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COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION

APPLICATION OF

PATH ALLEGHENY VIRGINIA TRANSMISSION CORPORATION

CASE NO. PUE-2009-00043

For certificates of public convenience and necessity to construct facilities: 765 kV Transmission Line through Loudoun, Frederick, and Clarke Counties

DIRECT TESTIMONY

ROBERT M. FAGAN

On Behalf of the Sierra Club

October 23, 2009

Table of Contents

List of Exhibits

I. INTRODUCTION AND SUMMARY

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 over 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 Sierra Club.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to examine and evaluate aspects of the applicants' (Allegheny Power, AEP, and PJM) i) overall analytical approach and ii) transmission system modeling details, in their assertion of a reliability need for the proposed Potomac Appalachian Transmission Highline ("PATH"). In doing so, I analyze in particular

fundamental technical considerations and the manner in which they are treated in the proponents' application for approval of the proposed PATH facilities:

- The reasonableness of key input assumptions used in PJM's transmission reliability modeling, particularly the magnitude of energy efficiency ("EE") and demand response ("DR") resources (in aggregate, "demand side" resources);
- The reasonableness of PJM's use of a January 2009 vintage peak load forecast (based on 4th quarter 2008 data) in support of its assertion for PATH need;
- The temporal duration of actual peak loads in PJM, and how such duration invites assessment of generation and demand-side "peaking" resource alternatives to the proposed PATH resource, which PJM did not do; and
- The level of generation resources in PJM's generation interconnection queue, and a comparison to the level of new generation resources used in their transmission reliability modeling.

I also document the lack of any economic cost/benefit analysis by the applicants of the proposed $1.85 billion PATH line, and the lack of such analysis for any of the alternatives to PATH for resolving alleged reliability concerns. Those alternatives include the use of demand-side and generation resources, and possibly lower-voltage reinforcement options.

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. It is clear that the alleged need for the PATH line is significantly dependent on peak load growth, in particular in the Mid-Atlantic region of PJM.[1] All of PJM's modeled

1 Exhibit PFM-2 contains a list of the alleged thermal reliability violations, which are dominated, especially in the earlier years of purported need, by "Mid-Atlantic Load Deliverability" test violations. The response to Sierra VA Sierra VA VI-3, Attachment A illustrates that PJM's analysis for future year grid effects involve an extrapolation of load growth trends.

"violations" in Exhibit PFM-1, PFM-2 and PFM-3 depend heavily on the load forecast and demand-side resource forecast used. The Mid-Atlantic region of PJM (also known as "MAAC"[2]) includes the service territories of the original PJM members, and essentially is comprised of customers located in central and eastern Pennsylvania, New Jersey, Maryland, the District of Columbia, and Delaware. However, in analyzing load growth and resource availability in the region, PJM

i. Fully excludes 2,908 MW of PJM-approved demand-side resources in the Mid-Atlantic region (more than 5% of the 2009 Mid-Atlantic peak load[3]), and 371 MW in the Dominion (Virginia) zone, available beginning in 2012 and already secured as a resource by PJM through its May 2009 capacity procurement process known as "RPM" (reliability pricing model)[4]. Demand-side resources are a FERC and PJM-approved capacity resource, yet due to the timing of PJM's most recent capacity procurement (May, 2009), the largest increase of such resource availability in PJM's history has not been considered in the PATH technical analyses (the latest of which were undertaken in March and April of 2009, just before the capacity procurement results were known);

2 "MAAC" is an acronym for "Mid-Atlantic Area Council", which was the North American Electric Reliability Council ("NERC") sub-region defined by the original PJM utilities. PJM still uses this designation to describe this sub-region of PJM, which includes the electric utility service territories of PECO (formerly, Philadelphia Electric Company), PPL (formerly, Pennsylvania Power and Light), PenElec, MetEd, Public Service Electric and Gas (PSEG), Jersey Central Light and Power (JCPL), Atlantic Electric (AEC), RECO (Rockland Electric Co.), BGE (Baltimore Gas and Electric), PEPCO (Potomac Electric Power Company), and the Delmarva Peninsula (DPL). The NERC sub-region boundaries and names have undergone considerable change in recent years; the original PJM utility service territory areas are now part of the NERC sub-region known as "ReliabilityFirst Corporation" (http://www.rfirst.org/), one of eight NERC sub-regions.

3 PJM, "Summer 2009 Weather Normalized Coincident Peaks (MW)", October 16, 2009. The PJM RTO total weather normalized coincident peak load in 2009 was 133,780 MW. A summation of the Mid-Atlantic load zone values from that publication results in a MAAC normalized summer 2009 coincident peak of 57,590 MW. Available at http://www.pjm.com/planning/resource-adequacy-planning/~/media/planning/res-adeq/load-forecast/summer-2009-pjm-scps-and-w-n-zonal-peaks.ashx and attached as Exhibit RMF-5 of this testimony.

4 Exhibit RMF-2 to this testimony contains PJM's report on the May 2009 RPM auction.

ii. Does not consider more than 2,000 MW (by 2015) of peak-load-reducing energy efficiency and demand response resources under development through electric utility programmatic efforts and other vehicles (pursuant to state law or policy) in all the PJM Mid-Atlantic states, the District of Columbia and Virginia. These resources are in addition to the 2,908 MW of excluded Mid-Atlantic demand-side resources noted above; and

iii. Uses an outdated peak load forecast released in January 2009 that uses fourth quarter 2008 data, during a time of one of the largest economic downturns in US history. The economic downturn has led to dramatically reduced electricity use in the region, and by PJM's own reckoning the 2009 summer coincident peak load in the Mid-Atlantic region of PJM was 3.4% lower than PJM's forecast peak for the Mid-Atlantic region from the January 2009 PJM Load Report.[5]

Thus, PJM has used wholly unreasonable demand-side modeling assumptions in support of its assertion of PATH need.

Futhermore, PJM fails to explore any alternative solutions to the alleged reliability concerns that consider the use of either demand-side resources or generation supply located in the Mid-Atlantic region. PJM does no modeling of the effect on PATH purported need of reducing the "net peak load" (i.e., the forecast peak load net of demand-side resources) seen on the grid. Instead, PJM proposes PATH as a solution to a peaking problem. The actual duration of the highest peak loads seen in summer in the Mid-Atlantic region is limited to relatively brief periods of time.

5 Exhibits RMF-3 and RMF-4 to this testimony contain PJM's January 2008 and January 2009 Load Forecast Reports, respectively.

PJM undertakes neither a direct nor a comparative economic analysis of the PATH line or feasible alternatives. PJM did not quantify the DR and EE resources that would defer or eliminate the need for PATH. PJM limits its inclusion of future Mid-Atlantic area generation resources to approximately one-tenth the level of generation that has indicated interest in connecting to the grid in the Mid-Atlantic region. PJM does not conduct sensitivity analyses of the how the grid might be effected if such generation were to come online in future years (2014 and beyond).

My testimony here will first provide summary background information on facets of the PJM electric market structure that is relative to the issues I address. I then proceed to demonstrate the following:

1. **Using current data on DR and EE resource availability, the "net peak load" PJM projects in its PATH analysis for 2014 for the Mid-Atlantic region will not be seen until 2018.** PJM uses outdated data on demand response and energy efficiency resource availability such that their modeling fails to properly reflect the net peak load that the transmission system would see in 2014, which is PJM's purported "year of need" for the PATH line. Properly incorporating PJM's May 2009 RPM results on demand response and energy efficiency resource availability leads to an outward shift of four years in the net peak load that would be seen by PJM's Mid-Atlantic region. This four year shift results from correcting just the first of the three major load-side input assumptions I identify above (namely DR/EE from the 2012/13 RPM auction that has yet to be modeled by PJM, additional DR/EE from state level initiatives in the Mid-Atlantic region, and an updated load forecast). I next describe the impact on the net peak load when the remaining two assumptions are corrected.

2. **Using current data on DR and EE resource availability and incorporating the additional effect of state-level DR and EE initiatives, the "net peak load" PJM projects in its PATH analysis for 2014 for the Mid-Atlantic region will not be seen until 2021.** Including projections of additional energy efficiency and demand response resources (beyond those available as a result of the May 2009 PJM RPM) estimated to be available in 2014 and later years in PA, NJ, MD, DE, DC, and Virginia further shifts outward the net peak load level that will be seen on the transmission system. PJM currently assumes that none of these additional resources will be available, even though state laws in PA, MD, and DE mandate such resources, and state policies and electric utility actions in NJ, VA and DC target significant peak load reduction. The information available from those jurisdictions illustrates how much EE and DR additional to that already reflected in the most recent RPM results will be available – over 2,000 MW of peak load reduction in the Mid-Atlantic region by 2015. Based on this estimate, along with the DR and EE resources from the 2012/13 RPM auction, the net peak load in the Mid-Atlantic region that PJM forecasts for 2014 – the year PJM says PATH is needed - will not be seen until 2021.

3. **Including an adjusted load forecast in addition to the DR and EE resource additions noted above shifts PJM's net peak load from 2014 to at least 2022.** PJM bases its current assessment on a load forecast prepared in December 2008 based on data available in the last quarter of 2008. By PJM's own reckoning, these data are outdated and contain too high an estimate of peak load growth. This past summer's coincident peak load in all of PJM was approximately 0.48% lower than PJM's January 2009 forecast load for the summer of 2009 for all of PJM, and the Mid-

Atlantic region load was 3.4% lower than forecast in January 2009. Using this information and adjusting PJM's forecast, the net peak load seen by the Mid-Atlantic region shifts out another year, to 2022, relative to the net peak load estimate that incorporates updated DR and EE resources.

4. **Peak load duration and reliability alternatives to PATH.** The PATH purported need is driven by extreme peak load levels that, if they do occur, occur for only a very small fraction of summer periods. For example, the PJM Mid-Atlantic region summer 2008 peak load of 59,653 MW occurred for just one hour; and the "top 50" hours of peak loading (over the course of 10 different days in the summer of 2008) make up the last increment of 7,540 MW of peak load. Thus, the last 13% of the peak load level was seen for less than 1% of the time in 2008. This pattern holds for all recent years (2006 through 2008), and represents the nature of a summer peaking system. PATH is a $1.85 billion interregional transmission project being proposed as a solution to a subregional "peaking" problem. The peaking need requirement could met with less expensive eastern MAAC/southwestern MAAC demand-side resources or generation, but an examination is required to determine this – and PJM has not analyzed this possibility. That PJM states its hands are tied with respect to demand-side and generation "market" solutions[6] does not validate their assertion of need for transmission, it just illustrates the lack of analysis of alternative solutions.

5. **No Economic Analysis Provided for a $1.85 Billion Proposed Facility.** PJM has not conducted any comprehensive economic analysis of the proposed PATH line. PJM provides no current estimate of the annual congestion or line loss savings

[6] Direct Testimony of Steven Herling, pages 51-52.

associated with the project. PJM does not prepare any benefit/cost assessment, or attempt to illustrate savings that may contribute towards offsetting the annual revenue requirement of $365 million that will be imposed on PJM consumers if the line is built. PJM has not prepared any assessment of comparable net costs of solutions such as peaking generation or additional demand response or energy efficiency. Earlier "market efficiency" analyses conducted by PJM show savings to load of only $47 million per year, thus the only information available on the potential economic benefits illustrates order-of-magnitude higher costs than benefits.

6. **Conclusions.** Based on my examination of PJM modeling assumptions for demand response resources, energy efficiency resources, and peak load forecast I conclude that the exclusion of considerable DR and EE resources made available through the 2012/13 RPM auction; the lack of consideration of additional legislated or policy-initiated state utility demand side initiatives in VA, MD, DC, DE, PA and NJ; and the use of an outdated load forecast all results in a flawed transmission need modeling result: simply put, net peak load in the Mid-Atlantic region is not what is forecast in the modeling for the PATH line, as the modeling estimate is not going to be reached until later years well beyond 2014. I also conclude that PJM has failed to sufficiently analyze demand-side and generation alternatives to the reliability concerns they express, especially given the limited duration of the peak load patterns in the Mid-Atlantic region, and given the lack of any comprehensive economic analysis of either the proposed transmission project or other alternatives.

7. **Recommendation.** My primary recommendation is that the Virginia State Corporation Commission deny the application outright due to the unsupported

assertions of need for the proposed PATH line. Alternatively, at a minimum the applicants must re-analyze the alleged need for PATH using current, reasonable input assumptions for demand-side resources and forecast peak load. Such assumptions should clearly include the results of the May 2009 RPM auction and the demand-side resources made available by that auction, and should also recognize the contribution to peak load reduction that will arise from the state-level initiatives identified and described in this testimony. The assumptions should also include a current peak load forecast. As part of any required re-examination of alleged PATH need, the applicants should analyze alternative reliability solutions and should conduct a full economic assessment of the effect on PJM ratepayers of the different alternatives.

II. RELEVANT BACKGROUND ON TRANSMISSION SYSTEM MODELING, ENERGY EFFICIENCY, DEMAND RESPONSE, AND GENERATION RESOURCES AND RPM

Q. WHAT BACKGROUND DO YOU DESCRIBE IN THIS SECTION?

A. I briefly describe relevant aspects of the PJM region and market structure as context for the issues I address in the body of this testimony. These include the following:

1. **Net Peak Load**. For the purposes of this testimony, I use the term "Net Peak Load" to define the peak load seen or modeled on the transmission system net of any demand-side resources – demand response and/or energy efficiency – that are seen or modeled.
2. **PJM RPM Market**. The PJM "Reliability Pricing Model" or RPM market is the capacity market for which existing and new generation and demand-side resources receive revenue streams for providing reliable capacity for the transmission grid. The

payments received for capacity are in addition to revenues received for energy and/or ancillary service provision in PJM. The RPM market is designed to provide pricing incentives for generators to locate in regions that require generation for reliability (thus the name, RPM). As PJM has noted, the RPM helps to ensure that units needed for reliability do not retire, and that new units needed in constrained areas have an incentive to invest and locate in those regions.

3. **Energy Efficiency and Demand Response as Resources.** PJM allows demand response resources to serve as firm, reliable capacity. As of May 2009, PJM also allows energy efficiency resources to serve as firm, reliable capacity. PJM uses the RPM construct to allow such capacity to "compete" with generation in the provision of reliable capacity for the grid.

4. **Energy Efficiency Affect on Peak Load.** In general, the implementation of energy efficiency resources lowers peak load. In addition to reducing consumption of energy (kWh), energy efficiency implementation can also reduce end-user load or demand (kW) during utilities' peak usage period. Utility-sponsored energy efficiency programs usually plan for peak load reducing effects as part of such programs.

5. **PJM Load Forecast Treatment of Energy Efficiency Resources.** PJM's econometric-based load forecast accounts for historical trends in energy efficiency seen in the individual utility service territories, but does not subtract planned energy efficiency savings, or account for any potential changes to historical trends that might be relevant. That would include, for example, the effect on future load of changes in state policy or state law that require increasing amounts of electric energy efficiency beyond what would occur in the absence of such directives.

6. **PJM Treatment of Energy Efficiency and Demand Response for Transmission Planning.** PJM limits the ability of demand response and energy efficiency resources to provide firm capacity to resources that have cleared in the RPM auctions, even though the RPM auctions are only for a single year's worth of capacity. PJM does not consider additional energy efficiency or demand response resources beyond those that have cleared in the most recent RPM auction as resources potentially able to resolve future reliability concerns.

7. **PJM Does Not Conduct Sensitivity Analysis.** PJM does not conduct any sensitivity analyses that evaluate the extent to which purported need for PATH might be eliminated or deferred by alternative projections of demand-side (i.e., demand response and/or energy efficiency) or supply side (i.e., generation) resource availability in future years.

8. **PJM Incorporates "Approved" Transmission Into the Modeling for RPM.** Once a transmission facility has been approved by PJM, it incorporates that facility into the modeling for RPM capacity. Such inclusion bias' the RPM auction outcome against generation and demand side resources that might otherwise have cleared such an auction absent the presence of the line in the auction model, and could otherwise provide reliability support to the grid.

III. THREE CRITICAL FACTORS SHIFT PJM'S CURRENT "NET PEAK LOAD" MID-ATLANTIC 2014 FORECAST BY EIGHT YEARS, TO 2022

Q. WHAT DO YOU EXAMINE IN THIS SECTION?

A. I examine three critical factors that have a dramatic material effect on PJM's assertion that PATH is needed in 2014 for reliability reasons. First, I address PJM's exclusion

from their April 2009 retool analysis (which uses data from the January 2009 Load Forecast Report) of key demand response and energy efficiency resources available in the Mid-Atlantic region of PJM. Inclusion of those resources leads to a reduction in "net peak load" such that PJM's forecast value for the Mid-Atlantic region net peak load for 2014 is not reached until 2018. Next, I present data from state initiatives for energy efficiency and demand response in Maryland, Delaware, New Jersey, the District of Columbia, and Pennsylvania and show how use of that data to estimate a further reduction in net peak load leads to a further shift in the Mid-Atlantic region net peak load such that PJM's forecast value for 2014 is not reached until 2021. Last, I update PJM's outdated load forecast, and I estimate that such an updated load forecast would further push out PJM's current estimate of Mid-Atlantic region net peak load for 2014, to at least 2022. Thus, when all three demand-side elements that PJM did not consider are incorporated into a revised estimate for net peak load for the Mid-Atlantic region of PJM, the net peak load forecasted by PJM for 2014 for use in the transmission planning model would not be reached until at least 2022.

PJM May 2009 RPM Demand Response and Energy Efficiency Resources

Q. DOES THE PRESENCE OF DEMAND RESPONSE AND ENERGY EFFICIENCY RESOURCES AFFECT TRANSMISSION NEED?

A. Yes. Demand response and energy efficiency, properly located, directly reduce the peak load seen on the transmission system and thus reduce the need for reinforcement of the grid. Demand response and energy efficiency resources are netted against peak load forecasts in PJM's process of analyzing the extent of projected "load deliverability" reliability concerns.

Q. DID PJM INCLUDE THE EFFECT OF THEIR MOST RECENTLY APPROVED DEMAND RESPONSE AND ENERGY EFFICIENCY RESOURCES IN THEIR ASSESSMENT OF NEED FOR PATH?

A. No. The data used to represent demand response and energy efficiency resources in the modeling used to assert PATH need are of 2008 vintage, even though more recent data is available from May of 2009. In particular, PJM's May 2009 procurement of demand-side capacity resources, through the RPM capacity market, was the largest procurement of demand-side resources in its history. The results presented by PJM in Exhibit PFM-2 for its analysis of load deliverability are thus based on outdated data. Using the most recent data, an increase in demand response and energy efficiency resource availability is seen.

Q. WHAT IS THE INCREASE IN DEMAND RESPONSE AND ENERGY EFFICIENCY RESOURCE AVAILABILITY ARISING FROM THE RECENTLY COMPLETED RPM AUCTION, RELATIVE TO PJM'S MODELING OF THOSE RESOURCES?

A. Table 1 below shows the increase. In 2012, there is an increase of 2,908 MW of demand side resources in the Mid-Atlantic region compared to the level PJM has included in its April 2009 retool modeling of transmission line need. This increase is comprised in part by an increase of over 1,000 MW available in the eastern Mid-Atlantic region (a subset of the Mid-Atlantic region, known as EMAAC). EMAAC is the region encompassing New Jersey, the Delmarva Peninsula and the PECO service territory. There is also 972 MW of additional demand side resource in the Southwest Mid-Atlantic region ("SWMAAC", another subset of the Mid-Atlantic region, consisting of the PEPCO and BGE territories)

just east and southeast of the proposed eastern terminus of the PATH line at Kemptown. And there is 371 MW of additional resources for the Dominion region (outside of the Mid-Atlantic area, but electrically close to the Kemptown terminus).

Table 1. Increase in Available DR and EE for 2012 Compared to PJM Modeled Levels

Delta (DR + EE), MW	2009	2010	2011	2012	2013	2014	2015
MAAC	0	0	0	2,908	2,908	2,908	2,908
EMAAC	0	0	0	1,046	1,046	1,046	1,046
SWMAAC	0	0	0	972	972	972	972
DOM	0	0	0	371	371	371	371

Note: There is no change to available DR and EE in 2009 through 2011 because the RPM results are for three years ahead; that is, I do not assume any increases in DR and EE relative to PJM's modeling for the years 2009 through 2011. Source: Computed from the difference between the values in Tables 2 and 4 below.

Q. WHAT LEVEL OF DEMAND RESPONSE AND ENERGY EFFICIENCY WAS USED BY PJM IN THE MODELING FOR THE PROPOSED LINE?

A. In their most recent analysis, PJM uses demand response and energy efficiency resources based on the information in the PJM 2009 Load Forecast Report (January, 2009). These resources include a combination of DR cleared in the 2011/12 RPM auction (held in May, 2008) and interruptible load resources (ILR); energy efficiency resources are listed as zero in the report for all PJM regions (Table B-8 of the report), since the incorporation of these resources into PJM's planning framework only commenced with the May 2009 RPM auctions. PJM's modeling does not include the additional 2,908 MW of DR and EE shown in Table 1 for the Mid-Atlantic region. Table 2 below shows PJM's levels of demand response values for the MAAC, EMAAC, and SWMAAC regions, and for the Dominion (Virginia Power) territory ("DOM").

Table 2. Demand Response and Energy Efficiency Used by PJM Modeling for Proposed PATH Line

DR + EE, MW	2009	2010	2011	2012	2013	2014	2015
MAAC	2,311	1,863	1,996	1,996	1,996	1,996	1,996
EMAAC	1,033	684	613	613	613	613	613
SWMAAC	904	747	961	961	961	961	961
DOM	28	23	126	126	126	126	126

Source: PJM, Table B-7, January 2009 Load Forecast Report. MAAC values taken directly. EMAAC values based on sum of values for NJ, DPL, and PECO territories. SWMAAC values are the sum of BGE and PEPCO values. Table B-8 of same report indicates that EE values for all regions are zero.

Q. DO TABLE 2 VALUES REPRESENT THE MOST RECENT INFORMATION AVAILABLE FOR DR AND EE THAT WILL BE A RESOURCE TO PJM?

A. No. In May of 2009 (subsequent to the re-tool conducted by PJM in April of 2009) the most recent RPM auction cleared an unprecedented increase in the amount of demand response – and for the first time in an RPM auction, energy efficiency – available for use as a capacity resource throughout PJM. This includes substantial increases over the values in Table 2 above for the MAAC, EMAAC, SWMAAC and Dominion (DOM) areas. Table 3A below reproduces a table from the PJM RPM auction report in May 2009 that shows the level of offered and cleared demand response and energy efficiency resources by utility service territory. Table 3B illustrates the increase in cleared demand-side resources between the May, 2008 2011/12 RPM auction (used by PJM in their PATH modeling) and the May 2009 2012/13 RPM auction, also by utility service territory.

Table 3A. DR and EE Offered and Cleared in the 2012/13 RPM Auction (May, 2009)

	Offered MW*			Cleared MW*		
Zone	Demand	EE	Total	Demand	EE	Total
AECO	78.9	1.9	80.8	74.3	2	76.3
AEP	1352.7	2.6	1355.3	710.8	0	710.8
APS	582.4	0	582.4	272.9	0	272.9
BGE	1370.6	105.8	1476.4	1312.9	103.2	1416.1
COMED	1049	386.4	1435.4	658	386.4	1044.4
DAY	405.6	0	405.6	112.3	0	112.3
DOM	1237.9	76.6	1314.5	494.7	2.4	497.1
DPL	289.6	12.7	302.3	283	12.2	295.2
DUQ	190.8	0.2	191	74.8	0.2	75
JCPL	362.7	2.8	365.5	321.9	1.8	323.7
METED	267.2	0	267.2	252	0	252
PECO	581.2	2.9	584.1	496.4	1.9	498.3
PENELEC	286.1	0.2	286.3	276.3	0.2	276.5
PEPCO	485.1	56.5	541.6	460.8	56.5	517.3
PPL	832.9	0	832.9	783.3	0	783.3
PSEG	472.9	4.1	477	460.1	2.9	463
RECO	2	0	2	2	0	2
Total	9847.6	652.7	10500.3	7047.3	568.9	7616.2

*All MW Values are in UCAP Terms

Table Source: PJM, 2012/2013 RPM Base Residual Auction Results, Table 3A, "Comparison of Demand Resources and Energy Efficiency Resources Offered versus Cleared in the 2012/13 BRA represented in UCAP". May 2009.

Table 3B. Comparison of DR and EE Offered and Cleared in the 2011/12 RPM Auction vs. DR and EE Offered and Cleared in the 2012/13 RPM Auction (May, 2009)

	Offered MW*			Cleared MW*		
Zone	2011/2012	2012/2013	Increase in Offered MW	2011/2012	2012/2013	Increase in Cleared MW
AEGO	11.7	78.9	67.2	11.7	79.8	68.1
AEP	24.2	1352.7	1328.5	14.6	710.8	696.2
APS	89.6	582.4	493.8	57.3	272.9	215.6
BGE	628.3	1370.6	742.3	595.8	1312.9	717.1
COMED	158	1049	891	122.3	653	530.7
DAY	25.4	405.6	380.2	15.3	112.3	97
DOM	155.8	1237.9	1082.1	105.9	494.7	388.8
DPL	58.9	289.6	230.7	43.8	283	239.2
DUQ	0	190.8	190.8	0	74.8	74.8
JCPL	55.4	362.7	307.3	46.4	321.9	275.5
METED	23.8	267.2	243.4	14.3	252	237.7
PECO	131.3	581.2	449.9	103.2	496.4	393.2
PENELEC	27.1	286.1	259	16.2	276.3	260.1
PEPCO	150.9	485.1	334.2	144.8	460.8	316
PPL	63.4	832.9	769.5	42.2	783.3	741.1
PSEG	49.6	472.9	423.3	30.8	460.1	429.3
RECO	10	2	2	0	2	2
Total	1652.4	9847.6	8195.2	1364.9	7047.3	5682.4

*All MW Values are in UCAP Terms

Table Source: PJM, 2012/2013 RPM Base Residual Auction Results, Table 3B, "Comparison of Demand Resources Offered and Cleared in 2011/12 BRA & 2012/13 BRA represented in UCAP. May 2009.

Table 4 below aggregates the cleared 2012/13 values in the table above to produce the levels for MAAC, EMAAC, SWMAAC, and includes the Dominion region also.

Table 4. Updated Levels of DR and EE Based on Results of 2012/13 RPM Auction

DR + EE, MW	2009	2010	2011	2012	2013	2014	2015
MAAC	2,311	1,863	1,996	4,904	4,904	4,904	4,904
EMAAC	1,033	684	613	1,659	1,659	1,659	1,659
SWMAAC	904	747	961	1933.4	1933.4	1933.4	1933.4
DOM	28	23	126	497.1	497.1	497.1	497.1

Q. HAS PJM UPDATED THEIR PATH ANALYSIS TO TAKE THIS INCREASED DEMAND SIDE RESOURCE AVAILABILITY INTO ACCOUNT?

A. No. PJM has not updated their analyses to take the increased levels into account. The April 2009 retool used the levels of demand response from Table 2 above, and did not use the more recent data shown in Table 3A and summarized for PJM subregions in Table 4.

Thus, PJM has not included the most recent information on demand-side resources that are now available for use in reducing net peak load modeled in their transmission analyses. If they were to include it, it would shift the net peak load for the Mid-Atlantic region out four years – in other words, the levels projected by PJM to occur in 2014 would not occur until 2018. This is seen in Table 5 below.

Table 5. Four Year Outward Shift in Mid-Atlantic Net Peak Load When Using May 2009 RPM Results for Demand Side Resources

	2013	2014	2015	2016	2017	2018
MAAC - Based on PJM's April Retool						
MAAC 90/10 CP Load Forecast, Jan 2009 Ld Rpt	67,890	68,940	69,748	70,590	71,449	71,915
MAAC DR and EE Reduction, Total, Jan 2009 Ld Rpt	1,996	1,996	1,996	1,996	1,996	1,996
MAAC 90/10 CP Net Peak Load Forecast w/o 2012/13 RPM DR+EE Resources	65,894	**66,944**	67,752	68,594	69,453	69,919
MAAC - Including the Effect of the DR/EE Available from the May 2009 RPM Auction						
MAAC 90/10 CP Load Forecast, Jan 2009 Ld Rpt	67,890	68,940	69,748	70,590	71,449	71,915
MAAC DR and EE Reduction, Total, 2012/13 RPM	4,903.70	4,903.70	4,903.70	4,903.70	4,903.70	4,903.70
MAAC 90/10 CP Net Peak Load Forecast with 2012/13 RPM DR+EE Resources	62,986	64,036	64,844	65,686	66,545	**67,011**

Q. PLEASE EXPLAIN HOW PJM MODELS DEMAND SIDE RESOURCES FOR FUTURE YEARS.

A. For transmission modeling purposes, PJM holds constant the level of demand-side resources in future years, equal to the value for the most recently completed capacity procurement for that year and all forward years. In their modeling for the proposed PATH line, PJM held the values constant for 2011 forward based on the information in the January 2009 load forecast report. This is seen in Table 2 above. For example, PJM's value for demand-side resources for the Mid-Atlantic area is held at 1,996 MW for the years 2011 and beyond. For the purpose of showing how demand-side resources would change under PJM's protocols if PJM incorporated the results of the May 2009 RPM auction into their modeling, I too held constant the level of demand-side resources from 2012 forward, as seen in Table 4.

Q. DO YOU THINK DEMAND SIDE RESOURCES WILL BE THE SAME IN FUTURE YEARS AS THEY ARE IN THE MOST RECENT YEAR FOR WHICH RPM RESULTS EXIST?

A. No. Current trends are for increasing levels of demand-side resource availability. For example, existing and developing energy efficiency and peak demand reduction programs in Virginia, New Jersey, Delaware, Maryland, DC, and Pennsylvania all will be a resource source for the PJM RPM market. PJM recognizes that the existence of the RPM market will help support state energy efficiency and demand response efforts, as seen in a PJM document on RPM and demand response and energy efficiency:

> "How does the capacity market fit into a state's master plan for energy?
>
> Participation in the PJM capacity market allows a consumer to monetize their ability to reduce demand for electricity and to monetize energy efficiency measures they have implemented. The consumer will not only experience savings from an altered energy

consumption pattern but can also receive a revenue stream for helping to increase the reliability of the electric system that serves them. RPM provides a revenue stream to make demand response and energy efficiency viable alternatives in support of state energy master plans."

Source: PJM, "Reliability Pricing Model, Demand Response and Energy Efficiency", April 6, 2009, available at http://www.pjm.com/markets-and-operations/demand-response/~/media/markets-ops/rpm/20090406-dr-ee-in-rpm-collateral.ashx

Q. WHAT IS THE EXPERIENCE OF OTHER REGIONS WITH DEMAND RESPONSE AS A CAPACITY RESOURCE?

A. Other regions have seen increases in the availability of demand response resources. For example, ISO-NE (the Independent System Operator for New England, analogous to PJM) has shown increased levels of DR and EE in each of its subsequent capacity market auctions, which use a similar construct as PJM.

Q. IS THERE SIGNIFICANT POTENTIAL FOR ADDITIONAL DEMAND RESPONSE AND ENERGY EFFICIENCY IN THE PJM REGION?

A. Yes. Both demand response and energy efficiency potential is considerable. Figure 1 below illustrates demand response potential by census region based on a June 2009 FERC Staff Report, "A National Assessment of Demand Response Potential".[7] As indicated, as a percentage of peak load demand response potential in the Mid-Atlantic region could reach as high as 17% of peak load. Based on the May 2009 PJM RPM results shown in Table 3A, and summarized in Table 4, current Mid-Atlantic region demand response of 4,724 MW represents 7.4% of PJM's 50/50 2012 Mid-Atlantic peak demand of 63,556 MW (based on the January 2009 load forecast), thus confirming the presence of significant additional demand response. Various recent reports on energy

7 Available at http://www.ferc.gov/legal/staff-reports/06-09-demand-response.pdf.

efficiency potential in the region confirm the potential for savings illustrated in the next section of this testimony on state-level energy efficiency initiatives.

Figure 1. Table ES-3 from the National Assesssment of Demand Response Potential

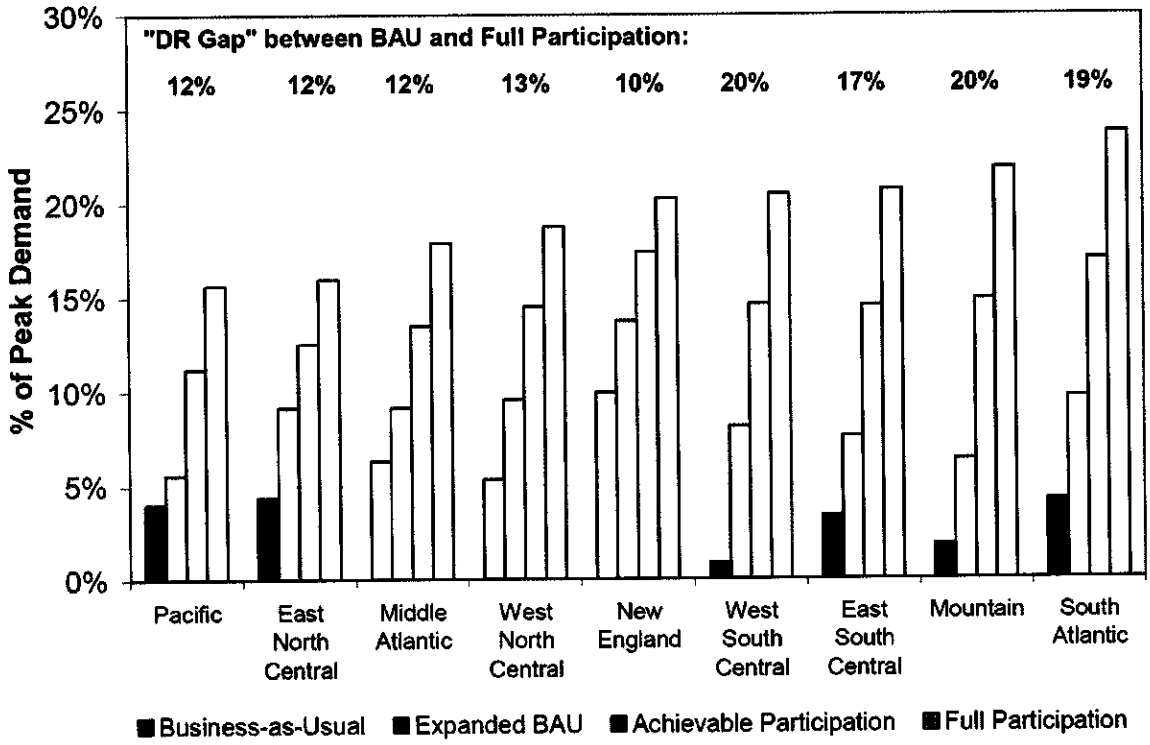

Figure ES-3: Demand Response Potential by Census Division (2019)

State Initiatives for Energy Efficiency and Demand Response

Q. WHAT DO YOU PRESENT IN THIS SECTION?

A. I identify, describe, and to the extent possible quantify[8] the energy efficiency and demand response resources that will be available pursuant to state level initiatives in the PJM Mid-Atlantic and Dominion (Virginia) region. These resources will help to reduce the

8 As will be noted in this section, I subtract out all 2012/13 RPM cleared DR and EE resources from the gross totals of peak load reduction reported for DR and EE resources pursuant to the state initiatives for BGE, PEPCO, and DPL. This is a conservative approach, in that at least some of the 2012/13 cleared RPM quantities in these states are likely sourced from DR providers other than the utility companies that are developing and implementing the state initiatives.

reliability concerns expressed by PJM because their effect is to reduce the net peak load in their respective regions.

Q. DOES PJM INCLUDE, IN ITS MODELING OF PATH ALLEGED NEED, THE PEAK-LOAD REDUCING EFFECT OF PLANNED ENERGY EFFICIENCY AND DEMAND RESPONSE PROGRAMS FROM THE STATES OF NJ, PA, MD, DE, VA AND THE DISTRICT OF COLUMBIA?

A. Generally, no. The possible[9] exceptions to this are program resources, primarily demand response resources in the SWMAAC region and the DPL service territory, that have already cleared PJM's RPM auction for capacity resources; although as noted in the above section, even these resources cleared in the 2012/13 RPM auction are not included in PJM's April 2009 retool modeling.

Q. WHAT STATE ENERGY EFFICIENCY AND DEMAND RESPONSE EFFORTS ARE NOT INCLUDED IN PJM'S ANALYSIS?

A. Energy efficiency and demand response initiatives in Virginia, Maryland, the District of Columbia, Delaware, Pennsylvania, and New Jersey are generally excluded from consideration as potential peak load reducing resources in these states. These initiatives primarily take the form of utility-sponsored "demand side management" programs targeted to reduce peak load through demand response and energy efficiency implementation pursuant to state law, state policy, and/or utility commission directives.

Q. DO THESE STATE-INITIATED EFFORTS HELP REDUCE NET PEAK LOAD?

9 For the purposes of this testimony, I have presumed that EE and DR resources cleared in the SWMAAC and DPL regions of PJM in the 2012/13 auction are part of the state utility initiative savings seen in Maryland and the District of Columbia and Delaware, since PJM RPM auction results do not publicly indicate the source of EE and DR savings in any given region. This is a conservatism, as to the extent that these cleared resources are sourced outside of the state initiated utility programs, they represent savings incremental to utility efforts.

A. Yes, absolutely. Peak load reduction in these areas, through EE or DR, is electrically important from the perspective of mitigating alleged need for additional generation or transmission such as the proposed PATH line. The BGE and PEPCO service territories in Maryland (together, the Southwest Mid-Atlantic region, or SWMAAC), for example, are electrically "downstream" from the planned terminus of the PATH line at Kemptown. In addition, New Jersey and Pennsylvania and Delaware demand-side resources all contribute towards reduced Eastern Mid-Atlantic, and Mid-Atlantic, peak loads. And much of the Dominion Power service territory in Virginia is located in the northern and eastern regions of the state, and thus is also electrically downstream of the main 500 kV facilities that make up the asserted reliability concerns shown in Exhibit PFM-2.[10]

Q. PLEASE SUMMARIZE THE EFFECT THAT THESE RESOURCES HAVE ON THE "NET PEAK LOAD" THAT UNDERLIES THE NEED FOR PATH.

A. The following Table 6 contains an estimate out to 2019[11] of the additional peak-load-reducing effect of these planned resources that are not currently considered by PJM in their analysis of need. These reductions are in addition to both the EE and DR resources that have already cleared in the 2012/13 RPM auction, though I emphasize again that those 2012/13 RPM cleared resources have not yet been included in PJM's analysis as resources that can help mitigate purported PATH need, and are also additional to any peak load reduction that would result from use of a more current peak load forecast.

10 See response to Sierra VA VI-3, Attachment A, Table 4, which contains the distribution factors for the PJM load zones with respect to the Mt. Storms-Doubs constraint. All of the cited service territories above, with the exception of Penelec, exhibit positive distribution factors, which illustrates that peak load reduction in these areas contributes towards mitigating the impact on a key facility for which PATH is proposed as a reliability solution.

11 The savings continue beyond 2019.

Table 6. Additional Peak Load Savings Available from State Level EE and DR Initiatives

	2013	2014	2015	2016	2017	2018	2019
Virginia	270	367	420	469	513	551	580
Maryland/DC (BGE, PEPCO)	212	265	257	257	257	257	257
New Jersey	525	788	1,050	1,313	1,575	1,838	2,100
Delmarva Peninsula	95	165	226	226	226	226	226
Pennsylvania	608	608	608	608	608	608	608
Mid-Atlantic Total	1,440	1,825	2,140	2,403	2,665	2,928	3,190

Note: Not Considered in PJM's PATH Need Modeling and Not Already Accounted for in 2012/13 RPM levels.
Sources: EmPower Maryland Filings and MD PSC Orders, DC Commission Filing and Order, NJ Energy Master Plan, PA Act 129, VA SCC Dominion filing. Synapse compilation.

The effect of including the savings in the above table is to push further outward the Mid-Atlantic peak load currently forecast by PJM for 2014. I estimate that including the 2012/13 RPM results pushes outward the forecast load for 2014 to 2018; adding in the resources in the above table pushes out to 2021 the net peak load PJM forecasts for 2014 for the Mid-Atlantic region. The following sections briefly describe the initiatives in each of these regions.

Virginia (Dominion) State Energy Efficiency and Demand Response Initiatives

Q. WHAT IS THE BASIS FOR THE VIRGINIA SAVINGS SHOWN IN TABLE 6?

A. The source of the savings is Schedule 6 of the Direct Testimony of Michael J. Jesensky of Dominion Power in Dominion's DSM Case before this Commission.[12] He includes an estimate of coincident peak savings arising from the 12 EE/DR programs planned by Dominion.

Table 7. Dominion Zone Coincident Peak Savings, MW

	2013	2014	2015	2016	2017	2018	2019
Dominion	270	367	420	469	513	551	580

[12] Available at http://docket.scc.virginia.gov/vaprod/main.asp for Docket PUE-20009-00081.

Southwest MAAC Region State Energy Efficiency and Demand Response Initiatives (Eastern Maryland and District of Columbia)

Q. WHAT IS THE BASIS FOR THE MARYLAND/DC SAVINGS?

A. The source of the savings includes the EmPower Maryland filings and resulting Maryland Public Service Commission Orders for PEPCO/MD and BGE, and the PEPCO/DC filing and DC Commission Orders in that case.[13]

Q. PLEASE SUMMARIZE THOSE FILINGS AND ORDERS AND THEIR BASIS IN STATE LAW OR POLICY.

A. Maryland's "Empower Maryland Energy Efficiency Act of 2008" directed utilities to achieve peak demand savings reductions, and directed the Maryland Commission to oversee and regulate the implementation of the utility EE and DR programs.[14] Table 8 below summarizes the savings values from the Commission orders and filings, and also illustrates how I first subtracted cleared 2012/13 RPM values to obtain the net peak load effect shown in Table 6 above. This step likely underestimates the peak load reduction that will be available from these programs. The first part of the table also includes the gross peak demand reductions from programs that include AMI and smart meter savings estimates; I do not include these peak demand savings in my summary estimate.

[13] Case 9154, November 10, 2008 filing of BGE, revised Table ES-2, peak load reduction. Order 82385 and PEPCO/MD filing in Case 9155, September 1, 2008 filing. District of Columbia Order 15205, March 3, 2009 and PEPCO/DC filing of April 4, 2007.

[14] Md. Public Utility Companies Code Ann. § 7-211 (2009).

Table 8. Southwest MAAC Region Additional Peak Reductions from State Utility Initiatives

SWMAAC Peak Savings MW - Approved Utility Programs Including All DR From AMI, Smart Meter, Dynamic Pricing

	2010	2011	2012	2013	2014	2015
BGE	928	1,369	1,746	1,805	1,870	1,941
PEPCO MD	263	535	656	716	779	801
PEPCO DC	21	27	51	51	51	51
Total SWMAAC	1,211	1,931	2,452	2,571	2,700	2,792

SWMAAC Peak Savings MW - Approved Utility Programs Excluding DR From AMI, Smart Meter, Dynamic Pricing

	2010	2011	2012	2013	2014	2015
BGE	928	1,319	1,646	1,630	1,620	1,591
PEPCO MD	166	309	409	468	530	552
PEPCO DC	16	25	48	48	48	48
Total SWMAAC	1,109	1,653	2,103	2,146	2,198	2,191

SWMAAC Total 2012/13 PJM RPM UCAP, MW

	2012	2013	2014	2015
EE	160	160	160	160
DR	1,774	1,774	1,774	1,774
Total EE+DR, SWMAAC	1,933	1,933	1,933	1,933

SWMAAC Incremental Peak Load Reduction Beyond Current 2012/13 RPM Levels Including Maryland and District of Columbia EE and DR Initiatives

	2012	2013	2014	2015
Total - Approved Utility Programs	2,103	2,146	2,198	2,191
Total - 2012/13 RPM	1,933	1,933	1,933	1,933
Incremental Peak Reduction, MW	169	212	265	257

Delaware and the DPL Zone

Q. WHAT IS THE BASIS FOR THE DPL ZONE SAVINGS?

A. In 2009 Delaware enacted the "Energy Conservation and Efficiency Act of 2009. That act included a requirement to reduce peak demand (MW), and energy consumption (MWh), by 15% by 2015.[15] The estimated savings shown in Table 6 above was computed based on a 15% peak load reduction from Delaware's peak load[16] based on the

[15] Title 26 of the Delaware Code, Chapter 15 – Energy Efficiency Resource Standards, Section 1502 (a)(1), "It is the goal of this chapter that each affected energy provider shall achieve a minimum percentage of energy savings as follows: . . . enery savings that is equivalent to 2% of the provider's 2007 electricity consumption, and coincident peak demand reduction that is equivalent to 2% of the provider's 2007 peak demand by 2011, with both of the foregoing increasing from 2% to 15% by 2015;..."

[16] Delaware peak load is assumed to be just under two-thirds of the DPL zone peak load.

PJM January 2009 Load Forecast Report, and subtracting out the cleared DR and EE savings from the 2012/13 RPM auction. The value also includes an estimate of savings for the non-Delaware remainder of the DPL zone, based on combined Maryland and Virginia DPL zone load achieving a 5% peak demand reduction by 2015.

New Jersey and Pennsylvania State Energy Efficiency Targets

Q. CAN YOU SUMMARIZE THE EASTERN PENNSYLVANIA AND NEW JERSEY PJM REGIONS' ENERGY EFFICIENCY AND DEMAND RESPONSE PLANS?

A. Yes. New Jersey is in the process of implementing energy efficiency programs arising from the state's Energy Master Plan, issued in October 2008, which seeks to dramatically reduce peak load growth by 2020 net of energy efficiency, demand response and some distributed generation.[17] The NJ EMP provision will affect the peak load growth of PSEG, JCPL, AECO and RECO, New Jersey's electric utilities. Pennsylvania utilities must meet the energy efficiency and demand response provisions of Act 129, which requires them to reduce their average peak demand in the top 100 hours of the summer of 2007 to levels 4.5% below that average by the summer of 2012.[18] These provisions affect PA utilities, including MetEd, PPL, and PECO.

Q. PLEASE SUMMARIZE THE PEAK LOAD SAVINGS ANTICIPATED FROM THE NEW JERSEY ENERGY MASTER PLAN ENERGY EFFICIENCY INITIATIVES.

17 "New Jersey Energy Master Plan", October 2008, available at http://nj.gov/emp/docs/pdf/081022_emp.pdf.

18 The provision states that the reduction must be in place by May 31, 2013. 66 Pa. C.S.A. § 2806.1(d).

A. New Jersey plans to reduce peak load by 3,300 MW between its base year of 2004 and 2020, solely from energy efficiency resources.[19] Peak demand for 2020 is projected to be approximately 21,900 MW, exclusive of the effect of intended incremental distributed generation and demand response. PJM currently projects a non-coincident peak of 25,717 MW for the four New Jersey utilities (PJM 2009 Load Forecast Report). Thus there is a difference of roughly 3,800 MW of peak load (in 2020) between what PJM projects for New Jersey, and what New Jersey is aiming for with its Energy Master Plan. New Jersey also plans for additional peak load reduction of 900 MW from demand response resources and 1,500 MW from distributed generation, by 2020.

Depending on the "ramp rate" of such efficiency and demand response gains, New Jersey could see energy efficiency and demand response peak savings in 2014 of anywhere from tens of MW to hundreds of MW, and most these savings are not considered in PJM's modeling of the need for the PATH line since at the time of the May 2009 auction, utility implementation plans had not been finalized.

Q. WHAT IS THE RELEVANT LANGUAGE IN PENNSYLVANIA'S ACT 129 IN REGARDS TO PEAK DEMAND REDUCTION?

A. The relevant language is as follows:

> (1) By May 31, 2013, the weather-normalized demand of the retail customers of each electric distribution company shall be reduced by a minimum of 4.5% of annual system peak demand in the 100 hours of highest demand. The reduction shall be measured against the electric distribution company's peak demand for June 1, 2007, through May 31, 2008.

Source: 66 Pa.C.S. Section 2806.1(d).

19 The Energy Master Plan also projects demand response savings of 900 MW over this time frame (Plan pp. 60-61), and distributed generation of 1,500 MW. See "Modeling Report for the Energy Master Plan, Appendix A: Business as Usual vs. Alternative Scenarios", October 21, 2008, available at http://www.nj.gov/emp/docs/pdf/10122208ceeepModEMP.pdf (downloaded June 5, 2009).

Q. PLEASE SUMMARIZE THE PERTINENT EFFECT OF PENNSYLVANIA'S ACT 129 ON THE ELECTRIC UTILITIES IN EASTERN PENNSYLVANIA.

A. Table 9 below is reproduced from the Pennsylvania Public Utility Commission's Order from March 26, 2009. It summarizes the level of peak demand reduction that must be attained by May 31, 2013 (the end of the PJM 2012/2013 planning period. The numbers in the statute indicate that the state is aiming to achieve a 1,193 MW peak demand reduction.

Table 9. Reproduction of Peak Demand Savings Table from PA PUC Order Implementing Act 129

Table 2. Average Historical Peak Loads and Act 129 Mandated Peak Demand Reductions as Measured in Megawatts		
EDC	Load	4.5% Reduction
Duquesne	2,518	113
Met-Ed	2,644	119
Penelec	2,395	108
Penn Power	980	44
PPL	6,592	297
PECO	7,899	355
West Penn	3,496	157
Total	26,524	1,193

Source: PA PUC Order, Docket No. M-2008-2069887, "Energy Consumption and Peak Demand Reduction Targets", March 26, 2009.

Q. ARE ANY OF THE PEAK LOAD REDUCTIONS PROJECTED HERE INCLUDED IN THE ENERGY EFFICIENCY RESOURCES THAT CLEARED IN THE 2012/13 RPM AUCTION, OR THE PJM JANUARY 2009 LOAD FORECAST?

A. None of these savings are considered in the January 2009 Load Forecast. It is possible that the RPM auction includes amounts that would be obtained through programs or initiatives resulting from the law, but the fraction is so small as to be *de minimus* relative

to the required savings. The amount of energy efficiency clearing in the RPM auction from these utilities is very small – a total of 1.9 MW, all from the PECO zone.

Q. IN CONCLUSION, FOR THE PURPOSES OF TRANSMISSION PLANNING, DOES PJM MODEL ANY SIGNIFICANT LEVEL OF THE PROJECTED ENERGY EFFICIENCY OR DEMAND RESPONSE SAVINGS MANDATED BY MARYLAND, PENNSYLVANIA AND DELAWARE LAW, OR BEING IMPLEMENTED AS PART OF NEW JERSEY'S ENERGY MASTER PLAN, AND DOMINION AND THE DISTRICT OF COLUMBIA'S DEMAND-SIDE MANAGEMENT INITIATIVES?

A. With the possible exception of certain demand response resources noted above for BGE, PEPCO and DPL, no.

Q. DOES PJM CONDUCT ANY SENSITIVITY OR SCENARIO ANALYSIS THAT WOULD CONSIDER EVEN A FRACTION OF THE DEMAND RESPONSE OR ENERGY EFFICIENCY RESOURCES FROM ANY OF THESE STATE INITIATIVES?

A. No. PJM does not attempt to assess the sensitivity of their needs analysis to energy efficiency implementation that is not already part of their load forecast or is not cleared in the RPM auction, and essentially treats the reliability value of these extensive initiatives as zero.

Q. EXPLAIN HOW THE INCREMENTAL SAVINGS SHOWN IN TABLE 6 ABOVE FROM ALL OF THESE STATE UTILITY EFFORTS SHOULD BE FACTORED INTO PJM'S PLANNING FOR THE PROPOSED PATH LINE.

A. These savings should be used to further reduce, for planning purposes, the "net peak load" used in the reliability power flow models that underlie PJM's assertion of need for the proposed PATH line. In particular, recognizing that the purported need for the PATH line would not arise until 2018 when considering only those resources that have already cleared the 2012/13 auction, PJM should examine carefully the effects of these initiatives in the years including 2018 and beyond.

Outdated Vintage of PJM Load Forecast

Q. WHAT LOAD FORECASTS ARE USED BY PJM IN ASSESSING ALLEGED NEED FOR THE PATH LINE?

A. In the most recent April 2009 "retool" analysis PJM uses the "PJM Load Forecast Report, January 2009".[20] The claimed reliability violations shown in Exhibit PFM-2 and Exhibit PFM-3 arise from use of the load forecast data in that report. The claimed reliability violations shown in Exhibit PFM-1 arise from use of data from the previous year's report, the "PJM Load Forecast Report, January 2008". The initial PJM Board recommendation for the PATH line, contained in the 2007 RTEP ("Regional Transmission Expansion Plan") report (released in February of 2008) relied on forecast data from the "PJM Load Forecast Report, January 2007".

Q. WHICH LOAD FORECAST DATA FROM THESE REPORTS ARE USED?

20 The 2009 report is available at http://www.pjm.com/documents/~/media/documents/reports/2009-pjm-load-report.ashx. Earlier Load Forecast reports are also available on the PJM website.

A. PJM uses "extreme" summer peak (90/10) load forecasts when assessing purported PATH need.[21] These data are shown on PJM's Table D-1 in the January 2009 Load Forecast report. An extreme summer peak (90/10) forecast means a forecast that has a probability 00of being exceeded of only 10%, and its use can be thought of as testing the system for reliability on an unusually hot and humid, non-holiday summer weekday.[22]

Q. WHAT OTHER DATA FROM THESE LOAD FORECAST REPORTS ARE USED?

A. The demand response data from the 2009 Load Forecast report is also used. The data is found in Table B-7 of the report.

Q. HOW DOES THE 90/10 EXTREME PEAK LOAD FORECAST CHANGE BETWEEN THE 2008 AND THE 2009 LOAD FORECAST REPORTS?

A. The January 2009 load forecast report reflects significantly lower PJM zonal peak demands than the January 2008 load forecast report. For example, the January 2009 PJM Mid-Atlantic Area coincident peak[23] extreme forecast for summer 2009 (62,452 MW) is 3.5% lower than the previous year's extreme forecast for summer 2009 (64,724 MW). The peak load in the Mid-Atlantic region is a key driver of the claimed need for the proposed PATH line.

Q. HOW DOES THE JANUARY 2009 FORECAST LOAD COMPARE TO THE ACTUAL LOAD SEEN IN PJM IN THE SUMMER OF 2009?

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21 "Load Deliverability" is tested by PJM using 90/10 forecast loads.

22 PJM's 2009 Load Forecast report 90/10 forecast load for the Mid-Atlantic region is 4.75% higher than the "normal" or "50/50" forecast load. This is a measure of the extent of "extremeness" used in the transmission planning model.

23 Coincident peak refers to the actual peak load seen across several or many regions or zones, and it accounts for the fact that not all zones will experience their own peak demand at the same time as other zones. Coincident peak load across a series of zones is usually lower than the sum of the non-coincident peak loads for those same zones.

A. Actual summer 2009 peak load in the Mid-Atlantic region was 3.4% lower than PJM's January 2009 forecast of peak load for that region, the same load forecast report used by PJM in its April 2009 "retool" of alleged PATH need. On October 6, 2009, PJM released the "Summer 2009 Weather Normalized Coincident Peaks (MW)"[24] data. This contained the data for each of the PJM zones. Summing the data for the Mid-Atlantic region, the weather-normalized peak load was 57,690 MW. The 50/50 forecast peak load for 2009 from the January 2009 Load Forecast Report for the Mid-Atlantic region was 59,621 MW, or 2,031 MW higher than the actual (weather-normalized) peak load seen in the summer of 2009.

Q. WHAT DOES THIS MEAN?

A. This means that PJM's January 2009 Load Forecast Report overestimated the level of summer 2009 peak load in the Mid-Atlantic region by 3.4%. Since the data released was corrected for weather effects, and the 50/50 peak load forecast From the January 2009 Load Forecast Report also represents a "weather normalized" forecast, the two values are directly comparable. The difference can be attributed primarily to economic effects; essentially, the January 2009 Load Forecast did not fully account for the effect of the downturn in the regional economy.

Q. WHAT IS THE EFFECT OF THIS DIFFERENCE IN PEAK LOAD?

A. The year-to-year peak load forecast changes in the Mid-Atlantic region vary depending on the forecast years examined, and depending on the forecast vintage used. However, reviewing the PJM January 2007 and PJM January 2008 Load Forecast Reports, the year to year peak load forecast change over ten years is 1.5% per year, or roughly 1,000 MW

24 Available at http://www.pjm.com/planning/resource-adequacy-planning/~/media/planning/res-adeq/load-forcast/summer-2009-pjm-scps-and-w-n-zonal-peaks.ashx.

each year. That is, prior to the economic downturn, PJM expected Mid-Atlantic area peak load to increase roughly 1,000 MW each year. Thus, an updated load forecast alone could shift outward the net peak load of the Mid-Atlantic region by roughly two years, depending on the manner in which the regional economy rebounds. For the purposes of this testimony, I have used the overall PJM peak load in summer 2009 compared to the overall PJM summer peak load forecast from January 2009 to adjust the estimate for peak load in future years.

Q. IF PJM WERE TO UPDATE ITS ANALYSIS TO REFLECT A LOAD FORECAST OF MORE RECENT VINTAGE THAN THE JANUARY 2009 LOAD FORECAST REPORT, WHAT WOULD YOU EXPECT?

A. If PJM updated its analysis using a more current vintage load forecast, due to the extremely unusual economic situation in the nation and the region, the actual peak load differences between those used in PJM model runs (based on the January 2009 PJM Load Forecast) and those that would arise from a current forecast would lead to an outward shift in the net peak load seen in the Mid-Atlantic region of PJM over and above the outward shifts that result from incorporating the demand response and energy efficiency resources noted earlier in this testimony.

Q. IS THERE OTHER EVIDENCE THAT A NEW FORECAST WOULD SHOW LOWER FORECAST PEAK LOAD THAN PJM'S JANUARY 2009 LOAD FORECAST REPORT?

A. Yes. PJM's Mr. Herling testified as to the state of PJM's knowledge in July 2009 that the overall PJM load in 2012 would be 1,004 MW lower than that forecast in the January 2009 Load Forecast Report.[25]

Q. WHAT DO YOU CONCLUDE FROM YOUR EXAMINATION OF PJM MODELING ASSUMPTIONS FOR THE PROPOSED PATH LINE?

A. Based on my examination of PJM modeling assumptions for demand response resources, energy efficiency resources, and peak load forecast I conclude that the exclusion of considerable DR and EE resources made available through the 2012/13 RPM auction; the lack of consideration of additional legislated or policy-initiated state utility demand side initiatives in VA, MD, DC, DE, PA and NJ; and the use of an outdated load forecast all results in a flawed transmission need modeling result.

IV. PEAK LOAD DURATION IN PJM REGIONS AND IMPLICATIONS FOR ALTERNATIVE RELIABILITY RESOURCES

Q. WHAT IS PEAK LOAD DURATION ?

A. Peak load duration is a measure of the amount of time over the course of any particular time interval – e.g, a calendar year, a PJM planning year (June through the following May), or a season – that load in an area reaches relative maximum levels. A "load duration curve" is used to display the frequency of loading level across all hours of a given interval, and represents a visual display of how often load reaches any given threshold level in a region or group of regions. For PJM regions, these patterns are

[25] Rebuttal Testimony of Steven R. Herling, PPL Electric Statement No. 7-R, Before the Pennsylvania Public Utility Commission, Docket No. A-2009-2082652, August 7, 2009, page 8, lines 17-20.

displayed in the figures that follow in this section of my testimony, and I discuss the implications of the peak load durations.

Q. HOW IS A LOAD DURATION CURVE PRODUCED?

A. Hourly data is collected for the region of interest and for the interval of interest. For the purposes of this testimony, I collected hourly data from PJM for the Mid-Atlantic region, and for some of its subregions. The data is sorted in descending order and the resulting data series is graphed to show the pattern of peak load duration. The dates and times of the highest peak loads are noted and tabulated to complete the picture of the pattern of peak loading.

Q. WHY IS PEAK LOAD DURATION IMPORTANT IN THE CONTEXT OF THE ALLEGED NEED FOR THE PROPOSED PATH LINE?

A. The purported need for the PATH line in 2014 is based on forecasted "extreme" peak load levels (in the Mid-Atlantic, and to a lesser degree, the Dominion, region of PJM) used in the load deliverability power flow modeling that underlies the alleged NERC criteria violations listed in applicants' Exhibits PFM-1, PFM-2 and PFM-3. The modeling uses a snapshot of time, representing the modeling of inordinately high stress levels on the transmission system. In its modeling of alleged PATH need, PJM does not consider that such a peak load value, or values close to it, may only occur infrequently throughout the year.

Q. SHOULD THEY CONSIDER THAT?

A. In my opinion, yes, absolutely. PJM should consider it because the economic cost of lowering peak load for a handful of hours each summer through alternatives such as

demand response or peaking generation could be lower than the costs of the PATH line. Until a closer examination is made, such a cost comparison cannot be made.

Q. WHAT WOULD BE THE EFFECT OF A LOWER PEAK LOAD?

A. If modeled peak loads in the Mid-Atlantic region, for example, are lower, the stresses seen by the transmission system are lower and any purported "need" for PATH is also lower. Indeed, PJM does lower the forecast peak load by a level of demand side resource in its testing, arriving at a "net" peak load that is purposefully reduced due to the presence of demand-side resources. However, PJM does not sufficiently account for the demand-side resources. The crux of my testimony is that PJM has modeled an unreasonably high "net peak load" in the Mid-Atlantic region.

Q. IS IT REASONABLE TO USE LOWER PEAK LOADS IN THIS CASE?

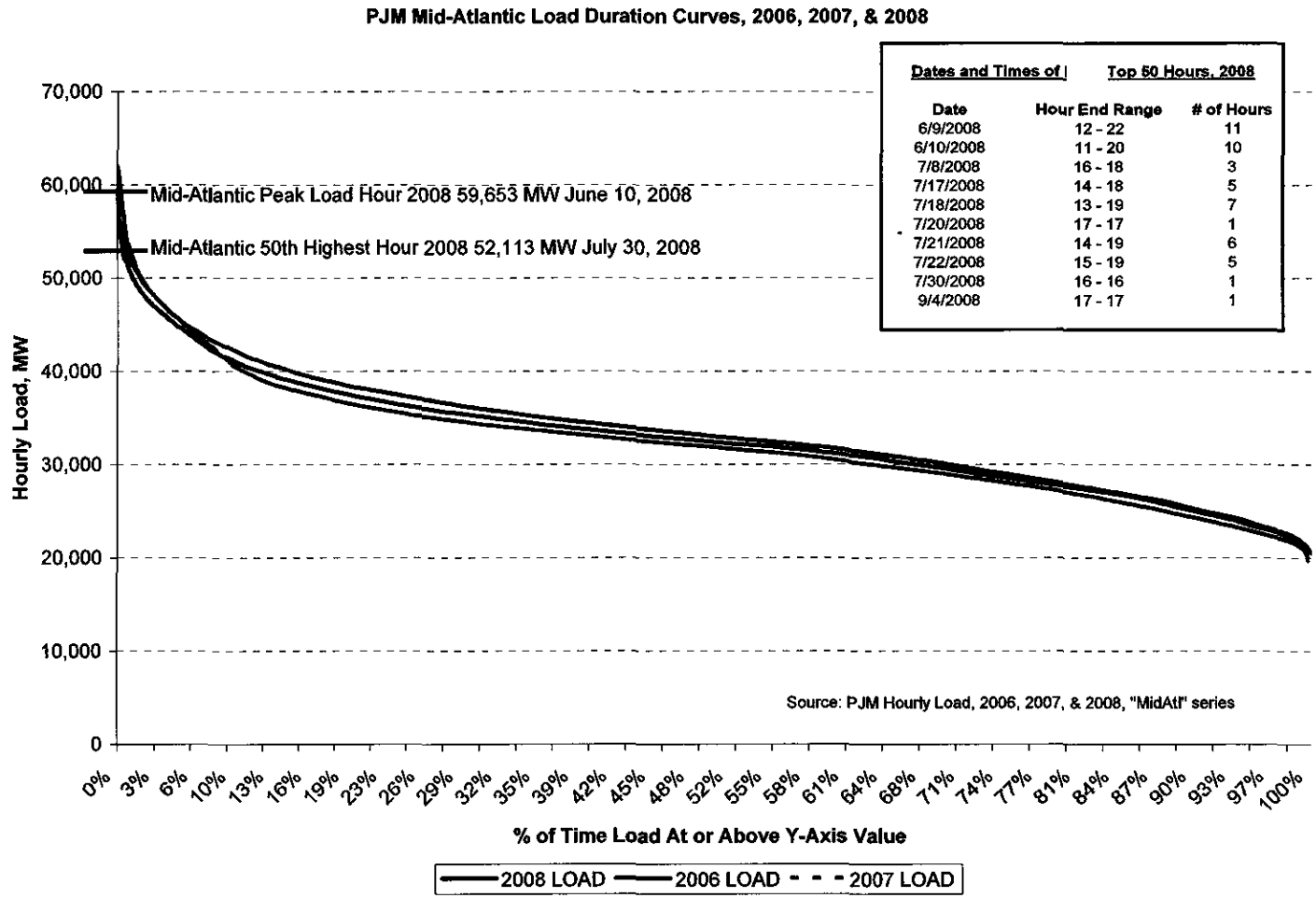
A. Yes. Peak loads seen on the most critical transmission system elements, such as those shown in the "Electrical Result" column of Exhibits PFM-1 and PFM-2, can be lowered through the implementation of energy efficiency improvements, the use of "demand response" or temporary reductions in load, and the use of generation close to load or even "behind the meter" at load sites.

Q. WHAT IS THE PATTERN OF LOAD DURATION, AND HOW OFTEN DOES LOAD REACH PEAK LEVELS, IN PJM?

A. Figures 2 through 4 below show load duration curves for three regions of PJM: the Mid-Atlantic ("MAAC"), the eastern portion of the Mid-Atlantic ("EMAAC"), and the service territories of BGE and PEPCO, together known as the Southwest Mid-Atlantic ("SWMAAC"). Each of the curves is of similar shape. The shape indicates that there are a relatively few hours per year over which the peak loading on the system is seen. To

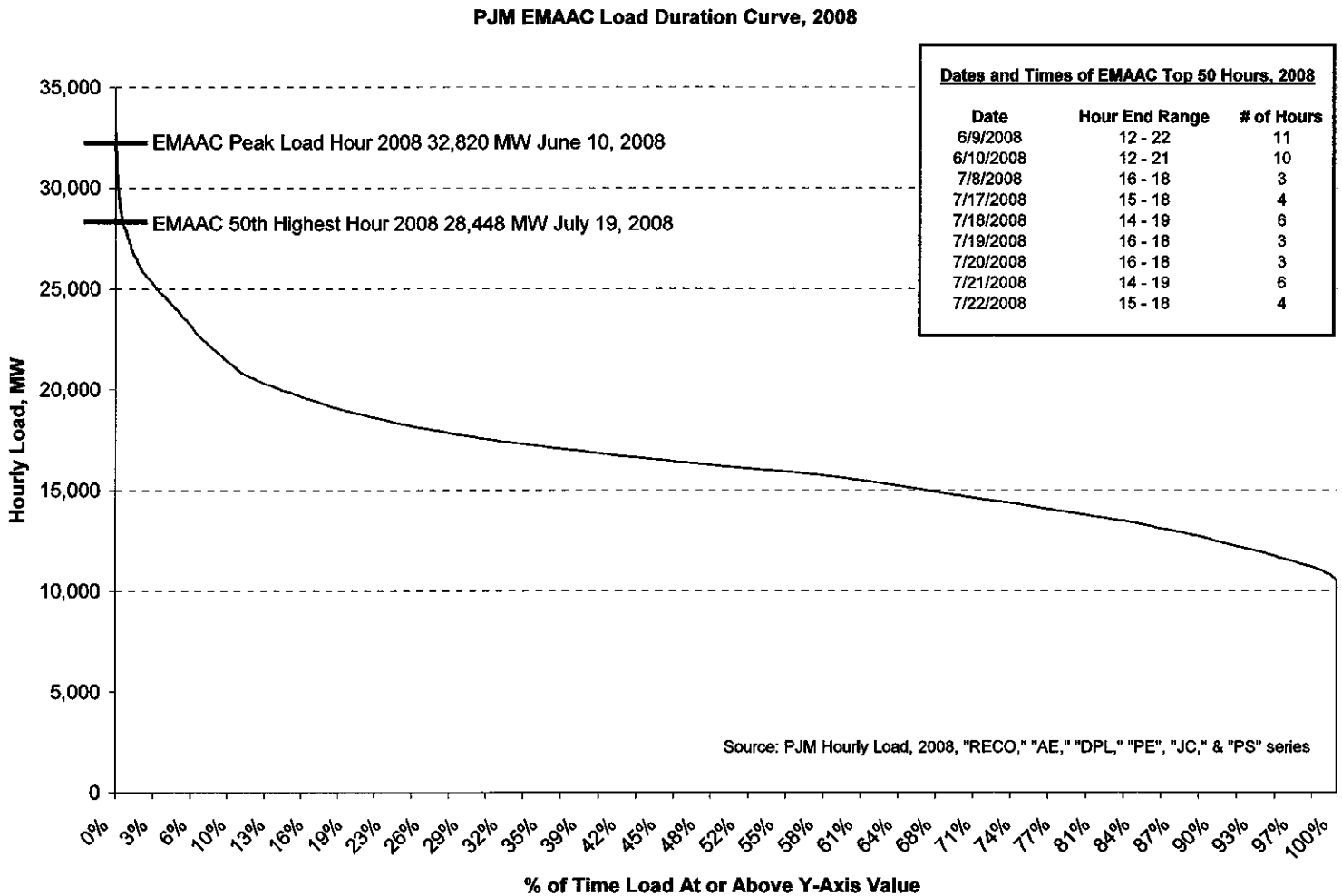
demonstrate that load duration patterns do not change appreciably in any given multiple-year period, I include load duration curves for 2006 through 2008 for the Mid-Atlantic region.

Figure 2. PJM MAAC Load Duration Curve, 2008, 2007, 2006 with Dates and Hours for Top 50 Hours of 2008



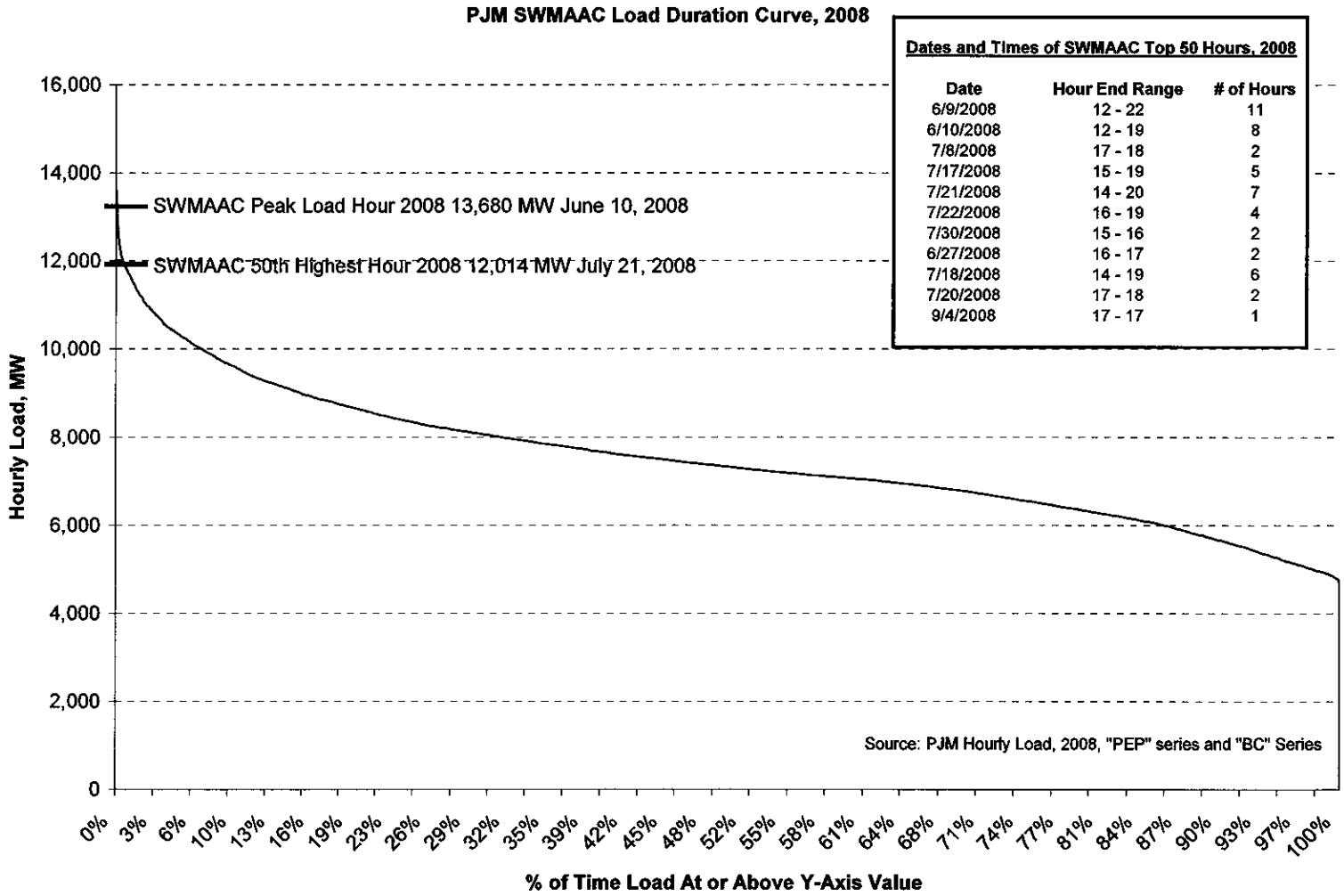
Source: Synapse, from PJM data at http://www.pjm.com/~/media/markets-ops/compliance/historical-load-data/2008-hourly-loads.ashx

Figure 3. PJM Eastern MAAC Load Duration Curve, 2008



Source: Synapse, from PJM data at http://www.pjm.com/~/media/markets-ops/compliance/historical-load-data/2008-hourly-loads.ashx

Figure 4. PJM Southwestern MAAC Load Duration Curve, 2008



Source: Synapse, from PJM data at http://www.pjm.com/~/media/markets-ops/compliance/historical-load-data/2008-hourly-loads.ashx

Q. WHAT DO THESE LOAD DURATION CURVES ILLUSTRATE?

A. The first load duration curve, for the PJM Mid-Atlantic area, shows that the load in the region reached its peak for 2008 at 59,653 MW on June 10. The graph also shows that the highest levels of peak load persist for only a limited amount of time. In this illustration, the "top 50" peak hours of the year (experienced during afternoon hours over the course of ten different days during the summer of 2008) are the only times when load exceeds 52,113 MW. In other words, the last 7,540 MW of peak load (59,653 MW minus 52,113 MW), or the last 13% of incremental peak loading in MAAC in 2008 occurred during just 50 hours, or for only six-tenths of 1% of the year (50/8,784 = 0.57%).

Q. WHAT DO THE OTHER LOAD DURATION CURVES ILLUSTRATE?

A. The other load duration curves, each of which represents a sub-region of the Mid-Atlantic region, confirm that the duration patterns are similar across the region. This is important because demand response and energy efficiency resources that serve to reduce local peak load can also serve to reduce the regional peak load.

Q. THE TITLE OF THIS SUBSECTION REFERENCES "ALTERNATIVE RELIABILITY RESOURCES". WHAT DO YOU MEAN BY "ALTERNATIVE RELIABILITY RESOURCES"?

A. Alternative reliability resources are those resources whose use would defer or eliminate the need for the PATH line to resolve modeled reliability issues. Those resources include generation and demand side resources in the Mid-Atlantic regions of PJM.

Q. HOW WOULD THE USE OF SUCH RESOURCES OFFER AN ALTERNATIVE TO PATH?

A. As can be seen by the load duration curves above, if resources can be used to lower peak demand during the limited hours in the summer period when load reaches its highest levels in these regions of PJM, the transmission system would only have to support delivery of energy to meet the "net peak load" or the peak load that would be seen after accounting for the presence of these resources.

V. GENERATION ASSUMPTIONS

Q. HOW MUCH GENERATION IS IN THE PJM INTERCONNECTION QUEUE IN THE MID-ATLANTIC REGION?

A. Table 10 below shows that in the most recent three PJM-lettered queues[26] - T, U, and V – there exists a total of 12,317 MW of capacity. A majority of this capacity (71%) is natural gas fired. As can be seen, the capacity is distributed across the service territories in the Mid-Atlantic region.

Table 10. Summary of MWC Generation Queued in the Mid-Atlantic Region in Queues T, U, and V

Utility Service Territory	MW of Capacity
AEC	364
BGE	1,887
DPL	87
JCPL	760
ME	1,870
PECO	1,412
PENELEC	128
PEPCO	2,045
PPL	1,689
PSEG	1,948
UGI	126
Mid-Atlantic Total	12,317

Source: PJM interconnection queue data, summarized by Synapse.

26 Earlier queued information from PJM did not have either "status" or "in-service" dates; for the purpose of this section of testimony, I have limited queue data to the T, U and V queues. It is possible that there is even additional Mid-Atlantic queued generation not represented in Table 10 above that could provide capacity to mitigate purported PATH need.

Q. WHAT LEVEL OF NEW MID-ATLANTIC GENERATION RESOURCES DOES PJM USE IN ITS ANALYSES?

A. In response to Sierra VA-IV-55 (Attachment A), PJM indicated that 1,276 MW of Mid-Atlantic region generation was included in its analysis. This amount includes 730 MW that was indicated to be in Area #25, the "PJM 500 kV" region. It is possible that some of this 730 MW of generation is not in the Mid-Atlantic region[27], thus my estimate of 1,276 MW of new generation in the Mid-Atlantic region may be too high.

Q. WHAT DOES THIS INDICATE?

A. It indicates that there is roughly ten times more generation in PJM's last three queues in the Mid-Atlantic region than PJM uses in its modeling of purported need for PATH.

Q. WILL PJM INCLUDE THE PRESENCE OF THE PATH LINE WHEN IT CONDUCTS THE RPM AUCTION FOR CAPACITY FOR 2014/15 IN MAY OF 2011?

A. Yes.

Q. WILL THE PRESENCE OF THE PATH LINE IN THAT MODELING FOR THE 2014/15 RPM AFFECT THE LEVEL OF GENERATION THAT MIGHT CLEAR IN SUCH AN AUCTION?

A. Yes. The presence of the line in the modeling will affect the amount of generation that would otherwise clear in the auction if the line were not modeled as "in-service", and it could also affect the clearing price for capacity resources in the Mid-Atlantic in the auction.

[27] The PJM 500 kV system extends out beyond the Mid-Atlantic region, to the western and southern regions of PJM.

VI. NO ECONOMIC ANALYSES OF PROPOSED PATH LINE OR ALTERNATIVES

Q. HAVE THE APPLICANTS CONDUCTED AN ECONOMIC ANALYSIS OF THE PROPOSED PATH LINE?

A. No.

Q. HAVE THE APPLICANTS CONDUCTED AN ECONOMIC ANALYSIS OF ANY ALTERNATIVES TO THE PROPOSED PATH LINE?

A. No.

Q. HOW MUCH IS THE PROPOSED PATH LINE PROJECTED TO COST?

A. Currently, PATH is projected to cost approximately $1.85 Billion, leading to an annual revenue requirement of $364.7 million by 2014.[28]

Q. IS THERE ANY COMPREHENSIVE DOCUMENTATION OF ENERGY, CAPACITY, OR OTHER SAVINGS FOR RATEPAYERS DUE TO THE PRESENCE OF THE PATH LINE?

A. No. A "market efficiency" analysis conducted by PJM in 2007 illustrated a "change in system load payment" of negative $47.6 million in the year 2013, illustrating that based on the production cost model used by PJM at that time, an estimate of $47.6 million in annual load savings in that year was seen.[29] However, there is no testimony from any of the applicants on, for example, year-by-year or long-term period projections of market savings or economic benefits that might accrue from the proposed PATH line.

Q. WHAT DO YOU CONCLUDE FROM THIS?

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[28] Direct Testimony, Mr. Pokrajac, page 6 and page 14.

[29] Amos-Kemptown market efficiency analysis. Available at http://www.pjm.com/committees-and-groups/committees/teac/~/media/committees-groups/committees/teac/postings/amos-kemptown-765kv.ashx

A. I conclude that the market efficiency analyses conducted by or on behalf of PJM in 2007 illustrate that aggregate annual market savings associated with PATH for the year 2013 was estimated to be an order of magnitude lower than the annual revenue requirements of the line for the first year of operation, i.e., $47 million in savings compared to $365 million in costs. There is no updated analysis accounting for any changes that have taken place since that earlier market efficiency analysis, and there is no analysis that looks at the economics beyond the year 2013. The line is now estimated by PJM to be needed in 2014.

VII. CONCLUSIONS AND RECOMMENDATIONS

Q. WHAT ARE YOUR KEY CONCLUSIONS FROM YOUR ANALYSIS OF THE PROPOSED PATH LINE?

A. 1. In its analysis of transmission reliability that is the foundation for its assertion of PATH need, PJM excludes the peak load reducing effect of 2,908 MW of Mid-Atlatnic region demand response and energy efficiency resources that have already cleared in the PJM May 2009 RPM auction. Incorporating these known capacity resources into the modeling would result in a net peak load in the Mid-Atlantic region of PJM that will not reach the level currently projected to occur in 2014 until 2018.

2. PJM gives no consideration to the additional peak-load reducing effect of energy efficiency and demand response resources that will come from planned initiatives in all of the Mid-Atlantic States and the District of Columbia, pursuant to state law or policy. The electric utility filings and/or utility commission determinations in those states indicate an additional 2,000+ MW of peak load reduction arising from the

implementation of these resources. PJM does not consider even a fraction of these resources when assessing PATH need.

3. The peak load in the PJM Mid-Atlantic region in the summer of 2009 was 57,590 MW, or 2,031 MW lower than PJM's January 2009 forecast load of 59,621 MW. Thus, actual load was 3.4% lower in the summer of 2009 than PJM's January 2009 Load Forecast had estimated.[30] This illustrates that the effect of the downturn in the regional economy in 2009 was significantly greater than PJM had estimated in its load forecast of January 2009.

4. Based on the above three conclusions, I broadly conclude that PJM has used unreasonable modeling assumptions in support of its assertion of PATH need, and thus the results of its modeling are flawed.

5. PJM has not analyzed demand-side or generation alternatives to PATH that address the very short duration of the peak load level that is a primary driver of the purported need for PATH. PJM has not conducted any economic analysis to determine if options other than the proposed PATH line could be the lower cost choice to resolve reliability concerns.

Q. WHAT DO YOU RECOMMEND?

A. My primary recommendation is that the Virginia State Corporation Commission deny the application outright due to the unsupported assertions of need for the proposed PATH line. Alternatively, at a minimum the applicants must re-analyze the alleged need for PATH using current, reasonable input assumptions for demand-side resources and forecast peak load. Such assumptions should clearly include the results of the May 2009

30 The load value stated for the summer 2009 Mid-Atlantic region is a "weather normalized" coincident peak, and thus is directly comparable to the 50/50 (i.e., weather normalized) peak load forecast in January 2009 for the Mid-Atlantic region.

RPM auction and the demand-side resources made available by that auction, and should also recognize the contribution to peak load reduction that will arise from the state level initiatives identified and described in this testimony. The assumptions should also include a current peak load forecast. As part of any such required re-examination of alleged PATH need, the applicants should analyze alternative reliability solutions and should conduct a full economic assessment of the effect on PJM ratepayers of the different alternatives.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

CERTIFICATE OF SERVICE

I, Emily Greenlee, hereby certify, under penalty of perjury, that a true and correct copy of the foregoing Direct Testimony of Bob Fagan on Behalf of the Sierra Club was served to the following by electronic mail or U.S. mail, first class, postage prepaid on this 23rd day of October, 2009:

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