relationship between those costs and the other line-haul costs of handling cross-over manifest traffic. The data in that sample show that the URCS costs for en route switching and classification of the manifest traffic average \$105 per car for BNSF and \$168 per car for UP, while the URCS line-haul costs average \$1.10 per mile for BNSF and \$1.05 per mile for UP.⁸² Those figures together demonstrate that defendants are entitled to a mileage credit (rounded to the nearest five miles) of 95 miles for BNSF manifest traffic and 160 miles for UP manifest traffic to reflect the fact that they bear all of these costs.⁸³ Accordingly, defendants applied these mileage-block credits to each carload of manifest traffic to reflect more accurately the relative on-SARR and off-SARR costs of handling that traffic.

(c) Automotive Traffic

Automotive traffic accounts for 6.5 percent of the cross-over traffic selected by AEPCO.⁸⁴ AEPCO's evidence also overstates ACE's appropriate division for cross-over automotive traffic.

⁸² BNSF/UP.SUPPRP.WP.III-A-0134 to 0135; BNSF/UP Supplemental Reply electronic workpaper "Manifest Divisions, Costs and Mileage Credits.xls."

⁸³ As was done for the origination and termination credit, Mr. Fisher determined the cost of intermediate switching per terminal event for each sample move that Whitehurst costed, divided that cost by the respective defendant's line-haul costs to generate a mileage equivalent for each move, and then calculated a simple average across the sample moves. *Id.*

⁸⁴ BNSF/UP Supplemental Reply Exh. III.A-1.

The generic MSP approach does a poor job of allocating automotive traffic revenues between ACE and the residual incumbents for the same two reasons that it produces flawed results when applied to manifest traffic. Defendants therefore used the same approach they applied to manifest traffic to develop a more accurate mileage block for originating and terminating automotive traffic and a separate mileage block to reflect their costs for en route switching of automotive traffic.

With respect to costs for originating and terminating automotive traffic, defendants rely upon AEPCO's "representative sample" of automotive traffic to develop a mileage credit (rounded to the nearest five miles) of 170 miles for BNSF automotive traffic and 215 miles for UP automotive traffic for each origination or termination on their respective networks.⁸⁵ With respect to en route switching costs, defendants again use AEPCO's sample of automotive traffic to develop a mileage credit (rounded to the nearest five miles) of 110 miles for BNSF and 140 miles for UP to reflect the fact that ACE performs none of that switching.⁸⁶ Accordingly, defendants applied these mileage-block credits to each carload of automotive traffic to reflect more accurately the relative on-SARR and off-SARR costs of handling that traffic.

(d) Coal and Grain Traffic

Coal and grain traffic account for approximately 11 percent of the cross-over traffic selected by AEPCO.⁸⁷ Defendants believe that the 100-mile credit assigned by the generic MSP approach for originating or terminating this traffic likely overstates the relative costs of those

⁸⁵ BNSF.SUPPRP.WP.III-A-0136 to 0137; BNSF/UP Supplemental Reply electronic workpaper "Auto Divisions, Costs and Mileage Credits.xls."

⁸⁶ *Id.*

⁸⁷ BNSF/UP Supplemental Reply electronic workpaper "ACE Traffic summary.xls."

activities due to their handling in trainload quantities. *TMPA* at 31. This overstatement may benefit AEPCO in this case, because its SARR originates the vast majority of the cross-over coal traffic.⁸⁸ However, cross-over coal and grain traffic represents a small part of the SARR's overall traffic group. Consequently, defendants have simply applied the generic MSP approach to this traffic for purposes of this case.

The overall result of defendants' adjustments to the "generic" MSP approach to reflect more accurately the allocation of on-SARR and off-SARR costs for traffic that AEPCO selected for its SARR traffic group are present in BNSF/UP Supplemental Reply Exhibit III.A-5.

(3) Rerouted Coal Traffic

ACE's traffic group includes certain cross-over coal traffic that currently moves in joint BNSF/UP service via BNSF's line from Belen to Deming, which is the present interchange with UP. AEPCO proposes to shift this traffic to much longer ACE routings that purport to use BNSF trackage rights over UP's line between Vaughn and El Paso. Even if AEPCO were permitted to use those trackage rights in lieu of constructing a north-south line, the Board could not permit it to implement longer routings that would "inappropriately shift a greater share of the revenues from [a cross-over] movement onto the SARR." *CP&L* at 21. Defendants therefore adjust AEPCO's revenue divisions for these movements to ensure that the reroutings do not diminish the residual defendants' revenues for their handling of the traffic.

ACE's rerouted cross-over coal traffic includes (i) movements from Lee Ranch and McKinley, New Mexico, to Tucson Electric Power's plant in Irvington, Arizona; (ii) movements from York Canyon, New Mexico, to AEPCO's plant at Cochise; and (iii) movements from York

⁸⁸ AEPCO Opening Exh. III-A-6, rows 1-6, 17-25.

Canyon, New Mexico, to California Portland Cement's ("CPC") plant in Rillito, Arizona.

AEPCO's proposed rerouting of CPC's traffic is addressed in section III.A.1.

Currently, Tucson Electric Power coal moves 563 miles from Lee Ranch to Irvington or 595 miles from McKinley to Irvington, including 78 miles on UP from Cochise to Irvington.⁸⁹ Under AEPCO's proposed routing, the coal would move a total of 790 miles from Lee Ranch to Irvington or 822 miles from McKinley to Irvington. UP would still handle the coal for 78 miles between Cochise and Irvington. However, if an unadjusted mileage based division were applied, UP would receive less revenue for handling the train the same number of miles simply because AEPCO elected to use a longer routing.

Similarly, AEPCO coal moves 623 miles from York Canyon to Cochise, including 278 miles on BNSF from York Canyon to Belen. Under AEPCO's proposed routing, the coal would move a total of 849 miles from York Canyon to Cochise. BNSF would still handle the coal for 278 miles between York Canyon and Belen. However, if an unadjusted mileage based division were applied, BNSF would be receiving less revenue for handling the train the same number of miles simply because AEPCO elected to use a longer routing.

Defendants should not receive a lower revenue division for performing the same work because of AEPCO's routing choices. Moreover, if AEPCO's reroutes are more efficient than the actual routings, AEPCO should have no objection to receiving the same mileage-based division it would have received had it replicated the actual routings. If AEPCO's new routings are less efficient, then they should not be permitted.

⁸⁹ The mile figures referenced in this section are based on PCRail. BNSF/UP.SUPPRP.WP.III-A-0140 to 0143.

In fact, defendants believe that AEPCO's proposed reroutes would be significantly less efficient than the current routes. As shown in UP's April 18 Petition, AEPCO's proposed reroutes would be extremely inefficient, and demonstrably less efficient than the current routings. For example, rerouted trains to the Irvington plant would travel a route that is at least 38 percent longer, with 42 percent more rise and fall and 26 percent more curvature. The estimated fuel consumption for these trains would increase by 51 percent. *See* April 18 Petition, Salzman VS at 4 & Ex. 2.⁹⁰ Moreover, the rerouted traffic will suffer significant service penalties in order to avoid causing significant adverse impacts on UP's other traffic on this line. *See* section III.C.2.c, *infra*. Nonetheless, for purposes of this case, defendants will not object to AEPCO's proposed reroutes of the AEPCO and Tucson Electric Power non-issue coal traffic, so long as their share of revenues for handling the traffic is not artificially diminished by AEPCO's routing choices.

Thus, for the Tucson Electric Power traffic, defendants have calculated AEPCO's revenue division by retaining for the residual incumbents the share of revenues to which they would be entitled were the Cochise to Tucson segment 13 to 14 percent of total route miles, as they would be had the traffic moved via Belen and Deming direct rather than via Vaughn and El Paso. For the York Canyon traffic, defendants likewise have calculated AEPCO's revenue division by retaining for the residual incumbents the share of revenues to which they would be entitled were the York Canyon to Belen segment 45 percent of total route miles, as they would be had the traffic moved via Belen and Deming direct.

⁹⁰ In its rebuttal evidence, AEPCO criticizes UP's fuel consumption estimate. UP provided detailed workpapers for its calculation. UP Reply electronic workpaper "TPS Runs.pdf." Moreover, AEPCO cannot plausibly dispute the basic point that the significant increase in route miles would cause a significant increase in fuel consumption.

(4) Overstated SARR Mileages

In calculating ACE's share of revenues for the overhead traffic that ACE will handle between El Paso and Cochise, AEPCO erred by overstating slightly the number of miles that ACE will handle the traffic. All of ACE's calculations incorrectly assumed that ACE would handle trains interchanged with UP at El Paso for 236.6 miles, between Cochise and milepost 1297.76 in El Paso.⁹¹ In fact, however, ACE will handle eastbound Cochise-El Paso trains for only 232.05 miles (a reduction of 4.55 miles), and westbound trains for only 231.22 miles (a reduction of 5.38 miles). As AEPCO explains, UP will deliver westbound overhead trains to ACE at ACE's El Paso yard, which begins at milepost 1292.82, more than five miles west of the point assumed in AEPCO's calculations. AEPCO Opening Nar. at III-C-21. Similarly, AEPCO explains that it will deliver overhead trains to UP at UP's El Paso yard, the turnout to which is shown at milepost 1293.65 in AEPCO's schematic of ACE's network, more than four miles short of the point assumed in AEPCO's calculations.⁹²

These errors had no effect on ACE's revenue divisions under the MMP approach, because they did not result in ACE receiving an additional 100-mile block. However, under the MSP approach, AEPCO's overstatement of miles must be corrected because it results in ACE receiving a disproportionate share of revenues. UP and not ACE is responsible for moving the

⁹¹ AEPCO Opening Exh. III-B-I at 15; AEPCO Rebuttal electronic workpaper "ACE Non-Coal Traffic and Revenue Forecast-Rebuttal" worksheet "ACE UP 2001 Traf. And Rev."

⁹² ACE's rerouted coal trains will use the trackage beyond the turnout to UP's El Paso yard (*i.e.*, between milepost 1293.65 and 1297.76) in order to reach BNSF's trackage rights over UP's Carrizozo Subdivision between Vaughn and El Paso. *See* AEPCO Opening Exh. III-B-1 at 15.

overhead traffic east of the point in El Paso where UP will deliver trains to ACE or ACE will deliver trains to UP. Defendants have made the necessary corrections.⁹³

d. Other – Projected Revenues for Non-Issue Traffic

AEPCO's methodology for projecting coal traffic revenues differs from its methodology for projecting non-coal revenues. Consequently, defendants address revenue projections for coal and non-coal traffic separately below.

(1) Projected Coal Revenues

AEPCO's coal revenue projections contain a significant flaw. AEPCO contends that ACE's coal revenues will grow by nearly 43 percent over the 20-year DCF period, from \$44.8 million in base year 2001 to \$64.0 million in 2020.⁹⁴ In the early part of the period, AEPCO bases its revenue projections on defendants' internal forecasts and the actual terms of existing contracts for coal shippers in ACE's traffic group.⁹⁵ For the later years, in which there are no internal forecasts or contracts, AEPCO uses a complicated formula for projecting coal revenues.⁹⁶ AEPCO's projections of coal rates are flawed because they rely upon outdated DRI-WEFA forecasts of railroad cost indices to project future rate increases. As explained below, defendants modify AEPCO's coal revenue projections by applying the proper forecasts.

⁹³ See, e.g., BNSF/UP Supplemental Reply electronic workpapers "popstadjmirev.prg" and "upsactraf01.xls," column CG.

⁹⁴ AEPCO Opening Exh. III-A-6, row 39, columns 10, 48.

⁹⁵ AEPCO Opening Nar. at III-A-33, items (1), (2).

⁹⁶ *Id.*, items (4), (5).

(a) Use of Current Forecast of RCAF-U and RCAF-A Indices

Many of defendants' coal transportation contracts adjust the contract rate periodically based upon either the RCAF-U index, the RCAF-A index, or some percentage of one or both of those indices. Consequently, to project future revenues under existing coal transportation contracts where the rate does not otherwise appear in defendants' forecasts, AEPCO must use a forecast of these RCAF indices. DRI-WEFA (now Global Insight) publishes a forecast of the RCAF indices each quarter. Rather than relying on the December 2002 DRI-WEFA forecast that was current as of the date that AEPCO filed its opening evidence, AEPCO instead utilized an outdated forecast from July 2001, nearly two years earlier.⁹⁷ Six DRI-WEFA forecasts of the RCAF indices had been published subsequent to the forecast that AEPCO used.

In the current posture of this case, neither the July 2002 forecast nor the December 2002 forecast is appropriate. Instead, defendants use the most current DRI-WEFA forecast, which was published in December 2003.⁹⁸ As the following table demonstrates, use of the July 2002 DRI-WEFA forecast rather than the current forecast would result in a significant overstatement of projected increases in RCAF indices. Defendants therefore adjust AEPCO's calculation of coal revenues using the most current DRI-WEFA forecast.⁹⁹

⁹⁷ The DRI-WEFA forecast used by AEPCO is provided in AEPCO's opening workpapers at 2198 and 2199.

⁹⁸ The DRI-WEFA index published in December 2003 is included in defendants' workpapers at BNSF/UP.SUPPRP.WP.III-A-009 to 028.

⁹⁹ BNSF/UP Supplemental Reply electronic workpaper "ACE Coal Traffic and Revenue Forecast_BNSF&UP Revised.xls."

Table III.A-1
Comparison Of December 2003 DRI-WEFA Forecast Of Changes In
The RCAF-U And RCAF-A With Assumptions Employed By AEPCO¹⁰⁰

Time Period	AEPCO's Forecast ¹⁰¹ (DRI-WEFA June 2001)		DRI-WEFA (December 2003 Forecast) ¹⁰²		% Difference	
	RCAF-U	RCAF-A	RCAF-U	RCAF-A	RCAF-U	RCAF-A
2003-2005	2.7%	2.3%	1.8%	-0.7%	-33.7%	N/A
2005-2010	2.8%	1.0%	2.3%	0.0%	-18.2%	-96.0%
2010-2015	3.0%	0.9%	2.4%	0.4%	-19.5%	-58.3%
2015-2020	3.0%	0.9%	2.4%	0.4%	-19.5%	-58.3%

Source: BNSF/UP Supplemental Reply electronic workpaper "Global Insights RCAF4Q03.pdf."

(b) Revenues Through The Term Of Existing Coal Transportation Contracts

AEPCO's projections of coal revenues through the terms of existing coal transportation contracts with shippers served by the hypothetical ACE are based on defendants' respective coal forecasts for those coal shippers and, after 2003 when no such forecasts are available, on the actual provisions of those contracts until the contract expires.¹⁰³ Specifically, AEPCO adjusts coal transportation contract rates annually from 2004 to the end of the contract by forecasting the change resulting from the application of the individual coal transportation contract adjustment mechanism. Defendants correct one error made by AEPCO in developing net revenues for AEPCO traffic originating in Colorado and the Powder River Basin that is destined for Cochise.

¹⁰⁰ DRI-WEFA only publishes a 10-year forecast, *i.e.*, the December 2003 forecast ends in 2013. The Railroads adopt AEPCO's methodology (*see* AEPCO Opening electronic workpaper "ACE Coal Traffic and Revenue Forecast.xls" worksheet "Contracts") of using the last forecast year to project the change in the annual index for the remaining years in the DCF period.

¹⁰¹ AEPCO's Opening workpapers at 2198 and 2199.

¹⁰² BNSF/UP Supplemental Reply electronic workpaper "DRI_WEFA RCAF Forecast_AEPCO.xls."

¹⁰³ AEPCO's Opening Nar. at III-A-33, items (1), (2).

AEPCO failed to incorporate { } set forth in the Settlement Agreement between UP and AEPCO for the { } period. { }

{ } Based on this contract provision, defendants have incorporated the { } in AEPCO's revenue projections for coal originating from Colorado and the Powder River Basin for the { } period.¹⁰⁴

(c) Revenues After Expiration of Existing Coal Transportation Contract

AEPCO uses a complicated formula for projecting future revenues after the expiration of existing coal transportation contracts.¹⁰⁵ Defendants disagree with AEPCO's approach for projecting such revenues, but they accept AEPCO's methodology for purposes of this case, given the small amount of coal traffic in the stand-alone traffic network. Defendants' revised coal traffic and revenue forecast is summarized in BNSF/UP Supplemental Reply Exh. III.A-2.

(2) Projected Non-Coal Revenues

AEPCO projects revenues for BNSF and UP non-coal traffic using different sources. Consequently, defendants discuss AEPCO's revenue projections for BNSF and UP non-coal traffic separately below.

¹⁰⁴ BNSF/UP Supplemental Reply electronic workpaper "ACE Coal Traffic and Revenue Forecast_BNSF&UP Revised.xls" worksheet "2001-2020 Traffic and Revenue." A copy of the UP/AEPCO settlement agreement is included in defendants' workpapers at BNSF/UP.SUPPRP. WP.III-A-0028 to 0049.

¹⁰⁵ See AEPCO Opening Nar. at III-A-33, items (4), (5).

(a) BNSF Non-Coal Revenues

Defendants generally accept AEPCO's methodology for projecting non-coal revenues for BNSF movements but correct one technical error in AEPCO's calculations that caused AEPCO to overstate by 1.6 percent ACE's revenues for BNSF's non-coal traffic.¹⁰⁶

AEPCO's revenue calculations for cross-over traffic generally follow two steps: (1) AEPCO determines the share (as a fraction, *e.g.*, 3/20) of the total revenues that are to be assigned to the ACE; and (2) AEPCO applies the share to the through revenues for the incumbent to determine the amount of revenue to be allocated to the ACE. As discussed above, AEPCO used the modified mileage prorate to determine the share of the revenues for step (1). For step (2), AEPCO recognized that the BNSF traffic tapes reported gross revenues as well as other amounts, *e.g.*, contract allowances, that reduce the actual revenue BNSF collected for each move.¹⁰⁷ AEPCO recognized that it should use net revenues (*i.e.*, gross revenues minus other amounts) to calculate SARR revenues and, accordingly, calculated an adjusted revenue figure (field "adjrev") that subtracted the other amounts from gross revenues (field "m_rev").¹⁰⁸ However, when performing the second step of its revenue calculation, AEPCO erroneously used

¹⁰⁶ BNSF/UP.SUPPRP.WP.III.A-0056.

¹⁰⁷ AEPCO Rebuttal electronic workpaper "lqrev&routelink.prg," included as BNSF/UP.SUPPRP.WP.III-A-0144 to 0146.

¹⁰⁸ AEPCO Rebuttal electronic workpaper "lqrev&routelink.prg," included as BNSF/UP.SUPPRP.WP.III-A-0144 to 0146.

the gross BNSF revenues (field "m_rev")¹⁰⁹ and, thus, overstated the revenues assigned to the ACE. Defendants correct this error.¹¹⁰

(b) UP Non-Coal Revenues

Defendants do not accept AEPCO's approach for projecting non-coal revenues for UP movements. For several reasons, AEPCO's approach to forecasting revenues for UP non-coal traffic, particularly intermodal revenues, results in a significant overstatement of ACE's future revenues.

First, AEPCO's intermodal revenue forecasts, which are based on UP business plans, improperly include the effect of projected increases in net tonnage. AEPCO used UP business plans in two steps of its revenue projection methodology. AEPCO developed 2003 revenues based on a projected rate of change in revenue-per-unit between 2002 and 2003 that was generated by a UP planning tool called "Prophecy."¹¹¹ It then developed 2004-2020 revenues based on the geometric mean of the annual percentage change in rates from 1999 to 2003.¹¹²

Both steps were flawed because Prophecy's 2003 revenue forecasts primarily reflect a projected increase in tonnages per unit, not revenues per ton. The Prophecy data, which are in AEPCO's workpapers, show a projected { }-percent increase in average tons per intermodal

¹⁰⁹ BNSF/UP.SUPPRP.WP.III-A-0144 to 0146.

¹¹⁰ BNSF/UP Supplemental Reply workpaper "bnrv2001rt34 traintype rev.xls."

¹¹¹ AEPCO Rebuttal electronic workpaper "ACE Non-Coal Traffic and Revenue Forecast-Rebuttal.xls" worksheet "UP 02-03 Traf. & Rev. Forecast."

¹¹² AEPCO Rebuttal electronic workpaper "ACE Non-Coal Traffic and Revenue Forecast-Rebuttal.xls" worksheet "UP Non-Coal Rev Forecast."

unit, from { } for 2002 to { } in 2003.¹¹³ As a result, although Prophecy predicted a more than { }-percent increase in intermodal revenue per unit from 2002 to 2003, the vast majority of that increase reflected increased tonnages. If tonnages were held constant, revenues would have increased by less than { } percent.¹¹⁴ This disparity significantly overstates ACE revenue growth over the 20-year life of the DCF model. AEPCO's SAC analysis assumes that ACE's traffic volumes will not exceed 2001 levels on a tonnage basis. This assumption pervades its construction and operating plans and costing. The Board thus should not permit AEPCO to incorporate "rate increases" that are actually volume increases, and defendants' revenue projections correct this error.¹¹⁵

Second, while AEPCO corrected its mistreatment of "Q" trains, which it wrongly interpreted as intermodal rather than manifest trains, when calculating its operating statistics in its rebuttal evidence,¹¹⁶ it erroneously continues to escalate "Q" train revenues by its higher forecasted growth rate for intermodal traffic.¹¹⁷ Defendants correct this error.¹¹⁸

¹¹³ AEPCO Rebuttal electronic workpaper "ACE Non-Coal Traffic and Revenue Forecast-Rebuttal.xls" worksheet "UP 02-03 Traf. & Rev. Forecast."

¹¹⁴ *Id.*

¹¹⁵ BNSF/UP Supplemental Reply electronic workpaper "ACE Non-Coal Traffic and Revenue Forecast-RR Revised.xls" worksheet "UP Non-Coal Rev Forecast."

¹¹⁶ AEPCO Rebuttal electronic workpaper "ACE Non-Coal Traffic and Revenue Forecast-Rebuttal.xls" worksheet "ACE UP 2001 Traf. and Rev."

¹¹⁷ AEPCO Rebuttal electronic workpaper "ACE Non-Coal Traffic and Revenue Forecast-Rebuttal.xls" worksheet "ACE UP '01-'20 Traf. and Rev."

¹¹⁸ BNSF/UP Supplemental Reply electronic workpaper "ACE Non-Coal Traffic and Revenue Forecast-RR Revised.xls" worksheet "ACE UP '01-'20 Traf. and Rev."

Finally, AEPCO escalates revenues for UP manifest traffic using changes in the average revenue-per-car for all traffic, excluding coal, but improperly including intermodal traffic.¹¹⁹ Defendants remove the effect of intermodal traffic in restating the revenue forecast that is applied to manifest traffic.¹²⁰

Table III.A-2 summarizes the impact of the three corrections that defendants make to AEPCO's revenue forecasts for UP non-coal traffic.

Table III.A-2
Comparison Of Annual Growth in UP Revenues

UP Traffic Group	AEPCO	Defendants
Intermodal	{ }	{ }
Q Trains	{ }	{ }
Manifest	{ }	{ }
Intermodal	{ }	{ }

Source: BNSF/UP Supplemental Reply electronic workpaper "ACE Non-Coal Traffic and Revenue Forecast-RR Revised.xls" worksheet "UP Non-Coal Rev Forecast."

Defendants' revised non-coal traffic and revenue forecast is summarized in BNSF/UP Supplemental Reply Exh. III.A-6 and defendants' revised total traffic and revenue forecast is summarized in BNSF/UP Supplemental Reply Exh. III.A-7.

¹¹⁹ AEPCO Rebuttal electronic workpaper "ACE Non-Coal Traffic and Revenue Forecast-Rebuttal.xls" worksheet "UP 02-03 Traf. & Rev. Forecast."

¹²⁰ BNSF/UP Supplemental Reply electronic workpaper "ACE Non-Coal Traffic and Revenue Forecast-RR Revised.xls" worksheet "UP 02-03 Traf. & Rev. Forecast."

B. STAND-ALONE RAILROAD SYSTEM

1. Route And Mileage

The ACE network configuration posited by AEPCO consists of 786.01 route miles traversing parts of Arizona and New Mexico. AEPCO Opening Nar. at III-B-5. Defendants accept the route miles posited by AEPCO.

2. Track Miles And Weight Of Track

In its opening evidence, AEPCO stated that the ACE required 902.75 miles of track for mainlines, passing sidings and branch lines and an additional 54.92 miles of yard, interchange and setout/storage tracks. AEPCO Opening Nar. at III-B-7. Defendants' experts determined that the ACE system requires several capacity improvements to serve the traffic group posited by AEPCO. First, defendants add mainline capacity at two separate locations to facilitate the movement of ACE trains into and out of Vaughn Yard and to prevent AEPCO's rerouted coal traffic from interfering with higher priority traffic traveling at greater maximum speeds. Second, defendants add capacity in the Vaughn and El Paso Yards to allow ACE to perform the functions that AEPCO proposes to perform in those yards. Third, defendants add set-out track capacity so that ACE can use set-out tracks to store bad-order cars and maintenance-of-way equipment as posited by AEPCO.

AEPCO's calculation of track miles contained an unexplained adjustment that added 11 mainline track miles to the ACE.¹ Defendants eliminate this adjustment in their calculation of track miles. As a result, defendants recommend fewer mainline track miles than AEPCO, even with the capacity improvements described above. Table III.B-1 contains a summary comparison of the miles of track assumed by AEPCO with the miles assumed by defendants' witnesses.

¹ AEPCO Opening electronic workpaper "track tabulation.xls."

Table III.B-1
Comparison Of AEPCO's Calculation Of Miles
With BNSF/UP's Calculation Of Miles Of ACE Track

Type of Track	AEPCO	BNSF/UP	Difference
Mainline Track	880.72	878.67	-2.11
Mine Spurs	22.03	22.03	0
Set-Out Track	10.76	18.09	7.33
Yards	44.16	50.91	6.75
Total	957.67	969.64	11.97

Source: AEPCO Opening Nar. at III-B-7 and
BNSF/UP Supp. Reply electronic workpaper "III F 3 Track.xls"

A detailed explanation of how defendants' witnesses arrived at their recommendations for the ACE's capacity is provided below in Section III.B.2.a on mainline track, Section III.B.3 on yards, and Section III.F.3.d.(2)(c) on set-out track.

AEPCO proposed to construct ACE using new 136-pound continuous welded rail (CWR) for mainline track, including passing sidings, and premium rail for curves with a radius of three degrees or more. The ACE's branch line will be laid with 132-pound Class 1 relay CWR, and the yard and set-out tracks will be laid with 132-pound relay jointed rail. Defendants accept AEPCO's assumptions for the weight of track on ACE and use these assumptions in their cost calculations in Section III.F. Table III.B-2 contains a comparison of the total track miles by weight of rail assumed by AEPCO with the total track miles by weight of rail assumed by defendants' witnesses.

Table III.B-2
Comparison Of Total Track Miles By Weight Of Rail

Type of Rail	AEPCO	BNSF/UP	Difference
136 Premium CWR	34.33	31.81	-2.52
136 Standard CWR	846.39	846.80	0.41
132 CWR Relay	22.03	22.03	0.00
132 Jointed Relay	54.92	69.00	14.08
Total	957.67	969.64	11.97

Source: AEPCO Opening electronic workpaper "iii3f.xls" and
BNSF/UP Supp. Reply electronic workpaper "III F 3 Track.xls"

a. Mainline

(1) AEPCO's Track Configuration Between Defiance-Vaughn
And El Paso-Cochise

AEPCO explained in its opening evidence that ACE would replicate the basic main-line configuration of the defendants between Defiance-Vaughn and El Paso-Cochise. AEPCO Opening Nar. at III-C-3 to 4. Since ACE's expected traffic volume is similar to current traffic volumes on the defendants' lines, the defendants have not conducted a detailed capacity analysis. However, defendants' main-line capacity witness, Mr. Wheeler, reviewed the ACE configuration posited by AEPCO and determined that two deficiencies in AEPCO's design needed to be remedied so that ACE could serve the traffic group assumed by AEPCO.

First, ACE's eastbound loaded coal trains rerouted by AEPCO will encounter a 1.25 ascending grade at the point where ACE's Defiance-Vaughn line must narrow to a single track to pass through Abo Canyon. Those trains do not encounter any similar bottleneck on the lower density Belen-Deming line used by the defendants in the real world. These trains will cause considerable delay to higher priority non-coal traffic as they slowly ascend the grade. Given the extraordinary volume of high priority traffic on this line and the frequency with which those trains will meet or overtake ACE's rerouted coal trains, Mr. Wheeler determined that ACE requires a siding extension at the west end of Abo Canyon between MP 876.8 and 878 in which loaded coal trains will dwell until there is a sufficient gap in opposing traffic to allow coal trains to ascend the single-track portion of the grade without interfering with other traffic. These findings are discussed in more detail in Section III.C.2.c.

Second, defendants determined that the ACE requires second main track from MP 797.80 to 791.13, the eastern terminus of the ACE system, to provide efficient and simultaneous movement of trains into and through Vaughn Yard, and to provide access to the double lead

tracks from either mainline track adjacent to the yard. AEPCO provided for single-track mainline adjacent to ACE's busiest yard which would result in excessive delays to trains entering and leaving the yard. This issue is discussed in more detail in Section III.B.3.a.(1)(b) below.

(2) AEPCO's Use Of Trackage Rights Between Vaughn-El Paso

In its opening and rebuttal evidence, AEPCO assumed that ACE would reroute the issue traffic and certain other coal traffic to take advantage of BNSF trackage rights over UP's line between Vaughn and El Paso. However, in its November 19, 2003 decision, the Board correctly recognized that SAC principles do not allow a SARR to incorporate such cost-sharing or cost-savings arrangements between joint-rate defendants to avoid a significant portion of the capital costs of providing service. November 19 Decision at 6. The Board explained that "the SAC test could not serve its purpose if the SAC analysis failed to take into account the full costs of providing and maintaining the physical plant needed to serve the traffic – costs which the joint defendants collectively must bear." *Id.*

Notwithstanding its conclusion that AEPCO should have included a north-south line in its SAC analysis, the Board did not dismiss the complaint or require AEPCO to file a new case-in-chief. Instead, it allowed AEPCO to rely on its rebuttal SAC presentation as its case-in-chief, in which case defendants would "be entitled to demonstrate the inadequacy (for purposes of the SAC analysis) of the usage fee reflected in the existing BNSF-UP trackage rights agreement and to show the level at which a usage fee would need to be set to satisfy the objectives of the SAC test." *Id.* Defendants explain in their motion to dismiss that the Board should dismiss AEPCO's complaint because AEPCO failed to present a viable SARR.²

² See Defendants' Motion to Dismiss on Reopening, filed Jan. 26, 2004.

Nevertheless, defendants demonstrate below that the level of the usage fee reflected in the existing BNSF-UP trackage rights agreement is plainly inadequate for purposes of a SAC analysis. They further explain that AEPCO could never satisfy the SAC test, because no calculation of SAC costs can be obtained from the record in this case. They show that AEPCO's comparison of the usage fee to UP's system-average, fully loaded URCS costs is no substitute for a SAC analysis. Finally, they explain that Board precedent precludes them from positing the route configuration or traffic selection rules necessary to construct a north-south route for AEPCO's SARR, which is the only way for them to derive "the level at which a usage fee would need to be set to satisfy the objectives of the SAC test."

The objectives of the SAC test are to evaluate the reasonableness of challenged rates by determining whether an optimally efficient entrant could provide service at a lower rate while covering the full costs of providing service on the line at issue. November 19 Decision at 5. The SAC test accomplishes its objectives by comparing the revenue from traffic moving over a line with the total forward-looking costs of constructing, operating and maintaining the line. Thus, in order to determine whether a particular "usage fee" is consistent with the objectives of the SAC test, one must determine whether the fee would generate sufficient contribution such that, together with freight revenues from the other traffic moving over the line, it generates enough dollars to ensure the full recovery of the line's costs. However, the only way to determine whether the fee would ensure the full recovery of the costs would be to examine the forward-looking costs of constructing and operating the line and the revenues available to cover those costs from shippers using the line – i.e., by conducting a SAC analysis.

(a) The Usage Fee AEPCO Posits Is Plainly Inadequate

Even without conducting a full SAC analysis, it is quite clear that the usage fee posited by AEPCO would be inadequate to cover the SAC costs of a Vaughn-El Paso line consistent with the objectives of the SAC test. Under AEPCO's assumption that only a few coal trains handled by the SARR would use the trackage rights, the trackage rights traffic would have generated \$1.66 million in trackage rights revenue for UP in 2001.³ Based on AEPCO's DCF model and its (understated) estimate of the average cost per mile for constructing other portions of its SARR, \$1.66 million in revenue would cover the annual investment costs associated with only about 12 miles of single-track mainline - a far cry from the 226 miles of single-track mainline between Vaughn and El Paso.⁴ Of course, only a full SAC analysis could properly estimate the actual costs of a Vaughn-El Paso line, including the additional operating and

³ AEPCO calculated that 2.29 million gross tons of ACE trackage rights traffic would move over the Vaughn-El Paso segment in 2001. It multiplied that figure by 226 miles to produce 517 million total segment gross ton-miles. AEPCO then multiplied that figure by a 3.2 mills per gross-ton trackage rights fee for unit trains, to arrive at \$1.66 million in revenues. AEPCO opening electronic workpaper "AEPCO Operating Expenses.123," Tab "seg4."

As discussed above, SAC principles preclude AEPCO from rerouting non-issue traffic over the Vaughn-El Paso line segment. However, in their demonstration above, defendants included revenues attributable to all of AEPCO's proposed reroutes in calculating revenues from trackage rights fees.

⁴ AEPCO's evidence posits construction costs of approximately \$1.4 million per route mile. FTI derived this figure based on AEPCO's road property investment costs for the portion of ACE that AEPCO constructed. AEPCO Opening electronic workpaper "EXHIBIT-III-H-1," Tab "Investment." FTI reviewed these costs and then determined whether the individual cost components of AEPCO's investments were properly allocated on a per route-mile or per track-mile basis for the purpose of estimating the investment necessary for a Vaughn-El Paso segment. BNSF/UP Supplemental Reply electronic workpaper "Vaughn-El Paso Construction.xls."

When a road property investment of \$1.4 million is run through AEPCO's DCF model, it produces a first year revenue requirement of \$139,000. Thus, with revenues of only \$1.66 million, AEPCO could cover the annual investment costs of only 11.9 miles of track.

maintenance costs that would be incurred to handle the ACE traffic, but the usage fees generated by AEPCO's rerouted traffic are plainly insufficient to cover those costs.

(b) AEPCO Could Never Demonstrate On The Record In This Case That A Usage Fee Satisfies The Objectives Of The SAC Test

Whatever other assumptions AEPCO may choose for the Vaughn-El Paso line, it could never satisfy the SAC test, because no calculation of SAC costs can be obtained from the record in this case. AEPCO presumably would contend that the usage fees generated from the SARR's trackage rights traffic cannot be viewed in isolation because non-issue UP traffic moving over the Vaughn-El Paso line would share the joint and common costs of constructing, operating, and maintaining the line. However, AEPCO did not introduce any evidence of the forward-looking costs of constructing, maintaining, or operating a Vaughn-El Paso line, despite many opportunities to supply the missing evidence. Nor did it introduce any evidence of the revenues generated by UP's traffic between Vaughn and El Paso. Without such evidence, it is impossible to determine whether the total revenues from the other traffic moving over the line (plus the trackage rights fees paid by the SARR) would be sufficient to cover the total forward-looking costs, including the construction, operating, and maintenance costs needed to accommodate that other traffic. In other words, there is no way of knowing, short of examining SAC evidence for the line, whether ACE's payment of any given usage fee would ensure a full recovery of the Vaughn-El Paso line's costs.

In its rebuttal evidence AEPCO purported to show that the current usage fee "covers UP's attributable and unattributable costs incurred in connection with BNSF's use of the Vaughn-El Paso line." AEPCO Rebuttal Exh. III-B-3 at 1. It claimed that the fee exceeded UP's "below-the-wheel" attributable plus unattributable costs. *Id.* at 5. However, AEPCO's evidence

does not show that the usage fee covers the attributable and unattributable costs of UP's Vaughn-El Paso line. AEPCO's analysis merely compares UP's system-wide URCS costs on a mills per gross ton-mile basis with the trackage rights fee, which is stated on a mills per gross-ton mile basis. The fact that AEPCO came up with a figure lower than the usage fee means only that the usage fee is slightly higher than the average revenue per gross ton-mile that UP would have to earn on all of its traffic system-wide in order to cover its average system-wide total costs per gross ton-mile as determined by URCS historical costs. This is quite obviously not an application of the SAC methodology because it has no bearing whatsoever on the forward-looking investment and operating costs of the Vaughn-El Paso line, or the potential contribution from the traffic that actually uses the line toward those costs.

The SAC test determines whether rates are reasonable by assessing whether the total revenues from traffic moving over a line are sufficient to cover the total forward-looking costs of constructing, operating and maintaining the line. Because AEPCO's analysis relies on URCS system-average costs, it reveals nothing about the specific costs of constructing, operating or maintaining a Vaughn-El Paso line. Moreover, AEPCO's analysis would be irrelevant even if AEPCO could show that UP's URCS costs relating to the Vaughn-El Paso line were close to UP's URCS system-average costs. URCS costs are based on historical costs, rather than the forward-looking costs of constructing, operating and maintaining the line required for a SAC analysis. Thus, AEPCO has not assessed whether the usage fee provides enough revenue to cover the unattributable costs of the Vaughn-El Paso line. Nor has AEPCO assessed whether the UP traffic on the Vaughn-El Paso line contributes revenue per gross ton-mile equivalent to the usage fee.

In fact, there is good reason to believe that UP's traffic on the Vaughn-El Paso line does not contribute sufficient revenue such that, when those revenues are combined with revenue from the usage fee, they would cover the unattributable costs of that line. UP plainly does not earn sufficient revenues on all of its system-wide traffic to cover its forward-looking, average system-wide total costs per gross ton-mile, as demonstrated by the fact that it is revenue inadequate. Most of UP's traffic moving over the Vaughn-El Paso line is highly competitive intermodal traffic that contributes less to unattributable costs than UP's average traffic.

Finally, there is no basis for the Board to assume that BNSF and SP in fact set the usage fee at a level sufficient to recover the forward-looking fully allocated costs of the Vaughn-El Paso line segment. Differential pricing principles apply in the setting of usage fees just as they apply in the setting of rates for shippers. In addition, the trackage rights at issue here were part of a wide-ranging agreement between SP and BNSF covering numerous different commercial arrangements, and there were many factors and quid pro quos apart from purely economic considerations that affected the terms agreed to by the parties.⁵ In other words, the circumstances giving rise to a multifaceted trackage rights negotiation may be such that, in the short-run, it is economically rational to establish rates or fees at a level below the forward-looking full economic costs of constructing, operating, and maintaining the right-of-way. The trackage rights traffic is incremental to traffic that exists on the landlord's line, and thus the landlord might be willing to carry it for marginally lower rates. As long as the fees are high enough to cover the relevant avoidable costs, they contribute to the going concern value of the "landlord" railroad. However, fees that contribute only marginally to the joint and common costs of the railroad cannot be assumed to ensure the railroad's long-term viability. The SAC

⁵ See *Burlington Northern/Santa Fe Merger*, 10 I.C.C. 2d 661, 811-12 (1995) (describing the settlement agreement's terms).

test requires a hypothetical railroad to be viable over the long term, and in the absence of a SAC analysis, it cannot be determined whether a fee that covers attributable costs is bearing an appropriate share of joint and common costs.

(c) Defendants Cannot Develop A Usage Fee That Would Satisfy The Purposes Of The SAC Test

Defendants have shown that AEPCO's proposed usage fee does not satisfy the objectives of the SAC test. There is no approach short of conducting a SAC analysis to determine the appropriate fee level. However, it would be manifestly inappropriate for defendants to present a SAC analysis that encompassed construction of a Vaughn-El Paso line or some other north-south line allowing ACE to provide origin-to-destination service. That burden rested with AEPCO, and it chose not to present new SAC evidence on this point. Were defendants required to come forward with a SAC analysis, they would be placed in the untenable position of having to make routing and traffic selection decisions that are within AEPCO's discretion. See *McCarty Farms v. Burlington Northern, Inc.*, ICC Docket No. 37809, at 7 (served Feb. 5, 1988).⁶ Because there is no solution to the usage fee dilemma, short of a full SAC analysis that defendants cannot be expected to perform, the complaint should be dismissed.

If the Board does not dismiss the complaint, defendants' SAC presentation in this case adopts solely for purposes of completing a DCF analysis of the improperly configured SARR a

⁶ If defendants were to attempt to make route configuration and traffic selection decisions for AEPCO, they would immediately be confronted by a wide range of intractable issues, such as whether ACE would choose to build its north-south line between Vaughn and El Paso and whether it would choose to take all available traffic on UP's Vaughn-El Paso line, including traffic that originates or terminates, or requires switching in El Paso, which in turn would require appropriate yard facilities and the design of appropriate (and inherently complex) local switching operations in El Paso. It is both impractical and inappropriate to require defendants to make those choices. Under Board precedent, AEPCO is allowed to design the SARR's network (within limits, of course), select the SARR's traffic group, and design its operations, so all of defendants' choices would be subject to second-guessing by AEPCO.

trackage rights fee suggested by AEPCO's Response to the Board's November 19 decision. Defendants have applied a 9.05 mills-per-GTM usage fee to SARR traffic moving over the Vaughn-El Paso line, and included the total fee thus generated in ACE's operating expenses. *See* Response of Complainant to Board's November 19, 2003 Order at 4. However, defendants maintain that the proper resolution of this issue is for the Board to dismiss AEPCO's complaint for failure to present a viable SARR.

b. Branch Line

Defendants accept the track configuration and specifications posited by AEPCO for the ACE branch line leading to McKinley Mine.

c. Sidings

Passing sidings are considered part of the ACE's mainline capacity and are therefore covered by the discussion above in Section III.B.2.a.

d. Other

Defendants discuss the ACE yards and related trackage in the next section. Defendants discuss the ACE's set-out/rip tracks in Section III.F.3.d.(2)(c).

3. Yards

a. Location And Purpose

(1) Portion Of ACE That Replicates BNSF Lines

AEPCO included four yards on the portion of the ACE system that replicates the BNSF -- at Defiance, Dalies, Belen, and Vaughn, New Mexico. The Vaughn Yard is ACE's principal yard. The Vaughn Yard connects ACE to the BNSF mainline extending east to Amarillo and beyond and to the UP Vaughn-to-El Paso line. AEPCO proposes to perform 1,500-mile car

inspections, locomotive fueling, locomotive maintenance, car maintenance and crew changes at Vaughn Yard. ACE also will interchange traffic with the residual BNSF at Vaughn, Belen, Dalies, and Defiance. AEPCO assumes that it will receive traffic from BNSF at Vaughn and Defiance and move it across its system without intermediate stops or switching, except for interchange of certain traffic at Belen and Dalies. AEPCO Opening Nar. at III-B-13 to 15.

There are two principal differences between BNSF's existing operations and the operations posited by AEPCO for the portion of the ACE system that replicates the BNSF line. First, BNSF performs extensive switching of local traffic at Belen for movement to and from Phoenix, Arizona; Barstow, California; Albuquerque, New Mexico; and El Paso, Texas, as well as intermediate points along these routes. As discussed in Section III.C.1. below, during AEPCO's peak week of September 12 - 18, 2001, 125 out of 466 trains (approximately 27%) in the traffic selected by AEPCO and operating between Vaughn and Defiance set out and/or picked up cars at Belen. During this period, an average of 417 cars per day in local traffic were set out from or picked up by these trains at Belen. As also discussed in Section III.C.1 below, in order to accommodate ACE's overhead service as designed by AEPCO, the residual BNSF would have to undertake significant changes to its existing operations. Specifically, the residual BNSF would have to establish operations that would move the cars dropped off at Vaughn and Defiance to Belen, where the residual BNSF could form them into local trains. In addition, empty cars and carloads originating at points within the Belen service area would have to be moved from Belen to Defiance or Vaughn so that they could be included on the residual BNSF through trains moving to their ultimate destination. The facilities needed to perform these operations are discussed below.

The second major change in operations relates to fuel. In the real world, BNSF performs fueling of locomotives on its transcontinental trains at its Belen Yard. AEPCO moved this fueling function to the Vaughn Yard, but it did not make any provision for delivery of fuel to Vaughn or provide storage capacity at Vaughn in the quantities that will be required to serve the traffic it assumed. The defendants have modified ACE's Vaughn Yard to accommodate the necessary fueling operations.

(a) Modifications Required To ACE Yards And
Residual BNSF To Accommodate The Fueling Of
Transcontinental Trains

BNSF/UP Supplemental Reply Exh. III.B-1 shows the fuel consumed by BNSF to fuel locomotives at its Belen Yard by month during 2001. The average daily fuel consumption at Belen Yard was approximately { } gallons in 2001. During the four months of April, August, September and October, 2001, average daily consumption exceeded { } gallons (varying from approximately { } gallons per day in April to approximately { } gallons in October). This fuel was consumed by being loaded into locomotives for essentially the same traffic that AEPCO has assumed for ACE. In AEPCO's stand-alone world, none of BNSF's overhead trains stop at Belen. Instead, AEPCO assumed that ACE would displace the incumbent for the fueling activities now occurring at Belen, and that the fueling of BNSF's transcontinental trains would occur at Vaughn instead of Belen. Therefore, AEPCO must make provision for delivery of sufficient fuel at Vaughn so that an average of { } gallons per day is available for locomotives.

There is no yard today at Vaughn and there is no available source of fuel at Vaughn. Vaughn is truly in the "middle of nowhere." Therefore, ACE must make arrangements to deliver sufficient fuel to Vaughn and it must establish the facilities at Vaughn that will enable ACE to

dispense the fuel that BNSF dispenses today at Belen. Defendants conclude that an efficient approach for ensuring that an adequate supply of fuel is available at Vaughn is to arrange for delivery of the fuel from Belen, where BNSF obtains the majority of its fuel today from an existing pipeline. Defendants assume that the fuel will be delivered by BNSF to Vaughn in fuel tank cars. (The additional costs associated with these tank car movements are discussed below in Section III.D.1.)

In order to provide this service for ACE, BNSF would have to construct additional facilities at Belen Yard to load fuel from its existing storage tanks into the tank cars. Since these are costs that the incumbent does not incur today, ACE would be responsible for them and the costs are therefore included in this SAC evidence. The daily fuel shipments would average approximately { } gallons which, as discussed above, is the average daily volume of fuel required by ACE at Vaughn for fueling locomotives. Assuming a capacity of 25,000 gallons per tank car, an average of { } tank car loads per day would be required to transport { } gallons of fuel. This fuel would be loaded in two sets of at least { } tank cars each per day. To accommodate these two { }-car sets, the loading facilities at Belen should have the capacity to load { } tank cars simultaneously. This provides additional (or surge) capacity for those days when demand exceeds { } tank cars per day. Additionally, this provides capacity to load at least { } tank cars at a time when one or two of the fuel-loading stanchions is unavailable because of mechanical difficulties or for other reasons.

In addition, facilities to unload the fuel would have to be included at the Vaughn Yard. These unloading facilities should have the same capacity as the loading facilities at Belen Yard (i.e., the capacity to unload { } tank cars simultaneously). AEPCO has provided { } gallons of fuel storage at its proposed Vaughn Yard. This represents approximately one day's

fueling requirement and is already inadequate. BNSF's Belen Yard has storage capacity of approximately { } million gallons today. Since ACE will perform the Belen fueling functions at Vaughn, storage capacity there should be comparable. Defendants have therefore increased the fuel storage at Vaughn to { } million gallons, equal to approximately a ten-day supply of fuel. This would ensure an adequate supply of fuel to meet the requirements at Vaughn in the case of a short-term interruption of deliveries due to weather or other causes.

The piping and other ancillary facilities necessary to move the fuel between the tank cars, storage tanks and fueling platforms also have to be added at the Vaughn Yard. Furthermore, two tracks, approximately 2,000 feet long each, have to be added at Vaughn Yard for staging of loaded tank cars prior to unloading, and empty tank cars prior to movement back to Belen for reloading. The costs for these facilities have been included in defendants' assessment of the costs for the Vaughn Yard.⁷

(b) Other Changes To Vaughn Yard

In other respects, the yard facilities proposed by AEPCO at Vaughn are inadequate and need to be enhanced as follows.⁸

As noted above, Vaughn Yard is ACE's principal yard. AEPCO has included the following facilities at the Vaughn Yard:

- Six 7000-foot relay/inspection tracks to be used for performing 1500-mile inspections.
- A locomotive shop.
- Two tracks to perform car repairs.

⁷ BNSF/UP Supplemental Reply electronic workpaper "III F Facilities.xls," Tab "Locomotive Fuel-Vaughn."

⁸ BNSF accepts the ACE yards at Defiance, Dalies and Belen as proposed by AEPCO.

- Four double-ended repair/spare car storage tracks.
- A wye track for turning locomotives and rotary-dump coal cars.
- Four sets of double fuel racks, two at the east end of the relay tracks and two at the west end of the relay tracks.

AEPCO Opening Nar. at III-B-14 to 15.

Although AEPCO depicted eight relay/inspection tracks at Vaughn Yard, which is an adequate number, it did not provide adequate track centers between all of its tracks to accommodate the procedure it proposes to use for inspecting trains.⁹ AEPCO Opening Exh. III-B-1 at 13a. AEPCO states that it will place two inspectors on four-wheel ATV-type vehicles on each side at the front and rear of the train, and that the inspectors will proceed along each side of the train and meet in the middle. AEPCO Opening Nar. at III-C-27 to 28. Such procedure requires adequate track centers for movement of the ATV vehicles. AEPCO did not provide the required track centers between tracks R3 and R4, and between tracks R7 and R8. AEPCO Opening Exh. III-B-1 at 13a. Adequate track centers must be provided between these tracks in order to accommodate this inspection procedure. Defendants' operating witness provided these revised requirements to defendants' engineering witness who provided a revised yard design.¹⁰

AEPCO provided four sets of double fuel racks, one each at the east and west ends between tracks R1 and R2, and between tracks R6 and R7. AEPCO Opening Exh. III-B-1 at

⁹ Eight relay/inspection tracks are required to process the average of 61 trains per day that ACE will interchange, inspect and fuel at the Vaughn Yard in light of the time designated by AEPCO for processing these trains and the additional time required for the trains to pull into and out of the relay/inspection/fueling tracks. AEPCO has not equipped the Vaughn Yard with power switches, signaled track, or high speed turnouts; therefore, all trains will be required to line their own switches when arriving and departing the tracks to which they have been assigned, and move at reduced speed (ten miles per hour or less) into and out of the yard. All trains will not arrive in the Vaughn Yard equally spaced apart, but on a more irregular schedule.

¹⁰ BNSF/UP Supplemental Reply Ex. III.B-2 is a revised schematic of ACE's Vaughn Yard that shows the revisions made by defendants.

13a. This limits fueling to four tracks, of which only three are on wide centers. In order to efficiently fuel locomotives for the average of 61 trains per day that will be passing through Vaughn Yard in both directions, each of the inspection tracks should have access to fueling.¹¹ To accomplish this, defendants have added a double fuel rack between the west ends of tracks R3 and R4, and a double fuel rack between the east ends of tracks R5 and R6. Additionally, the double fuel rack AEPCO positioned between the east ends of tracks R6 and R7 has been relocated between the east ends of tracks R7 and R8. This will then provide access to fueling for locomotives on four westbound trains simultaneously on tracks R1 through R4, and locomotives on four eastbound trains simultaneously on tracks R5 through R8. BNSF/UP Supplemental Reply Exh. III.B-2.

AEPCO provided double lead tracks at the west end of the yard accessing tracks R1 through R8, but only a single lead track at the east end of the yard. AEPCO Opening Exh. III-B-1 at 13a. Double lead tracks are also required at the east end of the yard to facilitate efficient and simultaneous movement of both eastbound and westbound trains entering and departing the yard at both ends of the yard. Additionally, as discussed below, an average of approximately { } bad-order cars per day will be required to be removed from the trains being processed on the relay/inspection tracks at Vaughn Yard and moved to the car repair facility in the yard. The double lead tracks defendants provided on both ends of the yard will allow this switching work to continue while other trains are arriving and departing via the second lead track. BNSF/UP Supplemental Reply Exh. III.B-2.

¹¹ AEPCO states that loaded coal trains will not be fueled at Vaughn. AEPCO Opening Nar. at III-C-18, n.14. There is an average of less than one loaded coal train per day that would not be fueled among the average of 61 trains per day that would be processed at Vaughn Yard.

AEPCO located its wye track between the double lead tracks at the west end of the yard. AEPCO Opening Exh. III-B-1 at 13a. This configuration does not allow efficient access to the wye track for turning locomotives and cars. Therefore, defendants relocated the wye track east of the car repair facility with access provided from the running track rather than the main lead track. BNSF/UP Supplemental Reply Exh. III.B-2.

AEPCO provided a single mainline track adjacent to and through the Vaughn Yard. AEPCO Opening Exh. III-B-1 at 13a. To provide efficient and simultaneous movement of trains into and through the yard, and in order to provide access to the double lead tracks from either mainline track adjacent to the yard, defendants added a second main track on the ACE from approximately MP 797.80 to MP 791.13, the eastern terminus of the ACE system. Single track segments of mainline adjacent to this busy yard (processing an average of 61 trains per day), as provided by AEPCO, would result in excessive delays with trains being required to wait as other trains enter and leave the yard. In order to provide adequate and simultaneous access to ACE's Vaughn Yard for interchange with BNSF, defendants also provided a second mainline on BNSF extending to the east between mileposts 791.13 and 788.5 to connect with the existing double track on the residual BNSF.¹² Defendants included universal crossovers in the double track segments that are located at both the east and west ends of the Vaughn Yard to permit efficient movement simultaneously between the two mainline tracks and the double leads at both ends of the yard. BNSF/UP Supplemental Reply Exh. III.B-2.

The size of the locomotive facility at the Vaughn Yard is adequate to handle approximately 190 locomotives that will be assigned to that facility for maintenance and major

¹² Although BNSF currently has single track at this location, it does not have a yard and the resulting congestion of slow moving trains while entering and departing the newly-created Vaughn Yard. The double tracking is required at this location on the ACE line to provide efficient access to the yard added by AEPCO at Vaughn.

repairs on all ACE locomotives. As described in Section III.F.7.b. below, however, the locomotive shop lacks certain necessary facilities that must be included.

BNSF averages { } bad-order cars per day at Belen Yard that have to be removed from trains for repair for essentially the same traffic that AEPCO assumed for ACE. BNSF/UP Supplemental Exh. III.B-3. Thus, the car repair facility at the Vaughn Yard should be constructed with the capacity to process approximately { } bad-order cars per day. There should also be trackage to hold one day's number of bad-order cars ({ } cars) prior to entering the car facility for repair and additional trackage to hold the average number of cars repaired each day in the car facility (i.e., { } cars). Two thousand feet of trackage for bad-order cars and repaired cars would be adequate for this purpose. Defendants operating witness provided these parameters for a car repair facility and associated trackage to defendants' engineering witness to use in constructing the Vaughn Yard.¹³

It is necessary for ACE to accommodate sufficient spare cars to maintain maximum tender on the coal trains being inspected at Vaughn Yard. Defendants determined that at least 35 spare coal cars for various shippers must be maintained at Vaughn Yard for this purpose. Two thousand feet of trackage will provide adequate space for storage of these spare cars (assuming each car is 55 feet long). Defendants included this trackage at Vaughn Yard. BNSF/UP Supplemental Reply Exh. III.B-2.

AEPCO did not provide adequate access between the locomotive shop, the car repair facility and the rest of the Vaughn Yard. Defendants have added a running track to provide access between the locomotive shop and either end of the yard to facilitate efficient movement of

¹³ The cars transported by the ACE will vary in size from approximately 55 feet to 80 feet, depending on car type. Two thousand feet of track can hold { } cars with an average length of approximately 65 feet.

locomotives to and from the locomotive shop. BNSF/UP Supplemental Reply Exh. III.B-2. This running track also will provide access between the car shop, the car storage tracks, the fuel unloading facilities and the wye track. The running track will be used to access and switch the fuel unloading facility, bad-order cars to the car repair facility, and repaired cars between the car repair facility and the storage tracks.

(c) Additional Facilities To Accommodate Revised Local Train Operations

As discussed in Section III.C.1. of this Narrative, AEPCO did not include BNSF's Belen Yard in its ACE, even though BNSF performs extensive switching operations at Belen. An average of 417 cars per day are switched at Belen for local service in the southwest. AEPCO assumes that some of these cars are switched off of the existing trains before the trains traverse the SARR. AEPCO assumes that other cars traverse the SARR and are switched out of the trains after moving over the SARR.¹⁴ In order to provide adequate trackage to store this number of cars, four 4,000-foot tracks should be added on the BNSF system immediately adjacent to ACE's Defiance and Vaughn Yards.¹⁵ Two of these tracks at each location would handle cars moving in an easterly direction and the other two tracks at each location would handle cars moving in a westerly direction. This provides capacity to hold approximately 100 cars in each direction at each location, assuming the maximum length of 80 feet for the set out cars.¹⁶

¹⁴ This is effectively what AEPCO assumes for the cars destined for Phoenix and Barstow, since AEPCO includes revenue for these carloads even though intermediate switching must be performed on them.

¹⁵ The cost of this additional trackage is included in defendants' total assessment of track miles.

¹⁶ The set out cars will vary in length from 55 feet to 80 feet depending on the type of car.

(2) Yards On Cochise-El Paso Segment

AEPCO designed two yards on ACE's Cochise-El Paso segment, one at Cochise and one at El Paso.

ACE's Cochise Yard will have three relay tracks and two double-ended setout tracks. It will be used for interchanging run-through trains with the residual UP and for changing crews. AEPCO Opening Nar. at III-B-16; AEPCO Opening Exh. III-B-3 at 20a. Given the limited functions performed by this yard, defendants accept AEPCO's configuration.

At El Paso, AEPCO proposes to construct a yard with four relay tracks (in addition to two mainline tracks) and two short double-ended tracks for the placement of bad-ordered cars, and two fueling facilities. AEPCO Opening Nar. at III-B-15; AEPCO Opening Exh. III-B-1 at 15a. AEPCO's operating plan calls for ACE to use this yard to fuel and inspect all westbound trains received from UP at El Paso. AEPCO Opening Nar. III-C-21 (inspection); III-D-2 (fueling). ACE will also inspect all coal trains moving to destinations west of Cochise at El Paso. *Id.* at III-C-12, 15 and 21. ACE's eastbound trains will be delivered to UP's El Paso yard for inspection and fueling by UP. *Id.* at III-C-21. All ACE trains will receive a new crew at El Paso. *Id.* at III-D-12 and 13. AEPCO says that ACE will base a "24/7" switch crew assignment at its El Paso yard, where two MP-15 locomotives (one a spare) will be stationed, to remove bad-ordered cars from trains following inspection, to move repaired cars to and from spare car storage tracks, and to insert repaired cars into outbound trains as necessary. *Id.* at III-C-14. AEPCO does not propose to locate any locomotive inspection or car repair facilities at ACE's El Paso yard. Instead, AEPCO envisions that locomotives on overhead El Paso-Cochise trains will be exchanged with power on ACE's coal trains "as necessary to enable them to receive 92-day inspections and necessary maintenance" at Vaughn. *Id.* at III-D-2. And, although AEPCO says

that ACE will have a “minor car repair facility” at Vaughn (*id.* at III-F-65), AEPCO did not place one at El Paso or provide any explanation of how ACE would repair cars there.

Defendants accept AEPCO’s chosen location for and basic configuration of ACE’s El Paso Yard. Four long relay tracks should be sufficient to carry out the interchange, inspection and fueling of the overhead and coal trains ACE will handle,¹⁷ provided those tracks have inspection roadways on both sides (as defendants have specified). Similarly, the two short double-ended bad-order set out tracks that AEPCO has specified should suffice for the placement of bad-ordered cars removed from trains. However, in several other respects, AEPCO’s design of ACE’s El Paso Yard is deficient and must be corrected.

First, AEPCO failed to include tracks to hold ACE’s switch locomotives and spare road locomotives at El Paso. AEPCO acknowledges that ACE will keep two switch locomotives at El Paso. AEPCO Opening Nar. at III-C-14. In addition, AEPCO acknowledges that ACE will locate spare road locomotives at El Paso to fill out consists for trains that encounter engine maintenance problems. *Id.* at III-D16. ACE’s yard must have some trackage set aside for these locomotives. ACE would need at least two short tracks so that the locomotives needed by ACE’s operations are not inaccessible because they are buried behind numerous other locomotives on a single storage track. At least one of the two tracks must be long enough to assemble and hold a complete locomotive consist (of up to six units on ACE) for placement on

¹⁷ AEPCO’s yard diagram (AEPCO Opening Exh. III-B-1 at 15a) depicts two mainline tracks and four relay tracks. Two of the six tracks are shown with dashed lines, apparently reflecting the specified type of rail. If this designation is intended to indicate that the dashed-line tracks are through mainline tracks, AEPCO’s design is faulty, because the southernmost track (shown at the top of AEPCO’s diagram) would traverse both yard ladders, and would thus be blocked by any activity being performed in the yard (*see* discussion below at III.B-23 to 24). Defendants have correctly designated the four southernmost tracks (labeled 3-6 on defendants’ diagram, BNSF/UP Supplemental Reply Exhibit III.B-4) as yard tracks.

an outgoing train. Defendants have added the required tracks. *See* BNSF/UP Supplemental Reply Exh. III.B-4.

Second, AEPCO failed to provide a track where ACE could store cars that have been repaired pending their placement on outgoing trains, despite acknowledging that ACE's switch engines will move repaired cars to and from such tracks. AEPCO Opening Nar. at III-C-14. Repaired cars cannot practicably be stored on the other tracks included in AEPCO's yard design because those tracks must be available for through trains, or for the placement of bad-ordered cars. Defendants have added a short (500-foot) track for this purpose. *See* BNSF/UP Supplemental Reply Exh. III.B-4.

Third, AEPCO's design does not include lead (or "drill") tracks needed to allow ACE to perform work in the yard (such as the removal of bad ordered cars or the insertion of repaired cars) without blocking access to the yard by mainline train that need to be refueled and inspected, and egress from the yard for trains that are ready to continue their westward journey. Any switching activity at either end of the yard would interfere with access to and from every track except the northernmost mainline track (labeled Track 1 on defendants' diagram, BNSF/UP Supplemental Reply Exh. III.B-4). The simple solution to this problem would be to add a lead track at each end of the yard (and in the process reconfigure one set of turnouts) to allow switching activity to take place on the ladder and lead track without interfering with trains entering and exiting from Tracks 1, 2 and 3. The lead track should be long enough to accommodate almost an entire train so that ACE can set out or insert cars near the back of the train without fouling the mainline. Defendants have added such a lead track on the west end of the yard, as shown in BNSF/UP Supplemental Reply Exh. III.B-4. A similar track should be added at the east end of the yard, so that westbound trains can enter the yard even when yard

activity is underway. However, defendants have not added a track at this location because doing so would be prohibitively expensive. Because AEPCO located ACE's yard just west of the Rio Grande River, adding a lead track at the yard's east end would require triple-tracking ACE's Rio Grande River Bridge at extraordinary cost. As a result, residual incumbents and ACE will suffer unavoidable inefficiencies, including the need to hold UP trains being delivered at ACE's yard out of the yard for long periods of time until access to yard tracks is cleared. Although those costs may be significant, especially given that UP's overhead trains will have covered long distances and their crews will be running out of time, defendants have not been able to quantify these costs in the limited time available to prepare their reply evidence.

Fourth, AEPCO explains that ACE will deliver its eastbound trains to UP's El Paso yard for inspection and fueling. To reach UP's yard without significant delay, these trains must be able to bypass other ACE trains that are stopped in the yard for fueling and inspection, and thus must use the northernmost mainline track (labeled Track 1 in BNSF/UP Supplemental Reply Exh. III.B-4). However, once on Track 1, eastbound trains destined for points east of El Paso must be able to cross back over to Track 2 to reach UP's El Paso Yard and UP's line to Houston and Dallas (instead of UP's Tucumcari Line, which heads toward Vaughn and Kansas City).¹⁸ AEPCO failed to provide a crossover for this purpose. Defendants have added it, as shown on BNSF/UP Supplemental Reply Exh. III.B-4.

Fifth, to facilitate fueling of westbound trains interchanged with UP at El Paso and certain of ACE's loaded coal trains (which use distributed power), AEPCO has located two permanent fuel racks at ACE's El Paso yard, one at each end of the northernmost yard

¹⁸ The need for this crossover is apparent from AEPCO's diagram of ACE's track configuration in the El Paso area; without it, trains on the northernmost mainline track can only move onto UP's "Carrizozo Sub to Vaughn." AEPCO Opening Exh. III-B-3 at 15.

relay/inspection tracks (between Tracks 2 and 3 on BNSF/UP Supplemental Reply Exh. III.B-4). AEPCO Opening Nar. at III-D-2; AEPCO Opening Exh. III-B-3 at 15a. Defendants accept the location of these two racks. However, ACE will need fueling capacity on *four* tracks rather than just two in order to fuel all westbound trains without incurring significant delays. ACE's racks can fuel only two westbound trains at one time. Those trains will pause on the tracks served by the racks for an average of 1.25 hours while they are inspected by ACE's yard forces, bad-ordered cars are removed, etc., preventing other westbound trains from proceeding into the same tracks for inspection and fueling.

If the westbound trains traversing ACE's El Paso-Cochise segment were always spread evenly across each 24 hour period, the throughput provided by fuel racks serving two yard tracks might in theory suffice. Unfortunately, reality is not so kind. Every day, ACE's average of 18 westbound trains (both its coal trains and the overhead trains received from UP) will arrive in bunches.¹⁹ A single two-track fuel rack will also not allow ACE to fuel trains at times when the rack is out of service for maintenance or other problems. In addition, ACE will incur additional costs and delays associated with fueling the power on trains required to arrive on other tracks in the yard when the fuel tracks are full. The units will have to be cut off these trains, taken to the fuel racks when they become available and then returned to the trains. To accommodate surges in demand for fueling and inspection, ACE must add at least one additional two-track fuel rack at the west end of its yard (along with the additional forces, discussed at III-D-33 to perform simultaneous inspections of more than two trains at a time). Defendants' revised schematic depicts this fuel rack between Tracks 4 and 5 at the west end of ACE's El Paso yard. *See* BNSF/UP Supplemental Reply Exh. III.B-4.

¹⁹ Even AEPCO's own string diagram shows bunching of ACE's westbound trains arriving at El Paso. AEPCO Errata Exh. III-C-3, Attachment A, p. 3 of 3.

Sixth, AEPCO failed to provide any capability for ACE to repair bad-ordered cars at El Paso. Like UP, ACE will need to be able to make basic repairs sufficient to render cars safe for transit to more capable, remote car repair facilities. ACE will need a minor facility comparable to that located at Vaughn that would allow ACE's contractors to pull and lift cars and make minor repairs. Such a facility and the tracks serving it are shown in BNSF/UP Supplemental Reply Exh. III.B-4; *see also* discussion at III.F.7.c., below.

Seventh, AEPCO failed to provide ACE with any capability to perform federally-mandated 92-day inspections on locomotives at El Paso. AEPCO's plan instead calls for all of ACE's locomotives to be cycled through its Vaughn locomotive shop for all purposes. This plan is not feasible, for at least two reasons. ACE will operate only about 100 empty coal trains per year through El Paso, or about one every three days. Locomotives arriving at El Paso will often need inspection sooner than would be possible if they had to first wait for one of ACE's empty coal trains and then be shuttled the 229 miles to Vaughn. Moreover, AEPCO has not allowed any dwell time in El Paso for its empty coal trains, such as would be necessary if power were to be swapped to facilitate inspections at Vaughn.²⁰ Defendants have added a rudimentary locomotive inspection pit on one track in ACE's El Paso yard to perform the required activity. BNSF/UP Supplemental Reply Exh. III.B-4; *see also* discussion at III.F.7.b., below.

²⁰ This is a more fundamental defect in AEPCO's calculations of cycle times, since even with a locomotive inspection pit at El Paso, ACE's locomotives will still need to be shuttled to Vaughn for most maintenance and repair work.

b. Miles And Weight Of Track

The ACE yards as proposed by AEPCO contain a total of 44.16 miles of track. AEPCO Opening Nar. at III-B-16. With the revisions to AEPCO's proposed yards discussed above, the ACE yards contain a total of 50.91 track miles.²¹

AEPCO states that the yard tracks consist of 132-pound relay jointed rail. AEPCO further states that the main running tracks through the yard will have the same weight and type of rail as on the adjacent mainline tracks. As discussed in Section III.F.3 below, defendants agree with AEPCO's proposed specifications for the yard tracks.

4. Other

a. Track Parameters

Defendants accept AEPCO's specifications that the ACE mainline track should be constructed to allow maximum trains speeds of 70 mph for empty coal trains and non-coal trains and 60 mph for loaded coal trains. AEPCO Opening Nar. at III-B-16. Defendants also accept AEPCO's assumptions that the maximum authorized train speed on the ACE's two branch lines will be 49 mph. Defendants agree with AEPCO that lower maximum speeds will prevail in areas where grades, curves and operating conditions do not permit trains to achieve these maximums.

Crosstie and other track and grading specifications are discussed in Sections III.F.2 and III.F.3.

b. Signal/Communication System

Defendants accept AEPCO's assumption that ACE's mainlines between Defiance-Vaughn and El Paso-Cochise will be equipped with a centralized traffic control (CTC) system

²¹ BNSF/UP Supplemental Reply electronic workpaper "III F 3 Track.xls."

that includes power switches controlled by centralized dispatchers, and that the branch lines will be “dark” and dispatched through Direct Train Control. The signal/communication system required by ACE is discussed in more detail in Section III.F.6.

c. Other

AEPCO discusses the use of turnouts, defective equipment detectors (DEDs) and AEI scanners in this Section. Defendants address these issues in Sections III.F.3 and III.F.6.

C. OPERATING PLAN

1. General Parameters

a. Traffic Flow And Interchange Points -- Implications Of AEPCO's Assumption That ACE Operates As An Overhead Carrier

AEPCO structured ACE to serve two mine origins in New Mexico and one destination power plant (AEPCO's Apache station). All of ACE's other coal traffic, and all of its non-coal traffic, is crossover traffic that is presently transported by BNSF or UP over the lines ACE is replicating. AEPCO proposes to interchange this traffic to and/or from BNSF/UP at six new interchange points - to BNSF at Defiance, Dalies, Belen, and Vaughn, New Mexico, and to UP at El Paso, Texas and Cochise, Arizona. AEPCO Opening Nar. at III-C-5.

In addition, this crossover traffic is all assumed to be handled in overhead service, i.e., ACE handles it between the eastern and western points on ACE without intermediate yard operations. Apart from the issue traffic and a few other coal trains, ACE also handles no local traffic that originates or terminates at any intermediate points on ACE. As BNSF explained in detail in its May 27, 2003 Reply evidence, to implement these assumptions AEPCO further assumes that each ACE train enters and leaves ACE with the same number of cars. BNSF Reply Nar. at III.C-7 to 14. Moreover, because these trains do not stop at an intermediate yard, AEPCO implicitly assumes that the same specific cars that enter ACE on one end of the system leave ACE on the same train at the other end.

This operating plan represents a significant departure from the operations that occur today on the BNSF lines that are replicated by ACE. In the real world, all trains traversing this line segment stop in BNSF's Belen Yard. The stop in Belen allows BNSF to perform basic train servicing operations (which ACE will perform at Vaughn) and it also supports BNSF's extensive local service in the southwest.

There are four basic local operations that are supported by the Belen Yard. BNSF's Reply Exhibit III.C-4 depicts the lines used to provide these local operations. First, on average, four roundtrip trains each day operate between Belen and Albuquerque, located 31 miles north of Belen. The trains assembled at Belen Yard for movement to Albuquerque range from 10 to 50 cars each trip from all three train type groups (intermodal, vehicle and manifest) that have been set out by other trains moving through the Belen Yard. The trains moving from Albuquerque to Belen include both empty and loaded cars to be set out at Belen Yard and picked up by trains from all these train type groups bound for other destinations. The level of daily service operating between Belen and Albuquerque is sufficient to require that one road crew be on duty on a continuous basis to handle it.

Second, BNSF's principal route into and out of El Paso is through Belen, which is 228 miles north of El Paso. On average, one train operates in each direction between Belen and El Paso each day. The train operating from Belen to El Paso is assembled each day with intermodal and merchandise cars set out of trains at Belen Yard. The returning train from El Paso includes cars to be set out at Belen Yard and picked up by trains bound for other destinations.

Third, an average of one train per day in each direction operates between Belen Yard and Phoenix. Phoenix is located 567 miles west of Belen and is reached by heading west on BNSF's mainline and turning south at Williams Jct. All intermodal and manifest traffic coming from the east and bound for Phoenix is set out of trains at Belen Yard. The cars are then assembled at Belen Yard into a train for transportation to Phoenix.

Fourth, on average, one train per day operating between Belen Yard and Barstow will pick up 30 to 50 cars for further movement to Barstow, which is located 731 miles from Belen. These trains include cars from all three train type groups (intermodal, vehicle and manifest) set

out from other trains at Belen Yard that are destined for all points in California. Trains returning from the west coast through Barstow include cars to be set out at Belen Yard for switching to trains bound for various destinations.¹

Defendants performed an analysis of BNSF's switching of cars at Belen Yard for the local traffic described above to or from the trains selected by AEPCO as part of its traffic during the one-week period from September 12-18, 2001.² The study showed that during this week 125 of 466 (or approximately 27%) of the trains selected by AEPCO showed either a pickup, a set out, or both at Belen Yard. It also showed that BNSF switched an average of 417 cars per day at Belen out of or into the trains selected by AEPCO during this week.

In order to accommodate ACE's overhead service as designed by AEPCO, the residual BNSF would have to undertake significant changes to its existing operations. Specifically, the residual BNSF would have to establish operations that would move the cars dropped off at Vaughn and Defiance to Belen, where the residual BNSF could form them into local trains. In addition, empty cars and carloads originating at points within the Belen service area would have to be moved from Belen to Defiance or Vaughn so that they could be included on the residual BNSF through trains moving to their ultimate destinations. AEPCO ignores the consequences of

¹ On rebuttal, AEPCO claimed that it is entitled to include cars destined for Phoenix in its SARR notwithstanding the intermediate switching performed on them at Belen because those cars traverse the entire ACE. AEPCO Rebuttal Nar. at III-C-15 to 16. While AEPCO did not discuss the California traffic, it presumably would make the same claim as to that traffic. Defendants do not believe this assumption is appropriate, as it ignores operations that must take place for the traffic to be served. However, defendants accepted AEPCO's alternate rebuttal traffic assumptions which included this traffic. Therefore, revenues associated with these movements are included in defendants' SAC presentation. However, the incremental facility costs that would be imposed on the residual BNSF at Defiance and Vaughn are included, as discussed below.

² BNSF/UP Supplemental Reply electronic workpaper "belen switching sept 12-18 - supp reply.xls."

the changes that its approach -- overhead trains running past Belen without stopping -- would impose upon BNSF's operations, or to estimate the costs that would be imposed on the residual BNSF. In the *TMPA* case, the Board made it clear that when a complainant uses crossover traffic in a way that imposes operational changes on the residual incumbent, it must investigate the impact of those changes and include any cost attributable to them.³ AEPCO failed to carry out such an analysis in this case.

Defendants, therefore, developed an operating plan to provide the necessary transportation for the cars in local service that AEPCO excludes from its overhead trains. Given the number of cars involved and the frequency of local service that BNSF provides today, defendants concluded that it would be necessary to provide a train to perform one round-trip daily between Vaughn and Belen, and a second train to perform one round-trip daily between Defiance and Belen. Even if the residual incumbent were responsible only for cars switched out today at Belen that are destined for Albuquerque or El Paso, which AEPCO has excluded from its traffic, the residual incumbent would have to transport about 50 cars daily in round-trip service between Vaughn and Belen and Defiance and Belen. Daily service on both segments would be required for the residual incumbent to meet existing service requirements.⁴ Each of these trains will require two SD40-2 locomotives to transport these numbers of cars.⁵ The costs

³ *TMPA*, slip op. at 22.

⁴ BNSF/UP Supplemental Reply electronic workpapers "BNSF ALB_TRAF_01.xls" and "BNSF elp_TRAF_01.xls."

⁵ Some trains would be relatively light with respect to cars and tonnage; however, two locomotives would be used on each train to provide a forward facing locomotive in both directions. There are no wye tracks on BNSF at Defiance or Vaughn.

associated with these additional operations are included in defendants' operating cost calculations.⁶

In addition, because BNSF does not have facilities at either Defiance or Vaughn where cars set out of the trains selected by AEPCO could be held for pickup by BNSF, set-out tracks need to be added to the BNSF system adjacent to ACE's Defiance and Vaughn Yards for this purpose. The trackage required is discussed in Section III.B.3 above.

b. Trains And Equipment

Defendants generally accept the parameters established by AEPCO concerning trains and equipment. In particular, defendants accept that the ACE will operate only unit and run-through trains, that the train sizes will be the same as those currently operated by BNSF and UP, that the horsepower-to-trailing-ton ratio for each train will remain unchanged, and that the train sizes and locomotive consists will remain the same throughout the 20-year DCF period. Defendants have used the specific 2001 trains identified in AEPCO's work papers in their calculations.⁷

AEPCO asserts that it will use four types of locomotives in road service – C44-9s, SD90s, SD70s, and SD40-2s – and a locomotive it designates as “FP-15” for switch service. AEPCO Opening Nar. at III-C-11. AEPCO's workpapers, however, do not show that AEPCO has made any use of SD90s. Nor does AEPCO make any showing concerning the cost of its

⁶ The costs of the locomotives, fuel and crews for these trains are set out in BNSF/UP Supplemental Reply electronic workpaper “bnsflocal.xls.”

⁷ Non-coal trains are those identified in AEPCO Reb. electronic work paper “ACE Non-Coal Traffic and Revenue Forecast.xls,” worksheets “ACE BNSF ‘01 Traf. and Rev.” and “ACE UP 2001 Traf. and Rev.” Coal trains are those identified in AEPCO Op. electronic workpaper “ACE Coal Traffic and Revenue Forecast.xls,” worksheet “2001 Statistics.” As described in Section III.A above, the number of coal trains was slightly modified to exclude 22 loaded and corresponding empty coal trains for which AEPCO had substantially changed the level of service by increasing the length/tons per train compared to real world operations.

designated switch locomotives. In fact, defendants are not familiar with and have not been able to identify any locomotive type corresponding to AEPCO's "FP-15" designation. Defendants have sought to adhere as closely as possible to AEPCO's locomotive designations, and therefore use C44-9s, SD70s and SD40-2s for road service. Defendants have substituted SD40-2s for switch trains and also use them for the work trains required by the SARR. These locomotive types should be capable of handling all the requirements of the SARR. The number of each locomotive type the SARR would require is developed in Section III.C.2.d below.

With respect to railcars, defendants have accepted AEPCO's 2001 base year railcar expense figure of \$55,412,947 and use that number for purposes of their DCF calculation.

2. Cycle Time

a. AEPCO's Defective String Program

The reliable calculation of cycle times on the stand-alone railroad is an important element of the complainant's burden of proof. A train's cycle time represents the total amount of time the train spends on a railroad's network or under the responsibility of the railroad (*e.g.*, during the loading process). This cycle time is used to determine the amount of equipment (*i.e.*, locomotives and railcars) required to provide service. It is also an important factor in establishing appropriate crew districts.

AEPCO uses its string program to calculate cycle times. The string program used by AEPCO in this case is the latest version of a program developed by L.E. Peabody & Associates (LEPA). The string program is a rudimentary computer program that attempts to model the operations of a specified set of trains across railroad lines with a specified configuration and operations. The string program and its associated input files include "rules" for the operation of the trains, such as speed limits, acceleration and deceleration formulae, and time for various

activities (e.g., crew changes). The output of the string program is the foundation for AEPCO's operating statistics that are used to calculate operating costs.

In its recent decision in the *TMPA* case, the Board found that it was unable to determine the reliability of a previous version of the LEPA string program and therefore did not accept its output as the basis for the operating plan for the hypothetical railroad in that case.⁸ In the *Xcel* and *Otter Tail* cases, BNSF has argued that the versions of the string program used in those cases were flawed and could not be relied on by the Board.⁹ For this case, defendants' witnesses Karl M. Leopold, Manager at FTI Consulting, and Terence J. Monks, a software consultant, analyzed the errata string program submitted by AEPCO and concluded that this version of the string program also suffers from fundamental defects that render it unreliable.

There are such significant errors in AEPCO's string program that it is impossible for the string program to generate accurate cycle times. The string program defects include:

1. Simplistic Assumptions That Ignore Real World Operations: The string program relies on many simplifying assumptions that allow AEPCO to posit unrealistic operations that understate transit times and contradict AEPCO's own operating plan. For example, the string program assumed that each ACE train is powered by four locomotives.¹⁰ However, AEPCO's operating plan assumes that all ACE trains (with the exception of the issue traffic) operate in run-through service with the residual BNSF or UP and have locomotive consists made up of the same

⁸ *TMPA*, slip op. at 68 n.112 and 73-74.

⁹ See, e.g., Final Brief of BNSF, *Public Service Co. of Colorado d/b/a Xcel Energy v. The Burlington No. and Santa Fe Ry. Co.*, STB Docket No. 42057, at 25-28 (filed Sept. 8, 2003); Public Version of BNSF's Reply Evidence, *Otter Tail Power Co. v. The Burlington No. and Santa Fe Ry. Co.*, STB Docket No. 42071, at III.B-10 to 17 and III.C-20 to 27 (filed Oct. 8, 2003).

¹⁰ AEPCO Errata electronic workpaper "route.dbf."

number and types of locomotives used by defendants in the year 2001.¹¹ According to AEPCO's calculations, the defendants' trains were powered, on average, by fewer than four locomotives.¹² Although AEPCO used the smaller, actual consist sizes to calculate operating costs for the ACE locomotives, it did not use the actual sizes in its string program which was used to generate ACE transit times.¹³ Thus, AEPCO reaped the benefit of larger consist sizes in its string program, but did not account for the costs associated with those locomotives.¹⁴

In addition, AEPCO's string program understates the weight of certain ACE trains. The string program assumes that each car on trains traveling in the non-prevailing direction (the opposite direction as the issue traffic) has the approximate weight of an empty coal car, { } tons.¹⁵ However, the majority of the traffic traveling in the non-prevailing direction is non-coal traffic with a higher weight per car or container than { } tons. AEPCO's understatement of car weights allows trains traveling in the non-prevailing direction to achieve transit times that could not be achieved in the real world.

Another example is the string program's simplistic determination of train priority, *i.e.*, whether one train or another is allowed to proceed in the event of a train meet or passing situation. The string program prioritizes all loaded coal and non-coal trains moving in the

¹¹ AEPCO Errata electronic workpapers "Peakweek_AEPCO" and "Average locos by node.xls."

¹² *Id.* AEPCO calculated the average number of locomotives per train per node based on actual trains operated by defendants during the peak week. The average is 3.24 to 3.55 locomotives.

¹³ AEPCO Errata electronic workpaper "statoutput.xls."

¹⁴ AEPCO also assumed that each of the four locomotives in the string program was capable of generating more tractive effort than is realistic. This issue is discussed in more detail below.

¹⁵ AEPCO Errata electronic workpaper "aepco.string.prg" at lines 1682-1684.

prevailing direction (the direction in which the issue traffic moves). The program's rudimentary logic is only capable of dispatching trains in one direction and then separately dispatching trains in another direction.¹⁶ In the real world, a railroad that carries coal and time-sensitive non-coal traffic would prioritize based on traffic type and characteristics rather than a simplistic directional priority.¹⁷ The string program's simplistic priority system results in a significant disparity in transit times in the prevailing direction versus the non-prevailing direction. For example, between Cochise and El Paso, an average intermodal train moving from east to west (the prevailing direction) is three hours faster than a similar train moving from west to east (the non-prevailing direction).¹⁸

Finally, AEPCO's string program does not provide for any track outages as a result of random failures that occur during the modeled period. It is unrealistic to expect that the ACE would not experience any delays due to unexpected locomotive or track failures. This issue is discussed in more detail in Section III.D.4.a.

¹⁶ To start the flow of trains, the string program first dispatches all loaded coal and general freight trains moving in the prevailing direction. AEPCO Supplemental electronic workpaper "aepco.string.prg" at lines 907ff. These trains traverse the network easily, experiencing no delays from oncoming trains since there are no trains moving in the non-prevailing direction at this point in the program. The string program next dispatches all trains moving in the non-prevailing direction. *Id.* at lines 1487ff. Finally, the program dispatches all of the empty trains moving in the prevailing direction. *Id.* at lines 2987ff. The movement of the first set of trains is fixed, *i.e.*, the string program does not adjust the positions of those trains once it starts flowing trains moving in the non-prevailing direction. By contrast, sophisticated models used in the railroad industry have advanced dispatching logic that flows trains in different directions simultaneously and determines the priority that should be given to each train based on the needs of each train and the impact on the network as a whole. See Public Version of BNSF Reply Evidence, *Otter Tail Power Co. v. The Burlington No. and Santa Fe Ry. Co.*, STB Docket No. 42071, at III.B-17 (Oct. 8, 2003).

¹⁷ See, for example, BNSF's train priorities, which were produced to AEPCO in discovery. BNSF/UP.SUPPRP.WP.III.C-0002 to 0003.

¹⁸ AEPCO Rebuttal electronic workpaper "Transit Time Comparison.xls."

2. The String Program Overstates Tractive Effort for the ACE Trains: To be a reliable model for cycle time calculations, the string program must be able to model the movement of a train as it would occur in the real world. But AEPCO's model does not represent realistic train operation. There are many fundamental errors in the string program code that are at least partially responsible for this result and which allow a train to move faster than is physically possible. Some of the more obvious errors are described below, but given the volume of code in the string program, there is no reason to believe that this list of errors is comprehensive.

The ability of a train to maintain its speed or to accelerate at any given time depends on (1) the total power or tractive effort available to move the train and (2) the total resistance acting to keep the train from moving or accelerating. Tractive effort depends on the type and number of locomotives on the train. Tractive effort actually available to accelerate or move the train is reduced by the total resistance, which in turn depends on a number of factors, including the train weight, the type of cars on the train, and the grade and curvature of the track. AEPCO's string program generates physically impossible transit times by *overstating* the tractive effort of the ACE trains and *understating* the resistance encountered by the ACE trains.

AEPCO made at least two errors when calculating the tractive effort of certain ACE trains. First, as discussed in more detail above, the string program assumes that each ACE train is powered by four locomotives, when the majority of the ACE trains have fewer locomotives. Second, the string program overstates the tractive effort available from the ACE locomotives.¹⁹

¹⁹ At speeds less than 10 mph, the string program calculated total tractive effort using the formula: {

} . AEPCO Errata electronic work paper "aepco.string.prg" at lines 1197, 1880 and 3348. Regardless of locomotive type, the string program assumed that the locomotive weight is { } tons and the adhesion value is { }. *Id.* at lines 1007, 1683 and 3160 (locomotive weight) and

Obviously, overstating locomotive power increases the speed of ACE trains, resulting in unrealistic transit times.

3. The String Program Understates Resistance for the ACE Trains: AEPCO made at least three errors in determining resistance of the ACE trains. First, as discussed in more detail above, the string program understates the weight of certain ACE trains.

Second, AEPCO's calculation of air drag resistance treats all car types as exhibiting the same level of resistance.²⁰ It is well-known that whether a car is loaded or empty, and the type of car -- gondola, covered hopper, or container or trailer on flat car -- has a significant impact on air drag resistance. AEPCO's own work papers show that each car type should have a unique coefficient for air drag resistance.²¹ Despite this, AEPCO uses a single coefficient for all cars, and the coefficient value used by AEPCO is not found in any of its work papers.

1145, 1828 and 3297 (adhesion). Using these figures, the string program calculated total tractive effort per locomotive equal to 144,900 pounds at all speeds less than 10 mph. However, the locomotives on the ACE trains cannot achieve a constant tractive effort equal to or greater than 144,900 pounds at the speeds assumed by AEPCO. BNSF/UP.SUPPRP.WP.III.C-0004 to 0010.

At speeds of 10 mph or greater, the string program calculated total tractive effort using the formula: {

} . AEPCO Errata electronic work paper "aepco.string.prg" at lines 1199, 1882 and 3350. The string program erroneously assumed that all of the ACE trains are powered by 4400-horsepower locomotives (C44-9s). However, since the ACE trains generally use a mix of less powerful locomotives, including 4000-horsepower SD70s and 3000-horsepower SD40-2s, the string program overstated tractive effort for these trains. BNSF/UP.SUPPRP.WP.III.C-0004 to 0010.

²⁰ AEPCO Errata electronic workpaper "aepco.string.prg" at lines 1191, 1874 and 3342. The same equation with identical constants is used by the string program for all trains, regardless of car type.

²¹ AEPCO Opening workpapers AEP 03569-03575.

Third, AEPCO erred in calculating grade-related resistance, assuming that trains traveling in opposite directions traverse the exact same grade -- an obvious impossibility. In the real world, for example, westbound trains traveling between El Paso and Vaughn encounter an ascending grade of 1.48 near Tecolote (UP MP 792) and trains traveling in the opposite direction encounter a descending grade of the same magnitude (-1.48).²² The string program, however, treats both northbound and southbound trains traversing this section as facing descending grades.²³ Once again, this error causes the string program to generate unreliable transit times.

4. Empty Trains Traveling in the Prevailing Direction: AEPCO further erred in its treatment of empty trains traveling in the prevailing direction (the direction in which the issue traffic moves). The string program allows these trains to travel at the maximum authorized speed for empty trains and does not account for any acceleration and deceleration when these trains come to a stop.²⁴ This error results in understated transit times.

5. Overloading of Sidings: The string program output shows that the model regularly allowed ACE trains to enter sidings when other trains already fully occupied that space. One example of this problem occurs on the ACE's supposed peak period at the siding between W. Cage and E. Cage on the Lordsburg Subdivision. Between 2:44 a.m. and 3:11 a.m., the string program allowed two trains (each of which is at least one mile in length) to occupy a 1.61-mile

²² BNSF/UP.SUPPRP.WP.III.C-0011 to 0012.

²³ AEPCO Errata electronic workpaper "aepco.string.prg" at lines 1066, 1172, 1743, 1855, 3218 and 3324. If the program worked properly, it would incorporate a positive grade into its calculations when the train is traveling uphill and a negative grade when the train is traveling downhill. However, the string program used the same grade value for movements in both the prevailing and non-prevailing directions.

²⁴ AEPCO's string program ("aepco.string.prg") calculates braking and acceleration time, but does not use these values.

siding while another train traveling in the opposite direction passed on the mainline.²⁵ This is not an isolated occurrence. Defendants found 66 examples in the week surrounding AEPCO's peak day.²⁶ One overloading demonstrates that the string program is flawed; a multiplicity of overloadings demonstrates that it is a worthless tool for developing transit times and operating statistics.

6. Failure to Link Empty and Loaded Coal Trains: AEPCO failed to make any connection between empty trains returning from destinations and loaded trains departing from the McKinley and Lee Ranch mines for those destinations.²⁷ This failure marks a significant departure from the real world unit coal train service that AEPCO purports to provide, in which equipment owned by individual shippers is employed continuously in the service of that shipper.

Exhibit III.C-1 illustrates this problem with a simple example taken directly from the output of AEPCO's string program. The first page of the Exhibit shows that train CMC MJCC47, an Arizona Public Service (APS) train, arrives at the branch line junction to McKinley mine on October 15 at 12:04 p.m. The next loaded train assumed to depart from McKinley - another APS train - does not leave the mine until October 17 at 6:11 p.m., 54 hours later. AEPCO's model, however, is programmed to assume that only five hours are spent by ACE trains loading at the mines, thus understating the cycle time for this particular train by 49 hours. The second page of the Exhibit shows that train CMC MCRD37 experiences the same sort of extended delay at the mine and the same sort of understatement of cycle times.

²⁵ BNSF/UP Supplemental Reply electronic workpaper "Siding Overloading Analysis.xls."

²⁶ *Id.* at worksheet "Results."

²⁷ The string program does not even model the ACE's operations on the branch lines leading to the McKinley and Lee Ranch mines served by ACE.

b. Defendants' Analysis Uses Actual Transit Times

Due to the numerous problems with the string program described above, transit times from the string program cannot be used to calculate operating statistics. Therefore, for each non-coal train, defendants used the actual transit time for that train as reported in the train movement data for each railroad.²⁸ For coal trains, transit times were also derived from real world data for coal trains moving across the SARR segments in question. On the Defiance-Vaughn section, weighted average actual transit times from the 2001 BNSF Quarterly Unit Coal Train Performance Reports were used. These transit times include loading time at the mine. They were also adjusted to reflect the fact that SARR trains travel between Belen and Vaughn rather than Belen and Clovis, the segment reported in the BNSF data.²⁹ For the UP segments, both Vaughn -El Paso and El Paso-Cochise, transit times were taken from full-year 2001 UP TUC data. Again, time was added to reflect unloading time at Cochise as well as crew changes and fueling and inspection.³⁰

Real world transit times are an appropriate proxy for the transit times SARR trains could actually achieve. AEPCO has largely replicated the track configuration and capacity of the real-world BNSF and UP and it purports to run essentially the same number of trains over the SARR that traverse the relevant track segments today. Only actual, real-world transit times capture all of the sorts of delay-causing real-world conditions that ACE trains will encounter. Indeed,

²⁸ BNSF/UP Supplemental Reply electronic workpapers "upsactraf01.xls," worksheet "upsactraf01," column "V" and "bngfsactrn01.xls," worksheet "bngfsactrn01," column "AB."

²⁹ BNSF/UP Supplemental Reply electronic workpaper "bngfsactrn01.xls," worksheet "bngfsactrn01," columns "X" and "Y." Eastbound coal train transit times between Belen and Vaughn include three hours to reflect expected delays at Abo Canyon, as discussed in more detail below.

³⁰ BNSF/UP Supplemental Reply electronic workpaper "upsactraf01.xls," worksheet "upsactraf01," columns "T," "U," and "V."

AEPCO submitted no evidence other than its flawed string analysis that indicates how transit time improvements could be achieved.

Elimination of BNSF's local traffic does not reduce the number of trains since, in the real world, cars with local destinations are carried on the same overhead trains AEPCO has selected. Likewise, elimination of UP's two local trains will not effect the ACE, because these trains have low priority and are dispatched in a way that avoids interference with other operations. As a result, overhead trains will not notice the omission of local traffic from ACE's network. Nor is AEPCO entitled to assert that ACE will improve its performance by omitting Amtrak operations. The defendants are legally required to allow Amtrak to operate over their lines and a complainant may not assume away burdens that defendant railroads must bear as a result of forces beyond their control. In any event, Amtrak operates only one train per day in each direction over a portion of the BNSF lines ACE will replicate (the double-tracked segment between Defiance and Dalies). Likewise, Amtrak operates only one train in each direction three days per week over UP's El Paso to Cochise segment. Under these circumstances, there is no reason to expect that AEPCO would be able to achieve transit times better than the actuals.

AEPCO claims in its opening evidence that the addition of five crossovers on the ACE main line between Defiance and Vaughn expands the capacity of that line. AEPCO Opening Nar. at III-B-8 to 9. The purpose of crossovers on a double-track section is to allow trains traveling in the same direction to pass or overtake one another and to allow traffic to flow more smoothly when one track is taken out of service for maintenance. However, AEPCO has made no provision for the ACE trains to overtake one another (not a single overtake occurs in the string program), and AEPCO located the additional ACE crossovers within several miles of existing crossovers, making them largely superfluous. Under these circumstances, defendant's

witness Mr. Wheeler concluded that five additional crossovers will have little effect on the transit times over the Defiance-Vaughn segment which already has 56 crossovers.

Actual transit times are likely conservative because they do not include the time that would be incurred for the two interchanges and the extra crew change that AEPCO has introduced by inserting its SARR into the middle of existing East-West routes for each railroad. The interchanges, in particular, would require extra time to turn the train over to the new railroad and perform necessary set and release air tests for each train. Actual transit times are also conservative because AEPCO has added additional, re-routed coal trains to the already very dense East-West routes east of Belen and Deming, as discussed in Section III.C.2.c.

Moreover, to the extent that the actuals include switching time at Belen for some BNSF trains, the SARR must be responsible for that time. Otherwise, the SARR would be imposing additional equipment and operating costs on the residual incumbent. In the stand-alone world, a through train must stop and perform switching at Vaughn or Defiance to remove “local” cars. These “local” cars must be reassembled into a new train for Belen, then switched again at Belen onto a train for their final destination. By contrast, in the real world, only one set of switching operations is required and that occurs at Belen. The time necessary to handle the extra switching required to get local cars to Belen on the residual BNSF and then onto a new train at Belen is the responsibility of the SARR.

c. Rerouted Coal Traffic

As defendants explained in their previous submissions in this case, AEPCO’s decision to re-route the issue traffic (and other coal movements) from the existing route via BNSF’s line between Belen and Deming to a route via Vaughn and El Paso imposes significant inefficiencies

on the stand-alone railroad's operations.³¹ The proposed routing takes the re-routed coal trains 222 miles out of the way (increasing the route of the issue traffic by 43 percent). It demands that these trains navigate, in each direction, an additional 6,329 feet of rise and fall in elevation (more than a vertical mile, and an increase of 55 percent) and 3,004 additional degrees of curvature (almost 10 complete circular loops, and an increase of 34 percent), as compared to the current routing via Belen and Deming.³² AEPCO's re-route also shifts this traffic from a lightly-traveled line (with only two trains per day on average, plus a grain train about once per week)³³ onto hundreds of miles of high-density mainline, much of which is single-tracked and crowded with service sensitive intermodal and automotive traffic. A map of the new, longer route these trains will use is shown in Exhibit III.C-2.

AEPCO did not propose this routing in order to increase efficiency or improve service. It did so in an effort to avoid the need for ACE to build any north-south line. As explained in Sections I.C and III.B.2.a.(2), AEPCO's gambit is inconsistent with the objectives of the SAC test. However, even if AEPCO were permitted to avoid building a north-south line, its proposal to re-route the issue traffic (and other coal trains) over a much longer and more difficult route requires the rejection of AEPCO's SAC case for another reason: the inferiority of the proposed route will prevent ACE from matching the level of service provided by incumbents, and thus render any SAC result based on ACE's reconfigured and inferior operations an invalid test of the defendants' joint rate.

³¹ UP Reply Nar. at III-B-1; UP Petition to Require Submission of New Opening Evidence or, Alternatively, to Dismiss at 17-20 & Salzman V.S. at 2-6.

³² UP Petition, Salzman V.S. at 3.

³³ *Id.* at 2; UP Reply Nar. at III-B-1.

As AEPCO acknowledges, the SARR's route must provide service that is "equivalent to the existing service for that traffic." AEPCO Rebuttal Nar. at III-B-7; *see also TMPA* at 16, 21. ACE's network cannot meet that standard. The longer Vaughn-El Paso route causes AEPCO's coal trains to incur round-trip cycle times that are many hours longer than defendants' cycle times via Belen and Deming. AEPCO's complaint must therefore be dismissed.

Even if AEPCO were allowed to proceed with a SAC analysis predicated on its proposed longer routing, ACE's SAC costs must reflect the additional costs – in terms of cycle times, fuel consumption, etc. – imposed by the routing choice. As defendants demonstrate in this section, AEPCO has not come to grips with the additional transit times ACE's trains will suffer as a result of going 444 round-trip miles (and more than two-and-a-half vertical miles) out of their way, all on routes with extensive opposing traffic. AEPCO's estimate of ACE's coal train cycle times must be increased by a dramatic margin to reflect the effect that the laws of physics and real-world railroading will have on their operations.

The Proposed Routing Is Demonstrably Inferior To The Existing Route

There is no question that the proposed routing is inferior to the existing route. The objective measures of this inferiority – additional distance, rise and fall, curvature and opposing traffic – are irrefutable. Those disadvantages will make it physically impossible for AEPCO's trains to achieve performance comparable to that provided in the real world today. The modest operational changes that ACE will make to its handling of rerouted coal trains -- the elimination of an interchange at Deming -- will not make up for the adverse effects on performance caused by the additional distance and congestion.

From the mines to Belen (and from Deming to Cochise), ACE's trains will be operated as they are in the real world. The proposed re-route will alter the operation of these trains radically

between Belen and Deming. Instead of turning south at Belen for the 200-mile run to Deming, ACE's loaded coal trains will continue along ACE's high-density transcontinental mainline for 106.5 miles to Vaughn. Beginning at Jarales, New Mexico, they must begin a 38.5-mile climb to Mountainair, gaining 1,700 feet in elevation. After 18 miles of steady 0.6 to 0.8 percent grade, the gradient steepens to 1.25 percent (and briefly as much as 1.44 percent). The steepest part of the grade is a 4.7-mile stretch of curvy single track through Abo Canyon (between East Sais and Scholle), but the steady climb continues for another 14 miles beyond Abo Canyon before cresting at Mountainair.³⁴ There is no comparable grade or operational bottleneck on the Belen-Deming line.³⁵

Moreover, ACE's Belen-Vaughn line will host an average of about 60 trains per day (and as many as 90 a day, not counting AEPCO's rerouted coal trains), as compared to the two BNSF trains per day (plus occasional grain trains, perhaps once per week) on BNSF's line between Belen and Rincon (again, excluding AEPCO's coal trains). These trains, most of which are high-speed, service-sensitive intermodal trains, must be able to pass or overtake AEPCO's coal trains with almost streetcar-like frequency.³⁶ That will be difficult to accomplish on the double-tracked portions of ACE's line, and ACE's re-routed coal trains will inevitably cause delays to other trains and suffer delays themselves as a result of the extraordinary density on this line segment.

However, the five-mile single-track bottleneck at Abo Canyon will pose far more extraordinary challenges. Because of the stiff grade facing loaded coal trains and the high frequency of existing traffic, ACE's coal trains will typically have to wait for several hours at the

³⁴ AEPCO Opening workpapers AEP 03445-03446.

³⁵ UP Petition, Salzman V.S. at 2.

³⁶ BNSF/UP Supplemental Reply electronic workpaper "AEPCO frequency at Keyser.xls" and "ABO CONSTRAINT.pdf."

west end of Abo Canyon for a gap in traffic of sufficient duration to permit the train to traverse the single-track segment without causing significant delays to other trains.

Mr. Wheeler analyzed this situation in detail, drawing on the typical headways between opposing movements (as reflected both by the extraordinary frequency of trains as well as by AEPCO's own string diagram analysis of train movements). Mr. Wheeler first determined the minimum running time needed for a coal train to traverse the difficult single-track bottleneck through Abo Canyon, which determined the minimum required headway (or clear time) necessary for the coal train to traverse the bottleneck without interfering with opposing or passing ACE traffic.³⁷ Mr. Wheeler next determined the frequency of opposing and passing trains.³⁸ This arrival rate could also be determined from historical BNSF data based on the total trains per day distributed at a peaking rate. Using the headway requirement and opposing/passing train occurrences, Mr. Wheeler determined the average dwell for an eastbound loaded coal train based on hourly intervals of arrival throughout a 24-hour period. On occasion, ACE's coal trains will not incur extraordinary delays, but most of the time the opposing and passing train occurrences will force significant periods of dwell for the coal trains to avoid causing the other 60-90 trains – the vast majority of which are service-sensitive – to incur significant delays. The typical ACE coal train will have to wait an average of three hours at the west end of Abo Canyon. (ACE will need to construct additional mainline siding capacity capable of chambering trains while they dwell at this location. The capacity provided by the

³⁷ Mr. Wheeler used minimum run time calculations produced by Mr. Salzman using the TPS program. BNSF/UP Supplemental Reply electronic workpaper "AEPCO-ABO CONSTRAINT.TXT."

³⁸ BNSF/UP Supplemental Reply electronic workpaper "AEPCO frequency at Keyser.xls."

existing track configuration is already needed to ensure that current volumes of traffic remain fluid.)

The only alternative to these coal train delays would be for AEPCO's rerouted coal trains to be given priority over all other trains. Such an approach would not be acceptable. It would not merely delay those other trains while they were moving on ACE's lines (affecting their cycle times and thus ACE's costs), but would also have impermissible adverse effects on the residual incumbents' operations. Delays to ACE's overhead trains will ripple beyond the boundaries of ACE, disrupting the operations of residual incumbents' operations and compromising their efforts to meet customer commitments and maintain existing levels of service performance.

The difficulties confronting ACE's coal trains on their new, longer route will not end when they reach the top of the grade at Mountainair. After traversing an additional 65 miles in the company of 60-90 high-priority trains, the coal trains will reach Vaughn, where they will stop for fueling and inspection. At Vaughn, the trains will turn south onto UP's single-track Tucumcari line. That line has only 16 sidings on the 226 miles between Vaughn and El Paso, and already hosts an average of { } trains per day, most of which are service-sensitive intermodal and automotive trains. The line approaches maximum capacity, and is at times congested, as reflected by UP's "TUC index" for this line. The TUC index is a measure UP uses internally to assess the extent to which operations over portions of UP's system are creating congestion that impedes train performance, and thereby to identify where additional capacity investment is most needed. In 2001, the TUC Index for the Vaughn-El Paso segment ranged between { } in July to { } in October, when intermodal volumes were heavier.³⁹ This indicates significant levels

³⁹ BNSF/UP.SUPPRP.WP.III.C-0013 to 0014.

of congestion. AEPCO's witness Crowley has previously testified that a TUC index greater than 42 indicates a "line congestion problem."⁴⁰

To make matters worse, AEPCO's loaded trains will encounter 32 miles of undulating 1.0+ percent ruling grade beginning just south of Vaughn.⁴¹ Following the crew change at the bottom of the grade in Vaughn, AEPCO's trains would creep up this grade very slowly to the crest of the grade beyond Corona, New Mexico. Because of the time needed to reach Corona, AEPCO's trains may often have to wait at Vaughn for an appropriate gap in the movement of higher-priority northbound (as well as overtaking southbound) UP trains.⁴²

Over the 193 miles between Corona and El Paso, AEPCO's coal trains will have to take sidings to meet and be overtaken by other high-priority trains. At El Paso, the re-routed trains will turn west onto ACE's mostly single-track line, which they must traverse for 89.4 more miles before rejoining the defendants' existing route at Deming. According to ACE's operating plan, this line hosts an average of about 40 trains per day, most carrying service sensitive intermodal and automotive traffic. Because the re-routed coal trains are being added to these lines, they will experience more delay (and cause more delay to other trains) than the typical coal train did during 2001, but in the limited time available to prepare reply evidence defendants have not been able to quantify precisely the costs of this additional operational interference.

⁴⁰ *Western Resources, Inc. v. Union Pacific R.R. & The Burlington Northern & Santa Fe Ry. Co.*, Civ. Action No. 00-2043 (D. Kan.), Testimony of Thomas Crowley, Aug. 30, 2002, at 1841-43. BNSF/UP.SUPPRP.WP.III.C-0015 to 0021.

⁴¹ The maximum grade on this segment is 1.13%. BNSF/UP Supplemental Reply electronic workpaper "Carrizozo sub.pdf."

⁴² In the future, AEPCO's traffic from the Powder River Basin to its Cochise plant will use UP's Tucumcari Line and contend with the other traffic on this line. UP is making new investments in this line to accommodate growing traffic levels. For PRB origins there is no alternative to such a route, but for AEPCO's New Mexico coal traffic such a route is unreasonably inferior to the route via Belen and Deming.

Effect On Cycle Times

AEPCO's proposed re-route will increase the cycle times of ACE's coal trains relative to their current, real-world routings. Common sense allows no other conclusion. Not surprisingly, the basic physical differences between the routes – leaving aside the effects of the additional congestion on the lines over which ACE will operate – indicate that the *minimum, ideal* running times will be 27 to 30 percent longer via a Vaughn-El Paso routing.⁴³ These calculations are based on Mr. Salzman's comparison of the relative transit times using the TPS model.⁴⁴ As AEPCO points out, Mr. Salzman's analysis addressed idealized minimum transit times that do not take account of real world factors that limit train speeds and result in delays from meets, passes and other events. AEPCO Rebuttal Nar. at III-B-10 n.11. Nevertheless, these results do provide a valid comparison of the *relative efficiency* of these routes.

Moreover, AEPCO's proposed route is also inferior when compared with the current route on the basis of real-world transit times. As discussed above, unlike the current route via BNSF's lightly traveled Belen-Deming line, AEPCO's proposed route will result in extensive delays caused by the need for its coal trains to meet or be passed by dozens of conflicting high-priority trains. See Exhibit III.C-2.

Defendants' analysis of the effect of AEPCO's proposed re-routing on the actual transit times that ACE's coal trains would experience demonstrates that those trains will require more than 10 additional hours to complete a round-trip from mine to plant and back than the same

⁴³ UP Petition, Salzman V.S., Exh. 1.

⁴⁴ The TPS ("Train Performance Simulator") is discussed in Section III.D.1.a.

trains require today via the shorter route via Belen and Deming.⁴⁵ Because ACE will not change anything about how its coal trains are loaded or unloaded, defendants focused their analysis on the time required to move these trains from the mine to the plant, and from the plant to the mine. Today, in the real world, defendants' coal trains complete one such cycle (again, excluding loading and unloading time) in an average of 60 hours for Lee Ranch origins.⁴⁶ On ACE, the same movements will consume at least 69.8 hours.⁴⁷

The source of the difference is straightforward: defendants analyzed the average running times (excluding any interchange or other dwell times) for real-world coal trains on the segments over which ACE will operate. As discussed above, this is the best available source of evidence of how ACE's trains will perform because ACE will not be changing anything significant about the capacity of and traffic on UP's and BNSF's east-west lines. Between Vaughn and El Paso, where ACE will be operating over UP's lines, ACE's trains must contend with precisely the conditions that existed on the real-world UP. As a result, ACE will not be able to improve upon BNSF's and UP's actual real world transit times. Defendants estimate that, with minimum-necessary time for changing crews and inspections (using actual times for inspection, fueling, and staging, which ACE will not be able to avoid, and AEPCO's assumptions about the time for the additional crew changes at El Paso) and the required three-hour dwell time west of Abo Canyon in the loaded direction (see above), AEPCO's Lee Ranch-Cochise coal trains will have round-trip cycle times (not including loading and unloading time) of 69.8 hours, or 14.6 percent

⁴⁵ This is a smaller differential than that suggested by TPS comparisons only because of sometimes significant dwell times at Deming associated with the interchange between UP and SWRR, which ACE purports to avoid.

⁴⁶ BNSF/UP Supplemental Reply electronic workpaper "AEPCO rebuttal exhibit II-A-2.pdf."

⁴⁷ BNSF/UP Supplemental Reply electronic workpaper "reroute compare.xls."

higher than via the Belen-Deming route.⁴⁸ These estimates corroborate Mr. Salzman's findings concerning the relative inefficiency of the Vaughn-El Paso route. Moreover, for purposes of developing SAC statistics, these estimated cycle times are understated because they do not take account of the operational interference caused by AEPCO's decision to add its coal trains to heavily-trafficked lines over which they do not currently move.

The fact that AEPCO's rerouting results in inferior cycle times relative to the movement of these trains in the real world is sufficient to render AEPCO's proposed SARR configuration unacceptable because it does not provide service that is "equivalent to the existing service for that traffic." AEPCO Rebuttal Nar. at III-B-7; *TMPA* at 16, 21.

Defendants' estimate of the cycle times of these coal trains via the Vaughn-El Paso route is also considerably longer than that presented by AEPCO. AEPCO contends that via the new routing its Lee Ranch trains will achieve round-trip transit times of only 45 hours and 43 minutes, *including loading and unloading*, which AEPCO observes is "faster than those achieved by the Defendants in the real world, notwithstanding the additional distance." AEPCO Rebuttal Nar. at III-B-9. Indeed, AEPCO's analysis – based solely on its invalid string program – purports to show that the cycle times of its coal trains will improve by 31 percent relative to AEPCO's understated estimate of historic cycle times (66:48), and by 45 percent relative to defendants' corrected actual cycle times (83:27). *Id.* This assertion is preposterous on its face

⁴⁸ Defendants estimate that AEPCO's Lee Ranch-Cochise trains will have cycle times of 87 hours and 26 minutes. *Id.* This includes a Cochise plant time of 9 hours and 49 minutes, which is a bare minimum time that understates what ACE will achieve on an average basis, but which defendants used for conservative SAC costing purposes. Actual time at the Cochise plant for year 2002 ranged from a low of 9 hours and 49 minutes to a high of 33 hours and 14 minutes. BNSF/UP Supplemental Reply electronic workpaper "AEPCO rebuttal exhibit II-A-2.pdf."

and underscores the unreliability of the string program. Defendants have used their superior estimate of transit time in their SAC calculations.

d. Locomotive Count

Defendants accept AEPCO's proposal to contribute locomotives to a pool used for run-through service in proportion to the amount of time locomotives spend on the SARR. AEPCO's locomotive count, however, is inherently unreliable because it is calculated based on the flawed string program which understates the number of hours locomotives spend on the SARR.

AEPCO derives a number of locomotive hours based on the string program's artificially fast transit times, reduces that number of hours (without explanation) by multiplying by the ratio of the tonnage AEPCO claims would be transported annually based on the peak period divided by the tonnage AEPCO claims would actually be transported over the full year 2001, and divides by the number of hours in a year to produce a locomotive count. AEPCO then adds a few additional locomotives by applying a five percent spare margin.

Because AEPCO's process was both convoluted and clearly incorrect, defendants sought to more accurately determine locomotive requirements by simply calculating locomotive hours for each train identified by AEPCO that traversed the SARR in 2001. For both non-coal and coal trains, defendant's first determined the composition of each locomotive consist for each train identified by AEPCO.⁴⁹ From this information, defendants determined what proportion of total locomotive hours should be assigned to each type of locomotive to be contributed to the pool for

⁴⁹ BNSF/UP Supplemental Reply electronic workpapers "upsactraf01.xls," worksheet "notes"; "bngfsactrn01.xls," worksheet "notes." For UP trains, UP data identifies the actual locomotives used on each train. BNSF data, on the other hand, identifies the total horsepower on the train and number of locomotive units. Defendants assigned to each BNSF locomotive consist the appropriate locomotives to make up the required horsepower. Where an actual train on UP or BNSF had more than six engines, defendants concluded that some locomotives were being ferried and used only six locomotives in determining AEPCO's locomotive requirements.

use in road service: C44-9, SD70, and SD40-2. Where an actual train used a type of locomotive other than one of these types, the locomotive hours for the non-conforming engine were assigned to the SARR locomotive type that appeared most appropriate based on the substitution rules contained in AEPCO's workpapers.⁵⁰

Locomotive hours were assigned to each engine on each train by using the real-world transit times described in Section III.C.2.b above. Having assigned a locomotive hour number for each engine on each train, defendants summed the locomotive hours by locomotive type to calculate total locomotive hours for the 2001 base year. The number of locomotives of each type that AEPCO would require if every locomotive could be in service 100 percent of the time was then determined by dividing the total annual locomotive hours for each type by the number of hours in a year.

As AEPCO has recognized, a spare margin must be included in the locomotive requirements to reflect time that a locomotive is not actually in use during the year. AEPCO used a spare margin of five percent that it asserts was "developed from BNSF's locomotive agreements." AEPCO Opening Nar. at III-C-14. AEPCO does not explain its derivation, but appears to have assumed that a 95 percent availability clause could be translated to a spare margin of five percent.

The definitions of "availability" under the contracts upon which AEPCO appears to rely demonstrate that the trains are considered "available" under the contracts even when they could not be used for hauling freight. The contracts treat locomotives as "available" when, for example, they are "not able to be utilized as a result of wrecks, accidents, theft or other casualty

⁵⁰ AEPCO Opening electronic workpaper "BNSF Lease.xls," tab "Weighted Lease." Although AEPCO's workpapers call for use of SD70s in place of SD75s, a more accurate substitution is to use a C44-9. The C44-9 more closely matches the horsepower of the SD75. Defendants have used the correct substitution in their calculation of locomotive requirements.

occurrences,” or because of a “Force Majeure” event.⁵¹ Indeed, the contracts effectively treat the locomotives as available except when they are being serviced by the contractor. Thus, locomotives are also treated as “available” under the contracts when a locomotive is being repositioned and moving as excess power on a train, when a locomotive is being serviced in a yard as part of its normal cycle, and when a locomotive is awaiting placement on a train. AEPCO’s reliance on these contracts to establish a five percent spare margin is clearly erroneous (and understates the required spare margin) since the five percent in the contracts does not encompass the many times when a locomotive is not being serviced but is also unavailable for use on a train.

Defendants developed separate spare margins for the modern engines used by the SARR – the C44-9s and the SD70s – and the older SD40-2s.⁵² In each case, the margin was based on real-world BNSF utilization data for locomotive pools that contribute power to trains traversing the BNSF transcontinental route that incorporates the Defiance to Vaughn segment of the SARR.⁵³ BNSF does not use the DC SD70s selected by AEPCO, so there was no BNSF utilization data available for these units. Because UP also does not have utilization data that allows a calculation of a spare margin for locomotives of this type, the BNSF spare margin for C44-9s is applied to the SARR’s SD70s. The SD70s are equal to the C44-9s in technology and vintage, and are used in the same type of service, so the spare margins should be of the same magnitude.

⁵¹ AEPCO Opening workpapers AEP 00332, AEP 03651.

⁵² BNSF/UP Supplemental Reply electronic workpaper “Loco Spare Margin_AEPCO.xls”

⁵³ BNSF/UP.SUPPRP.WP.III.C-0022 to 0024.

Calculation of a separate spare margin for SD40-2s was appropriate because these older engines tend to have a lower utilization factor than C44-9s and SD70s. The lower utilization rate of these engines stems from their gradual replacement by C44-9s and high-power SD locomotives. While SD40-2s used to be the predominant road locomotive in North America, they have been increasingly relegated to second-tier locomotives and are essentially used in road service on an as needed basis or for periods of peak traffic. Because the SARR is contributing locomotives to a pool, its SD40-2s will experience the same utilization patterns as those on the real-world BNSF and will require the same spare margin.

In addition to road engines, AEPCO specified it would require four switch engines. Defendants have added four SD40-2s for this function, as Defendants have been unable to determine what engine type AEPCO meant to use when it called for “FP-15” locomotives. Defendants have added an additional four SD40-2 locomotives for use on two full-year work trains that the SARR would require.

Table III.C-1
SARR Locomotive Requirements By Type

Locomotive Type	Number of Locomotives
C44-9	91
SD70	58
SD40-2	40

e. Car Count

Defendants have accepted AEPCO’s 2001 base year railcar expense figure of \$55,412,947 and use that number for purposes of their DCF calculation.

3. Other

a. 1,500-Mile Inspections

Defendants agree with AEPCO's proposed use of 1,500-mile inspections.

b. Train Control And Communications

AEPCO's proposals for train control and communications are discussed in Section III.F.6.

c. Miscellaneous

AEPCO's proposed crew change points, train crew districts and switch crew assignments are discussed in Section III.D.3.a.(1)(b) below. Like AEPCO, Defendants discuss other aspects of ACE's operating plan involving locomotive fueling and maintenance, equipment maintenance, and personnel requirements in Section III.D of this Narrative.

D. OPERATING EXPENSES

1. Locomotives

a. Leasing

AEPCO assumed that the AEPCO SARR would lease its locomotives, and Defendants have adopted that approach. AEPCO assumed an annual lease cost of { } for each SD70, based on a lease agreement provided by UP in discovery.¹ AEPCO assumed an annual lease cost of { } for each C44-9 locomotive, based on a lease agreement provided by BNSF in discovery.² Finally, AEPCO assumed an annual lease cost of { } for each SD-40 locomotive, based on a 1995 price for the locomotives found in the WTU decision.³

Defendants accept the AEPCO lease costs for SD70s and SD40s. With respect to C44-9s, AEPCO improperly calculated the annual lease cost. Defendants have corrected this miscalculation. The lease agreement upon which AEPCO based its lease costs for C44-9s covered 30 units for a 21.5 year term beginning January 15, 2001. AEPCO summed the first two lease payments – due January 15, 2001 and July 15, 2001 for approximately { } and { }, respectively – and divided by the number of locomotives to develop a supposed annual lease cost of \${ }. This approach was clearly incorrect. The payment schedules included in the lease vary dramatically, including a year (2011) where the annual payment for the 30 locomotives is { }, or { } per locomotive.⁴ AEPCO's apparent selection of the first two payments as representative of annual lease payments is therefore not supportable.

¹ AEPCO Opening electronic workpapers "UP Lease.xls" and "BNSF Lease.xls"

² *Id.*

³ *Id.* 1995 price indexed to 1Q 2001.

⁴ BNSF/UP.SUPPRP.WP.III-D-0003.

AEPCO, like BNSF, must expect to bear the full cost of the lease rather than cherry-picking unrepresentative, low semi-annual payments to produce a depressed lease price. Because the purpose of the DCF stand-alone analysis is to capture representative annual costs, the correct annual lease payment is the normalized annual payment calculated from total payments under the lease, or { }.⁵ Defendants' Supplemental Reply evidence adopts this lease figure for the ACE's C44-9 locomotives.

Table III.D.1 compares the parties' respective 2001 locomotive lease costs:

Table III.D.1
Comparison of AEPCO SARR Locomotive Costs – 2001

	AEPCO	Defendants	Difference
<i>Number of Locomotives</i>			
1. Number of SD70 Locomotives	19	58	39
2. Number of C44-9 Locomotives	65	91	26
3. Number of SD40-2 Locomotives	18	40	22
<i>Annual Locomotive Lease Payment⁶</i>			
4. Annual SD70 Unit Lease Cost	{ }	{ }	{ }
5. Annual C44-9 Unit Lease Cost	{ }	{ }	{ }
6. Annual SD40-2 Unit Lease Cost	{ }	{ }	{ }
7. Total Locomotive Lease Cost	{ }	{ }	{ }

b. Maintenance

Locomotive maintenance expenses consist of two components, a cost based on the annual number of locomotive unit miles ("LUMs") and a cost based on periodic overhauls of each locomotive. Defendants have modified AEPCO's unit costs to correct mistakes.

⁵ Normalized annual payments per locomotive equal the sum of all the lease payments over the life of the lease of the 30 C44-9s ({ }), divided by the number of locomotives (30) and the number of years in the lease (21.5).

⁶ AEPCO applied a weighted average of its unit lease costs ({ }) to its total number of locomotives ({ }) to obtain its total lease cost figure.

For C44-9 maintenance, AEPCO identified the wrong per-mile cost figure in the contract upon which it relied, selecting the figure for incremental locomotives after the first { } covered by the maintenance contract. Since the SARR will not have this many locomotives, it is not entitled to the volume discount. Defendants have used the slightly higher per-mile cost figure that BNSF actually pays for the first { } locomotives under the contract instead.⁷ Defendants accept the annual overhaul unit cost used by AEPCO for C44-9s and use that overhaul cost for SD70s as well.

AEPCO did not specify a separate per-mile or overhaul maintenance cost for SD40-2 locomotives. A BNSF maintenance contract applicable to SD40-2s was produced in discovery.⁸ Defendants apply indexed mileage and overhaul rates pursuant to that contract to the relevant SD40-2 LUMs.

The total locomotive maintenance costs employed in Defendants' DCF analysis are based on the number of locomotives Defendants have calculated the SARR would require, *see* Section III.C.2.c above, and upon Defendants revised calculation of the annual LUMs for the AEPCO SARR. Defendants did not use AEPCO's LUMs in this calculation because they were clearly unreliable.

First, AEPCO derived a number of LUMs for its "peak" period from its string program which, as described in Section III.C above, is fundamentally flawed for a variety of reasons. Second, as shown in AEPCO Opening Exh. III-C-2, AEPCO purported to calculate a "peak" annual number of LUMs. AEPCO then reduced that so-called peak number by multiplying by the ratio of the tonnage AEPCO claims would be transported annually based on the peak period

⁷ BNSF/UP.SUPPRP.WP.III-D.1-0005 to 0016. The same per-mile maintenance cost is used for SD70s.

⁸ BNSF/UP.SUPPRP.WP.III-D.1-0017 to 0024 and "Revised_locomaint.xls."

divided by the tonnage AEPCO claims would actually be transported over the full year 2001. There is no reason to take this convoluted approach when all of ACE's 2001 trains and their routes over the ACE network have been specified by AEPCO. Defendants derived the number of LUMs accrued by ACE in 2001 by simply identifying the number of route miles traveled by each train over the SARR, counting the appropriate number of LUMs for each locomotive on each train, and summing the LUMs for all locomotives on all trains.⁹

c. Servicing

Defendants accept AEPCO's locomotive servicing cost of \${ } per locomotive unit mile for BNSF LUMs and apply a cost of \${ } per locomotive unit mile to UP LUMs. In calculating overall locomotive operating expenses for the DCF analysis, these costs were applied to the number of LUMs calculated by Defendants for the BNSF and UP segments of the SARR.

d. Fueling, Sanding And Lubrication

(1) Fuel Price

AEPCO used a fuel price of { } cents per gallon for the first quarter of 2001, which it derived from BNSF's 2001 R-1.¹⁰ AEPCO escalated this fuel price for subsequent quarters using the RCAF-A index. There are several problems with AEPCO's fuel price calculations. First, the price does not include the additional fuel costs resulting from AEPCO's decision to move fueling operations from Belen, where they are currently performed by BNSF, to Vaughn. Second, a separate fuel price should be established for the portion of the ACE system that replicates UP, based on UP's R-1 fuel cost instead of BNSF's. Third, the price of fuel should be escalated using the RCAF-U index rather than the RCAF-A index.

⁹ BNSF/UP Supplemental Reply electronic workpaper "Equipment Counts.xls". As part of this calculation, corrections were made to AEPCO's treatment of mine spur miles.

¹⁰ AEPCO Rebuttal electronic workpaper "AEPCO Operating Expenses.123."

(a) Fuel Price For Portion Of ACE System That
Replicates BNSF Lines

As discussed previously in Section III.C.1., BNSF currently fuels its transcontinental trains moving between Vaughn and Defiance at BNSF's Belen Yard. AEPCO assumed ACE would handle virtually all of these trains over its SARR, but it also assumed that the trains would not stop at Belen. As discussed in Section III.B.3. above, AEPCO assumed that these trains would be fueled at Vaughn, where there presently are no fueling facilities. AEPCO's decision to fuel ACE's trains operating between Vaughn and Defiance at Vaughn will impose fuel costs above the level estimated by AEPCO for two reasons. First, although AEPCO recognized the need to construct fueling facilities at Vaughn (which defendants accept with certain corrections, as described in Section III.F.7 of this Narrative), it ignored the costs associated with obtaining fuel at Vaughn. No source of fuel currently exists at Vaughn, which is an isolated rural outpost far from any refinery, pipeline or other industrial infrastructure. ACE thus cannot simply assume that it could obtain the vast amount of fuel it would need for ACE trains at system-average prices. Rather it must incur the costs needed to get fuel to Vaughn.¹¹

Defendants determined that ACE would supply its Vaughn fueling facilities with fuel obtained at Belen, which is relatively close to Vaughn and which has a ready supply of fuel. BNSF today obtains most of its fuel at Belen from a pipeline that runs through Belen (but does not run near Vaughn). BNSF's R-1 fuel cost includes system-average fuel transportation costs. The cost BNSF incurs in obtaining fuel at Belen, including amounts paid to third parties to transport the fuel to Belen, is reflected in BNSF's R-1 system-average fuel cost. Since BNSF does not perform fueling at Vaughn, however, the additional cost of transporting fuel from Belen

¹¹ Additional facilities required at BNSF's Belen Yard and ACE's Vaughn Yard for this fuel transportation are identified in Section III.B.3 of this Narrative.

to Vaughn is not reflected in the BNSF system-average fuel cost. Moreover, as shown below, that cost is substantial. Therefore, the additional cost of transportation resulting from AEPCO's decision to move fueling operations from Belen to Vaughn must be added to the fuel cost derived by AEPCO from BNSF's R-1 to get a reasonable approximation of the total cost that ACE would incur for fuel at Vaughn.

Defendants determined that the fuel could efficiently be transported to Vaughn from Belen via rail (on the residual BNSF) in shipper-supplied tank cars under an existing BNSF tariff.¹² The Tariff rate is 4.22 cents/gallon.¹³ ACE's total transportation costs will include BNSF's tariff as well as the costs associated with the fleet of tank cars needed to transport the vast quantity of fuel used at Vaughn. Based upon information on tank car transportation charges for the first six months of 2002 included in the traffic files provided to AEPCO in discovery, defendants calculated a tank car cost of { } cents per gallon.¹⁴ The total cost for transporting fuel from Belen to Vaughn, including both tariff and tank car charges, is { } cents per gallon. Adding this transportation cost to the fuel price used by AEPCO results in a delivered price for fuel at Vaughn of { } cents per gallon for the first quarter of 2001. This is the appropriate first quarter 2001 fuel price for the portion of the ACE system that replicates BNSF lines.

Second, in addition to absorbing the additional transportation costs for all fuel consumed by ACE's trains on ACE's lines, ACE also must bear these additional costs for fuel dispensed at Vaughn but consumed on the residual BNSF east of Vaughn and west of Defiance. AEPCO assumes that all of BNSF's transcontinental trains that operate over ACE between Defiance and

¹² BNSF/UP.SUPPRP.WP.III.D- 0039 to 0044.

¹³ BNSF/UP Supplemental Reply electronic workpaper "Fuel Work Sheet.xls."

¹⁴ BNSF/UP Supplemental Reply electronic workpaper "Tank Car Costs.xls."

Vaughn will be fueled by ACE at Vaughn instead of by BNSF at Belen. BNSF today dispenses much more fuel at Belen than the fuel needed merely to traverse the line segment between Vaughn and Defiance. Belen is a major fueling station for BNSF's transcontinental trains. AEPCO's assumption that *all* of the fuel BNSF dispenses today at Belen for those trains must now be dispensed by the ACE at Vaughn assumes that BNSF would be willing to pay the fuel prices incurred by the SARR. But the residual BNSF would never agree to reimburse the ACE for fuel used on BNSF's lines at the *higher* fuel price that results from AEPCO's decision to move the fueling of those trains to Vaughn. Thus, the additional { } cents per gallon that results from AEPCO's decision to displace BNSF's current operations at Belen must be the responsibility of the ACE. Therefore, defendants have included in the fuel cost component of ACE's operating costs an amount representing the incremental fuel cost on the total amount of fuel that ACE will dispense into the trains traversing its lines, not just for the amount of fuel used to move those trains between Defiance and Vaughn.¹⁵

(b) Fuel Price For Portion Of ACE System That Replicates UP Lines

There is no basis for concluding, as AEPCO does, that ACE would be able to obtain fuel for the portion of the ACE system that replicates the UP at a price derived from BNSF's R-1. To the contrary, as AEPCO points out, ACE will share fueling responsibilities at El Paso with UP. UP will fuel eastbound trains received from ACE at its own fueling facility in El Paso, while ACE fuels westbound trains received from UP. AEPCO Op. Nar. at III-D-2. Accordingly, a price derived from UP's system average fuel cost should be used for this portion of the ACE system. Defendants used AEPCO's methodology for deriving a fuel price but substituted the UP system-average fuel price reported in UP's 2001 R-1, yielding a fuel price of { } cents per

¹⁵ BNSF/UP Supplemental Reply electronic workpaper "Fuel Work Sheet.xls."

gallon for the first quarter of 2001.¹⁶ This should be the starting fuel price for the portion of the ACE system that replicates the UP.¹⁷

(c) The RCAF-U Index Should Be Used To Escalate The Fuel Price

AEPCO escalated ACE's understated first quarter 2001 fuel price using the RCAF-A index, an index of railroad costs that is adjusted to take into account changes in the rail industry's productivity. As the Board recognized in the recent *CP&L* decision, fuel prices should be escalated using the RCAF-U index (which is not adjusted for productivity), rather than the RCAF-A index.¹⁸ Defendants make appropriate corrections.

(2) Fuel Consumption Rate

AEPCO significantly understated ACE's rate of fuel consumption by relying on system average R-1 data. However, system-average data on fuel consumption do not provide a reasonable proxy for fuel consumption that would be experienced by ACE trains. While AEPCO sought to minimize costs for its SARR by carving out an overhead portion of incumbents' main east-west trunk lines, that decision resulted in a SARR that handles traffic that is not representative of the incumbents' system-wide traffic. Indeed, as explained below, the predominance of high-speed, highly powered intermodal trains on ACE means that the fuel consumed on SARR trains would substantially exceed the system-average rate of fuel consumption.

¹⁶ *Id.*

¹⁷ AEPCO assumes that ACE will fuel trains on this segment at El Paso, where there is an adequate source of fuel today. Therefore, defendants do not make any additional adjustments to the price of fuel consumed over this portion of the ACE.

¹⁸ *CP&L* slip op. at 27-28.

Much of ACE's traffic consists of high-speed intermodal and other trains, which burn fuel at rates that exceed system-wide averages by a wide margin. There are many factors that contribute to the much-higher than average level of fuel consumption by ACE's trains. The most important factor is the interaction among these trains' high speed, high horsepower-per-trailing ton, and poor aerodynamic characteristics (which have a more pronounced effect at higher speeds). The segments that ACE replicates are among the highest speed segments of the defendant railroads, and the transcontinental intermodal and automotive trains that run over these segments are among the most service sensitive of any on these railroads.¹⁹ The need for speed dictates much higher than average horsepower per trailing ton ratios, meaning that ACE's trains will routinely have consists of four, five or six high-horsepower units consuming fuel rapaciously to maintain 60 or 70-mile-per hour track speeds and to accelerate out of sidings as quickly as possible.²⁰ Fuel consumption does not increase in direct linear proportion to increases in velocity. Fuel consumption increases at an increasing rate as speed increases, particularly at higher speeds. And the additional horsepower per ton needed to achieve velocity more rapidly and to maintain speeds traversing up and down grades and over undulating terrain magnifies consumption rates. Moreover, it is well known that intermodal trains, which comprise the majority of ACE's traffic, have unusually poor aerodynamic characteristics, caused by the varying heights of trailers and containers and the gaps between them. At the high speeds typical

¹⁹ ACE has a significantly higher proportion of service-sensitive intermodal and automotive traffic than the BNSF or UP systems as a whole, and significantly higher average speeds as well.

²⁰ BNSF/UP Supplemental Reply electronic workpapers "bngfsactrn01.xls," tab "BNSF HP per TrlTon," and "upsacraf01.xls," tab "UP HP per TrlTon." These workpapers show the average horsepower per trailing ton for the different types of UP and BNSF traffic selected by AEPCO for ACE.

of movements over many portions of ACE's mainlines, these characteristics impose significant drag and result in very high fuel consumption rates.

Use of a fuel consumption rate based on the system-average for BNSF also fails to take into account the specific characteristics of the ACE system, such as geography, curvature and grades. Additionally, AEPCO failed to determine fuel consumption for switching operations or work trains.

In light of the foregoing deficiencies, the fuel consumption data posited by AEPCO does not provide an accurate measure of the fuel consumption for ACE and must be rejected. Defendants have determined accurate fuel consumption information for ACE based on the specific characteristics of the equipment used by ACE and the geography of the ACE system, as discussed below.

(a) Road Trains

As a starting point for determining fuel consumption on ACE, defendants identified the characteristics of representative trains for the various types of traffic moving on the portions of the ACE system that replicate BNSF lines and UP lines. For each representative train type, defendants identified the specific type of locomotives on the train, the number of cars and the trailing tons. Defendants identified characteristics for 42 representative trains.²¹

Defendants' expert Mr. Salzman took the characteristics identified for each representative train and ran a simulation of the movement of the train across the portion of ACE it traverses using UP's Train Performance Simulator ("TPS"). These simulations identified the number of

²¹ BNSF/UP Supplemental Reply electronic workpapers "bngfsactrn01 mode trains.xls" and "upsactraf01 mode trains.xls."

gallons consumed by each representative train.²² Separate consumption figures were determined for trains in the segments of ACE that replicate BNSF and UP lines.

Because the trains were run across ACE on an unimpeded (unopposed) basis in the TPS simulation, the simulated trains did not spend as much time in sidings as the ACE trains could expect. As a result, the total time that the simulated trains spent on ACE lines was less than the time ACE trains would spend on the SARR when other traffic was present. It was necessary to make an adjustment to reflect this difference in transit times in order to determine fuel consumption for the entire time the train was on the ACE system. To make the adjustment, defendants' expert Mr. Wheeler assumed that the difference between the actual transit times for ACE trains and the transit times resulting from the TPS simulation was idling time. This was a very conservative approach because it did not take into account train stops and starts (as a train moved into a siding, for example) that would, in fact, have produced the longer transit times. As is commonly known, the acceleration associated with starts and stops obviously consumes greater amounts of fuel than idling.

Table III.D.2 below compares the fuel consumption for road locomotives resulting from the methodology applied by defendants and AEPCO's fuel consumption for ACE.

TABLE III.D.2
Comparison Of Fuel Consumption²³

	AEPCO	DEFENDANTS
Fuel Consumption (Gallons/Year)	60,854,344	81,976,208

²² BNSF/UP Supplemental Reply electronic workpapers "bngfsactrn01.xls," tabs "bngfsactrn01" and "Train Type Count," and "upsactraf01.xls," tabs "upsactraf01" and "Train Type Count."

²³ Source: AEPCO Rebuttal electronic workpaper "AEPCO Operating Expenses.123," cell "D92." BNSF/UP Supplemental Reply electronic workpaper "Fuel Work Sheet.xls," tab "Sheet1", cell "I81."

TPS simulations are widely used in the railroad industry. The TPS is a tool that UP, BNSF and other railroads have used for many years in the ordinary course of their businesses to estimate fuel consumption rates, minimum run times, horsepower requirements, the impact of speed restrictions on train performance and other operating parameters. Business decision makers at UP, BNSF and other railroads rely extensively on results of TPS simulations, including fuel consumption rates, because they are the best available evidence of expected performance. TPS fuel consumption outputs are based on detailed fuel consumption data supplied by the locomotive manufacturers which, combined with inputs for train size and terrain, provide reliable estimates of average minimum fuel consumption expectations (although the experience of any individual train can of course vary). The ICC has relied on the TPS model in the past to calculate fuel consumption rates, observing that it and has been “used both by railroads and locomotive manufacturers to determine ... fuel consumption.” *Arkansas Power & Light Co. v. Burlington Northern R.R.*, 3 I.C.C. 2d 757, 790 (1987). In that case, the ICC accepted the shipper’s use of TPS to calculate fuel consumption as the “best [evidence] of record” where – as here – the sponsoring party had “adapted TPS to the specific [SARR] routes, using data from the actual characteristics of operations (speed, elevation, grades, curvature and stops) and equipment (type and number of cars, axles, and locomotives).” *Id.* at 791.

In *WP&L*, the Board did not accept fuel consumption rates generated by a TPS run as evidence of the variable costs of the issue traffic. The Board’s resolution of the *variable cost* issue in *WP&L* should have no bearing on the treatment of fuel consumption rates *for SAC purposes* in this case. In the variable cost phase of a SAC case, the Board assesses the actual historical costs for a particular movement and it makes movement-specific adjustments to

system-average data only where data are available that are closely correlated to actual circumstances of the issue traffic. By contrast, the data used in determining SAC costs routinely do not reflect actual incurred costs, but rather are based upon the best available evidence of cost that a hypothetical carrier would encounter.

Moreover, unlike in *WP&L* (*slip op.* at 54-55), where the Board noted that there were inconsistencies between the cycle times used in the TPS model and those used in other aspects of the case to develop ownership costs, defendants have taken pains to match (in a conservative way) the cycle times used by TPS to calculate fuel consumption rates with the actual cycle times ACE trains will achieve in its operations.

Finally, TPS is particularly well suited for use in estimating fuel consumption rates in this case. TPS is often used to develop fuel consumption estimates for purposes of developing run-through power agreements allocating responsibility for fuel usage. Long before this case came before the Board, UP and BNSF agreed to allocate their responsibility for fuel consumption in connection with interline movements of AEPCO's coal.²⁴ The fuel consumption identified in that agreement was determined using UP's train performance simulator. Defendants' use of the TPS model in establishing the terms of their own commercial relationship for the specific movement at issue in this case establishes the appropriateness of using that model to generate the best possible evidence of fuel consumption rates for purposes of determining SAC costs in this case.

²⁴ BNSFUP.SUPPRP.WP.III.D- 0045. It is standard practice in the railroad industry to rely on results of the TPS or similar models to calculate fuel consumption rates for use in run-through agreements.

(b) Switch Locomotives

For switching operations, defendants determined fuel usage rates specific to BNSF and UP using data obtained from both URCS and each Railroad's R-1.²⁵ Defendants calculated the gallons per switching minute for both road and yard engines for each railroad by dividing the URCS switch engine minute (SEM) fuel costs for road or train switching operations and yard engine operations by the cost per gallon as determined from data included in Schedule 750 of each Railroad's R-1.²⁶ This calculation represents a fuel consumption rate for the average consist for each Railroad. This fuel consumption rate was divided by the average consist size in order to determine the average fuel consumption rate per locomotive switch minute. Defendants then averaged the fuel consumption rates for the two Railroads to calculate a single fuel consumption rate for switching on ACE.²⁷ This fuel consumption rate per locomotive switch minute was then multiplied by 60 to derive the fuel consumption rate per hour.

Defendants determined the number of hours that each switch crew was on duty and summed the total switch crew hours separately for the portions of ACE that replicate BNSF lines

²⁵ URCS develops a unit cost per switch engine minute (SEM) for train switching fuel on line 164 column 40 in worktable D3, as well as a unit cost per SEM for yard switching on line 135 column 10 in worktable D4. Schedule 755 of the R-1 provides data that can be used to determine the average consist size for switching performed by road engines as well as switching performed by smaller horsepower yard engines. Schedule 750 of the R-1 contains data that can be used to calculate the average cost per gallon for the year reported.

²⁶ The locomotives that BNSF and UP classify as switching units used for yard switching have an average rating of 1,600 horsepower or less based on data contained in their R-1 reports, Schedule 710, line 4. Fuel consumption statistics for yard switching included in URCS are based on those low horsepower units. As discussed above, ACE will perform yard switching with 3,000 horsepower SD40 locomotives which are more typically used in road service. Therefore, defendants have applied the fuel consumption rates for switch operations performed by road engines to determine the fuel consumption for switching operations on ACE.

²⁷ There was no need to differentiate between UP and BNSF in determining fuel consumption for switching operations on ACE because the same types of locomotives operating under similar conditions (*i.e.*, in yards) are used across the ACE system.

and UP lines, respectively. Defendants then multiplied the total switch crew hours for each portion of ACE by the hourly fuel consumption rate per locomotive unit for switching on ACE determined above and added the results to obtain total fuel switching costs.

The above methodology determined total annual fuel consumption of 372,962 gallons for switching on ACE.²⁸

(3) Correct Calculation Of LUMS

Derivation of the correct number of LUMs is described in Section III.D.1.b. above.

(4) Sanding And Lubrication Costs

These items are addressed above in Section III.D.1.c. (Locomotive Servicing).

e. Other

This section intentionally left blank.

2. Railcars

Defendants accept AEPCO's 2001 base year railcar expense figure of \$55,412,947 and use that number for purposes of their DCF calculation.

a. Leasing

This section intentionally left blank.

b. Maintenance

This section intentionally left blank.

c. Private Car Allowance

This section intentionally left blank.

²⁸ BNSF/UP Supplemental Reply electronic workpaper "Fuel Work Sheet.xls," tab "Sheet1," cell "H95." Defendants assume the fuel consumption rate for work trains will be the same as the fuel consumption experienced for road switching. This is because road switching and work trains use the same type of locomotives (SD40) operated in a similar manner (*i.e.*, at slow speed, with numerous stops and starts and back and forth movements). Total annual fuel consumption for work trains is 248,641 gallons. BNSF/UP Supplemental Reply electronic workpaper "Fuel Work Sheet.xls," tab "Sheet1," cell "H103."

d. Other

This section intentionally left blank.

3. Personnel

a. Operating

(1) Staffing Requirements

The table below compares the transportation operating personnel proposed by AEPCO and the minimum number determined to be required by Defendants.²⁹ The staffing requirements are discussed in more detail below.

TABLE III.D.3
Operating Personnel

<u>Position</u>	<u>AEPCO</u>	<u>Defendants</u>	<u>Difference</u>
Director of Operations Control*	1	1	0
Manager of Operations Control	5	5	0
Crew Callers	5	5	0
Dispatchers	14	14	0
Director of Train and Locomotive Operations*	1	1	0
Manager of Train Operations	4	4	0
Assistant Manager of Train Operations	4	4	0
Manager of Locomotive Operations	3	3	0
Director of Customer Service*	1	1	0
Customer Service Managers*	8	8	0
Manager of Operating Rules and Safety*	1	1	0
Yardmasters	0	5	5

²⁹ The Vice President-Transportation position is included in the G&A staffing discussed below.

Crew Haulers/Utility Clerks	0	27	27
Switch & Work Train Crew Members	26	30	4
Train Crew Members	253	277	24
Total	326	386	60

*AEPCO included this position in its G&A staffing. Defendants accept the staffing proposed by AEPCO but have included the positions as part of the transportation operating personnel.

Source: AEPCO column - AEPCO's Opening Nar., Tables III-D-1 and III-D-4.

(a) Transportation Department Personnel (Except Train Crews)

Two additions are required to the transportation staffing (other than train crews) proposed by AEPCO for the portion of ACE that replicates BNSF lines. First, AEPCO has not included any yardmasters in its staffing. Defendants add one yardmaster position, staffed on an around-the-clock basis 365 days a year, at Vaughn Yard in light of the substantial operations at that yard.

AEPCO proposes four Managers and four Assistant Managers of Train Operations, whose duties will be equivalent to trainmasters and assistant trainmasters on a Class I railroad. One Manager and Assistant Manager will be stationed at each of ACE's crew change points, including Vaughn Yard. These positions will each be staffed by an individual employee and not on an around-the-clock basis. AEPCO Opening Nar. at III-D-9 to 10.

The Vaughn Yard is responsible for the 1,500-mile mechanical inspection of all trains (including empty coal trains), removal of bad-order cars, adding fill cars and repaired cars to trains, and locomotive servicing and maintenance. Vaughn is a crew change point for loaded and empty coal trains and an interchange location with the residual BNSF for non-coal trains. In addition, the locomotive maintenance facility located in the Vaughn Yard has responsibility for scheduled maintenance and repair of approximately 189 locomotives in the ACE fleet. Defendants added a locomotive pit track at the El Paso Yard to accommodate 92-day inspections

of certain locomotives operating on the portion of ACE that replicates UP lines; however, annual maintenance, and major repair, of all ACE locomotives would be performed at the Vaughn locomotive shop.

The Manager and Assistant Manager of Train Operations at Vaughn Yard will have overall responsibility for the operation of the terminal and will be required to be “in the field” a majority of their time. These first line supervisors need to be in contact with the train crews that are reporting for duty or being relieved from duty at these terminals. This is the principal function of a trainmaster on a Class I railroad, the function that AEPCO states these managers are to perform. AEPCO Opening Nar. at III-D-9. In particular, trainmasters (and thus the Train Operations Manager and Assistant Manager) are responsible for conducting safety meetings; interpreting, instructing and enforcing rules and safety instructions; investigating accidents and injuries; operations testing; and coordination of overall yard operations including supervision of the yardmasters. On a typical day, approximately 120 road train crews will go on and off duty at Vaughn. It is therefore apparent that the Manager and Assistant Manager of Train Operations will not have the time, nor physically be in a position, to manage, the minute-by-minute operation of the Vaughn Yard as required, thus necessitating the addition of a yardmaster position in this yard to perform this function.³⁰

Defendants provide for the assignment of five yardmasters at the Vaughn Yard (one position on a 24/7 basis, for a total of 5 people). Yardmasters are responsible for the move-by-

³⁰ A Manager of Locomotive Operations also will be stationed at Vaughn Yard. This position will be staffed by a single individual and not on an around-the-clock basis. The duties of this position will be similar to those of a Traveling Engineer on a Class I railroad. This individual will perform FRA-mandated training and observation of engineers in train handling, efficiency testing, and other assistance as needed. AEPCO Opening Nar. at III-D-10. This person will not have responsibility, or be available, for management of the minute-by-minute operations at the Vaughn Yard.

move operation and coordination of train arrivals and departures, movement of locomotives to and from the service area, and supervision of switch crews working in the yard. The yardmasters are also responsible for data reporting for the car and locomotive inventory system that must be maintained at this yard.

The yardmaster's responsibilities include directing the movement of all trains into and out of the terminal, in coordination with the road dispatcher. Additionally the yardmaster determines the order in which all trains will be mechanically inspected, and directs the car inspectors accordingly. The yardmaster also is responsible for directing the two switch crews at Vaughn Yard that will be working at all times removing bad-order cars from inbound trains after they have been inspected, and adding fill cars and repaired cars as needed. There is a further requirement for any bad-order cars to be moved to the car repair facility, and after repairs have been made, movement of the repaired cars to the spare car tracks for sorting by destination and forwarding on the appropriate train. There will also be numerous locomotive consist movements at the Vaughn Yard, in connection with the movement of locomotives to and from the main locomotive facility. These functions are also under the direction and coordination of the yardmaster. It would be impossible for a major yard such as Vaughn Yard to function without this level of supervision on an around-the-clock basis.

Second, Defendants have added two crew hauler/utility clerk positions on an around-the-clock basis at each of the Defiance and Vaughn Yards, and one crew hauler/utility clerk position on an around-the-clock basis at each of the El Paso and Cochise Yards. AEPCO did not include this position in its staffing. The main duties assigned to these positions involve transporting train crews to and from trains within the yards and providing transportation for relief train crews that have exceeded their twelve hours-of-service limitation on the mainlines. There is a further

requirement for transportation of crews at Defiance and Cochise to and from the lodging facility as this is their away-from-home terminal. Train crews also require transportation between Defiance and the McKinley and Lee Ranch mines as well as the deadhead moves as described between Dalies and Belen. AEPCO Opening Nar. at III-D-14. The six crew hauler/utility clerk positions will be staffed on a 24/7 basis (for a total of 27 employees, assuming a multiplier of 4.5 to staff each position on a full-time basis) and each assignment will require a four-wheel drive Suburban truck (total six) in order to access the railroad right-of-way and the yard tracks. The rugged terrain, lack of hard top roads and the harsh weather conditions in the parts of New Mexico, Arizona, and Texas traversed by ACE make it essential for these vehicles to be equipped with four-wheel drive.

When the crew hauler/utility clerks are not hauling crews they will be responsible for additional duties not provided for in the AEPCO plan, such as janitorial duties at the crew facility and offices, maintaining the informational bulletin boards, maintaining the peripheral devices and paper for the printers at that location, receiving, storing and issuing stationery supplies and personal protective equipment, cleaning and maintaining the vehicle they are utilizing, and other administrative duties that may be required by the operating supervisors at that location.

(b) Train Crews

AEPCO purports to develop its road crew personnel requirements from a "peak" week based on the output of its string program analysis. AEPCO reports a total number of crew starts for that week in AEPCO Opening Exh. III-C-2. AEPCO multiplies the weekly crew starts by 52 to obtain an annual number of crew starts based on the "peak" week, and then makes an unexplained downward adjustment to the annual crew starts by multiplying by the ratio of the tonnage AEPCO claims would be transported annually based on the peak period divided by the

tonnage AEPCO claims would actually be transported over the full year 2001. The impact of the unexplained adjustment is to produce a road crew number that is 16 percent below what AEPCO's analysis shows would be required based on its "peak" week statistics.

A straight-forward counting exercise demonstrates that AEPCO has not provided enough crews to man the trains it specifies would move across the SARR even under the most favorable circumstances. Table III.D.4 below shows the number of trains AEPCO assumes would move across each segment of the SARR during 2001 and shows how many annual crew starts would occur based on AEPCO's assumption that each crew person would perform 270 crew starts per year.³¹ This count assumes the most optimistic conditions, namely a complete absence of delays, emergency track maintenance, or other events that would prevent a crew from completing its transit within the time allowed by federal hours of service regulations and that every crew performing a turn assignment has a second train available at the end of its assignment. The count also does not make allowance for crew scheduling issues such as the potential unavailability of crews in the right place at the right time and the impact of extended high-traffic periods on crew availability. The count below therefore reflects an absolute minimum assuming that everything goes right all the time.

³¹ As shown in Section III.D.3.a.(2) below, none of the sampled BNSF employees who worked on trains that traversed the SARR achieved 270 crew starts a year; those that worked more than the average number of shifts did, however, receive compensation well above that paid to an "average" crew member. Although it appears patently unreasonable to assume that employees of AEPCO's SARR could *average* 270 starts a year – more than one start every weekday of the year – Defendants have elected not to contest this assumption so long as AEPCO's T&E personnel receive the high compensation that would be commensurate with the exceptionally heavy workload assumed.

Table III.D.4
Minimum Road Crew Requirements³²

	Number of Trains ³³	Crews Required by Segment			Road Crew Starts	Road Crews	Road Crew Personnel
		Defiance-Vaughn	Vaughn-El Paso	El Paso-Cochise			
Non-Coal Trains							
Defiance-Vaughn	22,065	1			22,065	82	164
El Paso-Cochise	13,207			1	13,207	49	98
Coal Trains							
Issue & Tucson (BNSF)							
Loaded	99	1	1	1	297		
Empty	99	1	1	1	297		
Dalies-Defiance							
Loaded	23	1			23		
Empty	23						
Belen-Cochise							
Loaded	6	1	1	1	18		
Empty	6		1	1	12		
El Paso-Cochise							
Loaded	59			1	59		
Empty	59			1	59		
Vaughn-Defiance							
Loaded	69	1			69		
Empty	69	1			69		
All Other							
Loaded	1019	1			1,019		
Empty	1019						
Total Coal	2594				1922	7	15
TOTAL							277

³² Source: BNSF/UP Supplemental Reply electronic work paper "crew count.xls."

³³ Non-coal trains specified in AEPCO Reb. electronic work paper "ACE Non-Coal Traffic and Revenue Forecast.xls," worksheets "ACE BNSF '01 Traf. and Rev." and "ACE UP 2001 Traf. and Rev." Coal trains specified in AEPCO Opening Exh. "ACE Coal Traffic and Revenue Forecast.xls," worksheet "2001 Statistics." As described in Section III.A above, the number of coal trains was slightly modified to exclude 22 loaded and corresponding empty coal trains for which AEPCO had substantially changed the level of services by increasing the length/tons per train compared to real world operations. A corresponding empty coal train is assumed for each loaded coal train, but no additional crew is added for the empty where AEPCO has assumed that both a loaded and empty train could be handled in a single crew shift.

While Defendants allow the ACE tremendous flexibility in assigning its resources, there is one aspect of its operations that even the most efficient carrier cannot overcome: imbalances in traffic flows by direction. Specifically, the overhead non-coal trains that traverse the respective BNSF and UP east-west segments of the SARR have 11 percent and 6 percent more trains moving in one direction than the other in 2001. On the BNSF portion of the ACE, as 11,668 trains traveled Vaughn to Defiance and only 10,535 moved in the opposite direction, there will be at least 1,133 crews that will need to be taxied back to their home terminal. Similarly, there are 361 more non-coal trains that moved east between Cochise and El Paso than operated west over the UP portion of the ACE.³⁴ To account for at least a portion of the additional expense that is incurred in providing bridge service for an imbalanced traffic group, Defendants include approximately \$253,000 in taxi costs to return these 1,710 crews in 2001.³⁵

Defendants accept AEPCO's assumption of four switch locomotives and 26 crew personnel to man them. In addition, the SARR will have two work trains that operate five days a week year-round. Each work train will require a two-person crew, resulting in an additional 4 crew persons. Adding the switch and work crews to the road crews identified in Table III.D.4 above produces a crew requirement of 307 instead of the 279 originally posited by AEPCO.

³⁴ See AEPCO Rebuttal electronic workpaper "ACE Non-Coal Traffic and Revenue Forecast-Rebuttal.xls," worksheets "ACE BNSF '01 Traf. and Rev" and "ACE UP 2001 Traf. and Rev." In fact, by using the annual total, this number serves as the absolute minimum, as needs to reposition crews on a more timely basis during periods of either peak or particularly imbalanced traffic flows would only increase the number of trips.

³⁵ Defendants conservatively use a taxi cost of \$150 for each of the 259-mile one-way trip between Defiance and Vaughn and the 232-mile one-way trip between El Paso and Cochise. See BNSF/UP Supplemental Reply electronic workpaper "taxilodging.xls."

(2) Compensation

(a) Transportation Department Personnel (Except Train Crews)

Compensation for transportation department employees other than train crews was determined by calculating BNSF 2001 Wage Form A and B average annual salaries and indexing to first quarter 2001 levels by using the AAR first quarter wage index 308.9 and the average of the four quarterly indexes 310.4.

(b) Train Crews

AEPCO's only explanation of its crew salary figure is the general representation that for "line operating personnel" compensation was "established at or close to the same levels as those presently paid by BNSF UP [*sic.*] for comparable positions." AEPCO Nar. at III-D-17. With respect to crew, this statement is simply false. AEPCO's work papers reveal that, contrary to its representation, AEPCO intentionally calculated a crew salary that was nearly 25 percent less than the actual compensation paid to the BNSF conductors and engineers upon which AEPCO's calculation was based. On top of this illegitimate salary reduction, AEPCO manipulated its indexing for inflation in order to further understate crew wages.

i) AEPCO's Exclusion of Compensation Actually Paid

AEPCO used only BNSF wage data in its calculation of crew wages.³⁶ Although AEPCO does not reveal how it derived salary figures in its narrative, its work papers reveal that AEPCO included only straight and overtime compensation reflected in BNSF's 2001 Wage Form B and a small proportion of additional compensation paid in the form of "constructive

³⁶ See AEPCO Opening electronic workpaper "AEPCO_Salaries.123" and AEPCO Opening workpaper AEP 03828.

allowances.”³⁷ The extent of AEPCO’s exclusion of compensation actually paid (as reported in Wage Form B) is detailed in Table III.D.5.

Table III.D.5
AEPCO Exclusion of BNSF Crew Compensation³⁸

	Straight & Overtime Wages Included by AEPCO (A)	Vacation & Meal Compensation Included by AEPCO (B)=A x .1008	Compensation Used by AEPCO (D)=A + B	Total Compensation on Wage Form B (E)	% Total Compensation Excluded (F) =100-(D/E x 100)
Engineers	\$ { }	\$ { }	\$ { }	\$ { }	25.1%
Conductors	\$ { }	\$ { }	\$ { }	\$ { }	22.8%

AEPCO does not even disclose in its narrative that it has excluded this substantial proportion of the compensation actually paid to BNSF T&E personnel. Nor does AEPCO anywhere justify its arbitrary exclusion of actual wages paid. AEPCO may have held the misguided notion that “constructive allowances” are a method of calculating compensation for union railroads and that the SARR, as a supposedly non-union railroad, could simply ignore this portion of employee compensation. But as the Board recently held, there is no basis for excluding constructive allowance payments when there is no evidence that a non-union railroad could escape such payments. *CP & L*, slip op. at 63.

Excluding compensation as AEPCO has done would make no sense in any case, because that form of compensation includes payments for such activities as deadheading, being held

³⁷ To calculate total T&E expenses, AEPCO added a number apparently intended to reflect the cost of fringe benefits by applying a “T&E Fringe Ratio” of { } percent. See AEPCO Rebuttal electronic work paper “AEPCO Operating Expenses.123.” Defendants accept this fringe benefit ratio.

³⁸ Compensation used by AEPCO, including the meal and vacation allowance employed, is shown in AEPCO Opening electronic work paper “AEPCO_Salaries.123” and corresponds to straight and overtime compensation reported for BNSF in Wage Form B, AEPCO Opening workpaper AEP 03828. “Total Compensation” is as reported on Wage Form B.

away from home, significant training pay, and personal and annual leave. These are clearly activities that engineers and conductors on the ACE would perform and for which they would expect to be compensated. Even if a non-union railroad chose not to account for so-called constructive allowance dollars separately when calculating how much it pays its employees, it would still need to compensate them for the activities covered by the payments.

ii) AEPCO's Manipulation of Inflation Indexes

In addition to arbitrarily excluding a significant part of the actual compensation paid to BNSF crew personnel, AEPCO improperly manipulated the inflation indices it used to deflate crew salaries to first quarter 2001 levels and to project T&E expenses in future years. First, AEPCO deflated the 2001 crew salaries it calculated to first quarter levels by applying the ratio of the AAR first quarter wage index in the Western Region "Quarterly Indexes of Chargeout Prices and Wage Rates" (308.9) to the AAR annual wage index (314.1).³⁹ This approach was simply wrong. As the Board and its predecessor the ICC have long recognized, it is not possible to use the AAR annual wage indexes and the AAR quarterly wage indexes in the same calculation. Indeed, the AAR publication containing the indexes itself notes that the quarterly and annual indices are derived from different data sets and are not, therefore, directly comparable.⁴⁰ AEPCO should have used the ratio of the first quarter index to the average of the four quarterly indexes to determine first quarter 2001 wage levels.⁴¹

³⁹ See AEPCO Opening electronic work paper "AEPCO_Salaries.123." AEPCO does not identify the source of the indexes it uses, but they correspond to the indexes identified by Defendants. See BNSF/UP.SUPPRP.WP.III-D-0050 to 0051.

⁴⁰ See BNSF/UP.SUPPRP.WP.III-D-0050, at 8, Note to Table A.

⁴¹ The average of the four quarterly indexes – 308.9, 309.9, 311.4, and 311.4 (quarter one to four, respectively) – is 310.4. Hence, the appropriate ratio to apply was 308.9/310.4, not 308.9/314.1. The significant difference between the average of the four quarterly indexes and the annual index itself demonstrates that the two sets of indexes are not interchangeable.

Second, AEPCO used the RCAF-A to adjust operating costs for inflation going forward.⁴² The Board held in *TMPA*, slip op. at 161, in *Duke*, slip op. at 37, and again in *CP & L*, slip op. at 27-28, that the RCAF-U is the appropriate index to use for this purpose. As the Board recognized, there is no basis to believe that a newly-constructed SARR would enjoy the level of productivity gains predicted for existing railroads in the RCAF-A over the 20 year DCF-period. *CP & L*, at 27-28; *Duke*, at 37.

Defendants have corrected both of AEPCO's indexing errors in their own calculations of operating costs for the SARR.⁴³

iii) AEPCO's Inappropriate Use of "Average" Compensation for Employees Who Perform More than "Average" Work

Even correcting AEPCO's arbitrary exclusion of actual compensation and indexing errors, however, would not provide an adequate salary figure for the especially hard-working crews that AEPCO has specified for its SARR. The Wage Form B data on which AEPCO relies contains aggregate data for all BNSF engineers and conductors. Dividing aggregate wages by the number of employees, as AEPCO has done, necessarily indicates what the *average* BNSF employee earns, not what members of the hardest-working group earn.

Compensation data for { } full-year BNSF employees who served as engineers or conductors on trains included in the SARR traffic group reveal that the average number of crew starts in 2001 for these BNSF engineers and conductors was { }, nearly { } fewer

⁴² See, e.g., AEPCO Reb. electronic workpaper "Exhibit-III-H-4.123," worksheet "Operating SAC," column AH.

⁴³ AEPCO committed the described indexing errors with respect to its personnel salary calculations generally. See AEPCO Opening electronic workpaper "AEPCO_Salaries.123." Defendants have corrected these indexing errors throughout their own DCF analysis.

shifts than the 270 starts AEPCO says its crew personnel will perform.⁴⁴ Not a single one of the { } employees performed 270 crew starts or more in 2001. Indeed, only { } percent performed more than { } starts per year.

Given that none of the BNSF employees in the sample performed 270 crew starts per year, and very few came anywhere close, it appears unreasonable for AEPCO to assume that its entire work force would be able to average 270 starts per year. AEPCO has specified, however, that the ACE's work force will be composed only of employees who are willing to work harder than the hardest-working { } percent of BNSF crew personnel. In the remote event that such a work force could be developed, AEPCO would unquestionably need to pay more than an "average" wage. In the railroad world as elsewhere, employees who work more shifts and more hours in a year are better compensated than those who work fewer shifts and fewer hours. Indeed, the small proportion of BNSF T&E personnel who performed at this level were much more highly compensated than the "average" employee who performed only { } crew starts per year.

iv) Computation of Appropriate Crew Salaries

Absent compelling evidence to the contrary, there is no basis for AEPCO to arbitrarily reduce crew compensation below what is being paid in the marketplace today for work of similar type and quantity. Allowing proponents of stand-alone railroads to ignore fundamental

⁴⁴ See BNSF/UP Supplemental Reply electronic work paper "All Wages.xls," worksheet "Eng_Cond Combo." The wage data used for this analysis is contained in the same workpaper at worksheet "SMSSOC01." To develop this data, BNSF/UP consultants FTI identified relevant BNSF train symbols from those contained in the AEPCO traffic group. These included the most frequent non-coal trains for the ACE segment between Vaughn and Defiance. The subset of employees who worked these trains on this segment were then identified and full wage data was collected by unique social security number from BNSF's 2001 payroll tapes. An employee was counted as "full-year" if that employee had at least one crew start in each month. Only individual payment records that showed an employee actually worked a train on a shift (because the record contained a positive amount in the straight pay (STAmnt column) were used.

economic principles would violate the stand-alone concept. Simply put, the stand-alone railroad must pay the market rate for its T&E employees. If AEPCO expects its SARR T&E employees to average 270 crew starts per year, it must expect to pay the higher compensation such employees currently earn in the market.

The best evidence of what AEPCO would need to pay its 270-shift-per-year crew personnel is actual data that demonstrates what employees who performed the required amount and type of work earned at BNSF. Because AEPCO relied only on BNSF wage data, Defendants have taken the same approach. From data for { } BNSF engineers and conductors who worked on trains included in the AEPCO traffic group, Defendants calculated separately what an engineer or conductor who was in the hardest working group of engineers or conductors would have been paid.⁴⁵ Defendants then averaged the engineer and conductor salaries, just as AEPCO did, to derive an overall average wage for T&E employees (de-escalated to a 1Q2001 level) of \${ }.

As noted above, not one of the { } employees actually completed 270 crew starts in 2001. Personnel in the hardest working engineer group averaged only { } crew starts a year while those in the hardest working group of conductors averaged only { } starts per year. Thus, the salaries paid to these individuals represent considerably less than what a 270-start employee would have earned. Nonetheless, Defendants have taken the conservative approach

⁴⁵ For this calculation, Defendants used the group of engineers with annual starts in the range between { } and { } and the group of conductors with annual starts in the range between { } and { }. Calculation of the engineer and conductor average salaries are contained, respectively, in BNSF/UP Supplemental Reply electronic workpaper “Engineers.xls,” worksheet “summary,” and “Conductors.xls,” worksheet “summary.” When de-escalated to the 1Q2001 level, an average engineer salary for this group was \${ } and an average conductor salary was \${ }. BNSF/UP Supplemental Reply electronic workpaper “Salary Summary.xls.”

and assumed that AEPCO engineers and conductors would earn only what BNSF's hardest-working engineers and conductors earn.

(c) Summary Comparison

The table below compares the compensation for transportation operating personnel proposed by AEPCO and Defendants:

**TABLE III.D.6
Operations Personnel Compensation⁴⁶**

Position	AEPCO			Defendants			Total Difference
	Personnel	Annual Salary	Total Salaries	Personnel	Annual Salary	Total Salaries	
Director of Operations Control	1	\$ { }	\$ { }	1	\$ { }	\$ { }	\$ { }
Manager of Operations Control	5	\$ { }	\$ { }	5	\$ { }	\$ { }	(\$ { })
Crew Callers	5	\$ { }	\$ { }	5	\$ { }	\$ { }	\$ { }
Dispatchers	14	\$ { }	\$ { }	14	\$ { }	\$ { }	\$ { }
Director of Train and Locomotive Operations	1	\$ { }	\$ { }	1	\$ { }	\$ { }	\$ { }
Manager of Train Operations	4	\$ { }	\$ { }	4	\$ { }	\$ { }	\$ { }
Asst. Mgr. of Train Operations	4	\$ { }	\$ { }	4	\$ { }	\$ { }	\$ { }
Manager of Locomotive Operations	3	\$ { }	\$ { }	3	\$ { }	\$ { }	\$ { }
Director of Customer Service	1	\$ { }	\$ { }	1	\$ { }	\$ { }	\$ { }
Customer Service Managers	8	\$ { }	\$ { }	8	\$ { }	\$ { }	\$ { }

⁴⁶ Source: AEPCO information - AEPCO Opening Nar., Tables III-D-3 and III-D-5. Defendants' information - BNSF/UP Supplemental Reply electronic workpaper "OPR_EXP.xls," at worksheet "Summary."

Manager of Operating Rules and Safety	1	{ }	{ }	1	{ }	{ }	{ }
Yardmasters	0	0	0	5	{ }	{ }	{ }
Crew Haulers/Utility Clerks	0	0	0	27	{ }	{ }	{ }
Switch & Work Train Crew Members	26	{ }	{ }	30	{ }	{ }	{ }
Train Crew Members	253	{ }	{ }	277	{ }	{ }	{ }
Total Transportation Department Employees	326		\$17,525,126	386		\$39,712,018	\$22,186,892

(3) Materials, Supplies and Equipment

AEPCO assumed a 2001 annual expense of \$590,777 for materials, supplies and equipment (including office furniture and equipment, office supplies, safety equipment, EOTD devices, two-way radios and batteries, tools, vehicles, etc.) for operating personnel.⁴⁷

Defendants reviewed the individual item unit costs that make up the overall material and equipment expense costs; in general, Defendants accept these item unit costs and AEPCO's basic cost per employee with the exceptions of the aforementioned Suburban trucks, the unit cost of F-150 trucks, and the cost of safety equipment.⁴⁸

Because of the manner in which Defendants have addressed G&A below, the IT requirements for the operating personnel are included with operating materials and supplies.⁴⁹

⁴⁷ AEPCO Reb. Exh. III-H-3, p. 23 of 27, line 6, column 2.

⁴⁸ See BNSF/UP Supplemental Reply electronic workpaper "OPR_EXP.xls," worksheet "Safety Gear."

⁴⁹ See BNSF/UP Supplemental Reply electronic workpaper "OPR_EXP.xls," worksheet "Summary."

- b. Non-operating
 - (1) Staffing Requirements
 - (a) Mechanical

AEPCO's mechanical department is led by a Vice President-Engineering and Mechanical and staffed by one Manager of Mechanical Operations and 27 equipment inspectors.⁵⁰ AEPCO Opening Nar. at III-D-15. AEPCO presents at least three inconsistent numbers of crew inspectors at various points in its evidence. On page III-C-27 of its Opening Narrative, AEPCO states that "[t]wo [four-person] inspection crews will be on duty on a 24/7 basis at Vaughn and one [four-person] 24/7 inspection crew will be on duty at El Paso." This is a total of 12 inspector positions. Using a multiplier of 4.5 to provide full-time staffing for each of these positions, a total of 54 employees would be required for these positions.

On page III-B-16 of its Opening Narrative, however, AEPCO states that, "three four-person crews will work each shift at Vaughn on a 24/7 basis" and "one four-person inspection crew will be on duty at El Paso on a 24/7 basis." This is a total of 16 inspector positions. Using a multiplier of 4.5 to provide full-time staffing for each of these positions, a total of 72 employees would be required for these positions.

Finally, in the summary of ACE Operating Employees in Table III-D-1 (page III-D-8 of AEPCO's Opening Narrative), AEPCO lists only 27 equipment inspectors. This is half or less of the equipment inspectors AEPCO identified in the other portions of its testimony referenced above.

Defendants have provided three 4-person mechanical inspection crews on an around-the-clock basis at Vaughn Yard. This number of crews is required to inspect the average of 70 trains

⁵⁰ The Vice-President-Engineering and Mechanical position is included in the G&A staffing discussed below.

per day that will be passing through Vaughn Yard. This figure is consistent with the number of car inspection crews specified by AEPCO at this location in one portion of its evidence. This is also consistent with the current number of car inspectors used by BNSF at Belen for approximately the same level of traffic. In order to staff these 12 positions on a full-time basis (using a multiplier of 4.5), a total of 54 employees is required.

At El Paso Yard, AEPCO provided one 4-person mechanical inspection crew on an around-the-clock basis. Defendants have provided an additional 4-person crew for one shift per day, 7-days per week to provide adequate staffing to inspect trains that arrive in groups in order to avoid backing up trains. A total of 23 employees is required to staff these positions.

Defendants have provided a total of 77 employees to staff mechanical inspection positions at Vaughn and El Paso Yards.

The table below compares the mechanical staffing for the ACE proposal by AEPCO and defendants.

TABLE III.D.7
Mechanical Staffing

<u>Position</u>	<u>AEPCO</u>	<u>Defendants</u>	<u>Difference</u>
Director of Mechanical Services	1	1	0
Manager of Mechanical Operations	1	1	0
Equipment Inspectors	27	77	50
Total	29	79	50

Source: AEPCO information - AEPCO Opening Nar., Tables III-D-1 and III-D-4.

(b) Engineering

Engineering staffing is addressed in Section III.D.4.b. below.

(2) Compensation

(a) Mechanical

Compensation for mechanical employees was determined by calculating BNSF 2001 Wage Form A and B average annual salaries and indexing to first quarter 2001 levels by using the AAR first quarter wage index 308.9 and the average of the four quarterly indices 310.4.

The table below compares the compensation for Mechanical Department personnel for the ACE proposal by AEPCO and Defendants:

TABLE III.D.8
Mechanical Personnel Compensation⁵¹

Position	<u>AEPCO</u>			<u>Defendants</u>			Total Difference
	Personnel	Salary	Total	Personnel	Salary	Total	
Director of Mechanical Services	1	\$ { }	\$ { }	1	\$ { }	\$ { }	\$ { }
Manager of Mechanical Operations	1	\$ { }	\$ { }	1	\$ { }	\$ { }	\$ { }
Equipment Inspectors	27	\$ { }	\$ { }	77	\$ { }	\$ { }	\$ { }
Total	29		\$1,347,788	79		\$3,594,860	\$2,247,068

(b) Engineering

Compensation for engineering personnel is addressed in Section III.D.4.b. below.

(3) Materials, supplies and equipment

(a) Mechanical

Materials, supplies and equipment for non-operating mechanical personnel are included in the consideration of materials, supplies and equipment for operating personnel in Section III.D.3.a.(3) above.

⁵¹ Source: AEPCO information - AEPCO Opening Nar., Tables III-D-3 and III-D-5. Defendants' information - BNSF/UP Supplemental Reply electronic workpaper "OPR_EXP.xls," at worksheet "Summary."

(b) Engineering

Materials, supplies and equipment for engineering functions are addressed in Sections III.D.4.b. and c. below.

c. G&A

Defendants' witness Chris Kent compares AEPCO's cost assumptions for ACE to real world railroads. He then critiques AEPCO's methodology for arriving at ACE's General and Administrative ("G&A") expense. Finally, Mr. Kent presents an estimate of what ACE's G&A expense should be based on comparisons to similar real world railroads. Defendants' evidence on G&A costs is therefore the only evidence in the record that is grounded on verifiable data.

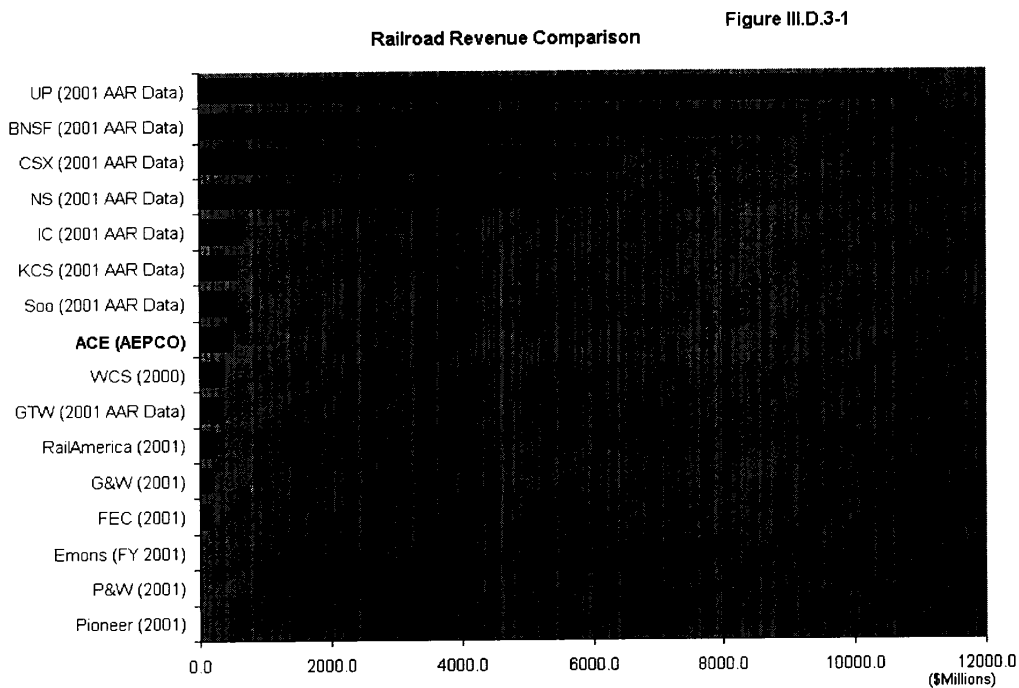
(1) Backdrop For Evaluation of AEPCO's Cost Assumptions — Comparison of ACE To Real World Railroads

In order to evaluate ACE's operations, Mr. Kent compares it to several real-world publicly traded railroads of varying sizes. AEPCO's hypothetical ACE qualifies as a Class I railroad.⁵² It substantially exceeds the scale of the commonly referred to "local" or "regional" railroad.⁵³ Mr. Kent notes that, by most measures, ACE is larger than all the publicly-traded regional railroads and short-line holding companies. In fact, based on ACE's assumed 2001 operating revenues it is larger than the former Class I carrier Grand Trunk Western Railroad, Inc. ("GTW") (with \$359.2 million in revenues).

⁵² The STB classifies railroads by revenue. Pursuant to STB regulations, 49 C.F.R. Part 1201, Section 1-1 of the General Instructions, the 2001 and 2002 revenue threshold for Class I railroads is \$266.7 and \$272 million, respectively, which AEPCO's ACE substantially exceeds.

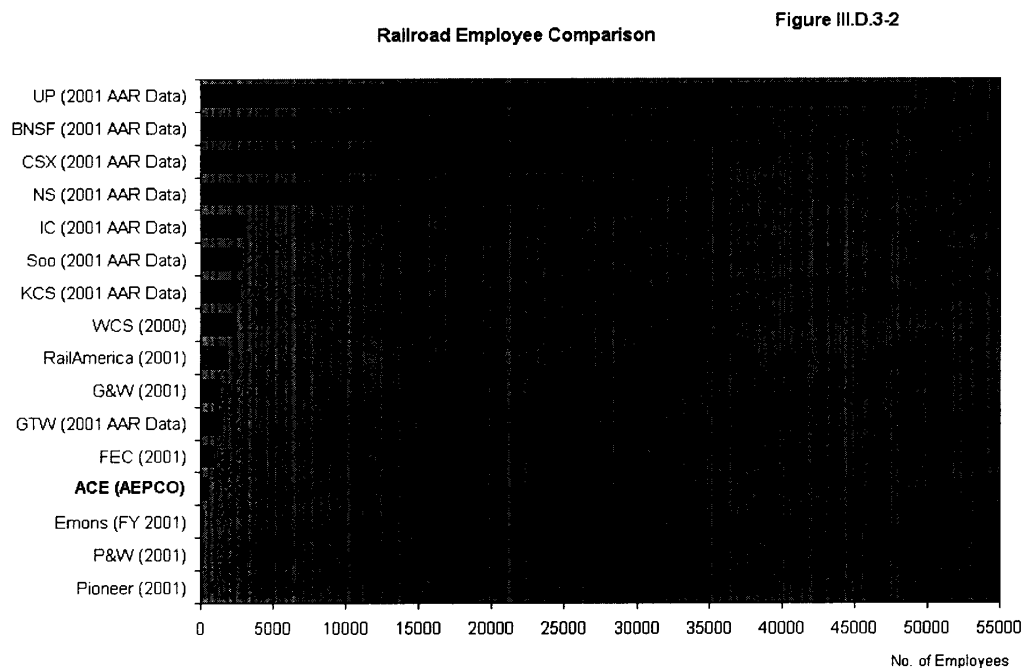
⁵³ The Association of American Railroads ("AAR") defines a "regional" railroad as a non-Class I carrier with \$40 million in revenue and at least 350 route miles, and a "local" railroad as one with revenue and miles less than a "regional" railroad. *Railroad Ten Year Trends*, AAR at 184, 185 (2001).

Annual gross revenues are the most commonly used basis for comparing size in the railroad industry. AEPCO estimates 2001 revenues of \$498 million (defendants have revised that downward to \$393.4 million) for ACE, which would place it as the seventh largest U.S. railroad of those currently operating independently. Figure III.D.3-1 shows ACE's 2001 revenue as proposed by AEPCO in relation to various other public carriers.⁵⁴



⁵⁴ The data in the figures that follow are derived from the companies 10-Ks, 14As or AAR publications.

ACE, while eighth in rank, is well behind the first four carriers in revenue. A better basis of comparison to ACE are five carriers: IC, KCS, Soo, WCS, and GTW. RailAmerica, which has slightly less revenue than these five carriers, is a multi-carrier holding company (comprised of 50 North American railroads, one in Australia and one in Chile) with totally different characteristics from a large single system railroad and, therefore, is not comparable to the proposed ACE.

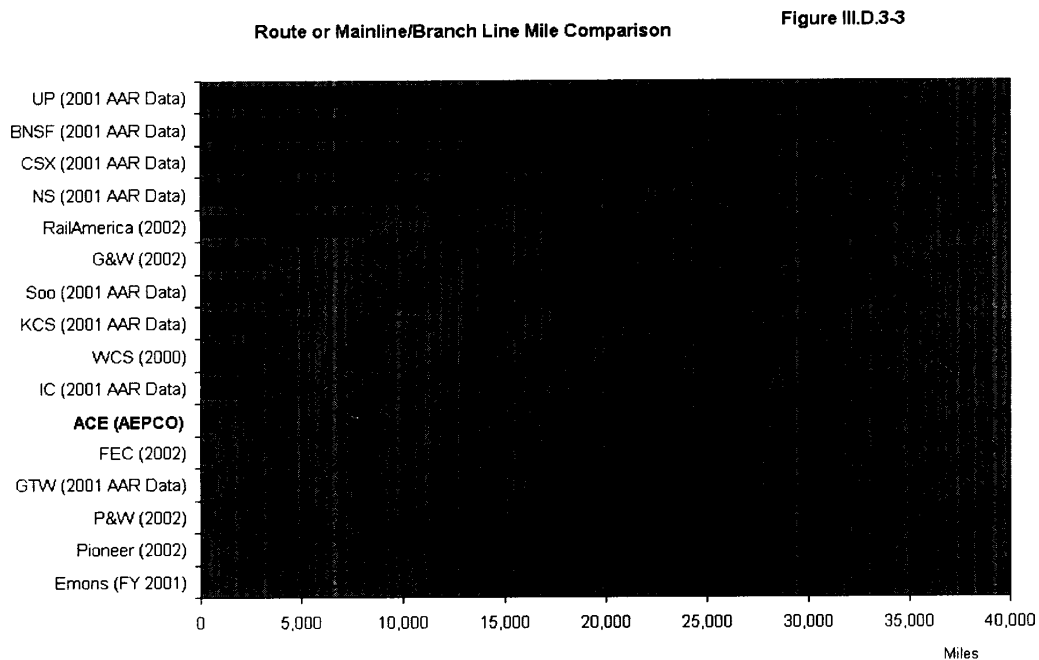


Employment levels usually reflect the size and scope of a rail operation. Comparison of overall employment levels with other carriers of similar scale can indicate which real-world carriers constitute the best models for the proposed ACE. Comparative railroad employment levels are shown in Figure III.D.3-2.

While one would expect ACE to have a similar number of employees to the five railroads with comparable revenues, it does not. Railroads with comparable revenues have between 1405 and 2896 total employees, but ACE as proposed by AEPCO has only 455 employees. That

number of employees puts ACE below the level of the Florida East Coast (“FEC”) railroad and slightly above the miniscule public carriers Emons, P&W and Pioneer.

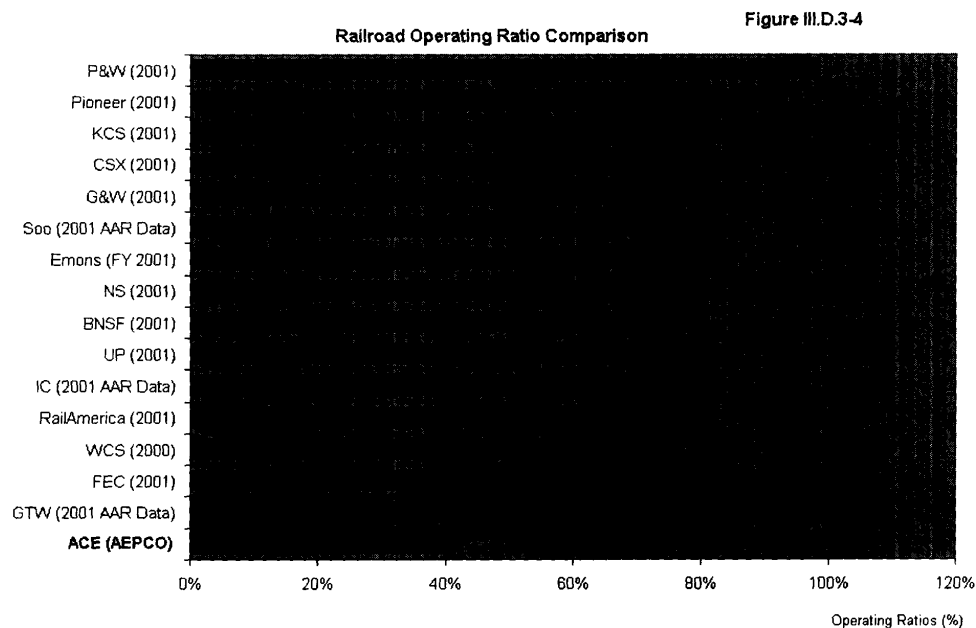
Operating mileage is another measure of comparability. ACE plans to operate 786 route miles of railroad, placing it at the low end in terms of size of carriers as shown in Figure III.D.3-3.



Good comparison carriers to ACE based on mileage, again excluding non-contiguous multi-carrier holding companies, include FEC and GTW. Mr. Kent notes that since the number of route miles and amount of revenues of ACE and GTW are reasonably close, GTW could serve as a smaller, but reasonable proxy for ACE. In which case he would expect ACE to have at least as many employees as GTW; *i.e.*, three times more employees than AEPCO proposes.

Overall, based on these three measures, GTW is the best real-world carrier with which to compare ACE.

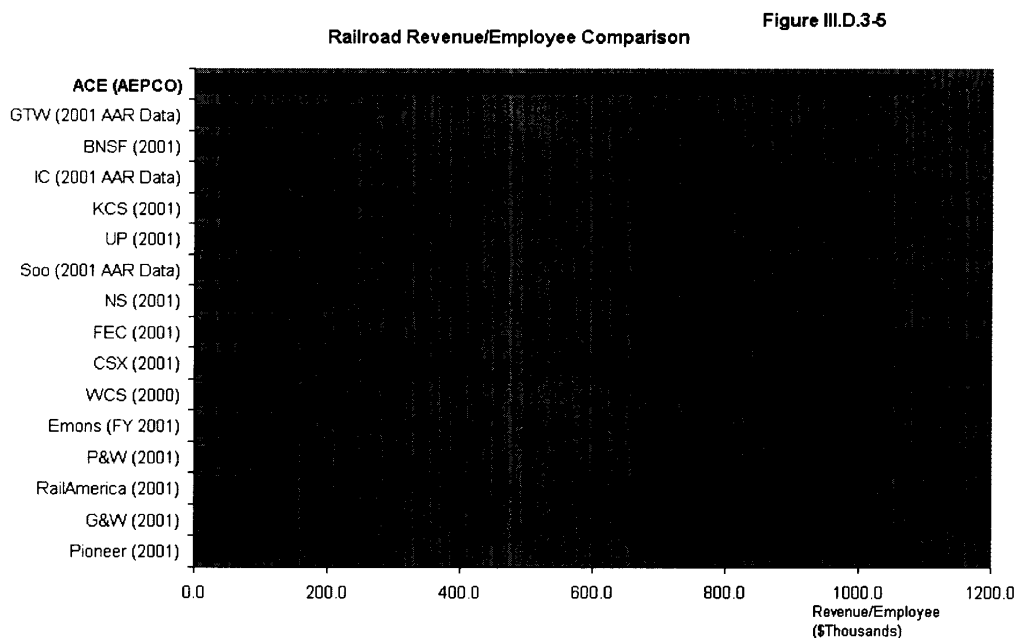
Having identified ACE's relevant real world peer, Mr. Kent considers how it measures up. He determines that ACE claims a level of efficiency not achieved by any operating railroad of its class. Railroad operating efficiency is judged primarily by operating ratios. The operating ratio represents a carrier's ratio of operating expenses to operating revenues. The railroad industry has long recognized that the lower the operating ratio, the more efficient the carrier.



AEPCO proposes that ACE will operate with an operating ratio of **39.7%**. This is nearly two times better than GTW (71.3%) performed in 2001. AAR statistics show that the Class I operating ratio for 2001 and 2002 was 84.3% and 83.8%, respectively.⁵⁵ The Class I railroad with the lowest operating ratio for the past few years has been CN, posting a 69% mark in 2002. Figure III.D.3-4 shows that ACE's proposed operations will yield an operating ratio less than

⁵⁵ "Class I Railroad Statistics," AAR, May 14, 2003, page 2, published at <http://www.aar.org/PubCommon/documents/AboutTheIndustry/Statistics.pdf>.

two-thirds *the best mark* posted by an independent U.S. railroad in modern times – IC in 1998 at 64%. From a historical perspective, the AAR has reported that Class I's as a group enjoyed an operating ratio of 80.28% in their best year over the past decade. Mr. Kent believes ACE's operating ratios are clearly anomalous.



Another key measure of efficiency is labor productivity. While measured in many ways, the most common standard is revenue per employee. ACE anticipates earning over \$1 million in revenue per employee. This measure is also “off the charts” when compared to recent railroad experience as shown in Figure III.D.3-5. Not only does ACE operate completely outside the normal range for this measure, it also defies the prevailing trend. As can be seen in Figure III.D.3-5, larger railroads generally outperform smaller ones in this measure, because of returns on scale. When compared to GTW, with revenue per employee of \$256 million, the results

predicted for ACE stand out in even greater contrast. Indeed, even as revised by Defendants, ACE would produce more revenue per employee than any other railroad.

Taken together, these two measures of operating performance strongly indicate that the structure and economics proposed for ACE are unrealistic. This overall result undermines the credibility and reliability of AEPCO's G&A projections (indeed all its operating expense projections) for ACE, which fails to comport with the experience of existing players in the industry.

Finally, Mr. Kent compared the G&A expense of the seven railroads reporting data to the STB in 2000, 2001 and 2002 with that of AEPCO's ACE. That comparison for 2002, which is summarized in Table III.D.9 below shows ACE's G&A expense as a percent of total operating expense, total operating revenue and net revenue. That table shows that ACE's G&A percentages are much lower than GTW's in 2002. GTW's G&A expense as a percentage of total operating expense was 21.97% compared to 6.71% at ACE; its G&A expense as a percentage of operating revenue was 19.76% compared to 2.66% at ACE; and its G&A expense as a percentage of net revenue was 196.09% compared to 4.41% at ACE. Mr. Kent concludes that ACE unrealistically out performs its closest peer.

**Table III.D.9
Comparison of G&A at Real World Railroads and AEPCO's ACE**

Railroad	CSXT	SOO LINE	UP	NS	KCS	BNSF	CN-GTW	INDUSTRY COMPOSITE	ACE (AEPCO Rebuttal- 2001)
G&A (\$000) ¹	958,528	36,089	908,101	876,334	64,299	730,487	298,664	3,872,502	13,271
Total Operating Expense (\$000) ²	5,790,852	466,656	8,845,867	5,292,680	499,124	7,337,877	1,359,270	29,592,326	197,702
% G&A/Total Operating Expense	16.55%	7.73%	10.27%	16.56%	12.88%	9.96%	21.97%	13.09%	6.71%
Total Operating Revenue (\$000) ³	6,368,140	552,226	10,987,114	6,269,821	559,560	8,962,920	1,511,577	35,211,358	498,308
% G&A/Total Operating Revenue	15.05%	6.54%	8.27%	13.98%	11.49%	8.15%	19.76%	11.00%	2.66%
Net Revenue (\$000) ⁴	577,288	85,570	2,252,972	977,141	60,436	1,625,043	152,307	5,730,757	300,606
% G&A/Net Revenue	166.04%	42.17%	40.31%	89.68%	106.39%	44.95%	196.09%	67.57%	4.41%

¹ R-1 Schedule 410, Line 619.

² R-1 Schedule 410, Line 620.

³ R-1 Schedule 210, Line 13.

⁴ R-1 Schedule 210, Line 15.

Mr. Kent concludes that it would be necessary to increase ACE's staffing substantially to operate the proposed rail system in a responsible manner. However, given the time constraints in the preparation of this evidence Defendants do not attempt to determine a G&A staff through a bottom-up analysis. Instead, Mr. Kent points out several problems with AEPCO's results and relies on the data reported by other railroads to the STB to indicate what total G&A expense ACE should expect to bear.

(2) Critique of AEPCO's Methodology

ACE as envisioned by AEPCO will be a multi-commodity railroad of significant scope. In its first year of operations, it will: earn \$498 million in revenue; operate and maintain 786.01 route miles; and transverse three states.

In terms of revenues, ACE falls just behind the smallest independent Class I carrier, Kansas City Southern (“KCS”) (with 2001 revenues of \$566.4 million),⁵⁶ and it is significantly larger than any regional carrier. In fact, ACE has approximately one-third more revenue than the Wisconsin Central System (“WCS” – the North American operations of Wisconsin Central Transportation Company (“WCTC”)), the nation’s largest regional carrier prior to its merger into Canadian National (“CN”) in 2001.⁵⁷ While defendants believe that AEPCO has overstated ACE revenue, even with defendants’ revisions ACE still earns about \$393.4 million in revenue in 2001 and grows to \$462.7 million by 2020.

Despite its substantial revenues, AEPCO proposes that ACE will require a G&A staff of only 61 employees and a G&A budget of a mere \$13.3 million. This figure is incredibly low, and, as discussed above, implies that ACE will operate at a level of administrative efficiency never before approached by other North American rail carriers of similar size and scope. AEPCO supplies almost no justification for such an aggressive assertion. In fact, with the exception of six of ACE’s executive salaries and its IT software and hardware costs, AEPCO provides *no* support for its G&A recommendations except the speculation of Frederic Yocum, John Toren and Joseph Kruzich. AEPCO does not offer any independent support for its G&A expense staffing, salary or cost levels. Indeed its entire outsourcing budget, on which its G&A function heavily relies, is pulled out of thin air.⁵⁸

AEPCO cannot carry its burden of proof on this element of SAC costs without submitting opening evidence to support its assumptions, particularly where a comparison with real world

⁵⁶ See KCS Year 2001 SEC Form 10-K.

⁵⁷ See WC Year 2000 SEC Form 10-K.

⁵⁸ See AEPCO Opening electronic workpaper “ACE G&A Outsourcing Costs.wpd.”

railroads shows that the ACE staffing and cost levels are totally unprecedented. Moreover, AEPCO fails to offer more than a cursory explanation of how the many functions that a G&A staff performs on a railroad will be accomplished on the ACE. The Board has previously rejected such unsupported data in *FMC*, slip op. at 165 and 167. It should do so here as well.

AEPCO claims that it will be able to achieve traditional G&A functions at significantly lower costs through outsourcing, but ACE will only spend \$860,108 per year on outsourcing. Moreover, the benefits ACE supposedly will receive are unprecedented among railroads using these same strategies. The railroad industry already makes substantial use of outsourcing non-critical functions, and has increased its use in the past decade. Yet no carrier has achieved the extraordinary level of efficiency claimed by AEPCO. A stand-alone railroad is permitted to base cost assessments on an assumption that it will operate efficiently, but it should be required to demonstrate where it will achieve those efficiencies and prove that they are achievable. In past cases, the Board has accepted complainant's extremely low G&A expense estimates on the ground that the railroad did not adequately respond to the complainant's proposed outsourcing. *CP&L*, slip opin. at 61. However, in this case it is AEPCO that has not sufficiently addressed how it will achieve the outsourcing it assumes. AEPCO has the burden to show that all its operating costs are verifiable. *Coal Guidelines*, 1 I.C.C. 2d at 543. It has not done so here.

In order to achieve the vast improvement in operating efficiency that AEPCO proposes Mr. Kent believes that ACE would have to achieve unique strategic advantages or implement new technologies or ways of doing business. However, there is no basis for this assumption. AEPCO proposes to utilize standard North American railroad operating methods. For example, ACE's track construction and maintenance will be done with standard AREMA specification materials, using standard methods used by virtually all railroads. Trains will be manned by

industry-standard two person crews. Standard issue locomotives will be employed; exactly the same type of locomotives currently purchased by the incumbent Defendants. AEPCO proposes to use a third party information system for railroad operations that is already used by hundreds of North American railroads. The service the ACE allegedly will provide to its customers will essentially mimic that provided by Defendants today. In Mr. Kent's opinion, the results contemplated by AEPCO could only occur if railroad economics were changed in a dramatic manner. Yet nowhere in the AEPCO evidence is there a unique idea, plan or proposal that could give rise to a fundamental change in railroad economics.

(a) Specific Problems With AEPCO's Results

AEPCO proposes a G&A staff of 61 for the ACE headquartered in Vaughn, New Mexico.⁵⁹ The ACE staff will supposedly either perform G&A functions themselves or oversee the functions that are outsourced to third parties. Mr. Kent explains below some of the reasons why the proposed staff is insufficient to accomplish the mission with which it is charged.

President's Office

- The size, composition and compensation of the ACE Board of Directors is inadequate when compared to that of other railroads.⁶⁰ Mr. Kent believes that since ACE will require significant financing by investors, those investors will demand oversight of the company by outside Directors, who in turn will expect to be compensated for their service and covered by Directors' and Officers' Insurance. AEPCO proposes none of those things. The Board has previously rejected similar undersized, undercompensated SARR Boards. *CP&L*, slip opin. at 62.

⁵⁹ There are several positions under the Transportation and Engineering/Mechanical Departments that Mr. Kent disagrees should be a part of the G&A function. Those positions are addressed in other parts of Defendants' evidence. Mr. Kent only includes the two Vice Presidents of those Departments and the Marketing Manager within the G&A function.

⁶⁰ See BNSF/UP Supplemental Reply electronic workpaper "RR_Board_of_Directors.doc."

Finance & Accounting

- ACE's Finance and Accounting Department with a mere 10 people (excluding IT specialists) is substantially undersized. Mr. Kent states that finance and accounting involve some of the most complex operations of a railroad. However, AEPCO ignores various functions that are performed by railroad finance and accounting groups such as analyzing revenue issues and trends and resolving substantive disputes that cannot be quickly settled by revenue accountants; performing internal audits; purchasing materials and equipment; and performing real estate work. By way of comparison other mid-sized carriers have significantly larger finance and accounting staffs such as WCS with 64 employees,⁶¹ IMRL with 34 employees (revenues of only \$130 million in its last year of operations),⁶² and MRL with 33 employees (with revenues of { } million).⁶³
- AEPCO's justification for such a small staff is predicated on outsourcing functions frequently performed in-house by Class I railroads. However, AEPCO plans to have the ACE handle large quantities of general freight traffic, the large majority of which will need to be settled with other rail carriers. With a diverse traffic mix and virtually all of its traffic handled in overhead service, significant efforts will be required to settle interline revenues with other railroads, even if other carriers handle the customer billing. Moreover, intermediate carriers such as ACE trying to entice customers to use their services frequently employ Rule 11 billing to conceal their rate from competitors and take advantage of proportional rates to interchange gateways. Even where interline rates apply, settlement in the railroad industry is far from straightforward, and a substantial number of interline bills require adjustment between carriers. AEPCO also ignores that most mid-sized carriers already outsource the same finance and accounting functions it proposes here so that no additional efficiency is gained by ACE over those carriers.
- AEPCO, without explanation as to the source of its estimate, places the cost of an annual audit and internal review at \$250,000. While ACE would not have the auditing fees associated with a public company, it would have fees associated with preparing R-1

⁶¹ See BNSF's Reply Evidence in *Otter Tail v. BNSF*, Docket No. 40971, at III.D-80.

⁶² *Id.*

⁶³ BNSF/UP Supplemental Reply electronic workpaper "MRL_Info.doc."

financials for the STB, which would make its audit fees comparable to those paid by other carriers.⁶⁴

- AEPCO's proposed staffing of ACE's information technology ("IT") department with one Director and seven specialists is not reasonable. Mr. Kent notes that WCS operated with an IT staff of 17 and as many as 6 consultants in a similarly outsourced environment.⁶⁵ He also notes that AEPCO does not identify who will be responsible for the voice communication network. While ACE expects to outsource many IT functions, AEPCO assigns no cost for such outsourcing. The Board has previously rejected IT outsourcing without associated costs. *CP&L*, slip opin. at 62.

Law and Administration Department

- The proposed outside legal budget of \$195,000 is substantially below that required for a railroad of ACE's size and scope. AEPCO offers no support for this budget estimate. Mr. Kent notes that the experience of other railroads undermines this estimate. For example, WCS paid legal fees of \$821,000 in 2000, \$1.8 million in 1999 and \$1.6 million in 1998; an average of \$1.4 million.⁶⁶ Another regional carrier, MRL, reports spending in excess of { } million in 2001 alone.⁶⁷
- ACE is configured as a non-union company, but it does not employ human resource ("HR") personnel to support that environment. Mr. Kent states that a non-union environment requires a more substantial and active HR Department than a traditional, unionized railroad to resolve employee issues that would otherwise be resolved through a grievance procedure in a union shop.⁶⁸ ACE will also need HR positions to interact with employees directly and handle compensation and benefits issues. Mr. Kent notes that AEPCO also makes no mention of how it will handle applicant pre-employment testing or whether it will administer a program of safety awards and incentives, which is common in the railroad business.

⁶⁴ See BNSF/UP Supplemental Reply electronic workpaper "RR_Comparisons.xls."

⁶⁵ See BNSF's Reply Evidence in *Otter Tail* at III.D-87.

⁶⁶ *Id.* at 89.

⁶⁷ BNSF/UP Supplemental Reply electronic workpaper "MRL_Info.doc."

⁶⁸ See BNSF's Reply Evidence in *Otter Tail* at III.D-90.

- In the claims area, AEPCO provides a single Director of Safety and Claims and an unsupported \$125,000 annual budget for claims services. Mr. Kent believes that claims are a substantial railroad expense and that more resources will be required for that function.

Transportation Department — Marketing

- AEPCO has vastly understated the marketing effort necessary to support ACE. AEPCO proposes to outsource marketing at \$120,000 per year for 2 FTE to handle the sales and marketing needs of the ACE. As proposed by AEPCO, ACE begins operating with \$498 million in revenues, growing to \$600 million over twenty years. Mr. Kent finds this department to be so woefully understaffed that ACE could not even begin to participate in handling the traffic it claims to transport.
- Mr. Kent rejects the suggestion that ACE's commercial services could practicably be contracted out. AEPCO has offered no real world support for the notion that marketing may be successfully outsourced. Merely identifying a company that says it provides that service is not enough. More importantly, AEPCO uses its assumption of a third party contractor as an excuse to avoid any consideration of the work that would be needed to perform marketing support for the ACE or the specific costs for that activity. AEPCO also does not indicate what services its outsourcing payment will provide. AEPCO's evidence on this point is inadequate on its face.
- The ACE marketing group will need to be skilled at understanding highly technical and specialized contracts for the energy market. Many ACE customers will ship coal under transportation contracts, thus contract administration will play a large role in its day-to-day tasks. Customers frequently seek to renegotiate the terms one or more times before the contract expires because of changes to their coal supply requirements and for other reasons. Renewal negotiations must occur for those customers that do not seek early renegotiation. Contract terms have decreased over the years so that the terms are shorter and shorter, in some cases requiring renewal every three to five years. Mr. Kent states that both contract renegotiations and renewals require significant effort by marketing personnel to analyze and respond to offers, make counter-proposals and negotiate new terms and conditions. Competitive threats make it necessary to support this effort.
- AEPCO has postulated that the marketing effort required by ACE will be minimized by excluding most originating and terminating traffic from the SARR. In the real world, the overhead traffic that

ACE has selected is the most difficult traffic to obtain and retain. Rail customers have expressed a strong preference to avoid routes involving additional carriers. Carriers participating in overhead traffic need to mount an intensive marketing campaign and provide customers with ample reason and financial incentive to utilize their services. The SAC conclusions set forth by the ICC with respect to marketing in *Nevada Power II* support this notion. In *Nevada Power II*, 10 I.C.C.2d at 301, the ICC found that “because most of the traffic now included in the SARR model would originate or terminate off the SARR system, and much of this traffic is highly competitive in nature, it is unreasonable to assume that all this traffic would move on the SARR without some off-line marketing.” Therefore, Mr. Kent’s conclusion that ACE needs a marketing force more substantial than AEPCO has proposed for ACE’s non-coal traffic is well justified.

- ACE will need marketing expertise across a wide variety of commodities, along with the ability to service a significant number of major accounts in order to participate in overhead, non-coal traffic to the extent contemplated. The ACE traffic base is quite diverse. See III.A above. While AEPCO has attempted to design the non-coal operations of the ACE to be operationally simple, the marketing challenge is quite substantial. Because much of the non-coal traffic that ACE proposes to handle is intermodal traffic, ACE will literally be dealing with thousands of shippers/customers annually. ACE will need to provide specific account coverage for each of its customers. Although most of this traffic represents smaller volumes, it will still need to be handled by ACE’s marketing staff.
- The ACE traffic base is quite diverse. Intermodal and auto traffic accounts for 71% of the total traffic. The carload traffic records indicate that 38 individual commodities (at just the two-digit STCC level) were handled; of these, 9 had significant volumes (representing 80% of all non-coal traffic). As a result, ACE will need marketing expertise across a wide variety of commodities along with the ability to service a significant number of major accounts, in order to participate in overhead, non-coal traffic to the extent contemplated. To further underscore the complexity of the non-coal traffic flows, the data shows that there are literally tens of thousands of unique origin-destination pairs. It is abundantly clear that the ACE marketing challenge will be quite demanding, and it is patently unreasonable to assume that the ACE will rely upon the incumbents to do all of the work for them.

Compensation

- The salaries that AEPCO proposes for the President/CEO and other ACE executives are inadequate.⁶⁹ Mr. Kent testifies that AEPCO's purported compensation figures are wrong because they do not include all the compensation. For example, in 2000, the WCS President, which is AEPCO's basis for the ACE President's salary of \$304,235, received total compensation (salary and bonus) of \$358,590 plus 40,000 stock options for WCTC shares at a strike price of \$13, which had a current value of \$520,000. The salary range for President/CEO's at other railroads in 2001 was up to \$1,200,003. Bonuses for those same employees ranged up to \$1 million, excluding stock options and other compensation. Stock options were granted to almost all of those executives, ranging from thousands to hundreds of thousands of shares. In addition, other annual compensation for those individuals went as high as \$2.8 million.⁷⁰

(3) Defendants' G&A Estimate

As discussed previously, Defendants do not develop G&A expenses for ACE from the "bottom-up." In lieu of a bottom-up approach, Mr. Kent developed G&A expenses for ACE using the G&A expenses reported on Schedule 410 of the R-1 reports.⁷¹ Specifically, Mr. Kent developed a G&A expense per revenue ton-mile for the years 2000, 2001 and 2002. Mr. Kent utilized this approach because AEPCO's G&A presentation was not based on any concrete evidence. AEPCO's assumptions about the specific G&A functions and employees that would perform those functions is without any support. It is impossible to assess the validity of evidence that has no support. That is why the Board requires that a complainant's case be supported by verifiable evidence. *Coal Guidelines*, 1 I.C.C.2d at 543. AEPCO submitted no verifiable evidence to establish that the G&A functions it posited were the functions necessary to operate a railroad, that it was possible to perform those functions using the employees it designated, or that

⁶⁹ See BNSF/UP Supplemental Reply electronic workpaper "RR_Executive_Salaries.doc."

⁷⁰ *Id.*

⁷¹ See BNSF/UP.SUPPRP.WP.III.D-0052-0097.

the outsourcing costs it proposed would actually cover the costs of outsourcing those functions. AEPCO never referred to any real world G&A operations in its presentation. Given the total lack of foundation for AEPCO's G&A assumptions, Mr. Kent assessed the ACE G&A costs by reference to the G&A expenses of real world railroads of comparable size. Use of these real-world expenses as a benchmark for the ACE is reasonable. Over the past 20 years, railroads have worked hard to minimize costs and improve efficiencies. Much of the productivity improvements experienced in the recent past has come from G&A cost savings. Railroads have dramatically reduced G&A costs in their search for operating efficiencies. Therefore, real world operations are the best basis on which to model ACE.

As shown in BNSF/UP workpapers,⁷² the G&A expenses per revenue ton-mile vary between carriers, and from year-to-year. It is also clear that the larger carriers enjoy lower unit costs, evidencing economies of scale. In order to develop an estimate of G&A expenses that would most closely represent real-world reported data, Mr. Kent developed a three-year average cost for all carriers with less than \$1 billion in reported revenue and applied that to the revenue ton-miles developed by the Defendants' operating plan. The result is G&A expenses for 2001 of \$18.59 million.

(4) Materials, Supplies And Equipment

These items are included in the figure developed above.

(5) Other General And Administrative Expenses

(a) Professional And Outside Services

As explained in detail above, AEPCO proposes to outsource many ACE G&A functions at a mere \$860,108 per year. However, AEPCO offers no indication of the source of its

⁷² BNSF/UP Supplemental Reply Electronic workpaper "G&A.xls."

estimates for any of these costs. Mr. Kent notes that AEPCO cannot reasonably contend that ACE will be able to achieve efficiencies the railroad industry has never known on the basis of outsourcing most of its G&A functions and then fail to provide any support for those costs. Mr. Kent's estimate of G&A expenses based on R-1 data encompasses outsourcing costs.

(b) Start-Up And Training

AEPCO's assumption that it will be able to hire from a large pool of former UP and BNSF employees is inconsistent with STB precedent. *CP&L*, slip opin. at 66. Nonetheless, for purposes of this case, Defendants will not challenge the unit hiring and training costs proposed by AEPCO here. Defendants' start-up and training costs are based on Defendants' revised personnel counts, including T&E, non-train operating personnel and the MOW workforce discussed in III.D.4,⁷³ and assume an on-going training need for those personnel at an annual attrition rate of 5.5%.

d. Other -- IT

The IT requirements of the SARR are already included in the Material and Supply Operating section above and the G&A estimate developed by Mr. Kent.

⁷³ The details of the MOW workforce training and start-up costs are included in BNSF/UP Supplemental Reply electronic workpaper III.D.4 "Maintenance_of_Way.xls."

4. Maintenance-Of-Way

The Railroads' evidence on maintenance of way was principally developed by witness Gerald G. Albin of TranSystems Corporation. Mr. Albin has many years of experience constructing and maintaining rail lines subject to heavy tonnage and time-sensitive freight. From 1970 through 1980, he held the positions of Assistant Maintenance Engineer, Regional Engineer, and Maintenance Engineer for The Burlington Northern Railroad Company ("BN") (predecessor to BNSF). From 1980 to 1988, he held various staff positions (Director & Assistant Director Maintenance Planning) in St. Paul and Kansas City as well as working for four years as Chief Engineer of the BN Springfield Region. From 1988 to 1995, he held the positions of Director Engineering, Chief Engineer Field Operations, Superintendent Roadway Engineering, and Assistant Chief Engineer of Design/Construction for the Southern Region of BN. He has managed the construction of coal track including the design and construction of the grading, drainage structures, track and signal work. Mr. Albin has extensive experience supervising maintenance activities, and is well acquainted with the practice and problems associated with maintenance on lines experiencing similar tonnages and traffic as AEPCO proposes for ACE. Thus, he is well positioned and highly qualified to critique AEPCO's evidence and opine on the actual maintenance requirements for these lines. As Mr. Albin's experience is largely with the BN, Mr. Albin's evidence draws primarily on BNSF's maintenance experience and practice with input as needed from UP.

The Railroads' evidence on maintenance of way (MOW) costs is organized as follows: First, the Railroads add a new subsection III.D.4.a to the Board's format to present a detailed critique of AEPCO's development of MOW costs. As explained in

greater detail below, AEPCO develops ACE MOW operating expense ("OE") by first developing total MOW costs for ACE (operating and capital expenses). Then AEPCO applies arbitrary percentages to the total MOW costs to estimate the portion attributable to OE. New **Section III.D.4.a (Critique of AEPCO's Approach)** is required because of the numerous flaws in AEPCO's percentage-based methodology for determining MOW OE.

Section III.D.4.b (Maintenance-of-Way Operating Expenses) sets forth Mr. Albin's estimate of ACE MOW operating expenses. This section is subdivided into subsections (1) ACE OE Personnel Requirements and Compensation; (2) ACE OE Track Maintenance Equipment, (3) ACE OE Contract Expenses; and (4) Summary of ACE OE Maintenance-of-Way.

Section III.D.4.c (ACE Capital Maintenance-of-Way) sets forth Mr. Albin's estimate of the capital expenditures for ACE. Although these capital expenditures are, for the most part, captured in the DCF analysis through the inherent depreciation assumptions and will not be added to the stand-alone costs, it is important to develop this section in order to demonstrate that AEPCO's total annual MOW costs are understated and, therefore, by extension, the percentage-based portions of these costs that AEPCO allocates to OE clearly are also understated. This would be true even if the percentages that AEPCO applied were valid; but as the Railroads' evidence demonstrates there is no basis for those percentages, AEPCO's OE evidence is therefore totally arbitrary and unsupported. Section III.D.4.c is divided into subsections (1) ACE Capital Replacement Programs and (2) Equipment Requirements for The Capital Budget (including capital work train requirements).

Section III.D.4.d (Total Annual Maintenance-of-Way Costs) compares AEPCO's estimate of the total annual MOW costs to the Railroads' estimate. In this section, Mr. Albin demonstrates that AEPCO's arbitrary percentage-based allocation of costs to OE fails to capture the myriad of operating expenses that are required to keep the railroad in operation on a day-to-day basis.

Section III.D.4.e (Maintenance Windows) discusses the track time (windows) that must be scheduled to ensure that maintenance crews have ready opportunities to access the track when necessary to respond to emergency and other unplanned maintenance calls.

a. Critique Of AEPCO's Approach

AEPCO's MOW plan is premised on the assumption that much of the routine maintenance could be contracted out while retaining only a small internal force of cross-trained MOW employees to perform inspections and daily unscheduled maintenance. This same approach has been used by complainants in other rate cases and has been rejected by the Board, most recently in *CP&L*. The Board stated that "CP&L has failed to meet its burden of establishing that a small, cross-trained MOW staff would be available and, even if available, whether such a limited MOW staff could provide the unplanned day-to-day maintenance that would be needed by a Class I railroad the size of the P & SH." *CP&L* at 69. The Board should reach the same conclusion here. Like the complainant in *CP&L*, AEPCO has not provided any evidence that such a cross-trained workforce exists. Nor is it realistic for AEPCO to assume that if such a highly-trained, super-efficient workforce did exist, it would be willing to work for the same wages that BNSF currently pays its employees who are generally trained in only one craft. Moreover, AEPCO has significantly underestimated the unplanned day-to-day maintenance and other duties, such

as inspections, that ACE's internal MOW staff will have to handle in order to keep ACE operating. The skeletal staff proposed by AEPCO, even if it were cross-trained, is inadequate to meet the daily MOW demands of a high tonnage railroad like ACE.

For purposes of a SAC analysis, it is important to develop that portion of maintenance costs that represent the daily operating expenses of the railroad. The program replacement of capital assets (or the capital portion of MOW expenditures) is already accounted for in the DCF analysis through the inherent depreciation assumptions.

AEPCO's development of MOW operating expenses for ACE is arbitrary and unsupported by any evidence. Rather than identify and quantify the actual activities and personnel associated with MOW operating expenses, AEPCO focuses on developing what it alleges are *total* MOW costs for ACE and then simply applies an arbitrary percentage to certain categories of those costs to derive the railroad's MOW operating expenses.

AEPCO's approach can be summarized as follows.

First, AEPCO develops the annual normalized maintenance-of-way costs for the replacement of capital assets by dividing the total investment in each asset category (*e.g.*, rails, ties, turnouts, crossings, bridges, culverts, etc.) by that category's purported asset life.⁷⁴

Second, based on its assumption that the program replacements of rail, ties and resurfacing are the major components of the MOW budget, AEPCO attempts to develop a contract cost for the labor associated with those activities. However, the unit costs AEPCO uses to develop that contract cost are inappropriate because they apply to the

⁷⁴ Mr. Albin's critique of certain of the asset lives used by AEPCO is set forth in Section III.D.4.c.

replacement of limited sections of line or side track and not to a major capital replacement of mainline segments. In addition, AEPFO fails to apply properly the unit costs on which it relies.

Third, having developed a labor contract cost for rail/tie/resurfacing, AEPFO then arbitrarily allocates to OE an amount equal to ten percent (10%) of that contract cost plus an additional five percent (5%) of the annual track material cost. AEPFO offers no explanation for its selection of these percentages.

Fourth, AEPFO develops contract costs for certain maintenance activities, some of which are typically contracted out by most railroads (e.g., weed spraying, rail grinding, rail testing, etc.), and many of which typically are not contracted out (e.g., rail relay, tie replacement, resurfacing, crossing rehabilitation, turnout replacement, switch and crossing grinding, and bridge, building and facilities maintenance). As described more fully in Section III.D.4.b.(3), in some instances the unit costs, quantities and/or frequencies of service are understated.

Finally, AEPFO develops a skeletal staff to handle all remaining non-contract maintenance and provides a meager assortment of light-duty equipment for that staff's use.⁷⁵ Although AEPFO asserts that all projects to be performed by the internal workforce will be expensed, in fact it arbitrarily allocates twenty-five percent (25%) of *all* labor (not just management and supervisory personnel) and twenty-five percent (25%) of *all* equipment costs to capital expenses. The remaining seventy-five percent (75%) of the already understated labor and equipment costs, by default, is attributed to OE. AEPFO's

⁷⁵ As discussed in Section III.D.4.c, there is scant provision in AEPFO's costs – or in its contract cost for rail/tie and surfacing – for the heavier equipment that would be used on major MOW projects, whether classified as OE or capital projects.

application of these arbitrary percentages result in an allocation of just twenty-eight percent (28%) of AEPCO's meager MOW budget (total contract and non-contract items) to OE. As discussed in Section III.D.4.d below, this is a far lower percentage than experienced by BNSF, UP, and real-world railroads comparable to ACE.

The MOW operating costs developed by AEPCO do not reflect the real-world costs associated with the performance of routine inspections, daily maintenance, and rapid response to unplanned occurrences that are characteristic of a high tonnage railroad. Indeed, AEPCO does not even attempt to address the particular geographical areas on ACE's route that pose unique challenges to both construction and maintenance. These include:

- The track running through the canyon along the Abo River at Scholle, New Mexico, that experiences stabilization issues requiring constant maintenance;
- The line between El Paso, Texas, and Strauss, New Mexico, that traverses deep cuts of 70 to 100 feet and experiences significant erosion requiring costly stabilization and erosion prevention measures;
- The track between Deming and Strauss, New Mexico, that requires special maintenance to clean sand that is continuously blown onto the tracks, fouling the ballast and blocking drainage;
- The track east of Cochise, Arizona, that is built on the Alto Flats, a dry lakebed and is sinking as a result of the soft soil conditions; and
- The high number of time-sensitive trains that traverse ACE, particularly between Defiance and Vaughn, New Mexico, require both that the track be maintained in excellent condition and that unplanned problems be dealt with quickly and efficiently.

AEPCO also proposes to use steel ties, claiming that this will result in lower construction and MOW costs. As discussed in Section III.F and below in Section III.D.4.a.(5), the Railroads' and industry's testing experience has shown that steel ties are impractical and result in substantially *increased* MOW costs. Because testing and actual

use of steel ties have resulted in significant problems, the Railroads in real life have rejected the use of steel ties on mainline track and have likewise rejected their use in their SAC evidence. In any event, AEPCO's MOW plan fails to provide for the frequent resurfacing and other additional maintenance activities that would be required to accommodate ACE's proposed use of steel ties and AEPCO fails to provide adequate track.

In light of these and other omissions, AEPCO has not presented a maintenance-of-way plan for ACE that would support the operating requirements needed to provide the necessary level of service to its customers. Its MOW evidence is seriously flawed because it fails to identify all of the activities and costs associated with the maintenance of a high tonnage railroad, and particularly those expenses that are typically characterized as operating expenses. Based on its underestimation of the work to be done, AEPCO developed a MOW workforce that is too small and poorly equipped to handle the maintenance that actually would be required on ACE. Moreover, in addition to understating the MOW activities and costs, AEPCO's percentage-based methodology for estimating OE costs is purely arbitrary and inconsistent with its MOW plan.

(1) AEPCO Totally Ignored The Costs Associated With Real-World Maintenance Activities Including Random Failures And Other Unexpected Problems

AEPCO has designed a high density railroad serving both coal and non-coal shippers, including extremely time-sensitive intermodal shippers, which demand consistent and reliable service. To be feasible, ACE must be able to provide at least the same level of service to these shippers as the incumbent provides.

A well-maintained railroad is critical to meeting these service levels. Inadequate maintenance leads to slow orders, track outages, decreased life of track structure and

components, and, ultimately, reduced reliability of train transit times and degraded service. AEPCO cannot posit a railroad that would have higher incidence of MOW outages due to its attempt to reduce maintenance costs and still expect to retain its customers, particularly those requiring reliable cycle times or engaged in time-sensitive shipments in the highly competitive intermodal and stack train markets.

As explained below, AEPCO has dramatically understated the level of day-to-day maintenance spending that would be required to provide the necessary level of service to the ACE shipper group. AEPCO ignores the real-world evidence that the continuous movement of heavy loads at high speeds takes a toll on a railroad's physical plant through the myriad of relatively small localized infrastructure failures (*e.g.*, broken rail, surface and alignment defects) that require immediate response to keep the traffic flowing. It also ignores the extraordinary and unplanned repairs that inevitably arise when the rail infrastructure is subjected to the continuous pounding of high tonnage, high speed freight trains and the ravages of excessive heat, wind, rain, and other elements of nature.

AEPCO proposes to maintain ACE's track to FRA Class 5 minimum standards to permit the movement of 286,000 GWR cars at the maximum authorized train speeds (70 miles per hour). AEPCO Opening Nar. at III-D-56. However, it fails to account for the magnitude of the maintenance required to maintain a railroad of ACE's size to these standards. The combination of mixed traffic and continuously cycling unit coal trains of up to 115 loaded to 286,000 pounds will subject ACE's track structure to tremendous pressures, requiring a far more extensive and sophisticated maintenance program than that proposed by AEPCO.

Industry publications have devoted volumes to discussion of the impact of increasingly heavy tonnages on the railroads' track structures, and the increased maintenance – both remedial and preventive – that has resulted from such loadings. As one article notes, the increases in heavy axle load traffic over the past years “have led many railroads, and especially track managers, to a growing interest in the area of track maintenance in relation to heavy-haul loads.”⁷⁶ Heavy tonnage railroads became concerned with the ever increasing train lengths and tonnages as they observed, and were forced to react to the increased stress and fatigue of track components caused by these loads. *Id.* After years of analyzing heavy axle load traffic, and implementing substantial improvements in maintenance methods and materials,⁷⁷ the railroads have concluded that, although preventive measures are of tremendous value, they do not eliminate the need for constant vigilance and frequent repair to the track structure. With the traffic levels assumed for ACE, it is important not only to maintain the railroad to the most up-to-date standards, but to explore additional testing to address new problems and challenges brought about by the increased loadings.

⁷⁶ Jennifer Gruber, *Heavy Haul Loads Require Top-Notch Track Maintenance*, Rail Track & Structures, December 1998 at 21. BNSF/UP.SUPPRP.WP.III.D.4-0002 to 0004.

⁷⁷ BNSF and UP both upgraded their track standard to 136-pound rail and more recently have begun using 141-pound rail. They also began using concrete ties in heavy haul areas, in sharp curvature and heavy grade areas and in most new construction areas. As an example, the route from Belen to Vaughn, New Mexico, has over 75 miles of concrete ties. Ballast specifications were upgraded to require exclusive use of granite or similar material as lesser materials repeatedly broke down under the load. Rail grinding frequencies and techniques were improved. Switch (turnout) maintenance, including programmed switch grinding, and materials were upgraded. Rail lubrication was upgraded and tie/rail fastening systems were tested and improved. Techniques and technology for testing rail for internal defects also have improved, and greater emphasis has been placed on strengthening and protecting the subgrade and subballast.

All of these factors result in frequent occurrences of unscheduled maintenance and the need for continuing repairs. AEPCO, however, refuses to even acknowledge the existence of these heavy daily maintenance requirements, let alone account for them in its MOW plan. In fact, even though a large percentage of most railroads' MOW operating budget is spent on maintaining switches and curves, AEPCO makes no provision for the special mobile welder/grinder and switch maintenance crews typically assigned to these tasks and does not even mention these activities in its Narrative or workpapers.

Unplanned occurrences or random failures have a substantial impact on the railroad's operations. If the railroad's MOW plan does not take these events into account, the railroad will not be able to meet its operating requirements. Both BNSF and UP maintain records of random failures. BNSF's Random Failures Reports record the daily instances of unplanned occurrences on BNSF lines that cause track outages, and thus disruption to traffic flows. These are *in addition* to mechanical *train* problems. The Report includes only those failures that the dispatcher's office records as a result of track/signal failures, *i.e.*, broken rail, signal failure, and hot box detector alarms. It does not include train delays due to faulty rear-end devices, locomotive failures, cars requiring set out, or other mechanical failures. Similarly, it may not include failures caused by events such as embankment failures, plugged culverts, low bridge end, switch maintenance (points not matching, frog low), and reported tight rail during hot weather. Furthermore, the duration of the failures in the Random Failures Report does not include all of the time necessary to correct the failure. For example, in the case of a broken rail, the time recorded in the Random Failures Report includes from when the dispatcher is notified of the problem to when the rail is temporarily repaired by being angle barred and trains begin

running again. It does not include the subsequent track time to make permanent repairs, *i.e.*, removing the angle bars and welding the rail joint, grinding the rail to match, and tamping the area of the joint to allow trains to proceed at track speed.

UP records similar failures, although not in as much detail as BNSF. UP's Director – Project Design, Gary Luenenborg, provided Mr. Albin with a summary of outages occurring between El Paso, Texas, and Cochise, Arizona, in 2001. Mr. Luenenborg reported 547 outages with an average duration of 3.5 to 4 hours. UP experienced as many as four to five outages in a day, and an average of 1.5 outages a day.

In 2001 on the Railroads' line segments replicated by ACE, there were 2,418 random failure occurrences, with an average duration of approximately three hours per outage. The table below shows the occurrences for the three major subdivisions on ACE. As AEPCO's proposed tonnages on ACE are comparable to the Railroads' existing tonnage, the occurrences in the table below are representative of the incidents that ACE could expect.

**Table III.D.4-1
Summary Of Random Failure Occurrences
On ACE Line Segments (2001)**

SUB-DIVISION	TOTAL NUMBER OF OCCURRENCES (2001)	AVERAGE DURATION (Hours)
Clovis (BNSF)	668	2.9
Gallup (BNSF)	1,203	2.8
Lordsburg (UP)	547	3.5 to 4.0

Source: BNSF/UP Supp. Reply electronic workpaper "BNSF Random Failures 2001.xls." BNSF/UP SUPPRP.WP.III.D.4-0005.

When a signal indication appears on the dispatcher's board, for safety reasons a train must stop and wait for clearance to proceed. The indication may be a problem either with the train, the signals system, or the track structure. Even relatively simple problems

that could be easily corrected when first identified would cause rapid deterioration of the track if unheeded, leading to track outages or even derailments.

An effective and efficient MOW plan must include adequate staff and equipment to handle these problems expeditiously and with as little disruption to traffic as possible. For example, the highly traveled lines on the BNSF Gallup Subdivision experienced an average of 4.4 unplanned occurrences per day in the month of August 2001, and 3.3 average occurrences total in 2001, with an average duration of 2.8 hours per outage. Given the amount of traffic on these lines, it would be foolish not to have sufficient resources to handle these emergencies and keep the trains running.

Attending to these occurrences is in addition to the internal staff's regular duties performing the FRA required inspections and the routine daily repairs that also must be performed diligently. The routine inspections and repairs cover hundreds of activities, including routine inspection of track, bridges, culverts, and other structures on the railroad; routine repairs to broken or defective rail, ties, or other track materials found during inspection; routine servicing of switch machines, wayside signals, crossing signals, and rail lubricators to keep them in good operating condition; ice removal from switch points and other critical areas; intermediate rail grinding; restoring track to proper geometry through spot lining and surfacing; repairing short areas of fouled ballast; replacement of cross ties and switch ties that have failed in pockets and thus fail to meet FRA standards; gauging track that may be in violation of FRA standards due to broken spikes or deteriorated ties; repairing or replacing damaged or missing right-of-way items such as fences and signs; maintaining mechanical facilities, particularly the fueling facilities; compliance with environmental laws regarding disposal of materials and operation of

sewer plants and fueling facilities; controlling vegetation between chemical spraying activities; repairing properties and facilities damaged by floods or snow; maintaining lighting in yards; maintaining buildings and grounds; and countless other tasks that arise on two properties that each extends approximately 250 miles and are separated by more than 200 miles.

AEPCO's maintenance plan as set out in its evidence fails to recognize the magnitude and importance of these tasks. Implicit in AEPCO's off-hand treatment of MOW expenditures is an assumption that its railroad would not experience the track degrading impacts of heavily-loaded trains or adverse geological and weather conditions that affect real-world railroads. Such an assumption is totally unsupported and any calculation of MOW OE resting on such an assumption must be rejected out of hand.

(2) AEPCO's Proposed MOW Staff Would Not Be Adequate To Handle Either Routine Or Extraordinary Maintenance Occurrences

Because it ignores critical OE activities, the internal workforce that AEPCO proposes is patently inadequate. As discussed more fully below, AEPCO's skeletal MOW workforce is too sparse to handle even the routine MOW work, let alone unplanned emergencies. As a result, AEPCO has developed an MOW OE budget insufficient to maintain the railroad at levels needed to provide high quality service for mixed types of traffic moving over high density lines.

As described in Section III.A above, for its proposed SARR, AEPCO took nearly all of the Railroads' non-local traffic that today traverses the lines replicated by ACE. Accordingly, the tonnages experienced by ACE are comparable to the Railroads' current tonnages.

Table III.D.4-2
Comparison of AEPCO Proposed Tonnage with Railroads' Actual Tonnage
On Line Segments Replicated by ACE

Segment	Route Miles	AEPCO Op. Evidence Proposed Tonnage 2001 MGT/Mi.	Railroads Actual 2001 MGT/Mi
Vaughn to Belen	107.32	125	134
Belen to Defiance	153.41	130	137
El Paso to Cochise	236.34	77	82
Defiance Branch Line	20.40	11	12

Source: AEPCO Opening Nar. Table III-C-2; BNSF/UP Supp. Reply electronic workpapers "2001 BNSF System Traffic Density Map.pdf" and "2001 UP System Traffic Density Map.pdf."

As ACE will carry nearly the same tonnage as the incumbent Railroads carry currently on the lines replicated by ACE, one would expect that ACE would experience similar maintenance requirements and thus would have similar staffing and equipment needs. AEPCO's hypothetical railroad, however, miraculously manages to maintain the same approximate tonnage over these lines while significantly *reducing* maintenance staff far below that which the Railroads currently have on the replicated lines. For example, the Railroads' present staffing for the replicated lines includes 222 field crew members.⁷⁸ AEPCO's proposed MOW field staff for those same line segments is 50 field workers (including five signal maintainers assigned to headquarters at Vaughn and eight field supervisors).⁷⁹

AEPCO's entire Engineering Department has only eight maintenance supervisors and 42 maintenance crew and structure crew workers to maintain 808 miles of main and second main track, six yards, and all the buildings, facilities and structures proposed by

⁷⁸ BNSF/UP.SUPPRP.WP.III.D.4-0006 to 0021.

⁷⁹ AEPCO Opening electronic workpaper "SpotMaint.xls," Tab "MOW Personnel."

AEPCO on ACE. As designed by AEPCO, ACE has five crews of five members each. AEPCO Opening Nar. at III-D-61. That means each crew of five is expected to handle all of the routine FRA required inspections of track and bridges, all of the routine daily maintenance of tracks, as well as all emergency maintenance for a territory as large as 124 miles. With crews spread out that far, travel time alone will preclude rapid response even to normal signal indications and calls from dispatchers to have signals cleared or track repaired to get the trains running. Failure to respond quickly to these and other calls with experienced personnel in the first instance and to provide prompt follow-up leads to deterioration of the track structure.

AEPCO implicitly recognizes its crews will need reinforcement when it states that its crews can assist in neighboring sub-districts as necessary. AEPCO Opening Nar. at III-D-62. That means that, rather than having crews dedicated to specific territories, ACE will rely on mobilizing forces, taking them away from other important maintenance activities. Such an arrangement precludes efficient MOW operations.

Also implicit in AEPCO's development of personnel requirements is the assumption that contracting out certain activities such as rail geometry testing, weed spraying, ultrasonic rail inspection, rail grinding, bridgework, and building maintenance means these activities will not be performed with any regularity by the internal workforce. This narrow view ignores the obvious need on a railroad of this size for internal staff to handle the day-to-day responsibilities to grind, weld and build up frogs and switches; to repair crossings; to remove ice and sand at switches and yards and other problem sites; to plow and maintain access roads on the right-of-way in order to maintain access to the track; and to perform electrical maintenance, carpentry and masonry.

AEPCO's proposed force of 42 field workers is too small to keep trains moving regularly and efficiently under the engineering challenges described above. AEPCO's meager internal force of 42 workers includes:

Track Foremen	5
Maintenance Workers (to handle all MOW activities for more than 500 miles of constructed track, structures and facilities)	15
Signal Maintainers (roving)	8
Signal Maintenance (Vaughn HQ)	5
Lubricator Technicians	3
Welders	3
Welder Helpers	<u>3</u>
Total	42

The following comparison of AEPCO's proposed staff with that of other real-world railroads demonstrates the inadequacy of AEPCO's MOW evidence.

**Table III.D.4-3
Comparison of MOW Staffing Levels**

Railroad	Route Miles	Track Miles	Average Tonnage	MOW Mg/Sup	Crew Members	Total
AEPCO's ACE	517	808	99.3 MGT	13	42	57
MRL	600	900	30 MGT	29	132 + seasonal gangs ⁸⁰	161 + seasonal gangs
FEC	360	500+	30 MGT	13	182 + seasonal gangs	195 + seasonal gangs
BNSF/UP (ACE replicated lines)	517	808	107.2 MGT	N/A	222 (including seasonal gangs)	222 (including seasonal gangs)

Source: Workpapers BNSF/UP.SUPPRP.WP.III.D.4-006-0025. An exact comparison with the Railroads is not possible, since this is only one portion of a vast system for the Railroads in contrast to being the entire systems of the other railroads in the table. The

⁸⁰ BNSF, UP, and other railroads employ part-time crews to assist the full-time staff with seasonal work such as plowing fireguards in the summer, snow removal in the winter, or stabilization and other special projects. These seasonal gangs are distinct from the system production gangs that handle the planned capital replacement projects (projects AEPCO asserts are handled by contractors in its MOW program). Seasonal gangs are included in the OE staff counts, whereas production gangs are not. The production gangs are included in Mr. Albin's capital costs.

Railroads' headquarters staff are not readily assignable to the line segments selected for ACE and thus only field supervisors assigned directly to the lines are included in the management count. Likewise, seasonal MOW employees serve where needed. Nonetheless, this table shows that AEPCO's reduced staffing levels make no sense, given the tonnages proposed for these lines.

The table above compares AEPCO's proposed staffing for ACE with the staffing levels of two regional railroads, Montana Rail Link (MRL) and Florida East Coast Railway (FEC) and with the current Railroads' staffing on the line segments replicated by ACE. The table shows that the comparably sized MRL and the smaller FEC, which each handle less than a third of the tonnage than ACE (thus requiring less frequent tonnage-based maintenance), maintain a much more robust internal workforce to handle their maintenance than AEPCO posited for ACE. In fact, AEPCO proposes a field staff that has less than a quarter of the field persons employed by FEC, even though ACE covers 155 more route miles, approximately 300 more track miles, and handles on average nearly 70 MGTs more than FEC. The Railroads' current staffing of field crew (222 including seasonal gangs) is more than five times the staffing levels that were proposed by AEPCO for these same line segments with nearly the same tonnage. Yet in the real world, the Railroads' staffing for these lines is comparable on a proportional basis to that of MRL and FEC. The table clearly demonstrates that AEPCO's proposed staffing levels are unrealistic.

In addition to being too sparse, AEPCO's limited MOW crews are stretched too thin to be efficient and effective. AEPCO's proposed crews are expected to cover on average more than 100 miles of territory. In addition, they are expected to assist on adjacent districts as needed. Under this MOW plan, crew members will not have the opportunity to develop the level of familiarity with all the facilities within an assigned territory that is critical to early detection of potential problems and rapid response to

emergencies. Familiarity and proximity are crucial to an effective and efficient maintenance plan. As discussed in Section III.D.4.b below, to address this issue Mr. Albin stationed sufficient crews at significantly shorter intervals to enable them to know their territories well and to have sufficient crew and equipment accessible to respond within one to two hours to any point within their territories. In addition, to respond to off-hour emergencies on ACE's heavily traveled northern line, he assigned two each special night track men at Vaughn, New Mexico, the principal yard for ACE, and at Dalies, New Mexico, which is centrally located on the line.

Many calls require response by personnel qualified in various skills, such as track, bridge, signals, communications, and electrical maintenance.⁸¹ AEPCO's MOW plan, with its limited employees, assumes its employees will be able to handle any and all tasks anywhere. AEPCO Opening Nar. at III-D-58. While this may work on a small regional or short line railroad with limited train activity or low tonnages, it does not work on a major coal-hauling/intermodal railroad with the trains, tonnages and configuration assumed for ACE. On a heavy tonnage railroad, all skills are occupied full time on their own projects and all workers must be fully skilled and qualified to perform the tasks they undertake. Even the larger regional railroads employ crews that are skilled and specialized in individual maintenance activities, *i.e.*, track, bridge, signals. It is uncommon to find workers who are FRA-qualified in more than one or two skills, and extremely rare for persons to become and remain qualified in both track and signals, even though many calls

⁸¹ Other than the railroad Chief Engineer, who typically gains his experience over the course of many years with the railroad, few railroad employees are qualified in more than one or two disciplines.

require the expertise in both disciplines. Accordingly, AEPCO's proposal to minimize the MOW workforce by using cross-trained employees is unrealistic.

As discussed more fully below, a combination of routine inspections by field workers and periodic inspection by highly experienced supervisors promotes early detection of minor defects that could develop into serious maintenance problems or employee hazards over time. Safety is a high priority on the railroads, and all supervisors' responsibilities include ensuring that safety standards are met at all times, that safety issues are addressed promptly and appropriately, and that remedial action, if necessary, is taken promptly. Field supervisors and foremen, including gang foremen, also play a critical role in training, teaching, assisting, and working directly with crew members both to ensure that the work is performed properly and to develop an efficient, reliable, and capable workforce.

AEPCO's opening evidence provides no support for its minimal staffing of MOW workforce. Indeed, ACE as conceived by AEPCO would not be able to provide anything near the level of service that the Railroads provide today.

(3) AEPCO's Proposed MOW Equipment For ACE Is Inadequate

AEPCO has provided only the bare minimum equipment for each of its crews. Each of the five maintenance crews will have a hi-rail inspection vehicle, a hi-rail boom truck, a signal maintainer hi-rail, and a supervisor hi-rail. Lubricator technicians and welders will also be equipped with hi-rail vehicles. Each of the five maintenance crews will also be equipped with an air compressor, rail drill, rail saw, rail puller, and an impact wrench. The welders will have an 800 amp and an oxy-acetylene welder, a profile grinder and a straight grinder. AEPCO apparently assumes that ACE will rent anything else the

crew might need, including backhoes, switch tampers, speed swings, and a plethora of other equipment, but does not budget anywhere close to the amount needed to meet ACE's equipment needs. This limited supply of equipment as well as the meager crew size makes it difficult for crews to handle multiple simultaneous calls. The need to move equipment possibly more than 100 miles from one end of a district to another also needlessly increases the duration of delays and track outages.

An efficient and effective workforce *must* be properly equipped. For a high tonnage railroad such as ACE, necessary equipment includes modern track and structure maintenance equipment (*i.e.*, switch/spot tampers, regulators, etc.). There must also be sufficient equipment so that crews and equipment are in close proximity to their territories, and to each other, to be able to respond immediately to problems with track or other structures assigned to them. Mr. Albin knows from his own experience that the only way modern heavy tonnage railroads have been able to *reduce* forces efficiently (a feat that AEPCO accomplishes with the mere stroke of pen) is through the use of *more* equipment, such as tampers, regulators, speed swings, and other state-of-the-art equipment capable of working efficiently within short track windows and between trains, and through better trained and experienced employees.⁸² In stark contrast to a well-equipped railroad, AEPCO's MOW crews do not have enough of even the most rudimentary vehicles, equipment, and tools to allow crew members to attend simultaneously to different tasks. It

⁸² Some of the state-of-the-art equipment needed includes tamping and track lining equipment (Jackson 6700 production tamper, switch tamper, junior tamper, and ballast regulator); rail change-out equipment (boom truck, speed swings, rail drills, rail expanders, rail heaters, rail saws, anchor machines, and bolt machines); rail maintenance equipment (rail grinders and rail welders); bridge maintenance equipment (bridge derricks, and small diesel cranes); track inspectors' equipment (hydraulic tools for hand tamping and bolt machines).

would be foolish for a heavy tonnage railroad like ACE to rely heavily on rental equipment to complete its crews' complement of basic equipment. There is no guarantee that rental equipment will be readily available on an as needed basis. Crews cannot delay responding to unplanned maintenance needs until the proper equipment is located, rented, and mobilized to the site. All of this would mean that ACE will be unable to respond quickly to unplanned outages leading to increased duration and severity of operational disruptions.

While much maintenance work is accomplished by heavy maintenance machinery, hand tools are needed to perform the day-to-day smaller maintenance work. AEPCO provides \$695,516.10 in its total annual budget for small tools and supplies for its internal workforce – of which only five percent (5%), or \$34,775.80, is allocated to the operating budget.⁸³ Hand tools include impact and cutting tools such as spike mauls, sledge hammers, picks, tamping picks, chisels, track punches, tie adzes, and drift pins. There are also various leverage tools such as anchor wrenches, speed wrenches, rail forks, lining bars, and spike pullers. Other important tools such as tie and rail tongs or track jacks, ballast forks, and brooms, and measuring tools such as tapes, levels, and track and rail gages are mainstays of the railroad maintenance apparatus. These tools must be in adequate supply to allow crew members to work efficiently. But the amount AEPCO budgets for these tools is inadequate.

⁸³ AEPCO Opening electronic workpaper "SpotMaint.xls," Tabs "Norm. Track Mat." and "Spot Maintenance."

(4) AEPCO's Method For Determining MOW OE is Arbitrary, Unsupported By Evidence, And Unsupportable

As discussed above, in addition to understating the *total* personnel and equipment needs of ACE, AEPCO further understates the OE portion of those costs by applying arbitrary percentages. AEPCO's method of determining what portion of total MOW costs is attributable to OE is simply to allocate a portion equal to ten percent (10%) of its contract cost for rail/tie/resurfacing programs to OE, seventy-five percent (75%) of total personnel and equipment to OE, and five percent (5%) of track materials costs (including miscellaneous small tools and supplies for the internal maintenance crew) to OE. None of these percentages is ever explained. The ten percent (10%) allocation for rail/tie/resurfacing programs apparently rests on an implicit and incorrect assumption that daily track maintenance is minimal.

The seventy-five percent (75%) allocation for personnel and equipment is not only unexplained, but it is inconsistent with AEPCO's assumption that programmed cyclical work is contracted out. Although AEPCO asserts that one hundred percent (100%) of field maintenance crew time will be OE (AEPCO Opening Nar. at III-D-69), it allocates twenty-five percent (25%) of *every MOW employee's time* to capital expense.⁸⁴ It is also inconsistent with regular railroad practice. The general railroad practice is to have capital replacement programs performed by system production gangs moving effectively across the railroad property equipped to perform a certain task such as rail and tie replacement, surfacing and undercutting efficiently and in assigned track windows that minimize train delays. These employees' times (or in AEPCO's MOW plan, contractors) are treated as capital

⁸⁴ AEPCO Opening electronic workpaper "Spot Maint.xls."

expenditures. Track section gang time of the regular MOW staff, including track inspectors, district gangs, and switch maintenance gangs, is treated as operating expense. AEPCO pays lip service to these criteria but applies percentages that appear to be taken out of thin air with no supporting rationale.

The five percent (5%) allocation for track materials costs is also unexplained. Moreover, AEPCO's allocation of only five percent (5%) of the internal MOW crews' small tools and supplies to OE is inconsistent with AEPCO's stated assumption that "all field maintenance crew time will be fully devoted to expense-related work." AEPCO Opening Nar. at III-D-69. It makes no sense to assert that the internal MOW workforce performs only OE work, and then to capitalize ninety-five percent (95%) of the cost of the workforce's tools and supplies. Clearly, the tools and supplies should be fully expensed.

AEPCO's assigned OE percentages and OE contract costs combined constitute a mere twenty-eight percent (28%) of AEPCO's total maintenance budget. AEPCO Opening Nar. at III-D-70. As a reality check to AEPCO's estimates, in Section III.D.4.d, Mr. Albin demonstrates that AEPCO's ratio of OE to total MOW costs is completely out of line with that of real-world railroads, as it is significantly lower than that of BNSF, and two other real-world railroads.

(5) AEPCO's Use of Steel Ties Is Impractical

AEPCO uses steel ties on ACE which it incorrectly claims lowers both construction and MOW costs. As explained in Section III.F.3.c, AEPCO's specification to use steel ties on ACE is impractical and not safe for a high tonnage railroad and therefore has been rejected by the Railroads' construction experts, with whom Mr. Albin concurs. Because the Railroads' construction witnesses specified wood ties for ACE, Mr. Albin developed his MOW plan based on the use of wood ties. In any event, there is no evidence

that would support AEPCO's claim that steel ties reduce MOW cost below that of wood ties. In fact, BNSF, UP, and industry testing show that use of steel ties result in substantial *increases* in MOW costs and produces untenable operational disruptions.

In August 1999, BNSF tested steel ties on a section of the high density Orin line in Wyoming. BNSF installed 1600 steel ties with 24 inch centers (the same as proposed by AEPCO) on Curve No. 100, a two degree curve. The installation included both curve and tangent track. Robert J. Boileau, BNSF Chief Engineer – North, reported that during the period between June 12, 2000 and July 27, 2000 alone, the test section of track required resurfacing four times, often requiring multiple passes.⁸⁵ BNSF Roadmaster, Wayne Meidinger, who oversaw the test section, told Mr. Albin that the steel ties experienced, among other problems, pumping which caused ballast to build-up on the high rail side of the curve, requiring frequent raising of the low rail side of the curve.⁸⁶ The ballast migration also required frequent tamping. The ballast migration and the corrective action in turn caused the ballast shoulder to become inadequate, requiring BNSF to install more ballast on the curve. As a result of the frequent line and surface problems, from May 12, 2000 to July 30, 2000, BNSF imposed 33 slow orders on Curve No. 100.⁸⁷ By July 2000, BNSF had determined that the steel ties do not support efficient operations. Mr. Boileau, in requesting funds to remove the steel ties, wrote that the “steel ties do not have the ability to adequately hold surface and line in heavy haul conditions with the temperature

⁸⁵ BNSF/UP.SUPPRP.WP.III.D.4-0026 to 0027.

⁸⁶ BNSF/UP.SUPPRP.WP.III.D.4-0028 to 0029.

⁸⁷ BNSF/UP Supp. Reply electronic workpaper “Orin_Slows.xls.”

variations present in this area.”⁸⁸ Within a year of installation, BNSF was forced to replace the steel ties with concrete ties to alleviate the operational disruptions and reduce the substantial risk of derailment caused by the steel ties.⁸⁹

UP, too, has had unsatisfactory maintenance experience with steel ties. In fact, UP experienced a major derailment that its personnel attribute in part to steel ties.

Mike Wright, UP’s Director of Track Maintenance in Cheyenne, Wyoming, reports that UP tested steel ties on a portion of its mainline west of Laramie, Wyoming, beginning in May 1998, and that its experience was highly unsatisfactory. UP found that there were constant maintenance problems on this portion of the track. The steel ties did not grip the ballast well, and they appeared to heat up more than wood or concrete ties. Among other things, (a) excessive vertical movement in the track structure caused mud to be pumped into the ballast; (b) insulating pads between the steel ties and the rail became dislodged, creating signal problems (the metal-to-metal contact caused short circuits); (c) steel ties would break in half; (d) track geometry equipment frequently detected problems on this track, requiring restrictions on train speed and repair work;⁹⁰ and (e) sun kinks caused misalignments. Train crews often reported that this section of track was rough. Because the track in this area was so unstable, UP had to make frequent inspections, and the track required an unusually high level of maintenance.⁹¹ Instability in the track

⁸⁸ BNSF/UP.SUPPRP.WP.III.D.4-0026 to 0027. The lines proposed by ACE are also subject to dramatic variations in temperature.

⁸⁹ BNSF/UP.SUPPRP.WP.III.D.4-0030 to 0034.

⁹⁰ BNSF/UP.SUPPRP.WP.III.D.4-0035.

⁹¹ BNSF/UP.SUPPRP.WP.III.D.4-0036 to 0045.

required slow orders, which delayed traffic. Several times UP maintenance crews had to raise spots in the track by hand to minimize train delays.

Signal problems related to loosening of the insulating pads (along with wet track due in part to mud) also caused delays and extra maintenance costs on the section of track with steel ties. David Olson, UP's Signal Manager responsible for the area, has reported to Mr. Wright that, in the period mid-September 2002 through mid-September 2003, over half of the calls signal crews received for this part of the track (14 out of 26) involved failures Mr. Olson attributes to the steel ties.⁹² In a number of these cases, insulation pads fell out, creating an electrical short, resulting in red signals that caused train delays and repair work.

Because of the difficulty in holding the surface, UP decided in 2003 to remove the steel ties. In May 2003, there were four or five thermal misalignments (sun kinks) on the part of the Wyoming track with steel ties. On July 3, 2003, UP suffered a major derailment on this part of the track. Mr. Wright believes that the steel ties (which appeared more subject to sun kinks) caused the track to be unstable and played a significant part in this derailment. Not long after the derailment, UP removed the steel ties from this part of the track and replaced them with concrete ties. According to Mr. Wright, there have been no maintenance problems with the concrete ties.

UP also installed steel ties on its bridge across the Missouri River on the mainline between Omaha, Nebraska, and Council Bluffs, Iowa, in July 1998. Steve Hoerstkamp, UP's Director of Track Maintenance in Council Bluffs reports that UP has experienced increased maintenance troubles on the bridge since then. The surface is difficult to hold at

⁹² BNSF/UP Supp. Reply electronic workpaper "UP Laramie Signal Problems.xls."

the tie joints, and, as in Wyoming, excessive vertical movement in the track structure causes mud to work into the ballast. Frequent tamping is required as a result. During 2003, UP twice had to institute 10-mph slow orders due to mud spots on the bridge, and it had to surface the bridge track four times. UP has hired a contractor to vacuum the mud on several occasions, but the mud keeps returning, and more cleaning on the bridge will be required in 2004.⁹³ In addition, as in Wyoming, UP has had difficulty keeping insulation pads on the steel ties, particularly during tamping activity. The insulation pads loosen and fall off (allowing metal-to-metal contact between the ties and the rail), resulting in signal problems and significant repair work.

The Railroads' experiences are consistent with testing performed by Transportation Technology Center, Inc. at the Facility for Accelerated Service Testing (FAST). The FAST test compared the performance of wood ties to that of steel ties. The ties were subjected to 39-ton heavy axle load traffic operating at 40 mph on a curve. By the end of the testing, most ties accumulated 170 MGT, and some as much as 360 MGT. The testing concluded that "steel ties required frequent maintenance. They demonstrated poor dynamic performance under load that resulted in rapid ballast degradation and occasional slow orders."⁹⁴ The tests found ballast migration, ballast degradation, and excessive track pumping, among other things. As a result of these problems, the FAST testing found that, among other things, steel ties required track surface maintenance about every seven (7)

⁹³ BNSF/UP.SUPPRP.WP.III.D.4-0046.

⁹⁴ Rafael Jimenez, David Davis, Joe LoPresti, *Final Results of Steel-Tie Testing at FAST*, Technology Digest, Timely Technology Transfer --00-015, Transportation Technology Center, Inc., Association of American Railroads, August 2000, BNSF/UP.SUPPRP.WP.III.D.4-0047 to 0050.

MGT as compared to every 150 MGTs for wood ties and curvature realignment had to be performed seven times during 170 MGT in the steel tie test zone while the wood ties required *no* realignment during the entire test period.

Thus, use of steel ties on ACE's mainline track, would substantially *increase* MOW costs that would have to be borne by ACE. According to the FAST test results, among other maintenance, the track would require resurfacing every seven (7) MGTs. Mr. Albin estimates that this would require some 30 additional MOW gangs working three to four hour track maintenance windows spaced every 25-35 miles on ACE. Unless ACE were to build another track, such a maintenance schedule would grind ACE to a virtual standstill. In addition, the Railroads' experiences demonstrate that use of steel ties would produce an unacceptable number of slow orders and track outages, would increase the risk of derailment, and would impose an increased need for MOW personnel, equipment, replacement ballast, and track inspections.

AEPCO relies on the steel tie manufacturer, { } undated sales brochure to support its use of ties on ACE.⁹⁵ That brochure includes a purported endorsement by a former UP Manager of Track Maintenance of use of steel ties on mainline track. That purported endorsement, however, relates to UP's failed trial of steel ties at Rock River, Wyoming (discussed above), focuses on just a few characteristics of those ties (primarily their lateral holding power), and is not reflective of UP's longer-term experience at that location (as described above by UP's Mr. Wright, the supervisor of the employee cited in the brochure). Moreover, the brochure presents a derailment that occurred on the Rock River test bed as evidence of the steel ties' durability, but fails to

⁹⁵ AEPCO Opening workpapers AEP 04648 to 04667.

mention UP's experience with steel ties breaking in half, as described above. It also fails to mention that UP personnel attributed the cause of a subsequent derailment in part to the steel ties.

In fact, even { } now appears to agree that its steel ties are not yet appropriate for use on mainline track on heavy tonnage North American railroads. Reportedly, { } steel ties are being installed in the United Kingdom on a railroad with a third of the tonnage that ACE would carry. According to a 2002 article, before tackling the U.S. market, { } "would like to continue to develop the tie and learn of its performance in Britain, then bring everything that is learned back to the U.S."⁹⁶ There is no evidence in the record, however, that enough has been learned in the U.K. to make steel ties a viable option for ACE. Indeed, a recent survey of seven major railroads and four regional/shortline railroads reported that steel ties accounted for less than 0.01% of all ties that the surveyed railroads installed in 2003.⁹⁷

(6) Outside Contractors Could Not Be Expected To Make Up For The Deficiencies In AEPCO's In-House MOW Staff

AEPCO claims that contractors will perform all program maintenance and some spot maintenance. AEPCO Opening Nar. at III-D-17. As discussed above, AEPCO provides only a skeletal in-house MOW force to perform the spot maintenance not performed by contractors. AEPCO's approach to day-to-day maintenance is clearly

⁹⁶ Mischa Wanek, *Crosstie report: Things are looking up*, Railway Track and Structures, October 2002, at 23-24, BNSF/UP.SUPPRP.WP.III.D.4-0051 to 0056.

⁹⁷ Rafael Jimenez, Joe LoPresti, *Performance of Alternative tie material under heavy-axle load traffic*, Railway Track and Structures, January 2004, at 16-18, BNSF/UP.SUPPRP.WP.III.D.4-0057 to 0060.

inappropriate because it ignores completely the myriad routine daily tasks and the need to respond promptly to unexpected events. Deferral of daily maintenance to save operating dollars is a prescription for disaster on a railroad with the traffic proposed for ACE.

There are various reasons why it would be imprudent for AEPCO to rely on contractors for daily maintenance. First, unlike internal workforces, contractors cannot respond immediately, and waiting for them to become available means additional delays and interruption to traffic flows. Both scheduled program and routine daily maintenance must be performed during tight work windows to minimize disruption to train cycles and schedules. In addition to the planned MOW activities, emergency maintenance calls come in on a daily basis. Broken rail, irregularities in alignment and in the surface of track, fires on the right-of-way, signal failures, damaged structures, or other problems reported by inspectors or train crews require immediate attention. Failure to respond quickly leads to line outages and derailments.

Contractors normally handle derailments, large washouts or embankment failures. Generally, their response time ranges anywhere from two to five hours. A response time of that length may be acceptable with these kinds of occurrences that arise only once every month or two, but it is unacceptable for the numerous day-to-day outages caused by broken rail and other problems where a response is needed in less than one hour and to have trains running within two to three hours.

Second, the workforce responding to emergency calls must be knowledgeable and dedicated to a particular skill, such as track work, signals, or structures, in order to respond promptly and efficiently. Well-trained maintenance workers are on call day and night and must be prepared to locate and fix a problem expediently, working in all kinds of

inclement weather. Contract forces historically have a large turnover of employees, and therefore cannot guarantee that at any given time they will have workers familiar with the territory and properly qualified for the tasks to be performed. Even when contractors retain long-term employees, because they must respond to the needs of several clients, contractors cannot guarantee that the same employees familiar with the railroad's territory, maintenance problems and maintenance procedures will be available at any given time. An inexperienced workforce significantly increases the risk of errors as well as the probability of injuries – areas of concern to railroads that are addressed most effectively through internal training and supervision.⁹⁸

Third, short-term “band-aid” repairs by a contractor are both inadequate and inefficient. It is imprudent to put off or perform inadequate temporary maintenance on a high tonnage railroad because seemingly small problems exacerbate quickly. An internal force generally can respond within one or two hours of being notified of a problem and is fully equipped with the proper knowledge and training to assess and address it.

⁹⁸ Railroad maintenance employees are generally required to have several years of education, training and even certification in their fields, as well as several years of experience. Training and staying qualified are on-going processes. An individual may have some knowledge in various areas, but it is rare to have persons who consistently maintain the required training and certifications for more than one field. Mr. Albin's workpapers include job descriptions for various positions similar to those proposed for ACE. The job descriptions show that the level of experience and training required for those positions cannot be filled by inexperienced contract workers. For example, by FRA regulations, a track inspector must have at least one year experience in railroad track inspection or a combination of experience in track inspections and training from a course in track inspection or from a college level educational program related to track inspection. Most Class I railroads on lines handling the tonnage of ACE require this as a minimum, with most of their inspectors having much more than one year's experience. BNSF/UP.SUPPRP.WP.III.D.4-0061 to 0106. See Section III.D.3.c for training costs.

Fourth, there is no reason to believe that an outside contractor could perform the services for less than an internal workforce. There are no economies of scale that an outside contractor would enjoy any more than ACE. In fact, it would be less efficient to rely on an outside contractor because a contractor cannot take immediate advantage of any unexpected maintenance window opportunities, which is critical to the scheduling of MOW track time. To provide responsiveness equivalent to that of an internal force, a contractor would have to maintain crews fully dedicated to the railroad and expend large sums to keep the force intact and properly qualified.

(7) In Contrast To AEPCO's Approach, Mr. Albin Has A Principled Basis For His Development Of MOW Costs

In developing his annual MOW costs, Mr. Albin employed the procedures for separating expenditures into "expenses" and "capitalized" items in accordance with BNSF's capitalization criteria. High tonnage railroads, such as BNSF, UP and other Class I's comparable to ACE, engage in two separate maintenance budgeting processes – (a) an OE budget to cover the day-to-day activities needed to keep the railroad running and (b) a program of cyclical asset replacements. Railroads classify maintenance expenses as either operating expenses or capital expenditures based on guidelines consistent with the STB guidelines for allocating such expenses in the railroad R-1s. It is this classification – based on whether the activity extends the asset life (capital replacement) or merely helps to maximize the asset life through maintenance and repair – that is the basis for the depreciation rates found in the DCF analysis. Thus, by replicating these processes as closely as possible using ACE's system and operating conditions, Mr. Albin has developed a maintenance budget that is consistent with both actual practice and the underlying assumptions in the DCF analysis.

AEPCO's opening evidence contains misleading statements concerning its method for separating capital and operating expenses. AEPCO asserts that its determinations as to whether to capitalize or expense MOW costs were largely based on BNSF's general guidelines that were produced in discovery (AEPCO Opening Nar. at III-D-68) and then presents a table (Table III-D-8) summarizing the rules it applied for capitalizing versus expensing. The reader is thus led to believe that Table III-D-8 summarizes BNSF's general guidelines, to which AEPCO adhered. In fact, Table III-D-8 does not reflect BNSF's general guidelines.

For example, the guidelines provide that "[t]ies not specifically budgeted (casualty replacements, etc.) must meet the Unit of Property Test of 300 per mile to qualify for capitalization." By contrast, AEPCO's summary treats as expensed work only "[o]ccasional joint tie replacement," and treats all other tie replacements as capital. Similarly, with respect to derailment costs, AEPCO lists as expensed items only "[b]olt/rail anchor replacement account derailed wheel damage" and capitalizes "[D]erailment (extensive) restoration." In fact, the majority of derailment costs are generally treated by BNSF as OE. The only instances in which costs may be capitalized are if the rail replacement necessitated by the derailment exceeds .25 track miles, tie replacement exceeds 300 ties per mile, or ballast replacement exceeds 500 cubic yards per mile.⁹⁹ Each cost category is considered separately. That is, if rail replacement exceeds .25 miles and tie replacement is less than 300 ties per mile, BNSF capitalizes the rail and expenses the ties. Only a very small portion of derailment costs meet the requirements for capitalization.

⁹⁹ BNSF/UP.SUPPRP.WP.III.D.4-0107 to 0108.

Another example of the wide disparity between AEPCO capitalization of costs and BNSF's guidelines is vegetation control. BNSF's capitalization guidelines do not even address vegetation control because BNSF treats that item entirely as an OE. In sharp contrast, AEPCO's table shows vegetation control as a capital cost, with only removal of the "odd offending limbs" expensed. Thus, AEPCO's table is a purely fictional rendition of the railroad's capitalization matrix.

AEPCO's capitalization approach significantly understates the amount of OE work that must be performed on a daily basis. Moreover, it acknowledges that there is indeed a range of MOW activities and costs that fall between the relatively small maintenance activities that AEPCO expenses and the large program maintenance that AEPCO capitalizes. This work is virtually ignored in AEPCO's SAC presentation. These activities are not covered by AEPCO's contract costs and are not being performed by AEPCO's limited and poorly equipped MOW forces. The costs are simply not accounted for in AEPCO's MOW plan.

In addition, AEPCO's erroneous treatment of OE work as capital costs results in exclusion of those costs from the SAC analysis. This is because the capital MOW costs reflected in the DCF are simply the asset replacement costs derived by dividing total construction costs by the asset lives for each property investment item. The capital MOW costs estimated by AEPCO are relevant only to its calculation of OE costs. Thus, by incorrectly designating a cost as a capital cost, AEPCO ensures that the cost is not accounted for either in the annual MOW operating budget or as a capital cost in the DCF analysis.

By contrast, Mr. Albin's OE budget covers the myriad day-to-day tasks associated with keeping ACE operating and ensuring that ACE's assets achieve their predicted lives. These tasks are classified as OE on BNSF, UP, and other railroads. ACE's internal forces would handle most of these activities, but some work would be performed by contract forces when it is cost-effective to do so or when specialized but infrequently used equipment is required.

Almost all of the costs associated with ACE's daily maintenance force would be classified as OE. The only exceptions are headquarters-level managers, who are responsible for designing, planning, and overseeing both the day-to-day OE maintenance and the programmed work carried out by system production gangs or contractors, and track Roadmasters and B&B, signal, telecommunications, and electrical supervisors. Because some of these positions' time would be spent on program maintenance issues, Mr. Albin included them in the maintenance-of-way organization and split their time *based on his real-world experience with the amount of time spent on program and OE projects*, respectively.

b. Maintenance-Of-Way Operating Expenses

Mr. Albin's estimate of ACE's maintenance-of-way costs is based on a real-world view of the maintenance needs of a high tonnage railroad that is consistent with railroad practices. Mr. Albin built from the bottom up the equivalent of a real-world maintenance-of-way staff that would be needed on ACE. Based on his experience, interviews with BNSF Assistant Vice President Engineering Services, UP Chief Engineer, and BNSF and UP Division Engineers and Roadmasters, observation of the lines to be replicated, and his review of records of recently needed maintenance on these lines, Mr. Albin identified the projects and problem areas that would be replicated on ACE and assigned work crews and

dollars accordingly. The projects and workforce are based, to some extent, on the Railroads' current MOW staffing for these lines, but they do not simply replicate BNSF or UP organizations. They are tailored to the proposed ACE tonnages, train densities, plant size and facilities, weather conditions, and other unique situations on the ACE route to provide as lean a maintenance team as possible and still cover all the required maintenance activities. Mr. Albin's estimate of the number of people needed is based on existing positions tailored to ACE's needs and the Railroads' production rates for the completion of tasks based on the size of the task and the crew. The salaries for the internal workforce are based on BNSF Wage Rates for the particular maintenance-of-way positions selected.¹⁰⁰ Mr. Albin analyzed the required ACE MOW staffing and maintenance activities based on ACE tonnage.

Mr. Albin's MOW OE budget is discussed under the following headings: (1) ACE OE Personnel Requirements and Compensation; (2) ACE OE Track Maintenance Equipment; and (3) ACE OE Contract Work.

(1) ACE OE Personnel Requirements And Compensation

(a) Personnel Requirements

AEPCO's ACE Engineering Department (which is wrapped in with ACE Mechanical Department) is significantly understaffed and omits key positions necessary for a railroad of ACE's size and tonnage. AEPCO's plan, for example, leaves no one in charge of telecommunications, an obvious critical component to the smooth functioning of

¹⁰⁰ Wages, manpower and production rates backing up Mr. Albin's staffing calculations are included in his workpapers. BNSF/UP.SUPPRP.WP.III.D.4-0109 to 0133.

any railroad. AEPCO also focuses too much responsibility on too few people. By example, the Manager of Track Maintenance is directly responsible for the budgeting, planning, scheduling, contracting with, and oversight of, contractors performing System Replacement Programs and bridge work; for supervision of all inspection and maintenance of track, bridge, structures and signal facilities including budgeting, planning and scheduling; and for dispatching crews to the unplanned outages, emergencies and follow-up maintenance work. Moreover, under AEPCO's scheme, the Manager of Track can expect little assistance from his subordinates, three Assistant Field Maintenance Supervisors and two Full Maintenance Supervisors as those positions also have more responsibilities than they can realistically handle. The understaffing is even more pronounced in the field where AEPCO has provided for just 45 employees including 8 supervisors.

AEPCO divided the railroad into two maintenance districts and five sub-districts with a total of five crews assigned to two MOW Supervisors and three Assistant Supervisors. Each crew will have five people including a foreman, three track inspectors and one signal maintainer. AEPCO Opening Nar. at III-D-62. Each crew of five is expected to handle all of the routine FRA required inspections of track, bridges, and signals, all of the routine daily maintenance of tracks, as well as all emergency maintenance for a territory as large as 124 miles. AEPCO provides no documentation supporting its staffing levels, nor does it explain the basis for its staffing.

In developing his restatement of workforces for ACE, Mr. Albin took into consideration the way in which railroads classify projects as capital expenditures or operating expenses, and in the real world, allocate salaries into those budgets. In his

analysis, Mr. Albin began with the actual BNSF and UP MOW staffing levels for these line segments, the salaries and wages of these positions, and the production rates for maintenance-of-way activities on the line segments replicated by ACE as a basis for his calculations. From these, he developed a MOW force that would meet the proven needs of a railroad carrying the tonnages and commodities selected for ACE.

The use of the existing Railroads as benchmarks is an obvious choice given that AEPCO is replicating these lines and the Railroads' existing traffic. However, Mr. Albin did not simply adopt the Railroads' staff. Instead, he took into consideration the proposed tonnages for ACE and selected the least number of positions that could perform adequately the maintenance needed on these line segments and enable ACE to meet its operating and service obligations.

Based on these criteria, Mr. Albin designed ACE's Engineering Department with a Systems Engineering Office located at the railroad's headquarters in Vaughn, New Mexico, and a field staff organized along departmental levels. The Systems Engineering Office includes 13 persons ranging from the Chief Engineer to the administrative clerks. The departmental offices are organized by skill (*e.g.*, track, bridge and buildings, signals, communications, electrical). Each department has one or more supervisors, depending on the amount of work, and several field workers assigned specifically to the tasks associated with that department. The table below summarizes the departmental organization and staffs in Mr. Albin's restatement of ACE's personnel requirements.

Table III.D.4-4
Mr. Albin's Restatement of ACE Personnel Requirements
Organized Along Departmental Lines

Department	Management/Supervisors	Field Workers
Systems Engineering Office	13	
Track Department	4	103 + 24 seasonal
Bridge & Building (B&B)	2	25
Signals Department	3	30
Communications Department	2	23
Electrical Department	1	7
Purchasing/Stores MOW Personnel	Included in G&A	10
Total	25	198 + 24 seasonal

Source: BNSF/UP Supplemental Reply Exh. III.D.4-1, Maintenance of Way Organization.

In addition to the four (4) supervisors and 103 full-time MOW field workers,¹⁰¹ there will be 24 seasonal track employees who work approximately nine months of the year performing work best done in good weather. Thus, Mr. Albin concluded that the total MOW OE workforce required to maintain ACE to the appropriate safety and operating standards is 247, including the 24 seasonal track employees and the ten Purchasing and Store Department MOW personnel.¹⁰²

The staff positions and responsibilities for the Systems Engineering Office and for each department are discussed under Section III.D.4.b.(1)(a)(i) and (ii) below. The compensation for these employees is discussed in Section III.D.4.b.(1)(b).

¹⁰¹ Comparable Railroads' staffing on these same lines are as follows: Track (132), B&B (27), Signals (31), Communications (26), and Electrical (6) for a total of 222. BNSF/UP.SUPPRP.WP.III.D.4-0006 to 0021. This total does not include management/supervisors.

¹⁰² ACE also would require 128 system production gang employees to perform the planned replacement of rail, ties, and other track materials. This is consistent with the way railroads staff programmed maintenance. Mr. Albin calculated the costs for these employees in order to demonstrate the minimum costs that ACE would incur to contract out these activities and to make clear that there is no overlap between replacement costs and operating costs. The cost associated with the system production gangs are capital expenditures and are not included in Mr. Albin's OE costs.

i) Systems Engineering General Office Requirements

The Systems Engineering General Office is responsible for the planning, budgeting, and supervision of the maintenance-of-way for all facilities – right-of-way, track structure, bridges, buildings, communications systems, signals, and electrical systems.

Mr. Albin's restatement includes a Systems Engineering general office that has a staff of 13 persons as well as a group of twelve (12) field departmental supervisors. These include four (4) roadmasters, three (3) signals supervisors and two (2) B&B supervisors, two (2) communications supervisors and one (1) electrical supervisor, as shown in Table III.D.4-4.

The general office staff includes

- Chief Engineer,
- Director of Track,
- Engineer Bridges & Buildings, and Electrical,
- Engineer Signals and Communicators,
- Field Engineer/Public Works Engineer,
- Environmental Engineer,
- Track Designer/Estimator,
- Manager of Welding/Rail Detectors/Grinding,
- Manager of Programs and Budgets,
- Manager of Manpower Planning,
- Manager of Work Equipment, and
- Two Administrative Assistants.¹⁰³

¹⁰³ In his workpapers, Mr. Albin includes an organizational chart of the Engineering Department. BNSF/UP.SUPPRP.WP.III.D.4-0134.

Each of these positions plays a vital role in establishing an efficient and safe maintenance program.

Although railroad systems groups generally spend more time on capital work projects than on day-to-day maintenance projects, a significant effort is expended by the systems engineering staff managing projects and budgets associated with operating expenses, as discussed in more detail below.

The system engineering department oversees both capital and OE maintenance operations, but at the higher management levels, the capital planning takes precedence. Mr. Albin has included them for completeness but as noted above has split their time between OE and capital based on his experience of the time each position spends on each type of project.¹⁰⁴ For the Chief Engineer and his or her direct reports (the Directors/Track; Field Engineer/Public Works; Environmental Engineer; Engineer Bridge, Building and Electrical Track Designer/Estimator; and Manager Programs/Budget), thirty-three percent (33%) of their time is classified as operating expense because of the lesser amount of time spent on managing operating budgets and dealing with operating spending and projects than on capital projects, as shown in the job descriptions below. Roadmasters and department supervisors' time, on the other hand, is classified as sixty-six percent (66%) OE because, although they are responsible for the planning and oversight of all work on their assigned territories, including capital replacement plans and projects, the largest share of their work involves supervising, planning and coordinating day-to-day maintenance and responding to emergency calls and problems. They are responsible for the daily decisions on work assignments, implementation of work plans, as well as making

¹⁰⁴ BNSF/UP Supplemental Reply Exh. III.D.4-1.

periodic inspections for quality control and overall effectiveness of the program, and safety implementation.

The following descriptions of the responsibilities of the management positions for ACE are based on actual job descriptions for BNSF employees with comparable positions.¹⁰⁵

The Chief Engineer is responsible for planning, directing and controlling engineering and maintenance activities related to track, bridge, buildings, environmental and signal and telecommunications control systems facilities. His or her duties include developing and recommending plans and objectives for engineering and maintenance activities; developing and monitoring budgets; organizing staff; coordinating major facilities improvement and maintenance programs; directing engineering and maintenance personnel and activities to effect positive direction and compliance with approved safety practices; supervising bridge plan preparation; supervising signal plan preparation; supervising quality control programs in track, bridge, and control systems departments; and supervising environmental engineering personnel. He or she is also involved in furnishing professional engineering guidance; direct field and office planning for construction projects; direct design of track layouts for customer requirements; negotiating highway grade separation and yard right-of-way occupancy arrangements with utilities, highways, and other government agencies; review and approval of consultants' plans; overseeing capital budget preparation; and analysis of actual charges to projects.

The Director of Track is responsible for providing practical and technical leadership in track maintenance and improvement activities. His or her duties include

¹⁰⁵ BNSF/UP.SUPPRP.WP.III.D.4-0061 to 0106.

reviewing information required for preparing the capital and operating budgets in line with current guidelines; evaluating the use of capital budget money; overseeing quality control of maintenance work; preparing short term and long term plans for maintenance of track and roadway equipment; developing improvement of facilities, maintenance of track and roadway equipment appurtenances; analyzing and investigating new and more functional equipment methods for maintenance; executing outside contracts; directing training programs; performing periodic inspection of track and right-of-way from geometry car, hi-rail and rail detector cars. He or she manages the capital program for ties, rail, and ballast. He or she also coordinates with the Program Engineer to schedule work gangs in conjunction with train movements to minimize the impact on train operations. This requires significant scheduling effort, as does the scheduling of efficient utilization of workers, work equipment, company service cars, and other work gang requirements. In addition, he or she is responsible for management of slow orders and works closely with the operating department and dispatchers to identify track windows for MOW projects. The Director of Track also is responsible for the planning, budgeting, supervision, and quality control of the large production track gangs for rail, ties and surfacing as well as for quality control of smaller gangs. He or she works closely with the operating department to coordinate gang activity with train operations and other maintenance work.

The Engineer Structures (Bridges and Buildings) is responsible for the management of engineering and inspection of bridge work and the maintenance and construction of railroad bridges and other railroad related structures. His or her duties include supervising the preparation of engineering plans and construction specifications for maintenance and replacement of existing structures and construction of new structures;

reviewing, inspecting and prioritizing projects; making special bridge inspections as needed and making recommendations for improvements; meeting with other departments and outside agencies in matters related to bridge planning and design; reviewing routine bridge plans affecting the railroad's interest prepared by various governmental agencies and outside consulting firms; and arranging for distribution of plans and ordering of materials.

The Signals and Telecommunications Engineer is responsible for directing the engineering activities of electrical, communications and control systems personnel to effect the most economical programs for installation, inspection, maintenance and repair of those systems and facilities. His or her duties include directing personnel responsible for providing the design and plans for installation of communication and controls systems and managing the CTC equipment and control centers; coordinating activities of railroad electrical, communications and control systems with internal and external agencies; effecting optimal performance and efficiency of the physical plant; researching and developing new ways or systems to improve services; and implementing proper budgetary controls for electrical, communications, and control systems forces. He or she also is responsible for improving engineering of electrical facilities and technical support to develop, install, monitor, and enforce compliance with standards and policies and for coordinating activities between the railroad and various power companies, cities, states and federal governmental agencies to ensure compliance with local codes and national electrical codes. His or her duties with respect to the electrical department include defining problems and establishing solutions, estimates, plans, bills of materials and specifications; researching advances in technology and making economic analyses and

recommendations; conducting performance audits in the field to ensure compliance with standards; providing training on electrical codes, safety rules, and standards pertaining to electrical systems; investigating code violations and electrical problems/failures; providing support to field personnel on both capital and operating projects; and maintaining up-to-date equipment unit inventories of various types and locations of electrical systems on the railroad.

The Field Engineer/Public Works Engineer is responsible for planning, directing, and controlling engineering activities related to the physical plant within the areas of field engineering, office planning, public works, and construction. His or her duties include working on many projects that would not involve construction by the railroad (such as mine spur track proposals); directing negotiations of highway grade separations, and right-of-way occupancies of various utilities with governmental agencies; working with other railroads on track connections; overseeing capital budget preparation for such projects; and negotiating with respect to commercial, industrial, or residential properties that affect drainage and use of the railroad's right-of-way. He or she also manages consultants who deal with complex specialized engineering issues and larger project.

Environmental Engineering is an important function in today's world. The Environmental Engineer is responsible for managing all environmental activities such as remediation efforts, disposal of batteries, and cleanup of fuel and chemical spills from derailments. An important aspect of the environmental engineer's job is to establish close working relationships with all federal, state, and local environmental agencies. Environmental engineers are essential; it would be unrealistic in today's world for AEPCO to assume that ACE would escape such critical assignments.

The Track Designer/Estimator is responsible for designing track for both capital and operating projects. He or she also functions as an Estimator. As such he or she is required to submit AFE documents as required by the STB and accounting rules and to prepare requisitions for all capital and some operating materials.

As to the administrative staff reporting to these positions, since they mainly support the upper engineering staff, Mr. Albin classified thirty-three percent (33%) of their time as OE. Based on the volume of work actually performed by BNSF administrative staff, Mr. Albin estimated that ACE would need two administrative assistants to perform support functions for the systems engineering staff. These assistants handle correspondence for utility permits, track leases, right-of-way occupancies and other operating permits; human resources matters such as maintaining training and safety logs; scheduling safety training and rules testing; tracing company service cars that distribute and pick up materials and scrap; maintaining FRA and DOT records; word-processing activities and miscellaneous activities such as mailings, telecopying and other administrative work; and providing some database support services. They also perform manpower planning functions.

In addition to these direct reports to the Chief Engineer, there are other important functions in the Engineering Department that are classified as OE. The positions that handle these functions are described below.

The Manager of Welding/Rail Detectors/Grinding manages track maintenance programs. All of the grinding and half of the welding projects supervised by this position are classified as OE projects.

The Manager of Welding/Rail Detectors/Grinding is responsible for direct oversight of the production and quality of the welding and grinding field operations on the various roadmaster districts. He or she is also responsible for oversight of welding and grinding work associated with production gangs for rail relay, contract out of face grinding, switch and crossing grinding and other types of welding and grinding. He or she also oversees welding and grinding repair work to frogs, switch points and other rail joints, and assists in the preparation of the welding and grinding capital and operating budgets.

The Manager of Programs and Budgets is responsible for developing the annual track maintenance programs. His or her duties include compiling recommendations for annual budget items and related track program work and prioritizing and scheduling the work; compiling statistics on track maintenance programs; developing software needed to keep records for such maintenance; and budget management for programmed and operating maintenance.

The Manager of Manpower Planning hires all MOW employees and deals with employee claims, including preparing and handling job bulletins and seniority rosters for all union departments. BNSF presently has 39 people involved in this activity, so Mr. Albin's estimate of one manager and two assistants for ACE is extremely conservative. The allocation of the manpower planner's time reflects the proportion of time spent on capital as opposed to operating projects. The capital projects are seasonal and require less of his or her time than that of handling these activities for the full-time staff.

The Work Equipment Manager manages the large amount of equipment that *must* be maintained on ACE. The Manager is responsible for supervising the work of the mechanics maintaining this equipment (whether it be internal staff or contractors) and for

maintaining an inventory of parts for all the different pieces of equipment. He or she is responsible for scheduling equipment movements and assignments between roadmaster districts to ensure maximum utilization of equipment, and for the timely dispatch of those parts to mechanics and to equipment in need of repair to ensure that the internal works gangs are not impeded by the breakdown of a key piece of work equipment. He or she also schedules shopping equipment for repairs and modifications and also recommends improved work methods for equipment repair and maintenance activities.

The Roadmasters¹⁰⁶ and other Departmental Supervisors are responsible for the planning, supervision, and oversight of the work of their departments.

All MOW supervisors, including Headquarters personnel, have as a top priority the preparation, implementation, and enforcement of an effective safety program. This is essential, because railroad activities can be very hazardous if safety precautions are not taken. Therefore, as much as twenty-five to thirty percent (25-30%) of an MOW supervisor's time can be spent on safety issues, including training, supervising, investigating, and reporting FRA reportable incidents. Follow-up after a serious accident or incident, whether a personal injury on the job or a derailment, is critical to ensure that, to the greatest extent possible, steps are taken to prevent a future occurrence.

ii) Departmental Maintenance-Of-Way

Consistent with railroad practice, Mr. Albin has determined his MOW staffing along departmental lines in order to provide a focused effort on major maintenance areas, such as Track, Bridge and Buildings, Signals, Communications, Electrical, and Stores. In

¹⁰⁶ A roadmaster is the equivalent of a departmental supervisor for track, but is assigned to a specific territory.

doing so, he shows that even if all programmed maintenance were contracted out, that still does not account for a significant proportion of maintenance work to be done, and certainly does not obviate the necessity for a well-staffed maintenance force.

For each department, Mr. Albin determined the skills (positions) required to maintain the structures and activities assigned to that department. He determined the number of persons required on the basis of the actual number and kinds of structures on ACE for which each group is responsible, the identification of the tasks and projects that the department would be responsible for, and BNSF production rates for accomplishing those tasks. The projects and individual responsibilities of the workforce for each department are described in detail in the subsections below.

An adequate internal maintenance force of well-trained individuals for each of these skill areas is critical to a good MOW plan. Department supervisors and workforces cannot rely solely upon program maintenance to replace damaged sections of rail or ties, turnouts, signal equipment, and electrical or microwave parts, because these components sometimes fail prematurely and must be fixed immediately.

Successful early detection of structural problems requires the combination of diligent oversight by supervisors and daily inspections by track/structure inspectors familiar with the territory. Many problems, however, are discovered only when a dispatcher receives a signal indication. A signal indication may require something as simple as a signal maintainer making an adjustment to a circuit at a switch point. On the other hand, it could require repair of a broken rail, which will require about two hours for a track crew with a boom truck to place new rail and joints and a three-hour track window the next day for a follow-up crew to replace the joints with welds and possibly even re-

surface the joint areas. As such defects could cause a derailment, there must be an immediate response from experienced crews fully equipped to resolve the problem. Thus, a robust, fully trained maintenance force is essential to minimize disruption to traffic flows, which is especially critical for high density traffic with cycle time and schedule requirements, such as the coal and intermodal traffic on ACE.

Each department is discussed below.

a) Track Maintenance Personnel

AEPCO's MOW field personnel are not organized on a departmental basis.

Rather, they are divided into two districts. Each district has a district supervisor, and three assistant supervisors. A crew of five crew members is assigned to each of the five sub-districts. Each crew has a foreman, four track maintainers, and one signal maintainer.

AEPCO Opening Nar. at III-D-59 to 60.

Mr. Albin's restatement of ACE personnel for the Track Department includes four Roadmasters and the following field personnel:

Maintenance Gang Foremen And Laborers	42
Night Response Laborers	4
Welder/Helpers/Grinders	16
Track Inspectors	8
Mechanical Machine Operators	19
Truck Drivers	11
Work Equipment Mechanics	<u>3</u>
Total	103 + 24 Seasonal = 127

The positions and salaries listed under Track Department in BNSF/UP Supplemental Reply Exh. III.D.4-1 are those for ongoing operating maintenance only and reflect the Railroads' personnel requirements for the typical activities involved in the day-to-day inspection and repair of the track structure. Mr. Albin performed a separate analysis (under Program Gangs in BNSF/UP Supplemental Reply Exh. III.D.4-1) to

determine the system production gangs that would be needed to accomplish the programmed maintenance-of-way.¹⁰⁷ This is the most reliable approach for two reasons. First, it recognizes that there is very little overlap between the work that is done by the system programmed capital replacement crews and the work performed by the full-time maintenance crews who handle the daily maintenance for an assigned territory. Second, it ensures that all of the operating-related activities are adequately staffed and that no crucial maintenance activity is overlooked.

For OE track maintenance, Mr. Albin divided the railroad into four Roadmaster Districts (geographical segments) based at Dalies, Vaughn, and Lordsburg, New Mexico, and El Paso, Texas, each covering an average of 130 route miles. In doing so, he followed a system used on BNSF, and affirmed by other railroads, for determining the size of Roadmaster Districts, which takes account of the number of miles, the tonnage, track conditions, number of road crossings, turnouts, accessibility, and weather conditions. Generally Class I railroads with line segment tonnages in the range of 100 MGT to 200 MGT assign Roadmaster districts averaging 130 route miles/180 track miles. The average district on lighter tonnage lines (30 MGT) of Class I, regional, and shortline carriers is generally 160 to 200 route miles/220 to 250 track miles.¹⁰⁸

¹⁰⁷ The system production gang workforce for programmed maintenance is included in BNSF/UP Supplemental Reply Exh. III.D.4-1 under the heading "Program Gangs." As explained above, these gangs are not part of the internal OE workforce that handles day-to-day maintenance.

¹⁰⁸ BNSF/UP.SUPPRP.WP.III.D.4-0135.

Each Roadmaster is responsible for all track maintenance within his or her territory, including planning, employee training, coordination with other internal departments, and interaction with outside agencies.

In Mr. Albin's restatement, the Roadmaster at Dalies, New Mexico, oversees four section crews; the Roadmaster at Vaughn, New Mexico, oversees three section crews; and the Roadmasters at El Paso, Texas, and Lordsburg, New Mexico, each oversee two section crews. The heavy traffic districts have more crew members and more supervisors. The Roadmasters also have crews for switch maintenance for welding and grinding switch points and frogs and for track inspection. Maintenance crews consist of track workers, machine operators, track inspectors, welders/grinders/helpers, and mechanical machine operators.

There are also district gangs to respond to major derailments, washouts, and other larger track problems. Two each night duty crew members are assigned to Vaughn, New Mexico, where the main yard and facility is located, and Dalies, New Mexico, to handle problems that arise during the off hours. Crews are on call 24 hours a day, seven days a week.

The section crews are required on a daily basis to handle approximately 35 to 50 route miles (depending on the traffic density in their assigned areas). The crews on the higher density lines have territories of 35 to 40 miles, while those on the lighter density lines may have as many as 50 miles. Their responsibilities include replacing broken or defective track components. In addition, they repair track geometry defects as they are detected; repair and remove slow orders; make derailment and washout repairs; cut brush; make minor repairs to grade crossings; inspect track in accordance with FRA standards;

clean up debris; maintain drainage facilities; maintain right-of-way fences; plow fireguards; regularly inspect, adjust, and lubricate all switches on the territory; replace damaged and missing signs; clean switches in the event of snow accumulation; spot raise bridge ends or areas of poor subgrade; maintain and service wayside curve lubricators and operate hi-rail curve lubrication systems; maintain orderly material stock piles; maintain safe walkways in the vicinity of buildings, platforms, switching leads, and sidings; weld and repair frogs; grind switches and stock rails; slot rail ends where necessary; field weld rail joints created as a result of replacement of defective or broken rail; replace defective insulated joints and joint plugs; maintain access roads; and gauge track, which is especially important on curves.

Welding crews are responsible for maintaining the condition of all frogs and switch points on the specified territory, and keeping the territory free of rail joints. On a high tonnage railroad, joints on welded rail cannot be tolerated because they become battered and chipped and result in broken rail. Therefore, where joints are created as a result of repairs to defective rail found by the detector cars,¹⁰⁹ welders must follow up immediately to weld all rail joints within 24 hours of the occurrence on high tonnage lines and as quickly as possible on other lines in order to avoid battered joints. Welding crews also provide the equipment to grind switches, frogs and crossings. The maintenance gangs correct the major items that go beyond the scope of what the two-person track patrol crews can be expected to accomplish.

¹⁰⁹ Detector cars frequent the high tonnage portions of the railroad several times a month.

Machine Operators operate front-end loaders, dozers, tractors, and speed swings, which are needed for day-to-day activities and to keep the territory clean of scrap rail and used ties and to maintain drainage and roadways. They also operate spot tampers, switch tampers, regulators, brooms, weed mowers, and cranes that are needed seasonally. All truck drivers who operate larger over-the-road vehicles must possess DOT and CDL licenses, which requires ACE to provide regular training and testing and ensure the proper renewal of licenses.

Mr. Albin concludes that the minimum ACE track maintenance force required to perform the daily OE maintenance of the 970 miles of track (includes mainline, second main, siding, yard, and set-out tracks) on ACE consists of 103 regular track employees, stationed at eleven locations across the ACE rail system. BNSF/UP Supplemental Reply Exh. III.D.4-3 is a schematic of Mr. Albin's MOW bases and crew locations. In addition there are 24 part-time track employees that handle seasonal works such as improving drainages, spot tamping, plowing maintenance roads on the right-of-way to allow access to the track, and special projects.

b) Bridge/Building Maintenance Personnel

AEPCO assumes that all program and most of the spot maintenance will be handled by contractors.¹¹⁰ Inspection of bridges, however, and some spot maintenance will be performed by field crews. AEPCO's bridge inspection and maintenance plan is based on the unrealistic premise that its field crews will have both the time and the training to perform FRA mandated bridge inspections and maintenance on the 460 bridges on

¹¹⁰ AEPCO Opening Nar. III-D-63.

ACE, all the while tending to their myriad other duties. Indeed, responding to the inevitable daily random failures alone will consume most of these crews' time, leaving little time to perform its other duties. As a result, bridge inspection and repair on ACE likely will be spotty at best, creating an unacceptable risk of slow orders, track outages, derailment, and non-compliance with FRA regulations.

As to building maintenance, AEPCO assumes that *all* of the spot maintenance work necessary to maintain its fueling facilities, locomotive repair shop, car shop, dispatch center at Vaughn, New Mexico, and other buildings on ACE will be contracted out. Reliance on outside contractors to perform all needed maintenance and upkeep of all facilities on ACE is not realistic. A significant percentage of ACE's traffic is time-sensitive intermodal trains, many of which will pass through Vaughn, New Mexico, for servicing. At Vaughn, the trains must be serviced quickly and sent on their way. Repairs and adjustments to facilities and equipment at the fueling facilities, locomotive repair shop, car shop, dispatch center and other facilities must be made immediately so as not to delay or back-up traffic on ACE. Waiting for a contractor to respond is often out of the question.

AEPCO's plan for inspecting and maintaining bridges and buildings on ACE is inconsistent with the daily real-world needs of a railroad. Those needs require regular inspection and often require immediate repair of bridges and buildings.

In his restatement of B&B personnel, Mr. Albin has two B&B supervisors located in Vaughn, New Mexico, where the major structures are located, including the locomotive repair facility, a car shop, fueling facilities, and headquarters office buildings, and Lordsburg, New Mexico, which is centrally located on ACE's southern line. Vaughn,

Dalies, and Lordsburg, New Mexico, will each have B&B crews consisting of a foreman, three carpenter/helpers, and one machine operator/truck driver. The B&B crews located at Dalies and Lordsburg each also include an inspector. The B&B crew at Vaughn includes a water service employee. A seven-person mobile gang equipped with boom trucks, chase vehicles, and hydraulic tools rounds out the B&B Department. The mobile units assist in tightening bolts, cleaning steel spans, clearing brush and debris at bridge openings, and small maintenance chores at buildings and fueling facilities. The total full-time B&B workforce includes two Supervisors and the following field personnel:

Inspectors	2
Foremen	3
Carpenter/Helpers	9
Water Service Mechanics	1
Truck Drivers	3
Mobile maintenance gang	<u>7</u>
Total	25

The two Supervisors of Bridges and Buildings directly supervise all B&B operating maintenance crews; the yearly bridge rebuilding, and scheduled maintenance programs. They also directly supervise the maintenance work on buildings, facilities and other related structures, *i.e.*, fueling, locomotive and car shops. They are responsible for bridge and building inspections; the review and prioritization of both operating and capital work for presentation to the B&B Engineer for funding; implementing the safety program for the department; coordinating B&B work with other departments, *i.e.*, track, signal, electrical, and telecommunications. They inspect and dispatch B&B forces to unplanned

outages and emergencies involving railroad structures such as bridge and culvert wash-outs and damage to structures from derailments, structures hit by high, wide loads, etc.¹¹¹

The Bridge Inspector is responsible for inspecting all bridges and large culverts and making instant repairs or calling in bridge crews as needed to address problems identified on inspection. (The track department will inspect and maintain culverts with less than 36" diameters.) The carpenters and helpers handle the larger repair jobs identified by the inspector.

Coordination between bridge maintenance crews and track department inspectors is essential as many maintenance tasks, such as raising bridge ends, aligning track on bridges, and ballast deck maintenance, require the expertise and involvement of both departments. The bridge crews work closely with track gangs to handle adjustments to structures required as a result of relay or tie work.

The B&B Foremen are responsible for direct supervision of the Bridge and Building crews. These crews are made up of carpenters, helpers, machine operators and truck drivers. The Foremen report to the B&B Supervisor who plans the projects that the foremen and crews perform. Examples of the type of work for which the Foremen is responsible on a daily basis are tightening bolts on bridges, adjusting bridge ties and other components on bridges and facilities, cleaning bridge spans and weeds and grass beneath and around structures, and fueling facility repair. B&B Foremen are also responsible for safety training and for implementing the B&B Department Safety Policy as it relates to their crews. They prepare reports on production of crew, time sheets, safety audits and

¹¹¹ In BNSF/UP Supplemental Reply Exh. III.D.4-1, Mr. Albin has shown the B&B supervisors in his maintenance-of-way summary with the maintenance-of-way general office personnel and assigned sixty-six percent (66%) of their time to OE.

reports. They also must coordinate work with other MOW crews, *i.e.*, track crews and signal crews. Foremen are responsible for ensuring that their crews are properly equipped and have the material to handle the projects assigned.

The B&B mobile crew, like the track and signal mobile crews, are staffed and equipped to travel the entire ACE system. The crew generally handles high priority maintenance activities such as emergency work, washouts, follow-up to derailments and other track structure outages and slow orders. The crew also handles preparation and follow-up maintenance work for the larger gangs such as tie, relay and surfacing (removal of crossing, etc.). The fact that the mobile crew can respond to the special maintenance needs that arise, helps to ensure that the headquartered crews are not taken away from the important work in their territories.

Truck Drivers are responsible for the safe and effective operation of a specific type of equipment, *e.g.*, boom trucks, larger maintenance vehicles, hi-rail truck and B&B bridge inspection vehicles. This equipment is critical to the efficient operation of the maintenance crew on both small and larger crews and gangs. The vehicles are used for the safe transportation of manpower, track, bridge and building materials, such as smaller bridge components, ties, other track materials, switch points, and frogs, and for scrap hauling and territory clean-up. Hi-rail trucks are also used for work on track and bridges that are not accessible from the maintenance roads.

The Water Service Mechanic is responsible for piping, testing, inspections, repairs, routine cleaning and pumping of systems, and lubrication of parts to keep them in proper working order on ACE's fueling facilities, water and sewer systems, boiler systems and other utilities on the railroad.

c) Signals Maintenance
Personnel

AEPCO includes in its company personnel 13 signal maintainers, but no other signals personnel. Mr. Albin includes a full-time staff of 30, including three Supervisors and the following field personnel:

Signal Maintainers	19
Electronic Technicians	3
Inspectors	3
Dispatch Center Maintainers	2
General Crew Members	<u>3</u>
Total	30

Based on the network configuration of ACE, Mr. Albin determined that the existing ACE territory would have 17,628 AAR signal units requiring 19 signals maintainers across the system.¹¹² An AAR signal unit is an industry wide standard that assigns a unit value to every piece of signal equipment on the railroad.¹¹³ The industry standard for AAR units per maintainer varies depending on the FRA requirements and rules for testing wayside signals and highway crossing equipment. Obviously, a maintainer can handle more units if the work units are confined to a small geographical area such as in a yard or terminal. However, if a territory exceeds 60 miles, the "windshield" time (*i.e.*, travel time) comes into play and the number of units must be reduced. In this area, where tonnage and windshield time are factors, Mr. Albin used a

¹¹² BNSF/UP Supp. Reply electronic workpaper "III F 6 Signals.xls," Tab "MAINTAINERS-EQUIPMENT."

¹¹³ This standard was established by all railroads so a uniform method of billing could be used at joint facilities or at railroad/railroad crossings. BNSF/UP.SUPPRP.WP.III.D.4-0136 to 0141.

standard of one maintainer for every 900 signal units. BNSF and UP each use this standard.

Mr. Albin determined that three signals supervisors would be required for the territory covered by ACE, based on the workforce that has been established. The supervisors would be located at Vaughn, Lordsburg, and Dalies, New Mexico. In addition, there would be two signal technicians assigned to the Dispatch Center at Vaughn.

Signal Supervisors are responsible for the direct supervision of all signal operating maintenance crews as well as the yearly capital improvement program. This involves supervision and coordination of signal work on projects such as additional tracks, turnouts and other facility improvements. Under their direct supervision are signal maintainers, electronic technicians, signal inspectors and dispatcher center technicians. The Signal Supervisors, together with the Telecommunications Supervisors are directly responsible for maintaining all CTC equipment and dispatching control center equipment. Signal Supervisors supervise inspections, installation and maintenance of highway/railway crossing signal systems. The Signal Supervisors, together with the Telecommunications Supervisors, are responsible for preparing an operating and capital plan for presentation to the Engineer of Signals and Telecommunications; the implementation of the safety program for the department; and are involved in dispatching signal and telecommunications forces in unplanned outages and emergencies requiring signal and telecommunications repairs.¹¹⁴

¹¹⁴ In BNSF/UP Supplemental Reply Exh. III.D.4-1, Mr. Albin has shown the signal supervisors in his maintenance-of-way summary with the maintenance-of-way general office personnel and assigned sixty-six percent (66%) of their time to OE.

The signal crews maintain the specialized equipment relating to the CTC system and are responsible for keeping in good operating condition all wayside signals, crossing signals, hot bearing detectors, and power switches. Signal crews also must follow the work of track gangs, (relay, ties, surfacing) to test and make adjustments to any signal circuits that may have been disturbed during those activities. These crews work directly with the Track Department on line outages relating to broken rail and switch problems.

Signal maintainers are required by FRA to perform a number of periodic tests on all wayside signals and wayside crossings.¹¹⁵ Approximately sixty percent (60%) of a signal maintainer's time is spent performing these tests. The other forty percent (40%) is spent on maintenance.¹¹⁶ ACE would be required to comply with these FRA regulations, but AEPCO's estimates and costs for maintenance personnel fail to take these requirements into account as AEPCO provides no additional maintenance workers in this area to assist with the daily work.

The signal inspector is required to perform relay testing as well as other signal related circuit testing. An inspector can normally handle about 200 miles of railroad. A signal electronic technician is responsible for keeping the network CTC in tolerance range and calibrating hot box detectors annually to maintain system integrity. Regular signal maintainers generally are not technically able to perform these tests.¹¹⁷

As noted above, AEPCO's MOW company personnel included only 13 signal maintainers, but ignored all of the other responsibilities of this department.

¹¹⁵ BNSF/UP.SUPPRP.WP.III.D.4-0142 to 0146.

¹¹⁶ BNSF/UP.SUPPRP.WP.III.D.4-0147.

¹¹⁷ *Id.*

d) Communications Maintenance
Personnel

AEPCO does not have any telecommunications maintenance personnel. In his restatement of telecommunications personnel for ACE, Mr. Albin included two supervisors, one each at Vaughn and Lordsburg, New Mexico.

Telecommunications Supervisors are responsible for the direct supervision of all telecommunications operating maintenance crews as well as the yearly capital improvement program. This involves supervision and coordination of telecommunications work on projects. They directly supervise maintainers, microwave technicians, communication technicians, radio shop technicians, and the telecommunications foreman. Telecommunications Supervisors are also responsible for installation, inspections and maintenance of the microwave towers and system, and the radio and telephone systems for the railroad. They supervise the locomotive radio shop.¹¹⁸

Each of the three telecommunications crews consists of a foreman, an electronic technician, communications technicians, and communications maintainers. The Telecommunications department includes:

Foremen	3
Microwave Technicians	5
Communications Technicians	5
Communications Maintainers	5
Radio Shop Technicians	<u>5</u>
Total	23

¹¹⁸ In BNSF/UP Supplemental Reply Exh. III.D.4-1, Mr. Albin has shown the telecommunications supervisors in his maintenance-of-way summary with the maintenance-of-way general office personnel and assigned sixty-six percent (66%) of their time to OE.

The foremen and technicians maintain the microwave systems, telephones, the infrastructure of the data network, the Automated Equipment Identification (AEI) sites and the equipment identification video equipment located at those sites, and all other train yard cameras and scanning equipment.

The radio shop technicians are responsible for maintaining the radios (diesel locomotive radios, portables, etc.) used on the railroad and maintain a radio repair shop with parts and supplies for repairing locomotive and portable radios and EOTDs.

The foremen and communications maintainers install and maintain cable (both underground and overhead) for data to the network, switches, interlockers, and the like. They also perform necessary maintenance on microwave towers and pole lines. They are responsible for responding to emergencies involving microwave and data network outages.

The total number of telecommunications personnel is 23.

e) Electrical Maintenance
Personnel

AEPCO includes no electricians in its company maintenance-of-way personnel.

In his restatement of the electrical department personnel for ACE, Mr. Albin assigned this department a supervisor, and included additional personnel located at Vaughn and Lordsburg, New Mexico. This department includes:

Foremen	2
Journeyman/Electricians	<u>5</u>
Total	7

The Electrical Supervisor provides technical and supervisory direction on projects. This position supervises the electrical staff, made up of electrical foremen and journeyman electricians. He or she helps develop, install, monitor and enforce compliance of standards, policies, methods and instructions that expedite the electrical department's

activities. He or she also monitors projects for adherence to local and material electrical codes, provides input for budgeting and planning of electrical costs for capital and operating plans, maintains an up-to-date equipment inventory, provides recommendations for new electrical equipment and methods, and is responsible for implementing and coordinating the safety program for the department. The Electrical Supervisor is responsible for coordinating electrical work with other departments, *i.e.*, B&B, Signal and Telecommunications.¹¹⁹

The electrical department crew maintains the electrical facilities and systems that are necessary to rail operations. A few of the systems that the electrical department maintains are:

- HVAC systems in buildings,
- Power distribution systems in yards and other facilities,
- Area lighting in yards and parking lots,
- Power control and lighting in shops and office buildings,
- Electrical and fuel monitoring systems at fueling facilities,
- Emergency power systems,
- Electrical systems for signal and telecommunications,
- Electrical systems at waste water treatment plants, and
- Track switch heaters.

f) Purchasing/Materials
Management Maintenance
Personnel

AEPCO included in its management staff a Manager of Budget and Purchasing, but provided no employees under this individual, possibly on the assumption that materials

¹¹⁹ In BNSF/UP Supplemental Reply Exh. III.D.4-1, Mr. Albin has shown the electrical supervisor in his maintenance-of-way summary with the maintenance-of-way general office personnel and assigned sixty-six percent (66%) of his or her time to OE.

would be shipped directly to the worksite on a just-in-time basis. Even though much of the material can be shipped directly from vendors to the worksite, some MOW and mechanical materials must be kept on hand for day-to-day maintenance and emergencies. Therefore, a small Purchasing and Materials Management (PMM) department is required for an efficient operation to avoid delays due to waiting for materials. Mr. Albin has estimated that ten MOW personnel would be required to handle the purchasing, inventories, receipt, and delivery of all maintenance materials required for ACE.

In BNSF's restatement of costs, the G&A department includes a PMM facility and a Director of Purchasing and a Purchasing Agent. As the Director and Purchasing Agent are part of the G&A staff of ACE, their salaries are not included in Mr. Albin's MOW budget. Mr. Albin includes only the ten MOW workers with responsibilities relating to engineering, MOW, operating, and mechanical departments. These workers include:

Purchasing Manager	1
Store Foreman	1
Machine Operator (forklift)	2
Crane Operator	2
Truck Driver	1
General Laborer	2
Administrative	<u>1</u>
Total	10

The PMM serves as a regional store for track, B&B, signal and communications, system electrical material, and roadway equipment parts. It also supplies locomotive and freight car parts to the repair shops, and supplies and monitors fuel, lubricating oil, and other such items for the fueling facilities. The store would operate three shifts per day, seven days per week. Truck deliveries of station supplies, freight car and locomotive parts, maintenance-of-way materials, AFE materials, and work equipment parts are made

directly from this facility to departments on ACE. The transportation and disposal of hazardous waste materials also are handled through this facility.

The Materials Manager is responsible for supervising the employees engaged in ordering, loading, unloading, storing, issuing, and distributing materials and supplies to the departments. The Machine Operators operate the cranes and other machinery used in disbursing, receiving, loading, and unloading material.

The fueling facilities at Vaughn, New Mexico, and El Paso, Texas, are supplied and managed by PMM department personnel who supply locomotive and freight car repair parts to the locomotive maintenance and servicing facilities at these points, and to the train yard and freight car repair tracks.

As the Purchasing Department procures and provides materials for both the capital and OE maintenance programs, a portion of the employees' time is allocated to OE maintenance based on the relationship of the materials purchased. Because most of the materials are consumed by OE related activities, Mr. Albin allocates seventy-five percent (75%) of the purchasing employees' time to OE maintenance.

iii) Comparison Of Mr. Albin's Proposed Staff With Other Railroads

A comparison of Mr. Albin's MOW organization with the current maintenance staff of other relatively large regional railroads and with BNSF's existing staff on ACE replicated line segments demonstrates that Mr. Albin's estimates are realistic. The table below shows comparisons with MRL, FEC, and the Railroads.

**Table III.D.4-5
Comparison of MOW Staffing Levels**

Railroad	Route Miles	Track Miles	Average Tonnage	MOW* Mg/Sup.	Crews*	Total
MRL	600	900	30 MGT	29	132 + seasonal gangs	161 + seasonal gangs
FEC	360	500+	30 MGT	13	182 + seasonal gangs	195 + seasonal gangs
Existing BNSF/UP (ACE replicated segments)	517	808	107.2 MGT	(not incl. headq.)	222	222
Railroads' ACE	517	970	99.3 MGT	25	188 + 24 seasonal gangs	213 + 24 seasonal gangs

Source: BNSF/UP.SUPPRP.WP.III.D.4-0006 to 0025. The Railroads' proposed ACE reflects changes in route miles and track miles determined by the Railroads' operating and capacity witnesses.

*PMM personnel not included.

The table above demonstrates that Mr. Albin's estimate of the full-time staffing requirements for ACE is in line with the crew that the Railroads currently have on all of the line segments replicated by ACE. Mr. Albin's staffing on a miles per regular (if not seasonal) employee basis is also more in line with that of FEC and MRL. MRL has 3.7 route miles per employee (5.6 track miles per employee); FEC has 1.9 route miles per employee (2.6 track miles per employee); and Mr. Albin's proposed ACE has 2.4 (517/213=2.4) route miles per employee (4.6 track miles per employee) despite much higher tonnage than MRL and FEC. In contrast, AEPCO's proposed 57-person MOW workforce would mean one person for every 9.1 route miles and 17.0 track miles.

(b) Compensation

AEPCO's salaries are based on Wage Forms A & B for most management positions and all field positions.¹²⁰ Wages are reported on Wage Forms A & B by STB occupation code. Each STB code covers a variety of positions and a wide range of salaries. For example, Code 103 covers assistant general managers, real estate agents and assistant sales agents, among various other positions.¹²¹ AEPCO applies Code 103 to several director positions and to the chief engineer. AEPCO also incorrectly applies Code 103 to general attorneys even though general attorneys' compensation is reported under Code 201.¹²² AEPCO allots to each of these positions the average salary paid to all employees whose wages are reported to Code 103. Implicit in AEPCO's approach is the incorrect assumption that each position is paid the same salary. As the Board recently acknowledged, a one-size fits all approach to salaries is not appropriate.¹²³ In reality, different positions are paid different salaries. BNSF compensation documents produced in discovery show that a chief engineer, for example, is paid more than a director, as the chief engineer is a more senior position.

AEPCO's wage levels include straight time wages, vacation allowance, overtime allowance, and other unspecified allowances. To those figures, AEPCO added thirty-eight percent (38%) of all salaries and wages for fringe benefits. AEPCO then added an equipment cost that accounts for only a partial inventory of the basic equipment necessary

¹²⁰ AEPCO Opening electronic workpaper "AEPCO_Salaries.123."

¹²¹ 49 C.F.R. § 1245.5. BNSF/UP.SUPPRP.WP.III.D.4-0148 to 0156.

¹²² *Id.*

¹²³ *CP&L* at 63 ("salaries tied to the duties of a specific position are more reflective of the compensation for an individual job than a single, one-size-fits-all salary").

to perform MOW work. The MOW equipment needs of ACE are discussed above at III.D.4.b(2). AEPCO's workpapers show that it then arbitrarily assumed that only seventy-five percent (75%) of the total salaries, wages, and equipment are associated with OE, notwithstanding its claim to have expensed one-hundred percent (100%) of the field MOW workforce's time.¹²⁴

AEPCO also provides for miscellaneous small tools and supplies based on thirty percent (30%) of the annual salaries of its field MOW personnel.¹²⁵ But AEPCO then arbitrarily assumes that only five percent (5%) of these costs are associated with OE. In light of the fact that AEPCO contracts out the vast majority of ACE's capital work, and claims that its field personnel will perform only OE work, AEPCO's assignment of any portion of the cost of its internal MOW force's small tools, supplies, salaries, and wages is clearly wrong.

Mr. Albin's labor costs for OE track personnel are taken from BNSF discovery documents providing the hourly wages for specific MOW positions.¹²⁶ Mr. Albin uses a { } percent overtime allowance, which reflects BNSF engineering office operating expense for overtime in 2001.¹²⁷ This is consistent with the percentages reflected in the

¹²⁴ Compare AEPCO Opening electronic workpaper "SpotMaint.xls" and AEPCO Opening Nar. at III-D-69.

¹²⁵ Five (5) of AEPCO's signal maintainers are assigned to the headquarters. Because AEPCO bases its miscellaneous small tools and supplies needs on field personnel only, it fails to provide the head office signal maintainers with any of the small tools and supplies necessary to perform their job.

¹²⁶ BNSF/UP.SUPPRP.WP.III.D.4-0109 to 0133.

¹²⁷ BNSF/UP.SUPPRP.WP.III.D.4-0157.

Wage Forms A & B and is reasonable considering that maintenance individuals are on call at all hours of the day and night, including holidays.

Mr. Albin then applied a { } additive for fringe benefits, based on current BNSF records for 2001 fringe benefits.¹²⁸ AEPCO did not give the source for its thirty-eight percent (38%) for fringe benefits.

Mr. Albin also relied on standard railroad practice in developing his additives for materials and supplies and for travel, meals, and accommodations.

For materials and supplies, it is customary for railroads such as BNSF and UP for *each* MOW department to include a labor-based charge for materials and supplies, which includes not only the myriad maintenance supplies and materials expended in performing its tasks, but also the required safety equipment.¹²⁹ The percentage of the additive for this item is based on the actual expenditures by each department for these materials and supplies. As set forth below, Mr. Albin applied each department's appropriate additive to the salaries of employees in that department. The materials additive should not be confused with the additive for *office* supplies and materials. Office supplies include paper, pens, files, stationery, envelopes, and other office supplies. The materials additive covers the particular expendable materials consumed in performing maintenance tasks.

Because the nature of maintenance work is that all MOW workers must travel to some extent in performing their jobs, an allowance is made per employee to cover travel,

¹²⁸ BNSF/UP.SUPPRP.WP.III.D.4-0158 to 0161.

¹²⁹ This does not include the track maintenance equipment and tools which are accounted for separately.

meals, and corporate accommodations. Accordingly, Mr. Albin applied the ten percent (10%) additive to all OE wages and salaries. AEPCO ignored these costs.

Mr. Albin's restatement of ACE's annual OE budget for MOW management by department is summarized below.

Systems Engineering Office. The OE portion of the General Office Staff salaries and wages is \$636,551 for managerial staff and \$1,074,733 for Roadmasters and Departmental Supervisors.

Track Department. The Track Department maintenance personnel cost includes a { } materials cost, based on BNSF records of the actual amounts used by BNSF to cover that cost. This covers the cost of small tools such as picks, chisels, wrenches, lining bars, measuring tools, and other such items that are regularly replaced as they wear out, as well as materials expended in the performance of tasks, such as nails, screws, spikes, adhesives, and other typical maintenance items. For the 103 track workers and 24 seasonal workers, that cost is more than \$1,248,818 million, which is substantially higher than the amount allowed by AEPCO. Mr. Albin's total cost for track department OE maintenance, including labor, fringe benefits, and other additives is \$9,730,377.

Bridge and Building Department. The B&B department personnel cost for twenty-five (25) employees includes a { } additive for structures' maintenance materials. The total B&B OE cost is \$2,161,898.

Signals Department. The Signals Department personnel cost for thirty (30) employees includes a { } materials cost because of the more expensive materials used in signal maintenance. The total cost is \$2,530,701.

Telecommunications Department. The Telecommunications personnel cost for twenty-three (23) employees includes a { } additive for materials, based on the actual cost of materials for this group. The total cost is \$2,004,889.

Electrical Department. The Electrical department personnel cost for seven (7) employees includes a { } additive for materials, due to the increased costs for the tools and supplies involved in maintaining these systems. The total cost is \$628,522.

Purchasing and Materials Management. The total OE budget for ten (10) PMM personnel is \$564,074.

Total Salaries and Wages. BNSF/UP Supplemental Reply Exh. III.D.4-1 depicts the personnel requirements, additives, and total costs for each of the departments of ACE Engineering Department. The total OE budget for company personnel is \$19,331,744.

(2) ACE OE Track Maintenance Equipment

As discussed above in Section III.D.4.a.(3), AEPCO inadequately outfits its MOW field personnel with the equipment necessary to perform their daily maintenance and inspection duties. BNSF/UP Supplemental Reply Exh. III.D.4-1 includes a comprehensive list of the Systems Engineering and Departmental equipment requirements that would be reasonable for the daily maintenance requirements of a railroad with the geographic configuration and annual tonnage of ACE. Mr. Albin's estimate of ACE operating expense equipment requirements are based on the projects that would have to be undertaken by each department, the number of crews in each department that would be needed to perform such projects, and the equipment that would have to be available to each crew or crew member, either on its own or in conjunction with other crews, to perform the work most efficiently. Where possible, equipment is shared. However,

equipment that is used regularly, such as rail grinders, rail saws, drills, air compressors, generators, and rail expanders, must be in sufficient supply to allow each crew ready access when small jobs such as grinding frogs and switches and replacing rail come up.

Some of the essential items of equipment that AEPCO overlooked include tampers, generators, brush cutters, speed swings, tie cranes, trenchers, ballast regulators, snooper cranes, dozers, anchor machines, tie adzers, loaders, mowers, curve lubricators, backhoes, and track inspectors' trucks. AEPCO includes an amount for miscellaneous equipment rental, but the amount provided for is inadequate to cover all of the equipment for which AEPCO has otherwise failed to provide. Moreover, it presumes that the equipment will be readily available for rent on an as needed basis and will be in close proximity to where it is needed. But this is unlikely to be the case. In fact, AEPCO's rental approach will likely result in delay which, in turn, will result in prolonged outages and deferral of needed maintenance. AEPCO's assumptions are not realistic. It is critical for railroads, particularly railroads carrying the tonnage and time-sensitive traffic that ACE carries, to own the equipment necessary to respond quickly and efficiently to unplanned maintenance needs as they arise. The meager allocations to small tools and miscellaneous equipment are not nearly sufficient to cover these items. A list of specific quantities and types of equipment and tools needed by each department and each production work gang in each craft area is set forth in Mr. Albin's workpapers.¹³⁰

¹³⁰ BNSF/UP.SUPPRP.WP.III.D.4-0162 to 0170.

Mr. Albin's estimate of the total cost of the maintenance-of-way equipment needed for daily operations on ACE is \$6,691,944¹³¹ compared to AEPCO's estimate of \$1,044,930 million. Mr. Albin's designation of the kinds and quantities of equipment needed to maintain ACE to the appropriate operating and safety standards is far more realistic than AEPCO's. In many instances, AEPCO's miserly allocation of equipment would cripple ACE crews' ability to handle multiple tasks simultaneously. Moreover, even assuming all program maintenance is contracted out, providing a minimal staff with a modicum of equipment to handle the daily maintenance is a false economy. An already sparse workforce of 50 persons would never be able to meet the demands of a high tonnage railroad such as ACE and would be further hampered without an adequate supply of the proper equipment. Based on AEPCO's provision of equipment, ACE efficiency would be undercut awaiting the availability of MOW personnel and equipment. Staffing and budget constraints would lead to the deferral of maintenance, which is a dangerous and highly inadvisable practice, as deferral seriously exacerbates existing MOW problems. BNSF and UP have had success in reducing their respective MOW forces to the extremely low present levels over the past five to six years only by researching/testing and equipping their MOW crews with modern day equipment, using concrete ties, and by handling the larger work projects with efficient system production gangs who handle not only the capital replacement programs, but also undercutting, shoulder ballast cleaning, out-of-face surfacing, and switch grinding.

¹³¹ BNSF/UP.SUPPRP.WP.III.D.4-0171 to 0178. BNSF/UP Supp. Reply electronic workpaper "III D 4 Maintenance of Way.xls, Tab "Annual Spot Equip."

(3) ACE OE Contract Work

There are certain maintenance activities, such as weed spraying and snow removal, that by and large are contracted out by both large and small railroads. AEPCO stated in its Narrative that ACE would use contractors for vegetation control, rail geometry testing, rail grinding, ultrasonic rail testing, ditching, communications and signals, derailment, snow removal, track program maintenance, and miscellaneous outside engineering contracts for surveys and bridge work. AEPCO Opening Nar. at III-D-60 to 61. While Mr. Albin agrees with the use of contractors for many of these tasks, he takes issue with the wholesale contracting of communication, signal, derailment cleanup and restoration of track, and track program maintenance. The Railroads have found it imperative and more efficient to handle either all or a portion of these responsibilities internally. Mr. Albin also disagrees that the costs are accurately reflected in AEPCO's OE costs.

The differences between Mr. Albin's estimates of contract work and those of AEPCO are driven for the most part by their use of different unit costs and different standards for determining the frequency with which track maintenance activities must be done. AEPCO estimates many of its unit costs without any support or explanation of what is included in the cost. In other instances, AEPCO claims to derive unit costs from BNSF contract costs, but overlooks key elements of the costs.

With respect to frequency standards, AEPCO offers no support for its standards, whereas Mr. Albin bases his standards on the tonnages involved, his many years of experience, and the actual, tried and proven standards currently applied by heavy tonnage railroads.

Moreover, AEPCO omitted entirely from its OE track maintenance estimate such crucial activities as switch and grade crossing grinding, stabilization projects along the

Abo River, on track west of El Paso, Texas, and across the Alto Flats lakebed, and special measures that must be taken to address persistent sand accumulation on the tracks west of Deming, New Mexico. Mr. Albin assumes that ACE would contract for these track maintenance projects as well. As shown in BNSF/UP Supplemental Reply Exh. III.D.4-1, Mr. Albin has included these costs in his estimate of contract work. Each of the OE contract costs is discussed below.

(a) Weed Spraying

AEPCO included a unit cost of \$22.21 per acre for regular and noxious weed control to be applied to 895 acres of ACE right of way. It purports to have used BNSF weed spraying contracts to derive its unit costs for these activities, but upon closer examination it is clear that AEPCO has misread the contracts. AEPCO took the unit costs for labor only for regular and noxious weed spraying and applied those unit costs to the miles of right-of-way in each state and then took the average as its unit cost. The contracts, however, clearly specified {

} AEPCO ignores both the cost of { } and the cost of the { }.

Moreover, AEPCO's unit cost was based only on contracts for {

}. When these additional costs are taken into account, BNSF's actual costs result in an average unit of cost of { } per mile for regular vegetation control and \${ } per mile for noxious weed spraying (including { }¹³²

¹³² {

(Continued ...)

All ACE main and secondary tracks must be sprayed annually with EPA approved pesticides. Chemicals must be rotated periodically to provide adequate vegetation kill from year to year. Certain areas require second applications and crossing areas require additional coverage to provide increased kill to improve sight distance for motorists at road crossings. The spraying program is managed by the Environmental Department with the field supervisors monitoring the application, the contractors' production, and the effectiveness of the kill. Regular weed spraying would be required on 970 miles of ACE track.

In addition to regular weed spraying, the railroad must also spray for noxious weed control. Noxious weeds are those which have a harmful effect on agricultural productivity or to human health and welfare, and therefore are "outlawed" by state governments. In some areas, noxious weeds must be controlled from right-of-way line to right-of-way line, which results in increased application costs. Approximately 259 miles of ACE right-of-way in various pasture and agricultural areas must be sprayed for noxious weeds at the unit cost of \$ { } /mile.¹³³

BNSF also incurs costs for spraying brush and crossings in these areas of the county at the same cost as for noxious weed spraying. Approximately 360 acres of brush and 440 acres of crossings would require weed control.

The FRA also requires railroads to provide vegetation control under bridges, which involves spreading the pellets by hand. This time-consuming activity, however, is not

} BNSF/UP.SUPPRP.WP.III.D.4-0179 to 0186.

¹³³ *Id.*

contracted out by BNSF, but is handled by BNSF's internal mobile bridge crew. Therefore, Mr. Albin has not included any additional cost for this task in his restatement of contract costs. It should be pointed out, however, that AEPCO has offered no evidence that it has included this important activity in either its contract or internal maintenance costs. Indeed, as AEPCO's proposed track and structure crews have too few members to spare any for this type of activity, it is likely that ACE as staffed by AEPCO would have to contract for this activity, but the costs to do so are clearly not reflected in AEPCO's vegetation control costs.

Total costs for vegetation control are \$383,804.¹³⁴

(b) Ultrasonic Rail Testing

AEPCO proposes to perform ultrasonic rail testing on mainline track only three times a year, but offers no support for that frequency. It also performs testing only on mainline tracks and not on branch lines or light density lines.

Rail lines which handle the tonnage levels proposed for ACE should be tested regularly. BNSF's standard for rail testing is to test all rail every 15 MGT.¹³⁵ Mr. Albin determined that 3,455 miles of rail would have to be tested annually on ACE. This frequency is required to locate internal rail defects and remove portions of rail that are

¹³⁴ BNSF/UP Supplemental Reply Exh. III.D.4-1.

¹³⁵ For planning purposes, BNSF also applies a rule-of-thumb standard to ensure that all rail is initially scheduled to receive at least the minimum testing appropriate. Rail with tonnages of 50 MGT or more are scheduled to be tested at least four times a year, and rail with less than 50 MGT are scheduled to be tested twice a year. But the actual number of test passes in a year will ultimately be determined based on actual tonnage applying the standards set out in the text above.

defective before they develop into failures that could result in derailments and/or interruption of service.

Mr. Albin accepts AEPCO's unit cost of \$98.78 and applies that unit cost to the 3,455 miles that must be tested annually for a total cost for ultrasonic rail testing of \$341,292.

(c) Rail Grinding

AEPCO's standard for rail grinding is to grind standard rail every 50 MGT and to grind premium rail on curves of three degrees or more every 100 MGT. AEPCO provides no support for this standard which is in sharp contrast to BNSF's and UP's general policies which are to grind curves greater than three degrees every 15 MGT, curves less than three degrees every 30 MGT and tangents every 60 MGT to maximize rail life. One pass is sufficient if grinding is performed on the above frequencies for tangent and curves less than three degrees. Curves greater than three degrees as a general rule require two passes. The Railroads' standards are the result of decades of experience and experimentation with grinding frequencies, and are considered the best practices in rail grinding.¹³⁶ If the rail is not ground regularly, it deteriorates and additional passes at additional cost would be required to properly profile the rail. It is important that a rail profile be maintained that fits the wheel profile of the heavy cars. If this is not done, areas of high stress are created in the ball of the rail, resulting in defects and fatigue. The only way heavy haul Class I railroads have been able to improve rail life to one (1) BGT and beyond is through a

¹³⁶ Peter Sroba, Eric Magel, Fred Prah, *Getting The Most From Rail Grinding*, Railway Track & Structures, December 2003 at 30. BNSF/UP.SUPPRP.WP.III.D.4-0187 to 0190.

diligent rail maintenance program. Strict adherence to an aggressive rail grinding schedule is an integral part of such program.¹³⁷

Even more important is an aggressive special grinding program at switches and crossings involving grinding at the frog, stock rail and switch points. Switches are by far the highest maintenance item on a heavy tonnage railroad both for track and signal maintenance forces. Modern switch grinding equipment has made it possible to improve turnout component life and to reduce outages at turnouts resulting from switch points and other components not matching or being out of alignment. Special grinding must also be done to rail at crossings because the large production grinders must pass by crossings due to flangeway restrictions. The rail at crossings takes both the load from trains and from traffic and thus requires special care. Mr. Albin has included grinding of switches and crossings in his rail grinding calculations.

For regular grinding, Mr. Albin calculated 1,189 pass miles including a single pass on tangents and curves less than three degrees and a double pass on curves greater than three degrees. Mr. Albin's calculations are included in electronic workpaper "III D 4 Maintenance of Way.xls." AEPCO used a unit cost of \$1,000 per mile applied to 1,011.56 miles. AEPCO's unit cost is unsupported. Mr. Albin uses a unit cost of { } per pass mile based on BNSF's 2001 costs for grinding.¹³⁸ Mr. Albin applied that cost to 1,189 pass miles per year, for an annual cost for rail grinding of { }.

¹³⁷ Tom Judge, *Grinding Delivering on its Promises*, Railway Track and Structures, June 2003 at 53; Robert J. Derocher, *Keeping a Low Profile*, Progressive Railroading, June 2003 at 50. BNSF/UP.SUPPRP.WP.III.D.4-0191 to 0199.

¹³⁸ BNSF/UP.SUPPRP.WP.III.D.4-0200 to 0203.

Mr. Albin has included switch grinding using BNSF's standard grinding frequency of 50 MGT and cost { } per switch for a total cost of { } per year.¹³⁹

Grinding at crossings is done at the same frequency as for mainline track. Based on the number of crossings on ACE and a unit cost of { }, Mr. Albin's cost for grinding at crossings is { }.¹⁴⁰

(d) Track Geometry Testing

Major railroads (Class I's and others) test track geometry on a regular basis to ensure that the track alignment, profile, cross level, super-elevation, gauge, and twist all meet FRA and corporate track safety standards. BNSF's policy is to test from two to four times per year on lines with the densities proposed for ACE. ACE line segments with densities greater than 50 MGT would be tested four times a year, and the segments with densities less than 50 MGT would be tested twice a year.

AEPCO tests only twice a year regardless of the density, but gives no explanation for this minimal testing. Mr. Albin used BNSF standard.

AEPCO uses a unit cost based on an excerpt from a purported contract offer that AEPCO's witnesses obtained from Holland/Trackstar. That offer provides for base daily rates of \${ } and production rates of { } miles of track tested per day. AEPCO's assumption of a unit cost per track mile of \${ } assumes that the maximum production will be achieved daily and, it does not include any mobilization costs or

¹³⁹ BNSF/UP Supplemental Reply Exh. III.D.4-1. BNSF/UP.SUPPRP.WP.III.D.4-0186.

¹⁴⁰ BNSF/UP Supplemental Reply Exh. III.D.4-1.

overtime allowance.¹⁴¹ These aggressive assumptions are not realistic on a high tonnage railroad such as ACE where track time is at a premium and maintenance work must accommodate a high number of time-sensitive trains.

Mr. Albin relies on a unit cost of { } per test mile based on BNSF's actual costs in 2001 for track geometry testing.¹⁴² The unit cost includes the costs for both the labor and equipment. Application of the { } unit cost to the 2,751 test miles that Mr. Albin determined would require testing under BNSF standard results in a total cost of { }.

(e) Miscellaneous Outside Contracts

For miscellaneous contracts, AEPCO includes \$750,000, but provides no support for this amount. Moreover, AEPCO asserts that this amount is supposed to include survey and bridge.

Based on his experience with contractors and his analysis of the structures and facilities on the lines replicated by ACE, Mr. Albin independently determined that the cost for bridge engineering would include concrete repairs, underwater inspection for scour on the substructure of the 460 ACE bridges, and steel repairs to the bridges for a total contract costs of \${ }. This amount is separate from the amount allocated for normalized bridge replacement.

For contract maintenance on buildings, AEPCO has included \$150,000. AEPCO provides no support for this amount. However, since AEPCO includes no electricians, carpenters, masons or water service employees in ACE's internal workforce, this amount

¹⁴¹ BNSF/UP.SUPPRP.WP.III.D.4-0205 to 0207.

¹⁴² BNSF/UP.SUPPRP.WP.III.D.4-0186.

would have to include all facets of building maintenance, including the numerous daily repairs and spot upkeep that ACE's numerous buildings will require. By contrast, Mr. Albin has included electricians, carpenters, masons, and water service employees in his restatement of ACE to attend to the day-to-day activities associated with building maintenance. Larger repairs and maintenance projects would be contracted out. Contract maintenance costs are generally 0.5% of the construction cost of such facilities. Therefore Mr. Albin has included \$445,552 for building maintenance.¹⁴³ Mr. Albin's calculations and supporting documents are in his workpapers.¹⁴⁴

(f) Ditching

Mr. Albin uses AEPCO's annual cost for ditch cleaning.

(g) Snow Removal, Derailment And Casualty Repairs.

AEPCO has included \$50,000 for snow removal, but has not provided any support for this amount. According to BNSF records, in 2002, BNSF spent a total of { } on snow removal and weather-related costs across BNSF system or approximately { } per route mile. In addition to snow removal, these expenditures account for costs associated with ice, storms, flooding and other weather related costs. Mr. Albin applied the per route mile cost to ACE route miles for a total snow removal and weather-related cost of \$ { }.¹⁴⁵ He then reduced this amount by twenty percent (20%) to account for the

¹⁴³ UP's agreement with the City of El Paso requires UP to bear the cost of maintenance of the El Paso Trainway. BNSF/UP.SUPPRP.WP.III.F-1065 to 1066. Accordingly, Mr. Albin has included the costing of maintain the El Paso Trainway in his calculation of building maintenance costs. BNSF/UP.SUPPRP.WP.III.D.4-0209.

¹⁴⁴ BNSF/UP Supplemental Reply Exh. III.D.4-1.

¹⁴⁵ BNSF/UP.SUPPRP.WP.III.D.4-0210 to 0211.

fact that BNSF's weather-related costs on its southern lines tend to be less than BNSF's system-average snow removal costs.

AEPCO has included \$1 million for derailments, but has not provided any support for this amount. BNSF's record of FRA reportable train accidents for 2001 show that there were significant train related derailments on the proposed ACE line segments. The clean-up costs for derailments on BNSF line from Defiance to Vaughn, New Mexico, experienced eleven derailments, with clean-up costs of \$ { }.¹⁴⁶ Some of these were caused by mechanical defects, some by impediments on the track, and some by weather conditions. No matter how carefully and well the railroad is maintained, derailments are, unfortunately, a fact of life that must be taken into account and the costs accounted for. As similar UP data was not available, Mr. Albin estimated the cost of derailments on the El Paso, Texas, to Cochise, Arizona, line based on UP's per route mile cost of derailments (system-wide cost for derailments/system total route miles). Mr. Albin therefore included an annual cost of \$ { } for derailments on ACE. His calculations are included in his workpapers.¹⁴⁷

In addition to derailments and other FRA reportable accidents, the Railroads incur substantial costs for other casualty losses as a result of washouts, floods, land slides, slope failures, and the like. From 1999 to 2002, BNSF incurred more than { } million in total casualty expenses across the system (including { } million in FRA reportable incidents, *i.e.*, derailments).¹⁴⁸ Mr. Albin's estimate for derailment costs does not cover the non-

¹⁴⁶ BNSF/UP.SUPPRP.WP.III.D.4-0212.

¹⁴⁷ BNSF/UP.SUPPRP.WP.III.D.4-0213.

¹⁴⁸ BNSF/UP.SUPPRP.WP.III.D.4-0214 to 0220.

derailment casualties that ACE can reasonably expect to incur. Neither of the Railroads keep records by line segment for these types of casualties as they do for the FRA reportable incidents. It is reasonable to believe that the 2001 proportion of FRA reportable derailment costs to non-derailment casualty costs for ACE segments would be similar to the four year average for BNSF's entire system – *i.e.*, {

}.¹⁴⁹ Therefore, Mr. Albin has included an additional allowance of { } to cover casualties to the track structure.

(h) Environmental Cleanup & Prevention

Railroads routinely incur substantial annual expenses for environmental mitigation associated with maintenance of fueling facilities and clean up of fuel spills. Over the past ten years, BNSF incurred more than { }, or more than { } annually, for environmental mitigation and diesel fuel clean-up at BNSF's fueling facility in Belen, New Mexico. Fuel spills are costly and hazardous to people and the environment. Accordingly, a preventative program that includes regular inspections and repair of pipes and fuel tanks is critical. For 2002 and 2003, BNSF incurred a total of { }, or an average of { } annually, in OE to inspect and repair tanks at Belen, New Mexico.¹⁵⁰ It is only reasonable to assume that fueling facilities on ACE would require the same. Therefore, Mr. Albin included these costs in his restatement of OE contract costs.

(i) Yard Cleaning

Mr. Albin uses AEPCO's costs for yard cleaning.

¹⁴⁹ BNSF's experience in 2001 was derailment costs of { } million and casualty costs of { } million, resulting in a { } split. Thus, the Railroads' use of the four-year average { } split is conservative.

¹⁵⁰ BNSF/UP.SUPPRP.WP.III.D.4-0221 to 0224.

(j) Special Maintenance Costs

i) Abo River Stabilization Issues

For ten miles, ACE runs through the canyon along the Abo River near Scholle, New Mexico (MP 865-875). In this stretch, the track curves fifteen times as it ascends a steep grade. Many of the curves approximate four degrees. There are a number of high hills and deep cuts and slide detector fences lining both sides of the track here. Erosion is a significant problem on this stretch. As a result, BNSF is constantly inspecting the track and performing frequent maintenance, including stabilization work, ditch cleaning in deep cuts, and maintenance of the slide detector fences. According to information provided by BNSF's Division Engineer, Craig Sloggett, BNSF spent { } in 2003 maintaining this stretch of track.¹⁵¹ AEPCO does not account for these costs, which are in addition to the regular maintenance costs on this stretch of track.

ii) Stabilization Issues West of El Paso, Texas

Similarly, the line between El Paso, Texas, and Strauss, New Mexico (MP 1295 to 1280), traverses deep cuts of 70 to 100 feet and experiences significant erosion. This requires UP to undertake costly stabilization and erosion prevention measures annually. Rock falls and sloughing on the steep slopes also require UP to clean ditches on a frequent basis. UP currently incurs { } in special maintenance costs to stabilize this line.¹⁵² AEPCO does not account for these costs.

¹⁵¹ BNSF/UP.SUPPRP.WP.III.D.4-0225 to 0229.

¹⁵² BNSF/UP.SUPPRP.WP.III.D.4-0230.

iii) Ballast Fouling West of Deming, New Mexico

As described in Section III.F.2.a.(3), the line between Deming and Strauss, New Mexico (approximately MP 1210 to 1280), also requires additional maintenance, particularly to combat the fine sandy soil that blows on to the track, fouls the ballast, and fills the ditches. UP and SP have engaged in a number of strategies to prevent the fouling in the first place. These include planting trees and constructing sand berms and sand fences. These strategies, while possibly mitigating the problem, have not solved it, and UP continues to incur additional costs to maintain these tracts, including { } in contract costs for ballast undercutting and shoulder cleaning over and above the normal costs for undercutting, ditching and shoulder cleaning.¹⁵³ AEPCO ignores these costs.

iv) Alto Flats Subgrade Instability

As described in Section III.F.2.a.(4), east of Cochise, Arizona, the track crosses the Alto Flats, a dry lakebed (MP 1065 to 70), which causes unique maintenance challenges and increased construction costs. According to information provided by UP's Manager Track Maintenance, Randy Sholl, the subgrade is unstable and as a consequence, the track continues to slowly sink. This requires inspection and spot raising in this five mile area of at least two to three times a year, especially in early spring and after heavy rainfall. UP has also had to construct earthen berms on the north side of the track to impede erosion caused by flash flooding. The unique condition requires additional inspection and maintenance activities and costs. The cost of the spot surfacing is included in Mr. Albin's surfacing costs and also

¹⁵³ *Id.*

included in the activities of the local section crew and district gang. AEPCO did not take these additional activities into account in determining the size of its MOW field workforce.

Mr. Albin's estimate of the annual cost for OE contract maintenance-of-way is 9.7 million. His calculations of costs for contracting work are included in BNSF/UP Supplemental Reply Exh. III.D.4-1, and in electronic workpaper "III D 4 Maintenance of Way.xls."

(4) Summary Of Maintenance-Of-Way OE

AEPCO's total MOW OE cost is \$10.1 million. Mr. Albin's total restated cost is 38.5 million. AEPCO's evidence fails to support its assumptions about the maintenance requirements of ACE's plant. AEPCO's MOW staff is meager, its equipment inadequate, and it has offered no support for its numbers. Its implied assumption that most maintenance (including what should be classified as operating maintenance) will be handled by contractors is a shell game designed to avoid having to address the real-world activities and real costs associated with providing adequate maintenance. As discussed above, AEPCO's total operating maintenance budget is based on the ridiculous and completely unsupported assumption that operating maintenance for track work is only ten percent (10%) of the cost for programmed track replacement. With respect to operating expense contract costs for activities that are typically contracted out, AEPCO's estimates are understated because it uses unsupported frequencies for track maintenance activities such as rail grinding and testing, and miscalculates the quantities for other contract work such as weed control and ditch cleaning.

Under SAC principles, AEPCO has the burden of proof to show in its opening evidence that its assumptions are reasonable and that its costs are supported. AEPCO's evidence fails to meet its burden of proof on maintenance of way OE.

c. ACE Capital Maintenance-Of-Way

Even though the annual capital cost is not added into the stand-alone costs, the exercise of developing these costs demonstrates the fallacy of AEPCO's arbitrary allocation methodology. Developing both the capital budget and the OE budget in a principled and consistent manner and then calculating (as opposed to allocating) the percentage of total annual MOW costs that are attributable to operating expense provides a basis for analyzing whether AEPCO's percentage-based allocations have any relationship to the real-world division between capital and OE. Mr. Albin demonstrates that AEPCO's approach produces totally unrealistic results.

Mr. Albin's MOW capital budget is discussed under the following headings: (1) ACE Capital Replacement Programs (by asset group) and (2) Equipment Requirements for the Capital Budget.

(1) ACE Capital Replacement Programs

In its estimate of total maintenance, AEPCO included the program replacement of various capital assets based on their asset lives, a labor cost for track replacement, and then allocated twenty-five percent (25%) of its internal workforce's salaries and equipment costs as capital expenditures. As discussed in the Overview, there is no principled explanation for AEPCO's allocations. AEPCO also erred in developing its contract labor costs. Specifically, AEPCO labor costs are based on tie replacement costs of \$19 per tie, rail replacement costs of \$8 per linear foot, and surfacing costs of \$3 per track foot.¹⁵⁴ AEPCO multiplied the surfacing cost by track miles rather than track feet thereby

¹⁵⁴ AEP Opening workpaper AEP 05259.

understating by several million dollars the actual labor cost ACE would pay based on these unit costs.

In his restatement of capital costs, Mr. Albin developed his capital budget for programmed maintenance in the same way that he developed the operating maintenance-of-way budget – adhering to the principles for classifying MOW activities and costs as either capital or operating expense. In the subsections below, he calculates the annualized replacement costs for each category of capital asset. For the programmed track maintenance he develops both the labor and materials cost for track replacement by building from the bottom up the system production gangs that are needed to handle the annual program maintenance of the 970 miles of track the Railroads calculated for ACE.

(a) Annual Track Replacement

For each of the major track items – rail, ties, surfacing, turnouts, and crossings – Mr. Albin estimated the amount that would be replaced each year and then determined the manpower requirements based on (1) the expected production rates for the appropriate gang types needed to perform that maintenance, (2) the manpower required to unload and place material at the work site in preparation for the gang, and (3) the manpower required to clean up the work site and load scrap and secondhand material.¹⁵⁵ The personnel requirements for the annual replacement maintenance program on ACE, including work train requirements, include rail gangs (44 persons), tie gangs (40 persons), surfacing gangs (8 persons), turnout gangs (6 persons), crossing gangs (6 persons), switch tie gangs (6 persons), switch undercutting gangs (6 persons), track undercutting gangs (6 persons) and

¹⁵⁵ Details of his calculations are in BNSF/UP Supp. Reply electronic workpaper “III D 4 Maintenance of Way.xls.” A summary of the normalized program maintenance costs is included in BNSF/UP Supplemental Reply Exh. III.D.4-1.

shoulder ballast cleaning gangs (6 persons). The number of personnel, wages and details are included in BNSF/UP Supplemental Reply Exh. III.D.4-1.

Mr. Albin used BNSF's rail labor cost for estimating gangs to develop the total cost for each of the pertinent gangs. To that total he added fringe benefits based on BNSF's benefits paid in 2001. He also added an allowance of twenty-two percent (22%) to cover the work crews' expenses including travel, corporate accommodations, and meals.

Mr. Albin's estimate of the total annual capital budget for track maintenance labor is 46.2 million.

In determining the annualized track materials cost, AEPCO used a rail life of 1 BGT on curves and 500 MGT on tangent but provides no support for these standards. AEPCO's standards are inconsistent with the Railroads' and Mr. Albin's experience as well as basic physics. Rail on curves are subjected to far greater forces than rail on tangent. As a result, rail on curves experience considerably shorter rail lives than rail on tangents, even where the curve rail is premium head hardened and the tangent rail is standard carbon as on ACE. The Railroads' standards reflect this fact. BNSF uses a standard rail life of 1 BGT for tangents, 500 MGT for curves less than three degrees, and 300 MGT for curves greater than three degrees. UP uses a standard rail life of 1.2 BGT for tangents, 500 MGT for curves less than three degrees, and 250 MGT for curves greater than three degrees. Based on the Railroads' curve inventory for the ACE replicated line segments, more than 94 route miles of ACE track is in curves.¹⁵⁶ Mr. Albin has used UP's rail life of for tangents and BNSF's rail life for curves. Even these lives are achievable

¹⁵⁶ BNSF/UP Supplemental Reply Exh.III.D.4-1.

only if specially equipped maintenance crews grind crossings and switches and spot grind curves on a regular basis – activities that AEPCO overlooks in its MOW costs.

The annual capital costs for track component replacements including rail/tie/surfacing, undercutting, shoulder ballast cleaning, switch undercutting, turnout replacement, switch tie, and crossing replacements total \$10.9 million.

(b) Annual Bridge And Culvert Replacement

AEPCO estimated \$645,852 for the normalized bridge and culvert maintenance costs based on replacing the assets at the end of their economic lives. Mr. Albin agrees with the asset lives and the methodology. However, because AEPCO underestimated the investment in facilities and buildings as discussed in Section III.F.7 *infra*, its costs for annualized maintenance of such facilities also are understated. Mr. Albin's normalized replacement costs reflect BNSF's restated road property investment costs.

His estimate of the total annual capital budget for bridges (\$2.0 million), for culverts (\$0.1 million), and for buildings and facilities (\$2.7 million) is \$4.8 million.

(c) Annual Signal And Communication Replacement

AEPCO included \$1,360,287 in its capital costs for replacement of signal and communication equipment, based on the economic lives of those assets. Mr. Albin calculated his replacement costs in the same way as AEPCO but his costs are higher because of the additional quantities of these items included in the Railroads' restated investment costs. In his restatement, Mr. Albin estimated the annual capital MOW budget for the signals and communications and electrical departments, which includes program maintenance of crossing warning devices, hot bearing and dragging equipment detectors,

microwave stations, and CTC. The total annual capital MOW cost for those items is \$4.4 million.

Total Asset Replacement Programs cost is \$29.9 million.

(2) Equipment Requirements For The Capital Budget

(a) Production Gang Equipment

AEPCO estimated a total annual equipment budget of a paltry \$208,986 and allocated twenty-five percent (25%) of that amount or \$52,246.50 to capital costs, notwithstanding AEPCO's claim that the crews that will use this equipment will perform entirely OE work. In his restatement of the capital MOW equipment, Mr. Albin developed a list of the equipment that would be needed by each of the system production gangs performing annual scheduled program maintenance on ACE. Some of the items omitted from AEPCO's list include anchor machines, anchor remover, back hoe, cranes, rail grinders, rail expanders, spike drivers, hopper cars for hauling ballast, tie adzers, and the like. Mr. Albin's comprehensive list includes the minimum standard equipment required to perform the programmed replacement of track structure and components. The list is included in BNSF/UP Supplemental Reply Exh. III.D.4-1. Mr. Albin's calculations of the pieces of equipment needed by each gang are included in his workpapers.¹⁵⁷ His estimate of the total annual maintenance equipment for the capital budget is \$5,274,409.

(b) Work Train Equipment

In his restatement, Mr. Albin determined the number of work trains that would be needed on ACE, an item that AEPCO ignored completely, possibly on the assumption that

¹⁵⁷ BNSF/UP.SUPPRP.WP.III.D.4-0162 to 0170.

contractors would take care of such things. However, nothing in AEPCO's evidence either supports that assumption or covers the costs associated with such assumption.

Mr. Albin calculated the number of work train days that would be needed for each activity, including tie distribution, rail gang distribution, surfacing and ballast distribution, and miscellaneous scrap clean-up. His estimate includes the cost for picking up released rail and ties. As state laws prohibit burning creosote coated scrap wood ties, they must be removed to an approved landfill, sold for landscaping, or disposed of in an environmentally acceptable manner. Mr. Albin took that into consideration as well. Mr. Albin has also estimated the costs for crews to load and unload materials from work trains. He estimates that maintenance of ACE would require {

} days for miscellaneous maintenance work) at \${ } per day for track maintenance for an annual OE cost of \${ } and a capital cost of \${ }.

BNSF/UP Supplemental Reply Exh. III.D.4-1 also summarizes Mr. Albin's estimate of the work train equipment. Details of his capital budget calculations are included in his workpapers.¹⁵⁸

Mr. Albin determined that ACE would need two work trains operating throughout the year. The work trains are used for such tasks as delivery and pick up of material for replacement track and bridge work and for maintenance activities such as hauling rip rap, dumping emergency ballast, hauling away waste from yard cleaning, hauling debris, etc. Mr. Albin conveyed work train requirements to BNSF witness Mr. Mueller, who then

¹⁵⁸ BNSF/UP Supp. Reply electronic workpaper "III D 4 Maintenance of Way.xls."

determined the number of locomotives needed for the work trains and included that locomotive cost in his operating costs in Section III.D.3.

d. Total Annual Maintenance-Of-Way Costs

Mr. Albin's estimate of the total annual cost of maintaining ACE, including costs for personnel, materials, equipment, and outside contract work, is \$84.8 million at First Quarter 2001 levels. Of this amount \$38.5 million or 45.5 percent, represents the amount attributable to OE. A comparison of Mr. Albin's estimate with AEPCO's estimate is set forth in Table III.D.4-6.

Table III.D.4-6
Comparison Of Summary Of BNSF Estimate Of Total Maintenance
And OE Maintenance Costs To AEPCO's Opening Statement

Item	Railroads (Millions)	AEPCO (Millions)
Personnel	\$30.4	\$4.4
Training	\$2.4	\$0.0
Normalized Track Materials	\$17.2	\$14.2
Contract Work	\$9.7	\$14.4
Equipment	\$12.0	\$0.2
Normalized (Capital) Maintenance	\$10.9	\$2.9
Work Trains	\$2.2	\$0.0
Total Maintenance Cost	\$84.8	\$36.1
Operating Expense	\$38.5	\$10.1
<i>Operating Expense Portion</i>	<i>45.5%</i>	<i>28%</i>

Source: AEPCO Opening electronic workpaper "SpotMaint.xls." BNSF/UP Supplemental Reply Exh. III.D.4-1.

As Table III.D.4-6 demonstrates, AEPCO has understated the MOW costs associated with maintaining a railroad designed to accommodate the traffic designated for ACE.

As noted above, the annual capital cost is not added into the stand-alone costs, but the exercise of developing these costs is essential to demonstrating the fallacy of AEPCO's arbitrary allocation methodology.

As can be seen from the figures above, developing both the capital budget and the operating expense budget in a principled and consistent manner shows that Mr. Albin's estimated operating expense maintenance-of-way is 45.5 percent of total annual MOW cost. This is considerably higher than AEPCO's estimate of only twenty-eight percent (28%) of its total annual maintenance and shows the arbitrariness of AEPCO's method of determining maintenance-of-way operating expenses by simply allocating an arbitrary percentage of certain categories of the total annual cost to the operating budget.

In contrast, Mr. Albin's estimate of the OE budget in relation to total MOW costs is consistent with the actual experience of BNSF and other real-world railroads comparable to ACE. According to BNSF Assistant Vice President of Engineering Services, the OE portion of the total BNSF MOW budget was { } in 2001 and { } in 2002.¹⁵⁹ As the table below shows, Mr. Albin's development of OE costs produces a result that is significantly closer to the real-world experience of MRL and FEC than is AEPCO's estimate of twenty-eight percent (28%). AEPCO has made no attempt to support its methodology and has put in no evidence on opening to counter the real world experience of other railroads.

¹⁵⁹ BNSF/UP.SUPPRP.WP.III.D.4-0231. To ensure an apples to apples comparison, Mr. Albin used BNSF's internal engineering department's MOW budget rather than MOW costs reported in the R-1. The R-1 MOW expenses reflect line items of charges and credits that are not relevant to SAC calculations. Similar internal budget data for UP were not readily available.

**Table III.D.4-7
Comparison of Operating to Capital Expense Ratios**

Railroad	OE as Percentage of Total MOW Budget
AEPCO's ACE	28%
MRL	58.5 – 64.5% ¹⁶⁰
FEC	37.5% - 44.4% ¹⁶¹
Railroads' ACE	45.5%

Source: BNSF/UP.SUPPRP.WP.III.D.4-0022 to 0025; BNSF/UP Supplemental Reply Exh. III.D.4-1.

In assigning an unreasonably low percentage of ACE's maintenance costs to OE, AEPCO overlooks the important relationship between a railroad's level of OE maintenance activity and its need for capital maintenance expenditures. Much of a railroad's OE maintenance is aimed at ensuring that its assets achieve their predicted lives. Without ongoing maintenance, those assets would have to be replaced *more* frequently, leading to additional costs associated with the programmed maintenance cycles. An unduly low OE, such as AEPCO proposed, is thus penny-wise and pound-foolish because the failure to spend operating dollars on a daily basis results in shorter economic lives for the track components and thus more frequent capital replacement of the assets. Moreover, as described in detail above, failure to provide an adequate operating budget would result in deferred maintenance that would degrade service. Insufficient OE resources would also hamper a railroad's ability to deal expeditiously with unexpected events that could interfere with critical train operations.

Mr. Albin has structured a program of maintenance for ACE that strikes the proper balance between OE and capitalized programmed maintenance.

¹⁶⁰ BNSF/UP.SUPPRP.WP.III.D.4-0024 to 0025. Calculated on basis of information provided by MRL, which gave range of budget for past few years.

¹⁶¹ BNSF/UP.SUPPRP.WP.III.D.4-0022 to 0023. Calculated on basis of information provided by FEC, which gave a range of budget for past few years.

e. Maintenance Windows

As discussed above in Section III.C.2.a, AEPCO's string program analysis failed to account for MOW maintenance windows for unplanned outages. There are three types of essential railroad maintenance activities that require extended periods of track time: (1) programmed replacement by system production gangs, *i.e.*, rail, tie, surfacing, planned contract work, and the like, (2) regular inspections and planned daily maintenance, and (3) maintenance work required to address unplanned events like the repair of broken rail, realignment of surface, or other emergencies that disrupt traffic. Programmed MOW work can be planned to avoid interference with peak traffic periods. To a lesser extent, the more regular inspections and planned day-to-day maintenance can also be worked around peak traffic periods, although it cannot be altogether ignored just because traffic volumes are heavy. Safety would be compromised if a railroad totally avoided routine inspections just because traffic levels were high during a particular time. But the third category of maintenance activities cannot be planned or avoided regardless of the level of traffic.

AEPCO based its operating plan on a string diagram that analyzes train movements for what AEPCO considers to be a peak traffic period. This string diagram assumes that there will be no maintenance activity on the railroad during that period. While it may be reasonable to assume that the railroad would not schedule its programmed replacement of assets, or its seasonal contracting activities such as weed spraying, ditching, rail grinding, track geometry, etc. during the peak period, it is unrealistic to expect that *no* maintenance will be conducted during that or any other period on a railroad handling the tonnages ACE is assumed to be handling and running the numbers of trains ACE is assumed to be operating. Some maintenance must be performed in the heavy-tonnage territories

throughout every week of the year. The Railroads' experience bears this out and there is no basis for assuming anything to the contrary.

In his analysis of BNSF's Random Failure Reports for 2001 and information provided by UP, discussed more fully in III.D.4.a, Mr. Albin noted that on the line segments replicated by ACE, during the peak year of 2001, there was a total of 2,418 outages on ACE line segments or an average of 6.6 occurrences per day, with resulting track outages averaging between 2.8 and 4 hours each. These occurrences cannot be ignored and time must be spent performing maintenance that shuts down the lines in order to address them.

In addition, other inspections and immediate repairs of detected problems must be conducted regardless of traffic volumes. Indeed, the need for regular performance of this maintenance activity increases with the increase in tonnage. Examples of situations requiring track time even during peak periods include:

- Immediate follow up and repair of any problems found by track inspectors,
- Closer inspection and subsequent repair of rough track reported by track and train crews;
- Immediate inspection of signal outages and malfunctions;
- Maintenance of turnouts, grinding frogs, welding frogs, and switch points;
- Mechanical adjustments of switches and corresponding signals;
- Prompt attention to track irregularities requiring adjustment or alignment and surfacing;
- Raising and maintenance of bridge ends, especially on open deck bridges in high tonnage areas;
- Immediate correction of drainage problems that could damage the subgrade or impede traffic;

- Maintenance to switch heaters and blowers;
- Inspections after unusual events, such as major rain or snow storms.

Often, equipment needed for repairs is too large to move by road and must move by rail. For example, a normal and somewhat minor daily occurrence is the need to raise or align track to remove a slow order. This must be done immediately to avoid a more serious outage or track failure. It may take two to three hours to move the large equipment into place, complete the job and return the equipment to storage. During that time, the track is closed to traffic. Similarly, a simple task such as unplugging a culvert or cross drain between double main tracks in an inaccessible area (*i.e.*, on a high fill or cut) may need several hours of track time, but that time is essential to avoid soft subgrade and an eventual slow order if the condition is not corrected.

AEPCO's operating plan provides no opportunity for ACE's MOW workforce to respond to the daily unplanned maintenance that is inevitable on a railroad the size and tonnage of ACE. In any event, as discussed above, ACE's MOW plan provides too few workers too sparsely equipped to perform all of the maintenance that would be required to keep ACE operating. For these reasons, AEPCO's MOW plan should be rejected and Mr. Albin's MOW plan should be accepted by the Board as the best evidence of record.

5. Leased Facilities

AEPCO assumed that, as the replacement for BNSF and UP, ACE would participate in any joint facility agreements, including joint facility agreements between the Railroads, on the same basis as the Railroads. In particular, AEPCO assumed that ACE would operate between Vaughn, New Mexico, and El Paso, Texas, via BNSF's trackage rights over UP. AEPCO Opening Nar. at III-D-71. As discussed in Section III.B.2 above, the Railroads believe this is not consistent with SAC principles and that AEPCO should be

required to build a north-south line so as to “take into account the full costs of providing and maintaining the physical plant needed to serve the traffic.” *November 19 Decision* at 6. As noted above (at Section III.B.2.(a)(ii)(c), for purposes of preparing DCF calculations for their Supplemental Reply evidence, the Railroads have used a 9.05 mills per-GTM rate to estimate the trackage rights payments ACE would make to UP were it permitted to operate over trackage rights between Vaughn and El Paso.

6. Loss & Damage

The Railroads accept AEPCO’s costs for ACE.

7. Insurance

AEPCO computed ACE’s insurance cost based on application of the 2001 BNSF and UP ratio of insurance to freight operating expenses (less depreciation and casualties and insurance) of 3.48% and 3.26%, respectively. The Railroads’ witness Mr. Kent testifies that a carrier the size of the hypothetical ACE would not be able to achieve the low insurance costs enjoyed by BNSF and UP. That is because Class I carriers the size of BNSF, UP, CSX, and NS, are self insured with deductibles per incident of around \$25,000,000. Limited resources and investor demands require smaller carriers to self insure at much lower levels. Beyond the self insured level, Class I carriers, and most regional and shortline carriers, secure insurance through major insurers such as Marsh Inc. and AIG. The lower the self-insurance level, the higher the insurance premium tends to be. As a result, smaller carriers often pay more in insurance costs as a percentage of their expenses than larger carriers do.

To examine the reasonableness of AEPCO’s application of the 2001 BNSF and UP ratio of insurance to freight operating expenses (less depreciation and casualties and insurance) of 3.48% and 3.26%, respectively, to ACE, Mr. Kent examined the historical

ratios for Class I carriers for the years 2000, 2001, and 2002.¹⁶² The ratios for Class I carriers range from a low of 2.03% to a high of 11.55%.¹⁶³ It is logical to assume that ACE would experience the same level of insurance costs as its peer group, that is, Class I carriers with less than \$1 billion in revenues per year. Table BNSF/UP III.D.7-1 shows that the three-year average for those carriers was 5.55% of total freight operating expenses as compared with 3.11% for larger carriers. Application of the higher ratio to ACE freight operating expenses yields an annual insurance expense of \$18.1 million. That amount is consistent with the insurance cost experienced historically by small Class I carriers.¹⁶⁴

Table BNSF/UP III.D.7-1

Category of Carrier	Insurance Operating Expense Ratio			
	2000	2001	2002	Average
Class I with <\$1 B revenues	6.30%	5.40%	4.96%	5.55%
Class I with >\$1 B revenues	3.00%	2.95%	3.38% ¹⁶⁵	3.11%

8. Ad Valorem Tax

For purposes of this case, because the Railroads accept AEPCO's route miles they also accept AEPCO's ad valorem taxes.

9. Other – Additional Costs Associated With Not Building to Alfalfa

As discussed above, AEPCO chose to terminate ACE's east-west Cochise-El Paso segment at UP milepost 1297.76 (Cotton St.), which is roughly at the east end of UP's

¹⁶² BNSF/UP Supp. Reply electronic workpaper "Insurance.xls"; *see also* BNSF/UP.SUPPRP.WP.III.D-0098-0116.

¹⁶³ AAR data shows CNGT experiencing 24.19% in insurance costs in 2002. However, given that 2002 was the first year in which CNGT reported as a consolidated carrier owned by a Canadian railroad, Mr. Kent excluded that outlying number from consideration here.

¹⁶⁴ BNSF/UP Supp. Reply electronic workpaper "Insurance.xls."

¹⁶⁵ Excludes outlier ratio of CNGT at 24.19%.

Dallas Street Yard just east of downtown El Paso. AEPCO Opening Exh. III-B-1 at 15. AEPCO places ACE's own El Paso yard more than five miles to the west, between mileposts 1292.82 and 1291.07. *Id.*; BNSF/UP Supplemental Reply Exh. III.D.9-1. ACE no doubt chose this location to avoid building its yard in downtown El Paso, where real estate would be quite expensive, or having it straddle the Rio Grande River, which ACE's line crosses west of downtown. BNSF/UP Supplemental Reply Exh. III.D.9-1.

AEPCO's operating plan calls for ACE to deliver eastbound trains to UP's El Paso Yard (known as Dallas Street Yard), where they will be fueled and inspected by UP forces. AEPCO Opening Nar. III-C-21. ACE plans to receive westbound trains at its yard, where ACE will fuel and inspect the trains. AEPCO Opening Nar. at III-C-24 to 26.

As noted above, the Railroads have accepted AEPCO's proposed plan as generally feasible. However, AEPCO's plan would impose additional costs on UP's operations. First, AEPCO has located ACE's yard several miles west of the point in El Paso at which UP trains customarily change crews. The requirement that UP move its westbound trains several miles farther west to deliver them to ACE's yard will add transit time and increase the potential for UP's crews to run out of time, requiring costly re-crews.

In addition, since UP's inbound (westbound) crews will be terminating at ACE's facility instead of UP's facility, they will need to be taxied from ACE's yard to UP's yard in downtown El Paso (across the Rio Grande River), incurring taxi costs. (Under ACE's plan to use run-through power, these crews will not return with their power or deadhead back to El Paso on an eastbound ACE train.) Likewise, ACE's eastbound crews arriving at El Paso will take their trains to UP's yard, and then will need to taxi back to ACE's yard on the west of town. The Railroads have added the cost that ACE will bear to its operating

expenses and also required ACE to shoulder the burden of the additional costs it will be imposing on UP, as required by Board precedent. Second, several UP westbound trains perform work at UP's Alfalfa Yard, which is on the outskirts of El Paso, miles farther east than UP's Dallas Street Yard where these trains currently change crews. BNSF/UP Supplemental Reply Exh. III.D.9-1.¹⁶⁶ Approximately fifty percent (50%) of the time, UP's inbound crews on these trains run out of time to complete their work at Alfalfa, or to reach the Dallas Street Yard to be relieved by a new crew. In those situations, UP adds a new crew at Alfalfa, which then completes any remaining work at Alfalfa and runs through to Tucson. Under ACE's plan as proposed, however, UP would have to add a crew at Alfalfa solely to traverse the ten miles from Alfalfa to ACE's El Paso yard. Such an operation would be highly inefficient and add costs that UP does not bear today.

The added costs of these inefficiencies must be borne by ACE rather than UP.¹⁶⁷ To estimate those costs, the Railroads' witnesses have calculated the crew costs that UP or ACE would incur in moving trains from Alfalfa to ACE's yard on those occasions when the inbound UP crew would terminate at Alfalfa. UP would have to incur additional unproductive crew costs associated with this inefficient and cumbersome operation approximately 248 times per year – *i.e.*, fifty percent (50%) of the time for the westbound trains that perform work at Alfalfa. Shuttling these trains to ACE's yard is unlikely to consume a crew's entire service time, but they will not be available to crew a UP line-haul train destined east or north of El Paso within their hours-of-service. Therefore, UP will in

¹⁶⁶ BNSF/UP Supp. Reply electronic workpaper "Alfalfa Shuttle crews.xls"; AEPCO Opening workpaper AEP 03526.

¹⁶⁷ *TMPA* at 23-24; *Duke/NS* at 29-30; *CP&L/NS* at 21-22.

effect incur a full day of crew cost for less than half a day of productive work — *i.e.*, the movement of the train beyond Alfalfa. The Railroads conservatively estimate the additional costs incurred by the residual UP as a result of ACE's service design at one half the cost of two crew people whose time would be spent shuttling trains from Alfalfa to ACE's yard, or \$127,332 per year.¹⁶⁸

10. Summary of Total Operating Expenses

Table III.D.10-1
Annual Operating Expense For The ACE — 2001

<u>Item</u> (1)	AEPCO ACE Amount <u>(millions)</u> (2)	BNSF/UP ACE Amount <u>(millions)</u> (3)
1. Trackage Rights	1.7	1.3
2. Maintenance of Way (spot)	10.1	38.5
3. Locomotive Fuel and Servicing	57.7	91.1
4. Locomotive Lease	7.2	18.4
5. Locomotive Maintenance	15.4	29.0
6. Operating Personnel Incl. Materials and Supplies	26.7	60.2
7. Freight Car Expenses	55.4	55.4
8. Ad Valorem Taxes	1.3	1.3
9. Loss and Damage	2.5	2.5
10. General and Administrative	13.3	18.6
11. Burden Shifting	0	1.7
12. Year 1 Training and Start-up	0	7.6
13. Insurance	6.4	18.1
14. Total	\$197.7	\$343.7

¹⁶⁸ BNSF/UP Supp. Reply electronic workpaper "Alfalfa Shuttle crews.xls."

E. NON-ROAD PROPERTY INVESTMENT

1. Locomotives

AEPCO assumed that all of the ACE's locomotives would be leased and defendants accept that arrangement. The ACE's locomotive requirements and leasing costs are discussed in Sections III.C.2.d and III.D.1.

2. Rail Cars

AEPCO assumed that all of the ACE's rail cars would be leased as well and Defendants accept that arrangement. Defendants have accepted AEPCO's rail car assumptions and costs.

3. Other

The ACE's company motor vehicles and office equipment, such as computers, software programs, telephones, and the like are discussed as operating expenses in Section III.D.3. Maintenance-of-way equipment is discussed in Section III.D.4.

F. ROAD PROPERTY INVESTMENT

BNSF/UP's road property investment evidence is sponsored by the following experts:

Robert J. Gloodt, Senior Manager Appraisals, Union Pacific Railroad (UP) (III.F.1 Land – Texas); Christopher D. Kent of FTI Consulting, Inc. (FTI) (III.F.1 Land – New Mexico and Arizona microwave tower sites); Robert C. Phillips, P.E. of Ralph Whitehead Associates, Inc.(RWA) (III.F.2 Roadbed Preparation), Michael R. Baranowski of FTI (III.F.2 and spreadsheets); George T. Zimmerman, P.E. of RWA (III.F.3 Track Construction and III.F.12.b Track Schedule (Staging)); Paul B. Michiels, P.E. of RWA (III.F.5 Bridges and III.F.12.a El Paso Trainway) and Rick A. Meredith of RWA (III.F.5 Bridges and Schematics); Joseph Walton III, Consultant on subcontract to RWA (III.F.6 Communications); C. W. (Pat) Price of RWA (III.F.6 Signals); James Primm, Consultant on subcontract to RWA (III.F.7 Facilities); Dennis K. Prewitt of RWA (III.F.2 Culverts and Compilations); and Robert H. Baughman, P.E. of RWA (III.F.9 Mobilization, III.F.10 Engineering/Construction Management and III.F.11 Contingencies) (together “BNSF/UP Engineering Consultants”). This team of experts reviewed AEPCO's road property investment evidence and concluded that AEPCO has used improper assumptions or incorrect calculations and thus has understated road property investment costs, in some areas by substantial amounts.

The problems with AEPCO's assumptions and development of costs are explained in detail in §§ III.F.1 through III.F.12. For the reasons set out in those sections, the Board should apply BNSF/UP's cost assumptions in carrying out its analysis of the stand-alone costs for ACE. The differences between BNSF/UP and AEPCO on the issues in dispute are set out in the table below.

Table III.F.1
Summary of BNSF/UP's Estimate of Road Property Investment
for ACE Railroad Versus Complainant's Estimate at 1Q2001 Levels

Item	BNSF/UP 2001 Amount (\$Millions)	AEPCO 2001 Amount (\$Millions)	Difference (\$Millions)
III-F-1. LAND	\$13.11	\$9.68	\$3.43
III-F-2. ROADBED PREPARATION			
a. Clearing and Grubbing	33.57	1.23	32.34
b. Earthwork	395.17	168.45	226.71
c. Lateral Drainage	0.00	0.00	0.00
d. Culverts	8.06	2.82	5.24
e. Other	142.29	7.00	135.29
III-F- 3. TRACK CONSTRUCTION			
a. Geotextiles	0.59	0.00	0.59
b. Subballast and Ballast	154.28	164.58	-10.30
c. Ties	101.01	104.60	-3.59
d. Track (Rail)	124.81	124.06	0.75
e. Switches (Turnouts)	28.51	26.67	1.84
f. Other	49.23	45.67	3.56
Track Labor	288.59	166.46	122.13
III-F-4. TUNNELS	0.00	0.00	0.00
III-F-5. BRIDGES	148.25	45.01	103.24
III-F-6. SIGNALS AND COMMUNICATIONS			
a. Centralized Traffic Control System (CTC)	85.67	39.40	46.27
b. Hot Bearing Detectors/Dragging Equipment Detectors	1.73	2.58	-0.85
c. Communications	40.39	6.79	33.60
III-F-7. BUILDINGS AND FACILITIES			
a. Fueling	61.03	18.36	42.66
b. Waste Water Treatment Plants	2.70	0.15	2.55
c. Locomotive Facility	12.57	3.82	8.76
d. Car Repair Shop	4.16	0.00	4.16
e. Headquarters/stations	2.19	1.39	0.80
f. Roadway buildings	2.44	1.11	1.33
g. Yard site	3.21	2.21	1.00
III-F-8. PUBLIC IMPROVEMENTS			
a. Fences	14.04	0.00	14.04
b. Roadway Signs	0.34	0.07	0.28
c. Crossings	3.03	0.15	2.88
III-F-9. MOBILIZATION	40.99	2.94	38.05
III-F-10. ENGINEERING COSTS	232.52	64.74	167.78
III-F-11. CONTINGENCIES	170.79	74.61	96.18
SUBTOTAL	\$2,165.27	\$1,084.55	\$1,080.72
BNSF/UP Reimbursable Expenditures	3.78	0.00	3.78
TOTAL	\$2,169.05	\$1,084.55	\$1,084.50

Source: BNSF/UP Supplemental Reply electronic workpaper "ACE Construction.xls"; BNSF Supplemental Reply Exh. No. III.F.1.

1. Land

AEPCO states that it used a comparison sales or substitution approach to develop costs for the real estate needed by the ACE.¹ It presented a report of an outside appraiser (Theodore E. Needham, Jr. of Real Estate Science Corporation) covering the New Mexico and Arizona real estate to be used by the ACE.² This real estate included the existing UP and BNSF rights of way, with the exception of the segment from Vaughn to El Paso, and certain yards and microwave tower locations. AEPCO's evidence on the value of the ACE right of way in Texas (all located in El Paso County) was sponsored by Philip R. Burris of L. E. Peabody & Associates, Inc.³ The statement of Mr. Burris's qualifications does not indicate that he has any credentials or experience in real estate appraisal.⁴

In view of the limited time available to prepare this reply evidence, and for purposes of this case only, BNSF and UP have determined that they will accept AEPCO's real estate values for the New Mexico and Arizona rights-of-way and its price per acre for yards and microwave towers in those states. The Railroads do not accept the value of \${ } AEPCO provided for the Texas portion of the ACE right of way. UP has analyzed real estate values in El Paso County and has concluded that the value of the Texas portion of the right of way is considerably higher than the figure AEPCO used. AEPCO relied on a few transactions involving industrial or agricultural land that is not in close proximity to the ACE right of way. Among other things, AEPCO failed to recognize that the right of way passes through valuable commercial property in downtown El Paso. Analysis of over 20 transactions in the vicinity of

¹ AEPCO Opening Nar. at III-F-2, 4.

² AEPCO Opening Nar. at III-F-8, IV-34.

³ AEPCO Opening Nar. at III-F-8, IV-35 to 36.

⁴ AEPCO Opening Nar. at IV-35 to 36.

the ACE right of way, along with other relevant information, shows that the value of the Texas real estate is almost { } AEPCO estimated.

Robert J. Gloodt, Senior Manager Appraisals in UP's Real Estate Department, performed the Railroads' analysis of the portion of the ACE right of way located in El Paso County. Mr. Gloodt is a real estate professional with 20 years of experience in commercial real estate appraisal, including positions with Bank of America Appraisals, Inc. and Arthur D. Little Valuation, Inc.⁵ He joined UP as Manager Appraisals in 1998 and was promoted to Senior Manager Appraisals in 1999. Mr. Gloodt manages the day-to-day appraisal process for UP and has substantial experience providing appraisals of corridor and non-corridor real estate for UP. He is an active member of the International Right of Way Association, an appraisal trade association.

a. Acreage

For the purposes of this case, BNSF and UP accept AEPCO's acreage for the ACE right of way located in New Mexico and Arizona. For the Texas portion of the right of way, AEPCO estimates that the ACE would need to acquire 48.73 acres of land along the current UP mainline right of way in and around El Paso, Texas.⁶ (This is part of the former SP mainline known as the Sunset Route.) This portion of the ACE begins at MP 1297.76 (the connection to the Tucumcari line, which the ACE proposes to use between El Paso and Vaughn, New Mexico, via trackage rights) and follows the UP right of way west to MP 1292.96 (location of the Texas/New Mexico border, where the right of way crosses the Rio Grande). AEPCO uses a 75-foot wide right of way for the property between MP 1294.68 and MP 1297.76, which is located in downtown El

⁵ See BNSF/UP Supplemental Reply § IV.

⁶ AEPCO Opening electronic workpapers "ACE land value.xls," Tab "Texas ROW."

Paso. It uses a 100-foot wide right of way for the portion between MP 1294.68 and 1292.96, a less highly developed area on the western side of El Paso. Because AEPCO has chosen to relocate its El Paso yard to Sunland Park, New Mexico, west of the Rio Grande, it does not include any Texas acreage for a yard.

Mr. Gloodt has accepted AEPCO's designation of mileposts and right-of-way widths. Using UP's valuation maps, he has computed total acreage of 48.68 acres for Texas, slightly less than AEPCO's total.⁷

The Railroads' witnesses have determined that the size of some yards AEPCO proposed for the ACE must be increased to meet operational needs.⁸ They have also provided for additional microwave towers, which results in increased acreage for those sites.⁹

b. Property Values

AEPCO has significantly underestimated the value of the Texas land required for the ACE right of way. Mr. Burris, AEPCO's real estate valuation witness for the Texas portion of the ACE right of way, has valued that right of way at { }.¹⁰ Mr. Gloodt's analysis, based on a larger and more representative group of real estate sales in El Paso and review of other relevant data, shows the value of the Texas right of way to be \$6.8 million.¹¹

⁷ BNSF/UP.SUPPRP.WP.III.F.1-0008; BNSF/UP Supplemental Reply electronic workpapers "El Paso Land Calculations.xls." In some cases, actual distances are slightly different from what is indicated by milepost numbers, due to occasional realignments of the track. Mr. Gloodt has relied on engineering station data in the valuation maps, rather than the milepost numbers, in computing the acreage.

⁸ See BNSF/UP Supplemental Reply §III.B.3. and BNSF/UP Supplemental Reply electronic workpaper "III F 1 Land.xls".

⁹ See BNSF/UP Supplemental Reply §III.F.6.b.

¹⁰ AEPCO Opening Exh. III-F-1.

¹¹ BNSF/UP.SUPPRP.WP.III.F.1-0003; BNSF/UP Supplemental Reply electronic workpapers "El Paso Land Calculations.xls."

(1) AEPCO's Analysis

AEPCO purports to base its Texas property values on comparable land sales in the El Paso area, but its analysis is plainly inadequate. AEPCO divided the Texas right of way into two segments. For the portion of the right of way between MP 1292.96 and MP 1294.68 (the west end of the ACE right of way in Texas), AEPCO uses just a single UP transaction to develop a unit cost.¹² The land involved in that transaction is not even close to the ACE right of way. It is located in Tornillo, Texas, approximately 15 miles southeast of El Paso.¹³ Moreover, the use of that property is different from the use along this portion of the right of way. The property in the vicinity of the right of way between MP 1292.96 and MP 1294.68 is industrial in nature. (It runs through an area known as "Smeltertown.")¹⁴ In contrast, the UP transaction AEPCO cited as the sole basis for its unit cost for this segment involved land used for agricultural purposes.¹⁵ AEPCO made no effort to adjust the sale price of this single transaction to reflect the different location and use of the property.

For the remainder of the ACE right of way, between MP 1294.68 and MP 1297.76, AEPCO took a weighted average of the prices of five UP transactions.¹⁶ None of the land

¹² AEPCO Opening electronic workpaper "ACE Land Value.xls," Tab "Texas Land Price." It appears that, unlike the Railroads, AEPCO did not bother to look for multiple sources of information to identify transactions for comparison purposes. Instead, it merely used several UP transactions reflected in real estate documents UP produced in response to discovery requests.

¹³ AEPCO Opening workpapers AEP 04377.

¹⁴ BNSF/UP.SUPPRP.WP.III.F.1-0009, 0266.

¹⁵ AEPCO Opening electronic workpapers "ACE land value.xls," Tab "Texas Land Price."

¹⁶ AEPCO Opening electronic workpapers "ACE land value.xls," Tab "Texas Land Price."

involved in these transactions is adjacent to the ACE right of way.¹⁷ One parcel is approximately five miles away, and three are located on the other side of a yard at the eastern end of the ACE right of way. The fifth is more than half a mile south of the ACE right of way. Several of the parcels have unusual dimensions, which tends to lower their value compared with typical land in the subject area.¹⁸ Moreover, all five transactions involved industrial property. However, at least half a mile of the ACE right of way -- between MP 1296.05 and 1296.56 -- runs through the heart of the downtown commercial district. AEPCO made no effort to adjust the transaction prices to account for the different location and use of the property, or the shape of the parcels.

There is no evidence that Mr. Burris visited El Paso to conduct an inspection of the property to evaluate the comparability of the UP land sales he used to value the ACE right of way. Rather, he simply took an average of a small number of UP transactions involving lower value property, without any adjustment to account for different characteristics of this property compared with land across the fence to the ACE right of way.

AEPCO may be taking the position that it need not establish property values by standard appraisal methods. While it identifies sales comparison as the appropriate technique, AEPCO further states that it has modified standard appraisal approaches by choosing "lower cost land transactions or sale analogues" to determine land values.¹⁹ Board precedent does not support such an approach. The *PPL Montana* decision, which AEPCO quotes, merely states that the

¹⁷ The locations are shown on BNSF/UP.SUPPRP.WP.III.F.1-0210. Three of the transactions involved rights of way different from the one ACE will use; they are portions of spur tracks or industrial leads formerly owned by SP or the Missouri Pacific Railroad Company. A fourth transaction, which AEPCO described as the sale of a former rail yard, involves an industrial lead near a former Missouri Pacific yard approximately eight blocks south of the ACE right of way.

¹⁸ BNSF/UP.SUPPRP.WP.III.F.1-0214 to 0223 (showing parcel shapes).

¹⁹ AEPCO Opening Nar. at III-F-6 to 7.

SARR is not required to duplicate the inefficiencies or cross-subsidization of the defendant railroad. It does not state that a complainant may choose a route, then determine its value with reference to less desirable property, with no adjustment for the difference in characteristics of the property.

Here AEPCO has elected to build the ACE on the same route as the current UP right of way in El Paso. It must therefore estimate the actual value of that right of way by using available data and accepted appraisal techniques. AEPCO is not entitled to “lowball” the property value by disregarding the use of the land surrounding the right of way and choosing only transactions with the lowest sales prices as the basis for its value, without regard to the location, use, or other characteristics of the land involved in those transactions.

(2) The Railroads’ Analysis

Mr. Gloodt, the Railroads’ witness, performed a careful, detailed analysis of the land values for the ACE right of way in Texas, between MP 1292.96 and MP 1297.76.²⁰ Mr. Gloodt determined that UP owns the right of way in fee simple for most of this distance. The exceptions are one parcel (between Stanton Street and Kansas Street) that UP’s predecessor sold to a developer in the 1960s, and on which UP retains an easement; eight street crossings between MP 1296.02 and MP 1296.56, on which UP operates by easement granted by the City; and three street crossings for which UP has granted an easement to the City or State.²¹

²⁰ BNSF/UP.SUPPRP.WP.III.F.1-0008 to 0021; BNSF/UP Supplemental Reply electronic workpapers “El Paso Land Calculations.xls.”

²¹ BNSF/UP.SUPPRP.WP.III.F.1-0253 to 0262. In its analysis, AEPCO subtracted an amount supposedly representing an easement relating to the closing of Octavia Street. AEPCO Opening electronic workpapers “ACE Land Value.xls” Tab “Easements.” However, the railroad originally owned this land, and the City vacated its interest by ordinance in 1947. BNSF/UP.SUPPRP.WP.III.F.1-0262.

Mr. Gloodt divided the right of way into five segments in order to capture more precisely the differences in land use along the route.²²

- Segment 1 - Beginning in the west at the Texas-New Mexico border, the right of way between MP 1292.96 and 1294.68 passes through an area that includes a mix of industrial uses, including a copper smelter, a cement plant and a power plant. The area adjacent to the north is somewhat mountainous. This land is zoned M-3 industrial. (AEPCO incorrectly described this as agricultural land.²³)
- Segment 2 - The right of way between MP 1294.68 and MP 1296.05 is bordered by an industrial area to the south and a commercial area to the north, with some residential and small commercial parcels interspersed. Because of the mix of commercial and industrial uses and the smaller parcel size, the land prices are higher in the second segment than in the first. This land is zoned M-3 industrial.
- Segment 3 - The right of way between MP 1296.05 and MP 1296.56 is the most valuable segment of the right of way, because it runs through the main commercial area of downtown El Paso, where the land is typically used for office buildings and parking garages. In this area, a depressed track (known as the Bataan Memorial Trainway) is crossed above by eight streets. A high rise office building has been built over the trainway on one block (between Stanton and Kansas). The right of way and adjacent land are zoned C-5 commercial.
- Segment 4 - The right of way between MP 1296.56 and MP 1296.68 continues east from the trainway to Ochoa Street, passing through an area with a mix of industrial and commercial uses. This land is zoned M-1 industrial and C-5 commercial.
- Segment 5 - This portion of the right of way, between MP 1296.68 and MP 1297.76, is primarily an industrial area with some light commercial uses. This area has higher property values than Segments 1 and 2, because it is flatter and more built up than the area at the west end of the Texas right of way. This land is zoned M-1 industrial.

²² BNSF/UP.SUPPRP.WP.III.F.1-0008 to 0009; 0023 to 0027.

²³ AEPCO Opening electronic workpapers "ACE Land Value.xls," Tab "Texas ROW."

Photographs of the property in the vicinity of each segment are included in the workpapers.²⁴

In order to determine a unit cost for each segment, Mr. Gloodt examined a wide range of information. He reviewed records of more than 20 transactions in the vicinity of the ACE right of way, the great majority of which involved properties within six blocks of the right of way.²⁵ In addition to reviewing the UP land sales information that AEPCO used for its analysis, Mr. Gloodt contacted brokers to identify other transactions, and he reviewed an appraisal report to determine how local appraisal firms view property values in the vicinity of the right of way.²⁶ He consulted First American Real Estate Solutions, which provides a database containing the assessed value of real estate for tax purposes, as well as some information on land prices, by location. He reviewed assessment information for a sample comprising over 70 pieces of property located adjacent to the right of way or within one or two blocks of it.²⁷ Mr. Gloodt also examined aerial photos of the right of way and the surrounding vicinity²⁸ and discussed real estate price trends with outside brokers and assessors.

Using the information he gathered, Mr. Gloodt identified the transactions he regarded as relevant to each of the five segments of the Texas right of way. In evaluating the information he collected, he adjusted market sales figures and other data to 1st Q 2001 and took account of the location relative to the ACE right of way, zoning of the property, shape of the property, and other factors commonly considered by appraisers. On the basis of the information he collected, Mr. Gloodt determined the 1Q 2001 values for each of the segments. Mr. Gloodt chose

²⁴ BNSF/UP.SUPPRP.WP.III.F.1-0285 to 0291.

²⁵ BNSF/UP.SUPPRP.WP.III.F.1-0011, 0028 to 0063; 0212 to 0213.

²⁶ BNSF/UP.SUPPRP.WP.III.F.1-0224 to 0252.

²⁷ BNSF/UP.SUPPRP.WP.III.F.1-0013 to 0014, 0064 to 0202.

²⁸ BNSF/UP.SUPPRP.WP.III.F.1-0273 to 0284.

conservative values within the ranges he had identified. For example, in Segment 3, the sale prices and assessed values he considered ranged from \$16.87 to \$35.00 per square foot, with many properties valued between \$20.00 and \$25.00 per square foot.²⁹ Taking into account dates of sales and assessments, locations of the property, and other relevant factors, Mr. Gloodt determined that the appropriate conservative estimate of value for Segment 3 is \$20.00 per square foot.³⁰ He used a similar process to determine values for the other segments. On January 19, 2004, Mr. Gloodt traveled to El Paso and inspected the property to verify his conclusions about the value of the right of way.

After determining the unit cost for each of the five segments, Mr. Gloodt adjusted one lot in Segment 3 (between Stanton and Kansas Streets) to account for the partial interest sold to a developer. (The railroad originally owned a fee interest in this lot, and it retains an easement.) He also adjusted segment values downward to account for the eleven street crossings referenced above. The City of El Paso in 1901 granted UP's predecessor an easement to cross eight of these streets. In exchange for the easement, UP's predecessor committed to the City that the railroad would build a line that would provide a connection between El Paso and Bisbee, Arizona, and construct at railroad expense street bridges across the railroad.³¹ Since UP does not possess the full fee interest in these small portions of the right of way, Mr. Gloodt reduced their value to 33% of the value of the fee interest.³² The other three street crossings involve land that the railroad originally owned in fee.³³ To reflect the railroad's grant of an easement to the City or

²⁹ BNSF/UP.SUPPRP.WP.III.F.1-0004 to 0006, 0015.

³⁰ BNSF/UP.SUPPRP.WP.III.F.1-0015.

³¹ BNSF/UP.SUPPRP.WP.III.F.1-0253 to 0260.

³² BNSF/UP.SUPPRP.WP.III.F.1-0016.

³³ BNSF/UP.SUPPRP.WP.III.F.1-0262.

County, Mr. Gloodt reduced the value of these small segments to 67% of the value of the fee interest.³⁴

Mr. Gloodt concluded on the basis of his analysis that the value of land for the ACE right of way in Texas is \$6,782,033. Mr. Gloodt's property values for each segment of the right of way are set out in Table BNSF/UP III.F.1-1 and in the workpapers.³⁵

Table BNSF/UP III.F.1-1 Summary of Land Values for ACE Texas Right of Way (1st Q 2001)							
Value Segments	West Extent	East Extent	Area	Across the Fence Land Value			
	Mile Post	Mile Post	Square Feet	Land Use	Unit Value	Ownership*	Value
1	1292.96	1294.68	908,132	industrial acreage	\$1.00	99.70%	\$905,495
2	1294.68	1296.05	541,570	industrial parcels	\$2.00	99.63%	\$1,079,180
3	1296.05	1296.56	201,351	commercial lots	\$20.00	78.17%	\$3,151,939
4	1296.56	1296.68	48,750	commercial parcels	\$8.00	100.00%	\$390,000
5	1296.68	1297.76	420,701	industrial parcels	\$3.00	99.47%	\$1,255,419
TOTAL			2,129,504 (48.680 acres)			\$6,782,033	

*Percentages reflect deductions for less than fee interests

Mr. Gloodt's analysis of the value of the Texas right of way is far more reliable than AEPCO's analysis. Mr. Gloodt (whose experience and credentials in railroad/transportation corridor real estate appraisal are far greater than those of AEPCO's witness Mr. Burris) examined a larger number of transactions; took account of location and use of the land and other

³⁴ BNSF/UP.SUPPRP.WP.III.F.1-0015, 0019, 0021.

³⁵ BNSF/UP.SUPPRP.WP.III.F.1-0018 to 0021; BNSF/UP Supplemental Reply electronic workpapers "El Paso Land Calculations.xls."

relevant factors to a greater extent; and verified his conclusions through other sources of information and through a personal inspection of the property (something AEPCO's witness apparently did not do).³⁶ Thus, the Board should use the BNSF/UP evidence on this issue.

For yards and microwave towers located in New Mexico and Arizona, the Railroads' witness Christopher Kent simply multiplied the acreage BNSF/UP witnesses developed by AEPCO's price per acre. The result is a property value of \$107,538 for all ACE yards and a property value of \$13,313 for ACE microwave towers in New Mexico and Arizona.³⁷ For the microwave tower that AEPCO proposes to locate in El Paso, the Railroads assumed that the tower would be located at MP 1295.0 (current location of a UP tower), where Mr. Gloodt values land at \$2.00 per square foot. The value of the land for that tower is \$130,680.³⁸

F.2 - F.12 CONSTRUCTION AND ENGINEERING OVERVIEW

BNSF/UP's Supplemental Reply Narrative on Construction and Engineering Costs includes an Overview in which BNSF/UP Engineering Consultants critique AEPCO's basic assumptions and specifications. It then discusses each of the major categories of engineering and construction costs identified by the Board in its March 12, 2001 decision in STB Ex Parte No. 347 (Sub-No. 3), *General Procedures for Presenting Evidence in Stand-Alone Cost Rate Cases*. Consistent with the Board's guidelines for filing SAC evidence, the Narrative is organized under the following topics:

³⁶ The Board has stated that a valuation method is superior where the party uses a greater number of comparable sales and examines parcels along the right of way, rather than valuing land in the general area. *See Duke v. Norfolk Southern*, slip op. at 88; *Carolina Power & Light v. Norfolk Southern*, slip op. at 74.

³⁷ BNSF/UP Supplemental Reply electronic workpaper "III F 1 Land.xls."

³⁸ BNSF/UP.SUPPRP.WP.III.F.1-0293.

1. Land. (Land was discussed above)
2. Roadbed Preparation. This topic covers the many grading activities involved in preparing the roadbed upon which the track will be constructed. These activities include clearing and grubbing, excavation (earthwork), placement of embankment, lateral drainage, culverts, and other smaller items.
3. Track Construction. This topic covers the rail, ties, ballast and other track material used in constructing the railroad. It also includes costs for transportation of materials from suppliers to the site and labor and equipment for construction.
4. Tunnels. (There are no existing tunnels on the ACE).
5. Bridges. This topic covers the design, specifications and methodology for costing construction of bridges on the ACE.
6. Signals and Communications Systems. This topic covers the Centralized Traffic Control (CTC) system, Failed Equipment Detectors, and the Microwave and Land Mobile Radio (LMR) systems needed on the railroad to provide essential communications.
7. Buildings and Facilities. In addition to the headquarters, office, crew and yard offices on ACE, this section includes discussion of the costs to construct fueling facilities and locomotive and car repair shops.
8. Public Improvements. Under this heading, fences, road crossings and crossing warning devices are discussed.
9. Mobilization. Under this heading the costs for mobilizing and demobilizing laborers and equipment involved in the construction of the railroad are discussed.
10. Engineering. This heading covers discussion of the costs involved in providing engineering services to plan, design and oversee construction of the railroad.
11. Contingencies. This heading includes a discussion of the necessity to provide a contingency additive to the estimated construction costs to account for unplanned events.
12. Other. This section discusses (a) issues related to the UP predecessors' contributions to the construction of the El Paso Trainway, which constitutes a portion of the UP line replicated by the ACE, and (b) the construction schedule.

Under each heading and subheading, BNSF/UP Engineering Consultants discuss AEPCO's inclusion (or omission) of items covered under that category heading, as well as AEPCO's selection of construction specifications, quantities, and unit cost for each component.

Where AEPCO's selection of an item, specification, quantity or unit cost is well supported and feasible, BNSF/UP Engineering Consultants have accepted them; where AEPCO has failed to include an item or to support its selection, or the selection is infeasible or impractical, they have substituted a more appropriate selection.

As a guiding principle for the construction of a railroad with the size, tonnage and traffic proposed for the ACE, BNSF/UP Engineering Consultants relied on real-world specifications, including BNSF, UP, industry and AREMA standards.

A second guiding principle in BNSF/UP's restatement of construction and engineering costs is that the design and construction specifications must meet the operating needs of ACE and enable ACE to satisfy customer requirements as determined by BNSF/UP operating witnesses.

For reasons stated in Counsel's Argument and Summary of Evidence, including time and resource constraints, the BNSF/UP Engineering Consultants have undertaken thorough analysis only of areas where there are significant shortcomings in AEPCO's evidence that could be corrected with reasonable effort. For example, they have accepted AEPCO's assumptions and schematics of the total constructed route miles of the ACE, and have made only minor adjustments in track miles. Schematics have been prepared only for the Vaughn and El Paso Yards where significant changes were required to accommodate the ACE traffic. In other instances, due to time and resource constraints they accepted AEPCO's methodologies for developing unit costs and only made adjustments to quantities -- *e.g.*, despite concerns with the way in which AEPCO developed its unit costs for Headquarters, crew change and MOW facilities, BNSF/UP Engineering Consultants made only the essential adjustments necessary to accommodate the ACE staffing requirements as determined by BNSF/UP witnesses.

BNSF/UP Engineering Consultants concluded that even accepting many of AEPCO's specifications and unit costs, AEPCO's ACE Railroad lacks the appropriate facilities to meet the service requirements hypothesized for it. As shown in Table III.F.1 above, and in more detail in BNSF/UP Supplemental Reply Exh.. III.F.1, AEPCO has *understated* the reasonable construction costs that would be incurred to construct a railroad project of this magnitude by \$1.1 billion.

The first specific construction cost category BNSF/UP addresses under Construction and Engineering is Roadbed Preparation, which is Section 2 according to the Board's format requirements. Section 1 (Land) was considered previously.

2. Roadbed Preparation

Proper preparation of the roadbed is critical to the construction of a track structure that can dissipate the dynamic loadings of heavy, fast moving intermodal, unit coal and other trains without critical, costly and time consuming failures. Roadbed preparation represents the largest construction cost difference between the parties, as summarized in the following table.

**Table III.F.2-1
Summary of Grading Costs**

Item	BNSF/UP Total Cost (\$Millions)	AEPCO Total Cost (\$Millions)	Difference
<u>Earthwork - Line Segment</u>			
Common	\$176.0	\$95.3	\$80.7
Loose	27.9	10.8	17.1
Solid	69.3	31.8	37.5
Borrow	34.4	29.0	5.3
<u>Earthwork - Yards</u>			
Common	51.5	0.0	51.5
Loose	16.5	0.0	16.5
Solid	19.3	0.0	19.3
Borrow	0.2	1.4	-1.2
Other Yard (Drainage, etc.)	20.2	0.0	20.2
Earthwork - Total	\$415.4	\$168.5	\$246.9
Water for Compaction	\$45.9	\$2.7	\$43.2

Item	BNSF/UP Total Cost (\$Millions)	AEPCO Total Cost (\$Millions)	Difference
Clearing	33.6	1.2	32.3
Grubbing	0.0	0.0	0.0
Undercutting	29.4	0.0	29.4
Sand Berm	18.7	0.0	18.7
Drainage Berm	5.8	0.0	5.8
Fine Grading	8.0	0.0	8.0
Lateral Drainage	0.0	0.0	0.0
Retaining Walls	3.9	0.4	3.5
Rip Rap	3.4	3.3	0.1
Road Surfacing	6.5	0.2	6.3
Relocation of Utilities	0.1	0.1	0.0
Land for waste quantities	0.1	0.1	0.1
Environmental Compliance	0.2	0.2	0.0
Total	\$571.0	\$176.7	\$394.3

Source: AEPCO Opening electronic workpaper "ACE RR GRADING.XLS," BNSF/UP Supplemental Reply electronic workpaper "III F 2 ACE Grading.xls."

As explained in detail in the remainder of this section, much of the difference in the parties' roadbed preparation cost is driven by errors and omissions made by AEPCO's engineering experts, many of which can be attributed to an inability to recognize costly earthwork activities and even to a general lack of familiarity with the characteristics of the proposed route. The roadbed preparation costs AEPCO's witnesses advocate miss many of the costs that would be encountered if the construction of the ACE were to actually occur. Much of this understatement, which ranges from selecting the wrong earthmoving equipment from RS Means for the varying soil and rock conditions along the route, to disregarding critical activities performed in the most recent large-scale railroad construction projects, is consistent with Complainant's overall approach of oversimplifying stand-alone construction costs.

Had AEPCO conducted a more thorough analysis of the ACE earthwork requirements, it would have recorded the wide range of soil and terrain characteristics encountered by the ACE along its over 500 constructed route miles. As explained below, BNSF/UP's engineering experts

did undertake such a detailed analysis, taking extensive field notes and supporting recorded observations with photographs. The BNSF/UP experts documented vast amounts of dry lakebed and other soils with poor adhesion qualities along the proposed route and conclude that the earthwork requirements for the ACE are more complex and thus far more costly than determined by AEPCO.

In its opening evidence, AEPCO presents ACE as a coal and general freight railroad with 517.47 constructed route miles, 225.84 trackage rights miles and 42.70 miles of private mine-owned track. The route begins at the McKinley Mine on the Defiance Branch and heads in a southerly direction, descending to the BNSF main line at Defiance. McKinley is located at the southern tip of the Chuska Mountains. The Defiance Branch reaches an elevation of just over 7,000 feet above sea level at MP 15.6 and descends to approximately 6,400 feet above sea level at Defiance. The Defiance Branch is characterized by curves and steep grades that are over 2.2%. From Defiance the route follows the BNSF mainline through Gallup and steadily ascends on its way to Gonzales, before descending to the Rio Puerco River at MP 34. The alignment along this stretch meanders to avoid small peaks, mesas, and short mountain ranges. The topography is high plateau with many short mountain ranges.

From the Rio Puerco, the route ascends to Dalies and then descends to Belen, following the Rio Puerco Basin to the Rio Grande Basin at Belen. After crossing the Rio Grande at Belen the route climbs steadily to the Manzano Mountains where the track negotiates through the steep undulations of Abo Canyon. Abo Canyon consists of deep rock cuts protected with slide fencing. This portion of the route crosses the dry arroyo beds of Abo River several times. Continuing east of Abo Canyon the elevation of this section peaks at just over 6,500 feet above sea level just west of Mountainair. From Mountainair the route travels through a fairly

undulating territory well above 6,000 feet to Vaughn. The soil along the route between McKinley and Vaughn consists of silty sand with vegetation ranging from large trees and heavy brush near McKinley to pockets of dense brush further east. The route is also characterized by prevailing winds of 30 to 40 mile per hour. Although maps show that Interstate 40 parallels the tracks between Gallup and Mesita, public access to the route is minimal.

The route then travels from Vaughn to El Paso over UP trackage rights. This segment basically follows the Tularosa Valley between the San Andres and Sacramento Mountains.

At El Paso the route begins to follow the UP east-west main line, where it again crosses the Rio Grande Basin after traveling through a large concrete viaduct in downtown El Paso. Moving westward from the Rio Grande the route traverses some rugged topography located at the southern tip of the San Andres Mountains. The mountains consist mostly of sand and sandstone rock. The track through this section has many curves and much of the roadbed is cut into the side of the small mountains. After the route reaches the control point at Strauss, it becomes almost completely tangent, crossing sandy high plateau with medium to thin brush. Between Strauss and Deming sand berms are constructed on the south side of the track to prevent the build up of blowing sand in the track. On the north side of the track from Carne to Deming drainage berms have been constructed to prevent damage to the roadbed from flash floods that frequent the area. Runoff from rainstorms that occur in the mountain ranges well north of the line affect the roadbed at these locations. Arroyos quickly fill beyond their banks and can cause significant erosion and washouts.

The route passes through Deming, which is located at the southern tip of the Black Range. West of Lordsburg the alignment again meanders over undulating territory at Steins. The alignment straightens out again in the vicinity of Vanar and then meanders again to avoid

small peaks and mesas on its way to the Arizona state line. After entering Arizona the route is sandwiched between the Chiricahau Mountains at San Simon and the Pinaleno Mountains at Willcox. Drainage berms are found on the north side of the track between San Simon and Bowie to protect the main line roadbed from rapid runoff or flash flooding. From Willcox the route proceeds west over the Dry Salt Flats or large dry lakebed just east of Cochise. Drainage berms are located on both sides of the main track through the dry lakebed area.

AEPCO used a roadbed width of 24 feet for single track (49 feet for double track) line segments. Its double track widths are based on the single track widths with 25 feet between track centers.³⁹ Passing tracks are spaced on 15 foot centers. AEPCO assumed that total right-of-way (ROW) widths would be 100 feet except for industrial, commercial and urban areas which AEPCO defines as Gallup, Grants, Belen, Santa Teresa, Deming and Lordsburg, NM, Wilcox, AZ and El Paso, TX, where 75-foot ROW widths were used.⁴⁰ Roadbed specifications included the use of a 1.5:1 side slope for all lines.⁴¹ BNSF/UP's Engineering Consultants developed constructions costs for ACE on the basis of the track mileage presented by BNSF/UP's capacity and operating witnesses Messrs. Mueller and Wheeler. Changes made by these witnesses to AEPCO's proposed main and yard track configuration for ACE are described in § III-B.

Aside from the differences in the track configuration of the railroad, BNSF/UP's Engineering Consultants accepted the majority of AEPCO's roadbed specifications and earthwork quantity calculations as shown in the table below. The BNSF/UP Engineering Consultants did find certain of the assumptions and calculations performed by AEPCO

³⁹ AEPCO Opening Nar. at III-F-20.

⁴⁰ *Id.* at III-F-2 to 3.

⁴¹ *Id.* at III-F-16.

inapplicable to the ACE. These relate primarily to the earthwork quantities for the more difficult terrain that characterize AEPCO's proposed locations for new yards and the need to protect the roadbed from the natural forces of blowing sand and rapid water runoff along portions of the ACE route. The table below summarizes BNSF/UP's Engineering Consultants' analysis and treatment of the roadbed specifications proposed by AEPCO.

**Table III.F.2-2
BNSF/UP's Analysis Of
AEPCO's Roadbed Specifications**

Specification	Accepted	Modified	Rejected
24' roadbed width (Single track)	X		
100' and 75' ROW width (with modification of specific points)	X		
Use of ICC Engineering Reports for grading quantities on sections for which reports exist	X		
Modifications of ICC Engineering Reports for modern roadbed on sections where reports exist	X		
Use of CARDS to estimate earthwork quantities for Defiance Spur	X		
Side Slope of 1.5:1	X		
1 foot fill for new yards			X
2' bottom width trapezoidal ditches	X		
Use of gabions instead of retaining walls	X		
Use of water for compaction	X		
Assumption of 30% waste	X		

Source: AEPCO Opening electronic workpaper "ACE RR GRADING.xls," BNSF/UP Supplemental Reply electronic workpaper "III F 2 ACE Grading.xls."

BNSF/UP's Engineering Consultants' disagreement with certain of AEPCO's roadbed specifications is discussed below.

Side Slopes

The BNSF/UP Engineering Consultants have accepted AEPCO's proposed 1.5:1 side slopes.

Access Roads

AEPCO does not include any access roads along the ACE right-of-way, and indeed, does not discuss them at all in its Narrative. Access roads are graded roadways constructed beside and, where possible, at the same grade level as the railroad's roadbed so as to provide convenient access by road vehicles to the track and ancillary facilities. Vehicle access from public roads is limited by the fencing protecting the right-of-way. Both BNSF and UP have constructed these roads along much of its tracks, including over a large portion of the route replicated by ACE. This network of roads is essential to the expeditious transportation of operating personnel, maintenance-of-way forces, outside contractors, suppliers, materials, and equipment to distant segments of the line without disrupting train traffic flows. Access roads increase efficiency by freeing up track time otherwise needed to move maintenance crews and equipment by hi-rail from one point on the line to another.

Access roads play a critical role in providing many outside vendors and contractors clear and safe access to track sites not readily accessible by public roads. For example, failed equipment detectors, wayside signals, rail lubricators, and a host of other facilities along the right-of-way are accessed today by contractors, suppliers and BNSF/UP's own forces using the access road network put in place by BNSF/UP without burdening track capacity. These same forces will require comparable access on ACE. AEPCO has not provided additional track capacity to accommodate movement of these forces along the track, therefore, the only viable option for access is via an access road network comparable to that in place along the ACE route today. Without these access roads, the ACE could not expect to provide the same level of service as the incumbent provides today.

Although the ACE will require access roads, the BNSF/UP Engineering Consultants did not develop separate construction cost for such roads. As discussed in more detail below, the ACE will require sand berms and drainage berms along large portions of its route to protect the roadbed from the blowing sand and flash flooding that characterizes the region. The construction of these berms leaves a passage way along the roadbed to accommodate vehicular traffic.

Right-of-Way Widths

AEPCO specifies 100-foot right-of-way widths, except in cities and towns, where a 75-foot right-of-way is used. As explained in more detail in the discussion of earthwork unit costs, the restricted right-of-way width chosen by AEPCO limits the type of equipment that can be used for earthwork excavation and hauling activities without causing damage to the adjacent property. In addition, as discussed in more detail below, the sand berms and drainage berms required to protect the ACE roadbed need to be placed on the right-of-way and will likely extend beyond the 100 foot limit. Nonetheless, for this proceeding, the BNSF/UP Engineering Consultants accept AEPCO's specification for ROW widths for all locations.

Unit Cost Source

AEPCO develops unit costs for a number of ACE's construction activities from the RS Means Site Work & Landscape Cost Data for 2001 (RS Means or Means Handbook). AEPCO applies the Means location factor adjustments to these costs and also applies an index to adjust these costs from July 1, 2001 levels to January 1, 2001 levels. The BNSF/UP Engineering Consultants accept the use of the 2001 Means Handbook as the source for ACE earthmoving unit

costs and the application of the Means location factors. They reject AEPCO's application of a cost adjustment because the Means unit prices are already at January 1, 2001 levels.⁴²

a. Roadbed Preparation -- Clearing, Grubbing and Undercutting

Preparation of the ground for roadbed construction includes clearing, grubbing, stripping and any other activities required to establish a suitable foundation for railroad track structures, as these activities are defined in AREMA standards in § 1.3.4.2, § 1.3.4.3 and § 1.3.5, respectively.⁴³ In developing its opening evidence, AEPCO includes some modest costs for clearing, no costs for grubbing, and neglects to consider other roadbed preparation costs necessary to properly construct railroad roadbed in the sand and silty soils that characterize this territory. These omitted costs relate generally to undercutting and other foundation preparation requirements.

(1) Clearing and Grubbing

"Clearing" is the cutting of all trees, stumps, brush, shrubs, and other vegetation at a level not more than 6 inches above ground, and the disposal of all cut material, other fallen branches and all surface litter. "Grubbing" is the removal and disposal of all stumps and roots and all boulders and debris visible on the surface.

AEPCO developed costs for clearing by identifying the acres per track mile that were identified as having been cleared when the rail lines being replicated by the ACE were originally constructed, based on quantities found in the ICC Valuation Section "Engineering Reports" for segments of the ACE for which such reports were available. AEPCO increased these quantities slightly to account for the larger modern day roadbed section it specifies for the ACE. For

⁴² In Xcel, Complainants on rebuttal acknowledged that the Means unit costs are indeed at January 1 levels. See BNSF/UP.SUPPRP.WP.III.F-0006.

⁴³ BNSF/UP.SUPPRP.WP.III.F-0007 to 0009.

BNSF/UP line segments used by the ACE that were constructed more recently, AEPCO determined clearing quantities from materials provided by BNSF in discovery. AEPCO provides no cost for grubbing.

AEPCO develops two different clearing unit costs from Means. For clearing quantities developed from the ICC Engineering Reports, which AEPCO experts describe as “dense brush” based on their field trip observations, AEPCO applies a cost for “Clearing with Dozer and Brush Rake, Medium Brush to 4” in diameter.”⁴⁴ For clearing the evergreen trees observed along portions of the BNSF Defiance Branch, AEPCO selects the Means unit cost for “Cut & Chip medium, trees up to 12” diameter.”

The BNSF/UP Engineering Consultants reviewed carefully AEPCO’s proposed clearing cost, the source documents used to develop the clearing quantities and their own field trip notes and conclude that AEPCO proposal is flawed on a number of fronts. For clearing, AEPCO’s proposal to use the cost for clearing medium brush with a brush rake understates the cost of clearing. The brush rake is essentially an open bulldozer blade with teeth that scrape the ground surface and can dislodge brush and push it into a pile. The unit cost proposed by AEPCO covers pushing medium brush into a pile along the right-of-way, but does not include any cost for removal and hauling of the brush pile for disposal. The correct unit cost from Means is that to “Clear and Grub dense brush including stumps.” This unit cost accepts AEPCO’s expert field observation that while there are minimal amounts of vegetation along the ACE route, the vegetation that does exist is dense brush and also provides for the removing the brush pile from the ROW and hauling it to an appropriate location for disposal. The use of this unit cost for

⁴⁴ AEPCO Opening Nar. at III-F-15.

removal and disposal of dense brush found along the route will also alleviate the need for a separate charge for stripping of the roadbed.

The BNSF/UP Engineering Consultants accept AEPCO's unit cost for cutting and chipping trees on the Defiance Branch, but add to that a cost for grubbing and removal of stumps. BNSF produced in discovery to AEPCO a copy of its Valuation Department Property Record indicating the actual earthwork quantities attributable to the construction of the Defiance Branch. That document shows clearly that both clearing and grubbing were required on this line.⁴⁵ AEPCO is simply wrong in asserting that the documents produced by BNSF show that no grubbing was required on the Defiance Branch. The BNSF/UP Engineering Consultants include the Means cost to "Grub stumps and remove" for the Defiance Branch acres requiring grubbing.

(2) Undercutting

Undercutting involves the excavation and removal of materials that cannot function as railroad subgrade. Along much of ACE's route there are red sand soil beds and dry lake beds that contain materials that are unsuitable for a railroad roadbed foundation. Those materials must be undercut and removed as part of ACE's grading operation. AEPCO has ignored the undercutting of unsuitable material. In the region traversed by ACE, a minimum of 5 to 10% of total excavation for a roadway project in this region would require undercutting. This percentage was confirmed by the BNSF/UP Engineering Consultants through interviews with contractors during their field inspection. In estimating ACE's construction costs, BNSF/UP Engineering Consultants conservatively assumed that only 5 percent of total excavation would require undercutting.

⁴⁵ AEPCO.OP.WP.04421.

Unit costs developed from Means for undercutting material and replacing with borrow are summarized in the following table.

**Table III.F.2-3
BNSF/UP Undercutting Unit Cost**

Excavating Bulk Bank Measure, Common earth piled, Backhoe, hydraulic, crawler mounted, 3-CY capacity = 160 CY/hour	\$2.24
Off highway hauler, 22CY rear/bottom dump; ½ mile round trip; 4.2 loads/hr	2.51
Borrow, Loading and/or Unloading, Front-end loader wheel mounted	8.00
Off highway hauler, 22CY rear/bottom dump; ½ mile round trip; 4.2 loads/hr	2.51
Spread dumped material by dozer, no compaction	1.32
Sheepsfoot or wobbly wheel roller, 6-inch lifts, 4 passes	0.91
Total Undercutting Unit Cost	17.49

Source: BNSF/UP Supplemental Reply workpaper "III F 2 ACE Grading.xls," Tab "IIIF Unit Costs."

Details of BNSF/UP's restatement of clearing, grubbing and undercutting quantities and costs are included in BNSF/UP Supplemental Reply electronic workpaper "III F 2 ACE Grading.xls."

(3) Sand Berms

The territory traversed by the ACE presents construction and maintenance issues unique to that region. One recurring problem is blowing sand, which settles in the ballast and causes drainage and other problems. To address the issue of blowing sand along its right-of-way, UP constructed a long sand berm to catch the sand before it reaches the track. The berm, which was inventoried by the BNSF/UP Engineering Consultants during their field inspection, extends along the south side of UP's mainline between milepost 1,280 in Strauss, New Mexico and milepost 1,190 at Deming, New Mexico. Portion of the sand berm are depicted in the photographs below.



The berm was constructed by UP after the Engineering Report quantities were developed and is thus not included in AEPCO's earthwork quantities.⁴⁶ In order to provide protection for the ACE track, ACE would have to build a comparable sand berm. If the sand berm is not built, it is unlikely that the ACE would be able to meet its proposed operating schedule because of the frequent shutdowns that would be required to constantly clean the track and ballast. The BNSF/UP Engineering Consultants developed the cost to build a sand berm covering 90 percent of the route miles between Strauss and Deming based on their field observations. Details of the costs are set forth in BNSF/UP Supplemental Reply electronic workpaper "III F 2 ACE Grading.xls," Tab "IIIF_110thr Cst."

(4) Drainage Berms

In addition to the sand berms, there are a number of locations along both the BNSF and UP routes where drainage berms are required to protect the track from water erosion from flash floods caused by the rapid runoff of rainfall in the mountains to the north of the UP line. Drainage berms found between Deming (MP-1210) and Carne (MP-1220) on north side of main track and between Bowie (MP-1100) and San Simon, AZ (MP-1112) on the UP portion of the route. Drainage berms were also located on each side of the track between Cochise (MP-1066) and Willcox, AZ (MP-1069) on the BNSF portion of the route. These berms were as deep as the main track embankment (estimated 12-foot fill) through the dry lakebed and are in place to protect the railroad roadbed from water erosion. Also similar to the sand berms, these drainage berms are not reflected in the Engineering Report quantities.

⁴⁶ Because sand berms are not part of the roadbed, they would fall under the Engineering Report category of "Protection of Roadway." A review of the Engineering Report information of the UP portion of the ACE RR confirms that there are no quantities for sand berms reported under Protection of Roadway.

These drainage berms would also be required by the ACE to protect its roadbed from washouts and erosion that normally occurs in this territory. The BNSF/UP Consulting Engineers developed the cost for drainage berms based on their field observations.

b. Earthwork

(1) Segments For Which Engineering Reports Exist

In developing earthwork quantities for ACE, AEPCO relied on the information contained in the ICC Engineering Reports (ICC Bureau of Valuation Form No. 561) for those line segments that were in existence when the ICC conducted its rail line valuations studies circa 1915. The Engineering Reports contain estimates of actual earthwork quantities for each valuation section of the BNSF/UP predecessor railroads by type of material – common, loose rock and solid rock - based on construction standards typical of that period. AEPCO adjusted the earthwork quantities reported in the Engineering Reports to reflect the more modern railroad roadbed construction specifications and applied a pro-rata portion of the adjusted quantities to the portions of each BNSF/UP valuation section used by ACE.

To minimize the disputes between the parties, BNSF/UP's Engineering Consultants have adopted much of AEPCO's approach in their restatement of the ACE earthwork quantities. They accept the use of the Engineering Reports for these valuation sections and the adjustments made by AEPCO where no better information is available. Based on their review of AEPCO's workpapers, the BNSF/UP Engineering Consultants did make one correction to AEPCO's calculations of earthwork quantities based on the Engineering Reports. In its opening, AEPCO explains that based on the prevailing literature at the time the Engineering Reports were prepared, the portion of the ACE to be constructed reflected an average roadbed width of 17 feet for fills and 20 feet for cuts. The BNSF/UP Engineering Consultants reviewed the workpapers

cited by AEPCO⁴⁷ and agree that they support 17 foot fills and 20 foot cuts on the BNSF portion of the ACE route. Those workpapers however, show that the original specifications for the UP portion of the route were 16 foot for fills and 18 feet for cuts.⁴⁸ The BNSF/UP Engineering Consultants thus corrected the original specifications for the UP portion of the route to reflect those set forth in the prevailing literature of the time.

(2) Segments For Which There Are No Engineering Reports

There are no Engineering Reports for the Defiance Branch or the proposed connecting track between the BNSF and UP at Vaughn on the ACE. For the Defiance Branch AEPCO estimated earthwork quantities using a computer program developed by AEPCO's consultant L. E. Peabody & Associates. For the proposed Vaughn connecting track AEPCO develops quantities using a new, poorly documented computer program. For purposes of this proceeding and to minimize the amount of dispute between the parties, the BNSF/UP Engineering Consultants accept AEPCO's calculated quantities for the Defiance Branch based on CARDS and the Vaughn connecting track.

(3) Yards and Interchange Tracks

AEPCO assumes that ACE will have six yards: Defiance, Dalies, Belen, Vaughn, El Paso and Cochise. AEPCO based the grading requirements for the ACE yards on an assumed fill height of one foot and 15-foot track centers applied to the miles of track in each yard. AEPCO fails to provide for any earthwork for the inspection roads it assumes will be placed between yard tracks. AEPCO argues that such small yard earthwork quantities are necessitated by the calculations performed by the parties to remove from the Engineering Report quantities

⁴⁷ AEPCO Opening workpaper AEP 04417

⁴⁸ The 18 foot width for cuts is based on a 15 foot cut roadbed width plus AEPCO's allowance of 3 feet for ditches in cuts.

earthwork attributable to yards from that attributable to the mainline section. All of the ACE yards, however, are in locations where no railroad yard has ever existed. Because earthwork quantities for these new yards are reflected in the Engineering Report quantities, there is no basis for concluding that the one-foot fill assumption AEPCO applies to the Engineering Report quantities are applicable to these new yard locations.

More importantly the BNSF/UP Engineering Consultants determined during their field inspections that these new yard locations – particularly Vaughn and El Paso – are placed by AEPCO in terrain that is more difficult than that in which existing yards are actually placed today. As explained above, terrain surrounding the Vaughn Yard is undulating and will require over four million cubic yards of excavation. The site selected by AEPCO for placement of the El Paso yard is on a large hill with a steep slope that will require almost six million yards of excavation.⁴⁹ To put earthwork requirements for these new yards into perspective, the entire 108 mile valuation section that houses the Vaughn Yard reports a total of less than 8.5 million cubic yards of excavation while the 168 mile El Paso Yard valuation section reports less than 3 million cubic yards. Clearly the earthwork requirements for these new yard locations cannot be reflected in the Engineering Report earthwork quantities.

AEPCO argues that the assumptions underlying its adjustment to the Engineering Report earthwork quantities to separate quantities associated with yard and other tracks from mainline quantities should be applied regardless of whether the yard existed at the time the Engineering Reports were prepared. AEPCO suggests that this is necessary because the parameters used to remove from the Engineering Report quantities the earthwork attributable to yard and other tracks might have understated those quantities, resulting in a possible overstatement of the

⁴⁹ BNSF/UP.SUPPRP.WP.III.F-0027 to 0093.

residual main track quantities. First, AEPCO provides no evidence that the assumptions used to remove yard and other track earthwork quantities – one foot of fill and a 15-foot roadbed – understate the quantities for the yards and other tracks in place at the time the Engineering Reports were prepared. Indeed, the yards and other tracks constructed in the late-1800's and early-1900's were likely in locations requiring minimal amounts of earthwork. As such, the one-foot fill assumption is not unreasonable. Second, AEPCO chose its methodology for determining mainline quantities and it cannot now argue that the methodology overstates mainline quantities.

In the design of ACE, by selecting yard locations where no yards ever existed previously, AEPCO is placing yards where the original builders of the railroad – for whatever reason – did not.⁵⁰ If AEPCO selects yard locations where no previous yards ever existed, it is likely that the earthwork requirements at the new location are more onerous than at those locations where yards existed previously.⁵¹ For each of these new yard locations, the earthwork required to build the ACE yard should be based on existing topography.⁵²

BNSF/UP's Engineering Consultants developed actual earthwork quantities based on the existing topography for ACE's Vaughn and El Paso yards and used incremental earthwork quantities for second main track derived from the ICC Engineering Reports as a surrogate for

⁵⁰ Based on the earthwork quantities required for the locations selected by AEPCO discussed above, it is clear why no railroad has built yards at these locations.

⁵¹ This is confirmed by the analyses conducted by the BNSF/UP Engineering Consultants to develop proper earthwork requirements for the ACE yard locations selected by AEPCO.

⁵² Any argument that this would result in a double counting of earthwork quantities is nonsensical because if the yard did not exist at the time the Engineering Reports were prepared, the quantities for that yard could not be included in the Engineering Report quantities. The existing topography takes into account the type of soil and any hills, mountains, rivers, creeks, roads or other natural or constructed elements in the proposed construction area.

quantities computed based on existing topography. The yard layouts used by the Engineering Consultants are based primarily on the yard layout proffered by AEPCO with only the addition of a few tracks at certain locations as dictated by Messrs. Mueller and Wheeler. Table III.F.2-5 compares the yard earthwork quantities assumed by AEPCO with the yard earthwork quantities included by BNSF/UP in its restatement.

**Table III.F.2-4
Comparison of Earthwork Quantities**

Yard Location	AEPCO Earthwork Quantities	BNSF/UP Restated Quantities
Vaughn	56,742	4,019,148
El Paso	19,650	5,957,019
Belen	9,744	66,242
Defiance	19,448	101,108
Dalies	9,237	48,021
Cochise	14,718	48,836

Source: BNSF/UP Supplemental Reply electronic workpaper "III F 2 ACE Grading.xls;" AEPCO Opening workpaper "ACE RR GRADING.xls."

(a) Vaughn Yard

AEPCO's proposed Vaughn Yard is located between MP 791.9 and MP 794.2 (over 12,000 feet) on BNSF's Clovis Subdivision. There is no yard at this location today. AEPCO has placed the yard on the north side of the main track where the siding at Tejon currently exists. Field observations revealed that this location is very remote. Water and utilities are scarce in this area. The terrain is very undulating and the site experiences a constant 30-40 mile per hour wind (experienced and confirmed by local BNSF officials). ACE plans to have fueling facilities, interchange tracks for inspection, repair tracks, storage tracks, locomotive facilities, shop facilities, a wye track, headquarters, maintenance, and crew facilities at this location. Earthwork quantities and costs for the Vaughn Yard are set forth in BNSF/UP Supplemental Reply electronic workpaper "III F 2 ACE Grading.xls," Tab "IIIF_9 Vaughn."

(b) El Paso Yard

The proposed El Paso Yard is located between MP 1293 and MP 1291 on the Lordsburg Subdivision. AEPCO has placed the yard just west of the Rio Grande River on the south side of the east-west main line, west of where UP has its yard today. Field observations revealed that the main line is on the side of a large hill or small mountain with very steep slopes. The terrain is fairly adverse and has a history of drainage and slope stability problems according to local Union Pacific maintenance personnel. The terrain is very sandy and rocky. ACE plans to have a fueling facility, interchange tracks for inspection, and some facilities. Earthwork quantities and costs for the El Paso Yard are set forth in BNSF/UP Supplemental Reply electronic workpaper "III F 2 ACE Grading.xls," Tab "IIIF_9 El Paso."

(4) Unit Costs

Based on a detailed review of AEPCO's workpapers, BNSF/UP's Engineering Consultants determined that the unit costs for earthwork AEPCO posits are flawed in a number of respects. Most critically, the unit costs selected by AEPCO from the Means Handbook are not correct for the type of earthwork activities necessary to construct the ACE roadbed. This is primarily the result of AEPCO's scattershot selection of the earthmoving equipment, ranging from the smallest, lowest cost equipment for excavating materials to oversized off-road haulers that are too large to maneuver within the confines of the proposed ACE right-of-way.

In preparing its reply evidence, BNSF/UP Engineering Consultants visited construction sites in the vicinity of the proposed ACE route and documented the types of equipment actually being used by contractors in the region. Thus, BNSF/UP's reply to AEPCO's selected earthmoving equipment is based on equipment actually being used by earthmoving contractors today.

The project most like that proposed by ACE was the expansion of US 70 through Hondo Valley, approximately 39 miles from Carrizozo and 120 miles from El Paso on the proposed ACE route. The project covers virtually all aspects of earthwork and is representative of the size and scope of the efforts that would be undertaken to construct the ACE. Notes and photographs from the Hondo Valley project visit are included in the BNSF/UP Engineering Consultants' workpapers.⁵³

(a) Common Excavation

Common excavation includes more than the cost of excavating material classified as common earthwork at the time of the original ICC valuation.⁵⁴ It includes the cost to reuse a portion of those excavated materials in the ACE roadbed as embankment as well as the cost to transport a portion of the materials that will not be used as embankment to a dump site to be "wasted."⁵⁵ AEPCO assumes that 70 percent of the earthen material excavated for ACE will be reused as embankment. BNSF/UP's Engineering Consultants adopt this assumption. However, as confirmed by their field observations, a number of different types of specialized earthmoving equipment are required to excavate the variety of materials classified as "common" along the ACE route and to transform a portion of those materials into a finished roadbed (and trimmed

⁵³ BNSF/UP.SUPPRP.WP.III.F-0096 to 0107; BNSF/UP Supplemental Reply electronic workpaper "III F 2 Hondo Valley.doc."

⁵⁴ The instructions to the valuation engineers from the ICC were to classify all earthwork that did not meet the ICC's established criteria for solid rock or loose rock as common. AEPCO Nar. at III-F-17.

⁵⁵ Waste is the term applied to material excavated during the construction of the roadbed that cannot economically be reused in the roadbed as embankment. Typical reasons for wasting materials are that the amount of excavation exceeds the amount of embankment required, or that the place where the embankment is required is far enough away from the point of excavation that it becomes too costly to haul materials to the embankment site. In some instances waste is material that is unsuitable for embankment.

waste sites). As explained below, AEPCO's experts have ignored many of the necessary costs.

AEPCO's unit cost development of common excavation is summarized in the following .

Table III.F.2-5
AEPCO's Development of Common Excavation

Means Unit	Embankment	Waste	Weighted
Loading into scraper 3000' haul, common earth	\$3.06	\$3.06	
<i>Compaction via Roller</i>	<i>\$0.48</i>		
<i>Compaction via Sheepsfoot</i>	<i>\$0.91</i>		
Avg. Compacting (above)	\$0.70		
Total	\$3.76	\$3.06	
Embankment/Waste Split	70.0%	30.0%	
Weighted Cost			\$3.55

Source: AEPCO Opening electronic workpaper "ACE RR GRADING.xls," Tab "IIIF Unit Costs."

AEPCO bases its unit cost for common excavation on the Means cost for an elevating scraper it assumes can excavate, haul, dump and spread excavation. The Means Handbook includes unit prices for five different types of scrapers.⁵⁶ AEPCO provides no explanation of the criteria it employed in selecting the elevating scraper. Indeed, the elevating scraper selected by AEPCO is the lowest cost and lightest duty of all of the scrapers listed by Means and it is unsuitable for excavating the materials that will be encountered during construction of ACE. The simple fact that the elevating scraper carries the lowest Means per cubic yard unit cost for the common excavation does not mean, as AEPCO might assert, that it reflects the most efficient

⁵⁶ Means includes unit costs for an 11CY elevating scraper, a 14CY self propelled scraper assisted by ¼ dozer, a 21CY self propelled scraper assisted by ¼ dozer, a 10CY towed scraper assisted by ¼ dozer and a 15CY towed scraper assisted by ¼ dozer. A "¼ dozer" refer to the ratio of dozers (push cats) to scrapers. Here ¼ means one dozer push cat for four scrapers to meet the production rates.

and economical choice for ACE excavation. Rather, it means that it is the lowest cost, least versatile of the scrapers offered. Indeed, the lack of versatility of the elevating scraper will lead to reduced production, which would translate directly to higher costs per cubic yard.

Most contractors refer to the elevating scraper as a “paddle-pan,” because it is essentially a big pan with a wide set of scrapers driven by belts on each side to elevate material and dump it into its own trailing pan. *The Track Cyclopedia* describes elevating scrapers, which are used for lighter work, as “designed for gathering and scraping up loose material” and notes that these scrapers can “work alone in loose materials where the additional cost of a cat tractor is not justified.”⁵⁷ This equipment is generally used for very loose material that in most cases first has been windrowed by a dozer or motor grader. It is not practical, or in most cases possible, to use this type of equipment for the heavy excavation required for ACE where the material will not be loose, but in its natural state.⁵⁸

Based on their field analysis, the BNSF/UP Engineering Consultants found that the use of the paddle scraper alone to excavate the gravelly desert soils along the ACE route is not feasible because of the partially to completely cemented nature of the soils. This cementation of desert soils is, except for their extremely low moisture content (i.e., <2%), their most obvious characteristic. The near surface soils become cemented with either calcium carbonate wherein they are referred to as “caliche,” or iron oxide to produce desert “hardpan.”⁵⁹ In both cases the

⁵⁷ *The Track Cyclopedia* at 60 (emphasis added). BNSF/UP.SUPPRP.WP.III.F-0110 to 0111.

⁵⁸ The soils that will be encountered along ACE RR are cohesive and semi-cohesive, i.e., clay and silt. These materials are very small and when wet, they are sticky, but when dry, they are hard and difficult to crumble -- i.e., they are not loose.

⁵⁹ See “Soil Mechanics in Engineering Practice,” Terzaghi, Peck, Mesri, pages 4 & 5, Third Edition, 1996, John Wiley and Sons.

cement fills the voids in the gravelly sand deposit, and is derived from the evaporation of ground water and/or surface runoff water. The paddle pan does is simply not capable of penetrating this cemented layer.

To remedy this problem it would be necessary for the ACE to use self-propelled pans that are assisted by dozers to excavate and haul common earth. The dozer will also construct and shape the slopes as cuts are formed. This selection reflects the scraper observed on the construction site in the Hondo Valley that the engineering team visited during their field inspection and is the lowest cost option for excavation of common materials along the ACE route. The dozer can provide the dual function of properly shaping the slopes as cuts are formed. The scraper/dozer combination, which is depicted in the photo below, is typical of the equipment observed in operation at the Hondo Valley project.



Following excavation, seventy percent of the common material excavated along the ACE right-of-way will be used as embankment. Placing and shaping the embankment into the final roadbed cross section requires additional earthmoving equipment and additional cost. A dozer accomplishes the spreading and shaping of material on embankments and in waste pits. BNSF/UP and DOT construction specifications call for the material placed in embankments to be placed in lifts not to exceed 8-inches. Scrapers, while capable of unloading and spreading materials to a certain degree, are not sufficiently versatile to shape properly the roadbed prior to compaction.

Once spread, embankment material must be compacted to the proper density. For compaction, AEPCO used the average cost for a sheepsfoot roller and a much less expensive steel wheel vibrating roller. This average cost is inappropriate because steel wheel rollers are unsuitable for ACE's conditions. They would bridge over areas where dirt is lumped together, resulting in inconsistent compaction patterns. Sheepsfoot rollers are used to compact embankment material in this region and were observed by the inspection team at the Hondo Valley building site. The BNSF/UP Engineering Consultants thus conclude that compaction for excavated material is primarily accomplished by the use of a sheepsfoot roller. The texture of the sheepsfoot is designed to break up dirt clods and push small rock down into the subgrade.

**Table III.F.2-6
BNSF/UP's Development of Common Excavation**

Means Unit	Embankment	Waste	Weighted
Self propelled scraper, 21CY, 1/4 push dozer, clay, 3000' haul	\$3.81	\$3.81	
Extra operator (Crew B-33E - \$91.60 for 0.25 operator at daily output of 790 CY)	\$0.12	\$0.12	
Extra dozer (Crew B-33E - \$282.45 for 0.25 dozer at daily output of 790 CY)	\$0.36	\$0.36	
Spread dumped material by dozer, no compaction	\$1.32	\$1.32	
Compaction via Sheepsfoot	\$0.91		
Total	\$6.57	\$5.60	
Embankment/Waste Split	70.0%	30.0%	
Weighted Cost			\$6.24

Source: BNSF/UP Supplemental Reply electronic workpaper "III F 2 ACE Grading.xls," Tab "IIIF Unit Costs."

(b) Loose Rock Excavation

AEPCO builds its unit cost per cubic yard for excavating loose rock from the Means Handbook. AEPCO has not provided any explanation of the process it used to select equipment appropriate for ripping, loading, hauling, placing, spreading and compacting the loose rock materials that would be encountered during the construction of ACE. BNSF/UP has reviewed AEPCO's selections and concluded that most of the equipment chosen by AEPCO would not, and in many cases could not, be used for ripping and hauling loose rock along the ACE proposed construction. AEPCO's unit cost development of loose rock excavation is summarized in the following table.

**Table III.F.2-7
AEPCO's Development of Loose Rock Excavation**

Means Unit	Embankment	Waste	Weighted
Ripping Trap rock, soft, ideal conditions	\$1.86	\$1.86	
Shovel, 3CY capacity	\$0.99	\$0.99	
Off Highway hauler 42CY rear bottom dump ½ mile round trip	\$2.05	\$2.05	
Spread dumped material by dozer- no compaction	\$1.32	\$1.32	
Avg. Compacting	\$0.70		
Total	\$6.92	\$6.22	
Embankment/Waste Split	70.0%	30.0%	
Weighted Cost			\$6.71

Source: AEPCO Opening electronic workpaper "ACE RR GRADING.xls," Tab "IIIF Unit Costs."

As explained in the remainder of this subsection, the unit selections by AEPCO are a clear indication that AEPCO did not choose from Means the proper equipment for the job, but focused rather on picking the lowest cost option. Any perceived economies generated by this technique will quickly evaporate however, because the equipment will not be able to achieve its rated daily throughput in the ACE construction environment. This will ultimately push unit costs above those for more suitable equipment.

AEPCO selects the Means cost for "ripping soft trap rock under ideal conditions," using a 200 HP (D7 Caterpillar) dozer. There are two fundamental problems with AEPCO's selection. First, AEPCO has not established that the materials classified as loose rock that would be encountered during the construction of ACE represent soft trap rock, nor has it established that ripping conditions would consistently be ideal. Second, adjustable rippers capable of dealing with loose rock cannot even be attached to the 200 HP dozer. As explained in the Caterpillar equipment handbook, the 200 HP dozer can only be equipped with the Fixed Radial and

Parallelogram linkage design. The Fixed Radial ripper, while adequate for “utility ripping close to walls, footings, and embankments,” cannot be effectively used for ripping rock. The Fixed Parallelogram holds tooth angle constant at all ripping depths, limiting flexibility and making it unsuitable for the irregularly shaped materials encountered when ripping rock. A minimum requirement for ripping materials indigenous to the ACE region is an adjustable parallelogram that allows the operator to adjust the angle of the ripper tip to the material for penetration at all ripping depths.

The BNSF/UP Engineering Consultants confirmed through their field trip surveys that the equipment most commonly provided by equipment suppliers for ripping rock in this region is the larger D9 or D10 dozer. Such larger machines are required to rip through the very hard basalt and granite found along the ACE route. In their restatement of AEPCO’s loose rock unit costs, BNSF/UP’s Engineering Consultants reject as unworkable AEPCO’s selection of a 200 horsepower dozer and select instead a 460 horsepower dozer - the type of equipment most commonly supplied for effectively and efficiently ripping rock along the ACE route.⁶⁰ The photo below was taken at the Hondo Valley work site.

⁶⁰ The Caterpillar D9 observed by the BNSF/UP Engineering Consultants at the Hondo Valley site has a gross horsepower rating of 474HP. BNSF/UP.SUPPRP.WP.III.F-0123 to 0131.



Once the rock has been ripped loose, it must be gathered into piles suitable for loading into trucks. Rock from the ripping operations will be scattered across the work area. Before it can be excavated and loaded into trucks, it must be consolidated into manageable piles. The BNSF/UP Engineering Consultants add the Means cost for dozing ripped materials, using the same 460 horsepower dozer, for an average haul of 100 feet to aggregate materials for loading onto trucks.

For the loading itself, AEPCO selects the Means unit cost for a 3CY shovel outfitted on a 75-ton crawler crane.⁶¹ Such equipment is found in Means under "Excavating, Bulk Bank

⁶¹ Although the Means unit cost selected by AEPCO is identified as a "shovel," the equipment costs are for a 75-ton crawler crane. AEPCO's experts could have determined this had they bothered to check the crew configuration immediately to the right of the Means description. For the line item selected by AEPCO, the crew configuration is a "B-12T." Means lists the details of the crew configuration toward the back of the manual. The B-12T crew is comprised of the following: 1 Equipment Operator (Crane), 1 Equipment Operator (Oiler), 1

Measure, Common Earth Piled” and is typically used in the construction of bridges and other structures, but not for earthwork excavation. The crane configuration that Means is referring to can be found in the strip mining operations of the Powder River basin, and possibly at stone quarries in the area. Such applications are manifest in the Means overall equipment production rates, which assume movement of 250 cubic yards per hour or 2,000 cubic yards per day. In order to achieve such lofty production rates, a 3CY bucket would have to make over 83 cycles per hour. Assuming an average of 50 productive minutes per hour, this translates into 1.67 cycles per minute or a dump cycle every 36 seconds. Unless the material has been consolidated into very large stockpiles, the 3CY crawler crane shovel - which is not the most mobile of earthmoving equipment - would have to be repositioned on virtually every cycle and would thus be unable to achieve its rated production. Because the Means unit costs are developed by dividing the total hourly cost by the hourly production, a drop in hourly production will result in an increase in unit costs. As such, the use of a crawler crane is unworkable for loading ripped rock.

The BNSF/UP Engineering Consultants instead include cost for the only piece of equipment actually observed loading ripped rock on the roadway projects in this region – a large hydraulic crawler mounted excavator equipped with a 3 cubic yard bucket. Below is a photograph of the excavator selected by the BNSF/UP Engineering Consultants excavating rock on the Hondo Valley site.

Crawler Crane, 75 Ton and 1 Front End Attachment, 3 CY. See BNSF/UP.SUPPRP.WP.III.F-0136.



AEPCO assumes the ripped loose rock materials will be excavated and loaded into trucks. It however fails to include two separate additives required by Means for such a loading operation. First, the piled common earth upon which the Means costs are developed is easier to excavate than piled loose rock. Means recognizes this by providing additives and deducts to the common earth excavation cost for excavating materials that are more difficult and less difficult to excavate than common earth. Specifically, Means provides an additive to common earth excavation for "heavy soil or stiff clay" of 60 percent, an additive for "wet excavation with clamshell or dragline" of 100 percent and a deduct for "soft soil or sand" of 15 percent.⁶² The ripped loose rock that will be loaded by the 3CY backhoe is more difficult to excavate than heavy soil or stiff clay, but is not as difficult as wet excavation with a clamshell or dragline. As

⁶² AEPCO.OP.WP.04556 and 04558.

such, BNSF/UP's Engineering Consultants have used the 60 percent additive for heavy soil or stiff clay and applied it to the Means excavation cost for loose rock.

Second, Means clearly and unconditionally requires an additive of 15 percent for loading excavated materials onto trucks.⁶³ The excavated loose rock will be placed in trucks for haulage to either embankment along the ACE route or to a waste pit. AEPCO does not explain why the 15 percent additive for loading bulk excavated materials onto trucks was not included in its unit costs. BNSF/UP's Engineering Consultants have properly included the 15 percent additive in their restatement of loose rock excavation costs.

For the cost of hauling the excavated loose rock materials for placement as embankment along the ACE roadbed or to a waste pit, AEPCO selects an off-highway hauler with 42CY capacity. BNSF/UP's Engineering Consultants demonstrate in their workpapers that a hauler this size is comparable to Caterpillar's 775D Quarry Truck. The Caterpillar 775D has a turning radius of 78 feet 9 inches, meaning it cannot turn within the 100-foot right-of-way specified by AEPCO. This vehicle would require a right-of-way of at least 160 feet just to turn around.⁶⁴ These oversized off-road haulers are also difficult to transport to the work site and to redeploy along the proposed route. For example, it takes at least three tractor-trailer loads to mobilize this oversized equipment. Because the 42CY hauler is too large and too difficult to deploy and cannot be used without inflicting damage on the adjacent landowner property, BNSF/UP's Engineering Consultants selected a 22CY articulated off-road hauler capable of both efficiently hauling excavated materials and staying within the 100- and 75-foot rights of way specified by

⁶³ BNSF/UP.SUPPRP.WP.III.F-0140.

⁶⁴ Calculations of the turning radius of the 775D truck and drawings of the turning space needed are included in BNSF/UP.SUPPRP.WP.III.F-0141 to 0142.

AEPCO. These are close in size to the 25CY hauling equipment observed by the BNSF/UP Engineering Consultants in the field.

Once the excavated materials have been hauled for placement in embankment or dumped as waste, the dumped material must be spread and shaped by a bulldozer. AEPCO recognizes that the material dumped for waste must be spread by bulldozer and the BNSF/UP Engineering Consultants accept this unit cost

The table below summarizes the loose rock excavation costs developed by BNSF/UP.

**Table III.F.2-8
BNSF/UP's Development of Loose Rock Excavation**

Means Unit	Embankment	Waste	Weighted
Ripping trap rock hard, 460 HP dozer, ideal conditions	\$6.55	\$6.55	
Dozing ripped material, 460 HP, 100' Haul	\$1.17	\$1.17	
Excavating Bulk Bank Measure, Common earth piled, Backhoe, hydraulic, crawler mounted 3CY capacity + 60% cost for heavy soil + 15% for loading	\$3.92	\$3.92	
Off highway hauler, 22 CY rear/bottom dump, 1 mile round trip.	\$2.71	\$2.71	
Spread dumped material by dozer-no compaction	\$1.32	\$1.32	
Compaction via Sheepsfoot	\$0.91		
Total	\$16.58	\$15.67	
Embankment/Waste Split	70.0%	30.0%	
Weighted Cost			\$16.31

Source: BNSF/UP Supplemental Reply electronic workpaper "III F 2 ACE Grading.xls," Tab "IIIF Unit Costs."

(c) Solid Rock Excavation

As it does with other components of earthwork, AEPCO builds its unit cost per cubic yard for excavating solid rock by starting with prices from the Means Handbook. Again,

AEPCO has not provided any explanation of the process it used to determine the type of blasting that would be required to remove the solid rock from its beds, nor does it provide any explanation for the equipment it selects for loading, transporting, dumping and compacting solid rock. It appears from its workpapers that AEPCO used the Means Handbook to find the lowest unit costs for the solid rock components and selected them without any regard for the amount or type of rock that will be encountered during the construction of ACE. BNSF/UP reviewed AEPCO's selections and concluded that for most of the solid rock excavation components, AEPCO chose the wrong component. AEPCO's unit cost development of solid rock excavation is summarized in the following table.

Table III.F.2-9
AEPCO's Development of Solid Rock Excavation

Means Unit	Embankment	Waste	Weighted
<i>Drilling and blasting rock over 1500 CY</i>	<i>\$7.85</i>	<i>\$7.85</i>	
<i>Bulk drilling and blasting</i>	<i>\$5.00</i>	<i>\$5.00</i>	
Avg Drilling and blasting	\$6.43	\$6.43	
Excavate and load blasted rock, 3CY power shovel	\$1.30	\$1.30	
Off Highway hauler 42CY rear bottom dump 1/2 mile round trip	\$2.05	\$2.05	
Spread dumped material by dozer-no compaction	\$1.32	\$1.32	
Avg. Compacting	\$0.70		
Total	\$11.80	\$11.10	
Embankment/Waste Split	70.0%	30.0%	
Weighted Cost			\$11.59

Source: AEPCO Opening electronic workpaper "ACE RR GRADING.XLS," Tab "IIIF Unit Costs."

The first problem is AEPCO's selections from Means for blasting costs. AEPCO selects the unit price for "drilling and blasting only, rock, open face, over 1500CY" and the price for "bulk drilling and blasting, can vary greatly, average" and then, without explanation, simply averages the two blasting prices. AEPCO provides no explanation of why or how it determined

the two unit prices it selects would be applicable to the ACE construction. In fact, they are not. Both unit costs selected reflect the economies attributable to large scale blasting operations. The economies that produce these lower average unit costs will not be available to the builders of ACE. The amount of solid rock along the route – even before considering AEPCO’s solid rock unit cost adjustment⁶⁵ – is not great enough to generate such economies. Based on AEPCO’s earthwork calculations, solid rock excavation on ACE will involve approximately 3.6 million cubic yards spread over its 552 plus route miles, or an average of approximately 6,500 cubic yards per mile.⁶⁶ At these volumes, the economies attributable to the bulk drilling and blasting cost in Means could never be achieved and the use of that unit cost here must be rejected.

The appropriate blasting unit cost for ACE is one that recognizes that while certain economies might be available in blasting larger beds of solid rock, most of the blasting that will occur will be less than 1500CY. BNSF/UP’s Engineering Consultants corrected AEPCO’s blasting price to conservatively reflect an average of the prices of “drilling and blasting only, rock, open face, over 1500 CY” and “drilling and blasting only, rock, open face, under 1500 CY.”

Blasting of solid rock produces rubble of all shapes and dimensions, ranging from dust and pebble size fragments to large boulders. These large boulders present a number of

⁶⁵ As explained in more detail below, AEPCO arbitrarily reduces the unit cost of solid rock excavation by asserting that half of the materials that were classified by the ICC valuation engineers as solid rock would be rippable by modern earthmoving equipment. On the basis of that assertion only, the unit cost applied by AEPCO to the solid rock quantities developed from the Engineering Report data is an average of the solid rock and loose rock unit costs it develops from Means.

⁶⁶ Taking into account AEPCO’s assertion that half of what was classified as solid rock could be rippable by modern earthwork equipment would reduce the amount of material requiring blasting to only roughly 3,250 cubic yards per mile. AEPCO Opening electronic workpaper “ACE RR GRADING.xls,” tab “IIIF_10 EW Cost.”

construction related issues. First, standard engineering practice is to not permit rock greater than 24-inches in size to be used as fill. Second, large boulders cannot be handled efficiently by mechanical earthmoving equipment. In addition, Means recognizes that there is an added cost associated with handling large boulders of \$14.05 per cubic yard. This cost is more than ten times the cost of the \$1.30 per cubic yard cost used by AEPCO to excavate and load blasted rock with a 3CY power shovel (crawler crane). The unit price selected by AEPCO clearly assumes that the material that is left after drilling and blasting the solid rock is a suitable size for fill or waste and that the material will be small enough to be easily excavated and placed into the trucks. Thus, AEPCO basically ignores the cost of the additional effort required to deal with these boulders, an example of which is included in the photograph below.



There are two ways to correct this deficiency in AEPCO's excavation unit costs. The first is simply to substitute the Means cost for excavating boulders in place of the excavation cost used by AEPCO. The second is to add costs to reduce those boulders that are needed for embankment to a manageable size that will allow the 3CY shovel to achieve its rated production capacity. BNSF/UP's Engineering Consultants have decided to substitute the Means cost for excavating boulders in place of the excavation cost used by AEPCO because it is less expense than reducing the size of the boulders.

The table below summarizes BNSF/UP's restatement of solid rock excavation costs.

**Table III.F.2-10
BNSF/UP's Development of Solid Rock Excavation**

Means Unit	Embankment	Waste	Weighted
Drilling and blasting rock under 1500 CY	\$7.85	\$7.85	
Drilling and blasting rock over 1500 CY	\$9.80	\$9.80	
Avg Drilling and Blasting	\$8.93	\$8.93	
Dozing ripped material, 460 HP, 100' Haul	\$1.17	\$1.17	
Excavating Bulk Bank Measure, Common earth piled, Backhoe, hydraulic, crawler mounted 3CY capacity + 60% cost for heavy soil + 15% for loading	\$3.92		
Off highway hauler, 22 CY rear/bottom dump, 1 mile round trip.	\$2.71		
Excavate and Load Boulders 0.5 to 1.0 CY		\$14.05	
Haul Boulders 25-ton off-highway dump, 1 mile round trip		\$3.89	
Spread dumped material by dozer-no compaction	\$1.32		
Compaction via Sheepsfoot	\$.91		
Total	\$18.86	\$27.94	
Embankment/Waste Split	70.0%	30.0%	
Weighted Cost			\$21.58

Source: BNSF/UP Supplemental Reply electronic workpaper "III F 2 ACE Grading.xls," Tab "IIIF Unit Costs."

AEPCO does not apply the solid rock unit price it develops from Means to the ACE solid rock quantities estimated from the engineering reports. Instead, AEPCO asserts that because modern earthmoving equipment is capable of ripping materials that were classified by the ICC

Valuation Engineers as solid rock, the applicable unit cost should be the average of the Means developed cost for loose rock and solid rock. BNSF/UP's Engineering Consultants agree that modern day equipment is more capable than the vintage of equipment available at the time the engineering valuations were conducted and have accepted AEPCO's assumption, based on their field observations, that 50 percent of the material classified as solid rock could be ripped. The weighted unit cost applied by BNSF/UP's Engineering Consultants to the ACE solid rock quantities is \$18.94 per cubic yard of average solid rock (before location factor).

(d) Borrow

The table below sets forth AEPCO's development of borrow costs from Means.

Table III.F.2-11
AEPCO's Development of Borrow Costs

Means Unit	Embankment
Front end loader - wheel mounted 5 CY bucket	\$8.00
Hauling 20 CY dump trailer - 1 mile round trip	\$2.79
Compacting	\$0.70
Total	\$11.49

Source: AEPCO Opening electronic workpaper "ACE RR GRADING.XLS," Tab "IIIF Unit Costs."

BNSF/UP's Engineering Consultants accept AEPCO's development of borrow costs with two exceptions. First, as explained under common excavation, compaction will be accomplished with a sheepsfoot and not the combination of sheepsfoot and vibrating roller assumed by AEPCO. Second, as explained above in the discussion of loose rock excavation, materials dumped for use as embankment require a bulldozer to spread the dumped materials in accordance with the engineering specifications for embankment. BNSF/UP's Engineering Consultants have thus added the cost of a dozer to spread the dumped borrow material in the embankment. The table below summarizes BNSF/UP's borrow cost.

**Table III.F.2-12
BNSF/UP's Development of Borrow Costs**

Means Unit	Embankment
Front end loader - wheel mounted 5 CY bucket	\$8.00
Hauling 20 CY dump trailer – 1 mile round trip	\$2.79
Spread dumped material by dozer-no compaction	\$1.32
Compacting	\$0.91
Total	\$13.02

Source: BNSF/UP Supplemental Reply electronic workpaper "III F 2 ACE Grading.xls," Tab "IIIF Unit Costs."

(e) Fine Grading

AEPCO's earthwork unit cost estimates fail to include the cost of fine grading.⁶⁷ Fine grading using specialized equipment is necessary to ensure that all cuts, fills and ditches are left in a neatly trimmed condition to the specified widths, elevations and particularly to the appropriate slopes. Fine grading eliminates ruts or depressions on the surface of the subgrade that cause water pockets, and is a vital step in avoiding future drainage problems.

AEPCO's unit costs for earthwork taken from RS Means do not include the fine grading of the subgrade, before subballast placement, and the finishing of the slopes.⁶⁸ When contractors form cuts and fills (embankments) they begin with slope stakes that define where the outside edges of cut and fill slopes intersect the natural ground line. The slope stakes define the area to be cleared and grubbed. After clearing and grubbing is complete and as the areas of excavation and fill progress, the engineers return to stakeout a centerline and final subgrade elevation for

⁶⁷ AREMA § 1.3.5.21. BNSF/UP.SUPPRP.WP.III.F-0152 to 0153. *See also* BNSF/UP Specifications for Excavation and Embankments § 03200, subsection 3.7. BNSF/UP Supplemental Reply electronic workpaper "III F 2 BNSF Fine Grading Spec.doc"

⁶⁸ In typical grading contracts, fine grading is included in the earthwork costs. BNSF/UP.SUPPRP.WP.III.F-0154 to 0156. The Means Handbook costs these activities separately. BNSF/UP.SUPPRP.WP.III.F-0157.

each track. The centerline stakes are set every 50 feet. The stakes are marked revealing the location of centerline (off-set) and design elevation.

Fine grading crews use these stakes to assure the roadbed is in the correct location and that grades are within 1/10 of a foot. This assures that the roadbed is being constructed according to the design criteria (grades, horizontal and vertical curvature, typical roadbed section). Incorrect curvature and abrupt vertical curves can create excessive draft forces in train and engine equipment. The roadbed must conform to the typical section designed, which includes roadbed crown, ditch line and slope. AEPCO defines in its typical roadbed sections found in opening evidence (AEPCO.OP.WP.04623-04629), a 40:1 runoff (or crown) from the centerline of the roadbed which is a railroad industry standard. Only a properly equipped finegrading crew can achieve the 40:1 crown and place the subgrade within 1/10 of a foot of design elevations.

The finegrading crew is also responsible for assuring that the top 12 to 24 inches of subgrade is compacted to a laboratory prescribed 95-100% optimum density. This can only be achieved with an optimum moisture content prescribed by laboratory test. A 40:1 crown cannot be "roughly graded." It requires a motorgrader, steel wheel vibratory roller, and water. This is the industry standard to properly finish subgrade preparation. The 40:1 crown allows water to run off of the roadbed. The 95 to 100% optimal compaction achieved with the steel wheel roller provides bearing strength and helps seal the roadbed (providing a moisture barrier), promoting the water to runoff instead of penetrating the soil.⁶⁹ Nowhere does AEPCO account for the equipment that it intends to use to form final grades and ditch lines. Also, in cuts where

⁶⁹ Interestingly, none of the equipment selected by AEPCO is capable of finishing the roadbed to the required level.

excavation takes place, the fine grading crew will construct the final shape of the roadbed surface as well as the ditch line.

Rock cuts will be excavated to an elevation one foot below subgrade and then select loose material will be placed, compacted, and fine graded to achieve the typical roadbed section. The fine grading crews normally consist of motorgraders, steel wheel vibratory rollers, water trucks, a ditching machine and a paddle pan to transfer material. The 40:1 crown specified for the top of roadbed can only be achieved using a motorgrader and steel wheel roller. AEPCO does not include any equipment capable of finishing or shaping the roadbed to the accuracy required in roadway construction.

Water trucks must be available to achieve optimum moisture in the compacted soil and make the material workable. If the material is too wet it must be scarified and dried or removed. A foreman and at least one laborer must be available to check the design grades set by survey stakes as the roadbed nears completion. In addition, this crew would be responsible for shaping the ditch line in cuts as well as ditches that divert water away from the fill locations. Paddle pans (self-elevating scrapers) are used to transfer windrowed loose material from areas of the roadbed that are too high to areas along the subgrade that are too low.

Means lists a fine grading crew that only includes a motorgrader with operator and one laborer. This crew was used as a base, and then modified by adding a steel wheel roller with operator, a Gradall (ditching machine) with operator and one paddle pan with operator. The daily rates supplied by Means were applied for a total daily rate of \$4,559.40 per day. A larger motorgrader was substituted for the smaller version supplied by Means. Production was also increased from 3,500 square yards per day to 5,000 square yards per day. The final cost for fine grading came to \$0.87 per square yard. For a 24-foot wide roadbed this amounts to \$12,182.58

per mile. Details of their calculations are included in BNSF/UP's Supplemental Reply electronic workpaper "III F 2 Fine Grading Cost.xls."

c. Lateral Drainage

Lateral drains are typically under-drains (in trenches) that are used to artificially lower the water table, to intercept ground water (such as side-hill seepage) before it reaches the roadbed, and to drain water trapped in pockets beneath the roadway. AEPCO develops the lateral drainage requirements for ACE from the Engineering Reports and from materials produced in discovery for the newly constructed segments. Its unit costs for lateral drainage are developed from Means. Overall, AEPCO has identified approximately \$524 in lateral drainage requirements for ACE. For purposes of this proceeding and to eliminate the number of disputed items between the parties, the BNSF/UP Engineering Consultants accept AEPCO's lateral drainage costs.

d. Culverts

A culvert is "an enclosed channel serving as a continuation of and a substitute for an open stream where that stream meets an artificial barrier such as a roadway, embankment or levee."⁷⁰ Culverts are used to control surface drainage, primarily to prevent standing water on the surface of the roadbed. Various factors are involved in designing a culvert, but the objective is to design an economical structure to handle the flow of water along with any debris with minimum damage to the railway or adjacent property. AEPCO assumes that there will be two different types of culverts on ACE, corrugated metal pipe (CMP) and structural plate pipe (SPP) culverts.

⁷⁰ *Handbook of Steel Drainage & Highway Construction Products*, American Iron and Steel Institute, 1993, Ch. 5 at 301. BNSF/UP.SUPPRP.WP.III.F-0162 to 0165.

Overall, AEPCO develops culvert costs for ACE of \$2.8 million as summarized in the following table.

**Table III.F.2-13
AEPCO's Culvert Costs**

Type	Length	Cost/Foot	Cost
Standard			
CMP	42,833 ft	\$57.61	\$2.5 m
SPP	892 ft	\$398.85	\$0.4 m
Total	43,725 ft	\$64.57	\$2.8 m

Source: AEPCO Opening electronic workpaper "Culvert Inventory and Costing.xls."

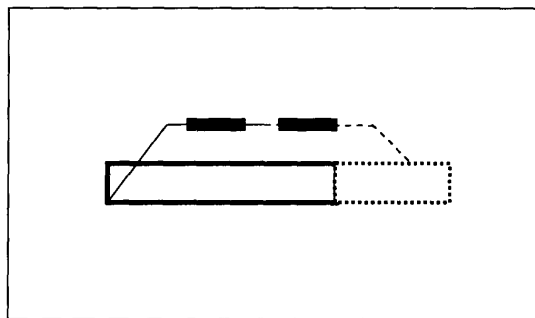
BNSF/UP's Engineering Consultants agree with the types of culverts selected by AEPCO, but have disagreements with both the inventory of ACE culverts and AEPCO's development of culvert unit costs.

Based on their review of the culvert inventory produced to AEPCO by BNSF/UP in discovery and an analysis of the proposed ACE route, the BNSF/UP Engineering Consultants determined that AEPCO missed a total of ten culverts that need to be added to the ACE culvert inventory, nine on the UP Lordsburg Subdivision and one on the BNSF Gallup Subdivision. Details of these missing culverts are set forth in BNSF/UP Supplemental Reply electronic workpaper "III F 2 Culverts.xls."

In addition to missing a handful of culverts, the BNSF/UP Engineering Consultants determined that AEPCO's approach to computing culvert lengths attributable to single and multiple tracks is seriously flawed and produces a substantial understatement in the length of culverts for the ACE. AEPCO first tries to convert the total length of each culvert to the length attributable to a single track. To do this, AEPCO simply divides the length of the culvert by the number of tracks. This understates the single track culvert length in two ways. First, in determining the total culvert length AEPCO only counts the first or originally built section of a

culvert. As such, if a culvert was extended after its original construction to accommodate an additional track or tracks, AEPCO's process ignores the added length in the numerator of its calculation, but includes the added track or tracks in the denominator. This is clearly wrong.

Second, simply dividing the total culvert length (even including the additional sections) by the number of tracks understates the culvert length allocated to the first main track and overstates the culvert length allocated to the additional track. This is because the length attributable to the first track must include adequate length to accommodate the side slopes of the roadbed cross section while the length attributable to the additional tracks needs to cover only the incremental length added by the track. For example, for a culvert that is perpendicular to the right-of-way, the additional length needed to accommodate a second track placed on 25-foot track centers is only 25 feet as depicted in the diagram below.



The BNSF/UP Engineering Consultants corrected AEPCO flawed culvert inventory formulas and restated the ACE culvert inventories. Details are set forth in the workpapers.

AEPCO develops unit costs for culverts from a quote from a supplier and from Means. The BNSF/UP Engineering Consultants reviewed AEPCO's workpapers and determined that AEPCO's development of culvert unit costs is flawed in a number of respects. For example, the culvert gage assumptions reflected in the quote relied upon by AEPCO for CMP costs falls

outside the diameter-to-gage range recommendations/requirements for AREMA, BNSF and UP. As a result, the gage assumptions employed by AEPCO are infeasible for the ACE and will likely fail. The unit prices reflected in Means after adjustment for the location factor are between 48 and 177 percent higher than the unit cost for CMP culverts quoted by Pacific Corrugated Pipe Co. In addition, the location factors used by AEPCO are incorrect and serve to further understate culvert costs. These and other problems with AEPCO development of culvert unit costs are explained and corrected in the BNSF/UP Engineering Consultants' workpapers.

BNSF/UP's corrected calculations show a system-wide requirement of 56,845 feet of culverts for a total cost of \$8.1 million. The table below compares BNSF/UP's total cost of culverts with that of AEPCO. The details of the calculations and unit costs, along with an inventory of the culverts on ACE, are in BNSF/UP Supplemental Reply electronic workpaper "III F 2 Culverts.xls."

Table III.F.2-14
Comparison Of BNSF/UP's Estimate Of Culvert Cost With
AEPCO's Estimate In Opening Evidence

	BNSF/UP	AEPCO	Difference
Total Feet	56,845	43,725	13,120
Total Cost (Millions)			
CMP	7.5	2.5	5.0
SPP	0.6	0.4	0.2
Total Cost (\$Millions)	8.1	2.8	5.3

Source: AEPCO Opening electronic workpaper "Culvert Inventory and Costing.xls"; BNSF/UP Supplemental Reply electronic workpaper "III F 2 Culverts.xls."

e. Other

(1) Drainage Ditches

AEPCO uses trapezoidal ditches that are 2 feet wide and 2 feet deep, claiming that this is consistent with the Board's decisions in *WPL* and that "in many cases, this size ditch is larger

than the existing ditches on the antecedent BNSF and UP lines.” AEPCO Opening Nar. at III-F-36-37.

In excavated sections of the roadbed, drainage ditches parallel to the tracks are needed to drain water off the surface of the roadbed and to hold snow and eroded soil and debris away from the track structure. Ditches should be adequately designed to ensure that no water will remain on the roadway surface to cause injury to the roadbed or interfere with traffic. Because ditches are subjected to erosion, sedimentation, change of channel, and overflowing, they should be wide enough to have the capacity to contain soil erosions or rock fallout without clogging. Wide ditches also provide a place to accumulate snow away from the track structure itself. For these reasons, AREMA § 1.2.4.2d. specifies a *minimum* bottom width of 3 feet for trapezoidal ditches. The use of narrower ditches by some railroads -- and under circumstances or conditions not explained by AEPCO -- should not be sufficient grounds to supplant the industry standard.

Nonetheless, in light of the Board’s rulings in the prior cases, BNSF/UP does not challenge AEPCO’s specification of 2-foot bottom ditch widths, but notes that the use of 2-foot ditches across the ACE system will inevitably result in increased clogging of surface drainage systems, requiring increased maintenance to the damaged roadbed. The BNSF/UP Engineering Consultants have taken that into account in restating the ACE maintenance-of-way costs.

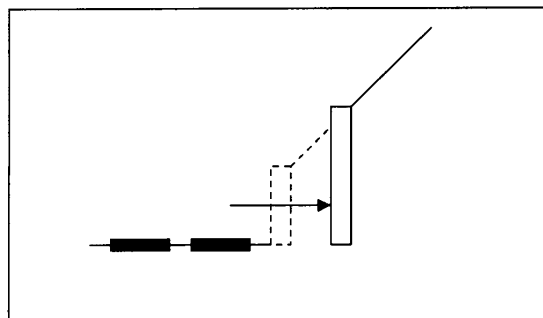
(2) Retaining Walls

Rather than build masonry retaining walls, AEPCO proposes constructing ACE with gabions (galvanized steel mesh boxes) filled with rock, which BNSF/UP accepts. AEPCO correctly calculated the square yards of retaining wall materials listed under masonry, timber, ties and pilings in the Engineering Reports.⁷¹ BNSF/UP’s Engineering Consultants accept

AEPCO's calculation of the square yards of gabions needed for all retaining walls except crib walls based on the square yards of retaining wall materials found in the Engineering Reports for line segments covered by the reports. Details are set forth in the workpapers.

The BNSF/UP Engineering Consultants also adjusted the Engineering Report retaining wall quantities to accommodate the expanded roadbed section used by AEPCO for the ACE. In its opening evidence, AEPCO increased the roadbed widths on embankments by 7 feet and in cuts by 19 feet from the original standard roadbed section upon which the Engineering Report quantities are based. Measuring from the center line of track this will move the break point of the slope out an additional 3.5 feet on embankments and almost 10 feet in cuts. This shift will have a significant effect on the retaining wall requirements of the ACE.

Retaining walls are deployed in special circumstances where there is not enough room to construct the full standard roadbed section. An adjacent roadway, building, side hill, stream or other obstacle encountered during construction, may dictate the need for a retaining wall. Widening the roadway does not relieve or move the constraint of the obstacle encountered. Therefore, the retaining walls will need to be enlarged to accommodate the wider roadbed. The BNSF/UP Engineering Consultants calculated the amount by which the retaining wall quantities reflected in the Engineering Reports would need to be increased to accommodate AEPCO's larger roadbed section as depicted in the diagram below.



Details of these calculations are set forth in BNSF/UP's workpapers.⁷²

In developing unit costs for retaining walls, AEPCO selected a unit cost from the Erosion and Sediment Control section of Means. AEPCO has not explained why it selected a unit cost for gabions from that section rather than for gabions under the Retaining Wall section of Means. Gabions for erosion control are generally used to stop erosion and sediments from proceeding beyond a certain point. AEPCO has not shown that such gabions would have the strength to structurally support earth where retaining walls are needed. Therefore, BNSF/UP's Engineering Consultants use the unit cost for gabions specifically cited in Means to be used as retaining walls. That cost is R.S. Means 02830-100-6080 stone-filled gabions.

AEPCO also omitted costs for installation of the retaining walls. The process for installing retaining walls, which includes trenching is demonstrated in a drawing in BNSF/UP's workpapers.⁷³ Based on this process, BNSF/UP Engineering Consultants added trenching costs from Means.⁷⁴

Detailed calculations for retaining wall costs are in BNSF/UP's workpapers.⁷⁵ The total costs for retaining walls are included in BNSF/UP Exhibit III.F-1.

(3) Rip Rap

AEPCO bases its cost for rip rap on material quantities reported in the Engineering Reports. It uses a unit cost from Means. BNSF/UP accepts the use of these sources for ACE rip rap costs. The costs for rip rap are included in BNSF/UP Exhibit III.F-2. The details of the

⁷² BNSF/UP.SUPPRP.WP.III.F-0180 to 0213.

⁷³ *Id.*

⁷⁴ BNSF/UP.SUPPRP.WP.III.F-0215.

⁷⁵ BNSF/UP Supplemental Reply electronic workpaper "III F 2 ACE Grading.xls," tab "IIIF_6 Othr EW."

calculations are in BNSF/UP Supplemental Reply electronic workpaper "III F 2 ACE Grading.xls."

(4) Utility Relocation

AEPCO includes costs for utility relocation on the line segments of ACE constructed in the past 50 years, but omits these costs on the remaining line segments on the theory that such costs constitute entry barriers. Relocation of utilities is a cost that is incurred when construction of the rail line requires the crossing of existing utility lines, including electrical power lines above and below ground, gas and oil pipelines, telephone lines and cables, fiber optic cables and water mains. For the most part, line segments of incumbent railroads replicated by the SARR in a SAC case were built before such utilities were in place. Thus, complainants have argued that the incumbent did not incur such costs and that they should be excluded as entry barriers. The Board has upheld that position, most recently in *TMPA*.

In light of the Board's refusal to allow relocation costs for utilities on anything but the newly constructed line segments, BNSF/UP's Engineering Consultants accept AEPCO's per mile unit cost for relocation of utilities and apply it to the miles of newly constructed segments. Calculations are included in BNSF/UP's Supplemental Reply electronic workpaper "III F 2 ACE Grading.xls," Tab "IIIF_11Othr Cst."

(5) Slope Stabilization (Topsoil Placing/Seeding)

AEPCO does not include any costs for seeding or topsoil replacement based on its review of the ICC Engineering Reports and information produced by BNSF in discovery. The BNSF/UP Engineering Consultants accept this except for the Vaughn and El Paso yards. Details are set forth in BNSF/UP Supplemental Reply electronic workpaper "III F 2 ACE Grading.xls."

(6) Water for Compaction

AEPCO correctly recognizes the need to ensure that the moisture content of the soil on ACE's fills is within an acceptable range, but improperly based both the quantity and cost for water on the BNSF experience in constructing the Orin Line. AEPCO has cited the price of water from a WYDOT document at \$0.009 per gallon. The BNSF/UP Engineering Consultants agree that this may be the price of water in Wyoming, but the availability of water in ACE region is scarce. The scarcity of water increases the price. When the railroads were being constructed many deep wells had to be installed and pipelines constructed to furnish water to the railroad. Along the Southern Pacific wells over 600 feet deep had to be installed. Rather than try to itemize wells and pipelines the BNSF/UP Engineering Consultants turn to Means as an unbiased source for the unit price of water. They select the cost for Water, 3,000-gallon truck, 12 mile haul. This cost includes the cost of water itself and the equipment and labor required to haul and apply the water. Given the scarcity of water in this region, the 12 mile average haul likely understates the actual average haul length and is thus very conservative. The Means cost per cubic yard was applied to the cubic yards of embankment to arrive at a total cost for water of \$45.9 million. Details are set forth in the workpapers.⁷⁶

(7) Road Surfacing

Road surfacing includes the cost for the construction of road detours that are built during construction, and the resurfacing of existing roads that are damaged during the construction process. As it did for utility relocation, AEPCO includes road surfacing only for the rail lines that are relatively or completely new. These are (1) the 20.4 mile Defiance Branch; (2) the 0.7 mile west leg of the Baca Branch wye; and (3) the 0.85 mile Vaughn Connecting Track.

⁷⁶ BNSF/UP.SUPPRP.WP.III.F-0216.

AEPCO develops costs for private crossings on a 6"-deep gravel detour road estimated at 10' wide and 300' feet long. For public crossings AEPCO includes costs for a paved detour road estimated at 24' wide and 500' long.

AEPCO's exclusion of road relocation costs on all other segments of ACE is inappropriate. The fact that the road infrastructure is in place today is a substantial benefit to ACE. The roads will be used extensively by ACE construction and operating personnel both during the actual construction and once the railroad becomes operational. For example, because of the roads in place today, many of the construction materials can be efficiently trucked from the delivery points to the construction staging areas. Once operations begin, maintenance crews can use the road infrastructure to access portions of the right-of-way without tying up track time. Similarly, taxi drivers hauling relief train crews will make significant use of the road network to get crews to the "outlawed" trains.

To the extent that ACE needs to have the roads in place to bring workforces and materials to the ACE site during construction, and will continue to use these roads to its benefit after construction, it should not be allowed to assert an entry barrier. As with utilities, costs to relocate roads that the SARR would have to construct if they were not already there should be included in SAC costs.

Moreover, there is evidence that BNSF/UP's predecessors incurred costs for roads even back before the Engineering Reports were developed. As described more fully in Section III.F.6, the BNSF/UP Engineering Consultants extracted from the Engineering Reports the material quantities for at grade crossings identified under ICC Account 15 – Crossings and Signs. They determined there were sufficient quantities of crossing materials to construct the equivalent of

269 grade crossings along the ACE route at the time the Engineering Reports were prepared.⁷⁷

The BNSF/UP Engineering Consultants therefore include road relocation costs based on the relative proportion of the road crossings build by BNSF and UP.

(8) Construction Site Access Roads

AEPCO includes a discussion of construction site access roads but does not include any costs. For purposes of this proceeding, the BNSF/UP Construction Experts also do not include additional costs for construction site access roads.

(9) Environmental Mitigation

Measures to control environmental factors are necessary expenditures in constructing a railroad and a natural outgrowth of preventive measures taken as part of the normal construction process. AEPCO recognized this and has included \$0.2 million for erosion control for the recently constructed line segments for which the railroad indisputably incurred such costs. AEPCO Opening Nar. at III-F-44. AEPCO calculated a cost per mile based on its assertion that the costs for environmental compliance on the Orin Line were \$1.5 million in 1997 dollars. AEPCO indexed that cost to 2001 levels and applied it to the new construction miles.

BNSF/UP's Engineering Consultants found AEPCO's unit cost of \$7,477 indexed to the 1Q01 level acceptable, as well as AEPCO's methodology for arriving at the \$0.2 million dollar amount.⁷⁸

⁷⁷ BNSF/UP Supplemental Reply electronic workpaper "III F 8 ICC Crossings.xls," tab "Crossings."

⁷⁸ BNSF/UP Supplemental Reply electronic workpaper "III F 2 ACE Grading.xls," tab "IIIF Summary."

(10) Land for Waste Quantities

AEPCO assumes that 30 percent of the material excavated during the construction of ACE will not be re-used as embankment and will instead be wasted along the right-of-way. ACE includes costs for additional land along the right-of-way to accommodate the dumping of the waste material as well as costs for the dumped material to be moved and shaped by a bulldozer. BNSF/UP's Engineering Consultants agree with the waste ratio and the inclusion of these costs. However, AEPCO's calculation of the additional acres of land that would be required as set forth in AEPCO Opening Exh. III-F-11 is illogical because it implicitly assumes the waste pile would have 15-foot high vertical walls, which would be impossible to maintain without extensive retaining walls. A more reasonable approach is to calculate the acreage on the assumption that the waste pile would be shaped using a 1.5:1 slope. This would require a larger area to accommodate the waste, but would eliminate the problem of retaining walls. BNSF/UP's calculations show that, when the proper slope is taken into consideration, the land requirement should be based on 14,300 CY per acre rather than 24,200 CY as calculated by AEPCO.⁷⁹ Based on this measure, BNSF/UP has included 872.2 acres of land for waste in its land costs. The BNSF/UP Engineering Consultants have accepted AEPCO's proposed cost per acre.

(11) Yard Drainage

The BNSF/UP Engineering Consultants also included cost for yard drainage where required. Details are set forth in the workpapers.

⁷⁹ BNSF/UP.SUPPRP.WP.III.F-0232.

(12) Summary

The table below summarizes the grading (roadbed preparation) costs that BNSF/UP's Engineering Consultants determined would be necessary to construct the railroad to the specifications necessary for a railroad with the tonnage requirements of ACE.

Table III.F.2-15
Summary of Grading Costs

Item	BNSF/UP Total Cost (\$Millions)	AEPCO Total Cost (\$Millions)	Difference
Earthwork - Line Segment			
Common	\$176.0	\$95.3	\$80.7
Loose	27.9	10.8	17.1
Solid	69.3	31.8	37.5
Borrow	34.4	29.0	5.3
Earthwork - Yards			
Common	51.5	0.0	51.5
Loose	16.5	0.0	16.5
Solid	19.3	0.0	19.3
Borrow	0.2	1.4	-1.2
Other Yard (Drainage, etc.)	20.2	0.0	20.2
Earthwork - Total	\$415.4	\$168.5	\$246.9
Water for Compaction	\$45.9	\$2.7	\$43.2
Clearing	33.6	1.2	32.3
Grubbing	0.0	0.0	0.0
Undercutting	29.4	0.0	29.4
Sand Berm	18.7	0.0	18.7
Drainage Berm	5.8	0.0	5.8
Fine Grading	8.0	0.0	8.0
Lateral Drainage	0.0	0.0	0.0
Retaining Walls	3.9	0.4	3.5
Rip Rap	3.4	3.3	0.1
Road Surfacing	6.5	0.2	6.3
Relocation of Utilities	0.1	0.1	0.0
Land for waste quantities	0.1	0.1	0.1
Environmental Compliance	0.2	0.2	0.0
Total	\$571.0	\$176.7	\$394.3

Source: AEPCO Opening electronic workpaper "ACE RR GRADING.XLS," BNSF/UP Supplemental Reply electronic workpaper "III F 2 ACE Grading.xls."

3. Track Construction

Track Construction entails the procurement, transportation, and installation of myriad components that come together to create the actual track structure for a line of railroad. In SAC cases, for simplicity, the parties provide for only the essential elements, including, generally, geotextile fabric, subballast, ballast, various weights and grades of rail, ties, tie plates, clips, anchors, and spikes as well as the essential components of turnouts (or switches). In this case, as shown in AEPCO Opening Exh. III-F-1, AEPCO has included twenty-nine (29) track components. Except as noted, in the interest of time and simplicity, BNSF/UP Engineering Consultants will address in their Narrative only those items with which they disagree with AEPCO's quantities or unit costs.

The quantity of each particular track component depends in large part on the total miles of track to be constructed. In its Opening Narrative, AEPCO included 786.01 total route miles (of which 517.47 are to be constructed by ACE) and 957.66 mainline track miles. AEPCO Opening Nar. at III-B-5. As discussed below, in assessing certain track construction costs, AEPCO misapplied its own track mile assumptions in a way that significantly overstated costs. Defendants have corrected these errors.

Despite the Railroads' objections to AEPCO's reliance on trackage rights (as discussed in the Counsel's Argument and Summary of Evidence), and given the time and resource constraints, the Railroads, for the purpose of this case, accept AEPCO's calculation of constructed route miles. With respect to track miles, given the nature of this case, the Railroads have not undertaken an expensive and time-consuming capacity study to ascertain whether the track structure is sufficient to handle the selected traffic, but performed only a limited study of coal train movements to determine the impact on traffic. BNSF/UP witness Wheeler determined that a third mainline would be necessary on the Vaughn-to-Defiance line between MP 875 and

878. Other than that, in the context of this particular case, the Railroads adjusted AEPCO's mainline track miles only to correct an error in their calculation as set forth in BNSF/UP Supplemental Reply electronic workpaper "III F Track Mile Reconciliation.xls," and to add track where needed to (a) facilitate movement into and out of the Vaughn yard and to prevent AEPCO's rerouted traffic from interfering with higher priority traffic traveling at maximum speed, and (b) provide setout tracks for bad-order cars and maintenance-of way equipment storage as posited by AEPCO. Defendants' experts have also added track miles in the Vaughn and El Paso Yards to meet the performance requirements that AEPCO has set out for those yards. These additions include:

- additional tracks at Vaughn for the staging of tank cars
- double lead tracks at the east end of the Vaughn yard and double main track through the yard
- additional running track at Vaughn for access to the locomotive shop, car repair facilities, storage tracks, and wye track
- additional track at Vaughn for placement for spare coal cars and repaired car storage
- additional tracks adjacent to the Vaughn and Defiance yards for holding stranded cars for setout and pickup by BNSF
- additional storage tracks at El Paso for locomotives and cars
- additional crossover between the double mainline tracks at El Paso
- additional track to serve the small car repair facility and locomotive repair pit at El Paso
- double lead tracks on the west end of the El Paso yard

Based on those changes, BNSF/UP Engineering Consultants have restated construction costs to reflect a total of 969.64 track miles. BNSF Supplemental Reply Nar. at III.B.1. These

additional miles of track result in minor increases in the quantities for all track components, as reflected in the BNSF/UP Engineering Consultants' restatement of ACE construction costs.⁸⁰

In addition to changes due to additional track miles, of the 29 items covered by AEPCO, the Railroads disagree with the quantity for eight (8) components and with the omission of four (4) components. These include:

- geotextile material (omission)
- ballast
- subballast
- wood ties
- field welds
- compromise joints (omission)
- turnouts
- switch stands
- single track lubricators
- environmental mat (omission)
- rail anchors
- wheel stops and derails (omission)

Likewise, the Railroads disagree with the unit costs that AEPCO has supplied for the following ten (10) components and installation items:

- ballast from Pedernal
- 6"x 8" Grade Three ties

⁸⁰ The restated total costs for track construction are contained in BNSF/UP Supplemental Reply electronic workpaper "III F 3 Track.xls". There were additional track quantities resulting from capital investments that UP and BNSF would have to make to reflect operational changes resulting from AEP's proposed operations for the ACE. Those costs are contained in BNSF/UP Supplemental Reply electronic workpaper "III F Reimbursable Track Qty.xls."

- field welds
- No. 20 and No. 24 turnouts
- rail lubricators
- tie plates
- rail anchors
- subballast installation
- No. 10 turnout installation
- yard and branch line 132-pound rail installation

The subsections below set forth the Railroads' Engineering Consultant George T. Zimmerman's analysis of each track component for which he disagrees either with the quantity or the unit cost proposed by AEPCO, as well as each item of track construction for which his estimates differ from those of AEPCO's witnesses, Messrs. Pattison and Stone.

a. Geotextile Fabric

(1) Specifications

Geotextile fabric is placed on the roadbed grade to protect the ballast and subballast from contamination, and to provide additional stabilization and support in areas of poor drainage and soil quality. Turnouts and road crossings are also widely recognized as areas that require additional support, making them regular candidates for geotextile fabric use. BNSF specifications require that geotextiles be placed between the subgrade and the subballast.⁸¹ The Board in its most recent ruling in *CP&L* commented on the general acceptance of geotextile use and concluded that the cost of placing it under turnouts and crossings should be generally included in a SAC presentation. *CP&L*, slip op. at 89

⁸¹ BNSF/UP.SUPPRP.WP.III.F-0236 to 0241.

AEPCO has not used *any* geotextile fabric in constructing the ACE. It bases its exclusion on two reasons—(1) the ACE replicates lines that were constructed before geotextile fabric use became the norm and thus their use can be excluded as an entry barrier, and (2) even though it has become common modern practice to use geotextiles on lines built in more recent years, since other tracks have survived without use of the fabric, AEPCO should be able to ignore modern practice for the entirety of the ACE. AEPCO Opening Nar. at III-F-44.

The Railroads take issue with both grounds for AEPCO's total exclusion of geotextile fabric. While it is true that many of the current geotextile fabrics were not developed until the 1960s, there have been several other types of materials used in the past that have performed an identical function. In the earliest railroad construction, the track roadbed often was underlain with brush and logs to create a wider support for the track in areas of poor drainage and poor soil quality, as well as at turnouts, road crossings and bridge approaches. Even if the specific materials used today were not in existence at the time the predecessor lines were established, it does not follow that the lines being replicated by the ACE were constructed without reliance on alternative materials that performed a parallel function to today's geotextile material.

AEPCO's rationale for exclusion of materials that were not developed at the time of original construction is not only inconsistent with the well-established SAC practice of building the SARR to modern standards, but nonsensical as well. The logical extension of that reasoning would also preclude the SARR from incorporating modern signal systems, electric switches, Pandrol plates and clips, rail lubricators, heavier weights of rail, concrete for bridges, or diesel engines and more efficient rail cars. Adopting a modern improvement in roadbed stabilization through use of geotextiles is no different than the inclusion in a SAC case of any of these other improvements.

AEPCO's second rationale is equally nonsensical. The mere existence of track built without geotextiles, whether because such track was constructed before 1960 or because that particular line of railroad does not need stabilization, is not "proof" that there is no need for geotextiles on any part of the ACE. Further investigation of the soil along the ACE could very well reveal either the existence of or need for geotextile fabric in its construction. For the purposes of this case, however, the Railroads will address only the need for geotextiles under turnouts on the mainline and all grade crossings, where it is well established that geotextiles play a vital role in supporting the structure under heavy haul loads.

(2) Geotextiles Under Turnouts

As noted above, AEPCO did not provide for geotextile fabric under any turnouts along the ACE line. The Railroads' Engineering Consultants, in keeping with standard practice, have determined that a 17-foot wide strip of geotextile fabric should be placed at the point of switch and widened to a 24-foot width at the end of the long turnout ties. The geotextile fabric also should be extended ahead of the turnout point of switch to encompass the transition ties located there, adding a section 17-feet wide by 16-feet long at each turnout. Allowance for overlap must also be made as the fabric typically comes in rolls that are 12 to 15 feet wide. This would be one longitudinal lap as detailed by AREMA Chapter 1, Part 10, page 1-10-7.⁸²

BNSF/UP Engineering Consultants calculated the quantities for each type of turnout found along the ACE as follows:

<u>Turnout No.</u>	<u>Ahead of POS</u>	<u>+</u>	<u>Lap</u>	<u>+</u>	<u>POS to end</u>	<u>x SF to SY</u>	<u>=</u>	<u>Total</u>
					<u>Long Ties</u>			
No. 10	272 SF		232 SF		2378 SF	X 11.1%		320 SY ea.
No. 14	272 SF		318 SF		3260 SF	X 11.1%		428 SY ea.
No. 20	272 SF		454 SF		4654 SF	X 11.1%		598 SY ea.

⁸² BNSF/UP.SUPPRP.WP.III.F-0241.

No. 24 272 SF 560 SF 5740 SF X 11.1% 730 SY ea.

BNSF/UP Engineering Consultants' calculations and standards are included in BNSF/UP workpapers.⁸³ These quantities were applied to the total number of turnouts on the final track configuration of the ACE as determined by the Defendants' operating and construction experts.

(3) Geotextiles Under Road Crossing

At each place where a highway crosses the ACE, there will be either an at-grade crossing or a separated crossing such as a bridge or underpass. Experience has made it increasingly evident, and the Board in *CP&L* concurred, that the subballast at an at-grade crossing should be underlain with a non-woven geotextile to add strength to the crossing structure and to protect the subballast and ballast from the transmission of fine soil particles from the subgrade. *CP&L* slip op. at 89. The subgrade in a grade crossing is subject to a much more demanding loading than that of a typical track section. The drainage at a grade crossing is usually not optimal since railroad side ditches cannot be placed across the road. As a result, the water level in the crossing area stays at a higher level after a rain than in a typical section. Not only does the subgrade remain wet for longer periods of time, but it is also subjected to many more loading cycles since the grade crossing also has to handle vehicular traffic.

Dr. Jerry Rose of the University of Kentucky, in his presentation to AREMA in September 2002, stated his findings that heavily loaded trucks can impart as much as a third of the loading to the subgrade at a highway crossing as a heavily loaded train.⁸⁴ The road traffic loading is typically concentrated in one place in the track (where the wheel tracks are) and the number of truck crossings could be many more than the train loads at the same spot. To

⁸³ BNSF/UP.SUPPRP.WP.III.F-0242 to 0245.

⁸⁴ BNSF/UP.SUPPRP.WP.III.F-0246 to 0250.

maintain ride quality and minimize future maintenance, geotextiles should be installed between the subgrade and subballast at each crossing.

BNSF/UP Engineering Consultants used a single roll width of geotextile fabric under each crossing for the length of the crossing, plus an additional ten feet of fabric on each side of the crossing.⁸⁵

(4) Unit Cost

Because AEPCO did not address the need for geotextile fabric anywhere on the ACE line, it has not presented evidence on the cost of these materials. As AEPCO has used the RS Means 2001 handbook for the pricing of other materials along the ACE, BNSF/UP takes its unit cost for 600-pound tensile strength geotextiles from Section 02340-500-1510 of this source, which includes materials, labor, transportation, and equipment.⁸⁶ The total unit cost per SY installed is \$1.95.

b. Ballast and Subballast

AEPCO's Opening Narrative is correct in its characterization of the importance of ballast and subballast. AEPCO Opening Nar. at III-F-44 to 45. These two layers are necessary to distribute heavy track loads to the subgrade at a bearing pressure that can be adequately supported by the native subgrade. The ballast and subballast layers are also essential to preserving subgrade stability by allowing water to escape from the ballast section. The subballast performs the additional function of filtering finer grained subgrade soils and preventing intrusion into the ballast; the ballast allows for maintenance of the track surface and alignment.

⁸⁵ The computation for geotextiles under grade crossings is 12' wide x [(Length of crossings) + (20' x number of crossings)] x 11.1%=SY. BNSF/UP.SUPPRP.WP.III.F-0242.

⁸⁶ BNSF/UP.SUPPRP.WP.III.F-0251.

Consistent with AREMA guidelines, AEPCO has assumed a subgrade bearing capacity of 25 psi as the standard, adequate subgrade level.⁸⁷ It has opted to use twenty inches of combined ballast and subballast, consisting of twelve inches of clean rock ballast and eight inches of similar, but more finely crushed, subballast. According to AEPCO's Opening Narrative, these levels will be used for all mainline track and passing siding sections. AEPCO Opening Nar. at III-F-45. BNSF and UP accept AEPCO's placement of twelve inches of ballast and eight inches of subballast under all mainline and branch line segments along the ACE. While AEPCO selected ballast and subballast depths of twelve and eight inches with steel ties in mind, the Railroads' Engineering Consultant George Zimmerman has determined that these levels are appropriate for wood ties as well.⁸⁸

AEPCO departs from its 12"-8" combination and instead uses only ten inches of ballast and no subballast in yard, mine lead and setout tracks. AEPCO Opening Nar. at III-F-46. AEPCO cites the lack of dynamic loading as a justification for not placing subballast in these areas and alleges that ten inches of ballast, combined with the twelve inches of existing compacted fill at yards, will exert 16.85 psi, which it claims is sufficient to meet AREMA standards.⁸⁹

The Railroads' Consulting Engineers do not accept AEPCO's assertion that ten inches of ballast with no subballast is appropriate for all yard, lead and setout tracks. BNSF/UP Consulting Engineer Zimmerman has determined that six inches of crushed stone subballast is necessary to perform the tasks of protection and stabilization that AEPCO has described in its Narrative. AEPCO Opening Nar. III-F-44 to 45. To determine the level of ballast and subballast

⁸⁷ AEPCO.OP.WP.04635 to 04641.

⁸⁸ BNSF/UP.SUPPRP.WP.III.F-0252 to 0256.

⁸⁹ AEPCO.OP.WP.04639 to 04641.

appropriate for yard and setout track use, Mr. Zimmerman took the generally accepted AREMA guidelines formula and adjusted for a lower speed of ten miles per hour to simulate the movement of trains over these tracks.⁹⁰ Despite the near absence of dynamic loading at this speed, a total section depth of at least 15.87 inches is still required; even when a speed of zero miles per hour is inserted into the AREMA equation, the required depth is only reduced to 14.80 inches. As train speeds in a yard commonly approach ten miles per hour (the amount of speed supportable by Class I track), these calculations support BNSF/UP's addition of six inches of subballast.

The formula that the Railroads' expert witness used to determine the appropriate level of subballast is superior to that used by AEPCO, as it is from the AREMA guidelines and takes into consideration the effect of train speed on ballast pressure—"dynamic loading". AEPCO's calculations are not found in AREMA, but were taken from a presentation delivered by a conference participant; these calculations do not consider the dynamic loading effect.⁹¹ Additionally, BNSF/UP witness Zimmerman has discovered several errors made by AEPCO in its calculations, including under-calculating the wheel loading and the elastic modulus of rail support, and applying an incorrect version of the AREMA 1.2.11.2.2 equation for P_c (uniform pressure on subgrade).⁹²

The BNSF/UP calculations demonstrate that including six inches of subballast in yard, mine and leadout tracks provides proper distribution of pressure to the subgrade. The placement

⁹⁰ Mr. Zimmerman's calculations are included as BNSF/UP.SUPPRP.WP.III.F-0257 to 0258. The AREMA guidelines can be found at BNSF/UP.SUPPRP.WP.III.F-0259 to 0265.

⁹¹ AEPCO.OP.WP.04639 to 04641.

⁹² A description of all the errors Mr. Zimmerman discovered in AEPCO's subgrade pressure calculations, and the supporting AREMA sections are included at BNSF/UP.SUPPRP.WP.III.F-0266 to 0277.

of subballast serves the additional tasks of preserving the subgrade by serving as a filtering mechanism protecting the ballast from fine-grained subgrade particles, and allowing drainage away from the ballast. It is for all these reasons that AREMA guidelines advise the placement of a minimum of six inches of subballast underneath track.⁹³

The weight of scholarship on geotechnical engineering also supports the inclusion of six inches of subballast at yards and setout tracks. In his book, "Introductory Soil Mechanics and Foundations: Geotechnical Engineering", George F. Sowers, a renowned authority in the area, outlined five requirements for constructing a geotechnical foundation: (1) sufficient strength to safely support its own weight as well as the weight that will be continually applied to it; (2) the ability to not settle or deform under a load; (3) a lack of excessive swelling or shrinking; (4) the retention of strength or compressibility over a lifetime; and (5) the proper permeability or drainage characteristics.⁹⁴ The calculations above give reason to believe that the subsoil fill alone will not adequately meet these first two requirements. Additionally, subsoil fill does not perform the same necessary draining and filtering tasks—Dr. Sowers' fifth requirement—that subballast does. Finally, without a subballast material to seal off the subsoil, rainwater can be expected to fall on the track and move directly to the subsoil, potentially leading to swelling and shrinking of a magnitude that can damage track. While Dr. Sowers acknowledges that shrinking and swelling mechanisms are complex and difficult to predict, there is a pronounced chance of shrinkage cracks 0.5 meters wide and 5.0 meters deep developing in extremely arid areas like those across which the ACE is built.⁹⁵ As discussed above, there are specific performance characteristics of subballast materials, manufactured in accordance with AREMA 1.2.11, that

⁹³ BNSF/UP.SUPPRP.WP.III.F-0269 to 0277.

⁹⁴ BNSF/UP.SUPPRP.WP.III.F-0278 to 0279.

⁹⁵ BNSF/UP.SUPPRP.WP.III.F-0280 to 0283.

make it superior to subsoil and allow it to perform the functions laid out by Dr. Sowers.⁹⁶ It is as important that the subballast perform these functions in yards and at setout tracks as it is across the rest of the ACE.

The six-inch subballast addition in yards and setout tracks is also appropriate given the construction sequence of the SARR. From both economic and efficiency standpoints, it is most sensible to use six inches of subballast and place it immediately on top of the shaped and compacted subsoil. This provides a hard working surface for constructing the track and laying ballast, avoids any moisture damage in the period between compacting the soil and laying the track to allow ballast trains to enter the area, and limits disruption and damage to the subsoil during the tamping process.

One final point of support for placing six inches of subballast in yards and under setout tracks is the fact that it is the practice of both UP and BNSF to include a minimum six inches of subballast in these locations. BNSF and UP both use standard engineering specifications in the construction of roadbeds and track. The UP Standards confirm the UP practice of placing a minimum depth of six inches of subballast under all track sections.⁹⁷ The BNSF Standards for new construction call for a minimum twelve inches of subballast in all mainline and major spur roadbeds, and a minimum of six inches under light traffic and industry track, which would include BNSF yard and setout track.⁹⁸

Consistent with the practice of the railroad industry, BNSF, UP, and the weight of scholarship, BNSF/UP Engineering Consultants have included six inches of subballast under all yard and setout tracks.

⁹⁶ BNSF/UP.SUPPRP.WP.III.F-0270 to 0277.

⁹⁷ BNSF/UP.SUPPRP.WP.III.F-0284 to 0285.

⁹⁸ BNSF/UP.SUPPRP.WP.III.F-0286 to 0287.

(1) Quantities

AEPCO has calculated that to construct the ACE will require a total of 7,656,269.96 tons of subballast and 5,104,553.95 tons of ballast. These quantities were computed using a general CF/F amount determined for each of seven typical track sections rendered by AEPCO's experts.⁹⁹ The BNSF/UP Engineering Consultants found that AEPCO has understated the ballast and subballast amounts required by particular track types occurring along the ACE.¹⁰⁰ While attempting to mathematically verify AEPCO's amounts, the Railroads' witness Mr. Zimmerman found that the measurements were generally not accurate. For instance, it is evident from AEPCO's typical mainline single track section drawing and Mr. Zimmerman's calculations below, that AEPCO's amounts for ballast and subballast have been reversed.¹⁰¹ Also, AEPCO's base width of the typical yard and setout track section does not correspond with the individual dimensions shown for the tie, ballast shoulder, and side slope; when recalculated, the appropriate base dimension is 15 feet-5 inches, not 16 feet-2 and 3/8th inches.¹⁰² Because of the presence of these errors, and the fact that AEPCO's calculations cannot be recreated due to its reliance on the AutoCAD 2002 computer program, Mr. Zimmerman mathematically recalculated the amounts of ballast and subballast required in each typical section. Using the same steel tie and sectional dimensions assumed by AEPCO as an illustration, Mr. Zimmerman determined the following quantities:

⁹⁹ This calculation is contained in AEPCO Opening electronic workpaper "Ballast Subballast.xls."

¹⁰⁰ AEPCO has not described its computations in its narrative or its workpapers. The information is listed only on its cross-sections of the typical track sections, contained at AEPCO.OP.WP.04623 to 04629.

¹⁰¹ The typical section rendering where the ballast and subballast amounts have been switched is AEPCO.OP.WP.04623.

¹⁰² AEPCO.OP.WP.04629

<u>Track Type</u>	<u>Ballast in CF/FT</u>		<u>Subballast in CF/FT</u>	
	<u>AEPCO</u>	<u>BNSF/UP</u>	<u>AEPCO</u>	<u>BNSF/UP</u>
Single Track –Tangent	17.80	13.08	12.51	17.83
Single Track - 3-5 Degree Curve	14.71	14.74	17.82	17.83
Single Track - 5+ Degree Curve	16.46	15.85	17.85	17.83
Double Track – Tangent	26.00	27.24	46.11	45.35
Double Track - 3-5 Degree Curve	29.80	31.36	37.45	45.35
Double Track - 5+ Degree Curve	32.47	34.20	37.47	45.35
Yard and Setout	18.91	16.14		

There are several areas where the difference is enough to create an error of significant value when extended over the length of track corresponding to that particular section. For example, with a double track section over three degrees, the difference in the quantity of subballast would be 0.439 Tons per foot, or an additional cost of approximately \$4.62 per foot, or \$24,378.35 per mile.¹⁰³ When the corrected track section amount was applied to AEPCO's mile count for double track sections on a curve three degrees or higher, the total additional cost was \$787,908.27.

In their final counts of ballast and subballast required by the ACE, BNSF/UP Engineering Consultants have mathematically re-calculated the amount of ballast and subballast required in typical track sections. They have also accounted for the additional amount of ballast depth (six inches) that will be required upon installation of wood ties:¹⁰⁴

<u>Track Type</u>	<u>Ballast in CF/FT (1)</u>	
	<u>AEPCO</u>	<u>BNSF/UP</u>
Single Track -Tangent	17.80	19.35
Single Track - 3-5 Degree Curve	14.71	21.23
Single Track - 5+ Degree Curve	16.46	22.49
Double Track - Tangent	26.00	41.21
Double Track - 3-5 Degree	29.80	46.15

¹⁰³ Mr. Zimmerman's calculations can be found at BNSF/UP.SUPPRP.WP.III.F-0288 to 0290.

¹⁰⁴ BNSF/UP.SUPPRP.WP.III.F-0288 to 0290.

Curve		
Double Track - 5+ Degree Curve	32.47	49.48
Yard and Setout	18.91	16.14

Additionally, three and four mainline tracks are required in certain sections of the ACE. For these sections, the BNSF/UP Consulting Engineers have adjusted the ballast and subballast quantities to reflect the extended track arrangement.¹⁰⁵ For subballast amounts, each additional track above two requires the addition of 16.67 CF/FT of subballast. Therefore, a triple track section requires a total subballast quantity of 62.02 CF/FT, and a quadruple track section requires 78.69 CF/FT. For ballast with 25-foot centers, there is no overlap area so a third track can be added using a factor of 1.5. Two additional tracks (i.e., tracks three and four) would be added using a factor of 2. Mr. Zimmerman has determined the following ballast quantities for extended track areas:

Super elevation In inches	Two-track CF/FT Ballast	Three Track CF/FT Ballast	Four Track CF/FT Ballast
0 inches	41.21	61.82	82.42
2.0 inches	46.15	69.23	92.30
4.0 inches	49.48	74.22	98.96

(2) Cost

AEPCO has determined a price for ballast by averaging the BNSF price provided in discovery with a quote it received from the Walker-Butte quarry in Mesa, Arizona.¹⁰⁶ As neither price included transportation costs, AEPCO determined the mileage from the two sources to the railheads and applied a unit cost of \$.035 per mile, an amount accepted by the Board in *WPL*.¹⁰⁷ BNSF and UP accept AEPCO's method of computing an average cost per ton delivered, but AEPCO incorrectly determined the appropriate base price for the Pederal, New Mexico ballast

¹⁰⁵ BNSF/UP.SUPPRP.WP.III.F-0291.

¹⁰⁶ AEPCO.OP.WP.04643 and 04647.

¹⁰⁷ AEPCO Opening electronic workpaper "cost_location_miles.xls."

from the BNSF price list. AEPCO indexed the price down to \${ } even though the price list provided in discovery and relied upon by AEPCO provides February of 2001 prices. As such, these prices should not be subject to adjustment. When the proper base price of \${ } is inserted, the average cost for delivered Pedernal ballast is \${ } and the average cost for both locations, including delivery, is \${ }.

For the price of subballast, AEPCO used a quote from LaFarge Construction Materials which places the price at \$10.52 per ton (delivered).¹⁰⁸ BNSF/UP Engineering Consultants accept this price.

As explained in greater detail in Section III.F.3.f.(5) on track construction labor costs, the Windgate quote that AEPCO relies on for all construction costs contains a bid for installing the subballast that applies only to a 39-foot double track roadbed, and not the proposed 50-foot roadbed.¹⁰⁹ The appropriate quantity of subballast for the 50-foot roadbed is included in AEPCO's material price, but the Windgate installation cost is not sufficient to include the labor to place those quantities. To account for this difference, the bid price has been increased proportionally as shown in BNSF/UP workpapers.¹¹⁰

As described in Section III.F.3.f.(5), BNSF/UP Consulting Engineers have also determined the cost for installing the six inches of subballast that they have determined is required underneath the yard and setout tracks. The basis for this price is AEPCO's Windgate quote for mainline single track subballast placement (Item #12).¹¹¹ Because this cost applies to a 24-foot wide roadbed section with subballast that is eight inches deep, the Railroads' witnesses

¹⁰⁸ AEPCO.OP.WP.04644.

¹⁰⁹ AEPCO.OP.WP.04754, 04624, 04626, and 04628.

¹¹⁰ BNSF/UP.SUPPRP.WP.III.F-0292.

¹¹¹ AEPCO.OP.WP.04754.

have adjusted the cost down to account for the 15.84-foot wide, six-inch deep subballast section that has been placed in these sections.¹¹²

c. Ties

(1) Specifications

AEPCO proposed the use of steel ties across the entire ACE line, with the exception of yard and setout tracks. BNSF and UP strongly disagree with AEPCO's characterization of the U.S. railroad industry's experience with steel ties, and particularly with its characterization of their own experiences. AEPCO Opening Nar. at III-F-48 to 49. Steel tie use has in no way become normal practice for U.S. railroads, which typically handle much heavier loadings than British railroad where steel tie use reportedly has been less problematic. In fact, steel ties reportedly account for less than 0.01% of all ties installed in 2003 by the U.S. major railroads.¹¹³ The evidence to date shows that steel ties are inferior to wood ties in heavy-load bearing, and their use on a test-basis by UP and BNSF has not been successful. In fact, both BNSF and UP have removed their test sections and enacted policies of excluding steel ties from their mainlines.¹¹⁴

AEPCO bases its decision to use steel ties across the ACE on a manufacturer's claims of a longer lifespan, reduced maintenance, smaller ballast requirements, and greater damage resistance in derailment situations. AEPCO Opening Nar. at III-F-48-49. However, the benefits of steel tie use are not as promising as either the manufacturer or AEPCO contends. As discussed in Section III.D.4.a(5), the long life of a steel tie is characterized by a prohibitive level

¹¹² Mr. Zimmerman's calculations have been included at BNSF/UP.SUPPRP.WP.III.F-0294.

¹¹³ BNSF/UP.SUPPRP.WP.III.D.4-0057 to 0060.

¹¹⁴ BNSF/UP.SUPPRP.WP.III.F-0295 to 0299.

of routine maintenance, as well as a high replacement rate for items like rail seat pads and insulators. Additionally, steel ties may also have the advantage, at initial installation, of requiring less ballast than installation of wood ties, but that advantage, if any, is short-lived. Reballasting expenses associated with steel tie use negate the benefit of lower initial ballast requirements.

BNSF and UP experiences and industry testing results by Transportation Technology Center, Inc. (TTCI) all show that substantial ballast-related problems abound with steel tie use. In track performance testing by TTCI, multiple surfacing passes were required over the entire test period.¹¹⁵ TTCI found generally that steel ties exhibited poor dynamic performance under load and pointed to the need for continual re-surfacing and reballasting throughout the test. TTCI's test sections for steel ties required significantly more tamping than the wood tie section; tamping was necessary every 7 MGT in the steel ties sections, while no additional tamping was required for the similarly situated wood ties during the 170 MGT interval of the test.¹¹⁶ The repeated tamping cycles were made more difficult by the special tamping method required. The inordinate amount of re-tamping required after TTCI had initially tamped under the rail seat (in keeping with manufacturer's guidelines) prompted TTCI to pursue other courses, and tamp the rail centers as well as the rail seats.¹¹⁷ {

}¹¹⁸ TTCI's tests were

¹¹⁵ BNSF/UP.SUPPRP.WP.III.F-0300 to 0303.

¹¹⁶ BNSF/UP.SUPPRP.WP.III.F-0302.

¹¹⁷ BNSF/UP.SUPPRP.WP.III.F-0302 to 0303.

¹¹⁸ BNSF/UP.SUPPRP.WP.III.F-0304. {

characterized generally by a high degree of ballast degradation and migration requiring continual maintenance, and a marked difference in the ability of steel ties and wood ties to perform under heavy-axle loads.

BNSF experienced similar difficulties in its placement of steel ties on a section of its Orin line in Wyoming. They found that the section required tamping several times a week during the few months the steel ties were in place. Between June 12th, 2000, and July 27, 2000, the test curve required resurfacing on four separate occasions, with multiple passes taken.¹¹⁹ At the end of July, these considerable maintenance requirements, constant slow orders, and concerns over keeping the track from deteriorating into potential derailment conditions prompted BNSF to remove the steel ties. Robert Boileau, BNSF's Chief Engineer-North, in his request for the removal of the ties, stated that "steel ties do not have the ability to adequately hold surface and line in heavy haul conditions with the temperature variations present in this area."¹²⁰ BNSF concluded that it was infeasible to construct a high density railroad segment with these ties, and adopted a general policy of no steel ties in its mainline tracks.¹²¹

UP also installed steel ties in a mainline test section near Laramie, Wyoming, and experienced highly unsatisfactory results according to UP Director of Maintenance, Mike Wright. UP found that the steel ties did not grip the ballast well, and appeared to heat up more than wood ties which caused weakening of the track structure. In addition, there were constant

} *Id.*

¹¹⁹ BNSF/UP.SUPPRP.WP.III.F-0297 to 0298.

¹²⁰ BNSF/UP.SUPPRP.WP.III.F-0297 to 0298.

¹²¹ BNSF/UP.SUPPRP.WP.III.F-0295 to 0296. A list of BNSF slow orders covering Curve #100, the site of the steel tie test installation on the Orin line, can be found at BNSF/UP.SUPPRP.WP.III.F-0305. Slow orders were issued on 33 days during a period of three months.

maintenance problems on this portion of track, including: (1) excessive vertical movement of the track caused mud to be pumped into and to contaminate the ballast; (2) insulating pads fell off, allowing metal-to-metal contact and creating signal problems due to short circuits; (3) steel ties broke in half; (4) track geometry problems required constant maintenance and slow orders; and (5) sun kinks caused misalignments.¹²² Train crews operating across the area made frequent reports of roughness and instability in the area. The instability led to slow orders and traffic delays, and an unusually high level of maintenance time.¹²³ Up to the point of removal, UP was surfacing that section about seven times a year-- more than 20 times the normal surfacing requirements.¹²⁴ Because of the difficulty in holding the surface and the resulting problems, UP decided to remove the steel ties in 2003. The ties were removed shortly after UP suffered a major derailment on this section of the track on July 3, 2003, which Mr. Wright believes resulted from thermal misalignments/sun kinks. He points out that steel ties are more prone to sun kinks than other types of ties, and in that steel tie test section of track, UP had experienced four thermal misalignments not long before the derailment. According to Mr. Wright, the replacement of steel ties with concrete ties marked the end of these problems.

UP had also installed steel ties in July of 1998 on a bridge crossing the Missouri River, located on the mainline between Omaha, Nebraska and Council Bluffs, Iowa. UP experience there has been that the ties continually have difficulty holding the surface at the tie joints and excessive vertical movement causes mud to work into the ballast. Frequent tamping is required

¹²² UP documents pertaining to the maintenance of this track section, including track geometry reports, maintenance gang hour reports, and signal malfunction reports, are included at BNSF/UP.SUPPRP.WP.III.F-0306 to 0318.

¹²³ BNSF/UP.SUPPRP.WP.III.F-0306 to 0318. The constant maintenance requirements experienced by UP, BNSF, and TTCI are addressed in greater detail in Section III.D.4.a on maintenance of way.

¹²⁴ BNSF/UP.SUPPRP.WP.III.F-0299.

as a result, and slow orders due to mud spots occurred twice in 2003. In that same year, the bridge track was resurfaced four times. The frequent tamping and pumping effect have made it difficult to keep insulation pads on the steel ties, resulting in signal problems and significant repair work. As a result of all its experiences with steel ties, UP has adopted a general policy of no steel ties on mainline track.¹²⁵

The high level of additional repair accompanying steel tie use has been developed extensively in BNSF/UP's maintenance of way evidence in Section III.D.4.a.(5). It is clear from TTCI testing and the Railroad's experiences that steel ties simply cannot support the traffic that is proposed for the ACE. Therefore, BNSF/UP Engineering Consultants have rejected their use on the high density lines of the ACE and have instead used tried-and-true wood ties on all ACE main and branch lines.

BNSF/UP Engineering Consultants have placed standard 7"x 9" Grade Five wood ties at a distance of 19.5 inches, in keeping with standard placement of wood ties for mainlines.¹²⁶ They accept AEPCO's specification for use of 6"x 8" Grade Three wood ties spaced at 24 inches for all yard and setout tracks. AEPCO Opening Nar. at III-F-50.

AEPCO has also included the cost of 2,370 transition ties in its III.F totals; the Railroads have been unable to find a discussion of transition ties or how AEPCO reached this number anywhere in its Narrative.¹²⁷ The use of transition ties under areas such as road crossings and turnouts is well documented in both AREMA and railroad standards.¹²⁸ Because of the transition from a flexible track structure to a rigid one, the additional length tie is required to insure

¹²⁵ BNSF/UP.SUPPRP.WP.III.F-0295, 0296 and 0299.

¹²⁶ BNSF/UP.SUPPRP.WP.III.F-0319 to 0325.

¹²⁷ AEPCO Opening electronic workpaper "IIIFTOTAL.xls"

¹²⁸ BNSF/UP.SUPPRP.WP.III.F-0326 to 0329.

stability and minimize wear of materials at these locations. The longer ties at railroad crossings spread the load and allow for the use of wider crossing surface materials that better withstand the highway traffic loads. AREMA Plan No. 913-52 uses varying sized timbers to transition.¹²⁹ To avoid having to purchase and stock several sizes of tie, railroads typically use a standard transition tie that can be used in various settings. AEPCO has followed standard practice and used a 9"x 12'x 10' bridge timber to serve as a transition tie.¹³⁰ The BNSF/UP Engineering Consultants accept the use of this tie and have provided for the number of transition ties needed to replace the standard ties before each grade crossing, road crossing, and at each turnout before the point of switch.

(2) Costs

AEPCO's unit cost of \$24.36 for 6"x 8" Grade Three wood ties is taken from Means 2001, but inappropriately indexed to 1Q01 as discussed in § III.F.2.¹³¹ The BNSF/UP Engineering Consultants accept this price, though they have used the RS Means 2001 price of \$27.78. BNSF and UP have taken a unit cost for 7"x 9" Grade Five wood ties (which AEPCO had not included in their original design) from price lists produced during discovery; the price was determined by averaging the price of the four suppliers with ties in stock.¹³² Indexed to 2001, the unit price is \$ { } each; this price does not include the cost of transportation. Mr. Zimmerman reviewed the distances between the supply points and the railheads, selected the closest one, and took the average of the distance from the two heads.¹³³ He factored the

¹²⁹ BNSF/UP.SUPPRP.WP.III.F-0326 to 0329.

¹³⁰ BNSF/UP Engineering Experts have traced the price for transition ties back to a quote for 9"x 12"x 10' bridge timbers contained in AEPCO.OP.WP.04701.

¹³¹ AEPCO.OP.WP.04672

¹³² BNSF/UP.SUPPRP.WP.III.F-0330 to 0332.

¹³³ BNSF/UP.SUPPRP.WP.III.F-0331.

transportation cost using the tie weight and the \$0.035 per ton-mile factor that AEPCO had used previously. When delivery costs are factored in, the total cost per unit is \$ { }.

For transition ties, AEPCO included an indexed unit price of \$168.14 for transition ties in its construction cost totals.¹³⁴ BNSF/UP Engineering Consultants accept that price.

d. Track Rail

(1) Main line

AEPCO proposes the use of 136-pound Continuous Welded Rail (CWR) for main line track construction, and uses premium 136-pound CWR on curves of three degrees or higher. AEPCO Opening Nar. at III-F-50 to 51. BNSF/UP Engineering Consultants agree with AEPCO's specifications for weights of rail, but disagree with AEPCO's rail quantities. They have determined that AEPCO have failed to provide sufficient track in several places along the mainline, including in the area of the Vaughn Yard or in setouts along the entire ACE. The additional track the Railroads have added to address these issues results in increased quantities of 136-pound rail.

AEPCO's base price for these two rail types was taken from a quote from A&K Railroad Materials of \$13.37/LF for standard rail and \$14.46/LF for premium rail and includes delivery to the railhead.¹³⁵ BNSF/UP Engineering Consultants accept AEPCO's unit prices for the rail material.¹³⁶

¹³⁴ AEPCO Opening electronic workpapers "IIIFTOTAL.xls"

¹³⁵ AEPCO.OP.WP.04689 to 04690

¹³⁶ BNSF/UP.SUPPRP.WP.III.F-0333.

(2) Yard Tracks and Branch Lines

(a) Yard Tracks

AEPCO specifies the use of Class I relay 132-pound CWR for the branch lines, and relay 132-pound jointed rail for yard and setout tracks; the main running tracks through the yard will have the same 136-pound CWR that is used on the adjacent mainline. AEPCO Opening Nar. at III-B-16 and III-F-51. BNSF/UP's Engineering Consultants agree with these specifications.

In its opening evidence, AEPCO specified that there would be one principal yard located at Vaughn, the ACE's largest BNSF interchange point. AEPCO placed its headquarters and crew-change facilities, as well as its locomotive maintenance, car inspection, car maintenance, and fueling facilities at Vaughn. BNSF/UP Engineering Consultants have made changes to the design of the Vaughn Yard to reflect real world space and congestion constraints.

As explained in Section III.B.3 and III.F.6, many of the changes made in the Vaughn Yard are due to AEPCO's placement of its fueling facilities there. Because of the large volume of fuel required to support ACE traffic, BNSF/UP Consulting Engineers have increased the fueling facilities for removing the fuel from tank cars arriving from Belen into fuel storage and then to the fueling platforms, and have included additional tracks for the staging of fuel tank cars prior to unloading and again, before they are returned empty to Belen.

As explained in III.F.6, BNSF/UP Engineers have also made the following track changes at Vaughn that affect the amount of rail needed for the Vaughn Yards. AEPCO has placed double lead tracks at the west end of the yard to facilitate the efficient movement of trains, but has not done the same at the east end; a double lead track has been provided by BNSF/UP Engineers for at the east end as well. To prevent backup of trains entering the yard, they have also provided for double main track between mileposts 797.8 and 788.5, and inserted universal crossovers to permit movement between the two tracks. Additionally, BNSF/UP witnesses have

placed tracks immediately adjacent to the Vaughn Yard for the placement of the stranded cars for setout and pickup by BNSF.

The track design at the locomotive maintenance facility at Vaughn has also been expanded as detailed in III.B.3 and III.F.6. BNSF/UP witnesses have provided for a car maintenance shop and additional repair tracks. Engineers have included additional running tracks at Vaughn for access between the locomotive shop and either end of the yard. They have also added tracks to accommodate both spare coal cars, repaired cars, and bad-order cars. BNSF/UP Engineers have added track for access between repair facilities and storage tracks.

AEPCO calls for locomotive fueling on Westbound trains at the El Paso Yard, and the Railroads' Consulting Engineers have provided for additional fueling facilities. As explained in III.B.3.a(2), they have also added a rip track for performing on-site repairs, and additional storage tracks. An additional lead track has been added onto the west end of the yard to allow work to be performed in the yard without blocking access for other trains.

AEPCO has included four additional yards along the ACE-- Belen, Dalies, Defiance, and Cochise. Because AEPCO obtains its fuel supply for the Vaughn Yard from Belen, facilities including fueling tracks have been added. At Defiance, there exists a similar stranded car problem to the one found at Vaughn; additional tracks have been placed adjacent to the Defiance Yard for the storage of stranded cars being delivered or picked up by BNSF. BNSF/UP Engineering Consultants accept the Dalies and Cochise Yards as designed by AEPCO.

(b) Branch Lines

AEPCO's ACE design includes two branch lines; one runs 20.40 miles from Defiance to the McKinley Mine, and the other runs 43.40 miles from Baca to the Lee Ranch Mine. BNSF/UP Engineers accept the track configuration that AEPCO has posited for the branch line between Defiance and McKinley. AEPCO constructed only a small segment of the Baca branch.

(c) Setout Tracks

AEPCO has provided for setout tracks approximately every eleven miles on the Defiance-to-Vaughn Line and approximately every thirteen miles on the El Paso-to-Cochise Line. These setout tracks are 860 feet long.

AEPCO states that it intends to have the setout tracks double as temporary storage for main equipment as well as for bad-order cars. AEPCO Opening Nar. at III-B-13. While AEPCO has provided for double-ended setouts here, which will reduce the occurrence of maintenance-of-way vehicles blocking in freight cars, or vice-versa, the length that AEPCO has shown on its track charts is insufficient. To avoid the blockage of the mainline, BNSF/UP Engineering Consultants have constructed a 2000-foot maintenance of way setout track every 20-25 miles along the ACE, extending approximately every other setout from its original 860 feet. The reason for the additional length at alternating setouts is that the length is necessary to accommodate welded rail trains, 20 to 30 car ballast trains, and large production surfacing gang equipment consists. It is important to have maintenance-of-way equipment stored close by, but all this equipment must clear the main tracks and operating sidings to minimize disruptions to traffic flow. Under this configuration, both the operating and maintenance needs will be efficiently accommodated.¹³⁷

(d) Cost

In its totals, AEPCO lists the CWR rail at \$9.14 per LF and \$7.07 per LF respectively. This amount is taken from the quote provided by A&K Railroad Materials, which prices the jointed rail at \$340.00 per net ton and the CWR at \$440.00 per net ton.¹³⁸ The BNSF/UP

¹³⁷ Mr. Zimmerman's calculations of the additional length needed for ACE setouts is included at BNSF/UP.SUPPRP.WP.III.F-0334 to 0335.

¹³⁸ AEPCO.OP.WP.04689.

Engineering Consultants agree with the calculation of unit prices and have applied it to their rail quantities.¹³⁹

For the installation of all types of rail, AEPCO uses a bid provided by Windgate Construction.¹⁴⁰ Item #2 contains the quote for rail installation for yards and parking sidings. Windgate bases its installation costs on the use of 119-pound relay jointed rail with 12 inches of ballast underneath; however, AEPCO uses 132-pound rail in all these areas. By relying on a quote that assumes the use of a lighter, more flexible, and more easily installed rail, AEPCO has understated installation costs in this area. 132-pound rail is heavier and stiffer than 119-pound rail and requires additional effort and materials to place and construct the track, increasing installation costs. This is particularly true as the contractor in this case, according to AEPCO, has taken on responsibility for transporting the materials and will have proportionally more weight of material to haul from the railheads to the job sites.

As detailed in Section III.F.3.f(5) on Track Labor, BNSF/UP Consulting Engineers have corrected for this increase in cost by applying a ratio to AEPCO's unit cost for installation.¹⁴¹

(3) Field Welds

AEPCO has included materials for 6,620 field welds across the entire ACE. BNSF/UP Engineering Consultants dispute this total. AEPCO has reached this number by computing the amount of field welds that it would take to lay all the strands of plant-welded rail end to end and weld it all together, but they have not allowed for breaks in the line that occur at access roads, bridges, culverts and the like. They have also neglected to include any cuts that would need to

¹³⁹ BNSF/UP.SUPPRP.WP.III.F-0333.

¹⁴⁰ AEPCO.OP.WP.04573 to 04574.

¹⁴¹ The revised base unit price was determined by: $(132\# \times \$114,880.00/119\# = \$127,429.92)$, and indexed to 1Q01.

be made to insert turnouts. Therefore, additional welds will need to be included for each place where the line is broken during construction. Each bridge location will require four welds for each track, and turnouts will require six welds.¹⁴²

In determining a unit price for field weld materials, AEPCO uses a \${ } welding kit quote provided by BNSF in discovery.¹⁴³ AEPCO Opening Nar. at III-F-51. According to AEPCO's Narrative, Windgate Construction's track installation bid includes the price to weld the CWR, but this claim is not borne out by the contractor's quote which AEPCO included in its workpapers.¹⁴⁴ *Id.* The quote contains no statement to the effect that welding is included in the price.¹⁴⁵ The only place in the entire quote where welding is mentioned is in Item #10 for insulated joints, where Windgate specifically lists that it will furnish the weld. While the rail is being furnished by a third party in the same manner as the insulated joint, the items relating to rail construction do not include this same statement that the contractor will provide the welds. As a result, the price of labor needs to be added to the materials price to determine a total field weld cost.

BNSF/UP Consulting Engineers have relied on a 2002 quote from Orgo-Thermit, Inc, which is based on a minimum of six welds per eight-hour day.¹⁴⁶ The field welding process is labor intensive and requires multiple steps of removing ballast, separating the rail from the ties, aligning and correcting for imperfect spacing, applying the actual weld, rail resurfacing, and replacing the rail, ties, and ballast. Indexed accordingly, the total cost for the materials and labor

¹⁴² BNSF/UP.SUPPRP.WP.III.F-0336 to 0340.

¹⁴³ AEPCO.OP.WP.04692.

¹⁴⁴ AEPCO.OP.WP.04753 to 04754.

¹⁴⁵ Insulated joints are covered under Signals in BNSF/UP Supp. Reply Nar. Section III.F.6.a.

¹⁴⁶ BNSF/UP.SUPPRP.WP.III.F-0338 to 0340.

is \$328.71 per weld. When the revised total weld cost is quantified for illustrative purposes, using AEPCO's figures for the amount of field welds, the result is a total cost of \$2,176,027.10.

(4) Compromise Joints

Compromise joints keep the tops of the two adjacent rails aligned and adjust for differences in height of rail and in the location of bolt holes using a reinforced pair of individual joint bars; the effect is that the rail car wheel will feel no difference as it proceeds over the jointed area. Where AEPCO's specifications call for the rail to change from 132-pound to 136-pound rail, it failed to include compromise joints to join the two different rail sections. While the two sections are similar, there is enough difference to require the use of these joints. Given the closeness of size between the two rail types, however, there is no need for intermediate compromise steps. Each location will require two pairs of compromise joint bars to accommodate the rail section change on both rails.

The Railroads have included the materials for compromise joints for each of the locations where a transition between different size rails occurs along the ACE. Prices for a pair of compromise joints and for the bolts, nuts and washers needed for each pair are found in the February 2002 BNSF materials price list. BNSF/UP Engineering consultants have also added the cost of transportation.¹⁴⁷ The complete indexed price for one pair of compromise joints and hardware, including transportation costs, is \${ }\$ { }.

e. Switches (Turnouts)

AEPCO has determined the amount of turnouts needed on the ACE by reference to its track diagrams (AEPCO Opening Exh. III-B-1) and the BNSF and UP placements on their own lines. It maintains that there are few differences between its number and size determinations and

¹⁴⁷ BNSF/UP.SUPPRP.WP.III.F-0341 to 0344.

the existing turnouts on the incumbents' lines. AEPCO Opening Nar. at III-F-52. AEPCO has changed all yard turnouts to No. 10 turnouts, and a single No. 30 main line turnout to a No. 24 for consistency. AEPCO Opening Nar. at III-F-52. The BNSF/UP Engineering Consultants agree with the selection of turnouts sizes for the ACE, but have determined that the ACE requires a greater quantity of turnouts than AEPCO had included in its initial design as a result of the additional yard track, double track and sidings required on the ACE.

AEPCO's unit costs for turnouts are based on quotes obtained from A&K Railroad Materials, Railworks, and Atlantic Track & Turnout.¹⁴⁸ Essentially, AEPCO has cherry-picked individual itemized prices from each of these three sources to obtain the lowest price for each individual turnout type. As a result, AEPCO has not included the costs of transportation for certain turnouts. AEPCO plans on obtaining No. 10 relay turnouts from A&K, who states in its bid that delivery has been included in the price.¹⁴⁹ AEPCO relies on Atlantic Track for No. 10 spring, No. 10 powered, No. 14 standard and No. 14 powered prices, which also includes delivery.¹⁵⁰ For No. 20 powered, No. 20 spring, and No. 24 powered turnout unit prices, AEPCO relies on a quote from Railworks which specifically states that it is only a "ballpark figure" for "material prices only."¹⁵¹ It made no representation as to delivery.

BNSF/UP Engineering Consultants accept the prices for all turnouts but add in the costs of transportation to the unit cost for the No. 20 spring, No. 20 powered, No. 24 powered turnouts. The transportation cost, based on shipping from the provider in Lakeville, Minnesota

¹⁴⁸ AEPCO.OP.WP.04702 to 04704

¹⁴⁹ AEPCO.OP.WP.04702

¹⁵⁰ AEPCO.OP.WP.04703

¹⁵¹ AEPCO.OP.WP.04704

(no manufacturer location was specified in the quote), is \$2,242.31 for the No. 20 turnouts, and \$2,255.93 for the No. 24 turnout.¹⁵² The Railroads accept all other turnout prices.

The two options for installing turnouts would be to build them from scratch at the site or to ship a turnout in several prefabricated pieces for assembling in the field. Either way, the labor for installation of turnouts is a much higher cost per running-foot than typical track installation because of the extra care that must be taken to make all adjustments to the switch points and mechanisms necessary to meet the FRA track standards pertinent to turnouts. Special tamping equipment also is required to surface the track within the turnout due to the diverging rails. AEPCO has used a bid from Windgate Construction for installation costs on all turnouts.¹⁵³ The price submitted by the contractor and relied upon by AEPCO incorrectly bases its price for installing No. 10 turnouts in yards on the use of 119-pound jointed rail; AEPCO places 132-pound Class One Relay Jointed rail in these locations. AEPCO Opening Nar. at III-F-51. Using a construction bid that assumes 119-pound Jointed rail results in an underestimate of the costs of installation—132-pound rails in the turnout weigh more and turnouts using the rails are consequently more difficult and costly to construct. BNSF/UP witness Mr. Zimmerman has determined a ratio to allow for the increase in installation costs for No. 10 turnouts.¹⁵⁴ The revised 2003 unit cost for this turnout is \$10,926.05. Using AEPCO's total number of No. 10 turnouts for illustrative purposes, the total cost for these installed No. 10 turnouts is \$5,509,516.89, an increase of \$220,566.79.

AEPCO has not included any information on switch stands in its narrative, but has listed a cost for 217 switch stands (hand thrown) in the III.F totals. It has included a unit price of

¹⁵² BNSF/UP.SUPPRP.WP.III.F-0345 to 0346.

¹⁵³ AEPCO.OP.WP.04753 to 04754.

¹⁵⁴ BNSF/UP.SUPPRP.WP.III.F-0345 to 0346.

\$755.68. BNSF/UP Engineering Consultants accept this price, and have determined that AEPCO has placed a switch stand at the location of each hand thrown turnout. The Engineers have done the same, but have also included a switch stand at each single switch point derail, an item that AEPCO had overlooked in its Narrative.¹⁵⁵

f. Other

(1) Rail Lubrication

As AEPCO acknowledges, rail lubrication is commonly and widely used in the rail industry to reduce rail wear in curved track areas. AEPCO Opening Nar. at III-F-53. AEPCO has replicated BNSF's and UP's in-gauge rail lubrication placements, for a total of 15 single track and 71 double track lubricators.¹⁵⁶ BNSF/UP Engineering Consultants reviewed the track charts and found that AEPCO had miscounted the rail lubricator locations or had missed portions of the track charts where there is some overlapped trackage. An additional four lubricators were found on the single-track portion of the ACE, for a total of 19. Consultants have confirmed AEPCO's count of 71 double track lubricators.¹⁵⁷

AEPCO has used a price supplied by BNSF in response to one of AEPCO's discovery requests; this quote contained installed and uninstalled prices for several lubricators.¹⁵⁸ AEPCO has not used the price for the installed rail lubricator, and has included only the price of the materials in its final tabulation. AEPCO's itemized construction quote from Windgate does not have an installation price for these items.¹⁵⁹ The installed unit costs for lubricators using the

¹⁵⁵ BNSF/UP.SUPPRP.WP.III.F-0348 to 0349.

¹⁵⁶ AEPCO.OP.WP.04741.

¹⁵⁷ BNSF/UP.SUPPRP.WP.III.F-0350 to 0353.

¹⁵⁸ BNSF provided this price information in response to AEPCO's Request No. 102(a)-(c); the quote was included as AEPCO.OP.WP.04740.

¹⁵⁹ AEPCO.OP.WP.04753 to 04754.

BNSF price indexed to 1Q01 are \${ } and \${ }, respectively for single-track and double-track lubricators.

An important item that AEPCO has omitted is the disposable environmental mat that is placed at the site of each lubricator. This mat is needed not only to catch excess grease and debris at the lubricator to limit groundwater contamination and environmental degradation, but also to protect the ballast track support, which helps minimize maintenance expenses. The Railroads' Engineering Consultants calculated the cost of the mats by indexing the most current (April 2003) BNSF materials price list, for a unit price of \${ } per mat.¹⁶⁰ Because the price does not include labor costs or transportation, the cost of installation has been derived from RS Means 2001 Heavy Construction Cost Data, for a total of \${ } per mat.¹⁶¹ The unit costs for installed lubricators including environmental mats are:

Single track	\${ }	+ \${ }	=\$ { }	each
Double track	\${ }	+2(\$632.78)	=\$ { }	each

(2) Plates, Spikes and Anchors

Because AEPCO used steel ties across the entire mainline of the ACE, it used only "Pandrol" style clips and no cut spikes, rail anchors, or plates were needed other than on the wood ties AEPCO used in yard and setout tracks. As explained in Section III.F.3.c on ties, because BNSF and UP have found steel ties infeasible for heavier traffic use, and Engineering Consultants have constructed the SARR with wood ties and the required tie plates, spikes and anchors. As a result, the number of clips for steel ties has been eliminated and the quantities for the plates, anchors and spikes have been increased.

¹⁶⁰ BNSF/UP.SUPPRP.WP.III.F-0350 to 0353.

¹⁶¹ BNSF/UP.SUPPRP.WP.III.F-0353.

For yard and setout tracks, AEPCO has used AREMA 14-inch tie plates with eight holes with six cut spikes per plate on bridge ties and on curves over five degrees, and four on other timber ties. AEPCO Opening Nar. at III-F-53. BNSF/UP Engineering Consultants agree with this plate/spike configuration and accept AEPCO's unit price of \$0.24 for a six-inch spike.¹⁶² However, they disagree with the price that AEPCO has proposed for tie plates. AEPCO has developed this price from an item listed only as "tie plate" in RS Means 2001.¹⁶³ Because the RS Means only includes 110-pound rails or smaller, it can be surmised that this tie plate is of the variety appropriate for this weight of rail—and inappropriate for the 132-pound and 136-pound rail that is used in the ACE. BNSF/UP Engineering Consultants have determined a reasonable price for 14-inch plates, the plate designed to fit 132 and 136-pound rail, by taking the prices from all the sites with availability on the BNSF material list from discovery, and averaging them.¹⁶⁴ The unit price for a new 14-inch tie plates is \${ }, including \$0.54 for delivery costs. This unit price is lower than the prices for 14-inch plates contained in AEPCO's third party quote of \${ } for new plates.¹⁶⁵

In its Narrative, AEPCO proposed the use of clip assemblies with steel ties to replicate the effect of rail anchors in restraining the track in temperature extremes. AEPCO Opening Nar. at III-F-54. The use of wood ties eliminates the need for clip assemblies. The wood tie needs to be restrained longitudinally, though, and the typical method is to use four anchors, or "boxed" anchors, on every other tie. BNSF/UP Consulting Engineers have determined that placing anchors only at every fifth tie (as AEPCO has done) is sufficient for the yard and setout tracks

¹⁶² AEPCO.OP.WP.04702

¹⁶³ AEPCO.OP.WP.04745

¹⁶⁴ BNSF/UP.SUPPRP.WP.III.F-0354 to 0356.

¹⁶⁵ AEPCO.OP.WP.04689, 04702, and 04704.

only, and have placed the customary boxed anchor configuration on every other tie along the ACE mainline.¹⁶⁶ Additionally, boxed anchors are used on each rail on all areas of more positively fixed rails, such as bridges, turnouts, and road crossing; the box anchoring of every tie typically begins 200 feet away from the fixed object. For example, for a turnout, the track would be fully anchored for 200 hundred feet in each direction. These placements are in keeping with AREMA recommended practices.¹⁶⁷ The BNSF/UP Engineering Consultants agree with AEPCO's proposed price of \$0.90 for rail anchors.¹⁶⁸ Because delivery has not been included in the original quote, an additional \$0.05 has been added to the anchor unit price for a total price of \$0.95 per anchor.¹⁶⁹

(3) Derails and Wheel Stops

Other track items that have been used by railroads in the past and are typically used today by any railroad operating in the United States are derails and wheel stops. These items are not addressed in AEPCO's Narrative or pricing workpapers. Derails are typically used any place where there is a possibility that a rail car or locomotive could move from one track to another in an uncontrolled manner. An early manufacturer of derails described them over 100 years ago as

. . . a device designed to limit the movement of free rolling, uncontrolled railroad cars. This is accomplished by guiding the flange of a car wheel up and over the railhead and deflecting it laterally, dropping the wheel clear of the rail on the field side (outside) of the rails. The wheels lodging in the tie cribbing and ballast halt movement of the car.¹⁷⁰

¹⁶⁶ BNSF/UP.SUPPRP.WP.III.F-0357.

¹⁶⁷ AREMA Chapter 5, Part 4--Section 5.4 and Part 7--Section 7.2, are included in the workpapers at BNSF/UP.SUPPRP.WP.III.F-0358 to 0362.

¹⁶⁸ AEPCO.OP.WP.04749

¹⁶⁹ BNSF/UP.SUPPRP.WP.III.F-0357.

¹⁷⁰ BNSF/UP.SUPPRP.WP.III.F-0363 to 0364.

They serve the same purpose today. Typically, side tracks and setout tracks that are not protected under the signal system would have either a hand thrown or sliding derail that would divert a car away from the main track should it roll or be pushed in that direction. This prevents cars from moving onto the mainline in front of another advancing train. There are also single and double switch point derails that are a more positive method of protecting the mainline. All styles of derails are also an important means of protecting personnel who are working under FRA "Blue Flag" protection on cars and equipment that have been placed into setout or yard tracks. The blue flag alerts the engineer of an approaching train that someone is working between cars. The derail together with the blue flag protects workers from getting caught between the couplers of the cars they are working on. FRA safety regulations in 49 CFR § 213.205 provide for inspection and application of the derail.¹⁷¹ At a minimum, all non-passing siding tracks should have derails located before the fouling point.

BNSF/UP Engineering Consultants have added hinged derails on yard tracks, using a indexed unit cost of \$1,100.00 from RS Means 2001.¹⁷² In more critical areas or where the possibility of higher speeds would mean more extensive damage to trains or track, a switch point derail is used to positively derail the car or cars before they reach the mainline. Thus, on tracks along the route where defined separation is desired, such as setouts and points of interchange, the engineers have placed single switch point derails tied into the signal system. The unit cost for a single switch point derail was taken from BNSF's materials price list for February 2002 and

¹⁷¹ BNSF/UP.SUPPRP.WP.III.F-0365.

¹⁷² BNSF/UP.SUPPRP.WP.III.F-0366 to 0367.

indexed for a unit cost of \${ } each.¹⁷³ An additional indexed labor cost of \$776.60 based on RS Means 2001 was added for installation, for a total unit cost of \${ }.¹⁷⁴

It is also standard railroad practice to use wheel stops at the end of each stub-ended setout track to keep rail cars from rolling off the end of the rail. Steel wheel stops are either bolted directly to the rail on which they sit or they are attached using a set of self-tightening wedges that grab tighter when a car wheel rolls against the wheel stop. Wheel stops are used today in place of earth mounds that were constructed in the past to perform this function because with today's more advanced braking, train control and dumping functions, there is a much greater danger of dirt from a struck mound getting into bearing surfaces and causing excessive wear. BNSF/UP Engineering Consultants have included a pair of fixed wheel stops on each stub-end track using a RS Means 2001 unit cost of \$615.00 each; this unit price was derived from a section of the Means that was included by AEPCO in its workpapers.¹⁷⁵

The table below summarizes the track material items for which AEPCO and the Defendants have developed different unit costs.

Table III.F.3-1
Summary Of Track Construction Items For Which BNSF/UP's Estimate Of
Unit Cost Differs From AEPCO's Opening Evidence

Item	BNSF/UP (1)	AEPCO (2)	Difference
Geotextiles	\$1.95	\$0.00	\$1.95
Ballast	\${ }	\${ }	\$0.07
6"x 8" Wood Ties	\$28.50	\$24.36	\$4.14
7"x 9" Wood Ties	\${ }	\$ 0.00	\${ }
Field Welds	\$328.71	\${ }	\${ }
Compromise Joints	\${ }	\$0.00	\${ }

¹⁷³ BNSF/UP.SUPPRP.WP.III.F-0368.

¹⁷⁴ BNSF/UP.SUPPRP.WP.III.F-0369.

¹⁷⁵ AEPCO.OP.WP.04745. Mr. Zimmerman's calculations and supporting materials are included at BNSF/UP.SUPPRP.WP.III.F-0366 and 0370 to 0371.

Item	BNSF/UP (1)	AEPCO (2)	Difference
No. 20 Turnouts Spring	\$ 82,533.31	\$80,291.00	\$2,242.31
No. 20 Turnouts Powered	\$ 73,087.31	\$70,845.00	\$2,242.31
No. 24 Turnouts-- Powered	\$91,992.93	\$89,737.00	\$2,255.93
Single Rail Lubricators	{ }	{ }	{ }
Double Rail Lubricators	{ }	{ }	{ }
Lubricator Mats	{ }	\$0.00	{ }
Tie Plates	\$4.22	\$1.28	\$2.94
Rail Anchors	\$0.95	\$0.90	\$0.05
Hinged/Sliding Derails	\$881.79	\$0.00	\$881.79
Switch Point Derails	\$5,221.70	\$0.00	\$5,221.70
Wheel Stops	\$615.00	\$0.00	\$615.00

Source: AEPCO Opening electronic workpaper "TRACK QTY.xls"; BNSF/UP electronic work paper "III F 3 Track.xls."

(4) Materials Transportation

Materials transportation is an important component of track construction. It involves getting the track materials from the various suppliers' sources to the railheads along the railroad right-of-way. AEPCO states in its Narrative that transportation costs are addressed on the individual item level, and that most of the material quotes it relies on include transportation costs. AEPCO Opening Nar. at III-F-55. AEPCO also asserts that it has added transportation costs where it has not been included in the quote. *Id.* Whether the costs of transportation have been included in the prices for each component has been addressed above in the individual discussion of the various track items. Generally speaking, the BNSF/UP Engineering Consultants determined that transportation costs had not been completely accounted for in the following areas: 7"x 9" wood ties, compromise joints, No. 20 and No. 24 turnouts, rail lubricator environmental mats, spikes, tie anchors, tie plates, and single switch derails.

A second important aspect of material transportation costing is the movement of materials from their delivery point at the railhead to the multiple jobsites along the ACE. AEPCO has obtained a quote for all construction from Windgate Construction Inc., which covers

“loading and unloading and transportation at the jobsite.”¹⁷⁶ On its face, the quote is not entirely clear on the matter of whether it includes the transportation cost of moving the track materials from the railhead to the jobsites located throughout Texas, New Mexico and Arizona; transportation is to occur “at the jobsite” which might not include the great distances the supplies must travel “to the jobsite”. However, BNSF/UP Engineering Consultants accept AEPCO’s assertions that this quote would cover online transportation.

(5) Track Labor and Equipment

One particularly central aspect of track construction cost is the expense for labor and the rental of equipment used during tracklaying. AEPCO relies on the single quote from Windgate Construction.¹⁷⁷ The quote provides for “labor and equipment only”, “all overhead, taxes, insurance, and profit”, and “loading and unloading and transportation of materials at the job site”.¹⁷⁸ According to AEPCO, Windgate will provide “turn-key” track installation for the entire ACE line. AEPCO Opening Nar. at III-F-55. However, BNSF/UP Consulting Engineers have discovered several important underestimations and omissions.¹⁷⁹

(a) Mainline Track Construction

Adjustments made to the Windgate quote for mainline track installation fall into two categories—(a) omissions and underestimations contained in the Windgate quote, and (b) differences in cost due to the Railroads’ substitution of traditional wood ties on the mainline.

¹⁷⁶ AEPCO.OP.WP.04753.

¹⁷⁷ AEPCO.OP.WP.04753 to 04754.

¹⁷⁸ AEPCO.OP.WP.04753 to 04754

¹⁷⁹ AEPCO generally has made significant errors in their Opening evidence calculations, including double counting the track labor costs for construction of double track and doubling the quantities of ballast and subballast in these track segments.

In an effort to measure the reliability of the Windgate quote for steel tie installation, BNSF/UP Engineering Consultants analyzed two 1998 BNSF AFE's for track construction using concrete ties.¹⁸⁰ Because of the scarcity of steel tie use in railroad construction, they used pricing information from similar projects using concrete ties because of the similarity in the installation processes. These two BNSF construction projects were located in the same area as the ACE RR, on the line between Belen and Vaughn, New Mexico, and both involved the addition of a second mainline track. The total track constructed was 10.63 miles in one case, and 21.53 miles in the other. The price of each for mainline single track construction (including installation of rails, ties, and ballast, but not subballast, which Windgate prices separately) in 1998 were \$239,861 and \$150,986 per track mile. Adjusted to 2001, the lowest per mile cost is \$162,206, significantly higher than the indexed Windgate price of \$94,157.73

From the above cases it can be seen that the price quotation from Windgate is out of line with construction costs in this area. A closer look at the Windgate bid reveals several ways that the quote has not been tailored to the specifics of AEPCO's design for the ACE. As a result, several construction expenses are not reflecting in the final installation costs generated by AEPCO on the basis of that quote. These errors have impact without reference to a particular type of tie, as these underestimations exist regardless of whether wood or steel ties are used.

As discussed above in Section III.F.3.b.(2), Windgate has supplied, and AEPCO has relied upon, a separate bid for installing subballast along the ACE. The Windgate bid assumes a 39-foot double track roadbed, and not the 50-foot roadbed for double track specified by AEPCO.¹⁸¹ While AEPCO has included the correct amount of subballast material required by the 50-foot roadbed, the installation price does not include the total cost for the installation of

¹⁸⁰ BNSF/UP.SUPPRP.WP.III.F-0372 to 0389.

¹⁸¹ AEPCO.OP.WP.04624, 04626 and 04628.

this material. BNSF/UP Engineers have provided an estimate for the additional cost by using a ratio of the cost of the 39-foot width installation price proportionally increased to the 50-foot width.¹⁸² The revised cost for placing the double track 50-foot roadbed is \$92,929.00 per track foot. For illustrative purposes only, making only the adjustment for roadbed width to the Windgate quotes for the following construction activities, and using the track miles for each set out in AEPCO's Opening Exhibit III-F-1, would result in the following increase in AEPCO's construction costs:

Table III.F.3-2
Calculation of Revised AEPCO Costs After Adjusting Windgate Quote
To Reflect Appropriate Roadbed Width

Windgate Track Construction Item	Unit	Quantity	Adjusted Unit Cost	Total
Double Mainline	Mile	332.13	\$256,146.70	\$85,074,003.47
Double Track 3-5 Degrees	Mile	24.82	\$281,084.14	\$6,976,506.36
Double Track >5 Degrees	Mile	7.50	\$281,084.14	\$2,108,131.05
TOTAL Revised Double Track Construction				\$94,158,642.88

The above represents an AEPCO *understatement* of double track construction costs in the amount of \$7,036,309.20.

An analysis of the Windgate prices shows an additional issue—the price for double track construction is significantly less than double the price of a single track, although AEPCO's design of the adjacent tracks provides no basis for this significant reduction.

Windgate's 2003 unit cost for the construction of a single, non-superelevated track on 24-inch centers is \$99,680 per track mile, and purportedly includes all labor and transportation of materials from the railhead on the ACE RR. The corresponding double-track price is \$178,240 per track mile. In cases where the tracks are relatively close together there are some possible construction savings due to the close proximity of the tracks. For instance, if the tracks were on

¹⁸² BNSF/UP.SUPPRP.WP.III.F-0292 to 0293.

15-foot track centers, the ballast area between the two tracks would become a sort of common section. The time to regulate and dress the ballast section might be reduced due to this closeness. With near track centers, there are also smaller track machines that can be used off one rail to handle track materials on the adjacent track.

On the ACE line, however, the track centers on a double-track section are 25 feet. As can be seen from AEPCO's section diagrams, the track centers are far enough apart to cause the track sections to be independent.¹⁸³ Each section is exactly alike and there is no common portion of the section where the contractor can realize cost savings. The track centers being 25-feet apart also create a separation wide enough for there to be virtually no way to utilize one track as a construction launching pad for the second track. The second track offers no real benefit in the construction of the adjacent track, and certainly offers no material savings in the range of the rebate Wingate has included in its quote.

Not only is there no less area being covered by the adjacent track installation, the construction of a double track actually covers a *wider* section than two single tracks because of the track centers. The single-track typical section shows a 24-foot wide base of subballast, while one half of a double-track section approaches 25-feet in width due to the track centers. The price for double-track is more properly set at two times the cost of a single track, before adjusting for the use of wood tie and corrections to the ballast sections. Because there is no explanation in the workpapers or the Narrative to justify a reduction of more than 10% in price for double-track construction with track centers separated by this distance, the BNSF/UP Engineering Consultants have adjusted the 2003 Windgate price for a double, non-superelevated track to two times the

¹⁸³ AEPCO.OP.WP.04624.

price of a single track, or \$199,360 per mile. When indexed to 1Q01, the unit price is \$188,410 per mile.

The second category of changes that UP/BNSF Engineering Consultants have made to construction costs are to account for their placement of traditional wood ties along the ACE mainline. As the Windgate quote is based on the use of steel ties at 24-inch spacing, an adjustment will have to be made to address BNSF/UP's replacement of that specification with the use of more conventional wood ties. Although the differences between steel tie construction and wood tie construction are not very great when looking at the whole package, they must nonetheless be taken into account. In making the change from steel to wood ties the main differences are in the number of wood ties and the amount of ballast.

Because of the level of generality of the Windgate quote, determining the impact of the switch to wood ties is somewhat complicated. To increase the total installation cost by a percentage derived from the additional number of ties would not correctly allow for the part each track component plays in the construction of the track. For instance, the substitution of wood ties has a substantial impact on the amount of ballast and ties that are required, but does not affect the quantity of rail, so there should be no increase in costs associated with laying the rail. To determine the impact of change in tie specification without otherwise affecting the Windgate quote, BNSF/UP Engineering Consultants looked for a way to modify the Windgate quote only with respect to ties. A track construction table submitted as evidence by UP in the *FMC* case provided the means to do so.¹⁸⁴ Because the costs in the table are fairly well broken down into individual items of track construction, it can be used to make the discreet changes to a single part of the Windgate pricing without improperly making an across-the-board change.

¹⁸⁴ BNSF/UP.SUPPRP.WP.III.F-0390 to 0391.

More specifically, *FMC* Table GM/HW-12 costs were used to assign percentages to each major item.¹⁸⁵ At the same time, the differences in the quantities of materials to be transported and built were factored in and a new construction price calculated. The 2003 pricing from AEPCO was used as the base for adjustment.

BNSF/UP Engineering Consultants determined that switching from steel to wood ties would require 23% more ties (3294 wood ties per mile as opposed to 2640 steel ties) and 55% more ballast to be both transported and installed (the difference in OTM, including rail, is not significant). They noted that in the *FMC* table, installation costs account for 77.4% of the per mile construction cost, and transportation accounts for 22.6%. As shown in more detail in BNSF/UP workpapers, using the *FMC* table, BNSF/UP's witnesses calculated the percentages of the total transportation costs attributable to the individual track components—15.89% of transportation costs to ties, 77.38% to ballast and 6.73% to other track items, including rail. They then calculated the percentages of the *FMC installation costs* attributable to the individual components.¹⁸⁶

They then applied these percentages to AEPCO's 2003 quote from Windgate for mainline single track construction (ties, rail and ballast) to derive a 2003 cost of \$131,770.36 per mile for construction of mainline single track, using wood ties. To that, BNSF/UP's Engineering Consultants added the 2003 Windgate quote for laying subballast to derive a total mainline single track construction cost of \$44,602.00 per mile.

To derive the cost for mainline double track construction, BNSF/UP Engineering Consultants doubled the adjusted 2003 single track cost for rail, ties and ballast resulting in a cost of \$263,541. To that, they added \$92,929 (the adjusted 2003 cost for laying subballast

¹⁸⁵ BNSF/UP.SUPPRP.WP.III.F-0392 to 0397.

¹⁸⁶ BNSF/UP.SUPPRP.WP.III.F-0392 to 0397.

(reflecting the 50-foot roadbed width as opposed to the 39-foot width in the Windgate quote) for a total cost of \$356,470. That total amount was then indexed to derive a 2001 cost for mainline double track construction (including subballast) of \$336,721.75.

Similar adjustments were made to Windgate quotes for construction of super-elevated sections. The results of these adjustments are set forth in the table below.

Table III.F.3-3
Track Construction Cost Per Mile After Adjusting for Roadbed Width,
Wood Ties and Double Track

Type	Roadbed	Track	2003 Total	Indexed to 2001
Mainline Single Track, no SE	\$44,602	\$131,770	\$176,372	\$166,601.33
Mainline Double Track, no SE	\$92,929	\$263,541	\$356,470	\$336,721.75
Single Track 3-5 Degree	\$44,602	\$131,770	\$176,372	\$166,601.33
Double Track 3-5 Degrees	\$92,929	\$302,575	\$395,505	\$373,593.55
Single, >5 Degrees	\$44,602	\$141,395	\$185,996	\$175,691.85
Double, >5	\$92,929	\$302,575	\$395,505	\$373,593.55

Details of the calculations are included in BNSF/UP Supplemental Reply electronic workpaper "III F 3 Track Construction.xls."

As a means of checking these adjustments against the real world construction means and methods, BNSF/UP witnesses analyzed the track labor and equipment costs for several other large track construction projects, which, while not of the same scope as construction of the ACE, involve real-world contractor quotes for large projects.

BNSF's recent (2004) budget for capital projects contains a detailed estimation of projected track expenses for construction projects on BNSF lines.¹⁸⁷ The information is at a much greater level of detail than was included in the Windgate price quote. They arrived at a

¹⁸⁷ BNSF/UP.SUPPRP.WP.III.F-0398 to 0400.

2003 cost per mile to build track of \${ } per mile, not including materials, small items and overtime for the labor. This price also does not include the laying of subballast, and should be compared to Windgate's price for mainline single track, Item #1. Indexed to 1Q01, the cost per mile is \$174,199.

BNSF Engineering Consultants also checked the Windgate quote against a bid obtained by BNSF for its Calwa to Bowles Trackwork Project.¹⁸⁸ This project for track items yielded a cost of \${ } per mile, and the construction specifications were very similar to the ACE, with the exception of additional ballast provided for walkways which is not included in most areas of the ACE. Taking out the ballast walkway cost and other miscellaneous items, the 2002 construction unit cost is over \${ } per mile. Indexed to 1Q01, the per mile price for single track construction (excluding roadbed costs) is approximately \$239,413.

When compared to price levels for other large construction projects, the Windgate bid, adjusted for miscalculations and for wood tie use, is consequently conservative. A comparison of per mile costs for mainline single track installation (including rail, ties and ballast placement, but not subballast placement which Windgate prices separately) is reflected in the following table:

**Table III.F.3-4
Comparison of Windgate Quote with BNSF Construction Costs**

Source	Year	Project Size	\$/Track Mile	\$/Track Mile Indexed to 2001
Windgate ACE RR	2003	System Wide	\$99,680	\$94,375
Windgate Adjusted using <i>FMC</i>	2003	System Wide	\$131,770	\$124,532
BNSF In-House	2003	System Wide	\${ }	\$174,199
Calwa-Bowles	2002	7.9 miles	\${ }est	\$239,413

These figures show that BNSF/UP's use of even the adjusted Windgate quote is very conservative.

¹⁸⁸ BNSF/UP.SUPPRP.WP.III.F-0401.

(b) Yard and Siding Construction

Adjustments to the Windgate quote are also necessary for items relating to construction in yards and sidings. Windgate's bid for the installation of track in yard and sidings (Item #2) bases its costs on the use of 119-pound Relay jointed rail with twelve inches of ballast underneath. However, AEPCO uses 132-pound rail in all these areas, which is heavier and stiffer than 119-pound rail and requires additional effort and materials to place and construct the track, thus increasing installation costs. By relying on a quote that assumes the use of a lighter, more flexible, and more easily installed rail, AEPCO has understated installation costs in this area. This is particularly true as the contractor in this case purports to include transportation of the materials and will have proportionally more weight of material to haul from the railheads to the job sites. BNSF/UP Consulting Engineers have increased the cost to account for the heavier rail.¹⁸⁹ The revised unit cost is \$120,370.30 per mile. When applied for illustrative purposes to AEPCO's yard tracks and parking sidings, the revised total cost for this item is \$6,610,736.88—an increase of \$651,057.49.¹⁹⁰

A similar underestimation has occurred in Windgate's quote for No. 10 turnouts (Item #9) which is also based on the use of 119-pound rail—AEPCO uses 132-pound Class One Relay Jointed rail in these locations. AEPCO Opening Nar. at III-F-51. Again, the use of the more flexible, lighter 119-pound jointed rail results in an underestimate of the costs of installation, magnified by the fact that Windgate purports to transport these materials to the jobsites located across three states. BNSF/UP Expert Witness Zimmerman has determined a ratio of the two rail weights to allow for the increase in construction costs for No. 10 turnouts.¹⁹¹ Applying, for

¹⁸⁹ BNSF/UP.SUPPRP.WP.III.F-0402.

¹⁹⁰ *Id.*

¹⁹¹ BNSF/UP.SUPPRP.WP.III.F-0345 to 0346.

illustrative purposes, the adjusted cost of \$25,389.69 to AEPCO's quantity of No. 10 turnouts yields a total installation cost for No. 10 turnouts of \$5,509,516.89, an increase of \$220,566.79 from AEPCO's costs.

BNSF/UP Consulting Engineers have also determined the cost for installing the six inches of subballast that they have included in the yards and at setout tracks. The basis for this price is AEPCO's Windgate quote for mainline single track subballast placement (Item #12), which assumes an eight-inch deep and 24-foot wide section of subballast.¹⁹² The amount of subballast that the Railroads' Consulting Engineers have specified for yard and setout tracks is six inches deep and 15.84 feet wide. To account for the difference, the Railroads' witness have computed the price per cubic foot from the Windgate quote, and have applied that cost to the smaller subballast section that has been included in these locations. Adjusted to 1Q01, the installation cost of subballast in yards and setouts is \$20,751.11 per track mile.¹⁹³

4. Tunnels

There are no tunnels on the ACE.

5. Bridges

AEPCO determined that the ACE would require a total of 466 railway bridges measuring 34,803.75 linear feet and one 32-foot bridge over a highway (on the Defiance Branch), at a total cost of approximately \$45.0 million.¹⁹⁴ This bridge investment cost is substantially understated. This is due in part to a significant error in AEPCO's computation of the unit cost for structural steel. In addition, AEPCO omitted some bridges from its inventory, and it failed to account for

¹⁹² AEPCO.OP.WP.04754.

¹⁹³ Mr. Zimmerman's calculations have been included at BNSF/UP.SUPPRP.WP.III.F-0294.

¹⁹⁴ AEPCO Opening Nar. at III-F-61; AEPCO Opening electronic workpaper "Bridge Inventory and Costing Type.xls," Tab "LF Total."

various aspects of railroad bridge design and construction, particularly in connection with construction of the bridge substructures.

BNSF/UP's analysis of bridge investment for the ACE was performed by Mr. Paul Michiels and Mr. Rick Meredith, bridge engineers with Ralph Whitehead Associates, Inc. As described above and in their statements of qualifications, Messrs. Michiels and Meredith have extensive experience with highway and railroad bridge design.

Messrs. Michiels and Meredith analyzed the portions of AEPCO's Narrative relating to bridges, as well as AEPCO's design diagrams, quantity calculations, and unit cost development. They found AEPCO's analysis of bridge investment to be acceptable in some respects, but they also identified various shortcomings in AEPCO's analysis. After correcting a number of errors in the AEPCO evidence, Messrs. Michiels and Meredith developed a bridge investment cost of \$145.0 million for the ACE.

a. General Approach

AEPCO assumed that the ACE would have bridges at all locations where they appear on the BNSF and UP lines, except that it omitted one of the two UP bridges crossing the Rio Grande River at El Paso.¹⁹⁵ In addition, AEPCO replaced bridges of less than 20 feet in length with culverts.¹⁹⁶ AEPCO states that it standardized the design of the bridges to provide the most economical construction package.¹⁹⁷

AEPCO began its analysis of bridge investment by grouping the BNSF and UP bridges along the ACE route into four categories.¹⁹⁸

¹⁹⁵ AEPCO Opening Nar. at III-F-56 to 57 & n.48.

¹⁹⁶ AEPCO Opening Nar. at III-F-56.

¹⁹⁷ AEPCO Opening Nar. at III-F-57.

¹⁹⁸ AEPCO Opening Nar. at III-F-57.

Type I:	Short to medium spans (up to 75 feet in length) with an average height greater than 15 feet.
Type II:	Long spans (75 to 125 feet in length) with an average height greater than 15 feet.
Type III:	Short to medium spans (up to 75 feet in length) with an average height of 15 feet or less.
Type IV:	Long spans (75 to 125 feet in length) with an average height of 15 feet or less.

The typical bridge AEPCO uses as the basis for its unit costs consists of two built-up girder sections, with necessary cross bracing.¹⁹⁹ The spans are open-deck type with timber bridge ties supporting the rails.²⁰⁰

AEPCO separately analyzed the two general components of a bridge — superstructure and substructure. For each of the four bridge types, its consultants developed a weighted average superstructure length and a weighted average substructure height, developed a design, determined estimated quantities for the main load-carrying members, and developed an estimated cost. Where an existing bridge has multiple tracks, AEPCO multiplied the applicable bridge type cost by the number of tracks.²⁰¹ AEPCO used a 70% rule for substructure height, i.e., it assumed that 30% of the bridge height is accounted for by the superstructure.²⁰²

Based on the length of existing BNSF and UP bridges on the route, AEPCO prescribed span lengths, number of spans, and number of piers for each railway bridge. AEPCO used information reported in the RSMeans® Handbook and bidTabs.com and information from

¹⁹⁹ AEPCO Opening Nar. at III-F-58.

²⁰⁰ AEPCO Opening Nar. at III-F-57.

²⁰¹ This is evident from close review of AEPCO Opening electronic workpaper “Bridge Inventory and Costing Type.xls,” Tab “Opening.”

²⁰² AEPCO Opening Nar. at III-F-59.

suppliers to develop costs for the various components of each superstructure type (defined in terms of length and number of spans) and substructure type (defined in terms of height and number of piers and abutments).²⁰³

Messrs. Michiels and Meredith adopted many of AEPCO's general assumptions (including its analysis based on bridge types), and they used AEPCO's bridge type definitions, with the exception of Type II. They concluded that AEPCO's Type II category does not permit a satisfactory analysis of bridge design and costs. This category includes 14 structures that are substantially larger than others in the category. These larger structures — bridges with heights exceeding 25 feet — have requirements that are significantly greater than the requirements for the other structures AEPCO has included in its Type II category, primarily because the taller piers will be subject to forces greater than AEPCO has assumed. In order to ensure that their analysis properly accounts for these requirements, Messrs. Michiels and Meredith created a fifth category for the taller Type II bridges, which they refer to as Type II Special bridges.

While AEPCO's narrative suggests that it classifies bridges based on their bridge height,²⁰⁴ AEPCO's consultants in fact categorized bridges based on 70% of the bridge height. Messrs. Michiels and Meredith believe that the full bridge height should be the basis for categorizing bridges and that each bridge type should then be divided into the superstructure and substructure components to more accurately develop the bridge inventory and cost. Messrs. Michiels and Meredith classified bridges based on the full height for each bridge, as shown in the records produced by BNSF and UP in discovery.

Messrs. Michiels and Meredith are in general agreement with the kinds of superstructure AEPCO specified for each type of bridge proposed for the ACE, with a few exceptions explained

²⁰³ AEPCO.OP.WP.04793-04808.

²⁰⁴ AEPCO Opening Nar. at II-F-57 to 58.

below. They also accept AEPCO's approach to developing the weighted average span length, a steel span design, and steel quantities. Messrs. Michiels and Meredith adopt AEPCO's formula for developing the estimated structural steel weight. They have designed their superstructures to conform to clearance requirements and design guidelines provided in the AREMA Manual.

For the substructure, Messrs. Michiels and Meredith accept AEPCO's assumption that substructure heights are 70% of total bridge height for purposes of this case. They accept AEPCO's proposed multi-column concrete pier types and pile bents, the abutment types it uses for the ACE bridges, and its specifications for placement of walkways on bridges. However, they do not accept AEPCO's proposed pier, pile bent, and abutment designs and quantities where they depart from the design guidelines prescribed by the AREMA Manual. Messrs. Michiels and Meredith identify several types of costs AEPCO omitted from its analysis, and they make various corrections to AEPCO's calculation of unit costs.

Messrs. Michiels and Meredith accept AEPCO's costs for the 32-foot "highway bridge" on the Defiance Branch.

The discussion below provides greater detail on the shortcomings Messrs. Michiels and Meredith have identified in AEPCO's bridge evidence and the corrections they have made. The discussion covers errors in AEPCO's inventory of bridges needed for the ACE, including an explanation for creation of the new Type II Special bridge classification; deficiencies in AEPCO's bridge design; and various costing errors (including mathematical calculation errors, omission of costs of certain construction activities, and methodology for developing unit costs). Messrs. Michiels and Meredith restate the bridge investment requirements for the ACE, as corrected for the errors they have identified.

b. Bridge Inventory

AEPCO alleges that it based its total linear feet of bridges on “information provided by BNSF and UP in discovery.”²⁰⁵ However, its restated bridge inventory reflects various errors, discussed below. This section also explains why Messrs. Michiels and Meredith found it necessary to create the Type II Special classification in order to perform an appropriate analysis of 14 very large bridge structures.

Messrs. Michiels and Meredith recalculated the weighted averages for each bridge type to correct for these errors and to reflect the addition of the Type II Special category and use of the total bridge height to classify the bridges. An inventory of the bridges on the ACE route is included in BNSF/UP’s electronic workpapers.²⁰⁶

(1) Bridges Omitted from the Inventory

Comparison of bridge inventory documents BNSF and UP produced in discovery with the ACE bridge inventory AEPCO developed²⁰⁷ shows that AEPCO excluded the following bridges along the ACE route:

- Bridge MP 166.9, West Defiance, NM
- Bridge MP 1099.74, Bowie, AZ
- Bridge MP 1100.78, Bowie, AZ
- Bridge MP 1101.48, Bowie, AZ
- Bridge MP 1101.77, Bowie, AZ
- Bridge MP 1218.11, Carne, NM

²⁰⁵ AEPCO Opening Nar. at III-F-56.

²⁰⁶ BNSF/UP Supplemental Reply electronic workpapers “III F 5 Bridge.xls” Tab “Opening.”

²⁰⁷ AEPCO Opening electronic workpapers “Bridge Inventory and Costing type.xls,” Tab “Opening.”

The first bridge is a BNSF bridge; the others are UP bridges. The BNSF and UP inventories clearly note that all of these bridges cross a waterway or are used to provide drainage.²⁰⁸ AEPCO does not explain why it excluded these bridges.

Messrs. Michiels and Meredith include these bridges in their restatement of the bridge inventory.²⁰⁹ They use AEPCO's method of determining the number of spans for each bridge crossing and use schematics contained in AEPCO's Opening Evidence²¹⁰ to determine the number of tracks for each bridge.

AEPCO also excludes from its ACE bridge inventory 11 railroad bridges that cross over only roads or highways, apparently based on Board precedent on this subject. In view of the limited time available to develop this reply evidence, the Railroads will acquiesce in this exclusion, for purposes of this case only. Messrs. Michiels and Meredith therefore excluded railroad bridges over highways from their bridge inventory.

(2) Bridges Duplicated in the Inventory

A review of AEPCO's bridge inventory²¹¹ shows that it duplicated six bridges on the ACE route:

- Bridge MP 89.30, East Grants, NM
- Bridge MP 89.70, East Grants, NM
- Bridge MP 141.40, Perea, NM
- Bridge MP 141.70, Perea, NM
- Bridge MP 1105.75, Olga, NM
- Bridge MP 1106.32, Olga, NM

²⁰⁸ AEPCO Opening electronic workpapers "Bridge Inventory and Costing type.xls," Tabs "UP," "BNSF."

²⁰⁹ BNSF/UP Supplemental Reply electronic workpapers "III F 5 Bridge.xls" Tab "Opening."

²¹⁰ AEPCO Opening Exh. III-B-1.

²¹¹ AEPCO Opening electronic workpapers "Bridge Inventory and Costing type.xls," Tab "Opening."

Messrs. Michiels and Meredith exclude these duplicates in their restatement of the bridge inventory.²¹²

(3) Span Length Criterion

AEPCO used a maximum span length of 125 feet for Type II and Type IV bridges.²¹³ At milepost 1152.16 on the Lordsburg Subdivision of the ACE route, AEPCO lists a one-span bridge measuring 210 feet.²¹⁴ This obviously exceeds the 125-foot maximum AEPCO has specified. In their restatement, Messrs. Michiels and Meredith have adjusted the bridge configuration to two 105-foot spans, along with a pile-bent and two abutments.²¹⁵

(4) Inconsistencies with Track Charts or AEPCO Schematics

There were 16 instances in which the “NO. OF TRACKS/BRIDGES USED” column in AEPCO’s Opening Evidence Bridge Inventory²¹⁶ did not match the track charts or ACE track schematics shown in AEPCO’s Opening Exh. III-B-1. Assuming that the schematics accurately reflect AEPCO’s intent regarding the configuration of the ACE, the inconsistencies resulted in an overstatement of the total number of tracks. Table BNSF/UP III.F-1 shows the inconsistencies.

Table III.F. 5-1 Inconsistencies Between AEPCO Bridge Inventory and Track Charts/AEPCO Schematics

²¹² BNSF/UP Supplemental Reply electronic workpapers “III F 5 Bridge.xls” Tab “Opening.”

²¹³ AEPCO Opening Nar. at III-F-58.

²¹⁴ AEPCO Opening electronic workpapers “Bridge Inventory and Costing type.xls,” Tab “Opening,” Row 293.

²¹⁵ BNSF/UP Supplemental Reply electronic workpapers “III F 5 Bridge.xls” Tab “Opening,” Row 232.

²¹⁶ AEPCO Opening electronic workpapers “Bridge Inventory and Costing type.xls,” Tab “Opening.”

Line Segment	Bridge Milepost	AEPCO Inventory Tracks	Track Chart/AEPCO Schematic Tracks	AEPCO Exh. III-B-1 Page Number
7100	870.40	1	2	9
7200	3.10	2	4	7
7200	34.70	2	1	6
7200	37.00	2	1	6
7200	39.10	2	1	6
7200	39.50	2	1	6
7200	39.60	2	1	6
7200	42.10	2	1	6
7200	43.50	2	1	6
7200	44.50	2	1	6
7200	45.60	2	1	6
7200	47.40	3	2	6
7200	143.60	1	2	2
7200	144.20	1	2	2
4968	1111.23	2	1	19
4968	1111.99	2	1	19

Source: BNSF/UP Supplemental Reply electronic workpaper "III F 5 Bridge.xls"

The inconsistencies for bridges between mileposts 34.09 and 46.62 on Line Segment 7200 apparently resulted from the fact that the two mainline tracks are non-parallel in this area. AEPCO apparently assumed that a bridge on one mainline would also exist on the other mainline. But the two tracks are some distance apart in this area. As indicated on BNSF Track

Charts pages 55 through 62, bridges that are on Main 1 are not necessarily on Main 2, and vice versa.²¹⁷ (On the track charts, the conventional milepost numbers are used for Main 1, and milepost numbers accompanied by 'X' are used for Main 2.) Because AEPCO has stated that it is including all the existing BNSF and UP bridges, with the exception of one Rio Grande Bridge in El Paso, bridges that do not exist on the non-parallel tracks should be removed.

In two other cases (the first two lines of the table), the AEPCO schematic indicates that AEPCO added sidings at locations where a bridge exists.²¹⁸ As a result, bridges must be added for the siding tracks.

Messrs. Michiels and Meredith revised the bridge inventory to conform to the number of tracks shown in the AEPCO schematics or the BNSF track charts.

(5) Bridge Structures Converted to Culverts

In its opening evidence, AEPCO states that "all bridges spanning 20 feet or less and crossing natural barriers have been built as culverts."²¹⁹ However, two such bridges -- located at MP 1147.58 in Lordsburg, NM and MP 1289.77 in Anapra, NM -- were included in AEPCO's Opening Evidence bridge inventory.²²⁰ These bridges have span lengths of 20 feet and 15 feet respectively.²²¹ Messrs. Michiels and Meredith removed these bridges from the bridge

²¹⁷ AEPCO.OP.WP.03421-28.

²¹⁸ AEPCO Opening Exh. III-B-1, pp. 7, 9.

²¹⁹ AEPCO Opening Nar. at III-F-56 to 57.

²²⁰ AEPCO Opening electronic workpapers "Bridge Inventory and Costing type.xls," Tab "Opening."

²²¹ AEPCO Opening electronic workpapers "Bridge Inventory and Costing type.xls," Tab "Opening."

inventory. They are included in BNSF/UP's restated culvert inventory, and the costs are included as part of culvert costs.²²²

(6) Pier Calculation for Single-Span Multiple Track Bridges

In reviewing the formulas AEPCO used in developing its Opening Evidence Bridge Inventory, Messrs. Michiels and Meredith discovered that AEPCO had provided for piers or pile bents in connection with multi-track single-span bridges.²²³ However, single-span bridges have only two abutments; they have no piers or pile-bents. (Piers and pile-bents are used where bridges have more than one span.) This problem stems from the fact that the AEPCO pier count formula multiplied the number of spans by the number of tracks, then computed piers on the basis of that total.²²⁴ (The same pier count formula includes a criterion that states, "if span length $\leq 40'$, then piers used = 0."²²⁵ There is no explanation of this 40-foot criterion, and it appears to play no role in AEPCO's pier calculation.)

As a result of this error, AEPCO has mistakenly included 280 extra piers in its Opening Evidence Inventory. Messrs. Michiels and Meredith have adjusted the AEPCO pier count formula to count the number of piers for a bridge before multiplying by the number of tracks. They have adjusted the pier inventory downward to reflect this correction.

²²² BNSF/UP Supplemental Reply electronic workpaper "III F 5 Bridge.xls" Tab "Opening;" BNSF/UP Supplemental Reply electronic workpaper "III F 2 Culverts.xls."

²²³ AEPCO Opening electronic workpaper "Bridge Inventory and Costing type.xls," Tab "Opening," column M.

²²⁴ AEPCO Opening electronic workpaper "Bridge Inventory and Costing type.xls," Tab "Opening," column M.

²²⁵ AEPCO Opening electronic workpaper "Bridge Inventory and Costing type.xls," Tab "Opening," column M.

(7) Type II Special Category

As explained above, Messrs. Michiels and Meredith created a new Type II Special bridge category because, for bridges that are greater than 25 feet in height, the substructures must have larger members (“members” are the multi-column concrete piers that support such bridges). Analyzing these structures separately allows a more accurate determination of costs.

The taller the pier, the greater the overturning effects on the columns and footings, due to wind, temperature, traction forces, and braking forces. The overturning effects (called “moments”) are forces that are applied at a distance from an actual or assumed point of an object (called an “origin”). With increases in the distance of an applied force from the origin point, an object will experience a greater tendency to rotate. As an example, consider a lug wrench used to remove lugs that secure a tire wheel to the drum of a car axle. The longer the arm of the lug wrench, the easier it becomes for a person to apply a force to turn the lug. Likewise, the longer the column length, the easier it becomes to overturn the pier footing or otherwise bend the column. If a column cannot withstand the large bending forces, the concrete may crack or the pier itself may rotate and tilt out of alignment. Cracked columns may lead to corrosion of the reinforcing steel in the concrete, ultimately weakening the structure over time.

To resist the large bending forces, a concrete column must be either large or heavily reinforced with steel bars. It is the reinforcing steel in the concrete that resists the bending forces in a column. However, there are limits to how reinforcing steel is spaced and limits to the quantity of such steel that may be used in a concrete section of a column.²²⁶ Therefore, in order

²²⁶ Reinforcing steel requirements are discussed in the AREMA Manual, Sections 8.2.5 and 8.2.11. BNSF/UP.SUPPRP.WP.III.F-0538 to 0541. AREMA Manual references are to the 2003 edition.

to provide resistance to large bending forces, structural engineers may need to increase the diameter of a reinforced concrete column.

To prevent the pier from tilting, it is necessary to include more piles and to position them to resist the overturning moment. AREMA spacing requirements prevent piles from being placed too close to each other.²²⁷ In the case of friction piles, such as those used on the ACE route, the resistive force that provides the necessary support comes from the interaction of the soil rubbing against the surface of the pile. Increasing the driven depth of the piles and/or increasing the surface area of the pile can increase the resistive force. Messrs. Michiels and Meredith have increased the surface area of the piles to obtain the necessary resistive force and reduce the depth requirement for the driven pile.²²⁸ Larger piles do not need to be placed as deep as smaller piles because they have greater surface area. This is analogous to an individual pushing a narrow stick farther into the ground to anchor it than a larger diameter shaft of a beach umbrella. Piles are usually driven to a point at which they will resist the design load by a factor of two as a minimum.²²⁹ This factor represents the safety level for the installation of piles taking into account some of the variances that may occur in connection with borings that are too far apart, changes in the subsurface conditions between borings, construction tolerances and unanticipated loadings caused by nature, construction, or increased train loads.

The loads on the pile foundations for a multi-column concrete pier would fall under Load Capacity Case B, as defined in the AREMA Manual, Article 8.4.2.2.²³⁰ In determining the

²²⁷ BNSF/UP.SUPPRP.WP.III.F-0545.

²²⁸ BNSF/UP.SUPPRP.WP.III.F-0420 to 0425.

²²⁹ BNSF/UP.SUPPRP.WP.III.F-0544.

²³⁰ BNSF/UP.SUPPRP.WP.III.F- 0544.

appropriate design for pile foundations, Messrs. Michiels and Meredith have referred to this section as well as to the AREMA Manual, Sections 8.4.2 and 8.4.3.²³¹

There are 14 bridges on the ACE route with heights that exceed 25 feet and span lengths that are between 75 feet and 125 feet:²³²

- Bridge MP 865.70, Scholle, NM (Double Track)
- Bridge MP 871.40, Scholle, NM
- Bridge MP 871.50, Scholle, NM
- Bridge MP 871.70, Scholle, NM
- Bridge MP 872.20, Scholle, NM
- Bridge MP 872.90, Scholle, NM
- Bridge MP 873.80, Scholle, NM
- Bridge MP 874.20, Scholle, NM
- Bridge MP 0.16, Defiance, NM
- Bridge MP 33.80, Gallup, NM (Double Track)
- Bridge MP 1292.92 El Paso, TX (Double Track).

The posted bridge heights for the BNSF inventory at Clovis, Defiance and Gallup, New Mexico range from 27 feet to 80 feet, with over 80% of the bridges having heights exceeding 35 feet.

The posted height of the UP bridge in El Paso, Texas is 65 feet.

Messrs. Michiels and Meredith based the design loads and the group loads for Type II Special bridge substructures on the AREMA Manual, Articles 8.2.2.3 and 8.2.2.4, respectively.²³³ They used a multi-column concrete pier similar to the Type II pier, with a weighted average pier height of 40.7 feet.²³⁴ They assumed a two-foot soil cover or water depth for rivers at all crossings with footings, since BNSF and UP consider the posted height to be

²³¹ BNSF/UP.SUPPRP.WP.III.F- 0543 to 0549.

²³² AEPCO counted a double track bridge as equivalent to two single track bridges in computing bridge investment. See page III.F-119 fn 201, *supra*.

²³³ The design loading of the pier includes dead load, live load, impact, wind loads, longitudinal forces from live load, and temperature forces. BNSF/UP.SUPPRP.WP.III.F-0434 to 0437, 0531 to 0537.

²³⁴ BNSF/UP.SUPPRP.WP.III.F-0434 to 0437, 0511.

measured from the top of tie to top of ground line or normal water elevation. The Type II Special pier requires a 5-foot deep cap and 60-inch diameter columns. The length of the column is approximately 37'-8". Messrs. Michiels and Meredith require 32 steel HP14 x 89 piles to be used in construction to support the loads of the Type II Special bridge. A 14.0' x 28.0' x 6.0' footing is used for this pier. The Type II Special pier supports a 109-foot open timber deck plate girder span.

c. Bridge Design Deficiencies

(1) Superstructure

In general, Messrs. Michiels and Meredith have accepted the plate girder spans that AEPCO proposed for the ACE route, including the design and computed weight for the structural steel. However, to comply with AREMA standards, they have made changes to the girder spacing and have added rail anchors and spacer timber.

For the Type II and Type II Special Bridges, the AEPCO girder spacing has been adjusted to meet the requirements in Article 15.1.2.4 of the AREMA Manual.²³⁵ As demonstrated in the BNSF/UP workpapers, the space between the girders must be increased to stabilize these bridges.²³⁶

AEPCO failed to include rail anchors (used to fasten the bridge ties to the steel girders) in the bridge superstructure cost. However, such anchors must be installed to comply with AREMA standards. The AREMA Manual, Article 7.1.14.8.5.b and c, provides recommended guidelines for the fastening of bridge ties to steel girders and for the size and spacing of the anchoring system.²³⁷ BNSF typically installs a ¾" diameter hook bolt with a spring lock washer,

²³⁵ BNSF/UP.SUPPRP.WP.III.F-0550.

²³⁶ BNSF/UP.SUPPRP.WP.III.F-0404 to 0405, 0508.

²³⁷ BNSF/UP.SUPPRP.WP.III.F-0531.

lock nut and cut washer at every other bridge tie on tangent track.²³⁸ UP uses a similar connection, with the exception of the spring lock washer. The AREMA Manual, Article 15.8.3.2.1.a, specifies that the maximum longitudinal spacing shall be 4'-6," or 54".²³⁹ AEPCO proposes to use 14" spacing for the bridge ties. To meet the 54" maximum requirement, every fourth tie (3 spaces x 14" = 42", which is less than 54") must be anchored.

AEPCO also has omitted spacer timbers and fasteners from its design. Spacer timber (or guard timber) is used on open timber decks to prevent bunching of the bridge timber ties. (Bridge timber ties control vertical and horizontal (lateral and longitudinal) movement on the bridge span.) The AREMA Manual, Article 15.8.3.2.1.c, specifies "spacer timber of section not less than 4"x 8" nominal shall be placed on the deck outside of each rail and secured to each tie with lag bolts or drive spikes not less than 5/8" diameter."²⁴⁰

(2) Pier and Pile Bent Design

Messrs. Michiels and Meredith have concluded that, based on the AREMA design loads, AEPCO's piers and pile bents associated with each bridge type are structurally inadequate. Both the piers associated with Type I and Type II bridges and the pile bents associated with Type III and Type IV bridges are not designed to withstand the longitudinal forces and standard loads associated with a railroad bridge, and there are additional structural flaws in the design of the pier foundations.

(a) Failure to Account for Longitudinal Forces and Standard Loads

²³⁸ BNSF/UP.SUPPRP.WP.III.F-0559.

²³⁹ BNSF/UP.SUPPRP.WP.III.F-0553.

²⁴⁰ BNSF/UP.SUPPRP.WP.III.F-0553.

The primary factor in the inadequacy of AEPCO's pier and pile bent designs is its failure to account properly for the longitudinal force from train loads. In the AEPCO Opening Evidence, the workpaper containing the superstructure portion of the calculations contains a brief statement that the longitudinal forces from the AREMA Manual, Article 15.1.3.11 "can be neglected with these short spans, CWR rail, [and] anchoring per conversation with Reid Potter."²⁴¹ While this may be true for this superstructure design, it is not true for the substructure design. For the design and analysis of the ACE substructure units, it is necessary to consult the AREMA Manual, Chapter 8.

The bridges on the ACE route will experience increased longitudinal forces due to the use of AC locomotives.²⁴² Research performed in 1996 and sponsored by The Association of American Railroads (AAR) showed that the tractive forces from AC locomotives are greater than those from DC locomotives.²⁴³ The tractive forces contribute to longitudinal forces that are described in AREMA Manual Chapters 8 and 15. The results of this research are based on a 50-foot open-deck steel deck plate girder bridge, and thus are applicable to the ACE bridges. The research found that there were ways to reduce the longitudinal force through tightening the anchoring of the rails and use of box anchoring. However, AEPCO does not propose to use anchoring or include costs for box anchors. Without the use of box anchors, the longitudinal

²⁴¹ AEPCO.OP.WP. 04764.

²⁴² At least some of the trains that will travel on the ACE route are to be powered by AC locomotives. Run-through power will be used for trains interlined with BNSF or UP. AEPCO Opening Nar. at III-C-13. Both BNSF and UP use AC locomotives. *E.g.*, AEPCO.OP.WP. 03621 (BNSF maintenance agreement referring to AC locomotives).

²⁴³ BNSF/UP.SUPPRP.WP.III.F-0406.

forces cannot be reduced.²⁴⁴ Thus, it is necessary to alter the pier and pile bent designs in several ways to ensure that these elements will be able to withstand the longitudinal forces.

(b) Piers

AEPCO's design for Type I and Type II Piers is inadequate because it does not consider longitudinal forces and because AEPCO's consultants have improperly calculated impact loads and live loads. Impact loads should be calculated based on AREMA Manual, Article 8.2.2.3.d.²⁴⁵ The maximum live load reaction for piers could be determined by consulting AREMA Manual Chapter 15, Table 15-1-16.²⁴⁶

In addition, AEPCO's proposed Type I and II pier foundations are unconventional and inconsistent with AREMA Manual guidelines outlined in Chapter 8, Part 4 – Pile Foundations.²⁴⁷ The two steel HP12 x 53 piles that AEPCO has proposed for these foundations will not fit in the proposed columns for these piers.²⁴⁸ These multi-column concrete piers require larger columns and a larger conventional foundation system that includes steel piles and footing. Furthermore, the AEPCO design does not meet the pile spacing requirements of AREMA Manual, Article 8.4.2.5.a.²⁴⁹

Using the AREMA Manual and considering the factors described in the discussion of Type II Special bridges above, Messrs. Michiels and Meredith have redesigned AEPCO's Type I and Type II piers.²⁵⁰ Based on the new design, the weighted average pier heights (70% of total

²⁴⁴ BNSF/UP.SUPPRP.WP.III.F-0406 to 0409.

²⁴⁵ BNSF/UP.SUPPRP.WP.III.F-0533.

²⁴⁶ BNSF/UP.SUPPRP.WP.III.F-0551 to 0552.

²⁴⁷ BNSF/UP.SUPPRP.WP.III.F-0542 to 0549.

²⁴⁸ BNSF/UP.SUPPRP.WP.III.F-0410 to 0411.

²⁴⁹ BNSF/UP.SUPPRP.WP.III.F-0410 to 0413.

²⁵⁰ BNSF/UP.SUPPRP.WP.III.F-0419 to 0437.

bridge heights) for the Type I, II and II Special bridges are 14'-6", 15'-7" and 40'-8", respectively. The number of piles and footing sizes for the multi-column concrete piers are as follows:

- Type I: 14 steel HP14 x 89 piles with a 7'x 24'x 4' footing
- Type II: 18 steel HP14 x 89 piles with a 10'x 24'x 4' footing
- Type II Special: 32 steel HP14 x 89 piles with a 14'x 28'x 6' footing.

(c) Pile Bents

AEPCO has used pile bents (i.e., piles and a pile cap) to support the superstructure of Type III and Type IV bridges. AEPCO describes the pile bent as "a reinforced concrete cap supported by six steel braced H 12 x 53 piles."²⁵¹

Messrs. Michiels and Meredith have concluded that pile bents will work for the Type III and IV bridges. However, AEPCO did not undertake the necessary analysis to design these pile bents. While AEPCO provided analysis and sketches for the Type I and Type II multi-column concrete piers (discussed above), it did not provide any analysis or sketches for the Type III and IV pile bents.²⁵² AEPCO states in its narrative that it based substructure design on Mr. Bastow's visual inspections that revealed "numerous piers containing only piles and a pile cap."²⁵³ However, AEPCO has not described the superstructure type and length or the pile bent heights of the particular bridges cited by Mr. Bastow. Without that information, its choice of a single row pile bent for the redefined span lengths of the Type III and IV bridges is arbitrary.

²⁵¹ AEPCO Opening Nar. at III-F-60.

²⁵² AEPCO provides no sketch to indicate whether piles for Type III and IV bridges are constructed plumb or with batter (at an angle) to resist lateral and longitudinal forces. The only relevant sketch refers to calculation of the length of the steel bracing. AEPCO.OP.WP. 04792.

²⁵³ AEPCO Opening Nar. at III-F-60.

To determine the configuration of the pile bents, it is necessary to consider the superstructure type and lengths in order to determine dead loads and live loads. The number of piles and the number of rows of piles must be based on design loads, which for substructure design includes vertical, longitudinal and lateral forces. Because they support different superstructures and thus have different design loads, the pile bent designs that Messrs. Michiels and Meredith developed for Type III and Type IV bridges differ from one another. The Type IV pile bent is referred to as a tower bent. Two rows of piles are needed to adequately handle the forces for the longer Type IV superstructure length.

The AEPCO design for the Type III and Type IV pile bents is also deficient because it simply replicates the size and numbers of piles used in the Type I and Type II piers.²⁵⁴ While the Type I and Type II bridges are bigger, and therefore require greater support, the piles for these bridges are embedded in the soil. The exposed piles used in the Type III and Type IV bridges will behave differently than a pile that is fully embedded in soil. Unlike the embedded pile, the exposed pile must be designed for impact forces, as well as the other forces described above. The exposed pile must also be capable of handling bending forces, much like the columns for the Type I and Type II piers. Messrs. Michiels and Meredith increased the size of the piles to steel HP14 x 89 to account for the bending forces.²⁵⁵ (Use of HP14 x 89 for all of the piles is consistent with AEPCO's effort to minimize use of different materials. It also improves the economics of the piers and pile bents, because an HP14 x 89 pile has more surface area than a HP12 x 53 pile, and thus the length of embedment for friction piles is reduced.)

Messrs. Michiels and Meredith have accepted the soil properties assumed by AEPCO and have calculated the loadings based on AREMA standards. Utilizing the accepted design

²⁵⁴ AEPCO.OP.WP. 04813-14.

²⁵⁵ BNSF/UP.SUPPRP.WP.III.F-0414 to 0416, 0420 to 0425.

guidelines, Messrs. Michiels and Meredith concluded that the piles needed to increase in size and length to attain a pile capacity that is two times the design load.²⁵⁶ Since the support strength of the pile is derived from the friction between the pile and the soil, either the piles must be longer or their surface area must be increased in order to attain the necessary strength. As Messrs. Michiels and Meredith redesigned them, the Type III and IV pile bents have weighted average heights (70% of full bridge heights) of 7'-7" and 7'-6", respectively. The Type III pile bent requires a single row of 6 steel HP14 x 89 piles. The Type IV pile bent requires a total of 12 steel HP14 x 89 piles with a double row arrangement.²⁵⁷

(d) Abutments

As in its pier design, AEPCO incorrectly calculated the loadings used in the analysis and design of the abutments.²⁵⁸ The tall abutment configuration used for the bridges is acceptable; however, the number of piles and footing dimensions do not comply with AREMA standards.

Messrs. Michiels and Meredith have resized and redesigned all of the abutments to comply with AREMA standards, including AREMA-specified loadings. Details of this analysis and calculations are included in the Railroads' electronic workpapers.²⁵⁹ They corrected the design loads of the superstructure, the live load, and soil loads on the backwall, which in turn affected the dimensions of the footing and the number of piles.

²⁵⁶ AREMA Manual Article 8.4.2.2 states that the minimum factor for safety is 2.0. BNSF/UP.SUPPRP.WP.III.F-0544.

²⁵⁷ BNSF/UP.SUPPRP.WP.III.F-0423 to 0425, 0438 to 0439. Use of HP14 x 89 piles is based on bending requirements for Type III pile bents. Length is based on the friction needed for support strength for Type IV pile bents.

²⁵⁸ AEPCO.OP.WP. 04762-04780.

²⁵⁹ BNSF/UP.SUPPRP.WP.III.F-0440 to 0506, 0512 to 0516.

(e) Walkways

AEPCO states in its Narrative that it included bridge timbers, walkways and railings on one side of each span.²⁶⁰ Messrs. Michiels and Meredith concur that walkways are needed on only one side of single-track bridges. AEPCO proposes that every third bridge tie extend an additional five feet on one side of the bridge to support the timber walkway and railing. Messrs. Michiels and Meredith suggest that, instead, every fourth tie extend the additional five feet, in view of the fact that every fourth tie is to be fastened to the steel girders.²⁶¹ Locating the rail anchors on the same ties that are extended to support the walkway would simplify construction of this portion of the ACE bridges. Messrs. Michiels and Meredith accept AEPCO's unit cost per linear foot for walkways and railings and include the cost for those items as part of their bridge investment costs.

d. Cost Issues

The changes in quantities required as a result of corrections to AEPCO's structural design, discussed above, affect bridge investment costs. Separately, Messrs. Michiels and Meredith found deficiencies in AEPCO's cost data. AEPCO's opening evidence contains mathematical errors that have a major impact on its calculation of costs, and it omits certain categories of costs. In addition, Messrs. Michiels and Meredith identify flaws in AEPCO's method of determining unit costs.

²⁶⁰ AEPCO Opening Nar. at III-F-59-60.

²⁶¹ See page III.F-132, *supra*.

(1) Mathematical Calculation Errors

(a) Superstructure Unit Cost

AEPCO has seriously underestimated the cost of the steel girders used in the superstructure of the bridges. Apart from any other adjustments to inventory and unit costs, the correction of this calculation error adds approximately \$50 million to bridge investment costs.

The AEPCO Opening Evidence lists a superstructure unit cost of \$206.97/LF (linear foot).²⁶² Messrs. Michiels and Meredith determined that this is the result of adding AEPCO's steel girders cost of \$1.08/LB (pound) with its cost for timbers, handrails, and walkways of \$205.89/LF.²⁶³ This is obviously wrong. To correct the mistake, the steel girders cost of \$1.08/LB must be multiplied by the weight of steel per LF, to obtain a unit cost of steel girders per LF. For example, apart from other adjustments to inventory and unit costs, the superstructure unit cost for AEPCO's Type I bridges should be calculated as follows:

- First, convert the cost of steel girders from price per LB to price per LF.

Type I Weight of Steel (by length) = 1236 LB/LF²⁶⁴

Unit Cost of Steel Girders (by weight) = \$1.08 /LB²⁶⁵

Unit Cost of Steel Girders (by length) = 1236 LB/LF x \$1.08 /LB

Unit Cost of Steel Girders (by length) = \$1334.88 /LF

²⁶² AEPCO Opening electronic workpaper "Bridge Inventory and Costing Type.xls," Tab "Final Cost," cells D4, D14, D23, and D33.

²⁶³ This error is reflected in AEPCO Opening electronic workpaper "Bridge Inventory and Costing Type.xls," Tab "Final Cost", cells D4, D14, D23 and D33. *See also* AEPCO Opening electronic workpapers "Bridge Inventory and Costing Type.xls," Tab "Unit Costs." Messrs. Michiels and Meredith have corrected for this error in computing steel costs.

²⁶⁴ AEPCO Opening electronic workpapers "Bridge Inventory and Costing.xls," Tab "Type I."

²⁶⁵ Messrs. Michiels and Meredith developed a unit cost for steel girders of \$1.23/LB. Like AEPCO, they used the RSMeans unit cost for structural steel, but they indexed that cost in a more appropriate manner, as described in the discussion of unit cost methodology below. However, for this example, they use AEPCO's unit cost to demonstrate AEPCO's error and to isolate its effect.

- Second, add the Unit Cost of Steel Girders (per LF) to the Unit Cost of Timbers, Handrail and Walkway (per LF) to obtain a correct Unit Cost of Superstructure per LF.

Unit Cost of Superstructure = Unit Cost of Steel Girders (per LF) + Unit Cost of Timbers, etc. (per LF)

$$\begin{aligned}\text{Unit Cost of Superstructure} &= \$1334.88 / \text{LF} + \$205.89 / \text{LF} \\ \text{Unit Cost of Superstructure} &= \underline{\$1540.77 / \text{LF}}\end{aligned}$$

Messrs. Michiels and Meredith agree that the cost per linear foot of superstructure steel, bridge timber ties, walkway and handrail may be combined to develop a superstructure unit cost, as described in the example. They include hook bolts for every fourth tie, guard timbers, and lag screws as part of the superstructure unit cost.

(b) Abutment Cost

Due to another mathematical miscalculation, AEPCO has overestimated the cost of concrete to be used in abutments by \$11 million, apart from other adjustments to inventory and unit costs. In its Opening Evidence, AEPCO effectively doubled the required quantity of abutment concrete. AEPCO's "Bridge Inventory and Costing type.xls, "TYPE I" worksheet" accounts for two abutments per bridge, as noted in cell F26. However, it then multiplies the total volume of concrete for two abutments by the number of abutments in the inventory. This same error is replicated in the "TYPE II", "TYPE III" and "TYPE IV" worksheets.

Messrs. Michiels and Meredith have corrected for this error in computing abutment concrete costs.

(c) Omission of Pile Bracing Costs for Type III and Type IV Bridges

In its Opening Evidence AEPCO fails to include pile bracing costs for Type III and Type IV bridges. While costs for pile bracing are shown in the AEPCO workpapers, the formula used

to calculate the final costs mistakenly omits those pile bracing costs. In AEPCO's "Bridge Inventory and Costing type.xls, "Final Costs" worksheet," cells E30 and E40 sum the totals of items Superstructure (cells E23 and E33) through Riprap (cells E28 and E38), but they exclude Pile Bracing (cells E29 and E39) for Type III and Type IV Bridges. Cell E30 should read '=SUM(E23:E29)' and cell E40 should read '=SUM(E33:E39).'

Messrs. Michiels and Meredith have corrected for this error. The correction increases costs by approximately \$461,000, apart from adjustments to inventory and unit costs.

(2) Omission of Construction Requirements

AEPCO failed to consider costs for at least two important construction requirements -- cofferdams and excavation.²⁶⁶

(a) Cofferdams

Where bridges are constructed over waterways such as the Rio Puerco, the Rio Grande, and the Rio Abo, special measures must be undertaken in constructing the footings for the bridges in the waterway. Cofferdams are temporary retaining structures that are used to support the soil of deep excavations where water is present. These temporary structures usually consist of vertical sheet piling, a bracing system composed of wales and struts or prestressed tiebacks, and, if required, a bottom seal course to keep out water. Contractors use cofferdams in situations where soils may settle or slide during construction of piers or abutments. The cofferdams are installed and excavations are usually taken to the base of the proposed footing depths. The footing area is dewatered by either pumping the water out of the enclosed cofferdam or placing a

²⁶⁶ AEPCO's opening evidence also did not include any costs relating to the causeways, barges, cranes, and land bridges that would be needed in connection with the installation of the superstructure on the longer bridges. In view of the limited time available to them, Messrs. Michiels and Meredith have not attempted to provide costs for these items.

seal course (consisting of concrete slab and/or slurry placed underwater) to prevent subsurface water from entering the cofferdam.²⁶⁷

AEPCO's Opening Evidence includes no provision for cofferdams. Messrs. Michiels and Meredith therefore developed measurements and quantities of materials for the ACE bridges constructed over the Rio Puerco, the Rio Grande, and the Rio Abo and costed these items for the ACE.²⁶⁸ For construction of bridge piers on the ACE, steel sheet piling with wales and struts would be utilized. The steel sheet piles would have interlocks, which are connections for sheets to maintain alignment. Messrs. Michiels and Meredith used Z-shaped section type sheets, which are readily available from steel manufacturers and distributors. Such sheets have a greater level of resistance, which will be needed for some of the large structures that are proposed on the ACE.

AEPCO also did not account for the use of tremie concrete to construct the piers that are in water. Tremie concrete is a method of placing concrete under water through a pipe or tube (tremie). This method is used to place a monolithic surface of concrete underwater without creating turbulence. The concrete flows through the tremie by either gravity with a hopper located at the top of the pipe or by direct connection to a concrete pump. The discharge end of the tremie is embedded in the concrete as it is placed. A crane supports and maneuvers the tremie as concrete is placed. Tremie concrete is also used in cases where concrete is not allowed to freely drop when it is placed. Tremie concrete would be necessary for the construction of

²⁶⁷ The Board has previously agreed that costs of cofferdams are properly included in the calculation of SAC costs. *See Duke Energy Corp. v. Norfolk Southern Ry.*, STB Docket No. 42069 (STB served Nov. 6, 2003), pp. 110-11.

²⁶⁸ BNSF/UP.Supplemental Reply electronic workpaper "III F 5 Bridge.xls" Tabs "Type I," "Type II," "Type IIsp." Based on a review of aerial photos, Messrs. Michiels and Meredith determined that it was appropriate to consider only 50 percent of the piers in developing the number of cofferdams for the bridge over the Rio Grande at El Paso.

bridges over the Rio Grande, Rio Puerco and Rio Abo (i.e., the rivers with water flowing in them).

Messrs. Michiels and Meredith have included costs for a concrete sealer course with their cofferdam costs. They assume that a minimum one-foot thick concrete seal course will be pumped at each location.

(b) Excavation

AEPCO did not account for the excavation required to construct abutments and multi-column concrete pier footings in developing its bridge investment cost. Messrs. Michiels and Meredith have used the plan dimensions and depth of footing, which includes a two-foot soil cover on top of the footing, to determine the excavation quantity for the multi-column concrete pier footings. They have determined the excavation quantity for the abutment footings in a similar manner. They added 18" to each side of the footing plan dimensions to provide for room to erect formwork for casting the concrete footings and to allow room for laborers to perform their work. Details of the calculations used in determining the excavation quantities for the abutments and the multi-column concrete piers are included in BNSF/UP's electronic workpapers.²⁶⁹

(3) Unit Cost Methodology

Messrs. Michiels and Meredith have identified several errors in the methodology AEPCO used in developing unit costs for bridge investment.

²⁶⁹ BNSF/UP Supplemental Reply electronic workpapers "III F 6 Bridge.xls" Tabs "Type I," "Type II," "Type IIsp," "Type III," "Type IV;" *see also* BNSF/UP.SUPPRP.WP.III.F-0509 to 0511, 0512 to 0516.

(a) Historical Cost Index

AEPCO chose a method for calculating costs as of January 2001 that distorts the unit costs of many items. Instead of simply using the costs from the 2001 edition of RSMeans® to obtain first quarter 2001 costs for the ACE, AEPCO apparently applied a Historical Cost Index to prices from that volume.²⁷⁰ However, the 2001 edition of RSMeans makes clear that the costs in that volume are as of January 1, 2001.²⁷¹ Thus, there should be no historical adjustment to the costs from the 2001 RSMeans.

To accurately determine construction costs for 1Q 2001, Messrs. Michiels and Meredith developed unit costs using the 2001 RSMeans® 15th Annual Edition, without any application of an historical cost factor.²⁷²

(b) City Cost Index

In adjusting costs for location, AEPCO incorrectly weighted the location factors for different cities. This indexing issue is discussed in Section III.F-2. That discussion applies to bridges as well, and the same corrections have been made for bridge cost indexing.

(c) Source of Unit Costs

AEPCO used RSMeans as its source for unit costs for most categories. Messrs. Michiels and Meredith also used RSMeans for these categories (although they used the 2001 edition and corrected the indexing, as described above). AEPCO used other sources for some categories. Messrs. Michiels and Meredith accepted these unit costs where they appeared reasonable. However, they rejected AEPCO's unit costs in two categories -- reinforced concrete and steel

²⁷⁰ AEPCO.OP.WP. 04803; AEPCO Opening electronic workpapers "Bridge Inventory and Costing.xls," Tab "Unit Costs."

²⁷¹ BNSF/UP Supplemental Reply electronic workpaper "III F Means Index.pdf."

²⁷² BNSF/UP.SUPP.RP.WP.III.F-0517 to 0530.

piles. For these two categories, AEPCO failed to show why its choice of a unit cost was reasonable.

To obtain a unit cost for reinforced concrete, AEPCO reviewed three 1996 bids by contractors to build two bridges in South Dakota (referred to as the Dunbar Loop Bridge and the Service Road Bridge).²⁷³ AEPCO selected the lowest of six figures for reinforced concrete (\$250 per cubic yard) from these bids.²⁷⁴ However, it fails to explain why the ACE could expect to pay that low price. AEPCO has not demonstrated that the South Dakota bridges are similar to the ones the ACE would construct or that the economic conditions faced by the ACE in 2001 would be similar to those that existed in South Dakota in 1996. Moreover, the concrete cost chosen by AEPCO is an outlier. The three bids contain two concrete line items each (614 CY and 210 CY), and the line item costs range from \$250/CY to \$760/CY. The average of the six concrete unit costs (before indexing) is approximately \$425/CY.

AEPCO has not shown that the ACE faced similar circumstances and could expect to obtain a price equal to the lowest concrete cost found in three 1996 bids for a South Dakota project. Because AEPCO provided no basis for concluding that the unit cost it chose would be available to the ACE, Messrs. Michiels and Meredith used RSMeans to obtain a unit cost for concrete. They applied seven separate unit costs for concrete found in RSMeans to the different bridge structure elements (abutments, pier footings, etc.).²⁷⁵

For steel ties, AEPCO used the New Mexico bidTabs, choosing the low bid of \$25.00/LF for HP14 x 89 steel piles.²⁷⁶ (This source compiles bid tabs supplied by the New Mexico

²⁷³ AEPCO.OP.WP. 04800.

²⁷⁴ AEPCO.OP.WP. 04798.

²⁷⁵ BNSF/UP.SUPPRP.WP.III.F-0524.

²⁷⁶ AEPCO.OP.WP. 04795.

highway department for materials used in surface transportation projects.) Here at least AEPCO selected a bid from the relevant geographical area. However, AEPCO again offered no explanation for why this low bid would be available to the ACE. It provided no information about the circumstances of the bid. In fact, the range of bids suggests that the \$25.00 price is not likely to be generally available. For HP14 x 89 steel piles, the high bid shown in the New Mexico bidTabs was \$64.98/LF, and the weighted average bid (based on 32 bids) was \$39.74/LF.²⁷⁷ The RSMeans national average unit cost for HP14 x 89 steel piles is \$33.50/LF (subject to adjustment by historical and city cost indices).²⁷⁸ Because AEPCO provided no basis for concluding that the ACE would be able to obtain the \$25.00/LF low bid, Messrs. Michiels and Meredith used RSMeans as their source for the unit cost for steel piles.

Messrs. Michiels and Meredith also rejected AEPCO's unit cost for timber ties and associated hardware because AEPCO did not identify a source for that cost. In addition, AEPCO did not provide information on relevant factors such as treatment of lumber, connection requirements, and transportation and installation cost for the timber, nor did it include a cost for hook bolts (discussed above). Messrs. Michiels and Meredith obtained a detailed manufacturer's quote for timber ties FOB Las Cruces, New Mexico and added costs for hook bolts.²⁷⁹

(d) Comparison of Costs

Table III.F.5-2 summarizes the differences between BNSF/UP's bridge investment costs and those of AEPCO.

²⁷⁷ AEPCO.OP.WP. 04795.

²⁷⁸ BNSF/UP.SUPPRP.WP.III.F-0521.

²⁷⁹ BNSF/UP.SUPPRP.WP.III.F-0554 to 0558.

Table III.F.5-2 Comparison of BNSF/UP's Estimates Of Linear Feet And Bridge Costs With AEPCO's Opening Evidence Estimates						
	BNSF/UP			AEPCO		
<u>Category</u>	<u>LF</u>	<u>Cost per LF</u>	<u>Cost</u>	<u>LF</u>	<u>Cost per LF</u>	<u>Cost</u>
Type I	4,452.24	\$4,392.25	\$19,555,347.02	1,174.00	\$1,594.84	\$1,872,343.70
Type II	4,833.02	\$4,033.59	\$19,494,402.44	8,803.22	\$764.12	\$6,726,739.49
Type II Sp.	5,774.38	\$5,067.50	\$29,261,691.77	-	-	-
Type III	12,171.53	\$4,176.03	\$50,828,627.40	15,418.07	\$1,771.39	\$27,311,387.22
Type IV	7,165.28	\$3,601.27	\$25,804,119.64	9,376.46	\$961.75	\$9,017,837.20
Hwy. Br.	32.00	\$2,506.52	\$80,208.77	32.00	\$2506.52	\$80,208.77
Total	34,428.45		\$145,024,397.04	34,803.75		\$45,008,516.37

Source: BNSF/UP Supplemental Reply Exh. III.F-1 and AEPCO Opening Nar. at III-F-61.

6. Signals and Communications

a. Centralized Traffic Control

AEPCO has determined that the ACE will be CTC-equipped on all mainlines, but not on branch lines.²⁸⁰ AEPCO's estimate for the cost of the CTC system -- \$39.3 million -- is inadequate because (a) it fails to include all of the necessary components and (b) it relies on installation costs based on average hourly costs from RS Means for an electrician's crew that is not specific enough for the signal work involved. RS Means crew costs are for general building

²⁸⁰ AEPCO Opening Nar. at III-F-61.

construction and not for installation of railroad signals.²⁸¹ As can be seen from AEPCO's workpapers,²⁸² AEPCO's consultant requested estimates from Alstom Transport Information Solutions for "design, material and installation" of a list of eleven items covering essential components in a CTC system. The response²⁸³ was less than complete. It gave very general estimates of only off the shelf products and expressly noted the prices were "only estimates and only for equipment as listed." It further stated that final bid prices would be determined only after detailed specifications and plan drawings were received, and that the estimate did not include any design or installation nor did it include track circuits for interlockings. In its opening evidence, AEPCO used only a few of the components and paid little attention to these caveats.²⁸⁴

The Railroads' signals expert, Charles P. Price submitted the identical request for estimates to Southwest Signal Engineering, Inc. – a company that specializes in providing and installing railroad signals systems – and received a much more complete response that included material, design and installation costs for every item on the list.²⁸⁵ Mr. Price used these estimates in his restatement of CTC costs for the ACE. The Table below summarizes the differences between AEPCO's costs for Signals and Mr. Price's restated costs.

Table III.F.6-1
Comparison of BNSF/UP and AEPCO Estimates of Signal Costs

Item	AEPCO (millions)	Railroads (millions)	Difference (millions)
CTC	\$39.332	\$67.586	\$28.254
Dark Territory Signals	0.678	0.250	0.428

²⁸¹ AEPCO improperly indexed the RS Means Costs here as in other places in its evidence as discussed above in § III.F.2.

²⁸² AEPCO.OP.WP.04834.

²⁸³ AEPCO.OP.WP.04832 to 33.

²⁸⁴ AEPCO Opening electronic workpaper "CTC & Signals.xls" Tab "Total CTC & Signals."

²⁸⁵ BNSF/UP.SUPPRP.WP.III.F-0561.

Power to Signals	0	15.092	15.092
Dispatch Center	0.410	3.763	3.353
FEDS ¹	2.584	1.711	(0.873)
Crossing Signals (10%)	0.068	1.058	0.990
Slide Fence	0	0.798	0.924
Snow Melters	0	0.531	0.531
Weather Stations	0	2.214	2.214
Insulated Joints	Incl. in Track cost	Incl. in CTC cost	
TOTAL	\$42.052	\$93.002	\$50.950

Source: Electronic Workpaper BNSF/UP "III.F.6 Signals.xls" Tab "Summary Signal Costs."
 AEPCO Opening Exhibit No. III-F-1.

¹ BNSF/UP cost is for the signal portion only. The communications portion is included in communications costs.

The differences are discussed below.

(1) Signal Control Points

(a) Components

AEPCO developed its signal costs from rough estimates for materials from Alstom Transport Information Solutions. Although its request was for very specific types of controls, Alstom provided generalized information from which AEPCO gleaned the following components.²⁸⁶

- 1 Track Intermediate Automatic Signal \$5000
- 2 Track Intermediate Automatic Signal \$5000
- End of Siding Control Point with dual control power operated switch \$36,000
- Single Crossover control point with dual control operated switches \$72,000
- Double Crossover control point with dual control power operated switches \$240,000

²⁸⁶ AEPCO Opening electronic workpaper "CTC System & Signals.xls" Tab "Individual Cost Codes."

However, as stated explicitly in the estimate these unit costs cover only the bare materials – *i.e.*, the specific machinery itself and not all of the additional equipment that goes with it. For example the Alstom price for a “signal complete” of \$5,000 covers only the pole and signal light (mast, base and ladder). It does not include an instrument house, electrocode unit for each track, backup batteries, battery charger, cable for signal units, cable for track connections, AC power and other items needed for lighting protection and wiring of the house. The Alstom estimates for interlockings also are the bare costs for the switch machines without all of the additional equipment needed. In its electronic spreadsheet “CTC System – Individual Cost Calculations,” AEPCO takes these bare costs and uses the appropriate combination of components to develop a total materials cost for five general categories: Interlocking Type 1 – Single Turnout; Interlocking Type 2 – Single Crossover; Interlocking Type 3 – Double Crossover; Signal – Single Track; and Signal – Double Track. AEPCO also purports to include a pre-wired control building with microprocessor and radio based code system, but this is merely a shell of a house that is wired for the equipment – it does include the equipment itself. These additional materials – batteries, battery chargers, cables, and electrocodes – are not items that would be included in installation or miscellaneous. They are very expensive pieces of machinery or equipment that must be included in the materials cost.

The quote from Southwest Signal is a comprehensive quote for design, materials and installation, which means that it covers all of the materials and installation costs required to complete each specific project. In contrast, AEPCO used an installation cost from RS Means based on a general electrician’s crew and estimated crew days. BNSF/UP’s unit costs based on a quote from a company that specializes in this type of work is clearly the better evidence.

(b) Control Point Protection

In addition to the components integral to the signal machines, railroads install other equipment designed to protect the signal control points, including snow melters (hot air blowers) and weather stations. Hot air blowers that can be automatically and remotely activated keep snow and ice from accumulating and interfering with the devices. Weather stations provide dispatchers real-time data on wind, snow, ice and rain conditions. This alerts them to turn on the hot air blowers, to notify engineers and train and maintenance crews of adverse conditions at the points, or to take other measures as needed.

In costing the signal control points on the northern Vaughn to Defiance line, Mr. Price included snow melters (hot air blowers) at each FED location and spring switch. He included weather stations at all ACE control points and FED locations. Snow and ice are a concern on the northern line where the elevation is more than a mile high and wind is a significant factor on both lines of the ACE. AEPCO did not include either hot air blowers or weather stations in its costs. To determine the appropriate cost for these items, Mr. Price obtained estimates for the installed cost of snow melters and weather stations from another Class I railroad, Norfolk Southern.²⁸⁷

Mr. Price also obtained a quote for the installed price of insulated joints from Southwest Signal Engineering.²⁸⁸ The price includes the material cost, plus labor and includes the costs for two field welds for each joint. AEPCO includes a line item in AEPCO Opening Exhibit No. III-F-1 for 551 “insulated joint bars” with a unit cost of \$331 per “set.” AEPCO does not indicate what a “set” means, but as the cost is derived from a quote from Railworks for “insulated joint bars” at \$350 a pair, which AEPCO indexed to the 1Q01 cost of \$331, it apparently means a set

²⁸⁷ BNSF/UP.SUPP.RPWP.III.F-0562 to 0563.

²⁸⁸ BNSF/UP.SUPP.RPWP.III.F-0565.

of two. This unit cost is extremely low even for the materials and clearly does not cover installation or field welds. Although AEPCO's track construction cost from Windgate Contractors did include a cost of \$1,450 to install "insulated joints furnished by other" and two field welds, that cost is not reflected anywhere in AEPCO's final costs.²⁸⁹

Mr. Price obtained from Southwest Signal an installed cost of \$2,220 for insulated joints that includes two field welds for each joint. That cost is included in the cost of each signal component as shown in BNSF/UP's electronic workpapers "III F 6 Signals.xls" Tabs "*Signal Inventory BNSF*" and "*Signal Inventory UPRR*." As shown on those worksheets, Mr. Price also determined the total number of insulated joints needed for each signal component. His total quantity shows that AEPCO had significantly undercounted the joints. Mr. Price found that 2,232 joints were required as opposed to AEPCO's estimate of 551 pairs (or 1,102 individual joints).

(c) Circuitry on Hand Thrown Switches

AEPCO does not address the cost of installing normal switch repeater (NWP) circuits on any of its hand thrown switches. The NWP is relayed to a signal location and integrated into the signal system where it ensures that the switch is in the normal position and protects the signal system. This circuit is required by the Federal Railroad Administration (FRA) on all hand thrown switches located in CTC territory.²⁹⁰

AEPCO equips all power switches with electric locks, but excluded electric locks on hand-thrown switches along the mainline, claiming that FRA regulations do not require electric locks on turnouts to side tracks that are not long enough to accommodate a single train length or

²⁸⁹ See e.g., AEPCO Opening Exhibit No. III-F-1.

²⁹⁰ See FRA rules 49 CFR 236.60, 49 CFR 236.205 and 49 CFR 236.303 in BNSF/UP.SUPP.RPWP.III.F-0566 to 0569.

more.²⁹¹ The regulation cited by AEPCO does not address the length of sidings, but rather requires that

Each hand-operated switch in main track shall be locked either electrically or mechanically in normal position, except: (1) Where train speeds over the switch do not exceed 20 miles per hour; (2) Where trains are not permitted to clear the main track; (3) Where a signals provided to govern train movements from the auxiliary track to the signaled track; or (4) On a signaled siding without intermediate signals where the maximum authorized speed on the siding does not exceed 30 miles per hour.²⁹²

AEPCO does not assert that it meets exception requirements (1) (3) or (4) but simply asserts that all ACE sidings are designed to accommodate less than an entire train,²⁹³ apparently to fit under exception (2). AEPCO's reasoning is flawed. Electrically locked hand thrown switches are required by FRA Rule 236.410 on all switches where trains or engines are allowed to clear the main track in CTC territory. FRA regulations define a train as "A locomotive or more than one locomotive coupled, with or without cars." FRA Rule 236.832.²⁹⁴ Therefore, if any locomotive operates into or out of these tracks from the mainline, including helper units or locomotives setting out bad-order cars, the switches will need to be electrically locked. Any hand thrown switch in circuited (CTC) track must be equipped with electric locks and obtain dispatcher authority prior to throwing the switch as without this authority the circuit would be broken and all signals in block would be red. The purpose of an electric lock is so that no one can accidentally throw a switch in front of a train traveling at maximum authorized speed therefore causing a derailment. The time on the electric lock is set for the characteristics of the block that the switch is located. The switch cannot be thrown until the time has run off. This

²⁹¹ AEPCO Opening Nar. at III-F-61, citing FRA 236.410; AEPCO OP.WP. 04855.

²⁹² 49 CFR § 236.410.

²⁹³ AEPCO Opening Nar. at III-F-61.

²⁹⁴ 49 CFR 236.832.

time period allows a train that may be operating in that block to clear before the switch is thrown. If the track is CTC and the speeds are over that which is shown in the rule referred, it must be electrically locked. A train is considered delayed in the block if it has stopped or for some reason the speed of the train has slowed considerably below the authorized speed. Then it must proceed to the next signal at restricted speed to insure no one has opened a switch against that train's movement or has entered the track. This is also true for sidings that are controlled in the CTC system.²⁹⁵

(2) Power to Signals

AEPCO has not included any cost for providing power to signals. The Railroads Engineering Consultants' field trip revealed that because of the remote location of the lines replicated by the ACE, the Railroads maintain a pole line along a substantial portion of their respective right of ways. BNSF maintains a pole line between Belen and Gallup and for significant sections between Vaughn and Belen. UP has a pole line between El Paso and Cochise.²⁹⁶ Mr. Price therefore obtained estimates from Henkels & McCoy, Inc.,²⁹⁷ an engineering and contracting company, for the per mile material, labor and equipment costs to install three-phase power lines, single-phase power lines and transformers. Three-phase power lines are put in place by the power company at the railroad's expense and the power is distributed to lines along the ROW through transformer drops. The three-phase lines provide much more power, are more efficient and more reliable than single-phase lines and have the

²⁹⁵ 49 CFR 236.60 ("Switch shunting circuit shall not be hereafter installed except where tract or control circuit is operated by the circuit controller."); 49 CFR 236.205 (2003); 49 CFR 236.314.

²⁹⁶ Photographs taken on the BNSF/UP Engineering Consultants' field trip show the pole lines. BNSF/UP.SUPP.RPWP.III.F-0570 to 0573 and electronic workpaper "III F 6 Pole Line Photo.doc."

²⁹⁷ BNSF/UP.SUPP.RPWP III.F-0574 to 0575.

capacity to provide power not only to signals but to signal houses and other buildings and facilities as needed. Single-phase lines are lines that are run initially from the utility source and then run along the railroad ROW to each signal location. Single-phase lines are less powerful because they are not backed up by periodic three-phase lines. The cost for a system of single-phase lines across the entire system is \$10.899 million.²⁹⁸ The cost for a three-phase system is \$15.092 million.²⁹⁹ The three-phase system, though initially more expensive, provides greater reliability and efficiency over the long run, as it will be able to provide for future increased power needs. Therefore, the Railroads have included that cost rather than the single-phase system in their restatement of Signal costs. The cost includes transformer power drops and standby generators.

(3) Dispatch Center

The only cost AEPCO included for its Dispatch Center is \$410,000 for the Alstom Dispatching System that it included in its Information Technology and Communications Capital Budget under the heading "Software Applications."³⁰⁰ That cost does not cover the construction of the hardware portion of the system or the necessary equipment. Mr. Price obtained recent unit costs for the installation of all of the appropriate equipment for a railroad dispatch center from Norfolk Southern.³⁰¹ AEPCO's total cost of \$410,000 is just over a tenth of the actual cost, as shown in the table below.

²⁹⁸ Henkels & McCoy provides a unit cost of \$16,000 for a single-phase line on a per-mile. In his electronic workpaper "III F 6 Signals.xls" Tab "Signal Cost ACE RR," Mr. Price adjusted the unit cost to \$24,000 per *signal* unit based on an average of 1.5 miles between signal points..

²⁹⁹ BNSF/UP Supplemental Reply electronic workpaper "III F 6 Signals.xls" Tab "Summary Signal Cost ACE RR."

³⁰⁰ AEPCO Opening electronic workpaper "ACE Capital Budget.xls" Cell C15.

³⁰¹ BNSF/UP.SUPPRP.WP.III.F-0576.

**Table III.F.6-2
Railroads Dispatch Center Costs**

Equipment	Total
Dispatcher Desk (includes all engineering, equipment, licensing and installation, including spare equipment)	\$115,197
Core Office Unit (includes engineering, equipment, licensing and installation, spare equipment with one main computer and a hot backup computer)	\$191,995
Mobile Communication Package at each location (includes all engineering, equipment, licensing and installation, including spare equipment)	\$1,943,951
Base Communication Package at each location (includes all engineering, equipment, licensing and installation, including spare equipment)	\$1,511,962
Total	\$3,763,105

Source: BNSF/UP Supplemental Reply electronic workpaper "III F 6 Signals.xls" Tab Dispatch Center. Data Radio."

(4) Detectors

To prevent damage to trains and track as a result of equipment failures, railroads install detectors along the route to identify and remove problem equipment before any damage occurs. Hot bearing detectors (HBDs) notify the crew when roller bearings are overheated. Dragging equipment detectors (DEDs) alert the train crew to defective and/or dragging equipment that could cause the train to derail or cause damage to the track, bridge or tunnel structures. Combined HBD/DED detectors are referred to as Failed Equipment Detectors (FEDs). FEDs have both a signal and a communications component. The signal indication alerts train crews of dragging equipment or overheated bearings. The immediate output is an audio voice message transmitted to the train crew over the FED's two-way radio, which has the same frequency as that used on that particular territory. When no defects are detected, the FED will transmit a simple message -- "Defect Detector Milepost #, No Defects." The engineer cannot

proceed unless he hears that message. If there is no message, the crew must stop and inspect (walk) the entire train for defects.

In addition to the signal to the engineer, the FED has a distinct communications component that transmits data from the FED to management, as discussed in Section III.F.6.b. AEPCO included 24 automatic roll-by FEDs along the mainline spaced every 25 miles, or generally where they are placed on the existing lines.³⁰² Mr. Price obtained quotes for the installed price of single-track and double-track hot bearing and dragging equipment detectors with radios from Southwest Signal Engineering, Inc., the same company from which he received quotes for the other signal components. Mr. Price's count of FEDs varies slightly from AEPCO's. He determined that 25 detectors (15 single track and 10 double track) would be needed on the ACE.

Along the portions of the ACE that replicate BNSF/UP lines, AEPCO asserts that it has included slide fences/detectors where they currently exist, for a total of 3,696 feet, using a unit cost of \$200 per foot taken from *FMC* and indexed to 1Q01.³⁰³ However, although there is a workpaper showing the calculation of the 3,696 feet of slide fence,³⁰⁴ and the workpapers include a page from *FMC* showing the \$200/LF unit cost,³⁰⁵ AEPCO has failed to include those costs anywhere in its road property investment costs.³⁰⁶ Mr. Price accepts AEPCO's calculation of total feet of slide fence, but obtained a more recent quote from Southwest Signal for the installed

³⁰² AEPCO Opening Nar. at III-F-62.

³⁰³ AEPCO Opening Nar. at III-F-63.

³⁰⁴ AEPCO Opening electronic workpaper "iiifsignals&commun/slide fence.xls."

³⁰⁵ AEPCO.OP.WP.04892.

³⁰⁶ BNSF/UP Engineering Consultants have not been able to find any indication that the costs were included. The cost is not listed as a separate item, and the amount does not appear to be included in any other costs.

cost of a typical 500 foot section of slide fence,³⁰⁷ which was indexed to 1Q01 for a unit cost of \$215.88/LF.

(5) Crossing Signals

With the exception of crossings on the Defiance Subdivision and one small segment of the Baca Branch that AEPCO included in the ACE route, both of which were constructed within the last 50 years, AEPCO excluded from its SAC costs all at-grade crossings and grade separations and the associated crossing signals for such crossings on the ground that the costs for such crossings were not incurred by the railroads at the time the lines were originally constructed.³⁰⁸ Based on its analysis of the Railroads' track charts, AEPCO determined that only one of the crossings that it did include requires signals,³⁰⁹ and based its cost for that signal on an Engineer's Estimate and Materials for a specific crossing in Westmoreland County, PA.³¹⁰

Mr. Price's inventory indicates a substantially greater number of crossings, including those that require crossing signals.³¹¹ The Railroads maintain that even when the crossings are public projects, they have been responsible for paying at least a portion of the crossing warning devices, generally around ten percent. The Engineering Reports indicate that there were crossings at the time of the original construction of the lines. Therefore, for segments other than

³⁰⁷ BNSF/UP.SUPPRP.WP.III.F-0577. Engineering and contingency costs were deducted from the estimate to develop the unit cost.

³⁰⁸ AEPCO Opening Nar. at III-F-69.

³⁰⁹ AEPCO Opening electronic workpaper "iiif3f.xls" cell H140 and "IIIFTotals.xls" Line 75.

³¹⁰ AEPCO.OP.WP.050101 to102.

³¹¹ BNSF/UP Supplemental Reply electronic workpaper "III F 6 Signals.xls" Tabs "Signal Cost ACE RR/Signal Inventory UPRR" and "Signal Cost ACE RR/Signal Inventory BNSF."

Baca and Defiance, consistent with the Board's recent decisions in *Duke* and *CP&L*,³¹² the Railroads have developed costs for a quantity of crossings based on the Engineering Reports and have included ten percent of those costs in their restatement. Accordingly, Mr. Price has included the full cost for the crossing signals on the Defiance line and ten percent of the costs for those on other line segments.

The crossing signals on the lines replicated by the ACE include one-track, two-track and three-track flashing lights and flashing lights with gates. Both for consistency and because AEPCO's unit cost applied to only one type of crossing signal,³¹³ Mr. Price used the installed unit costs for these devices provided by Southwest Signal Engineering.³¹⁴ The total cost for signals included in the Railroads' restatement is \$93.002 million.

b. Communications System

In its Opening Narrative, AEPCO includes only \$6.8 million for its communications system.³¹⁵ In describing that system AEPCO states simply that "the ACE communication system will rely on 6 GHz microwave backbone network as its primary infrastructure," with microwave towers to support "locomotive communications, two-way radio communications, AEI reader data transfers, and FED alerts."³¹⁶

AEPCO asserts that it has placed its microwave towers in close proximity to those of BNSF and UP on replicated lines. It further asserts that it included additional microwave sites where "the BNSF and UP microwave site locations did not facilitate adequate coverage for the

³¹² *Duke* at 122; *CP&L* at 106.

³¹³ AEPCO.OP.WP.05010.

³¹⁴ BNSF/UP.SUPPRP.WP.III.F-0561.

³¹⁵ AEPCO Opening Exhibit No. III-F-1.

³¹⁶ AEPCO Opening Nar. at III-F-63.

ACE microwave network,” and that for tower heights where there was no BNSF/UP information as to the height, “tower height was over-engineered at 200 feet.”³¹⁷ AEPCO further states that it relies on an 800 MHz Land Mobile Radio network to provide “communications access via mobile and portable radios for operating crews, field supervisory personnel, and track maintenance personnel that need to communicate with the railroad’s operating headquarters and central dispatching facility at Cochise, AZ.”³¹⁸

The Narrative would suggest that AEPCO has improved on UP’s and BNSF’s microwave system, but the truth is that it has not even created a communications system that would be operable in the railroad industry. AEPCO’s proposed microwave and radio system is simply an amalgamation of information off the internet that has no relevance to railroads and is completely lacking in design. It gives no specifications, no standards, and no explanation of how it supposedly “over-engineered” the microwave towers or the impact of such “over-engineering.” AEPCO witness Mullan is proposing an all digital all wireless system using UHF band radio communications for the ACE that is apparently based on specifications for a bid request by the State of Colorado Department of Transportation (CDOT).³¹⁹ A system used by state highway departments is generally confined to a limited jurisdiction and involves such things as timing of intersections, cameras for enforcing traffic signals and speed limits, and coordination of emergency vehicles within one or more jurisdictions in a metropolitan area, or traffic message boards. It does not involve the rapid two-way communications required over an entire railroad system, and inter-railroad communications where railroads interchange or run over trackage rights. Railroads require a system with a much larger voice channel capacity, much higher level

³¹⁷ *Id.* at III-F-63 to 64.

³¹⁸ *Id.*

³¹⁹ AEPCO.OP.WP.04894 to 934.

of reliability, and much greater rapid response capability. The Alcatel MDR 8500 6 GHz Base Station does not provide the speed (capacity) or reliability necessary for a railroad system. Maximum channel capacity is around 24 which is much lower than the over 600 channel systems used by railroads.

Based only on general information on microwave tower sites provided by BNSF and UP in discovery and the general specifications for the components for the system ordered by CDOT, AEPCO purports to fashion an all digital, all wireless system for the ACE railroad. Glaringly lacking, however, is any physical architecture or system engineering design documentation for the proposed system. The system they present is not even a functional system.

The ACE must replicate a railroad communications system that meets the standards for a Class 1 railroad. The communications system proposed by AEPCO is not suitable for the complex radio communications required in the railroad environment, as discussed below.

(1) Critique of AEPCO Specifications

AEPCO's proposed communications system has two major flaws. First, the equipment it relies on cannot provide the reliability that is required on a Class 1 railroad, which the ACE will be. Second, its microwave system does not take into account the proper tower spacing and heights for the ACE route.

(a) AEPCO's Proposed Equipment Does Not Provide Sufficient Reliability

Reliability is the most important requirement of a railroad communications system because good communications are essential to safe train operations, which is a high priority on all railroads. FRA regulations require railroads to maintain reliable and clear communications

throughout their entire systems and to pay stiff penalties for any failure to comply.³²⁰ As the author of one article on railroad communications notes

A PMRS licensee, such as a manufacturer, is told by the FCC (or the frequency coordinator): 'Thou shalt not exceed certain limits in your coverage.' (And if you have dead areas, that's your problem.) A railroad is told by the Federal Railroad Administration (FRA): 'Thou shalt cover everything you've got.' (And if you have dead areas, you're going to have a problem, to the tune of \$11,000 a day, until you fix it.)³²¹

To ensure reliable communications, FRA regulations at 49 CFR § 220 require that railroad employees have "working radios," defined by the regulations as "a radio that can communicate with the control center of the railroad (through repeater stations if necessary to reach the center) from any location within the rail system" (with limited exceptions for localized areas of extreme topography) and in the case of joint operations on another railroad, "able to reach the control center of the host railroad." 49 CFR § 220.5. The FRA further requires that all trains be equipped with a working radio in the controlling locomotive and also have communications redundancy, meaning "a working radio on another locomotive in the consist or other means of working wireless communications." 49 CFR § 220.9. Roadway workers also must have "immediate access to a working radio." 49 CFR § 220.11(b). All railroad communications must be clear and complete before any action can be taken. 49 CFR § 220.45. Failure to comply with FRA regulations carries penalties of up to \$11,000 per day. 49 CFR § 220.7.

Reliability means that the system has good coverage with minimal interference and virtually no downtime. To achieve the necessary coverage, all major railroads in the U.S.,

³²⁰ See 49 CFR §§ 220.5; 49 CFR 220.9; 220.11(b); 49 CFR 220.7 and 49 CFR 220.45. BNSF/UP.SUPPRP.WP.III.F-0578 to 0586.

³²¹ "Challenges for Railroad Radio", by D.A. Keckler, *Mobile Radio Technology*, (May 1, 2000). BNSF/UP.SUPPRP.WP.III.F-0587 to 0590.

Canada and Mexico have agreed to use dedicated VHF band channels in order to ensure reliability and inter-operability. VHF bands have a lower frequency than UHF (which is the system proposed by AEPCO). The higher the frequency of the wave, the more easily it is affected by natural phenomenon such as thunderstorms, rain, thermal energy changes, sun spots or passing over bodies of water. UHF waves travel in a straight line through space and thus lose their strength within a relatively short distance. In contrast, VHF waves use the earth as part of their propagation, which gives them very good coverage. Because railroads must maintain instantaneous and uninterrupted communications between headquarters, dispatchers, yard masters, train crews, remotely controlled locomotives within a train consist, maintenance crews across their entire systems as well as with other railroads with whom they interchange or over whose lines they have trackage rights, they must use a frequency band that is strong and reliable. The UHF bands do not provide the necessary coverage or reliability.

Second, because reliability is essential, interference must be minimized. For that reason, the FCC assigned the railroad industry 96 channels for their exclusive use. Keeping these channels in the private sector -- *i.e.*, free from interference from non-railroad users -- is the best way to ensure the reliability and rapid response that are absolutely essential to a railroad's day-to-day operations. These 96 VHF channels play a vital role in railroad communications not only within an individual railroad system, but in communications between railroads as well. Canada and Mexico have dedicated these same two-way radio channel frequencies to exclusive railroad use to provide compatibility for railroads throughout North America. The use of trackage rights is common on modern railroads, which means that locomotives and trains will pass from the operations of one railroad to another. Use of these 96 dedicated frequencies ensures inter-

operability and makes possible the safe and efficient operation of many trains and crews within close proximity.

Because the railroad industry relies on VHF, railroads have equipped their locomotives and control centers with VHF equipment. Thus, an individual railroad that will be interchanging with other railroads or using trackage rights over other railroads cannot unilaterally switch to UHF because UHF is incompatible with the other railroads' systems and the railroad's locomotives must be able to communicate with other railroads' dispatchers and yardmasters using reliable radio equipment with instant response.

AEPCO's proposed 800 band UHF system does not provide either the coverage or inter-operability that is necessary for major rail operations like those across the ACE.

(b) AEPCO's Proposed Microwave System Does Not Take Into Consideration the Actual Needs of the ACE

Although the general microwave information provided by BNSF and UP in response to discovery indicates that BNSF's existing system is a mix of digital and analog microwave systems, it is clear from AEPCO's workpapers that it intended to design an all digital all wireless system for the ACE. Mr. Walton accepts the specification for an all digital all wireless system, but costs a system that meets the reliability and compatibility requirements of a Class 1 railroad.³²² This means a high speed wireless communications system with fully integrated subsystems that are activated by a rapid response mechanism such as a "push-to-talk" button or "simply speak" feature.

In the real-world, the only way to accurately determine a clear path or proper distance between microwave towers is to use the latitude/longitude information for the particular sites.

³²² BNSF/UP.SUPPRP.WP.III.F-0591 to 0606.

BNSF/UP provided that information for its existing sites, but as AEPCO chose to set up an entirely new system of towers, it had such information only for the sites it selected from the BNSF/UP data. Thus, AEPCO used a simplifying methodology: it relied on an average line of sight based on irrelevant information and calculated the number of microwave towers and approximate locations based on that average. Operating from a 150-foot tower, a digital microwave signal as proposed by AEPCO will travel 17 miles before going into the ground. The design standard for this type of system to achieve the reliability demanded by the railroad industry requires that the signals meet at 100 feet ground clearance. This dictates that the average tower spacing for a reliable system be 24.56 miles apart. All aspects of the signals paths require extremely accurate engineering. Locations of towers, control points, stations, FEDs, etc. fit into this equation. For purposes of reply evidence, Mr. Walton used the 24.56 mile spacing. It must be noted that AEPCO proposes a different system than what is currently in place and therefore the spacing is different than that of the actual BNSF and UP existing towers. Using the above methodology the number of towers required is 32 and the average tower height is 150 feet.

AEPCO's average space between microwave towers and average tower heights are based on materials that have no relevance to a modern wireless digital railroad communications system and has no relevance to the actual route upon which they are placed.

(2) Requirements for a Class I Railroad Communications System

In today's railroading, the communications network will be made up of digital wireless subsystems that operate at very high speeds. As more capacity is added, the microwave towers must be sited closer together in order to achieve high speed communications (reliability). Railroads require at least 672 channels (DS3) for operations within their systems.

There are two fundamental functions that drive the operational design of railroad communications: (1) the loading, unloading, interchange and switching of railcars into and out of trains and (2) the safe movement of trains from the assembly point to final destination. Each of these functions requires a communications system that is characterized by rapid response capabilities and a very high reliability for continuous uptime.

Rail yard operations provide a good example of how two-radio communications enable all rail employees to perform their duties safely and properly. Yardmasters, who are in charge of building trains and shepherding them through yards, have control of many radio channels. These various radio channels represent the many people who have individual responsibilities for rail operations. The channels are assigned in a way that separates the various rail operating functions so that there is no confusion as to whom instructions are directed and what the instructions mean. This separation of functions ensures both the safety of personnel and the proper handling of loaded and empty cars.

For example, the ACE rail yard at Vaughn will have the following radio communication subsystems:

- One or more Road Channels
- One or more Foreign Road Channels
- One or more Yard Switching Channels
- One or more Car Inspection Channels
- One or more Signals Channels
- One or more Mechanical Channels
- One or more Maintenance--of--Way Channels
- One or more Communications Channels
- One or more Special Services Channels
- One or more Distributed Power Channels
- One or more End-of-Train-Device Channels
- One or more Automatic Equipment Identification Channels
- Administrative Radio Network (radio to telephone) Channel

- Wireless Modems (various) Channels
- Wireless Video Channels
- Intermodal Channels.

The physical communications plant requires towers, antennas, radio base stations, radio consoles, copper wires (cables), AC power, generators, telephones, telephone exchanges, portable radios, mobile radios, locomotive radios, batteries, computer work stations, servers, routers, modems, audio systems, voice recorders, videos and monitors, battery chargers, beepers, cellular telephones, end-of-train-devices, head-of-train-devices, distributed power radios, weigh-in-motion scale radios, automatic equipment identification radios and a whole host of other electronic equipment. Generally, all the above equipment must coexist within the space of several miles. Radio or wireless communications when confined become very complicated because of the levels of output power of each radio system, the frequency compatibility of each system, and the interference caused by other radio or wireless systems. All of these things must be taken into consideration in developing a reliable radio communications system.

The various components of a railroad communications system are discussed below. While the costs for some of these components (*e.g.*, the locomotive control systems, servers, routers, cellular phones, laptops), are included in other portions of the SAC evidence, they are *described* here because the equipment must be fully integrated into the overall railroad radio communication system and therefore must be fully compatible with all other subsystems. The costs for these items are not included in the Communications costs.

(a) Microwave System

The backbone microwave system is the means by which the various railroad communication subsystems are integrated into a wireless digital voice and data environment. In creating a hypothetical railroad microwave system, some reliance on an average system is necessary to avoid the monumental task of calculating the optimal placement of each tower site

using the proper latitude and longitude for each site. However, unlike AEPCO's estimates that have nothing to do with railroad standards, Mr. Walton relied on averages based on actual information about the microwave paths between BNSF/UP existing sites and the heights and placement of the existing towers. Estimating the number of terrestrial microwave towers along a railroad right-of-way depends in large part on the terrain.

Mr. Walton used average spacing of 24.56 miles for microwave towers to determine the total microwave towers. Based on the 786.01 route miles for the ACE (including miles traversed via trackage rights) he determined that 32 towers would be required for the ACE microwave system. Based on the digital microwave signal, he calculated an average tower height of 150 feet.

A microwave radio station at the end of a path is referred to as a terminal station (only one path) and (as in this case) the backbone microwave stations can require many paths. The station serves as a hub for the various directions that are necessary to reach important railroad operational infrastructure. The radio communications microwave network is very much like the rail network itself: it connects the entire railroad together (end-to-end) and supports the operational control and management that takes place 24 hours a day, seven days per week.

(b) Dispatch System

The terminal microwave station is located close to the Dispatch Center, which is the focal point for train control. Through the microwave system, dispatchers remotely control the wayside signal system and communicate with field personnel involved in handling and moving trains. In addition to controlling train movement, the dispatchers coordinate the daily maintenance of roadway work by track crews, bridge crews, and signal maintainers as well as the various activities of outside contractors and vendors that occur along the right of way.

The base cost for the dispatching system is included in signals costs in Section 6.a above. In addition, there is a Dispatch Voice Recorder System for data that is included in communications costs. The antennas of VHF two-way radio stations and the antennas of the base stations of signal data radios are focused in the direction of microwave towers that connect to the dispatcher's center. This makes coordination in "real-time" possible.

The ACE will have around-the-clock dispatcher positions. Each dispatch section will use different two-way radio frequencies on the mainline controlled by that section to reduce interference. Interference could result in the transmission of misinformation. The use of distinct radio frequencies coupled with rapid response capability promotes reliable communications.

(c) Locomotive Control

The subsystems for train control are critical components of the communications system. Each train (which by FRA definition includes a single locomotive³²³) is assigned a train number and each locomotive is assigned a locomotive number. It is important to understand the difference between the locomotive number and the train number, particularly when communications are directed to the train crew operating the lead locomotive in trains with distributed power (DP).

The ACE will have a locomotive fleet equipped with VHF two-way radio (FRA 96 Channels), a four frequency distributed power two-way radio system and a head-of-train-device (HOTD) as basic equipment.³²⁴ The distributed power (Locotrol) is a two-way radio system that provides a radio communication link between two locomotives where the controls of one

³²³ 49 CFR 236.832.

³²⁴ Discussion of these items is mainly for illustrative purposes. Costs for the locomotive EOTD, HOTD, VHF radios and DP system are included in locomotive lease costs discussed in § III.D.3. Only the cost for repeaters at yards and the batteries needed for those repeaters are included in communications costs.

locomotive (the lead unit in consist) remotely control a second locomotive located on the end or in the middle of the same train. The remote locomotive mimics the lead. For example, if the lead locomotive goes into throttle position three (power), the rear remote control locomotive will go into throttle position three (power). A train operating in DP will have continuous automatic radio communications between the remote and the lead. When the lead locomotive changes status, a radio transmission is sent to the remote. The remote receives the data message, acts on it, and then transmits a message back to the lead unit acknowledging the original set of instructions. When the radio signals (radio link) between these two locomotives fail, an air brake application causes the remote locomotive to throttle down to idle.

It is crucial that trains using DP equipment not lose the radio link between the lead unit and the remote unit, particularly when handling heavy tonnage coal unit trains. Mr. Walton estimated locations along the ACE route where loss of DP may occur, requiring DEP radio repeaters. The first is in the trainway at El Paso and the other two are along the Defiance Subdivision. These repeaters are designed to prevent loss of radio signal continuity. Train control devices such as End-of-Train-Devices (EOTDs), Head-of-Train Devices (HOTDs), and Distributed Power (DP) are generally included in the lease costs for leased locomotives discussed in Section III.D.1.

(d) FEDs

The ACE will have 15 FEDs in single track and 10 in double track locations. The FEDs will require 35 two-way radios using the mainline frequency of the division where located. The detector can transmit anytime after a train movement turns on the system in order to enable it to detect a defect anywhere along the train. As noted above, the FED system includes both a VHF radio signal component for direct communication to the train crew and a data communications component for relaying data back to management. The communications component relays a

message to the dispatcher to alert management of any problems. At the same time data is transmitted from the location to the IT archive system to ensure that the event is recorded. Only the communications portion (tower) of the FED is included in the communications cost.³²⁵

(e) Control Points

In addition to its communications function, the Dispatch System is designed to send controls to signal control points and receive indications from them. The ACE has 135 signal control points (CP) that use signal data radios to transmit/receive from the CP to the nearest microwave tower. At the CP location a data radio system with antenna mounted on a tower co-located adjacent to the CP connects the field equipment to the office dispatcher control center riding the microwave radio communication system. The dispatcher will use the microwave system to interface in the field to the signal data radio system to clear signals at the control points. The CP location will send back a signal indication every time a change in status occurs. The control messages sent out by the dispatcher include changes to “reverse” or “normal” position of power switch (s), clear a signal (s), turn on snow blowers, call a signal maintainer, etc. The indications from CP(s) include changes in status of train occupancy (track circuits on/off), power switch locked-up, signal cleared, AC power on/off, and snow blowers on/off.

(f) AEIs

Another important component of railroad communications is the Automatic Equipment Identifications (AEI) system. The data communication message from the AEI is sent 20 seconds after the rear of the train has passed the location. The telephone message is a data format using an AAR railroad standard. The AEI will automatically call and download data to the IT data network via a data radio co-located at the AEI location and transmitted to the nearest microwave

³²⁵ The signal portion of the DED is included in signal costs.

station. From there the data is routed to the IT center at Vaughn. The IT data network will use the data to verify and/or correct any errors in a train consist. The AEI system provides the electronic identification of each rail vehicle in the train. This electronic train list includes locomotives, railcars and EOTDs (End-of-Train-Devices). Dynamic AEI transponders are also mounted on the sides of locomotives to measure the amount of fuel onboard, which is valuable information for the refueling of locomotives. AEPCO listed nine AEI scanners.³²⁶ After the BNSF/UP track additions, there are six AEIs in double track and one in single track.

(g) Telephone System

Telephones are another component of the communications system. The ACE will have its own private telephone network riding the digital microwave radio communications system with PBX Telephone Exchanges located at headquarters and major rail yard locations. The microwave system also enables train employees to use the Teleconference System and thus reduce travel expenses.

A PBX system must be customized to meet the exact requirements for the system being developed. In the real world, a complex capacity study would be undertaken to determine the specifications for the system. To determine the appropriate PBX system for the ACE, Mr. Walton reviewed three systems developed for Class I Railroads. While not as precise as a design based on a capacity study, the use of actual railroad estimates for comparable systems provides a much closer approximation than simply selecting components off the shelf. BNSF/UP Engineering Consultants can find no evidence that AEPCO included any costs for a PBX system in its construction or operating costs. The only costs that AEPCO included for a PBX exchange were in its workpapers for operating expenses in § III.D. However, those costs pertain only to an

³²⁶ AEPCO Opening Nar. at III-D-54.

off-the-shelf system that would be used in a small business office and interfaced with the local telephone company. It is not the type of system that would interface with the microwave system, and indeed AEPCO has no discussion to that affect.

The ARN (Administration Radio Network) two-way radio system provides all operating personnel using company vehicles equipped with mobile VHF radios access to the telephone network at any point over the entire right of way. Using the ARN frequency, users can place calls to both the private railroad telephone network or to the public telephone networks of their customers. When necessary, field operating personnel and management level personnel can handle company business by radio, by telephone and with wireless equipped laptop computers.

The railroad communications system also facilitates rapid and thorough investigation of incidents on the railroad, such as accidents, derailments, washouts or other emergencies. When an incident has occurred, the ACE management investigating team has full access to the Dispatcher Voice Recording System where all train movement radio channels are monitored 24 hours a day.

To ensure the safety of trains and personnel, the ACE like all other major railroads in North America must be equipped with a communications system that provides the clearest, most reliable, and most rapid response communications possible. AEPCO's communications evidence covers only the most rudimentary components of a complete communications system. As a result, its proposed system understates the costs associated with providing a reliable railroad communications system.

(3) The Proposed ACE Communications System

The heart of the ACE Communication Network will consist of a 99.999% reliable digital microwave system where a digital VHF radio system and other wireless communications

subsystems are integrated in a least-cost and most-efficient manner. The specifications for the system and equipment are included in BNSF/UP's workpapers.³²⁷

The microwave system will parallel the entire rail network route consisting of approximately 786.01 route miles. The average spacing of the microwave stations is 24.56 miles consistent with the range of the digital microwave equipment over the terrain of the ACE. The average cost per microwave station is approximately \${ }. The approximate cost of the backbone ACE microwave system is \${ } million based on the average of the UP and BNSF costs.³²⁸ The cost for the Microwave Management System is based on specifications and costs provided by Harris Corporation, Microwave Communications Division.³²⁹

The headquarters for the ACE Railroad will be located at Vaughn, New Mexico where the communications related operating facilities will be centralized for train control and operating management. The ACE Dispatching Office, Signals and Communications Control Center and the Information Technology Control Center will be co-located for maximum efficiency and minimum downtime. The estimated cost for these facilities is included in Signals costs in Section III.F.6.a. The cost for the Dispatch Voice Recording System is included in communications costs and is based on costs for Dictaphone supplies. The Dispatcher Equipment Battery and Charger, which is specific to communications, is not included in the Signals costs. That unit cost of { } for the battery and charger is based on estimates for materials and labor for those items provided by BNSF in discovery with respect to the battery and charger used for the BNSF microwave system. This cost included here is for the battery and charger at the

³²⁷ BNSF/UP.SUPPRP.WP.III.F-0593 to 0665.

³²⁸ BNSF/UP.SUPPRP.WP.III.F-0666 to 0672.

³²⁹ BNSF/UP.SUPPRP.WP.III.F-0675 to 0693, 0711 to 0735.

dispatch center and is in addition to the battery and charger at each microwave tower included in the microwave costs.³³⁰

Each of the six rail yards at Defiance, Dalies, Belen, Vaughn, El Paso and Cochise also requires a PBX Telephone Exchange and Communications Package to interface with the exchanges at the microwave towers. The cost for the PBX package at the ACE's headquarters in Vaughn is \${ }\$ and the packages for the field locations are \${ }\$ per site for a total of \${ }\$. The costs for these items are based on materials provided by UP in discovery.³³¹ These packages at the office locations are in addition to the PBX packages needed at each microwave tower location, and are necessary for the interface with the microwave system. Based on his experience, Mr. Walton estimated that the Teleconference System for the ACE would be approximately \$300,000.

The communication costs for the operating personnel with mobile radio units and those employees with portable (handheld) two-way VHF radio are based on June 24, 2002 unit costs of \$799 for Motorola Mobile Radios MX-1000 and \$1,095 for HT-1000,³³² respectively, indexed to 1Q01.

In addition, Mr. Walton included costs based on unit costs from Comet for Data Radio Tower & Equipment required for all Signal Control Points (\$101,797 each), for AEI Equipment (\$157,043.75 each for single track and \$182,785 each for double track) and for data radio towers for FEDs (\$101,797 each)³³³ indexed to 1Q01. (The cost for radio equipment other than the tower for FEDs is included in the signals costs in Section III.F.6.a.).

³³⁰ BNSF/UP.SUPPRP.WP.III.F-0694.

³³¹ BNSF/UP.SUPPRP.WP.III.F-0671.

³³² BNSF/UP.SUPPRP.WP.III.F-0697.

³³³ BNSF/UP.SUPPRP.WP.III.F-0705 to 0710.

Other communication equipment for the Information Technology Department, cellular telephones, pagers, laptops and other portable communications devices for railroad personnel are determined by the operating and administration managers and are included in operating costs..

(4) Summary

The table below summarizes total communications cost. Details of the equipment selected and the costs are included in BNSF/UP workpapers.³³⁴

Table III.F. 6-3
BNSF/UP Estimate of Communications Costs for the ACE

Description	Quantity	Unit Cost 1Q01	Cost
32 Station Digital Microwave System	32	\$485,016.67	\$15,520,533.28
Microwave Management System	1	\$230,422.13	\$230,422.13
Dispatching System (Comm. & Signals)	Included in Signals		
Dispatcher Voice Recording System	1	\$148,943.00	\$148,943.00
Dispatcher Equipment Battery & Charger	1	\$13,500.00	\$13,500.00
Teleconference System	1	\$300,000.00	\$300,000.00
PBX Tel. Exchange & Communications Package for Headquarters – Vaughn	1	\$921,741.00	\$921,741.00
PBX Tel. Exchange & Communications Package for Field Locations	3	\$277,050.00	\$831,150.00
Data Radio Tower & Equip. Control Points	135	\$97,104.34	\$13,109,085.80
Data Radio Tower <i>only</i> FED, Single ¹	15	\$96,083.00	\$1,441,245.00
Data Radio Tower <i>only</i> . FED, Double ¹	10	\$121,368.00	\$1,213,680.00
Data Radio Tower & AEI Equip. Single ¹	1	\$149,804.31	\$149,804.31
Data Radio Tower & AEI Equip. Double ¹	6	\$175,470.13	\$1,052,820.76
DP Tunnel Repeaters > 1000'	3	\$125,000	\$375,000.00
Mobile Two-way VHF Radio, Opr. Personne	476	\$767.02	\$365,101.81
Portable (HH) two-way VHF Radio, Personnel	147	\$1,051.17	\$154,522.50
TOTAL			\$35,827,549.58

Source: BNSF/UP Supplemental Reply electronic workpaper "III F 6 Microwave System.xls," Tab "Costs Summary." ¹ Includes only communications components.

³³⁴ BNSF/UP Supplemental Reply electronic workpaper "III F 6 Microwave System.xls" Tab "Costs Summary."

7. Buildings and Facilities

AEPCO includes \$27 million for buildings and facilities along the ACE line.³³⁵

AEPCO's Opening Narrative asserts that it has located its major facilities at Vaughn, New Mexico which include the ACE headquarter buildings, a locomotive repair shop, a minor car repair facility, fueling facilities, a track maintenance base, inspection facilities, and car and locomotive storage facilities.³³⁶ Additional fueling and inspection facilities are located at El Paso, Texas.³³⁷

For reasons explained in Section I, including time and resource constraints, the Railroads' Engineering Consultants have not undertaken a comprehensive analysis of AEPCO's proposed buildings and facilities evidence, but have focused primarily on facilities that the BNSF/UP operating witnesses have found inadequate to meet the operating needs of the ACE, namely, the fueling facilities and the locomotive maintenance and railcar repair facilities.

For purposes of this case, the Railroads have accepted the unit costs for the Headquarters, MOW and Roadway buildings, and have adjusted only the size and/or number of the buildings to accommodate the larger staff and increased number of MOW stations determined by the Railroads' G&A, operating and MOW witnesses. Acceptance for purposes of this case does not mean that the Railroads necessarily agree with the unit costs, materials used or other characteristics of the buildings, but merely that the Railroads will not address those issues in this case.

The table below summarizes the Railroads' restatement of costs for buildings and facilities on the ACE.

³³⁵ AEPCO.OP.WP. 04938 and electronic workpaper AEPCO "IIIFTotals.xls"

³³⁶ AEPCO Opening Nar. at III-B-14.

³³⁷ AEPCO Opening Nar. at III-B-15 to 16.

Table III.F.7-1
Comparison Of BNSF's Estimated Of Facilities Cost
To AEPCO's Opening Estimate (\$Millions)

	BNSF/UP (millions)	AEPCO (millions)	Difference (millions)
Fueling Facilities	\$61.0	\$18.4	\$42.6
Wastewater Treatment Plants	\$2.7	\$.2	\$2.5
Locomotive Shop	\$12.6	\$3.8	\$8.8
Car Repair Facilities	\$4.2	\$0.0	\$4.2
Headquarters/Yards	\$5.4	\$1.4	\$4.0
MOW/Roadway Buildings	\$2.4	\$1.1	\$1.3
Yard Sites	Incl. in Bldg	\$2.2	
TOTAL*	\$88.2	27.0	\$61.2

* The totals may not represent the sum of the parts due to rounding.

Source: BNSF/UP Supplemental Reply electronic workpaper "III F 7 Facilities.xls" Tab "Summary." AEPCO Opening Exhibit No. III-F-1.

a. Fueling Facilities

The major inadequacies in AEPCO's facilities costs involve the fueling facilities.

AEPCO has included fueling facilities at both its Vaughn and El Paso yards at a total cost of \$18.36 million.³³⁸ For the facilities at Vaughn, AEPCO has included twenty four fuel cranes on four platforms for front-end and tail-end fueling. AEPCO has placed twelve cranes on two platforms for fueling at El Paso to allow two trains with six locomotives to be fueled simultaneously.³³⁹

AEPCO does not provide specific information with respect to the methods and materials to be used in the construction of these locomotive facilities. It relies on an e-mail quote from Hanson-Wilson Company³⁴⁰ for a \$320,000 per fuel crane unit cost for the fueling platforms and \$100,000 per gravity sand tower installed on a typical two-track fueling facility. The quote specifically notes that it does NOT cover "fuel storage/supply pumping costs [] within the

³³⁸ AEPCO Opening Exhibit No. III-F-1.

³³⁹ AEPCO Opening Nar. at III-F-65 to 66.

³⁴⁰ AEPCO.OP.WP.04953.

Fueling Platform costs” and does NOT cover other costs associated with developing the site such as “site utilities, grading, drainage, paving, fuel delivery method (pipeline or unloading facility), industrial waste treatment, site trackwork, etc.” AEPCO entirely ignored the fuel delivery system costs, and, although it attempted to address some of these other additional costs, its cost estimates are inadequate.

The inadequacies in AEPCO’s fuel delivery and storage costs and in its fueling platform design are discussed below.

(1) Fuel Delivery and Storage

AEPCO has failed to take into consideration that its proposed facilities at Vaughn are located in a remote area where typical fuel deliveries are non-existent. Indeed, BNSF’s fueling facility at Belen is supplied by a special pipeline and stored in tanks having a capacity of 5.8 million gallons of diesel fuel. As described in Section III.B.3, the ACE will be fueling at Vaughn locomotives that currently are fueled by BNSF at Belen. There is no third-party pipeline or other fuel supplier at Vaughn. As there is no source of fuel at Vaughn, the ACE would have to build a pipeline to Vaughn or move the fuel from Belen to Vaughn by tank cars. AEPCO has failed to provide costs for either option.. While fuel availability is not an issue at El Paso, AEPCO has nonetheless failed to provide sufficient storage facilities at its El Paso Yard to meet the requirements for the locomotives that ACE will service there. The appropriate fuel delivery and storage for each of the yards is discussed below.

(a) Vaughn Yard

Because of the distance between Belen and Vaughn, construction of a pipeline from a connection into the pipeline that serves BNSF and the ACE yard at Vaughn would be prohibitively expensive. Moreover, BNSF’s Belen facility already has a storage capacity of {
} gallons of fuel, and most of that fuel will no longer be necessary under AEPCO’s

proposed operating plan where locomotives now fueled by BNSF at Belen would be fueled by ACE at Vaughn. Therefore, Defendants assume the ACE will transport fuel from Belen to Vaughn by tank cars. This system requires

- fuel loading facility at Belen,
- fuel unloading facility at Vaughn,
- fuel storage capacity at Vaughn with the necessary piping.

AEPCO's costs include only a 500,000 gallon diesel fuel storage tank and concrete containment structure, 15,840 lineal feet of 4- and 6-inch diameter fiberglass reinforced plastic pipe, costs for excavation and direct burial of the piping, and a ten (10%) percent allowance for pipe fittings.³⁴¹ These costs do not account for all materials and equipment necessary for a fully functional locomotive fueling facility as shown below.

(i) Fuel Loading Facility at Belen

AEPCO did not account for any means of delivering fuel to Vaughn. To transport fuel from the Belen facility to Vaughn by tank car, BNSF will need a diesel fuel loading facility at Belen. BNSF/UP operating witness Mueller estimated that it would take twenty tank cars to transport sufficient fuel to meet the daily requirements of the Vaughn facility and that the fuel loading facility should have the capacity to accommodate twelve cars simultaneously.³⁴² BNSF/UP witness James Primm created a conceptual design for a loading facility that has two 400-foot tracks sized to hold six tank cars each based on a car length of 65 feet. A secondary containment system is provided under the facility to collect and contain any fuel spillage or oily waste. Rail would be directly attached to a concrete foundation. A steel scaffold structure would be constructed to allow access to the tops of the tank cars for fuel loading. The access hatch on

³⁴¹ AEPCO Opening electronic workpaper "IIIF&Bldgs/fuel storage 1.xls."

³⁴² The requirements are discussed in BNSF/UP Supplemental Reply Nar. § III.B.3.

each tank car would be reached by a drop-down gangway. Pumps, piping, controls and lighting are included. Personnel fall protection is also provided. Connections will be made to the existing wastewater collection lines at Belen Yard. The current Belen yard has the track capacity for staging loaded and empty tank cars so there is no need for additional tracks for that purpose at Belen. Total cost of the loading facility is \$1,896,101. Details of the materials and costs for the facility are included in BNSF/UP electronic workpapers.³⁴³

(ii) Unloading Facility at Vaughn

In his restatement of the costs for the fueling facility at Vaughn, BNSF witness Primm included the costs for the necessary facilities needed to unload tank cars of fuel into storage tanks at the Vaughn facility. These additions included diesel fuel unloading tracks and platform with a spill containment structure large enough to accommodate twelve (12) tank cars simultaneously. Two additional tracks each approximately 2,000 feet in length were added for staging and switching loaded and empty tank cars in the vicinity of the unloading facility. A double wall steel piping was constructed between storage tanks, the unloading facility and the fueling platforms with heat tracing and leak detection systems. The piping is routed between areas on pipe racks to allow access for inspections for leak detection. Details of the costs for these items are included in BNSF/UP Supplemental Reply electronic workpapers.³⁴⁴

(iii) Fuel Storage Capacity

The 500,000 gallon storage tank provided by AEPCO is inadequate to provide the necessary diesel fuel storage to fuel the number of trains AEPCO proposed to operate through Vaughn. As discussed in Section III.B.3 above, BNSF/UP operating witnesses have based the

³⁴³ BNSF/UP Supplemental Reply electronic workpaper "III F 7 Facilities.xls" Tab "Fuel Loading - Belen."

³⁴⁴ BNSF/UP Supplemental Reply electronic workpaper "III F 7 Facilities.xls" Tab "Locomotive Fuel - Vaughn."

fuel requirements for Vaughn on BNSF's experience at Belen.³⁴⁵ Belen currently dispenses more than { } gallons of fuel per day to fuel both the overhead traffic that will be handled by the ACE and BNSF's local traffic. BNSF maintains a ten-day supply of fuel and therefore has a fuel storage capacity of { } gallons.³⁴⁶ In order to provide adequate surge storage for diesel fuel to meet ACE's projected traffic levels, BNSF/UP operating witnesses determined that a { }-gallon (approximately ten days supply) diesel oil storage tank would be required at Vaughn.³⁴⁷

Because any routine maintenance or repair of defects in the tank that would require draining the tank would render the fueling facility totally inoperative, multiple tanks are used to distribute storage of fuel so that there is only a partial loss of storage capacity should a tank need to be drained for repair or maintenance. This practice allows the fueling facility to remain in operation. Therefore, BNSF/UP witness Primm designed the storage capacity using two { }-gallon and one { }-gallon storage tanks to provide the required { } gallon storage capacity at Vaughn. Details of these costs are included in the development of the total costs for the Vaughn facility in BNSF/UP electronic workpapers.³⁴⁸

(b) El Paso

AEPCO constructed a 500,000 gallon storage tank at El Paso, which is inadequate for the requirements of the ACE. Based upon UP's experience at its El Paso Yard, the fuel requirements for the locomotives that the ACE is assumed to service (*i.e.*, westbound trains only) is approximately { } gallons per day. Therefore, to provide for surge capacity and ensure

³⁴⁵ BNSF/UP Supplemental Reply Nar. § III.B.1.

³⁴⁶ *Id.*

³⁴⁷ *Id.*

³⁴⁸ BNSF/UP Supplemental Reply electronic workpaper "III F 7 Facilities.xls" Tab "Locomotive Fuel - Vaughn."

that locomotives can continue to be refueled during temporary supply interruptions, the storage facility must have capacity for a ten-day supply or { } gallons.³⁴⁹ Mr. Primm therefore constructed two storage tanks of { } gallons each at the El Paso facility. These costs are accounted for in BNSF/UP's restatement of construction costs for the El Paso locomotive fueling facility.³⁵⁰

(2) Fueling Platforms

The Hanson-Wilson quote for a fueling facility included the costs for fueling platforms and sanding towers, but did not include all of the necessary components involved in construction of fueling facilities. In addition to the fuel delivery and storage requirements discussed in the preceding subsections, a fully functioning fueling facility requires the following:

1. Site utilities including sanitary and industrial wastewater sewers, storm water collection, water, natural gas, and electrical service, including an electrical substation
2. Connections to utilities
 - Sanitary sewer
 - Wastewater sewer
 - Water
 - Natural gas
 - Electricity
3. Grading for the fueling facility.
4. Parking areas for personnel or maintenance vehicles
5. Support building for locomotive service personnel and material storage, including office, lunch room, restrooms and warehouse
6. Lubricating oil, air compressor oil, journal oil, toilet chemical, and soap unloading facility
7. Waste oil loading facility
8. Fire suppression system at diesel fuel storage tank
9. Storage tanks for lubricating oil, air compressor oil, journal oil, waste oil, toilet chemical, and soap
10. Concrete containment structure enclosing storage tanks holding locomotive lubricating oil, journal oil, air compressor oil, waste oil, soap, and toilet chemical

³⁴⁹ BNSF/UP Supplemental Reply Section III.B.3.

³⁵⁰ BNSF/UP Supplemental Reply electronic workbook "III F 7 Facilities.xls" Tab "Locomotive Fuel - El Paso."

11. Pump house for distribution of fuel, locomotive lubricating oil, journal oil, air compressor oil, waste oil, radiator water, soap, and toilet chemical from unloading facility to storage tanks and fueling platforms. Pump House encloses locomotive radiator water preparation equipment
12. Diesel fuel, lubricating oil, journal oil, air compressor oil, waste oil collection, compressed air, soap, and toilet chemical dispensing lines at fueling platforms.
13. Sand unloading facility
14. Industrial wastewater treatment plant and connection to existing publicly-owned sewer system
15. Sanitary waste collection and treatment and discharge to existing publicly-owned sewer system
16. Storm water retention and treatment or discharge to existing publicly-owned sewer system.

In order to correct the errors and omissions contained in AEPCO's fueling facility design, BNSF/UP witness Primm recalculated the costs of the locomotive fueling facilities. He accepted the Hanson-Wilson estimated construction costs of \$320,000 per fuel crane for calculating the cost of the fueling platform with respect to the components listed in the Hanson-Wilson e-mail.

These components include:

- Reinforced concrete fueling platform
- Platform pipe trenches
- Diesel fuel, lubricating oil, air compressor oil, and water piping on platform
- Diesel fuel dispensing stations on platform
- Lubricating oil dispensing stations on platform
- Air compressor oil dispensing stations on platform
- Water hydrants on platform
- Platform electrical power distribution system
- Pump and electrical control system on platform
- Direct rail fixation to concrete track structure for full length of fueling platform.³⁵¹

He also accepted the Hanson-Wilson estimate of \$100,000 per gravity sand tower. However, the size of the facilities at Vaughn and El Paso was changed to meet the locomotive fueling requirements of the ACE at those sites. Conceptual designs for the fueling facilities were

³⁵¹ AEPCO.OP.WP.04953.

based on the general arrangement of a locomotive fueling facility designed for the UPRR at Hermiston, Oregon in 1996 and constructed during 1997.³⁵² Unit prices from the Hermiston fueling facility were escalated to 2001 using cost indices from RS Means³⁵³ and then multiplied by the quantities of construction materials and equipment to develop the cost of the facilities.

The Hermiston locomotive fueling facility complies with all federal, state, and local storm water discharge and treatment regulations. The costs for the facility include fuel spill containment at locomotive fueling tracks, fuel delivery tracks, tank truck delivery areas, storage tanks, sanding equipment, fuel dispensing equipment, lubricant and engine combustion additive dispensing systems, and storm and wastewater collection and treatment facilities. These costs are shown on BNSF/UP electronic spreadsheet "III F 7 Facilities.xls" Tab "Locomotive Fuel - Vaughn."

Each fueling platform is designed to serve two tracks and simultaneously fuel six locomotives per train. Each platform is 500 feet long. The platform length was determined by taking the length of the longest locomotive currently used in freight service (EMD SD-90MAC at 80'-2" over pulling faces of couplers)³⁵⁴ and multiplying the locomotive's length by six locomotives per train for a total length of 481 feet. An allowance was added for spotting the locomotives and blue light and derail protection. This allowance brings the length of each fueling platform to 500 feet.

Each fueling platform has twelve (12) fuel columns, six (6) gravity sanding towers, and six (6) hose reel cabinets for dispensing lubricants, toilet chemicals, soap, and water.

³⁵² BNSF/UP.SUPP.RPWP.III-F-0737 to 0764, 0842 to 0843.

³⁵³ BNSF/UP.SUPPRP.WP.III.F-0765 to 0813.

³⁵⁴ BNSF/UP.SUPPRP.WP.III.F-0819 to 0928.

AEPCO also has inadequately designed its diesel fuel distribution piping. AEPCO bases its pipe pricing for diesel fuel distribution on the use of fiberglass reinforced plastic pipe. Although this pipe may be acceptable for use at gasoline stations (as shown in RS Means)³⁵⁵ it is not acceptable for use in locomotive fueling facilities because of the higher pressure and flow rates in dispensing lines and composition of diesel fuel and lubricants. Steel pipe is required³⁵⁶ in all fluid dispensing systems for durability and safety.

Also AEPCO understates the cost of the 4-inch diameter fiberglass reinforced plastic pipe in its electronic workpapers. AEPCO uses \$8.70 per lineal foot as the unit cost of the pipe in its electronic workpapers.³⁵⁷ The RS Means cost that AEPCO included in its workpapers (page AEP 04957) shows the unit price as \$8.90.

(a) Vaughn Fueling Platform Design

AEPCO provides four (4) fueling platforms at Vaughn with six (6) fuel cranes per platform. Each fueling platform serves two tracks. The fueling platforms are arranged so that two fueling platforms fuel westbound trains and two fueling platforms fuel eastbound trains. AEPCO arranges the platforms so that the fueling platforms serve four tracks. In other words, a pair of platforms (eastbound and westbound) serve two tracks. Therefore a maximum of four (4) trains could be spotted on the fueling platforms for fueling at any one time.

Furthermore, AEPCO's fueling platform design provides only six (6) fueling nozzles per platform. As ACE states that it will operate trains with six (6) locomotives per train, ACE could

³⁵⁵ AEPCO.OP.WP.04957.

³⁵⁶ *AREMA Manual for Railway Engineering*, Design Criteria for Main Line Fueling Facilities, §16.4.6 p. 6-7 (2002). BNSF/UP.SUPPRP.WP.III.F-0829 to 0840.

³⁵⁷ AEPCO Opening electronic workpaper "IIIF7Bldgs/fuel storage 1.xls" cell E45.

fuel only one train at each platform because it does not provide sufficient fueling nozzles (12) at each platform to fuel two trains simultaneously.

AEPCO's locomotive fueling platform design is further limited by the location of the fueling platforms at each end of a pair of fueling tracks. For example, a maximum of only four (4) trains could be fueled simultaneously provided that there is one eastbound and one westbound train on each pair of fueling tracks. In any other situation where two trains operating in the same direction occupy a pair of fueling tracks, only one train could be fueled because of the insufficient number of fueling nozzles on the platform and because the trains are blocking use of the platforms at the opposite end of the pair of tracks. In this situation, a maximum of two trains could be fueled simultaneously at the four fueling platforms.

Because AEPCO states that its trains will be operated with up to six locomotives, the fueling platforms must be able to sand as well as fuel six locomotives per track. AEPCO, in its electronic workpapers costs only three (3) sand towers per platform at Vaughn and El Paso.³⁵⁸ Three sand towers would allow AEPCO to sand only three locomotives per track without moving the train. AEPCO therefore understates the cost of each fueling platform by \$300,000.

BNSF/UP operating witness Mueller has determined that a total of eight (8) fueling tracks at Vaughn would be required to fuel the number of trains operating on the ACE. The conceptual design for the fueling facility therefore provides three (3) fueling platforms (each serving two tracks) at the west end of six fueling tracks (1 through 4, 6 and 7) to fuel westbound trains and three (3) fueling platforms (each also serving two tracks) at the east end of six fueling tracks (1, 2 and 5 through 8) to fuel eastbound trains.

³⁵⁸ AEPCO Opening electronic workpaper "Fuel Storage 1.xls" Tab "Fuel" Cells B69 and B71.

Therefore, BNSF witness Primm has replaced the AEPCO design with a fueling platform design that provides four fueling platforms, each with 12 fueling nozzles, serving eight tracks and capable of simultaneously fueling eight trains.

The storage tanks, pump house, and fuel and maintenance fluid delivery areas will be located at the west end of the yard. According to AEPCO's track schematic for Vaughn Yard, the total length of the yard is 12,038 feet (MP 791.92 to MP 794.2). Although the track schematic is not to scale, it appears that the eastbound and westbound fueling platforms are approximately 8,000 feet apart. An allowance of an additional 3,000 feet is included to account for piping from the storage tanks and pump house to the westbound fueling platforms. These distances are used to calculate pipe and site utility runs from utility tie-ins to the fueling platforms.

Mr. Primm's platform design provides 12 fueling columns and six sanding towers per platform to meet the ACE's requirements to fuel simultaneously and sand up to six locomotives per fuel track.

The total cost for the Vaughn Fueling facility is \$40.7 million. Details are included in BNSF/UP Supplemental Reply electronic workpaper "III F 7 Facilities.xls" Tab "Locomotive Fuel - Vaughn."

(b) El Paso Fueling Platform Design.

AEPCO's fueling facility at El Paso suffers the same design deficiencies as the Vaughn facility. AEPCO provides two (2) fueling platforms at El Paso with six (6) fuel cranes per platform, with each fueling platform serving two tracks. The platforms are arranged to fuel the head end and tail end of two trains, but assume that the lengths and consists of the trains will be consistent. Thus, a maximum of two (2) trains could be spotted on the fueling platforms for

fueling at any one time and in some instances only some of the locomotives on a train could be fueled at the same time.

As with the design at Vaughn, the El Paso fueling platforms provide only six (6) fueling nozzles per platform, which are not sufficient to fuel two trains simultaneously, and the location of the platforms at the end of a pair of fueling tracks results in situations where only one train could be fueled at the two fueling platforms

BNSF/UP operating witnesses determined that ACE would need a total of four (4) fueling tracks at El Paso in order to fuel the number of trains operating on the ACE. The conceptual design for the fueling facility therefore provides three (3) fueling platforms for the westbound trains that will be fueled at El Paso. Two platforms on the west end (each serving two tracks) provide fueling on Tracks 2 and 3 and Tracks 4 and 5 and one platform at the east end provides fueling on Tracks 2 and 3. Therefore, BNSF/UP witness Primm has replaced the AEPCO design with a fueling platform design that provides three fueling platforms, each with 12 fueling nozzles, serving four tracks and capable of simultaneously fueling four trains.

The storage tanks, pump house, and fuel and maintenance fluid delivery areas will be located at the west end of the yard. According to AEPCO's track schematic for El Paso Yard, the total length of the yard is 10,454 feet (MP 1291.64 to MP 1293.62). Although the track schematic is not to scale, it appears that the eastbound and westbound fueling platforms are approximately 9,240 feet (MP 1291.75 to MP 1293.50). An allowance of an additional 3,000 feet of piping is included to account for piping from the storage tanks and pump house to the westbound fueling platforms. These distances are used to calculate pipe and site utility runs from utility tie-ins to the fueling platforms.

(3) Waste Water Treatment Plants

AEPCO included an unsupported total of \$150,607³⁵⁹ for waste water treatment plants at all yards, including \$115,208 for plants at Vaughn and El Paso (\$57,604 each).³⁶⁰ AEPCO gave no support for these costs in either its Narrative or workpapers. Therefore, Mr. Primm separately costed waste water treatment plants for each of the fueling facilities at Vaughn and El Paso at \$1.5 million and \$1.2 million, respectively. Details of the costs for these plants are included in BNSF/UP electronic workpapers.³⁶¹

The total BNSF/UP restatement of fueling facilities and waste water treatment plants is \$63.7 million.

(4) Construction Cost Location Factors.

AEPCO uses a location factor adjustment of 86.96 in its electronic workpapers to adjust the national average pricing contained in RS Means tables to the specific construction locations of Vaughn, New Mexico and El Paso, Texas. RS Means does not provide a location factor for Vaughn but it does provide a location factor of 92.2 for the town of Carrizozo (approximately 77 miles south of Vaughn and equally as remote from major highways). RS Means does not provide a location adjustment factor for the City of Belen but does provide a location factor of 91.2 for Albuquerque (approximately 37 miles to the north).

RS Means provides a location factor of 78.7 for the City of El Paso.

Mr. Primm used the location adjustment factor for Carrizozo for construction at Vaughn; the location adjustment factor for El Paso for construction at El Paso; and the location

³⁵⁹ AEPCO Opening Exhibit No. III-F-1.

³⁶⁰ AEPCO Opening electronic workpaper "IIIFBldgs.Bldgcst2.xls"

³⁶¹ BNSF/UP Supplemental Reply electronic workpaper "III F 7 Facilities.xls" Tabs "WWTP - Vaughn" and "WWTP - El Paso."

adjustment factor for Albuquerque for construction at Belen. These factors are more accurate than the average that AEPCO applied. AEPCO's average location factor resulted in a significant understatement of costs as it substantially lowered the cost of the much larger Vaughn facility.

(5) Summary

The Table below summarizes the BNSF/UP restatement of fueling facility costs.

Table III.F.7-2
Summary of BNSF/UP Fueling Facility Costs

Structure	Cost
Locomotive Fuel Loading Facility – Belen	\$1,896,101
Locomotive Fueling Facility – Vaughn	\$40,657,609
Locomotive Fueling Facility – El Paso	\$18,471,993
Waste Water Treatment Plant – Vaughn	\$1,457,119
Waste Water Treatment Plant – El Paso	\$1,243,767
TOTAL	\$63,726,589

Source: BNSF/UP Supplemental Reply electronic workpaper “III F 7 Facilities.xls” Tab “Summary.”

b. Locomotive Maintenance Facilities

AEPCO states in its Opening Narrative that it has provided for a 27,400 square-foot locomotive repair facility at the Vaughn Yard at a total cost of \$3.82 million.³⁶² However, the spreadsheet calculating the total cost for the facility contains an error because AEPCO transposed the numbers and put 24,700 instead of 27,400 for the square footage, resulting in an understatement of \$85,460.22.³⁶³

For the building itself, AEPCO averaged five bids for a 45,800 square foot building to obtain a unit cost of \$22.92 per square foot.³⁶⁴ For the built-in equipment (including the open pit, embedded pit, cranes, drop table and pit, wheel truing machine and pit, and platforms),

³⁶² AEPCO Opening Nar. at III-F-66.

³⁶³ AEPCO Opening electronic workpaper “Bldgs.2.xls” cell C9.

³⁶⁴ AEPCO.OP.WP.04966 to 04970 and AEPCO Opening electronic workpaper “All Buildings.xls” Tab “Type 3 Loco Shop ”

AEPCO included a cost of \$2,103,543.13. AEPCO developed the unit costs for the two pits by averaging eleven (11) bids for a project in 2000 that included an approach pad and pit track for a locomotive repair facility.³⁶⁵ The unit costs for cranes are taken from the RS Means 2001.³⁶⁶ For the cost of the drop table, AEPCO obtained a quote from Macton Moeller Railroad Equipment.³⁶⁷ AEPCO does not specify the source for its other equipment costs, but includes a percentage additive derived from R-1 data for BNSF's expenditures for shops and shop equipment.

BNSF/UP operating witnesses determined that the locomotive facility proposed by AEPCO for the ACE was inadequate to handle the locomotives that would be repaired at Vaughn and therefore Mr. Primm designed a new facility for the Vaughn Yard. The design of the two-track locomotive shop included in AEPCO's workpapers³⁶⁸ is inefficient because it places the wheel truing machine at the end of one repair track and the drop table at the end of the other track, which means that the two most time-consuming operations (dropping a traction motor/wheelset or truing wheels) will prevent locomotives from flowing through the shop. It has become standard practice to put the wheel truing machine and drop table on a separate track so that locomotives on the inspection tracks are not otherwise delayed by the longer duration wheel truing and wheel replacement operations.

The warehouse space allotted in AEPCO's design is also inadequate given the remote area in which the Vaughn Yard is located. The warehouse at the Hermiston, Oregon facility that Mr.

³⁶⁵ AEPCO.OP.WP.04974 to 04977 and AEPCO Opening electronic workpaper "All Buildings.xls" Tab "Type3 pit&emb. track & equip."

³⁶⁶ AEPCO.OP.WP.04971 to 04973 and AEPCO Opening electronic workpaper "All Buildings.xls" Tab "Type 3."

³⁶⁷ AEPCO.OP.WP.04981.

³⁶⁸ AEPCO.OP.WP.04964.

Primm used as the basis for his design was approximately 14,000 square feet, whereas the AEPCO design allows only 420 square feet.³⁶⁹ The warehouse size for Hermiston was dictated by UP's materials handling department because of Hermiston's remoteness from the warehouses of its equipment and spare parts suppliers. The same would be true of the ACE's situation at Vaughn. Therefore, Mr. Primm increased the warehouse space. The office and locker rooms were also increased to accommodate locomotive maintenance forces.

Mr. Primm's design also includes a wash house, which is a necessary part of locomotive maintenance. The wash house ensures a clean working environment that promotes the efficiency and safety of the maintenance staff. The FRA imposes fines on railroads for permitting locomotives be covered with oil, grime and grease that either prevent proper maintenance and inspection procedures or endanger the safety of personnel.³⁷⁰ Since 1991, BNSF has added wash houses to its locomotive shops at North Kansas City, Missouri; Topeka, Kansas; and Corwith, Illinois and UP included a wash house as an integral part of its locomotive shop at Hinkle, Oregon built in 1997. A wash house enclosing an area of 6,000 square feet, sufficient to enclose an area spanning the width of two tracks (60 feet) with each track being 100 feet long was added to the costs for the locomotive facility at Vaughn.³⁷¹

Mr. Primm's design for the shop at Vaughn is based on a design he prepared for another SAC case using the Hermiston facility as his model. The costs have been indexed to 1Q01.³⁷²

³⁶⁹ AEPCO.OP.WP.04963.

³⁷⁰ 49 CFR 229.45; BNSF/UP.SUPPRP.WP.III.F-0841.

³⁷¹ Details of the design and costs are included in BNSF/UP Supplemental Reply electronic workpaper "III F 7 Facilities.xls" Tab "Locomotive Maint. - Vaughn."

³⁷² BNSF/UP Supplemental Reply electronic workpaper "III F 7 Facilities.xls" Tab "Locomotive Maint. - Vaughn."

Because some of the ACE locomotives operating over the replicated UP Sunset line will need to have the federally-mandated 92-day inspections performed at El Paso, a locomotive inspection pit was constructed at the ACE's El Paso Yard at a cost of \$163,076. This facility provides an inspection pit and walkways for access to the locomotive. The design of the inspection pit was based on a similar pit at the Hermiston facility. The cost for the inspection facility at El Paso was calculated by escalating the final construction cost estimates for the Hermiston facility to 2001 using construction cost indices from RS Means.³⁷³

BNSF/UP's restatement of costs for locomotive repair facilities includes:

Locomotive Shop – Vaughn	\$12,411,342
Inspection pit at El Paso	\$ 163,076
Total	\$12,574,418

c. Rail Car Maintenance Shop

AEPCO states in its opening evidence that railcar maintenance will be performed by contractors under the terms of a full-service lease.³⁷⁴ However, AEPCO did not provide a facility in which the contractors could perform the needed repairs. BNSF/UP witness Primm, therefore, prepared construction cost estimates for two railcar repair facilities for the ACE. The first facility is located at Vaughn Yard and the second is located at El Paso Yard.

Based on requirements determined by BNSF/UP operating witness Mueller, the Vaughn facility is designed to repair { } cars per day. The El Paso facility is designed to repair { } cars per day. Mr. Primm therefore included costs for two small two-track enclosed repair shops. The shops are equipped with jib cranes and car pullers and have space for offices, tools and

³⁷³ Details of the design and costs are included in BNSF/UP Supplemental Reply electronic workpaper "III F 7 Facilities.xls" Tab "Insp. Pt. - El Paso" and BNSF/UP.SUPPRP.WP.III.F-0844 to 0847, 0864 to 0885.

³⁷⁴ AEPCO Opening Nar. at III-D-3 to 4.

materials. The design and cost of these facilities have been adapted from a railcar maintenance facility design prepared by Mr. Primm in another recent stand-alone cost case adjusted using the proper location factors for Vaughn and El Paso and with the cost indexed to 2001 using cost indices from RS Means.

AEPCO is also silent on how it intends to repair railcars set out along the ACE. Association of American Railroad (AAR) Interchange Rules require that railcars with safety defects not be accepted in interchange between railroads and not be moved until repairs are completed. Therefore, the ACE must provide some type of mobile maintenance system to allow repair crews to reach and repair railcars located along its route. BNSF/UP witnesses presume that repair crews will be based at the railcar repair shops and travel to the locations of the defective railcars. Therefore, they have not added any capital costs to the facilities to accommodate the mobile repair crews.

BNSF/UP's restatement of costs for car repair facilities include

Car Shop – Vaughn	\$2,241,802
Car Shop – El Paso	\$1,913,555
Total	\$4,155,357

Details of the costs are included in BNSF/UP electronic workpapers.³⁷⁵

d. Headquarters Building

AEPCO states that its headquarters building will accommodate the ACE's senior operating and mechanical staff, its clerical and dispatching staff, its customer service personnel,

³⁷⁵ BNSF/UP Supplemental Reply electronic workpaper "III F 7 Facilities.xls" Tabs "Railcar Maint. - Vaughn" and "Railcar Maint. - El Paso" and BNSF/UP.SUPPRP.WP.III.F-0848 to 0863.

the CTC control center, and its general and administrative staff.³⁷⁶ AEPCO maintains that a 16,000 square foot building that houses all this personnel can be built for \$1,387,569.74, including costs for site development.³⁷⁷ Due to time and resource constraints, BNSF/UP do not challenge AEPCO's unit costs for the Headquarters Building, but have adjusted the size of the buildings to meet the needs of the ACE as determined by BNSF/UP G&A, operating and MOW witnesses. Based on BNSF/UP's adjustment to G&A costs as discussed in BNSF/UP Supplemental Reply Narrative in § III.D.3, BNSF/UP estimated that the space for G&A staff and operating and maintenance personnel with offices in the Headquarters building would also increase proportionately. Therefore, BNSF/UP adjusted the Headquarters' building cost by the same percentage increase as was used for the G&A adjustment. BNSF/UP's restatement of costs includes a cost of \$2.19 million for the ACE headquarters and \$3.21 million for yard offices. Details of its adjustments to the AEPCO costs are included in BNSF/UP's electronic workpapers.³⁷⁸

e. Crew Change Facilities/Yard Offices/MOW Facilities

AEPCO has placed small crew change facilities at both Cochise and Defiance and medium sized facilities at Vaughn and El Paso. The facilities include locker room, break room, and office space.³⁷⁹ In addition, it constructed five MOW crew facilities and a MOW garage. AEPCO designated all of these facilities as "Type 1" buildings for purposes of developing costs. AEPCO developed its single average square foot price for Type 1 buildings by averaging two quotes from R.A. Greig Equipment Company for "Speed Space" module trailer units (one for a

³⁷⁶ AEPCO OP.WP.04941 to 04950.

³⁷⁷ AEPCO.OP.WP.04038.

³⁷⁸ BNSF/UP Supplemental Reply electronic workpaper "III F 7 Buildings.xls."

³⁷⁹ AEPCO Opening Narr at III-F-66.

“complex MOW unit” and one for a “complex crew unit”³⁸⁰ to get a single “Type 1” square-foot price of \$70 (including delivery and installation).³⁸¹ AEPCO’s total cost for all roadway buildings is \$1.1 million.³⁸²

Although there are other serious concerns with the manner in which AEPCO has developed costs for these crew change and maintenance of way facilities, for the reasons stated in BNSF/UP’s Counsels Argument and Summary of Evidence (including time and resource constraints), BNSF/UP witness Primm has not undertaken the task of critiquing AEPCO’s evidence and recalculating the costs to construct adequate crew change and MOW facilities. Instead, the Railroads accept -- for the purpose of this case only -- AEPCO’s unit costs and adjust only the number and size of the buildings to meet the staffing requirements determined by BNSF/UP operating and MOW witnesses. BNSF/UP witnesses determined that the increase in road crew members would not require an increase in crew change facilities and therefore, no adjustment was made for road crews. BNSF/UP’s MOW witness Albin found AEPCO’s proposed ACE MOW crew of only 50 field workers located at five locations completely inadequate to handle the maintenance needs of the railroad as discussed in BNSF/UP’s Supplemental Reply Narrative in § III.D.4. Mr. Albin determined that the ACE would need a maintenance staff of over 200 field workers stationed at eleven locations across the system. Therefore, additional facilities were added to accommodate the MOW staffing needs.

In calculating its cost for its Type 2 MOW garage, AEPCO made an error in its calculations. AEPCO has a cost of \$7.03 per square foot for the “Hi-Rail Garage with Shop and

³⁸⁰ AEPCO.OP.WP. 05026 to 05039.

³⁸¹ AEPCO Opening electronic workpaper “All Buildings.xls” Tab “Type 1 Crew & MOW” and “Bldgcst2.xls”

³⁸² AEPCO Opening electronic workpaper “Bldgcst2.xls” Tab “Roadway buildings.”

Storage Area” building type which is developed in its electronic workpaper “All Buildings.xls” Tab “Type 2 MOW Garage.” In its calculation, AEPCO failed to properly include the line item costs for “Wood frame metal siding” and the “Concrete Floor” in Cells F5 and F7. Correcting this error results in a unit price of \$16.33 per square foot based on AEPCO’s worksheet. However, AEPCO also erred in indexing certain of the other unit costs used in its calculation. The final cost per square foot after correcting AEPCO’s indexing factors is \$16.42.

BNSF/UP’s restated cost for the ACE crew change and MOW facilities is \$2.44 million. Details of its adjustments to the AEPCO costs are included in BNSF/UP’s electronic workpapers.³⁸³

f. Yard Lighting

AEPCO has provided lighting for the yard along the ACE at a cost derived from the RS Means.³⁸⁴ Although there are issues with the manner in which AEPCO has developed costs for this item, for the reasons stated above, BNSF/UP witness Primm has not undertaken the task of critiquing AEPCO’s evidence and recalculating the costs. The Railroads accept -- for the purpose of this case only -- AEPCO’s costs per site and apply them to the correct number and size of buildings sites. BNSF/UP’s restatement of yard lighting and site development costs is included in the total building costs. Details of BNSF/UP’s adjustments to the AEPCO costs are included in BNSF/UP’s electronic workpapers.³⁸⁵

³⁸³ BNSF/UP Supplemental Reply electronic workpaper “III F 7 Buildings.xls.”

³⁸⁴ AEPCO.OP.WP.05058 to 05060.

³⁸⁵ BNSF/UP Supplemental Reply electronic workpaper “III F 7 Buildings.xls.”

8. Public Improvements

a. Fences

AEPCO states in its Opening Narrative that its witness Mr. Barstow visited 80% of the lines being replicated by the ACE and saw no fencing in any area that was not directly adjacent to the BNSF Gallup Yard.³⁸⁶ As a result, AEPCO only included six-foot fencing around the Dalies and Belen Yards, for a total of 417.5 LF of fencing at a total cost of \$5,020.00.³⁸⁷ The unit cost for the gates AEPCO used was derived from RS Means.³⁸⁸

The BNSF/UP Engineering Consultants disagree with Mr. Barstow's conclusions. BNSF/UP witnesses Phillips, Albin, Meredith and others conducted their own field trip in February 2003 and observed right-of-way fencing with gates and cattle guards on at least 90% of the BNSF route that they inspected by hi-rail.³⁸⁹ They noted in their report that "the track from Vaughn to Belen has right-of-way (r/w) fence on both sides except where highways parallel the railroad" and for Belen to Gallup that "Right-of-Way fencing was on both sides of the track for at least 90% of the subdivision."³⁹⁰ From their observations of the UP line, they estimated that approximately 80% of the UP line was fenced. The lesser amount on the UP line is because those lines are in some place parallel to and extremely close to public highways where the state DOT provides right-of-way fencing. Photographs taken on the field trip showing fencing along the rights of way are included in BNSF/UP workpapers.³⁹¹

³⁸⁶ AEPCO Opening Nar. at III-F-68.

³⁸⁷ AEPCO.OP.WP.05062.

³⁸⁸ AEPCO.OP.WP.05064 to 05065.

³⁸⁹ They inspected all of the BNSF route except the Defiance branch line.

³⁹⁰ BNSF/UP Supplemental Reply electronic workpaper "III F 8 Fence Photo.doc" and BNSF/UP.SUPPRP.WP.III.F-0887 to 0888.

³⁹¹ BNSF/UP.SUPPRP.WP.III.F-0890 to 0900.

Moreover, New Mexico law requires that “Every railroad in this state whose lines of road, or any part thereof, are open for use . . . shall . . . erect and thereafter maintain fences on the sides of their said railroad, or part thereof, suitably and amply sufficient to prevent cattle, horses, sheep . . . from getting on the said railroad.” N.M. Stat. Ann. § 77-18-16 (2003).³⁹² The statute further requires that railroads “maintain at all public road crossings, now existing or hereafter established, cattle guards suitable and sufficient to prevent cattle . . . from getting onto said railroad.” *Id.* Thus, the ACE would be required by law to construct fencing and cattle guards on the replicated BNSF line.

Arizona does not require railroads to fence the right of way, but does require that a railroad fencing its right of way make an opening every three miles for cattle to pass through with cattle guards and wing fences sufficient to prevent cattle from entering the right of way. A.R.S. §3-1702 (2003).³⁹³ This is consistent with the BNSF/UP witnesses’ observations of gates and cattle guards every three or four miles.³⁹⁴

Based on their observations, the BNSF/UP Engineering Consultants calculated 4,669,357 feet of fence and estimated 296 gates (two gates for every three miles of fence) and 177 cattle guards (two every five miles). This is also consistent with the fencing quantities reported in the ICC Engineering Reports, which show the quantities of fencing, gates and cattle guards at the time of original construction. For the valuation sections on the ACE route, the Engineering Reports recorded 4,072,391 feet of fencing on the route. (This does not include the 193,882 feet on the more recently constructed Defiance Subdivision, which would bring the total to 4,266,273). Based on the Engineering Reports, there were 122 gates and 258 cattle guards on the

³⁹² BNSF/UP.SUPPRP.WP.III.F-0901 to 0902.

³⁹³ BNSF/UP.SUPPRP.WP.III.F-0903.

³⁹⁴ BNSF/UP.SUPPRP.WP.III.F-0904.

valuation sections covering the ACE route.³⁹⁵ The BNSF/UP Consultants used the quantities based on field observations and railroad information acquired during the field trip as the most up to date evidence.³⁹⁶

BNSF/UP Engineering Consultants obtained RS Means as well as BNSF and UP costs for barbed wire. Based on the average cost of four AFE's, BNSF's average cost is \${ } per linear foot.³⁹⁷ UP gave an estimate of \${ } per foot.³⁹⁸ RS Means listed a price of \$0.56 per strand of barbed wire per foot in their 2001 Heavy Construction Cost Data Book.³⁹⁹ Since the STB has accepted Means as a reputable source for costs in these cases, BNSF/UP used the Means cost. For gates, the UP Engineering Department provided a cost estimate of \${ } for a 16-foot gate. RS Means lists a similar gate for \$840 and the Means cost was used. Means does not have a cost for cattle guards, so BNSF/UP used a unit cost from New Mexico DOT Average Bid Tabs for cattle guards of \$5,927.08.⁴⁰⁰ The total cost for right of way fencing on the ACE is \$14.036 million.⁴⁰¹

³⁹⁵ BNSF/UP Supplemental Reply electronic workpaper "III F 8 ICC Fencing.xls."

³⁹⁶ BNSF/UP Supplemental Reply electronic workpaper "III F 8 ICC Fencing.xls."

³⁹⁷ BNSF/UP.SUPPRP.WP.III.F-0905 to 0938.

³⁹⁸ BNSF/UP.SUPPRP.WP.III.F-0939.

³⁹⁹ BNSF/UP.SUPPRP.WP.III.F-0941.

⁴⁰⁰ BNSF/UP Supplemental Reply electronic workpaper "III F 8 Fence.xls" Tab "Cattle Guards Price."

⁴⁰¹ BNSF/UP Supplemental Reply electronic workpaper. "III F 8 Fence.xls." Tab "Cost Summary.xls."

b. Signs and Road Crossing Devices

AEPCO has included a very limited number of signs across the entire ACE at a total of \$65,489.73. This price includes mile post, whistle post, and some advanced warning signs and crossing signs and the steel mounting posts.⁴⁰²

AEPCO omitted entirely speed restriction and yard limit signs, most advanced warning signs, and all crossing signs other than those on the Defiance subdivision claiming that where the appropriate instructions are included in operating time tables, such signs are not required. This is incorrect. FRA regulation 218.35 specifically mandates the use of Yard Limit signs *in addition to the notification in the timetable*. It says

After August 1, 1977, yard limits must be designated by –

- (1) Yard limit signs, and
- (2) Timetable, train orders, or special instructions.⁴⁰³

The General Code of Operating Rules that has been adopted by all Western Class 1 and 83 short line railroads, require the placement of advance warning signs, speed signs and resume speed signs. No exceptions are made for having the information in the timetables.⁴⁰⁴

Advance warning, speed restriction and resume speed signs put locomotive engineers on notice that they are about to enter or leave a restricted speed zone so that they can maintain a safe

⁴⁰² AEPCO Opening electronic workpaper “Signs.xls.”

⁴⁰³ 49 CFR § 218.35. BNSF/UP.SUPPRP.WP.III.F-0942 to 0945.

⁴⁰⁴ General Code of Operating Rules, Third Edition, effective April 10, 1994. Copies of the pertinent pages of the Code are included in BNSF/UP.SUPPRP.WP.III.F-0943. AEPCO cites the NORAC Operating Rules, adopted by Eastern railroads for the proposition that the signs are not required if the information is in the timetables. AEPCO Opening Nar. at III-F-68. The provisions cited and included in AEPCO.OP.WP. 5091 to 5092 provide that an employee coming on duty must familiarize himself with General Orders, Bulletin Orders and division notices. These provisions have nothing to do with the requirement for signs, and in any event the NORAC rule are applicable only to the eastern railroads who have adopted them and certainly do not supercede the General Code adopted by the western carriers.

and efficient train speed. Without these signs, the engineer cannot know precisely where he is and adjust his speed appropriately to pull into sidings, yards or mines. Similarly, signs giving advance warning of upcoming crossings and yard limits provide essential information to the train crew. Whistle posts are required at public crossings to give advance warning to the public.

AEPCO did not explain how it determined its quantities for milepost signs and its spreadsheet "Signs.xls" contains only hard coded numbers. For whistle posts, AEPCO used BNSF discovery quantities for the northern portion of the route and purportedly provided a like number per mile for the southern portions.

BNSF Engineering Consultants adjusted the quantities of signs where they found that signs should have been included on the ACE and were not. BNSF/UP Engineering Consultants determined the quantity of advanced warning and speed limit signs based on the number of locations where the speed limit changes. For each of these locations there should be two advanced warning signs, and one speed limit sign, plus additional signs on double track to ensure visibility when trains occupy both tracks. Based on the track charts, there are 62 locations where the track speed changes. For each of these there should be a minimum of two advanced warning signs and one speed limit sign. This would equate to a *minimum* of 186 signs in contrast to AEPCO's count of only 22 advanced warning signs, which is clearly inadequate. The additional signs needed at the 39 double-track locations would be 117 signs for a total of 303 advanced warning and speed limit signs.

In addition to the above, BNSF Engineering Consultants recommended other signs that are used on railroads for safety and regulatory reasons. These include the following:

- Danger – Keep off Bridge: For safety reasons, at each bridge location four warning signs should be used to keep trespassers away from the structure where they could be hit by a train. Even

with walkways there is limited clearance for walking when there is a moving train.

- FRA required 1-800 signs at crossings: The FRA requires that each grade crossing have a posted identification number and contact telephone number in case of an emergency. Each crossing would have a minimum of two signs.
- Scour Critical. FRA Safety Advisory 97-1⁴⁰⁵ requires warning signs at each end of a bridge where structures are being undermined by moving water resulting in problems that could cause a part of the bridge to fail. The signs alert track inspectors of the safety concern in the event of high water. These signs would be installed on ACE bridges where the track class is Class 4 or higher and the bridge has mud sills or spread footings.
- Stop signs at all yard exits: At least one stop sign should be placed at the exit of each yard or terminal.
- Directional signs for emergency crews at facilities: In the event of an emergency at any ACE facility, there should be a minimum of two signs indicating the access locations for emergency vehicles and directing them to a central meeting point or points.

AEPCO used an average unit cost of \$44.46 for its signs.⁴⁰⁶ The price is based on a bid from Sperling Railway Services for the signs⁴⁰⁷ and a 2001 RS Means amount for installation with galvanized steel posts.⁴⁰⁸ Although the Means cost was listed as \$24.50, AEPCO used a unit cost of \$20.95, which it apparently obtained by incorrectly indexing the already 1Q01 cost.⁴⁰⁹

The unit costs for signs ranged from \$7.95 for whistle post signs to \$32.00 for advanced warning signs. Because AEPCO did not include most of the types of signs that are required on a railroad, it did not request prices on the other signs. BNSF/UP Engineering Consultants

⁴⁰⁵ BNSF/UP.SUPPRP.WP.III.F-0946 to 0950.

⁴⁰⁶ AEPCO Opening electronic workpaper "Signs.xls"

⁴⁰⁷ AEPCO.OP.WP.05090.

⁴⁰⁸ AEPCO.OP.WP.05089.

⁴⁰⁹ AEPCO Opening electronic workpaper "iif3.xls.Tab unit costs."

therefore relied on information produced by BNSF in discovery in response to a request for costs for the installed price of signs. BNSF's original production included a 2001 average cost for signs of \$82.40.⁴¹⁰ BNSF's supplemental discovery production included a price of \$83.00.⁴¹¹ Therefore, BNSF/UP Engineering Consultants used the 2001 BNSF cost of \$82.40 per sign.

BNSF/UP's restatement of signs includes a total of 4,137 signs at a cost of \$340,889. Details of the quantities and costs are included in BNSF/UP's electronic workpapers.⁴¹²

c. Grade-Separated and At-Grade Crossings

With the exception of the Defiance branch line and the small segment of the Baca branch line that AEPCO included in the ACE route, AEPCO excluded all costs for at-grade and grade-separated crossings on the ACE line, on the grounds that the replicated lines were built prior to the construction of highways and the incumbents would not have borne the cost of these crossings. AEPCO dismisses the ICC Engineering Reports as non-dispositive on the issue of real railroad costs.⁴¹³

Despite AEPCO's dismissal of the ICC Engineering Reports, the Board held in its recent *Duke* and *CP&L* decisions that

It is reasonable to presume that, where a group of assets are listed in *Engrg Rpts*, the existing railroad, or its predecessor, incurred some investment cost. To the extent that such investment is still necessary for current rail operations, it is appropriate to include those costs in the SAC analysis.⁴¹⁴

⁴¹⁰ BNSF/UP.SUPPRP.WP.III.F-0951.

⁴¹¹ BNSF/UP.SUPPRP.WP.III.F-0952.

⁴¹² BNSF/UP Supplemental Reply electronic workpaper "III F ACE Construction.xls."

⁴¹³ AEPCO Opening Nar. at III-F-69.

⁴¹⁴ *Duke* at 122; *CP&L* at 106; see also *TMPA* at 154 (accepting the Engineering Report quantities as evidence that "BNSF's predecessor railroads incurred investment for a substantial amount of at-grade crossing materials.").

The ICC Engineering Reports provide evidence of the existence of a number of crossings at the time the Railroads' lines were originally constructed. The reports for some of the valuation sections provided the precise number of crossings, while others provided only the quantities of materials listed under Account #15 - Crossings. BNSF/UP Engineering Consultant Phillips summarized the information in the Engineering Reports and determined that there was sufficient material for the equivalent of 4,519 feet of public crossings and 1,937 feet of private crossings. This is evidence that BNSF and UP or their predecessors incurred at least some investment for these crossings. BNSF and UP generally incur at least ten percent for crossings. Therefore, in accordance with the Board's ruling in *Duke* and *CP&L*, BNSF/UP's restatement of at-grade and grade separations includes ten (10%) of the estimated cost to construct these crossings.

As for the Defiance and Baca branch lines, AEPCO acknowledges that these lines post-date the roads they cross and has included costs for those crossings. AEPCO's total cost of \$78,687.83 for 12 crossings is based on a unit price of \$182.15 per LF from a 2002 bid of \$210.00/LF to "Rebuild Crossings"⁴¹⁵ indexed to 1Q01. The bid tab relied upon by AEPCO is for crossing work associated with track rehabilitation. It is not a cost for new construction, but for a maintenance project following track work, which usually refers to replacing some cross ties in the crossing area and replacing the crossing surface after a surfacing gang has worked through the crossing. The BNSF/UP Engineering Consultants developed the costs for construction of new crossings using a quote for materials from Southeast Railroad Supply Company for concrete

⁴¹⁵ AEPCO.OP.WP.05103

and rubber crossing surfaces⁴¹⁶ and from BNSF discovery for materials for private farm crossings.⁴¹⁷ The costs for labor and equipment were developed from Means.⁴¹⁸

BNSF/UP's contemporary cost for crossings in the ICC Reports is \$3,048,763 and ten percent of that is \$304,876.30. The cost for the new crossings on the Baca and Defiance segments is \$1,586,266. BNSF/UP's total restated cost for crossings on the ACE is \$1,891,142. Details are included in the workpapers.⁴¹⁹

9. Mobilization

Mobilization plays a significant role in a project that involves the construction of over five hundred miles of a proposed eight hundred mile railroad and includes the construction of both roadbed and structures. It takes a tremendous effort to coordinate and transport personnel, equipment, materials and supplies to the project sites and to establish temporary offices and other support facilities needed at the various construction sites both before and during the project. A similar effort is also required to dismantle the temporary facilities and return heavy construction equipment to the contractors' storage areas.

The STB has recognized the legitimacy of this cost in the past, approving factors up to 2.2 percent in *PPL*,⁴²⁰ 2.4% in *FMC* and most recently 2.5 percent in *Duke*⁴²¹ and 2.6% in

⁴¹⁶ BNSF/UP.SUPPRP.WP.III.F-0953.

⁴¹⁷ BNSF/UP Supplemental Reply electronic workpaper "III F ACE Construction.xls" Tab "At Grade."

⁴¹⁸ BNSF/UP Supplemental Reply electronic workpaper "III F ACE Construction" Tab "At Grade."

⁴¹⁹ BNSF/UP Supplemental Reply electronic workpaper "III F Construction.xls" Tab "At Grade."

⁴²⁰ This is the percentage for mobilization cited in the Board's decision in *CP&L at 106*.

⁴²¹ *Duke* at 122.

CP&L.⁴²² Nonetheless, AEPCO argues here for a one (1%) percent factor that, because it is only applied to some items is effectively much less than one percent. This is clearly inconsistent with precedent and completely unwarranted.

a. Analysis of AEPCO's Position

AEPCO's argument for a low mobilization cost is riddled with inconsistency. On the one hand, AEPCO begins its argument by pulling, out of context, a percentage for mobilization of 1.2% from the STB decision in *WPL*. Not only does AEPCO offer no justification as to why this percentage from this case is in any way applicable to the ACE, but it also chooses to ignore the fact that in the same decision, the Board found that performance bonds and demobilization are legitimate components of the overall mobilization cost.⁴²³ In fact, the Board accepted a 2.6% mobilization cost (including performance bonds and demobilization) in *WPL*.

AEPCO's arguments are discussed under the subheadings Mobilization, Performance Bond and Demobilization.

(1) Mobilization.

AEPCO offers little analysis to support its argument for a mobilization cost of 1.0% of the estimated construction cost. AEPCO appears to accept the 1.2% mobilization cost determined by the STB in *WPL*. AEPCO then offers three generalized arguments advocating lowering this to 1.0%. These limited arguments have recently been rejected by the STB in *Duke*.⁴²⁴ Each of these arguments is without merit:

⁴²² *CP&L* at 107.

⁴²³ This is the percentage cited in the Board's decision in *CP&L*.

⁴²⁴ *Duke* at 122.

1. AEPCO asserts that “mobilization is basically a fixed cost for a project... [and]... the larger the project, the less significant the cost.”⁴²⁵ In *WPL*, the STB determined the total construction cost of the stand-alone railroad to be \$2.94 billion. In the present case, AEPCO estimates the construction cost of the ACE to be \$1.08 billion. AEPCO is arguing that the larger the railroad, the lower the mobilization costs (as a percentage of the construction cost). Conversely, the smaller the railroad, the higher the mobilization costs. Since the ACE is smaller than the stand-alone railroad in *WPL*, then by its own logic, AEPCO should be arguing that the mobilization for the ACE should be greater, not less than the 1.2% adopted by the STB in *WPL*.
2. AEPCO asserts that “the ACE has obtained actual construction bids... [and]... these bids include mobilization and demobilization.”⁴²⁶ This is simply incorrect on several counts. First, many of the prices used by AEPCO come from Means, not construction bids. Second, the prices AEPCO uses from contractors are best characterized as telephone conversations based upon sketchy, incomplete information. They clearly are not equivalent to bonded bid prices based upon detailed drawings and specifications. As pointed out elsewhere, it is questionable whether many of AEPCO’s prices include the basic components necessary to construct the project, let alone a relatively smaller item such as mobilization.
3. AEPCO further argues that the “index lists only five places where mobilization is stated as a separate item” and further argues that because the mobilization costs are small, “it is obvious mobilization costs are insignificant.”⁴²⁷ The number of listings in Means is irrelevant to the applicability of the cost of the ACE. Following this logic would lead to the conclusion that if an item isn’t listed in Means, then it’s not an appropriate cost. Also within the five listings of mobilization in Means that AEPCO cites, are mobilization costs for nearly 20 different pieces of construction equipment.

Finally, AEPCO has made no attempt to actually calculate what the mobilization costs are for the various categories of equipment. Instead, AEPCO, in its electronic worksheet “iiiF9mob/ Mobilization.xls” simply applies the 1.0% factor it is advocating to some, but not all, of the items in its construction cost estimate. AEPCO offers no explanation why mobilization was omitted on some items.

⁴²⁵ AEPCO Opening Nar. at III-F-70.

⁴²⁶ AEPCO Opening Nar. at III-F-71.

⁴²⁷ *Id.*

(2) Performance Bond.

AEPCO failed to include performance bonds in its costs for the ACE. The STB has established many precedents supporting the inclusion of performance bonds in the cost of the stand-alone railroad, including its recent decision in *CP&L* and the decisions cited therein. In *CP&L*, the Board rejected the complainants' evidence advocating a one percent factor "because it ignores several cost elements (bridge mobilization, performance bonds and demobilization) accepted in prior cases." *CP&L* at 107.

(3) Demobilization.

AEPCO argues that the ACE will incur zero demobilization costs and puts forth several arguments to support this contention. AEPCO's arguments are flawed for the following reasons:

1. The STB has long recognized the validity of demobilization costs as evidenced in *WPL* (cited by AEPCO), *FMC* and most recently, *Duke* and *CP&L*.
2. AEPCO asserts the equipment "probably would not be returned to the contractor's base of operations [and the] equipment is generally disposed of at the end of the project ... by selling it to dealers or other contractors."⁴²⁸ There is no evidence that AEPCO made the necessary adjustments in the Means and other pricing it used to reflect this approach to equipment disposition at the end of the project. Therefore, AEPCO forfeited its option to use this approach by failing to consistently apply this assumption elsewhere in its analysis. Further, AEPCO offers no evidence that demobilization costs would be avoided by its suggested approach. Even if the equipment were sold at the end of the project, it would still have to be made "saleable," including cleaning, servicing and transporting it to a regional location for sale.
3. AEPCO attempts to make a "scarcity of resources" argument by asserting the demobilization "charges are typically applied to construction work when there is no further immediate need for the equipment at another location."⁴²⁹ AEPCO then appears to characterize demobilization costs as some kind of "premium" that

⁴²⁸ AEPCO Opening Nar. at III-F-73.

⁴²⁹ AEPCO Opening Nar. at III-F-73 to 74.

should be disallowed. The STB has clearly rejected this type of argument in previous cases. Demobilization costs are a legitimate expenditure on all construction projects as they reflect the orderly shutdown of a project so that the resources can continue to be productively employed on future projects. To assume otherwise would require an additional premium elsewhere in the estimate.

b. BNSF/UP's Restated Mobilization Cost

Defendants believe that mobilization costs in many cases exceed the levels approved by the Board. However, since AEPCO chose to rely on previous STB decisions as its starting point (and because of limited time) for the purposes of this case, Defendants accept that approach, but believe that the correct mobilization factor should be based in fact on recent STB precedent, rather than through cherry picking a particular number. The STB summarized this information in its recent decision in *CP&L* where it noted the mobilization costs that had been accepted in previous cases. The Table below summarizes those percentages (including *CP&L*) and derives an average mobilization factor.

Table III.F.9-1
Summary of ICC/STB Approved Mobilization in Recent Cases

Case	Mobilization Percentage
<i>FMC</i> (STB 05/00 Decision)	2.4%
<i>WPL</i> (STB 09/01 Decision)	2.6%
<i>PPL</i> (STB 08/02 Decision)	2.2%
<i>TMPA</i> (STB 03/03 Decision)	2.0%
<i>Duke</i> (STB 11/03 Decision)	2.5%
<i>CP&L</i> (STB 12/03 Decision)	2.6%
<i>Arizona</i>	2.8%
Average of STB Decisions	2.4%

Source: *CP&L* at 107.

While AEPCO wishes to create the illusion that they are following STB precedent, they are in fact asserting mobilization costs that are less than half those repeatedly accepted by the Board.⁴³⁰ Moreover, their attempt to exclude performance bonds and demobilization costs has been soundly rejected. Therefore, based solely upon AEPCO's preferred rationale of relying upon previous STB precedents, the Defendants have calculated mobilization costs (including performance bond and demobilization) using a factor of 2.4 percent – the average of the most recent ICC/Board Decisions -- in their restatement of road property investment costs for a total mobilization cost of \$41.0 million.

10. Engineering

AEPCO's estimate of an engineering cost additive for the ACE is inadequate. AEPCO estimates a total additive for engineering for the ACE of 6.8 percent of construction costs, comprised of only 5.0 percent for basic services and 1.8 percent for resident inspection, based on a source that has no relevance to railroad construction. AEPCO also misrepresents other sources and, as a result, ignores completely the cost of construction management that the STB has consistently recognized as a legitimate cost of building a stand-alone railroad.

AEPCO's fundamental premise for its low engineering additive is its notion that as the size of a particular project increases, the percentage of the total that is applied to the engineering component declines. As is clear however from both AEPCO's own narrative and the detailed discussion of the individual components of the ACE construction in this narrative, the ACE construction, while large in overall project scope, will actually commence as a series of hundreds

⁴³⁰ In AEPCO Opening electronic workpaper "Mobilization.xls" AEPCO failed to compute mobilization for its microwave system. Using AEPCO's numbers, this omission understates AEPCO's mobilization costs by \$67,876 (*i.e.*, one percent of \$6,787,612).

of individual smaller projects along the length of the proposed route. As such, the ACE will require more, not less, of a construction management effort.

To justify this low additive, AEPCO misrepresents and misinterprets several sources and ultimately relies upon an irrelevant third source - a state-based Rural Utilities Service of the U.S. Department of Agriculture (RUS) purported standard for bids on water and wastewater projects. AEPCO asserts that the RUS standard allows for a five percent additive for Basic Services and an additional 1.8 percent additive for resident inspection for projects over \$25 million.⁴³¹ In fact, a review of AEPCO's limited supporting workpapers reveals that the figures quoted and relied upon by AEPCO are from a Farmers Home Administration fee schedule for Pennsylvania, but the ACE does not touch any part of the Commonwealth of Pennsylvania. AEPCO's first source is also a Pennsylvania-only recommended practice published by the Pennsylvania Society of Land Surveyors, the Pennsylvania Society of Professional Engineers and the American Consulting Engineers Councils of Pennsylvania and Greater Pittsburgh in 1975.

Further, AEPCO asserts, without support, that water and wastewater projects are more prone to unforeseen complexity than rail projects because of what AEPCO refers to as "unknown factors."⁴³² AEPCO lists similarities between water and sewer projects and railroads as obtaining aerial survey information and establishing a horizontal and vertical alignment and the calculation of cuts and fills. AEPCO also asserts that complex designs for pumping stations, waste water and water treatment facilities, the crossing of rivers and other obstructions and the requirements for subsurface investigations for water and sewer projects render them closely parallel in complexity to railroad design projects.⁴³³ AEPCO offers no evidence beyond these

⁴³¹ AEPCO Opening Nar. at III-F-77.

⁴³² AEPCO Opening Nar. at III-F-76.

⁴³³ AEPCO Opening Nar. at III-F-76.

anecdotal suggestions that the components of the basic engineering services for the types of rural water and sewer projects designed under the RUS are comparable to the design and construction of an over 500-mile railroad, or that the engineering for water and sewer projects is more complex than for railroad projects. In fact, as described in more detail below, the documents produced by AEPCO suggest just the opposite.

The BNSF/UP Engineering Consultants explain that AEPCO's Pennsylvania based 6.8 percent additive for engineering services is insufficient for the planning and design of the ACE railroad project and ignores completely the critical cost for construction management. This omission is particularly egregious given AEPCO's implicit assumption that the construction of the ACE will be broken into small segments with work mostly done simultaneously on a fast track schedule. Such an ambitious schedule requires diligent and constant construction management in addition to material and quantity control inspections, which AEPCO's estimate simply does not provide.

Based upon the activities required for a project of this magnitude, the BNSF/UP Engineering Consultants developed separate estimates for basic and special services from a relevant authoritative national industry publication for the planning, design, bid and construction phases of the project. In developing their estimate, the BNSF/UP Engineering Consultants take into consideration the construction schedule established by AEPCO, the engineering tasks that would have to be undertaken, and the corresponding labor, expenses and equipment costs.

At the outset of this analysis, it is important to focus on AEPCO's analysis (or lack thereof) of the proposed ACE construction. Although AEPCO does not bother to even identify the construction railheads or geographic areas covered by the various construction packages it refers to in its narrative, it is clear from AEPCO's description of its proposed construction

schedule that the construction of the ACE will be segregated into a number of mini-projects. AEPCO proposes six grading packages, six track packages, 21 bridge packages and additional signal and communication and structural packages. AEPCO explains that when the design phase is 60% complete, the multiple grading and bridge packages would be initiated with a special focus on access to critical sites and establishment of staging areas. AEPCO further asserts that, shortly thereafter, multiple bridge and structural contracts would start at their readily accessible locations.⁴³⁴ Such an aggressive schedule imposes a heavy burden on construction management because overseeing, coordinating and inspecting construction on multiple simultaneous projects requires rigorous management. Thus, the construction management portion of engineering costs, which AEPCO completely ignores, inevitably will be greater than that of a single location project such as those upon which the Pennsylvania RUS standards are predicated.

a. Critique of AEPCO's Evidence: AEPCO Has Misrepresented The Engineering Additives From its Source Data

AEPCO asserts that its proposed engineering additive for the ACE is supported by a number of "well-respected, often used sources."⁴³⁵ As discussed previously, two of the three sources are from Pennsylvania – a state not even touched by the ACE. Further, AEPCO is wrong in concluding that any of its cited sources are representative of the engineering effort that would be required for the ACE. AEPCO's reliance on its three sources is flawed in many respects.

AEPCO's first source is the out-dated, state-specific *Manual A of the Standards of Practice of Consulting Engineers* (1975) for Pennsylvania. The most current nation-wide version of the cost curves (*i.e.* engineering cost as a percentage of construction cost), that is not

⁴³⁴ AEPCO Opening Nar. at III-F-85.

⁴³⁵ AEPCO Opening Nar. at III-F-75.

restricted to Pennsylvania is the American Society of Civil Engineers (ASCE) cost curves from their 1981 *ASCE Manual 45*. The engineering cost curves cited by AEPCO are for “basic services” only. By definition, basic services do not include all of the planning, design and construction management services that will be required to engineer the ACE railroad. However, AEPCO does concede in citing this source that the ACE is a project of above average complexity and therefore subject to a higher design fee.

The second source upon which AEPCO relies, the *R.S. Means Building Construction Cost Data* is designed to apply only to building projects and is not intended for, or applicable to, the major transportation elements of a railroad like the ACE. Further, AEPCO misrepresents the Means additives by suggesting that the individual Means engineering fees are directly comparable to the overall engineering additive for the ACE. It is not, as evidenced by the fact that Means indicates that the fees for Architectural and Structural Engineering services are expressed as a percentage of the total project cost, while fees for specialized disciplines are a percentage of the cost of construction for elements of that discipline only. To render the Means data cited by AEPCO even remotely comparable to an overall ACE engineering additive, additives for all required engineering disciplines would have to be aggregated. Design services for a typical building project include architectural, electrical, landscape & site development, mechanical and structural disciplines enumerated by Means. This would result in a range of fees for professional design services as follows:

	<u>Discipline</u>	<u>Range</u>			<u>Unit</u>
<i>PLUS</i>	Architectural	4.9%	-	16.0%	Total Project
<i>PLUS</i>	Structural	1.0%	-	2.5%	Total Project
	Electrical	4.1%	-	10.1%	Discipline

-or-	Landscape & Site Development	2.5%	-	6.0%	Discipline
-or-	Mechanical	4.1%	-	10.1%	Discipline
	TOTAL FEES FOR ANY ELEMENT	8.4%	-	28.6%	

Thus, the proper interpretation of this source cited by AEPCO yields an engineering design fee of 8.4% to 28.6% of the estimated building construction cost, depending upon the discipline being considered.

AEPCO's third source, which it advertises as "*more current and inclusive*"⁴³⁶ is the Pennsylvania-specific engineering cost curve from the RUS. In addition to addressing the wrong state, the RUS data addresses *rural* water and sewer projects, which are typically less complex than *urban* water and sewer projects and much less complex than major transportation projects crossing hundreds of miles. Engineering for rural water and sewer lines are essentially a surveying exercise to lay lines along existing drainage features or roadways. Construction typically entails costs for trenching and pipe laying. Railroads, on the other hand, require a precise, complex geometric layout, extensive grading and roadbed preparation, sophisticated signaling and communications systems, bridges designed to carry heavy loads, buildings and complex fueling facilities and pose far more complex right-of-way issues.

AEPCO attempts to justify its use of the Pennsylvania RUS data by referring to the RUS information for New Mexico. However, AEPCO conveniently omitted the second of the three pages of this guideline in its workpapers. This second page⁴³⁷ happens to be the page that indicates that basic services do not include the following:

- Survey (both design surveys and construction stakeout)

⁴³⁶ AEPCO Opening Nar. at III-F-76.

⁴³⁷ BNSF/UP.SUPPRP.WP.III.F-0965.

- Construction Inspection
- Engineer & General Supervisor
- Reimbursable Expenses

The BNSF/UP Engineering Consultants also attempted to obtain RUS data for Colorado. The

response from Colorado⁴³⁸ indicates that they:

"have no such curve ... Engineering fees ... are negotiated by the firms themselves with the entity itself... I review each proposal on an individual basis and generally do not permit total fees, including construction inspection, administration and design to exceed 16% - 18% of total construction costs."

Clearly, AEPFCO has not interpreted the sources from which it derives its ACE

engineering additive correctly, nor has it established that its sources are representative of the

ACE construction. Therefore, AEPFCO's arguments should be rejected by the STB.

b. BNSF/UP's Development of Engineering Services

Adequate engineering services are essential to the success of a project of the magnitude, complexity and fast-track construction schedule as the ACE. All of the appropriate steps in the engineering process must be addressed, especially if the least cost construction option is going to be realized.

The American Society of Civil Engineers (ASCE) publishes a widely accepted *Manual 45 - Consulting Engineering: A Guide for the Engagement of Engineering Services*. Although *Manual 45* is periodically updated, the 1981 edition was the last one to include "cost curves" for engineering services. (As explained in subsequent editions of *Manual 45*, ASCE has since abandoned the practice of publishing cost curves).

In assessing *Manual 45*, it is extremely important to read and understand the terminology being used to describe and classify the various engineering services required for a project. AEPFCO has confused this issue by failing to categorize properly the engineering services

⁴³⁸ BNSF/UP, SUPPRP, WP, III, F-0967.

required for the ACE. A complete copy of this section of *Manual 45* is included in the workpapers.⁴³⁹ This section of *Manual 45* begins by indicating that “*engineering services ... can ... be grouped into two broad categories: (1) Consultations, investigations and reports; and (2) services for design-type projects.*” *Manual 45* further explains that the second category, “*engineering services for design-type projects are differentiated into two separate categories, i.e. Basic Services and Special Services.*” Whereas AEPCO has attempted to cast the listing of services in *Manual 45* as indicative that they are included under basic services, it is clear that the listing in *Manual 45* places services in three different categories:

- Consultations, investigations and reports (which are not included in basic services)
- Design-type projects – Basic Services
- Design-type projects – Special Services (which are not included in basic services)

Applying this to the explicit listing of services contained in *Manual 45*⁴⁴⁰ results in a classification of engineering services by phase of the project and as basic vs. special services as follows:

Phase	Basic Services	Special Services
Planning Studies	• <none>	• Feasibility Investigations • Cost Studies • Planning Studies
Design Phase	• Preliminary Design • Final Design • Specifications	• Surveying • Geotechnical Investigations

⁴³⁹ BNSF/UP.SUPPRP.WP.III.F-0968 to 0975.

⁴⁴⁰ BNSF/UP.SUPPRP.WP.III.F-0971.

	• Contract Documents	
Bid Phase	• Assistance to the Owner	• <none>
Construction Phase	• Office Consultation • Shop Drawings • Periodic Site Visits	• Construction Stakeout • Construction Management • Material Testing

(1) Planning Studies – Special Services

In more recent times, much greater emphasis and work effort has been placed upon Planning Studies for transportation projects. A good deal of this is in response to the myriad of environmental regulations that have emerged over the past several decades. Under the SAC barriers to entry principle, it is inappropriate to include these environmental-related costs for portions of the line that run along existing routes that did not face similar requirements when they were designed and constructed.

However, the location of the existing routes did not occur by happenstance. Today's railroad network is the result of a tremendous amount of planning, study and evaluation by the current and predecessor railroads. The importance of adequate planning is widely recognized as a necessary and cost-effective expenditure within the transportation industry and the AREMA guidelines.⁴⁴¹

The cost of performing Planning Studies can vary widely, depending upon the level of detail and number of options to be considered. The number of routes and analysis required to find the least cost option along the over 500 mile ACE is substantial. Several factors suggest the ACE costs for Planning Studies will be on the mid-to upper end of the range:

⁴⁴¹ BNSF/UP.SUPPRP.WP.III.F- 0976 to 0978.

- The SARR is intended to be the least cost, most efficient option. To arrive at this option requires an extensive amount of study to consider the vast array of options available. Not only does the basic route itself have to be assessed, but also the resulting construction techniques and costs need to be assessed for each alternative route.
- The ACE is following existing routes. These routes reflect not only the original planning that went into the route, but also refinements that are the results of years of operational experience and “tinkering” with the layout of the railroad.
- As discussed in § III.F.11, the level of contingencies included in the ACE is low for a project of this magnitude and complexity. To justify such a low contingency allowance demands adequate upfront planning.

All of the information on the existing route came at a cost to the railroad in the form of alternative route studies, design and construction experience, operational adjustments, maintenance experience, analysis associated with acquisitions and just plain trial and error. This knowledge should not be a “free” starting point for the ACE.

Fortunately, the ACE will be able to employ more modern, cost effective techniques to evaluate these options than those available to the railroad or its predecessors. Aerial reconnaissance and computer modeling will be far cheaper than the field reconnaissance methods available to engineers when the lines were originally evaluated.

Means offers some guidance in the area of planning and feasibility studies. Means indicates a range of 0.5% to 2.5% of total project cost for educational planning consultant services.⁴⁴² As demonstrated above, the ACE case warrants consideration of costs in the mid to upper level of this range. Nonetheless, the BNSF/UP Engineering Consultants have taken a conservative approach and used the low end of this range, which is 0.5%. Applying this 0.5% to

⁴⁴² BNSF/UP.SUPPRP.WP.III.F-0979 to 0980.

the estimated cost of the ACE of \$1.72 billion results in a cost of \$8.5 million for the Planning Studies.

Typically, planning for a multi-billion dollar project would stretch over years. While the ACE is allowed to assume this can be done within a limited time, that does not mean that it does not incur the costs for planning. It simply means that they are assumed to be accelerated. The low end of the RS Means range is conservative and is used here only in recognition of the SAC principle that the SARR is not liable for the environmental and regulatory costs that would be reflected in a larger percentage.

(2) Design Phase / Bid Phase / Construction Phase – Basic Services

ASCE's 1981 *Manual 45* contains a cost curve for basic services of 5.7% for projects of above average complexity.⁴⁴³ While ordinary railroad track construction is generally average complexity, the construction of an entire railroad system with over 500 route miles is above average complexity because of the magnitude of the project which involves construction of extensive facilities other than track laying, including fueling facilities, wastewater treatment plants, 460 bridges including several large bridges, office buildings, grade separations, pumping stations and sewer systems at rail yards, an 800 mile communications and microwave system, and its fast track construction schedule. This is also consistent with the first source cited by AEPCO that is a cost curve for projects of above average complexity.

Applying this 5.7% to the estimated cost of the ACE of \$1.72 billion results in a cost of \$97.3 million for the Basic Services for the Design, Bid and Construction Phases of the ACE.

⁴⁴³ BNSF/UP.SUPPRP.WP.III.F-0981 to 0982.

(3) Design Phase – Special Services

Special services required for the ACE during the Design Phase that are not included in the Basic Services described above include Surveying and Geotechnical Subsurface Investigations. The BNSF/UP Engineering Consultants employ a thorough, detailed analysis to arrive at the costs for these services for this particular project.

(a) Surveys

Location and design surveys are required to provide survey information on existing conditions upon which the design can be based.

AEPCO will have the advantage of using modern, lower cost aerial mapping techniques to obtain this information. This contrasts with the technology available to the railroad, at the time of original construction of the lines, which consisted of an extensive number of field survey crews working on the ground through rugged terrain.

The per acre unit cost for location and design surveys was developed using Means.⁴⁴⁴ This unit cost was then applied to twice the total number of acres of right of way and easements to be acquired for the ACE. Use of twice the acreage is required to account for the need for survey information beyond the proposed right-of-way line to:

- account for the fact that airplanes fly in straight lines to obtain this information
- provide data for the design of access roads
- provide data to assess drainage features
- provide data so engineers can assess the implications of slight alignment shifts during the design process.

⁴⁴⁴ BNSF/UP.SUPPRP.WP.III.F-0983 to 0984.

As detailed in the workpapers,⁴⁴⁵ the total cost for location and design surveys for the ACE is \$2.6 million.

(b) Geotechnical Subsurface Investigations

Geotechnical Subsurface Investigations (*i.e.*, borings, sampling and testing) of existing conditions are required to provide adequate data upon which the design can be based. Sufficient up-front geotechnical investigations during the design phase are required to avoid subsequent construction schedule delays due to unknown foundation conditions being encountered and increased unit bid prices as contractors attempt to mitigate the risk of the unknown subsurface conditions.

AEPCO claims to address the cost of geotechnical subsurface investigations by cobbling together a quote from a firm in Ohio, using a driller from Pennsylvania for an industrial development site. AEPCO's analysis includes a nominal number of borings, of insufficient depth for bridge sites only and totally omits borings at other key locations along the corridor as described below. Although AEPCO purports to include testing costs in its estimate, its worksheet does not include these costs. Clearly, AEPCO's attempt to use an easily accessible industrial site in the East is a poor indication of the cost required to conduct an adequate subsurface investigation program for an over 500-mile transportation corridor across undisturbed terrain.

Geotechnical Subsurface Investigations are conducted "upfront," before the corridor has been cleared and graded, and are required in four primary areas:

1. Evaluation of foundation conditions at bridges ("Bridges")
2. Evaluation of slope stability in cuts ("Cut Slopes")

⁴⁴⁵ BNSF/UP Supplemental Reply electronic workpaper "III F 10 Engineering.xls" Tab "Surveys."

3. Evaluation of the suitability of excavated and borrow site material for use as embankment (“Embankment Material”)
4. Evaluation of foundation conditions at culverts (“Culverts”)

The American Association of State Highway and Transportation Officials (AASHTO) is made up of representatives from state departments of transportation from across the country. AASHTO’s 1988 Manual on Subsurface Investigations⁴⁴⁶ contains “Guidelines for Minimum Investigations” that state:

Experienced geotechnical personnel in transportation agencies generally agree that about 0.7 to 1.0 percent of total construction costs should be allocated for an ‘average-condition’ project. For sites or alignments in areas which are underlain by poorer quality soil or rock units, or which may be impacted by geological constraints, an increased level of expenditure should be budgeted.

The ACE passes through a wide range of difficult geological conditions that include the Abo Canyon on the Clovis Subdivision, unpredictable shale and sandstone conditions, red sand beds, potential lava rock formations, and adverse conditions in the El Paso and Rio Grande areas. These conditions clearly support a level of expenditure for geotechnical subsurface investigations toward the upper end of this range. Nonetheless, the BNSF/UP Engineering Consultants have taken a conservative approach and used the mid-point of this range, or 0.85%. Applying this 0.85% to the estimated cost of the ACE of \$1.72 billion results in a cost of \$14.5 million for the Geotechnical Subsurface Investigations.

To verify this cost, a second approach was utilized. This approach uses the unit costs for borings and testing contained in Means.⁴⁴⁷ These unit costs were then applied to the total linear

⁴⁴⁶ BNSF/UP.SUPP.RP.WP III-F-0985 to 0987.

⁴⁴⁷ BNSF/UP.SUPPRP.WP.III.F-0988 to 0990.

feet of borings and the total number of tests required for the ACE to develop a cost for the geotechnical subsurface investigation program.

The depth of borings required at bridge sites is of particular importance. AEPCO's inadequate subsurface investigation program is predicated on boring depths of 20 feet. This is clearly inadequate when assessed against their proposed bridge foundation design and the AREMA Guidelines. AEPCO's proposed friction pile design calls for pile lengths of 30 feet and the AREMA Guidelines call for borings to extend at least 10 feet below the bottom of the pile.⁴⁴⁸ Thus AEPCO's own design requires borings of at least 40 feet in length. However, the BNSF/UP Engineering Consultants have determined that AEPCO's friction pile design is inadequate and that pile lengths of 45 feet will be required. Therefore, boring depths will need to extend 55 feet, not the 20 feet proposed by AEPCO, to accommodate the pile length required and the AREMA Guidelines.

As detailed in the workpapers,⁴⁴⁹ the total cost for Geotechnical Subsurface Investigations, using this second approach is \$15.9 million.

The cost using the AASHTO criteria and the cost using the Means data are fairly close. Because the Board has expressed its preference for percentages derived from respected neutral industry sources rather than built up costs, the cost based on the AASHTO criteria is used and the estimated cost of the Geotechnical Subsurface Investigations for the ACE is \$14.5 million.

(4) Construction Phase – Special Services

Special services required for the ACE during the Construction Phase that are not included in the Basic Services described above include Construction Stakeout, Construction Management

⁴⁴⁸ BNSF/UP.SUPPRP.WP.III.F-0991 to 0994.

⁴⁴⁹ BNSF/UP Supplemental Reply electronic workpaper "III F 10 Engineering.xls" Tab "Geotech."

and Material Testing. AEPCO purported to include all Construction Phase services in the 1.8% additive that is part of its overall 6.8% additive for engineering.⁴⁵⁰ This approach significantly understates the costs required to adequately protect the Owner's interest during the construction of the ACE. The BNSF/UP Engineering Consultants employ a more thorough, detailed analysis to arrive at their costs.

(a) Construction Stakeout

Construction Stakeout is the means by which the information in the design and plans is transferred to the field so the project can be built.

The major elements of construction stakeout that will be required for the ACE are:

1. Staking construction access roads
2. Staking vegetation clearing limits
3. Staking the railway centerline
4. Slope staking in cut and fill areas
5. Staking the location of drainage structures
6. Staking the location of bridge foundations
7. Re-staking the railway centerline after rough grading is complete
8. Setting finish grade stakes
9. Layout for bridge superstructures
10. Rail yard facilities layout
11. Layout for buildings
12. Layout for signal and communication systems
13. Track layout, including yards
14. As-built surveys

⁴⁵⁰ AEPCO Opening Nar. at III-F-81.

AEPCO will have the advantage of using modern, lower cost electronic survey equipment to perform this task. This contrasts with the technology available to the railroads, at the time of original construction of the lines, which consisted of an extensive number of field survey crews working on the ground.

The unit cost, per day, for a construction stakeout survey crew was developed using Means.⁴⁵¹ This unit cost was then applied to the total number of survey crew-days required for the ACE to develop the cost for Construction Stakeout services.

As detailed in workpapers⁴⁵² the total cost for Construction Stakeout surveys for the ACE is \$11.4 million.

(b) Construction Management

Construction of the ACE is truly a monumental undertaking that will require a professional staff to manage. Construction of over 500 miles of railroad with over 400 bridges, rail yards and rail facilities dwarfs any project in recent memory. Construction of such “mega projects” requires far greater oversight and management – a fact that is drawing increasing attention in the industry and Congress.⁴⁵³ The staff and systems this requires are costly.

A vast array of suppliers, contractors, subcontractors and work crews must be choreographed to execute literally hundreds of smaller, individual projects in order to complete the ACE within its 30-month schedule. Any unexpected problem in the process will cost the ACE dearly in terms of both time and money. Thus, in order to construct a least cost railroad on

⁴⁵¹ BNSF/UP.SUPPRP.WP.III.F-0995 to 0997.

⁴⁵² BNSF/UP Supplemental Reply electronic workpaper “III F 10 Engineering.xls” Tab “Stakeout.”

⁴⁵³ BNSF/UP.SUPPRP.WP.III.F-0998.

an accelerated schedule, AEPCO must account for adequate resources to manage the project during construction.

The BNSF/UP Engineering Consultants utilize three sources to develop a cost estimate for Construction Management. The first source is Means, which the STB has looked to in some previous cases for data on construction management fees.⁴⁵⁴ The Means data indicate that construction management fees for building projects range from 2.50% to 4.00%.⁴⁵⁵ In *FMC*, the STB used the average of this range, which is 3.25%.⁴⁵⁶ However, there is evidence that using this midpoint understates the cost of construction management services because

- The Means data cited applies to building projects. Unfortunately, Means does not contain information for construction administration costs for transportation projects, such as the ACE. However, by using the BNSF/UP Engineering Consultants' second source (see below) this data can be correlated to transportation projects.
- The Means data is for a \$5 million project. As previously discussed, construction management complexities, and costs, increase for “mega projects” such as the ACE.

Second, the BNSF/UP Engineering Consultants have considered a recent 2000 survey by the Construction Management Association of America (CMAA).⁴⁵⁷ This survey indicates that construction management costs for transportation projects are higher than the 3.25% average cost indicated in the Means data for buildings. The CMAA survey supports the following construction management costs:

Overall average	4.6%
Private Sector average	4.8%

⁴⁵⁴ *FMC*, Appendix C, Article K.2 at 146. In *PPL*, the STB used the low end of the Means range, which is inappropriate for the reasons stated in this section.

⁴⁵⁵ BNSF/UP.SUPPRP.WP.III.F-0999 to 1000.

⁴⁵⁶ *FMC* at 146.

⁴⁵⁷ BNSF/UP.SUPPRP.WP.III.F-1001 to 1004.

Transportation Projects average	6.6%
New Transportation Projects average	4.3%

The BNSF/UP Engineering Consultants adopt a conservative approach and use the 4.3% average cost for new transportation projects.

Fortunately, the CMAA survey cited above also provides data on building projects. This allows this CMAA data to be compared to the Means data to assess the legitimacy of using the CMAA data for transportation projects. The data in the CMAA study for a variety of building types indicates an average cost for construction administration for new building construction of 3.22%.⁴⁵⁸ This compares favorably with the Means average of 3.25% for building projects. Since the CMAA data for buildings matches the Means data for buildings, it is reasonable to use the CMAA data (*i.e.*, 4.3%) for transportation projects. Applying this 4.3% to the estimated cost of the ACE of \$1.72 billion results in a cost of \$73.4 million for Construction Management for the ACE.

Finally, the BNSF/UP Engineering Consultants have undertaken a detailed estimate of the effort and costs required to adequately provide construction management services for the ACE project. This analysis takes into account the field and office staff and expenses that will be required to schedule and manage a construction workforce that will include:

1. Management of the overall construction project and the individual construction segments. This includes
 - a. Construction contract administration
 - b. Materials management
 - c. Scheduling
 - d. Coordination of construction stakeout and material testing
2. Management, oversight and resolution of problems of construction activities in each of the specialized areas of construction:

⁴⁵⁸ BNSF/UP.SUPPRP.WP.III.F-1005 to 1012.

- a. Clearing, grading, drainage and culverts
- b. Bridges
- c. Trackwork
- d. Yards and facilities
- e. Signals and communications

The construction management staff required is a function of the volume of work being performed and the construction schedule. AEPCO has provided little guidance on their intent for organizing the construction, other than general indications that the ACE is divided into construction segments or contract packages (*e.g.*, grading and drainage, bridge construction, trackwork, and communications and signals).

The BNSF/UP Engineering Consultants used 50 miles (which results in approximately 17 construction segments) as a reasonable length for a construction segment for the following reasons:

- During the initial phases of construction, when access is via temporary roads or circuitous detour routes, twenty five miles (*i.e.*, half of the 50 miles) is a reasonable one-hour drive for construction management personnel to access any place along the segment from the field office.
- The construction cost of each segment will be approximately \$100 million, which is a large, but manageable size.
- Approximately 460 bridges along approximately seventeen 50-mile segments results in approximately 25 bridges per construction segment, which is a reasonable number for two senior engineers, with appropriate support staff, to handle over the 20-month construction period.

The unit costs for the staff and expenses were developed using the Means⁴⁵⁹ and *PSMJ*⁴⁶⁰ data. *PSMJ* was used because Means lacks data on hourly rates for the engineering staff required for construction management. The *Professional Service Management Journal* provides

⁴⁵⁹ BNSF/UP.SUPPRP.WP.III.F-1013 to 1015.

⁴⁶⁰ BNSF/UP.SUPPRP.WP.III.F-1016 to 1019.

management services and publication to the Architectural and Engineering (A/E) communities. The data used is from their 2002 (17th edition) *A/E Fees & Pricing Survey*. These unit costs were then applied to the effort required for the ACE to develop the cost for Construction Management.

As detailed in workpapers,⁴⁶¹ the total cost for Construction Management for the ACE is \$63.7 million.

Since the cost using the CMAA data and the detailed estimate using the Means and PSMJ data are similar, the CMAA data is used because the Board has expressed its preference for use of neutral percentages and it has accepted the CMAA percentage in *Duke* and *CP&L*. The total estimated cost of the Construction Management for the ACE is \$73.4 million.

(c) Material Testing During Construction

As with all major construction projects, the quality of the material used in the ACE must be verified and monitored. This is accomplished by a team of field technicians conducting a variety of tests on the material as construction progresses. These tests range from compaction tests of the earth fill and subgrade to concrete strength tests to inspection and verification of materials provided by fabrications shops.

These services may be provided by the Contractor as part of a Quality Control program or by an independent firm hired by the ACE. Regardless, the testing costs are incurred.

The BNSF/UP Engineering Consultants' approach uses the unit costs for material testing technicians contained in Means.⁴⁶² Alternatively, Means provides data on the cost of each of the multitude of tests that will be required. Since these per-test costs would yield significantly

⁴⁶¹ BNSF/UP Supplemental Reply electronic workpaper "III F 10 Engineering.xls" Tab "Manage."

⁴⁶² BNSF/UP.SUPPRP.WP.III.F-1020 to 1023.

higher costs, the BNSF/UP Engineering Consultants chose the more conservative approach of using the per-staff cost. While this understates the cost of material testing because it doesn't include the costs of testing equipment and supplies, it is more indicative of how the work would actually be carried out on a project the size of the ACE.

This unit cost was then applied to the total number of days required for the ACE to develop the cost for Material Testing services.

As detailed in the workpapers,⁴⁶³ the total cost for material testing during construction for the ACE is \$24.7 million.

c. Summary

Table III.F.10-1 summarizes the engineering costs for the ACE:

**Table III.F.10-1
SUMMARY OF ENGINEERING COSTS**

<u>Item</u>	<u>Cost</u> <u>(Millions)</u>
Planning Studies	\$8.5
Basic Services (Design, Bid, Construction)	\$97.3
Surveys	\$2.6
Geotechnical Subsurface Investigations	\$14.5
Construction Stakeout	\$11.4
Construction Management	\$73.4
Material Testing	\$24.7
TOTAL	\$232.5

11. Contingencies

In its opening evidence, AEPCO attempts to re-open the long-standing STB precedent of including a contingency factor of at least ten (10%) percent. AEPCO presents two arguments in

⁴⁶³ BNSF/UP Supplemental Reply electronic workpaper "III F 10 Engineering.xls" Tab "Testing."

support of its attempt to reduce the contingency to eight (8%) percent. It first recycles an argument that was rejected long ago that focuses on the “unique aspects of the concepts surrounding the building of a stand-alone railroad.” This argument is just another way of saying that because the railroad is being built on an existing route where certain quantities are already known, and sufficient supplies and equipment to complete the project on time are assumed, there should be no surprises. Not only has that argument been soundly rejected by the Board, but it is simply illogical—contractors who undertake similar projects, using basically similar designs, nonetheless encounter unexpected problems and therefore include contingencies in their bids, as is evidenced by the inclusion of provisions for contingencies in all engineering handbooks and the use of such by virtually all engineers. Even though much of the ACE is being built on a line that already exists, that does not mean there are fewer unknowns.

AEPCO’s second argument is that modern day practice has introduced critical path project management and risk management techniques that have obviated the need for a contingency factor. The BNSF/UP Engineering Consultants note that as desirable as that may sound, successfully identifying all potential causes of problems in advance is still the ideal and not the norm. Examples demonstrating that such modern techniques have not mitigated the need for a contingency factor are all around us. Despite employing a sophisticated estimating and project management system, the Boston Central Artery Project has escalated in cost from \$2.6 billion in 1985 to over \$14 billion today, with projections of up to \$18 billion by the time the project is completed.⁴⁶⁴ Similarly, Washington’s own Wilson Bridge (Interstate 495 bridge over the Potomac River) replacement project estimated costs have ballooned to 75 percent above

⁴⁶⁴ BNSF/UP.SUPPRP.WP.III.F-1025 to 1026.

original estimates. These real-world modern-day assessments of escalating costs and blown budgets are typical of mega projects such as the ACE.

In the experience of the BNSF/UP Engineering Consultants, contingency factors in excess of ten percent are not uncommon at the *final* design level of a project of this magnitude, and are substantially higher during the initial planning stage. As planning and design work progress, the estimates become more site specific and precise, and contingencies are reduced accordingly. There is a body of resources that has long supported contingencies that decline from twenty (20%) percent during Planning to ten (10%) percent, or maybe less, during Construction. For example:

- Means, which AEPCO cited, includes information on contingencies. However, AEPCO incorrectly characterized the Means data as supporting a contingency range of 10% to 3% when, in fact, it identifies a potential range of 20% to 3%, depending upon the stage of project development.⁴⁶⁵
- The American Society of Civil Engineers (ASCE) 1981 *Consulting Engineering: A Guide for the Engagement of Engineering Services*, supports contingency factors of 20% to 10%.⁴⁶⁶
- The 1994 U.S. Army Corp of Engineers' policy for contingencies, recognizes the need for large contingencies. Appendix D at page D-9 of the Corp manual provides a "reasonable guide" for projects with an estimated total direct construction cost of more than \$10,000,000 in which it recommends 20% at the reconnaissance/feasibility stage, 15% at the project/design stage, and 10% at the plans and specifications stage.⁴⁶⁷

Clearly, there is no single, one-size fits-all "standard practice" on the use of contingencies in construction cost estimates. However, there is general consensus that the

⁴⁶⁵ BNSF/UP.SUPPRP.WP.III.F-1027 to 1028.

⁴⁶⁶ BNSF/UP.SUPPRP.WP.III.F-1029 to 1030.

⁴⁶⁷ BNSF/UP.SUPPRP.WP.III.F-1031 to 1032.

contingency should decrease as the project develops from planning to design to bidding generally along the following lines:

Planning Phase	20% Contingencies
Preliminary Design Phase	15% Contingencies
Final Design Phase	10% Contingencies

AEPCO asserts “a factor is normally added to the contingency item for uncertainty in obtaining bids from contractors [and] in this case the cost estimates ... are far more certain ... [because] AEPCO has obtained actual quotes from contractors and suppliers.” In effect, AEPCO is arguing that the project is somehow beyond the design phase and into the bidding phase. Nothing could be further from the truth.

First, obtaining input and cost estimates from contractors and suppliers during the planning phase of a project is nothing new. Prudent engineers routinely do this as a normal course of business when they encounter situations and issues with which they are unfamiliar. Second, there appears to be an implication in AEPCO’s assertion that the “quotes” they have obtained are some how equivalent to a bid price. Clearly, much of the supporting documentation AEPCO has provided in this regard is more appropriately characterized as telephone conversations based upon very limited and incomplete information. A telephone response based upon a verbal description is in no way comparable to a bonded bid price based upon hundreds of sheets of detailed drawings and thousands of pages of detailed specifications that would ultimately be required for the ACE project.

Despite the contradictory evidence of real-world practice, which would argue for a 15-20% contingency factor for a project at the planning level of the SARR, the Railroads reluctantly accept the Board’s standard of a ten (10%) percent contingency factor in SAC cases, based solely

on STB precedent to date. The Board has not only consistently approved the use of a ten (10%) percent contingency factor in SAC cases, but appears disinclined to reexamine this issue. The Board therefore clearly should reject AEPCO's proposed eight (8%) percent factor and keep in mind that this project in the real world would be considered in the most preliminary stages of planning, where a contingency factor of ten percent would be viewed as extremely out of line with projects of this magnitude. Thus, any attempt by complainants in future SAC cases to reduce that factor to an even lower level as AEPCO attempts here is unreasonable. Moreover, the Railroads' acquiescence in an extremely low overall contingency factor of ten (10%) percent assumes a level of preplanning that can only be achieved through adequate engineering. Thus, the use of a ten percent contingency is only justified if used in combination with realistic engineering costs.

Applying this ten (10%) factor to the estimated construction cost of the ACE of \$1.72 billion results in a cost of \$170.8 million for contingencies on the ACE.

12. Other

a. El Paso Trainway

AEPCO has ignored the costs associated with the underground "Trainway" that ACE must build in order to traverse downtown El Paso. AEPCO has built ACE's mainline along UP's existing alignment to UP milepost 1297.76, roughly at the east end of UP's Dallas Street Yard in El Paso, where ACE will deliver eastbound trains interchanged with UP. ACE's mainline thus passes through downtown El Paso. A map depicting the ACE route and the location of the Trainway is included as BNSF/UP Supplemental Reply Exhibit No. III.F.12-1.

AEPCO has ignored the extraordinary costs associated with ACE's (and UP's) route through downtown El Paso. The only construction costs that ACE has assumed are those associated with building double-track across flat open countryside. In fact, however, ACE's

route is submerged in a half-mile-long trench below El Paso's downtown streets – known as the Bataan Memorial Trainway – that UP's predecessors built between 1947 and 1951.⁴⁶⁸ This massive project was paid for in part with public funds, but UP's predecessors paid 33.7 percent of the costs of the project.⁴⁶⁹ Total project costs totaled almost \$5 million dollars (in 1947 dollars), and included costs for excavating a trench through downtown El Paso, building huge retaining walls the entire length of the trench, and constructing numerous street overpasses to reconnect the city streets bisected by the new trench.⁴⁷⁰

Under settled Board precedent, ACE must bear the costs – at 2001 levels – of constructing a similar grade-separated route for its double track mainline. BNSF/UP estimate the minimum costs of such a project – including a trench just wide enough for ACE's two tracks – to exceed \$9.5 million. BNSF/UP's estimate is highly conservative. It includes only three basic construction elements, all re-sized to accommodate ACE's double-track mainline instead of the three-track configuration for which the project was originally designed: the excavation associated with removing earth and rock down to permit installation of track and drainage facilities (the latter of which are assumed to be paid for by others); the construction of

⁴⁶⁸ The west end of the Trainway is depicted in a vintage postcard included in BNSF/UP.SUPPRP.WP.III.F-1034. Aerial and ground photographs of the 3,300-foot Trainway as it exists today are included in BNSF/UP Supplemental Reply electronic workpaper "III F 12 Trainway Photos.doc."

⁴⁶⁹ The costs of the project were shared by the State of Texas, the City of El Paso and three railroads, all of which are UP predecessors pursuant to a 1947 agreement. *See* 1947 Agreement between the State of Texas, the City of El Paso, the El Paso and Southwestern Railroad Company (EP&SW), Texas & New Orleans Railroad Company (T&NO) and the Texas & Pacific Railway Company (T&P), Article VII (1) and (2) (defining "Joint Costs" paid in part by the railroads.). BNSF/UP.SUPPRP.WP.III.F-1037 to 1076. Joint costs totaled \$4.611 million; the State paid \$1.5 million and the railroads paid 50% of the remainder, or \$1.555 million. *See* EP&SW Board Minutes, April 1947 at BNSF/UP.SUPPRP.WP.III.F-1035 to 1036. The railroads' net share was thus 33.7% (*i.e.* \$1.555 million divided by \$4.611 million).

⁴⁷⁰ *Id.*

economical soldier-pile retaining walls; and the construction of six roadway overpasses to replicate the overpasses that exist today and were part of the original 1947 project.⁴⁷¹

UP/BNSF's estimate necessarily omits many elements of costs that would be associated with completing a project of this sort through the downtown of a significant urban area.⁴⁷² ACE's 33.7 percent share totals \$3.222 million.

To avoid any double count of costs, the BNSF/UP Engineering Consultants calculated the amount of ACE's total earthwork costs that is attributable to the portion of ACE's right of way that traverses the Trainway. BNSF/UP have removed that amount of costs from ACE's share of Trainway costs, on the assumption that – unlike the incumbents – ACE would not have to grade its railroad first and then subsequently contribute to the building of the Trainway. Using the average cost per track-mile for excavation yields \$235,000 for the length of the Trainway and total net Trainway costs of \$2.987 million.⁴⁷³

b. Schedule

The BNSF/UP Engineering Consultants do not take issue with AEPCO's proposed construction schedule for the ACE.

⁴⁷¹ BNSF/UP Supplemental Reply electronic workpaper "III F 12 Trainway.xls." BNSF/UP.SUPPRP.WP.III.F-1077 to 1115.

⁴⁷² As another indication that UP/BNSF's estimate of 2001 Trainway-related costs is highly conservative, BNSF/UP note that the \$4.611 million spent on the original project in 1947 dollars is equivalent to more than \$36.5 million in 2001 dollars (for an ACE share of \$12.3 million). See <http://eh.net/hmit/ppowerusd/>.

⁴⁷³ BNSF/UP Supplemental Reply electronic workpaper "III F ACE Construction.xls."

G. DISCOUNTED CASH FLOW ANALYSIS

1. Cost of Capital

Defendants have accepted AEPCO's cost of capital.

2. Inflation Indices

The prices of goods and services used by the ACE will change in future years, and it is necessary to reflect various rates of inflation for capital assets and operating expenses, over the useful life of the ACE, in order to recover properly those capital costs and operating expenses. Accordingly, forecasts of (1) operating expenses, (2) capital costs, and (3) land values are needed to run the 20-year DCF model and to compute overall stand-alone costs for the ACE.

a. Operating Expenses

For operating expenses, AEPCO employed a forecast of the RCAF-A from DRI-WEFA's RCAF forecast dated October 2001. AEPCO provides no explanation of why the RCAF-A is the appropriate index to adjust stand-alone operating expenses nor does it offer any explanation for using the now stale October 2001 forecast. In its rebuttal narrative, AEPCO makes a passing reference to the Board's decision in *WPL* and concludes that "...there is substantial reason to think that the traffic would be able to benefit from productivity improvements, particularly given the least cost, most-efficient nature of the SARR." AEPCO Rebuttal Nar. at III-G-4.

The Board has historically relied upon RCAF-U data to estimate rates of change in future operating expenses in stand-alone railroad cases and affirmed its position most recently in *Duke* and *CP&L*.

Use of the RCAF-U is clearly the appropriate approach for at least two related reasons. First, because the ACE is designed to be the most efficient, least-cost railroad, it would be inappropriate to impute to the ACE improvements in productivity that the nation's Class I railroads are still in the process of achieving. These efficiencies (and then some) are already

built into the base year operating expenses that have been developed for the ACE. Thus, it is much more likely that future operating expenses on the ACE will inflate at the rate of the RCAF-U, not at the rate of the RCAF-A.

Second, most railroad productivity improvements come from technological improvements that occur over time as assets are replaced – a point the Board recognized in its *WPL* decision.¹ In the real world, railroad assets of all types are being replaced continuously, so improvements in productivity occur across asset types year by year. In the stand-alone analysis, however, the ACE is assumed to be built in its entirety over a three-year time period, and most of the investment is in assets with lives longer than the 20-year DCF period. Under these circumstances, it makes no sense to impute to the ACE the productivity anticipated for the nation's railroad industry as a whole.

In its *TMPA* decision, and more recently in its *Duke* and *CP&L* decisions, the Board agreed and held that RCAF-U is the appropriate index to apply to operating expenses because the RCAF-A incorporates productivity adjustments that there is no reason to believe a stand-alone railroad transporting only coal in unit trains could achieve. The Board in *TMPA* held: “We have no evidence, and we find it unrealistic to assume, that projected industry-wide productivity adjustments would result primarily from the transportation of coal. In the absence of any evidence showing specific productivity improvements for unit coal train operations . . . we use the RCAF-U to index the operating expenses . . .” *TMPA* at 161. AEPCO has submitted no evidence that it would be able to achieve specific productivity gains in its unit train or

¹ See *WPL* at 106, n. 197: “For example, the parties assume that the [stand-alone railroad] would replace its information technology and communications systems every 5 years. The [stand-alone railroad] could be expected to purchase equipment that would allow for productivity improvements.”

merchandise train operations. Nor could it submit evidence that it would be able to do so given its assumption that the ACE would be a least-cost, most-efficient railroad.

In addition, AEPCO's reliance on *WPL* as precedent is not relevant for this proceeding. As the *WPL* decision explains, the Board did not accept an index that captures all of the industry-wide productivity reflected in the RCAF-A as AEPCO advocates here. Rather, the Board accepted a UP internal forecast of expected inflation in providing its coal transportation service. While that estimate did include some unspecified level of future productivity, because it was applicable to highly efficient unit coal train operations, it is unlikely that it was anywhere near the level of productivity in the railroad industry as a whole. Further, the UP coal specific forecast likely considered the effects of planned short term capital expenditures for the UP system. Such expenditures are not explicitly accounted for in the Board's DCF process.

In its DCF analysis, BNSF/UP has relied upon the Board's traditional approach of applying the DRI-WEFA forecast of the RCAF-U to estimate operating expenses in future years, but used a December 2003 forecast in place of the three year old October 2001 forecast relied upon by AEPCO.² This more recent forecast also includes historical changes in the RCAF-U through 2003, which BNSF/UP has used in place of AEPCO's forecasts for the same period.

b. Road Property Assets Other than Land

The annual inflation forecast used by AEPCO to calculate the value of the ACE's road property assets is based on a DRI-WEFA October 2001 forecast for rail labor and rail materials and supplies. As AEPCO points out, this is the same procedure utilized by the Board in *FMC*. However, as the Board itself recognized, the standard Board/ICC procedure has "relied on historical rates of railroad inflation to project future inflation." *FMC* at 179. More significantly,

² DRI WEFA changed its name to Global Insight. A copy of the December 2003 Global Insight Forecast is included as BNSF/UP.RP.WP.III-G-0001 to 0005.

in three decisions rendered *subsequent* to *FMC*, *i.e.*, *WPL*, *PPL*, and *TMPA*, the Board has returned to its practice of using a five-year average of the historical AAR indexes to forecast future changes in road asset values. However, in its recent decisions in *Duke* and *CP&L*, the Board has again changed course on this issue, explaining that forecasts of future inflation, when available, are preferable to historical inflation rates. For this proceeding, to eliminate the number of differences between the parties, BNSF/UP have accepted AEPCO's use of the DRI-WEFA forecast, but corrected AEPCO's indexes to reflect the December 2003 forecast.

c. Land

AEPCO's filing used a composite index for all land owned by the ACE. In its reply, BNSF/UP adopts AEPCO's land inflation value

3. Asset Lives

The Board's DCF model uses estimates of asset lives to determine the proper replacement and recovery schedule for each of the construction road property accounts. AEPCO uses the BNSF asset lives for all road property accounts except for ties, for which it assumes an 80 year life, presumably because of its assumed use of steel ties. BNSF/UP accept AEPCO's use of the BNSF asset lives for all accounts except ties and reject AEPCO's 80 year tie life. As explained in Section III.F.3.c, the BNSF/UP Engineering Consultants determined that AEPCO's proposal to use steel ties was unworkable and developed construction costs for the ACE assuming the use of wood ties. Therefore BNSF/UP use the BNSF average tie life of 21 years in place of the 80 years assumed by AEPCO.

4. Tax Liability

As did AEPCO, BNSF/UP has calculated Federal taxes payable by the ACE in a manner consistent with the approaches approved by the Board in prior maximum rate cases. *See, e.g., FMC* at 178-81; *WTU* at 714. The ACE is assumed to pay federal taxes at the corporate rate of 35%, with payments for debt interest, depreciation expense, and state income taxes treated as deductibles. The ACE also will be subject to income taxes in Arizona, New Mexico and Texas. Consistent with the method adopted by the Board in *FMC* and *APS*, the taxes applicable to railroads in each of the states were weighted together based on the number of ACE route-miles in each state.

5. Other

a. Capital Cost Recovery

The Board's DCF methodology uses economic depreciation to calculate the capital recovery cost of the stand-alone entity's property. The value of an asset at any point in time thus equals the discounted present value of the earnings that it will produce over its remaining useful life. Consistent with long-standing Board/ICC precedent, AEPCO employed a 20-year DCF period to develop annual costs of assets, and BNSF/UP have adopted the same approach, including the calculation of a residual value to reflect the continued operation of the railroad after the end of the 20-year DCF period (*i.e.*, after 2020) using the methodology endorsed by the Board in *FMC*, *WPL*, *TMPA*, *Duke* and *CP&L*. As did AEPCO, BNSF/UP employed the "time-based" method of capital recovery adopted by the Board in these recent decisions.

b. Reparations

BNSF/UP's stand-alone cost evidence demonstrates that, when properly developed, the stand-alone costs of the ACE substantially exceed the revenues that would be generated by the ACE traffic group. Under such circumstances, the issue traffic rates are reasonable and no rate prescription is warranted.

H. RESULTS OF SAC ANALYSIS

As discussed in Section III.G, BNSF/UP have calculated the ACE's cost of moving coal to AEPCO's Cochise facility. The results of those calculations are summarized in the table at the end of this Section and set out in detail in Exhibit III.H-1. The following paragraphs describe the contents of Exhibit III.H-1.

1. Road Property Investment Values

The calculation of road property investment costs is based on construction cost as of 1Q01. This calculation is summarized in Table C. The investment cost incorporates the amount of investment the residual ACE would be required to incur for the procurement of equity financing.

2. Interest During Construction

Interest During Construction ("IDC") accrues on the assets of the ACE. Table D contains both the total IDC amount and the IDC amount that is debt-related. IDC is calculated based on the investment values in Table C, the composite cost of capital from Table A, and the length of finance period for each account. The construction schedule described in Section III.F determines the length of the finance period for each asset account. The amount of IDC that is debt-related is calculated by multiplying the investment by the length of the finance period, the ACE's percentage of debt, and the cost of debt. For tax purposes, the debt-related IDC is shown as an interest deduction during the construction period.

3. Amortization Schedule of Assets Purchased With Debt Capital

Table E is the amortization schedule for the debt-related portion of the ACE's investment. The debt principal is developed by multiplying the debt percentage from Table A – for the appropriate investment period – by the sum of the total investment and the interest during construction. The quarterly annuity payment is then calculated based on the principal, the debt

rate from Table A, and the DCF model life of 20 years. The amount of interest included in the quarterly payment is calculated by multiplying the beginning balance (*i.e.*, the principal in the first period) by the interest rate.

4. Present Value of Replacement Cost

Table F calculates the additional investment (on a present value basis) the ACE would have to make if the hypothetical railroad replaced each asset indefinitely at the end of each asset's life. This additional investment is added to the initial investment in Table I prior to determining the quarterly cash flows.

5. Tax Depreciation Schedules

Table G displays the tax depreciation required under the Federal Tax Code currently in effect.¹ Investment in communications (Account 26), signals and interlockers (Account 27), and the track accounts (Accounts 8-12) was depreciated over seven (7) years employing a 200 percent declining balance methodology switching to straight-line depreciation when the straight line percentage exceeds the declining balance percentage. Investment in bridges and culverts (Account 6), public improvements (Account 39), fences and roadway signs (Account 13), roadway buildings (Account 17), fuel stations (Account 19), shops and engine houses (Account 20) and public improvements (Account 39) was depreciated over 15 years using a 150 percent declining balance method switching to straight-line depreciation. Investment in grading (Account 3) was amortized over 50 years using straight-line amortization.

¹ The mandatory method for depreciating most tangible property placed in service after December 31, 1986 is the Modified Accelerated Cost Recovery System ("MACRS").

6. Average Annual Inflation In Asset Prices

Table H calculates the average annual inflation rate that is applied to the capital recovery charge in Table I. The weighted average inflation rate was used because Table H calculates the required capital recovery necessary to return the investment. All road property accounts are indexed at the quarterly rates shown in Table B. The weighted average inflation rates are based on the inflation indexes discussed above in Section III.G.

7. Discounted Cash Flow

Table I displays the calculation of the capital carrying charge and associated flow of funds required to recover the total road property investment. Inputs to this spreadsheet were taken from the tables described above. The quarterly capital recovery stream reflects the tax benefits associated with interest on the investment financed with debt from Table E and the road property tax depreciation from Table G. The cash flow shown in Column (8) of Table I is the amount remaining each quarter after the payment of federal and state tax liabilities. This cash flow is used for payment of return on and return of total investment in the ACE. This quarterly figure is then discounted by the fourth root of the composite annual cost of capital from Table A, adjusted to reflect the asset being placed in service on January 1, 2002. The present value cash flow is then summed for each quarter along with the future cash flow and the total equals the total cost that must be recovered. The future cash flow is the residual value of the unconsumed assets of the ACE and serves to reflect the cash flow required to account for the value of the assets not consumed during the 20-year life of the DCF model.

The development of the quarterly levelized capital carrying charge requirement is a relatively simple calculation, *i.e.*, starting capital carrying charge requirement multiplied by the quarterly index factor from Table H that will recover total investment during the 20 year DCF model period. The starting capital carrying charge requirement that recovers the total investment

is developed through an iterative process in which an arbitrary starting cost per ton is adjusted upward or downward as necessary until the starting quarterly charge yields a cumulative present value cash flow that just equals the required investment.

8. Computation Of Tax Liability -- Taxable Income

Table J - Part 1 displays the calculation of the ACE federal tax liability. The procedures followed to develop the federal tax liability are those discussed in Section III.G.3. Table J - Part 2 displays the calculation of the ACE state income tax liability, as discussed in Section III.G.

9. Operating Expenses

Table K displays the operating expenses incurred in each year of the ACE's operation based on the traffic levels described earlier. Rows were added to this Table to accommodate stand-alone expenses for Training Costs and Burden Shifting discussed in Section III.D. Table K uses the annual operating costs, states them on a quarterly basis, and indexes them to reflect inflation over the life of the ACE based on the RCAF-U inflation rates shown in Table B.

10. Summary of SAC

The total SAC for the ACE based on investment and operating costs is summarized in Table L of Exhibit III.H-1. The capital requirement from Table I and the annual operating expenses from Table K are presented and summed in Table L for each year the ACE operates. The following tables summarize these results.

Table III.H-1
Summary of Stand-Alone Cost Results - ACE
(All Figures in Millions of Dollars)

Year	Annual Revenue	Stand-Alone Cost	Difference
2001	\$393.4	\$567.8	(\$174.4)
2002	392.4	553.8	(161.4)
2003	394.1	565.9	(171.8)
2004	394.6	581.8	(187.1)
2005	399.3	594.6	(195.3)

2006	403.1	608.9	(205.8)
2007	409.1	624.7	(215.5)
2008	416.7	638.6	(221.9)
2009	425.5	654.4	(228.9)
2010	428.6	670.3	(241.8)
2011	431.7	686.8	(255.1)
2012	434.9	703.7	(268.8)
2013	438.2	721.0	(282.8)
2014	441.5	738.8	(297.3)
2015	444.9	757.0	(312.1)
2016	448.3	775.7	(327.4)
2017	451.8	794.9	(343.1)
2018	455.4	814.6	(359.2)
2019	459.1	834.8	(375.7)
2020	462.7	855.5	(392.7)

As noted above, the full results of the SAC analysis are contained in BNSF/UP Supplemental
Reply Exhibit III.H-1.

IV. WITNESS VERIFICATIONS

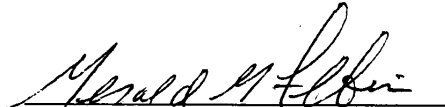
1. Gerald G. Albin

Gerald G. Albin is a Principal and Vice President of TranSystems Corporation, a civil engineering company located in Denver, Colorado. His business address is 4949 S. Syracuse, Suite 620, Denver, CO 80237. Mr. Albin is a registered professional civil engineer in five states including Colorado, Wyoming, Idaho, Montana and Minnesota. He has been involved in railroad engineering since 1962. He has had more than thirty years experience working for BNSF and its predecessors. Between 1970 and 1980, he held the positions of Assistant Maintenance Engineer, Regional Engineer, and Maintenance Engineer for The Burlington Northern Railroad Company ("BN") (predecessor to BNSF). From 1980 to 1988, he held various staff positions (Director & Assistant Director of Maintenance planning) in St. Paul and Kansas City, as well as working for four years as Chief Engineer of the BN Springfield Region. From 1988 to 1995, he held the positions of Director of Engineering, Chief Engineer of Field Operations, Superintendent of Roadway Engineering, and Assistant Chief Engineer of Design/Construction for the Southern Region of BN. His responsibilities included project management, design and construction of rail lines, and maintenance of way activities throughout the railroad system. For 18 of his 33 years' experience, he had responsibility for the direct supervision of maintenance activities in various departments, including track, bridge, signal and telecommunications.

Mr. Albin is sponsoring evidence relating to maintenance-of-way costs set forth in Section III.D.4. Mr. Albin has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

I declare under penalty of perjury that I have read the Supplemental Reply Evidence that I have sponsored, as described in the foregoing Statement of Qualifications, and that the contents thereof are true and correct. Further, I certify that I am qualified and authorized to sponsor this testimony.

Executed on January 21, 2004


Gerald G. Albin

2. Michael R. Baranowski

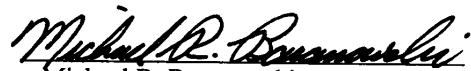
Michael R. Baranowski is a Senior Managing Director at FTI Consulting, Inc., an economic and financial consulting firm. His business address is 1201 Eye Street, N.W., Suite 400, Washington, DC 20005. Since 1980, Mr. Baranowski has been involved in many aspects of transportation consulting including operational analyses, terminal switching studies, facility and equipment valuation, liquidation studies, merger studies as well as a variety of cost studies including the development of both short and long run marginal cost, variable cost and stand-alone costs. He has been responsible for developing costs and working with the Board's discounted cash flow model in stand-alone cost proceedings since 1987 and has sponsored testimony in a number of those proceedings including the *APS, Potomac Elec. Power Co. v. CSX Transp., Inc.*, *WPL, Duke Energy Co. v. CSX Transp. Co.*, *Duke Energy Co. v. Norfolk Southern Ry. Co.*, and *Carolina Power & Light v. Norfolk Southern Ry. Co.* cases.

Mr. Baranowski received his Bachelor of Science in Accounting degree from Fairfield University in 1980. In 1988, he joined Klick, Kent & Allen, Inc. ("KK&A"), which was acquired by FTI Consulting in 1998. While with KK&A and FTI, Mr. Baranowski has conducted a wide range of studies in both the transportation and telecommunications industries and testified in proceedings before the Interstate Commerce Commission, Surface Transportation Board, Federal Communications Commission, and various State Utility Commissions.

Mr. Baranowski is sponsoring evidence relating to Section III.F.2 Roadbed Preparation and the Board's DCF model and SAC calculations contained in Sections III.G and III.H. Mr. Baranowski has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

I declare under penalty of perjury that I have read the Supplemental Reply Evidence that I have sponsored, as described in the foregoing Statement of Qualifications, and that the contents thereof are true and correct. Further, I certify that I am qualified and authorized to sponsor this testimony.

Executed on January 23, 2004


Michael R. Baranowski

3. Robert H. Baughman, P.E.

Robert H. Baughman is a Vice President and Project Manager in the Rail Division at Ralph Whitehead Associates, an engineering consulting firm. His business address is 1000 West Morehead St., Charlotte, NC 28208. Mr. Baughman oversees and directs all of Ralph Whitehead Associates' services to the railway industry. As Project Manager, Mr. Baughman has coordinated and/or supervised the preparation of computations, plans, and specifications on many large projects. These have included: the planning and design services for a two-mile trolley line along an abandoned railway corridor, the bridge structure for a 42-inch water line with cast-in-place retaining walls in a \$24 million project, fifteen highway bridges in North Carolina, South Carolina and Georgia, four railway bridges in North Carolina, South Carolina, and Georgia, and retaining walls for the widening of I-75, among many others.

Mr. Baughman is a 23 year veteran of the railroad industry. Mr. Baughman received his Bachelor of Science degree in Civil Engineering from Ohio Northern University in 1979. He then graduated with a Masters in Business Administration from the University of North Carolina at Charlotte in 1984. He holds licenses as a Registered Professional Engineer in Alabama, North Carolina, Ohio, and Kansas. He is also a member of the North Carolina Consulting Engineers Council, the American Society of Civil Engineers, and the National Society of Professional Engineers.

Mr. Baughman is sponsoring evidence relating to Sections III.F.9 Mobilization, III.F.10 Engineering/Construction Management and III.F.11 Contingencies. Mr. Baughman has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

I declare under penalty of perjury that I have read the Supplemental Reply Evidence that I have sponsored, as described in the foregoing Statement of Qualifications, and that the contents thereof are true and correct. Further, I certify that I am qualified and authorized to sponsor this testimony.

Executed on January 21, 2004

Robert H. Baughman
Robert H. Baughman, P.E.

4. William K. Berry

William K. Berry is a former Vice President -- Intermodal and Vice President -- IMX Development and Implementation for the Canadian National Railway. His address is 1836 Afshin Court, Port Orange, Florida, 32128. Mr. Berry has been extensively involved in intermodal marketing, sales and operations for several railroads. From 1989 to 1992, he held the positions of Assistant Vice President, Domestic Container System and then Senior Vice President, Intermodal with the Burlington Northern Railroad Company. From 1992 to 1996, he was the Vice President -- Intermodal/Automotive Operations and then Managing Director -- Coal Marketing/Sales with the Southern Pacific Lines. From 1996 to 1996, he worked for the Union Pacific Railroad as the Business Director -- Deregulated Opportunities. From 1999 to 2003, he worked for the Canadian National Railway as Vice President -- Intermodal and then Vice President -- IMX Development and Implementation. In addition, Mr. Berry has held leadership positions in many intermodal associations. He has been an officer and member of the Board of directors of the National Railroad Intermodal Association; Chairman and Vice Chairman of the AAR Intermodal Steering Committee; President and First Vice President of the Intermodal Transportation Association; and Vice Chairman of the Intermodal Association of North America.

Mr. Berry received his Bachelor of Science degree in Agriculture and Marketing from S.W. Missouri State University. He also attended a Masters Program in Marketing at S.W. Missouri State University.

Mr. Berry is sponsoring evidence relating to the cost of intermodal rail operations. His evidence is incorporated in Section III.A.3.c of the Narrative. Mr. Berry has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

I declare under penalty of perjury that I have read the Reply Evidence that I have sponsored, as described in the foregoing Statement of Qualifications, and that the contents thereof are true and correct. Further, I certify that I am qualified and authorized to sponsor this testimony.

Executed on January 22, 2004

William K. Berry
William K. Berry

5. Benton V. Fisher

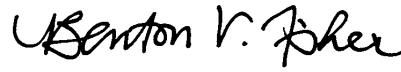
Benton V. Fisher is a Managing Director at FTI Consulting, Inc., an economic and financial consulting firm with offices located at 1201 Eye Street, N.W., Suite 400, Washington, DC, 20005. Since 1991, Mr. Fisher has been involved in various aspects of transportation consulting including economic studies involving costs and revenues, traffic and operating analyses, and work with performance measurement and financial reporting systems.

Mr. Fisher holds a Bachelor of Science in Engineering degree from Princeton University. In 1990, he served as the Deputy Controller for the Bill Bradley for U.S. Senate Campaign. In 1991, he joined Klick, Kent & Allen, Inc., which was acquired by FTI Consulting, Inc. in 1998. While with the firm Mr. Fisher has performed numerous analyses for and assisted in the preparation of expert testimony related to merger applications, rate reasonableness proceedings, contract disputes, and other regulatory costing issues before the Interstate Commerce Commission, Surface Transportation Board, Federal Energy Regulatory Commission, Postal Rate Commission, Federal Court, and State Utility Commissions.

Mr. Fisher is sponsoring evidence relating to non-coal traffic and revenues, revenue divisions for cross-over traffic, locomotive operating expenses, road crew personnel, and T&E salaries for the ACE. His evidence is incorporated in Sections III.A, III.D.1, and III.D.3 of the Narrative. Mr. Fisher has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

I declare under penalty of perjury that I have read the Supplemental Reply Evidence that I have sponsored, as described in the foregoing Statement of Qualifications, and that the contents thereof are true and correct. Further, I certify that I am qualified and authorized to sponsor this testimony.

Executed on January 23, 2004

A handwritten signature in black ink, reading "Benton V. Fisher". The signature is written in a cursive style with a large initial "B".

Benton V. Fisher

6. Robert J. Gloodt

Robert J. Gloodt is Senior Manager-Appraisals for Union Pacific Railroad Company ("UP"). His business address is 1800 Farnam Street, Omaha, Nebraska 68102. Mr. Gloodt has 20 years of experience in the appraisal of vacant and commercial land, including transportation corridors for railroads. He is an active member of the International Right of Way Association, a professional organization for individuals active in the acquisition, management and disposal of rights of way and related real estate.

Mr. Gloodt holds a B.A. from the University of Wisconsin - Milwaukee. Beginning in 1984, he worked in the San Francisco office of Bank of America Appraisals, Inc., attaining the position of Senior Appraiser and Vice President. After this company was acquired by Arthur D. Little Valuation, Inc. in 1986, Mr. Gloodt co-managed the appraisal practice at Arthur D. Little Valuation, conducting appraisal research and authoring appraisal reports, including reports on railroad corridors. In 1989, Mr. Gloodt started a private appraisal practice in Illinois, Gloodt Associates. At Gloodt Associates, he performed appraisals of commercial land and also reviewed appraisals performed by independent firms for banks and other customers.

Mr. Gloodt joined the UP Real Estate Department in 1998 as Manager-Appraisals. Since his promotion to Senior Manager-Appraisals in 1999, he has managed the appraisals conducted by UP personnel, contracted with outside appraisers, and produced internal appraisal estimates. His work covers all of the real estate owned by UP, including rail corridors. The property includes land and improved property and full and partial interests.

Mr. Gloodt is sponsoring evidence relating to property values for the portion of the ACE right of way located in Texas and the value of land used for a microwave tower in El Paso, Texas. His evidence is contained in Section III.F.1 of the Narrative. Mr. Gloodt has signed a

verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

STATE OF NEBRASKA)
)
COUNTY OF DOUGLAS) ss

VERIFICATION

Robert J. Gloodt, being duly sworn, deposes and says that he has read the Supplemental Reply Evidence that he has sponsored, as described in his foregoing Statement of Qualifications, and that the contents thereof are true and correct to the best of his knowledge and belief.



Robert J. Gloodt

Subscribed and Sworn to before me on this
21st day of January, 2004



Notary Public



My Commission expires: 12/20/05.

7. Richard A. Gray

Richard A. Gray is General Director, Premium Operations for Union Pacific Railroad Company ("UP"). As UP's General Director, Premium Operations, his responsibilities include planning and transportation design for UP's intermodal operations.

He began his career in 1979 with The Atchison, Topeka, and Santa Fe Railway. Since 1989, he has been employed at UP in a variety of transportation management positions. He assumed his current position in 2001.

Mr. Gray is sponsoring evidence regarding the types and frequencies of terminal activities involved in forwarding and receiving intermodal traffic. His evidence is incorporated in Section III.A.2.c of the Narrative. Mr. Gray has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

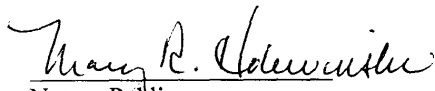
STATE OF NEBRASKA)
) ss
COUNTY OF DOUGLAS)

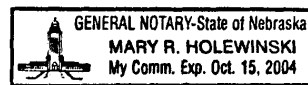
VERIFICATION

Richard Gray, being duly sworn, deposes and says that he has read the Supplemental Reply Evidence that he has sponsored, as described in his foregoing Statement of Qualifications, and that the contents thereof are true and correct to the best of his knowledge and belief.


Richard A. Gray

Subscribed and sworn to before me on this 22nd day of January, 2004.


Notary Public



My Commission expires: October 15, 2004

8. Steve K. Hoerstkamp

Steve K. Hoerstkamp is Director-Track Maintenance for the Council Bluffs Service Unit of Union Pacific Railroad Company ("UP"). He is located in Council Bluffs, Iowa. As Director-Track Maintenance, he is responsible for supervising the activities of UP's Managers-Track Maintenance in the area between Grand Island, Nebraska, and Clinton, Iowa.

Mr. Hoerstkamp began employment with the Missouri Pacific Railroad Company ("MP") in 1969. He joined UP when UP acquired MP in 1982. Mr. Hoerstkamp has held various track maintenance positions at MP and UP since 1969. He was promoted to his current position in 1994.

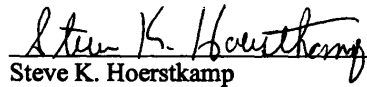
Mr. Hoerstkamp directly supervised Dave Mitchell, UP's Manager-Track Maintenance for the Council Bluffs Division, during approximately 1997 to 2001. Mr. Mitchell is now deceased.

In this case, Mr. Hoerstkamp is sponsoring evidence relating to UP's experience with the use of steel ties on the bridge between Omaha, Nebraska and Council Bluffs, Iowa. His evidence is contained in Sections III.D.4 and III.F.3 of the Narrative. Mr Hoerstkamp has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

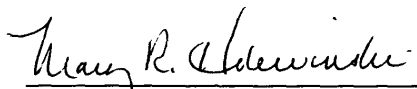
STATE OF NEBRASKA)
)
COUNTY OF DOUGLAS) ss

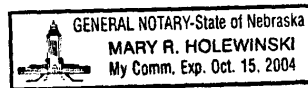
VERIFICATION

Steve K. Hoerstkamp, being duly sworn, deposes and says that he has read the Supplemental Reply Evidence that he has sponsored, as described in his foregoing Statement of Qualifications, and that the contents thereof are true and correct to the best of his knowledge and belief.


Steve K. Hoerstkamp

Subscribed and Sworn to before me on this
21st day of January, 2004


Notary Public



My Commission expires: October 15, 2004

9. Christopher D. Kent

Christopher D. Kent is Senior Managing Director of FTI Consulting, Inc., an economic and financial consulting firm. His business address is 1201 Eye Street, N.W., Suite 400, Washington, DC 20005. He holds a Bachelor of Arts degree from the University of Virginia. In 1970, he joined Western Electric, Inc. as a Management Trainee in its "High Risk-High Reward" program. During the next six years, he was promoted through various levels in the production, production scheduling, and costs and forecasting departments.

Since 1977, Mr. Kent has been involved in various aspects of transportation including traffic analyses, economic studies including costs and revenue analyses, railroad valuations, and the development of railroad operating plans, railroad facility plans and rolling stock requirements.

In 1977, Mr. Kent joined Conrail as Project Manager and worked primarily in assisting the Operating Department in optimizing fleet availability.

In 1978, Mr. Kent was employed by the United States Railway Association as Manager of Equipment and Facilities. He was subsequently appointed Chief, Equipment and Facilities, Rail Asset Valuation, in the Office of General Counsel. In this capacity, he supervised a staff of in-house professionals and outside consultants in developing the equipment, maintenance of way, and operating evidence submitted by the U.S. government in the valuation proceedings before the Special Court created under Sections 303(c) and 306 of the Regional Rail Reorganization Act.

In 1980, Mr. Kent formed Kent Associates, a consulting firm dealing with operating, transportation and marketing issues for various clients. Kent Associates was affiliated with the Washington Management Group, and Mr. Kent served as Vice President of that firm.

In 1984, Mr. Kent joined the economic consulting firm of Snavelly, King & Associates, Inc. as a Senior Consultant. While with that firm, he participated in numerous studies related to Section 229 proceedings and anti-trust litigation.

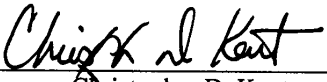
In 1987, Mr. Kent founded Klick, Kent & Allen, Inc. ("KK&A"), an economic and financial consulting firm. He served as a Principal of KK&A until its acquisition by FTI Consulting, Inc. in June 1998.

Mr. Kent has presented testimony in the valuation proceedings before the Special Court, the House of Courts of Justice Committee of the Virginia General Assembly, various state courts and federal courts and the Interstate Commerce Commission and Surface Transportation Board.

Mr. Kent is sponsoring evidence relating to the calculation of operating costs, general and administrative expenses and real estate valuation contained in Sections III.D and III.F.1. Mr. Kent has signed a verification of the truth of the statements contained therein. A copy of Mr. Kent's verification is attached hereto.

I declare under penalty of perjury that I have read the Supplemental Reply Evidence that I have sponsored, as described in the foregoing Statement of Qualifications, and that the contents thereof are true and correct. Further, I certify that I am qualified and authorized to sponsor this testimony.

Executed on January 23, 2004



Christopher D. Kent

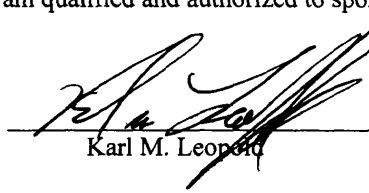
10. Karl M. Leopold

Karl M. Leopold is a Manager at FTI Consulting, Inc., an economic and financial consulting firm. His business address is 1201 Eye Street, N.W., Suite 400, Washington, DC 20005. Mr. Leopold holds a Bachelor's Degree in Government and Politics. In 1997, he joined Klick, Kent & Allen, Inc., which was acquired by FTI Consulting, Inc. in 1998. Since that time he has been involved continuously in analyzing accounting, cost, financial and engineering issues associated with railroad operations and pricing. He has conducted numerous stand-alone cost studies, conducted and evaluated railroad contract provisions, and developed computer models to evaluate railroad engineering and operating requirements.

Mr. Leopold is sponsoring evidence relating to AEPCO's string program. His evidence is contained in Section III.C.2 of the Narrative. Mr. Leopold has signed a verification of the truth of the statements contained therein. A copy of Mr. Leopold's verification is attached hereto.

I declare under penalty of perjury that I have read the Supplemental Reply Evidence that I have sponsored, as described in the foregoing Statement of Qualifications, and that the contents thereof are true and correct. Further, I certify that I am qualified and authorized to sponsor this testimony.

Executed on January 23, 2004



Karl M. Leopold

11. Rick A. Meredith

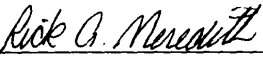
Rick A. Meredith is a Design Engineer with Ralph Whitehead Associates, an engineering consulting firm. His corporate business address is 1000 West Morehead St., Charlotte, NC 28208. As a Design Engineer at RWA, Mr. Meredith is responsible for the design and plan preparation of a variety of highway and railway projects, including span bridge replacements. He is also a qualified On-Track Worker Training instructor conducting courses for CSXT and Norfolk Southern contractors. His major project experience for RWA includes work on over a dozen bridge projects such as: the final engineering design of a dual track two simple deck plate girder spans with a composite concrete ballast deck bridge, the replacement of a single track 163'-0" 7-span open deck bridge on timber piles with a 4-span timber ballast deck steel beam bridge on steel pile and drilled shaft bents, the replacement of a single track 137'-4" 4-span open deck bridge on timber and steel pile bents with a 3-span timber ballast deck steel beam bridge on steel pile bents, among others.

Mr. Meredith received his Bachelor of Science in Civil Engineering in 1995 from the Virginia Polytechnic Institute and State University. He is a member of the American Railway Engineering and Maintenance of Way Association (AREMA), and the American Society of Civil Engineers (ASCE). Mr. Meredith previously worked for Norfolk Southern Corporation as Track Supervisor, managing all aspects of track maintenance and operations for several large metropolitan areas.

Mr. Meredith is sponsoring evidence relating to Section III.F.5 Bridges and Schematics. Mr. Meredith has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

I declare under penalty of perjury that I have read the Supplemental Reply Evidence that I have sponsored, as described in the foregoing Statement of Qualifications, and that the contents thereof are true and correct. Further, I certify that I am qualified and authorized to sponsor this testimony.

Executed on January 21, 2004



Rick A. Meredith

12. Paul B. Michiels, P.E.

Paul B. Michiels is a Project Manager and Senior Engineer with Ralph Whitehead Associates. His corporate business address is 1000 West Morehead St., Charlotte, NC 28208. At RWA, Mr. Michiels manages the railway design group, and he also administers contracts. He has extensive experience in the design and review of railway structures, including serving as Senior Engineer or Engineer on more than a dozen complex bridge projects. His major project experience at RWA includes serving as Senior Engineer on large bridge replacements in the southeastern region. Mr. Michiels has also worked on widening existing structures.

Mr. Michiels has worked for 16 years in the bridge industry. His previous work experience includes working for three years at the Virginia Department of Transportation. He also has worked for the engineering firms URS Greiner Woodward Clyde, Inc. and HDR Engineering, Inc. Mr. Michiels received his Bachelor of Science in Civil Engineering in 1986 from Old Dominion University. He holds a license as a Professional Engineer in Virginia, North Carolina, and South Carolina. He is a member of the American Railway Engineering & Maintenance-of-Way Association (AREMA), where he sits on two committees, and is also a member of the American Institute of Steel Construction.

Mr. Michiels is sponsoring evidence relating to Section III.F.5 Bridges and III.F.12a El Paso Trainway. Mr. Michiels has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

I declare under penalty of perjury that I have read the Supplemental Reply Evidence that I have sponsored, as described in the foregoing Statement of Qualifications, and that the contents thereof are true and correct. Further, I certify that I am qualified and authorized to sponsor this testimony.

Executed on January 21, 2004



Paul B. Michiels, P.E.

13. Terence J. Monks

Terence J. Monks is a computer programmer and software consultant. His business address is 2450 Freetown Drive, Reston, Virginia 20191.

Mr. Monks holds a Bachelor of Arts degree in French and German from the University of Exeter, United Kingdom. He also spent two years in a doctoral program in Computational Linguistics at Birkbeck College, University of London, United Kingdom.

Since 1968, Mr. Monks has been employed as a programmer, systems analyst and Director of Computer Services and Systems Development for various organizations. He has specialized in computer modeling and simulation, providing studies and software to the National Aeronautics and Space Administration (NASA), the Raytheon Corporation, and the Federal Aviation Administration (FAA). Mr. Monks was a lead designer/programmer for a project sponsored by the FAA to simulate day-to-day air traffic between the West Coast and Hawaii.

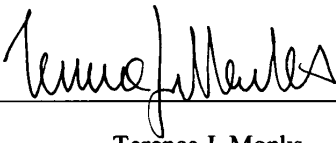
Mr. Monks held the titles of Chief, Operational Support and Director, Computer Services, for the United States Railway Association. During this time, he oversaw the development and deployment of the Operations Cost Model (OCM), a large-scale simulation of day-to-day operations on the entire Conrail rail network. Following deployment of the OCM, Mr. Monks spent considerable time refining the model and increasing the throughput and accuracy.

Throughout his professional career, Mr. Monks has had the opportunity to study and use many computer languages and operating systems, including all those in common use today. His work also includes program verification, debugging techniques and error checking in software development.

Mr. Monks is sponsoring evidence relating to AEPCO's string program. His evidence is contained in Section III.C.2 of the Narrative. Mr. Monks has signed a verification of the truth of the statements contained therein. A copy of Mr. Monks' verification is attached hereto.

I declare under penalty of perjury that I have read the Supplemental Reply Evidence that I have sponsored, as described in the foregoing Statement of Qualifications, and that the contents thereof are true and correct. Further, I certify that I am qualified and authorized to sponsor this testimony.

Executed on January 21, 2004



Terence J. Monks

14. Loren E. Mueller

Loren E. Mueller is a railroad transportation consultant. His business address is 614 Regency Crossing, Southlake, TX 76092.

Mr. Mueller was employed by BNSF and its predecessors for 32 years. His management positions with the Burlington Northern Railroad began in 1975 as yardmaster at Lincoln, Nebraska. He held a number of positions with the railroad. From 1992 to 1994, Mr. Mueller was General Manager - Coal Operations, responsible for operations of the BN system coal business unit. During this time, he directed major construction and expansion of the BN's operations in the Powder River Basin ("PRB") of Wyoming to include coordination of the joint line with Chicago and North Western Railway Company ("CNW")/Union Pacific ("UP"). From 1995 through 1996, he was Vice President of Burlington Lines, responsible for the total transportation function for one-third of the BNSF Railroad, including major terminals, mechanical, engineering and operations. Mr. Mueller retired from BNSF in 1996. From May, 2000, through April 30, 2001, he held a one-year assignment as Vice President and Chief Operating Officer of the Alaska Railroad. He was responsible for all aspects of operation for the Alaska Railroad, including operations, engineering, mechanical, marketing and safety.

Mr. Mueller is sponsoring evidence relating to operations of the stand-alone railroad. His evidence is incorporated in Sections III.B.3, III.C, III.D.1, and III.D.3 of the Narrative. Mr. Mueller has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

I declare under penalty of perjury that I have read the Supplemental Reply Evidence that I have sponsored, as described in the foregoing Statement of Qualifications, and that the contents thereof are true and correct. Further, I certify that I am qualified and authorized to sponsor this testimony.

Executed on January 24, 2004


Loren E. Mueller

15. Julie A. Murphy

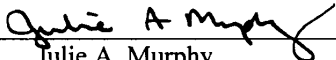
Julie A. Murphy is a Director at FTI Consulting, Inc., an economic and financial consulting firm. Her business address is 1201 Eye Street, N.W., Suite 400, Washington, D.C. 20005. Ms. Murphy holds a Bachelor of Arts and a Master of Arts in Economics from Allegheny College and Pennsylvania State University. Since 1994, Ms. Murphy has been involved in various aspects of consulting for network industries including electric utilities, transportation and telecommunications firms. Her work has encompassed damages analysis, competition and antitrust analyses, asset valuations, pricing and costing analyses.

Ms. Murphy joined FTI Consulting in 2000. While with FTI, Ms. Murphy has provided technical support and filed testimony in several proceedings before the Surface Transportation Board, Federal Communications Commission, and the California State Utility Commission. She has been involved in developing traffic and revenue forecast in stand-alone cost proceedings since 2000 including the *WPL*, *TMPA*, *Duke Energy Co. v. CSX Transp. Co.*, *Duke Energy Co. v. Norfolk Southern Ry. Co.*, and *Carolina Power & Light v. Norfolk Southern Ry. Co.* cases.

Ms. Murphy is sponsoring evidence relating to coal traffic and revenues. Her evidence is incorporated in Section III.A of the Narrative. Ms. Murphy has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

I declare under penalty of perjury that I have read the Supplemental Reply Evidence that I have sponsored, as described in the foregoing Statement of Qualifications, and that the contents thereof are true and correct. Further, I certify that I am qualified and authorized to sponsor this testimony.

Executed on January 23, 2004



Julie A. Murphy

16. Robert C. Phillips, P.E.

Robert C. Phillips is a Project and Branch Manager with Ralph Whitehead Associates. His business address is 1000 West Morehead St., Charlotte, NC 28208. As Project and Branch Manager for RWA, he is responsible for branch office management, construction management for fiber optic construction, and the general administration of construction inspection for railway projects. He has extensive experience in fiber optic construction management, railroad track and bridge construction, track maintenance and railroad operations. His special expertise is roadbed preparation, and his major project experience with RWA includes construction management at approximately ten sites.

Mr. Phillips is a 27 year veteran of the railroad industry. Mr. Phillips received his Bachelor of Science in Civil Engineering at Virginia Polytechnic Institute in 1975. He received his Masters in Business Administration from Averett College in 1992. Upon graduation he worked for Norfolk Southern Railroad as a Track Supervisor, where he inspected and maintained tracks, scheduled track maintenance, supervised track gangs, and maintained a successful safety program. He then worked for APAC-Virginia, Inc. as a project manager, which included cost estimating and analysis, as well as site engineering and development. He holds a license as a Registered Professional Engineer in Virginia.

Mr. Phillips is sponsoring evidence relating to Section III.F.2 Roadbed Preparation. Mr. Phillips has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

I declare under penalty of perjury that I have read the Supplemental Reply Evidence that I have sponsored, as described in the foregoing Statement of Qualifications, and that the contents thereof are true and correct. Further, I certify that I am qualified and authorized to sponsor this testimony.

Executed on January 21, 2004


Robert C. Phillips, P.E.

17. Robert J. Plum, III

Robert J. Plum, III, is a Director of FTI Consulting, Inc. ("FTI"), with offices at 1201 Eye Street, N.W., Suite 400, Washington, DC 20005.

Mr. Plum holds a Bachelor's Degree in Accounting and an MBA degree with a concentration in finance. He began his career in 1979 with Wyer Dick & Company, a consulting firm that specialized in railroad costing issues. Since that time he has been involved continuously in analyzing accounting, cost, financial and engineering issues associated with railroad operations and pricing. He has conducted numerous variable and stand-alone cost studies, conducted and evaluated railroad contract provisions, field studies of railroad operations, and developed computer models to evaluate railroad engineering and operating requirements.

Mr. Plum is sponsoring evidence relating to transit times and the number of locomotives and locomotive unit miles required by ACE. His evidence is incorporated in Section III.C.2 of the Narrative. Mr. Plum has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

I declare under penalty of perjury that I have read the Supplemental Reply Evidence that I have sponsored, as described in the foregoing Statement of Qualifications, and that the contents thereof are true and correct. Further, I certify that I am qualified and authorized to sponsor this testimony.

Executed on January 23, 2004



Robert J. Plum, III

18. Dennis K. Prewitt

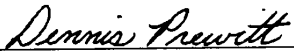
Dennis K. Prewitt is a Construction Inspector with Ralph Whitehead Associates, an engineering consulting firm. His business address is 1000 West Morehead St., Charlotte, NC 28208. As Construction Inspector for RWA, Mr. Prewitt is responsible for the general administration and construction inspection of railway projects. He has extensive experience in bridge inspections, bridge replacements, structural steel protective coatings, siding and mainline track construction upgrades and earthwork. His major project experience at RWA includes such duties as the daily on-site observation at work locations and the verification of construction compliance to approved plans and specifications for multiple projects. He has evaluated hundreds of bridges, and has provided detailed inspection reports, including photographs and videos.

Mr. Prewitt studied Physics at both Washington & Jefferson College and Wright State University. He holds multiple Inspector Certificates, including Bituminous Concrete Inspector, Portland Cement Concrete Inspector, DOT Corrugated Metal Culverts over 10' Span, DOT Structural Steel Protective Coatings with Lead Abatement, and Bridge Inspector, Concrete and Structural Steel. Mr. Prewitt has previously worked at Balke Engineers of Cincinnati, OH as a Resident Project Representative, responsible for the general administration and inspection of private and public works projects, including highways, bridges, railroad grade separations, water mains, sanitary installations and bridge painting.

Mr. Prewitt is sponsoring evidence relating to Sections III.F.2 Culverts and Compilations. Mr. Prewitt has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

I declare under penalty of perjury that I have read the Supplemental Reply Evidence that I have sponsored, as described in the foregoing Statement of Qualifications, and that the contents thereof are true and correct. Further, I certify that I am qualified and authorized to sponsor this testimony.

Executed on January 21, 2004


Dennis K. Prewitt

19. Charles W. Price

Charles W. Price is a Project Inspector at Ralph Whitehead Associates, an engineering consulting firm. His business address is 1000 West Morehead St., Charlotte, NC 28208. As Project Inspector for RWA, Mr. Price is responsible for the general administration of construction inspection for railway projects, as well as for providing safety awareness training on fiber optic construction. His special expertise is in the area of signals, and his major project experience for RWA involving signals has included the oversight for all construction engineering and inspection services for fiber optic installation on the Norfolk Southern right of way. His daily responsibilities included providing on-site reports for all work locations and enforcing compliance with safety rules. He has performed a similar oversight role on other major right of ways. He has also served as Project Inspector for the construction of a large mixing facility, including the creation of a large excavation, the laying of track, paving of a storage yard, and installation of 2 railroad and 1 highway bridges.

Mr. Price is a 38 year veteran of the railroad industry. He graduated from the Master Course in Industrial Electronics Technology at the National Radio Institute in Washington D.C. in 1983. Mr. Price previously worked for Norfolk Southern Corporation as a Senior Project Engineer in the Signal Department, overseeing all signal projects in the northeastern region. This included the scheduling of all signal projects, meeting with contractors to solicit bids for signal projects, coordinating with material management to ensure materials were provided in a timely fashion, and monitoring of material and labor budgets.

Mr. Price is sponsoring evidence relating to Section III.F.6 Signals. Mr. Price has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

I declare under penalty of perjury that I have read the Supplemental Reply Evidence that I have sponsored, as described in the foregoing Statement of Qualifications, and that the contents thereof are true and correct. Further, I certify that I am qualified and authorized to sponsor this testimony.

Executed on January 22, 2004

C.W. Price
Charles W. (Pat) Price

20. James Primm

James Primm specializes in all aspects of railroad engineering, specifically in the design of maintenance facilities for and the procurement of railcars and locomotives. He is currently working on subcontract for Ralph Whitehead Associates, an engineering consulting firm. His business address while on subcontract is 1000 West Morehead St., Charlotte, NC 28208. Mr. Primm has supervised the design of locomotive maintenance facility renovation projects and has helped procure over 1,300 unit train coal cars.

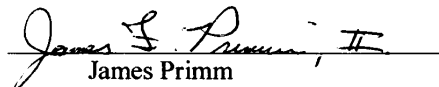
Among Mr. Primm's many engineering achievements are the direction of design and management of construction at Barstow Locomotive Facility in Barstow, California, Hinkle Locomotive Facilities in Hermiston, Oregon, and Topeka System Maintenance Terminal Renovation in Topeka, Kansas. He has also prepared conceptual designs for high speed train maintenance facilities.

Mr. Primm has authored numerous transportation studies, as well as undertaken geotechnical and environmental investigations. He received his Bachelor of Science in 1973 in Electrical Engineering from the University of Oklahoma. He is a member of the American Railway Engineering Association, the American Welding Society, the Locomotive Maintenance Officers Association, and the International Association of Railway Operating Officers.

Mr. Primm is sponsoring evidence relating to Section III.F.7 Buildings. Mr. Primm has signed a verification of the truth of statements contained therein. A copy of that verification is attached hereto.

I declare under penalty of perjury that I have read the Supplemental Reply Evidence that I have sponsored, as described in the foregoing Statement of Qualifications, and that the contents thereof are true and correct. Further, I certify that I am qualified and authorized to sponsor this testimony.

Executed on January 21, 2004


James Primm

21. Dale W. Salzman

Dale W. Salzman is Director, Transportation Research for Union Pacific Railroad Company ("UP"). As UP's Director, Transportation Research, he is responsible for conducting studies of rail operations for various railroad departments.

He began his career in 1965 with Missouri Pacific. Since 1974, he has been employed at UP in a variety of transportation management positions. He assumed his current position in 1996.

Mr. Salzman has been involved in many rail consolidation cases and has submitted testimony to the Interstate Commerce Commission and the Surface Transportation Board on a number of occasions, including the Union Pacific/Southern Pacific merger proceeding and the *FMC Wyoming Corp. v. Union Pacific Railroad Co.* and *Wisconsin Power & Light Co. v. Union Pacific Railroad Co.* rate reasonableness proceedings. More recently, he submitted testimony to the Surface Transportation Board in Docket No. 42059, *Northern States Power Company Minnesota v. Union Pacific Railroad Co.*. In that testimony, he described how UP moved Northern States' coal trains between the Powder River Basin in Wyoming and the Twin Cities area in Minnesota.

On opening, Mr. Salzman sponsored evidence relating to the operation of UP unit coal train service between Deming, New Mexico, and Apache Station in Cochise, Arizona. He sponsored similar evidence in defendants' joint reply submissions with respect to variable costs.

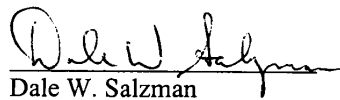
In UP's April 18 Petition to Require Submission of New Opening Evidence, Mr. Salzman sponsored evidence addressing the operating inefficiencies that would arise if AEPCO's coal and other coal traffic that UP and BNSF currently route via Belen and Deming, New Mexico, were rerouted via Vaughn, New Mexico, and El Paso, Texas. That evidence was included with UP's Reply filed on May 27, 2003. Mr. Salzman sponsors similar evidence in this submission. Mr.

Salzman also sponsors evidence addressing AEPCO's design of its yard in El Paso, transit times for AEPCO's stand-alone railroad, locomotive fuel consumption, and the costs associated with AEPCO's decision to terminate its stand-alone railroad west of UP's Alfalfa Yard. His evidence is contained in Sections III.B.3.a.(2), III.C.2.c, III.D.1.d.(2), and III.D.9 of the Narrative. A copy of Mr. Salzman's verification is attached hereto.

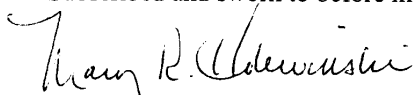
STATE OF NEBRASKA)
) ss
COUNTY OF DOUGLAS)

VERIFICATION

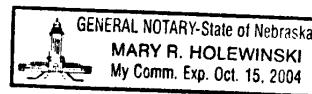
Dale W. Salzman, being duly sworn, deposes and says that he has read the Supplemental Reply Evidence that he has sponsored, as described in his foregoing Statement of Qualifications, and that the contents thereof are true and correct to the best of his knowledge and belief.


Dale W. Salzman

Subscribed and sworn to before me on this 21st day of January, 2004.


Notary Public

My Commission expires: October 15, 2004



22. Joseph L. Walton III

Joseph L. Walton III is a consultant who has worked for 42 years in the railroad signals and communications field. He is currently on subcontract to Ralph Whitehead Associates, an engineering consulting firm. His business address while on subcontract is 1000 West Morehead St., Charlotte, NC 28208.

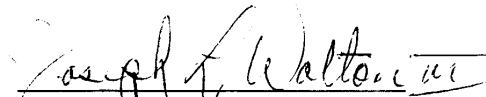
Mr. Walton has provided leadership, management and supervisory responsibility in the field of signals and communications since December, 1959. His experience includes the engineering, operating, construction and maintenance of railway signals and communications systems. His career has spanned the job of being an assistant signalman to being a top manager of complex signals and communications systems. Most of his career has been spent working in various positions involving signals and communications at Norfolk Southern Corporation.

Mr. Walton received an Associate Degree from Rowan Technical Institute in 1969 in Electronic Technology. He is a member of AREMA, the Association of American Railroads, and the American Short Line and Regional Railroad Association.

Mr. Walton is sponsoring evidence relating to Signals and Communications. His evidence is contained in Section III.F.6 of the Narrative. Mr. Walton has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

I declare under penalty of perjury that I have read the Reply Evidence that I have sponsored, as described in the foregoing Statement of Qualifications, and that the contents thereof are true and correct. Further, I certify that I am qualified and authorized to sponsor this testimony.

Executed on January 17, 2004


Joseph L. Walton III

23. David R. Wheeler

David R. Wheeler is the founder and President of Rail Network Analytics. His business address is 9222 Nottingham Way, Mason, OH 45040.

Mr. Wheeler received a Bachelor of Science degree in engineering and computer science from Merrimack College in 1985. He also received a Masters of Business Administration degree in finance and operations management from Miami University in 1992. He has training in Six Sigma methodology and holds a Six Sigma Blackbelt certification.

Throughout his career, Mr. Wheeler has focused on advanced analytical techniques for operational improvement and strategic planning. He has more than fifteen years experience in areas including rail operations analysis, capacity analysis, simulation, stand-alone rate case litigation, structured problem solving using the Six Sigma methodology, supply chain efficiency and mergers & acquisitions. Mr. Wheeler has experience not only in the simulation and analysis of railroads, but also in other high technology industries including cockpit simulation work on the F-16 and F-22 fighter aircraft.

Mr. Wheeler held a number of leadership positions within the Union Pacific Railroad Company (UP). During his tenure with UP, Mr. Wheeler led teams within Finance, Capacity Planning, Network & Capital Planning and Network Design & Integration. He has submitted testimony in previous stand-alone cost cases and presented research in a variety of forums. As General Director, Capacity Planning & Analysis, Mr. Wheeler was responsible for and led the capital planning function for UP's annual capital development and implementation. In this capacity, Mr. Wheeler analyzed and directed spending of more than \$300 million for Powder River Basin coal traffic. Mr. Wheeler uses simulation tools on a regular basis and has conducted a number of simulation benchmarking studies to determine and lead vendors toward simulation improvements.

Mr. Wheeler has worked on a variety of projects in the railroad industry. Mr. Wheeler developed UP's Colorado/Utah coal capacity plan and guided the Intermodal growth capacity initiative from Chicago to Los Angeles across UP's Sunset and Tucumcari routes. He has worked on multiple projects for the BNSF, NS, CSX, CP and CN, as well as the many short lines that connect with the UP. Mr. Wheeler has also led teams working on proposals for new passenger service for Amtrak, various commuter agencies, and UP's Joint Facilities, Finance, Operations and Engineering groups.

Mr. Wheeler is sponsoring evidence relating to the ACE's capacity requirements and cycle times. His evidence is contained in Sections III.B.2 and III.C.2 of the Narrative. Mr. Wheeler has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

I declare under penalty of perjury that I have read the Supplemental Reply Evidence that I have sponsored, as described in the foregoing Statement of Qualifications, and that the contents thereof are true and correct. Further, I certify that I am qualified and authorized to sponsor this testimony.

Executed on January 22, 2004


David R. Wheeler

24. Mike Wright

Mike Wright is Director-Track Maintenance for the Cheyenne Service Unit of Union Pacific Railroad Company ("UP"). As Director-Track Maintenance, he is responsible for supervising the activities of UP track maintenance personnel in the area between Granger, Wyoming, and points in western Nebraska.

Mr. Wright began his employment with UP in 1974. He has held various UP track maintenance positions in Wyoming and Texas since the mid-1970s. He was promoted to his current position in 1994. From 1969 through 1971, Mr. Wright served with the Army Corps of Engineers in Fort Leonard Wood, Missouri, Germany, and Vietnam.

Mr. Wright directly supervised Kevin Durrant, UP's Manager-Track Maintenance for the Laramie Subdivision, during approximately 1998 to 2001. Mr. Durrant is no longer Manager-Track Maintenance.

In this case, Mr. Wright is sponsoring evidence relating to UP's experience with the use of steel ties on a portion of its mainline west of Laramie, Wyoming. His evidence is contained in Sections III.D.4 and III.F.3 of the Narrative. Mr. Wright has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

STATE OF WYOMING)
)
COUNTY OF LARAMIE) ss

VERIFICATION

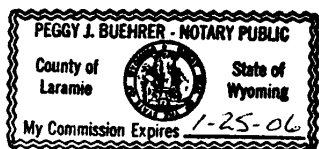
Mike Wright, being duly sworn, deposes and says that he has read the Supplemental Reply Evidence that he has sponsored, as described in his foregoing Statement of Qualifications, and that the contents thereof are true and correct to the best of his knowledge and belief.

Mike Wright
Mike Wright

Subscribed and Sworn to before me on this
20 day of January, 2004

Peggy J. Buehrer
Notary Public

My Commission expires: 1-25-2006



25. George T. Zimmerman, P.E.

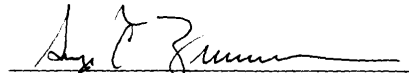
George T. Zimmerman is a Branch Manager and Project Manager/Senior Engineer with Ralph Whitehead Associates. His business address is 1000 West Morehead St., Charlotte, NC 28208. As Project Manager/Senior Engineer for RWA, Mr. Zimmerman manages all aspects of Ralph Whitehead Associates' relationship with Norfolk Southern. He assists in the preparation of proposals and contracts, and provides structural design and plan reviews for railway and bridge projects. His major project experience, among others, includes serving on an on-call as-needed basis for Norfolk Southern, for plan review and periodic construction inspection throughout the system. Mr. Zimmerman also has served as Project Manager for several large projects for CSXT.

Mr. Zimmerman is a veteran of 24 years in the railroad industry. Mr. Zimmerman received his Bachelor of Science in Civil Engineering in 1979, from West Virginia University. He holds a license as a Registered Professional Engineer in South Carolina, Georgia, Ohio, and Kansas. He is a member of the American Railway Engineering and Maintenance of Way Association (AREMA), and a member of the American Society of Civil Engineers.

Mr. Zimmerman is sponsoring evidence relating to Section III.F.3 Track Construction. Mr. Zimmerman has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

I declare under penalty of perjury that I have read the Supplemental Reply Evidence that I have sponsored, as described in the foregoing Statement of Qualifications, and that the contents thereof are true and correct. Further, I certify that I am qualified and authorized to sponsor this testimony.

Executed on January 21, 2004


George T. Zimmerman