OCA STATEMENT NO. 2

BEFORE THE

PENNSYLVANIA PUBLIC UTILITY COMMISSION

IN RE: APPLICATION OF TRANS-ALLEGHENY INTERSTATE LINE COMPANY FOR (I) A CERTIFICATE OF PUBLIC CONVENIENCE TO OFFER, RENDER, FURNISH AND/OR SUPPLY TRANSMISSION SERVICE IN THE COMMONWEALTH OF PENNSYLVANIA; (II) AUTHORIZATION AND CERTIFICATION TO LOCATE, CONSTRUCT, OPERATE AND MAINTAIN CERTAIN HIGH VOLTAGE ELECTRIC TRANSMISSION LINES AND RELATED ELECTRIC SUBSTATION FACILITIES; (III) AUTHORITY TO EXERCISE THE POWER OF EMINENT DOMAIN FOR THE CONSTRUCTION AND INSTALLATION OF AERIAL ELECTRIC TRANSMISSION FACILITIES ALONG THE PROPOSED TRANSMISSION LINE ROUTES IN PENNSYLVANIA; (IV) APPROVAL OF AN EXEMPTION FROM MUNICIPAL ZONING REGULATION WITH RESPECT TO THE CONSTRUCTION OF BUILDINGS; AND (V) APPROVAL OF CERTAIN RELATED AFFILIATED INTEREST ARRANGEMENTS	**))**	**Docket Nos. A-110172 A-110172F0002 A-110172F0003 A-110172F0004 G-00071229**

DIRECT TESTIMONY
AND EXHIBITS OF
ROBERT M. FAGAN

On Behalf of the Pennsylvania Office of Consumer Advocate

October 31, 2007

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I. INTRODUCTION, SUMMARY AND RECOMMENDATIONS

Q. PLEASE STATE YOUR NAME, OCCUPATION, AND BUSINESS ADDRESS.

A. My name is Robert M. Fagan. I am a Senior Associate at Synapse Energy Economics, Inc., 22 Pearl Street, Cambridge, Massachusetts, 02139.

Q. PLEASE SUMMARIZE YOUR PROFESSIONAL EXPERIENCE AND EDUCATIONAL BACKGROUND.

A. I am an energy economics analyst and mechanical engineer with 20 years of experience in the energy industry. My work has focused on myriad electric power industry issues, including economic and technical analysis of competitive electricity markets development, electric power transmission pricing structures, examination of utility-scale wind power potential and integration, and assessment and implementation of demand-side resource alternatives. I hold an M.A. from Boston University in Energy and Environmental Studies (1992) and a B.S. from Clarkson University in Mechanical Engineering (1981). Details of my experience are provided in my resume as Exhibit RMF-1.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING?

A. I am testifying on behalf of the Pennsylvania Office of Consumer Advocate ("PA OCA").

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to address two issues raised by Allegheny Energy, Inc.'s Trans-Allegheny Interstate Line Company ("TrAILCo" or the Company) Application for a Certificate of Public Convenience for the transmission facilities known in aggregate as the TrAIL facilities (i.e., the 138 kV and 500 kV electric transmission lines and related facilities in Pennsylvania, West Virginia and Virginia[1]).

First, I examine the potential impact of energy efficiency ("EE") and demand response ("DR") resource initiatives on the need for additional transmission facilities in the West Penn Power territory such as the Prexy portion[2] of the TrAIL facilities, including primarily initiatives that could be undertaken by Allegheny Power on behalf of its West Penn Power customers.

Next, I examine the impact of the proposed TrAIL facilities on regional generation patterns based on PJM's "base case" modeling of the impact of the 502 Junction to Loudoun segments of the project. In particular, I examine the extent to which PJM has considered the potential impacts of carbon dioxide emission regulation when analyzing the economic benefits associated with the TrAIL facilities.

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[1] As described in the Direct Testimony of Allegheny Energy Service Corporation's Lawrence Hozempa, pages 3-4, and David E. Flitman, Exhibit DEF-1.

[2] The Prexy portion of the TrAIL facilities consists of the 500 kV and 138 kV facilities associated with the Prexy substation and the 500 kV line that runs north from the 502 Junction substation to the Prexy substation.

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. I draw the following conclusions from my examination and analyses:

1. As found by Mr. Lanzalotta, the 500 kV Prexy facilities are not needed to meet the asserted reliability concerns. I would add that increased energy efficiency programs and demand response programs, in particular programs directed toward reducing the loading on the 138 kV facilities in the electrical vicinity of the proposed Prexy substation, would provide additional insurance that 138 kV system reinforcement and/or reconfiguration options (rather than a new 500 kV line into a new Prexy substation) can reliably meet West Penn Power customer needs well into the future. With targeted efforts, West Penn Power ("WPP") could reduce or moderate the loading on the portion of WPP's system served by 138 kV systems in the proposed Prexy substation vicinity. Energy efficiency and demand response savings potential exists across all utility sectors and most end uses, as documented in national and state/regional level "technical potential" studies[3]. Allegheny Power itself has recently completed analyses and recommended implementation of eight proposed demand-side management programs for its Maryland subsidiary, Potomac Edison.[4]

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[3] See for example, Nadel, Steven and Anna Shipley and R. Neal Elliott, American Council for an Energy Efficient Economy, "The Technical, Economic and Achievable Potential for Energy-Efficiency in the U.S. - A Meta-Analysis of Recent Studies," August 2004, from the proceedings of the 2004 ACEEE Summer Study on Energy Efficiency in Buildings.

[4] Initial Report of The Potomac Edison Company dba Allegheny Power on Energy Efficiency, Conservation, and Demand Reduction Plans, MD Public Service Commission, Case 9111,

2. Based on PJM's initial modeling, the impact of the proposed TrAIL facilities would be to increase the amount of generation in the western regions of PJM, especially in the coal-heavy AEP and AP zones, and reduce the amount of generation in the eastern regions of PJM, especially Dominion, PEPCO and BG&E regions, which have more gas-fired resources.
3. PJM's economic framework for analysis of the proposed TrAIL facilities has not sufficiently considered the potential effects of likely federal carbon dioxide regulation on the economics of the proposed TrAIL facilities. While minimal sensitivity analysis has been performed by PJM, there has been no substantial analysis of the future effects of likely CO_2 regulation.

Q. WHAT DO YOU RECOMMEND?

A. I have two recommendations.

1. As to the Prexy facilities, given the alternative means available to resolve reliability concerns, as explained in Mr. Lanzalotta's testimony, coupled with the ability of targeted energy efficiency and demand response resource alternatives to further reduce future loading on the 138 kV facilities in the Prexy region, I support Mr. Lanzalotta's recommendation.

2. Given the insufficient analysis of the economic effects of the non-Prexy portion of the proposed TrAIL facilities and, specifically, the effect of likely

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(submitted Oct. 26, 2007), available at http://webapp.psc.state.md.us/intranet/maillog/content.cfm?filepath=C:\Casenum\Admin%20Filings\60000-109999\108049%5CRomine10%2D26%2D07%2DDSMReport%2Epdf federal carbon dioxide regulation, I recommend the Commission direct Allegheny Power to conduct additional analysis of the 502 Junction to Loudoun facilities and more rigorously examine the impact of carbon emission regulation on the economic benefits of the line.

II. WEST PENN POWER ENERGY EFFICIENCY AND DEMAND RESPONSE RESOURCE ALTERNATIVES AND THE NEED FOR THE PREXY FACILITIES

Q. WHAT ARE THE PREXY FACILITIES?

A. The Prexy facilities consist of the 500 kV line running north from the 502 Junction substation, facilities at the 502 Junction substation to support such a line, the Prexy substation itself, and the three 138 kV lines running between the proposed new Prexy substation and the existing 138 kV system in the Prexy area.

Q. WHAT ARE ENERGY EFFICIENCY AND DEMAND RESPONSE RESOURCES?

A. Energy efficiency ("EE") resources can be generally defined as improvements to the technical efficiency of end use devices or systems – e.g., lighting, air conditioning, industrial process systems, refrigeration, hot water, building shell, and heating systems – that results in reduced energy usage for the same end use service, and can also result in reduced peak period consumption rates. They are different from "conservation" resources, which imply reduced end use services and usually imply a requirement for behavioral change on the part of end users.

Demand response ("DR") resources are those resources that allow for load to "shift" from on-peak to off-peak periods, or allow loads to be cycled off during on-peak periods. For example, cycling air conditioning systems or producing products during off-peak shifts instead of on-peak shifts are two types of demand response resources. Sometimes, demand response resources are used to refer to customer “behind-the-meter” generation that mimics the interruption or shifting of load. Demand response resources can be as simple as an automatic increase in a thermostat’s air conditioning setpoint, or as complex as varying the on/off cycles of an office facilities’ set of rooftop heating, ventilation and air conditioning systems.

Q. HOW CAN ENERGY EFFICIENCY AND DEMAND RESPONSE RESOURCES AFFECT THE NEED FOR TRANSMISSION FACILITIES?

A. Energy efficiency and demand response resources can directly reduce peak period end user loads at West Penn Power customer sites served by the underlying 138 kV system in the region. Lower end user loads during peak periods reduce the peak period stresses on those underlying 138 kV transmission facilities. Depending on the extent of peak load reduction, the need for augmenting or reinforcing the transmission or distribution system can be reduced, delayed, eliminated, or met with alternatives that can be lower cost and lower impact than large transmission facilities. If effectively targeted to end use load in certain areas, initial energy efficiency and demand response efforts can result in permanent reduced peak load on the most vulnerable parts of the underlying system.

Q. CAN THESE RESOURCES BE CONSIDERED RELIABLE MEANS OF REDUCING THE STRESSES ON THE UNDERLYING SYSTEM?

A. Yes. PJM, New England and New York all consider demand response resources as "reliable" resources that can contribute to the capacity required to serve load.[5] For example, PJM states the following:

> The PJM Market provides opportunities for demand resources to realize value for demand reductions in the Energy, Capacity, Synchronized Reserve, and Regulation markets, The FERC authorized PJM to provide these opportunities as permanent features of these markets in early 2006. PJM completed the systems modifications required to enhance or implement these opportunities on June 1, 2006. This effort integrates demand response into the PJM wholesale market and provides symmetrical treatment for generation and demand resources.[6]

The Midwest System Operator is also considering ways to incorporate demand response resources in similar ways. New England explicitly allows the effect of energy efficiency programs to be included as reliable capacity, and PJM is considering allowing the impact of energy efficiency programs to be incorporated as a reliability resource.

Q. WHAT ARE WEST PENN POWER'S PROJECTIONS FOR LOAD THROUGH 2026?

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[5] See the following for each northeastern RTO:

PJM: http://www.pjm.com/markets/demand-response/demand-response.html

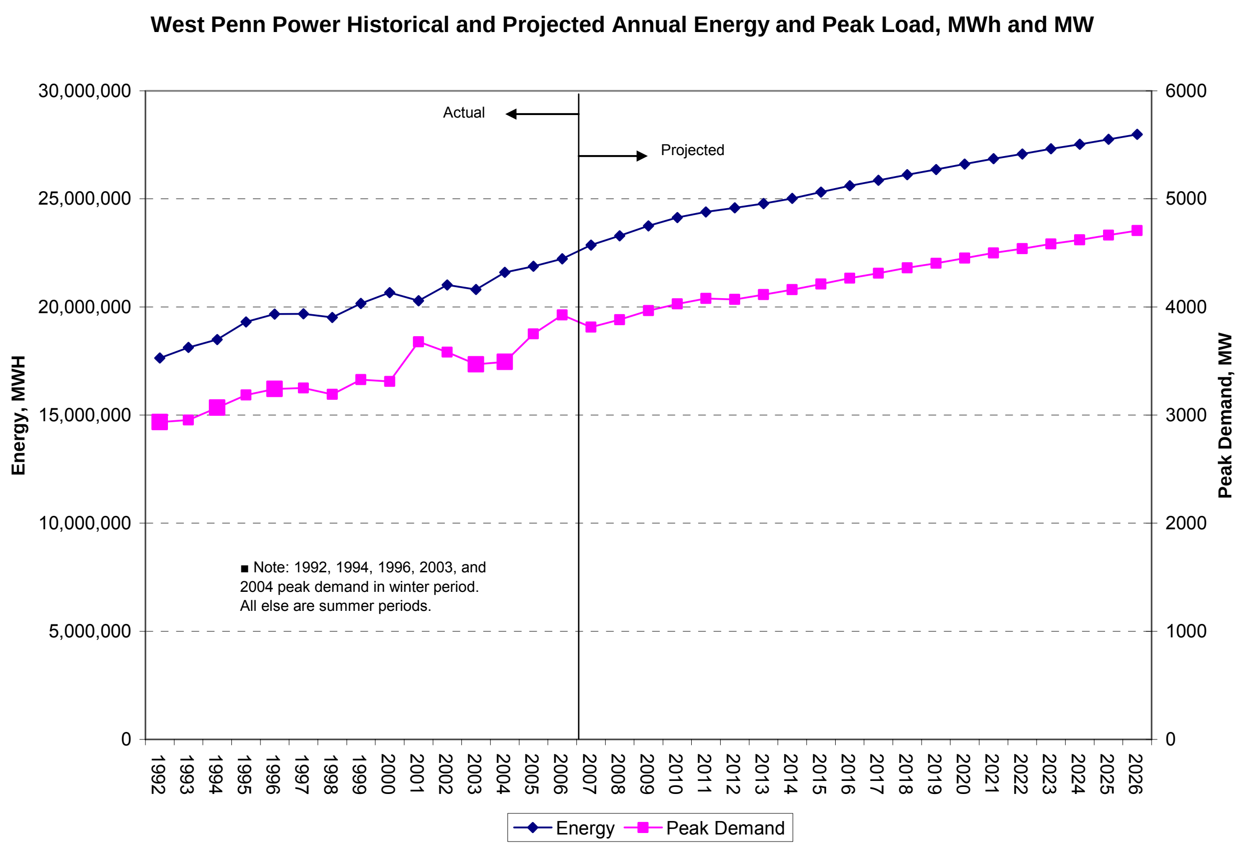
New York: http://www.nyiso.com/public/products/demand_response/index.jsp.

New England: http://www.iso-ne.com/genrtion_resrcs/dr/index.html.

[6] PJM, at http://www.pjm.com/markets/demand-response/demand-response.html.

A. In response to discovery request OCA-II-10, West Penn Power provided actual peak demand and energy use from 1992 forward, and load projections through 2026. Those are shown in Figure 1 below.

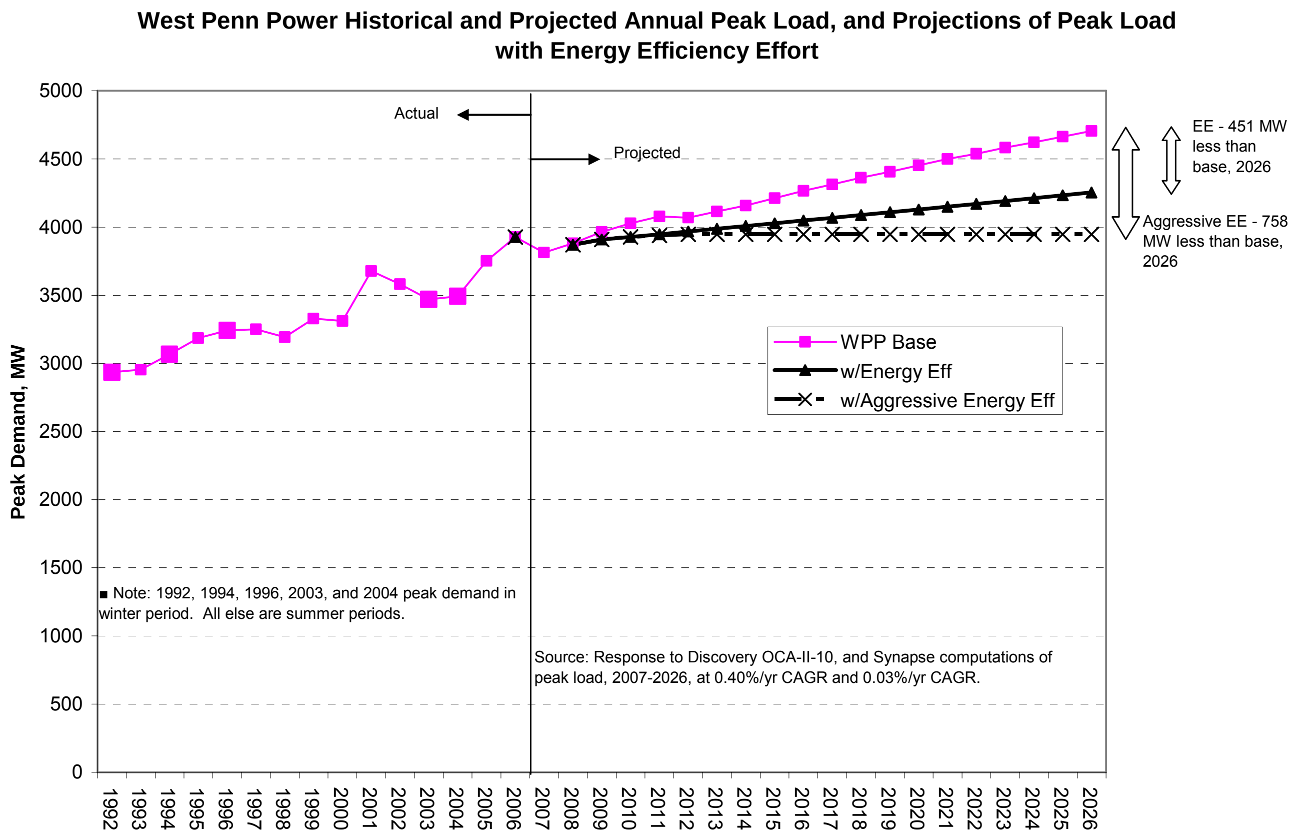
Figure 1. West Penn Power Historical and Projected Annual Energy and Peak Load



Q. HOW WOULD ENERGY EFFICIENCY AND/OR DEMAND RESPONSE AFFECT THOSE PROJECTIONS?

A. Fundamentally, increased energy efficiency and/or use of demand response can reduce year-to-year increases in peak load. Over time, the compounding effect can be considerable, as shown in the Figure 2 below. If the Company took energy efficiency and demand response resource peak load reduction steps, such that compound annual growth rate of demand between 2006 and 2026 was reduced from the projected level of 0.91%[7] to just under half that level, or 0.40%, West Penn Power would see a peak load reduction of 451 MW relative to their forecast. If the Company took more aggressive steps, to essentially slow the net growth of demand to zero after five years, the cumulative effect would be to reduce the load by approximately 750 MW by 2026. These potential reductions are shown in Figure 2 below.

Figure 2. Energy Efficiency Effort Effect on West Penn Power Projected Annual Peak Load



[7] Between 2006 (3,926 MW) and 2026 (4,706 MW), West Penn Power's peak load is projected to grow at a compound annual growth rate of 0.91% per year. Response to OCA-II-10.

Q. ARE PEAK LOAD REDUCTIONS OF MORE THAN ONE-HALF OF PROJECTED DEMAND GROWTH REALLY POSSIBLE?

A. Yes. A recent study by the American Council for an Energy Efficient Economy ("ACEEE")[8] found that

> Reducing demand growth by two-thirds has been shown to be achievable in several recent analyses. A meta-analysis of energy efficiency achievable potential studies found that energy efficiency measures can reduce electricity sales by about 1% each year over the next 20 years (Nadel et al. 2004). Realizing this potential would require a substantial and persistent policy commitment, but the leading states in energy efficiency investment are already

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[8] "The American Council for an Energy Efficient Economy is a nonprofit, 501(c)(3) organization dedicated to advancing energy efficiency as a means of promoting both economic prosperity and environmental protection. ACEEE fulfills its mission by conducting in-depth technical and policy assessments, advising policymakers and program managers, working collaboratively with businesses, public interest groups, and other organizations, organizing conferences and workshops, publishing books, conference proceedings, and reports, and educating consumers and businesses" (ACEEE, website). It is funded through a broad array of public and private sources, including the US DOE, the US EPA, utilities, state agencies, national laboratories, and private foundations and companies. Information is available at www.aceee.org.

> documenting savings in the range of 1% of total electricity sales on an annual basis.[9]

The underlying basis for such achievement is ongoing improvement, sometimes dramatic, in the technical capability of new energy-using equipment to do more with less electricity.

Q. ARE THESE TYPES OF REDUCTIONS ACHIEVABLE IN THE PREXY VICINITY?

A. Yes. The potential for energy efficiency and demand response savings cuts across all sectors of the economy and all utility customer sectors, and affects both existing buildings and new construction. It is driven by technological improvement in the end use devices that deliver and control energy services, such as lighting, air conditioning, motors, refrigeration equipment, heating and ventilation equipment, hot water heating systems, and industrial process systems.

Q. HOW MUCH DO SUCH IMPROVEMENTS COST?

A. The cost of energy efficiency and demand response efforts varies depending on the specific technologies, techniques and, in the case of utility-sponsored

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[9] American Council for an Energy Efficient Economy, "The Twin Pillars of Sustainable Energy: Synergies between Energy Efficiency and Renewable Energy Technology and Policy," Bill Prindle and Maggie Eldridge, American Council for an Energy-Efficient Economy, Mike Eckhardt and Alyssa Frederick, American Council on Renewable Energy. May 2007, ACEEE Report Number E074.

programs, the types of programmatic activity. However, much of the energy efficiency gains seen throughout the economy have come at a cost considerably lower than the fixed and operating costs of new generation capacity, and often at a cost lower than even just the operating costs of existing generation.

Allegheny Power's recent filing of a report before the Maryland Public Service Commission indicated that eight of its proposed demand-side management programs passed all the cost-effectiveness tests set out by the Maryland Public Service Commission[10] and on that basis Allegheny Power has recommended implementation of those programs in its Maryland service territory. Cost-effectiveness tests essentially are used to determine if the value of energy efficiency – i.e., the avoided costs of the energy and capacity that would otherwise be used and the additional value of avoided or deferred transmission and distribution investment - is greater than the costs. Allegheny reports that its programs will save 141 MW of demand and 270 GWh of energy in 2015 at a cost of $23.69 million over a period of eight years.[11]

Q. HOW COULD WEST PENN POWER ACHIEVE SUCH REDUCTIONS?

A. West Penn Power currently does not directly procure any energy efficiency or demand response resources. In a manner similar to that undertaken by many utilities around the nation, or similar to its sister Company's efforts in Maryland,

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[10] Case No. 9111 before the Maryland Public Service Commission. No formal review of Allegheny Power's filing has yet taken place. See footnote 4.

[11] Op. Cit., Executive Summary and Conclusions of report, page 4.

West Penn Power could implement or contract for the implementation of a “suite” of demand management programs that would procure EE and DR resources that would 1) target end user sites served off of the most vulnerable 138 kV systems in the vicinity of the proposed Prexy substation, and 2) strive to achieve as much cost-effective energy efficiency and demand response implementation as is possible, given constraints associated with developing and ramping up such efforts.

Q. WHAT DO YOU MEAN BY A “SUITE” OF DEMAND MANAGEMENT PROGRAMS?

A. Utilities often establish a number of initiatives that target energy efficiency reductions for different sectors and different end uses. The format and structure of such initiatives take many forms. A common framework might include programs designed and managed by energy services professionals. For example, such programs could be designed to help residential customers obtain compact fluorescent lighting products by working with area distributors and regional/national manufacturers to ensure availability of such products in local stores or to provide financial incentives to customers for replacing inefficient lighting systems and air conditioning units. A host of market barriers exist that slow the otherwise “normal” penetration of such technologies throughout the economy, and utilities’ efforts can help to lower such barriers. As noted, Allegheny Power’s Maryland subsidiary Potomac Edison has initiated this type of process in Maryland.

Such a "suite" may also include separate "demand response" programs, often targeted at large industrial users, or targeted to specific end uses and sectors such as new residential air conditioning control. These types of efforts are targeted at reducing peak period consumption, effectively shifting energy use to off-peak hours.

Q. WHAT STEPS HAVE UTILITIES TAKEN TO SECURE ENERGY EFFICIENCY AND / OR DEMAND RESPONSE RESOURCES?

A. Many utilities procure energy efficiency resources through programmatic efforts that address existing and new customer end uses across all sectors; Potomac Edison is initiating these types of programmatic efforts in Maryland.

The American Council for an Energy Efficient Economy regularly reports on state-level efforts by utilities to obtain energy efficiency through demand-side management programs.[12] Some of the leading states, for example in the Northeast and California, spend up to 2% of retail revenues on energy efficiency procurement.[13]

Q. DOES WEST PENN POWER INCORPORATE ESTIMATES OF ENERGY EFFICIENCY OR DEMAND RESPONSE IN ITS LOAD FORECASTS?

A. No. Interrogatory OCA-II-11(a) asked this:

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[12] ACEEE, "The State Energy Efficiency Scorecard for 2006." Table 1.2.

[13] Ibid., Table 1.3.

> **OCA-II-11 (a)**: Have any demand-side management efforts been accounted for in the load forecasts for West Penn Power peak demand and annual energy?
>
> **Response**: At this time, the Allegheny Power load forecast does not contain any specific calculation of load or energy impacts from current demand side management ("DSM") programs. The results of prior DSM programs are included in the load in the historical data used to develop the load forecast models. Current programs, which are described in the response to subpart b below, are reviewed each year in order to determine if a material and predictable amount of load impact is expected in the future from these programs. For the present time, Allegheny Power has determined that because the load reductions from current programs have not yet been material and predictable, it is not prudent to include any load and energy reduction assumptions based on such programs "AP load forecasts do not contain load or energy impacts from DSM because the load reductions from current programs have not yet been material and predictable, it is not prudent to include any load and energy reduction assumptions based on such programs".

Q. IS IT POSSIBLE TO GIVE GREATER WEIGHT TO FUTURE IMPACTS OF ENERGY EFFICIENCY AND DEMAND RESPONSE IN WEST PENN POWER'S LOAD FORECASTING?

A. Yes. There is an enormous information resource base available across the utility industry and from demand-side management experts in particular. The ability to assess technical and "achievable" energy efficiency potential within a region is well understood, and the technology associated with achieving improved energy efficiency – e.g., more efficient lighting, air conditioning, and motor systems - is readily available.

Q. WHAT PORTION OF THE POTENTIAL REDUCTION SHOWN IN FIGURE 2 COULD BE ACHIEVED AT END USER SITES SERVED BY

THE UNDERLYING 138 KV TRANSMISSION SYSTEM IN THE VICINITY OF THE PROPOSED PREXY SUBSTATION?

A. At minimum, a proportionate amount of the system-wide available peak demand reduction shown in Figure 2 could be achieved at end user sites in the Prexy vicinity. The current load served by the 138 kV facilities roughly bounded by Wylie Ridge, Windsor and Charleroi substations is approximately 800 MW, or approximately 20% of West Penn Power's 2009 peak load of approximately 4,000 MW.[14] Scaling down proportionately from the system-wide potential illustrated in Figure 2, energy efficiency and demand response efforts could lead to 90 MW peak load reduction by 2026 with moderate effort, and 150 MW peak load reduction by 2026 with an aggressive effort. However, a more careful targeting of energy efficiency and demand response implementation in the Prexy vicinity could achieve these types of reductions more quickly. The actual level of reduction would depend on the scope of effort undertaken by West Penn Power and its customers.

Q. WHAT EFFECT WOULD ENERGY EFFICIENCY AND DEMAND RESPONSE RESOURCES HAVE ON THE ANALYSIS CONDUCTED BY MR. LANZALOTTA REGARDING THE NEED FOR THE PREXY FACILITIES AND THE OPTION OF BOLSTERING THE SYSTEM WITH ADDITIONAL OR REINFORCED 138 KV LINES, OR SYSTEM

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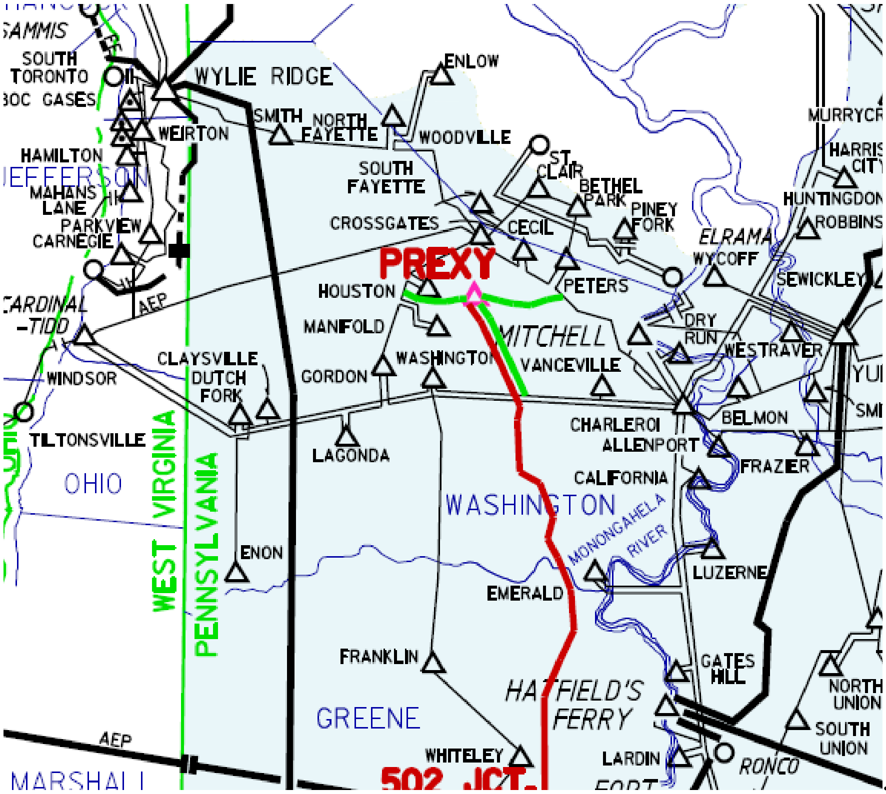
[14] Response to discovery request ECC-I-47-B, and OCA-II-10.

RECONFIGURATION OPTIONS, INSTEAD OF THE 500 KV PREXY FACILITIES?

A. Their effect, if targeted properly, would be to make Mr. Lanzalotta's recommendations even more robust due to lower loading on the 138 kV facilities in question, those in the vicinity of the proposed Prexy substation. Generally that includes the 138 kV facilities extending east from the Wylie Ridge substation, southeast from the Windsor substation and west and northwest from the Charleroi substation. A more careful analysis of 138 kV system transmission flows would be necessary to comprehensively document the effect of any given EE or DR effort on specified lines or line segments. Figure 3 below shows the 138 kV facilities in the vicinity of the proposed Prexy substation.

Figure 3. 138 kV Facilities in the Proposed Prexy Substation Region



Source: Section of Exhibit LAH-5

III. TRAIL EFFECT ON PJM GENERATION DISPATCH

Q. WHAT EFFECT WILL THE 502 JUNCTION TO LOUDOUN FACILITIES HAVE ON GENERATION PATTERNS IN THE REGION?

A. These facilities will allow for a large increase in transmission transfer capability from the western to the eastern/southwestern regions of PJM. This will allow for the operation of increased lower-production-cost generation from western PJM and decreased operation of higher production cost generation in the eastern PJM regions. PJM confirmed this general pattern, and the quantities involved, in response to Interrogatory OCA-V-1:

> OCA-V-1 (a): Qualitatively, what effect does the presence of the proposed TrAIL facility have on the aggregate annual dispatch of energy from generators located in each of the load zones in PJM, in 2011 or any other future year? Indicate if it increases or decreases the level of annual MWh generation from facilities in each of the PJM load zones, for 2011 or any other future year.
>
> Response: By relieving west-to-east transmission bottlenecks, the addition of the 502 Junction – Loudoun 500 kV project will increase generation MWh levels from facilities located in the western part of the system and decrease generation MWh levels from facilities located in the eastern part of the PJM system. No determination has been made with regard to the effect of the installation of the Prexy Facilities on the aggregate annual dispatch of regional generation.

Q. HOW EXACTLY IS THE DISPATCHED ENERGY QUANTITY PROJECTED TO CHANGE DUE TO THE 502 JUNCTION TO LOUDOUN FACILITIES?

A. Allegheny Power's response to OCA-V-1 (b) contained this information:

> OCA-V-1 (b): Provide any quantitative analysis for 2011 or any other future year that shows the aggregate generation output by PJM load zone with the TrAIL facilities. Provide the aggregate generation output for the same time period for the same year or years by PJM load zone in the absence of the TrAIL facilities.
>
> Response: Pages 11, 12 and 13 of the April 19 [sic], 2007 Transmission Expansion Advisory Committee presentation (located at http://www.pjm.com/committees/teac/downloads/20070418-item-10-market-efficiency-analysis-prog-rep.pdf) show the projected change in generation MWh resulting from the addition of the 502 Junction – Loudoun line. These projections are from simulations of the years 2007, 2010 and 2013, respectively, and are made by comparing simulations made with the project assumed to be in-service to simulations made without the 502 Junction – Loudoun line modeled.

Exhibit RMF-2 is the presentation noted in the quotation above. Pages 11 through 13 show the 2007, 2010 and 2013 change in annual MWh generation across each of the PJM zones. A portion of that exhibit is shown below. It illustrates that PJM's modeling shows that in 2013, the zonal dispatch will change such that almost 11 million MWh per year will be "shifted" from eastern and southern zones to western zones.

Figure 4. Change in Generation MWh Output in 2013 by PJM Zone with 502 J. to Loudoun Line

Change in Zonal Generation Output, 2013
With 502 Junction to Loudoun Line

Zone	Delta Gen, MWh	% of Decrease	% of Increase
ACEC	-250,700	2.30%	
AEP	4,390,033		40.60%
APS	3,202,342		29.60%
BG&E	-1,272,884	11.80%	
COED	1,473,114		13.60%
DOM	-4,671,642	43.20%	
DP&L	749,248		6.90%
DPLC	-604,345	5.60%	
DQE	816,737		7.60%
JC	-24,251	0.20%	
ME	-376,121	3.50%	
PECO	-1,274,949	11.80%	
PEPCO	-1,528,205	14.10%	
PN	172,700		1.60%
PPL	-392,553	3.60%	
PSEG	-408,523	3.80%	
Total	0	100.00%	100.00%
Total Decrease	-10,804,173		
Total Increase	10,804,174		

Source: PJM presentation to the Transmission Expansion Advisory Committee and the PJM Planning Committee, "Market Efficiency Analysis Progress Report," dated April 18, 2007, page 13. Full presentation included as Exhibit RMF-2.

Q. WHAT ELSE DOES EXHIBIT RMF-2 ILLUSTRATE?

A. Pages 11 through 13 show the change in "generator revenues" for each of 2007, 2010 and 2013, which indicates (based on the modeling) that through a combination of output and price changes, generators in the western zones see increased revenues of $1.8 billion per year (2013), and generators in the eastern and southern zones see decreases of $1.9 billion per year (2013).

Q. WHAT DOES THE MWH SHIFT IN GENERATION IMPLY FOR THE CHANGE IN FUEL USE ASSOCIATED WITH THIS DISPATCH CHANGE?

A. The western regions modeled as increasing MWh output are heavily dominated by coal-fired resources, and potential new generation in the western regions is also dominated by coal-fired facilities.[15] Absent potential CO_2 emission regulation, coal-fired facilities see relatively low production costs and would likely dominate the "run-up," or increase, in generation seen in the western regions. In contrast, the first fuels dispatched "down" in the east (i.e., the generators that would operate less) would be more expensive power produced by, for example, natural gas or oil. Thus the dominant effect on fuels in the PJM generation mix due to the 502 Junction to Loudoun line would be an increase in

[15] The PJM "generation interconnection queue" (or the list of potential new generation within the PJM region seeking access to connect to the transmission grid) shows coal-fired facilities dominating in the AEP and AP zones. PJM 2006 State of the Market Report, Volume II, Table 3.32, page 136.

coal use (at western region generators) and a decrease in natural gas and oil use (at southern and eastern region generation stations).

Q. WHAT DOES THIS SHIFT TO LOWER PRODUCTION COST COAL-FIRED GENERATION DO TO PROJECTED WHOLESALE MARKET PRICES?

A. Generally it increases prices in the western regions and decreases prices in the eastern and southern regions, as shown in PJM's presentation, Exhibit RMF-2, page 10. The "Delta LMP" column for 2007, 2010 and 2013 shows this.[16]

Q. HAS PJM ESTIMATED ANY GREENHOUSE GAS EMISSION EFFECT ASSOCIATED WITH THIS CHANGE IN GENERATION DISPATCH ARISING FROM THESE FACILITIES?

A. No. The response to OCA-V-3 states that Allegheny Power, TrAILCo and PJM have not studied the effect of TrAIL on greenhouse gas emissions:

> **OCA-V-3:** What effect do the TrAIL facilities have on the annual greenhouse gas emissions produced in 2011 or any other future year in the PJM region due to changes in the aggregate MWH output of PJM region generation associated with security-constrained economic dispatch of generation in PJM?
>
> **Response**: The effect of the TrAIL facilities on annual greenhouse gas emissions has not been studied by PJM, TrAILCo or Allegheny Power. The TrAIL facilities are transmission facilities, not generation facilities. The need determinations for the TrAIL facilities are based on transmission reliability criteria, not upon any determination of need for additional generating capacity. To the extent that a generation owner would seek to increase the

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[16] "LMP" refers to locational marginal price. LMP is the actual market clearing price in a specific location during a specific time period.

> capacity of existing generating facilities interconnected to the PJM transmission system or to interconnect a new generating facility to the PJM transmission system, including the TrAIL facilities, such generating facility owner would be required to comply with applicable environmental laws regarding air emissions.

Q. DO THE MODELING RESULTS IDENTIFIED ABOVE CONSIDER THE EFFECT OF POSSIBLE GREENHOUSE GAS REGULATION, AT STATE OR FEDERAL LEVELS?

A. No.

Q. WHAT MIGHT BE SUCH AN EFFECT?

A. A national cap and trade program, such as those envisioned by current bills in the US Congress,[17] would likely result in increased production costs for generation using carbon-intensive fuels, primarily coal, but also oil and gas. Production costs of "marginal units" in PJM drive the underlying prices seen in the PJM wholesale market for electricity. In particular, a cap and trade program would increase the production costs for coal-fired facilities relative to the production costs for oil and especially natural gas fired facilities (i.e., a "carbon adder" is attached to fossil-fueled facilities). This essentially means that prices in western PJM (coal dominated) would increase in proportion to the "carbon adder"

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[17] For example, McCain-Lieberman; Kerry-Snowe; Oliver-Gilchrest; and Sanders-Boxer-Waxman. All of these potential bills show a need to reduce 2050 carbon emissions significantly below current levels. McCain Lieberman is projected to reduce 2050 emissions to 70% below 2005 emissions. A "cap and trade" program is one where the "regulation" (i.e., the federal law) caps the total amount of CO_2 that can be emitted nationwide, and then utilities "trade" their "allowances" or their permission to pollute such that total emissions remain below the cap and the "cheapest" CO_2 reductions are obtained first.

associated with coal; and prices in eastern PJM (natural gas generation "on the margin") would increase in proportion to the "carbon adder" associated with natural gas.

Coal is a more "carbon-intensive" fuel than natural gas. Coal-fired generation generally emits approximately 1.2 tons of CO_2 per MWh of electricity generated, and natural gas emits about one-third to one-half of that amount, or from 0.4 to 0.6 tons of CO_2 per MWh generated.[18] Thus "carbon adders" will be substantially higher for coal plants than for natural gas plants, and the marginal price differential between coal plants in western PJM regions and natural gas plants in eastern PJM regions will decline. On net, the change resulting from generating with coal instead of generating with gas results in increased CO_2 emissions on the order of 0.6 to 0.8 tons/MWh.

Q. WOULD SUCH AN EFFECT CHANGE THE OVERALL PRODUCTION COST ECONOMICS OF THE 502 JUNCTION TO LOUDOUN LINE?

A. Yes. With different cost inputs for the fuels that generate the "increased" and "decreased" MWHs in the table above, the computed production cost savings would be changed. For example, if net increased CO_2 emissions associated with TrAIL were 0.6 tons/MWh, at a carbon cost of $10 per ton, the reduction in production cost savings in 2013 would be (0.6 tons/MWh x 10 million MWh x

[18] The exact amount depends on the heat rate of the generator in question, and the exact chemical makeup of the coal and the natural gas.

$10/ton) or $60 million per year. In later years, higher carbon adders could reduce the production cost savings substantially more.

Q. HOW MUCH WOULD PRODUCTION COST SAVINGS CHANGE, AND IN WHAT DIRECTION?

A. The actual level of change in production cost savings (from PJM's current "base case") due to a carbon adder would depend on the specifics of the regulation and would require careful production cost modeling to ascertain. But the direction of change is clear: production cost savings from the 502-to-Loudoun line will be less in a "carbon-constrained" world that places higher costs on more carbon intensive fuels such as coal. If the economic benefit of the line comes from using greater amounts of lower-production-cost coal generation and lesser amounts of higher-production cost natural gas generation, then carbon adders will reduce this benefit because the relative marginal cost difference between the fuels will decrease. Production cost savings from the 502 Junction to Loudoun line would be reduced because the effect of any carbon regulation would be felt more heavily in the more coal-dominated regions, such as the AEP and AP zones of PJM.

Q. SHOULD THIS EFFECT BE TAKEN INTO ACCOUNT WHEN ASSESSING THE ECONOMICS OF THE 502 JUNCTION TO LOUDOUN LINE?

A. Yes. A proposed one billion dollar plus investment in transmission that will take a number of years to construct and will be relatively long-lived should be rigorously assessed for economic impact. In this case, rigor demands a careful and comprehensive examination of the likely impact of carbon dioxide regulation affecting the region.

Q. HAS SUCH A COMPREHENSIVE EXAMINATION BEEN PERFORMED?

A. No. PJM's initial efforts have only begun to explore the potential effects under different carbon dioxide regulation scenarios.

Q. HAS PJM ADDRESSED THE ECONOMICS OF THE 502 TO LOUDOUN LINE?

A. Yes. They were addressed in a presentation to the PJM Transmission Expansion Advisory Committee on May 9, 2007.[19]

Q. WHAT DID THAT PRESENTATION SHOW?

A. A major point illustrated by that presentation is that production cost savings, and other economic impact indicators, vary depending on the assumptions made when modeling the PJM system with and without the 502 Junction to Loudoun line. In particular, varying assumptions about load growth, fuel prices and base generation levels and the location of generation impact the savings significantly.

PJM conducted a minimal "carbon adder" sensitivity analysis, but that analysis did not address the carbon adder in years beyond 2013. The 502 Junction – Loudoun line is projected to come in-service in 2011, thus PJM has not yet

[19] "Market Efficiency Update," May 9, 2007, http://www.pjm.com/committees/teac/teac.html.

analyzed the effect of carbon regulations on any year except “year two” of operation.

Q. WHY IS IT IMPORTANT TO ANALYZE MORE THAN JUST ONE EARLY YEAR OF ITS OPERATION?

A. As the information in PJM’s presentation shows, the economic benefits of the line will be computed for 10, 20 or even 30 years. Just as the line is coming in to service, carbon dioxide regulations will likely commence; further it is likely that carbon adders will begin at a fairly low level and then are likely to increase the relative costs of fossil-fuel generation steadily from the 2012 timeframe forward. Such a potentially significant component of cost that changes the proposed line’s production cost savings needs to be considered.

Q. WHAT DO YOU CONCLUDE FROM THIS ASSESSMENT OF THE IMPACT OF THE TRAIL FACILITIES ON PJM GENERATION PATTERNS?

A. I conclude that Allegheny Power should more fully assess the impact of likely carbon dioxide regulation scenarios when considering the economic benefit and costs of the 502 Junction to Loudoun line. In particular, the cost-benefit analyses conducted by PJM to date show the greatest amount of net benefit accruing in the later years of the line’s existence. The likelihood is great, however, that carbon adders will be in place, and will be considerable, in the later years, if the current bills before the US Congress are any indication.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does, at this time. I reserve the right to supplement my testimony if additional relevant information becomes available.

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Market Efficiency Analysis Progress Report

PJM Planning Committee

Transmission Expansion Advisory Committee

April 18, 2007

Progress Report on Energy Market Simulations

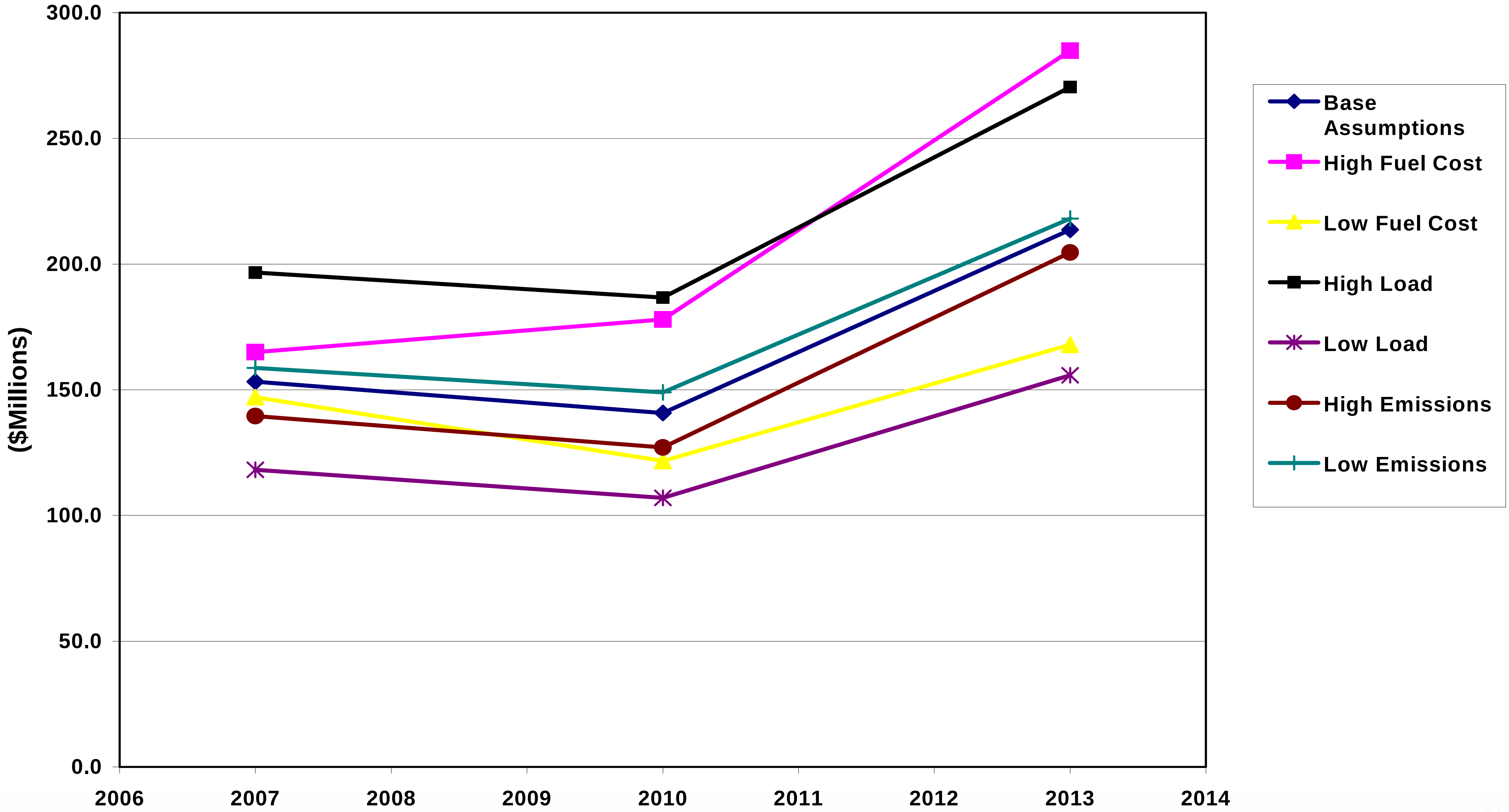
- Energy market simulation analysis of 502 Junction-Loudoun 500 kV line completed for all sensitivity scenarios for 2007, 2010 and 2013.
  - Change in FTR credits by zone and change in production cost by zone compiled for 2007 base run
  - Change in zonal production cost and change in zonal generation revenue compiled for 2007, 2010 and 2013 base case runs
- Energy market simulation analysis completed for 2007, 2010 and 2013 base assumption cases for:
  - Susquehanna-Roseland 500 kV
  - Bossards-Roseland 500 kV
  - Amos-Kemptown circuit
  - Kemptown-Deans circuit
  - Amos-Kemptown-Deans circuit
  - Possum Point-Calvert Cliffs-Indian River-Salem circuit
  - Kammer-Prexy-Conemaugh-TMI circuit
  - South Canton-Keystone-Sunbury circuit

Progress Report of Energy Market Simulation Analysis for 502 Junction-Loudoun 500 kV Line

	Year				
Sensitivity	2007	2010	2013	2016	2021
Base Assumptions	X	X	X	X	X
High Fuel	X	X	X	X	X
Low Fuel	X	X	X	X	X
High Load	X	X	X	X	X
Low Load	X	X	X	X	X
High Emissions	X	X	X	X	X
Low Emission	X	X	X	X	X
High Generation	n/a	n/a	n/a	X	X
Low Generation	n/a	n/a	n/a	X	X
Others ??	X	X	X	X	X

For 502Junc-Mdwbrk-Loudoun 500 kV line, energy market simulation analysis complete for 2007, 2010 and 2013 including all sensitivity scenarios

System Production Cost Savings associated with 502 Junction-Meadowbrook-Loudoun 500 kV Line



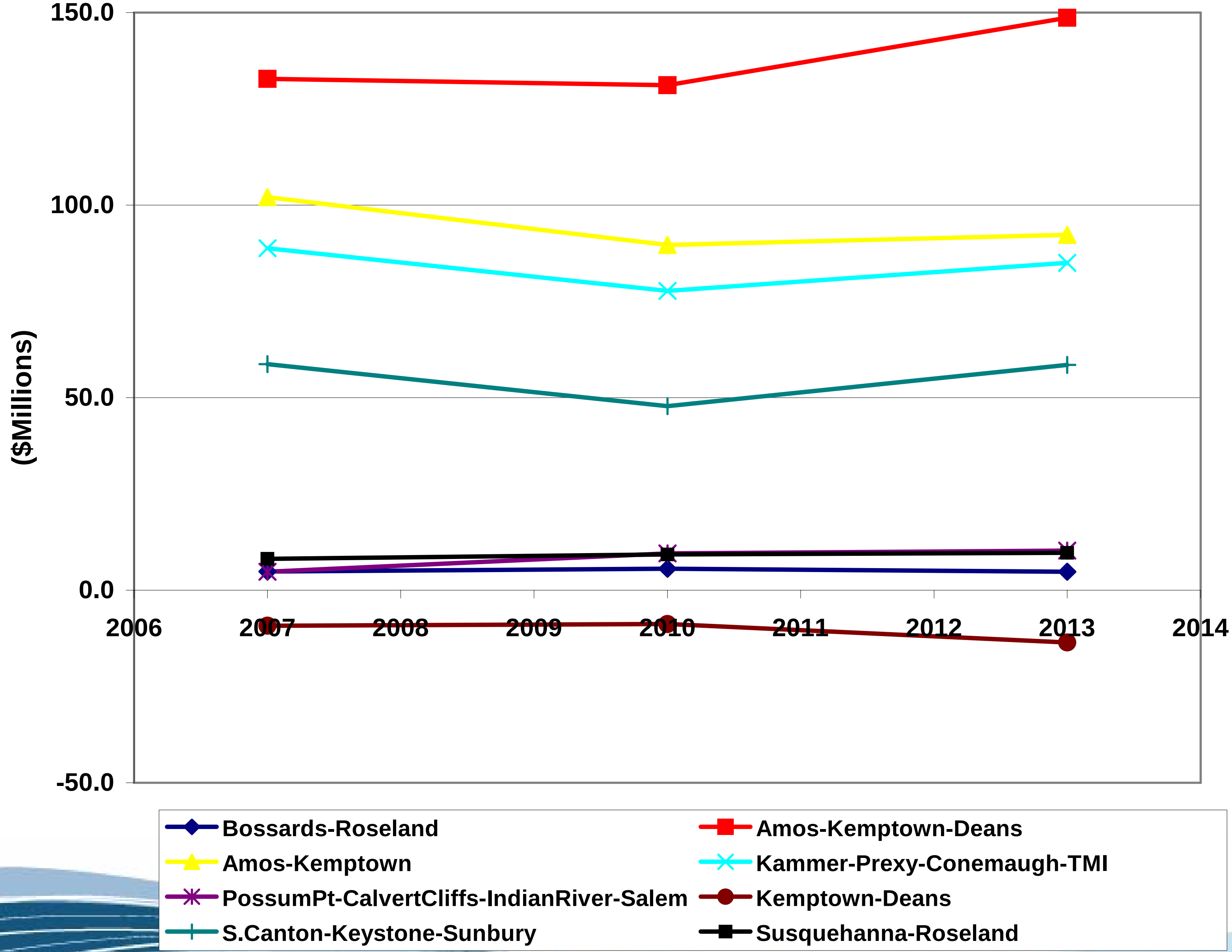
Progress Report of Energy Market Simulation Analysis for Backbone Projects

	Year				
Sensitivity	2007	2010	2013	2016	2021
Base Assumptions	X	X	X	X	X
High Fuel	X	X	X	X	X
Low Fuel	X	X	X	X	X
High Load	X	X	X	X	X
Low Load	X	X	X	X	X
High Emissions	X	X	X	X	X
Low Emission	X	X	X	X	X
High Generation	n/a	n/a	n/a	X	X
Low Generation	n/a	n/a	n/a	X	X
Others ??	X	X	X	X	X

Base case analysis for 2007, 2010 and 2013 complete for following projects:

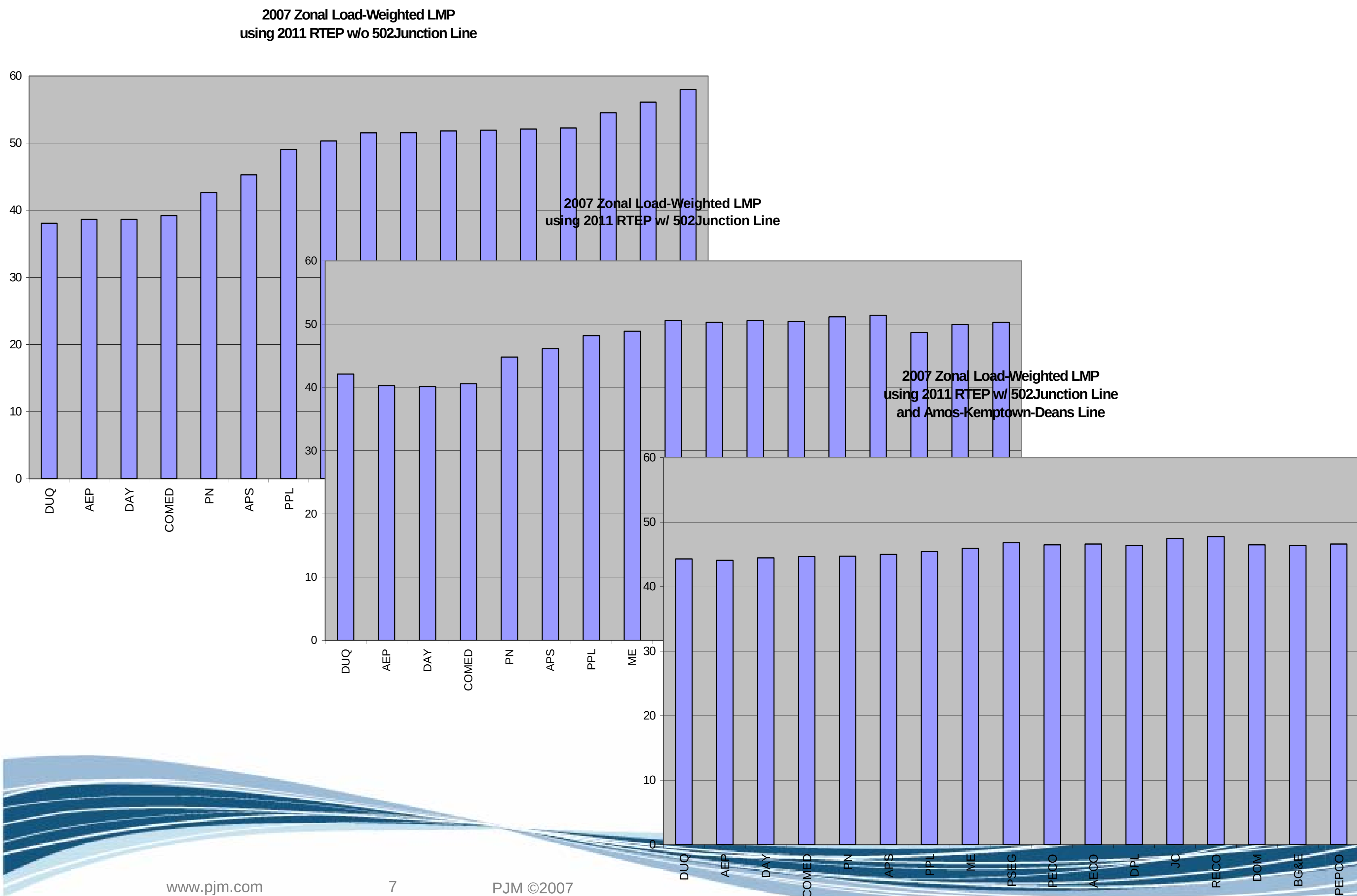
- Susq-Roseland
- Bossards-Roseland
- Amos-Kemptown
- Kemptown-Deans
- Amos-Kemptown-Deans
- PossPt-CalvCliffs-IR-Salem
- Kammer-Prexy-Conema-TMI
- S.Canton-Keystone-Sunbury

System Production Cost Savings associated with Various Backbone Projects[1]



(1) These savings are measured against the 2011 RTEP system including the 502Junction-Meadowbrook-Loudoun 500 kV line

Impact of Increased Transmission Capability on Zonal LMPs



Change in Zonal Load Payments & FTR Credits associated with 502 Junction-Loudoun Line

	2007 Base Simulation w/o 502Junc-Loudoun line		2007 Base Simulation w/ 502Junc-Loudoun line		Delta Load Payment		Delta FTR Credit	Delta Load Payment minus Delta FTR Credit	
Zone	Load Payment ($)	$/MWh	Load Payment ($)	$/MWh	($)	$/MWh	($)	($)	$/MWh
ACEC	618,618,364	51.82	603,210,345	50.53	-15,408,019	-1.29	-1,545,577	-13,862,443	-1.16
AEP	5,371,261,726	38.64	5,595,666,290	40.26	224,404,564	1.61	62,015,390	162,389,174	1.17
APS	2,339,348,764	45.29	2,382,018,354	46.11	42,669,590	0.83	-410,427,673	453,097,263	8.77
BG&E	1,978,166,180	56.11	1,760,499,769	49.94	-217,666,411	-6.17	-36,804,827	-180,861,584	-5.13
COED	4,164,080,516	39.18	4,310,488,946	40.56	146,408,430	1.38	-5,349,609	151,758,039	1.43
DOM	5,183,001,308	54.51	4,627,398,244	48.67	-555,603,064	-5.84	-358,988,286	-196,614,778	-2.07
DP&L	724,908,697	38.66	752,371,800	40.12	27,463,104	1.46	-5,745,651	33,208,754	1.77
DPLC	1,027,352,040	51.93	997,157,085	50.40	-30,194,955	-1.53	-5,172,447	-25,022,508	-1.26
DQE	558,563,943	38.06	617,669,745	42.09	59,105,802	4.03	16,292,179	42,813,622	2.92
JC	1,306,051,858	52.09	1,282,434,900	51.15	-23,616,958	-0.94	-10,442,764	-13,174,194	-0.53
ME	793,076,158	50.33	770,322,760	48.89	-22,753,399	-1.44	-16,144,623	-6,608,776	-0.42
PECO	2,139,352,180	51.56	2,086,785,257	50.29	-52,566,923	-1.27	-4,894,038	-47,672,885	-1.15
PEPCO	1,933,019,895	57.97	1,676,834,934	50.29	-256,184,961	-7.68	-17,042,605	-239,142,356	-7.17
PN	771,591,700	42.62	810,742,112	44.79	39,150,412	2.16	-9,748,947	48,899,359	2.70
PPL	2,091,095,307	49.06	2,052,912,311	48.16	-38,182,996	-0.90	-28,820,188	-9,362,808	-0.22
PSEG	2,501,099,258	51.53	2,454,367,529	50.57	-46,731,729	-0.96	-5,518,397	-41,213,332	-0.85
RECO	79,706,373	52.27	78,395,461	51.41	-1,310,912	-0.86	-71,899	-1,239,013	-0.81
Neptune	283,516,438	47.25	278,529,398	46.42	-4,987,040	-0.83	-108,482	-4,878,558	-0.81
Total	**33,863,810,704**	**46.72**	**33,137,805,238**	**45.72**	**-726,005,466**	**-1.00**	**-838,518,441**	**112,512,976**	**0.16**

Change in Zonal Load Payment, FTR Credits & Production Costs associated with 502 Junction-Loudoun Line (2007 Simulation)

	Delta Load Payment			Delta Load Payment - FTR Credit			Delta Production Cost		
Zone	**($000)**	**% of Decrease**	**% of Increase**	**($000)**	**% of Decrease**	**% of Increase**	**($000)**	**% of Decrease**	**% of Increase**
ACEC	-15,408	1.2%		-13,862	1.8%		-7,119	1.6%	
AEP	224,405		41.6%	162,389		18.2%	104,611		35.1%
APS	42,670		7.9%	453,097		50.8%	120,323		40.3%
BG&E	-217,666	17.2%		-180,862	23.2%		-41,354	9.2%	
COED	146,408		27.2%	151,758		17.0%	44,908		15.0%
DOM	-555,603	43.9%		-196,615	25.2%		-233,243	51.6%	
DP&L	27,463		5.1%	33,209		3.7%	11,162		3.7%
DPLC	-30,195	2.4%		-25,023	3.2%		-21,197	4.7%	
DQE	59,106		11.0%	42,814		4.8%	8,855		3.0%
JC	-23,617	1.9%		-13,174	1.7%		2,348		0.8%
ME	-22,753	1.8%		-6,609	0.8%		-10,314	2.3%	
PECO	-52,567	4.2%		-47,673	6.1%		-34,039	7.5%	
PEPCO	-256,185	20.2%		-239,142	30.7%		-73,519	16.3%	
PN	39,150		7.3%	48,899		5.5%	6,250		2.1%
PPL	-38,183	3.0%		-9,363	1.2%		-11,937	2.6%	
PSEG	-46,732	3.7%		-41,213	5.3%		-18,987	4.2%	
RECO	-1,311	0.1%		-1,239	0.2%		0		
Neptune	-4,987	0.4%		-4,879	0.6%		0		
Total	**-726,005**	**100.0%**	**100.0%**	**112,513**	**100.0%**	**100.0%**	**-153,254**	**100.0%**	**100.0%**
Total Decrease	**-1,265,207**			**-779,653**			**-451,710**		
Total Increase	**539,202**			**892,166**			**298,456**		

Change in Zonal Load Payments associated with 502 Junction-Loudoun Line (2007, 2010 & 2013 Simulations)

	2007 Base Case Assumptions				2010 Base Case Assumptions				2013 Base Case Assumptions			
Zone	Delta Load Payment ($000)	Delta LMP	% of Decrease	% of Increase	Delta Load Payment ($000)	Delta LMP	% of Decrease	% of Increase	Delta Load Payment ($000)	Delta LMP	% of Decrease	% of Increase
ACEC	-15,408	-1.29	1.2%		-13,678	-1.08	1.1%		-30,781	-2.30	1.5%	
AEP	224,405	1.61		41.6%	294,082	2.04		45.4%	402,210	2.70		46.9%
APS	42,670	0.83		7.9%	32,554	0.62		5.0%	-9,037	-0.17	0.4%	
BG&E	-217,666	-6.17	17.2%		-226,795	-6.18	17.9%		-325,223	-8.60	16.1%	
COED	146,408	1.38		27.2%	187,511	1.63		29.0%	288,569	2.35		33.7%
DOM	-555,603	-5.84	43.9%		-554,698	-5.52	43.7%		-834,986	-7.88	41.2%	
DP&L	27,463	1.46		5.1%	34,271	1.75		5.3%	52,463	2.57		6.1%
DPLC	-30,195	-1.53	2.4%		-27,015	-1.30	2.1%		-54,018	-2.48	2.7%	
DQE	59,106	4.03		11.0%	59,487	3.93		9.2%	73,087	4.69		8.5%
JC	-23,617	-0.94	1.9%		-20,698	-0.78	1.6%		-55,157	-1.95	2.7%	
ME	-22,753	-1.44	1.8%		-23,055	-1.39	1.8%		-42,368	-2.44	2.1%	
PECO	-52,567	-1.27	4.2%		-47,152	-1.09	3.7%		-98,688	-2.18	4.9%	
PEPCO	-256,185	-7.68	20.2%		-268,997	-7.70	21.2%		-385,216	-10.59	19.0%	
PN	39,150	2.16		7.3%	39,182	2.05		6.1%	40,967	2.04		4.8%
PPL	-38,183	-0.90	3.0%		-37,316	-0.84	2.9%		-76,080	-1.64	3.8%	
PSEG	-46,732	-0.96	3.7%		-40,720	-0.80	3.2%		-99,197	-1.86	4.9%	
RECO	-1,311	-0.86	0.1%		-1,122	-0.74	0.1%		-2,922	-1.92	0.1%	
Neptune	-4,987	-0.83	0.4%		-4,243	-0.71	0.3%		-8,156	-1.36	0.4%	
GE VFT	0	0.00			-2,831	-0.98	0.2%		-3,948	-1.37	0.2%	
Total	**-726,005**	**-1.00**	**100.0%**	**100.0%**	**-621,234**	**-0.81**	**100.0%**	**100.0%**	**-1,168,480**	**-1.46**	**100.0%**	**100.0%**

	2007	2010	2013
Total Decrease	**-1,265,207**	**-1,268,321**	**-2,025,776**
Total Increase	**539,202**	**647,087**	**857,296**

Change in Zonal Production Costs and Zonal Generator Revenues associated with 502 Junction-Loudoun Line (2007 Simulation)

ZONE	Delta Gen MWh	% of Decrease	% of Increase	Delta Production Cost ($000)	% of Decrease	% of Increase	Delta Gen Rev ($000)	% of Decrease	% of Increase
ACEC	-150,806	2.0%		-7,119	1.6%		-13,414	1.1%	
AEP	2,903,906		38.3%	104,611		35.1%	359,640		27.5%
APS	3,203,334		42.2%	120,323		40.3%	506,789		38.8%
BG&E	-909,279	12.0%		-41,354	9.2%		-211,442	17.3%	
COED	760,690		10.0%	44,908		15.0%	190,246		14.6%
DOM	-3,346,975	44.1%		-233,243	51.6%		-467,362	38.2%	
DP&L	199,986		2.6%	11,162		3.7%	36,706		2.8%
DPLC	-424,480	5.6%		-21,197	4.7%		-36,650	3.0%	
DQE	255,751		3.4%	8,855		3.0%	84,204		6.4%
JC	36,768		0.5%	2,348		0.8%	-7,768	0.6%	
ME	-242,491	3.2%		-10,314	2.3%		-29,888	2.4%	
PECO	-580,715	7.7%		-34,039	7.5%		-112,139	9.2%	
PEPCO	-1,104,672	14.6%		-73,519	16.3%		-230,614	18.8%	
PN	223,882		3.0%	6,250		2.1%	129,386		9.9%
PPL	-384,980	5.1%		-11,937	2.6%		-43,542	3.6%	
PSEG	-439,921	5.8%		-18,987	4.2%		-70,762	5.8%	
Total	**0**	**100.0%**	**100.0%**	**-153,254**	**100.0%**	**100.0%**	**83,389**	**100.0%**	**100.0%**

Total Decrease	**-7,584,317**	**-451,710**	**-1,223,582**
Total Increase	**7,584,317**	**298,456**	**1,306,971**

Change in Zonal Production Costs and Zonal Generator Revenues associated with 502 Junction-Loudoun Line (2010 Simulation)

ZONE	Delta Gen MWh	% of Decrease	% of Increase	Delta Production Cost ($000)	% of Decrease	% of Increase	Delta Gen Rev ($000)	% of Decrease	% of Increase
ACEC	-173,212	2.1%		-8,135	1.7%		-13,279	1.1%	
AEP	3,335,172		39.6%	125,004		36.6%	432,990		30.7%
APS	2,975,915		35.4%	119,469		35.0%	462,719		32.8%
BG&E	-1,074,547	12.8%		-48,754	10.1%		-212,403	17.1%	
COED	1,026,808		12.2%	52,296		15.3%	242,514		17.2%
DOM	-3,534,865	42.0%		-233,339	48.4%		-461,112	37.2%	
DP&L	9,143		0.1%	6,121		1.8%	38,619		2.7%
DPLC	-521,764	6.2%		-27,564	5.7%		-43,682	3.5%	
DQE	552,210		6.6%	20,485		6.0%	93,283		6.6%
JC	48,762		0.6%	1,902		0.6%	-9,170	0.7%	
ME	-262,173	3.1%		-12,600	2.6%		-31,008	2.5%	
PECO	-926,347	11.0%		-48,930	10.1%		-119,770	9.7%	
PEPCO	-1,110,053	13.2%		-71,684	14.9%		-241,499	19.5%	
PN	464,770		5.5%	16,104		4.7%	139,133		9.9%
PPL	-397,594	4.7%		-13,447	2.8%		-45,818	3.7%	
PSEG	-412,226	4.9%		-17,696	3.7%		-62,690	5.1%	
Total	**0**	**100.0%**	**100.0%**	**-140,770**	**100.0%**	**100.0%**	**168,827**	**100.0%**	**100.0%**

	Delta Gen MWh	Delta Production Cost ($000)	Delta Gen Rev ($000)
Total Decrease	**-8,412,780**	**-482,150**	**-1,240,431**
Total Increase	**8,412,780**	**341,381**	**1,409,258**

Change in Zonal Production Costs and Zonal Generator Revenues associated with 502 Junction-Loudoun Line (2013 Simulation)

ZONE	Delta Gen MWh	% of Decrease	% of Increase	Delta Production Cost ($000)	% of Decrease	% of Increase	Delta Gen Rev ($000)	% of Decrease	% of Increase
ACEC	-250,700	2.3%		-11,959	2.0%		-26,332	1.3%	
AEP	4,390,033		40.6%	160,868		40.3%	652,119		35.8%
APS	3,202,342		29.6%	113,201		28.4%	512,594		28.2%
BG&E	-1,272,884	11.8%		-57,061	9.3%		-308,401	15.8%	
COED	1,473,114		13.6%	65,950		16.5%	343,439		18.9%
DOM	-4,671,642	43.2%		-286,069	46.7%		-698,286	35.8%	
DP&L	749,248		6.9%	25,145		6.3%	80,713		4.4%
DPLC	-604,345	5.6%		-31,976	5.2%		-69,520	3.6%	
DQE	816,737		7.6%	28,598		7.2%	118,476		6.5%
JC	-24,251	0.2%		-4,148	0.7%		-31,996	1.6%	
ME	-376,121	3.5%		-17,751	2.9%		-55,140	2.8%	
PECO	-1,274,949	11.8%		-65,474	10.7%		-201,530	10.3%	
PEPCO	-1,528,205	14.1%		-106,368	17.4%		-357,588	18.3%	
PN	172,700		1.6%	5,298		1.3%	112,579		6.2%
PPL	-392,553	3.6%		-10,889	1.8%		-82,118	4.2%	
PSEG	-408,523	3.8%		-21,031	3.4%		-121,156	6.2%	
Total	**0**	**100.0%**	**100.0%**	**-213,665**	**100.0%**	**100.0%**	**-132,149**	**100.0%**	**100.0%**

Total Decrease	**-10,804,173**	**-612,725**	**-1,952,067**
Total Increase	**10,804,173**	**399,060**	**1,819,919**

Next Steps

- Develop future generation scenarios for 2016 and 2021 and continue sensitivity analysis
- Develop and incorporate carbon emission costs into sensitivity analysis
- Calculate impact of upgrades on RPM metrics
- Provide status updates as analysis progresses