OCA Statement No. 2
2/26/19 Hbg Px

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

Application of Transource Pennsylvania, LLC for approval of the Siting and Construction of the 230 kV Transmission Line Associated with the Independence Energy Connection - East and West Projects in portions of York and Franklin Counties, Pennsylvania.	:	A-2017-2640195 A-2017-2640200
Petition of Transource Pennsylvania, LLC for a finding that a building to shelter control equipment at the Rice Substation in Franklin County, Pennsylvania is reasonably necessary for the convenience or welfare of the public.	:	P-2018-3001878
Petition of Transource Pennsylvania, LLC for a finding that a building to shelter control equipment at the Furnace Run Substation in York County, Pennsylvania is reasonably necessary for the convenience or welfare of the public.	:	P-2018-3001883
Application of Transource Pennsylvania, LLC for approval to acquire a certain portion of the lands of various landowners in York and Franklin Counties, Pennsylvania for the siting and construction of the 230 kV Transmission Line associated with the Independence Energy Connection – East and West Projects as necessary or proper for the service, accommodation, convenience or safety of the public.	:	A-2018-3001881, *et al.*

DIRECT TESTIMONY AND EXHIBITS OF

PETER LANZALOTTA

Filed on Behalf of the

PENNSYLVANIA OFFICE OF CONSUMER ADVOCATE

September 25, 2018

DIRECT TESTIMONY OF
PETER J. LANZALOTTA

Q. Please state your name, affiliation and business address.

A. Peter J. Lanzalotta, Lanzalotta & Associates LLC, 67 Royal Pointe Drive, Hilton Head Island SC 29926.

Q. Please describe your educational background.

A. I am a graduate of Rensselaer Polytechnic Institute, where I received a Bachelor of Science degree in Electric Power Engineering. In addition, I hold a Masters degree in Business Administration with a concentration in Finance from Loyola College in Baltimore.

Q. Please describe your professional experience.

A. I am a Principal of Lanzalotta & Associates LLC, which was formed in January 2001. Prior to that, I was a partner of Whitfield Russell Associates, with which I had been associated since March 1982. My areas of expertise include electric utility system planning and operation, electric service reliability, cost of service, and utility rate design. I am a registered professional engineer in the states of Maryland and Connecticut. My prior professional experience is described in Exhibit PJL-1, which is attached hereto.

I have been involved with the planning operation, and analysis of electric utility systems and with utility regulatory matters, including reliability-related matters, certification of new facilities, cost of service, cost allocation, and rate design, as an employee of and as a consultant to a number of privately- and publicly-owned electric utilities, regulatory agencies, developers, and electricity users over a period exceeding thirty years.

I have been involved in a number of projects focused on electric utility transmission and distribution system reliability. I have worked in recent years on behalf of various government offices and agencies in the states of Maryland, New Jersey, and Pennsylvania to help address electric service reliability concerns on behalf of various government offices and agencies in the states of Maryland, New Jersey, Virginia, and other states regarding proposed and/or abandoned electric transmission facilities.

Q. Have you given expert testimony in any judicial or quasi-judicial proceedings?

A. Yes, I have presented expert testimony before the Federal Energy Regulatory Commission and before regulatory commissions and other judicial and legislative bodies in 25 states, the District of Columbia, and the Provinces of Alberta, Ontario, and Nova Scotia. My clients have included utilities, regulatory agencies, ratepayer advocates, independent producers, industrial consumers, the federal government, and various city and state government agencies. The proceedings in which I have testified are listed in Exhibit PJL-2.

Q. What is the purpose of your testimony?

A. My testimony, on behalf of the Pennsylvania Office of Consumer Advocate, is intended to address the need for the transmission facilities proposed by Transource in the IEC Project, the value of such facilities, and technical alternatives to such facilities.

Q. On what information is your testimony based?

A. In preparing my testimony I have reviewed the Company's Application, the initial testimony of Company expert witnesses, the Company's responses to interrogatories in this proceeding, various documents in other transmission line cases in Pennsylvania and Maryland, various PJM and PJM-related documents and information, and other miscellaneous documents.

General Project Information

Q. Please describe the proposed elements of the transmission system additions being proposed by Transource Pennsylvania, LLC ("Transource PA") for approval from the Pennsylvania Public Utility Commission ("Commission").

A. The facilities proposed by Transource PA in this proceeding are part of the Independence Energy Connection Project ("IEC Project") which has been approved by PJM Interconnection, L.L.C. ("PJM") for the purposes of alleviating transmission congestion constraints in Maryland, West Virginia, and Virginia on transmission facilities referred to as the AP South Reactive Interface ("APSRI").

The IEC Project approved by PJM involves: (i) construction of two new substations in Pennsylvania, the Rice Substation and the Furnace Run Substation; and (ii) construction of two new overhead double-circuit 230 kV transmission lines, the Rice-Ringgold 230 kV transmission line ("the IEC West Project Line") and the Furnace Run-Conastone 230 kV transmission line ("the IEC East Project Line").

Q. Please summarize your findings.

A. Based on my review, I conclude the following:
The congestion levels on the transmission lines between West Virginia, Maryland and Virginia on the APSRI have been decreasing since the IEC Project was proposed. As addressed in the testimony of Scott Rubin in OCA Statement No.1, the benefit-cost ("B/C") ratio for the IEC Project has been decreasing since the project was initially evaluated by PJM, and recent evaluations of the B/C ratio, reported by PJM in early 2018, have failed to reflect any complete updates to the project cost, so estimates of B/C ratios are inaccurately high because of such failure. In addition, there are alternatives to elements of the IEC East Project transmission lines as proposed that likely could avoid much or all of the proposed new transmission right-of-way ("ROW") and new double circuit 230 kV transmission line towers; PJM did not consider these alternatives. There

was also an alternative to the IEC West transmission lines that would not require new transmission line ROW that was considered and rejected by PJM.

Detailed Project Information

Q. Please summarize the project elements that Transource is filing for approval of in this proceeding.

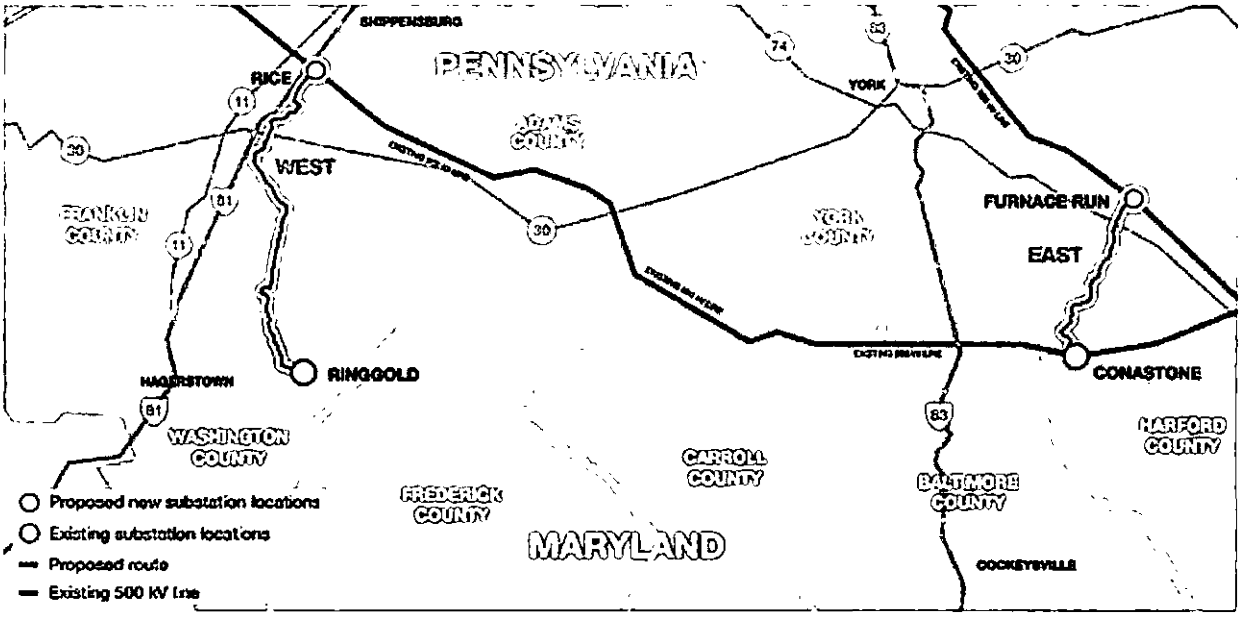
A. As summarized above, The IEC Project approved by PJM involves: (i) construction of two new substations in Pennsylvania, the Rice Substation and the Furnace Run Substation; and (ii) construction of two new overhead double-circuit 230 kV transmission lines, the Rice-Ringgold 230 kV transmission line ("the IEC West Project Line") and the Furnace Run-Conastone 230 kV transmission line ("the IEC East Project Line").

The new IEC West Project Line will be sited to extend approximately 28.8 miles, connecting the existing Ringgold Substation located near Smithsburg, Washington County, MD, and the new Rice Substation to be located in Franklin County, PA.

The new IEC East Project Line will be sited to extend approximately 15.8 miles, connecting the existing Conastone Substation located near Norrisville, Harford County, MD, and the new Furnace Run Substation to be located in York County, PA.

Figure 1 below depicts the proposed new substations and the proposed new double circuit 230 kV transmission lines.

Figure 1



Q. Please describe any other facilities that are required in order for the IEC facilities addressed above to be able to function.

A. Baltimore Gas & Electric Company ("BGE") is required to i) construct a new 230 kV breaker and associated equipment, and ii) to reconductor/rebuild two 230 kV transmission lines running from Conastone substation to Northwest substation and upgrade terminal equipment at both substations.

Philadelphia Electric Company ("PECO") is required to construct a tie in to PECO-owned Peach Bottom to Three Mile Island 500 kV line for the Furnace Run substation, and ii) upgraded terminal equipment and relaying on the Peach Bottom to Three Mile Island 500 kV line.

Mid-Atlantic Interstate Transmission LLC ("MAIT") and affiliates are required to i) construct a 500 kV loop connecting the Conemaugh to Hunterstown 500 kV line to the proposed Rice substation, ii) reconfigure the Ringgold substation and replace transformers, and iii) reconductor the 138 kV Ringgold to Catoctin transmission line.

These projects are not part of the Transource applications in this proceeding. However, these ancillary parts of the IEC Project do make up the total cost that PJM is using to calculate its B/C ratio. As such, Witness Scott Rubin addresses the costs of these parts of the IEC Project in his testimony in OCA Statement No. 1.

Q. Please describe the process by which PJM solicited the proposals which led to the IEC Project.

A. PJM manages the annual development of its Regional Transmission Expansion Plan ("RTEP"). As part of this process, PJM seeks technical solution proposals from participants to resolve potential North American Electric Reliability Corporation ("NERC") reliability criteria violations, market efficiency congestion, and other constraints on facilities in accordance with reliability planning and market efficiency criteria. PJM issued its 2014/15 RTEP Long Term Proposal Window Problem Statement ("Problem Statement"), dated October 30, 2014. The Problem Statement provided:

> PJM seeks technical solution alternatives (hereinafter referred to as "Proposals") to resolve potential reliability criteria violations, market efficiency congestion, and Reliability Pricing Model (RPM) constraints on facilities identified below in accordance with planning (PJM, NERC, SERC, RFC, and Local Transmission Owner criteria) and market efficiency criteria.

Transource Energy LLC, together with Dominion High Voltage, submitted a proposal referenced by PJM as Project 9A, one of 93 market efficiency projects proposed by PJM participants and one of 41 proposals directed at congestion on the AP South transmission interface.[1] Exhibit___(PJL-3) lists these 41 proposals, with some detailed evaluation information, as taken from the Transmission Expansion Advisory Committee ("TEAC") documents dated September 10, 2015.

[1] See TEAC Market Efficiency Update dated August 13, 2015, page 4.

PJM evaluated these proposals based in part on B/C ratios reflecting 15 years of projected loads, projected fuel prices, projected generation mix, projected transmission system capacity, and on various degrees of sensitivity to changes in these system characteristics. Based on these evaluations, PJM chose a group of six finalists from the original 41 proposals. These are shown in Exhibit___(PJL-4). The IEC is listed by the project name "201415_1-9A" by "DOM High Voltage/Transource". The IEC is frequently referred to by PJM as Project 9A.

Note in Exhibit___(PJL-4) that Project 9A is the most expensive of the six finalists. With what was then an estimated cost of $300 million, Project 9A costs more than the other five projects added together. In general, bigger projects can support more congestion relief than a smaller project, as long as they can meet the required B/C ratio hurdle of 1.25.

Q. Please discuss the factors PJM considers when it is evaluating market efficiency projects.

A. As discussed in "Guidelines For Market Efficiency Projects Selection Process"[2]:

> Schedule 6 section 1.5.8 (e) of the PJM Operating Agreement discusses Market Efficiency criteria used in considering the inclusion of Market Efficiency projects in the recommended plan. This document provides 'bright line' primary and 'other' secondary consideration criteria that could be utilized as guidelines in order to facilitate the recommendation process.
>
> 'Bright line' Primary Considerations –
>
> 1) Congestion Mitigation: Consistent with the Operating Agreement (OA) Schedule 6 section 1.5.7 (b) (iii) and OA Schedule 6 section 1.5.8 (e), a Market Efficiency proposal will relieve one or more economic constraint(s). If a proposal is submitted to mitigate one congestion driver, then in order to meet this criteria the proposal shall relieve projected congestion on the driver by at least $1. Similarly, if a proposal is submitted to address multiple congestion drivers, then in the order to meet this criteria the proposal shall relieve projected congestion on all the drivers by at least $1. (Economic constraints may be either energy or capacity market congestion. Energy market uplift charges typically born due to local reactive support issues are addressed in the Operational Performance category.)

[2] https://www.pjm.com/-/media/committees-groups/committees/pc/20161103/20161103-item-12b-guidelines-for-market-efficiency-projects-selection-process.ashx

2) Benefit/Cost (B/C): Consistent with the OA Schedule 6 section 1.5.7 (d), a Market Efficiency proposal addressing one or more target congestion driver(s) must meet a B/C ratio threshold of at least 1.25:1, calculated over the first 15 years of the life of the proposal. The B/C ratio is calculated using the procedure described in Manual 14B, section 2.6.5. The Market Efficiency Discount Rate and Fixed Carrying Charge Rate are subject to change for any given 24-month Market Efficiency cycle. Therefore, during every cycle, these values are published along with other Market Efficiency input assumptions. Rates published during the 2016/17 cycle are documented in the appendix.

3) Cost Estimate Review: Consistent with the OA Schedule 6 section 1.5.7 (g), for a Market Efficiency proposal with costs in excess of $50 million, an independent review of such costs will be performed.

The first "bright line primary consideration" mentioned regarding the selection of market efficiency projects is the amount of congestion mitigation. Projects still have to meet the B/C ratio minimum of 1.25, but within that minimum requirement, projects that produce more congestion relief will be preferred to projects that produce less congestion relief. I note that there is nothing in this language that requires PJM to select the project with the highest B/C ratio.

Q. Please discuss the PJM evaluations of proposed projects to address congestion on the AP South transmission interface.

A. In evaluating potential projects, PJM looked at proposals by participants, at combinations of the six proposals listed in Exhibit___(PJL-4), with and without additional capacitors,[3] as well as at other proposal modifications and other proposal combinations. PJM looked at impacts on reliability, congestion, and costs relative to benefits. For the most part, PJM limited its evaluations to submitted proposals and to combinations of projects and project elements that had been proposed by participants.

Q. Does the PJM Analysis you just described match up in any way with the analysis that this Commission must perform when considering an Application for the siting of new transmission facilities?

[3] Capacitors are switchable electric devices that can be installed on transmission lines or substation busses in order to help control the voltage at which the line or bus is operating.

A. No. Commission regulations require that the Commission determine that proposed transmission line(s) will have minimum adverse environmental impact, considering the electric power needs of the public, the state of available technology, and the available alternatives.[4]

The evaluations of market efficiency projects proposed to address congestion on the AP South transmission interface fall short of this determination in several respects. First, neither Transource nor PJM considered minimizing the environmental impacts of new transmission ROW and new transmission towers proposed for the IEC. As discussed later in my testimony, there are two existing available PPL transmission lines on existing rights-of-way, recently completely rebuilt with towers that have the capability of carrying an additional 230 kV circuit in the vicinity of the IEC East Project Line. PJM did not consider trying to use these as part of the IEC, because such use was not included as part of any of the proposals submitted to PJM.[5] Such use could significantly reduce the environmental impact of this portion of the IEC.[6]

In addition, the Commission is required to take the public's need for electric power into consideration when evaluating the environmental impacts of proposed transmission lines. Based on the Company's filed testimony, there is no reliability need for the IEC, which PJM says would address congestion on the transmission system. The following section of my testimony discusses what constitutes a reliability need and why the IEC is meant to address economic concerns and not reliability needs.

<u>No Public Need For the IEC Project</u>

[4] 52 Pa.Code Sec.57.76 (a) (4).

[5] See Exhibit PJL-13 Attached.

[6] Please note the testimony of Witness Scott Rubin (OCA Statement No. 1) where he addresses the possible effects of the Pennsylvania Supreme Court's decision in PEDF and of Act 45 of 2018 on the Commission's determinations regarding proposed transmission lines.

Q. Please address whether the IEC Project is needed for system reliability.

A. Based on the Company's filed testimony, the IEC Project is not required to meet system reliability needs, either at present or in the foreseeable system planning horizon, which for PJM is fifteen years.

Q. Transource witness Ali testified that an additional benefit of this Project was that it would also improve reliability. How do you respond?

A. Any major new piece of transmission line infrastructure will provide additional paths for power to flow, and thus could potentially improve reliability. However, there is no stated reliability need here, based on the Company's filed testimony.

Q. Please describe how electric transmission system planners typically determine that transmission system reinforcements are needed for reliability.

A. The transmission planning criteria formulated by NERC require that the effect of projected future peak loads and the operation of existing and planned generation (less retirements) on existing and planned transmission system facilities, such as transmission lines and substation transformers, be studied to determine if such loads can be reliably served under normal conditions[7] and under prescribed contingency conditions.[8] If the loading of transmission system facilities in these studies under these conditions exceeds the capability of these facilities, or if the transmission system voltage levels fall below or increase above specified levels, this is typically referred to as a NERC violation[9] which is a reliability problem that must then be addressed by the transmission planners.

---

[7] Normal conditions assume that all system facilities, such as transmission lines and substation transformers, are in service. Normal conditions can assume various levels of dispatch of existing generating units.

[8] Contingency conditions assume that one or more system facilities, such as transmission lines and substation transformers, are experiencing a forced (unplanned) outage. Contingency conditions can assume various levels of dispatch of existing generating units, including forced outages of generating units.

[9] NERC violations may be referenced as "thermal" which reflect overloaded facilities, or as "voltage" which reflect substation bus voltages that are outside acceptable planning ranges.

Transmission system reinforcement is frequently implemented to maintain required levels of system reliability when NERC transmission planning violations are found by planners. The transmission system reinforcements included in the IEC Project are not required to address any NERC violations and must, therefore, be justified on the basis of economics.

Q. Please discuss why the IEC Project is being proposed if it is not needed to address reliability concerns.

A. The IEC Project is being proposed in order to reduce congestion on PJM's transmission system. Congestion generally refers to loadings of facilities on the transmission system up to their capacities. PJM dispatches generating units in PJM such that generating units with less expensive operating costs are generally loaded up before generating units with higher operating costs are loaded up. If the transmission facilities in some areas are loaded up to their capacity, then sometimes PJM has to increase the dispatch for generating units with higher operating costs that are not dependent on congested transmission lines in order to serve loads without overloading the transmission system. The result of such congestion is typically increased generation costs and increased customer payments for electricity. In the case of the IEC, such congestion does not affect reliability to the extent that it causes a NERC violation that requires a remedy under NERC transmission planning requirements.

Q. Please discuss the congested transmission facilities that the IEC is intended to help address.

A. PJM solicited proposals to address congestion on the AP South Reactive Interface ("APSRI") as part of its 2014/15 Long Term Proposal Window. The APSRI is a set of four 500 kV transmission lines running from West Virginia into Maryland and Virginia. If the sum of the power flows over these four lines exceeds certain calculated limits, then the electric system can be susceptible to low voltages or voltage collapse under certain operating conditions. The power flow across the APSRI must be kept within these limits. Sometimes that means that less expensive-to-operate generating units outside of

Maryland and Virginia will be backed down to generate less power, while more expensive-to-operate generating units inside Maryland and Virginia will be ramped up to generate more power, thus resulting in decreased power flows across the APSRI and increased generation costs for Maryland, DC, and Virginia customers.[10] Transource witness Paul McGlynn references the PJM Independent Market Monitor, which has estimated that congestion costs on the APSRI were about $800 million from 2012 through 2016. The IEC reduces congestion costs on the APSRI by providing an alternative path to load centers in Maryland, DC, and Virginia, connecting them mainly to lower-cost generating units located outside of these areas.

Q. If the IEC helps prevent a potential system voltage collapse, why isn't it considered to be required to meet NERC reliability requirements?

A. The potential for a voltage collapse associated with power flows across the APSRI exists only when such power flows exceed stable limit loadings. If such power flow limits are maintained, such power flows will not cause a voltage collapse. Transource does not know of any such voltage collapses having occurred since 2012.[11] There is no NERC violation and no reliability-based need for more transmission capacity. PJM can limit flows over the APSRI by increasing the operation of generating units in Maryland and Virginia. It is not a NERC violation for PJM to have to operate a less economical mix of generation because of congestion.

As a general matter, the NERC transmission planning reliability regulations define a minimum level of reliability that transmission planners must meet. In doing so, these regulations help prevent excessive levels of planned reliability and the cost of achieving such levels. It is virtually always possible to increase electric system reliability, if cost is no object. But, if a proposed electric transmission reinforcement exceeds NERC required minimum levels of planning reliability, then such a project is considered to be a market

[10] There are only a limited number of generators located in DC.

[11] See the Response to OCA Set I, request no. 18 (e), which is included as Exhibit___(PJL-11).

efficiency project. As such, the cost of such reinforcement needs to be justified by lowering electric system operating costs enough to pay the costs of building and maintaining the reinforcement, according to PJM criteria.

Evaluating Project Economics

Q. Please discuss how PJM evaluated the economics of proposals it received to address congestion on the APSRI.

A. PJM evaluated these proposals based in part on the calculation of B/C ratios reflecting 15 years of projected loads, projected fuel prices, projected generation mix, projected transmission system capacity, and on various degrees of sensitivity to changes in these system characteristics.

Q. Please discuss some of the issues with PJM's evaluation of market efficiency projects.

A. This critique is in addition to the evaluation of PJM's evaluation of market efficiency projects discussed in the testimony of Scott Rubin in OCA Statement No. 1.

PJM's evaluation of market efficiency projects requires accurate forecasts of loads, in-service generation, in-service transmission facilities, fuel costs, and other factors for 15 years into the future. This task is made even more difficult by the volatile nature of relevant system parameters in recent years.

One of the major shortcomings of PJM's process of determining the B/C ratios of the IEC Project is that the costs of the project elements have not been updated since the project was initially evaluated in 2015. Additional project elements have been added as the need for them has become apparent, but the costs of the new substations and new 230 kV double circuit transmission lines have not been updated. Table 1 below, shows the change in the Handy Whitman Index for total transmission costs from January 2015

through January 2018. Exhibit___(PJL-10) contains an excerpt from the Handy Whitman Index regarding transmission construction costs. [12]

Table 1

Escalation of Typical Total Transmission Costs			
Year	Month	Index	Increase %
2015	Jan	722	
2018	Jan	778	7.76%
Based on Handy Whitman Index - North Atlantic Region			

Since 2015, the costs of new typical transmission facilities as reported in the Handy Whitman Index has increased by 7.76% through January 1, 2018. Obviously, if the costs of the proposed facilities have increased since the Projects were evaluated by PJM, then the B/C ratios produced by PJM are not representative of the economic value of the projects.

Another concern, for example, is that PJM peak summer load levels have been decreasing, and the load growth that was projected for when the IEC would go into service have been significantly reduced. While PJM uses its load forecasts in its evaluation of market efficiency projects, the fact that its load forecasts are continually declining means that PJM's market efficiency project evaluations are based on future peak load forecasts that are overstated.

Table 2 below shows actual summer peak loads for BGE, for Pepco, and For Dominion for 2014 and 2017, as well as peak load forecasts for the year 2020 from the PJM 2015 Forecast and the PJM 2018 Forecast, where 2020 is the proposed in-service date for the IEC.[13]

[12] The Handy Whitman Index is a widely-recognized index of utility construction costs over time.

[13] Summer peak loads are used here because PJM is summer peaking, because the level of loads on days other than the day of the annual peak can decrease when the load on the day of the annual peak decreases, and because the load

Table 2

	Actual and Forecast Peak Loads (MW)			
	Actual Summer Peak		Forecast 2020 Peak	
	2014	2017	2015 Forecast	2018 Forecast
BGE	6,666	6,449	7,457	6,753
Pepco	6,346	6,098	6,853	6,405
DOM	18,761	18,903	22,068	19,858
Total	31,773	31,450	36,378	33,016

When the proposal for the IEC was submitted in 2015, the most recent summer peaks for BGE, Pepco, and Dominion were from 2014 and totaled 31,773 MW, as shown in Table 2. By 2017, these peak loads had decreased to 31,450 MW. These three companies represent the bulk of the loads in Maryland, DC and Virginia.[14] The 2015 forecast of the projected summer peak loads for 2020 was 36,378 MW for these three companies. This was the peak load expected for the year in which the IEC would go into service. The 2018 forecast of the 2020 peak load for the three companies, at 33,016 MW, has dropped by more than 3,300 MW in the past three years. Such a continuing decrease in forecasted loads is likely to affect the level of congestion on transmission facilities and is likely to lower the value of reducing such congestion.

Summer peak loads and peak load forecasts have been declining across PJM's Mid-Atlantic area for at least the past five years or more. This area includes loads in New Jersey, Maryland, Delaware, DC, and Pennsylvania, some of which are loads that contribute to the projected loads on the IEC Project transmission lines.

carrying capacity of transmission lines is frequently lower in summer than in winter when cooler ambient temperatures frequently allow increased loading.

[14] As described in McGlynn's Direct Testimony, the AP South Interface is a set of four 500 kV transmission lines which run from West Virginia to Maryland and Virginia. See pp.24, lines 19-21. As such, the loading on the lines of the APSRI can be affected by the level of loads in Maryland, Virginia, and the District of Columbia.

Exhibit___(PJL-6) shows actual summer peak loads from 2012 through 2017 on line 12, and PJM forecast summer peak loads on lines 4 through 10 for PJM's Mid-Atlantic area. Note that actual peak loads for the Mid-Atlantic have decreased from 60,037 MW in 2012 down to 55,220 in 2017. During this time, the forecast peak load for 2020 (IEP's projected in-service date) has decreased from 66,408 MW in the 2012 PJM Forecast down to 56,283 MW in the 2018 PJM Forecast. Note also that the 2018 PJM Forecast is projecting further declines in summer peak load for the Mid-Atlantic area for the years 2019, 2020, and 2021 (see line 10 on Exhibit___(PJL-6)).

Q. Please discuss any other areas of volatility that are of concern.

A. Another area of volatility is congestion costs. Witness McGlynn reports $800 million of congestion costs on the AP South Interface from 2012 through 2016 in his direct testimony.

Table 3 below summarizes PJM's annual congestion costs due to congestion on the AP South Interface, the percentage of total PJM congestion represented by such costs, and the annual total of congestion costs on the PJM system from 2014 through the first half of 2018.

Table 3

PJM Annual Congestion Costs ($M)			
Year	AP South Interface	% of PJM	Total PJM
2014	$486.8	25.20%	$1,932
2015	$56.2	4.10%	$1,371
2016	$16.8	1.60%	$1,050
2017	$21.6	3.10%	$697
2018 1st 6 mo	$17.6	2.00%	$880

As Table 3 shows, the annual congestion costs due to the AP South Interface have been sharply declining since 2014 both in absolute terms and as a percentage of PJM total congestion costs. The 2017 annual congestion cost due to the AP South Interface has decreased by more than 95% from 2014. Table 3 also shows the total decline in PJM

congestion costs since 2014. For 2014, total PJM congestion is $1.98 billion. For 2017, total PJM congestion has decreased to $697 million. This means that total congestion on PJM's transmission system has decreased by more than 60% over the past three years.

Q. What do you conclude from this current data on the need to address congestion on the APSRI?

A. I conclude that the original need for this Project was based on economic conditions that simply no longer exist. With these economic conditions changing so rapidly, it is difficult for PJM to keep its forward looking models accurately reflecting projected future conditions.

Q. Please discuss any national studies regarding transmission system congestion.

A. The U. S. Department of Energy has conducted an ongoing study of electric transmission congestion. The most recent report addressing this study was in September 2015 ("2015 Study"). The summary section of this report stated:

> Recent Nation-Wide Trends Affecting Transmission Constraints and Congestion since the 2009 Congestion Study
>
> Transmission constraints and congestion are influenced by both broad, economy-wide trends or conditions, and unique regional and sometimes local circumstances. The Department found that several broad, nation-wide trends have affected transmission usage patterns since the publication of the 2009 Congestion Study. In most areas, the net effect of these trends has been a reduction in the incidence of congestion and its economic costs.[15]

Among the trends referenced in the 2015 Study are i) reduced electric demand from the 2008-2009 economic recession, ii) government policies supporting improvements in electric efficiency, iii) sustained investments in transmission facilities, and iv) state renewable portfolio standards.

[15] National Electric Transmission Congestion Study, September 2015, pp. xv.

An excerpt from the 2015 Study is included as Exhibit___(PJL-7).

Q. Please address changes to electric markets that are currently being considered and how they might affect transmission congestion costs 15 years into the future.

A. The U. S. DOE has been ordered to consider changes to electric power markets that have the goal of increasing the financial attractiveness to owners of base-load coal and nuclear generating units of keeping such units in service. Exhibit___(PJL-8) is an article from the New York Times that describes presidential orders to DOE to prepare steps to stop the closing of coal and nuclear plants around the country. Such an initiative could change i) the number of coal plants expected to be in service in the future, ii) how those units are dispatched and iii) what the generation from those plants will cost over the next 15 years. Such changes could significantly affect the results of the studies being run by PJM to estimate the effects of Project 9A on power costs and system congestion for 15 years into the future.

Q. The generation mix in PJM in is a state of flux, with announcements of plans to increase the amount of renewable generation to be installed and plans to accelerate generator unit retirements. Please address how such changes can affect estimates of transmission system congestion or congestion costs 15 years into the future.

A. In recent months, there have been proposals of new renewable resource generating units proposed to be located in Maryland and Virginia on the load-side of the APSRI. On July 24, 2018, Dominion Energy announced new plans to add 3,000 MW of new solar and wind generation during the 2020s. The Dominion announcement also referenced plans to add 240 MW of solar generation to be located in Virginia. Included as Exhibit___(PJL-9) is the Transource Response to OCA Set XXIII request no. 2 which included the full text of the Dominion press release. There is no indication that the effects of any of these recent proposals, which could reduce the amount of load in Maryland and Virginia

potentially being served over the APSRI,[16] have been reflected in PJM evaluations of the IEC Project.

Transmission Alternatives

Q. The proposed IEC includes new transmission right-of-way ("ROW") for both of its proposed double circuit 230 kV transmission lines. Please discuss any existing transmission alternatives to these new ROWs.

A. If we assume that there is a need for the IEC, there are viable alternatives to both of the proposed new ROWs. These are important because transmission planners typically try to avoid greenfield construction of overhead transmission lines because of their significant effects on communities and landowners. Based on my own observations on site visits in Franklin and York counties and on public input hearing testimony, that is certainly the case for these proposed new transmission lines, much of which will located in new ROW which will be crossing preserved farmland.

Regarding the IEC – East Project which proposes a double circuit 230 kV transmission line to run from Furnace Run substation in York County to the Conastone substation in Maryland, there are two recently-rebuilt PPL 230 kV transmission lines, each of which carries one 230 kV circuit and each of which has the capacity to carry another new 230 kV circuit, that are both in the vicinity of the route of the proposed Furnace Run to Conastone transmission line.[17] One of the newly rebuilt 230 kV lines runs from Otter Creek substation in Pennsylvania to Conastone substation, while the other newly rebuilt 230 kV line runs from Manor substation in Pennsylvania to the Graceton substation in Maryland, which is located to the east of Conastone and is interconnected by a 230 kV transmission line. Both of these newly rebuilt 230 kV transmission lines are designed to carry two circuits, but since each carries only one circuit, each can accommodate the

[16] See Exhibit___(PJL- 9) Response to OCA Set XXIII, request no. 2.

[17] See PPL responses to OCA Set XII, nos. 1, 2, 3, 6, 8, 9, 10, and 13, all of which are attached in Exhibit___(PJL-12)

addition of a new circuit. Adding a new 230 kV circuit to each of these PPL tower lines would duplicate to a great extent the two proposed new 230 kV circuits of the IEC – East Project without the need for about 16 miles of new ROW. There may be some additional facilities needed in addition to these two new circuits, one from Otter Creek to Conastone and one from Manor to Graceton, in order to provide the capabilities of the proposed Furnace Run to Conastone double circuit. One such instance is the need to address a 1.1 mile section of the PPL Manor to Graceton tower line where it crosses the Susquehanna River that has capacity only for its existing circuit. However, using these existing PPL transmission line towers to each carry an additional 230 kV circuit would eliminate the need, if any at all, for the expense, and the detrimental environmental impacts of about 16 miles of new ROW and new transmission towers.

Q. Please discuss why PJM chose a proposal which requires new transmission towers and a new transmission ROW over one that makes use of existing towers and existing ROW.

A. PJM did not evaluate the use of the existing PPL transmission towers and existing ROWs because such use was not part of a proposal submitted to PJM as part of their solicitation process.[18] PJM does not maintain an inventory of transmission lines that have been built or rebuilt as double circuit lines yet which currently have only one set of conductors.[19]

Q. Please discuss any transmission alternatives considered to the new transmission ROW from the Rice substation in PA to the Ringgold substation in MD and the new double circuit 230 kV towers proposed by Transource for the IEC-West Project

A. PJM evaluated a modified version of Proposal 18H submitted by MAIT, which was a proposal to upgrade existing facilities, together with 9A East.[20] PJM's evaluation of 18H plus 9A East shows that it has either the 1st or second highest B/C ratio of all four

[18] See response to OCA Set XI, request no 7 which is included as Exhibit___(PJL-13)

[19] See response to OCA Set XVII, request no 1 (c) which is included as Exhibit___(PJL-14)

[20] See response to OCA Set XVII, request no. 1 and McGlynn's Direct Testimony, pp. 26 – 31.

alternatives it is evaluating among the seven different sensitivity scenarios shown in Mr. McGlynn's testimony. While it shows that the 18H plus 9A has lower congestion benefits and load payment benefits than the other three alternatives, this reflects a relatively low implementation cost and limited scope for the project that is implicit with the high B/C ratio for 18H plus 9A East.

While 18H plus 9A East may produce smaller benefits, it is an alternative to 9A West reflecting an upgrade of existing facilities, eliminating the need for 29 miles of new ROW and new transmission towers. PJM assigns no value to the environmental benefits of avoiding the impacts of 29 miles of new ROW and new overhead transmission lines. PJM focuses on the size of the B/C ratio and on the size of the benefits. But, in consideration of the greatly reduced impacts of available alternatives to elements of the IEC, such as 18H plus 9A, I recommend that the Commission deny approval for the IEC Project as proposed.

Q. What do you recommend?

A. It is clear from the Company's filed testimony that this portion of the project is not needed to maintain reliability. It is not clear that, given the reduced congestion and reduced peak loads in PJM and given the failure to consider up-to-date costs that the proposed facilities are an optimal way of addressing congestion, if it should be addressed at all. Commission regulations require that the Commission determine that proposed transmission line(s) will have minimum adverse environmental impact, considering the electric power needs of the public, the state of available technology and the available alternatives.[21] This is an instance where there are what could be viable alternatives to the Company's proposals that were not considered by PJM. It is difficult to perceive how the Commission could determine that the proposed transmission line for the IEC East Project would have minimum environmental impacts.

Q. Does this conclude your testimony?

[21] 52 Pa.Code Sec. 57.76 (a) (4).

1

2 A. Yes, at this time.

3 259197

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

Application of Transource Pennsylvania, LLC for approval of the Siting and Construction of the 230 kV Transmission Line Associated with the Independence Energy Connection - East and West Projects in portions of York and Franklin Counties, Pennsylvania.	:	A-2017-2640195 A-2017-2640200
Petition of Transource Pennsylvania, LLC for a finding that a building to shelter control equipment at the Rice Substation in Franklin County, Pennsylvania is reasonably necessary for the convenience or welfare of the public.	:	P-2018-3001878
Petition of Transource Pennsylvania, LLC for a finding that a building to shelter control equipment at the Furnace Run Substation in York County, Pennsylvania is reasonably necessary for the convenience or welfare of the public.	:	P-2018-3001883
Application of Transource Pennsylvania, LLC for approval to acquire a certain portion of the lands of various landowners in York and Franklin Counties, Pennsylvania for the siting and construction of the 230 kV Transmission Line associated with the Independence Energy Connection – East and West Projects as necessary or proper for the service, accommodation, convenience or safety of the public.	:	A-2018-3001881, *et al.*

VERIFICATION

I, Peter Lanzalotta, hereby state that the facts above set forth in my Direct Testimony OCA Statement No. 2 are true and correct and that I expect to be able to prove the same at a hearing held in this matter. I understand that the statements herein are made subject to the penalties of 18 Pa.C.S. § 4904 (relating to unsworn falsification to authorities).

Signature: Peter J. Lanzalotta

Peter J. Lanzalotta
Lanzalotta & Associates LLC
67 Royal Pointe Drive
Moss Creek Plantation
Hilton Head Island, SC. 29926
petelanz@lanzalotta.com

DATED: September 25, 2018
*259204

Exhibit___(PJL-1)
OCA Statement No. 2

Prior Experience Of Peter J. Lanzalotta

Mr. Lanzalotta has more than thirty-five years experience in electric utility system planning, power pool operations, distribution operations, electric service reliability, load and price forecasting, and market analysis and development. Mr. Lanzalotta has appeared as an expert witness on utility reliability, planning, operation, and rate matters in more than 130 proceedings in 25 states, the District of Columbia, the Provinces of Alberta, Nova Scotia, and Ontario, before the Federal Energy Regulatory Commission, and before U. S. District Court. He has developed evaluations of electric utility system cost, system value, reliability planning, transmission and distribution maintenance practices, and reliability of service.

Prior to his forming Lanzalotta & Associates LLC in 2001, he was a Partner at Whitfield Russell Associates in Washington DC for fifteen years and a Senior Associate for approximately four years before that. He holds a Bachelor of Science in Electric Power Engineering from Rensselaer Polytechnic Institute and a Master of Business Administration with a concentration in Finance from Loyola College of Baltimore.

Prior to joining Whitfield Russell Associates in 1982, Mr. Lanzalotta was employed by the Connecticut Municipal Electric Energy Cooperative ("CMEEC") as a System Engineer. He was responsible for providing operational, financial, and rate expertise to Coop's budgeting, ratemaking and system planning processes. He participated on behalf of CMEEC in the Hydro-Quebec/New England Power Pool Interconnection project and initiated the development of a database to support CMEEC's pool billing and financial data needs.

Prior to his CMEEC employment, he served as Chief Engineer at the South Norwalk (Connecticut) Electric Works, with responsibility for planning, data processing, engineering, rates and tariffs, generation and bulk power sales, and distribution operations. While at South Norwalk, he conceived and implemented, through Northeast Utilities and NEPOOL, a peak-shaving plan for South Norwalk and a neighboring municipal electric utility, which resulted in substantial power supply savings. He programmed and implemented a computer system to perform customer billing and maintain accounts receivable accounting. He also helped manage a generating station overhaul and the undergrounding of the distribution system in South Norwalk's downtown.

From 1977 to 1979, Mr. Lanzalotta worked as a public utility consultant for Van Scoyoc & Wiskup and separately for Whitman Requart & Associates in a variety of positions. During this time, he developed cost of service, rate base evaluation, and rate design impact data to support direct testimony and exhibits in a variety of utility proceedings, including utility price squeeze cases, gas pipeline rates, and wholesale electric rate cases.

Prior to that, He worked for approximately 2 years as a Service Tariffs Analyst for the Finance Division of the Baltimore Gas & Electric Company where he developed cost and revenue studies, evaluated alternative rate structures, and studied the rate structures of other utilities for a variety of applications. He was also employed by BG&E in Electric System Operations for approximately 3 years, where his duties included operations analysis, outage reporting, and participation in the development of BG&E's first computerized customer information and service order system.

Mr. Lanzalotta is a member of the Institute of Electrical & Electronic Engineers, the Association of Energy Engineers, the National Fire Protection Association, and the American Solar Energy Society. He is also registered Professional Engineer in the states of Maryland and Connecticut.

Exhibit___(PJL-2)
OCA Statement No. 2

Proceedings In Which
Peter J. Lanzalotta
Has Testified

1. **In re: Public Service Company of New Mexico**, Docket Nos. ER78-337 and ER78-338 before the Federal Energy Regulatory Commission, concerning the need for access to calculation methodology underlying filing.

2. **In re: Baltimore Gas and Electric Company**, Case No. 7238-V before the Maryland Public Service Commission, concerning outage replacement power costs.

3. **In re: Houston Lighting & Power Company**, Texas Public Utilities Commission Docket No. 4712, concerning modeling methods to determine rates to be paid to cogenerators and small power producers.

4. **In re: Nevada Power Company**, Nevada Public Service Commission, Docket No. 83-707 concerning rate case fuel inventories, rate base items, and O&M expense.

5. **In re: Virginia Electric & Power Company**, Virginia State Corporation Commission, Case No. PUE820091, concerning the operating and reliability-based need for additional transmission facilities.

6. **In re: Public Service Electric & Gas Company**, New Jersey Board of Public Utilities, Docket No. 831-25, concerning outage replacement power costs.

7. **In re: Philadelphia Electric Company**, Pennsylvania Public Utilities Commission, Docket No. P-830453, concerning outage replacement power costs.

8. **In re: Cincinnati Gas & Electric Company**, Public Utilities Commission of Ohio, Case No. 83-33-EL-EFC, concerning the results of an operations/fuel-use audit conducted by Mr. Lanzalotta.

9. **In re: Kansas City Power and Light Company**, before the State Corporation Commission of the state of Kansas, Docket Nos. 142,099-U and 120,924-U, concerning the determination of the capacity, from a new base-load generating facility, needed for reliable system operation, and the capacity available from existing generating units.

Proceedings In Which
Peter J. Lanzalotta
Has Testified

10. **In re: Philadelphia Electric Company**, Pennsylvania Public Utilities Commission, Docket No. R-850152, concerning the determination of the capacity, from a new base-load generating facility, needed for reliable system operation, and the capacity available from existing generating units.

11. **In re: ABC Method Proposed for Application to Public Service Company of Colorado**, before the Public Utilities Commission of the State of Colorado, on behalf of the Federal Executive Agencies ("FEA"), concerning a production cost allocation methodology proposed for use in Colorado.

12. **In re: Duquesne Light Company**, Docket No. R-870651, before the Pennsylvania Public Utilities Commission, on behalf of the Office of Consumer Advocate, concerning the system reserve margin needed for reliable service.

13. **In re: Pennsylvania Power Company**, Docket No. I-7970318 before the Pennsylvania Public Utilities Commission, on behalf of the Office of Consumer Advocate, concerning outage replacement power costs.

14. **In re: Commonwealth Edison Company**, Docket No. 87-0427 before the Illinois Commerce Commission, on behalf of the Citizen's Utility Board of Illinois, concerning the determination of the capacity, from new base-load generating facilities, needed for reliable system operation.

15. **In re: Central Illinois Public Service Company**, Docket No. 88-0031 before the Illinois Commerce Commission, on behalf of the Citizen's Utility Board of Illinois, concerning the degree to which existing generating capacity is needed for reliable and/or economic system operation.

16. **In re: Illinois Power Company**, Docket No. 87-0695 before the State of Illinois Commerce Commission, on behalf of Citizens Utility Board of Illinois, Governors Office of Consumer Services, Office of Public Counsel and Small Business Utility Advocate, concerning the determination of the capacity, from a new base-load generating facility, needed for reliable system operation, and the capacity available from existing generating units.

Proceedings In Which
Peter J. Lanzalotta
Has Testified

17. **In re: Florida Power Corporation**, Docket No. 860001-EI-G (Phase II), before the Florida Public Service Commission, on behalf of the Federal Executive Agencies of the United States, concerning an investigation into fuel supply relationships of Florida Power Corporation.

18. **In re: Potomac Electric Power Company**, before the Public Service Commission of the District of Columbia, Docket No. 877, on behalf of the Public Service Commission Staff, concerning the need for and availability of new generating facilities.

19. **In re: South Carolina Electric & Gas Company**, before the South Carolina Public Service Commission, Docket No. 88-681-E, On Behalf of the State of Carolina Department of Consumer Affairs, concerning the capacity needed for reliable system operation, the capacity available from existing generating units, relative jurisdictional rate of return, reconnection charges, and the provision of supplementary, backup, and maintenance services for QFs.

20. **In re: Commonwealth Edison Company**, Illinois Commerce Commission, Docket Nos. 87-0169, 87-0427, 88-0189, 88-0219, and 88-0253, on behalf of the Citizen's Utility Board of Illinois, concerning the determination of the capacity, from a new base-load generating facility, needed for reliable system operation.

21. **In re: Illinois Power Company**, Illinois Commerce Commission, Docket No. 89-0276, on behalf of the Citizen's Utility Board Of Illinois, concerning the determination of capacity available from existing generating units.

22. **In re: Jersey Central Power & Light Company**, New Jersey Board of Public Utilities, Docket No. EE88-121293, on behalf of the State of New Jersey Department of the Public Advocate, concerning evaluation of transmission planning.

23. **In re: Canal Electric Company**, before the Federal Energy Regulatory Commission, Docket No. ER90-245-000, on behalf of the Municipal Light Department of the Town of Belmont, Massachusetts, concerning the reasonableness of Seabrook Unit No. 1 Operating and Maintenance expense.

Proceedings In Which
Peter J. Lanzalotta
Has Testified

24. **In re: New Hampshire Electric Cooperative Rate Plan Proposal**, before the New Hampshire Public Utilities Commission, Docket No. DR90-078, on behalf of the New Hampshire Electric Cooperative, concerning contract valuation.

25. **In re: Connecticut Light & Power Company**, before the Connecticut Department of Public Utility Control, Docket No. 90-04-14, on behalf of a group of Qualifying Facilities concerning O&M expenses payable by the QFs.

26. **In re: Duke Power Company**, before the South Carolina Public Service Commission, Docket No. 91-216-E, on behalf of the State of South Carolina Department of Consumer Advocate, concerning System Planning, Rate Design and Nuclear Decommissioning Fund issues.

27. **In re: Jersey Central Power & Light Company**, before the Federal Energy Regulatory Commission, Docket No. ER91-480-000, on behalf of the Boroughs of Butler, Madison, Lavallette, Pemberton and Seaside Heights, concerning the appropriateness of a separate rate class for a large wholesale customer.

28. **In re: Potomac Electric Power Company**, before the Public Service Commission of the District of Columbia, Formal Case No. 912, on behalf of the Staff of the Public Service Commission of the District of Columbia, concerning the Application of PEPCO for an increase in retail rates for the sale of electric energy.

29. **Commonwealth of Pennsylvania, House of Representatives**, General Assembly House Bill No. 2273. Oral testimony before the Committee on Conservation, concerning proposed Electromagnetic Field Exposure Avoidance Act.

30. **In re: Hearings on the 1990 Ontario Hydro Demand\Supply Plan**, before the Ontario Environmental Assessment Board, concerning Ontario Hydro's System Reliability Planning and Transmission Planning.

Proceedings In Which
Peter J. Lanzalotta
Has Testified

31. **In re: Maui Electric Company**, Docket No. 7000, before the Public Utilities Commission of the State of Hawaii, on behalf of the Division of Consumer Advocacy, concerning MECO's generation system, fuel and purchased power expense, depreciation, plant additions and retirements, contributions and advances.

32. **In re: Hawaiian Electric Company, Inc.**, Docket No. 7256, before the Public Utilities Commission of the State of Hawaii, on behalf of the Division of Consumer Advocacy, concerning need for, design of, and routing of proposed transmission facilities.

33. **In re: Commonwealth Edison Company**, Docket No. 94-0065 before the Illinois Commerce Commission on behalf of the City of Chicago, concerning the capacity needed for system reliability.

34. **In re: Commonwealth Edison Company**, Docket No. 93-0216 before the Illinois Commerce Commission on behalf of the Citizens for Responsible Electric Power, concerning the need for proposed 138 kV transmission and substation facilities.

35. **In re: Commonwealth Edison Company**, Docket No. 92-0221 before the Illinois Commerce Commission on behalf of the Friends of Illinois Prairie Path, concerning the need for proposed 138 kV transmission and substation facilities.

36. **In re: Commonwealth Edison Company**, Docket No. 94-0179 before the Illinois Commerce Commission on behalf of the Friends of Sugar Ridge, concerning the need for proposed 138 kV transmission and substation facilities.

37. **In re: Public Service Company of Colorado**, Docket Nos. 95A-531EG and 95I-464E before the Colorado Public Utilities Commission on behalf of the Office of Consumer Counsel, concerning a proposed merger with Southwestern Public Service Company and a proposed performance-based rate-making plan.

Proceedings In Which
Peter J. Lanzalotta
Has Testified

38. **In re: South Carolina Electric & Gas Company, Duke Power Company, and Carolina Power & Light Company**, Docket No. 95-1192-E, before the South Carolina Public Service Commission on behalf of the South Carolina Department of Consumer Advocate, concerning avoided cost rates payable to qualifying facilities.

39. **In re: Lawrence A. Baker v. Truckee Donner Public Utility District**, Case No. 55899, before the Superior Court of the State of California on behalf of Truckee Donner Public Utility District, concerning the reasonableness of electric rates.

40. **In re: Black Hills Power & Light Company**, Docket No. OA96-75-000, before the Federal Energy Regulatory Commission on behalf of the City of Gillette, Wyoming, concerning the Black Hills' proposed open access transmission tariff.

41. **In re: Metropolitan Edison Company and Pennsylvania Electric Company** for Approvals of the Restructuring Plan Under Section 2806, Docket Nos. R-00974008 and R-00974009 before the Pennsylvania PUC on behalf of Operating NUG Group, concerning miscellaneous restructuring issues.

42. **In re: New Jersey State Restructuring Proceeding** for consideration of proposals for retail competition under BPU Docket Nos. EX94120585U; E097070457; E097070460; E097070463; E097070466 before the New Jersey BPU on behalf of the New Jersey Division of Ratepayer Advocate, concerning load balancing, third party settlements, and market power.

43. **In re: Arbitration Proceeding In City of Chicago v. Commonwealth Edison** for consideration of claims that franchise agreement has been breached, Proceeding No. 51Y-114-350-96 before an arbitration panel board on behalf of the City of Chicago concerning electric system reliability.

44. **In re: Transalta Utilities Corporation**, Application No. RE 95081 on behalf of the ACD companies, before the Alberta Energy And Utilities Board in reference to the use and value of interruptible capacity.

Proceedings In Which
Peter J. Lanzalotta
Has Testified

45. **In re: Consolidated Edison Company,** Docket No. EL99-58-000 on behalf of The Village of Freeport, New York, before FERC in reference to remedies for a breach of contract to provide firm transmission service on a non-discriminatory basis.

46. **In re: ESBI Alberta Ltd.,** Application No. 990005 on behalf of the FIRM Customers, before the Alberta Energy And Utilities Board concerning the reasonableness of the cost of service plus management fee proposed for 1999 and 2000 by the transmission administrator.

47. **In re: South Carolina Electric & Gas Company,** Docket No. 2000-0170-E on behalf of the South Carolina Department of Consumer Affairs before the Public Service Commission of South Carolina concerning an application for a Certificate of Environmental Compatibility and Public Convenience and Necessity for new and repowered generating units at the Urquhart generating station.

48. **In re: BGE,** Case No. 8837 on behalf of the Maryland Office of People's Counsel before the Maryland Public Service Commission concerning proposed electric line extension charges.

49. **In re: PEPCO,** Case No. 8844 on behalf of the Maryland Office of People's Counsel before the Maryland Public Service Commission concerning proposed electric line extension charges.

50. **In re: GenPower Anderson LLC,** Docket No. 2001-78-E on behalf of the South Carolina Department of Consumer Affairs before the Public Service Commission of South Carolina concerning an application for a Certificate of Environmental Compatibility and Public Convenience and Necessity for new generating units at the GenPower Anderson LLC generating station.

51. **In re: Pike County Light & Power Company,** Docket No. P-00011872, on behalf of Pennsylvania Office of Consumer Advocate before the Pennsylvania Public Utility Commission concerning the Pike County request for a retail rate cap exception.

Proceedings In Which
Peter J. Lanzalotta
Has Testified

52. **In re: Potomac Electric Power Company and Conectiv,** Case No. 8890, on behalf of the Maryland Office of People's Counsel before the Maryland Public Service Commission concerning the proposed merger of Potomac Electric Power Company and Conectiv.

53. **In re: South Carolina Electric & Gas Company,** Docket No. 2001-420-E on behalf of the South Carolina Department of Consumer Affairs before the Public Service Commission of South Carolina concerning an application for a Certificate of Environmental Compatibility and Public Convenience and Necessity for new generating units at the Jasper County generating station.

54. **In re: Connecticut Light & Power Company,** Docket No. 217 on behalf of the Towns of Bethel, Redding, Weston, and Wilton, Connecticut before the Connecticut Siting Council concerning an application for a Certificate of Environmental Compatibility and Public Need for a new transmission line facility between Plumtree Substation, Bethel and Norwalk Substation, Norwalk.

55. **In re: The City of Vernon, California,** Docket No. EL02-103 on behalf of the City of Vernon before the Federal Energy Regulatory Commission concerning Vernon's transmission revenue balancing account adjustment reflecting calendar year 2001 transactions.

56. **In re: San Diego Gas & Electric Company et. al.,** Docket No. EL00-95-045 on behalf of the City of Vernon, California before the Federal Energy Regulatory Commission concerning refunds and other monies payable in the California wholesale energy markets.

57. **In re: The City of Vernon, California,** Docket No. EL03-31 on behalf of the City of Vernon before the Federal Energy Regulatory Commission concerning Vernon's transmission revenue balancing account adjustment reflecting 2002 transactions.

58. **In re: Jersey Central Power & Light Company,** Docket Nos. ER02080506, ER02080507, ER02030173, and EO02070417 on behalf of the New Jersey Division of Ratepayer Advocate before the New Jersey Board of Public Utilities concerning reliability issues involved in the approval of an increase in

Proceedings In Which
Peter J. Lanzalotta
Has Testified

base tariff rates.

59. **In re: Proposed Electric Service Reliability Rules, Standards, and Indices To Ensure Reliable Service by Electric Distribution Companies,** PSC Regulation Docket No. 50, on behalf of the Delaware Public Service Commission Staff before the Delaware Public Service Commission concerning proposed electric service reliability rules, standards and indices.

60. **In re: Central Maine Power Company,** Docket No. 2002-665, on behalf of the Maine Public Advocate and the Town of York before the Maine Public Utilities Commission concerning a Request for Commission Investigation into the New CMP Transmission Line Proposal for Eliot, Kittery, and York.

61. **In re: Metropolitan Edison Company,** Docket No. C-20028394, on behalf of the Pennsylvania Office of Consumer Advocate, before the Pennsylvania Public Utility Commission concerning the reliability service complaint of Robert Lawrence.

62. **In re: The California Independent System Operator Corporation,** Docket No. ER00-2019 *et al.* on behalf of the City of Vernon, California, before the Federal Energy Regulatory Commission concerning wholesale transmission tariffs, rates and rate structures proposed by the California ISO.

63. **In re: The Narragansett Electric Company,** Docket No. 3564 on behalf of the Rhode Island Department of Attorney General, before the Rhode Island Public Utilities Commission concerning the proposed relocation of the E-183 transmission line.

64. **In re: The City of Vernon, California,** Docket No. EL04-34 on behalf of the City of Vernon before the Federal Energy Regulatory Commission concerning Vernon's transmission revenue balancing account adjustment reflecting 2003 transactions.

65. **In re: Atlantic City Electric Company,** Docket No. ER03020110 on behalf of the New Jersey Division of Ratepayer Advocate before the New Jersey Board of Public Utilities concerning reliability issues involved in the approval of an increase in base tariff rates.

Proceedings In Which
Peter J. Lanzalotta
Has Testified

66. **In re: Connecticut Light & Power Company and the United Illuminating Company,** Docket No. 272 on behalf of the Towns of Bethany, Cheshire, Durham, Easton, Fairfield, Hamden, Middlefield, Milford, North Haven, Norwalk, Orange, Wallingford, Weston, Westport, Wilton, and Woodbridge, Connecticut before the Connecticut Siting Council concerning an application for a Certificate of Environmental Compatibility and Public Need for a new transmission line facility between the Scoville Rock Switching Station in Middletown and the Norwalk Substation in Norwalk, Connecticut.

67. **In re: Metropolitan Edison Company, Pennsylvania Electric Company, and Pennsylvania Power Company,** Docket No. I-00040102, on behalf of the Pennsylvania Office of Consumer Advocate before the Pennsylvania Public Utility Commission concerning electric service reliability performance.

68. **In re: Entergy Louisiana, Inc.,** Docket No. U-20925 RRF-2004 on behalf of Bayou Steel before the Louisiana Public Service Commission concerning a proposed increase in base rates.

69. **In re: Jersey Central Power & Light Company,** Docket No. ER02080506, Phase II, on behalf of the New Jersey Division of Ratepayer Advocate before the New Jersey Board of Public Utilities concerning reliability issues involved in the approval of an increase in base tariff rates.

70. **In re: Maine Public Service Company,** Docket No. 2004-538, on behalf of the Main Public Advocate before the Maine Public Utilities Commission concerning a request to construct a 138 kV transmission line from Limestone, Maine to the Canadian border near Hamlin, Maine.

71. **In re: Pike County Light and Power Company,** Docket No. M-00991220F0002, on behalf of the Pennsylvania Office of Consumer Advocate before the Pennsylvania Public Utility Commission concerning the Company's Petition to amend benchmarks for distribution reliability.

72. **In re: Atlantic City Electric Company,** Docket No. EE04111374, on behalf of the New Jersey Division of Ratepayer Advocate before the New Jersey

Proceedings In Which
Peter J. Lanzalotta
Has Testified

Board of Public Utilities concerning the need for transmission system reinforcement, and related issues.

73. **In re: Bangor Hydro-Electric Company,** Docket No. 2004-771, on behalf of the Main Public Advocate before the Maine Public Utilities Commission concerning a request to construct a 345 kV transmission line from Orrington, Maine to the Canadian border near Baileyville, Maine.

74. **In re: Eastern Maine Electric Cooperatve,** Docket No. 2005-17, on behalf of the Main Public Advocate before the Maine Public Utilities Commission concerning a petition to approve a purchase of transmission capacity on a 345 kV transmission line from Maine to the Canadian province of New Brunswick.

75. **In re: Virginia Electric and Power Company,** Case No. PUE-2005-00018, on behalf of the Town of Leesburg VA and Loudoun County VA before the Virginia State Corporation Commission concerning a request for a certificate of public convenience and necessity for transmission and substation facilities in Loudoun County.

76. **In re: Proposed Electric Service Reliability Rules, Standards, and Indices To Ensure Reliable Service by Electric Distribution Companies,** PSC Regulation Docket No. 50, on behalf of the Delaware Public Service Commission Staff before the Delaware Public Service Commission concerning proposed electric service reliability reporting, standards, and indices.

77. **In re: Proposed Merger Involving Constellation Energy Group Inc. and the FPL Group, Inc.**, Case No. 9054, on behalf of the Maryland Office of Peoples' Counsel before the Maryland Public Service Commission concerning the proposed merger involving Baltimore Gas & Electric Company and Florida Light & Power Company.

78. **In re: Proposed Sale and Transfer of Electric Franchise of the Town of St. Michaels to Choptank Electric Cooperative, Inc.,** Case No. 9071, on behalf of the Maryland Office of Peoples' Counsel before the Maryland Public Service Commission concerning the sale by St. Michaels of their electric franchise and service area to Choptank.

Proceedings In Which
Peter J. Lanzalotta
Has Testified

79. **In re: Petition of Rockland Electric Company for the Approval of Changes in Electric Rates, and Other Relief,** BPU Docket No. ER06060483, on behalf of the Department of the Public Advocate, Division of Rate Counsel, before the New Jersey Board of Public Utilities, concerning electric service reliability and reliability-related spending.

80. **In re: The Complaint of the County of Pike v. Pike County Light & Power Company, Inc.,** Docket No. C-20065942, et al., on behalf of the Pennsylvania Office of Consumer Advocate before the Pennsylvania Public Utilities Commission, concerning electric service reliability and interconnecting with the PJM ISO.

81. **In re: Application of American Transmission Company to Construct a New Transmission Line,** Docket No. 137-CE-139, on behalf of The Sierra Club of Wisconsin, before the Public Service Commission of Wisconsin, concerning the request to build a new 138 kV transmission line.

82. **In re: The Matter of the Self-Complaint of Columbus Southern Power Company and Ohio Power Company Regarding the Implementation of Programs to Enhance Distribution Service Reliability,** Case No. 06-222-EL-SLF, on behalf of The Office of The Ohio Consumers' Counsel, before the Public Utilities Commission of Ohio, concerning distribution system reliability and related topics.

83. **In re: Central Maine Power Company,** Docket No. 2006-487, on behalf of the Maine Public Advocate before the Maine Public Utilities Commission concerning CMP's Petition for Finding of Public Convenience & Necessity to build a 115 kV transmission line between Saco and Old Orchard Beach.

84. **In re: Bangor Hydro Electric Company,** Docket No. 2006-686, on behalf of the Maine Public Advocate before the Maine Public Utilities Commission concerning BHE's Petition for Finding of Public Convenience & Necessity to build a 115 kV transmission line and substation in Hancock County.

85. **In re: Commission Staff's Petition For Designation of Competitive Renewable Energy Zones,** Docket No. 33672, on behalf of the Texas Office

Proceedings In Which
Peter J. Lanzalotta
Has Testified

of Public Utility Counsel, concerning the Staff's Petition and the determination of what areas should be designated as CREZs by the Commission.

86. **In re: Virginia Electric and Power Company,** Case No. PUE-2006-00091, on behalf of the Towering Concerns and Stafford County VA before the Virginia State Corporation Commission concerning a request for a certificate of public convenience and necessity for electric transmission and substation facilities in Stafford County.

87. **In re: Trans-Allegheny Interstate Line Company,** Docket Nos. A-110172 et al., on behalf of the Pennsylvania Office of Consumer Advocate, before the Pennsylvania Public Utility Commission, concerning a request for a certificate of public convenience and necessity for electric transmission and substation facilities in Pennsylvania.

88. **In re: Commonwealth Edison Company,** Docket No. 07-0566, on behalf of the Illinois Attorney General, before the Illinois Commerce Commission, concerning electric transmission and distribution projects promoted as smart grid projects, and the rider proposed to pay for them.

89. **In re: Commonwealth Edison Company,** Docket No. 07-0491, on behalf of the Illinois Attorney General, before the Illinois Commerce Commission, concerning the applicability of electric service interruption provisions.

90. **In re: Hydro One Networks ,** Case No. EB-2007-0050, on behalf of Pollution Probe, before the Ontario Energy Board, concerning a request for leave to construct electric transmission facilities in the Province of Ontario.

91. **In re: PEPCO Holdings, Inc.,** Docket No. ER-08-686-000, on behalf of the Maryland Office of Peoples' Counsel, before the Federal Energy Regulatory Commission, concerning a request for incentive rates of return on transmission projects.

92. **In re: PPL Electric Utilities Corporation and Public Service Electric and Gas Company,** Docket No. ER-08-23-000, on behalf of the Joint Consumer Advocates, including the state consumer advocacy offices for the States of

Proceedings In Which
Peter J. Lanzalotta
Has Testified

Maryland, West Virginia, before the Federal Energy Regulatory Commission, concerning a request for incentive rates of return on transmission projects.

93. **In re: PPL Electric Utilities Corporation,** Docket Nos. A-2008-2022941 and P-2008-2038262, on behalf of Springfield Township, Bucks County, PA, before the Pennsylvania Public Utility Commission, concerning the need for and alternatives to proposed electric transmission lines and a proposed electric substation.

94. **In re: PEPCO Holdings, Inc.,** Docket No. ER08-1423-000, on behalf of the Maryland Office of Peoples' Counsel, before the Federal Energy Regulatory Commission, concerning a request for incentive rates of return on transmission projects.

95. **In re: Public Service Electric and Gas Company, Inc.,** Docket No. ER09-249-000, on behalf of the New Jersey Division of Rate Counsel, before the Federal Energy Regulatory Commission, concerning a request for incentive rates of return on transmission projects.

96. **In re: New York Regional Interconnect Inc.,** Case No. 06-T-0650, on behalf of the Citizens Against Regional Interconnect, before the New York Public Service Commission, concerning the economics of and alternatives to proposed transmission facilities.

97. **In re: Central Maine Power Company and Public Service of New Hampshire,** Docket No. 2008-255, on behalf of the Maine Public Advocate, before the Maine Public Utilities Commission, concerning CMP's and PSNH's Petition for Finding of Public Convenience & Necessity to build the Maine Power Reliability Project, a series of new and rebuilt electric transmission facilities to operate at 345 kV and 115 kV in Maine and New Hampshire.

98. **In re: PPL Electric Utilities Corporation, Docket No. A-2009-2082652 et al,** on behalf of the Pennsylvania Office of Consumer Advocate, before the Pennsylvania Public Utility Commission, concerning the Company's application for approval to site and construct electric transmission facilities in Pennsylvania.

Proceedings In Which
Peter J. Lanzalotta
Has Testified

99. **In re: Bangor Hydro-Electric,** Docket No. 2009-26, on behalf of the Maine Public Advocate, before the Maine Public Utilities Commission, concerning BHE's Petition for Certificate of Public Convenience & Necessity to build a 115 kV transmission line in Washington and Hancock Counties.

100. **In re: United States, et al. v. Cinergy Corp., et al.** Civil Action No. IP99-1693 C-M/S, on behalf of Plaintiff United States and Plaintiff-Intervenors State of New York, State of New Jersey, State of Connecticut, Hoosier Environmental Council, and Ohio Environmental Council, before the United States District Court for the Southern District of Indiana, concerning the system reliability impacts of the potential retirement of Gallagher Power Station Unit 1 and Unit 3.

101. **In re: Application of Potomac Electric Power Company, et al.** Case No. 9179, on behalf of the Maryland Office of Peoples' Counsel before the Maryland Public Service Commission concerning the application for a determination of need under a certificate of public convenience and necessity for the Maryland portion of the MAPP transmission line, and related facilities.

102. **In re: Potomac Electric Power Company v. Perini/Tompkins Joint Venture,** Case No. 9210, on behalf of Perini Tompkins before the Maryland Public Service Commission concerning a review of PEPCO's estimates of electric consumption by Perini Tompkins Joint Venture's temporary electric service at National Harbor during a 29 month period for which no metered consumption data is available.

103. **In re: Duke Energy Ohio, Inc.,** Case No. 10-503-EL-FOR, on behalf of the Natural Resources Defense Council and Sierra Club before the Public Utilities Commission Of Ohio, concerning a review of the reliability impacts that would result from closure of selected generating units as part of a review of Duke's 2010 Electric Long-Term Forecast Report and Resources Plan.

104. **In re: Detroit Edison Company,** Case Nos. U-16472 and 16489, on behalf of the Michigan Environmental Council and the Natural Resources Defense Council, before the Michigan Public Service Commission, concerning a review looking for studies of the reliability impacts that would result from closure of selected generating units as part of an electric rate increase case.

Proceedings In Which
Peter J. Lanzalotta
Has Testified

105. **In re: Potomac Electric Power Company,** Case No. 9240, on behalf of the Maryland Office of Peoples' Counsel, before the Maryland Public Service Commission, concerning electric service reliability performance.

106. **In re: ISO New England, Inc.,** Docket No. ER12-991-000, on behalf of the Conservation Law Foundation, before the Federal Energy Regulatory Commission, concerning proposals for procedures for obtaining temporary regulations addressing emissions from electric generating facilities.

107. **In re: Western Massachusetts Electric Company, Docket No. D.P.U. 11-119-C** on behalf of the Attorney General of the Commonwealth of Massachusetts, before the Massachusetts Department of Public Utilities, concerning storm preparation, performance, and restoration of electric service.

108. **In re: Delmarva Power & Light Company,** Case No. 9285, on behalf of the Maryland Office of Peoples' Counsel, before the Maryland Public Service Commission, concerning storm restoration expenses and tree trimming expenses as part of a base rate increase case.

109. **In re: Potomac Electric Power Company,** Case No. 9286, on behalf of the Maryland Office of Peoples' Counsel, before the Maryland Public Service Commission, concerning storm restoration expenses and tree trimming expenses as part of a base rate increase case.

110. **In re: Fitchburg Gas And Electric Company,** Civil Action No. 09-00023, on behalf of Marcia D. Bellerman, et al., before the Commonwealth of Massachusetts Superior Court, concerning company and electric system preparedness and execution in dealing with a major winter storm.

111. **In re: Duke Energy Indiana, Inc.,** Cause No. 44217, on behalf of Citizens Action Coalition of Indiana, Sierra Club, Save The Valley, and Valley Watch, before the Indiana Utility Regulatory Commission, concerning the role of transmission planning studies as part of the process of deciding whether to retire coal-fired generation or equip such generation with environmental retrofits.

Proceedings In Which
Peter J. Lanzalotta
Has Testified

112. **In re: Indianapolis Power & Light Company,** Cause No. 44242, on behalf of Citizens Action Coalition of Indiana and the Sierra Club, before the Indiana Utility Regulatory Commission, concerning the role of transmission planning studies as part of the process of deciding whether to retire coal-fired generation or equip such generation with environmental retrofits.

113. **In re: Consumers Energy Company,** Case No. U-17087, on behalf of Michigan Environmental Council and Natural Resources Defense Council, before the Michigan Public Service Commission, concerning the role of transmission planning studies as part of the process of deciding whether to retire coal-fired generation or equip such generation with environmental retrofits.

114. **In re: Potomac Electric Power Company,** Case No. 9311, on behalf of the Maryland Office of Peoples' Counsel, before the Maryland Public Service Commission, concerning electric service reliability matters and tree trimming expenses as part of a base rate increase case.

115. **In re: Jersey Central Power & Light Company,** BPU Docket No. ER12111052, on behalf of the New Jersey Division of Rate Counsel, before the New Jersey Board of Public Utilities, concerning reliability issues and storm performance involved in the approval of an increase in base tariff rates.

116. **In re: Delmarva Power & Light Company,** Case No. 9317, on behalf of the Maryland Office of Peoples' Counsel, before the Maryland Public Service Commission, concerning electric service reliability matters as part of a base rate increase case.

117. **In re: PPL Electric Utilities Corporation,** Docket Nos. A-2012-2340872 et al., on behalf of the Pennsylvania Office of Consumer Advocate, before the Pennsylvania Public Utility Commission, concerning the need for and alternatives to proposed electric transmission lines and proposed electric substations as part of the Northeast Pocono Reliability Project.

118. **In re: Baltimore Gas & Electric Co.,** Case No. 9326, on behalf of the Maryland Office of Peoples' Counsel, before the Maryland Public Service

Proceedings In Which
Peter J. Lanzalotta
Has Testified

Commission, concerning electric service reliability matters as part of a base rate increase case.

119. **In re: Jersey Central Power & Light Company,** BPU Docket Nos. EO13050391 and AX13030196, on behalf of the New Jersey Division of Rate Counsel, before the New Jersey Board of Public Utilities, concerning the prudency of costs incurred in response to major storms.

120. **In re: Potomac Electric Power Company,** Case No. 9336, on behalf of the Maryland Office of Peoples' Counsel, before the Maryland Public Service Commission, concerning electric service reliability matters as part of a base rate increase case.

121. **In re: Baltimore Gas & Electric Co.,** Case No. 9355, on behalf of the Maryland Office of Peoples' Counsel, before the Maryland Public Service Commission, concerning electric service reliability matters as part of a base rate increase case.

122. **In re: American Transmission Company LLC and Northern States Power Company – Wisconsin,** Docket No. 5-CE-142, on behalf of Citizens Energy Task Force, Inc. and Save Our Unique Lands of Wisconsin, Inc., before the Public Service Commission of Wisconsin, concerning the need for and the benefits expected from proposed transmission facilities.

123. **In re: Potomac-Appalachian Transmission Highline, LLC and PJM Interconnection, LLC,** Docket Nos. ER09-1256-002 and ER12-2708-003, on behalf of Intervenors' State Agencies, including the Virginia Office Of The Attorney General's Division Of Consumer Counsel, the Delaware Division Of The Public Advocate, the Maryland Office Of People's Counsel, the Maryland Public Service Commission, the Delaware Public Service Commission, and the Pennsylvania Office Of Consumer Advocate, before the Federal Energy Regulatory Commission, concerning transmission line abandonment costs.

124. **In re: The Matter of the Merger of Exelon Corporation and Pepco Holdings, Inc.,** Case No. 9361, on behalf of the Maryland Office of Peoples' Counsel, before the Maryland Public Service Commission, concerning electric service reliability-related matters as part of a proposed merger case.

Proceedings In Which
Peter J. Lanzalotta
Has Testified

125. **In re: the Matter of the Application of the Ohio Edison Company, the Cleveland Electric Illuminating Company and the Toledo Edison Company for Authority to Provide for an Electric Security Plan,** Case No. 14-1297-EL-SSO, on behalf of the Sierra Club, before the Public Utilities Commission Of Ohio, concerning electric system reliability and transmission matters.

126. **In re: Delmarva Power & Light Company,** Case No. 9393, on behalf of the Maryland Office of Peoples' Counsel, before the Maryland Public Service Commission, concerning an application for a CPCN for a new 138 kV electric transmission line.

127. **In re: The Baltimore Gas & Electric Company,** Case No. 9406, on behalf of the Maryland Office of Peoples' Counsel, before the Maryland Public Service Commission, concerning electric service reliability-related matters as part of a base rate increase case.

128. **In re: The Potomac Electric Power Company,** Case No. 9418, on behalf of the Maryland Office of Peoples' Counsel, before the Maryland Public Service Commission, concerning electric service reliability-related matters as part of a base rate increase case.

129. **In re: The Matter Of Nova Scotia Power Performance Standards ,** Case No. M07387, on behalf of the Nova Scotia Consumer Advocate, before the Nova Scotia Utility and Review Board, concerning electric service reliability-related performance standards.

130. **In re: the Matter of the Application of the Ohio Power Company,** Case No. 13-1939-EL-RDR, on behalf of the Ohio Consumers' Counsel, before the Public Utilities Commission Of Ohio, concerning Phase 2 of its gridSMART Project and its gridSMART Phase 2 Rider.

131. **In re: PECO Energy Company,** Docket No. P-2016-2546452 et al., on behalf of the Pennsylvania Office of Consumer Advocate, before the Pennsylvania Public Utility Commission, concerning a proposed microgrid pilot plan and recovery of its costs.

Proceedings In Which
Peter J. Lanzalotta
Has Testified

132. **In re: The Delmarva Power & Light Company,** Case No. 9424, on behalf of the Maryland Office of Peoples' Counsel, before the Maryland Public Service Commission, concerning electric service reliability-related matters as part of a base rate increase case.

133. **In re: Jersey Central Power & Light Company,** BPU Docket No. EO16080750, on behalf of the New Jersey Division of Rate Counsel, before the New Jersey Board of Public Utilities, concerning a determination that a proposed transmission line in Monmouth County NJ is necessary for the service, convenience, and welfare of the public.

134. **In re: Virginia Electric and Power Company,** SCC Case No. PUE-2016-00021, on behalf of Lancaster County, Virginia, before the Virginia State Corporation Commission, concerning the need for rebuilding an existing electric transmission line across the Rappahannock River and the desirability of placing such rebuilt transmission line underground.

135. **In re: Virginia Electric and Power Company,** SCC Case No. PUR-2017-00002, on behalf of Fairfax County, Virginia, before the Virginia State Corporation Commission, concerning the need for rebuilding an existing electric substation and the desirability of transmission lines in the vicinity being placed underground.

136. **In re: The Potomac Electric Power Company,** Case No. 9443, on behalf of the Maryland Office of Peoples' Counsel, before the Maryland Public Service Commission, concerning electric service reliability-related matters as part of a base rate increase case.

137. **In re: The Delmarva Power & Light Company,** Case No. 9455, on behalf of the Maryland Office of Peoples' Counsel, before the Maryland Public Service Commission, concerning electric service reliability-related matters as part of a base rate increase case.

Proceedings In Which
Peter J. Lanzalotta
Has Testified

138. **In re: Entergy New Orleans, Inc.,** Docket No. UD-16-02, on behalf of the Sierra Club, the Deep South Center For Environmental Justice, and the Alliance For Affordable Energy, before the Council of the City of New Orleans, concerning electric service reliability-related matters.

139. **In re: Delmarva Power & Light Company,** Docket No. 17-0977, on behalf of the Delaware Division of the Public Advocate, before the Delaware Public Service Commission, concerning electric service reliability-related matters.

140. **In re: Virginia Electric and Power Company,** SCC Case No. PUR-2017-00143, on behalf of Fairfax County, Virginia, before the Virginia State Corporation Commission, concerning the need for building a new 230 kV transmission line and related facilities and the desirability of this new transmission line being placed underground.

141. **In re: the Matter of the Application of the Duke Energy Ohio, Inc.,** Case No. 17-0032-EL-AIR et al, on behalf of the Ohio Consumers' Counsel, before the Public Utilities Commission Of Ohio, concerning the establishment of Minimum Reliability Performance Standards for electric service.

259075

Exhibit___(PJL-3)

OCA Statement No. 2

Updated Group 1 Detailed Results

Project Name	Company	Cost	In-service Date	B/C 2015 Sensitivity	B/C with Recommended Groups 2-19 projects included	B/C Gas price increase sensitivity	B/C Gas price decrease sensitivity	B/C Load increase sensitivity	B/C Load decrease sensitivity	ApSouth Congestion Delta ($ millions) (2019+2022)	AEP-DOM Congestion Delta ($ millions) (2019+2022)
201415_1-6B	Dominion	25.00	2019	2.37	1.94	1.48	1.82	2.02	1.97	-$10.9	$2.9
201415_1-6C	Dominion	39.1	2019	4.07	4.64	4.05	3.46	5.05	4.60	-$91.7	$2.3
201415_1-6D	Dominion	42.70	2019	2.93	2.42	2.93	2.67	3.06	2.84	-$52.6	$2.5
201415_1-9A	DOM High Voltage/Transource	300.7	2020	5.07	2.64	2.09	3.39	3.02	2.56	-$134.0	-$10.9
201415_1-14A	DATC	51.53	2019	3.73	1.76	1.35	2.13	2.19	1.72	-$37.4	-$0.2
201415_1-19G	LSPower	48.60	2020	2.09	2.76	1.82	4.17	4.13	2.81	-$7.9	$8.0
201415_1-17A	Nextera	16.5	2019	3.96	3.64	1.89	3.84	5.34	4.83	-$45.2	$28.2
201415_1-17C	Nextera	15.7	2019	4.83	2.45	1.35	2.97	5.79	3.14	-$42.5	$20.8
201415_1-18E	FirstEnergy	66.0	2019	2.63	1.71	1.92	1.60	1.93	2.08	-$65.8	$13.0
201415_1-19H	LSPower	38.9	2020	11.34	4.07	2.68	2.82	4.08	3.47	-$19.0	$28.7
201415_1-19C	LSPower	41.90	2020	13.45	5.68	5.49	3.67	6.17	4.02	$56.4	-$6.0
201415_1-6A	Dominion	25.00	2019	3.48	3.22	3.86	0.86	3.90	4.26	N/A	N/A
201415_1-7A	Transource	155.36	2020	1.44	1.40	1.64	1.88	1.81	1.15	N/A	N/A
201415_1-7B	Transource	270.8	2021	1.37	1.11	0.71	1.10	1.08	1.08	N/A	N/A
201415_1-7C	Transource	240.0	2021	1.40	1.36	1.28	1.24	1.41	1.41	N/A	N/A
201415_1-17B	Nextera	41.00	2019	1.55	1.43	0.85	2.00	2.69	1.52	N/A	N/A
201415_1-17D	Nextera	36.4	2019	2.47	1.29	0.59	1.11	2.21	1.52	N/A	N/A
201415_1-17E	Nextera	297.0	2020	2.77	1.48	1.12	1.87	1.84	1.59	N/A	N/A
201415_1-18F	FirstEnergy	68.00	2019	2.62	1.13	1.60	1.34	1.55	0.92	N/A	N/A
201415_1-19D	LSPower	104.5	2020	8.19	1.50	1.09	1.84	2.23	1.71	N/A	N/A
201415_1-19F	LSPower	432.50	2023	1.29	1.19	1.19	2.71	1.18	1.26	N/A	N/A
201415_1-2C	PPL	33.95	2018	0.65	N/A	N/A	N/A	N/A	N/A	N/A	N/A
201415_1-8A	Dominion/Transource	384.00	2020	0.56	N/A	N/A	N/A	N/A	N/A	N/A	N/A
201415_1-8B	Dominion/Transource	293.00	2020	0.99	N/A	N/A	N/A	N/A	N/A	N/A	N/A
201415_1-8C	Dominion/Transource	317.00	2020	0.41	N/A	N/A	N/A	N/A	N/A	N/A	N/A
201415_1-8D	Dominion/Transource	222.00	2020	0.78	N/A	N/A	N/A	N/A	N/A	N/A	N/A
201415_1-8E	Dominion/Transource	181.00	2019	0.88	N/A	N/A	N/A	N/A	N/A	N/A	N/A
201415_1-8F	Dominion/Transource	193.00	2021	1.21	N/A	N/A	N/A	N/A	N/A	N/A	N/A
201415_1-17F	Nextera	76.20	2019	0.90	N/A	N/A	N/A	N/A	N/A	N/A	N/A
201415_1-17G	Nextera	86.30	2019	1.11	N/A	N/A	N/A	N/A	N/A	N/A	N/A
201415_1-19E	LSPower	53.70	2020	0.79	N/A	N/A	N/A	N/A	N/A	N/A	N/A
201415_1-20A	ITC	209.56	2020	0.25	N/A	N/A	N/A	N/A	N/A	N/A	N/A
201415_1-20G	ITC	174.36	2020	0.21	N/A	N/A	N/A	N/A	N/A	N/A	N/A
201415_1-20J	ITC	212.58	2020	0.32	N/A	N/A	N/A	N/A	N/A	N/A	N/A
201415_1-20K	ITC	177.38	2020	0.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A
201415_1-20L	ITC	226.33	2020	0.17	N/A	N/A	N/A	N/A	N/A	N/A	N/A
201415_1-20M	ITC	229.35	2020	0.45	N/A	N/A	N/A	N/A	N/A	N/A	N/A
201415_1-20N	ITC	191.12	2020	0.71	N/A	N/A	N/A	N/A	N/A	N/A	N/A
201415_1-20O	ITC	194.14	2020	0.66	N/A	N/A	N/A	N/A	N/A	N/A	N/A
201415_1-22A	Ameren	46.6	2019	0.75	N/A	N/A	N/A	N/A	N/A	N/A	N/A
201415_1-22B	Ameren	46.6	2019	0.75	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Tier 1 finalists criteria: Projects with B/C>1.25 (all scenarios), ApSouth Congestion Delta<$10 million, AEP-DOM Congestion Delta <$10 million

*Negative represents a reduction as a result of the project

Exhibit___(PJL-4)

OCA Statement No. 2

Updated Group 1 Tier 1 Project Finalists

Project Name	Company	Cost	In-service Date	B/C 2015 Sensitivity	B/C with Recommended Groups 2-19 projects included	B/C Gas price increase sensitivty	B/C Gas price decrease sensitivty	B/C Load increase sensitivty	B/C Load decrease sensitivty	ApSouth Congestion Delta ($ millions) (2019+2022)	AEP-DOM Congestion Delta ($ millions) (2019+2022)	(Reference Only) Production Cost Delta ($ millions) (2019+2022)	(Reference Only) Gross Load Payment Delta ($ millions) (2019+2022)
201415_1-6B	Dominion	25.00	2019	2.37	1.94	1.48	1.82	2.02	1.97	-$10.9	$2.9	-$15.6	$16.7
201415_1-6C	Dominion	39.1	2019	4.07	4.64	4.05	3.46	5.05	4.60	-$91.7	$2.3	-$25.9	-$86.6
201415_1-6D	Dominion	42.70	2019	2.93	2.42	2.93	2.67	3.06	2.64	-$52.6	$2.5	-$33.7	$4.2
201415_1-9A	DOM High Voltage/Transource	300.7	2020	5.07	2.64	2.09	3.39	3.02	2.56	-$134.0	-$10.9	-$67.1	-$48.3
201415_1-14A	DATC	51.53	2019	3.73	1.76	1.35	2.13	2.19	1.72	-$37.4	-$0.2	-$18.4	$153.5
201415_1-19G	LSPower	48.60	2020	2.09	2.76	1.82	4.17	4.13	2.81	-$7.9	$8.0	-$18.9	-$2.2

Tier 1 finalists criteria: Projects with B/C>1.25 (all scenarios), ApSouth Congestion Delta<$10 million, AEP-DOM Congestion Delta <$10 million

*Negative represents a reduction as a result of the project

Exhibit___(PJL-5)

OCA Statement No. 2

Reevaluation Results (updated 02/2018)

PJM Window Project ID	Baseline#	Type	Area	Constraint	Cost ($mill)	In-Service Date	B/C 2014/15 Window	BC Reevaluation 2017
201415_1-2A	b2690	Upgrade	PPL/BGE	Safe Harbor to Graceton 230 kV	$ 1.10	2019	14.4	1.72
201415_1-2B	b2691	Upgrade	ME/PPL	Brunner Island to Yorkana 230 kV	$ 3.10	2019	22.2	2.84
201415_1-4I	b2697.1-2	Upgrade	AEP	Fieldale to Thornton 138 kV	$ 0.75	2019	101.2	9.47
201415_1-4J	b2698	Upgrade	AEP	Jacksons Ferry to Cloverdale 765 KV	$ 0.50	2019	62	46.18
201415_1-9A	b2743.1-8, b2752.1-7	Greenfield	APS/BGE	AP-South	$340.60	2020	2.48	1.32*
201415_1-10B	b2693	Upgrade	COMED	Wayne to South Elgin 138 kV	$ 0.10	2019	6.4	25.03
201415_1-10J	b2692.1-2	Upgrade	COMED	Cordova to Nelson 345 kV	$ 24.60	2019	1.9	1.59
201415_1-10D	b2728	Upgrade	COMED	Loretto-Wilton 345 kV (RPM)	$ 11.50	2017	64.5	In-service
201415_1-11H	b2694	Upgrade	PECO	Peach Bottom 500 kV	$ 9.70	2019	3	5.70
201415_1-12A	b2689.1-2	Upgrade	DUQ	Dravosburg to West Mifflin 138 kV	$ 11.18	2018	2	2.63
201415_1-13E	b2695	Upgrade	DPL	Worcester to Ocean Pines (I) 69 kV	$ 2.40	2019	65.3	10.14
201415_1-18G	b2688.1-3	Upgrade	APS	Taneytown to Carroll 138 kV	$ 5.20	2019	90.1	8.50
201415_1-18I	b2696	Upgrade	APS/ATSI	Krendale to Shanor Manor 138 kV	$ 0.60	2019	123.4	78.88
Optimal Caps	b2729	Upgrade	DOM	AP-South	$ 8.98	2019	15.4	2.16

Note: * B/C ratio calculated based on the Market Efficiency Base Case posted on 1/9/2018

Exhibit___(PJL-6)

OCA Statement No. 2

	A	B	C	D	E	F	G	H	I	J	K	L
1												
2		Annual Projections of Load for PJM Mid-Atlantic (MW)										
3	**Year of Forecast**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
4	**2012**	59,457	60,569	61,883	63,083	63,948	64,471	64,954	65,733	66,408	67,032	67,648
5	**2013**		59,736	60,778	62,025	63,051	63,767	64,184	64,786	65,585	66,189	66,788
6	**2014**			60,331	61,364	62,095	62,636	62,985	63,657	64,157	64,620	65,070
7	**2015**				58,901	59,711	60,315	60,737	61,205	61,639	62,058	62,527
8	**2016**					57,174	57,736	58,194	58,464	58,523	58,310	58,438
9	**2017**						57,164	57,332	57,330	57,217	56,789	56,730
10	**2018**							56,601	56,441	56,283	55,999	56,070
11												
12	**Unrestricted Peak**	60,067	59,580	54,964	54,890	56,666	55,220					
13												

Exhibit___(PJL-7)

OCA Statement No. 2

U.S. DEPARTMENT OF ENERGY

National Electric Transmission Congestion Study

September 2015

United States Department of Energy
Washington, DC 20585

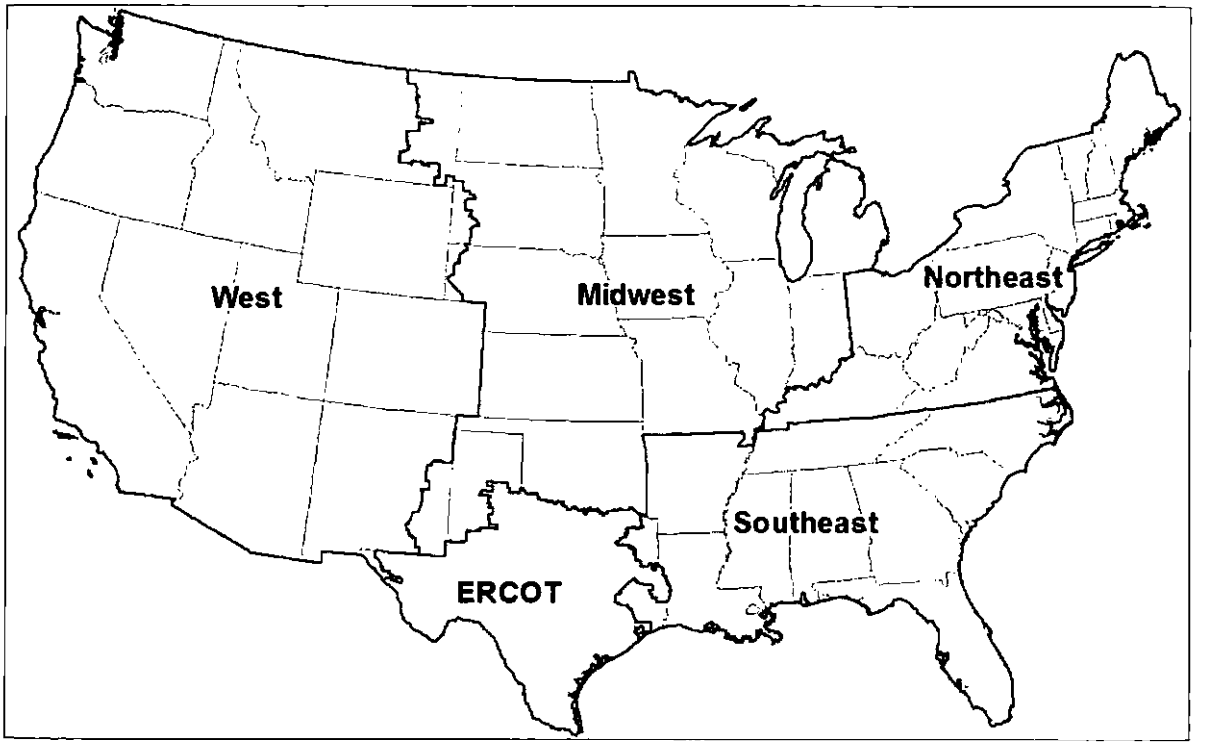
Executive Summary

The Energy Policy Act of 2005 amended the Federal Power Act (FPA) to require the U.S. Department of Energy (DOE, the Department) to conduct a transmission congestion study every three years, in consultation with the states and appropriate regional reliability entities. DOE published its first study in 2006, and a second for 2009, which was released in early 2010. This is the Department's third congestion study. It is based on publicly available data through 2012, with limited updates in December 2013.

Differences between this Study and Previous Congestion Studies

In this study the Department seeks to provide information about congestion by focusing on specific indications of transmission constraints and congestion—and their consequences. It focuses primarily on a specific time frame: historical trends over the few years prior to 2012 (with limited updates in 2013), and looking into the future to the extent available studies permit. It does not apply congestion labels to broad geographic areas such as the "critical congestion areas," "congestion areas of concern," and "conditional congestion areas" identified in earlier studies. For analytic convenience, the study's results are presented and discussed in relation to four large regions of the United States: the West, Midwest, Northeast, and Southeast (see Figure ES - 1).[1] The area covered by the Electric Reliability Council of Texas (ERCOT) is excluded by law from this study.

Figure ES - 1. Regional boundaries used for this study



[1] *Map regions are drawn to show geographic boundaries and not necessarily electrical ones. Transmission facilities shown in stated regions are not necessarily owned or operated by entities within that region. Note: the area covered by ERCOT is excluded by law from DOE congestion studies.*

This study identifies (to the extent supported by publicly available data as of 2012, with limited updates in December 2013) where transmission constraints and congestion occur across the eastern and western portions of the United States' electric power system. All of the conclusions presented in this study are based on (and limited to) the data reviewed, all of which are publicly available data series, studies, analyses, and reports. DOE reviewed more than 450 sources in preparing this report, all of which are listed in Appendix E. In addition, the data used to develop the analysis and conclusions in this document is compiled in a companion report released by the Department in early 2014.[2] DOE did not conduct independent modeling for this study. The Department does not endorse and has not independently validated the data and analyses referred to in this study.

The transmission constraints and congestion identified in this study represent a snapshot in time that is dependent on available information. Recognizing the changeability of circumstances and information, Congress directed the Department to conduct a congestion study every three years. The Department plans to initiate a fresh study of transmission constraints and congestion impacts in 2015. In addition to the triennial congestion studies, the Department will work with the Energy Information Administration (EIA) and the Federal Energy Regulatory Commission (FERC) to prepare an annual *Transmission Data Review* summarizing publicly available data and information on transmission matters, including congestion.

Transmission Constraints and Congestion

Transmission constraints and congestion are related but distinctly different concepts. The term "transmission constraint" may refer to:

(1) An element of the transmission system (either an individual piece of equipment, such as a transformer, or a group of closely related pieces, such as the conductors that link one substation to another) that limits power flows;

(2) An operational limit imposed on an element (or group of elements) to protect reliability; or

(3) The lack of adequate transmission system capacity to deliver electricity from potential sources of generation (either from new sources or re-routed flows from existing sources when other plants are retired) without violating reliability rules.

Transmission constraints, as defined above in (1), are a result of many factors including load level, generation dispatch, and facility outages. Jointly, these conditions establish a specific level or limit—as in (2)—to the permissible flow over the affected element(s) in order to comply with reliability rules and standards established to ensure that the grid is operated in a safe and secure manner. Reliability standards, developed by the North American Electric Reliability Corporation

[2] United States Department of Energy (2014). *Transmission Constraints and Congestion in the Western and Eastern Interconnections, 2009-2012*, January 2014, at http://energy.gov/sites/prod/files/2014/02/f7/TransConstraintsCongestion-01-23-2014%20.pdf.

(NERC) and approved by FERC, specify how equipment or facility ratings should be calculated to avoid exceeding thermal, voltage, and stability limits following credible contingencies.

Transmission operating limits, which constrain throughput on affected transmission elements, are identified to comply with these rules and practices. Thus, although it is commonly thought that transmission constraints indicate reliability problems, in fact, constraints result from compliance with reliability rules. However, when constraints frequently limit desired flows, or when these limits are violated to avoid shedding firm load, they may indicate reliability problems that warrant mitigation.

The term "congestion" refers to situations where transmission constraints reduce transmission flows or throughput[3] below levels desired by market participants or government policy (e.g., to comply with reliability rules). A high degree or level of transmission system utilization alone does not necessarily mean congestion is occurring. Congestion can only arise when there is a desire to increase throughput across a transmission path, but such higher utilization is thwarted by one or more constraints. Transmission congestion has costs—they may induce higher costs for consumers on the downstream side of the transmission constraint if the consumers' electricity supplier(s) must rely on higher-cost generation sources, and they may make it more difficult to achieve policy goals such as increased reliance on renewable generation resources. Transmission congestion may also cause reliability problems where such constraints impact operations by limiting access to reserves.

The Department has defined these terms narrowly for the purpose of this study, to ensure that they are used consistently here; these terms sometimes have different meanings in industry usage.

This Study Does Not Make Recommendations to Address Transmission Constraints and Congestion

This study's assessment of transmission constraints and congestion does not address whether or how to fix constraints or the congestion they may cause. The presence of transmission congestion reflects only a desire or demand for increased transmission system utilization.

Whether it is appropriate to mitigate transmission congestion requires information and judgment about the purposes or objectives that would be served which goes beyond this study's snapshot of physical constraints and congestion in the transmission system. For example, increased flow of electricity from lower-cost generation sources could reduce the overall cost of supplying electricity to consumers, while increased flow of electricity from remote renewable generation could help meet state energy policy goals. The point is that determining whether to address congestion requires determining first what objectives would be met by doing so. These objectives may conflict. For example, new generation could create new transmission congestion and raise electricity supply costs if it is located upstream of a constraint, at the same time that it helps to

[3] Throughout this study, the terms "transmission flows" and "transmission throughput" are used interchangeably to refer to the transport of electricity over transmission lines.

satisfy an energy policy goal. The differing objectives relative to transmission congestion should be recognized in determining whether and how to relieve transmission constraints. This study seeks to inform these discussions but does not seek to resolve the questions that underlie them.

Further, the transmission system is dynamic. Transmission flows change continuously as load, generation, fuel prices, reliability rules and other factors change. The magnitude, duration and impact of constraints and congestion change by time of day, day of the week, season, and year. Both past experience and expectations for the continued persistence of transmission constraints and congestion should be considered when evaluating solutions.

This study's snapshot of current conditions does not capture the full value that may be provided by mitigating the congestion identified, because congestion solutions typically bring multiple benefits over a long time horizon—such as improved reliability, more efficient generation dispatch, increased usage of variable renewable resources, or lower customer bills (from energy efficiency or other factors) on the load-side of a congested path. For example, one of the most strategically significant aspects of major new transmission projects that is seldom taken into account explicitly in the planning phase is that transmission may serve multiple purposes over a long life – typically 40 years or more. That is, a well-designed transmission system enhancement will not only enable the reliable transfer of electricity from Point A to Point B—it will also strengthen and increase the flexibility of the overall transmission network. Stronger and more flexible networks, in turn, create real options to use the transmission system in ways that were not originally envisioned. In the past, these unexpected uses have often proven to be highly valuable and in some cases have outweighed the original purposes the transmission enhancement was intended to serve. Past examples have included enabling grid operators to adjust smoothly and efficiently to unexpected yet ongoing changes in the relative prices of generation fuels, diverse renewable resource profiles, economic volatility, new environmental requirements, unanticipated outages of major generation and transmission facilities, and natural disasters. The options created by a strong and flexible transmission network are real. These benefits are important and should be recognized in a full assessment of potential solutions.

Moreover, it will not be appropriate to mitigate every transmission constraint or the congestion it causes. One must evaluate whether the benefits of mitigation—in monetary, policy, consumer impact, or other terms—outweigh or otherwise justify the costs involved. Such an evaluation should consider the ever-changing flows over the transmission grid, the length of time needed to design, site and build transmission solutions, transmission's long asset lifetime, and its many benefits over a lengthy time horizon. When the monetary, policy, or adverse consumer consequences of constraints and congestion rise to levels that warrant action, decision- and policy-makers will look at a variety of options to moderate or mitigate these costs, including creation of financial hedging mechanisms for congestion, deployment of energy efficiency or demand response to lower demand, construction of new generation, changes in other market mechanisms or operational rules, and the construction of new transmission facilities. This study does not evaluate or recommend particular solutions.

Indicators of Transmission Constraints and Congestion

Transmission constraints and congestion vary over time and location as a function of many factors, including changes in the patterns of electricity consumption, changes in the relative prices of the fuels and thus generating units used to generate electricity, and changes in the real-time availability of specific grid-related assets (such as power plants or transmission lines). There is also significant variation between and within regions in practices to manage congestion. This means that different kinds of indicators of congestion are relevant.

Some empirical indicators of congestion are:

- Frequent usage by grid operators of transmission loading relief (TLR) or equivalent procedures to mitigate congestion. These procedures typically involve shifting to a different combination of generation and transmission facilities so as to mitigate potential or actual operating security-limit violations while respecting transmission service reservation priorities.
- Frequent or recurrent disparities in wholesale electricity prices across regional markets, as seen in congestion costs reported by Regional Transmission Operators (RTOs) and Independent System Operators (ISOs), differentials in locational marginal prices (LMPs), differentials in forward prices for generation capacity, and differences in prices at wholesale electricity trading "hubs." For example, in a market operated by an RTO, when low-cost power is fully subscribed, higher cost sources are tapped, and LMP goes up. In such markets, persistent price separation between sub-regions is an indicator of delivery problems from the low-cost to the high-cost sub-regions. RTO markets reflect the economic cost effect of the congestion in the locational marginal prices for the different sub-regions. See Figure ES - 2 for an example of such price disparities across the Midwestern and Northeastern states.[4] It is possible to identify the consistent impacts of a few specific constraint points and congestion hot spots from pricing maps—in particular the Upper Michigan Peninsula, the Delmarva Peninsula, and New Jersey and New York City, and the constraints that follow the Appalachian Mountains from Pennsylvania and western Maryland into Virginia.
- "Queues" of proposed generation projects seeking interconnection studies by relevant regional or sub-regional grid planning authorities are indicators of potential transmission demand. Figure ES - 3 and Figure ES - 4 are maps of interconnection queues.[5] Large queues are not in and of themselves indications that transmission is or will become constrained. In particular, new generation interconnecting on the load-side of a traditionally constrained region may help to relieve congestion. Some proposed projects may never reach commercial viability or finalize interconnection.

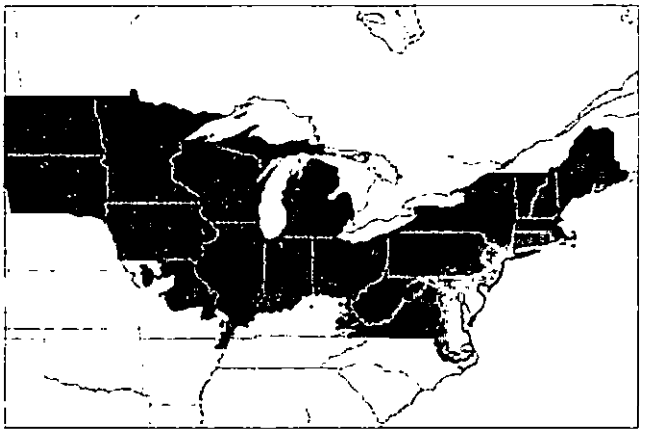
[4] While the four organized markets pictured in these Figures dispatch their regions separately, there is some expectation that trades between systems are made on an economic basis, which makes price patterns spanning these markets relevant to examining potential congestion across seams.

[5] These maps show queues as of 2012, and were developed for the stand-alone companion report, *Transmission Constraints and Congestion in the Western and Eastern Interconnections, 2009-2012*, released in January 2014.

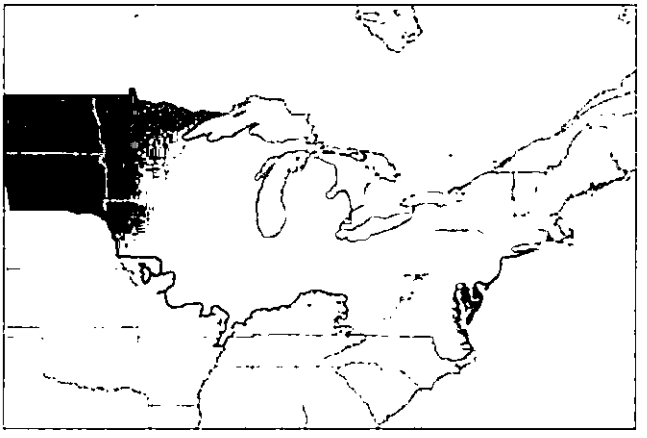
However, when the aggregate capacity in the queue is larger than available or projected transmission capacity connecting it to load regions, it is an indication that transmission may be or will become constrained depending on how many of these projects materialize and how capacity interconnection and energy delivery is pursued.[6]

[6] Generators seeking interconnection are responsible for certain transmission system upgrades, depending on the type of interconnection service they request. (FERC (2003). *Standardization of Generator Interconnection Agreements and Procedures*. Docket No. RM02-1-000; Order No. 2003, July 24, 2003, at http://www.ferc.gov/legal/maj-ord-reg/land-docs/order2003.asp, p. 23)

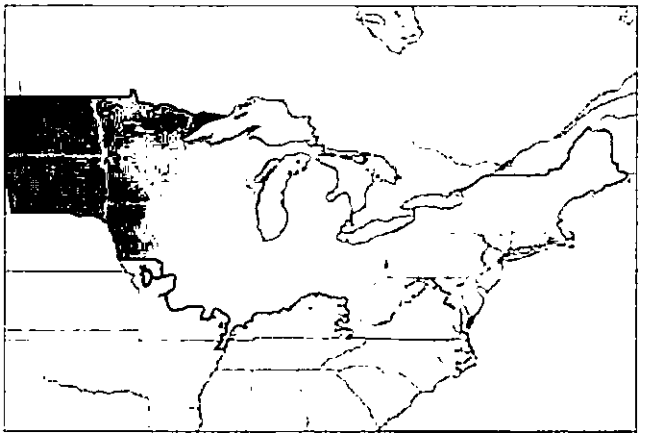
Figure ES - 2. Summer peak LMPs for 2009, 2010, and 2011 ($/MWh)



2009 Summer Peak (Weekdays 3-7 pm, Jul-Sep) LMPs



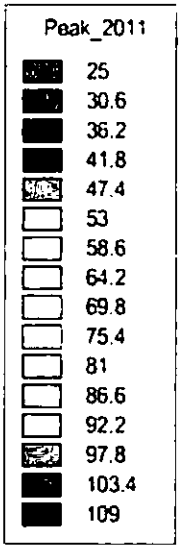
2010 Summer Peak (Weekdays 3-7 pm, Jul-Sep) LMPs



2011 Summer Peak (Weekdays 3-7 pm, Jul-Sep) LMPs

This figure maps average hourly day-ahead LMPs across the MISO, PJM, New York and New England markets for the peak hours of 2009, 2010, and 2011. Peak hours are defined here as non-holiday weekday afternoons (3-7 pm, eastern standard time) July through September. This comparison reveals several points:

- Energy prices are lowest in the western part of the region, where there is extensive low-cost wind and coal generation, and increase to the eastern region, where most of the load is concentrated.
- The highest prices are concentrated in the heavily populated stretch from upper North Carolina through coastal Virginia, Maryland, Pennsylvania, Delaware, New Jersey, New York City, and southwest Connecticut – all areas that have limited supplies of low-cost generation and long-standing transmission constraints to the west across the Appalachian Mountains, although in some cases congestion may be due to planned transmission outages.
- LMPs were highest in 2010 (when natural gas prices were slightly higher and consistently higher temperatures pushed loads very high) and lowest in 2009.



Average hourly LMPs [$/MWh]

Source: Ventyx (2012). "Ventyx Velocity Suite."

Figure ES - 3. Midwest interconnection queue map (created June 2012)

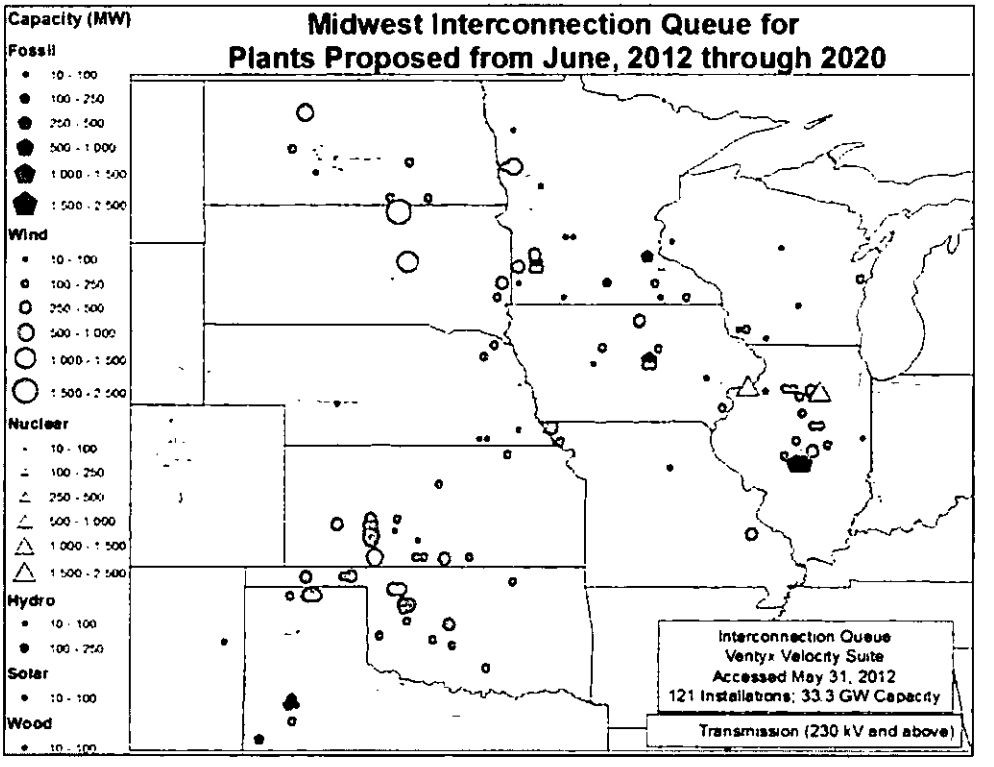
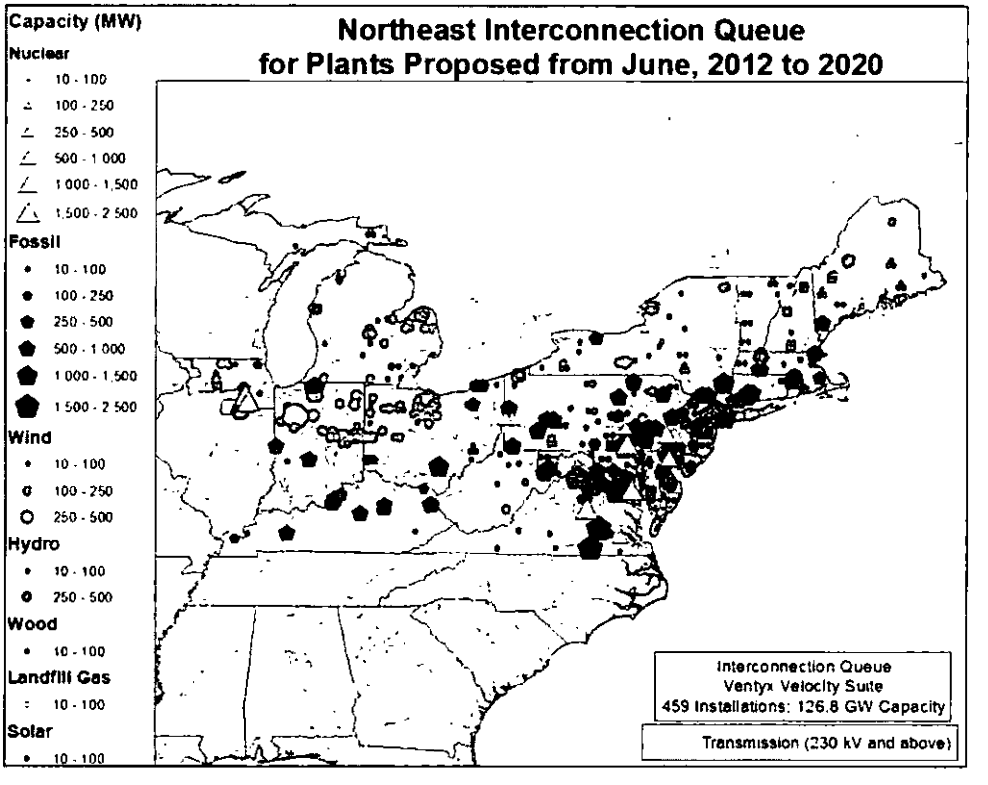


Figure ES - 4. Northeast interconnection queue map (created June 2012)



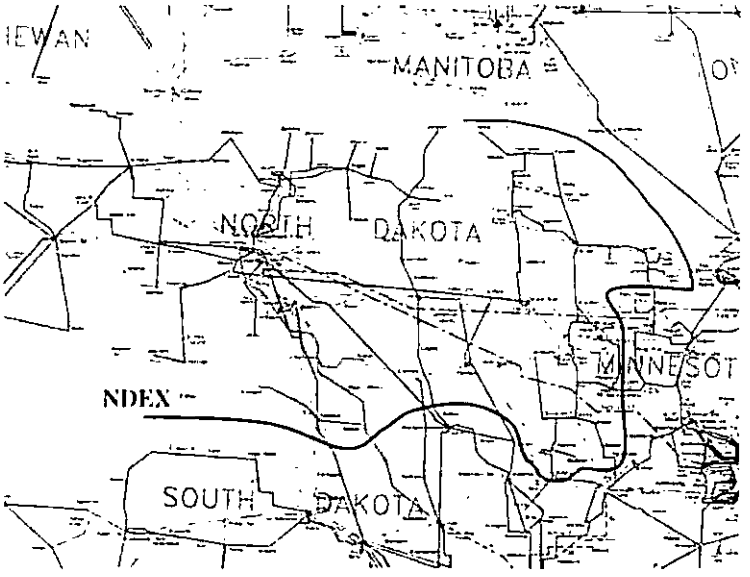
Recent Nation-Wide Trends Affecting Transmission Constraints and Congestion since the 2009 Congestion Study

Transmission constraints and congestion are influenced by both broad, economy-wide trends or conditions, and unique regional and sometimes local circumstances. The Department found that several broad, nation-wide trends have affected transmission usage patterns since the publication of the 2009 Congestion Study. In most areas, the net effect of these trends has been a reduction in the incidence of congestion and its economic costs. These trends are:

- The economic recession of 2008–2009 reduced electricity demand significantly. In the ensuing economic recovery, electricity demand growth has still been lower than its long-term historical trend, relative to the rate of economic growth. All else equal, lower electricity demand frequently means lower transmission usage and lower congestion.
- State and federal governments and many utilities are implementing policies to improve energy efficiency. These improvements in efficiency put downward pressure on electricity demand across the country. Many utilities, ISOs and RTOs have implemented robust demand response programs to pay loads and reduce consumption during periods of peak demand, which has tended to lower system peak demands and energy consumption, and therefore, to lower congestion.
- Sustained investment in transmission and construction of major new transmission projects in many areas has also helped to reduce congestion.
- Compliance with state renewable portfolio standards (RPSs) and goals has been significant. In response to the RPSs, renewable output has risen sharply. Responsibility for who pays for the transmission to interconnect this new generation has not been definitively settled in all areas. Increased generation from renewables in remote locations, though generally beneficial, is increasing congestion in some areas (between prime resources and load centers). For example, Figure ES - 5 shows the North Dakota Export Limit (NDEX), a long constraint that crosses parts of North Dakota, Minnesota, and South Dakota limiting the flow of major new wind resources out of the constrained area. In other regions, congestion on the high voltage transmission system is less of a concern for interconnection and operation of renewable resources.[7]

[7] RPSs do not directly require investment in infrastructure. In some regions, like ISO-NE, the owners of the new capacity or Renewable Energy Certificate (REC) marketers are required to ensure adequate transmission capacity to deliver the resources or the load serving entity may make Alternative Compliance Payments, which also serve as a cap on the price of RECs. In other regions, sufficient transmission capacity already exists or is being added based on approved plans. For instance, a NYISO wind study indicates no major high voltage transmission additions would be necessary to accommodate additional wind resources, although certain contingencies and local transmission facilities cause some "bottling" of wind production.
NYISO (2010b). *Growing Wind: Final Report of the NYISO 2010 Wind Generation Study.* Rensselaer, NY: NYISO. September 2010, available at http://www.uwig.org/growing_wind_-_final_report_of_the_nyiso_2010_wind_generation_study.pdf

Figure ES - 5. The North Dakota Export Limit (NDEX)



Source: Lein, J. (North Dakota Public Service Commission) (2011). "U.S. Department of Energy National Electric Transmission Congestion Study Workshop." Presented at the United States Department of Energy (2011a). "Material Submitted: Pre-Congestion Study Regional Workshops" at http://energy.gov/sites/prod/files/Presentation%20by%20Jerry%20Lein%2C%20ND%20PSC.pdf, p. 8.

- Abundant supplies of natural gas at low prices. This trend has had two effects:
    1. Some gas-fired generators are being used more intensively, and some coal-fired generators are being used less intensively. Because gas plants are often sited closer to load centers than the capacity being displaced, transmission usage and congestion patterns shift.
    2. Lower natural gas costs mean somewhat lower overall fuel costs for generation, and lower overall wholesale electricity prices. This means that even if a transmission constraint forces a buyer in a congested area to purchase from an alternate generator, the economic cost premium to the buyer may be lower than previously.
- Recent trends in retirement of both nuclear and coal-fired power plants have been changing transmission flows in many areas of the country.
- New environmental regulations—some still under development—affect the composition and usage of regional generation fleets. As coal-fired and other plants are retired or retrofitted, grid operators will modify dispatch patterns according to the economics of available generation and transmission capacity in relation to fluctuating electricity demand. Appropriate actions will be taken to maintain grid reliability, but congestion may increase or decrease in specific locations.

Regional Findings: Western Interconnection

The Western region contains one organized wholesale electricity market, which is operated by the California Independent System Operator (CAISO); the rest of the Western region consists of vertically integrated utilities, public power entities, and independent generators that trade bilaterally and cooperate for regional planning purposes.[8] There are many common issues across the West, but there is more extensive data availability within the CAISO than elsewhere, so that region is discussed separately in portions of this report. The CAISO serves an estimated 35% of electric load in the western interconnection.[9]

The Department's findings regarding congestion in the West are:

- Although a number of paths in the Western Interconnection are heavily utilized, most of these do not appear to be operating at such consistently high levels that they act as persistent, reliability-threatening transmission constraints. In 2009 (the only year for which data is publicly available), unscheduled flow mitigation procedures were used less than 0.5% of the hours of the year.
- With respect to the economic consequences of congestion, there is only information available about the area covered by CAISO. That information indicates that individual transmission constraints limit system operations in at most 8% of the year, and that these constraints do not increase electric prices and congestion costs by a significant amount.
- There has been a marked increase in transmission construction and project completions across the West over the past three years, and equal progress in planning and coordination of new transmission project proposals. These completions have already improved western transmission throughput, reducing usage on many key interfaces and reducing congestion and associated costs.
- In addition, the permanent closure of the San Onofre Nuclear Generating Station has created some local reliability challenges for Southern California. A preliminary inter-agency plan has proposed several near- and longer-term transmission, resource and regulatory solutions to ensure reliability in this area, and to address existing congestion that was exacerbated by the plant closure.
- Although current congestion in the West is relatively low, in the next few years more congestion is expected due to transmission constraints related to new development of renewable resources and upcoming generator retirements. This is evidenced by WECC's list of Common Case Transmission Projects, which are not yet built or operational, but are assumed to become so within ten years for the purposes of WECC's interconnection-wide planning studies. Congestion resulting from these constraints could be exacerbated by higher demand growth induced by extreme weather or economic activity.

[8] The western provinces of Canada and the northern portion of Mexico are also part of this electrically interconnected system, but they are not included in this analysis.
[9] California ISO (CAISO) (2012e), "The ISO grid," at http://www.caiso.com/about/Pages/OurBusiness/UnderstandingtheISO/The-ISO-grid.aspx.

- Many factors make future congestion patterns hard to predict—these complications include the impacts of environmental regulations (both federal and state level), state RPS compliance requirements, the pace of general economic recovery, relative fuel prices for electricity generation, new natural gas, nuclear, and other generation construction, and the feasibility of building long high-voltage transmission lines across federal lands.

Regional Findings: Midwest

The Midwest area contains the Midcontinent ISO (MISO),[10] Southwest Power Pool (SPP),[11] the far western portion of PJM, and some areas that are not part of an RTO or organized wholesale power market. Although the ISOs and RTOs in the Midwest collect data about transmission constraints, congestion costs, and LMPs, these terms are defined and calculated differently in each ISO and RTO. For this reason, transmission constraints and congestion matters are considered on an RTO- or ISO-specific basis.[12]

The Department's findings regarding congestion in the Midwest are:

- Congestion results from high and growing levels of wind generation that cannot be delivered from the western side to more distant, eastern loads, and the lack of additional transmission to enable further development in renewable-rich areas. These factors resulted in higher real-time congestion costs in central MISO.
- Congestion is also due to generation and capacity reserves that are higher in the western and central side of MISO than they are in the eastern part of the Midwest region, increasing west-to-east flows.[13] These factors resulted in higher real-time congestion costs at some locations on the interface between MISO and PJM.
- Congestion is also due to administrative and institutional differences that create "seams" between and among the western RTO/ISOs (MISO, PJM, and SPP) and the eastern RTO/ISOs (PJM and New York ISO via the "Lake Erie Loop"), which lead to loop flows, and pricing and scheduling inconsistencies. These RTOs/ISOs are aware of these issues and in many cases are actively working to address them.
- Real-time congestion costs increased to $1.24 billion for MISO in 2011, up 20% from 2010. In PJM, total congestion costs decreased to $1 billion in 2011, down 30% from 2010.

[10] In April 2013, Midwest ISO changed its name to Midcontinent ISO to reflect its broadening geographic scope.
[11] In 2015, Western Area Power Authority/Basin Integrated System will be joining the SPP.
[12] In this study, the western portions of PJM that are interspersed with MISO are presented as part of the Midwest, while the eastern portions of PJM are presented with the Northeast. Below in Section 6.2, the infrastructure update for PJM is fully presented in the Northeast section. In the data document accompanying this congestion study, economic congestion and other data are presented for the whole of PJM. (United States Department of Energy (2014). *Transmission Constraints and Congestion in the Western and Eastern Interconnections, 2009-2012*, January 2014, at http://energy.gov/sites/prod/files/2014/02/f7/TransConstraintsCongestion-01-23-2014%20.pdf.)
[13] Potomac Economics (2012b). *2011 State of the Market Report for the MISO Electricity Markets*. Prepared by Potomac Economics for the Independent Market Monitor for MISO. June 2012, at http://www.potomaceconomics.com/uploads/midwest_reports/2011_SOM_Report.pdf, p.13.

- Interconnection queues for the Midwest, as of 2012, were dominated by siting requests for wind generation, generally in locations distant from population centers.

Regional Findings: Northeast

The Northeast region includes the footprints of the New York and New England ISOs and the eastern portion of PJM.[14]
The Department's findings regarding congestion in the Northeast are:

- Transmission constraints have limited flows across the Northeast for fewer hours per year (comparing 2009–2011 to 2008 and before).
- Generation and transmission additions across the Northeast in recent years have contributed to lower overall congestion, particularly within New England and PJM.
- Congestion is also down due to lower demand reflecting the economic recession of 2008–2009, aggressive energy efficiency and demand response, lower natural gas prices, and the resulting smaller price differentials between natural gas and competing generation fuels (e.g., coal). This reduces the economic incentive to use transmission to displace electricity from one source with electricity from another source using less costly fuel.
- Congestion costs for NYISO in 2012 were 50% below the $2.6 billion reported in DOE's previous congestion study (2009). Congestion costs for ISO-NE in 2012 were less than 10% of the ~$0.5 billion reported in 2009 by DOE.
- However, some congestion still exists. Much of the congestion that remains in the Northeast reflects three factors:
    - Transmission constraints continue to restrict delivery of power into load centers in central New York and the New York City and Long Island areas.
    - Increased quantities of low-cost onshore wind generation in concentrated locations remote from major load centers are shipped during off-peak hours as "as available capacity," because they exceed the throughput capability of existing transmission facilities. These facilities were designed to meet the on-peak demands of load centers rather than deliver off-peak generation from the remote wind locations.[15]
    - Administrative and institutional issues arising from different market rules, scheduling practices, and transmission reservations hinder more effective use of facilities between neighboring RTOs and ISOs and result in congestion at locations

[14] As mentioned above, the western portions of PJM that are interspersed with MISO are presented as part of the Midwest, while the eastern portions of PJM are presented with the Northeast. Below in Section 6.2, the infrastructure update for PJM is fully presented in the Northeast section. In the data document accompanying this congestion study, economic congestion and other data are presented for the whole of PJM. (United States Department of Energy (2014) *Transmission Constraints and Congestion in the Western and Eastern Interconnections, 2009-2012*, January 2014, at http://energy.gov/sites/prod/files/2014/02/f7/TransConstraintsCongestion-01-23-2014%20.pdf.)
[15] As noted above, increases in remotely-located renewables is not a concern in all regions, e.g. NYISO (2010b). *Growing Wind: Final Report of the NYISO 2010 Wind Generation Study.* Rensselaer, NY: NYISO. September 2010, available from http://www.uwig.org/growing_wind_-_final_report_of_the_nyiso_2010_wind_generation_study.pdf.

along the seams between markets. RTOs and ISOs in the Northeast are aware of these issues and in many cases are actively working to address them.[16]

Regional Findings: Southeast

The Southeast region covers North and South Carolina, Tennessee, Arkansas, Georgia, Alabama, Mississippi, Louisiana, Florida, and parts of (non-ERCOT) Texas. It includes some or all of the NERC regions of SERC (Southeast Reliability Corporation), SPP, and FRCC (Florida Reliability Coordinating Council).

The Department's findings regarding congestion in the Southeast are:

- There are no clear trends in the application of administrative congestion management procedures over the period 2006–2011, with the exception of an increase in level 5 TLRs (the most severe TLR level because it involves curtailment of firm transactions), called by ICTE (Entergy's Independent Coordinator of Transmission).
- There is one report of a persistent transmission constraint within the region.[17]
- As with the portions of the Western Interconnection outside of CAISO, there are no reports on the economic cost of congestion because no organized wholesale electricity markets operate in the Southeast which produce locational marginal prices that reflect differences in production costs due to congestion. Transmission is being built in coordination with generation additions following long-standing planning practices overseen by state and regional protocols.
- Interconnection queues indicate that future generation will consist largely of fossil-fuel and nuclear generation in Georgia, Alabama, and Florida, wind generation in the western part of the interconnection and in Tennessee, and solar in Florida.

The Need for Better Transmission Data

Table ES - 1 summarizes the main sources of information relied on to develop the transmission constraints and congestion data and to develop the findings presented in this report. Despite widespread agreement on the strategic importance of electric transmission infrastructure—to our economy, our quality of life, and our national security—there is little comprehensive, consistent information available on transmission usage, congestion and its economic consequences, or transmission investment. Transmission Open Access and the formation of ISOs and RTOs over the past two decades have dramatically increased the transparency of planning and operations information in various areas of the country. However, certain challenges remain. In particular:

[16] For instance, the development of Coordinated Transaction Scheduling between ISO-NE and NYISO, which will be described in more detail below. While FERC permits regional differences in strategies for system operations and market rules, FERC generally encourages coordination between different regions to support economically efficient trade. See, e,g., The Energy Daily (2013b). "FERC steps into 'seams' fight between MISO, PJM." December 23, 2013; The Energy Daily (2014). "FERC moves to defuse mushrooming SPP-MISO fight." April 1, 2014.

[17] Florida Municipal Power Agency (FMPA) submitted comments on the draft study that the Florida-Georgia interface is constrained. FMPA also provided information on OASIS service queues and available transmission capacity.

- Data are not available uniformly across the country. The most evident differences reflect the fact that portions of the country use organized and transparent markets to manage transmission system use, while others use administrative, non-public means. While there is a great deal of publicly available data on constraints and congestion within the regions with organized markets (i.e., CAISO, ISO-NE, MISO, NYISO, PJM, and SPP), the non-RTO/ISO regions have different methods for managing congestion and thus different kinds of data are available.
- Due to organizational or market-specific practices, each RTO and ISO has its own definitions, conventions, and practices for how LMPs and annual congestion costs are calculated and presented to the public. Similarly, differences in regional practices affect whether and how administrative congestion management procedures, such as unscheduled flow mitigations (UFMs) and TLRs, are used to manage transmission scheduling conflicts in operations.
- Data and practices can change over time, limiting trend assessment. The California ISO, for example, changed its market design in 2009, so pre-2009 market information is not directly comparable to later information. The PJM Interconnection's footprint expanded dramatically in 2004, creating another data discontinuity. Data comparisons and trend analysis must recognize and account for fundamental changes in a region's market organization and operation.

These issues make it difficult to compare transmission infrastructure availability, usage, investment, constraints, and congestion on a nation-wide basis. The discrepancies in data are of particular concern when the data cannot be compared among neighboring regions within the same interconnection; the impact of changes in one region on its connected neighbors cannot be correctly identified if the data are not comparable. Moreover, the data shared among regions within the same interconnection do not always follow the same database definitions. This makes it difficult to ensure that studies conducted by different parties are using the same nomenclature, models, connectivity, control settings, etc. for the same equipment, and makes it more likely that neighboring regions will produce conflicting analytical results.

Public Comment on the Draft Congestion Study

In the fall of 2014, the Department invited public comment on the draft Congestion Study with reference to several specific questions.[18] The questions on which the Department requested input, the other topics on which comments were provided, and the conclusions reached by the Department are summarized below.

In the draft study, the Department said that it

[18] The Department received a total of 97 public comments on the draft study, from 13 organizations and 82 individuals. The entities and individuals submitting these comments are listed in the appendices to this report and their comments are on posted on the Department's website http://www.energy.gov/oe/public-comments-received-draft-congestion-study. In addition, in its consultation with states and regional reliability entities, the Department received 13 comments addressed to its three questions.

> *... is particularly interested in comments on the reliance on publicly available data to assess congestion and transmission constraints. In Chapter 3 this study discusses the limitations of available data and indicates actions the Department intends to take to improve data quality and availability in the future. The Department invites comments on these plans, insight into whether such data would have value for other parties, and comment on possible issues relating to the collection and public availability of the targeted data.*

After reviewing and considering the public comments, the Department's findings and conclusions regarding data are:

(1) The Department concludes that relying on publicly available data is appropriate and necessary for the preparation of its Congestion Studies. Doing so ensures transparency in the Department's analysis and would help to address questions that would likely arise in the event the Department seeks to designate National Corridors based on the findings of such analyses. Accordingly, the Department will continue to rely on publicly available data to assess transmission congestion and constraints in future congestion studies. It will, however, also consider incorporating previously non-public data in future studies, if the source agrees to make the data public via their inclusion in the study.

(2) The Department agrees that some additional public information was available on topics relevant to the study, and that the information was not included in the initial draft study. As noted below, additional data or information provided to the Department through the comment process has either been incorporated into the final study or will be considered by future congestion studies.

(3) The Department will continue to work with stakeholders to refine existing or new sources of publicly available data, in part through the vehicle of DOE's new annual *Transmission Data Review*.

In the draft study, the Department also invited comments on two questions related to the usefulness of the Congestion Studies and National Corridors:

> *Do the Congestion Studies continue to serve a useful purpose in informing the national discussion of transmission infrastructure needs? Should the scope and process for conducting such studies be modified to better serve this objective?*
> *Does the possible designation of National Corridors, under the statutory language as presently written and interpreted by the courts, help to ensure that adequate and appropriate transmission infrastructure is built in a timely manner? Should the concept of such corridors, or the process for their designation be modified to better serve this objective?*

After reviewing and considering the public comments, the Department's conclusions concerning the usefulness of triennial Congestion Studies are:

(1) Publication by DOE of an annual *Transmission Data Review* should be continued, as a means of making transmission data and information available to the public on a timely basis.

(2) Triennial Congestion Studies can serve a useful purpose other than providing a basis for designation of National Corridors, by focusing national attention on aspects of transmission infrastructure that may warrant other forms of federal attention and action.

(3) The Department recognizes that future Congestion Studies should be coordinated with regional transmission planning efforts, including those mandated by FERC Order No. 1000, and that some of these efforts are still being developed.

The Department's responses to comments concerning the designation of National Corridors will be presented in a separate document, *Report by the U.S. Department of Energy Concerning Designation of National Interest Electric Transmission Corridors* (forthcoming).

The Department also received and considered comments on a number of other topics related to the draft study. The Department's responses to these comments are:

(1) The suggestions for edits, corrections, and clarifications in the draft study have been considered and in most cases incorporated into the final study.

(2) The suggestions for improving future congestion studies are generally reasonable and will be taken into consideration when the Department prepares its next Congestion Study.

Finally, the Department received a number of comments on topics related to transmission development and construction. After considering these comments, the Department's responses to these comments are:

(1) Some of these comments refer to ways to improve the content of future Congestion Studies and the Department will take them into account in preparing future studies.

(2) Some of these comments, such as those pertaining to the use of eminent domain, burdens associated with easements, federal or state laws, regulations or policies concerning energy resource development are outside the scope of this Congestion Study.

Exhibit___(PJL-8)

OCA Statement No. 2

Trump Orders a Lifeline for Struggling Coal and Nuclear Plants

By Brad Plumer

June 1, 2018

WASHINGTON — President Trump has ordered Energy Secretary Rick Perry to "prepare immediate steps" to stop the closing of unprofitable coal and nuclear plants around the country, Sarah Huckabee Sanders, the White House press secretary, said on Friday.

It remains to be seen what actions Mr. Perry will recommend, but many of the proposals being floated within the Trump administration, according to a leaked internal memo, would involve drastic government intervention in America's energy markets.

Under one proposal outlined in the memo, which was reported by Bloomberg, the Department of Energy would order grid operators to buy electricity from struggling coal and nuclear plants for two years, using emergency authority that is normally reserved for exceptional crises like natural disasters.

That idea triggered immediate blowback from a broad alliance of energy companies, consumer groups and environmentalists. On Friday, oil and gas trade groups joined with wind and solar organizations in a joint statement condemning the plan, saying that it was "legally indefensible" and would force consumers to pay more for electricity.

In her statement, Ms. Sanders said that the ongoing retirement of coal and nuclear plants, which are being pushed out of competitive electricity markets by a glut of natural gas and renewable power, were "leading to a rapid depletion of a critical part of our nation's energy mix, and impacting the resilience of our power grid."

Grid operators disputed that. PJM Interconnection, which runs the Mid-Atlantic electric grid serving more than 65 million people, said in a statement that its grid was "more reliable than ever," and that any federal intervention "would be damaging to the markets and therefore costly to consumers" by raising electricity prices.

Mr. Trump, who campaigned on a pledge to revive the coal industry, has so far struggled to fulfill his promise. According to data from the Sierra Club, at least 25 coal plants have shut down since he took office, largely squeezed out by competition from natural gas, wind and solar power.

In September, in an attempt to stave off those powerful market trends, Mr. Perry asked the Federal Energy Regulatory Commission, which oversees regional electricity markets, to consider guaranteeing financial returns for any power plant that could stockpile 90 days' worth of fuel on-site, which could include many coal and nuclear plants. He argued that the loss of such plants would threaten "reliability and resiliency of our nation's grid."

But in January, the commission unanimously rejected Mr. Perry's request, saying that the nation's grids currently had plenty of spare electric capacity on hand, even with the loss of coal and nuclear units in recent years, and that grid operators had sufficient tools to keep the lights on.

That hasn't stopped the Trump administration from exploring other options. In April, FirstEnergy Solutions, an Ohio-based utility, announced that it would file for bankruptcy, threatening the future of three nuclear plants and two coal plants in Ohio and Pennsylvania.

The company had earlier sent a letter to Mr. Perry asking him to save the country's coal and nuclear plants by invoking Section 202(c) of the Federal Power Act, under which the Energy Department can order certain power facilities to stay open in a crisis, such as a hurricane.

A few days later, Mr. Trump mentioned the idea in public, telling coal miners at a rally in West Virginia: "Nine of your people just came up to me outside. 'Could you talk about 202?' We'll be looking at that 202. You know what a 202 is? We're trying."

The administration has also discussed invoking the Defense Production Act of 1950, which allows the federal government to intervene in private industry in the name of national security. (Harry S. Truman used the law to impose price controls on the steel industry during the Korean War.)

But legal experts say that neither law was designed to provide unprofitable industries with extended financial support.

"The idea of superseding the market for a full two years and directing that purchases be made from specific plants is well beyond any existing use of these statutory powers," said Joel B. Eisen, a professor of law at the University of Richmond in Virginia.

If the Trump administration were to invoke these two statutes, the move would almost certainly be challenged in federal court by natural gas and renewable energy companies, which could stand to lose market share.

Depending on what the Trump administration decides, an intervention to prop up unprofitable coal and nuclear plants could cost consumers between $311 million to $11.8 billion per year, according to a preliminary estimate by Robbie Orvis, director of energy policy design at Energy Innovation.

Some analysts have asserted that there is an environmental case for keeping the nation's ailing nuclear plants open, since, if they closed, their carbon-free electricity would most likely be replaced by natural gas and emissions would rise. A few states, including New York and New

Jersey, have offered subsidies to their struggling nuclear plants in the name of fighting climate change.

There is no environmental argument for keeping open coal plants, which are the most carbon-intensive form of power.

The leaked memo circulating within the White House does not mention climate change. Instead, it says that the loss of both coal and nuclear plants could threaten national security, given that Department of Defense installations are 99 percent dependent on the grid.

Among other things, the report asserts that natural gas pipelines are vulnerable to cyberattacks and that coal and nuclear plants are essential during extreme weather because they can keep large amounts of fuel on-hand.

Brad Plumer is a reporter covering climate change, energy policy and other environmental issues for The Times's climate team. @bradplumer

A version of this article appears in print on June 2, 2018, on Page A17 of the New York edition with the headline: Trump Orders Moves To Keep Waning Coal And Nuclear Sites Open.

https://www.nytimes.com/2018/06/01/climate/trump-coal-nuclear-power.html

accessed 09 11 18

Exhibit___(PJL-9)

OCA Statement No. 2

Application of Transource Pennsylvania LLC
Independence Energy Connection-East & West Projects
Docket Nos. A-2017-2640195 and A-2017-2640200

Interrogatories of the Office of Consumer Advocate
Set XXIII
(Responses dated 8/22/2018)

Data Request 02:
On July 24, 2018, Dominion Energy announced new plans to add 3,000 MW of new solar and wind generation during the 2020's. The Company's announcement also referenced a related filing the same day announcing that it was seeking to add 240 MW of solar energy in Virginia. (See attached Company press release.) Please discuss i) the extent to which these planned resources are currently reflected in the most recent evaluation of project 9A, ii) the date on which the results of the most recent evaluation of project 9A were published by PJM, and iii) if not yet reflected in any completed evaluation of project 9A, the time frame for including these planned resources in an evaluation of project 9A.

Dominion Energy Launches Grid Transformation Program, Paving Way for Virginia's Energy Future With 3,000 Megawatts of New Solar and Wind Planned by 2022 - *New law saves Dominion Energy Virginia customers hundreds of millions of dollars - Calls for unprecedented expansion of solar and wind energy to be in public interest - Provides significant boost to energy efficiency and EnergyShare programs - Reduces outages, speeds restoration and improves service through new technology*

Company Release - 07/24/2018 15:08

RICHMOND, Va., July 24, 2018 /PRNewswire/ -- Dominion Energy Virginia customers stand to benefit from a smarter, stronger and greener energy grid in the first set of plans filed today under the Grid Transformation & Security Act (GTSA). The landmark legislation, signed by Gov. Ralph Northam, became effective July 1 and provides a roadmap for Virginia's energy future. Dominion Energy is committing to having 3,000 megawatts of new solar and wind -- enough to power 750,000 homes -- under development or in operation by the beginning of 2022.

"Thanks to the Grid Transformation & Security Act, Dominion Energy plans to develop a system that meets the increasingly complex demands and expectations of our customers," said Ed Baine, Senior Vice President – Power Delivery. "And we are doing it with more renewable energy."

The law paves the way for expanded investments in renewable energy, smart grid technology, a stronger, more secure grid and energy efficiency programs, all while keeping rates affordable. It provides hundreds of millions of dollars in bill credits and rate reductions for customers, and expands the EnergyShare program to help Virginia's most vulnerable citizens.

The Grid Transformation & Security Act includes provisions for:

- $200 million in bill credits to customers, and $125 million in annual rate cuts due to tax relief
- Modernizing the energy grid to improve reliability, resiliency and the ability to integrate more renewable energy and emerging technology

- Significantly expanding the company's renewable energy fleet in Virginia
- Future testing of wind turbines off the coast of Virginia Beach

In today's regulatory filing, the company asked the State Corporation Commission (SCC) to approve the programs, investments and costs included in the first three years of the 10-year grid transformation program. The company will update the plan and request approval of additional programs and spending in later filings with the SCC.

Keeping Energy Affordable

Customers will continue to see affordable energy prices even as the company makes critical investments in grid transformation. Through the provisions of the new law, Dominion Energy customers will see significant savings, starting with the $133 million bill credit this month, another $67 million credit in January, and $125 million annually in rate cuts due to recent federal tax reform.

Additionally, customers who need assistance will benefit from the significant expansion of EnergyShare. The law directs Dominion Energy to commit at least $13 million in shareholder funds each year through 2028 for bill assistance and weatherization services for seniors, veterans, low-income customers and people with disabilities.

Expanding Virginia's Renewable Resources

The Grid Transformation & Security Act set Virginia's energy policy on a course for a massive expansion in new wind and solar energy -- 3,000 megawatts of which Dominion Energy is committed to having in operation or under development by the beginning of 2022. The projects will be a combination of assets developed and procured by the company.

In a related filing with the SCC today, Dominion Energy will seek to specifically add 240 megawatts of solar energy in Virginia. The proposed projects will continue to grow the company's solar fleet, which is already the sixth largest in the nation. Dominion Energy is also working this summer to gather input from stakeholders before announcing the next phase in its solar strategy later this year.

Later this summer, the company will seek SCC approval for its proposed Coastal Virginia Offshore Wind (CVOW) project. The 12-megawatt facility would be the first of its kind in the Mid-Atlantic, located in a federal lease area about 27 miles off the coast of Virginia Beach. The two-turbine test project is being developed through a partnership with Ørsted Energy of Denmark, a global leader in wind generation. It will provide valuable information that could lead to more extensive wind development.

Smart Grid Technology and Grid Security

Customers can expect better service under the grid transformation initiative, which includes the installation of approximately 2.1 million smart meters in homes and businesses. If approved by the SCC, these smart meters in conjunction with a new customer information platform will give customers more information and tools to better manage their energy use and bills. The approximately $450 million investment in smart meters and the customer information platform during the first three years of the initiative will be funded without any rate increase by using the reinvestment model enabled by the GTSA.

Smart meters and other grid transformation investments will help integrate new technologies like private solar and electric vehicle charging stations into the grid. Investments in intelligent grid devices, smart meters, and automated control systems will enable a "self-healing" grid which will speed the restoration process by quickly identifying and isolating outages.

New construction and material standards will improve grid resiliency and reduce outages caused by weather and other events. Additional measures will be taken to protect the grid against the growing threat of both physical and cyber-attacks. These measures include hardening substations serving critical facilities and the deployment of new intelligent devices and control systems which help energy companies detect and recover from events more quickly.

Other provisions of the GTSA reinforce efforts by Dominion Energy to place more vulnerable and outage-prone distribution lines underground. The latest expansion of the company's Strategic Underground Program (SUP) is now under review by the SCC.

Energy Efficiency

The GTSA directs Dominion Energy to propose at least $870 million in energy efficiency programs over the next decade, designed to help customers save energy and manage the demand on Virginia's electric system. The new law designates that at least five percent of energy efficiency programs must benefit low income, elderly or disabled individuals, most likely through residential weatherization upgrades.

Dominion Energy will file its initial proposals for new energy efficiency projects with the SCC for approval later this year following input provided by stakeholders.

"The GTSA lays out a very clear path for Virginia to reach a clean energy future that includes greater reliability, more security and grid resiliency," Baine said. "And it does this while ensuring prices remain reasonable and competitive. Virginia will make great strides in the coming years, because of the new law."

For more information visit: http://www.dominionenergy.com/next.

Customers and developers interested in learning more about the company's wind and solar

expansion plans can contact renewableenergy@dominionenergy.com.

About Dominion Energy Nearly 6 million customers in 19 states energize their homes and businesses with electricity or natural gas from **Dominion Energy (NYSE: D).** The company is committed to sustainable, reliable, affordable, and safe energy and is one of the nation's largest producers and transporters of energy with over $75 billion of assets providing electric generation, transmission and distribution, as well as natural gas storage, transmission, distribution, and import/export services. As one of the nation's leading solar operators, the company intends to reduce its carbon intensity 50 percent by 2030. Headquartered in Richmond, Va., Dominion Energy contributes more than $20 million annually to the communities it serves and actively supports veterans and their families. Please visit http://www.dominionenergy.com/, Facebook or Twitter to learn more.

View original content with multimedia:http://www.prnewswire.com/news-releases/dominion-energy-launches-grid-transformation-program-paving-way-for-virginias-energy-future-with-3-000-megawatts-of-new-solar-and-wind-planned-by-2022--300685854.html

SOURCE Dominion Energy Virginia

Response:
Neither the Company nor PJM have information sufficient to form a belief about whether Dominion Energy or its affiliates will in fact place in service 3,000 MW of new solar and wind generation between 2020 and the end of 2029, or whether in fact any such generation capacity additions would be offset by the retirement of any generation resources. The Company and PJM further lack information sufficient to form a belief about whether Dominion Energy or its affiliates will in fact obtain the necessary approvals to construct solar generation facilities in Virginia to add 240 MW of new generation capacity, or otherwise to add 240 MW of solar energy to serve electric load in Virginia, or where such solar energy would be generated. The Company and PJM further lack information sufficient to form a belief about whether the 240 MW referenced in the question is a component of the 3,000 MW also referenced.

The Company and PJM also lack information to form a belief about the preparation, publication, or substance of the documents included with the question as Exhibit A, or the matters described therein.

(i) PJM has not assessed the extent to which the 3,000 MW of wind and solar generation described in the question was reflected in the most recent evaluation of Project 9A, reviewed at the February 2018 PJM Transmission Expansion Advisory Committee (TEAC) meeting. To do so would require PJM to speculate on the number of wind and solar projects that comprise the 3,000 MW as well as the size, location, and timing of

each project. Nor is PJM in a position to speculate on the likelihood that each project would reach commercial operation. PJM does not include proposed generation as that described in the question in its FERC-approved RTEP Process PROMOD market efficiency analysis – including that which justified the need for Project 9A – until that generation is submitted to PJM through its new services queue, has received a completed System Impact Study, and has executed a Facilities Study Agreement (FSA) or Interconnection Service Agreement (ISA).

Additionally, PJM notes that absent specific information on the nature of the solar and wind projects described in the question, they may already be accounted-for in PJM load forecasts as discussed in the Company's responses to OCA-IV-24, OCA-IV-26, OCA-IV-27, OCA-IV-29, OCA-IV-31, OCA-IV-32, OCA-IV-34, OCA-IV-36, OCA-IV-37, OCA-IV-39, OCA-IV-41, OCA-IV-42, and OCA-XIII-17. Further, from a generation perspective, retirements from 2020 through 2029 could offset the wind and solar generation described in the question. PJM does not speculate on that either.

The Company notes that the most recent, second re-evaluation – February 2018 – justifying the need for Project 9A was discussed in responses to OCA-III-02, OCA-IV-13, OCA-IV-15, OCA-IV-16, OCA-IV-44, OCA-V-01, OCA-VI-02, OCA-VIII-01, OCA-VIII-02, OCA-VIII-04, OCA-IX-10, OCA-X-02, OCA-X-08, OCA-XI-10, OCA-XI-11,OCA-XIII-18, OCA-XVIII-03, OCA-XVIII-06, OCA-XX-01, OCA-XX-02, OCA-XXI-04, OCA-XXII-01, and OCA-XXII-03. The generators modeled in the analysis leading to that evaluation were provided in the .UNT and .TRN files provided in OCA-XVIII-03, OCA-XVIII-06, OCA-XX-01, OCA-XX-02, OCA-XX-03, OCA-XX-04, OCA-XX-05, OCA-XX-06. The results of a third re-evaluation of Project 9A are expected to be published by PJM in connection with the September 2018 TEAC meeting. See the Company's response to OCA-XXII-01.

(ii) See the Company's response to OCA-XXIII-02-(i).

(iii) The next, and third, re-evaluation of Project 9A is expected to be published by PJM in connection with the September 2018 TEAC meeting. Input parameters for that evaluation will not speculate on the 3,000 MW of wind and solar described in the question. See the Company's response to OCA-XXIII-02-(i).

Witness: Paul F. McGlynn

Exhibit___(PJL-10)

OCA Statement No. 2

	A	B	C	ES	ET	EV	EW	EY	EZ	FB	FC	FE	FF	FH	FI	FK	FL	FN	FO	FQ	FR
1		**E-1**		**COST TRENDS OF ELECTRIC UTILITY CONSTRUCTION**														**COST TRENDS OF E**			
2																					
3				**NORTH ATLANTIC REGION (1973=100)**														**NORTH ATLANTI**			
4																					
5				**COST INDEX NUMBERS**																	
6				2011		2012		2013		2014		2015		2016		2017		2018		2019	
7	Line	CONSTRUCTION AND EQUIPMENT	FERC	Jan. 1	Jul. 1	Jan. 1	Jul. 1	Jan. 1	Jul. 1	Jan. 1	Jul. 1	Jan. 1	Jul. 1	Jan. 1	Jul. 1	Jan. 1	Jul. 1	Jan. 1	Jul. 1	Jan. 1	Jul. 1
37	30	Gas Turbogenerators	344	693	714	767	785	808	803	822	838	859	863	886	903	926	944	970			
38	31																				
39	32	**Transmission Plant**																			
40	33	Total Transmission Plant		654	669	675	682	696	695	704	712	722	724	735	738	746	750	778			
41	34	Station Equipment	353	705	721	734	742	761	753	760	772	784	790	798	801	816	818	843			
42	35	Towers & Fixtures	354	561	563	576	576	595	585	593	600	609	611	617	620	626	617	634			
43	36	Poles & Fixtures	355	617	619	637	640	645	647	645	647	653	648	663	666	668	679	683			
44	37	Overhead Conductors & Devices	356	611	661	611	618	629	643	647	653	659	659	683	683	669	669	724			
45	38	Underground Conduit	357	590	596	626	627	625	623	648	646	658	655	667	669	680	684	703			
46	39	Underground Conductors & Devices	358	913	917	935	966	978	1000	1029	1040	1050	1055	1070	1070	1082	1130	1188			
47	40																				
48	41	**Distribution Plant**																			
49	42	Total Distribution Plant		634	649	667	679	689	701	714	720	734	735	745	744	753	766	787			

Exhibit___(PJL-11)

OCA Statement No. 2

Application of Transource Pennsylvania LLC
Independence Energy Connection-East Project
Docket No A-2017-2640195

Interrogatories of the Office of Consumer Advocate
Set I
(Responses dated 1/31/2018)

Data Request OCA-I-18:
Reference: Transource Statement 2 (East), p. 7, lines 9-17. Concerning the statements made in this paragraph:

a. Please provide the workpapers and other source documents used to determine the $800 million figure.
b. Approximately what percentage of the $800 million in additional AP South Interface congestion costs from 2012 through 2016 was charged to electricity consumers in Pennsylvania? Please provide all workpapers and other documents used in responding to this question.
c. What does Mr. Ali mean by "low voltages" as used in this paragraph?
d. Please identify each instance between 2012 and the present when the AP South Reactive Interface experienced "low voltages."
e. Please identify each instance between 2012 and the present when the AP South Reactive Interface experienced "voltage collapse."

Response:
a. The $800 million figure was determined by using information from the PJM State of the Market Reports. Specifically, the Grand Total Value for the AP South Reactive Interface is the sum of information taken from the following sources:

2016 Report
http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2016.shtml
Section 11
Table 11-24 Top 25 constraints affecting PJM congestion costs (By facility): 2016

2015 Report
http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2015.shtml
Section 11
Table 11-24 Top 25 constraints affecting PJM congestion costs (By facility): 2015
Table 11-25 Top 25 constraints affecting PJM congestion costs (By facility): 2014

2013 Report
http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2013.shtml
Section 11
Table 11-18 Top 25 constraints affecting PJM congestion costs (By facility): 2013
Table 11-19 Top 25 constraints affecting PJM congestion costs (By facility): 2012

Application of Transource Pennsylvania LLC
Independence Energy Connection-East Project
Docket No A-2017-2640195

Interrogatories of the Office of Consumer Advocate
Set I
(Responses dated 1/31/2018)

Response to Data Request OCA-I-18 continued:

b. Transource does not have information that could be used to estimate the impact of particular market constraints on customers of load-serving entities in a particular state and time period.

c. The term "low voltages" used by Mr. Ali has its plain meaning as used in the context in which it appears, and it is used in a manner consistent with the use of this term in PJM's operational criteria documentation. Please refer to Section III of PJM Manual M-3, which is available at: http://pjm.com/directory/manuals/m03/index.html

d. and e. Please see the response to part c. Transource is not aware of any such instance.

Witness: Kamran Ali

Exhibit___(PJL-12)

OCA Statement No. 2

Witness: Phil Osei Penny

PPL Electric Utilities Corporation
Response to Interrogatories of
Office of Consumer Advocate, Set XII
Dated April 4, 2018
Docket No. A-2017-2640195 and A-2017-2640200

Q.1 Please discuss when PPL's portion of the 230 kV transmission line between Conastone substation and Otter Creek substation ("the C-OC line") was most recently rebuilt.

A.1 Construction of the rebuild of PPL's section of the C-OC lines was completed in Q1 of 2017.

PPL Electric Utilities Corporation
Response to Interrogatories of
Office of Consumer Advocate, Set XII
Dated April 4, 2018
Docket No. A-2017-2640195 and A-2017-2640200

Q.2 Please confirm i) that the rebuilt PPL portion of the C-OC line carries one 230 kV circuit and has space on the transmission towers where a future transmission line could be connected, assuming appropriate attachment hardware, and ii) please describe such appropriate attachment hardware.

A.2 The structures of the rebuilt PPL portion of the C-OC carry one 230kV circuit and have space for a future transmission line.

To install the second circuit, three additional arms and insulator assemblies will need to be installed on the monopole structures. On the dead-end structures, three sets of dead-end insulator assemblies will need to be installed.

Witness: Phil Osei Penny

PPL Electric Utilities Corporation
Response to Interrogatories of
Office of Consumer Advocate, Set XII
Dated April 4, 2018
Docket No. A-2017-2640195 and A-2017-2640200

Q.3 Please confirm that the rebuilt PPL portion of the C-OC line has transmission towers with the structural capacity to support a second 230 kV transmission line using the same size conductors as are used in the existing transmission line. If not, please discuss why not.

A.3 The structures of the rebuilt PPL portion of the C-OC transmission line are designed to support a second 230kV transmission line using the same conductor as the currently installed circuit.

Witness: Phil Osei Penny

PPL Electric Utilities Corporation
Response to Interrogatories of
Office of Consumer Advocate, Set XII
Dated April 4, 2018
Docket No. A-2017-2640195 and A-2017-2640200

Q.4 Please describe the conductors that are used in the PPL portion of the existing C-OC line, and provide the summer normal rating and the summer emergency capacity for those conductors.

A.4 The rebuilt PPL portion of the C-OC line utilizes 1590 KCMIL 45/7 ACSR "Lapwing" conductor with a summer normal rating of 1626 Amps (647 MVA @ 230kV) and summer emergency rating of 2013 Amps (801 MVA @ 230kV). There is ability to utilize conductors with a higher capacity rating.

Witness: Phil Osei Penny

PPL Electric Utilities Corporation
Response to Interrogatories of
Office of Consumer Advocate, Set XII
Dated April 4, 2018
Docket No. A-2017-2640195 and A-2017-2640200

Q.5 Please provide the summer normal capacity in MW and the summer emergency capacity in MW of the C-OC line prior to its most recent rebuild.

A.5 Prior to the rebuild of the C-OC line the 795 KCMIL 30/19 ACSR "Mallard" conductor had a summer normal rating of 1058 Amps (421 MVA @ 230kV) and a summer emergency rating of 1350 Amps (537 MVA @ 230kV). The capacity in MW is variable as it depends on both the line rating and the power factor of the circuit.

Witness: Phil Osei Penny

PPL Electric Utilities Corporation
Response to Interrogatories of
Office of Consumer Advocate, Set XII
Dated April 4, 2018
Docket No. A-2017-2640195 and A-2017-2640200

Q.6 Please provide the summer normal capacity in MW and the summer emergency capacity in MW of the existing C-OC line.

A.6 The existing C-OC line has a coordinated rating between PPL and BGE. The BGE portion of the C-OC line is the most limiting facility with a summer normal rating of 1224 amps (487 MVA @ 230kV) and a summer emergency rating of 1393 amps (554 MVA @ 230kV). The capacity in MW is variable as it depends on both the line rating and the power factor of the circuit.

PPL Electric Utilities Corporation
Response to Interrogatories of
Office of Consumer Advocate, Set XII
Dated April 4, 2018
Docket No. A-2017-2640195 and A-2017-2640200

Q.7 Please describe i) whether the portion of the C-OC line not owned by PPL has been rebuilt to conform with the configuration and the capacity of the rebuilt PPL portion, ii) if so, when this occurred, iii) if not, when it is expected to occur, and iv) when it occurs, what the summer normal and emergency ratings for the entire C-OC line will be.

A.7 PPL does not have information responsive to this data request.

Witness: Phil Osei Penny

PPL Electric Utilities Corporation
Response to Interrogatories of
Office of Consumer Advocate, Set XII
Dated April 4, 2018
Docket No. A-2017-2640195 and A-2017-2640200

Q.8 Please discuss when PPL's portion of the 230 kV transmission line between Graceton substation and Manor substation ("the G-M line") was most recently rebuilt.

A.8 The PPL portion of the G-M line rebuild was executed as two separate projects. The rebuild of PPL's portion of the G-M Line (excluding the 1.1 mile Susquehanna River crossing) was completed in Q4 of 2013. The 1.1 mile Susquehanna River crossing spans were reconductored in Q4 of 2017.

PPL Electric Utilities Corporation
Response to Interrogatories of
Office of Consumer Advocate, Set XII
Dated April 4, 2018
Docket No. A-2017-2640195 and A-2017-2640200

Q.9 Please confirm i) that the rebuilt PPL portion of the G-M line carries one 230 kV circuit and has space on the transmission towers where a future transmission line could be connected, assuming appropriate attachment hardware, and ii) please describe such appropriate attachment hardware.

A.9 The structures of the rebuilt PPL portion of the G-M line (excluding the 1.1 mile Susquehanna River crossing) currently has one 230kV circuit and has space to accommodate a future second 230kV circuit. To install the second circuit, four additional arms, one OPGW assembly, and three insulator assemblies will need to be installed on the monopole structures. On the dead-end structures, a second steel pole will need to be installed, as well three sets of dead-end insulator assemblies and OPGW dead-end assemblies.

The 1.1 mile Susquehanna River crossing portion of the G-M line does not have provision for a future 230kV line.

Witness: Phil Osei Penny

PPL Electric Utilities Corporation
Response to Interrogatories of
Office of Consumer Advocate, Set XII
Dated April 4, 2018
Docket No. A-2017-2640195 and A-2017-2640200

Q.10 Please confirm that the rebuilt PPL portion of the G-M line has transmission towers with the structural capacity to support a second 230 kV transmission line using the same size conductors as are used in the existing transmission line. If not, please discuss why not.

A.10 The structures of the rebuilt PPL portion of the G-M transmission line (excluding the 1.1 mile.Susquehanna River crossing) are designed to support a second 230kV transmission line using the same conductor as the currently installed circuit. The 1.1 mile Susquehanna River crossing portion cannot accommodate an additional 230kV circuit in its existing configuration.

Witness: Phil Osei Penny

PPL Electric Utilities Corporation
Response to Interrogatories of
Office of Consumer Advocate, Set XII
Dated April 4, 2018
Docket No. A-2017-2640195 and A-2017-2640200

Q.11 Please describe the conductors that are used in the PPL portion of the existing G-M line, and provide the summer normal rating and the summer emergency capacity for those conductors.

A.11 The rebuilt PPL portion of the G-M line (excluding the 1.1 mile Susquehanna River crossing) utilizes 1590 KCMIL 45/7 ACSR "Lapwing" conductor with a summer normal rating of 1626 Amps (647 MVA @ 230kV) and summer emergency rating of 2013 Amps (801 MVA @ 230kV). There is ability to utilize conductors with a higher capacity rating.

The reconductored 1.1 mile Susquehanna River crossing span of the G-M line utilizes 1033 KCMIL 54/19 ACCR "Curlew" conductor with a summer normal rating of 1786 Amps (710 MVA @ 230kV) and summer emergency rating of 2106 Amps (838 MVA @ 230kV).

PPL Electric Utilities Corporation
Response to Interrogatories of
Office of Consumer Advocate, Set XII
Dated April 4, 2018
Docket No. A-2017-2640195 and A-2017-2640200

Q.12 Please provide the summer normal capacity in MW and the summer emergency capacity in MW of the G-M line prior to its most recent rebuild.

A.12 Prior to the rebuild of the G-M line the 795 KCMIL 30/19 ACSR "Mallard" conductor had a summer normal rating of 1058 Amps (421 MVA @ 230 kV) and a summer emergency rating of 1350 Amps (537 MVA @ 230 kV). The capacity in MW is variable as it depends on both the line rating and the power factor of the circuit.

Witness: Phil Osei Penny

PPL Electric Utilities Corporation
Response to Interrogatories of
Office of Consumer Advocate, Set XII
Dated April 4, 2018
Docket No. A-2017-2640195 and A-2017-2640200

Q.13 Please provide the summer normal capacity in MW and the summer emergency capacity in MW of the existing G-M line.

A.13 The existing G-M line has a coordinated rating between PPL and BGE. The BGE portion of the G-M line is the most limiting facility with a summer normal rating of 1058 Amps (421 MVA @ 230kV) and a summer emergency rating of 1350 Amps (537 MVA @ 230 kV). The capacity in MW is variable as it depends on both the line rating and the power factor of the circuit.

Exhibit___(PJL-13)

OCA Statement No. 2

Application of Transource Pennsylvania LLC
Independence Energy Connection-East Project
Docket Nos. A-2017-2640195 and A-2017-2640200

Interrogatories of the Office of Consumer Advocate
Set XI
(Responses dated 5/23/2018)

Data Request 07:
The PP&L portion of a 230 kV transmission line running from Conastone to Otter Creek was recently rebuilt with available tower space for a second 230 kV transmission line that, if built, would roughly follow the proposed Furnace Run to Conastone double circuit 230 kV transmission line. i) Please discuss what consideration was given, by the Company and/or by PJM, to the suitability of a new second Conastone to Otter Creek 230 kV transmission line, using the rebuilt towers on the PP&L portion of the line, as an alternative to all or part of the proposed Furnace Run to Conastone double circuit 230 kV transmission line and associated substation facilities, and ii) if not considered, please discuss why not.

Response:
The system enhancement cited in OCA XI-7 was not submitted as part of PJM's solicitation process and therefore has not been evaluated by PJM.

Witness: Paul F. McGlynn

Application of Transource Pennsylvania LLC
Independence Energy Connection-East Project
Docket Nos. A-2017-2640195 and A-2017-2640200

Interrogatories of the Office of Consumer Advocate
Set XI
(Responses dated 5/23/2018)

Data Request 08:
The PP&L portion of a 230 kV transmission line running from Graceton to Manor was recently rebuilt with available tower space for a second 230 kV transmission line that, if built, would roughly follow the direction of the proposed Furnace Run to Conastone double circuit 230 kV transmission line. i) Please discuss what consideration was given by the Company and/or by PJM, to the suitability of a new second Graceton to Manor 230 kV transmission line, using the rebuilt towers on the PP&L portion of the line, as an alternative to all or part of the proposed Furnace Run to Conastone double circuit 230 kV transmission line and associated substation facilities, and ii) if not considered, please discuss why not.

Response:
The system enhancement cited in OCA XI-8 was not submitted as part of PJM's solicitation process and therefore has not been evaluated by PJM.

Witness: Paul F. McGlynn

Exhibit___(PJL-14)

OCA Statement No. 2

Application of Transource Pennsylvania LLC
Independence Energy Connection-East & West Projects
Docket Nos. A-2017-2640195 and A-2017-2640200

Interrogatories of the Office of Consumer Advocate
Set XVII
(Responses dated 6/12/2018)

Data Request 01:
Starting on page 16 of his direct testimony, Transource witness Paul McGlynn describes the process by which PJM determines new transmission upgrades that may result in economic benefits:

a. During PJM's initial analyses of the AP South Interface congestion, prior to the selection of Transource's Project 9A, please describe whether PJM evaluated the existing transmission infrastructure in the Project 9A project area to determine whether existing transmission infrastructure could be upgraded/reconductored/rebuilt in order to address the congestion issue. If so, please describe in detail the studies and/or analyses that were performed in this regard and provide copies of all documentation relating to same.
b. If the answer to the above is no, please explain in detail why such existing infrastructure was not so examined.
c. Does PJM maintain a current inventory of all transmission lines that have been built or rebuilt as double circuit lines and yet currently only have one set of conductors on one side? If so, please describe in detail how PJM uses such information in its planning processes. If not, please explain why PJM does not currently track such transmission lines?
d. During PJM's initial analyses of the AP South Interface congestion and the proposals submitted to PJM to mitigate that congestion, please describe the extent to which PJM developed and evaluated adjustments to and/modifications of the submitted proposals in order to maximize benefits, minimize costs, or otherwise improve one or more of the proposals.

Response:
a. Yes. Out of the 93 proposals received during the 2014/2015 Long-Term Window, 35 were primarily proposals to upgrade existing facilities. Regarding specifically the 41 proposals addressing the congestion on the AP South Reactive Interface, four of these were primarily proposals to upgrade existing facilities. In October of 2015, the PJM Board approved the construction of 11 upgrade proposals. Four of these were in Southern Pennsylvania or Northern Maryland, in the vicinity of Transource's Project 9A proposal.

   Additionally, in February of 2016, the PJM Board approved an optimized set of capacitor bank installations at existing substations, specifically to help address congestion on the AP South Reactive Interface. Several of the proposals to address congestion on the AP South Reactive Interface, including the 9A proposal, had capacitor bank components. PJM deemed it appropriate to remove these components from their respective proposals and consider them

separately.

Even after all these upgrades to existing facilities were approved by the PJM Board and incorporated into PJM's baseline models, there remained sufficient congestion to warrant the consideration of additional greenfield proposals. Transource' s Project 9A proposal performed so well relative to the other proposals that PJM deemed it appropriate to analyze some of the remaining proposals (including proposed upgrades to existing facilities and certain other greenfield projects) in combination with the "East Line" element from Project 9A, as described in Mr. McGlynn's testimony on pages 26- 31. One of these remaining finalists, proposal 18H (as modified by PJM) was a proposal to upgrade existing facilities. PJM's modification of the original 18H proposal enhanced that proposal's performance as compared to the configuration that was originally submitted to PJM. In the end, Transource's Project 9A proposal outperformed all the combinations of the proposals that PJM evaluated and was approved for construction by the PJM Board.

In parallel with PJM's analysis of the alternatives proposed by stakeholders submitted during the 2014/15 Long-term Proposal Window, PJM did not conduct analysis of other hypothetical projects that were not proposed by any stakeholder. Please also refer to the Company's response to subsection d. PJM's planning analysis included both a review of approved reliability-based enhancements or expansions to determine whether acceleration or expansion of these project's scope could relieve congestion on the AP South Reactive Interface. Consistent with existing practices, PJM's analysis also ensured the final configuration of the selected projects was compliant with all reliability criteria.

Information about PJM's evaluation of the modified proposals described in Mr. McGlynn's testimony pages 26-31 is available at the PJM TEAC's website and is included in the following TEAC meeting presentations:

Combination Project Evaluation - TEAC Presentations:

- November 5, 2015 TEAC Meeting: [http://pjm.com/-/media/committees-groups/committees/teac/20151105/20151105-market-efficiency-update.ashx]
- December 3, 2015 TEAC Meeting: [http://pjm.com/-/media/committees-groups/committees/teac/20151203/20151203-market-efficiency-update.ashx]
- March 10, 2016 TEAC Meeting: [http://pjm.com/-/media/committees-groups/committees/teac/20160310/20160310-market-efficiency-update.ashx]
- April 7, 2016 TEAC Meeting: [http://pjm.com/-/media/committees-groups/committees/teac/20160407/20160407-teac-market-efficiency-update.ashx]
- May 12, 2016 TEAC Meeting: [http://pjm.com/-/media/committees-groups/committees/teac/20160512/20160512-market-efficiency-update.ashx]

- June 9, 2016 TEAC Meeting: [http://pjm.com/-/media/committees-groups/committees/teac/20160609/20160609-market-efficiency-update.ashx]

- "Transmission Expansion Advisory Committee (TEAC) Recommendations to the PJM Board PJM", PJM Staff Whitepaper, August 2016: [http://pjm.com/-/media/committees-groups/committees/teac/20160811/20160811-board-whitepaper-august-2016.ashx]

Evaluation of Capacitors - TEAC Presentations:

- January 7, 2016 TEAC Meeting: [http://pjm.com/-/media/committees-groups/committees/teac/20160107/20160107-market-efficiency-update.ashx]

- February 22, 2016 TEAC Meeting: [http://pjm.com/-/media/committees-groups/committees/teac/20160211/20160211-market-efficiency-update.ashx]

b. See response to OCA-XVII-1-a.

c. PJM does not maintain a list of "all transmission lines that have been built or rebuilt as double circuit lines and yet currently only have one set of conductors on one side." Each transmission owner retains an inventory of its respective transmission lines and existing circuit configurations. PJM works with transmission owners to obtain existing circuit configurations when its planning responsibilities require it to do so.

d. See response to OCA-XVII-1-a.

Under PJM's RTEP process, PJM has the ability modify proposals to enhance their performance, to evaluate certain aspects of proposals in isolation, or to combine aspects of multiple proposals. PJM exercised this ability in the evaluation of the 2014/2015 Long Term Window proposals, and properly determined that Project 9A was the most effective proposal to address the Market Efficiency needs in this area. PJM also evaluated in this context the possibility of accelerating or expanding the scope of approved reliability-based projects to relieve congestion on the AP South Reactive Interface.

Witness: Paul F. McGlynn

OCA STATEMENT NO. 2SR

2/26/19 Hbg TX

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

Application of Transource Pennsylvania, LLC for approval of the Siting and Construction of the 230 kV Transmission Line Associated with the Independence Energy Connection - East and West Projects in portions of York and Franklin Counties, Pennsylvania.	:	Docket No. A-2017-2640195 Docket No. A-2017-2640200
Petition of Transource Pennsylvania, LLC for a finding that a building to shelter control equipment at the Rice Substation in Franklin County, Pennsylvania is reasonably necessary for the convenience or welfare of the public.	:	P-2018-3001878
Petition of Transource Pennsylvania, LLC for a finding that a building to shelter control equipment at the Furnace Run Substation in York County, Pennsylvania is reasonably necessary for the convenience or welfare of the public.	:	P-2018-3001883
Application of Transource Pennsylvania, LLC for approval to acquire a certain portion of the lands of various landowners in York and Franklin Counties, Pennsylvania for the siting and construction of the 230 kV Transmission Line associated with the Independence Energy Connection – East and West Projects as necessary or proper for the service, accommodation, convenience or safety of the public.	:	A-2018-3001881, *et al.*

SURREBUTTAL TESTIMONY OF
PETER LANZALOTTA

ON BEHALF OF
THE OFFICE OF CONSUMER ADVOCATE

JANUARY 30, 2019

Surrebuttal Testimony of Peter J. Lanzalotta

Q. Have you previously submitted testimony in this proceeding?

A. Yes. I submitted direct testimony on behalf of the Pennsylvania Office of Consumer Advocate ("OCA") on September 25, 2018.

Q. What is the purpose of this surrebuttal testimony?

A. The purpose of my surrebuttal testimony is to address portions of the rebuttal testimony filed on behalf of Transource Pennsylvania LLC ("the Company") by Brian Weber, Kamran Ali, Steven Herling, and Timothy Horger.

Q. Brian Weber, starting on pg. 20, disagrees with your claim that PJM did not consider various alternatives to the Project. Please comment.

A. My direct testimony on the subject[1] states that there are viable alternatives to the new transmission rights-of-way (ROWs) for both its proposed new transmission lines, which PJM did not consider as specific potential alternatives to the Project. Regarding the eastern portion of Project 9A, there are two recently-rebuilt PPL 230 kV transmission lines, each of which carries one 230 kV circuit and each of which has the capacity to carry another new 230 kV circuit, that are both in the vicinity of the route of the proposed new double circuit 230 kV transmission line in the eastern portion of Project 9A.[2] I testify that they should have been considered as alternatives to the new transmission line.

[1] OCA Statement No. 2, pg.20 L4 to pg.21 L19.

[2] See PPL responses to OCA Set XII which are attached to OCA Statement No. 2 as Exhibit___(PJL-12).

1 Mr. Weber's surrebuttal testimony does not directly address the contentions in my direct
2 testimony. Mr. Weber touts PJM's competitive planning process and says that this
3 process creates an incentive for participants to evaluate every realistic option in the
4 process of developing their competitive proposals. Despite any such incentives, PJM did
5 not consider using these existing transmission ROWs and existing available transmission
6 tower positions that duplicate substantial portions of the eastern portion of Project 9A,
7 which requires new transmission lines and ROWs. This failure to consider using existing
8 available transmission ROWs and tower positions had nothing to do with their suitability
9 to address congestion at the AP South Interface, the reason that PJM sought the market
10 efficiency projects that included Project 9A. PJM's procedures for market efficiency
11 proposals do not seek out system reinforcements that reflect optimal use of all available
12 system resources. PJM limits its evaluation of market efficiency proposals to system
13 enhancements that were submitted as part of its solicitation process. PJM did not
14 evaluate the use of the existing PPL transmission towers and existing ROWs because
15 such use was not part of a proposal submitted to PJM as part of their solicitation process.[3]
16 Further, PJM is not aware of available transmission line positions on existing
17 transmission lines, as PJM does not maintain an inventory of transmission lines that have
18 been built or rebuilt as double circuit lines yet which currently have only one set of
19 conductors.[4]

---

[3] See response to OCA Set XI, request nos. 7-8 which is included with Mr. Lanzalotta's Direct Testimony as Exhibit___(PJL-13)

[4] See response to OCA Set XVII, request no 1 (c) which is included with Mr. Lanzalotta's Direct Testimony as Exhibit___(PJL-14)

1 Q. Mr. Weber, starting on page 22, discusses alternatives to the eastern portion of Project
2 9A. Please comment.

3 A. Mr. Weber appears to state that my testimony recommends that the Eastern portion of the
4 Project should be replaced either i) by new lines in existing transmission ROWs[5] or ii) by
5 additional circuits on lines already owned by PPL[6]. The first part of this contention is
6 completely incorrect. My direct testimony addresses the use of additional circuits on
7 lines already owned by PPL. It does not address the installation of new transmission
8 lines on new towers along existing ROW. My direct testimony points out that PJM did
9 not evaluate the use of additional circuit positions already available on transmission
10 towers owned by PPL. I do not develop an alternative to the facilities in the eastern
11 portion of Project 9A. I only present the recommendation that use of additional circuits
12 on transmission towers already owned by PPL be evaluated as part of an alternative to the
13 proposed facilities in the eastern portion of Project 9A.

14 Q. Mr. Weber testifies (pg. 23) that PJM has studied the East Leg Replacement Option and
15 determined that it is not an acceptable technical solution. Please comment.

16 A. As I testify below, while PJM has recently run some studies of an east leg alternative that
17 makes use of some existing transmission ROWs and tower positions, PJM has not made
18 the necessary effort to determine the optimal facilities needed as part of a realistic east
19 leg replacement option.

---

[5] Referred to as the East Leg Paralleling Option, Weber Rebuttal 22:8-18.

[6] Referred to as the East Leg Replacement Option, Weber Rebuttal 22:8-18.

1 Q. Mr. Weber testifies (starting on pg. 23) about PJM's analysis of the East Leg
2 Replacement Option. Please comment.

3 A. Subsequent to my direct testimony, PPRP, a Maryland state entity participating in
4 Maryland regulatory proceedings regarding the Maryland portion of Project 9A,
5 submitted a data request describing what Mr. Weber calls the Conceptual Alternative
6 ("CA") which he describes as "...a more detailed and technically supported version of
7 the option described by Mr. Lanzalotta."[7] I note that my direct testimony states that
8 additional facilities may be needed in order to utilize the available PPL transmission line
9 positions to replace all or part of the proposed transmission lines in the eastern portion of
10 Project 9A. My direct testimony does not determine or identify any such additional
11 facilities. The CA apparently reflects PPRP's thinking as to what additional facilities
12 may be needed to utilize these PPL transmission line positions. Mr. Weber testifies that
13 Steven Herling describes PJM's evaluation of the CA.

14 Q. Steven Herling testifies, starting on pg. 29, that PJM studied the CA and found that, as
15 proposed by PPRP, the CA would violate NERC reliability standards. Please comment.

16 A. While PJM found that the CA *could* result in reliability violations, PJM has declined to
17 consider what, if any, modifications to the CA would be sufficient to address these
18 reliability violations. PJM's given reason for not considering these modifications is that
19 Project 9A does not suffer from such violations.[8]

---

[7] Weber Rebuttal, 23:13-17.

[8] See the Company's response to OCA Set XXIX-06 (a), (b), and (c), included as Exhibit___(PJL-SR2)

1 Q. Why is it important for PJM to give the CA a thorough evaluation?

2 A. It is important because the Company's proposal for the east portion of Project 9A
3 requires 16 miles of new transmission ROW and new transmission towers that could be
4 avoidable at this time. While PJM has determined that the CA could cause reliability
5 violations, these violations may be addressable with relatively minor upgrades compared
6 to new transmission line facilities proposed as part of the eastern portion of Project 9A. I
7 asked in discovery about whether changes in specific system reinforcements, changes in
8 emergency transmission line ratings, or changes in conductor size might enable the CA to
9 address reliability violations (see Exhibit___(PJL-SR2)). PJM simply says the requested
10 analyses have not been performed.

11 Q. Please summarize your position as to PJM's efforts at fairly and reasonably assessing the
12 possibility of using newly rebuilt, existing infrastructure to supplant the need for the
13 Eastern part of the Project.

14 A. PJM has only considered the specific CA configuration proposed by PPRP and has not
15 made any attempt to fully analyze this potential alternative. The use of the spare PPL
16 transmission line positions may still be a viable and/or a less costly alternative to the need
17 for some or all of the proposed new transmission line ROW in the eastern portion of
18 Project 9A.

19 Q. Please discuss whether and/or the extent to which PPL has indicated any willingness to
20 consider use of its available ROWs or transmission line towers by the IEC.

1 A. Exhibit___(PJL-SR3) contains PPL responses to requests by Transource about its use of
2 PPL transmission assets. In response to requests (Q.3 and Q.7) about PPL's willingness
3 to allow Transource to locate any part of the proposed IEC transmission lines along PPL
4 ROWs, PPL responded that i) it had not studied the feasibility of locating additional
5 facilities in its ROWs and ii) should PJM re-evaluate solutions in the market efficiency
6 planning process, that PPL Electric is open to a request from PJM to consider use of
7 existing PPL Electric facilities as a solution.

8 Q. Mr. Herling criticizes your use of declining PJM peak loads to demonstrate a declining
9 need for the Project because peak load reflects only one hour and PJM's market
10 efficiency analysis looks at all 8,760 hours in each year. Please comment.

11 A. Annual peak loads and annual energy consumption typically increase or decrease
12 together. Annual energy consumption reflects all 8,760 hours per year[9].
13 Exhibit___(PJL-SR1) looks at the peak summer demand and the annual energy
14 consumption forecast for 2021 for the PJM Mid-Atlantic area and for BGE, Pepco, and
15 Dominion in PJM load forecast studies for each year from 2014 through 2019. These
16 three companies reflect major load entities served in part over the AP South Interface.
17 2021 is the first full year after the proposed in-service date of Project 9A. The Project 9A
18 proposal was submitted in response to a PJM solicitation in late 2014.

19 For the majority of annual entries in Exhibit___(PJL-SR1) and for all of the companies
20 from the year 2014 when proposals were solicited, to the year 2019, the most current

[9] 8,784 hours in a leap year.

1 forecast available, all entities shown in Exhibit___(PJL-SR1) show decreases in both
2 projected annual peak demand and projected annual energy consumption for the year
3 2021.

4 These decreases in forecasted annual energy consumption result in a decrease in total
5 forecasted energy consumption for the year 2021 for the three companies from 186,372
6 GWh, in the 2014 forecast, down to 164,653 GWh in the 2019 forecast, a decrease of
7 11.7%.[10]

8 As net forecasted energy consumption decreases (in conjunction with peak load
9 decreases) the loads carried by transmission facilities will also decrease, all else equal.

10 Exhibit___(PJL-SR1) also shows that the total forecast 2021 peak demand for the three
11 companies decreases from 38,615 MW in the 2014 load forecast report to 32,840 MW in
12 the 2019 load forecast report, a decrease of 15%.

13 Q. Kamran Ali criticizes Table 2 from your direct testimony which compares actual
14 historical peak loads and projected peak loads for the year 2020. (Ali Rebuttal, pg.4, L18
15 to pg.5, L19) Please comment.

16 A. Mr. Ali contends that, because PJM revised its load forecast method after the 2015 load
17 forecast, comparisons between the peak loads assumed for 2020 in the 2015 load forecast
18 versus the 2018 load forecast, as reflected in my Table 2, are not valid. Table 1-SR
19 below updates Table 2 from my direct testimony with 2018 Summer peak loads

[10] (186,372-164,653) divided by 186,372 equals 11.7%.

substituted for the 2017 peak loads in Table 2, and with 2020 forecast loads from the 2016 load forecast and from the 2019 load forecast.

Table 1-SR

	Actual and Forecast Peak Loads (MW)			
	Actual Summer Peak		Forecast 2020 Peak	
	2014	2018	2016 Forecast	2019 Forecast
BGE	6,666	6,627	7,079	6,689
Pepco	6,346	6,204	6,702	6,415
DOM	18,761	19,245	20,882	19,552
Total	31,773	32,076	34,663	32,656

Updating the 2020 load forecast from the 2015 load forecast report reflected in Table 2 to reflect the 2016 load forecast report as shown above, and updating the 2020 load forecast from the 2018 load forecast report reflected in Table 2 to reflect the 2019 load forecast report shown, the 2020 forecast for these three companies decreases by more than 2,000 MW in the 2019 load forecast report. As discussed above, decreases in forecasted peak load are typically accompanied by decreased forecasted energy consumption.

Q. Mr. Ali (pg.5, L15-19) characterizes your testimony as concluding that the need for the Project will go away on its own. Please comment.

A. Mr. Ali mischaracterizes my testimony in this regard. My testimony is that decreases in forecasted peak loads are likely to affect the level of congestion on transmission facilities and are likely to lower the value of reducing such congestion.

This idea is reflected in PJM's congestion costs as addressed in Table 3 of my direct testimony, which is reproduced below as Table 2-SR.

Table 2-SR

PJM Annual Congestion Costs ($M)			
Year	AP South Interface	% of PJM	Total PJM
2014	$486.8	25.20%	$1,932
2015	$56.2	4.10%	$1,371
2016	$16.8	1.60%	$1,050
2017	$21.6	3.10%	$697
2018 1st 6 mo	$17.6	2.00%	$880

Table 2-SR shows that the cost of congestion due to the AP South Interface has decreased from $486.8 million in 2014 to less than $25 million the last three years to date.

Q. Mr. Ali (pg.7, L14-17) criticizes you for not having performed a detailed simulation using forward looking models within the PJM RTEP construct. Please comment.

A. Running such models is difficult and time consuming, not to mention potentially expensive. The Applicant and PJM already have access to the model(s) in question and to the data needed to run this or these model(s), and they are running this or these model(s) in this case. For them to suggest that OCA's views on issues in this case should be disregarded because it lacks such access is an attempt to shift the burden of showing the reasonableness of their proposals as compared to less intrusive and potentially less expensive alternatives.

1 Q. Mr. Ali (pg.16, L22 to pg.17, L7) also states that your direct testimony suggests replacing
2 the entire East Leg of the Project, including the new Furnace Run substation, with new
3 transmission lines on existing PPL structures. He goes on to coin the term "Lanzalotta
4 Option." Please comment.

5 A. As I stated in response to Mr. Weber, my direct testimony does not define a "Lanzalotta
6 Option". My direct testimony points out that PJM did not evaluate the use of additional
7 circuits on transmission towers owned by PPL. My testimony does not develop an
8 alternative to the facilities in the eastern portion of Project 9A. Instead, I present the
9 recommendation that use of additional circuits on lines already owned by PPL be
10 evaluated as part of an alternative to the proposed facilities in the eastern portion of
11 Project 9A.

12 Mr. Ali's subsequent criticisms of the Lanzalotta Option are misdirected, since I have not
13 designed an alternative option to the facilities in the eastern portion of Project 9A.

14

15 Q. Timothy Horger's Rebuttal Testimony discusses your testimony about alternatives to the
16 western portion of Project 9A (pg.22, L6 to pg.23, L11). Please comment.

17 A. Mr. Horger discusses MAIT proposal 18H which is one of the alternative market
18 efficiency proposals to the western portion of project 9A. Mr. Horger states that proposal
19 18H would reduce congestion costs by a smaller amount than Project 9A would reduce
20 them. My direct testimony does not dispute this. However, my direct testimony points
21 out that proposal 18H would cost less than Project 9A and not require some 29 miles of

new transmission ROW and new 230 kV transmission line towers, as is the case with the western portion of Project 9A.

Q. Does this conclude your surrebuttal testimony?

A. Yes, at this time.

265627

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

Application of Transource Pennsylvania, LLC for approval of the Siting and Construction of the 230 kV Transmission Line Associated with the Independence Energy Connection - East and West Projects in portions of York and Franklin Counties, Pennsylvania.	:	A-2017-2640195 A-2017-2640200
Petition of Transource Pennsylvania, LLC for a finding that a building to shelter control equipment at the Rice Substation in Franklin County, Pennsylvania is reasonably necessary for the convenience or welfare of the public.	:	P-2018-3001878
Petition of Transource Pennsylvania, LLC for a finding that a building to shelter control equipment at the Furnace Run Substation in York County, Pennsylvania is reasonably necessary for the convenience or welfare of the public.	:	P-2018-3001883
Application of Transource Pennsylvania, LLC for approval to acquire a certain portion of the lands of various landowners in York and Franklin Counties, Pennsylvania for the siting and construction of the 230 kV Transmission Line associated with the Independence Energy Connection – East and West Projects as necessary or proper for the service, accommodation, convenience or safety of the public.	:	A-2018-3001881, *et al.*

VERIFICATION

I, Peter Lanzalotta, hereby state that the facts above set forth in my Surrebuttal Testimony, OCA Statement No. 2SR are true and correct and that I expect to be able to prove the same at a hearing held in this matter. I understand that the statements herein are made subject to the penalties of 18 Pa.C.S. § 4904 (relating to unsworn falsification to authorities).

Signature: _____

Peter J. Lanzalotta
Lanzalotta & Associates LLC
67 Royal Pointe Drive
Moss Creek Plantation
Hilton Head Island, SC. 29926
petelanz@lanzalotta.com

DATED: January 30, 2019
*265480

Exhibit___(PJL-SR1)
OCA Statement No. 2SR

	A	B	C	D	E	F	G
1	**Comparison of Forecast Annual Summer Peak (MW) and Annual Net Forecast Energy (GWh) for 2021**						
2							
3	**Forecast Report Year**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
4	**BG&E**						
5	2021 Summer Peak (MW)	7,836	7,511	7,064	6,824	6,685	6,608
6	2021 Net Energy (GWh)	36,823	34,712	34,644	32,923	32,430	32,924
7	**PEPCO**						
8	2021 Summer Peak (MW)	7,177	6,881	6,672	6,515	6,381	6,384
9	2021 Net Energy (GWh)	34,434	32,570	32,751	31,705	31,310	31,447
10	**Dominion**						
11	2021 Summer Peak (MW)	23,602	22,367	21,054	20,162	20,031	19,848
12	2021 Net Energy (GWh)	115,115	110,835	106,527	101,803	100,842	100,282
13	**Total Three Companies**						
14	2021 Summer Peak (MW)	38,615	36,759	34,790	33,501	33,097	32,840
15	2021 Net Energy (GWh)	186,372	178,117	173,922	166,431	164,582	164,653
16							

Exhibit___(PJL-SR2)
OCA Statement No. 2SR

OCA Set XXIX-06:

Re: TPA Exhibit No. BDW-2R to Weber's Rebuttal Testimony wherein it states that the Conceptual Alternative creates reliability violations. Please respond to or provide the following:

a. Explain specifically how the Conceptual Alternative would need to be changed for it to be sufficient to address the reliability violations identified by PJM in 2023 study year.

b. What emergency ratings for the Conceptual Alternative's Furnace Run-Conastone and Furnace Run-Graceton 230 kV lines would be required for the Conceptual Alternative to be sufficient to address the reliability violations identified by PJM in 2023 study year?

c. Is the Applicant aware of any conductors in lieu of those initially described by PPRP for the Conceptual Alternative's Furnace Run-Conastone and Furnace Run-Graceton 230 kV lines that (1) when operated at 230 kV could achieve emergency ratings that would be sufficient to address the reliability violations identified by PJM in 2023 study year, and (2) would not exceed the capability of the transmission towers listed in the Conceptual Alternative that have an open position for a second circuit?

d. If the answer to c. above is yes, please provide a description of those conductors and the normal and emergency ratings they would be able to achieve without baseline system enhancements to either the Conastone or Graceton substations that were not otherwise modeled with the Conceptual Alternative. What would be the limiting equipment that determined those ratings?

e. If the ratings provided in response to d. above were limited by equipment other than the conductors, please describe what baseline system enhancements to the Conastone and Graceton substations would be necessary so that the emergency ratings of those lines would be established based upon conductor capability.

Response:

a. The requested analysis has not been performed. Project 9A does not suffer from any reliability criteria violations.

b. The requested analysis has not been performed. Project 9A does not suffer from any reliability criteria violations.

c. The requested analysis has not been performed. Project 9A does not suffer from any reliability criteria violations.

d. Not applicable.

e. Not applicable.

Witness: Herling and Horger

Exhibit___(PJL-SR3)
OCA Statement No. 2SR

Witness: Phil O. Penny

PPL Electric Utilities Corporation
Response to Interrogatories of
TRANSOURCE PA, Set I
Dated October 2, 2018
Docket Nos. A-2017-2640195 and A-2017-2640200

Q.1 Is PPL Electric's position that the proposed Furnace Run-Conastone route for the IEC Project is not reasonable because it can be replaced by a route whereby the Furnace Run-Conastone transmission line structures would be located within PPL Electric's Otter Creek to Conastone existing right-of-way? Please provide all documents and opinions that support or are related to that position (either favorably or unfavorably, or which are neutral).

A.1 PPL Electric has no position on the reasonableness of the IEC project and has no related documents.

Witness: Phil O. Penny

PPL Electric Utilities Corporation
Response to Interrogatories of
TRANSOURCE PA, Set I
Dated October 2, 2018
Docket Nos. A-2017-2640195 and A-2017-2640200

Q.2 Do the existing easements owned by PPL Electric allow for Transource PA to locate any part of the proposed Furnace Run-Conastone portion of the ICE Project in the PPL Electric's Otter Creek to Conastone right of way? If yes, please describe in detail all the requirements and conditions necessary for Transource PA to locate its facilities in PPL Electric's right-of-way, including any need for expanding the existing right-of-way and any new right-of-way that may be necessary.

A. 2 The existing easements owned by PPL Electric do not allow for Transource PA to locate any part of the proposed IEC project in the PPL Electric's Otter Creek to Conastone right of way.

Witness: Phil O. Penny

PPL Electric Utilities Corporation
Response to Interrogatories of
TRANSOURCE PA, Set I
Dated October 2, 2018
Docket Nos. A-2017-2640195 and A-2017-2640200

Q.3 Would PPL Electric allow Transource PA to locate any part of the proposed Furnace Run-Conastone portion of the ICE Project in the PPL Electric's Otter Creek to Conastone right of way? If yes, please describe in detail all the requirements and conditions necessary for Transource PA to locate its facilities in PPL Electric's right-of-way.

A.3 PPL Electric has not studied the feasibility of locating additional facilities in the Otter Creek to Conestone rights-of-way. Should PJM re-evaluate solutions in the Market Efficiency planning process, PPL Electric is open to a request from PJM to consider use of existing PPL Electric facilities as a solution.

PPL Electric Utilities Corporation
Response to Interrogatories of
TRANSOURCE PA, Set I
Dated October 2, 2018
Docket Nos. A-2017-2640195 and A-2017-2640200

Q.4 Has PPL Electric conducted any analyses, studies, or reviews to determine whether PPL Electric's Otter Creek to Conastone could be modified by adding a second circuit in order to provide the equivalent electrical characteristics (as measured by the performance criteria below) of the proposed Furnace Run-Conastone portion of the IEC Project? Please describe in detail any such modifications, and provide any analyses, reviews, plans, documents, or opinions related to such modifications.

Performance criteria
1800 / 2400 MVA summer normal / emergency rating with the following parameters:
R = 0. 00134928 pu
X = 0. 0146981 pu
B = 0. 0608184 pu

A.4 PPL Electric has not conducted analyses or studies or reviews to determine if adding a second circuit to the Otter Creek to Conestone line would provide equivalent electrical characteristics as measured by the performance criteria cited in the above question # 4.

Witness: Phil O. Penny

PPL Electric Utilities Corporation
Response to Interrogatories of
TRANSOURCE PA, Set I
Dated October 2, 2018
Docket Nos. A-2017-2640195 and A-2017-2640200

Q.5 Is PPL Electric's position that the proposed Furnace Run-Conastone route for the IEC Project is not reasonable because it can be replaced by a route whereby the Furnace Run-Conastone transmission line structures would be located within PPL Electric's Graceton-Manor existing right-of-way? Please provide all documents and opinions that support or are related to that position (either favorably or unfavorably, or which are neutral).

A.5 PPL Electric has no position on the reasonableness of the IEC project and has no related documents.

PPL Electric Utilities Corporation
Response to Interrogatories of
TRANSOURCE PA, Set I
Dated October 2, 2018
Docket Nos. A-2017-2640195 and A-2017-2640200

Q.6 Do the existing easements owned by PPL Electric allow for Transource PA to locate any part of the proposed Furnace Run-Conastone portion of the ICE Project in PPL Electric's Graceton-Manor right-of-way? If yes, please describe in detail all the requirements and conditions necessary for Transource PA to locate its facilities in PPL Electric's right-of-way, including any need for expanding the existing right-of-way and any new right-of-way that may be necessary.

A.6 The existing easements owned by PPL Electric do not allow for Transource PA to locate any part of the proposed IEC project in the PPL Electric's Graceton-Manor right-of-way.

PPL Electric Utilities Corporation
Response to Interrogatories of
TRANSOURCE PA, Set I
Dated October 2, 2018
Docket Nos. A-2017-2640195 and A-2017-2640200

Q.7 Would PPL Electric allow Transource PA to locate any part of the *proposed Furnace Run-Conastone portion of the ICE Project in PPL* Electric's Graceton-Manor right-of-way? If yes, please describe in detail all the requirements and conditions necessary for Transource PA to locate its facilities in PPL Electric's right-of-way.

A.7 PPL Electric has not studied the feasibility of locating additional facilities in the Graceton-Manor right-of-way . Should PJM re-evaluate solutions in the Market Efficiency planning process, PPL Electric is open to a request from PJM to consider use of existing PPL Electric facilities as a solution.

PPL Electric Utilities Corporation
Response to Interrogatories of
TRANSOURCE PA, Set I
Dated October 2, 2018
Docket Nos. A-2017-2640195 and A-2017-2640200

Q.8 Has PPL Electric conducted any analyses, studies, or reviews to determine whether PPL Electric's Graceton-Manor could be modified by adding a second circuit in order to provide the equivalent electrical characteristics (as measured by the performance criteria below) of the proposed Furnace Run-Conastone portion of the IEC Project? Please describe in detail any such modifications, and provide any analyses, reviews, plans, documents, or opinions related to such modifications.

Performance criteria
1800 / 2400 MVA summer normal / emergency rating with the following parameters:
R = 0. 00134928 pu
X = 0. 0146981 pu
B = 0. 0608184 pu

A.8 PPL Electric has not conducted analyses or studies or reviews to determine if adding a second circuit to the Graceton-Manor line would provide equivalent electrical characteristics as measured by the performance criteria cited in the above question # 8.

Witness: Phil O. Penny

PPL Electric Utilities Corporation
Response to Interrogatories of
TRANSOURCE PA, Set I
Dated October 2, 2018
Docket Nos. A-2017-2640195 and A-2017-2640200

Q.9 Please provide the names and contact information for the individuals who conducted the above-referenced analyses along with their qualifications and any applicable professional certifications that they possess.

A.9 PPL has not performed the above-referenced analyses.

PPL Electric Utilities Corporation
Response to Interrogatories of
TRANSOURCE PA, Set I
Dated October 2, 2018
Docket Nos. A-2017-2640195 and A-2017-2640200

Q.10 In PPL Electric Utilities Corporation Response to Interrogatories of *Office of Consumer Advocate, Set XII, Q.4, it was stated that "there is* ability to utilize conductors with a higher capacity rating" for the Otter Creek-Conastone transmission line.

a. Based upon all studies and analyses completed or known at the time of the integratory response, please provide the maximum rating of any conductors studied along with the conductor specifications that can be added to the existing structures without modification to the structures or land rights, and the related summer normal and summer emergency ratings in MVA and the associated R, X and B pu values. Please provide the engineer(s) responsible for any assessment supporting this determination, their contact information and qualifications along with any applicable professional certifications that they possess.

A.10 PPL Electric performed a preliminary review that showed that almost all existing structures could accommodate higher capacity conductors. PPL Electric has not performed the detailed engineering or planning studies required to select a specific higher capacity conductor or determine specific modifications to structures or land rights that may be required. The review was performed by Mr. Horst Lehmann. Mr. Lehmann is employed by PPL Electric Utilities, Two North Ninth Street Allentown, PA 18101. Mr. Lehmann has over ten years of electric utility operating experience including six years in the design of transmission lines. Mr. Lehmann has B.S. degrees in both Electrical Engineering and Economics from Rensselaer Polytechnic Institute and is a licensed Professional Engineer in the Commonwealth of Pennsylvania.

PPL Electric Utilities Corporation
Response to Interrogatories of
TRANSOURCE PA, Set I
Dated October 2, 2018
Docket Nos. A-2017-2640195 and A-2017-2640200

Q.11 In PPL Electric Utilities Corporation Response to Interrogatories of Office of Consumer Advocate, Set XII, Q.11, it was stated that "there is ability to utilize conductors with a higher capacity rating" for the rebuilt portions of the Graceton-Manor transmission line.

a. Based upon all studies and analyses completed or known at the time of the integratory response, please provide the maximum rating of any conductors studied along with the conductor specifications that can be added to the existing structures without modification to the structures or land rights, and the related summer normal and summer emergency ratings in MVA and the associated R, X and B pu values. Please provide the names of any engineer(s) or other persons responsible for any assessment supporting this determination, their contact information and qualifications along with any applicable professional certifications that they possess.

A.11 PPL Electric performed a preliminary review that showed that almost all existing structures could accommodate higher capacity conductors. PPL Electric has not performed the detailed engineering or planning studies required to select a specific higher capacity conductor or determine specific modifications to structures or land rights that may be required. The review was performed by Mr. Horst Lehmann. Mr. Lehmann is employed by PPL Electric Utilities, Two North Ninth Street Allentown, PA 18101. Mr. Lehmann has over ten years of electric utility operating experience including six years in the design of transmission lines. Mr. Lehmann has B.S. degrees in both Electrical Engineering and Economics from Rensselaer Polytechnic Institute and is a licensed Professional Engineer in the Commonwealth of Pennsylvania.

Witness: Phil O. Penny

PPL Electric Utilities Corporation
Response to Interrogatories of
TRANSOURCE PA, Set I
Dated October 2, 2018
Docket Nos. A-2017-2640195 and A-2017-2640200

Q.12 In PPL Electric Utilities Corporation Response to Interrogatories of Office of Consumer Advocate, Set XVI, Question 2, it was stated that "future studies may identify a need" for reconductoring. Please identify any such studies planned or conducted by PPL Electric, and described the timeframe and scope for each such study.

A.12 PPL Electric transmission planning practices, including future studies to be performed are publicly available at: https://www.pjm.com/-/media/planning/planning-criteria/ppl-planning-criteria.ashx?la=en

OCA STATEMENT NO. 3

2/26/19 Hbg

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

Application of Transource Pennsylvania, LLC for approval of the Siting and Construction of the 230 kV Transmission Line Associated with the Independence Energy Connection - East and West Projects in portions of York and Franklin Counties, Pennsylvania.	:	**Docket No. A-2017-2640195** **Docket No. A-2017-2640200**
Petition of Transource Pennsylvania, LLC for a finding that a building to shelter control equipment at the Rice Substation in Franklin County, Pennsylvania is reasonably necessary for the convenience or welfare of the public.	:	**P-2018-3001878**
Petition of Transource Pennsylvania, LLC for a finding that a building to shelter control equipment at the Furnace Run Substation in York County, Pennsylvania is reasonably necessary for the convenience or welfare of the public.	:	**P-2018-3001883**
Application of Transource Pennsylvania, LLC for approval to acquire a certain portion of the lands of various landowners in York and Franklin Counties, Pennsylvania for the siting and construction of the 230 kV Transmission Line associated with the Independence Energy Connection – East and West Projects as necessary or proper for the service, accommodation, convenience or safety of the public.	:	**A-2018-3001881, *et al.***

DIRECT TESTIMONY OF
GEOFFREY C. CRANDALL

ON BEHALF OF
THE OFFICE OF CONSUMER ADVOCATE

SEPTEMBER 25, 2018

I. QUALIFICATIONS

Q. What is your name and business address?

A. My name is Geoffrey C. Crandall. My business address is MSB Energy Associates, Inc., 6907 University Avenue #162, Middleton, Wisconsin 53562.

Q. On whose behalf are you testifying today?

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

Q. Please describe your background and experience in the field of gas and electric utility regulation.

A. I am a principal and the Vice President of MSB Energy Associates, Inc. I have over 40 years of experience in utility regulatory issues, including resource planning, restructuring, mergers, fuel, purchase power and gas cost recovery and planning analysis, energy efficiency, conservation and load management impacts, program design and other issues. I have provided expert testimony before more than a dozen public utility regulatory bodies throughout the United States. I have provided expert testimony before the United States Congress on several occasions and have previously filed testimony in numerous cases before the Michigan Public Service Commission.

My experience includes over 15 years of service on the Staff of the Michigan Public Service Commission (Commission). In my tenure at the Commission, I served as an analyst in the Electric Division (Rates and Tariff section) involving rate cases, as well as fuel and purchase power cases. I also served as the Technical Assistant to the Chief of

Staff, supervisor of the energy conservation section (involving residential and commercial energy efficiency programs). I also served as the Division Director of the Industrial, Commercial and Institutional Division. In that capacity, I was Director of the Division that had responsibility for the energy efficiency and conservation program design, funding, and implementation of Michigan utility and DOE-funded private company implemented programs and initiatives involving Industrial, Commercial and Institutional gas and electric customers throughout Michigan.

In 1990, I became employed by MSB Energy Associates, Inc. and have served clients throughout the United States on numerous projects related to system planning, fuel, purchase power and gas cost recovery assessments, energy efficiency and load management program development, electric restructuring, customer impact analyses, and other issues. My vita is attached as Exhibit OCA 3-1.

II. DIRECT TESTIMONY

Q. What is the purpose of your testimony in this case?

A. The purpose of my testimony is to assist the OCA in assessing the reasonableness of the Application of Transource Pennsylvania, LLC (Transource or Company) for Approval of the siting and construction of the 230kV Transmission Lines associated with the Independence Energy Connection both West and East Projects in portions of Franklin and York County. The focus of my testimony is the non-transmission alternatives to Transource's proposed Independence Energy Connection Project (IEC Project). OCA Witness Rubin is assessing the IEC Project in the context of Pennsylvania's laws and

policy objectives. OCA Witness Lanzalotta is assessing the need for the IEC Project and transmission alternatives to it. Together, we demonstrate that:

- The transmission constraints the IEC Project was chosen to alleviate are greatly diminished from when the IEC Project was conceived.
- The viability of the IEC Project is based in large part on a cost/benefit analysis that appears to have numerous, substantial flaws.
- The proposed greenfield construction of the IEC Project is inconsistent with the public Policy of PA.
- If necessary, transmission alternatives exist that should be considered in light of their substantially reduced environmental and economic impacts to PA.
- There are also non-transmission alternatives that could address the load requirements in the MD-DC-VA area and reduce any congestion levels that currently exist in the Project area and without the impact on land, the environment and communities that have been identified in the public input hearings and site views.

These concerns and issues involve the following:

- Non-transmission alternatives including energy efficiency programs, demand response, distributed generation, solar, wind resources in the areas where higher (Locational Marginal Prices)[1] LMP's are projected due to congestion.

[1] Locational Marginal Price is defined by PJM as the "marginal price for energy at the location where the energy is delivered or received. It is expressed in $/MWh. LMP Is a pricing approach that addresses Transmission System congestion and loss cost, as well as energy cost."

- We have identified resources that are available in the transmission-constrained areas, which impact the economics of IEC Project.
- In our review of PJM's model outputs, which PJM used to select the IEC Project, we have determined that transmission congestion and higher electric prices as modeled occur not only at time of peak, but also deeper into the intermediate and base load levels. As such, the constraints as modeled could occur many hours each year. The actual hours of constraint, however, have declined substantially since the time the IEC Project was approved.
- Energy efficiency, distributed generation (including combined heat and power - CHP) and renewable resources have the potential to materially reduce the transmission congestion and thus the electricity prices in the DC-MD-VA areas.
- Energy efficiency resource potential is present both East and South of PA and has not been adequately accounted for in the PJM forecast.
- Renewable resources, especially solar (Photo Voltaic) PV and wind are also available in the IEC Project area. These resources were not given due consideration in the PJM forecast.
- Other distributed generation resources are site and process specific but have been estimated by Federal Government sources and may also have a material impact on the economic viability and need for the IEC Project.
- In this testimony I provide an assessment of whether or not energy efficiency, renewable energy and distributed generation resources would be available to substantially affect the need for and reduce the benefits of the proposed transmission project.

We have assessed non-transmission alternatives focusing primarily on Maryland, Virginia and the District of Columbia that would reduce the need for the IEC Project.

Q. Why did you select the District of Columbia, Maryland and Virginia as the three states that would primarily benefit from completion of the IEC Project?

A In response to OCA-II-14, PJM provided OCA with a chart that depicts the areas served by Baltimore Gas & Electric Company, Dominion Power Company and Potomac Electric Power Company as serving customers who are most likely to benefit significantly assuming the project is completed. It is possible that there may be minimal benefits to Pennsylvania electricity consumers served by Duquesne Light Company and West Penn Power Company. However, the benefits are expected to be miniscule.

Q. Could you describe the proposed IEC Project?

A. This is a project that PJM selected in conjunction with their 2014/2015 RTEP Long Term Proposal Window Statement. The stated purpose of the project, according to the Company's filed testimony and discovery responses, is to alleviate transmission congestion not for reliability enhancement purposes, but rather to move power more freely East and South of Pennsylvania and thereby improve market efficiencies.

Q. What would need to be acquired and constructed in order to get the project operational?

A. It would require forty-five miles of 230 kV (double-circuit, located mostly in Pennsylvania) lines, support structures and several substations. For a more complete description of the IEC Project see Witness Lanzalotta's testimony on page 5.

Q. What is congestion?

A. The term "congestion" as defined by PJM (see: www.pjm.com/en/Glossary) as a condition that arises on the transmission system when one or more restrictions prevent the economic dispatch of electric energy from serving load.

DETERMINATION OF DESIGN TARGETS FOR NON-TRANSMISSION ALTERNATIVES

Q. The proposal in this case is to construct additional transmission to address the identified transmission congestion. Is construction of transmission the only solution?

A. No. Depending on the facts, other non-transmission alternatives can be employed to materially affect the congestion levels at issue here and thus also materially impact the need to build new transmission infrastructure.

Q. What non-transmission alternatives to the IEC Project have you considered?

A. I have considered expanded end-use energy efficiency measures, expanded demand response programs, expanded renewable resource programs, and expanded distributed resource programs.

Q. Why are these measures, programs and actions appropriate alternatives to the proposed IEC Project?

A. The IEC Project is represented as and considered to be a market efficiency project, as affirmed by the Company and PJM in their filed testimonies. Simply put, according to PJM, the transmission network on the AP South Reactive Interface is constrained, preventing generation resources from being dispatched in economic order under certain conditions. PJM would like to dispatch all of its generation resources in economic dispatch order to minimize overall production costs.

Transmission constraints sometimes limit the amount of power that can be taken from lower-cost resources, and instead cause PJM to dispatch higher-cost generation resources to serve the load. The price differential between the higher- and lower-cost generation resources, together with the amount of generation which is dispatched out of economic order and the frequency/duration of time during which the generation is dispatched out of economic order determines the significance of the market inefficiency.

PJM's solution is to seek a more balanced transmission network to reduce market inefficiency. PJM's preferred solution here is to build more transmission lines to reduce the transmission constraints and thus enhance the efficiency of the electricity market. This is neither the only solution, nor in this case, the best solution.

1 Market inefficiency occurs when the loads on the constrained side (higher cost
2 generation) are greater than the capacity of the transmission network to carry power from
3 the lower cost side (lower cost generation). Thus, reducing load on the constrained side
4 will mitigate the constraint and the degree of market inefficiency.

5 Additionally, if sufficient lower cost resources can be added to the constrained side, they
6 may mitigate or eliminate the constraint altogether. Thus, for example, siting low cost
7 generation on the constrained side will mitigate or alleviate the constraint and thereby
8 reduce market inefficiency to a certain degree.

9 A caution to the differential cost of generating resources is that over time, generators on
10 the lower cost side may be retired, may face higher fuel costs, or may face higher
11 maintenance costs. Thus, today's market inefficiency may be reduced or eliminated if
12 the electricity prices at the lower cost side increase.

13 For purposes of this analysis, I focused on those resources that would reduce the load on
14 the higher cost side of the constraint or reduce the cost of generation on the higher cost
15 side of the constraint.

16 **Q. Is the IEC Project a market efficiency project?**

17 A. Yes. Witness McGlynn in his direct testimony, page 16, lines 7-9 unequivocally states,
18 "IEC Project was deemed necessary under the RTEP market efficiency analysis." In
19 addition, see Exhibit OCA-3-2 (PJM response to OCA XIII-09) and PJM's response to
20 OCA XIII-01. PJM clearly indicates that the IEC Project is a market efficiency project,
21 "PJM analysis determined that IEC Project is needed as a market efficiency project..."

The project addresses a market efficiency issue in which power costs on the constrained side may be higher as a result of the congestion but there is ample generation available and deliverable to serve the load although not strictly in order of lowest cost economic dispatch.

Q. Please describe the AP South Reactive Interface constraint?

A. The AP South Reactive Interface consists of four 500 kV transmission lines originating in the west near Mt. Storm, West Virginia, and terminating in Doubs (Maryland) and Meadow Brook (Virginia) to the east and Valley (Virginia) to the south. Generally speaking, under certain circumstances these four transmission lines limit the ability to transfer lower cost power available at the west end of the AP South Reactive Interface to load areas of higher cost power to the east and south. The lower-cost generation can be located in many parts of the PJM footprint (not necessarily at the western terminus of the AP South Reactive Interface), but it flows to the western terminus of the AP South Reactive Interface via the transmission network. Its ability to flow to the east and south from there is constrained at certain times by the capacity of the four transmission lines. PJM responses to OCA-IX-01 and OCA-XXI-01.

Q. Does the AP South Reactive constraint result in higher costs all of the time?

A. No. The constraint, and therefore the higher costs, exists only under certain conditions. PJM determines the AP South Reactive Interface limits to ensure safe and reliable operation. According to Witness McGlynn Statement 3, page 25, lines 16-20, "If the flows across the interface are expected to exceed the established limits, PJM will direct

higher cost generation in Maryland and Virginia to increase output, while lower cost generation output will be reduced in other parts of PJM to prevent the flows across the interface from exceeding the established limits." The conditions, which determine the limits, can change over time, and with them, the severity of the constraint and the magnitude of the congestion cost.

Q. Witness McGlynn testified that the primary goal of the 2014/2105 Long Term Proposal window was to "solicit proposals to reduce congestion on the AP South Reactive Interface, which is one of the most historically congested flowgates in PJM". According to State of the Market Reports by PJM's market monitoring unit, Monitoring Analytics, the congestion cost on the AP South Interface totaled approximately $800 million from 2012 through 2016. Is the $800 million indicative of the future congestion costs associated with the AP South Reactive Interface?

A. No. When PJM solicited proposals to address the congestion costs associated with the AP South Reactive Interface, the amount of time congestion was a factor was much higher than it has been since 2015.

From 2008 through 2014, the AP South Reactive Interface ranked number one in PJM for congestion costs. This constraint was responsible for approximately one-fourth of PJM's total system-wide congestion costs, an average of $307 million per year. Beginning in 2015, the congestion cost dropped dramatically, averaging $31 million per year over the 2015-2017 period, which was less than 3% of PJM's total system-wide congestion costs over the 2015-2017 period. Current congestion costs are about a tenth of the congestion

costs at the time PJM issued its 2014-2015 Long Term Proposal window from which the IEC Project was selected.

Similarly, the congestion event hours on the AP South Reactive Interface also dropped precipitously beginning in 2015. The day ahead (Defined as a forward market in which PJM market participants buy and sell energy bids. Results are financially binding and are posted by 1:30 p.m. on the day before) congestion hours over the 2008-2014 period averaged 4,259[2] hours per year at the AP South Reactive Interface. This dropped to an average of 1,225-day ahead congestion hours per year for the 2015-2017 period.

The same pattern exists for the real time (defined as the real time energy market in which clearing prices are calculated every five minutes based on actual system operations constrained economic dispatch) event hours on the AP South Reactive Interface. The real time congestion event hours averaged 946 hours per year for the 2008-2014 period. This dropped to an average of 43 real time congestion hours per year for the 2015-2017 period.

[2] There are 8,760 hours in a year.

1 Table 1

AP South Reactive Interface Historical Congestion

From Monitoring Analytics Reports

	Cost Millions $	% of Annual PJM Total Congestion Cost	Rank PJM	Event Hours Day Ahead	Event Hours Real Time
2008	$ 558.0	26.0%	1	3,572	1,016
2009	$ 206.5	29.0%	1	3,501	604
2010	$ 420.2	30.0%	1	4,622	1,516
2011	$ 238.9	24.0%	1	4,111	1,013
2012	$ 68.5	12.9%	1	2,586	351
2013	$ 169.1	25.0%	1	6,330	1,138
2014	$ 486.8	25.2%	1	5,090	981
2015	$ 56.2	4.1%	6	1,285	42
2016	$ 16.8	1.6%	11	1,076	14
2017	$ 21.6	3.1%	6	1,315	74

2012-2016	$	797.4	Witness McGlynn's $800 million congestion cost reference
2008-2014	$	306.9	Average annual congestion cost in period that APS constraint was No. 1 ranked
2012-2014	$	241.5	Average annual congestion cost
2015-2017	$	31.5	Average annual congestion cost

2

3 Table 1 summarizes the congestion information from the Monitoring Analytics annual

4 reports.

5

6 **Q. How did the dramatic decline in congestion event hours affect your analysis of non-**

7 **transmission alternatives?**

8 A. First, the decline in the number of congestion event hours and the congestion costs

9 reduces the severity of the problem and the benefits derived from resolving the problem.

10 In other words, the amount of money that could or should be invested to resolve the

11 congestion problem is greatly reduced. That would apply to transmission as well as non-

12 transmission alternatives.

Second, non-transmission alternatives are frequently time dependent. As such, the narrowing of the number of congestion event hours would probably limit the non-transmission resources available to address these congestion events.

Q. Reducing the number of congestion event hours would clearly reduce the severity of the congestion, and thus the need for the project. Please explain how reducing the number of congestion hours could affect the viability of potential non-transmission resources?

A. The non-transmission alternatives I have analyzed consist of energy efficiency, demand response, and distributed generation resources (e.g., renewable energy and combined heat and power (CHP)). It is important to know when the congestion events can occur in order to identify the resources that are available at those times. For example, if the constraint occurs during the off-peak winter hours, it would not make sense to focus on air conditioner efficiency programs, or air conditioner demand response programs. For an off-peak winter constraint, lighting and space heating efficiency programs may be viable, along with wind generation and CHP. For summer on peak congestion hours, air conditioner efficiency and demand response programs, solar photovoltaic's and CHP may be a better fit.

Generally speaking, the more the annual congestion hours, the larger the portfolio of non-transmission alternative resources are available. Thus, the reduction in reported congestion hours shown in Table 1 would be expected to reduce the non-transmission alternative resources available. In addition, the fewer the hours of congestion, the more precisely they should be characterized to ensure that the alternative resources selected are

likely to be available at those times. Stated differently, if the congestion occurs 6,000 hours per year, a larger set of non-transmission resources will contribute to reducing congestion than if congestion occurs 60 hours per year.

Q. Did Transource or PJM provide you with a useful characterization of when congestion events are likely to occur?

A. No. They did not narrow it down by season, month, week, or hour of day. In response to OCA-XIII-01, Witness McGlynn stated that "Power flow on the lines that comprise the AP South reactive Interface can vary by hour, day, month and season.... AP South Reactive Interface constraints can be seen at any hour of the operating day (24-hour period) at any point during the year."

In response to OCA-XXI-03, Witness McGlynn further clarified it is theoretically possible to have constraints occur any time of day or time of year, and that he was not suggesting that there is an equal probability that a constraint can occur in any hour of the year.

Even though the actual hours of congestion have dropped dramatically, Transource and PJM repeatedly indicated that the congestion could occur any time of day, any day of the year. In effect, any non-transmission alternative resource may contribute to mitigating the potential for congestion, irrespective of when the resource is available, because the congestion can occur at any time.

Q. What were your design targets for the non-transmission alternatives?

A. I looked for resources that could be located to the east and south of the AP South Reactive Interface, generally northern Virginia, Maryland and District of Columbia. I looked for any resource available any time of day or year, but considered those resources available between 7AM and 10PM to be typically more valuable as an alternative to the IEC Project.

END-USE ENERGY EFFICIENCY MEASURES & RENEWABLE RESOURCES

Q. Before you continue could you first explain what energy conservation, energy efficiency, demand response, renewable energy resources are and why they are relevant to the proposed IEC Project?

- Energy Conservation (EC) can be defined as the reduction in the amount of energy consumed in process or system, or by an organization or society, through economy, elimination of waste, and rational use.

- Energy efficiency (EE) can be defined as a percentage of total energy input to a building, machine or equipment that is consumed in useful work and not wasted as useless heat. This definition pertains to homes, businesses, cooled air and heated water and a multitude of end uses and generally means to do more with the same or a lesser amount of energy without amenity loss. New Home construction, high efficiency lighting, air conditioning, and refrigerators are all examples of commonly employed strategies to promote energy efficiency.

- Demand Response (DR) can be defined as a means for consumers to impact the electric grid by reducing or shifting their electricity usage during peak periods in response to time-based rates or other forms of financial incentives. Methods of engaging customers in demand response efforts include time-sensitive rates such as critical peak pricing, real time pricing, time-of-use pricing, variable peak pricing, critical peak rebates and other options.

- Renewable Resources:

  - Solar: Solar resources can be either utility scale or small scale and typically customer owned. Solar cells are used to generate electricity from sunlight. It is a device that converts light energy into electrical energy. Solar energy is a flexible energy technology, which can be built as distributed generation (located at or near the point of use) or as a central-station, utility-scale solar power plant (similar to traditional power plants). Both of these methods can also store the energy they produce for distribution after the sun sets using storage technologies.

  - Wind Energy Resources can be defined as wind power, a widely applied and accepted renewable energy resource. Historically, wind power in the form of windmills has been used for centuries for such tasks as grinding grain and pumping water. Modern commercial wind turbines produce electricity by using rotational energy to drive an electrical generator. Wind energy can also be stored using battery storage technologies and distributed after the wind dissipates.

- Renewable energy storage is typically referred to as Battery Storage. It is a device that reserves energy for later consumption and is charged by a connected solar or wind system. The stored electricity can be consumed after sundown, the wind dissipates, during energy demand peaks, constrained/congested transmission conditions or during a power outage.

Q. Did PJM analyze and assess increased energy efficiency resource strategies as a potential non-wires alternative in assessing the economic viability of the IEC Project?

A. Not that I am aware of. See Exhibit OCA-3-3 wherein the Company response to OCA's discovery question OCA-IV-24 was that "The Company lacks information to form a belief about the conduct of other electric utilities. The Company further states that levels of energy efficiency, demand responses, wind resources, solar resources and other distributed energy resources are assumptions incorporated into PJM's RTEP at the start of the RTEP process cycle pursuant to PJM's Operating Agreement, Schedule 6, 1.5.3."

However, in my review of the analytics that were done when PJM was considering the various congestion reduction projects, I saw no evidence that PJM assessed the need for the IEC Project with and without significantly increased levels of energy efficiency resources e.g., commercial lighting in the congested zones.

1 Q. **Did PJM analyze and assess increased solar and wind renewable resources (in**
2 **combination with storage systems) as a potential non-wires alternative in assessing**
3 **the economic viability of the IEC Project?**

4 Not that I am aware of. See Exhibit OCA-3-3 wherein the Company response to OCA's
5 discovery question OCA-IV-24 was that "The Company lacks information to form a
6 belief about the conduct of other electric utilities. The Company further states that levels
7 of energy efficiency, demand responses, wind resources, solar resources and other
8 distributed energy resources are assumptions incorporated into PJM's RTEP at the start
9 of the RTEP process cycle pursuant to PJM's Operating Agreement, Schedule 6, 1.5.3."
10 However, in my review of the analytics that were done when PJM was considering the
11 various congestion reduction projects, I saw no evidence that PJM assessed the need for
12 the IEC Project with and without significantly increased levels of distributed resources
13 e.g., Utility scale wind resources in the congested zones.

14

15 **Q. Did PJM analyze and assess increased Distributed Generation resource strategies as**
16 **a potential non-wires alternative in assessing the economic viability of the IEC**
17 **Project?**

18 A. Not that I am aware of. See Exhibit OCA-3-3 wherein the Company response to OCA's
19 discovery question OCA-IV-24 was that "The Company lacks information to form a
20 belief about the conduct of other electric utilities. The Company further states that levels
21 of energy efficiency, demand responses, wind resources, solar resources and other
22 distributed energy resources are assumptions incorporated into PJM's RTEP at the start

of the RTEP process cycle pursuant to PJM's Operating Agreement, Schedule 6, 1.5.3." However, in my review of the analytics that were done when PJM was considering the various congestion reduction projects, I saw no evidence that PJM assessed the need for the IEC Project with and without significantly increased levels of distributed generation resources.

Q. Did PJM include state energy efficiency or renewable resource mandates and requirements in conducting its analysis to approve the IEC Project?

A. No. OCA XIII-14 indicated that PJM had not conducted studies to identify the impact of existing or imminent state-approved utility programs for energy efficiency, demand response, CHP or renewable resources as it relates to the need for the IEC Project. See Exhibit OCA-3-4

Q. Is information available regarding the potential for Energy Efficiency and Renewable resources in Virginia?

A. Yes. The Virginia General Assembly earlier this year, adopted a law that encourages the increased reliance on renewable energy and energy efficiency resources by passing the Grid Transformation and Security Act of 2018 (the "GTSA"), which became effective in March 2018. The new law finds that up to an additional 5,000 MW of utility-scale electric generating facilities powered by solar and wind energy is in the public interest, and in addition finds that an additional 500 MW of non-utility scale solar or wind generating facilities, including rooftop solar installations are in the public interest.

The GTSA also encourages increased demand-side management programs to help customers conserve energy and reduce system peak loads. This law will cause the implementation of energy efficiency and demand response programs capable of reducing customers' overall annual energy usage by 805 gigawatt-hours (GWh) and system peak demand by 304 MW by 2033.

The GTSA requires Virginia Power Company (Dominion) to commit at least $870 million to implement energy efficiency programs for the period beginning July 1, 2018, and ending July 1, 2028, which includes Virginia Power's existing energy efficiency programs.

Q. Why is the passage of the GTSA in Virginia relevant to the IEC Project?

A. It is relevant for several reasons.

- Virginia is in the target zone for locating alternative non-transmission resources that would unload the congested transmission lines of the AP South reactive Interface. GTSA will reduce the load in Virginia, and thus will tend to mitigate congestion levels on the AP South Reactive Interface, which would reduce the projected market inefficiency. Accordingly, the implementation of GTSA will reduce the purported benefits (and need for) the IEC Project.

- The largest beneficiary of the IEC Project, as modeled by PJM, is Dominion, which is also the largest electric distributor in Virginia. In 2016, Dominion sold or distributed 68% of the electricity consumed in Virginia. Being the largest

1 beneficiary of the IEC Project means that Dominion is the zone most adversely
2 affected by the congestion – it faces the highest duration and/or magnitude and/or
3 price differentials due to transmission congestion. This means actions reducing
4 loads at Dominion will relieve the congestion on the AP South Reactive Interface.
5 Because of Dominion's dominance as an electricity supplier in Virginia, a
6 statewide action such as GTSA will have a profound impact on Dominion.

7 • The GTSA is proof that States and utilities in the PJM footprint are serious about
8 energy efficiency and renewable energy and are taking actions to achieve more of
9 it. Energy efficiency and renewable energy are not merely potentials, but will be
10 profoundly affecting the loads and load shapes PJM will attempt to serve.

11 • The impacts of the GTSA on reducing load in the target area and relieving
12 transmission congestion were not considered by PJM, neither when the IEC
13 Project was selected nor in any of the re-evaluations, including the one most
14 recently presented to the TEAC on September 13, 2018.

15 Q. How much would you expect GTSA to reduce Dominion's forecasted loads?

16 A. With 68% of Virginia's load in Dominion's service territory, I would expect about 68%
17 of the GTSA targets to be achieved in Dominion's service territory. Dominion's load
18 would be reduced by 206 MW and 545 GWH/year as a result of energy efficiency and
19 3,723 MW as a result of renewable energy. Using a conservative assumption that on
20 average wind and solar generation has a capacity factor of 20%, the renewable energy

sources would reduce Dominion's annual energy needs by 6,523 GWH. These are significant reductions.

Q. **Has the District of Columbia undertaken an assessment of energy efficiency and renewable resources in the District of Columbia?**

A. Yes. The District of Columbia's Department of the Environment conducted an analysis wherein they quantified the economic energy efficiency potential in the District of Columbia to be 5,537,521 MWh/yr in 2022. In addition the District of Columbia's Department of the Environment estimated that there is a technical potential of 2,498,000 MWh/year for rooftop PV and Urban Utility scale PV potential in the District of Columbia.

Q. Why is this activity in the District of Columbia relevant to the IEC Project?

A. It is relevant for several reasons.

- The District of Columbia is in the target zone for locating alternative non-transmission resources that would unload the congested transmission lines and thus will tend to mitigate congestion levels on the AP South Reactive Interface. Efforts to reduce the load in the District of Columbia and mitigate congestion would reduce the projected market inefficiency. It would reduce the purported benefits of the IEC Project.

- The second largest beneficiary of the IEC Project, as modeled by PJM, is PEPCo, which is also the largest electric distributor in the District of Columbia. In 2016, PEPCo sold or distributed 58% of the electricity consumed in DC. Being the

second largest beneficiary of the IEC Project means that PEPCo is adversely affected by the congestion. Actions reducing loads at PEPCo will relieve the congestion on the AP South Reactive Interface.

- The District of Columbia City Council recently determined that by 2032 half of the electric energy used in the District of Columbia should be supplied by solar photovoltaics. With electric sales in the District in 2016 being nearly 20,000 GWH, half of the energy from renewables would amount to about 10,000 GWH. Again, this is proof that States and utilities in the PJM footprint are serious about energy efficiency and renewable energy and are taking actions to achieve more of it. Energy efficiency and renewable energy will be profoundly affecting the loads and load shapes PJM will attempt to serve.

Q. How much would you expect energy efficiency and renewable energy initiatives in the District of Columbia to reduce PEPCo's forecasted loads?

A. I have assumed that 15% of the economic potential for energy efficiency as quantified by District of Columbia's Department of the Environment would be captured. With 58% of the load in the District of Columbia, I would expect about 58% of the captured load to be PEPCo's load. PEPCo's load would be reduced by 479 GWH annually as a result of energy efficiency. I assumed that 5% of the renewable energy technical potential as quantified by District of Columbia's Department of the Environment would be captured, yielding 72 GWH of renewable energy. Assuming PEPCo's energy efficiency programs would deliver results similar to Dominion's, energy efficiency would reduce PEPCo's peak demand by 181 MW. Using a conservative assumption that on average wind and

solar generation has a capacity factor of 20%, the renewable energy sources would add about 41 MWs of capacity

Q. Is information available regarding the potential for Energy Efficiency and Renewable resources in Maryland?

A. Yes. The Maryland Legislature passed a law in April 2017 that mandated a 2% per year reduction in electric energy use. With Maryland's electric energy use in 2016 at over 93,000 GWH, the 2% mandate would be 1,868 GWH.

Q. Why is this activity in Maryland relevant to the IEC Project?

A. It is relevant for several reasons.

- Maryland is in the target zone for locating alternative non-transmission resources that would unload the congested transmission lines and thus will tend to mitigate congestion levels on the AP South Reactive Interface. Efforts to reduce the load in the Maryland would mitigate the congestion, which would reduce the projected market inefficiency. It would reduce the purported benefits of the IEC Project.

- The third largest beneficiary of the IEC Project, as modeled by PJM, is BGE, which is also the largest electric distributor in Maryland. In 2016, BGE sold or distributed 32% of the electricity consumed in MD. Being a large beneficiary of the IEC Project means that BGE is adversely affected by the congestion. Actions reducing loads at BGE will relieve the congestion on the AP South Reactive Interface.

- The statutory efficiency mandate is proof that States and utilities in the PJM footprint are serious about energy efficiency and renewable energy and are taking actions to achieve more of it. Energy efficiency and renewable energy will be profoundly affecting the loads and load shapes PJM will attempt to serve.

- It is unclear whether and how this Maryland energy efficiency mandate was incorporated into PJM's planning. Clearly it was not included in the forecasts when the IEC Project was selected, as the selection process predated the legislation. However, the impacts of this legislation may not have yet fully made their way into the end use energy intensity trendlines utilized in PJM's recent forecasting models.

Q. How much would you expect energy efficiency and renewable energy initiatives in Maryland to reduce BGE's forecasted loads?

A. With 32% of the load in the Maryland, I would expect about 32% of the captured load to be BGE's load. BGE's load would be reduced by about 600 GWH annually as a result of energy efficiency. Assuming BGE's energy efficiency programs would deliver results similar to Dominion's, energy efficiency would reduce BGE's peak demand by about 227 MW.

Q. Are you proposing specific energy efficiency, demand response, or renewable portfolios for Maryland, the District of Columbia or Virginia?

1 A. I am not recommending that any particular state specific programs be implemented in a
2 certain manner as alternatives to the IEC Project. How these programs are enacted, rolled
3 out, implemented, maintained & improved is up to the local jurisdiction, Public Utility
4 Commission, or Legislature in those areas.
5 I am identifying viable non-wires alternatives that do exist beyond merely building new
6 transmission infrastructure.
7

8 **DISTRIBUTED GENERATION RESOURCE PROGRAMS**

9

10 **Q. How much CHP resource is available in the target area comprised of Maryland,**
11 **Virginia and the District of Columbia?**
12 A. According to the United States Department of Energy 2016 Technical potential study
13 there is 7,861 MW's of CHP technical potential in the District of Columbia, Maryland
14 and Virginia. Technical potential is defined as the estimation of market size constrained
15 only by technological limits without regard to economic or market factors.

16 **Q. How much of this technical potential CHP resource is likely to be developed?**
17 A. That is difficult to forecast, since each CHP unit is in essence customized to the specific
18 heat and electrical needs of the company installing it. However, to provide some context,
19 I've assumed that 5% of the technical potential is developed, or about 400 MW in the
20 District of Columbia, Maryland and Virginia.
21

22 **Q. Did you estimate how much of the CHP resource would be developed in Dominion,**
23 **PEPCo and BGE?**

A. Yes. CHP would be developed primarily in the commercial and industrial sectors. For purposes of this assessment, I assumed that 400 MW would be allocated by the amount of commercial/industrial sales in Dominion, PEPCo and BGE in proportion to the combined commercial/industrial sales in the District of Columbia, Maryland and Virginia. On that basis, about 131 MW of CHP would be developed in Dominion, 47 MW in BG&E and 24 MW in PEPCo and would reduce demand.

CHP units will have high utilization rates (a high percentage of capacity that a device is expected to be used productively). I've assumed capacity factors(ratio of actual output compared to a period of time a unit is a providing full nameplate output) averaging 70%. On that basis, about 802 GWH of CHP would be developed in Dominion, 286 GWH in BGE and 144 GWH in PEPCo.

DEMAND RESPONSE PROGRAMS

Q. Is Demand Response considered to be a good fit when considering a transmission related economic efficiency project?

A. No. DR is a short term, "peaky" response strategy that is valuable when dealing with an acute short-term load imbalance and system reliability issues. The value of DR applied to an economic efficiency project is very limited because demand response resources are designed to respond to short-term load imbalance conditions. Energy efficiency measures and resources produce benefits over long periods of time and are more valuable and responsive to a transmission congestion/constraint condition.

NON-TRANSMISSION ALTERNATIVES SUMMARY

Q. Would inclusion of the non-wire alternatives mentioned earlier in this testimony impact the benefit cost ratio for The IEC Project?

A. Yes. MD, VA and DC have a significant magnitude of energy efficiency, renewable energy and distributed generation potential. Even with the conservative assumptions I have built into my assessment, the amount of energy efficiency, renewable energy and CHP that will be developed over the next 15 years in the target zone will be the equivalent of a moderately sized utility. As shown in Table 2, the load reduction on the target utilities due to these resources could be on the order of ~~80~~ 36% of the size of PEPCo and ~~120~~ 47% of the size of West Penn Power. These are substantial impacts. Some are already underway through formal initiatives, while others are likely to develop due to economics and resource use.

Table 2

NON-TRANSMISSION ALTERNATIVE RESOURCES				
ENERGY GWH				
	Energy Efficiency	Renewable Energy	CHP	Total
Dominion	545	6,523	802	7,870
PEPCo	479	72	144	695
BGE	600	0	286	886
TOTAL	1,624	6,595	1,232	9,451
			PEPCO 2016 Sales	~~11,397~~ 26114
			TOTAL as % of PEPCO	~~83%~~ 36%
			West Penn Power 2016 Sales	~~7,461~~ 15,966
			TOTAL as % of West Penn	~~127%~~ 47%
CAPACITY MW				
	Energy Efficiency	Renewable Energy	CHP	Total
Dominion	206	3,723	131	4,060
PEPCo	181	41	24	246
BGE	227	0	47	273
TOTAL	614	3,764	201	4,579
			PEPCO 2016 Peak	5,786
			TOTAL as % of PEPCO	79%
			West Penn Power 2016 Peak	3,947
			TOTAL as % of West Penn	116%

PJM did not give due consideration to these alternatives in their benefit/cost analysis. The impact of including the alternatives mentioned above would impact the economic viability of The IEC Project.

Q. Please summarize your recommendations in this case.

A. The Commission should adopt the following recommendations, in this case:

(1) Non-transmission alternatives exist and are available, which reduce the need for the IEC Project and should be recognized and included in the assessment gauging the need for the IEC Project.

(2); Energy efficiency, renewable energy resources, distributed resources can offset transmission congestion during any hour, day, month, season and at any point during the year and this was not reflected in PJM's analysis.

(3); The proposed IEC Project should not be authorized;

Q. Does this complete your testimony?

A. Yes.

259519

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

Application of Transource Pennsylvania, LLC for approval of the Siting and Construction of the 230 kV Transmission Line Associated with the Independence Energy Connection - East and West Projects in portions of York and Franklin Counties, Pennsylvania.	:	A-2017-2640195 A-2017-2640200
Petition of Transource Pennsylvania, LLC for a finding that a building to shelter control equipment at the Rice Substation in Franklin County, Pennsylvania is reasonably necessary for the convenience or welfare of the public.	:	P-2018-3001878
Petition of Transource Pennsylvania, LLC for a finding that a building to shelter control equipment at the Furnace Run Substation in York County, Pennsylvania is reasonably necessary for the convenience or welfare of the public.	:	P-2018-3001883
Application of Transource Pennsylvania, LLC for approval to acquire a certain portion of the lands of various landowners in York and Franklin Counties, Pennsylvania for the siting and construction of the 230 kV Transmission Line associated with the Independence Energy Connection – East and West Projects as necessary or proper for the service, accommodation, convenience or safety of the public.	:	A-2018-3001881, *et al.*

46

VERIFICATION

I, Geoffrey Crandall, hereby state that the facts above set forth in my Direct Testimony OCA Statement No. 3 are true and correct and that I expect to be able to prove the same at a hearing held in this matter. I understand that the statements herein are made subject to the penalties of 18 Pa.C.S. § 4904 (relating to unsworn falsification to authorities).

Signature: _____

Geoffrey Crandall
MSB Energy Associates, Incorporated
Suite 162
6907 University
Middleton, WI 53562-3135
crandall@msbnrg.com

DATED: September 25, 2018
*259206

OCA Witness Crandall
EXHIBIT OCA 3-1

Résumé of

Geoffrey C. Crandall

Vice President and Principal

EDUCATION

B.S. in Business and Pre-Law, Western Michigan University, 1974.

Mr. Crandall has also completed courses at Michigan State University Graduate School, the University of Wisconsin-Madison and Wayne State University, in areas of federal taxation, accounting, management and the economics of utility regulation. Mr. Crandall also completed the examination for the National Conference of States on Building Codes and Standards Energy Auditor.

EXPERIENCE

Mr. Crandall joined MSB in January 1990. Mr. Crandall has addressed issues related to fuel and purchase power, natural gas, re-regulation, planning, regulatory issues, residential and low-income issues, energy efficiency and impacts of utility restructuring on customers in California, New York, Colorado, Iowa, and Michigan. He has analyzed and/or designed energy efficiency programs for residential customers in Michigan, Georgia, Wisconsin, Arizona, and New Orleans, and has conducted workshops on system planning, energy efficiency, low-income restructuring and energy efficiency issues in over 20 states, including Washington, Hawaii, Nevada, Kansas, Michigan, Rhode Island, California, Virginia, and New Orleans. Mr. Crandall has analyzed integrated resource plan and or energy efficiency programs in the states of Arizona, Georgia, Hawaii, Illinois, Maine, Michigan, Minnesota, North Carolina, Ohio, Pennsylvania, Utah, Washington State, California, Iowa, Montana, Colorado, Missouri, Virginia, Wisconsin, and Washington D.C.

Prior to joining MSB, Mr. Crandall was employed by the Michigan Public Service Commission from 1974 through 1989, where he served in several capacities including analyst in the rates and tariff section, Technical Assistant to the Chief of Staff, and as the Director of the Demand-Side Management Division. He had responsibilities that included rate and tariff review, rate cases, utilities uncollectible and bad debts, integrated resource planning, the development, implementation and monitoring of government- and utility-sponsored demand-side management, energy-efficiency and load response policies and programs. These activities involved customers in the residential, commercial, industrial and institutional sectors.

Mr. Crandall has dealt with a wide variety of regulatory issues beyond energy efficiency, including utility diversification, incentive regulation, utility billing practices, utility power plant maintenance and management of plant outages.

Mr. Crandall served as Chair of the NARUC Energy Conservation Staff Subcommittee from 1986-1989. He has lectured and made presentations to many groups on demand-side programs and least-cost planning, including two NARUC-sponsored least-cost planning conferences; the 1990 NARUC Regional Workshops on Least-Cost Utility Planning in Newport, Rhode Island and Little Rock, Arkansas; the Wisconsin Public Service Commission's Integrated Resource Planning Workshop; the 1988, 1989, and 1990 Michigan State University Graduate School of Public Utilities and the U.S. Department of Energy.

Mr. Crandall has testified before the: United States Congress, Michigan Legislature, Michigan Public Service Commission, North Carolina Utilities Commission, Public Service Commission of the District of Columbia, Illinois Commerce Commission, Maine Public Utilities Commission, Massachusetts Department of Public Utilities, Public Service Commission of Hawaii, Minnesota Public Service Commission, Iowa Public Service Commission, Georgia Public Service Commission, Public Utility Commission of Ohio, Virginia Public Service Commission, Wisconsin Public Service Commission, and the City Council of the City of New Orleans, Louisiana.

Mr. Crandall has written several articles published in the Public Utilities Fortnightly and Electricity Journal, Natural Gas Magazine, and a number of proceedings for the Biennial Regulatory Information Conference and the American Council for an Energy-Efficient Economy.

TESTIMONY

Case No. U-5531, (8/77), Consumers' Power Company electric rate increase application. Mr. Crandall served as the Staff Witness and recommended that the Applicant initiate the Residential Electric Customers' Information program.

Case No. U-6743, (3/81), Michigan Consolidated Gas Company. Mr. Crandall served as the Staff policy witness and recommended that the Commission approve a surcharge to cover all reasonable and prudent costs associated with Applicant's implementation of the Michigan Residential Conservation Services Program.

Case No. U-6819, (6/81), Michigan Power Company-Gas. Mr. Crandall served as the Staff policy witness and described the basis for the program and the expected level of activity, recommending that the Commission approve a surcharge to cover all reasonable and prudent costs associated with Applicant's implementation of the Michigan Residential Conservation Service Program.

Case No. U-6787, (6/81), Michigan Gas Utilities Company. Served as the Staff policy witness and described the basis for the program and the expected level of activity, recommending that the Commission approve a surcharge to cover all reasonable and prudent costs associated with the implementation of the Michigan Residential Conservation Service Program.

Case No. U-6820, (6/81), Michigan Power Company-Electric. Served as the Staff policy witness and reviewed the Applicant's request to operate the Michigan Residential Conservation Service Program. Although not mandated by federal law, Applicant chose to operate the program in conjunction with its other services offered to residential gas customers. Recommended the establishment of a surcharge to cover all reasonable and prudent costs associated with the operation of that program.

Case No. U-5451-R, (10/82), Michigan Consolidated Gas Company. Served as the Staff policy witness and described the Staff's position regarding Applicant's proposed adjustment of surcharge level. Recommended that the eligibility criteria for customers be adjusted to more accurately reflect proper fuel consumption and to include customers who would be likely to realize a seven-year return on their investment by installing flue-modification devices in conjunction with Applicant's financing program.

Case No. U-6743-R, (10/82), Michigan Consolidated Gas Company. Served as the Staff policy witness regarding the Applicant's proposed expenses and revenues, as well as the reasonableness of activity and expense levels in the company's projected period.

Case No. U-7341, (12/84), Detroit Edison Company, Request for Authority for Certain Non-Utility Business Activities. Represented the Staff's position during settlement discussions and sponsored the settlement agreement.

Case No. U-6787-R, (3/84), Michigan Gas Utilities Company. Served as the Staff witness regarding the Applicant's proposed expenses and revenues. This also included a review of the company's future expenses associated with the Energy Assurance Program, the Specialized Unemployed Energy Analyses, and the Michigan Business Energy Efficiency Program expenses.

Case No. U-8528, (3/87), Commission's Own Motion on the Costs, Benefits, Goals and Objectives of Michigan's Utility Conservation Programs. Represented the Staff on the costs and savings of conservation programs and the other benefits of existing programs, and described alternative actions available to the Commission relative to future energy-conservation programs and services and other conservation policy matters.

Case No. U-8871, et al., (4/88), Midland Cogeneration Venture Limited Partnership. For approval of capacity charges contained in a power-purchase agreement with Consumers' Power Company. Served as the Staff witness on Michigan conservation potential and reasonably achievable programs that could be operated by Consumers' Power Company, and testified to the potential impact of these conservation programs on the Company's request for use of its converted nuclear plant cogeneration project. Also recommended levels of demand-side management potential for the commercial, industrial and institutional sectors in Consumers' Power service territory.

Case No. U-9172, (1/89), Consumers' Power Company, Power-Supply Cost-Recovery Plan and Authorization of Monthly Power-Supply Cost-Recovery Factors for 1989. Served as Staff witness on the conservation potential and reasonably achievable programs that could be operated by Consumers' Power Company. Testified to the potential impact of these conservation programs

on the Company's fuel and purchase practices, its five-year forecast and the fuel factor. Recommended levels of demand-side management potential for the commercial, industrial and institutional sectors in Consumers' Power service territory as an offset to its more-expensive outside and internally generated power. Suggested that CPCO vigorously pursue conservation, demand-side management research, and planning and program implementation.

Case No. U-9263, (4/89), Consumers' Power Company Request to Amend its Gas Rate Schedule to Modify its Rule on Central Metering. Served as a Staff witness on the conservation effect of converting from individual metered apartments to a master meter. Suggested that the Commission continue its moratorium on the master meters, due to the adverse energy-conservation and efficiency impact.

Case No. E-100, (1/90), North Carolina Public Service Commission proceeding on review of the Duke Power Company's least-cost utility plan. Testified on behalf of the North Carolina Consumers' Council regarding utility energy-efficiency and demand-side management programs and the concept of profitability and implementation of demand-side management programs.

Case No. 889, (1/90), Public Service Commission of the District of Columbia. Testified on behalf of the Government of the District of Columbia in the Potomac Electric Power Company's application for an increase in its retail rates (general rate case). Sponsored testimony regarding the design and implementation and overall appropriateness of PEPCO's existing and proposed energy-efficiency and conservation programs.

Case No. 889, (4/90), Public Service Commission of the District of Columbia. Provided supplemental direct testimony and testified on behalf of the Government of the District of Columbia in the Potomac Electric Power Company's application for an increase in its retail rates (general rate case). Offered supplemental testimony regarding a more detailed review of PEPCO's existing pilot and full-scale energy-efficiency and conservation programs. Offered suggestions and recommendations for a future direction for PEPCO to pursue in order to implement more cost-effective and higher-impact energy-efficiency and conservation programs.

Case No. ICC Docket 90-004 and 90-0041, (6/90), Illinois Commerce Commission proceeding to adopt an electric-energy plan for Central Illinois Light Company (CILCO). Testified on behalf of the State of Illinois, Office of Public Counsel and the Small-Business Utility Advocate. Reviewed the CILCO electric least-cost plan filing and the conservation and load-management programs proposed in its filing. Sponsored testimony regarding my analysis of the proposed programs, and offered alternative programs for the Company's and the Commission's consideration.

Case No. D.P.U. 90-55, (6/90), Commonwealth of Massachusetts Department of Public Utilities. Testified on behalf of the Commonwealth of Massachusetts, Division of Energy Resources. Reviewed and analyzed Boston Gas' proposed energy-conservation programs that were submitted for pre-approval in its main rate case. In addition, suggested that it might consider implementation of other natural-gas energy- efficiency programs, and not award an economic incentive for energy-efficiency and conservation programs until minimum program-implementation standards are satisfied.

Case No. U-9346, (6/90), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency Association. Reviewed and analyzed the Consumers' Power Company rate-case filing related to energy-efficiency and demand-side management programs. Proposed alternative energy-efficiency programs and recommended program budgets and a cost-recovery mechanism.

Case No. 89-193; 89-194; 89-195; and 90-001, (6/90), Maine Public Utilities Commission. Testified on behalf of the Maine Public Advocate's Office. Reviewed the appropriateness of Bangor Hydro-Electric Company's existing energy-efficiency and demand-side management programs in the context of BHE's main rate case and request for approval to construct the Basin Mills Hydro-Electric dam. Reviewed the overall resource plan and suggested alternative programs to strengthen the energy-efficiency and demand-side management resource efforts.

Case No. 6617, (4/91), Hawaii Public Utility Commission. Testified on behalf of the Hawaii Division of Consumer Advocacy. Described what demand-side management resources are, why they should be included in the integrated resource planning process, and proposed the implementation of several pilot projects in Hawaii along with guidelines for the pilot programs.

Case No. E002/GR-91-001, (5/91), Minnesota Public Utilities Commission. Testified on behalf of Minnesotans for an Energy Efficient Economy. Assessed the DSM programs being operated or proposed by Northern States Power Company and made recommendations as to ways in which NSP could improve its DSM efforts.

Case No. 905, (6/91), Public Service Commission of the District of Columbia. Testified on behalf of the District of Columbia Energy Office. Responded to the energy-efficiency and load management aspects of Potomac Electric Company's filing and made several recommendations for DC-PSC action.

Case No. 6690-UR-106, (9/91), Public Service Commission of Wisconsin. Testified on behalf of The Citizens' Utility Board of Wisconsin. Assessed the DSM programs being operated or proposed by the Wisconsin Public Service Corporation, made recommendations as to the WPSCO energy efficiency programs, and suggested ways the company could improve its DSM efforts.

Case No. E002/CN-91-19, (12/91), Minnesota Public Utilities Commission. Testified on behalf of Minnesota Department of Public Service. Assessed the DSM potential and programs being operated or proposed by Northern States Power Company and made recommendations as to the potential for energy efficiency in the NSP service territory and ways in which NSP could improve its DSM efforts.

Case No. 912, (4/92), Public Service Commission of the District of Columbia. Testified on behalf of the Government of the District of Columbia in the Potomac Electric Power Company's application for an increase in its retail rates for the sale of electric energy. Testified regarding the reasonableness of DSM and EUM policy changes, the cost allocation of the DSM and EUM expenses, an examination of the prudence of management regarding the energy-efficiency

programs, and an examination of the appropriateness of the costs associated with energy-efficiency programs.

Case No. PUE 910050, (5/92), Virginia State Corporation Commission. Testified on behalf of the Citizens for the Preservation of Craig County regarding the need for the Wyoming-Cloverdale 765 kV transmission line. Specifically, addressed the adequacy of the DSM planning of Appalachian Power Company and Virginia Power/North Carolina Power. Made recommendations as to APCO and VEPCO's energy efficiency programs, and suggested ways the company could improve its DSM efforts.

Case No. EEP-91-8, (5/92), Iowa Utilities Board. Testified on behalf of the Izaak Walton League concerning the adequacy of Iowa Public Service Company's Energy Efficiency Plan. Reviewed the plan and suggested modifications to it.

Case No. 4131-U and 4134-U, (5/92), Georgia Public Service Commission. Testified on behalf of the Georgia Public Service Commission staff regarding the demand-side management portions of Georgia Power Company's and Savannah Electric and Power Company's Integrated Resource Plans. Testimony demonstrated that it is reasonable for the Commission to expect that the utilities can successfully secure substantial amounts of demand-side management resources by working effectively with customers.

Case No. 917, (8/92), Public Service Commission of the District of Columbia. Testified on behalf of the District of Columbia Energy Office in hearings on Potomac Electric Power Company's Integrated Resource Planning process. Addressed a number of program-specific issues related to PEPCO's demand-side management efforts.

Case No. 4132-U, 4133-U, 4135-U, 4136-U, (10/92), Georgia Public Service Commission. Testified on behalf of the Staff Adversary IRP Team of the Georgia PSC. Provided a critique of Georgia Power Company's and Savannah Electric and Power Company's proposed residential and small commercial DSM programs.

Case No. 4135-U, (3/93), Georgia Public Service Commission. Testified on behalf of the Staff Adversary IRP Team of the Georgia PSC. Provided a critique of Savannah Electric and Power Company's proposed Commercial and Industrial DSM programs.

Case No. R-0000-93-052, (12/93), Arizona Corporation Commission. Testified on behalf of the Arizona Community Action Association. Critiqued and made recommendations regarding the integrated resource plans and demand-side management programs of Arizona Public Service Company and Tucson Electric Power Company.

Case No. 934, (4/94), Public Service Commission of the District of Columbia. Filed testimony on behalf of the District of Columbia Energy Office in hearings concerning the Washington Gas Light Company (WGL) general rate case application to increase existing rates and charges for gas service. Testimony involved critiquing and reviewing WGL's least cost planning efforts and integration of DSM, marketing and gas supply efforts.

Case No. U-10640, (10/94), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency Association concerning the need to integrate DSM and load promotion analysis into MichCon's GCR planning process.

Case No. 05-EP-7, (3/95), Wisconsin Public Service Commission. Testified on behalf of the Citizens' Utility Board on level of utility DSM and program designs and strategies.

Case No. 05-EP-7, (3/95), Wisconsin Public Service Commission. Testified on behalf of the Wisconsin Community Action Program Association on low-income customers and utility DSM programs.

Case No. TVA 2020-IRP, (9/95), Tennessee Valley Authority. Testified on behalf of the Tennessee Valley Energy Reform Coalition. Assessed, critiqued and made recommendations regarding the integrated resource plans and demand-side management programs proposed by the Tennessee Valley Authority.

Case No. R-96-1, (10/95), Alaska Public Utilities Commission. Testified on behalf of the Alaska Weatherization Directors Association regarding the proposed standards and guidelines for integrated resource planning and energy efficiency initiatives under consideration in Alaska.

Case No. D95.9.128, (2/96), Montana Public Service Commission. Testified on behalf of the District XI Human Resources Council concerning the low-income energy efficiency programs offered by the Montana Power Company.

Case No. DPSC Docket No. 95-172, (5/96), Delaware Public Service Commission. Prepared draft testimony on behalf of the Low-Income Energy Consumer Interest Group regarding Delmarva Power & Light Company's application to revise its demand-side programs. The case was settled, with LIECIG obtaining funding for low-income energy efficiency programs, prior to testimony.

Case No. U-11076, (8/96), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Michigan Jobs Commission's recommendations regarding electric and gas reform. Discussed the implications of utility restructuring and the needs of residential and low-income households, and proposed regulatory and industry solutions.

Case No. 96-E-0897, (3/97), New York Public Service Commission. Prepared draft testimony for New York's Association for Energy Affordability regarding the impact of proposed utility restructuring plans on low-income customers. The case was settled in Spring 1997.

Case No. R-00973954, (7/97), Pennsylvania Public Utilities Commission. Testified on behalf of the Commission on Economic Opportunity regarding the economics of demand-side measures and programs proposed for implementation by Pennsylvania Power & Light Company.

Case No. 98-07-037, (7/98), California Public Utilities Commission. Testified on the California Alternative Rates for Energy and the Low Income Energy Efficiency programs regarding the

implementation and adoption of revisions to these programs necessitated by the AB 1890 and the Low Income Governing Board.

Case No. U-12613, (3/01), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Wisconsin Public Service Corporation application to implement PA 141 the electricity deregulation law. I reviewed the portions of the filing related to their provision of electric energy efficiency and load management.

Case No. U-12649, (3/01), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Wisconsin Electric Power Company and the Edison Sault Electric Company application to implement PA 141 Michigan's electricity deregulation law. I reviewed the portions of the filing related to their provision of electric energy efficiency and load management.

Case No. U-12651, (3/01), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Northern States Power Company – Wisconsin application to implement PA 141 the electricity deregulation law. I reviewed the portions of the filing related to their provision of electric energy efficiency and load management.

Case No. U-12652. (3/01), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Indiana Michigan Power Company d/b/a American Electric Power application to implement PA 141 the electricity deregulation law. I reviewed the portions of the filing related to their provision of electric energy efficiency and load management.

Case No. U-12725, (4/01), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Wisconsin Electric Power Company and the Edison Sault Electric Company application to increase its residential rates. I reviewed the portions of the filing related to their provision of electric energy efficiency and load management and recommended a significant increase in these activities.

Case No. U-13060, (12/01), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Michigan Consolidated Gas Company application for Approval of their Gas Cost Recovery Plan and Five-Year gas Forecast. I reviewed the filing and recommended the Commission reject the proposed GCR factor and suggested continuation of the existing GCR factor or adopt an adjusted MCAAA sponsored GCR factor. I also suggested a set-aside allocation be designated for low-income customers to ensure access to alternative gas providers under the applicant's customer choice program.

Case No. 6690-UR-114, (9/02), Wisconsin Public Service Commission. Testified on behalf of the Citizens Utility Board regarding the Wisconsin Public Service Corporation application to increase its electric and natural gas rates. I reviewed the portions of the filing related to their low-income assistance/weatherization and the proposed executive compensation incentive plan.

Case No. U-14401, (04/05), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Michigan Consolidated Gas Company application for Approval of their Gas Cost Recovery Plan and Five-Year gas Forecast. I reviewed the filing and recommended the Commission reject the proposed plan and suggested initiation of strategies that would lower the need to acquire expensive and unnecessary gas supplies.

Case No. U-14401-R, (10/05), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Michigan Consolidated Gas Company application re-opener Approval of their Gas Cost Recovery Plan and Five-Year gas Forecast. I reviewed the filing and recommended the Commission reject the proposed plan and suggested initiation of strategies that would lower the need to acquire expensive and unnecessary gas supplies.

Case No. U-14701, (02/06), Michigan Public Service Commission. Testified on behalf of the Michigan Environmental Council and The Public Interest Group In Michigan regarding the Consumers Energy Company application for Approval of a Power Supply Cost Recovery Plan and for Authorization of Monthly Power Supply Cost Recovery Factors for calendar year 2006. I reviewed the filing including the application, testimony, exhibits, discovery responses and submitted testimony recommending that the Commission not approve the five-year PSCR plan as filed due to the impacts related to the Palisades sale and the absence of alternative resources in the projected five-year resource portfolio.

Case No. U-14702, (02/06), Michigan Public Service Commission. Testified on behalf of the Michigan Environmental Council and The Public Interest Group In Michigan regarding The Detroit Edison Company application for authority to implement a Power Supply Cost Recovery Plan in its rate schedules for 2006-metered jurisdictional sales of electricity. I reviewed the application; testimony, exhibits and submitted testimony that recommended that the Commission not approve the proposed five-year PSCR plan as filed due because it was deficient in its selection of alternative resources in the projected five-year resource portfolio.

Case No. U-14992, (12/06), Michigan Public Service Commission. Testified on behalf of the Michigan Environmental Council and The Public Interest Group In Michigan regarding The Consumers Energy Company application for approval of the proposed Power Purchase Agreement in connection with the sale of the Palisades Nuclear Power Plant and other assets. The purpose of my testimony was to address the overall soundness of this application and proposal. I reviewed the application, testimony, exhibits and submitted testimony that recommended that the Commission not approve the proposed purchase power agreement and transfer the ownership of the nuclear plant and other assets.

Case No. 06-0800, (3/07), Illinois Commerce Commission. Provided testimony on behalf of the Illinois Citizens Utility Board regarding the Illinois electricity resource auction process. I assessed the existing resource/power supply auction based bidding process and recommended modifications and improvements to the Illinois resource acquisition mechanism.

Case No. 24505-U, (5/07), Georgia Public Service Commission. Testified on behalf of the Georgia Public Service Commission Advocacy staff regarding the demand-side management portions of Georgia Power Company's Integrated Resource Plans. Testimony demonstrated that it is reasonable for the Commission to approve the five proposed DSM programs and expect that Georgia Power can successfully secure considerably more demand-side management resources by working effectively with its customers.

Case No. U-14992, (11/07), Michigan Public Service Commission. Testified on behalf of the Michigan Environmental Council and The Public Interest Group In Michigan regarding The Consumers Energy Company rate application for approval of a rate increase and the recovery of energy efficiency programs and certain costs in connection with the sale of the Palisades Nuclear Power Plant and other assets. I reviewed the application, testimony, exhibits and submitted testimony that recommended that the Commission not approve the recovery of transaction costs involving the transfer the ownership of the nuclear plant and other assets and on various aspects of its proposed energy efficiency programs and proposed incentives.

Case No. 07-0540, (12/07), Illinois Commerce Commission. Provided testimony on behalf of the Environmental Law and Policy Center regarding the Commonwealth Edison Company application for approval of its proposed Energy Efficiency and Demand Response Plan. I assessed the proposed energy efficiency and demand response plan and recommended modifications and improvements to the proposed plan filing.

Case No. 07-0539, (12/07), Illinois Commerce Commission. Provided testimony on behalf of the Environmental Law and Policy Center regarding the Central Illinois Light Company d/b/a and Ameren CIPS CENTRAL ILLINOIS PUBLIC SERVICE COMPANY and Ameren CIPS ILLINOIS POWER COMPANY d/b/a Ameren IP application for approval of its proposed Energy Efficiency and Demand Response Plan. I assessed the proposed energy efficiency and demand response plan and recommended modifications and improvements to the proposed plan filing.

Case No. U-15415, (2/08), Michigan Public Service Commission. Testified on behalf of the American Association of Retired People regarding The Consumers Power Company application for approval for authority to implement a Purchase Power recovery plan, 5-year forecast, and monthly PSCR factors for the 12-month period calendar year 2008. I reviewed the application, testimony, exhibits and submitted testimony that recommended that the Commission adopt a more effective and less expensive resource acquisition procedure to help keep the cost of energy down in Michigan.

Case No. U-15417, (4/08), Michigan Public Service Commission. Provided testimony on behalf of the American Association of Retired People regarding The Detroit Edison Company for Authority to Implement a Power Supply Cost Recovery Plan in its Rate Schedule for 2008 Metered Jurisdictional Sales of Electricity. I reviewed the application, testimony, exhibits and submitted testimony that recommended that the Commission adopt a more effective and less expensive resource acquisition procedure to help keep the cost of energy down in Michigan.

Case No. U-15244, (7/08), Michigan Public Service Commission. Provided testimony on behalf of the Michigan Environmental Council and The Public Interest Group In Michigan regarding The Detroit Edison Company request for Authority to increase rates, amend its rate schedules and rules governing the distribution and supply of electric energy, and for miscellaneous accounting authority. I reviewed the application, testimony, and exhibits and submitted testimony that recommended that the Commission direct DECO to make modifications to its Integrate Resource Planning analysis.

Case No. EEP-08-2, (7-08), Iowa Public Utilities Board. Provided testimony on behalf of the environmental interveners regarding the request of the Mid American Energy Company for approval of an Energy Efficiency Plan. I made an assessment of the proposed energy efficiency and demand response plan and recommended modifications and improvements to the implementation strategy and proposed programs.

Case No. EEP-08-1, (8-08), Iowa Public Utilities Board. Provided testimony on behalf of the environmental interveners regarding the Interstate Power and Light Company request for approval of an Energy Efficiency Plan. I made an assessment of the proposed energy efficiency and demand response plan and recommended modifications and improvements to the proposed programs and implementation strategy.

Case No. 137-CE-147, (2-09), Public Service Commission of Wisconsin. Provided testimony on behalf of PRESERVE OUR RURAL LANDS regarding the Application of American Transmission Company, as an Electric Public Utility, to Construct a new 345 kV Line from the Rockdale Substation to the West Middleton Substation, Dane County, Wisconsin. I suggested modifications of the proposal and rejection of the approval of the line.

Case No. M2009-2093218, (8-09), Pennsylvania Public Utility Commission. Provided testimony on behalf of The Office Of Consumer Advocate regarding the West Penn Power Company d/b/a Allegheny Power Energy Efficiency and Conservation Plan request for plan approval. I analyzed the proposed plan and made an assessment of the proposed energy efficiency and demand response and cost recovery plan. I suggested modifications and improvements to the proposed programs as well as the proposed implementation strategy.

Case No. 09-1947-EL-POR, 09-1948-EL-POR, 09-1949-EL-POR, 09-1942-EL-EEC, 09-1943-EL-EEC, 09-1944-EL-EEC, POR, 09-580-EL-EEC, 09-580-EL-EEC, 09-580-EL-EEC, Public Utilities Commission of Ohio. Provided testimony on behalf of The Office Of The Environmental Law and Policy Center regarding the Ohio Edison Company, The Cleveland Electric Illuminating Company and the Toledo Edison Company for approval of their energy efficiency and peak demand reduction program portfolio and associated cost recovery mechanism and approval of their initial benchmark reports and in the matter of the energy efficiency and peak demand reduction programs. I reviewed, analyzed and assessed the appropriateness of the proposed plans, benchmark reports and proposed peak reduction program portfolio. I suggested modifications and improvements to the proposed programs. I also made recommendations regarding the proposed implementation strategy as well as accounting and program cost tracking.

Case No. U-16412, (10/10), Michigan Public Service Commission. Provided testimony on behalf of the Natural Resources Defense Council, Michigan Environmental Council and The Environmental Law and Policy Center regarding the Consumers Energy Company request to Amend its natural gas & energy efficiency Energy Optimization Plan. I reviewed the application, testimony, exhibits, discovery responses and submitted testimony that recommended modifications to the proposed Energy Optimization Plan.

Case No. 10-0570, (11/10), Illinois Commerce Commission. Provided testimony on behalf of the Environmental Law and Policy Center regarding the Commonwealth Edison Company application for approval of its proposed Energy Efficiency and Demand Response Plan. Assessed the proposed energy efficiency and demand response plan and recommended modifications and improvements to the proposed plan filing.

Case No. 10-0568, (11/10), Illinois Commerce Commission. Provided testimony on behalf of the Environmental Law and Policy Center regarding the Central Illinois Light Company d/b/a and Ameren CIPS CENTRAL ILLINOIS PUBLIC SERVICE COMPANY and Ameren CIPS ILLINOIS POWER COMPANY d/b/a Ameren IP application for approval of its proposed Energy Efficiency and Demand Response Plan. Assessed the proposed energy efficiency and demand response plan and recommended modifications and improvements to the proposed plan filing.

Case No. 10-0564, (11/10), Illinois Commerce Commission. Provided testimony on behalf of the Environmental Law and Policy Center regarding the People's Gas Light and Coke Company and North Shore Gas Company request for approval of its proposed Energy Efficiency Plan. Assessed the proposed energy efficiency and demand response plan and recommended modifications and improvements to the proposed plan filing.

Case No. 10-0567, (11/10), Illinois Commerce Commission. Provided testimony on behalf of the Environmental Law and Policy Center regarding the Northern Illinois Gas Company application for approval of its proposed Energy Efficiency Plan and approval of Rider 30, Energy Efficiency Plan Cost recovery and related changes to Nicor tariffs. Assessed the proposed energy efficiency and demand response plan and recommended modifications and improvements to the proposed plan filing.

Case No. M-2010-2210316, (3/11), Pennsylvania Public Utility Commission. I provided testimony on behalf of The Office Of Consumer Advocate regarding the UGI Utilities, Inc. Electric Division (UGI-Electric) request for Efficiency and Conservation Plan approval. I analyzed the proposed plan and made an assessment of the proposed energy efficiency and demand response and cost recovery plan. I suggested modifications and improvements to the proposed programs and implementation strategy.

Case No. 11-07026 and 11-07027, (11/11), Public Utilities Commission of Nevada. I provided testimony on behalf of the Bureau of Consumer Protection regarding both the Sierra Pacific Power Company and Nevada Power Company 2011 Annual Demand Side Management Update reports. I reviewed the filings and made recommendations regarding various aspects of demand response resources and demand side management portfolios.

Case No., U-16671 (01/12), Michigan Public Service Commission. I provided testimony on behalf of the Environmental Law and Policy Center regarding the reasonableness of the Detroit Edison Company's filing and assertions made by a witness regarding a net-to-gross factor relative to the 2010 and 2011 energy efficiency programs implemented in response to Public Act 295 of 2008.

Case Nos. P-2012-2320468, P-2012-2320480, P-2012-2320484, P-2012-2320450, (10/12), Pennsylvania Public Utility Commission. I provided testimony on behalf of The Office Of the Consumer Advocate regarding the application of Metropolitan Edison Company, Pennsylvania Electric Company, West Penn Power, Pennsylvania Power Company on the Energy Efficiency regarding the benchmarks established for the period June 1, 2013 through May 31, 2016. I analyzed the proposed adjustments of Phase II Energy Efficiency and Conservation target levels and energy efficiency acquisition costs.

Case No. Case Nos. 12-2190-EL-POR, 12-2191-EL-POR, 12-2192-EL-POR, (10/12) Application of Ohio Edison Company, The Cleveland Electric Illuminating Company and the Toledo Edison Company for Approval of their energy efficiency and peak demand reduction program portfolio plan for 2013-2015. I provided testimony on behalf of Ohio Environmental Council and The Environmental Law and Policy Center regarding the Ohio Edison Company, The Cleveland Electric Illuminating Company and the Toledo Edison Company for approval of their 2013-2015 energy efficiency and peak demand reduction program portfolio. I reviewed, analyzed and assessed the appropriateness of the proposed plans, benchmark reports and proposed peak reduction program portfolio. I suggested modifications and improvements to the proposed programs and made recommendations and proposed new approaches to the proposed implementation strategy.

Case No., 12-06052 and 12-06053 (10/12), Public Utilities Commission of Nevada, I provided testimony on behalf of the Attorney General of the State of Nevada, Bureau of Consumer Protection regarding both the Sierra Pacific Power Company and Nevada Power Company 2013-2015 Triennial Integrated Resource Plan covering the period 2013-2032 and Approval of its Energy Supply Plan for the period 2013-2015. I reviewed, analyzed and assessed the appropriateness of the proposed plans and proposed peak reduction portfolio. I suggested modifications and improvements to the proposed programs and made recommendations and proposed new approaches to the implementation strategy.

Case No. U-16434-R, (10/12), Michigan Public Service Commission. Provided testimony on behalf of the Michigan Community Action Agency Association regarding The Detroit Edison Company for Reconciliation of its Power Supply Cost Recovery Plan for 12-month Period Ending December 31, 2011. I reviewed the application, testimony, exhibits and submitted testimony that recommended that the Commission adopt a remedy in regards to several aspects of the Reduced Emission Fuels projects that Detroit Edison was involved in.

Case No. Docket No. M-2012-2334388 (12/12), Pennsylvania Public Utility Commission. I provided testimony on behalf of The Office of the Consumer Advocate regarding the Petition of PPL Electric Utilities Corporation for Approval of an Energy Efficiency and Conservation Plan. I analyzed the proposed plan and made an assessment of the proposed energy efficiency and demand response and cost recovery plan. I suggested modifications to the proposed programs and implementation strategy to enhance its effectiveness.

Case No. U-17097, (03/13) Michigan Public Service Commission. Provided testimony on behalf of the Michigan Community Action Agency Association regarding The Detroit Edison Company filing for Reconciliation of its Power Supply Cost Recovery Plan for 12-month Period Ending December 31, 2013. I reviewed the application, testimony, exhibits and submitted testimony recommending that the Commission adopt a remedy regarding the Reduced Emission Fuels projects that Detroit Edison was participating in.

Case No. U-17095, (04/13) Michigan Public Service Commission. Provided testimony on behalf of the Michigan Community Action Agency Association regarding The Consumers Electric Company Application for Approval of A Power Supply Cost Recovery Plan and for Authorization of Monthly Power Supply Cost Recovery Factors for 2013. I reviewed the application, testimony, and exhibits and submitted testimony recommending that the Commission reject the proposed five-year resource plan. I also recommend that the Commission prohibit CECO from collecting capital related investments for a pipeline in Zeeland, Michigan. I also recommended that CECO demonstrate to the Commission that the Palisades and MCV generation plants purchase power agreements are cost-effective, being complied with and are in the public interest.

Case No. EEP-2012-0001, (4-13), Iowa Public Utilities Board. Provided testimony on behalf of the environmental interveners regarding the Interstate Power and Light Company 2014-2018 Energy Efficiency Plan. I made an assessment of IPL's proposed resource planning as well their energy efficiency, renewable energy and demand response resources. I recommended modifications and improvements to the proposed programs, implementation and resource measurement strategy.

Case No. U-17131, (04/13), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Michigan Consolidated Gas Company application for Approval of their Gas Cost Recovery Plan and Five-Year gas Forecast and approval to implement a reservation charge. I reviewed the filing and recommended the Commission require MichCon to initiate procurement strategies that would reduce the heavy reliance that is being placed on the 75% VCA gas procurement strategy.

Case No. U-17133, (04/13), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Consumers Energy Company application for approval of its gas cost recovery plan and authorization of a gas cost recovery factor from April

2013- March 2014. I reviewed the filing and made recommendations regarding the Quartile Fixed Price Purchases Gas purchasing strategy used by CECO.

Case No. EEP-2012-0002, (6/13), Iowa Public Utilities Board. Provided testimony on behalf of the environmental interveners regarding the Mid American Energy Company 2014-2018 Energy Efficiency Plan. I made an assessment of MidAm's proposed resource planning as well their energy efficiency, renewable energy and demand response resources. I recommended modifications and improvements to the proposed programs, implementation and resource measurement strategy.

Case No. 13-0431-EL-POR (08/13), Public Utility Commission of Ohio. Provided testimony regarding the Application of Duke Energy Ohio, Inc. for Approval of its Energy Efficiency and Peak Demand Reduction Portfolio of Programs.
The testimony was provided on behalf of Ohio Environmental Council and The Environmental Law and Policy Center. Duke Energy Ohio, Inc. was seeking approval of their revised energy efficiency and peak demand reduction program portfolio. I analyzed and reviewed the appropriateness of the revised plan and proposed peak reduction program portfolio. I suggested significant additions and modifications to the proposed programs. I offered specific program recommendations and new elements be added to their programs and implementation strategy.

Case No. 13-0498, (10/13), Illinois Commerce Commission. Provided testimony on behalf of the Environmental Law and Policy Center regarding the request by Ameren Illinois for approval of its proposed Energy Efficiency and Demand Response Plan 3. Assessed the proposed energy efficiency and demand response plan and recommended modifications and improvements to the proposed plan filing.

Case No. 13-0499 (10/13), Illinois Commerce Commission. Provided testimony on behalf of the Environmental Law and Policy Center regarding the request by The Illinois Department of Commerce and Economic Opportunity for approval of its proposed Energy Efficiency Plan 3. Assessed the proposed energy efficiency plan and recommended modifications and improvements to the proposed plan filing.

Case No. 13-0495 (11/13), Illinois Commerce Commission. Provided testimony on behalf of the Environmental Law and Policy Center regarding the request by Commonwealth Edison application for approval of its proposed third Energy Efficiency Plan. I assessed the proposed energy efficiency plan and recommended modifications and enhancements to the proposed plan.

Case No. 13-0550 (12/13), Illinois Commerce Commission. Provided testimony on behalf of the Environmental Law and Policy Center regarding the request by North Shore Gas Company and The Peoples Gas Light and Coke Company for approval of its proposed second Energy Efficiency Plan. I assessed the proposed energy efficiency plan and recommended modifications and enhancements to the proposed plan.

Case No. 13-0549, (01/14), Illinois Commerce Commission. Provided testimony on behalf of the Environmental Law and Policy Center regarding the Northern Illinois Gas Company

D/b/a/ Nicor for approval of its proposed second Energy Efficiency Plan, Cost recovery and related changes to Nicor tariffs. I assessed the proposed energy efficiency plan and recommended modifications and improvements to the proposed plan filing.
Case No. U-17319, (06/14), Michigan Public Service Commission. Provided testimony on behalf of the Great Lakes Renewable Energy Association regarding the DTE Electric Company application for approval of its PSCR Plan 2014 - 2018. I reviewed the filing and made recommendations regarding the PSCR five-year forecast and plan.

Case No. U-17317, (08/14), Michigan Public Service Commission. Provided testimony on behalf of the Great Lakes Renewable Energy Association regarding the Consumers Energy Company application for approval of its PSCR Plan 2014 - March 2018. I reviewed the filing and made recommendations regarding the PSCR five-year forecast and plan.

Case No. U-17680, (03/15), Michigan Public Service Commission. Provided testimony on behalf of the Great Lakes Renewable Energy Association regarding the DTE Electric Company application for approval of its PSCR Plan 2015 - 2019. I reviewed the filing and made recommendations regarding the PSCR five-year forecast and plan.

Case No. U-17678, (04/15), Michigan Public Service Commission. Provided testimony on behalf of the Great Lakes Renewable Energy Association regarding the Consumers Energy Company application for approval of its 2015 – 2019 PSCR Plan. I reviewed the application, filing and related documents and offered suggestions to improve the proposed five-year PSCR forecast and plan.

Case No. U-17735, (04/15), Michigan Public Service Commission. Provided testimony on behalf of the Michelle Rison and the Residential Consumer Group regarding aspects of the Consumers Energy Company general rate case application for authority to increase its rates for the generation and distribution of electricity and other relief. I reviewed the general rate case application, filing and related documents regarding CECO's reliance on and implementation of an Advanced Metering Infrastructure to deliver services to its customers. I offered specific recommendations regarding tariffs and policies related to Advanced metering infrastructure.

Case No. U-17767, (05/15), Michigan Public Service Commission. Provided testimony on behalf of a number of residential customers of DTE Electric under the nomenclature of Dominic and Lillian Cusumano and the Residential Customer Group. I provided testimony regarding DTE Electric's general rate case application for authority to increase its rates for the generation and distribution of electricity and other relief. I reviewed the general rate case filing and issues related to DTE Electric's reliance on and implementation of an Advanced Metering Infrastructure. I offered specific suggestions to improve DTE Electric's tariffs, policies and procedures related to implementation of an advanced metering infrastructure.

Case No. Docket No. P-2014-2459362 (06/15), Pennsylvania Public Utility Commission. I provided testimony on behalf of The Office of the Consumer Advocate regarding the Petition of Philadelphia Gas Works for Approval of Demand-Side Management Plan for FY 2016-2020; and Philadelphia Gas Works Universal Service and Energy Conservation Plan for 2014-2016 52 Pa Code Section 62.4- Request for Waivers. I analyzed the proposed five-year DSM plan and made

an assessment of the proposed plan emphasizing the proposed conservation adjustment mechanism and the proposed performance incentives mechanisms. I suggested extensive modifications to the proposed Plan.

Case No. U-17792 (08/15), Michigan Public Service Commission. Provided testimony on behalf of the Great Lakes Renewable Energy Association. I provided testimony and exhibits regarding Consumers Energy Company proposed 2015 Biennial Renewable Energy Plan. I reviewed the Biennial Renewable Energy Plan, testimony, exhibits and supporting information related to Consumers Energy Company renewable resource strategy resulting from the enabling statute (Public Act 295 of 2008). I offered my opinion and assessment of the reasonableness of the proposed plan as well as specific recommendations to improve the 2015 Biennial Renewable Energy Plan as well as Consumers Energy Company's electric resource planning procedures.

Case No. U-17793 (08/15), Michigan Public Service Commission. Provided testimony on behalf of the Great Lakes Renewable Energy Association. I provided testimony and exhibits regarding the proposed DTE Electric Company 2015 Biennial Renewable Energy Plan. I reviewed the proposed Biennial Renewable Energy Plan, testimony, exhibits and supporting information related to the DTE Electric Company renewable resource strategy resulting from Public Act 295 of 2008. I offered my opinion and assessment of the reasonableness of the proposed plan and made specific recommendations for improvement of the 2015 Biennial Renewable Energy Plan as well as DTE Electric Company's annual PSCR plan development and electric resource planning procedures.

Case No. M-2015-2514767 (01/16). I provided testimony on behalf of The Office of the Consumer Advocate regarding the joint Petition of the First Energy Companies serving customers in Pennsylvania. I reviewed the proposed five-year Energy Efficiency and Conservation Plan and offered suggestions to modify and improve various programs proposed for the 2016-2020 Plans.

Case No. M-2015-2515691 (01/16). I provided testimony on behalf of The Office of the Consumer Advocate regarding the joint Petition of the PECO Energy Company serving customers in Pennsylvania. I reviewed the proposed five-year Energy Efficiency and Conservation Plan and offered suggestions to modify and improve various programs proposed for the Act 129 related Energy Efficiency and Conservation Plan for 2016 – 2020.

Case No. U-17920, (03/16), Michigan Public Service Commission. Provided testimony on behalf of the Great Lakes Renewable Energy Association regarding the DTE Electric Company application for approval of its PSCR Plan 2016 – 2020. I reviewed the filing and made recommendations regarding the PSCR five-year forecast and plan.

Case No. U-17918, (03/16), Michigan Public Service Commission. Provided testimony on behalf of the Great Lakes Renewable Energy Association regarding the Consumers Energy Company application for approval of its PSCR Plan 2016 – 2020. I reviewed the application,

filing and supporting materials and made recommendations regarding the PSCR five-year forecast and plan.

Case No. U-18014, (07/16), Michigan Public Service Commission. Provided testimony on behalf of the Great Lakes Renewable Energy Association regarding the DTE Electric Company general rate case application for approval to raise rates. I reviewed the filing and made recommendations regarding inclusion of a corporate tax deferred debit, policies and tariffs related to smart meters and DTE's transition to an automated meter infrastructure.

Case No. U-17087 (Remand), (08/16), Michigan Public Service Commission. Provided testimony on behalf of the Residential Consumer Group regarding the Consumers Energy Company application to increase its rates for the generation and distribution of electricity. I reviewed the filing regarding the support and substantiation for the opt-out tariff that is included and approved for Consumers Energy Company. I made a series of specific recommendations regarding the lack of substantiation for the up-front and monthly charges (both existing and proposed) contained within the non-transmitting meter tariff (among other tariffs) and policies related to smart meters and DTE's transition to an automated meter infrastructure.

Case No. U-18111, (08/16), Michigan Public Service Commission. The purpose of my testimony was to address the reasonableness of Detroit Edison Company's (DTE) requested changes to its Biennial Renewable Energy Plan which had been previously approved in Case No. U-17793. I also recommended procedural changes in an effort to enhance the review, assessment and ultimately the integration of additional renewable resources into DTE's provision of electricity to its customers in the future.

Case No. U-18090, (10/16), Michigan Public Service Commission. Provided testimony on behalf of the Great Lakes Renewable Energy Association regarding the Consumers Energy response to the Commission's own Motion to establish a method and avoided cost for comply with the Public Utilities Regulatory Policy Act of 1978, 16 USC 2601 et seq. I reviewed the filing including Consumers Energy proposal for their preferred avoid cost methodology and made recommendations as to an appropriate approach and methodology for deriving avoided costs to be relied upon by Qualifying Facilities in Michigan.

Case No. U-18402 (04/18), I provided testimony on behalf of the Great Lakes Renewable Energy Association regarding Consumers Energy Company PSCR application, 2018-2022 five-year plan and filing materials. Based on my review I offered suggestions and recommendations regarding the PSCR level, impacts of residential, commercial and industrial customer owned renewable resources in its 2018-2022 PSCR resource mix.

Case No. M-2017-2640306 (04/18), The Pennsylvania Office of Consumer Advocate regarding a Peoples Natural Gas Company proposed the Energy Efficiency and Conservation Plan. I reviewed the proposed five-year Combined Heat and Power, Energy Efficiency and Conservation Plan proposed by Peoples Natural Gas Company. I sponsored direct, rebuttal and surrebuttal testimony, which addressed the design of the programs due to the deficiencies that were embodied in the proposed Plan.

Case No. U-18403 (04/18), I provided testimony on behalf of the Great Lakes Renewable Energy Association regarding the Application of DTE Electric Company for authority to Implement a Power Supply Cost Recovery Plan in its Rate Schedules For 2018 Metered Jurisdictional Sales of Electricity. Based on my review I offered recommendations regarding the reasonableness of its PSCR factor level and resource mix proposed for its 2018-2022 PSCR resource mix.

Case No. U-18231 (04/18), I provided testimony on behalf of the Great Lakes Renewable Energy Association regarding Consumers Energy Company Renewable Energy Plan application. I reviewed the proposed renewable energy plan and related filing materials. Based on my review I offered suggestions and recommendations regarding to improve the REP Plan development process. I recommended that the REP Plan development process be coordinated with Act 304 as well as Integrated Resource Planning processes and general rate proceedings to result in a more beneficial resource mix to better serve CECO ratepayers.

Case No. U-18232 (07/18), I provided testimony on behalf of the Great Lakes Renewable Energy Association regarding The Detroit Edison Company Biennial Renewable Energy Plan application. I reviewed the proposed renewable energy plan and related filing materials. Based on my review I offered suggestions and recommendations regarding to improve the REP Plan development process. I recommended that the REP Plan development process be coordinated with Act 304 as well as Integrated Resource Planning processes and general rate proceedings to result in a more beneficial resource mix which would benefit Detroit Edison Company ratepayers.

Case No. M-2017-2640306 (09/18), The Pennsylvania Office of Consumer Advocate regarding a Peoples Natural Gas Company proposed the Energy Efficiency and Conservation Plan. I reviewed the proposed five-year Combined Heat and Power, Energy Efficiency and Conservation Plan proposed by Peoples Natural Gas Company. I offered Supplemental Surrebuttal testimony with suggestions for energy efficiency program and plan improvements.

In addition, I have served the following public sector clients since 1990.

Client	**Nature of Service**
Alaska Housing Finance Corporation	Analysis of energy efficiency, system planning and applicability of Energy Policy Act standards to Alaska resource selection process.
California Low Income	In conjunction with AB 1890 the state's restructuring statute

Governing Board	provided analyses of options to deliver energy efficiency and assistance programs to low-income households in a restructured utility environment. Assisted the CPUC and Low Income Governing Board in developing low-income energy assistance and energy efficiency programs, implementation methods and procedures under interim utility administration.
Conservation Law Foundation of New England	Provided technical support to the collaborative working groups with Boston Edison, United Illuminating, Eastern Utilities Association, and Nantucket Electric regarding system planning approaches, energy efficiency programs and resource screening.
District of Columbia Public Service Commission	Testimony regarding demand-side management, least cost planning principles.
Germantown Settlement, Philadelphia	Analysis and technical support regarding business structure and market to aggregate load and/or provide energy efficiency and energy assistance services to low-income households.
City of New Orleans	Developed least cost planning rules, guided a public working group to develop demand-side programs, and developed a low income, senior citizens energy efficiency program.
Oak Ridge National Laboratory	Prepared an economic analysis of the customer impact from various electricity restructuring configurations for the State of Ohio
Ohio Office of Consumer Council	Analyzed two utilities' long-range plans and energy efficiency resource options. Analyzed the Dominion East Gas Company application to be relieved of the merchant function.
Ontario Energy Board	Developed demand-side management programs and evaluated need for natural gas integrated resource planning rules.
U.S. Environmental Protection Agency	Developed handbook, "Energy Efficiency and Renewable Energy: Opportunities from Title IV of the Clean Air Act", which focuses on how energy efficiency and renewables relate to acid rain compliance strategies.
U.S. Environmental Protection Agency and U.S. Department of Energy	Analyzed and compared utility supply- and demand-side resource selection for Clean Air Act compliance on the Pennsylvania-New Jersey-Maryland (PJM) interconnection.
Washington State	Natural Gas energy conservation program design involving

Weatherization Directors	Cascade Natural Gas Company

OCA Witness Crandall
EXHIBIT OCA 3-2

Application of Transource Pennsylvania LLC
Independence Energy Connection-East & West Projects
Docket Nos. A-2017-2640195 and A-2017-2640200

Interrogatories of the Office of Consumer Advocate
Set XIII
(Responses dated 5/14/2018)

Data Request OCA-XIII-09:

According to Monitoring Analytics' PJM State of the Market Reports (http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2017.shtml), under the Section titled "Congestion and Marginal Losses," the cost associated with the AP South constraint dropped dramatically between 2014 and 2015. The average congestion cost at AP South was 8 times higher in 2012-2014 than it was in 2015-2017. The same dramatic drop also occurred in the number of hours of congestion from the day ahead and real time perspectives between 2014 and 2015. Please describe in detail the change in circumstances that led to these dramatic changes.

Response:

PJM has not conducted analysis to identify the unique causes of AP South Reactive Interface congestion each year, 2012 through 2017. Power flow on the transmission lines comprising the AP South Reactive Interface can vary by hour, month, season, and year based on a number of parameters as described in Mr. McGlynn's testimony at page 24, lines 1 through 15. For information purposes, congestion on the system can be affected by fuel prices, including gas and system topology. The Company further notes, consistent with PJM's FERC-approved planning process and PJM's Manual 14B, that the model used by PJM to conduct its market efficiency analysis reflects projected changes to these inputs, as well as system topology changes approved by the PJM Board, among many other factors.

PJM analysis that determined that Project 9A is needed as a market efficiency project in PJM's RTEP was based on forward-looking annual production cost across 8,760 hours for four discrete years, not based on the historical congestion experienced by PJM from 2012 through 2017.

Witness: Paul F. McGlynn

OCA Witness Crandall
EXHIBIT OCA 3-3

Application of Transource Pennsylvania LLC
Independence Energy Connection-West Project
Docket No A-2017-2640200

Interrogatories of the Office of Consumer Advocate
Set IV
(Responses dated 3/8/2018)

Data Request OCA-IV-24:

Have PJM and electric utilities promoted efforts and policies to encourage increased reliance on energy efficiency, demand response, wind energy, solar PV energy, and distributed resources as a means to mitigate congestion in Maryland? If so, what actions have been taken by PJM and what is the expected impact? If not, why not?

Response:

The Company lacks information to form a belief about the conduct of other electric utilities. The Company further states that levels of energy efficiency, demand response, wind resources, solar resources, and other distributed energy resources are assumptions incorporated into PJM's RTEP at the start of the RTEP process cycle pursuant to PJM's Operating Agreement, Schedule 6, 1.5.3. More information can be found regarding PJM's support for variable resources through the following link: https://www.pjm.com/-/media/about-pjm/newsroom/fact-sheets/support-variable-resources.ashx?la=en

Witness: Paul F. McGlynn

Application of Transource Pennsylvania LLC
Independence Energy Connection-West Project
Docket No A-2017-2640200

Interrogatories of the Office of Consumer Advocate
Set IV
(Responses dated 3/8/2018)

Data Request OCA-IV-29:

Have PJM and electric utilities promoted efforts and policies to encourage increased reliance on energy efficiency, demand response, wind energy, solar PV energy, and distributed resources as a means to mitigate congestion in Virginia? If so, what actions have been taken by PJM and what is the expected impact? If not, why not?

Response:

Please see the Company's response to OCA-IV-24.

Witness: Paul F. McGlynn

17

16820119v1

Application of Transource Pennsylvania LLC
Independence Energy Connection-West Project
Docket No A-2017-2640200

Interrogatories of the Office of Consumer Advocate
Set IV
(Responses dated 3/8/2018)

Data Request OCA-IV-39:

Have PJM and electric utilities promoted efforts and policies to encourage increased reliance on energy efficiency, demand response, wind energy, solar PV energy, and distributed resources as a means to mitigate transmission congestion and loads on the transmission grid in the District of Columbia? If so, please provide, If not, why not?

Response:

Please see the Company's response to OCA-IV-24.

Witness: Paul F. McGlynn

OCA Witness Crandall
EXHIBIT OCA 3-4

Application of Transource Pennsylvania LLC
Independence Energy Connection-East & West Projects
Docket Nos. A-2017-2640195 and A-2017-2640200

Interrogatories of the Office of Consumer Advocate
Set XIII
(Responses dated 5/14/2018)

Data Request OCA-XIII-14:

Please describe how PJM considers the impact of state-approved energy efficiency programs in its planning. For example, if the Pennsylvania PUC approves a Pennsylvania utility's energy efficiency program, i) how does PJM consider the impact of that program on PJM's planning and Plans? ii) Are the energy efficiency resources subject to PJM's Auction and clearing process completely independent of and in addition to the resources included in the state-approved energy efficiency programs? iii) Please explain.

Response:

Please refer to the Company's responses to OCA IV-06, OCA IV-24, OCA IV-45, OCA IV-46, and OCA IV-47. Please also refer to additional information regarding PJM's support for variable resources through the following link: [https://www.pjm.com/-/media/about-pjm/newsroom/fact-sheets/support-variable-resources.ashx?la=en]

i. Please refer to the Company's response to OCA XIII-11. PJM has not conducted studies to identify the impact of existing or imminent state-approved utility programs for energy efficiency, demand response, CHP or renewable resources as it relates to the need for Project 9A.

   Notwithstanding, the Company further states that whether or not a resource is driven by a state program does not affect how capacity resources are reflected in PJM's applicable forecasts. From a PJM planning perspective, capacity resources are incorporated into the RTEP consistent with established processes and business rules as described in Manual 14B, "PJM Region Transmission Planning Process": [http://pjm.com/-/media/documents/manuals/m14b.ashx].

ii. Please refer to the Company's response to subpart i.

iii. Please refer to the Company's response to subpart i. Please also refer to the Company's response to OCA XIII-11.

Witness: Paul F. McGlynn

OCA STATEMENT NO. 3SR

2/26/19 Hbg

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

Application of Transource Pennsylvania, LLC for approval of the Siting and Construction of the 230 kV Transmission Line Associated with the Independence Energy Connection - East and West Projects in portions of York and Franklin Counties, Pennsylvania.	:	Docket No. A-2017-2640195 Docket No. A-2017-2640200
Petition of Transource Pennsylvania, LLC for a finding that a building to shelter control equipment at the Rice Substation in Franklin County, Pennsylvania is reasonably necessary for the convenience or welfare of the public.	:	P-2018-3001878
Petition of Transource Pennsylvania, LLC for a finding that a building to shelter control equipment at the Furnace Run Substation in York County, Pennsylvania is reasonably necessary for the convenience or welfare of the public.	:	P-2018-3001883
Application of Transource Pennsylvania, LLC for approval to acquire a certain portion of the lands of various landowners in York and Franklin Counties, Pennsylvania for the siting and construction of the 230 kV Transmission Line associated with the Independence Energy Connection – East and West Projects as necessary or proper for the service, accommodation, convenience or safety of the public.	:	A-2018-3001881, *et al.*

SURREBUTTAL TESTIMONY OF

GEOFFREY C. CRANDALL

ON BEHALF OF

THE OFFICE OF CONSUMER ADVOCATE

JANUARY 30, 2019

I. QUALIFICATIONS

Q. What is your name and business address?

A. My name is Geoffrey C. Crandall. My business address is MSB Energy Associates, Inc., 6907 University Avenue #162, Middleton, Wisconsin 53562.

Q. On whose behalf are you testifying today?

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

Q. Are you the same Geoffrey Crandall that submitted direct testimony in this docket?

A. Yes.

Q. What is the purpose of your Surrebuttal testimony?

A. The purpose of my Surrebuttal testimony is to respond to the testimony of several Transource Pennsylvania, LLC (TS) witnesses, specifically Witnesses Weber and Ali and PJM Witnesses Horger and Herling who opposed or took exception to portions of my Direct Testimony that was filed in this docket.

II. SURREBUTTAL TESTIMONY

Q. What are your conclusions and recommendations?

(1) Non-transmission alternatives exist and are available which could reduce the need for the IEC Project and PJM should recognize and include non-transmission alternatives in its assessment gauging the need for the IEC Project.

(2) Energy efficiency, renewable energy resources, distributed resources can offset transmission congestion during any hour, day, month, season and at any point during the year and this was not reflected in PJM's analysis.

Q. How is your testimony organized?

A. My testimony is organized to address six major themes. These are:

I. TS witnesses misconstrued or misstated my testimony.

II. TS witnesses discounted State energy initiatives that could substantially effect congestion.

III. TS witnesses criticized that I focused my assessment of non-transmission alternatives to the south and east of the interface.

IV. TS witnesses stated that no bids were received for non-transmission alternatives.

V. TS witnesses stated that historical data is irrelevant because modeling was done on a forward-looking basis.

VI. TS witnesses criticized my statement that they failed to provide useful information regarding the timing of the congestion events.

I. Misconstruing or misstating my testimony

Q. Please explain your concerns regarding TS witnesses misconstruing or misstating portions of your testimony.

A. 1) Witness Weber (see page 27 Rebuttal Testimony) asserted that I sponsored a forecast regarding energy efficiency resources. My Direct testimony addressed non-transmission alternatives including energy efficiency, Combined Heat and Power (CHP) and Renewable Energy. The potential impact of the non-transmission alternatives was identified to demonstrate the potential significance of PJM's failure to consider them. However, I did not offer or sponsor a specific forecast and I never intended to do so. In my direct testimony I conclude that even though energy efficiency resources, renewable resources and CHP resources are not only available, but being implemented as a result of economics and governmental policy, these non-transmission alternatives were not and have not yet been integrated into PJM's assessment leading to the approval of the IEC Project.

PJM erred by not including an in-depth analysis and the integration of non-transmission alternatives.

2) Witness Herling (page 32) asserted that I concluded that as a result of the availability of non-transmission alternatives such as solar and wind that the IEC project is no longer needed. The purpose of my direct testimony was to review and assess whether or not non-transmission alternatives would mitigate congestion. I concluded that non-transmission resources, which were not considered by PJM, have a significant role to play. I also concluded that PJM failed to consider these non-transmission alternatives, and particularly the changing economics and governmental policies that will cause them to be implemented. I am not providing a forecast of the amounts of these non-transmission alternatives, but I am pointing out that some level of these non-transmission alternatives will occur and will have an impact on the cost-benefit analysis for this Project. PJM does not consider these non-transmission alternatives, has not quantified the role these non-transmission alternatives are expected to play, and has not quantified the role these non-transmission alternatives are likely to play due to changing economics and policies. My testimony was not a forecast of the levels of non-transmission alternatives that would occur; my testimony is pointing out that PJM based its Project 9A proposal on an unreasonable and unrealistic forecast of non-transmission alternatives. Witness Herling misconstrued and misstated my testimony.

(3) Witness Ali (page 14) also asserted that I concluded that the IEC Project was not necessary due to the implementation of energy efficiency resources, renewable resources and CHP. As stated above, the purpose of my direct testimony was to identify viable non-transmission alternatives that would mitigate or eliminate congestion and to

demonstrate that the potential exists. PJM erred by not considering non-transmission alternatives. Witness Ali misconstrued and misstated my Direct Testimony.

4) In addition, Witness Weber (see pages 28 & 29) indicated that he reviewed the Dominion Energy Integrated Resource Plan ("Dominion IRP") and agreed that Dominion expects that its customers would reduce overall annual energy usage by 805 GWH and peak demand by 304 MW's by 2033. He testified that I did not mention that Dominion projects a capacity and energy shortfall throughout much of the IRP Plan period even with the inclusion of capacity and energy reductions resulting from the Virginia Grid Transformation and Security Act of 2018. I have a two-part response to his criticism. First, as I indicated on page 24 of my Direct Testimony, Dominion is not limited to energy efficiency to address resource needs. As shown on Table 2 on page 24 of my direct testimony, there are a considerable number of non-transmission alternatives, such as renewable energy, combined heat and power and energy efficiency that could mitigate congestion and address Dominion's capacity shortfall. The point of my direct testimony is that PJM did not consider these non-transmission resources in issuing its 2014/2015 Long Term Proposal Window, selecting Project 9A, and continuing to propose Project 9A.

Witness Weber cites the Dominion Integrated Resource Plan and argues that there is a sizeable gap in 2033 between Dominion's energy requirement and the 805 GWH's of energy efficiency resources that have been included in the Dominion Energy Integrated Resource Plan. Table 2 of my direct testimony included the potential impact of non-

1 transmission alternative resources on Dominion Energy, PEPCO and BG&E. However,
2 Witness Weber only selected Dominion's energy efficiency resources and excluded the
3 7,065 GWH impact on Dominion of Combined Heat and Power and Renewable Energy
4 resources as were depicted on Table 2. The combined impact as shown for Dominion
5 totaled 7,870 GWH, nearly 10 times greater than the energy efficiency portfolio
6 referenced by Witness Weber.

7 The second part of my response to Witness Weber's observation about Dominion's
8 capacity shortfall in 2033 is that in PJM's modeling, a capacity shortfall cannot exist.
9 PJM's models must dispatch generation resources to meet the loads, subject to the ability
10 of the transmission network to deliver the power. PJM, in its 15-year assessment of
11 Project 9A, could not have modeled Dominion to have a capacity shortfall with unserved
12 energy in Dominion's service territory. It is ironic that PJM witnesses repeatedly argue
13 that PJM cannot rely on speculative resources, that it can only rely on those that are
14 committed, that State policies and mandates cannot be relied upon for its planning, and
15 uses those types of arguments to urge the Commission to dismiss my point that PJM has
16 not considered viable non-transmission alternatives that I have identified. Witness Weber
17 testified that I did not address the capacity and energy shortfall (even though he focused
18 only on the energy efficiency component and ignored the renewable energy and CHP
19 components that I provided), and yet PJM must speculate how Dominion is going to
20 address the capacity shortfall up through 2033. I say, "must speculate" because if
21 Dominion identifies it as a capacity shortfall in its plan, by definition that means
22 Dominion has not determined how it will close the capacity shortfall, and that means
23 PJM had to speculate about how Dominion would meet its load requirements out through

2033. PJM's speculation about what Dominion might do could increase the apparent congestion, or decrease it.

II. State energy initiatives discounted by PJM

Q. Please explain your response to witness Herling who addressed your observation and conclusion that the impacts of various state energy initiatives were not integrated into PJM's decision making process resulting in the selection of Project 9A.

A. Witness Herling on page 33 of his rebuttal testimony states that "Resources that are related to the achievement of public policy initiatives that are not committed through agreements or cannot be forecasted based on sales trends are not included, as PJM cannot count on the resource to be placed into service." PJM applies a double standard, claiming here that PJM cannot count on a resource to be placed into service if it is not committed through agreements when it applies to energy efficiency, renewable energy and CHP resources, but then speculates how Dominion will fill a capacity shortfall in 2033.

Transource and PJM witnesses, however, also offer conflicting perspectives on this issue. In Data Request OCA-XIII-14 (Exhibit OCA 3-4), OCA asked, "Please describe how PJM considers the impact of state-approved energy efficiency programs in its planning. For example if the Pennsylvania PUC approves a Pennsylvania utility's energy efficiency program, i) how does PJM consider the impact of that program on PJM's planning and Plans?" Mr. McGlynn responded, "Please refer to the Company's response to OCA XIII-

11. PJM has not conducted studies to identify the impact of existing or imminent state-approved utility programs for energy efficiency, demand response, CHP or renewable resources as it relates to the need for Project 9A."

Q. Do you have another indication that PJM's decision-making process fails to consider the impacts of non-transmission alternatives in PJM's project selection process?

A. Yes. In OCA-IV-24 (Exhibit 3-3) OCA asked the question "Have PJM and electric utilities promoted efforts and policies to encourage increased reliance on energy efficiency, demand response, wind energy, solar PV energy, and distributed resources as a means to mitigate congestion in Maryland? If so, what actions have been taken by PJM and what is the expected impact? If not, why not?" Mr. McGlynn responded as follows: "The Company lacks information to form a belief about the conduct of other electric utilities. The Company further states that levels of energy efficiency, demand response, wind resources, solar resources, and other distributed energy resources are assumptions incorporated into PJM's RTEP at the start of the RTEP process cycle pursuant to PJM's Operating agreement, Schedule 65, 1.5.3. ...." As Mr. McGlynn indicated in his response to OCA IV-24 (Exhibit 3-3), PJM lacks information to form a belief about the conduct of other electric utilities. Without the basic information PJM would be unable to assess the non-transmission alternatives and the relevant activities of the electric distribution utilities served by PJM and incorporate them into the RTEP.

Q. Do other TS witnesses agree with Mr. McGlynn's response?

1 A. No. In sharp contrast Witness Ali indicated (see page 14 of his rebuttal testimony) that
2 "PJM's transmission planning process already appropriately takes into consideration the
3 resources, including renewable generation, energy efficiency, and CHP, that can be
4 reasonably expected to be present during the planning horizon."

5 We have three statements from three Witnesses on the consideration of energy
6 efficiency/renewable energy/CHP, especially as resources driven by State policy and
7 mandates that could alleviate congestion. One says PJM cannot rely on it unless it is in a
8 committed agreement. One says that PJM has not conducted studies to identify the
9 potential impact of State policies/mandates. One says the PJM planning process already
10 takes it into full consideration. Based on my review of PJM's filing to date and responses
11 to Data requests it is my understanding that PJM has not conducted studies as a means to
12 identify the impact of existing or imminent state-approved utility programs for energy
13 efficiency, demand response, CHP or renewable resources as it relates to the need for
14 Project 9A. Therefore impacts of legislative or utility company initiatives such as the
15 passage of an energy efficiency law e.g., Virginia's Grid Transformation and Security
16 Act of 2018, have not been included in their analysis which led to the selection of Project
17 9A.

18

19 **Q. Beyond the Virginia initiatives are there any other relevant developments that PJM**
20 **has not included in its decision making process it used to select Project 9A?**

21 A. Yes, in January 2019 the District of Columbia's Mayor Bowser signed into law the
22 "Clean Energy DC Omnibus Act of 2018". See Exhibit GCC-SR1. This law established

a goal of making significant improvements to the energy efficiency of existing buildings in the District and the law also mandates that 100% of the electricity sold in the District come from renewable sources by 2032. The impacts resulting from the Clean Energy DC Omnibus Amendment Act of 2018 have not been integrated into the analysis PJM relied upon in the selection of Project 9A.

Q. What is your overarching concern mentioned above regarding PJM's failure to include non-transmission alternatives in its decision to select Project 9A?

A. Transource and PJM have sponsored witnesses who have presented conflicting positions in their testimony and in response to data requests submitted to them by OCA. My point is that non-transmission alternatives exist which could reduce the need for the IEC Project and should be included in the selection assessment.

III. Viability of non-transmission alternatives to the north and west

Q. Please explain your response to witness Herling's comments that you did not address the viability of Non-Transmission Alternatives in the North and West portions of the transmission system in lieu of or in addition to the South and East areas.

A. Witness Herling (see page 33), stated that "Mr. Crandall also seems to focus on purported non-transmission alternatives in Maryland and Virginia but ignores the potential for

additional non-transmission alternatives to the north and west of the AP South interface, which will continue to develop through the normal course of market activity in the generation interconnection queue and would further increase congestion. Mr. Crandall's conclusion that the need for Project 9A can be eliminated completely by non-transmission alternatives is unsupported and inaccurate."

In the Application PJM represented Project 9A to be a market efficiency project because the transmission network on the AP South Reactive Interface is constrained impeding generation resources from being dispatched in economic order under certain conditions. First, PJM generally describes the congestion as caused by transmission constraints on power flow from the north and west to the south and east. The focus of my testimony was to review plans to reduce congestion and power costs to the east and south of the AP South Reactive Interface. My direct testimony is that reducing energy demands to the south and east, by introducing non-transmission alternatives, such as energy efficiency, renewable energy and CHP in the region south and east of the constraint, would reduce power flows and alleviate the frequency and magnitude of the constraints. It is logical that I look to the south and east for a solution, rather than to the north and west to further exacerbate the problem.

Q. What could be done to encourage the development of non-transmission resources to the south and east, where they would alleviate constraints on the AP South Reactive Interface?

A. Non-transmission resources can be encouraged through state and local government policies, improved economics for renewable resources to replace or supplement existing generation, and through locational marginal pricing.

Q. Please explain the role of locational marginal pricing.

A. PJM's LMP works to situate resources in the locations most affected by congestion on the transmission system. Constrained areas include congestion costs, meaning that resources located in those areas should have higher value than those located in other regions. Thus, it should be more profitable for the developer to build supply, whether renewable resources or natural gas-fired combined cycle plants, in the constrained area rather than the lower LMP area. It would in this case encourage generation to be built to the south and east of the interface rather than the north and west.

Q. Please expand on the role of improved economics of renewable resources.

A. Generally, the economics of renewable resources, such as solar photovoltaics, are improving to the point where they are often the least cost resource. As such, these resources will replace or supplement existing generation and new generation, which may have previously been fossil-based. Locating these resources in the high price side of the constraint will result in them being dispatched before power from the north and west, and thus would alleviate the congestion across the AP South Reactive Interface.

The United States Department of Energy Lawrence Berkley National Laboratory (LBNL) issued a report entitled "Utility-Scale Solar, Empirical Trends in Project Technology,

Cost, Performance, and PPA Pricing in the United Stated – 2018 Edition" in September 2018. The report found declining Purchased Power Agreement prices, (with many outside of California and the Southwest), including a few priced in the low $20/MWH range. This makes the all-in cost of these resources competitive with the operating cost of existing units, meaning that it would be cheaper to build and operate utility scale solar photovoltaic systems than to only operate many other resources on the existing system.

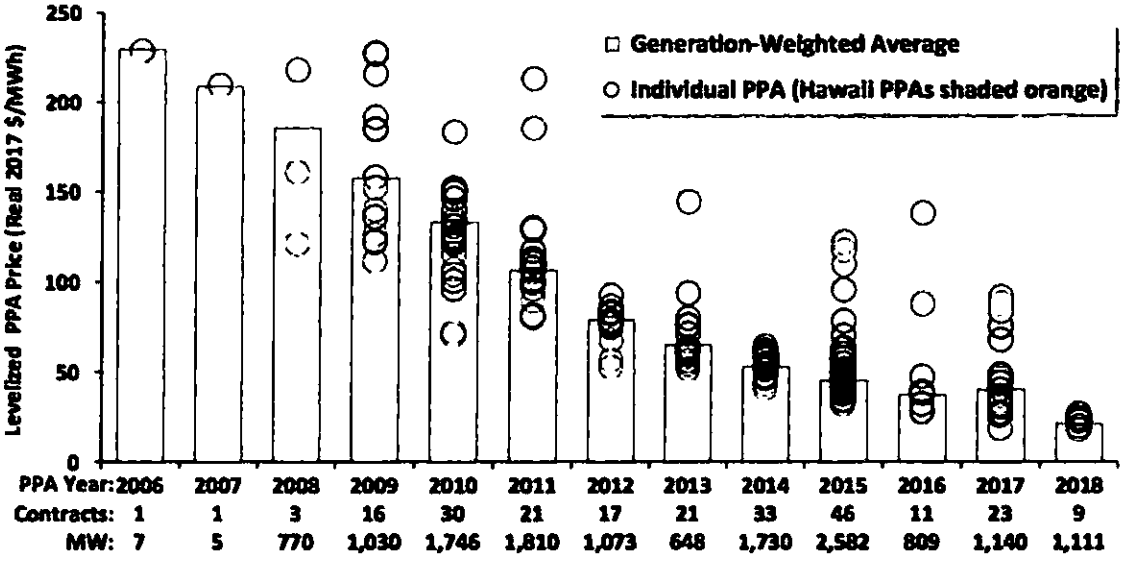


Figure 20. Levelized PV PPA Prices by Contract Vintage[51]

Source: LBNL, "Utility Scale Solar", September 2018, page 36

The report also found that adding battery storage is relatively low cost and declining, concluding that the "incremental PPA price adder for storage has fallen to ~$5/MWh, down from ~$15/MWh just a year ago for a similarly configured project." (LBNL, "Utility Scale Solar", September 2018, page iii) See Exhibit GCC-SR2.

The Public Utilities Commission of Nevada recently approved purchased power agreements for 1001 MW of solar power, all priced below $30/MWh without battery storage. These include PPAs for a 250 MW facility at Copper Mountain priced at $21.55/MWh for 25 years, escalating at 2.5% per year and a 300 MW facility at Eagle Shadow Mountain priced at $23.76/MWh for 25 years, with no escalation. (Order, Docket 18-06003, December 21, 2018)

The point is that the economics of renewables are favorable, and utilities across the country are increasing their reliance upon them due to favorable economics, corporate policies to reduce their carbon footprints, and customer preferences for green power. For PJM not to consider the role of renewable energy, and especially solar photovoltaics, is to ignore the probable future, which includes economic renewable resources that could alleviate the congestion.

Q. Please expand on the role of state and local government policies.

A. State and local governmental policies, whether mandates or energy initiatives, can encourage the development of non-transmission alternatives in the areas that benefit the transmission network. I've already addressed statewide or utility specific policies and initiatives that have been implemented to the south and east of the interface. These could be fine-tuned to focus on subareas that have the greatest impact on the constraints, if that proved to be useful. At this point, the first order of business is to get PJM to consider the effect of the existing policies, with fine-tuning if appropriate in subsequent analyses.

1

2 **IV. No bids for non-transmission alternatives**

3 **Q. What is your response to the comments by witnesses Herling and Ali who asserted**
4 **that no non-transmission alternatives were bid into PJM's 2014/2015 Long Term**
5 **Proposal Window?**

6 A. Simply put, their criticism is a red herring. First and foremost, the renewable energy,
7 energy efficiency and CHP resources don't have to be bid into PJM's Long Term Open
8 Window mechanism to be implemented and have an impact in the identified area. They
9 will occur naturally as a result of good economics of non-transmission resources and
10 public attitudes increasingly favoring green power resources/reduced environmental
11 impact. In addition, they will be encouraged and mandated by governmental public
12 policy. Depending on who, when and how these non-transmission resources are
13 developed, some of them may ultimately be bid through PJM's capacity and energy
14 markets rather than the Long Term Open Window. The point is that the non-transmission
15 alternatives do not have to, and often won't, be bid through a PJM mechanism. To
16 suggest that the resources don't exist because PJM did not receive bids in response to the
17 2014/2015 Long Term Open Window, as TS witnesses have done, is simply wrong.

18 Furthermore, it doesn't surprise me that PJM received no non-transmission alternative
19 proposals. Exhibit GCC-SR3 is the PJM RTEP – 2014/15 RTEP Long Term Proposal
20 Window Problem Statement & Requirements Document, released on October 30, 2014,
21 specified the process by which potential bidders receive information on the specific
22 problem and instructions on how to prepare a proposal. A cursory review of that request

for proposals shows that it is presented primarily in terms of transmission. It shows that the required deliverables are geared toward demonstrating the proposal's transmission system effectiveness by running proprietary transmission power flow/dispatch models (e.g., PROMOD) and having access to Critical Energy Infrastructure Information (CEII), both of which are readily accessible to transmission providers but not needed for the core business of developers of energy efficiency, renewable energy or CHP resources. Add to it a $30,000 fee to submit a bid, and PJM's 2014-2015 Long Term Open Window would not encourage developers of energy efficiency, renewable energy and CHP resources to bid, especially since their projects can and will be developed without engaging in PJM's bid process. It is no surprise that PJM received no bids for non-transmission alternatives to Project 9A.

In any event, it is incorrect to suggest that the non-transmission resources don't exist because PJM did not receive bids in response to the 2014/2015 Long Term Open Window.

Q. Regardless of whether or not PJM received non-transmission bids in the 2014/2015 Long Term Window is there a significant magnitude of energy efficiency resources, CHP and renewable energy resources in Virginia, and the District of Columbia that will be implemented and impact the need for Project 9A.

A. Yes. PJM did not consider these non-transmission resources in its planning and selection of Project 9A. Mr. McGlynn indicated in OCA XIII-11 that PJM has not conducted studies to identify the impact of existing or imminent state-approved utility programs for

energy efficiency, demand response, CHP or renewable resources as it relates to the need for Project 9A. As was mentioned earlier in this testimony Mr. McGlynn indicated : "The Company lacks information to form a belief about the conduct of other electric utilities." With the declining costs of renewable energy resources and battery storage and state and local government energy policies that require compliance by regulated electric utilities, there will be an increase in the utilization of distributed resources, energy efficiency resources and renewable energy resources. Since PJM is lacking essential, fundamental information on non-transmission alternatives PJM is unable to gauge the bona fide need for Project 9A during the 2014/2015 long term planning period.

V. Relevance of historical data

Q. Please comment on witness Horger's suggestion that the information regarding events and congestion as shown in my Direct Testimony is irrelevant to the assessment of Project 9A.

A. Witness Horger on pages 20-21 of his rebuttal testimony states the information contained in my testimony is of no value because PJM does its benefit/cost analysis on a 15 year forward looking only basis. I acknowledge that evaluating the constraints and potential solutions requires modeling and looking forward. The 15-year forward benefit cost analysis is not in and of itself unreasonable. However, historical data also has a role.

Historical data establishes a starting point for the forward-looking analysis. Recall that when the 2014/15 Long Term Window was opened, the frequency and duration of the constraints was relatively high. This was the context in which the problem and potential solutions were identified – high frequency and duration of constraints contributing to the

economic cost of the constraints, approximately $800 million, Mr. McGlynn offered as the congestion cost from 2012-2016. Mr. McGlynn was using the historic $800 million cost as support for Project 9A going forward. When I pointed out that the historic frequency and duration of congestion then dropped radically to a much lower level, PJM no longer relied on the historical data to support the Project 9A proposal, instead declaring it irrelevant. Table 1 below provides that historical congestion information. This is the same table I described and used in my direct testimony.

AP South Reactive Interface Historical Congestion

From Monitoring Analytics Reports

	Cost Millions $	% of Annual PJM Total Congestion Cost	Rank PJM	Event Hours Day Ahead	Event Hours Real Time
2008	$ 558.0	26.0%	1	3,572	1,016
2009	$ 206.5	29.0%	1	3,501	604
2010	$ 420.2	30.0%	1	4,622	1,516
2011	$ 238.9	24.0%	1	4,111	1,013
2012	$ 68.5	12.9%	1	2,586	351
2013	$ 169.1	25.0%	1	6,330	1,138
2014	$ 486.8	25.2%	1	5,090	981
2015	$ 56.2	4.1%	6	1,285	42
2016	$ 16.8	1.6%	11	1,076	14
2017	$ 21.6	3.1%	6	1,315	74

2012-2016	$	797.4	Witness McGlynn's $800 million congestion cost reference
2008-2014	$	306.9	Average annual congestion cost in period that APS constraint was No. 1 ranked
2012-2014	$	241.5	Average annual congestion cost
2015-2017	$	31.5	Average annual congestion cost

It makes no sense to ignore recent data.

- If the modeling picked up the recent drop in frequency and duration of constraints, it would reduce the benefits attributable to Project 9A. Since the

project was only slightly above the 1.25 benefit/cost ratio threshold, it could easily have driven it below the threshold.

- If the modeling failed to pick up the decreased frequency and duration of constraints, one would wonder why and whether 15-year forward-looking projections are reasonable.

In either case, TS witness Horger simply declared historical data irrelevant when it clearly is not.

VI. Timing of congestion events

Q. What is your response to TS witness Horger's rebuttal to your testimony that PJM did not provide a useful characterization of when congestion events are likely to occur?

A. As I stated in my direct testimony, the timing of when constraints occur is important to determining what non-transmission alternatives may be viable. With regard to the forward looking modeling, which PJM used to evaluate solutions to the constraint (not including non-transmission alternative solutions, which PJM did not model), PJM was unable or unwilling to state anything more definitive than the constraints can occur any time of day or time of year. See OCA Data Request OCA III-01, which is provided in Exhibit GCC-SR4. That is not sufficient to narrow down alternatives (e.g., air conditioner efficiency will not assist with constraints occurring in the winter, nor will a small solar PV (without battery storage) assist with constraints occurring at 2:00 AM.

Since a constraint could apparently occur any hour of the year, according to the modeling PJM performed, I did not exclude resources based on their availability by hour or season. Any resource thus can potentially contribute to alleviating the constraint.

Witness Horger, on page 21 of his rebuttal testimony, asserts that PJM provided a useful characterization of when the constraints occur by providing four years of historical data. This data does not necessarily correspond to the modeled times of constraint or what future constraints may be. It was thus not useful in narrowing non-transmission alternatives.

Q. Please summarize your recommendations.

A. The Commission should adopt the following recommendations, in this case:

(1) Non-transmission alternatives exist, are available and would reduce the need for the IEC Project and should be recognized and PJM erred by not including non-transmission alternatives in the assessment gauging the need for the IEC Project.

(2); Energy efficiency, renewable energy resources, distributed resources can offset transmission congestion during any hour, day, month, season and at any point during the year and this was not reflected in PJM's analysis.

Q. Does this complete your testimony?

A. Yes.

1 265471-4

2

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

Application of Transource Pennsylvania, LLC for approval of the Siting and Construction of the 230 kV Transmission Line Associated with the Independence Energy Connection - East and West Projects in portions of York and Franklin Counties, Pennsylvania.	:	A-2017-2640195 A-2017-2640200
Petition of Transource Pennsylvania, LLC for a finding that a building to shelter control equipment at the Rice Substation in Franklin County, Pennsylvania is reasonably necessary for the convenience or welfare of the public.	:	P-2018-3001878
Petition of Transource Pennsylvania, LLC for a finding that a building to shelter control equipment at the Furnace Run Substation in York County, Pennsylvania is reasonably necessary for the convenience or welfare of the public.	:	P-2018-3001883
Application of Transource Pennsylvania, LLC for approval to acquire a certain portion of the lands of various landowners in York and Franklin Counties, Pennsylvania for the siting and construction of the 230 kV Transmission Line associated with the Independence Energy Connection – East and West Projects as necessary or proper for the service, accommodation, convenience or safety of the public.	:	A-2018-3001881, *et al.*

VERIFICATION

I, Geoffrey Crandall, hereby state that the facts above set forth in my Surrebuttal Testimony, OCA Statement No. 3SR are true and correct and that I expect to be able to prove the same at a hearing held in this matter. I understand that the statements herein are made subject to the penalties of 18 Pa.C.S. § 4904 (relating to unsworn falsification to authorities).

Signature: _____

Geoffrey Crandall
MSB Energy Associates, Incorporated
6907 University Avenue #162
Middleton, WI 53562
crandall@msbnrg.com

DATED: January 30, 2019
*265481

OCA STATEMENT NO. 3SR

OCA WITNESS CRANDALL
EXHIBIT GCC 3-1

Executive Office of the MayorExecutive Office of the Mayor

As of 7 pm on January 23, 2019, 8,001 federal workers and an estimated 1,928 contractors, for a combined estimated total of **9,929** individuals, have filed for unemployment benefits in the District of Columbia during the partial federal government shutdown that is still underway. #EndTheShutdown

Mayor Bowser Signs Historic Clean Energy Bill, Calling for 100% Renewable Electricity by 2032

Friday, January 18, 2019

(Washington, DC) – Today, Mayor Bowser signed the Clean Energy DC Omnibus Amendment Act of 2018, codifying the District as the nation's preeminent leader in clean energy and climate action by setting a mandate of 100% renewable electricity by the year 2032.

This historic piece of legislation will bolster Mayor Bowser's Clean Energy DC plan, which includes 57 action items for how the District will reach this ambitious target. Additionally, the bill provides a roadmap to achieving our goals including, but not limited to:

- Mandating 100 percent of the electricity sold in the District come from renewable sources.
- Doubling the required amount of solar energy deployed in the District.
- Making significant improvements to the energy efficiency of existing buildings in the District.
- Providing energy bill assistance to support low- and moderate-income residents.
- Requiring all public transportation and privately owned fleet vehicles to become emissions-free by the year 2045.
- Funding the DC Green Bank to attract private investment in clean energy projects.

"By signing the Clean Energy DC Omnibus Amendment Act of 2018 into law, we solidify Washington, DC's place as the national leader in the fight against climate change and proudly communicate to the world that 'we are still in,'" said Mayor Bowser. ***"If we are going to make progress on addressing climate change and global warming in our country, it's going to be cities and states leading the way. With this groundbreaking clean energy law, we have created***

a model for jurisdictions across the nation to follow."

The bill was signed into law at the newly renovated headquarters of the American Geophysical Union, the first net-zero renovation of a building in the District which will serve as a national model of sustainability and green building design. Additionally, the bill will lead to a boost in clean energy investment in the District with the mandated increases in funding mechanisms such as the Renewable Energy Trust Fund (RETF) and Alternative Compliance Payment (ACP).

"Make no mistake about it, this is by far the most aggressive and impactful clean energy goal passed by any state to-date" said Department of Energy and Environment (DOEE) Director Tommy Wells. "As great as the commitments are from states leading the fight against climate change, our goal as the nation's capital is to reach 100% renewable electricity despite Federal inaction in our own backyard."

Office of the Mayor

Connect With Us
John A. Wilson Building
1350 Pennsylvania Avenue, NW, Washington, DC 20004
Phone: (202) 727-2643
TTY: 711
Email: eom@dc.gov

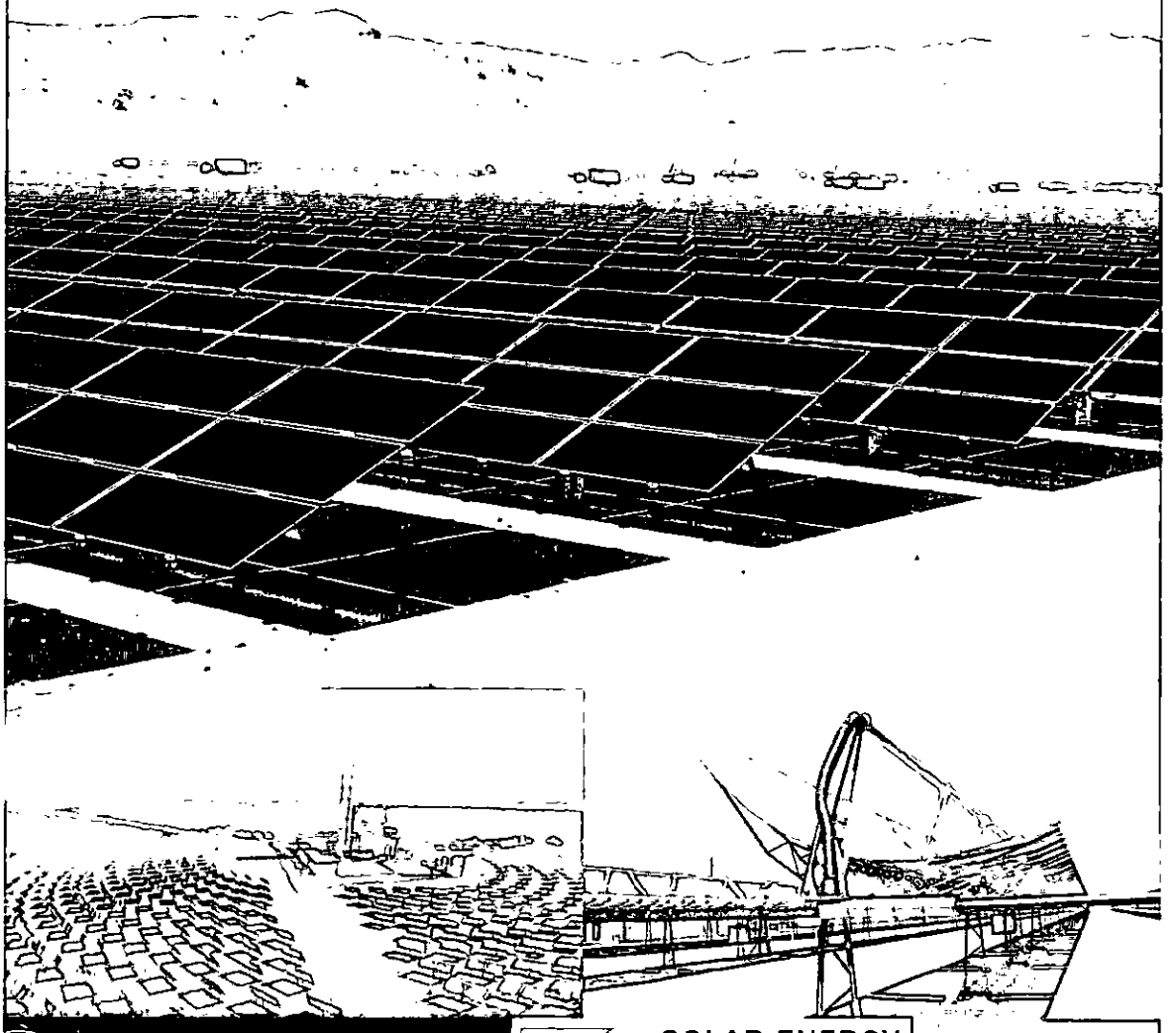
OCA STATEMENT NO. 3SR

OCA WITNESS CRANDALL
EXHIBIT GCC 3-2

Utility-Scale Solar

Empirical Trends in Project Technology, Cost, Performance, and PPA Pricing in the United States – 2018 Edition

Authors: Mark Bolinger, Joachim Seel
Lawrence Berkeley National Laboratory



BERKELEY LAB

SOLAR ENERGY TECHNOLOGIES OFFICE

September 201

Table of Contents

List of Acronyms

AC	Alternating Current
c-Si	Crystalline Silicon
CapEx	Capital Expenditures
COD	Commercial Operation Date
CPV	Concentrating Photovoltaics
CSP	Concentrating Solar-Thermal Power
DC	Direct Current
DIF	Diffuse Horizontal Irradiance
DNI	Direct Normal Irradiance
DOE	U.S. Department of Energy
EIA	U.S. Energy Information Administration
EPC	Engineering, Procurement & Construction
FERC	Federal Energy Regulatory Commission
GDP	Gross Domestic Product
GHI	Global Horizontal Irradiance
GW	Gigawatt(s)
FiT	Feed-in Tariff
ILR	Inverter Loading Ratio
ISO	Independent System Operator
ITC	Investment Tax Credit
LBNL	Lawrence Berkeley National Laboratory
LCOE	Levelized Cost of Energy
MW	Megawatt(s)
NCF	Net Capacity Factor
NREL	National Renewable Energy Laboratory
O&M	Operation and Maintenance
OpEx	Total Operational Expenses
PII	Permitting, Interconnection & Inspection
PPA	Power Purchase Agreement
PV	Photovoltaics
REC	Renewable Energy Credit
RTO	Regional Transmission Organization
TOD	Time of Delivery

Executive Summary

The utility-scale solar sector—defined here to include any ground-mounted photovoltaic ("PV"), concentrating photovoltaic ("CPV"), or concentrating solar-thermal power ("CSP") project that is larger than 5 MW_{AC} in capacity—has led the overall U.S. solar market in terms of installed capacity since 2012. In 2017, the utility-scale sector accounted for nearly 60% of all new solar capacity, and is expected to maintain its market-leading position for at least another six years, driven in part by the December 2015 extension of the 30% federal investment tax credit ("ITC") through 2019 and favorable IRS "safe harbor" guidance relating to construction start deadlines. With four new states having added their first utility-scale solar project in 2017, two thirds of all states, representing all regions of the country, are now home to one or more utility-scale solar projects. This ongoing solar boom makes it difficult—yet more important than ever—to stay abreast of the latest utility-scale market developments and trends.

This report—the sixth edition in an ongoing annual series[1]—is intended to help meet this need, by providing in-depth, annually updated, data-driven analysis of the utility-scale solar project fleet in the United States. Drawing on empirical project-level data from a wide range of sources, this report analyzes not just installed project prices—i.e., the traditional realm of most solar economic analyses—but also operating costs, capacity factors, and power purchase agreement ("PPA") prices from a large sample of utility-scale solar projects throughout the United States. The report also includes several offshoot analyses that are housed in side-bars or text boxes throughout, on topics such as trends in the levelized cost of energy ("LCOE") among operational projects, the declining market value of solar energy with increasing solar penetration in California, and observations about completed or recently announced solar+storage projects. Given its current dominance in the market, utility-scale PV also dominates much of this report, though data from CPV and CSP projects are also presented where appropriate.

Some of the more-notable findings from this year's edition include the following:

- ***Installation and Technology Trends:*** Among the total population of 590 utility-scale PV projects from which data samples are drawn, several trends are worth noting due to their influence on (or perhaps reflection of) the cost, performance, and PPA price data analyzed later. For example, the use of solar trackers (with one dual-axis exception they are all single-axis, east-west tracking) dominates 2017 installations with nearly 80% of all new capacity. In a reflection of the ongoing geographic expansion of the market beyond California and the high-insolation Southwest, the median long-term insolation level at newly built project sites declined again in 2017. While new fixed-tilt projects are now seen predominantly in less-sunny regions (GHI < 4.75 $kWh/m^2/day$), tracking projects are increasingly pushing into these same regions. Meanwhile, the median inverter loading ratio—i.e., the ratio of a project's DC module array nameplate rating to its AC inverter nameplate rating—has grown steadily since

[1] In an attempt to minimize potential confusion over which edition of this annual report is most-current, we have altered the report's naming convention so that the year that is included in the report title is the same as the year of publication. For example, this year's report—published in September 2018—is subtitled "2018 Edition," even though the focus is still primarily on projects built in the preceding year (in this case, 2017). In comparison, last year's edition—published in September 2017—was titled "Utility-Scale Solar 2016" (due to its focus on projects built in 2016), which generated confusion among some readers who, seeking the most up-to-date version at the time, searched in vain for a "Utility-Scale Solar 2017." We hope that this new naming convention is easier to follow.

2014 to 1.32 in 2017 for both tracking and fixed-tilt projects, allowing the inverters operate closer to (or at) full capacity for a greater percentage of the day.

- ***Installed Prices:*** Median installed PV project prices within a sizable sample have steadily fallen by two-thirds since the 2007-2009 period, to \$2.0/W_{AC} (or \$1.6/W_{DC}) for projects completed in 2017. The lowest 20th percentile of projects within our 2017 sample (of 76 PV projects totaling 2,303 MW_{AC}) were priced at or below \$1.8/W_{AC}, with the lowest-priced projects around \$0.9/W_{AC}. For the first time within our sample, projects that use single-axis trackers exhibited no upfront cost premium compared to fixed-tilt installations, but actually slightly lower prices. Overall price dispersion across the entire sample has decreased steadily every year since 2013, just as price variation across regions decreased in 2017.
- ***Operation and Maintenance ("O&M") Costs:*** What limited empirical O&M cost data are publicly available suggest that PV O&M costs were in the neighborhood of \$16/kW_{AC}-year, or \$8/MWh, in 2017. These numbers—from a limited sample of 39 projects totaling 806 MW_{AC}—include only those costs incurred to directly operate and maintain the generating plant, and should not be confused with total operating expenses, which would also include property taxes, insurance, land royalties, performance bonds, various administrative and other fees, and overhead.
- ***Capacity Factors:*** The cumulative net AC capacity factors of individual projects in a sample of 392 PV projects totaling 16,052 MW_{AC} range widely, from 14.3% to 35.2%, with a sample median of 26.3% and a capacity-weighted average of 27.6%. This project-level variation is based on a number of factors, including the strength of the solar resource at the project site, whether the array is mounted at a fixed tilt or on a tracking mechanism, the inverter loading ratio, degradation, and curtailment. Changes in at least the first three of these factors drove mean capacity factors higher from 2010-vintage (at 21.8%) to 2013-vintage (at 27.1%) projects, where they've remained fairly steady among more-recent project vintages as an ongoing increase in the prevalence of tracking has been offset by a build-out of lower resource sites. Turning to CSP, two recent trough projects without storage have largely matched ex-ante capacity factor expectations, while two power tower projects and a third trough project with storage continue to underperform relative to projected long-term, steady-state levels.
- ***PPA Prices and LCOE:*** Driven by lower installed project prices and improving capacity factors, levelized PPA prices for utility-scale PV have fallen dramatically over time, by \$20-\$30/MWh per year on average from 2006 through 2012, with a smaller price decline of ~\$10/MWh per year evident from 2013 through 2016. Most recent PPAs in our sample—including many outside of California and the Southwest—are priced at or below \$40/MWh levelized (in real 2017 dollars), with a few priced as aggressively as ~\$20/MWh. The median LCOE among operational PV projects in our sample has followed PPA prices lower, suggesting a relatively competitive market for PPAs.
- ***Solar's Wholesale Energy Market Value:*** Falling PPA prices have been offset to some degree by a decline in the wholesale energy market value of solar within higher-penetration solar markets like California. Due to an abundance of solar energy pushing down mid-day wholesale power prices, solar generation in California earned just 79% of the average price across all hours within CAISO's real-time wholesale energy market in 2017 (down from 125% back in 2012). In other markets with less solar penetration, however, solar's hourly generation profile

still earns more than the average wholesale price across all hours (e.g., 127% in ERCOT, 112% in PJM).

- ***Solar+Storage:*** Adding battery storage is one way to at least partially restore the value of solar, and three recent PV plus storage PPAs in Nevada (each using 4-hour batteries sized at 25% of PV nameplate capacity) suggest that the incremental PPA price adder for storage has fallen to ~$5/MWh, down from ~$15/MWh just a year ago for a similarly configured project. As PV plus battery storage becomes more cost-effective, a number of developers are regularly offering it as a viable upgrade to standalone PV.

Looking ahead, the amount of utility-scale solar capacity in the development pipeline suggests continued momentum and a significant expansion of the industry in future years. At the end of 2017, there were at least 188.5 GW of utility-scale solar power capacity within the interconnection queues across the nation, 99.2 GW of which first entered the queues in 2017. The growth within these queues is widely distributed across all regions of the country, and is most pronounced in the up-and-coming Central region, which accounts for 27% of the 99.2 GW, followed by the Southwest (19%), Southeast (15%), Northeast (12%), California and Texas (each at 11%), and the Northwest (5%). Though not all of these projects will ultimately be built as planned, the widening geographic distribution of solar projects within these queues is as clear of a sign as any that the utility-scale market is maturing and expanding outside of its traditional high-insolation comfort zones.

Finally, we have set up several data visualizations that are housed on the home page for this report: https://utilityscalesolar.lbl.gov. There you can also find a data workbook corresponding to the report's figures, a slide deck, and a post-release webinar recording.

OCA STATEMENT NO. 3SR

OCA WITNESS CRANDALL
EXHIBIT GCC 3-3

PJM RTEP – 2014/15 RTEP Long Term Proposal Window Problem Statement & Requirements Document

PJM Interconnection

Original Document: October 30, 2014

Version 2

Email: RTEP@pjm.com with any questions or clarifications and include a reference to 2014/15 RTEP Long Term Proposal Window

2014/15 RTEP Long Term Proposal Window

I. Purpose of Proposal

PJM seeks technical solution alternatives (hereinafter referred to as "Proposals") to resolve potential reliability criteria violations, market efficiency congestion, and Reliability Pricing Model (RPM) constraints on facilities identified below in accordance with planning (PJM, NERC, SERC, RFC, and Local Transmission Owner criteria) and market efficiency criteria.

II. Criterion applied by PJM for this proposal window:

A) Reliability Criteria

i) 15 Year Reliability Analysis

ii) Long Term Transmission Owner Criteria

B) Market Efficiency Criteria

i) Market Efficiency Congestion

ii) Limiting Facilities in Reliability Pricing Model (RPM)

III. Terminology

For Reliability proposal windows, PJM will distribute an Excel workbook of potential violations on facilities identified through a series of analyses. The following column headings are generally representative of the data fields that will be used to identify the specific facility and other factors of the output of this analysis. Not all column headings will appear in every sheet within the workbook. Additional information deemed necessary by PJM will be provided on a separate sheet along with the results file.

Typical thermal analysis column headings:

Column Headings	Title	Description
FG #	Flowgate Number	A sequential numbering of the identified potential violations

Fr Bus	From Bus Number	PSSE model Bus number corresponding to one end of line identified as a potential violation
Fr Name	From Bus Name	PSSE model Bus name corresponding to one end of line identified as a potential violation
To Bus	To Bus Number	PSSE model Bus number corresponding to other end of line identified as a potential violation
To Name	To Bus Name	PSSE model Bus name corresponding to other end of line identified as a potential violation
CKT	Circuit	Circuit number of identified potential violation
KVs	Kilovolt level (A/B)	Kilovolt level of both sides of potential violation, if A does not equal B, potential violation is a transformer
Areas	Area Numbers (A/B)	Area numbers of both ends of potential violation (A=From Bus Area Number, B=To Bus Area Number) If A does not equal B, potential violation is a tie line
100% Year	Year of Violation	This is the year in which PJM has determined that the identified facility may reach 100% of its rating.
Contingency	Contingency	Event causing overload, names corresponding to specific contingency within contingency file
Test	Test	Type of analysis causing violation, indication of which files to use for analysis replication

For Market Efficiency proposal windows, PJM will post an Excel workbook of simulated congested facilities for the relevant study years that were identified through the analysis. The following column headings are generally representative of the data fields that will be used to identify the specific facility and other factors of the output of this analysis. Additional information will be provided as necessary by PJM.

Typical Market Efficiency column headings:

Column Headings	Title	Description
Facility Name	Facility Name	Description of Facility
AREA	AREA	Identifies the PJM Transmission Zone for the Facility. M2M signifies a Market to Market facility.
TYPE	TYPE	Identifies the type of facility such as a Transformer, Interface, or a Transmission Line.
Frequency (Hours)	Frequency	Number of hours the facility is constrained for the annual study year of the simulation
Market Congestion ($millions)	Market Congestion	Total annual congestion dollars for the facility as a result of the simulation
Potential Upgrade	Potential Upgrade	Identifies potential upgrades to relieve congestion for the facility.

IV. Analysis Procedure

PJM Planning follows a documented procedure for all RTEP analysis as set forth in PJM Manual 14B. This problem statement requires participants to perform analysis and identify solutions to potential violations identified using RTEP procedures detailed in Manual 14B, section 2.3, RTEP Reliability Planning, and section 2.6, RTEP Market Efficiency Planning, at:

http://pjm.com/~/media/documents/manuals/m14b.ashx

Additionally, all proposed solutions must meet the performance requirements outlined in PJM Transmission Owner Criteria:

http://www.pjm.com/planning/planning-criteria/to-planning-criteria.aspx

PJM performs a preliminary quality assessment of the analysis in coordination with PJM Transmission Owners, Generation Owners, Neighboring Transmission Owners, and any other affected parties. In this quality assessment PJM reviews potential violations as determined by the analytical tools used throughout RTEP analysis. Through this coordination PJM seeks to identify only the violations for inclusion in the proposal window process. As PJM works through this quality assessment and continues to develop the RTEP analysis, it is possible that identified potential violations will be removed from the potential violation list as determined by PJM Planning. It is also possible that as the analysis continues, other potential violations that were not on the potential violation list originally are added to that list as deemed necessary by PJM Planning.

This process is intended to develop upgrades to address system reliability criteria violations and market efficiency projects. PJM will regularly retool analysis based on updated system information to ensure that solutions address the identified violations, do not cause any new violations, and are still needed to address reliability criteria and/or market efficiency projects.

V. Scope of Work

Through this Proposal window PJM is seeking solutions to identified Reliability Criteria violations, Market Efficiency congestion, and Reliability Pricing Model (RPM) limiting constraints.

Objectives

Reliability:

1. Develop solutions to identified potential violations;
2. Solutions should not cause any additional violations (Such as: Thermal, Voltage, Short Circuit or Stability). If additional violations are caused by the solutions, this should be addressed within proposal package; and
3. Adhere to all PJM, NERC, SERC, RFC and Local Transmission Owner Criteria

Market Efficiency:

4. Identify enhancements or expansion that could relieve PJM transmission constraints stemming from the 2014 Market Efficiency Analysis for which no reliability based project has already been identified.
5. Perform and compare market simulations with and without proposed enhancements or expansions to evaluate if the Benefit/Cost Ratio is at least 1.25 using the criteria as defined in Schedule 6, Section 1.5.7 of the PJM Operating Agreement and PJM Manual 14B, Attachment E.
6. Perform high level reliability analysis of proposed Market Efficiency enhancements or expansions to ensure the proposed enhancement or expansion does not create any reliability issues.

What PJM Provides:

The following data and related information is required for this analysis and is expected to be available from PJM:

Reliability Modeling Data:

The following data is provided (Please note these files are Critical Energy Infrastructure Information (CEII) and should be handled accordingly):

1. **Base Power Flow Case.**
    a. This window addresses a variety of reliability criterion that span several corresponding power flow cases. The data in the Excel spreadsheet notes which case(s) correspond to each identified reliability criteria violation.
2. **Contingency List.** All Contingency Types (Single, Bus, Tower, Line w/ stuck breaker).
3. **Subsystem File**. Identifying all subsystem zones to be considered in analysis.
4. **Monitor File** Identifying specific ranges of facilities by area and kV level to be considered in analysis.
5. **Applicable Ratings (if different from what is in case)**
6. **Excel Workbook** containing the detailed power flow results and any additional technical comments.

Market Efficiency Modeling Data:

The following data and related information is provided for this proposal window. This data is provided through the PJM 2014 Market Efficiency web page, the PJM Transmission Expansion Advisory Committee (TEAC) materials, or on the PJM RTEP Development web pages.

The following data is provided:

1. **2014 Market Efficiency Economic Models:** These models contain the base set of PROMOD data for the 2014 Market Efficiency Analysis. Access to these models requires CEII authorization (available on the PJM web site: http://www.pjm.com/planning/rtep-development/market-efficiency.aspx) along with an active license with Ventyx for PROMOD and Nodal Simulation Data. PROMOD Case and supporting files are available under the Modeling Information section at the following link: http://pjm.com/planning/rtep-development/market-efficiency.aspx
2. **Market Efficiency Base Congestion results:** Proposed enhancements or expansions should provide congestion reduction for recommended facilities identified within the results at the

v

following link: http://pjm.com/planning/rtep-development/market-efficiency.aspx. PJM recommends proposals for facilities that meet the below criteria. Facilities below these thresholds are not anticipated to pass the Benefit/Cost threshold because of the expected cost of an upgrade. Congestion for 2025 study year is considered more speculative and therefore will be monitored in future analysis.

a. Market Efficiency Criteria:
   i. Annual simulated congestion frequency of at least 25 hours in both 2019 and 2022 study years.
   ii. Lower voltage facilities: Minimum of $1 million congestion in both 2019 and 2022 study years.
   iii. Regional facilities: Minimum of $10 million congestion in both 2019 and 2022 study years.
b. RPM Criteria: PJM will accept proposals to address the following that has had consistent capacity import limitations and thermal overloads.
   i. Roseland-Cedar Grove-Clifton 230 kV corridor

Other Supporting Market Efficiency Data:

Additional Supporting Market Efficiency Data is available at the following link: http://pjm.com/planning/rtep-development/market-efficiency.aspx

1. **2014 Market Efficiency Analysis Input Assumptions:** This file contains the input assumptions used for each study year of the 2014 Market Efficiency Analysis.
2. **Market Efficiency Modeling Practices Document:** This file provides a description of the modeling methods and procedures used for PJM Market Efficiency Analysis.

Response back to PJM (Deliverables)

The following must be provided no later than the close of the window. Please use the PJM provided templates to describe the high level details of your proposal. If the proposer wishes to include more detail, additional narrative may be added to address specifics of your proposal including, but not limited to:

1. Description of the proposed solution and corresponding violation(s) it resolves.
   a) Describe to PJM if the project should be considered only as a whole or if portions of the project should be considered as well.
2. Detailed analysis report on proposed solutions, including:
   a) Breaker one-line diagrams to illustrate system topology
   b) Spreadsheets (e.g. Output of analysis showing solution to identified issue)
   c) High level estimate of:
      i. Time to construct the proposed solutions
      ii. Cost estimates with a description of assumptions (e.g. base cost, risk and contingency (R&C) costs, and total cost)
      iii. Availability of right of ways
3. Equipment parameters and assumptions
   a) All parameters (Ratings, impedances, mileage, etc.)
   b) For reactive devices, settings and outputs
   c) For synchronous machines, MW and MVAR output assumptions

4. Complete set of power flow and dynamic cases containing proposed solutions (all cases should be solvable, not containing any non-convergence issues, in line with industry standards). If possible, provide a PSS/E IDEV file so that the modeling of the proposal may be easily applied to other models (please only use unused bus numbers for the creation of new busses). Please contact PJM with any questions. Provide any other necessary data including critical contingency files to reproduce the proposed solutions. All cases and data files for dynamic simulations must be in PSS/E ver. 32 format.
5. Modeling for Economic Simulation - Complete set of PROMOD model change files in XML format and power flow cases containing proposed solutions. If it is not possible to provide PROMOD model change files and power flow cases then at a minimum a PSS/E IDEV file compatible with the PJM 2018 RTEP power flow should be provided to facilitate modeling the proposal. Also, provide updated contingency definitions for all contingencies that require modification. Provide any other necessary data including any new monitored elements and contingencies to enable PJM to reproduce the proposed solution's results.
6. Any other supporting documentation required by PJM that is required to perform verification review, that isn't explicitly stated in this document.
7. Submission of Deliverables
    a) Preferred - VIA electronic mail to RTEP@pjm.com
    b) Alternate (e.g.: DVD or flash/thumb drive) - VIA FedEx to Nancy Muhl, PJM Interconnection, 2750 Monroe Boulevard, Audubon, PA 19403

PJM requires all proposal solutions, both upgrades to existing facilities and Greenfield projects, to complete the 2014 RTEP Proposal Window Template:

http://pjm.com/~/media/planning/rtep-dev/expan-plan-process/ferc-order-1000/rtep-proposal-windows/2014-rtep-proposal-window-template.ashx

If the proposal is a Greenfield solution then, the 'Greenfield Project Proposal Template' must also be included in the project proposal package to provide company evaluation and constructability information:

http://www.pjm.com/~/media/planning/rtep-dev/expan-plan-process/ferc-order-1000/order-1000-greenfield-project-proposal-template.ashx

Proposing entities are required to provide a public and non-public version of the project proposal. Proposing entities should expect that PJM will post the public version of the proposals after the close of the window. The public version must include redactions for any CEII information and information which the proposing entity deems is business proprietary and confidential (Note: PJM reserves the right to review the proposing entity's proposed redactions to ensure the appropriate level of transparency while protecting confidential and proprietary information and CEII)

Proposal Fees

Proposing entities must submit a non-refundable fee of $30,000 with each greenfield proposal. Within 30 days after the close of this window, PJM will notify the project sponsor if submitted fees are found to be insufficient. If a proposal is submitted without the applicable fee or insufficient funds, the proposal may be excluded from consideration.

The proposal fee requirement conditioned upon issuance of a FERC order accepting PJM's filing with FERC proposing to add a proposal fee requirement to its open window process developed and endorsed at by the Regional Planning Process Task Force, the Markets and Reliability Committee and Members Committee. In its filing, PJM will request that the proposal fee requirement be effective for this window. Please submit payment to PJM in the form of a check including identification of the associated project proposal.

Timeline

Thursday, 10/30/2014, Opening of 2014/15 RTEP Long Term Proposal Window
Friday, 2/27/2015, Close of 2014/15 RTEP Long Term Proposal Window

- All proposals and pre-qualification documentation due by 2/27/2015

Action	Target Date
Recipients submit pre-qualification packages and updates to PJM*	On or before 2/27/2015
PJM distributes Problem Statement to RTEP proposal window participants	10/30/2014
Recipients submit questions to PJM	10/30/2014– 2/27/2015
PJM distributes answers to questions to all recipients*	10/30/2014– 2/27/2015
Recipients submit proposals to PJM**	On or before 2/27/2015

*PJM will maintain confidentiality of individual proposals for the duration of the window.

**Any proposals received after close of the proposal will not be accepted.

Document Revision History

V1: October 30, 2014
Original File Posted

V2: October 31, 2014
Long Term Transmission Owner Criteria added to "Criterion applied by PJM for this proposal window" section

OCA STATEMENT NO. 3SR

OCA WITNESS CRANDALL
EXHIBIT GCC 3-4

Application of Transource Pennsylvania LLC
Independence Energy Connection-East & West Projects
Docket Nos. A-2017-2640195 and A-2017-2640200

Interrogatories of the Office of Consumer Advocate
Set XIII
(Responses dated 5/23/2018)

Data Request OCA-XIII-01:

Please describe the time of day and time of year (e.g., month or season) during which the APS South constraint typically occurs.

Response:

Power flow on the lines that comprise the AP South Reactive Interface can vary by hour, day, month, and season. Such market efficiency production cost analysis (like that which led to justification of Project 9A) is based on the 8,760 hours in a year, for four discrete years, and then interpolated and extrapolated to cover the 15-year analysis period. The determination that Project 9A is needed as a market efficiency project in PJM's RTEP is not based on an individual hour, day, month, or season. AP South Reactive Interface constraints can be seen at any hour or the operating day (24-hour period) at any point during the year.

The Company further notes that PJM's market efficiency B/C ratio analysis is based on a forward-looking planning horizon, and therefore the information requested is not a parameter used in the determination that Project 9A is needed as a market efficiency project in PJM's RTEP. For additional information about historical congestion in the AP South Reactive Interface, please refer to the Company's responses to OCA I-18 and OCA IX-2. Please refer also to OCA XIII-1 Attachment 1 for an hourly accounting of times when the AP South Reactive Interface was an active binding constraint in day-ahead and real time PJM markets during the period from January 1, 2014 to May 12, 2018.

Witness: Paul McGlynn