

**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 : Docket Nos. A-2017-2640195
with the Independence Energy Connection - : A-2017-2640200
East and West Project in Portions of York and :
Franklin Counties, Pennsylvania :

Petition of Transource Pennsylvania, LLC for :
a Finding that a Building to Shelter Control :
Equipment at the Rice Substation in Franklin : Docket No. P-2018-3001878
County, Pennsylvania is Reasonably Necessary :
For the Convenience or Welfare of the Public :

Petition of Transource Pennsylvania, LLC for :
a Finding that a Building to Shelter Control :
Equipment at the Furnace Run Substation in : Docket No. P-2018-3001883
York County, Pennsylvania is Reasonably :
Necessary For the Convenience or Welfare of :
the Public :

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 : Docket No. A-2018-3001881,
Line Associated with the Independence Energy : *et al.*
Connection – East and West Projects as :
Necessary or Proper for the Service, :
Accommodation, Convenience or safety of the :
Public :

**THE OFFICE OF CONSUMER ADVOCATE'S
HEARING EXHIBIT I**

2/22/19

1/16/19

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**Application of Transource Pennsylvania LLC
Independence Energy Connection-West Project
Docket No A-2017-2640200**

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

Data Request OCA-I-19:

Reference: Transource Statement 2 (West), p. 9, lines 1-3. Please provide a copy of the PJM updated analysis referred to in this paragraph.

Response:

Please refer to OCA-I-19 Attachment 1, containing the September 14, 2017 PJM Transmission Expansion Advisory Committee Meeting Market Efficiency Update, at slides 14-17, and specifically refer to the baseline numbers b2743.1-8 and b2752.1-7.

Witnesses: Kamran Ali and Paul F. McGlynn



Data Request OCA-I-19 Attachment 1 East
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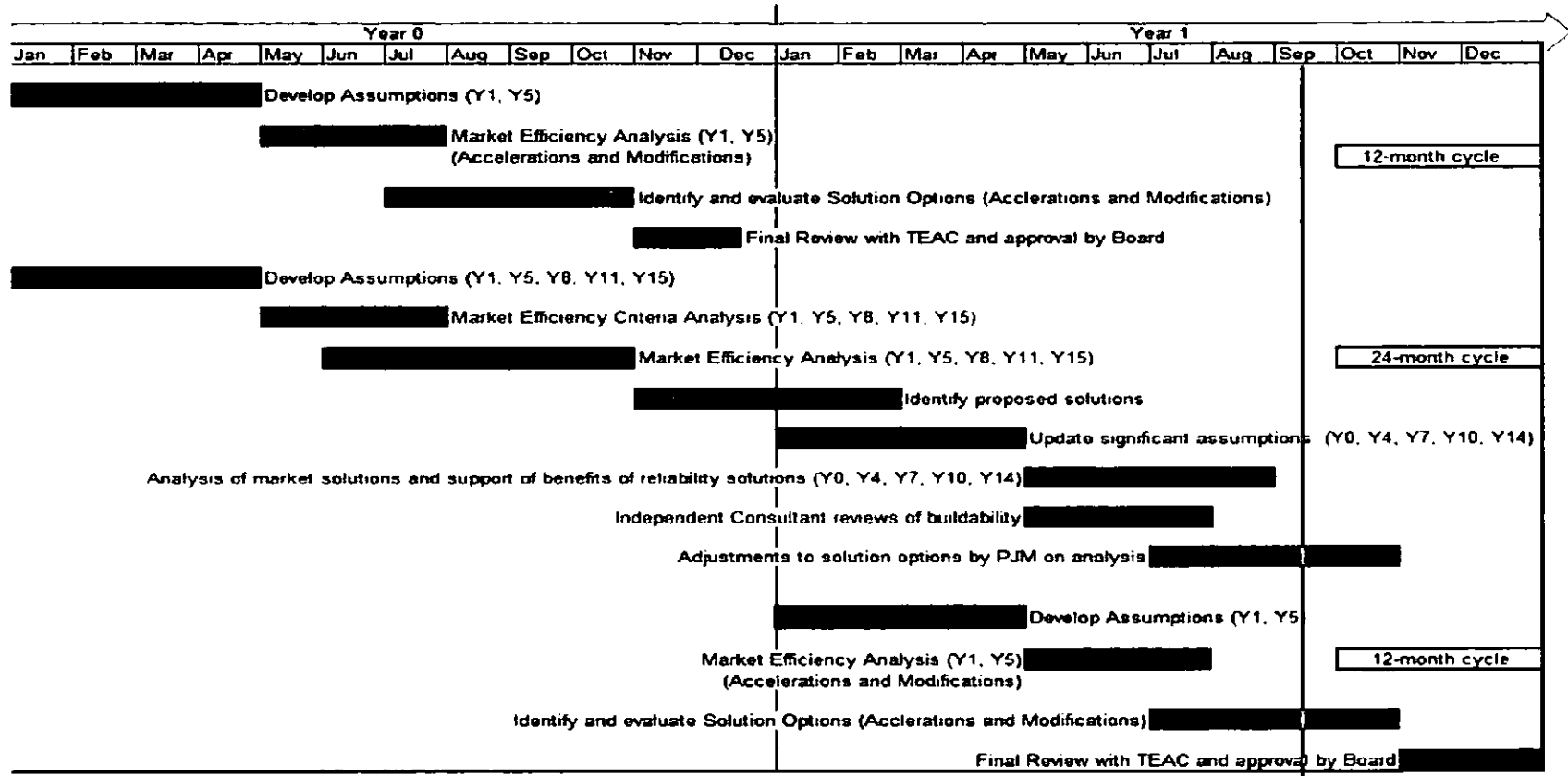
Market Efficiency Update

Transmission Expansion Advisory Committee
September 14, 2017





Where we are - Market Efficiency Timeline





Abbreviated Market Efficiency Proposal Window 2016-2017 Long Term Proposal Window 1A



2016-2017 Long Term Proposal Window 1A

- Addendum to the 2016-2017 Long Term Proposal Window closed on Feb 2018
 - Will be designated as **2016-2017 Long Term Proposal Window 1A**.
 - Opening on September 14, 2017
 - Closing on September 28, 2017.
 - Solicit proposals to address the Tanners Creek - Dearborn 345 kV thermal constraint, which is a Reliability Pricing Model (RPM) constraint.
- Target facility Tanners Creek - Dearborn 345 kV is the next limiting element in the 2020/2021 RPM Base Residual Auction CETL study for the DEOK LDA*
- All participants of the 2016-2017 Long Term Proposal Window remain eligible to participate.

* After RTEP baseline upgrade b2831 (Upgrade the Tanner Creek - Miami Fort 345 kV circuit) is constructed



Data Access

- Data is available on the PJM website here:
 - <http://www.pjm.com/planning/rtep-development/expansion-plan-process/ferc-order-1000/rtep-proposal-windows/2016-2017-rtep-long-term-proposal-window.aspx>
- The access requests should be submitted here:
 - <http://www.pjm.com/library/request-access/form-ceii-request.aspx>
 - The request should specify access to MISO and Production Cost Model data as well as the 2016-17 RTEP Long Term Proposal Window data.
 - As a reminder, each individual from the organization who will access the Proposal Window data is required to have CEII clearance with PJM. This is in addition to the organization's CEII clearance.
- Please contact PJM via Proposalwindow-admin@pjm.com with any questions.



PJM Identified Low Cost Solution

Project ID: 201617 PJM RPM DEOK

Proposed by: PJM

Proposed Solution:

After the close of the initial Market Efficiency Proposal Window, a low-cost, high-impact upgrade was identified. Replace terminal equipment at Tanners Creek on Tanners Creek - Dearborn 345 kV line.

kV Level: 345 kV

In-Service Cost (\$M): \$1.5, B/C Ratio = 53.13

In-Service Date: 2021

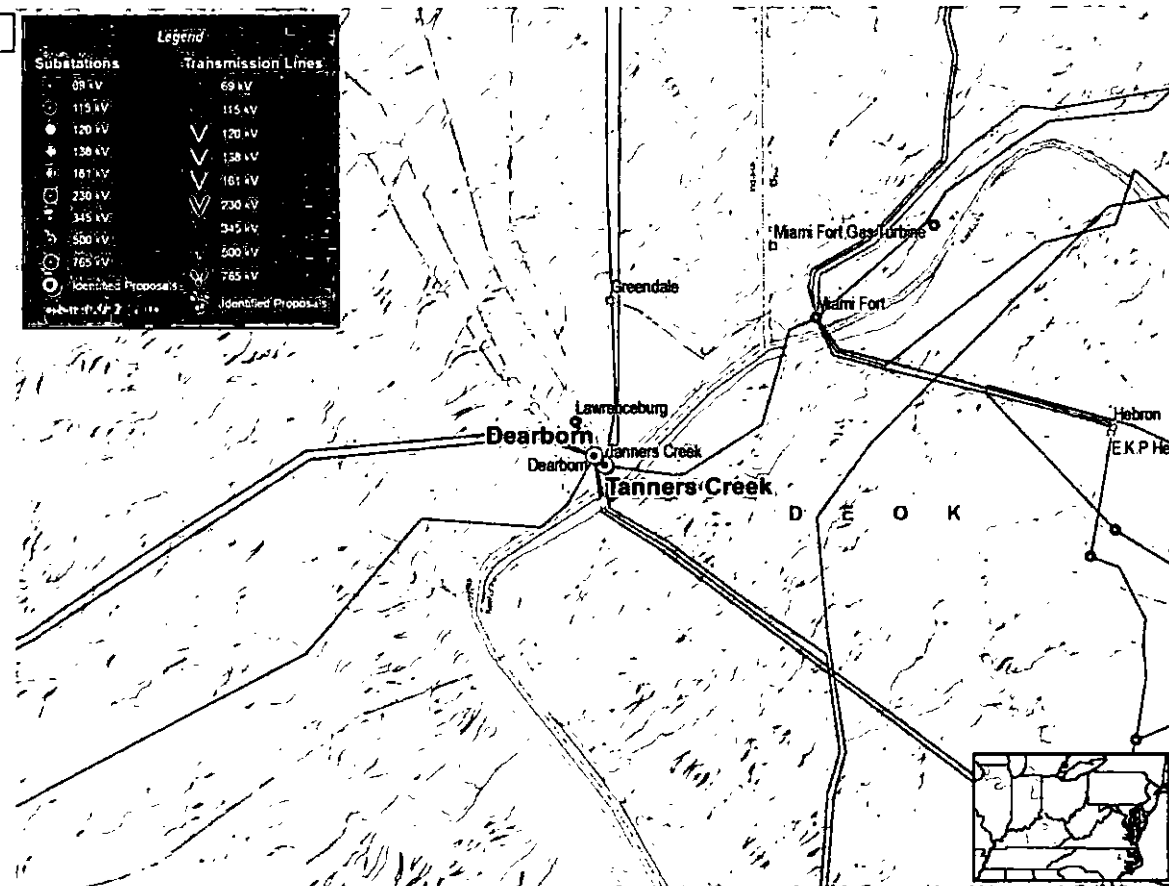
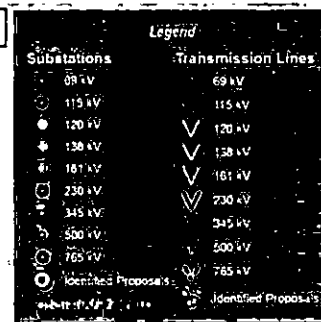
Target Zone: DEOK

ME Constraints:

TANNERS CREEK - MIAMI FORT 345 kV

Notes:

- CETL improvement of 332 MW and very low cost
- Anticipate request for Board approval in Oct 2017 (pending Window 1A outcome)
- Designated Entity: AEP (the local TO)
- Cost Allocation: TBD





2016-2017 Long Term Window



- **Market Efficiency Base Case Mid-Cycle Update**
 - Base case reposted with updates from stakeholders feedback
 - Olive - Bosserman supplemental project removed from the base case
- **Analysis of proposed solutions:** Aug 2017 - Dec 2017 (in-progress)
 - RPM and Interregional Projects analysis 90% completed
 - PPL projects analysis in-progress
 - BGE projects will be analyzed after PPL
 - Any high-value low-risk* type projects may be analyzed in parallel with the above
 - All other regional projects will be analyzed last
- **Target determination of recommended projects: Feb 2018**
 - RPM projects to be recommended at Oct, 2017 Board meeting
 - Interregional, PPL and high-value low-risk projects at Dec, 2017 Board meeting
 - BGE and other projects to be recommended at Feb, 2018 Board meeting

**High-value low-risk projects are generally classified as low cost upgrades, with significant B/C, and with minimum competition.*



Base Case Mid-Cycle Updates

- TMI nuclear unit retirement: September 2019
- PPL supplemental project correction: Juniata - Cumberland 230 kV line
- Impedance correction: Conemaugh – Rice – Hunterstown
- NIPSCO retirements: Bailey units to retire in 2018
- AMEREN rating corrections
 - Kincaid – Austin 345 kV line
 - Gifford – Paxton 138 kV line
- Olive – Bosserman 138 kV supplemental project removed from the base case



Interregional Projects



Interregional Evaluation Process

- Benefits to each RTO shall be determined by that RTO using their respective regional process and metrics
- Costs shall be allocated interregional based on pro rata share of benefits, as determined above
- Projects must meet the B/C criteria in each RTO (based on allocated costs) and identified by both RTOs as the best solution to be recommended to each RTOs board
- Use 15 year stream of benefits
- Use average discount rate to move benefits to in service year
 - PJM: 7.4%
 - MISO: 7.1%
 - Average: 7.25%



Interregional Evaluation Status

- **PROMOD simulations:**
 - Base Case with Olive – Bosserman 138 kV Supplemental project
 - Base Case without Olive – Bosserman 138 kV Supplemental project
 - Sensitivity Run: Dune Acre Transformer 345/138 kV closed
- **Analysis completed 90%**
 - Currently performing additional analysis on projects that shifted congestion downstream. This may cause B/C ratio to change, if additional upgrades are required to address congestion created by the project.
- **Coordination with MISO**
 - PJM discussed simulations results with MISO. Factors considered for project selection: congestion driver, PJM and MISO benefits, additional congestion created by the project.
 - Projects that don't show MISO benefits will not be considered for further interregional analysis.
 - PJM to share final results with MISO and vice versa.
 - RTOs jointly select the most beneficial project (if any) and inform stakeholders.



Interregional Projects Results

Project information					Base Runs (Dune Acres Transformer open)				Sensitivity Run Dune Acre Transformer	
					With Olive-Bosserman Dune Acre 345/138 kV open		Without Olive-Bosserman Dune Acre 345/138 kV open		Without Olive-Bosserman Dune Acre 345/138 kV closed	
Project Id	Submitter	Description	Cost (\$M)	Constraint	BC Ratio Lower	NLP	BC Ratio Lower	NLP	BC Ratio Lower	NLP
201617_1-10B	Nextera	Build a new 345/138 kV substation (Rolling Prairie) connecting the following an existing 345 kV line to two existing 138 kV lines.	\$ 19.25	Olive-Bosserman 138 kV	0.28	\$ 7.21	1.71	\$ 44.56	1.29	\$ 33.54
201617_1-12D	AEP NIPSCO	Rebuild the 34.5 kV line between New Carlisle and Silver Lake as 138 kV. Rebuild the Michigan City - Trail Creek-Bosserman 138 kV.	\$ 41.86	Olive-Bosserman 138 kV	1.53	\$ 35.34	1.41	\$ 80.37	0.86	\$ 48.81
201617_1-13H	Transource	Tap the Tanners Creek - Losantville 345 kV line and build a single circuit line to a new 345/138 station (Coyote) next to Wiley.	\$ 71.89	Tanners Creek - Miami Fort 345 kV	0.28	\$ 27.12	0.27	\$ 25.99	0.51	\$ 49.90
201617_1-17B	AEP Exelon	Meadow Lake - Pike Creek 345 kV Double Circuit Greenfield Line and Pike Creek 345kV Station	\$ 197.97	Olive-Bosserman 138 kV	0.29	\$ 78.68	0.36	\$ 96.59	0.29	\$ 76.92
201617_1-18S*	Northeast Transmission Development	Build a 345/138 kV substation ("Coffee Creek") interconnecting Green Acres to Olive 345 kV line and Flint Lake to Luchtman Road 138 kV line.	\$ 17.40	Olive-Bosserman 138 kV	0.54	\$ 12.76	2.39	\$ 56.57	1.76*	\$ 41.68
201617_1-1A**	WPPI	Provide a second New Carlisle-Olive 138 kV circuit. Upgrade substation equipment at New Carlisle and Olive substations.	\$ 2.50	Olive-Bosserman 138 kV	0.17	\$ 0.58	3.75	\$ 12.73	14.35**	\$ 48.75
201617_1-9A	NIPSCO	Reconductor existing NIPSCO line sections between AEP Bosserman and Olive 138 kV substations and between AEP Bosserman and New Carlisle 138 kV substations.	\$ 8.00	Olive-Bosserman 138 kV	0	\$ -	4.84	\$ 52.65	1.60	\$ 17.40
201617_1-9B	NIPSCO	New NIPSCO line section between Thayer and Morrison 138 kV substations.	\$ 42.50	Paxton-Gifford 138 kV	0.13	\$ 7.32	0.33	\$ 18.92	0.87	\$ 50.34

Notes: *201617_1-18S does not fully solve Olive - Bosserman congestion driver.

** WPPI interest in 201617_1-1A is limited to submitting the project description.
If approved this upgrade will be assigned to the incumbent TO (AEP).



Re-evaluation of Approved Market Efficiency Projects (2014/15 RTEP Window)



Re-evaluation of Market Efficiency Projects - Process

- Applies to market efficiency projects approved during the 2014/15 RTEP Window
- Using the Market Efficiency Base Case Mid-Cycle Update
- Analysis performed individually, one project at a time
- Reevaluation Study Process
 - Create a new base case by removing/reversing the topology related to the approved market efficiency project
 - Measure the impact of adding back the approved market efficiency project
 - Measure benefits for 15-year period starting with the in-service date
 - For RPM projects also measure the capacity benefits
 - Calculate the new B/C ratios
- Projects must meet the B/C criterion of 1.25



Reevaluation Status

- All projects analyzed so far pass the B/C ratios.
- Baseline project b2728, Loretto – Wilton 345 kV, does not need reevaluation due to new in-service date of 12/31/2017
- Baseline project b2696, Krendale to Shanor Manor 138 kV upgrade, work in-progress



Reevaluation Results

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	1.30
201415_1-10B	b2693	Upgrade	COMED	Wayne to South Elgin 138 kV	\$ 0.10	2019	6.4	in-progress
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	2019	64.5	New In-Service Date: 12/31/2017
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: * 201415_1-9A B/C ratio calculation based on the original cost. Cost of project currently under review and will be updated as necessary.



Next Steps

Milestone	Schedule 2016 - 2017
Proposed RPM projects analysis	Sept – Oct 2017
Proposed projects analysis - Interregional, PPL and high value low cost projects	Sept – Dec 2017
Proposed projects analysis - BGE and other	Oct 2017 – Dec 2017
Acceleration Analysis	Oct – Dec 2017
Final TEAC Review and Board Recommendation	Feb 2018

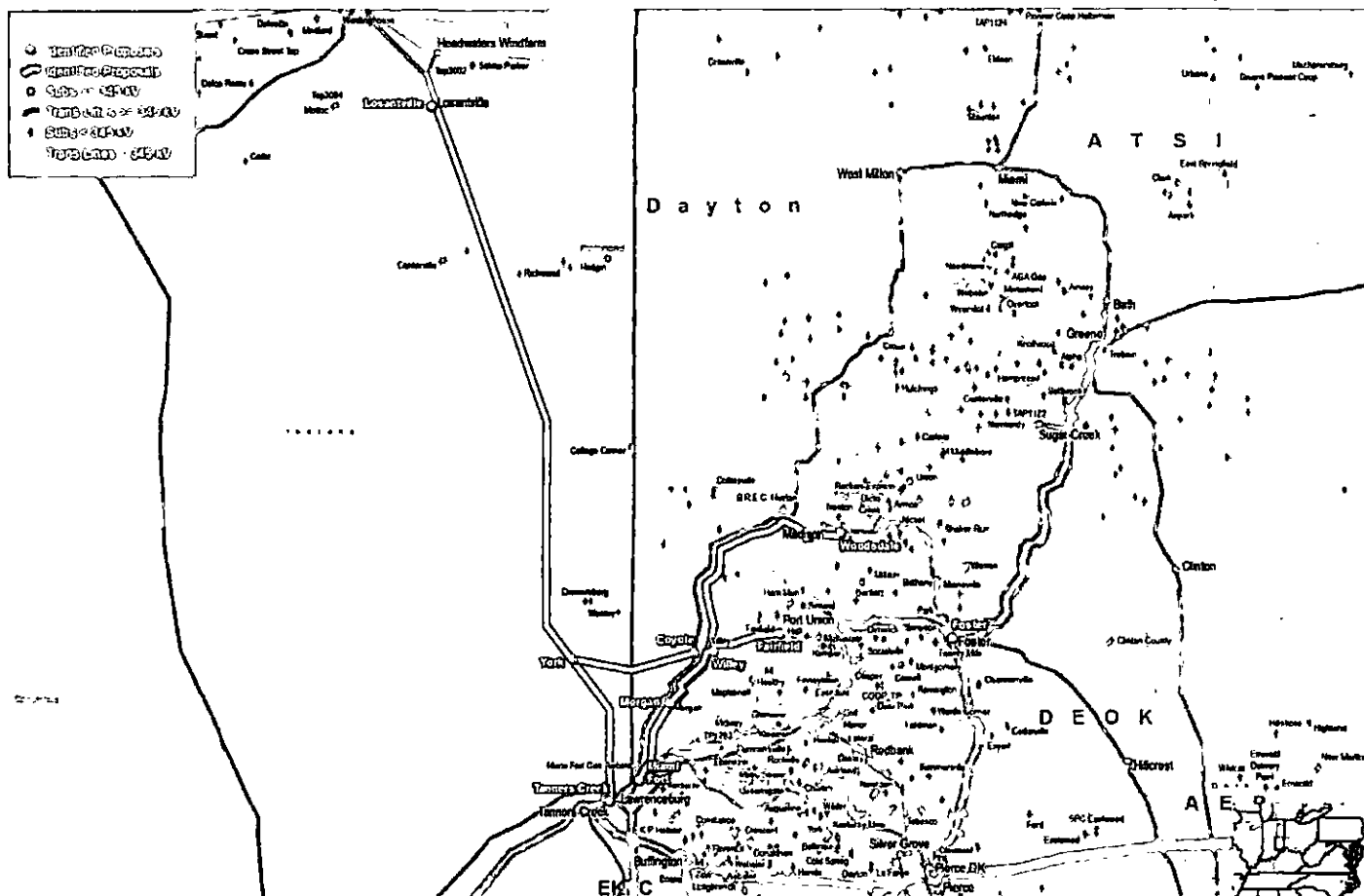


Appendix A - Interregional Projects Descriptions



DEOK Interregional

- **1 Project:**
 - 1-13H
- **Cost:**
 - \$71.88 M
- **ME Constraint:**
 - TANNERS CREEK - MIAMI
FORT 345 KV
- **2020/2021 RPM BRA Results**
 - DEOK LDA binding with
Tanners Creek - Miami Fort
345KV as limiting CETL
constraint





WPPI 1-1A

Project ID: 201617_1-1A

Proposed by: WPPI

Proposed Solution: Interregional

Provide a second New Carlisle-Olive 138 kV circuit. Upgrade substation equipment at New Carlisle and Olive substations.

kV Level: 138 kV

In-Service Cost (\$M): \$2.5

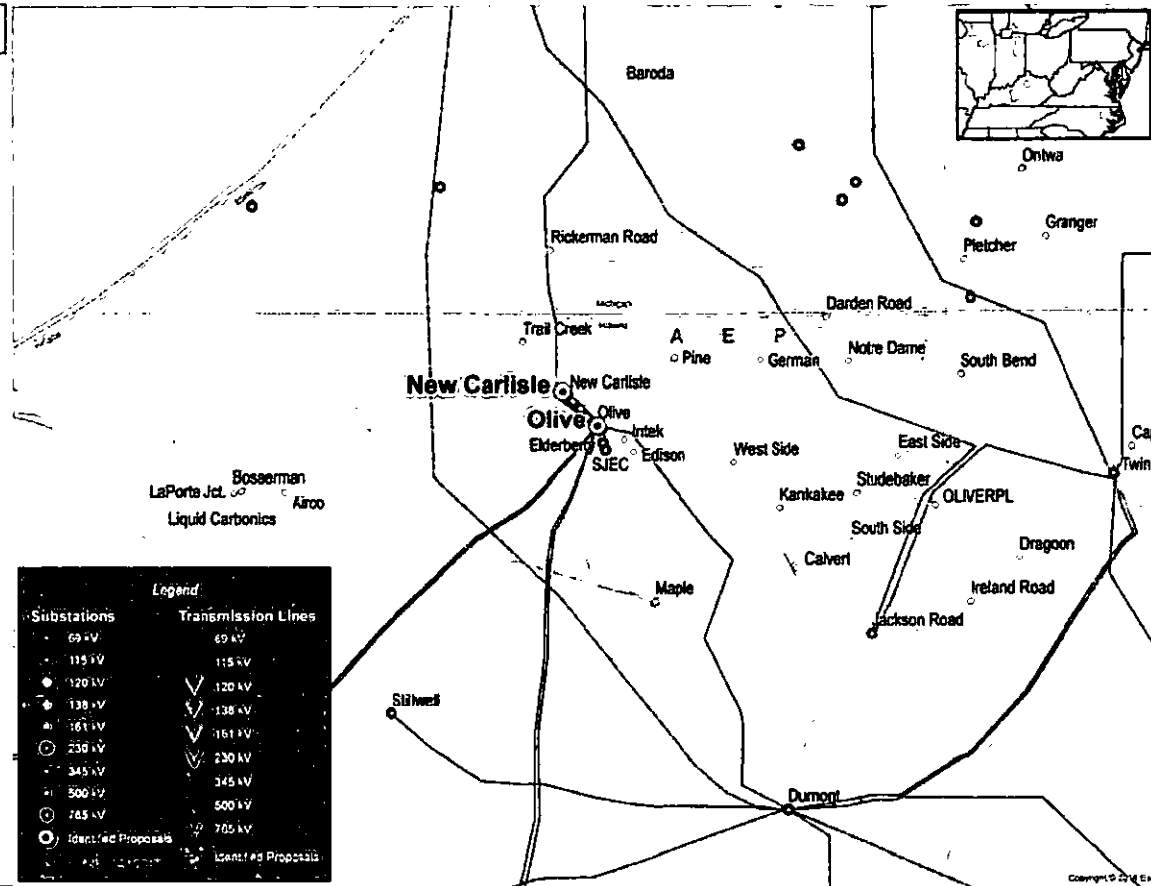
In-Service Date: 2019

Target Zone: AEP

ME Constraints:

OLIVE - BOSSERMAN 138 kV

Notes:





NIPSCO 1-9A

Project ID: NIPSCO 1-9A

Proposed by: NIPSCO

Proposed Solution: Interregional
Reconductor existing NIPSCO line section between AEP
Bosserman and Olive 138 kV substations. Reconductor
existing NIPSCO line section between AEP Bosserman and
New Carlisle 138 kV substations.

kV Level: 138 kV

In-Service Cost (\$M): \$8.00

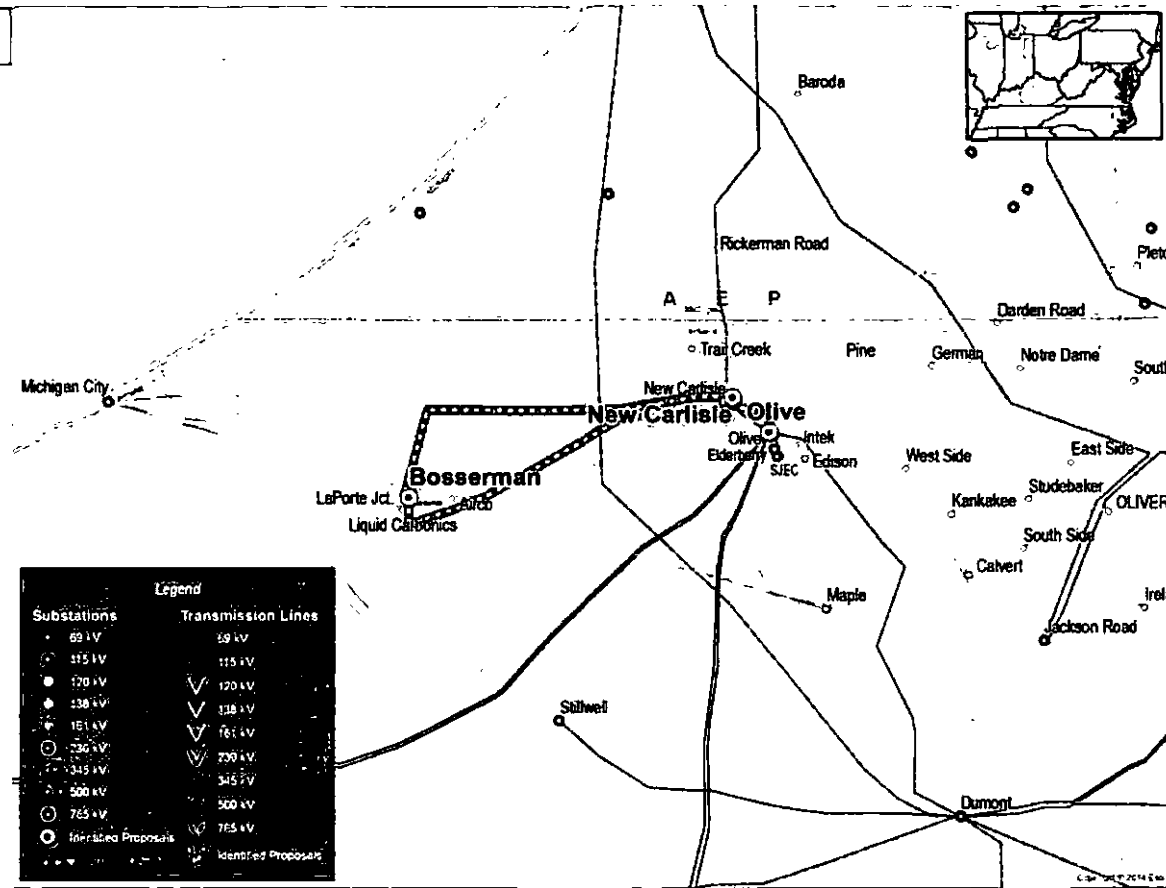
In-Service Date: 2019

Target Zone: AEP NIPSCO

ME Constraints:

OLIVE - BOSSERMAN 138 kV

Notes:





NIPSCO 1-9B

Project ID: 201617_1-9B

Proposed by: NIPSCO

Proposed Solution: Greenfield, Interregional
New NIPSCO line section between Thayer and Morrison 138
kV substations.

kV Level: 138 kV

In-Service Cost (\$M): \$42.50

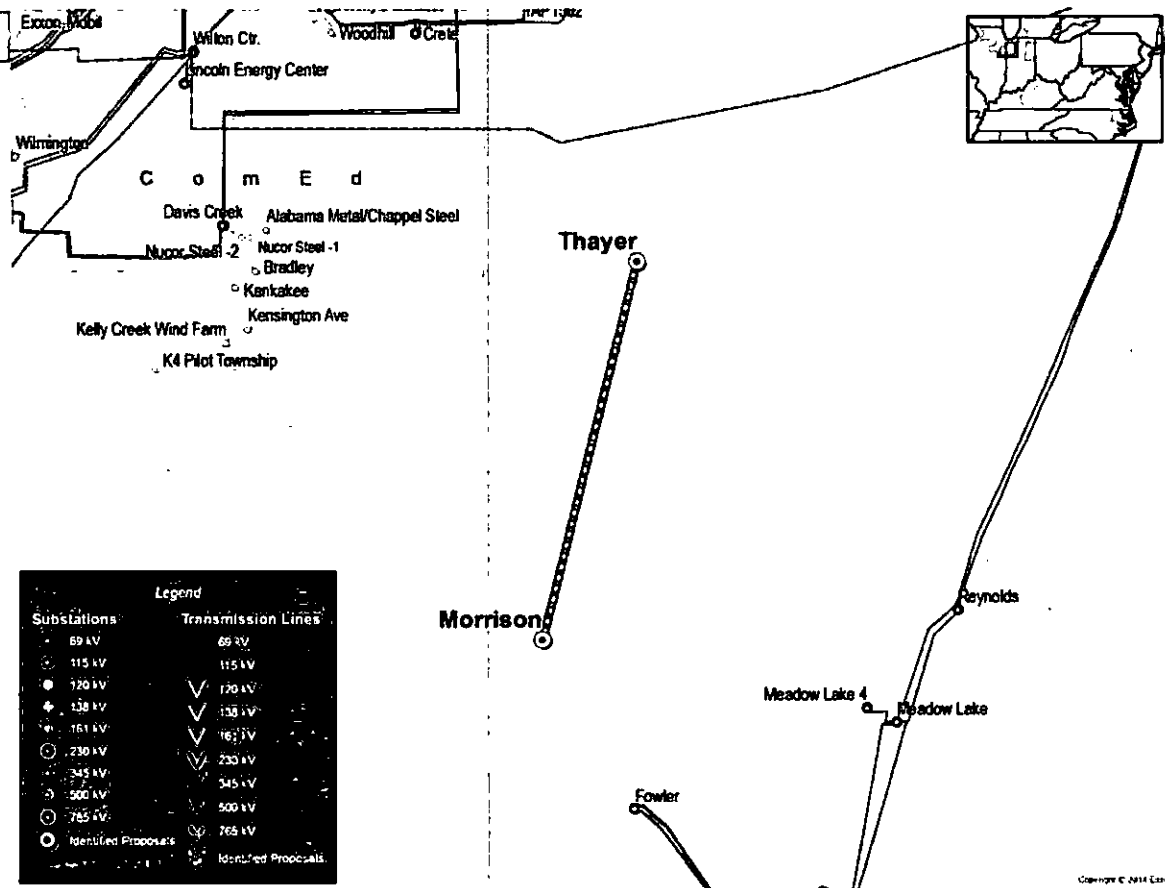
In-Service Date: 2022

Target Zone: AML ComEd NIPSCO

ME Constraints:

PAXTON - GIFFORD 138 kV

Notes:





NEXTERA 1-10B

Project ID: 201617_1-10B

Proposed by: Nextera

Proposed Solution: Greenfield, Interregional
Cut the University Park - Olive 345 kV and tie into a new 345/138 kV substation (Rolling Prairie). Cut the Maple - New Carlisle 138 kV and Maple - LNG 138 kV lines and tie into the new substation.

kV Level: 138 kV

In-Service Cost (\$M): \$19.2

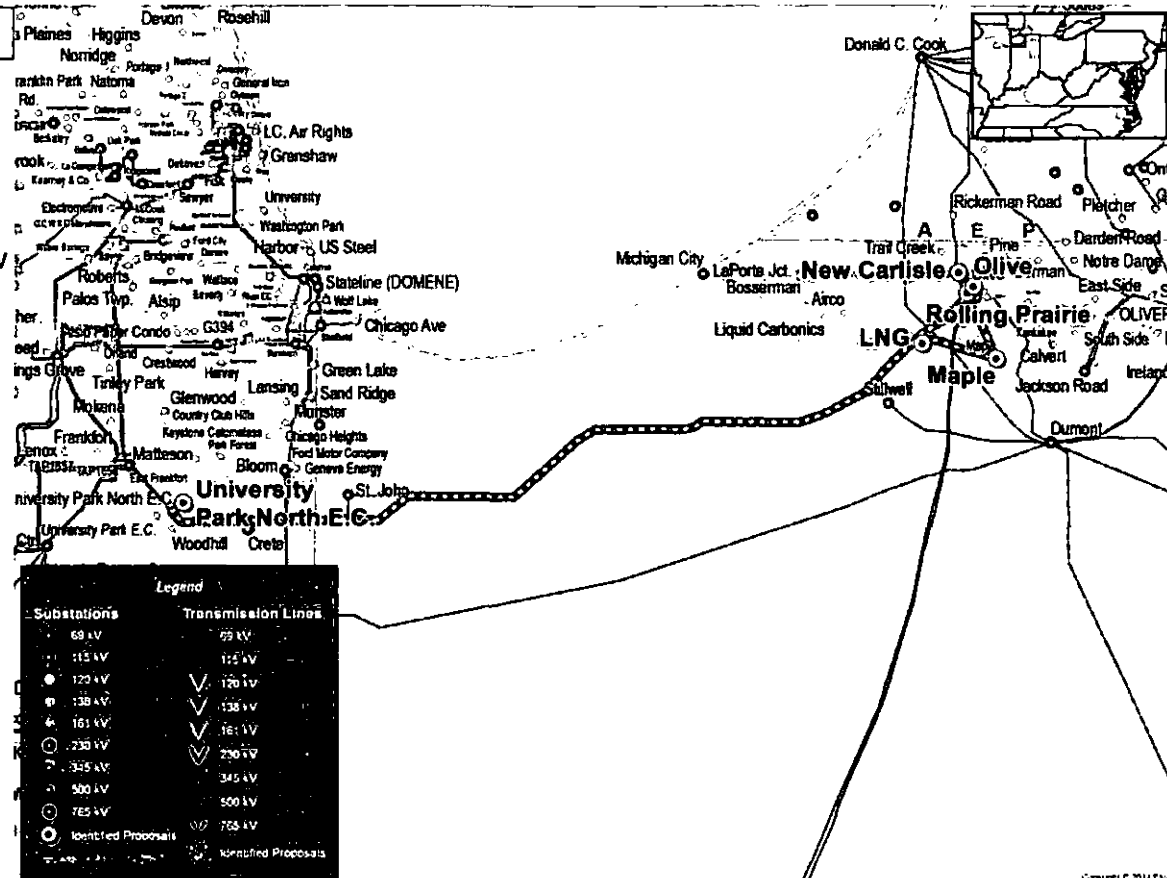
In-Service Date: 2021

Target Zone: AEP

ME Constraints:

BOSSERMAN - OLIVE 138 kV

Notes:





AEP NIPSCO 1-12D

Project ID: 201617_1-12D

Proposed by: AEP NIPSCO

Proposed Solution: Interregional

Terminate Olive-Bosserman 138 kV line at New Carlisle.
Rebuild the 34.5 kV line between New Carlisle and Silver Lake as double circuit 138 kV, operating one circuit as 34.5 kV while extending the other at 138 kV with a new circuit to Liquid Carbonics. Establish an Olive-Liquid Carbonics-Bosserman 138 kV line. Rebuild the Michigan City-Trail Creek-Bosserman 138 kV.

kV Level: 138 kV

In-Service Cost (\$M): \$41.86

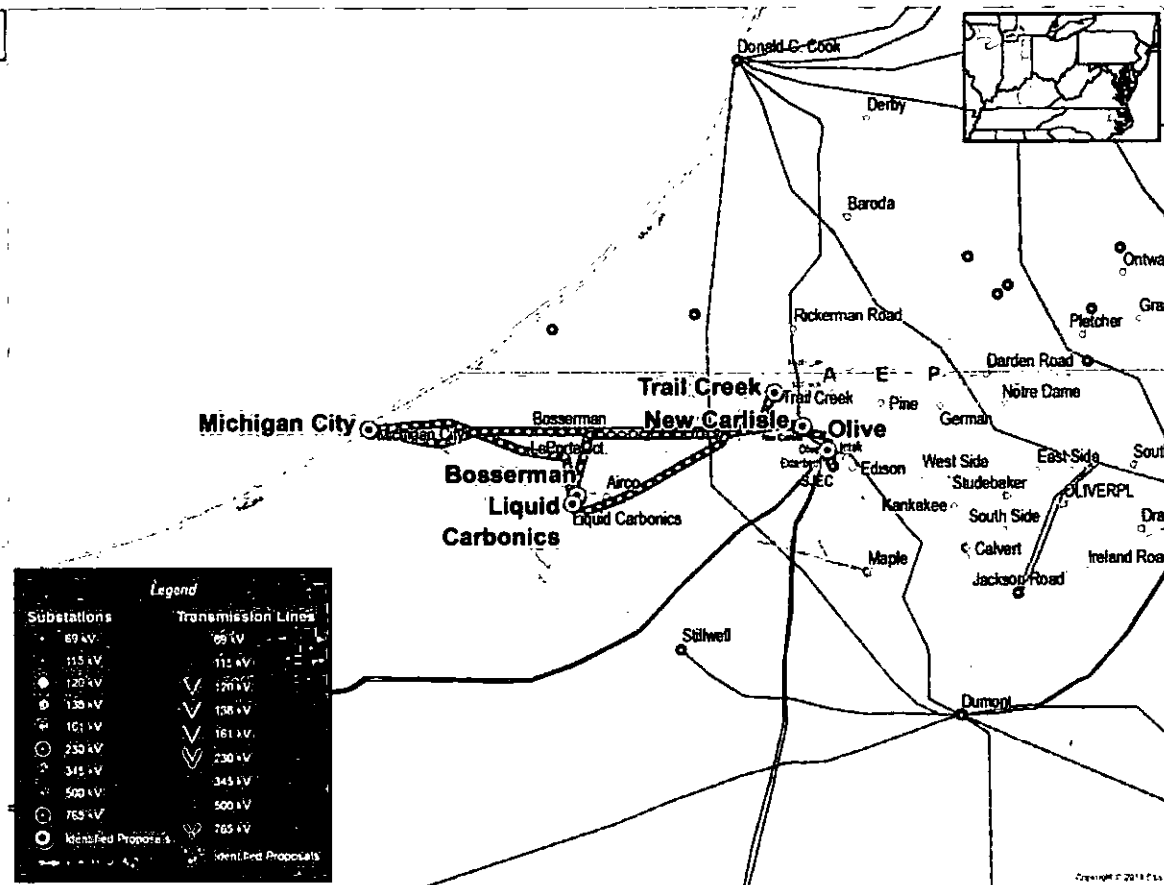
In-Service Date: 2021

Target Zone: AEP

ME Constraints:

OLIVE - BOSSERMAN 138 kV

Notes:





TRANSOURCE 1-13H

Project ID: 201617_1-13H

Proposed by: Transource

Proposed Solution: Greenfield, Interregional

Tap the Tanners Creek - Losantville 345 kV line and build a new 345 kV switchyard (York). Tap the Miami Fort - Woodsdale 345 kV line and build a new 345/138 kV substation (Coyote) next to Wiley 138kV switchyard. Build a new 345 kV line between York and Coyote stations. Expand Wiley 138 kV switchyard by tying the Coyote 345/138 kV transformer into the Wiley 138 kV yard. Loop the Morgan-Fairfield 138 kV line into Wiley 138 kV station. Install a new 345/138 kV transformer at Foster substation.

kV Level: 138/345 kV

In-Service Cost (\$M): \$71.89

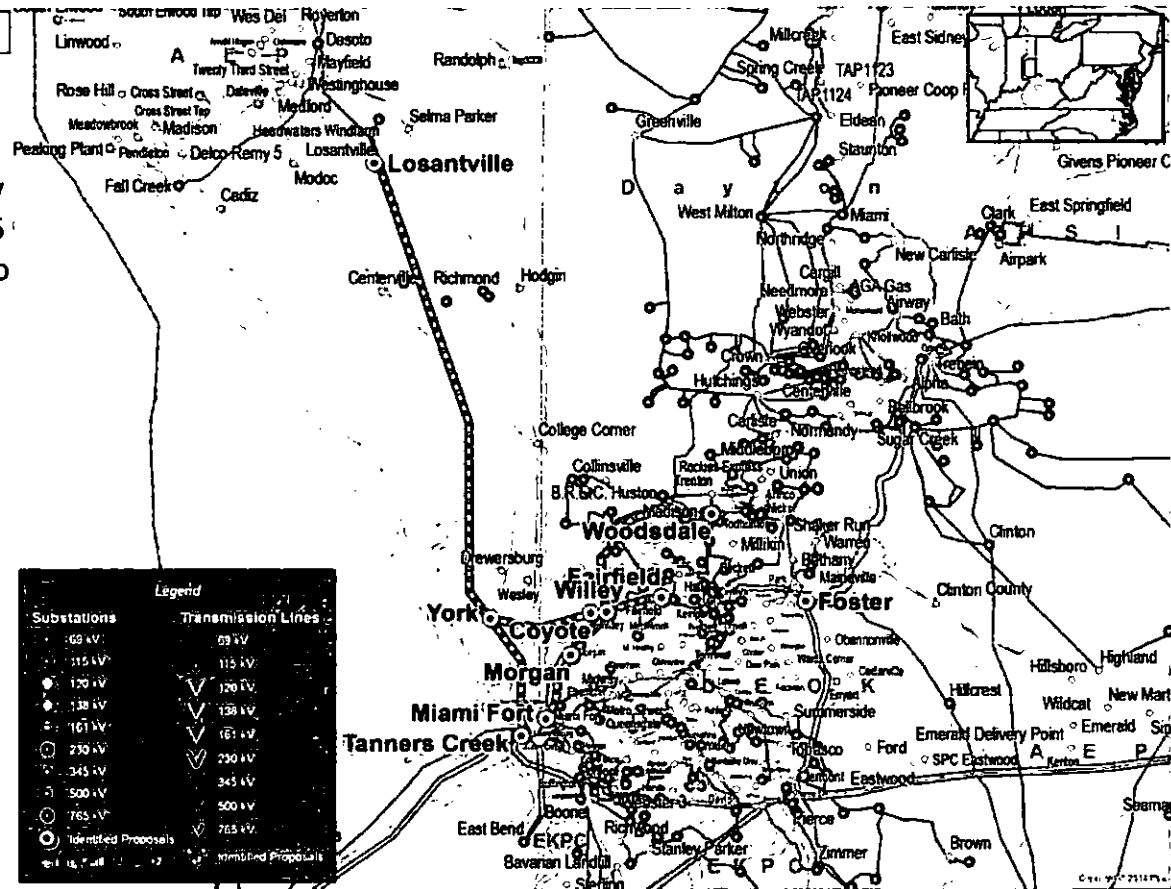
In-Service Date: 2021

Target Zone: DEOK

ME Constraints:

TANNERS CREEK - MIAMI FORT 345 kV

Notes:





AEP EXELON 1-17B

Project ID: 201617_1-17B

Proposed by: AEP Exelon

Proposed Solution: Greenfield, Interregional
Build a new 345 kV switchyard (Pike Creek). Build a new Meadow Lake - Pike Creek 345 kV double circuit line. Loop the Bloom - Davis Creek 345 kV line and Burnham - Davis Creek 345 kV line into Pike Creek switchyard.

kV Level: 345 kV

In-Service Cost (\$M): \$197.97

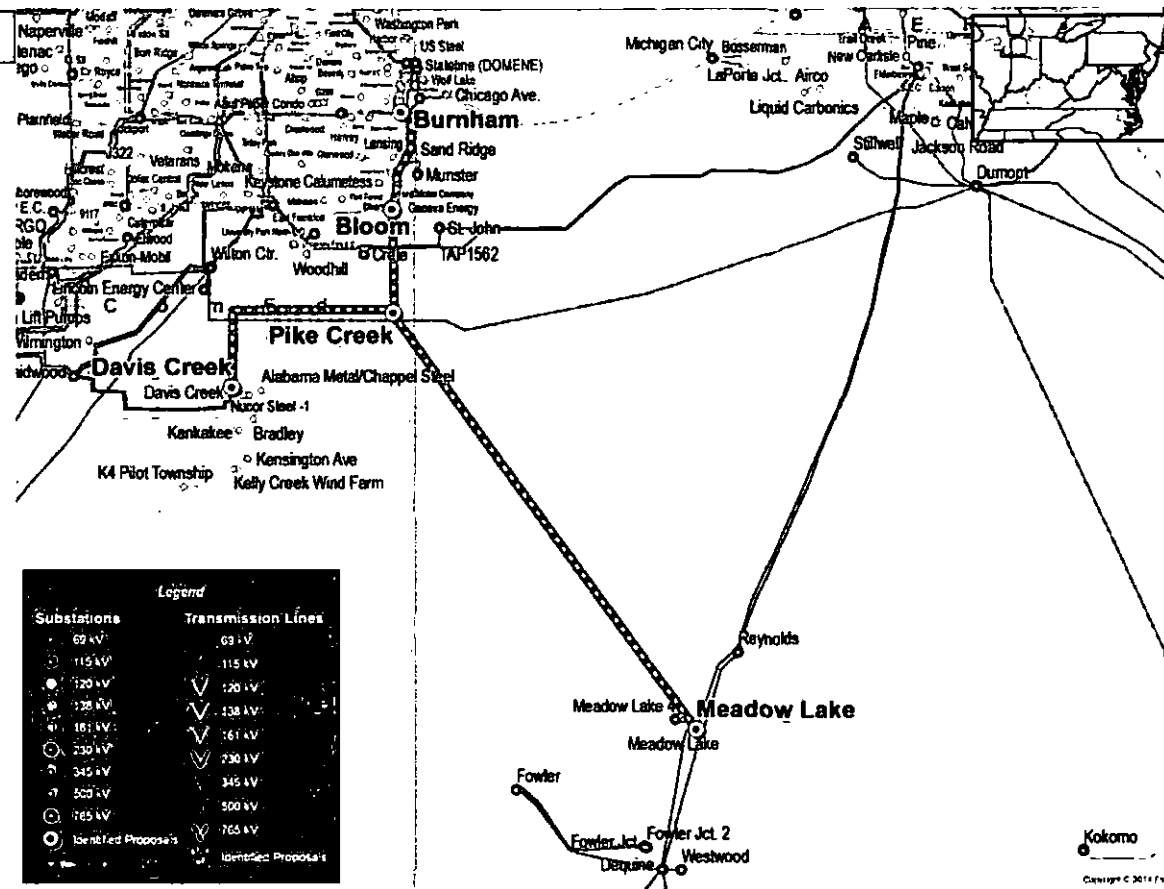
In-Service Date: 2021

Target Zone: ComEd

ME Constraints:

OLIVE - BOSSERMAN 138 kV + RPM Benefits

Notes:





NTD 1-18S

Project ID: 201617_1-18S

Proposed by: Northeast Transmission Development

Proposed Solution: Greenfield, Interregional
Tap the Green Acres - Olive 345 kV line and build a new
345/138 kV substation (Coffee Creek). Loop the Flint Lake to
Luchtman Road 138 kV line into Coffee Creek.

kV Level: 138/345 kV

In-Service Cost (\$M): \$17.4

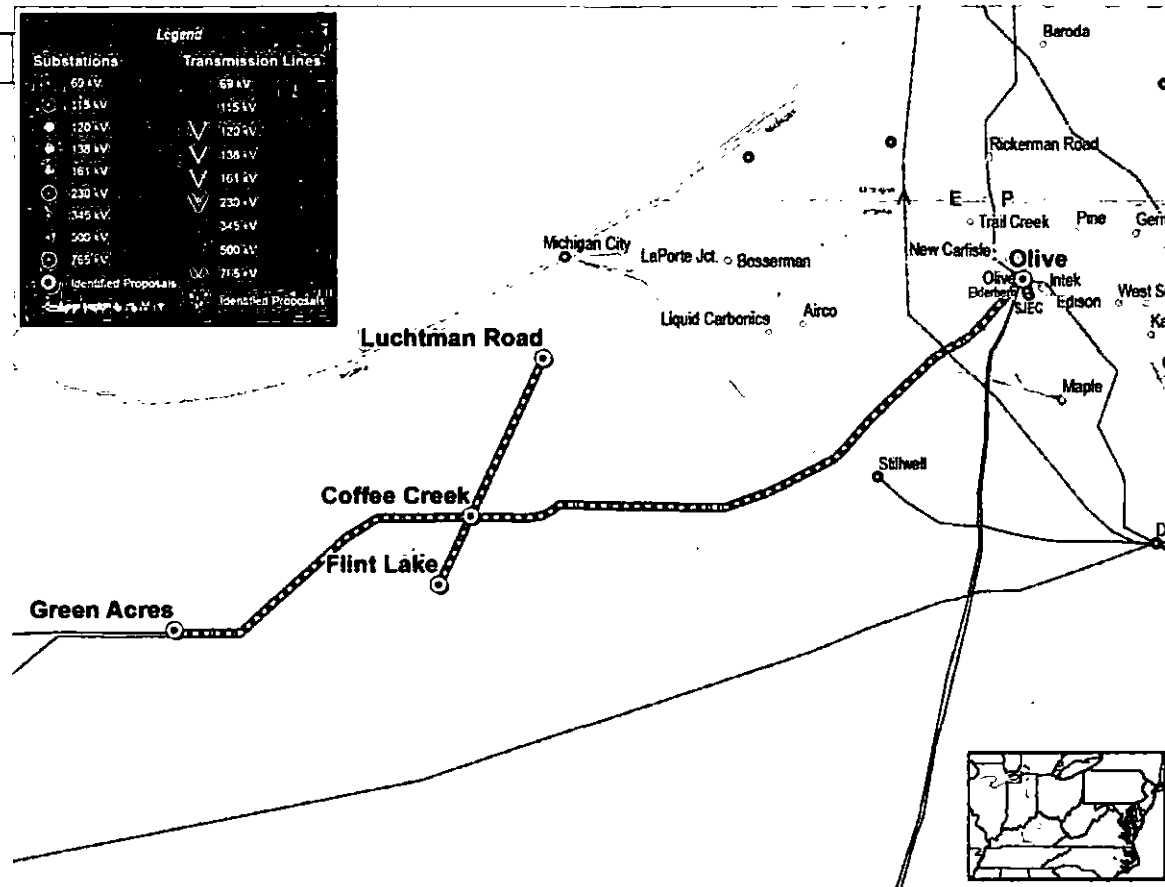
In-Service Date: 2021

Target Zone: AEP

ME Constraints:

OLIVE - BOSSERMAN 138 kV

Notes:





Appendix B - AEP Supplemental Project Olive – Bosserman 138 kV



AEP Supplemental Project

- AEP has planned a supplemental project that impacts the Olive – Bosserman market efficiency constraint
- Supplemental projects are:
 - Not needed for reliability criteria, market efficiency, or operational performance
 - Funded wholly by Transmission Owner
 - No PJM approval needed
- This supplemental project is NOT included in the mid-cycle update of the Market Efficiency base case.



Supplemental Project: Olive-Bosserman 138 kV
Previously Presented at 4/13/2017 TEAC and 4/21/2017 Western SRTEAC

Problem Statement/Driver:

The LaPorte Junction - New Carlisle 34.5 kV circuit has a vintage from 1930s and is wood pole construction. Between 2010-2015, ~2 million customer minutes of interruption (CMI) were recorded at Silver Lakes station. There are 183 open conditions, 95 of which are category A conditions on the ~20 mile long line.

Indiana and Michigan Power Company has requested to convert Silver Lake and Springville to 138 kV operation.

This project would also resolve congestion on the Olive-Bosserman 138 kV identified during MISO-PJM JOA market efficiency studies in addition to addressing the a potential overload identified on this facility during the PJM 2021 RTEP. It was submitted (without the new distribution station additions) to the PJM reliability and market efficiency windows.

Recommended Solution:

Construct two 138/12 kV distribution stations, Bootjack and Marquette, to replace Silver Lake 34.5 kV and Springville 69 kV stations. (S1279.1)

Cut the existing Olive - Bosserman line into New Carlisle station. (S1279.2)

Rebuild sections of the LaPorte Junction-New Carlisle/New Buffalo 34.5 kV line to 138 kV to establish Bootjack-Olive 138 kV circuit. (S1279.3)

Install a three way phase over phase switch, called Kuchar, near Liquid Carbonics station and construct a new 138 kV line between Bootjack and Kuchar. (S1279.4)

Construct a 138 kV extension to Marquette station by tapping the Bosserman-Liquid Carbonics 138 kV line. (S1279.5)

Alternatives:

Rebuild ~20 mile long New Carlisle - LaPorte Junction 34.5 kV utilizing existing line ROW corridor. This alternative was not selected because it did not provide the operational flexibility & efficiency and customer service benefits provided by the preferred option. Estimated cost: ~\$32M

Cost Estimate: \$36.786M

Projected IS date: 12/1/2019

Status: Conceptual

AEP Transmission Zone





Revision History

- Revision History
 - V1 – 9/8/2017 – Original Version Posted to PJM.com
 - V2 – 9/12/2017 – Slide 17 corrections
 - 9A in-service date from 2021 to 2020
 - added note regarding 9A cost review

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

**Interrogatories of the Office of Consumer Advocate
Set II
(Responses dated 2/16/2018)**

Data Request OCA-II-13:

Reference: Transource Statement 3 (McGlynn), p. 19 line 18 to p. 20 line 2. Please define the term "customers" as used in this portion of Mr. McGlynn's testimony

Response:

From PJM's perspective "customers" are Load Serving Entities in the transmission zones that are benefited by the Project.

Witness: Paul McGlynn

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

**Interrogatories of the Office of Consumer Advocate
Set II
(Responses dated 2/16/2018)**

Data Request OCA-II-15:

Reference: Transource Statement 3 (McGlynn), p. 22, lines 15-17.

- a. Please describe in detail what Mr. McGlynn means by the statement: "in determining the Change in Load Capacity Payments, only PJM transmission zones that show a decrease will be considered in determining the Change in Load Capacity Payments."
- b. For example, if a particular project results in capacity costs to Zone A decreasing by \$10 million and capacity costs to Zone B increasing by \$8 million, would the Change in Load Capacity Payments for purposes of the cost-benefit analysis be \$10 million or \$2 million?
- c. Specifically for the Independence Energy Project, did the modeling show any zones experiencing an increase in capacity costs? If so, please identify each such zone, the amount of cost increase in the zone, and the total Change in Load Capacity Payments for the Project (both including and excluding zones with cost increases).

Response:

- a. The quoted portion of Mr. McGlynn's testimony refers to the market efficiency process contained in Manual 14B.
- b. \$10 Million.
- c. No.

Witness: Paul McGlynn

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

**Interrogatories of the Office of Consumer Advocate
Set II
(Responses dated 2/16/2018)**

Data Request OCA-II-16:

Reference: Transource Statement 3 (McGlynn), p. 33, lines 2-3.

- a. Is the \$320.19 million figure the construction cost of Project 9A or the 15-year discounted revenue requirement for Project 9A. If it is the construction cost, please provide the 15-year discounted revenue requirement used in the cost-benefit analysis.
- b. Please provide a workpaper showing the calculation of the 15-year discounted revenue requirement for Project 9A.

Response:

- a. PJM used for the cost-benefit analysis a cost of \$340.6 million estimated by escalating the cost of project components to the project's planned in-service date. The estimated 15-year discounted revenue requirement was \$478.15 million.
- b. Workpaper showing the 15-year discounted revenue requirement For project 9A

Inputs: Market Efficiency Project Cost = \$340.6; Project Benefit Period = 15 yrs;
PJM Fixed Carrying Charge Rate = 16.2%; PJM Discount Rate = 7.8%

Project Annual Revenue Requirement = Project Cost x Fixed Carrying Charge Rate
= \$340.6 Million x 16.2% = \$55.18 Million Annually

Net Present Value of Project Costs

Excel Formula: pv(rate, # periods, payment per period)

Net Present Value of Project Costs = pv(7.8%, 15, -55.18) = \$478.15 Million

Witness: Paul 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-02:

How and to what extent did PJM ensure that the United States Department of Energy (DOE) Appliance and Equipment minimum energy efficiency standards including 60 categories of end use equipment e.g., space heating, cooling, ventilation, refrigeration, cooking, clothes washing, clothes drying, electronics, industrial process, get factored in to the PJM energy and power forecasts?

Response:

PJM ensured that the DOE Appliance and Equipment minimum energy efficiency standards of end use equipment were factored into the PJM energy and power forecasts by incorporating the Electric Information Administration's (EIA) historical and forecasted saturation rates and usage intensities for end-use equipment into the PJM load forecast. While the data is actually supplied by Itron, Inc. (as noted in the Company's response to OCA-IV-02), it is drawn from EIA's Annual Energy Outlook. PJM used the provided end-use detail to derive three variables used in the load forecast model: one each for heating and cooling equipment and another for all other equipment. Please refer to PJM's 2016 load forecast whitepaper, Section IV, available at: [<http://www.pjm.com/~media/library/reports-notice/load-forecast/2016-load-forecast-whitepaper.ashx>.]

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 3/16/2018)**

Data Request OCA-IV-21:

With respect to the Direct Testimony of Witness McGlynn addressing the Applications for the Independence Energy Connection – West Project and East Project, please provide supporting documentation and substantiation for the \$622 million and \$269 million (15 year) savings attributable to the Transource Project 9A mentioned on page 33, lines 3-5 of his testimony.

Response:

The value of \$269 million Load Payments savings was computed as 15-years benefits based on an average of years 2019 and 2022 annual gross load payments savings across all PJM zones.

	Simulated Annual Gross Load Payments (\$)		Gross Load Payment Savings (\$)
Year	Base case	Project Case	
2019	\$ 33,716,808,002	\$ 33,721,704,238	\$ (4,896,236)
2022	\$ 39,995,671,983	\$ 39,954,904,806	\$ 40,767,176
		Average Benefits	\$ 17,935,470
		15-Years Average	\$ 269,032,054

The value of \$622 million congestion savings was computed as 15-years benefits based on an average of years 2019 and 2022 annual PJM congestion savings.

Total PJM Congestion Savings (\$million) (annual sum 2019+2022)*	\$ 83
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**Application of Transource Pennsylvania LLC
Independence Energy Connection-West Project
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**Interrogatories of the Office of Consumer Advocate
Set IV
(Responses dated 3/16/2018)**

Average Benefits (\$million) (2019+2022)/2	\$ 41.50
Number of years	15
15-Years Benefits (\$million)	\$ 623

These savings estimate calculations are not considered in PJM's Market Efficiency cost/benefit analysis.

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-46:

Reference to PJM Manual 14B, page 20 Section 1.3.2 PJM annually reviews changes to expected new generation, existing generation refinements and anticipated levels of demand response. Please explain what is included in the category of demand response and on what basis and criteria are the projected levels of demand response resources modified?

Response:

PJM annually reviews changes to all factors, including Demand Response, to the extent that it is included in the load forecast. Only Demand Response that has cleared the RPM auction is included in the Market Efficiency model.

Witness: Paul F. McGlynn

**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 VI
(Responses dated 5/23/2018)**

Data Request OCA-VI-01:

Referring to Mr. McGlynn's testimony (IEC East, 8:3-5) where it states:

Specifically, during its competitive solicitation process conducted in 2014 and 2015, PJM estimated that Project 9A was expected to save customers approximately \$620 million over 15 years.

- a. Please specify the years included in the 15 year period reflected in PJM's evaluation.
- b. Please specify the years included in the 15 year period reflected in PJM's evaluation that were performed using market simulations.
- c. Please specify the years included in the 15 year period reflected in PJM's evaluation that were performed using interpolations or extrapolations of the results from market simulations.

Response:

- a. The 15 year period reflected in PJM's evaluation is 2020 – 2035.
- b. Regarding the May/June 2016 Analysis, the years 2015, 2019, 2022 and 2025 contained in the 15 year period reflected in PJM's evaluation were performed using market simulations.
- c. All of the years within the 15 year evaluation period except the years in answer 1b.

Witness: Paul F. McGlynn

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

**Interrogatories of the Office of Consumer Advocate
Set VII
(Responses dated 3/19/2018)**

Data Request OCA-VII-01:

Reference: Transource response to OCA II-14.

- a. Please confirm that the table shows only load energy payments and does not include load capacity payments. If this is not confirmed, please provide a table that shows separately energy and capacity payments for each PJM zone.
- b. Were the increases in load energy payments (\$851.67 million, as shown on Attachment 1) considered in any aspect of PJM's cost-benefit analysis for the project? If so, please state specifically where and how they were considered. If not, why not?

Response:

- a. Confirmed. The Project does not affect capacity payments.
- b. PJM's Market Efficiency analysis does not take into consideration the effect of relieving or eliminating congestion on zones that incidentally "benefit" from the congestion. To the extent there are increases in load energy payments in certain transmission zones those increases reflect the elimination or relief of market price distortions caused by the congestion, and therefore are appropriately not part of market efficiency cost/benefit analysis. The Company further states that the cost of the solution to address congestion is allocated to the zones that benefit from the elimination of the congestion. Please see PJM Manual 14B at Section 2.6.5 and Attachment E, available at <http://www.pjm.com/~media/documents/manuals/m14b.ashx>.

Witness: Paul F. McGlynn

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

**Interrogatories of the Office of Consumer Advocate
Set VII
(Responses dated 3/19/2018)**

Data Request OCA-VII-03:

Reference: Transource response to OCA II-16. Why is the cost of the project calculated using the cost of project components as of the in-service date, rather than the discounted stream of revenue requirements for 15 years?

Response:

For purposes of PJM's Market Efficiency analysis, as described in PJM Manual 14B, the cost of Project 9A is calculated using the cost of project components as of the in-service date in order to enable an appropriate comparison between multiple possible alternatives addressing the same need or needs. The Company further states that PJM's Market Efficiency analysis does include an estimated discounted stream of revenue requirements for 15 years, and that therefore the two statements in OCA's data request OCA-VII-3 are in fact not mutually exclusive.

Witness: Paul F. McGlynn

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

**Interrogatories of the Office of Consumer Advocate
Set VIII
(Responses dated 5/24/2018)**

Data Request OCA-VIII-01:

Reference: Transource Statement 3 (McGlynn) and PJM Market Efficiency Update for the TEAC meeting of February 8, 2018. On page 34 of the Market Efficiency Update, there are results from reevaluating Project 9A and 13 other projects. Please provide:

- a. A description of the 15 year evaluation period
- b. Please specify the years included in the 15 year period reflected in PJM's evaluation that were performed using market simulations.
- c. Please specify the years included in the 15 year period reflected in PJM's evaluation that were performed using interpolations or extrapolations of the results from market simulations.
- d. For each year of the evaluation period, assuming no enhancement project, please provide the annual peak MW load in each transmission zone ("base case").
- e. If different base cases were used to compare against specific projects, i) identify those projects, ii) provide comparable annual peak loads for each year of the evaluation period for each transmission zone, and iii) provide an explanation as to why different base cases were used.
- f. For each of the project evaluations for Projects 2A, 9A, 11H and Optimal Caps, for each year of the evaluation period, please provide the annual peak MW load in each transmission zone.

Response:

- a. 2020 (in service date) + 15
- b. 2017, 2021, 2024, 2027. The process for determining these are described in Manual 14B.
- c. All of the years within the 15 year evaluation period except the years in answer 1b.
- d. The peak MW load used for each simulated year as shown in the answer to 1b is taken from the PJM 2018 load forecast.
<http://www.pjm.com/-/media/library/reports-notices/load-forecast/2018-load-forecast-report.ashx?la=en>
- e. Page 34 of the Market Efficiency update presented at the February 8, 2018 TEAC meeting was an update to the September 2017 TEAC where PJM reviewed the results of PJM's Market Efficiency retool analysis using 2017 RTEP assumptions. In February 2018, PJM presented an updated analysis of Project 9A at the request of stakeholders. The analyses of the other projects shown on page 34 were not updated.
- f. The other projects listed in the table on slide 34 were approved prior to Project 9A approval. Therefore, they were already included in the power flow cases used in the Project 9A analysis. Please refer to the Company's response to subsection e.

Witness: Paul F. McGlynn

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

**Interrogatories of the Office of Consumer Advocate
Set VIII
(Responses dated 5/24/2018)**

Data Request OCA-VIII-02:

Reference: Transource Statement 3 (McGlynn) and PJM Market Efficiency Update for the TEAC meeting of February 8, 2018. On page 34 of the Market Efficiency Update, there are results from reevaluating Project 9A and 13 other projects. Please provide:

- a. Please provide workpapers for the energy market benefit as calculated in the Market Efficiency Update for each of Project 2A, Project 9A, Project 11H, and Optimal Caps.
- b. For each year of the 15 year evaluation period, please provide a spreadsheet depicting the total energy production cost calculated for each zone without any enhancement projects. If different base cases are used for the evaluation of different projects, provide the requested data for each base case and specify which project evaluation it is applicable to.
- c. For each year of the 15 year evaluation period, please provide a spreadsheet depicting the total energy production cost calculated for each zone with each of Project 2A, Project 9A, Project 11H, or Optimal Caps implemented.
- d. For each year of the 15 year evaluation period, please provide a spreadsheet depicting the load energy payment calculated for each zone without any enhancement projects. If different base cases are used for the evaluation of different projects, provide the requested data for each base case and specify which project evaluation it is applicable to.
- e. For each year of the 15 year evaluation period, please provide a spreadsheet depicting the load energy payment calculated for each zone with each of Project 2A, Project 9A, Project 11H, or Optimal Caps implemented.
- f. For each year of the 15 year evaluation period, please identify each zone that shows an increase in load energy payments with each of Project 2A, Project 9A, Project 11H, or Optimal Caps implemented, and provide the amount of the increase.

Response:

- a. In the February 8, 2018, presentation PJM analyzed only the b/c ratio for Project 9A, and not for the other projects. Please refer to OCA VI-02 CONFIDENTIAL Attachment 1 for the workbook containing the requested information.
- b. Please refer to the Company's response to subpart "a". Specifically refer to OCA VI-02 CONFIDENTIAL Attachment 1 for the production costs for Project 9A. The production cost is not used for the b/c calculation. Different base cases were not used in the February 2018 analysis.
- c. Please refer to the Company's response to subpart "b".

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**Interrogatories of the Office of Consumer Advocate
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- d. Please refer to the Company's response to subpart "a". Different base cases were not used in the February 2018 analysis.
- e. Please refer to the Company's response to subpart "a". Specifically refer to OCA VI-02 CONFIDENTIAL Attachment 1 for information related to Project 9A; analyses were not performed for the other projects, as explained in subpart "a".
- f. Please refer to the Company's response to subpart "a". Specifically refer to OCA VI-02 CONFIDENTIAL Attachment 1 for information related to Project 9A; analyses were not performed for the other projects, as explained in subpart "a".

Witness: Paul F. McGlynn

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**Interrogatories of the Office of Consumer Advocate
Set VIII
(Responses dated 5/24/2018)**

Data Request OCA-VIII-04:

Reference: Transource Statement 3 (McGlynn) and PJM Market Efficiency Update for the TEAC meeting of February 8, 2018. On page 34 of the Market Efficiency Update, there are results from reevaluating Project 9A and 13 other projects. Please provide:

- a. Please provide workpapers for i) the total annual benefit for each year of the 15 year evaluation period for each of Project 2A, Project 9A, Project 11H, and Optimal Caps, and for ii) the present value of the total annual benefits for each year for each of Project 2A, Project 9A, Project 11H, and Optimal Caps.
- b. Please specify the discount rate and all other assumptions used to calculate the present value of the total annual benefits for each of Project 2A, Project 9A, Project 11H, and Optimal Caps.
- c. A breakdown of the costs for each of Project 2A, Project 9A, Project 11H, and Optimal Caps into individual elements that make up each project.
- d. Please provide workpapers for i) the total annual revenue requirement for costs for each year of the 15 year evaluation period for each of Project 2A, Project 9A, Project 11H, and Optimal Caps, and for ii) the present value of the total annual revenue requirements for each year for each of Project 2A, Project 9A, Project 11H, and Optimal Caps.
- e. Please specify the discount rate and all other assumptions used to calculate the present value of the total annual benefits for each year for each of Project 2A, Project 9A, Project 11H, and Optimal Caps.
- f. Please provide workpapers for the B/C ratio for each of Project 2A, Project 9A, Project 11H, and Optimal Caps.

Response:

- a. (i) The information requested by year is not available because the overall benefits of the Project are determined following the present value calculations of the Change Load Payments metric as defined in Section 1.5.7 of Schedule 6 of the PJM Operating Agreement for each Zone. Zones which benefit on that present value basis are included in the overall project benefit calculation. Zones which do not benefit are excluded. As a result, the data is not intended to be used to determine the benefits of the Project on an annual individual-year basis. Please refer to OCA VI-02 CONFIDENTIAL Attachment 1, the "NLP Analysis" tab, for details of the calculation. Only Project 9A was analyzed in the February 2018 analysis. Please note that all of the information contained in OCA VI-02 CONFIDENTIAL

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**Interrogatories of the Office of Consumer Advocate
Set VIII
(Responses dated 5/24/2018)**

Attachment 1 is provided subject to the Protective Order in this case.

- (ii) Please refer to the response to subpart a(i). The present value of total benefits is listed specifically in OCA VI-02 CONFIDENTIAL Attachment 1, the "NLP analysis" tab, cell AG3.
- b. Please refer to the Company's response to subpart "a".
- c. Please refer to the Company's response to subpart "a".
- d. (i) The information requested by year is not available because the present value of payments is computed with a single present value formula that uses the annual revenue requirement, and a fixed discount rate of 7.40 percent that covers the entire 15 year horizon. Please refer to OCA VI-02 CONFIDENTIAL Attachment 1, the "BC_CA Results" tab, cell E13 for the annual revenue requirement for each year of Project 9A. Only Project 9A was analyzed in the February 2018 analysis. Please note that all of the information contained in OCA VI-02 CONFIDENTIAL Attachment 1 is provided subject to the Protective Agreement in this case.
- (ii) Please refer to the response to subpart d(i). Please refer to OCA VI-02 CONFIDENTIAL Attachment 1, the "BC_CA Results" tab, cell E14 for the present value of the total annual revenue requirement of Project 9A.
- e. Please refer to the Company's response to subpart "a".
- f. Please refer to the Company's response to subpart "a".

Witness: Paul F. McGlynn

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**Interrogatories of the Office of Consumer Advocate
Set IX
(Responses of Transource dated 4/13/2018)**

Data Request OCA-IX-01:

Referring to Mr. McGlynn's testimony (IEC East, 24:19-21), the AP South Reactive Interface is described as "...a set of four 500 kV lines which originate in West Virginia and terminate in Maryland and Virginia."

- a. Please identify each of these four lines.
- b. For each of these four lines, please identify the name and location of each of the substations at which they originate and the name and locations of each of the substations at which they terminate.
- c. For each of these four lines, please provide the summer normal rating, the summer emergency rating, the winter normal rating, and the winter emergency rating, all in MVA, that were used in the initial evaluations of Project 9A in 2015 and 2016.
- d. For each of these four lines, please provide the summer normal rating, the summer emergency rating, the winter normal rating, and the winter emergency rating, all in MVA, that were used in the re-evaluations of Project 9A in early 2018.
- e. For each of these four lines, please describe when the existing towers and conductors were placed in service.

Response:

- a. Please refer to PJM's Manual M-3 – Section 3.8 Transfer Limits (Reactive/Voltage Transfer Limits) at 53:

AP South (AP South):

- 583 Bismark – Doubs 500 kV line
- 540 Greenland Gap – Meadow Brook 500 kV line
- 550 Mt. Storm – Valley 500 kV line
- 5529 Mt. Storm – Meadow Brook 500 kV line

PJM's Manual M-3 is available at: [<http://pjm.com/directory/manuals/m03/index.html>.]
Please refer also to the Company's response to OCA IV-08.

- b. Please refer to the Company's response to OCA IV-08.

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- c. The information requested, to the extent relevant to the PJM's market efficiency analysis that determined that Project 9A is needed as a market efficiency project in PJM's RTEP, is contained in the model used to conduct the analysis, which is being made available subject to confidentiality, licensing, and CEII protection requirements consistent with the Protective Order entered in this case.

The Company further states that thermal ratings of the individual lines have no bearing on the AP South Reactive Interface congestion that Project 9A is designed to address.

- d. See the Company's response to c.
- e. The Company lacks information sufficient to form a belief about the information requested. The Company further states that the information requested has no bearing on the AP South Reactive Interface congestion that Project 9A is designed to address.

Witness: Paul F. McGlynn

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**Interrogatories of the Office of Consumer Advocate
Set IX
(Responses of Transource dated 4/13/2018)**

Data Request OCA-IX-07:

Operations data available from the PJM website includes annual spreadsheets depicting RTO Transfer Limits and Flows for the AP South Interface and numerous other interfaces. (See attached sample.) Please discuss:

- a. What units (kW, MW, or something else) are reflected in these spreadsheets?
- b. How the AP South Pre-Contingency Limit is determined?
- c. How the AP South Post-Contingency Limit is determined?
- d. What contingency is used in determining the AP South Post-Contingency Limit.

Response:

- a. MW
- b. See Section 3.8 of Manual 3 "Transmission Operations": <http://pjm.com/-/media/documents/manuals/m03.ashx>
- c. See response to b.
- d. Contingencies used in determining the AP South Post-Contingency limits vary from moment to moment and time to time, depending on system conditions.

Witness: Paul F. McGlynn

**Application of Transource Pennsylvania LLC
Independence Energy Connection-East Project
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**Interrogatories of the Office of Consumer Advocate
Set XI
(Responses dated 5/23/2018)**

Data Request 05:

Please compare transmission system losses with and without Project 9A as modelled in the February 8, 2018 Market Efficiency Update and discuss how such losses were determined.

Response:

Such a comparison has not been performed. The Company further states that transmission system losses are part of the load forecast inputs to the PROMOD case (model), and are therefore held constant in the analysis with and without Project 9A. The PROMOD model is proprietary and confidential, is subject to licensing from an unaffiliated third-party, and is being provided to OCA subject to licensing requirements and confidentiality and Critical Energy Infrastructure Information ("CEII") protections, consistent with the protective order in this case.

Witness: Paul F. McGlynn

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

Data Request 10:

Witness Paul McGlynn testifies that PJM has conducted additional analyses with Project 9A. (East and West testimonies starting on page 31, line 10.)

- a. Please discuss when these additional analyses were conducted and provide documentation of what assumptions were used and what results were obtained.
- b. Please identify any analyses conducted after this testimony was prepared and provide documentation of what assumptions were used and what results were obtained.
- c. Please identify the extent to which any future additional analyses will be prepared.
- d. Please discuss whether, and if so the extent to which, PJM has the ability to modify or manipulate certain model parameters in order to show that a particular project is still viable, even though, presumably, using the original model parameters would not so indicate.
- e. Regarding the TEAC Market Efficiency Update dated February 8, 2018, please discuss whether, and if so the extent to which, PJM has modified, compared to earlier evaluations of Project 9A, certain model parameters that will affect the costs and/or benefits attributed to Project 9A.

Response:

- a. The reference in Mr. McGlynn's testimony is to the analysis included in the second bullet in slide 5 of the June 2016 Teac presentation, which is available at the following link: [<http://pjm.com/-/media/committees-groups/committees/teac/20160609/20160609-market-efficiency-update.ashx>]. The B/C analysis described used the same model assumptions as the rest of the market efficiency analysis, plus the inclusion of Project 9A as in service, as described in Mr. McGlynn's testimony.
- b. Please refer to the Company's response to "a." The additional analyses that were conducted up to the February 2018 TEAC Presentation pertain to Project 9A, and not to the other projects referred to in the referenced testimony. The Company further states that no analyses were conducted as it pertains to those other projects after Mr. McGlynn's testimony, since the referenced proposals were eliminated from further study once it was determined they did not meet PJM's market efficiency planning criteria, as described in the testimony.

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- c. Please refer to the response to b. No further analysis will be conducted regarding the projects eliminated from consideration.
- d. PJM does not manipulate model data to determine what makes a particular project pass the 1.25 Benefit/Cost ratio threshold. PJM's stakeholder-endorsed, FERC-approved open and transparent RTEP process provides stakeholders opportunity to raise issues and objections to all study input assumptions. No such objections were raised as part of evaluating proposals submitted in the 2014/15 Long-term RTEP Window.

The process for updating model parameters for PJM's 24-month market efficiency analysis study cycles is described in PJM's Manual 14B Section 2.1.3. Please see also, e.g., the Company's response to OCA IV-46.

The process for updating model parameters is open and transparent, part of PJM's FERC-approved planning process, and subject to review and input by process stakeholders, including TEAC members. The Company further notes that this RTEP planning process provides stakeholders opportunity to raise issues and objections to all study input assumptions. No such objections were raised as part of evaluating proposals submitted in the 2014/15 Long-term RTEP Window.

The Company further notes that the scenario described in the question (i.e., "particular project is still viable, even though, presumably, using the original model parameters would not so indicate") does not take into consideration that re-analysis using "original model parameters" can be reasonably expected to result in a repetition of the original analysis results.

The scenario is not applicable to the PJM's market efficiency analysis that determined the Project 9A is needed as part of PJM's RTEP, since the original analysis indicates the project is viable, beneficial, and needed, and subsequent analyses using updated model parameters (i.e., input assumptions in the modeled simulations using modelling software and analytical tools widely accepted in the industry, and performed and reviewed in the context of the TEAC stakeholder process) have continued to indicate that Project 9A is viable, beneficial, and needed. The projects eliminated from consideration referenced in Mr. McGlynn's testimony did not meet these criteria.

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Additionally, please refer to the documents mentioned below for a description or indication of information updates reflecting in the inputs to the model PJM used to conduct its market efficiency analysis. This list is not exhaustive, but it is indicative of the type of information updated:

- 4/10/2014 TEAC Market Efficiency – Discussion of assumptions for the initial 2014/2015 Series model build. <http://pjm.com/-/media/committees-groups/committees/teac/20140410/20140410-market-efficiency.ashx>
- 5/7/2015 TEAC Market Efficiency, beginning slide 28 – Discussion of assumption updates to the 2014/2015 Series models. <http://pjm.com/-/media/committees-groups/committees/teac/20150507/20150507-market-efficiency-update.ashx>
- 4/7/2016 TEAC Market Efficiency, slide 3 – Discussion of assumption updates to the 2014/2015 Series models. <http://pjm.com/-/media/committees-groups/committees/teac/20160407/20160407-teac-market-efficiency-update.ashx>
- 4/7/2016 TEAC Market Efficiency, beginning slide 12 – Discussion of assumptions for the initial 2016/2017 Series model build. Note that this includes the use of new data release from ABB. <http://pjm.com/-/media/committees-groups/committees/teac/20160407/20160407-teac-market-efficiency-update.ashx>
- 6/9/2016 TEAC Market Efficiency, beginning with slide 6 – Additional discussion of assumptions for the 2016/2017 Series model build. <http://pjm.com/-/media/committees-groups/committees/teac/20160407/20160407-teac-market-efficiency-update.ashx>
- 4/13/2017 TEAC Market Efficiency, beginning with slide 4 – Discussion of assumption updates to the 2016/2017 Series models. <http://pjm.com/-/media/committees-groups/committees/teac/20170413/20170413-market-efficiency-update.ashx>
- 9/14/2017 TEAC, slide 9. – Discussion of additional specific updates to the 2016/2017 Series models. <http://pjm.com/-/media/committees-groups/committees/teac/20170914/20170914-market-efficiency-update.ashx>

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- 10/12/2017 TEAC Market Efficiency – Slide 11 – Discussion of additional specific updates to the 2016/2017 Series models. <http://pjm.com/-/media/committees-groups/committees/teac/20171012/20171012-teac-market-efficiency-update.ashx>
 - 12/14/2017 TEAC Market Efficiency – Slide 4 – Discussion of additional specific updates to the 2016/2017 Series models. <http://pjm.com/-/media/committees-groups/committees/teac/20171214/20171214-teac-market-efficiency-update.ashx>
 - 1/11/2018 TEAC Market Efficiency – Slide 10 – Discussion of additional specific updates to the 2016/2017 Series models. <http://pjm.com/-/media/committees-groups/committees/teac/20180111/20180111-market-efficiency-update.ashx>
- e. Yes, the PJM production cost analysis that led to the February 8, 2018 benefit/cost ratio result for Project 9A employed updated input assumptions (“model parameters”). Please refer to the response to “d”, particularly the last five bullet points.

Witness: Paul F. McGlynn

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

Data Request 11:

Witness McGlynn testifies:

To assure that projects selected by the PJM Board for market efficiency continue to be economically beneficial, both the costs and benefits of these projects will be reviewed periodically (nominally on an annual basis). Substantive changes in the costs and/or benefits of the approved RTEP projects will be reviewed with the TEAC at a subsequent meeting to determine if these projects continue to provide economic benefits relative to their costs and should remain in the RTEP. (East and West: pp.23:5-10)

a. Page 50 of Manual 14B states:

For each market efficiency project proposed for RTEP, PJM will also post, as soon as practical, the following:

- Anticipated high-level project schedule and milestone dates
- Final commitment date after which any change to input factors or drivers will not result in transmission project deferral or cancellation.

Please discuss how the periodic review described in McGlynn's testimony is consistent with the final commitment date provided for in Manual 14B.

b. Please discuss whether, and if so the extent to which, PJM has set a date for Project 9A beyond which it will no longer be subject to cancelation or postponement.

c. Please discuss whether PJM has set a date for Project 9A beyond which it will no longer consider modifications.

Response:

- a. Once approved by the PJM Board, a project becomes part of PJM's RTEP, is considered final, and remains so unless PJM staff returns with a recommendation otherwise to modify or cancel. Regarding Transource's Project 9A, following the August 9, 2016 PJM Board approval, PJM reviewed the benefits and costs of the project in September 2017 and February 2018, and confirmed that the project continues to meet PJM's Benefit-Cost criteria and should remain in the RTEP.

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The Designated Entity Agreement contains the overall project schedule and project milestone dates. Section 4.1 and Schedule C speak to project schedule and milestones that Transource must meet. Section 8.0 speaks to project termination by the Transmission Provider (PJM).

- b. Please refer to the Company's response to "a."
- c. Please refer to the Company's response to "a."

Witness: Paul F. McGlynn

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**Interrogatories of the Office of Consumer Advocate
Set XI
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Data Request 13:

Witness Kamran Ali testifies that the AP South Interface, if loaded beyond dynamically determined limits can cause low voltages and even a potential voltage collapse. (East testimony starting on page 7, line 10, West testimony starting on page 7, line 20.)

- a. Please discuss the operating scenarios under which loads higher than these limits can cause low voltage and provide a copy of any reports, analyses, etc. that document these low voltages.
- b. Please discuss the operating scenarios under which loads higher than these limits can cause a voltage collapse and provide a copy of any reports, analyses, etc. that document these voltage collapses.
- c. Please describe the extent to which Project 9A will eliminate or change the need to set a dynamically determined limit for the AP South Interface above which low voltage or voltage collapse is possible, and please provide a copy of any reports, analyses, etc. that document these changes.

Response:

- a. Mr. McGlynn's testimony at page 25, lines 4 – 22 discusses the type of operating scenarios that could result in voltage violations on the transmission system. PJM Manual 3, Transmission Operations, Section 3.8, also describes the reactive interfaces and how PJM determines limits which the system needs to be operated with to ensure compliance with voltage criteria: [<http://pjm.com/-/media/documents/manuals/m03.ashx>].

PJM operates the grid to prevent voltage violations including low voltages and voltage collapse in accordance with established NERC criteria.

- b. Please refer to the Company's response to "a."
- c. Project 9A will not eliminate or change the need to set a dynamically-determined *limit* for PJM's AP South Reactive Interface. Rather, Project 9A will reduce transmission *congestion* across the interface. Mr. McGlynn discusses this in his direct testimony, page 25, lines 4 – 22. The Company further notes that Project 9A will reduce congestion on a number of other transmission facilities, in addition to Project 9A's primary purpose of reducing congestion in PJM's AP-South Reactive Interface.

Witness: Kamran Ali and Paul McGlynn

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**Interrogatories of the Office of Consumer Advocate
Set XIII
(Responses dated 5/14/2018)**

Data Request OCA-XIII-04:

Please identify, describe and provide the location of the generating units that would typically have been dispatched in economic order but for the AP South constraints

Response:

The information is not maintained as requested. However, model simulations serve to identify dispatch scenarios in which specific units would be dispatched in economic order once Project 9A is taken into consideration as being in service, and therefore reflecting the effect of Project 9A on transmission congestion in the AP South Interface and other facilities. Please refer to the model used by PJM to conduct the market efficiency analysis that determined that Project 9A is needed as a market efficiency project in PJM's RTEP.

The Company further states that it is not appropriate to evaluate congestion as if the AP South Reactive Interface was the only constraint on the PJM electric transmission network. Multiple constraints in addition to the congestion in the AP South Reactive Interface can exist at any one time such that PJM cannot uniquely identify which units were or would be dispatched solely to address the AP South Reactive Interface congestion. The model simulations used in PJM's market efficiency analysis take into consideration the complex interrelationship of these multiple constraints, and do not model congestion as if the AP South Reactive Interface was the only constraint on the PJM electric transmission network.

Witness: Paul F. McGlynn

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**Interrogatories of the Office of Consumer Advocate
Set XIII
(Responses dated 5/14/2018)**

Data Request OCA-XIII-05:

If the Transource proposal and associated utility upgrades are implemented, will all of the AP South constraints be eliminated? Please confirm that the result of implementing the Transource proposal and associated utility upgrades would be that generating units identified in Question 3 would no longer be dispatched out of economic order. If PJM cannot confirm that, please provide a detailed explanation.

Response:

The AP South Reactive Interface congestion is not completely eliminated in the simulations based on the models. The simulations show reduced congestion as a result of Project 9A, which results in a more economically-efficient dispatch of generating resources which leads to benefits for the public. Please refer to the Company's responses to OCA XIII-3 and OCA XIII-4.

Please also refer to Mr. McGlynn's testimony at page 34. In general, congestion savings typically reflect that fewer generating unit MW are "dispatched out of economic order."

Once it is placed in service, Project 9A will have a beneficial effect on congestion not only across the AP South Reactive Interface but also across other transmission facilities as well. The Company notes that it is not possible to uniquely identify which generating units would no longer be dispatched out of economic order solely to address the AP South Reactive Interface constraint, as reflected in the Company's responses to OCA XIII-3 and OCA XIII-4.

The Company further states that when Project 9A goes in service, it additionally will enable the PJM transmission system generally to operate more efficiently. Consistent with PJM's market efficiency analysis process, analysis of proposals to address congestion in PJM's transmission network subsequent to the PJM Board approval of Project 9A assume for modelling purpose that Project 9A is placed in service as planned.

Witness: Paul F. McGlynn

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**Interrogatories of the Office of Consumer Advocate
Set XIII
(Responses dated 5/14/2018)**

Data Request OCA-XIII-10:

In presentation slides for PJM's July 2017 Maryland and Washington, D.C. Infrastructure Report (<http://pjm.com/-/media/library/reports-notice/2016-rtep/2016-maryland-and-dc-state-reports.ashx?la=en>) , the cleared Demand Response resources are 127 MW and 85 MW for Maryland and Washington, respectively, in the 2020/21 Auction. The slides indicate that these are 660 MW and 109 MW less, respectively, than the Demand Response resources cleared in the 2019/20 Auction. Please explain why the cleared Demand Response resources declined between the 2019/20 and 2020/21 Auctions.

Response:

The Benefit-Cost ratio justifying the need for the Project 9A was not based on retrospective RPM auction Demand Resource activity. Nor has PJM conducted studies to identify the specific, unique factors driving changes in levels of Demand Response that cleared the 2019/20 and 2020/21 auctions.

Notwithstanding, the Company further notes that Demand Response would only be a factor in forward-looking production cost analysis – like that which justified the Project 9A - if it were to displace a lower cost resource. PJM did not observe this in its production cost analyses.

Witness: Paul F. McGlynn

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Data Request OCA-XIII-11:

In presentation slides for PJM's July 2017 Maryland and Washington, D.C. Infrastructure Report, the cleared Energy Efficiency resources are 40 MW and 27 MW for Maryland and Washington, respectively, in the 2020/21 Auction. The slides indicate that these are 117 MW and 5 MW less, respectively, than the Energy Efficiency resources cleared in the 2019/20 Auction. Please explain why the cleared Energy Efficiency resources declined between the 2019/20 and 2020/21 Auctions.

Response:

The Benefit-Cost ratio justifying the need for Project 9A was not based on retrospective RPM auction Energy Efficiency ("EE") resource activity. Nor has PJM conducted studies to identify the specific, unique factors for changes in levels of Energy Efficiency resources that cleared the 2019/20 and 2020/21 auctions.

Notwithstanding, the Company further notes that PJM's load forecast incorporates equipment indices that reflect trends in energy efficiency (state-approved and other), as described in PJM Manual 19, Load Forecasting and Analysis, Section 3: [<http://pjm.com/~media/documents/manuals/m19.ashx>]. Given that all energy efficiency is accounted for, no additional adjustment to the load forecast is needed for PJM's system planning studies.

Since energy efficiency resources are reflected in the PJM load forecast, any EE resources participating in PJM auctions will result in an increase to the load forecast by the amount of the EE program's offered amount. This is done in order to not double-count the value of the energy efficiency program (both as lower load and as a supply resource). The adjustment is applied only to the load used in the RPM auction, not the load used in planning studies.

Witness: Paul F. McGlynn

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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

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**Interrogatories of the Office of Consumer Advocate
Set XIII
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Data Request OCA-XIII-16:

Please describe how PJM considers the impact of state-approved combined heat and power (CHP) programs in its planning. For example, if the Pennsylvania PUC approves a Pennsylvania utility's CHP program, i) how does PJM consider the impact of that program on PJM's planning and Plans? ii) Are the CHP resources subject to PJM's Auction and clearing process completely independent of and in addition to the CHP resources resulting from the state-approved CHP programs? iii) Please explain.

Response:

- i. Please refer to the Company's response to OCA XIII-14.
- ii. Please refer to the Company's response to OCA XIII-14.
- iii. Please refer to the Company's response to OCA XIII-14. In addition, combined heat and power plant – whether incentivized by state programs or not - is treated as a generating resource from a PJM planning perspective. Such plant is often behind-the-meter. However, to the extent CHP seeks to participate in PJM's wholesale markets, including PJM RPM capacity auctions, plant owners must submit a generator interconnection request through PJM's new services queue. Doing so initiates a series of planning studies to ensure compliance with NERC reliability standards. PJM explicitly models these resources in all future RTEP analyses.

Witness: Paul F. McGlynn

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Data Request OCA-XIII-17:

Please describe how PJM considers the impact of state-approved renewable energy programs in its planning. For example, if the Pennsylvania PUC approves a Pennsylvania utility's renewable energy program, i) how does PJM consider the impact of that program on PJM's planning and Plans? ii) Are the renewable energy resources subject to PJM's Auction and clearing process completely independent of and in addition to the resources included in the state-approved renewable energy programs? iii) Please explain..

Response:

- i. Please refer to the Company's response to OCA XIII-14.
- ii. Please refer to the Company's response to OCA XIII-14.
- iii. Please refer to the Company's response to OCA XIII-14. In addition state-approved renewable energy programs incentivize developer consideration of new generating plants powered by renewable fuels. To that extent, PJM's RTEP process evaluates each generator interconnection request when it enters PJM's new services queue. A capacity resource powered by a renewable fuel is eligible to participate in PJM capacity auctions to the extent it acquires Capacity Interconnection Rights, regardless of whether or not it is part of a state renewable energy program.

The Company further notes that PJM's load forecast model incorporates an estimate of the historical impact of behind-the-meter distributed solar generation. Distributed solar generation acts to lower load from what it otherwise would be, and those lowered loads are used in PJM's planning process. PJM develops estimated distributed solar generation values based on historical installed capacity, DC to AC conversion factors, solar insolation, cloud cover, solar panel efficiency degradation due to temperature, and panel tilt angle. Additional description can be found in the following on-line PJM document: "Load Forecasting Model Whitepaper" which is available at: [<http://www.pjm.com/~media/library/reports-notice/load-forecast/2016-load-forecast-whitepaper.ashx>].

Witness: Paul F. McGlynn

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Data Request OCA-XVIII-01:

Please refer to Mr. McGlynn's response to OCA-XIII-03, which asked Mr. McGlynn to identify, describe and provide the location of the generating units that are most frequently dispatched out of economic order to compensate for the AP South constraints. His response was that "the information is not maintained as requested."

- a. Which of the requested information - the identity, the description or the location - is not available?
- b. How is the requested information maintained?
- c. Is the requested information, even if not "maintained" in the sense used by Mr. McGlynn in his response, available or derivable?
- d. If so, please provide as much of the requested information as is available or derivable.

Response:

a., b., c., Please refer to the Company's response to OCA-XIII-04. The identity, description, and location of generating units that historically "are most frequently dispatched out of economic order to compensate for the AP South [Reactive Interface transmission congestion] constraints" is not data relevant to the determination that under PJM's planning criteria and analysis methodology Project 9A is needed as a market efficiency enhancement part of PJM's RTEP. Please note that the analysis conducted by PJM as part of the RTEP process, and with the input and review of PJM's Transmission Expansion Advisory Committee ("TEAC") stakeholder group, is based on forward-looking PROMOD simulations. That analysis is not based on individual, historical generation movement or production cost. The Benefit/Cost ratio justifying the need for the project was based on Load Payment savings, for which the information requested in data request OCA-XVIII-01 is not relevant or applicable.

Moreover, as explained in the Company's response to OCA-XIII-04, and referenced in the cited response to OCA-XIII-03, it is methodologically incorrect to attribute a generating unit's "dispatch[] out of economic order" specifically "to compensate for the AP South constraints" because doing so incorrectly assumes that congestion on the AP South Reactive Interface can exist at any one time such that it was the only constraint on the PJM electric transmission network. PJM has not performed after-the-fact analysis of historical data to identify those generating units operated out of economic order to control the AP South Interface transmission congestion constraint, as described in the question.

Notwithstanding, the Company further states that although not methodologically relevant to the determination that Project 9A is needed, it is possible to identify specific generating units that are

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dispatched or not dispatched per the forward-looking simulations performed by the PROMOD model used by PJM to conduct its market efficiency analysis. The Company notes that, like operations, units dispatched out of economic order in PROMOD simulations cannot be uniquely attributed to just the AP South Interface. PJM also notes though that while PROMOD simulation models may not mirror the real-time system at any one specific point in time – and thus, congestion constraints - PROMOD simulations do match how PJM operates the system under the generation and transmission topology assumptions used.

As explained in the Company's response to OCA-XIII-04, a generating unit in real-time operation each hour may be dispatched out of economic order for multiple constraints and for such ancillary services as regulation control, and therefore while real-time hourly unit name, location, output, dispatch rate, and distribution factor information is retained, that data is insufficient to identify the units or portions of units dispatched out of economic order in real-time to uniquely control AP South Interface congestion. Similarly, even though forward-looking market simulations in PROMOD with and without Project 9A would include specific differences in the dispatch of specific generating units, it is methodologically incorrect to infer that the economic or uneconomic dispatch of those units in those simulations can specifically be attributed to congestion on the AP South Interface. The methodologically appropriate approach to determine the benefits of Project 9A as a market efficiency project (which, incidentally, do not quantify any other benefits the project may provide, such as ancillary reliability benefits) is to measure the Load Payment savings identified in the PROMOD simulation analysis, consistent with PJM's FERC-approved RTEP Process and as reviewed in the context of PJM's TEAC.

Witness: Paul McGlynn

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Data Request OCA-XVIII-07:

In the second paragraph of his response to OCA-XIII-04, Mr. McGlynn states that “it is not appropriate to evaluate congestion as if the AP South Reactive Interface was the only constraint” and that “the model simulations... take into consideration the complex interrelationship of these multiple constraints, and do not model congestion as if the AP South Reactive Interface was the only constraint on the PJM electric transmission network.”

- a. Is Mr. McGlynn suggesting that all the constraints are modeled simultaneously, such that there is no analysis of the AP South Reactive Interface constraint alone? Please confirm or correct/clarify.
- b. Is Mr. McGlynn suggesting that all the projects are modeled simultaneously, since all of the selected projects operate within an interactive system, with each affecting multiple constraints and thus each affecting the impact of other projects? Please confirm or correct/clarify.

Response:

- a. Correct. Based on all model inputs, PROMOD dispatches units to address all system constraints simultaneously to the extent they may exist in any of the 8,760 hours in a given study year. For purposes of PJM’s market efficiency analysis, it would be methodologically erroneous to evaluate congestion as if the AP South Reactive Interface was the only constraint on the PJM electric transmission network.
- b. No, the questions statement suggesting “that all the projects are modeled simultaneously, since all of the selected projects operate within an interactive system, with each affecting multiple constraints and thus each affecting the impact of other projects” would be methodologically erroneous and illogical. As described in Mr. McGlynn’s testimony, PJM independently evaluated each of the 41 proposals submitted during the 2014/15 Long Term Proposal Window addressing congestion on the AP South Reactive Interface. This followed initial PJM evaluation after the window closed during which proposals were grouped by congestion they were intended to fix in order to find the most effective solution.

PJM notes that its RTEP process does allow it the discretion to consider possible combinations of proposals to determine the most effective overall solution to multiple constraints. Additionally, PJM’s planning process is continuous, and over time new analyses incorporate topology changes approved by the PJM Board. Please refer, for

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example, to the analysis described in Mr. Glynn's testimony at pages 26 to 31, and particularly the reference to the remaining three proposals analyzed after adding Project 9A to PJM's base model. The analysis of these three remaining proposals indicated that none of them passed the B/C 1.25 threshold test once analyzed using the PJM base model after adding Project 9A, thus obviating their need under those planning assumptions.

Witness: Paul McGlynn

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Data Request OCA-XVIII-08:

In response to OCA-XIII-08, Mr. McGlynn indicates that the Day Ahead constraint cost and the Real Time constraint cost are not the metrics used in PJM's market efficiency analysis that determined Project 9A is needed.

- a. Is it appropriate to characterize Mr. McGlynn's point as being the Day Ahead and Real Time constraint costs reflect actual occurrences used for setting power prices, and that PJM's market efficiency analysis is based solely on forward-looking modeling? Please confirm or correct/clarify.
- b. Is the forward-looking modeling calibrated to the actual occurrences regarding constraint costs? If not, why not?
- c. Would you expect the cost of actual constraints to closely correlate with modeled forward-looking results? Please explain.

Response:

- a. The statement that "PJM's market efficiency analysis is based solely on forward-looking modeling" is correct. The statement that "Day Ahead and Real Time constraint costs reflect actual occurrences used for setting power prices" is correct to the extent it is limited to indicating that actual historical Day Ahead and Real Time constraint costs reflect actual occurrences. The Company notes that the two statements are not related, and therefore it would be a meaningless characterization to put them together as stated in the question. PJM's market efficiency analysis does not employ backward-looking historical Day Ahead constraint cost and the Real Time constraint cost in its justification of need for a market efficiency project.

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- b. PJM does not “calibrate” its forward-looking PROMOD model insofar as that means modifying or “tweaking” that model to match specific constraint congestion costs experienced in actual operations. However, PJM does benchmark PROMOD results insofar as the model assumptions would be reviewed if PROMOD results yielded significant congestion not seen in real-time operations or if PROMOD results did not yield congestion – like that across the AP South Interface - where PJM would expect it to be given historical experience, for example, as indicated in annual MMU reports. Please note that Real-time constraint costs are dependent on a number of factors not considered in the forward looking model. By way of example, many individual transmission facilities may be out of service simultaneously in real-time. PJM Day-Ahead and Real Time Markets regularly experience conditions much more severe than those assumed in PROMOD models, which assume all transmission facilities are in-service for each of the 8,760 hours in a given study year.

Similarly, real-time constraints are also highly dependent on real-time generating unit availability and fuel costs. Both vary regularly. PROMOD models for each of the 8,760 hours in each study year contain consistent forward-looking assumptions which are likely to be different than that experienced historically.

The Company further notes that transmission and generation changes which may have led to variations in historical congestion are naturally incorporated into the inputs to the forward looking PROMOD Models. For example, the PROMOD models reflect the retirement of generation which either has been retired or has formally notified PJM that it will retire. The same can be said for new generation which has gone into service, as well as, significantly, changes in transmission network topology reflecting projects approved by the PJM Board and included in the RTEP.

- c. See the Company’s response to OCA-XVIII-08b.

Witness: Paul McGlynn

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Data Request OCA-XVIII-10:

In response to OCA Set XIII-11 Witness Paul F McGlynn makes reference to PJM Manual 19. The PJM Manual 19 contains information on forecasting including the following: the PJM load forecast model produces "15-year monthly forecasts of unrestricted peaks assuming a range of weather conditions for each PJM zone, locational deliverability area (LDA) and the RTO. The model uses trends in equipment and appliance usage, anticipated economic growth and historical weather patterns to estimate growth in peak load and energy use. It is used to set the peak loads for capacity obligations, for reliability studies, and to support the Regional Transmission Expansion Plan." Please provide an explanation of the forecast methodology used by PJM, which is based on "trends in equipment and appliance usage".

Response:

Trends in equipment saturation and efficiency are incorporated into the PJM load forecast model through the use of three end-use variables (heating, cooling, and other). The heating variable uses detail for the following uses: electric furnaces and resistant room space heaters, heat pumps, ground-source heat pumps, secondary heating, and furnace fans. The cooling variable uses detail for the following uses: central air conditioning, heat pumps, ground-source heat pumps, and room air conditioners. The other variable uses detail for the following uses: water heating, electric cooking, refrigerator, second refrigerator, freezer, dishwasher, electric clothes washer, electric clothes dryer, TV sets, lighting, and a miscellaneous electric appliances category. An outside vendor provides the historic and forecast data for the end-use variables, which are drawn from the Energy Information Administration's Annual Energy Outlook. A full description of this methodology is provided in Section IV of the load forecasting whitepaper available here: [<http://www.pjm.com/~media/library/reports-notice/load-forecast/2016-load-forecast-whitepaper.ashx>.]

Witness: Paul McGlynn

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Data Request OCA-XVIII-11:

What timeframe and period of years is relied upon to derive the equipment trends and changes to appliance usage patterns? How often is the information on equipment trends and appliance usage updated and included in the modeling?

Response:

While available over a longer period, PJM used data from 1998 through 2017 to develop the historic trends in the 2018 PJM load forecast. Forecasted trends were used for the period 2018 through 2033. The information on equipment trends and appliance usage is updated and included in the modeling on an annual basis.

Witness: Paul McGlynn

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Data Request OCA-XVIII-12:

Are the equipment trends and usage data derived from assessment of specific equipment and products (such as manufacturer, vintage, size, model number, etc.) or from econometrics or other end use data?

Response:

The specific equipment and products used to derive trends are those listed in the response to OCA-XVIII-10. The trends are the result of analysis and forecasting of the U.S. Energy Information Administration, supplemented by analysis and forecasting by the vendor of the Energy Information Administration's data.

Witness: Paul McGlynn

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Data Request OCA-XVIII-14:

Please explain if and how PJM forecasting would or would not include significant and abrupt efficiency improvements (well beyond historical trends) in end use equipment in the event that federal legislation or U.S. Department of Energy rules were promulgated and implemented that were to take effect within a year.

Response:

The PJM load forecast already includes any anticipated efficiency improvements based on currently enacted federal or state legislation, to the extent interpreted by the Energy Information Administration and included in the Annual Energy Outlook. The impact of any additional rules that are promulgated and implemented would be picked up by PJM in the annual update to the vendor's dataset.

Witness: Paul McGlynn

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Set XVIII
(Responses dated 7/2/2018)**

Data Request OCA-XVIII-16:

In response to OCA Set XIII-11 Witness Paul F McGlynn states "Nor has PJM conducted studies to identify specific, unique factors for changes in levels of Energy Efficiency resources that cleared the 2019/20 and 2020/21 auctions". Please provide a list and complete description and costs of all energy efficiency projects that were bid and either won or were not selected in the PJM auction process.

Response:

PJM reliability pricing model auction activity -- and related energy efficiency bidding and selection activity -- had no bearing on PJM's FERC-approved RTEP planning process market efficiency analysis leading to the justification of Project 9A. Please refer to the Company's response to OCA XIII-11.

Notwithstanding, publicly available aggregated PJM annual auction energy efficiency information can be obtained at the following link: [<http://www.pjm.com/-/media/markets-ops/rpm/rpm-auction-info/2021-2022/2021-2022-base-residual-auction-report.ashx?la=en>].

The Company notes that the load forecasts used by PJM in its market efficiency analyses justifying the need for Project 9A reflect energy efficiency trends well in excess of the amounts which participated in the RPM auctions referenced in the question.

Witness: Paul McGlynn

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Set XVIII
(Responses dated 7/2/2018)**

Data Request OCA-XVIII-21:

Please refer to Mr. McGlynn's response to OCA-IV-10. Mr. McGlynn did not understand the term "transmission-constrained area." For clarity, it was referring to the locations where access to economic power is constrained by the transmission network's ability to deliver it. In effect, this is the area in which prices are higher because the most economical resources cannot be dispatched because of limits on the transmission system, resulting in the dispatch of more expensive generation in order to reliably serve load. Obviously, if generation resources with low production costs are built in the constrained area, those would be dispatched in economic order, and the dispatch would no longer be constrained by the transmission network. With that understanding:

- a. Are any of the new plants, including those in the interconnection queue, being built in the transmission-constrained area? The interconnection queue lists projects by state, and we know that the transmission constrained area does not follow state borders, so simply referencing the interconnection queue is not responsive.
- b. In response to sub-part g, which asked about the efforts PJM has undertaken to encourage new generation to locate in areas that address transmission constraints, Mr. McGlynn said that "Generation developers get signals from PJM's market that may inform where generation developers decide to locate their projects."
 - i. What precisely are those market signals?
 - ii. Are those market signals stable? I.e., would they continue to exist after the generation is built and economically dispatched (after the market inefficiency is eliminated)?
- c. What efforts is PJM planning to make to encourage new generation being located in areas that address transmission constraints.

Response:

The introductory section of the question reflects a misunderstanding of generator interconnection process in PJM. PJM's Reliability Pricing Model (RPM) capacity auction and Locational Marginal Pricing (LMP) provide economic signals to the market to incent developers to construct new generation where it is needed.

To that end, though, the statement that "[o]bviously, if generation resources with low production costs are built in the constrained area, those would be dispatched in economic order, and the dispatch would no longer be constrained by the transmission network" is in fact not "obviously"

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always the case. The statement incorrectly assumes that generation resources with lower production costs will always be built in the areas where locational marginal prices are higher due to congestion. PJM does not speculate nor assume that they will do so. Developer decisions regarding new generating resources (new plant or uprates to existing plant) are based on a number of factors including fuel availability (natural gas or wind, for example) and access to transmission facilities to deliver output to PJM markets. Company also notes the statement does not account for the fact that generation may be dispatched for another reason like providing regulation ancillary service. The statement disregards the fact that the dispatch of specific resources cannot uniquely be attributed to AP South Reactive Interface congestion, as explained in the Company's response to OCA-XIII-4.

a. The statement "The interconnection queue lists projects by state, and we know that the transmission constrained area does not follow state borders," is only partially correct, and therefore the question is based on a misunderstanding of PJM's new services queue with respect to interconnection requests. PJM's new services queue contains county and PJM TO Zone information. This information is sufficient to generally identify the location of a generator in the queue with respect to a location experiencing higher energy costs as a result of congestion on the AP South Reactive Interface.

The Company further notes, however, that determining the location and identity of such generator, in isolation, is not sufficient to make inferences about the effect of adding specific generation resources on the load payment savings resulting from Project 9A once it goes in service. The additional analysis required to draw such inference requires the use of an analytical tool such as PROMOD (the tool used by PJM in its analysis, and widely accepted in the industry as a reliable and appropriate planning tool). Although insufficient on its own to draw any conclusions regarding the need and benefits of Project 9A once it goes in service, please refer to the PJM new services queue for the requested information, as referenced in the Company's response to OCA-IV-10, and available at the following link: [<http://www.pjm.com/planning/generation-interconnection.aspx>].

b. i. The signals from PJM's market referenced in Mr. McGlynn's testimony are the prices in PJM's capacity market and energy market. See response to OCA-XVIII-21 a.

ii. Capacity market signals are based on annual auctions for a specified planning year. Energy market signals are based on hourly locational marginal prices. See response to OCA-XVIII-21a.

c. See responses to OCA-XVIII-21 a and b.

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Set XX
(Responses dated 7/02/2018)**

Data Request 07:

In response to OCA-XIII-01, PJM provided the hours during which the AP South Interface was constrained, as well as the monitored facility.

- a. Please explain what is meant by "monitored facility."
- b. Please explain what is meant by "APSOUTH" as the monitored facility, e.g., the transmission elements involved and the criteria by which they are determined to be constraining.
- c. Is it accurate to interpret the "APSOUTH" monitored facility as showing the baseline of conditions under which the AP South Interface is constrained with all transmission facilities in service (n-0)? Please confirm or correct.
- d. Is it accurate to interpret the "APSOUTH contingency xx" monitored facility as showing the conditions under which the AP South Interface is constrained with one transmission facility out of service (n-1)? Please confirm or correct.
- e. Please define each of the contingencies (name and location of the elements out of service) listed in OCA XIII-01 Attachment 1, including:
 - i. Contingency 3
 - ii. Contingency 4
 - iii. Contingency 8
 - iv. Contingency 9
 - v. Contingency 11
 - vi. Contingency 12
 - vii. Contingency 13
 - viii. Contingency 14
 - ix. Contingency 16
 - x. Contingency 17
 - xi. Contingency 18
 - xii. Contingency 19
 - xiii. Contingency 20
 - xiv. Contingency 21
 - xv. Contingency 22
 - xvi. Contingency 23
 - xvii. Contingency 24
 - xviii. Contingency 25
 - xix. Contingency 26
 - xx. Contingency 28
 - xxi. Contingency 29
 - xxii. Contingency 30

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xxiii.	Contingency 31
xxiv.	Contingency 33
xxv.	Contingency 34
xxvi.	Contingency 35
xxvii.	Contingency 36
xxviii.	Contingency 37
xxix.	Contingency 38
xxx.	Contingency 39
xxxi.	Contingency 40
xxxii.	Contingency 41
xxxiii.	Contingency 42
xxxiv.	Contingency 45
xxxv.	Contingency 47
xxxvi.	Contingency 48
xxxvii.	Contingency 49
xxxviii.	Contingency 50
xxxix.	Contingency 51
xl.	Contingency 54

Response:

- a. With reference to OCA-XIII-01 Attachment 1, the column title “monitored facility” refers to power system facilities over which PJM has functional control and which are included in PJM’s energy management system. The facilities listed under that column are specific transmission facilities that were constrained in actual operations and for which PJM dispatched generation out of economic merit order for constraint control. Significantly, please note the information provided in OCA-XIII-01 Attachment 1 is historical operations data, as explained in more detail in the Company’s response to OCA-XIII-01. The data requested in OCA-XIII-01 does not reflect forward-looking projections or assumptions used in the RTEP process PROMOD studies by which PJM justified the need for Project 9A.

The Company further states that with reference to OCA-XIII-01 Attachment 1, the term “APSOUTH” in the column titled “monitored facility” refers to the AP South Reactive Interface and comprises the transmission lines enumerated in Section 3.8 of PJM Manual 3, “Transmission Operations” available at the following link: [\[http://pjm.com/-/media/documents/manuals/m03.ashx\]](http://pjm.com/-/media/documents/manuals/m03.ashx). Additionally, also in the column labeled “monitored facility,” the alphanumeric

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string "contingency [xx]" indicates that a monitored transmission facility was constrained by the specific "n-1" contingency identified. It does not mean that a facility was actually out-of-service.

- b. See the response to subsection a. The "criteria" by which the AP South Reactive Interface is "determined to be constraining" are described in Section 3.8 of PJM Manual 3, referenced in subsection a.
- c. No, it is incorrect "to interpret the 'APSOUTH' monitored facility as showing the baseline of conditions under which the AP South Interface is constrained with all transmission facilities in service (n-0)." See the response to subsection a.
- d. No, it is incorrect "to interpret the "APSOUTH contingency xx" monitored facility as showing the conditions under which the AP South Interface is constrained with one transmission facility out of service (n-1)." See the response to subsection a.
- e. Please refer to OCA XX-7 Attachment 1 for a listing of the contingencies included in OCA XIII-1 Attachment 1.

Witness: Paul F. McGlynn

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Data Request 08:

During the Technical Conference Call with OCA on June 8, PJM responded to a question about the PJM response to OCA Set XIII –11. During that discussion PJM indicated that the RTEP process includes development of an independent load forecast, and that PJM identifies and either accepts, rejects or adopts a modified level of energy efficiency, energy conservation, renewable resources, Demand Response, CHP, etc. in the PJM independent load forecast.

- a. Given those PJM responses, please clarify what is meant (when PJM responded to OCA XIII-11) that it had not conducted studies to identify the specific, unique factors for changes in levels of Energy Efficiency resources that cleared the 2019/20 and 2020/21 auctions.
- b. PJM also indicated that PJM's load forecast incorporates equipment indices that reflect trends in energy efficiency (state-approved and other), as described in PJM Manual 19, Load Forecasting and Analysis, Section 3: [<http://pjm.com/~media/documents/manuals/ml9.ashx>]. "Given that all energy efficiency is accounted for, no additional adjustment to the load forecast is needed for PJM's system planning studies." Specifically what is meant that "all energy efficiency is accounted for" in PJM's system planning studies?"
- c. How specifically does PJM ensure that "all energy efficiency is accounted for" in its load forecast?

Response:

- a. The phrase "Nor has PJM conducted studies to identify the specific, unique factors for changes in levels of Energy Efficiency resources that cleared the 2019/20 and 2020/21 auctions" in the Company's response to OCA-XIII-11 has its plain meaning. No such studies were conducted to identify the specific factors that drove "changes in Energy Efficiency resources that cleared the 2019/20 and 2020/21 auctions" and the degree to which each factor did so.

Please refer to the Company's responses to OCA-XIII-11 and OCA-IV-52, and specifically note that the Benefit-Cost ratio justifying the need for Project 9A was not based on retrospective RPM auction Energy Efficiency ("EE") resource activity. As explained in the Company's response to OCA-XIII-11:

PJM's load forecast incorporates equipment indices that reflect trends in energy efficiency (state-approved and other), as described in PJM Manual 19, Load Forecasting and Analysis, Section 3: [<http://pjm.com/>

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/media/documents/manuals/ml9.ashx]. Given that all energy efficiency is accounted for, no additional adjustment to the load forecast is needed for PJM's system planning studies. Since energy efficiency resources are reflected in the PJM load forecast, any EE resources participating in PJM auctions will result in an increase to the load forecast by the amount of the EE program's offered amount. This is done in order to not double count the value of the energy efficiency program (both as lower load and as a supply resource). The adjustment is applied only to the load used in the RPM auction, not the load used in planning studies.

Please note that the context of the Company's response clearly refers to information used by PJM during the RTEP process and market efficiency analysis that determined that Project 9A is needed. Please refer also to the Company's responses to OCA-IV-02, OCA-IV-24 (as well as responses referring thereto, including OCA-IV-25 through OCA-IV-43), OCA-IV-45, OCA-IV-46, OCA-IV-47, OCA-IV-48, OCA-IV-50, OCA-IV-51. Note also that, as explained in the Company's response to OCA-XX-09, the treatment of Energy Efficiency in RPM auctions to prevent double counting occurs outside of the PJM system planning load forecast used in market efficiency PROMOD models and is not germane to the analysis that identified the need for Project 9A.

- b. By "all energy efficiency is accounted for in PJM's system planning studies" PJM meant that the inclusion of end-use variables in its load model results in a load forecast that captures the impact of energy efficiency from all sources, whether state-driven, utility-driven, third party-driven, or from non-incentivized customer choice. Also, please refer to the Company's response to subsection a.
- c. PJM ensures that "all energy efficiency is accounted for" in its load forecast by incorporating the Electric Information Administration's (EIA) historical and forecasted saturation rates and usage intensities for end-use equipment into the PJM load forecast. Changing saturation rates depict the evolving stock of appliances and equipment, while the intensity trends reflect that stock of equipment will consume less electricity. PJM uses the EIA end-use detail to derive three variables used in the load forecast model: one each for heating and cooling equipment and another for all other equipment. A full explanation of those variables is provided in the whitepaper (see Section IV) available at: [<http://www.pjm.com/~media/library/reports-notice/load-forecast/2016-load-forecast-whitepaper.ashx>]. Also, please refer to the Company's responses to subsections a. and b.

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Data Request 01:

During the technical conference call with OCA on June 8, PJM indicated that the AP South interface constrained power flows from the west to the east, specifically on four transmission lines connecting Mt. Storm/Greenland Gap in the west to Doubs and Meadow Brook in the east and Valley to the south.

- a. Please confirm that the market inefficiency that Project 9A is proposed to mitigate is the result of constraints on west-to-east power flows on those four lines. If not, please correct and explain.
- b. Please confirm that the access to lower cost power for the purposes of the proposed Project 9A is at Mt. Storm/Greenland Gap. If not, please correct and explain.
- c. Please confirm that the higher cost power dispatched to address the AP South Interface transmission constraints is generally to the east and south of Mt. Storm/Greenland Gap. If not, please correct and explain.
- d. Would it be reasonably accurate to say that the area affected by higher costs due to the AP South Interface market inefficiency would be part of PJM's footprint east and south of Mt. Storm? If not, what would be a fair characterization of the area affected?

Response:

- a. Project 9A will mitigate congestion on the four transmission lines comprising the AP South Reactive Interface as defined in PJM Manual No. 3, Section 3:
[<http://pjm.com/-/media/documents/manuals/m03.ashx>]

Project 9A also mitigates congestion on other facilities and yields Energy Load Payment Savings over the studied planning horizon, as described in responses to OCA-II-12, OCA-II-14 Attachment 1, OCA-IV-09, OCA-IV-14 through 16, OCA-VI-02, OCA-VII-01, OCA-VII-02, and OCA-VIII-01 through 03. These savings are most prominent in the geographic area corresponding to PJM Transmission Zones generally located east and south of the AP South Reactive Interface.

PJM's statement at the June 8 technical conference was to convey that power flow across its footprint tends to be from west to east geographically. As such, the power that flows across the AP South Reactive Interface tends to be from the western terminal of each line to the eastern terminal of each line comprising the interface. PJM notes that the networked physical nature of the transmission system (i.e., relevant impedance matrix) dictates the extent to which the location of generation impacts AP South Reactive Interface flow.

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- b. The question oversimplifies the nature of PJM generation dispatch and the effects of transmission congestion. Lower cost power can exist anywhere on the PJM system. In general, for a given constraint, such as the AP South Reactive Interface, generators on the sending end of the constraint will reduce output and generators on the receiving end of the constraint will increase output. However, the generators which change output will not necessarily be the ones closest, either physically or electrically, to the constraint terminals. This is because the economic considerations also play a role, in combination with the electrical considerations. This can be further impacted by other constraints on the system, which can occur simultaneously. It is therefore possible that the generators which change may be quite distant from the terminals of the constraint in question.

AP South Reactive Interface congestion causes higher energy costs in the same PJM transmission zones that benefit most directly from Project 9A. However, dispatch of specific resources cannot be uniquely attributable to congestion on specific transmission facilities. Congestion on the AP South Reactive Interface does not occur in isolation. Also, mitigating congestion on other transmission facilities affects which generating resource sets the energy price in a particular location at a particular time. Please refer to the Company's response to OCA XIII-4.

See also the Company's response to OCA-XXI-1a.

- c. See the Company's response to OCA-XXI-1b.
- d. No. As explained in the Company's responses to OCA-II-09, OCA-II-12, OCA-IV-14 through 16, and OCA-X-01 CONFIDENTIAL Attachment 1 the benefits of Project 9A are calculated in terms of energy load payments savings, which are discrete to each PJM transmission zone. The general location of those transmission zones is East and South of the AP South Reactive Interface.

Witness: Paul F. McGlynn

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Data Request 02:

It is unclear whether PJM's characterization during the technical conference call on June 8 of the AP South Interface constraints was referring to the forward-looking modeled conditions, or the actual historic conditions or some combination of the two.

- a. Are PJM's responses to question 1, parts a-d, applicable to the forward looking modeled conditions, actual historical conditions, or both?
- b. How would PJM's responses to question 1, parts a-d, differ depending on whether PJM was considering forward-looking modeled or actual historic conditions?
- c. Please explain.

Response:

- a. Company notes that the June 8, 2018 conference call included discussion of both historical congestion on the AP South Reactive Interface as well as forward-looking PROMOD analysis that showed congestion will persist and justified the need for the Project 9A.

The Company reiterates that the Benefit-Cost ratio justifying the need for the Project 9A was *not* based on historical congestion constraints on the AP South Reactive Interface.

The 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 (actually 8,784 hours for one of the year, on account of it being a leap year), not based on the historical congestion experienced by PJM.

Notwithstanding, congestion observed in forward-looking PROMOD results absent Transource's Project 9A confirm PJM's expectation that congestion will persist under the input assumptions modeled.

Please refer to the Company's response to OCA-XXI-1. Please also refer to the Company's responses to OCA IV-7, OCA IV-9, and OCA I-18 for information regarding the significance of historical data reflecting, for example, the \$800 million congestion cost for each year from 2012 to 2016, described in Mr. McGlynn's testimony at page 25, and that this historical problem is projected to continue into the future, as reflected in the simulated congestion costs for the AP South Reactive Interface that were presented in the November 2014 TEAC slides, available at the following link: [<http://pjm.com/-/media/committeesgroups/committees/teac/20141111/20141111-market-efficiency-update.ashx>] (please refer to slide 9 for information regarding the AP South Reactive Interface). The projected congestion costs reflected in the November 2014 TEAC

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presentation were the driver for the opening of the 2014/15 Long Term Proposal Window and ultimately for Project 9A.

The Company also reiterates that justification of Project 9A was not based on a review of the historical dispatch patterns of identified individual generating units at either end of the transmission lines that comprise the AP South Reactive Interface. Rather, justification was based on the load payment benefits that Project 9A provides, as discussed in the responses to OCA X-01 through 02, OCA XVIII-04, OCA XVIII-08, and OCA XVIII-16. Specific load zone benefits are discussed in the responses to OCA IV-14 through 16, and OCA VIII-04.

- b. Please see the Company's response to OCA XXI-02a. The benefit/cost ratio justifying the need to Project 9A is based on forward-looking conditions, as prescribed by PJM's established and FERC-approved transmission expansion planning process for market efficiency projects. The FERC-approved procedures by which PJM determined that Project 9A is needed as part of PJM's RTEP do not incorporate historic information into the project's benefit/cost ratio. The benefit/cost ratio calculation is not based on historic system conditions. Please also refer to the Company's response to OCA-XXI-1.
- c. Please see the Company's response to OCA XXI-02a.

Witness: Paul F. McGlynn

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Data Request 03:

Please refer to OCA-XIII-01. OCA asked PJM to describe the time of day and time of year the AP South Interface constraint typically occurs. Mr. McGlynn responded that "Power flow on the lines that comprise the AP South Reactive Interface can vary by hour, day, month and season," and that "AP South Reactive Interface constraints can be seen at any hour or the operating day (24-hour period) at any point during the year."

- a. Please clarify whether Mr. McGlynn's response applies to the actual historic data or forward-looking modeled conditions, or both.
- b. Should Mr. McGlynn's statement that "AP South Reactive Interface constraints can be seen at any hour or the operating day (24-hour period) at any point during the year" be interpreted as meaning:
 - i. It is theoretically possible to have constraints occur any time of day or time of year, or
 - ii. That the forward-looking modeling includes constraints the model predicted would occur any time of day or time of year, or
 - iii. That actual historic data shows the constraints occur any time of day or time of year?
 - iv. Please explain.
- c. Is Mr. McGlynn suggesting that there is equal probability that a constraint on the AP South Reactive Interface can occur in any hour of the year?
- d. If not, please indicate which hours of the year PJM believes are more likely to be constrained on the AP South Reactive interface.

Response:

- a. OCA-XIII-01 inquired about historical data. PROMOD models employ a forward-looking set of base inputs. PROMOD results allow the user to assess congestion – like that observed on the AP South Reactive Interface - during a specified time period. The PROMOD model and the underlying scenario information are available to OCA, subject to licensing, CEII, and confidentiality requirements.
- b. The statement quoted has its plain meaning. The Company further states as follows: the statement in subsection (i) is correct, and is consistent with the quoted statement, although narrower; Mr. McGlynn's statement was provided in response to OCA's question, pertaining to historical data. The Company notes that whether the congestion occurs at particular times during the day, month or year is not relevant to the benefit to cost ratio demonstrating the need for Project 9A, which is based on energy load payments savings. The PROMOD model

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and the underlying scenario information are available to OCA, subject to licensing, CEII, and confidentiality requirements. See response to subsection a.

(ii) Please refer to the response to OCA-XXI-2(a); the statement quoted was provided in response to a question pertaining to historical data. Neither the Company nor PJM have conducted analysis that would confirm or deny whether constraints on either the AP South Reactive Interface or on any of the other facilities on which congestion is reduced as a result of placing Project 9A in service would occur any time of day, month, or season of a year absent Project 9A; such analysis is neither necessary nor useful to determine the need for Project 9A, which is demonstrated on the basis of load energy payment savings (based on information aggregated on an annual basis), in accordance with PJM's market efficiency transmission expansion planning procedures.

(iii) See response to (i) and also refer to OCA XIII-1 Attachment 1. A review of the historical data provided allows the reviewer to identify examples of congestion on the AP South Reactive Interface any hour of the operating day (24-hour period) at any point during the year.

(iv) See responses to (i), (ii) and (iii).

- c. No, he is not. The Company further reiterates that the degree to which congestion can vary by hour, day, month, and season has no impact on the benefit cost ratio demonstrating the need for Project 9A. Please refer to the response to subsection b.
- d. Please see the Company's response to OCA XXI-03 subparts b. and c. and refer to the Company's response to OCA-XIII-1 where historical data is provided. The Company further reiterates that the degree to which congestion can vary by hour, day, month, and season has no impact on the benefit cost ratio demonstrating the need for Project 9A.

Witness: Paul F. McGlynn

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Set XXII
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Data Request 01:

The following questions are directed to Mr. McGlynn/PJM. These questions should be viewed as a continuing request to provide updated responses (with the exception of Question 4) thereto as soon as they are available, but in no event later than every 60 days.

1. Please reference OCA-V-01 and the responses thereto:
 - a. Please provide a current, updated cost estimate for the project.
 - b. Please provide a current, updated benefit estimate for the project.
 - c. Based on the responses to a. and b., please provide the current, updated benefit-cost ratio.

Response:

a.

The current, updated, cost estimate for Project 9A is the cost estimate used in connection with the analysis presented February 8, 2018 at the TEAC. This cost estimate is a \$340.6 million project capital cost, which is estimated for analysis purposes to represent \$462.87 million expressed in Present Value of Payments.

PJM anticipates completion of another Benefit/Cost ratio re-evaluation by the end of September 2018, to be presented during the October 11, 2019 TEAC meeting. As part of that analysis, pursuant to PJM's governing documents and manuals, PJM will update its market efficiency analysis to include any changes to the project costs provided by the project sponsor, as well as changes to the costs of accompanying reliability upgrades as provided by the Transmission Owners. Please refer to the Company's response to OCA-V-01. Costs will be updated for (1) Transource's market efficiency elements of Project 9A; (2) the components of Project 9A assigned to existing transmission owners consisting of system improvements to interconnect the elements of Project 9A; and, (3) the components of Project 9A assigned to existing transmission owners consisting of system improvements to satisfy reliability requirements.

The Company will supplement its response accordingly upon PJM completion of the Benefit/Cost ratio re-evaluation.

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- b. The most recent benefit estimate for Project 9A is the benefits estimate calculated in connection with the analysis presented February 8, 2018 at the TEAC. This benefits estimate is \$611.48 million.

PJM anticipates completion of another Benefit/Cost ratio re-evaluation by the end of September 2018, to be presented during the October 11, 2019 TEAC meeting. See response to a. Load payment benefit will be based on market efficiency PROMOD simulations reflecting updated models.

- c. The most recent benefit to cost ratio estimate for Project 9A is the benefit to cost ratio estimate calculated in connection with the analysis presented February 8, 2018 at the TEAC. This benefit to cost ratio is 1.32/1.00.

PJM anticipates completion of another Benefit/Cost ratio re-evaluation by the end of September 2018, to be presented during the October 11, 2019 TEAC meeting. See the responses to a. and b. The benefit to cost ratio will be based on market efficiency PROMOD simulations reflecting updated models.

Witness: Paul F. McGlynn

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Data Request 02:

The following questions are directed to Mr. McGlynn/PJM. These questions should be viewed as a continuing request to provide updated responses (with the exception of Question 4) thereto as soon as they are available, but in no event later than every 60 days.

Please reference OCA-II-14(c) and the responses thereto. Please provide a current, updated chart in the same format and containing the same information as provided in OCA-II-14 Attachment 1.

Response:

Please refer to the Company's response to OCA-XXII-01. Company will supplement its response accordingly upon PJM completion of the Benefit/Cost ratio re-evaluation.

Witness: Paul F. McGlynn

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Data Request 03:

The following questions are directed to Mr. McGlynn/PJM. These questions should be viewed as a continuing request to provide updated responses (with the exception of Question 4) thereto as soon as they are available, but in no event later than every 60 days.

Please provide a current, updated load forecast for the project area as identified in this matter.

Response:

The February 2018 PJM Load forecast can be found on-line:

[<http://www.pjm.com/-/media/library/reports-notice/load-forecast/2018-load-forecast-report.ashx?la=en>]

On July 16, 2018, consistent with established practice, PJM published its mid-year update of the PJM load forecast for informational purpose. This update is intended to provide RPM market participants an indication of the next full load forecast to be released in January 2019 and is for market informational purposes only. PJM does not retool its annual RTEP cycle studies based on this particular forecast.

The mid-year forecast contains summer coincident peak forecasts for each PJM zone, Locational Deliverability Area and the RTO. Forecasts are supplied for the current and three upcoming Delivery Years. The update includes the following changes from the load forecast released in January 2018:

- Uses the Moody's Analytics' May 2018 economic forecast release;
- Uses solar addbacks from a third-party vendor drawn from satellite imagery;
- Uses a weather simulation period of 1993-2017.

[<http://www.pjm.com/-/media/planning/res-adeq/load-forecast/20180716-pjm-load-forecast-update-mid-year-18.ashx?la=en>]

Witness: Paul F. McGlynn

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Data Request 04:

As to the AP South Interface Constraints, for each year 2014-2017 please provide:

- a. The annual congestion cost.
- b. The responses to part a. shown as a percentage of total PJM congestion costs.
- c. The PJM ranking of the AP South Interface Constraints based on such costs as compared to other identified congested areas within PJM, i.e., #1, #6, etc.

Response:

- a. Please refer to the Company's response to OCA IX-02. See also the Company's responses to OCA I-18 and OCA-XIII-07.
- b. See response to a. and the information referenced in the Company's response to OCA-IX-02 and OCA-XIII-07. Annual AP South Interface congestion costs as a percentage of total PJM congestion costs can be found in the referenced reports.
- c. See response to OCAXXII-(a) and (b). The information requested can be found in the referenced reports.

Witness: Paul F. McGlynn

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Data Request 05:

The following questions are directed to Mr. McGlynn/PJM. These questions should be viewed as a continuing request to provide updated responses (with the exception of Question 4) thereto as soon as they are available, but in no event later than every 60 days.

Please provide the same information requested in Question 4 for calendar year 2018 thus far.

- a. The annual congestion cost.
- b. The responses to part a. shown as a percentage of total PJM congestion costs.
- c. The PJM ranking of the AP South Interface Constraints based on such costs as compared to other identified congested areas within PJM, i.e., #1, #6, etc.

Response:

- a. See the First Quarter, 2018, State of the Market Report, Section 11, beginning on page 521:
[http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2018/2018q1-som-pjm.pdf]
- b. See response to OCA-XXII-a.
- c. See response to OCA-XXII-a.

Witness: Paul F. McGlynn

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(Supplemental Response dated October 17, 2018)

Data Request 01:

The following questions are directed to Mr. McGlynn/PJM. These questions should be viewed as a continuing request to provide updated responses (with the exception of Question 4) thereto as soon as they are available, but in no event later than every 60 days.

1. Please reference OCA-V-01 and the responses thereto:
 - a. Please provide a current, updated cost estimate for the project.
 - b. Please provide a current, updated benefit estimate for the project.
 - c. Based on the responses to a. and b., please provide the current, updated benefit-cost ratio.

Response:

- a. The current, updated, cost estimate for Project 9A is the cost estimate used in connection with the analysis presented February 8, 2018 at the TEAC. This cost estimate is a \$340.6 million project capital cost, which is estimated for analysis purposes to represent \$462.87 million expressed in Present Value of Payments.

PJM anticipates completion of another Benefit/Cost ratio re-evaluation by the end of September 2018, to be presented during the October 11, 2019 TEAC meeting. As part of that analysis, pursuant to PJM's governing documents and manuals, PJM will update its market efficiency analysis to include any changes to the project costs provided by the project sponsor, as well as changes to the costs of accompanying reliability upgrades as provided by the Transmission Owners. Please refer to the Company's response to OCA-V-01. Costs will be updated for (1) Transource's market efficiency elements of Project 9A; (2) the components of Project 9A assigned to existing transmission owners consisting of system improvements to interconnect the elements of Project 9A; and, (3) the components of Project 9A assigned to existing transmission owners consisting of system improvements to satisfy reliability requirements.

The Company will supplement its response accordingly upon PJM completion of the Benefit/Cost ratio re-evaluation.

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- b. The most recent benefit estimate for Project 9A is the benefits estimate calculated in connection with the analysis presented February 8, 2018 at the TEAC. This benefits estimate is \$611.48 million.
PJM anticipates completion of another Benefit/Cost ratio re-evaluation by the end of September 2018, to be presented during the October 11, 2019 TEAC meeting. See response to a. Load payment benefit will be based on market efficiency PROMOD simulations reflecting updated models.
- c. The most recent benefit to cost ratio estimate for Project 9A is the benefit to cost ratio estimate calculated in connection with the analysis presented February 8, 2018 at the TEAC. This benefit to cost ratio is 1.32.

PJM anticipates completion of another Benefit/Cost ratio re-evaluation by the end of September 2018, to be presented during the October 11, 2019 TEAC meeting. See the responses to a. and b. The benefit to cost ratio will be based on market efficiency PROMOD simulations reflecting updated models.

Supplemental Response (August 2, 2018):

In accordance with the PJM Operating Agreement, Schedule 6, section 1.5.7(f), PJM has initiated its annual review of market efficiency projects that were approved in both the 2014/15 and 2016/17 RTEP window, including Project 9A. PJM anticipates completing its reevaluation and reviewing the results of the analysis with the TEAC at its September 13, 2018 meeting.

Supplemental Response (September 19, 2018):

- a. The current, updated, cost estimate for Project 9A is the cost estimate used in connection with the analysis presented September 13, 2018 at the TEAC. This cost estimate is a \$366.17 million project capital cost, which is estimated for analysis purposes to represent \$497.62 million expressed in Present Value of Payments.
- b. The most recent benefit estimate for Project 9A is the benefits estimate calculated in connection with the analysis presented September 13, 2018 at the TEAC. This benefit estimate is \$707.29 million.
- c. The most recent benefit to cost ratio estimate for Project 9A is the benefit to cost ratio estimate calculated in connection with the analysis presented September 13, 2018 at the TEAC. This benefit to cost ratio is 1.42.

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Supplemental Response (October 17, 2018):

a. IEC Total Cost Estimate

The updated total estimated cost for the IEC project is \$217 million expressed in 2018 dollars, which is the equivalent to \$200 million in 2015 dollars. As shown in the table below, this represents less than 3% cost increase versus the original cost estimate for the IEC project.

Total IEC Cost Estimate (\$M)		Escalation Year		
	Escalation Rate ¹	2015	2018	2020
Original Proposal	3.0%	197		230
Current Estimate	2.3%	200	217	
Percent Difference		2%		

This update can be reconciled to the testimony of witness Simmons as follows:

- The original total estimated cost of the IEC project of \$230 million referenced by witness Simmons was the estimated cost expressed in 2020 dollars (in-service year dollars)
- This original cost estimate (\$230 million) was consistent with the cost estimate included in Transource's proposal for the project of \$197 million expressed 2015 dollars (proposal submission year dollars) escalated by 3% annually¹ to 2020
- Transource has updated the total estimated cost of the IEC project to \$200 million expressed in 2015 dollars, an increase of \$3 million (approximately 2%) versus the original IEC cost estimate
- Transource has provided this update to PJM expressed in 2018 dollars (current year dollars) as an updated total estimated cost of the IEC project of \$217 million
- The updated IEC cost estimate of \$217 million expressed in 2018 dollars can be broken down as follows:
 - The IEC East Project is estimated at \$91 million, which includes \$40 million for substation work and \$51 million for the new Furnace Run-Conastone 230 kV Transmission Line

¹ Transource used a 3.0% annual escalation factor for the cost estimate contained in the original proposal for the IEC project; this figure was conservative and slightly above the 2.3% annual escalation factor used by PJM in its market efficiency benefit/cost analysis. For consistency with PJM's analysis, Transource has adopted the 2.3% escalation rate for the updated cost estimate of the IEC project.

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- The IEC West Project is estimated at \$126 million, which includes \$32 million for substation work and \$94 million for the new Rice-Ringgold 230 kV Transmission Line

Project 9A Total Cost Estimate

The cost estimate referenced in witness McGlynn's testimony of \$320.19 million is the total estimated cost of Project 9A (which includes the IEC Project) expressed in in-service year dollars for each component. PJM has received cost estimate updates for several of the components of Project 9A, including the updated cost estimate for the IEC project described above, and the updated total estimated cost for Project 9A is \$372.23 million expressed in in-service year dollars for each component. A reconciliation of the update to the cost estimate for Project 9A is provided below:

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Upgrade Id	Description	Responsible Party	Original Estimate	Oct 2018 Estimate
b2752.7	Reconductor/Rebuild the two Conastone - Northwest 230 kV lines and upgrade terminal equipment on both ends	BGE	\$45.88	\$52.14
b2752.6	Conastone 230 kV substation tie-in work (install a new circuit breaker at Conastone 230 kV and upgrade any required terminal equipment to terminate the new circuit)	BGE	\$4.12	\$6.14
b2752.5	Build new 230 kV double circuit line between Furnace Run and Conastone 230 kV, operated as a single circuit.	Transource	\$39.72	\$53.25
b2752.4	Upgrade terminal equipment and required relay communication at TMI 500 kV: on the Peach Bottom - TMI 500 kV circuit	ME	\$2.0	\$2.0
b2752.3	Upgrade terminal equipment and required relay communication at Peach Bottom 500 kV: on the Peach Bottom - TMI 500 kV circuit	PECO	\$2.0	\$2.0
b2752.2	Tie in new Furnace Run substation to Peach Bottom-TMI 500 kV	PECO	\$5.5	\$6.9
b2752.1	Tap the Peach Bottom - TMI 500 kV line & create new Furnace Run 500 kV & 230 kV stations. Install two 500/230 kV transformers, operated together.	Transource	\$44.66	\$41.46
b2743.6.1	Replace the two Ringgold 230/138 kV transformers	APS	\$6.26	\$14.13
b2743.6	Reconfigure the Ringgold 230 kV substation to double bus double breaker scheme	APS	\$7.87	
b2743.7	Rebuild/Reconductor the Ringgold - Catoctin 138 kV circuit and upgrade terminal equipment on both ends	APS	\$44.89	\$47.04
b2743.5	Build new 230 kV double circuit line between Rice and Ringgold 230 kV, operated as a single circuit.	Transource	\$72.88	\$98.35
b2743.4	Upgrade terminal equipment at Hunterstown 500 kV: on the Conemaugh - Hunterstown 500 kV circuit	ME	\$0.2	\$0.2
b2743.3	Upgrade terminal equipment at Conemaugh 500 kV: on the Conemaugh - Hunterstown 500 kV circuit	PENELEC	\$0.2	\$0.2
b2743.2	Tie in new Rice substation to Conemaugh-Hunterstown 500 kV	PENELEC	\$4.2	\$15.16
b2743.1	Tap the Conemaugh - Hunterstown 500 kV line & create new Rice 500 kV & 230 kV stations. Install two 500/230 kV transformers, operated together.	Transource	\$39.81	\$33.26

Witness: Paul F. McGlynn & Brian D. Weber

Change in 15-Year Net Present Value of Net Load Payment
Project 9A

PJM ZONE	(\$million)
AECO	17.90
AEP	5.32
APS	-4.74
BGE	-158.44
COMED	67.47
DAY	1.67
DEOK	17.19
DOM	-382.05
DPL	30.42
DUQ	4.23
EKPC	-0.36
FE-ATSI	55.32
JCPL	52.66
LINDVFT	5.32
METED	62.15
NEPTHVDC	9.97
O66HVDC	5.11
PECO	83.00
PENELEC	31.63
PEPCO	-161.71
PLGRP	164.91
PSEG	72.97
RECO	2.99
Total PJM Change	-17.05
Zones that decrease	-707.29
Zones that increase	690.24

Change in 15-Year Net Present Value of Net Load Payment
Project 9A

PJM ZONE		NLP NPV (\$)
AECO	\$	17,903,639
AEP	\$	5,318,294
APS	\$	(4,738,473)
BGE	\$	(158,435,444)
COMED	\$	67,467,567
DAY	\$	1,670,667
DEOK	\$	17,188,314
DOM	\$	(382,049,485)
DPL	\$	30,415,129
DUQ	\$	4,232,346
EKPC	\$	(357,204)
FE-ATSI	\$	55,324,876
JCPL	\$	52,659,515
LINDVFT	\$	5,322,364
METED	\$	62,147,589
NEPTHVDC	\$	9,969,764
O66HVDC	\$	5,107,620
PECO	\$	83,000,950
PENELEC	\$	31,631,372
PEPCO	\$	(161,710,391)
PLGRP	\$	164,913,851
PSEG	\$	72,968,290
RECO	\$	2,994,278
Total PJM Change	\$	(17,054,570)
Zones that decrease	\$	(707,290,998)
Zones that increase	\$	690,236,427