

Reliability Analysis Update

Wenzheng Qiu

Stan Sliwa

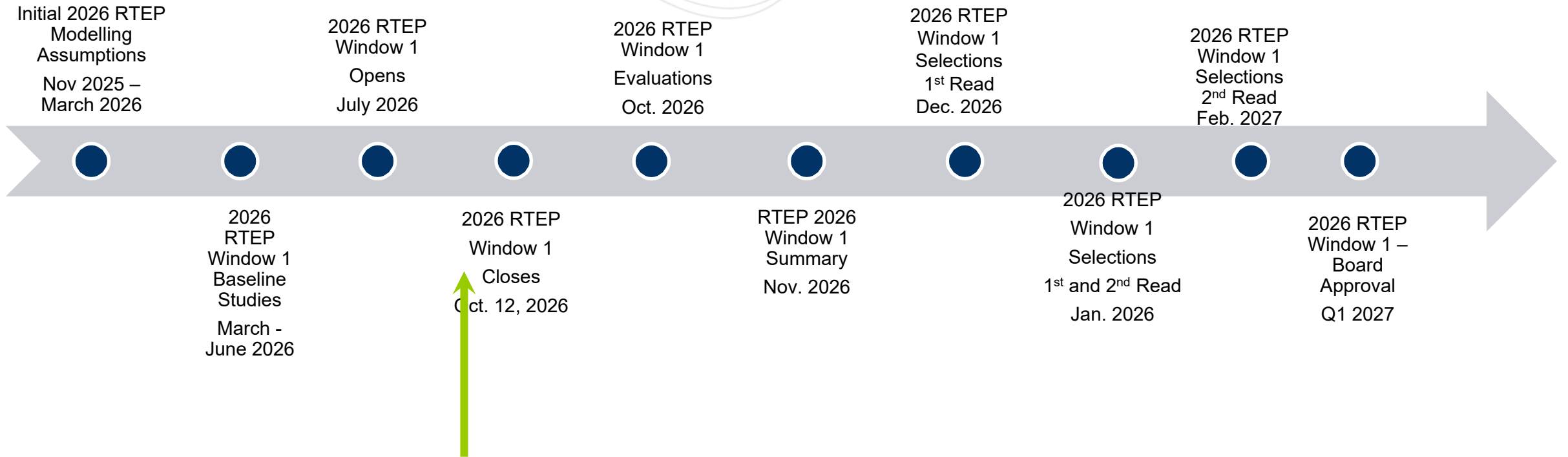
Transmission Expansion Advisory Committee

October 6, 2026

Disclaimer: While materials are current at the time of publishing, applicable requirements may change. PJM Governing Documents control.

2026 RTEP Window 1 Update

2026 RTEP Window 1 – Timeline



- Current schedule
 - 2026 RTEP proposal Window 1 opened on July 20th, 2026, and will close on October 12, 2026 (extending the 2026 RTEP Window for three weeks from the original closing date)
 - Updated Window 1 files/results and window problem statement were reposted on August 21st to reflect ComEd load forecast update
 - On July 30th, 2026, PJM was informed by Exelon of an anticipated reduction in the ComEd load forecast resulting from the latest information about the firmness of commitments from customers.
 - 1.3GW load reduction for 2031; 3.3GW load reduction for 2034
- Window summary and solutions to be brought forward to the TEAC starting in November 2026 through January 2027
- Board approvals in 1st Quarter of 2027

Scope / Cost Changes Dominion

Dominion Transmission Zone: Baseline 500kV Line #588 Rebuild (End of Life Criteria)

Cost Change for b3850.1 – b3850.3 (2023-W2-367) 500kV Line #588 Yadkin – Fentress Rebuild:

- Rebuild approximately 13.51 miles of 500 kV line #588 from structure 588/184 inside Yadkin substation to structure 588/254 outside of Fentress substation. **(b3850.1)**
- Line #588 terminal equipment at Yadkin substation will be upgraded to a rating of 5000A. Since the new 500kV line will be using fiber, the wave trap will be removed and the line protection scheme will be updated. **(b3850.2)**
- At Fentress substation, since the new 500kV line will be using fiber, the wave trap will be removed and the line protection scheme will be updated. **(b3850.3)**

Transmission Estimated Cost: ~~\$79.7M~~ \$113.8M

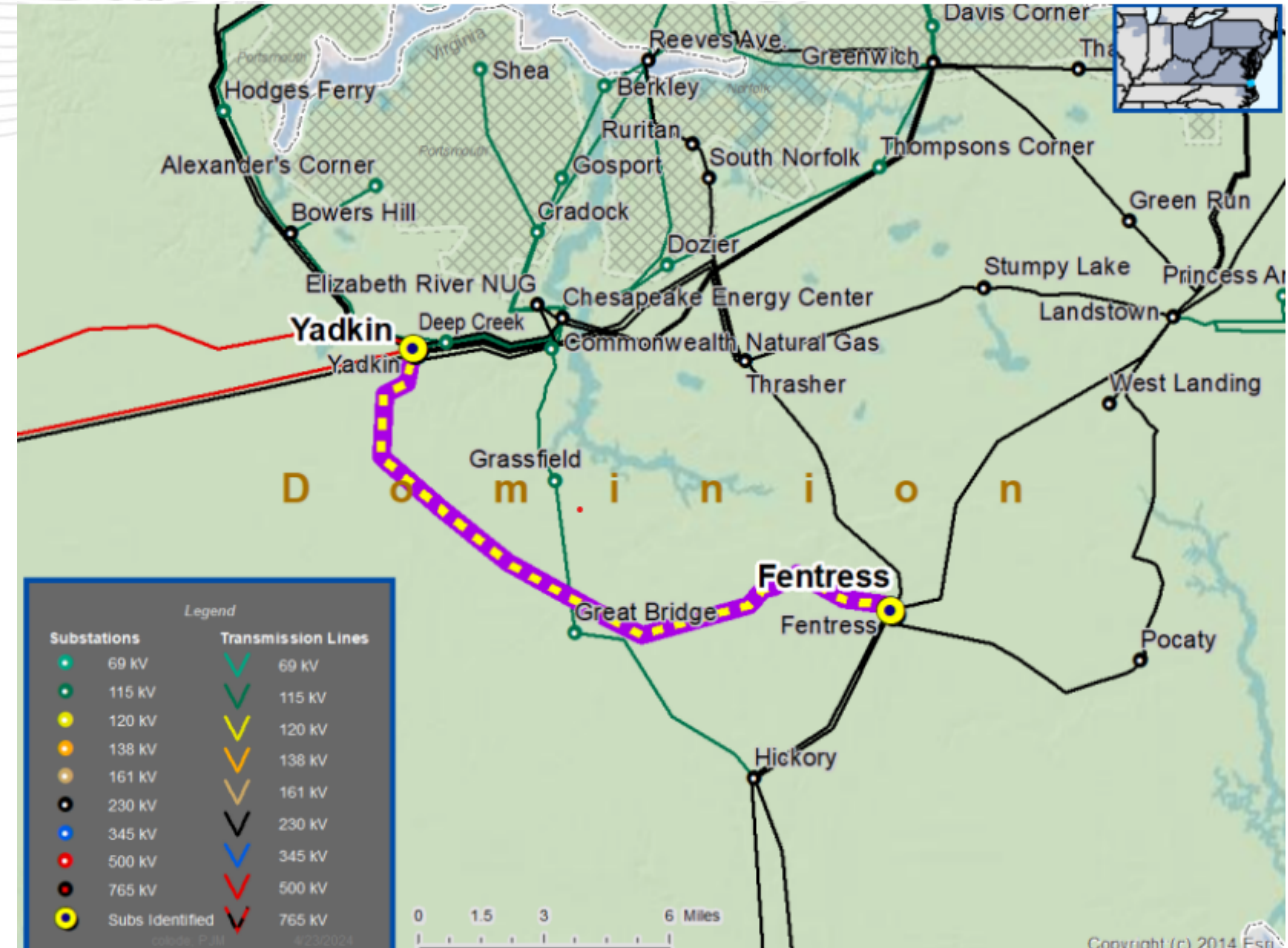
Required In-Service Date: 6/1/2028

Projected In-Service Date: 12/31/2026

Previously Presented: 6/4/2024

Reason for Project Update:

- Construction bids for the transmission line work were received above the original estimate.
- Permitting delays resulted in schedule impacts, leading to change orders for both standby time and schedule acceleration.
- Material delivery delays affected project execution and required additional change orders to recover schedule and maintain project milestones.



Dominion Transmission Zone: Baseline 502 Jct-Woodside-Aspen 500 kV & Doubs Corridor Projects (DOM Portion)

Cost Change for b3800.118, b3800.120 & b3800.375 (2022-W3-853) :

Proposal 2022-W3-853 (DOM Scope):

- Line work for terminating Doubs to Bismark line into Woodside 500 kV substation. **(b3800.118) - \$5.1M**
- Terminate new NextEra 500 kV line from Woodside into Goose Creek substation. The Goose Creek 500kV cap bank will be moved to Aspen substation. **(b3800.120) - \$30.49M**
- Construct new Woodside – Goose Creek 500 kV line for ~3 miles on single circuit monopole structures within the Doubs – Goose Creek Corridor. **(b3800.375) - \$15.60M \$38.35M**

Transmission Estimated Cost: ~~\$51.19M~~ \$73.94M

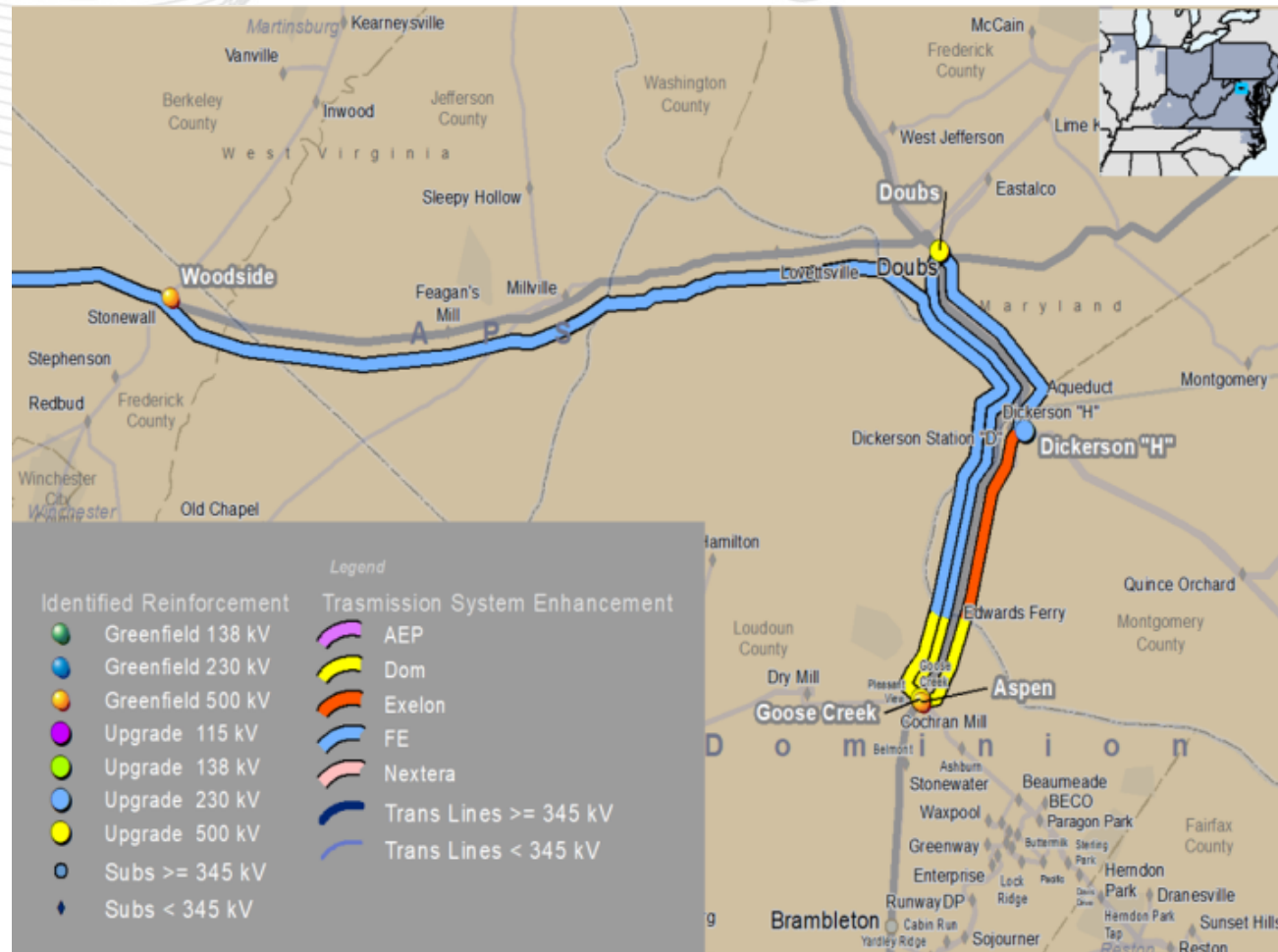
Required In-Service Date: 6/1/2027 (b3800.118/b3800.120), 6/1/2029 (b3800.375)

Projected In-Service Date: 9/30/2030 (b3800.120 & b3800.375), 6/1/2028 (b3800.118)

Previously Presented: 12/5/2023 (b3800.118/b3800.120), 7/10/2024 (b3800.375)

Reason for Project Update:

- Project costs update are driven by upgraded conductor design, catwalk installation, updated geotechnical conditions, additional splice boxes, increased crossing requirements, taller structures for EMF and clearance compliance, and the inclusion of forestry and access work not accounted for in the previous project.



Dominion Transmission Zone: Thornburg 500/230kV Substation (Line #568 Ladysmith – Possum Point Cut-In)

PJM Recommended Solution: Proposal 2024-W1-967:

- Cut in Line #568 Ladysmith - Possum Point into Kraken, creating Line #568 Ladysmith to Kraken. **Estimated Cost: \$3.6M (b4000.351)**
- Cut in Line #568 Ladysmith - Possum Point into Kraken, creating new Line #5XX Kraken to Possum Point. **Estimated Cost: \$3.6M (b4000.352)**
- The designated entity for both baseline projects is **Dominion**.

Transmission Estimated Cost: \$7.2M (\$3.6M b4000.351 & \$3.6M b4000.352)

Required In-Service Date: 6/1/2029

Projected In-Service Date: 9/16/2030

Previously Presented: 10/6/2026

Change in Description & Cost for Original Baseline IDs:

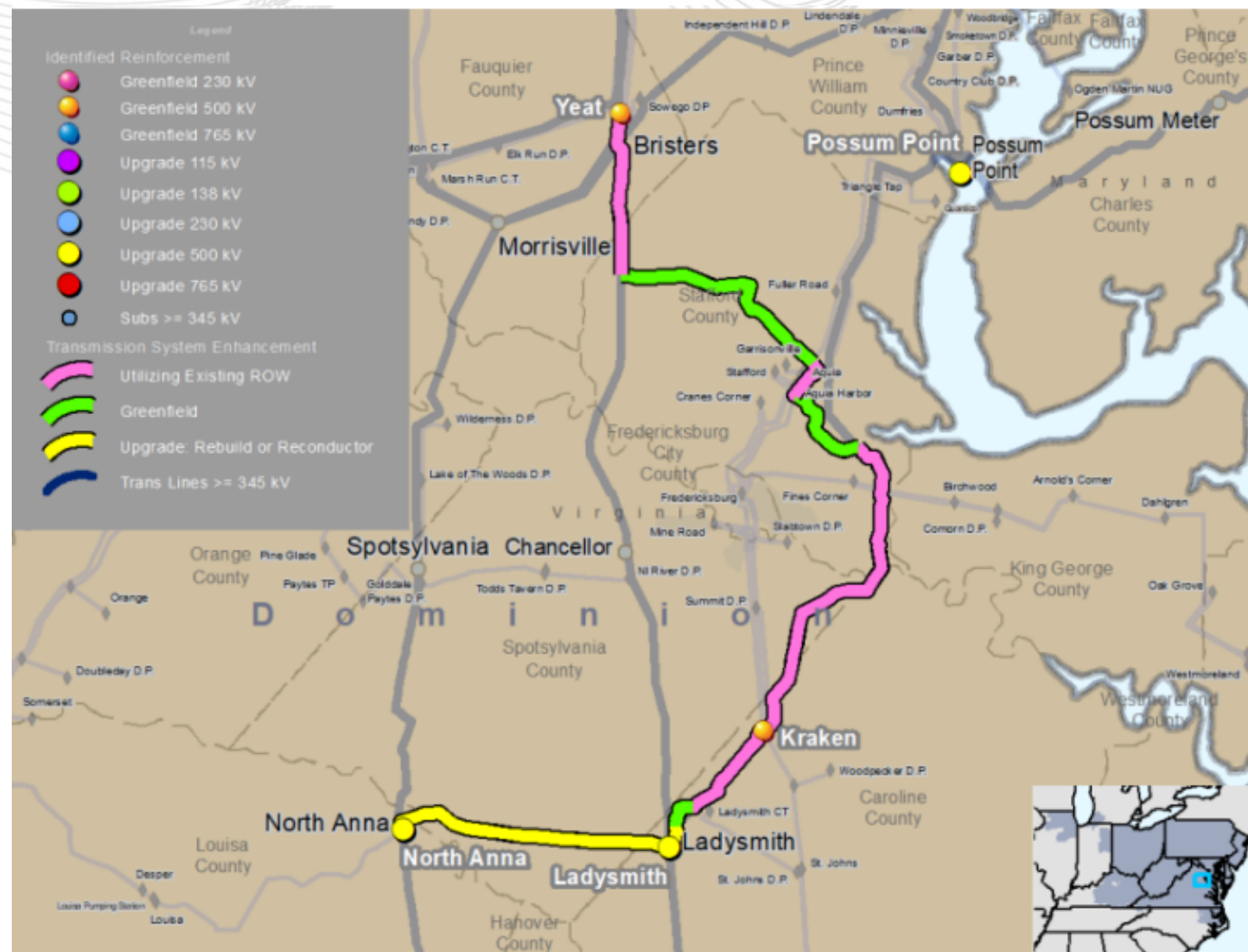
- Cut into line 568 Ladysmith to Possum Point and run to the line of demarcation at Thornburg substation (Ladysmith - Thornburg portion). **Estimated Cost: \$1.1M (b4000.351)**
- Cut into line 568 Ladysmith to Possum Point and run to the line of demarcation at Thornburg substation (Possum Point - Thornburg portion). **Estimated Cost: \$1.1M (b4000.352)**

New Baseline Projects:

- Terminate line 568 Ladysmith to Possum Point from the line of demarcation into Thornburg substation (Ladysmith - Thornburg portion). **Estimated Cost: \$2.5M (b4000.364)**
- Terminate line 568 Ladysmith to Possum Point from the line of demarcation into Thornburg substation (Possum Point - Thornburg portion). **Estimated Cost: \$2.5M (b4000.365)**
- The designated entity for both new baseline IDs is **Valley Link Transmission**.

Reason for new Baseline IDs:

- Further discussion between Valley Link Transmission & Dominion determined that the work for the cut-in of 500kV line #568 Ladysmith – Possum Point into Thornburg substation should be split as highlighted above.



Dominion Transmission Zone: Thornburg 500/230kV Substation (Bypass Elmont & Possum Point 500kV)

PJM Recommended Solution: Proposal 2024-W1-820:

- Tie the Elmont – Thornburg and Thornburg – Possum Pt 500kV lines by removing line terminations at Thornburg (bypassing the Thornburg substation).
Estimated Cost: \$1M (b4053.34)
- The designated entity for this baseline project was Dominion when the Yeat relocation scope change was presented in April/May of 2026

Transmission Estimated Cost: \$1M

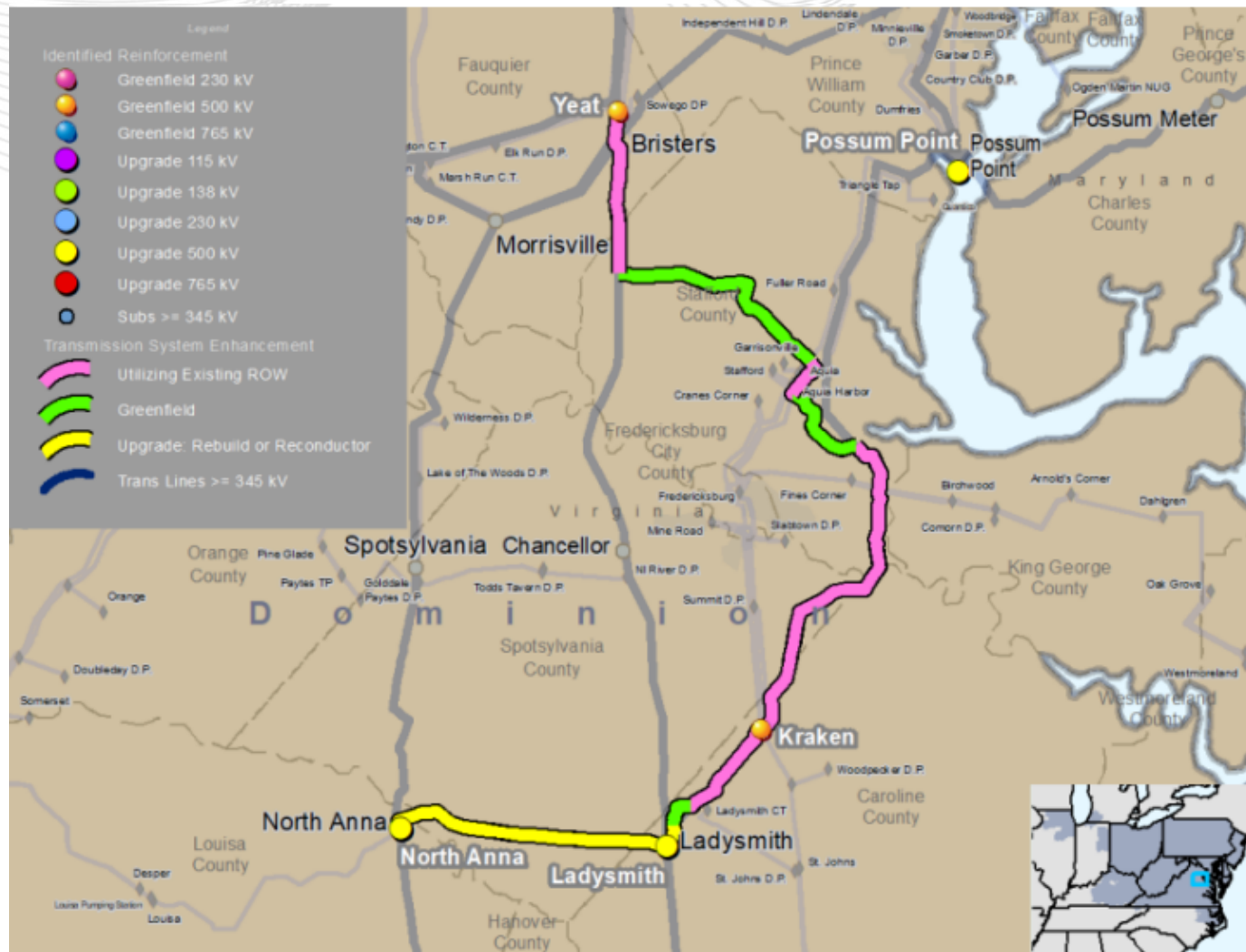
Required In-Service Date: 6/1/2032

Projected In-Service Date: 6/1/2032

Previously Presented: 5/8/2026

Change in Designated Entity:

- Further discussion between Valley Link Transmission & Dominion determined that the designated entity for this baseline ID should be Valley Link Transmission over Dominion.



Dominion Transmission Zone: Nokesville – Hornbaker New 230kV Line

Scope Change for b4000.322 – b4000.324 (230kV Line Nokesville – Hornbaker 230kV line):

Part of recommended solution for 2024 Window 1 (2024-W1-24) is to construct a new 230kV line from Nokesville – Hornbaker.

Original Solution:

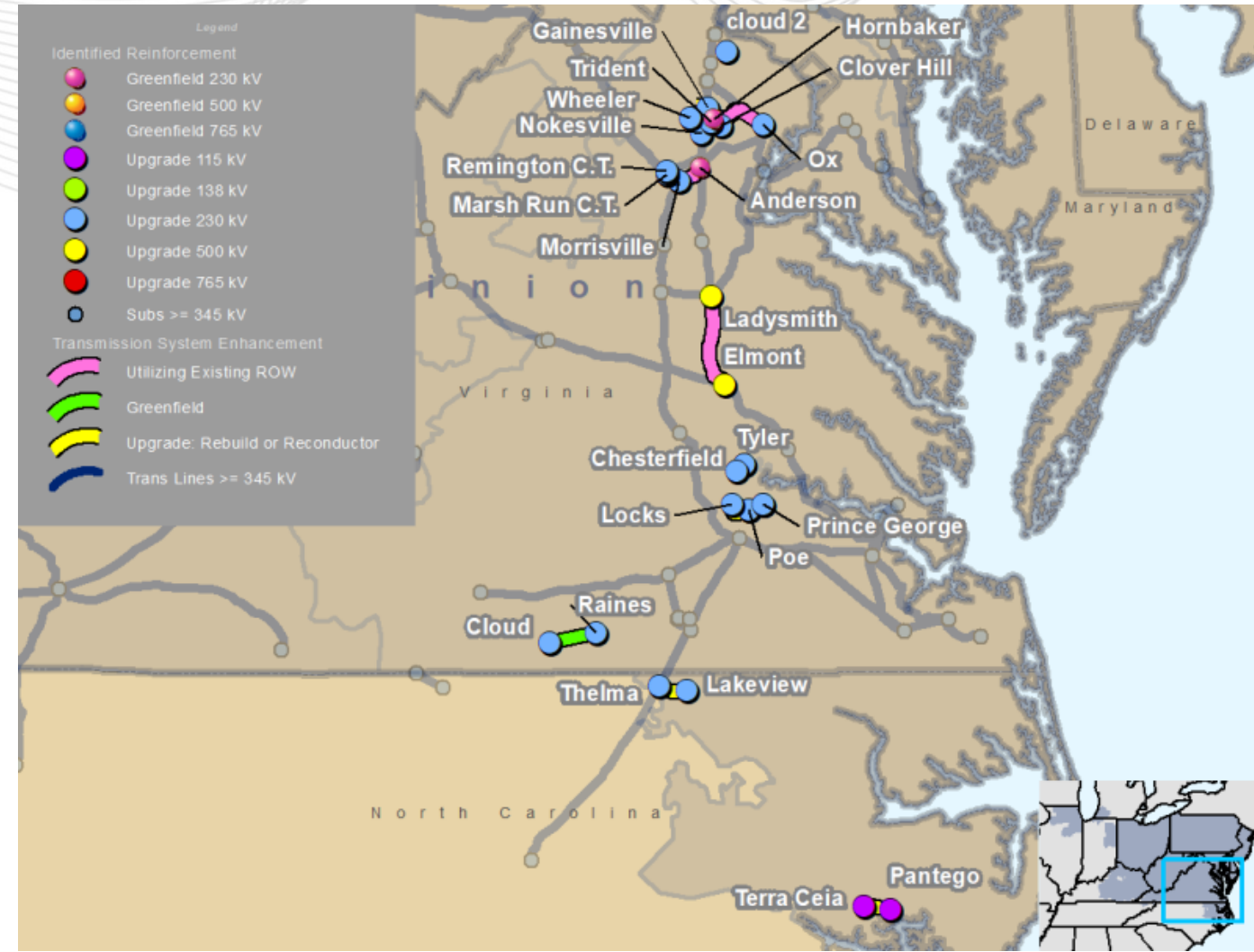
- Build a new 230kV Line from Nokesville – Hornbaker using the vacant arms of the double circuit monopole structures installed as part of a previous project. **Estimated Cost: \$15.28M (b4000.322)**
- Terminal equipment upgrades at Nokesville & Hornbaker. **Estimated Cost: \$2.86M (\$1.43M each) (b4000.323 & b4000.324)**

Transmission Estimated Cost: \$18.14M

Required In-Service: 6/1/2029

Projected In-Service: 6/1/2029

Previously Presented: 1/7/2025



Dominion Transmission Zone: Nokesville – ~~Hornbaker~~ Bristow New 230kV Line

Revised Solution:

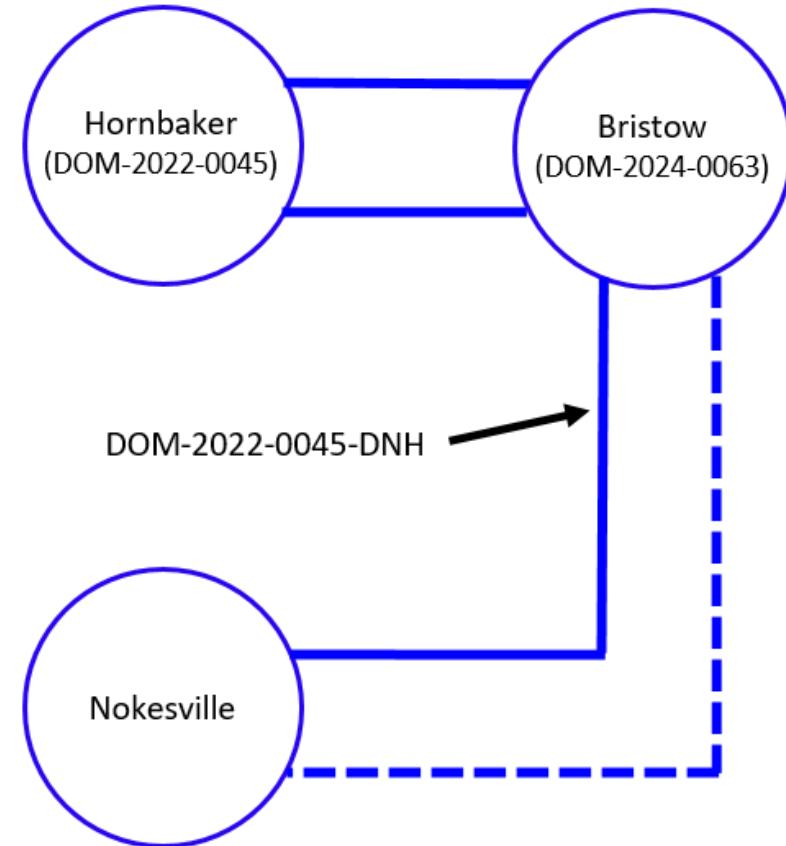
- Build a new 230kV Line from Nokesville – Bristow using the vacant arms of the double circuit monopole structures installed as part of previous supplemental project s3035.2. **Estimated Cost: \$15.28M (b4000.322)**
- Terminal equipment upgrades at Nokesville and Bristow 230kV substations. **Estimated Cost: \$2.86M (\$1.43M: b4000.323 & \$1.43M: b4000.324)**

Reason for Project Update:

- Bristow will be located directly adjacent to Hornbaker. At the 12/03/2024 TEAC meeting, the scope of DOM-2022-0045-DNH (Nokesville-Hornbaker 230 kV Ckt #1) was reconfigured to terminate from Nokesville into Bristow rather than Hornbaker. This change applies the same update to the second 230 kV circuit.

Transmission Estimated Cost: \$18.14M (No Additional Cost)

Projected In-Service Date: 6/1/2029 (No Change)



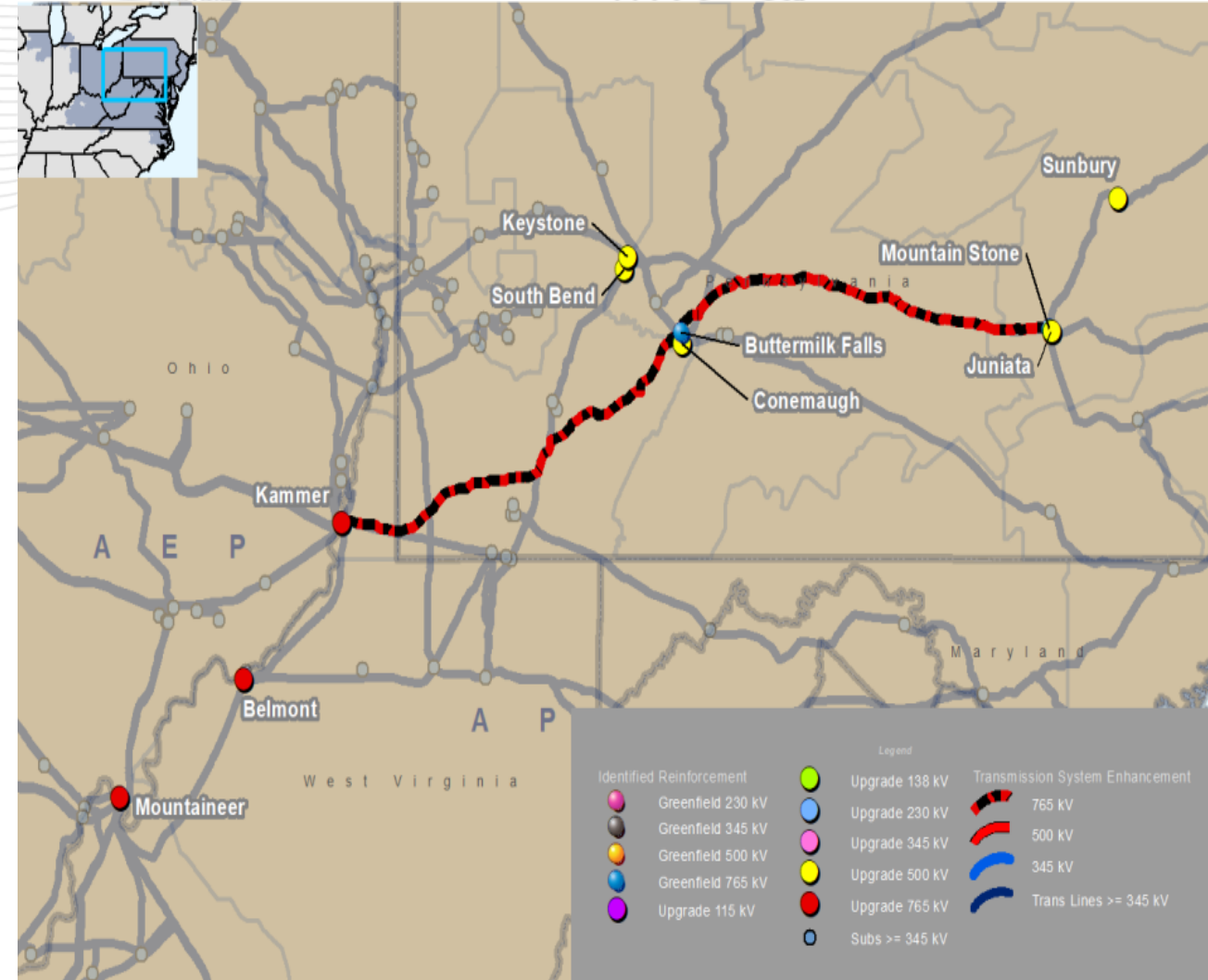
Scope / Cost Changes PPL

B4036.15 Scope Change

Part of the 2025 Window 1 process, PJM approved the NextEra submitted proposal 2025-W1-237 - construct 765 kV transmission line from Kammer – Buttermilk Falls - Mountain Stone and 765/500 kV station at Mountain Stone. The proposed project includes termination of two 500 kV lines at Juniata substation.

Old Scope: Install two new 500 kV CB at North and South bus to terminate the 765-500 kV transformers leads

Old Estimated Total Cost: \$9.95M



B4036.15 Scope Change

PPL has completed its review of the NextEra proposed scope. The evaluation identified broader scope of work than originally anticipated. The additional scope involves constructing a new station adjacent to the existing facility.

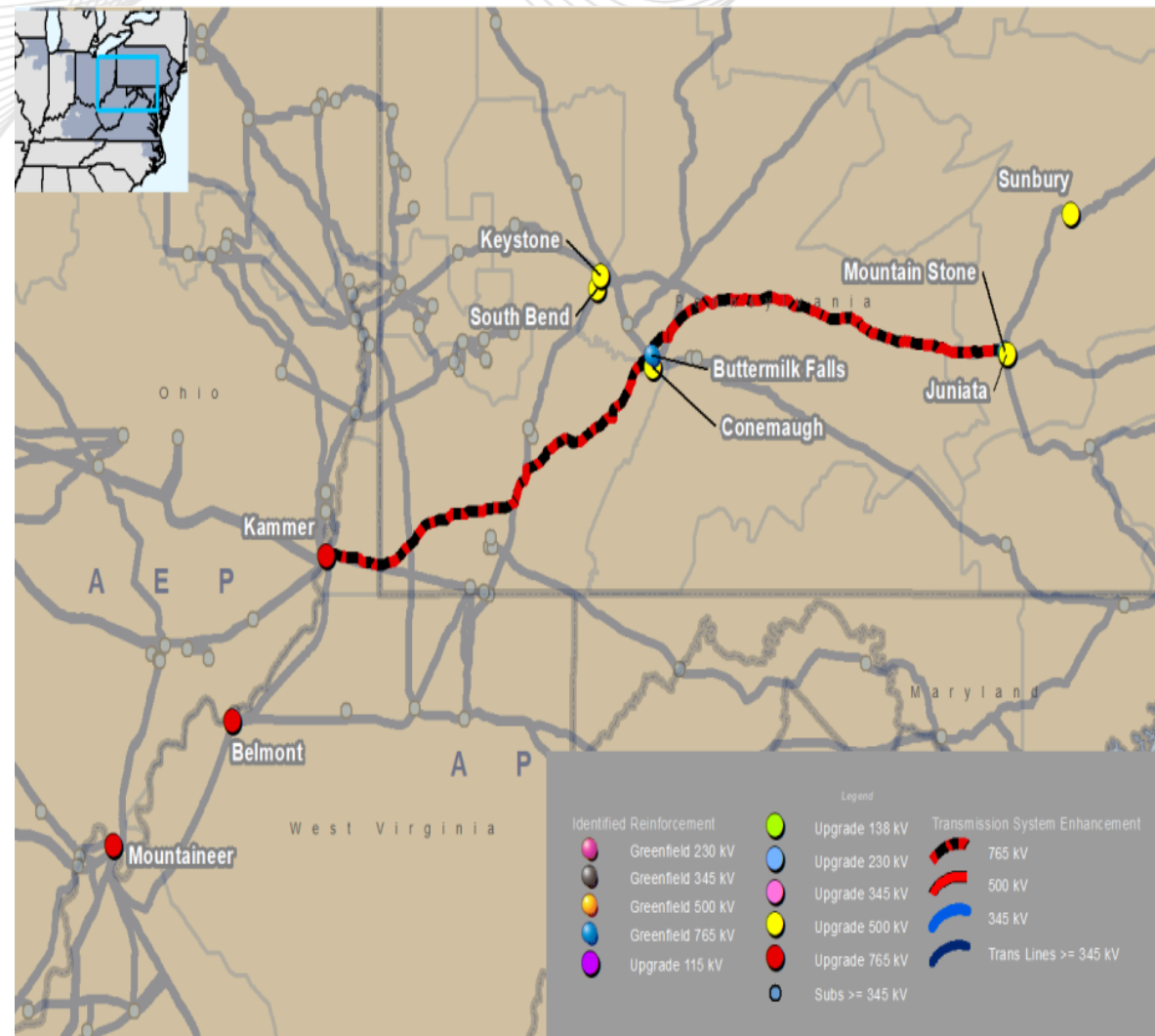
The larger scope is required because:

- Bringing the 765/500 kV transformer lead lines into the existing Juniata 500 kV buses would cause thermal requirements that exceed the capability of the existing Juniata 500 kV buses.
- Given outage constraints and the limited footprint of the existing Juniata Substation, it is not feasible to upgrade the existing facility to meet the required rating
- The Juniata 500 kV Substation is already the designated termination point for multiple new 500 kV transmission lines, further limiting expansion and upgrade options

New Scope: Build new Juniata 500 kV station adjacent to the existing Juniata station and re-terminate a portion of the 500 kV transmission lines at the new substation.

New Estimated Total Cost: \$131.53M

Projected ISD: 6/1/2032



B4036.17 Scope Change

As part of the NextEra approved 2025-W1-237 projects, NextEra submitted a project to reconfigure the Sunbury 500 kV GIS substation. PPL further reviewed the scope and identified additional work is needed

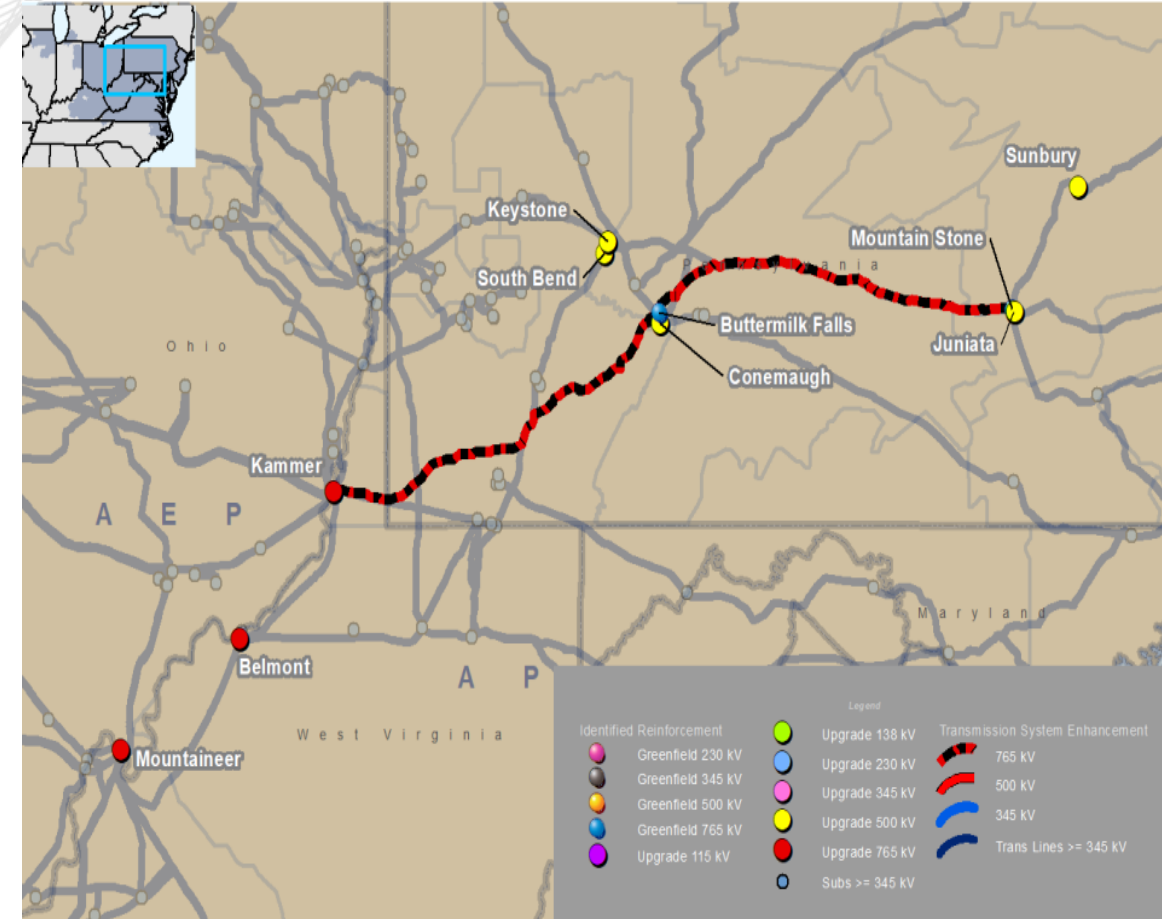
Old Scope : Sunbury - Install two new 500 kV circuit breakers with 63 kA, 5,000 Amps rating in transformer T24 and T25 bay . Both transformers will be in double bus double breaker position after adding these two new breakers.

Old Estimated Total Cost: \$4.98M

New Scope: Reconfigure the Sunbury 500 kV substation. Install new 500 kV circuit breaker at bay 4 and move T24 to bay 4 making it breaker and half configuration.

New Estimated Total Cost: \$30M

Projected ISD: 6/1/2032



RTEP 2022 Window #1 Projects Cost Changes Exelon

RTEP 2022 Window #1 Projects Summary of Cost Changes

RTEP ID	Project Description	Transmission Owner	Original Cost Estimate (\$M)	Updated Cost Estimate (\$M)	Cost Change
b3770	Rebuild 1.4 miles of existing single circuit 230 kV tower line between BGE's Graceton substation to the PPL tie-line at the MD/PA state line to double circuit steel pole line with one (1) circuit installed to uprate 2303 circuit.	BGE	8.4	11.04	2.64
b3771	Reconductor two (2) 230 kV circuits from Conastone to Northwest #2	BGE	37.76	136.2	98.44
Total			46.16	147.24	101.08

- Projects were proposed to address violations identified in the 2022 Window 1 part of the cluster 2 (2022-W1-912 and 2022-W1-94). Refer to presentation at the 01/10/2023 TEAC slides 7 to 20 (<https://www.pjm.com/-/media/DotCom/committees-groups/committees/teac/2023/20230110/item-06---reliability-analysis-update.pdf>). Original cost estimates do not reflect \$3M (b3770) and \$43.6M (b3771) spent previously as part of the 9-A project.
- Primary drivers of cost increases include:
 - Reactivation of transmission projects required revalidation of key project assumptions under current field conditions. Further engineering analysis and field assessments identified constructability constraints and execution requirements not previously captured.
 - Accelerated execution strategies were necessary to resolve outage constraints and achieve required in-service dates.
 - Increases in electric utility labor rates for engineering, construction, and commissioning services driven by a combination of workforce shortages, unprecedented infrastructure investment, competition for skilled resources, wage inflation, and project complexity.

RTEP 2022 Window #3 Projects Cost Changes Exelon

RTEP 2022 Window #3 Projects

Summary of Cost Changes

RTEP ID	Project Description	Transmission Owner	Original Cost Estimate (\$M)	Updated Cost Estimate (\$M)	Cost Change	Cost Containment Applicable
b3800.27	High Ridge 500 kV substation (cut into Brighton-Waugh Chapel 500 kV line) - Waugh Chapel side	BGE	33.67	40.16	6.49	Yes
b3800.28	High Ridge 500 kV substation (cut into Brighton-Waugh Chapel 500 kV line) -Brighton side	BGE	33.67	40.16	6.49	Yes
b3800.29	High Ridge termination for the Bramah-High Ridge 500 kV line	BGE	33.67	40.16	6.49	Yes
b3800.30	High Ridge - Install two 500/230 kV transformers	BGE	22.11	78.34	56.23	Yes
b3800.32	Build new Bramah-High Ridge 500 kV line. (~59 miles)	BGE	407.11	810.14	403.03	Yes
b3800.34	Rebuild 5012 (existing Peach Bottom-Conastone) (Gracetone-Conastone) 500 kV line on single circuit structures and cut into Bramah and Gracetone 500kV stations	BGE	70	61.17	-8.83	Yes
b3800.36	Rebuild 5012 (existing Peach Bottom-Conastone) (Bramah-Gracetone BGE) 500 kV line on single circuit structures and cut into Bramah and Gracetone 500 kV stations	BGE	10.44	21.32	10.88	Yes
b3800.37	Replace terminal equipment limitations at Conastone 500 kV - on the (existing Peach Bottom- Conastone) or (new Gracetone-Conastone) 500 kV line	BGE	4.93	6.27	1.34	Yes
b3800.4	New Otter Creek to Doubs 500 kV line (MD Border-PSEG Demarcation Point). Rebuild and expand existing ~1.6 miles of Otter Creek-Conastone 230 kV line to become a double-circuit 500 and 230 kV lines	BGE	11.11*	33.73	22.62	No
b3800.41	Conastone-Brighton 500 kV (5011 circuit) - Replace terminal equipment limitations at Conastone 500 kV	BGE	7.16	8.01	0.85	Yes
b3800.38	Chalk Point 5073 Terminal	PEPCO	0.34	0.76	0.42	Yes
b3800.243	New 500kV Doubs to Aspen	PEPCO	37.20	26.53	-10.67	Yes
b3800.244	Dickerson H 23111 Rebuild & relocation	PEPCO	18.60	65.06	46.46	Yes
b3800.31	Build new Bramah-High Ridge 500 kV line.	PECO	13.36	71.2	57.84	No
b3800.35	Rebuild 5012 (existing Peach Bottom-Conastone) (Bramah-Gracetone PECO) 500 kV line on single circuit structures and cut into Bramah and Gracetone 500 kV stations.	PECO	29.86	60.9	31.04	No
b3800.42	Peach Bottom North bus upgrade - Replace 11 – Instances of strain bus conductor, 7 – 500 kV switches, 7 – CTs, 1 – 500 kV breaker, 2 – Breaker relays or meters.	PECO	2.7	7.27	4.57	No
b3800.44	Bramah termination for the Bramah-High Ridge 500 line (PECO work).	PECO	3.4	5.0	1.6	No
b3800.45	Bramah 500 kV termination for the Rock Springs 500 kV line (5034/5014 line) (PECO work).	PECO	0.8	1.9	1.1	No
b3800.47	Build new Peach Bottom South-Bramah 500 kV line – cut in to Peach Bottom tie No. 1 and extending line to Bramah (~1.25 miles new ROW).	PECO	5.5	21.4	15.9	No
b3800.52	Reconfigure Peach Bottom North/South to allow for termination of 500 kV lines from Peach Bottom to Bramah. Bramah termination for the new Peach Bottom-Bramah line.	PECO	7.86	21.5	13.64	No
Total			753.49	1420.98	667.49	

*b3800.4 original cost provided by PPL submittal 2022-W3-374

Note: BGE b3800.26, b3800.33, b3800.40, PEPCO b3800.245, PECO b3800.5, b3800.46, DPL b3800.39 do not have changes compared to the original cost estimates at this time

- Costs submitted during the RTEP process were based upon preliminary, concept-level, project definition and limited design and engineering analysis. Updated cost estimates reflect an advanced level of project scope maturity and are based upon completion of at least 30% design and engineering and procurement of long-lead major equipment. The 30% design included constructability reviews, which resulted in more comprehensive plans for right of way (ROW) access and construction and outage requirements.
- Primary drivers of cost increases include:
 - Competition for labor, materials, manufacturing capacity, and specialized resources from rapidly expanding data center construction projects, electrification initiatives, grid modernization programs, and renewable interconnections has significantly increased market demand and cost escalation across the industry. As a result, actual vendor quotes received through the competitive bid process for major long-lead equipment were higher than the budgetary estimates developed during the conceptual phase to support RTEP. Higher pricing reflects constrained global manufacturing capacity, elevated commodity costs, and broader supply chain pressures.
 - Increases in electric utility labor rates for engineering, construction, and commissioning services driven by a combination of workforce shortages, unprecedented infrastructure investment, competition for skilled resources, wage inflation, and project complexity.
 - Extended permitting and regulatory review timelines have increased project complexity and execution risk. Prolonged approval processes often require schedule adjustments, compressed construction windows, additional coordination efforts, and increased resource requirements to maintain critical in-service dates.
 - Increased overhead costs necessary to manage significant volume and complexity of work.
- Cost containment provisions are applicable to most of the BGE & PEPCO 2022 Window 3 projects. These provisions are intended soften, within their own provisions, the cost increase impacts on rates. Please refer to 2022W3 detailed project information part of the Competitive Window submissions for applicable cost containment provisions.

RTEP 2024 Window #1 Projects Cost Changes Exelon

RTEP 2024 Window #1 Projects Summary of Cost Changes

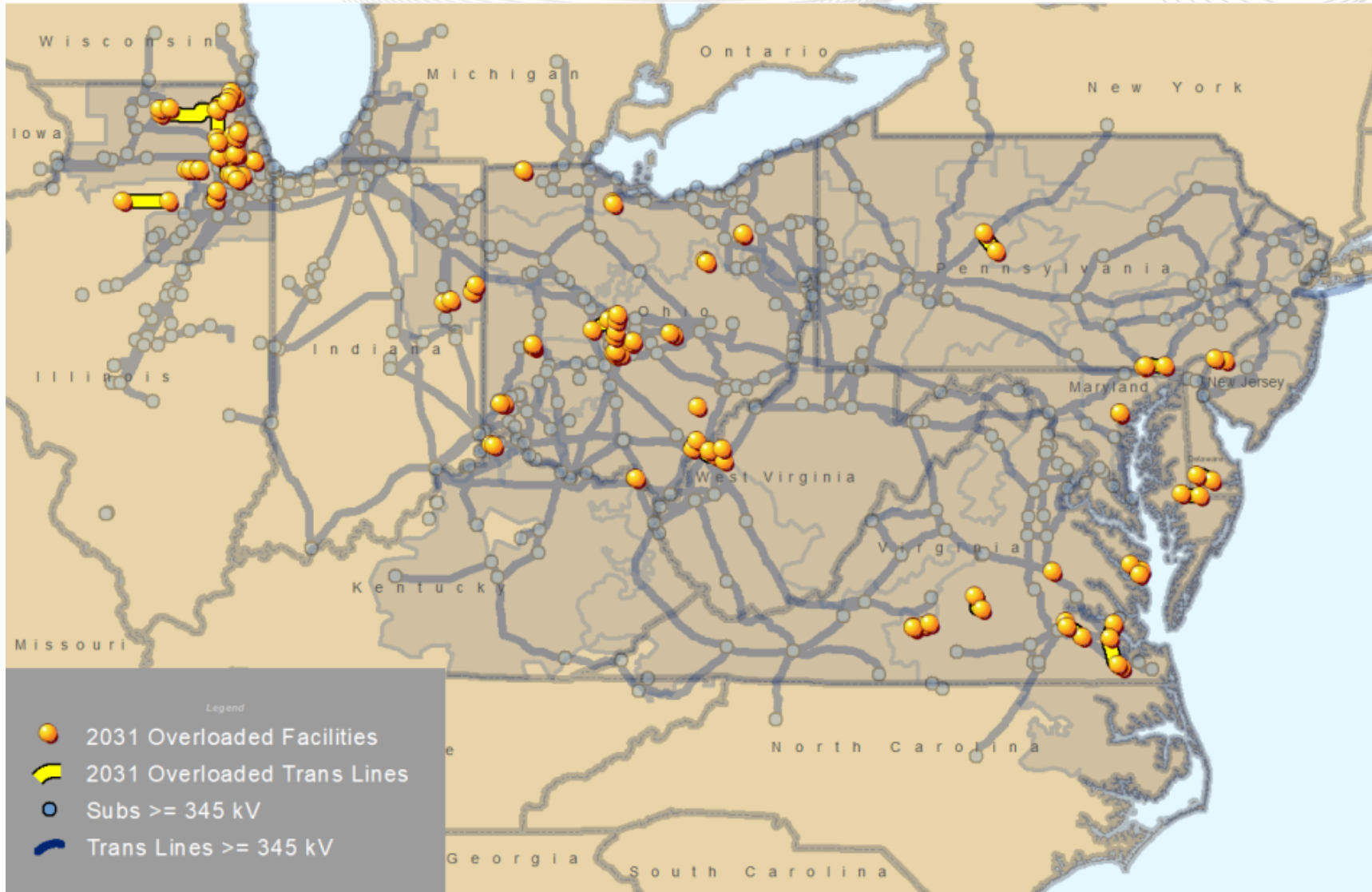
RTEP ID	Project Description	Transmission Owner	Original Cost Estimate (\$M)	Updated Cost Estimate (\$M)	Cost Change
b3906.1	Marley Neck 115kV Substation	BGE	107.62	122.07	14.45
Total			107.62	122.07	14.45

- Costs submitted during the RTEP process were based upon preliminary concept-level project definition and limited design and engineering analysis. Updated cost estimates reflect an advanced level of project scope maturity and are based upon completion of 30% design and engineering and procurement of long-lead major equipment.
- Primary drivers of cost increases include:
 - Competition for labor, materials, manufacturing capacity, and specialized resources from rapidly expanding data center construction projects, electrification initiatives, grid modernization programs, and renewable interconnections has significantly increased market demand and cost escalation across the industry. As a result, actual vendor quotes received through the competitive bid process for major long-lead equipment were higher than the budgetary estimates developed during the conceptual phase to support RTEP. Higher pricing reflects constrained global manufacturing capacity, elevated commodity costs, and broader supply chain pressures.
 - Increases in electric utility labor rates for engineering, construction, and commissioning services driven by a combination of workforce shortages, unprecedented infrastructure investment, competition for skilled resources, wage inflation, and project complexity.
 - Increased overhead costs necessary to manage significant volume and complexity of work.

Appendix

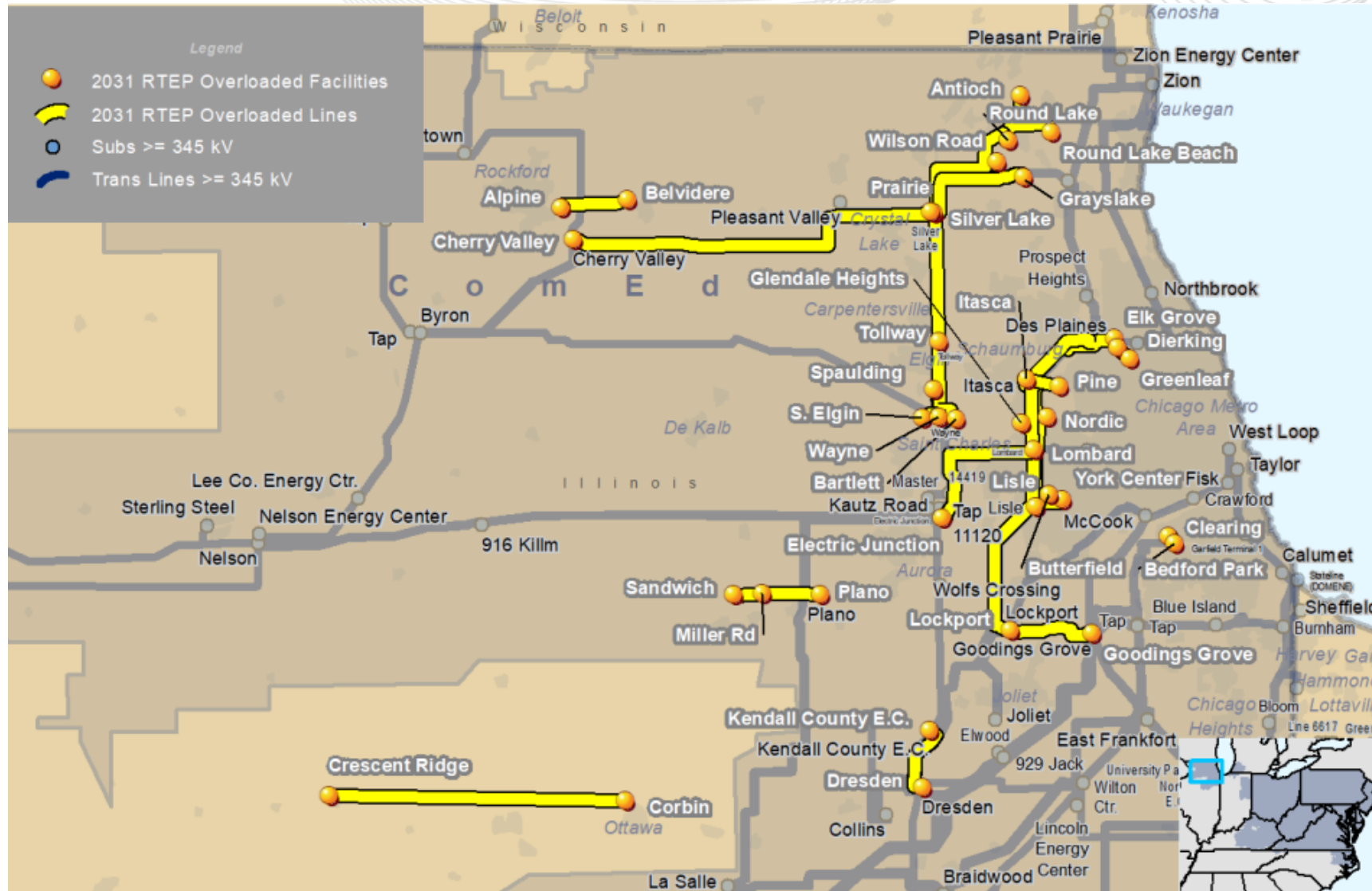
2026 RTEP Results - Overall

2031 Thermal Overloads - PJM Footprint

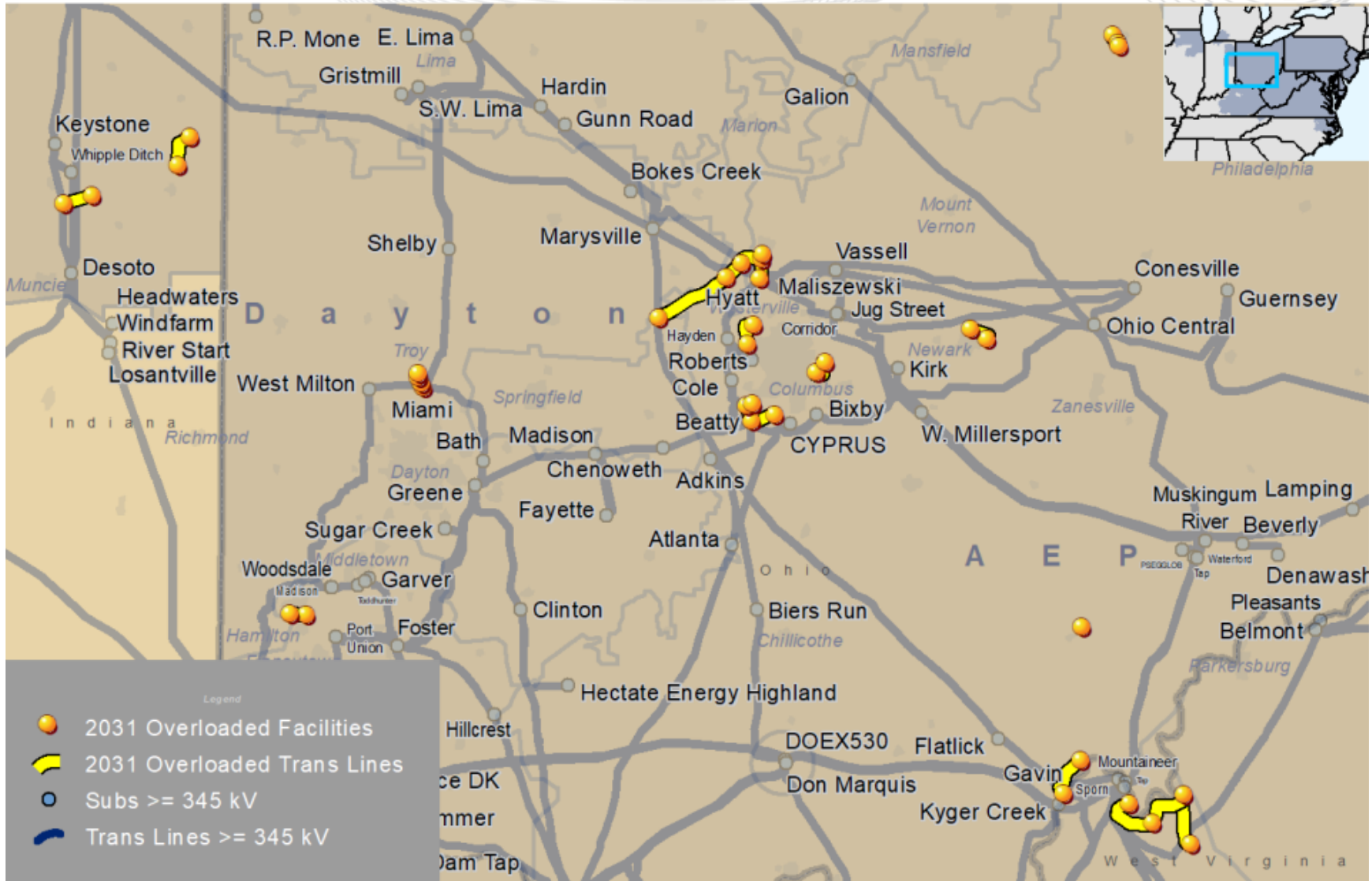


2026 RTEP Results – By Zone

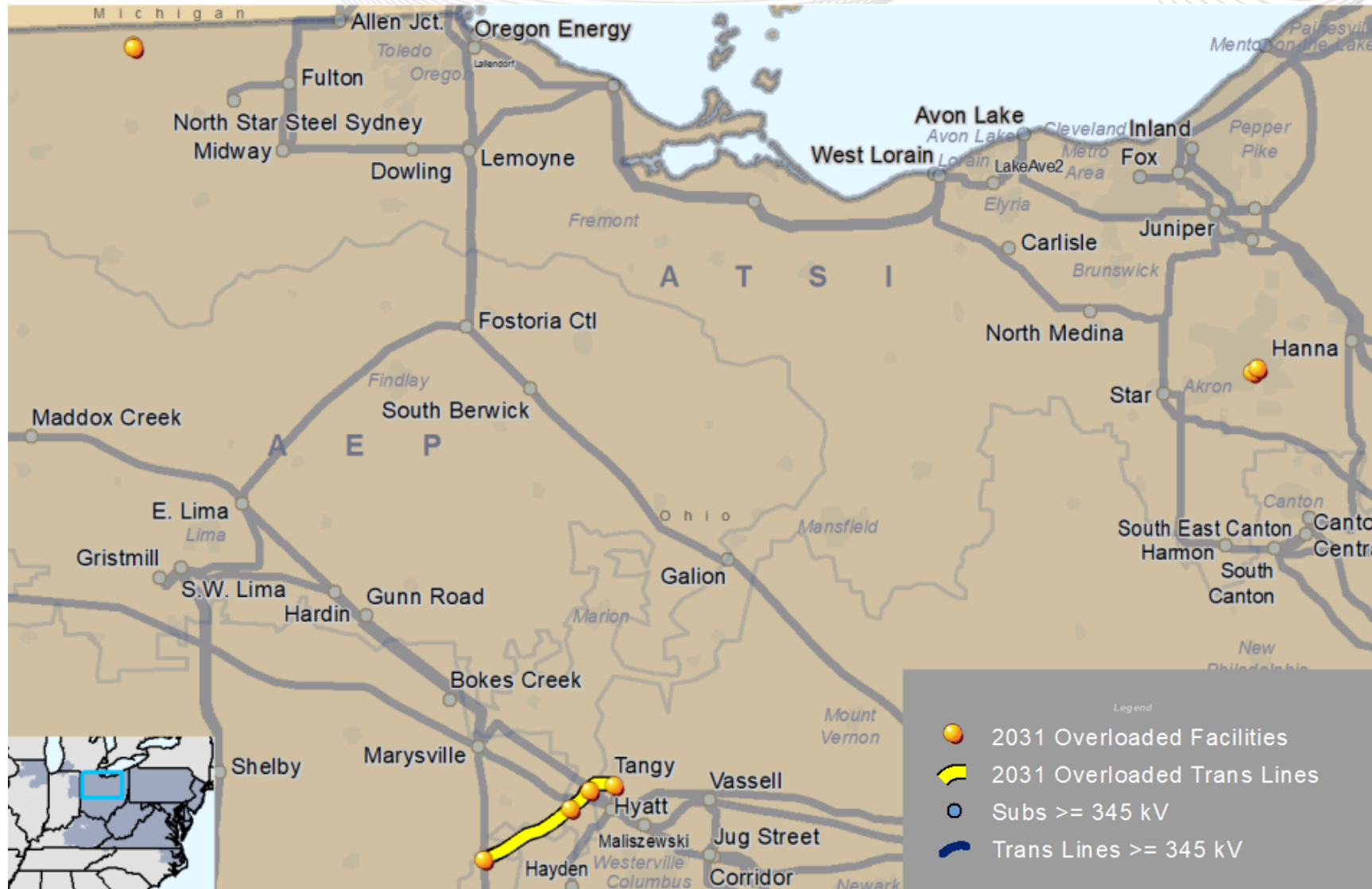
2031 Thermal Overloads - ComEd Transmission Zone



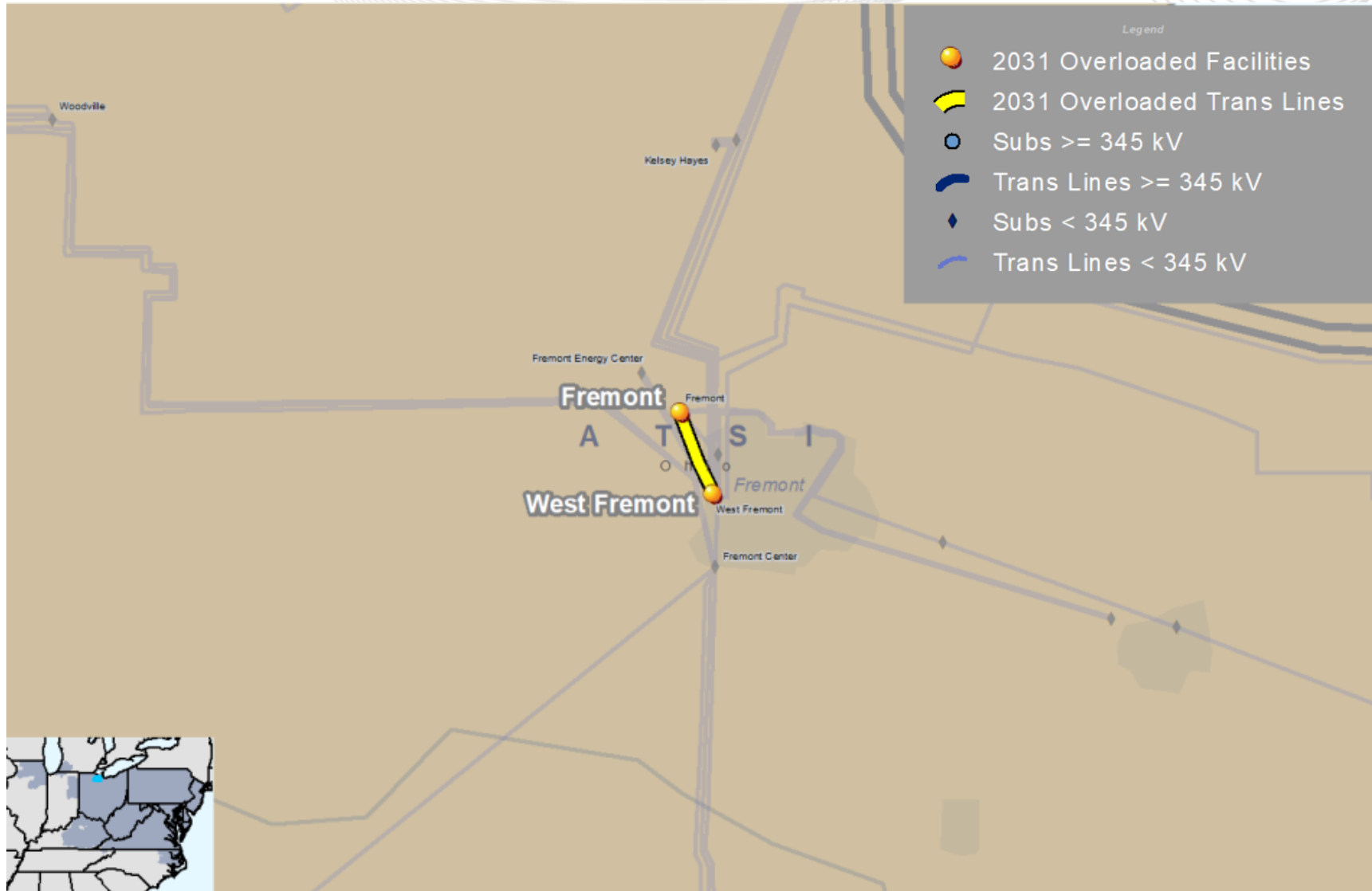
2031 Thermal Overloads - AEP Transmission Zone



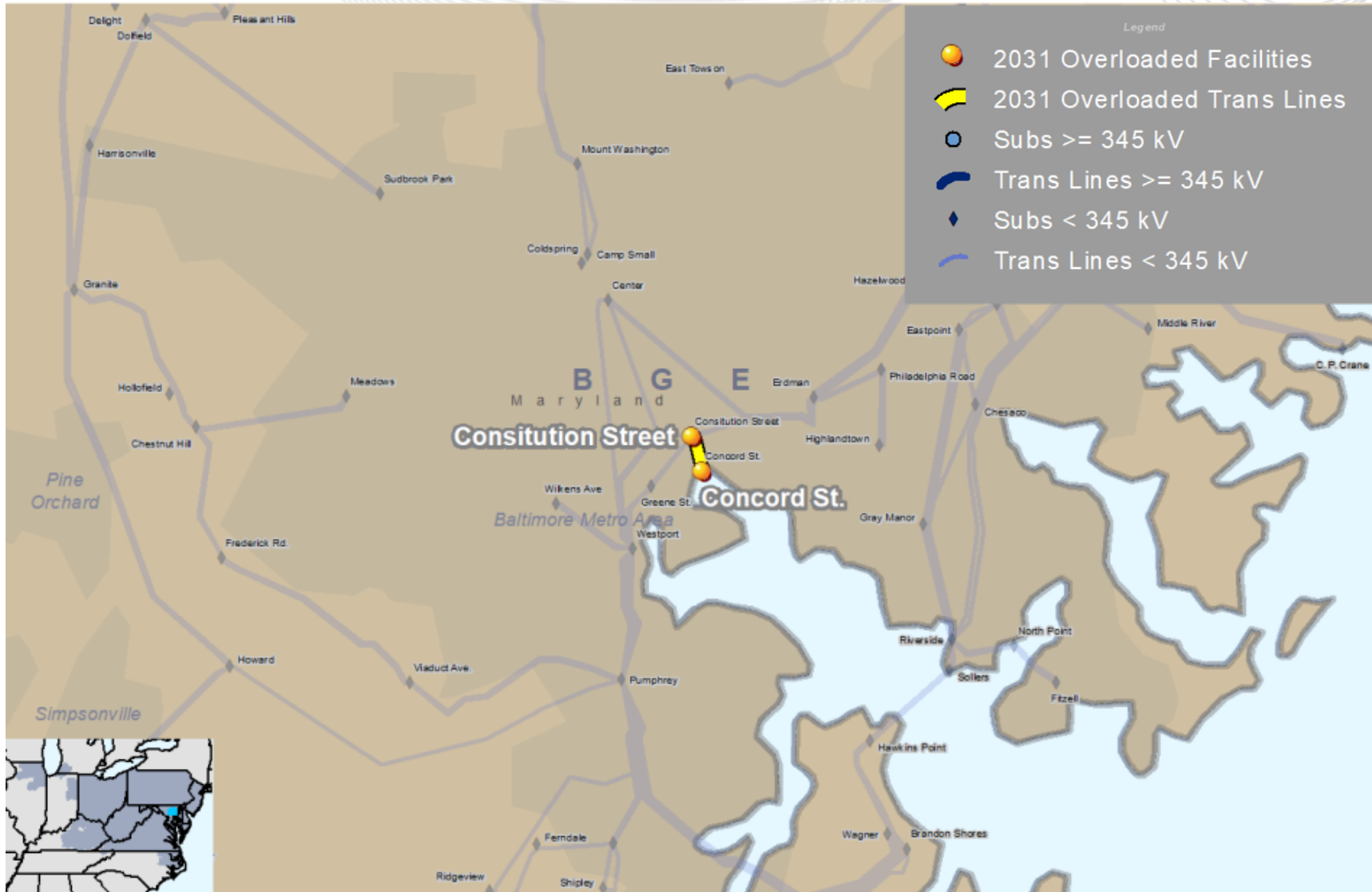
2031 Thermal Overloads - ATSI Transmission Zone



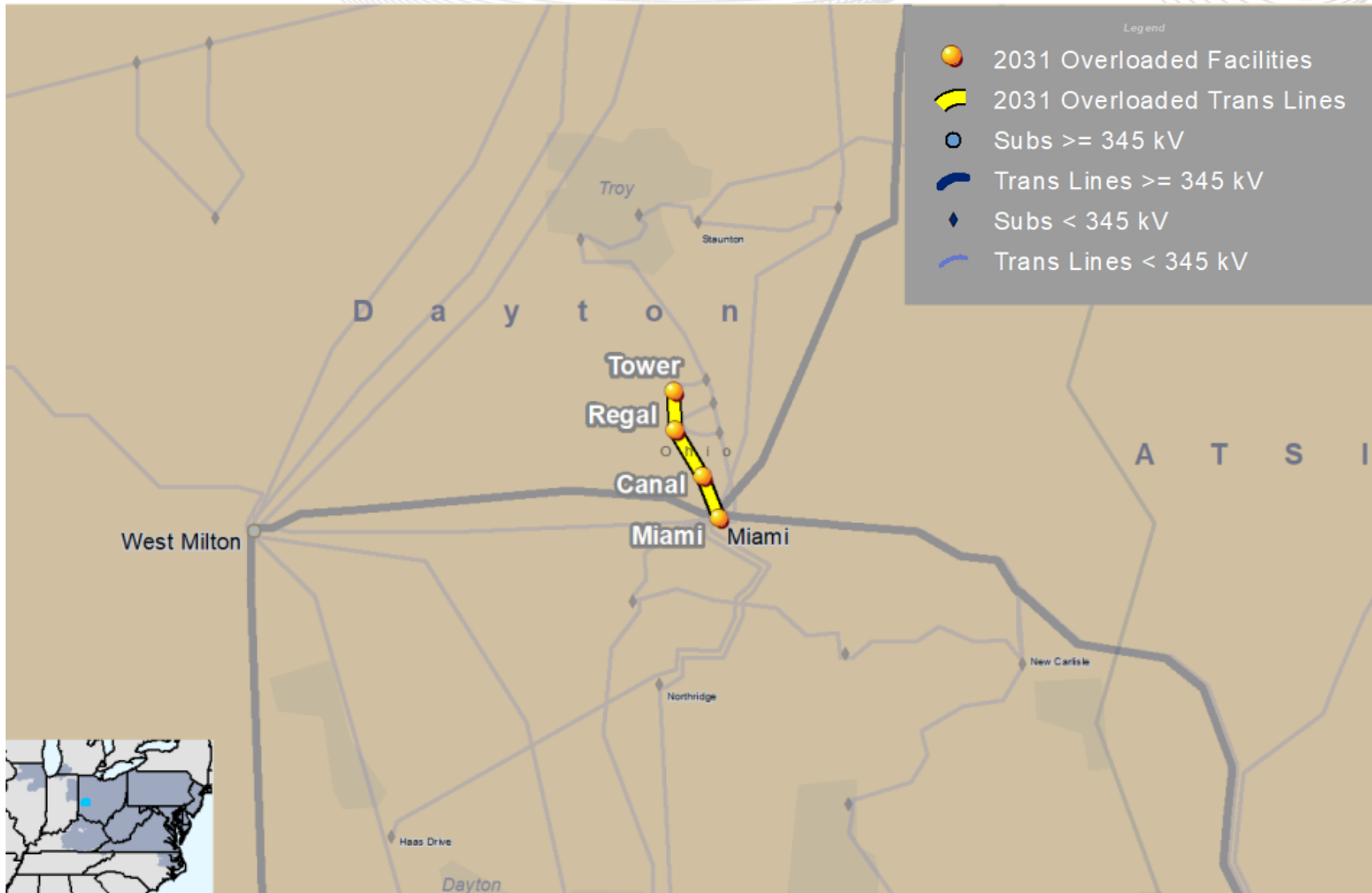
2031 Thermal Overloads - ATSI/AEP Transmission Zone



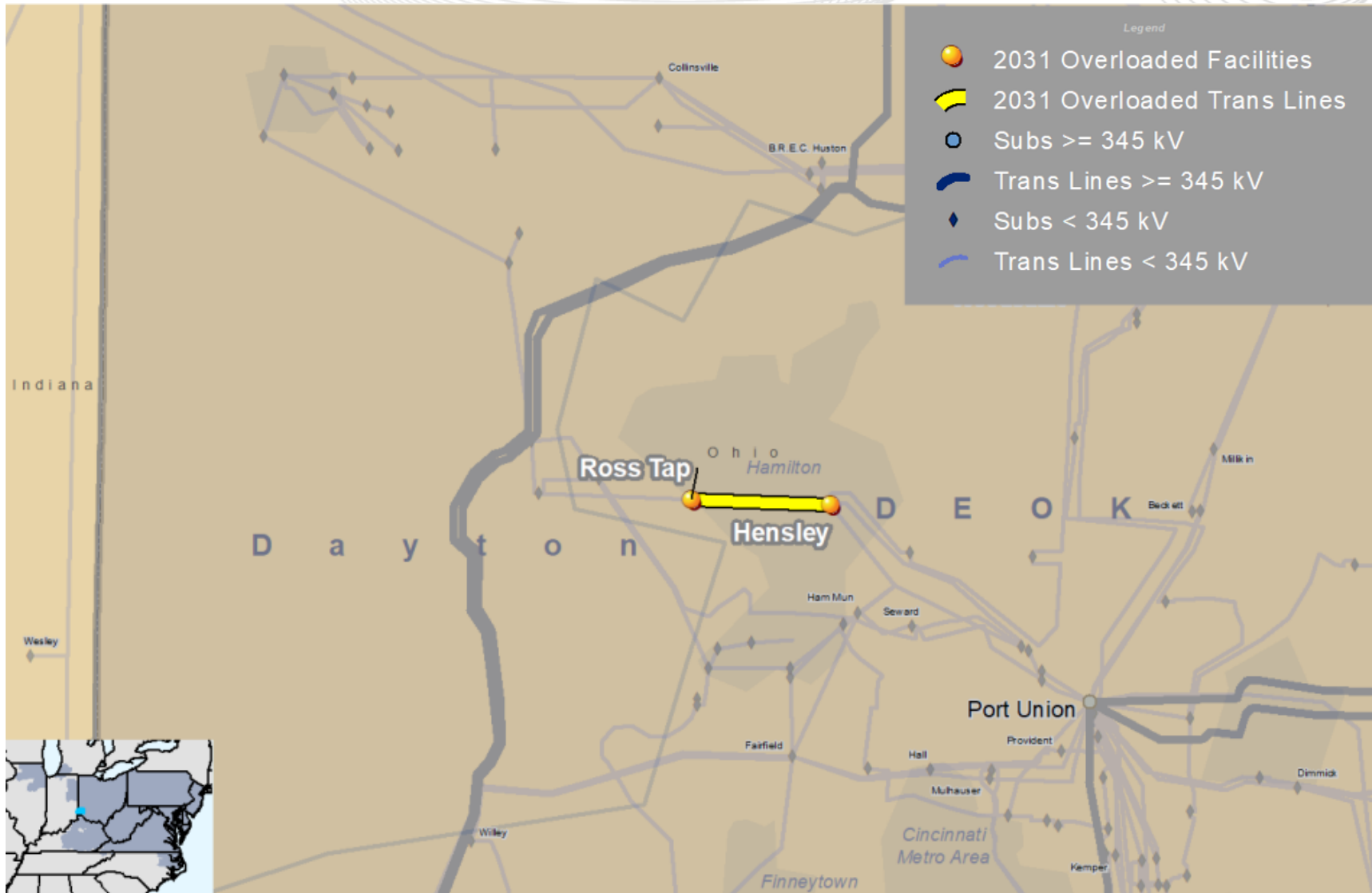
2031 Thermal Overloads - BGE Transmission Zone



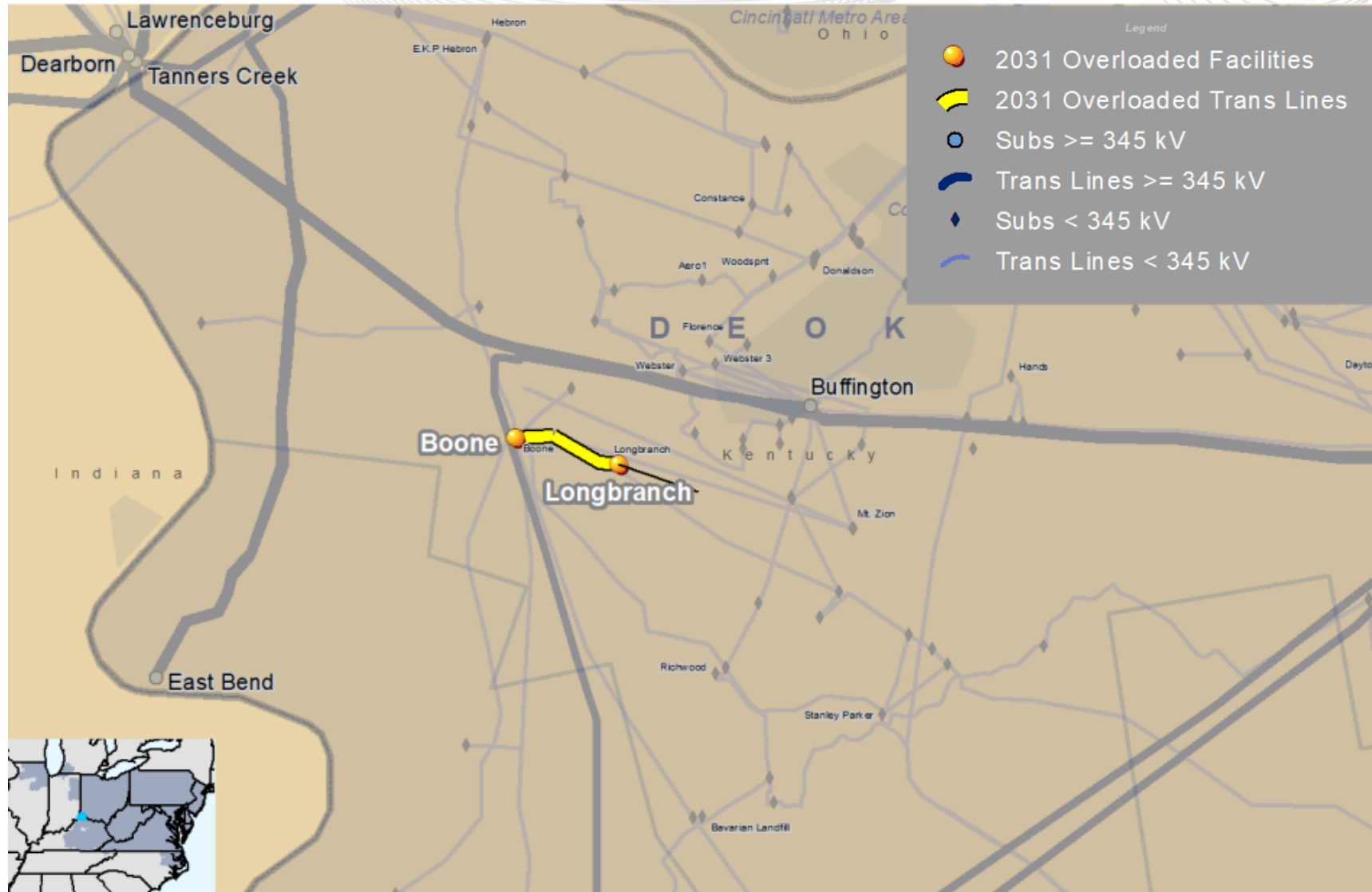
2031 Thermal Overloads - Dayton Transmission Zone



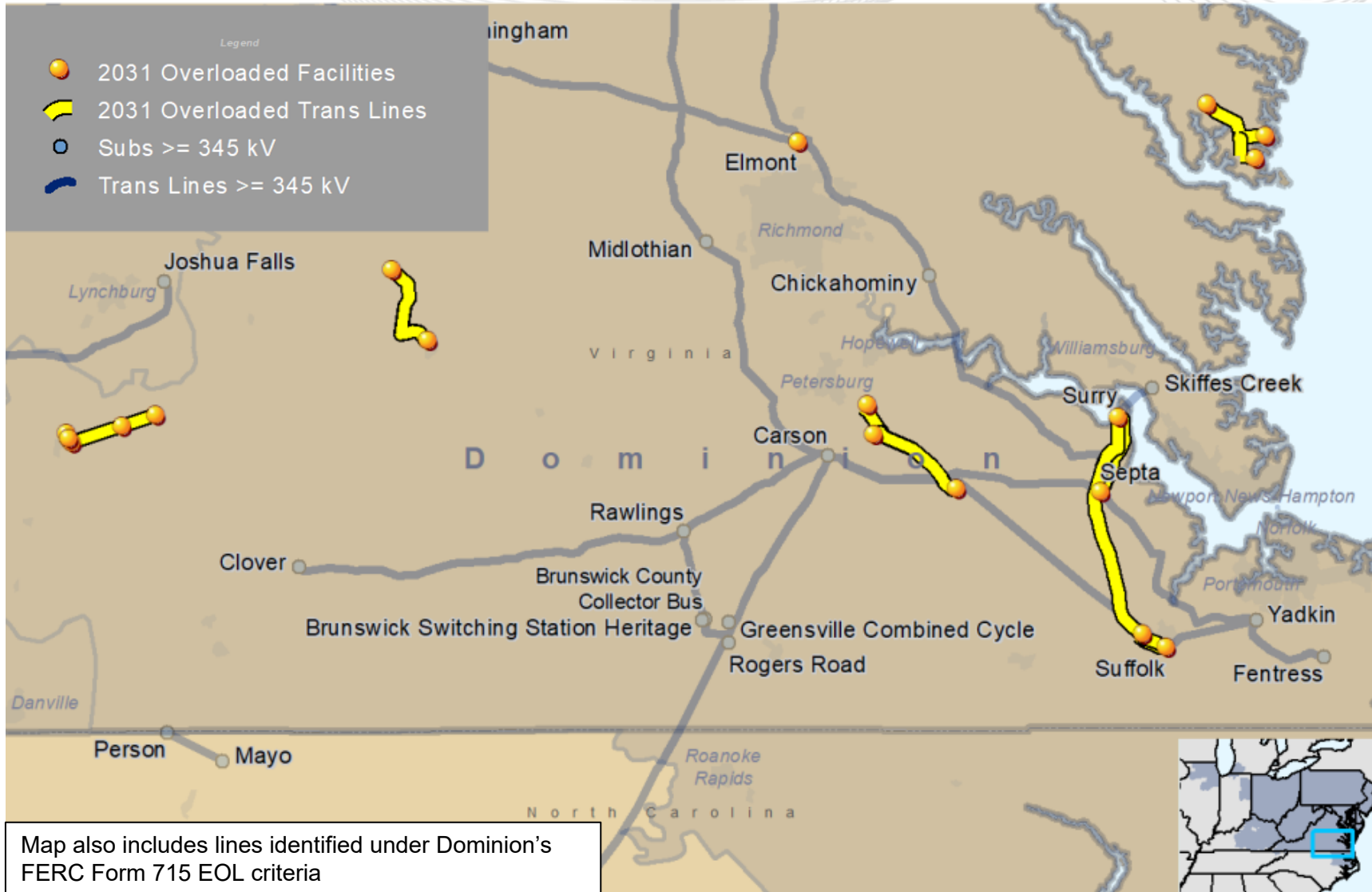
2031 Thermal Overloads - DEOK Transmission Zone



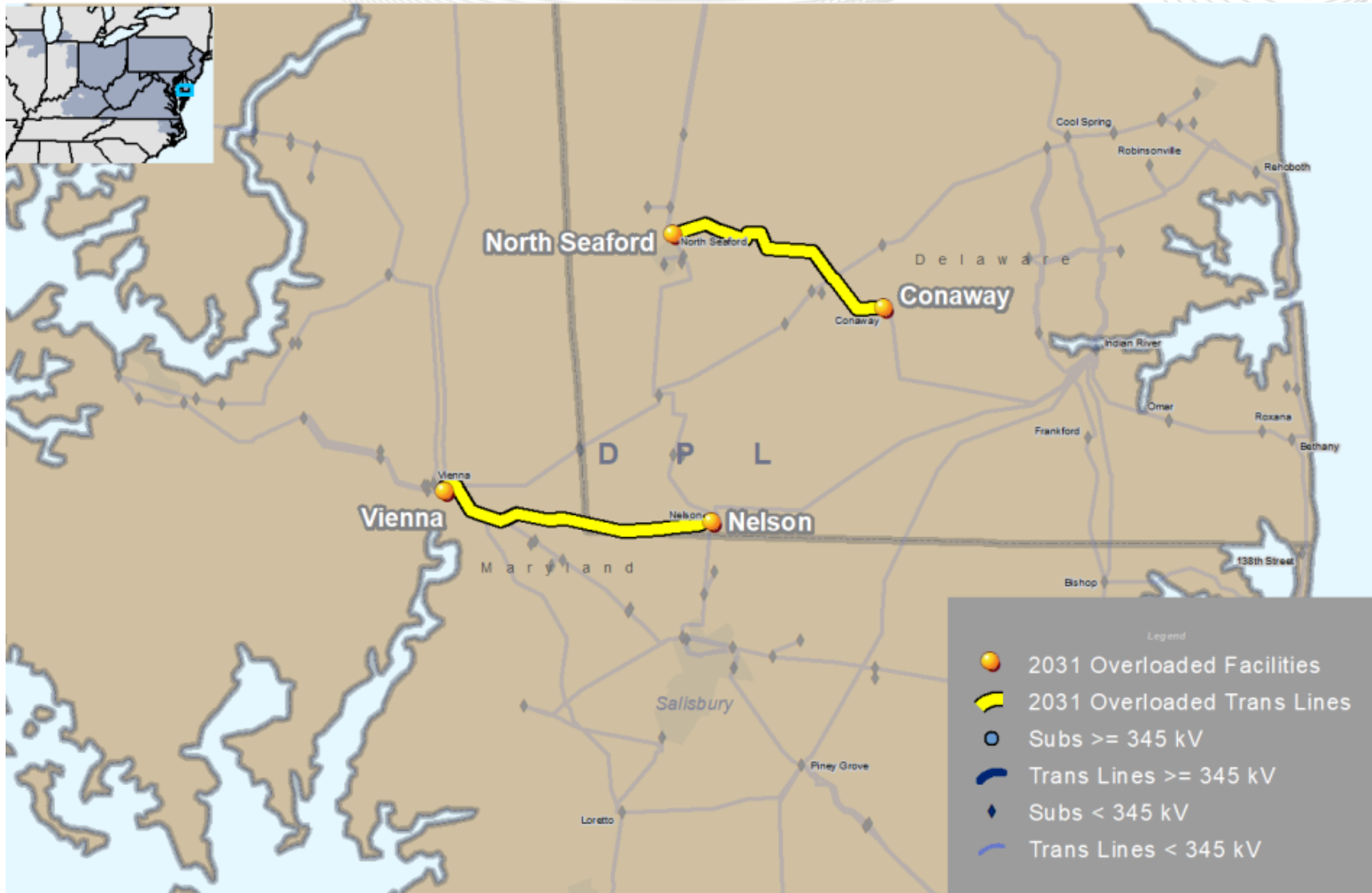
2031 Thermal Overloads - DEOK/EKPC Transmission Zone



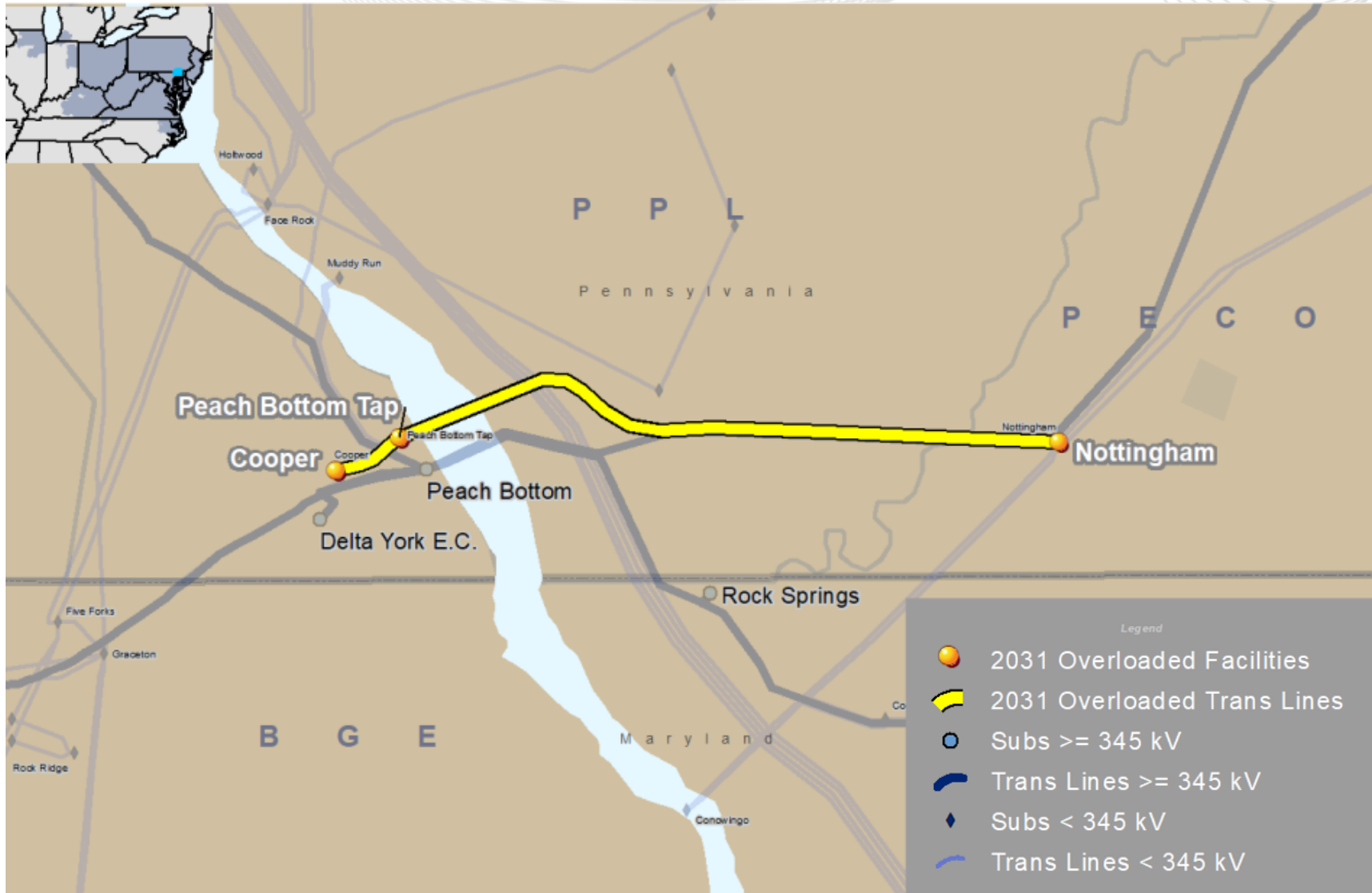
2031 Thermal Overloads - Dominion Transmission Zone



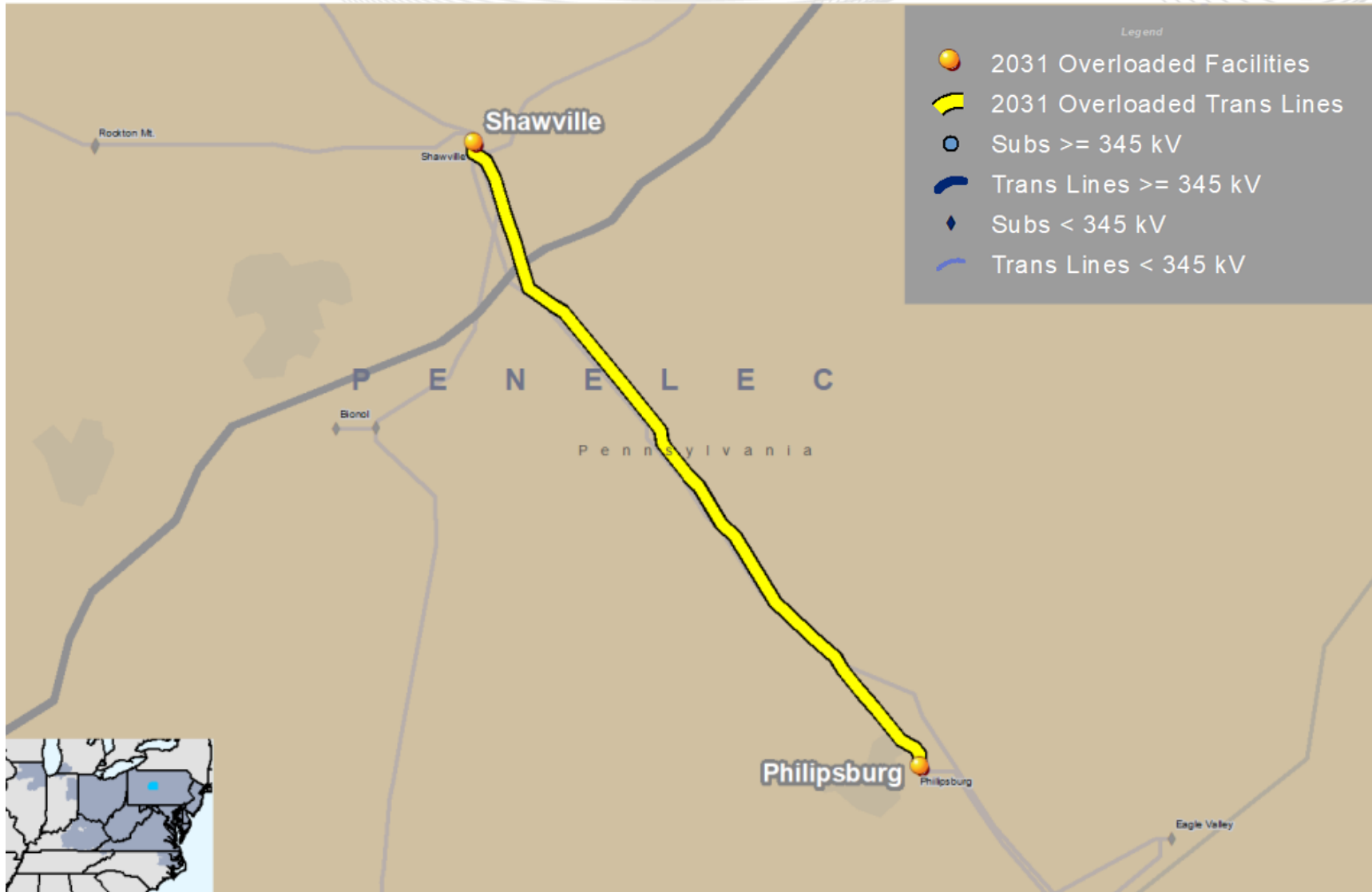
2031 Thermal Overloads - DPL Transmission Zones

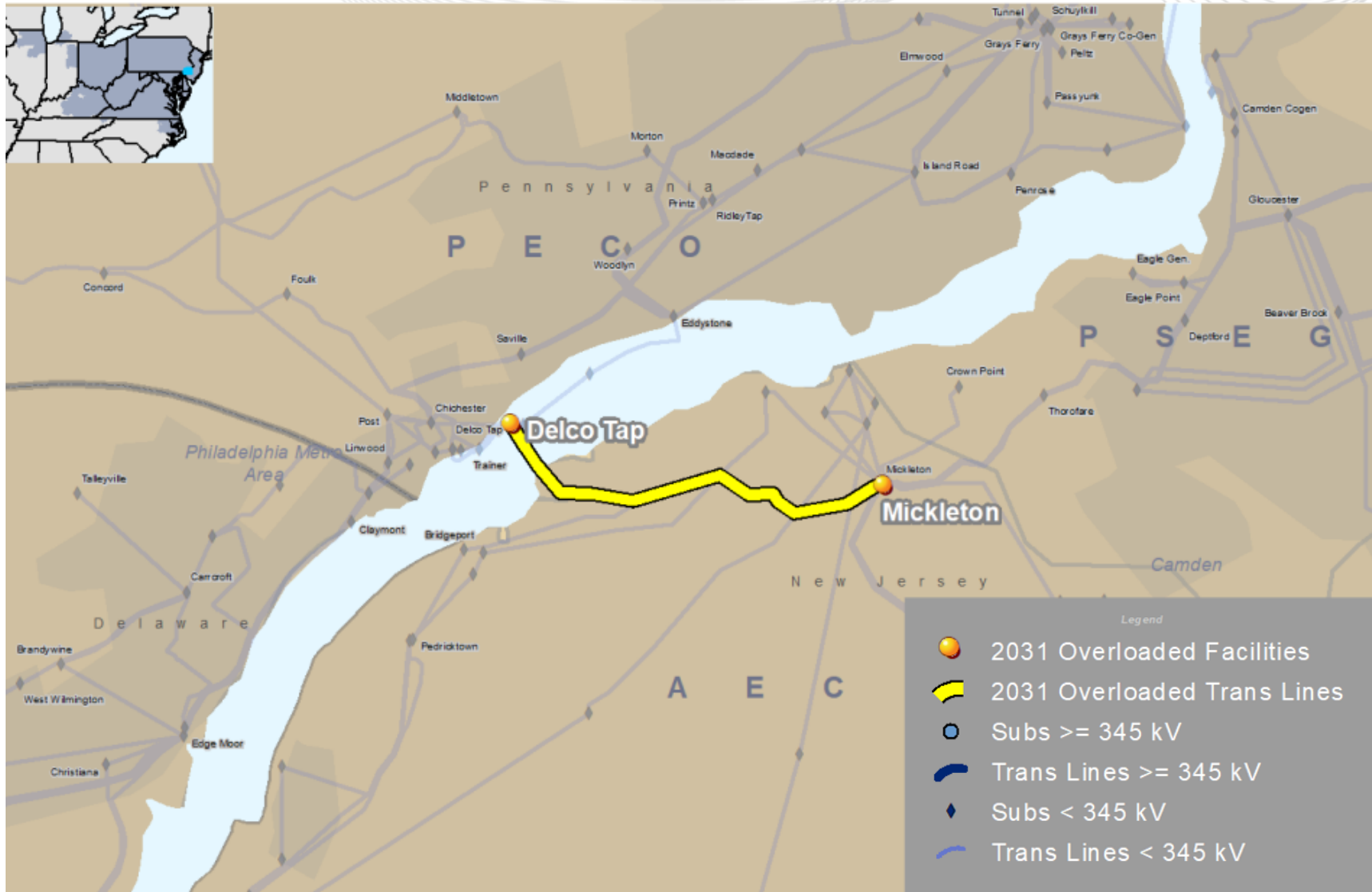


2031 Thermal Overloads - PECO Transmission Zone



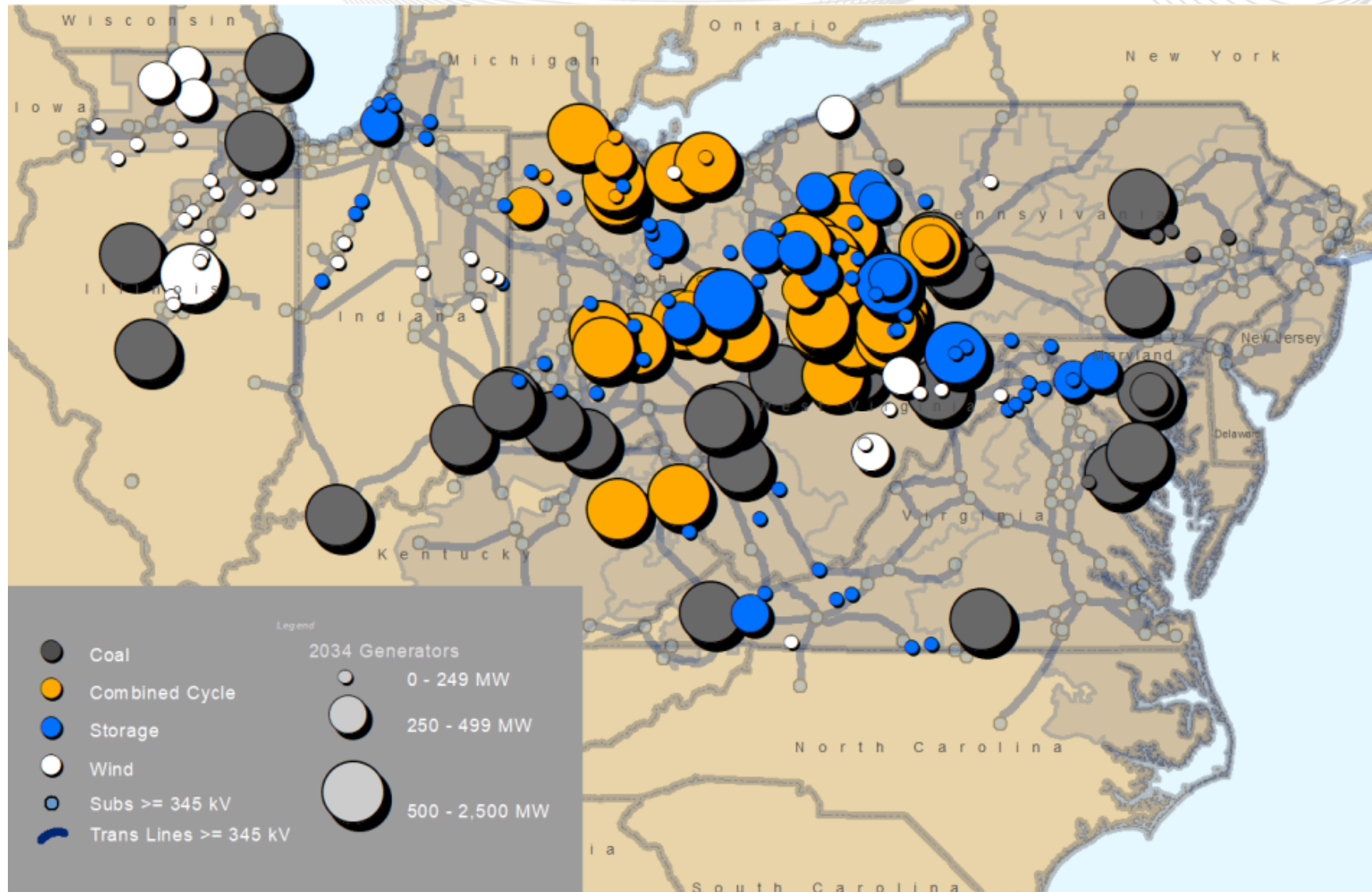
2031 Thermal Overloads - PENELEC Transmission Zone





2034 CapEx Units

2034 CapEx Units + Existing Coal Units



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Reliability Analysis UpdateA green speech bubble containing a large black question mark, pointing towards a blue speech bubble with three horizontal lines, which is positioned above a yellow circle containing contact information.

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Member Hotline

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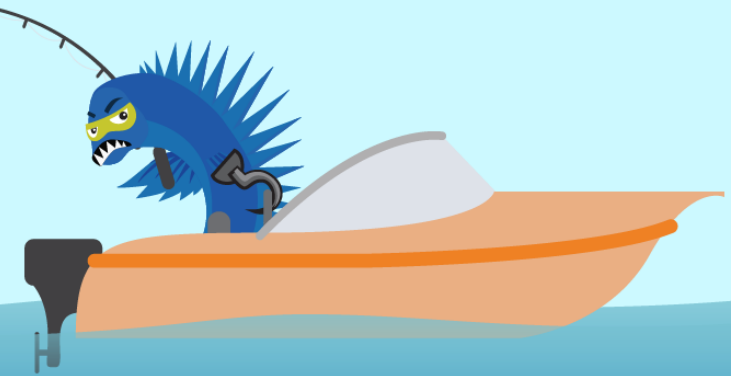
Version No.	Date	Description
1	10/1/2026	Initial slides posted

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POWER GRID**

**THINK BEFORE
YOU CLICK!**



**BE ALERT TO
MALICIOUS PHISHING
EMAILS**



Report suspicious email activity to PJM.
Call (610) 666-2244 or email it_ops_ctr_shift@pjm.com