PJM Identified Issues and Planned Solutions Near the MISO Seam

1st Quarter Review - 2021

February 26, 2021

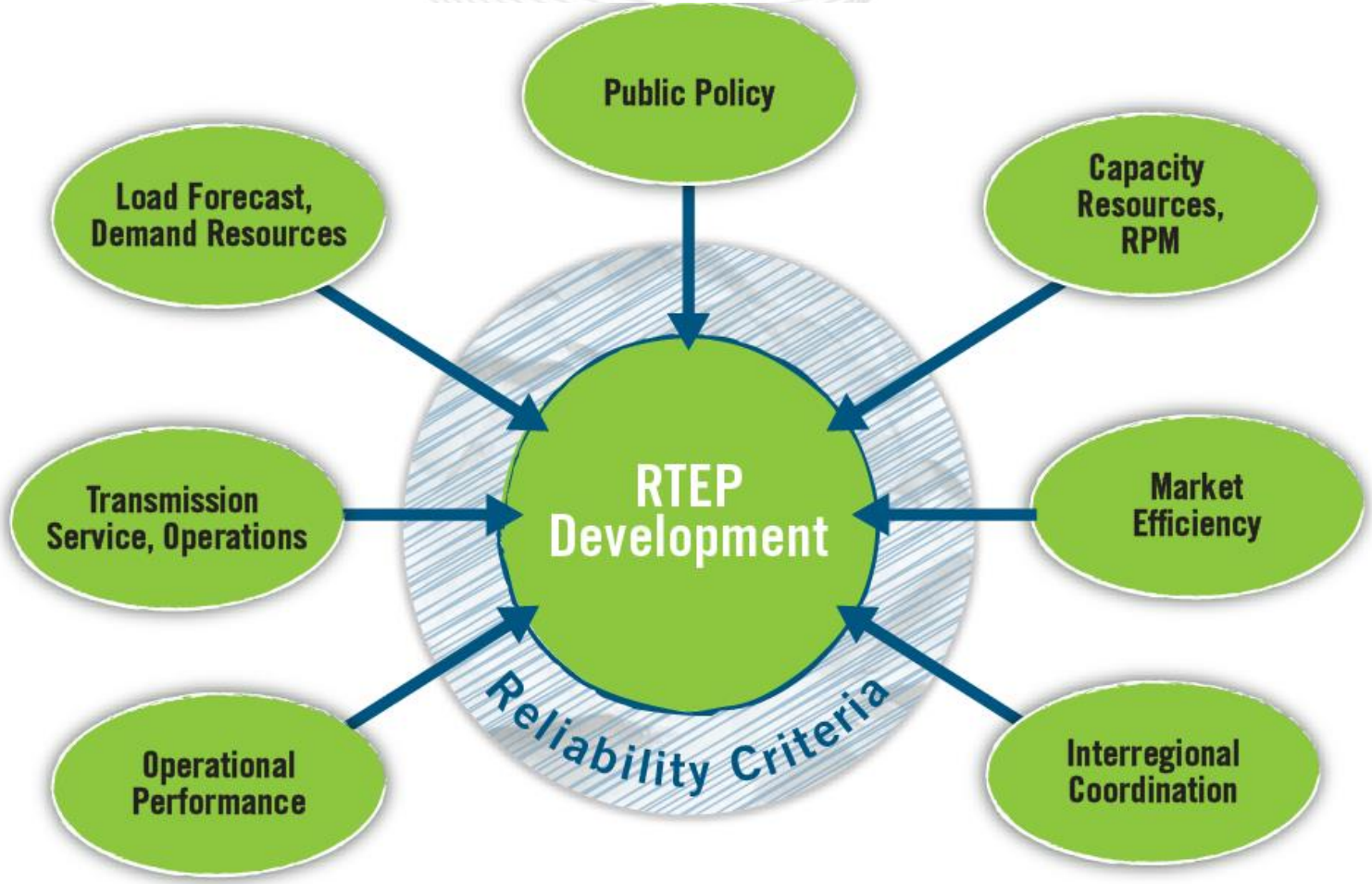
Notes

- This slide deck provides a summary of significant transmission projects near the PJM – MISO seam which have been added or modified in 2020
  - **It is not a comprehensive review of all planned projects**
- Where projects were presented on multiple occasions, efforts were made to only include the latest information
- For additional information:
  - TEAC: http://pjm.com/committees-and-groups/committees/teac.aspx
  - Subregional RTEP Committee – Western: http://pjm.com/committees-and-groups/committees/srrtep-w.aspx

Links for Various Information related to PJM Planning

- Transmission Expansion Advisory Committee (TEAC)/PJM RTEP Windows
  - http://www.pjm.com/committees-and-groups/committees/teac.aspx
- Interregional Planning
  - http://www.pjm.com/planning/interregional-planning.aspx
- Queue (future) Generation
  - https://pjm.com/planning/services-requests/interconnection-queues.aspx
- Generation Deactivation
  - http://www.pjm.com/planning/generation-deactivation.aspx
- Competitive Planning Process
  - https://www.pjm.com/planning/competitive-planning-process.aspx

System Expansion Drivers for RTEP



Open Issues

Open Issues

PJM currently has no open issues for which potential solutions have not been identified

- New reliability issues will be identified in Q2, 2021
- No new market efficiency issues will be identified since all issues were identified in Q4, 2020 (24 month cycle)
- New operational performance or public policy issues will be identified on an ad-hoc basis

Identified Issues: Market Efficiency

Preliminary Issues identified in anticipation of the 2020/2021 Long Term Window
(24-month Market Efficiency cycle)

Posted Congestion Drivers

2020/21 RTEP Market Efficiency Window Eligible Energy Market Congestion Drivers (Posted 01-11-2021)				ME Base Case (Annual Congestion $million)		ME Base Case (Hours Binding)				
FG#	Constraint	FROM AREA	TO AREA	2025 Simulated Year	2028 Simulated Year	2025 Simulated Year	2028 Simulated Year	Is Line Conductor Limited?	Conductor Ratings*	Comment
ME-1	Kammer North to Natrium 138 kV	AEP	AEP	$ 2.60	$ 13.19	102	244	Yes		Internal Flowgate
ME-2	Muskingum River to Beverly 345 kV**	AEP	AEP	$ 1.00	$ 2.21	113	187	Yes		Internal Flowgate
ME-3	Junction to French's Mill 138 kV	APS	APS	$ 18.45	$ 25.88	510	634	No	SN/SE=221/268 MVA WN/WE=250/317 MVA	Internal Flowgate
ME-4	Yukon to AA2-161 Tap 138 kV	APS	APS	$ 4.30	$ 5.37	1740	2059	Yes		Internal Flowgate
ME-5	Charlottesville to Proffit Rd Del Pt 230 kV	DOM	DOM	$ 3.93	$ 4.21	129	115	Yes		Internal Flowgate
ME-6	Plymouth Meeting to Whitpain 230 kV	PECO	PECO	$ 5.44	$ 7.27	154	153	No	SN/SE=463/578 MVA WN/WE=521/639 MVA	Internal Flowgate
ME-7	Cumberland to Juniata 230 kV***	PLGRP	PLGRP	$ 8.70	$ 9.07	233	216	Yes		Internal Flowgate
ME-8	Harwood to Susquehanna 230 kV***	PLGRP	PLGRP	$ 16.73	$ 12.40	949	723	Yes		Internal Flowgate
ME-9	Duff to Francisco 345 kV	DUK-IN	DUK-IN	$ 0.96	$ 3.82	81	125	No	SN/SE=1374/1374 MVA WN/WE=1798/1798 MVA	M2M
ME-10	Gibson to Francisco 345 kV	DUK-IN	DUK-IN	$ 4.28	$ 3.71	198	211	Yes		M2M

Notes:

** Conductor ratings provided by TOs for congestion drivers that are limited by station equipment.*

*** A sag study being performed by the TO may decrease or eliminate the Muskingum River to Beverly 345 kV congestion driver.*

**** Cumberland – Juniata and Harwood – Susquehanna Congestion drivers may be impacted by DLR (Dynamic Link Rating) projects (Expected in-service date 06/01/2021). Harwood – Susquehanna driver may be impacted by recently announced Talen Energy retirements. (Retirement notice not submitted to PJM).*

Planned Projects: Baseline Market Efficiency

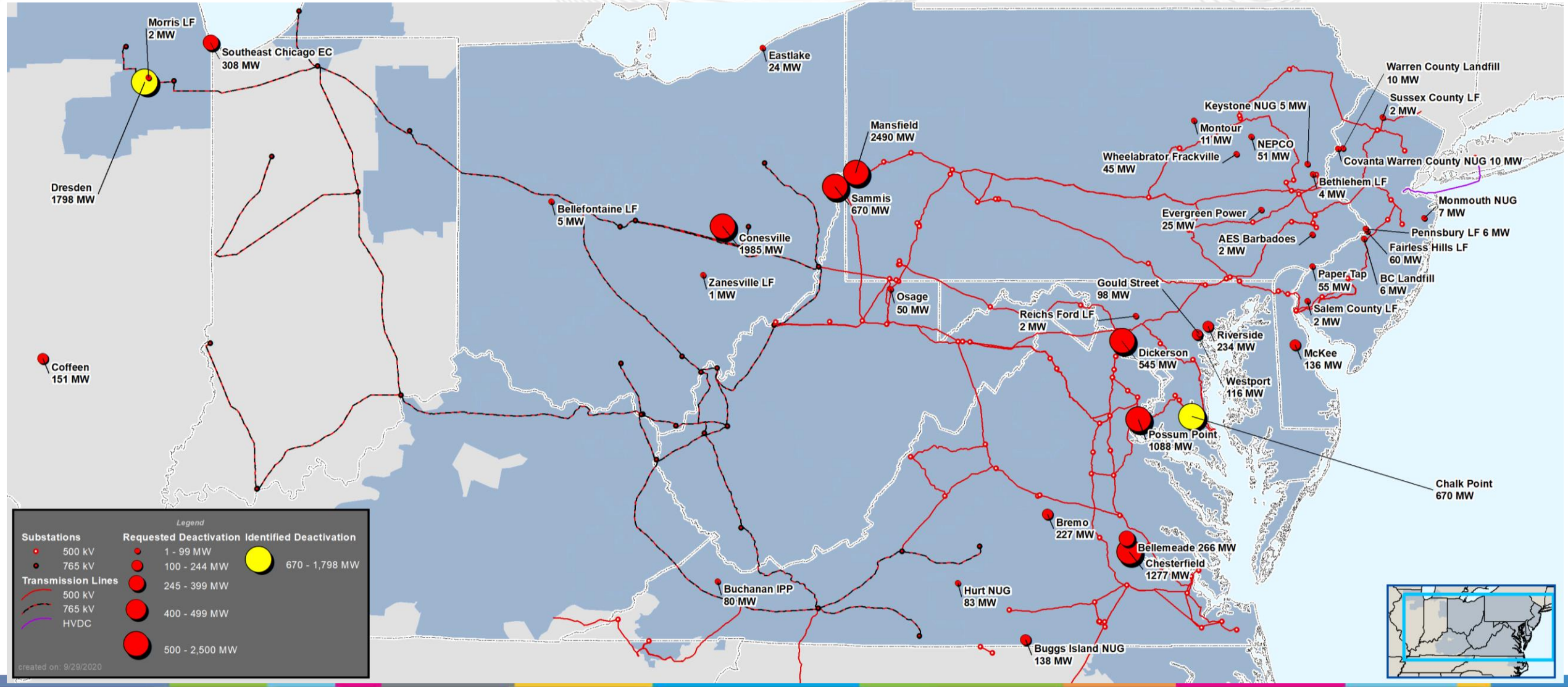
Michigan City to Trail Creek to Bosserman138kV

- The PJM Board approved project b3142 (BT-481), the rebuild of Michigan City to Trail Creek to Bosserman138kV lines, December 3, 2019
  - The approval was conditional on MISO approval of same project

- MISO Project (P18585) approved by MISO Board of Directors on September 17, 2020
  - Project approval was pending the approval of MISO regional cost allocation by FERC, which occurred on July 28, 2020
  - Project Status: **Under Construction**
    - NIPSCO to provide quarterly status reports consistent with MISO Tariff requirements, which will be posted here

Identified Issues: Generation Deactivation

Generation Deactivation Announcements 2018-2020



Deactivation Status

Unit(s)	Transmission Zone	Requested Deactivation Date	PJM Reliability Status
Dresden 2 and 3 (1798 MW)	ComEd	11/01/2021	Reliability analysis complete. No violation identified.

No Identified Issues: Operational Performance

Identified Issues: Reliability

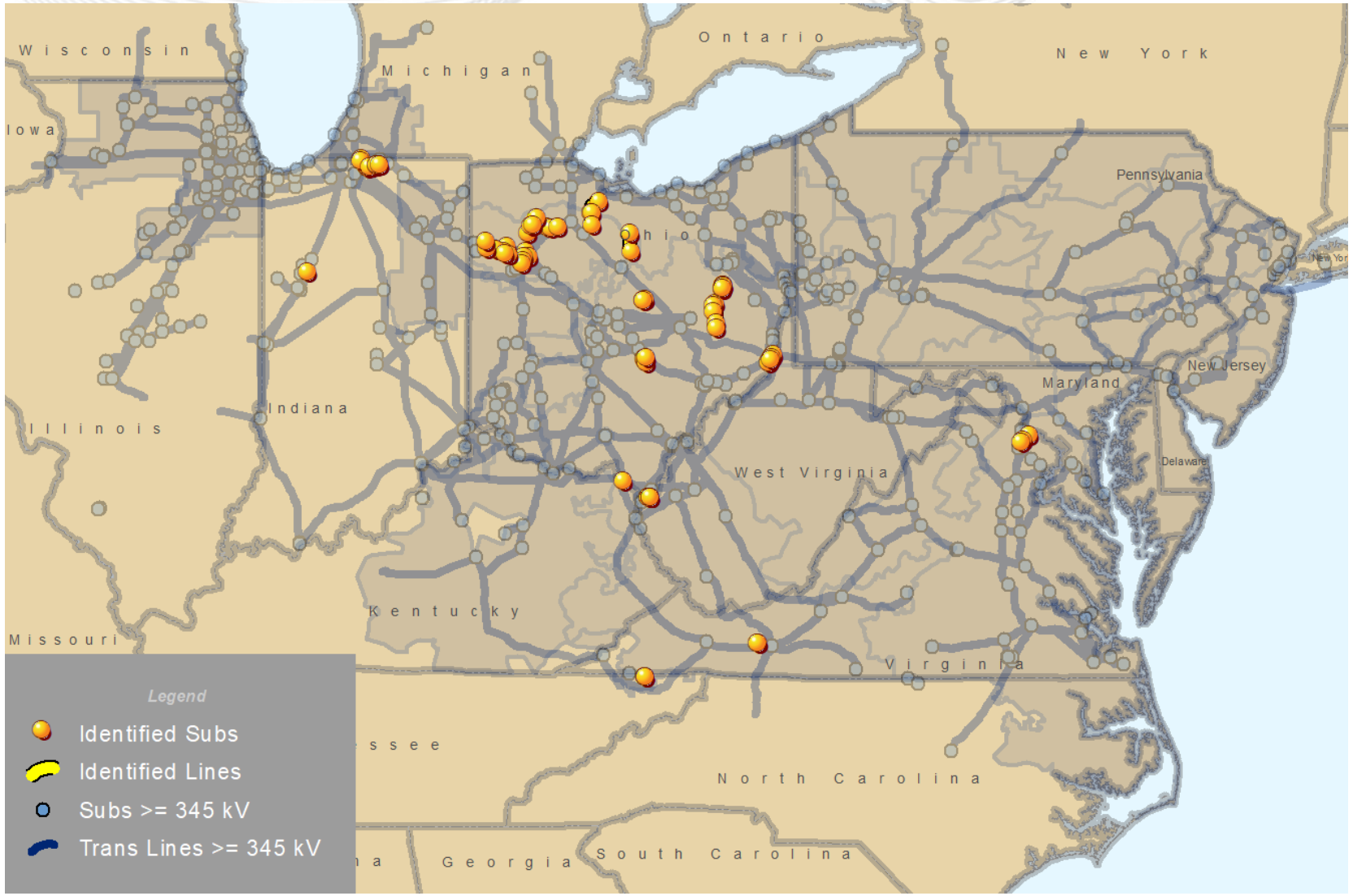
Issues identified in 2020 Window 1, 2 and 3

Analysis of 2025 - Violations

Overview of 2025 Results
Total of 3228 flowgates identified

- 207 flowgates are eligible
  - 165 in the PJM West Region
  - 31 in the PJM South Region
  - 11 in PJM Mid-Atlantic Region

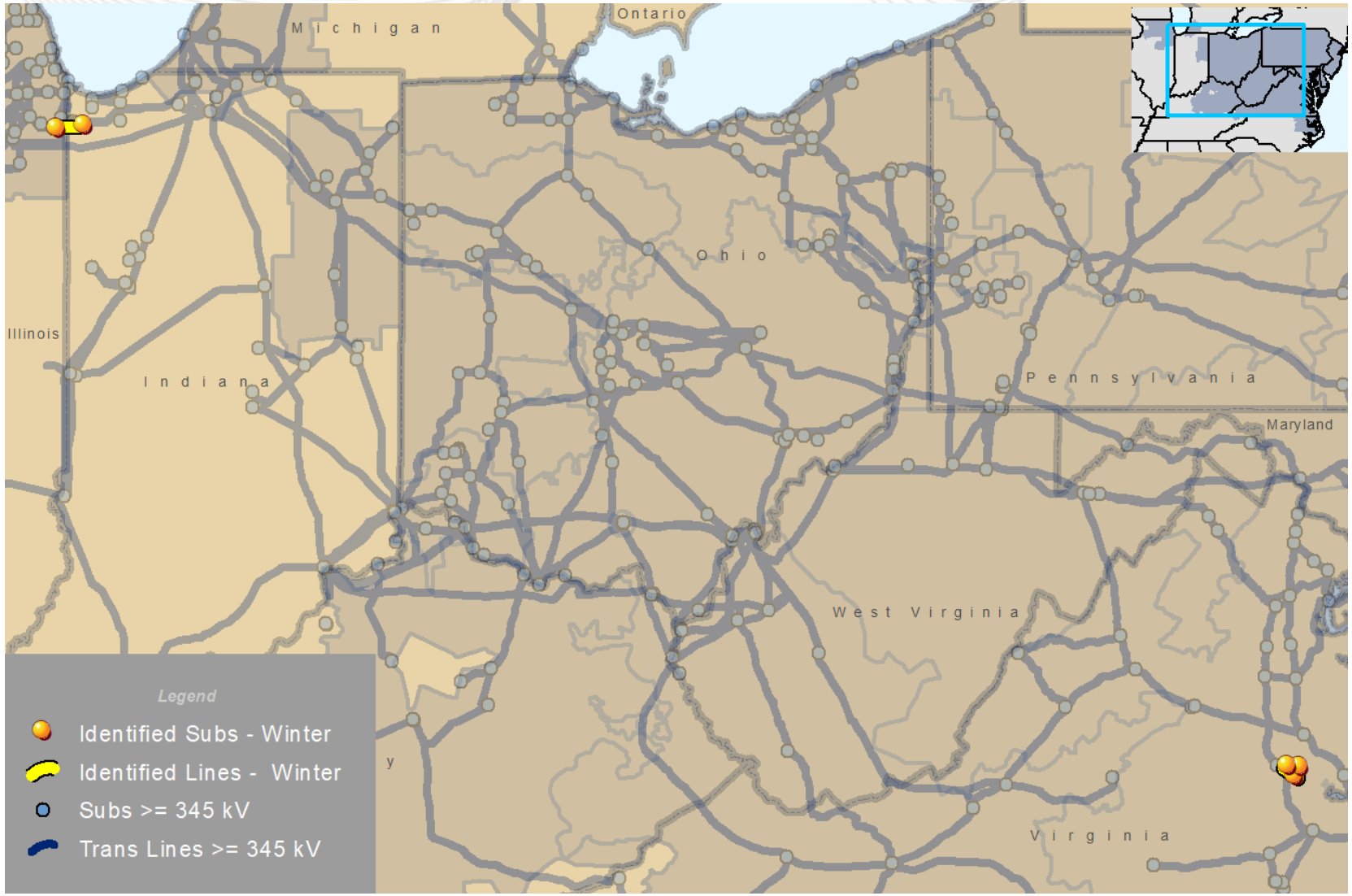
- 3021 flowgates excluded
  - 2226 due to the below 200 kV exclusion
  - 122 due to the substation equipment exclusion
  - 545 fixed by existing baseline
  - 108 Dominion Immediate Need
  - 11 fixed by supplemental project already in service due to customer needs or required as part of the customer service due to do no harm studies
  - 6 Non PJM Facility
  - 3 suspended queue generator



Analysis of 2025 - Violations

2025 Winter conditions

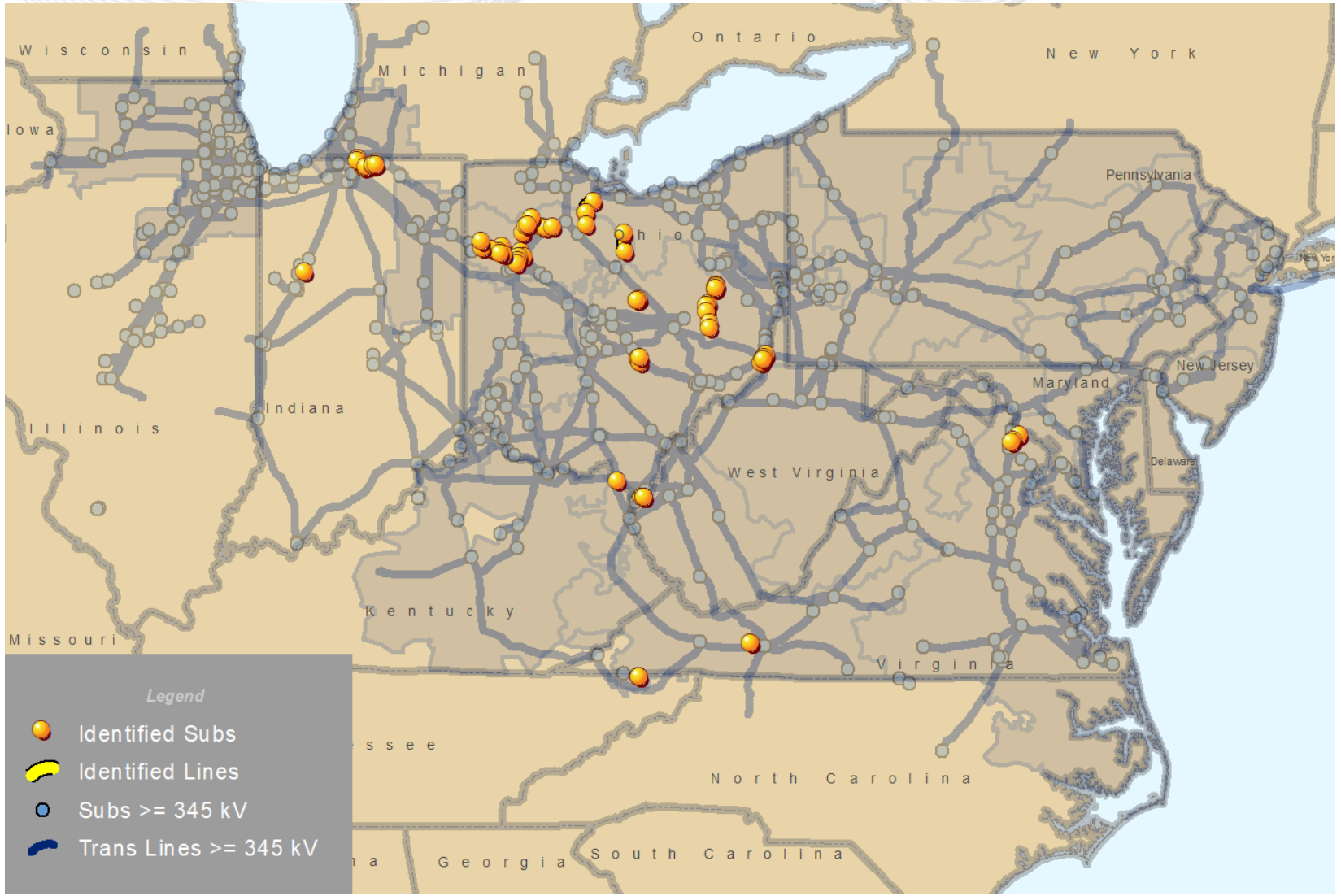
- 15 included violations
  - 13 N-1-1
  - 2 generation deliverability



Analysis of 2025 - Violations

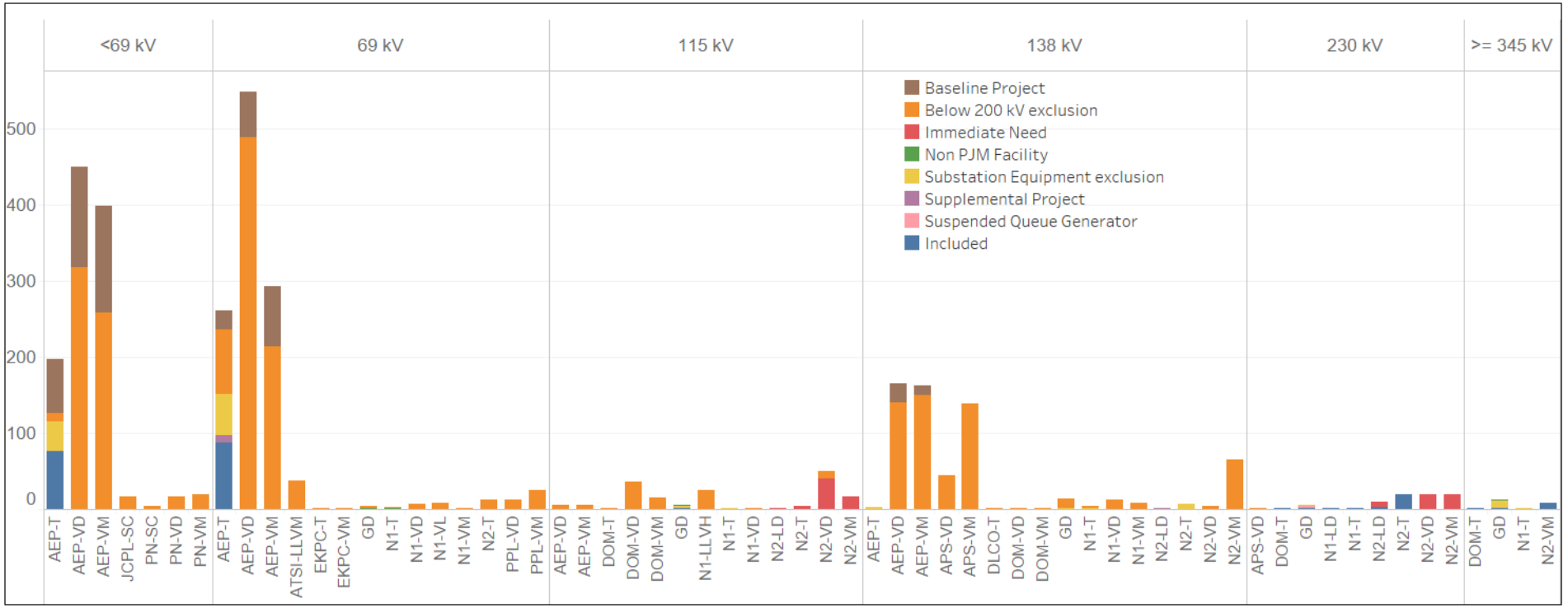
2025 FERC Form 715

- 165 included thermal violations



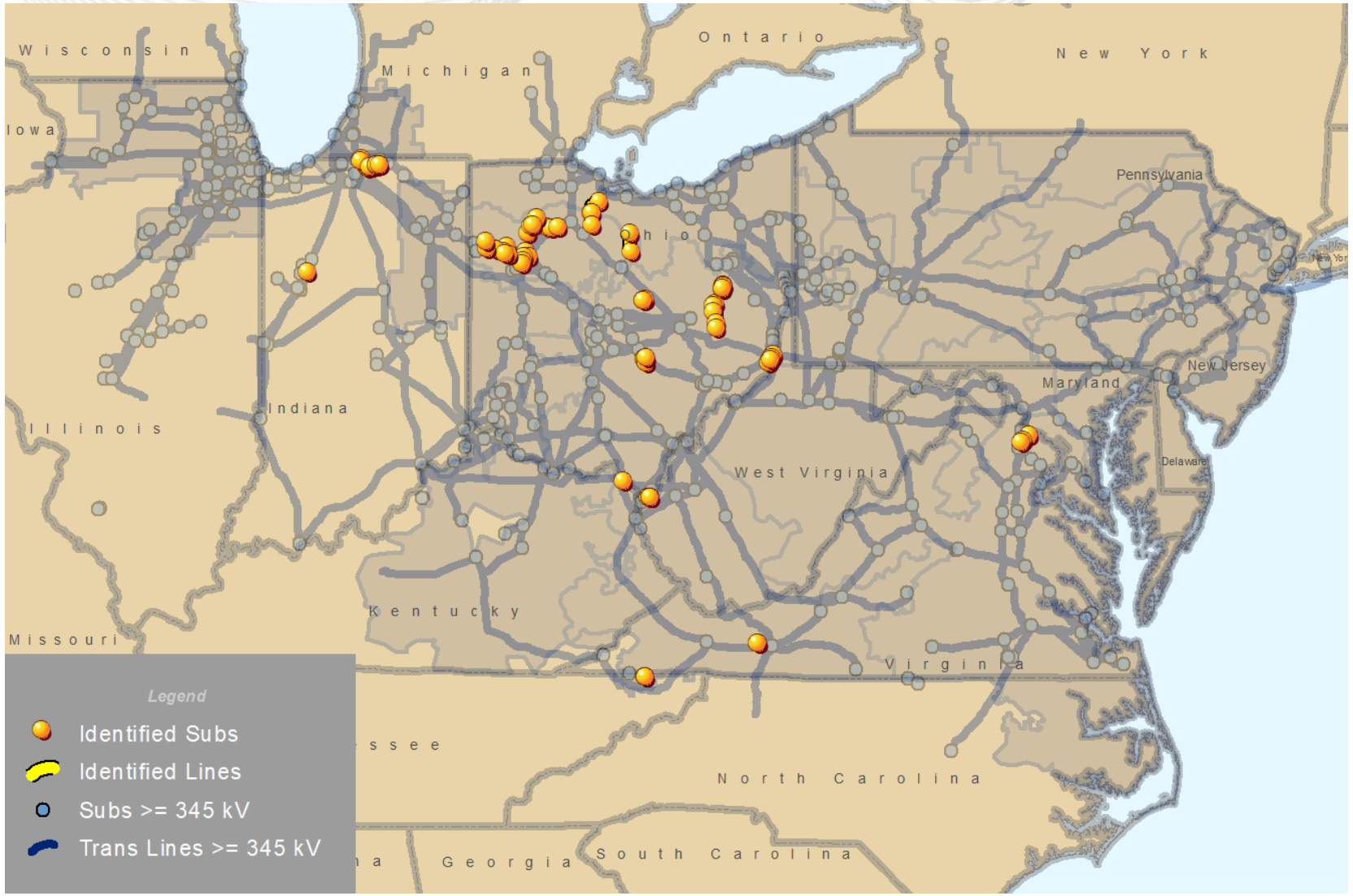
2025 Analysis Violations

Voltage	Window Excluded							Window Included	Total
	Baseline Project	Below 200 kV exclusion	Immediate Need	Non PJM Facility	Substation Equipment exclusion	Supplemental Project	Suspended Queue Generator		
<69 kV	345	642			40			76	**1,103**
69 kV	163	898		4	55	10		87	**1,217**
115 kV		99	61	1	3			2	**166**
138 kV	37	585			12	1			**635**
230 kV		2	47		1		3	30	**83**
345 kV				1	10			11	**22**
500 kV								1	**1**
765 kV					1				**1**
Total	**545**	**2,226**	**108**	**6**	**122**	**11**	**3**	**207**	**3,228**



2020 RTEP Proposal Window 1 - Violations

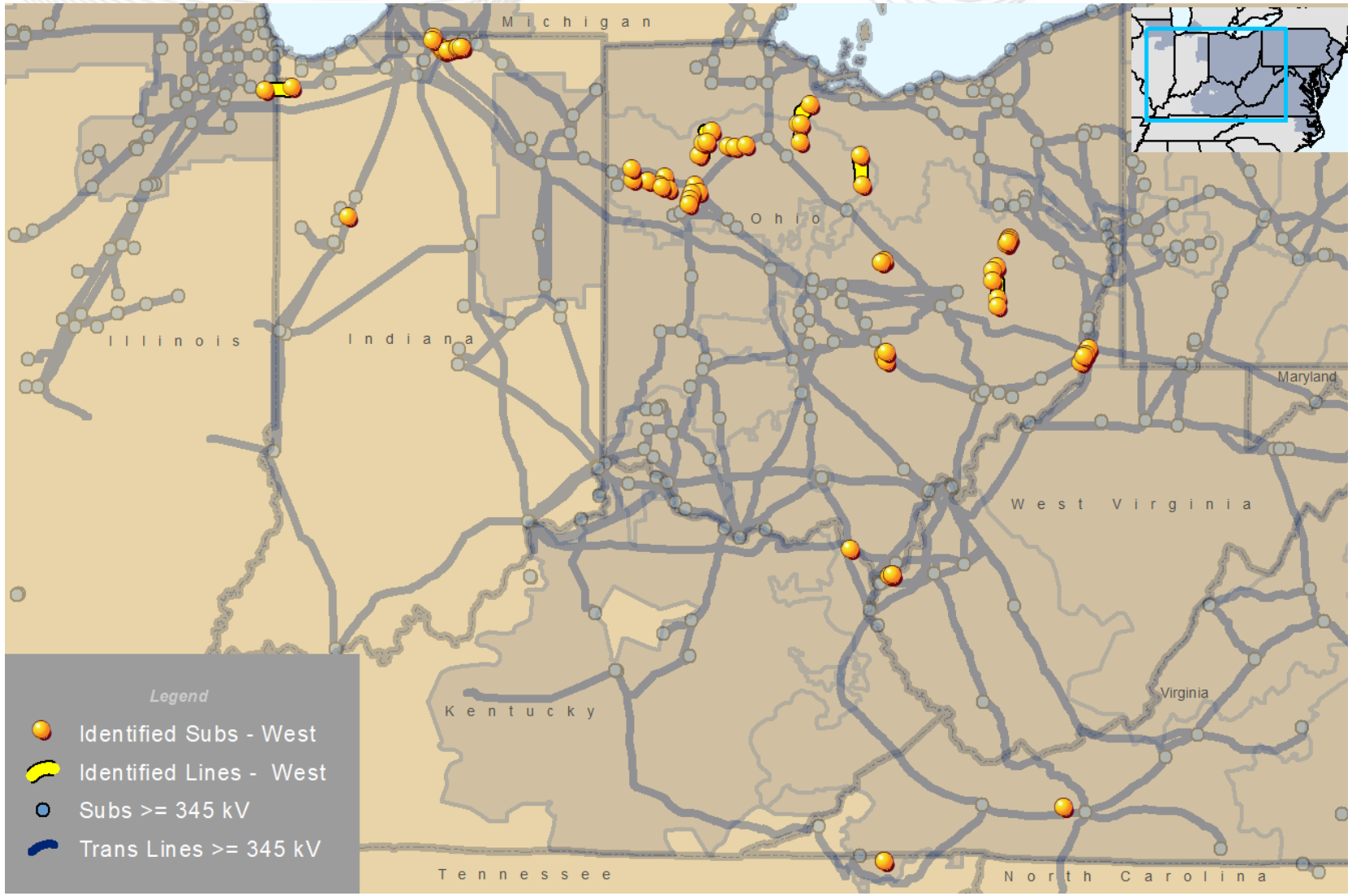
207 flowgates are eligible for Window 1



2020 RTEP Proposal Window 1 – West Results

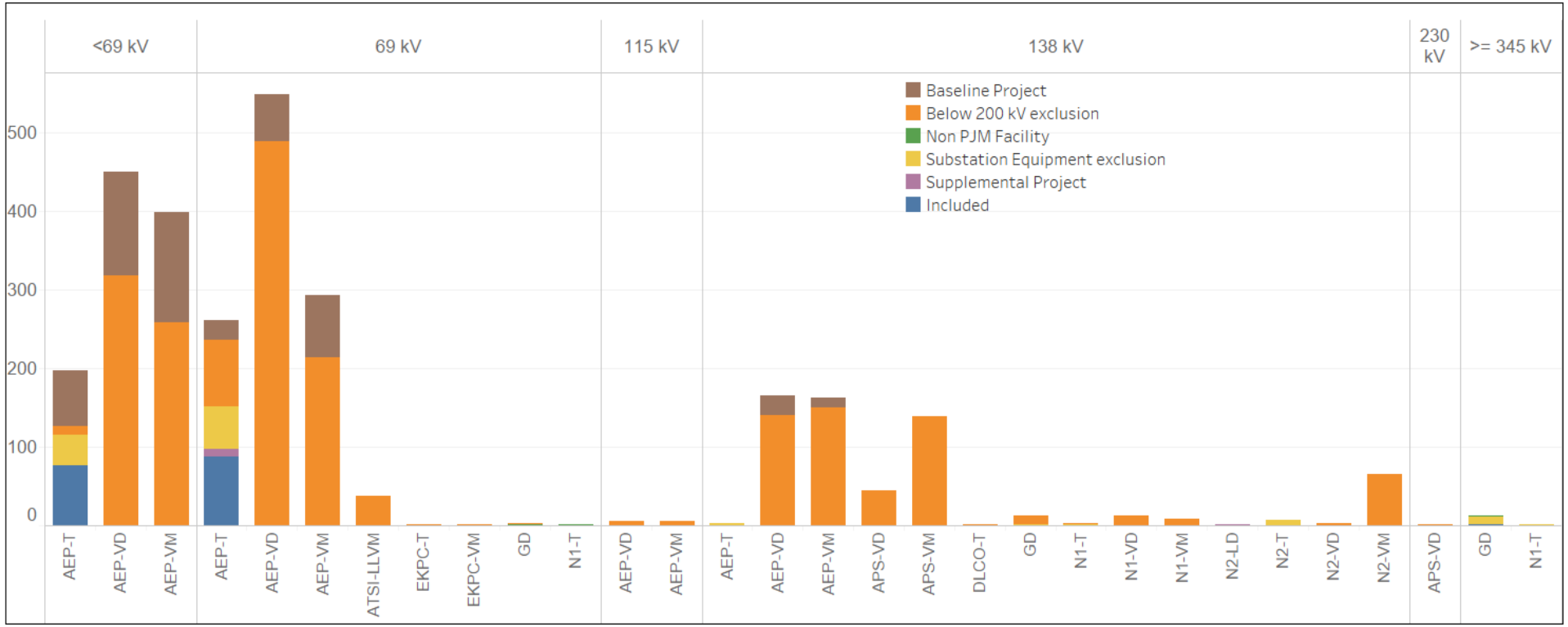
165 Eligible Flowgates
- 2 Generation Deliverability
- 163 Thermal

2685 Excluded Flowgates
- 2006 Below 200 kV
- 118 Substation Equipment
- 545 Existing Baseline
- 11 fixed by supplemental project already in service due to customer needs or required as part of the customer service due to do no harm studies
- 5 Non PJM Facility



2020 RTEP Proposal Window 1 – West Results

Voltage	Window Excluded					Window Included	Total
	Baseline Project	Below 200 kV exclusion	Non PJM Facility	Substation Equipment exclusion	Supplemental Project		
<69 kV	345	586		40		76	**1,047**
69 kV	163	830	4	55	10	87	**1,149**
115 kV		10					**10**
138 kV	37	578		12	1		**628**
230 kV		2					**2**
345 kV			1	10		2	**13**
765 kV				1			**1**
Total	**545**	**2,006**	**5**	**118**	**11**	**165**	**2,850**



Competitive Planner Contact Information

- If you have any questions related to Competitive Planning Process and Competitive Planner Tool, please contact ProposalWindow-Admin@pjm.com
- If you need an assistance with registration to Competitive Planner Tool, please contact AccountManager@pjm.com
- PJM Competitive Planning Process Webpage
  https://www.pjm.com/planning/competitive-planning-process.aspx
- Access Competitive Planner tool through PJM Planning Center Webpage
  https://www.pjm.com/markets-and-operations/etools/planning-center.aspx
- Competitive Planner Tool Updates at Tech Change Forum
  https://www.pjm.com/committees-and-groups/tech-change-forum.aspx

Planned Projects: Baseline Reliability

Update for Existing Projects

Baseline Reliability Projects

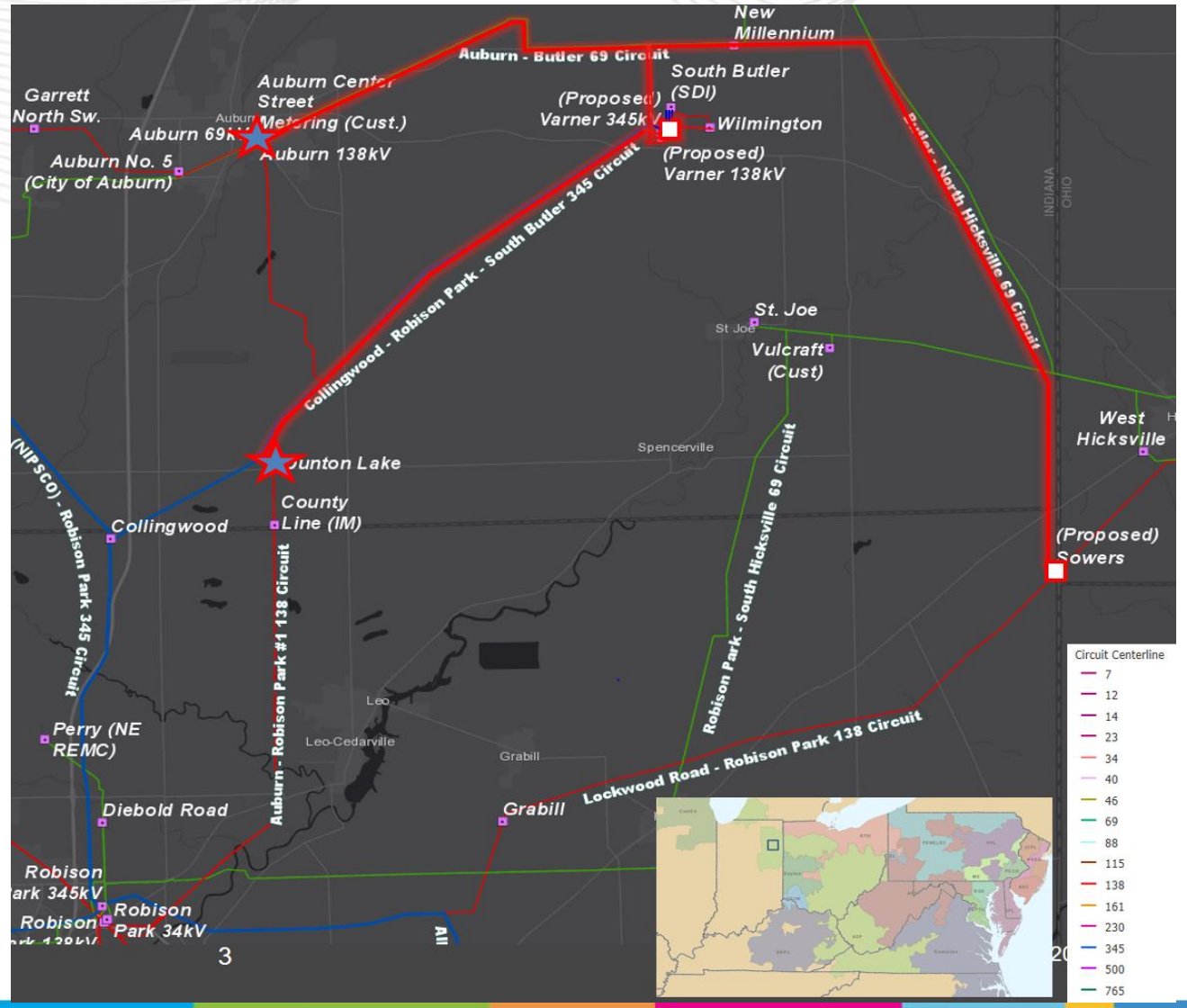
AEP Transmission Zone
B2779 Scope/Cost change

Scope/Cost change for B2779.1 -.5

Original Project Scope: (Previous presented on 1/12/2017 TEAC)

- Construct a new 138 kV station, Sowers (Originally named Campbell Road), tapping into the Grabill – South Hicksville138kV line (**B2779.1**)
- Reconstruct sections of the Butler-N.Hicksville and Auburn-Butler 69kV circuits as 138kV double circuit and extend 138kV from Sowers station (**B2779.2**)
- Construct a new 345/138kV SDI Varner (Originally named Willington) Station which will be sourced from Collingwood 345kV and serve the SDI load at 345kV and 138 kV respectively (**B2779.3**)
- 138kV circuits will be looped in-out of the new SDI Varner station resulting in a direct circuit to Auburn and Rob Park via Dunton Lake, and a circuit to Sowers; Reconductor 138kV line section between Dunton Lake – SDI Wilmington (**B2779.4**)
- Expand 138kV bus at Auburn (**B2779.5**)

Original Total Estimated Cost: $107.7M



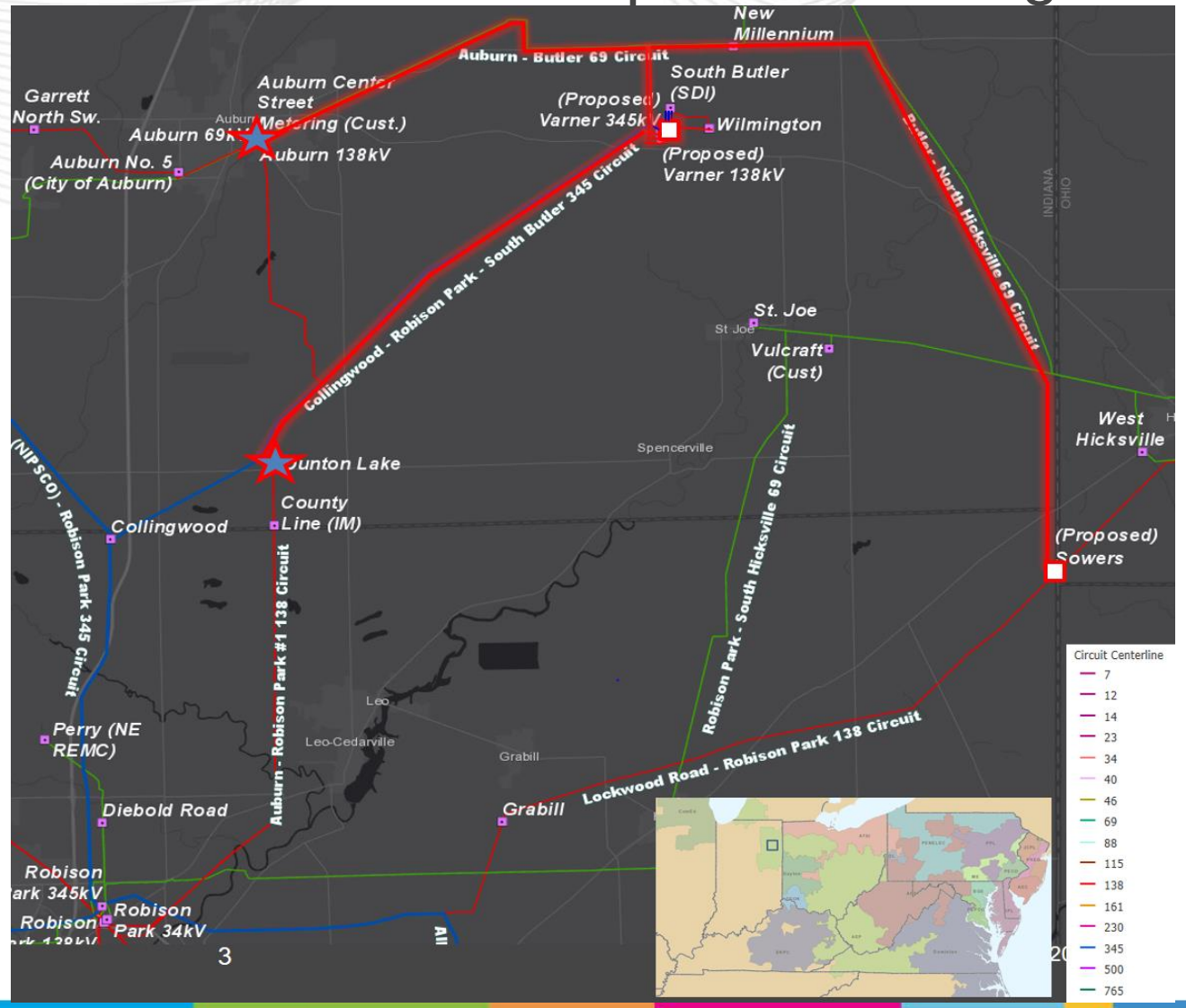
AEP Transmission Zone
B2779 Scope/Cost change

Major Cost Drivers:

- Varner & South Butler cost increase due to circuit breaker additions to ensure segregation of customer and AEP facilities in accordance with AEP connection requirements*: $6.7 M
- Flicker reduction for local customers requiring an expanded 345kV yard with reactors and capacitor banks: $20.3 M
- Collingwood cost increase due to security enhancements and space constraints: $14M
- Cost increase from functional to detail scope: $6.9M
- Wilmington Tap relocation work**: $2.4M
- Cost of (3) 345kV feeds from Varner to South Butler: $6M

Cost at Submittal: $107.7M
Updated Cost: : $164.2M

- *AEP's interconnection requirements require a circuit breaker at the customer end for lines longer than 2 spans. Additional 345kV CB's at South Butler station are required due to supplying three feeds to the load. This configuration also would have required AEP to purchase the through path at South Butler station.
- **To accommodate (3) 345kV lines from Varner to South Butler, the Wilmington Tap had to be rerouted and rebuilt.



Additional Considerations

- The proposed construction plan would require a prolonged outage of the Collingwood 345kV line, which is the only line that currently serves 300+ MW demand at SDI.
- SDI cannot afford to take a prolonged outage.
- The resolution would involve building of the 138 kV infrastructure before the 345 kV outages can be taken resulting in prolonged flicker exposure to local customers.
- Additionally, the future expansion at SDI would risk increased flicker levels to other customers.
- To arrest cost increases and avoid flicker exposure, AEP is recommending modifications to the project scope in consultation with SDI.

AEP Transmission Zone
B2779 Scope/Cost change

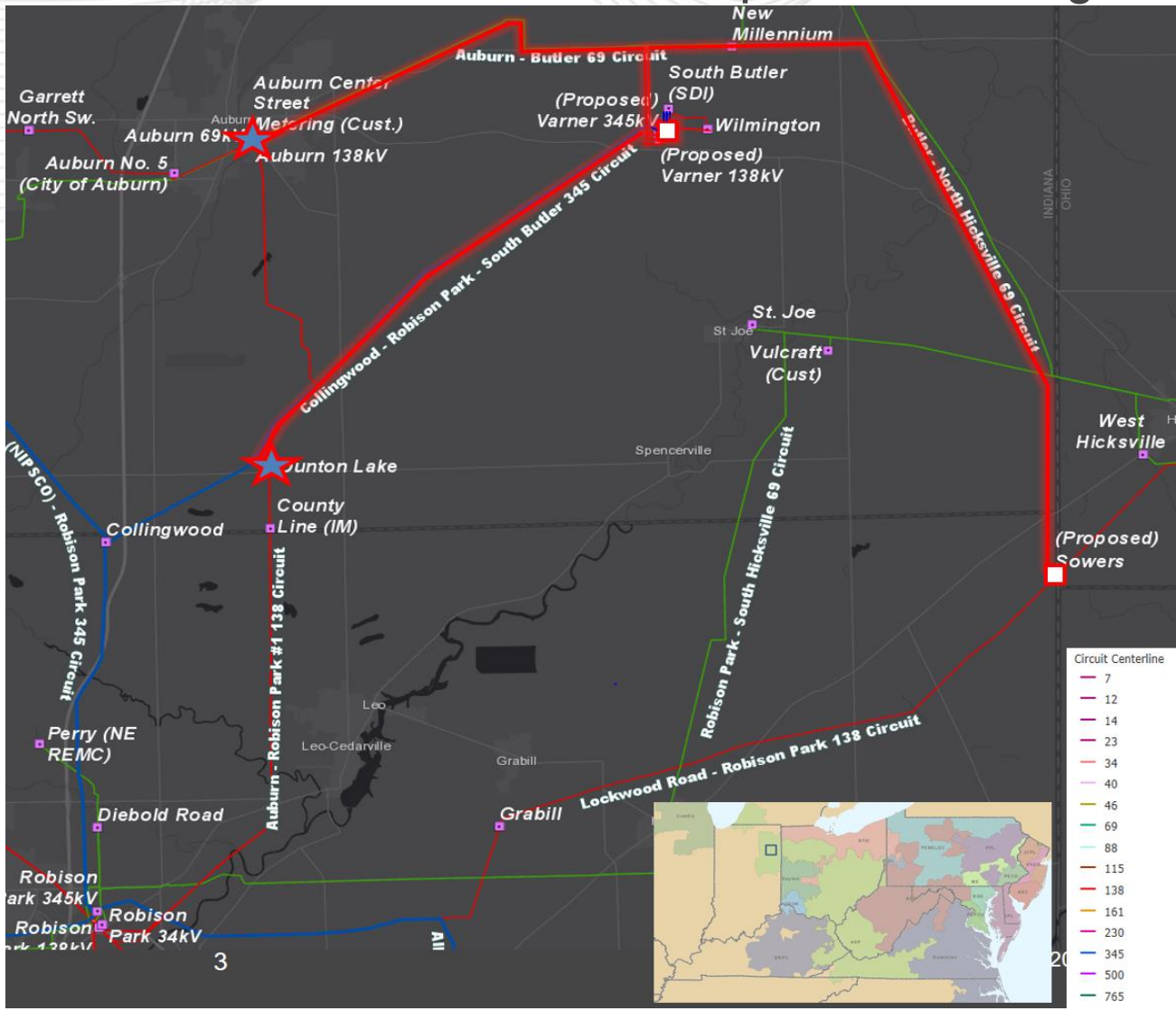
New Project Scope:

- Construction a new 138 kV station, Sowers, tapping into the Grabill – South Hicksville138kV line (**B2779.1**)
- Reconstruct sections of the Butler-N.Hicksville and Auburn-Butler 69kV circuits as 138kV double circuit and extend 138kV from Sowers station; (**B2779.2**)
- Construct a new 345/138kV SDI Varner Station which will ~~be sourced from Collingwood 345kV and~~ serve a portion of the SDI load from the ~~345kV and~~ 138 kV system; ~~respectively~~ Serve Wilmington Tap from new Varner 138 kV station.
- (**B2779.3**)
- 138kV circuits will be looped in-out of the new SDI Varner station resulting in a direct circuit to to Auburn ~~and Rob Park via Dunton Lake, and a circuit to~~ Sowers and Wilmington; String approximately 3 miles of the open side of circuit between Collingwood and Dunton Lake with new conductor thus establishing a second 345 kV feed (utilizing 9 miles of existing 138 kV feed constructed as 345 kV) (**B2779.4**)
- Expand 138kV bus at Auburn (**B2779.5**)
- Construct a 345kV ring bus at Dunton Lake to serve load at SDI at 345 kV via two circuits (**B2779.6**)
- Retire Collingwood station (**B2779.7**)

New Estimated Total Cost: $152.2M

Notes:

The new configuration splits the load at SDI to serve the furnaces via the 345 kV lines from Dunton Lake and the segregated load via the 138 kV lines from Auburn and Sowers. This configuration eliminates the prolonged outage concerns and also improves power quality by keeping the arc furnaces on the 345 kV. Additionally, the updated configuration allows for future maintenance on any feed to SDI. The total estimated cost is $12M less than the original solution.



2020 RTEP Window 1

2020 RTEP Proposal Window 1 - Statistics

Timeline

- Window 1 Opened: July 1, 2020
- Window 1 Closed: August 31, 2020

47 proposals received from 8 entities

- 8 proposal includes cost containment provisions
- 12 proposals include greenfield construction

2020 RTEP Proposal Window 1 - Proposals

Proposal ID#	Project Type	Project Description	Total Construction Cost M$	Zone	kV Level	Analysis	Flowgate	Cluster
575	Upgrade	Crete-St. John 345 kV Reconductoring Proposal	8.25	ComEd	345kV	GenDeliv	GD-W3,GD-W4	5
173	Upgrade	Reconductor 345 kV Line 94507 Crete - St. John	22.786	ComEd	345kV	GenDeliv	GD-W3,GD-W4	5
573	Upgrade	Reconductor 345 kV Lines 6607 East Frankfort - Crete and 94507 Crete - St. John	50.251	ComEd	345kV	GenDeliv	GD-W3,GD-W4	5
148	Greenfield	Cedar Run - Cline 345kV Transmission Project	29.629	ComEd	345kV	GenDeliv	GD-W3,GD-W4	5
281	Upgrade	Rebuild 345 kV double circuit Lines 94507 and 97008 Crete - St. John	42.485	ComEd	345kV	GenDeliv	GD-W3,GD-W4	5
354	Upgrade	Rebuild 345 kV Lines 6607/6608 East Frankfort - Crete and 94507/97008 Crete - St. John	88.935	ComEd	345kV	GenDeliv	GD-W3,GD-W4	5

2020 RTEP Proposal Window 1 - Proposals

Proposal ID#	Project Type	Project Description	Total Construction Cost M$	Zone	kV Level	Analysis	Flowgate	Cluster
241	Upgrade	Crete - St. John SmartValve	12	ComEd	345kV	GenDeliv	GD-W3,GD-W4	5
901	Upgrade	Install Series Inductor on Line 94507	7.998	ComEd	345kV	GenDeliv	GD-W3,GD-W4	5
393	Greenfield	Zebedee 345 kV Greenfield Station	25.91	ComEd	345kV	GenDeliv	GD-W3	5
235	Greenfield	Goodenow-Lemon Lake 345kV Greenfield Line and Stations	46.194	ComEd	345kV	GenDeliv	GD-W3	5

Crete – St. John 345kV overloads

- **Crete – St. Johns 345kV overloads (GD-W3 and GD-W4) in 2025 winter generator deliverability were posted in 2020 RTEP Window 1 opened in July and designated as Cluster No. 5**
- **Changes with significant impact on the line loading after Window #1 opened**
    - Dresden units deactivation request
    - Execution of additional ISAs for generation from the New Services Queue
        - ComEd generation decrease -> loading decrease on Crete – St. Johns 345kV line
        - ComEd generation Increase -> loading increase on Crete – St. Johns 345kV line
- **Based on a re-tool of the 2025 conditions with updates based on current information, PJM has determined that to not pursue mitigation of the violations for the Crete-St. Johns 345kV line as identified in the 2020 RTEP but continue to monitor the conditions in the area in future studies**

2020 RTEP Proposal Window 1 - Proposals

Proposal ID#	Project Type	Project Description	Total Construction Cost M$	Zone	kV Level	Analysis	Flowgate	Cluster
308	Upgrade	Dragoon Transformer and Line Addition	4.894	AEP	35kV	Thermal	AEP-T7,AEP-T8,AEP-T9,AEP-T10,AEP-T11,AEP-T220,AEP-T224,AEP-T235,AEP-T236,AEP-T241,AEP-T242,AEP-T245,AEP-T246,AEP-T247,AEP-T248,AEP-T249,AEP-T254,AEP-T255,AEP-T263,AEP-T264,AEP-T275,AEP-T276,AEP-T282,AEP-T283,AEP-T378,AEP-T379,AEP-T382,AEP-T383,AEP-T386,AEP-T387,AEP-T392,AEP-T393,AEP-T394,AEP-T395,AEP-T396,AEP-T397,AEP-T400,AEP-T401,AEP-T402,AEP-T408,AEP-T411,AEP-T417,AEP-T419,AEP-T420,AEP-T427,AEP-T428,AEP-T435,AEP-T436,AEP-T439,AEP-T440,AEP-T441,AEP-T461,AEP-T462,AEP-T463,AEP-T465	N/A

Note: “N/A” in the cluster column denotes that only one proposal was received to mitigate the violations identified by the flowgates listed

2020 RTEP Window 1

- July 1, 2020 – Proposal Window No.1 opened
- August 31, 2020– Proposal Window No.1 closed

PJM evaluating proposals and violations

- Proposals presented for violations without competing proposals in this slide deck based on completion of reviews
- PJM performing analysis for other violations with multiple proposals
  - Performance, constructability, cost commitment reviews

Recommended Solution

Baseline Reliability Projects

AEP Transmission Zone: Baseline Dragoon

Process Stage: Second Review

Criteria: AEP FERC 715 Criteria

Assumption Reference: 2025 RTEP assumption

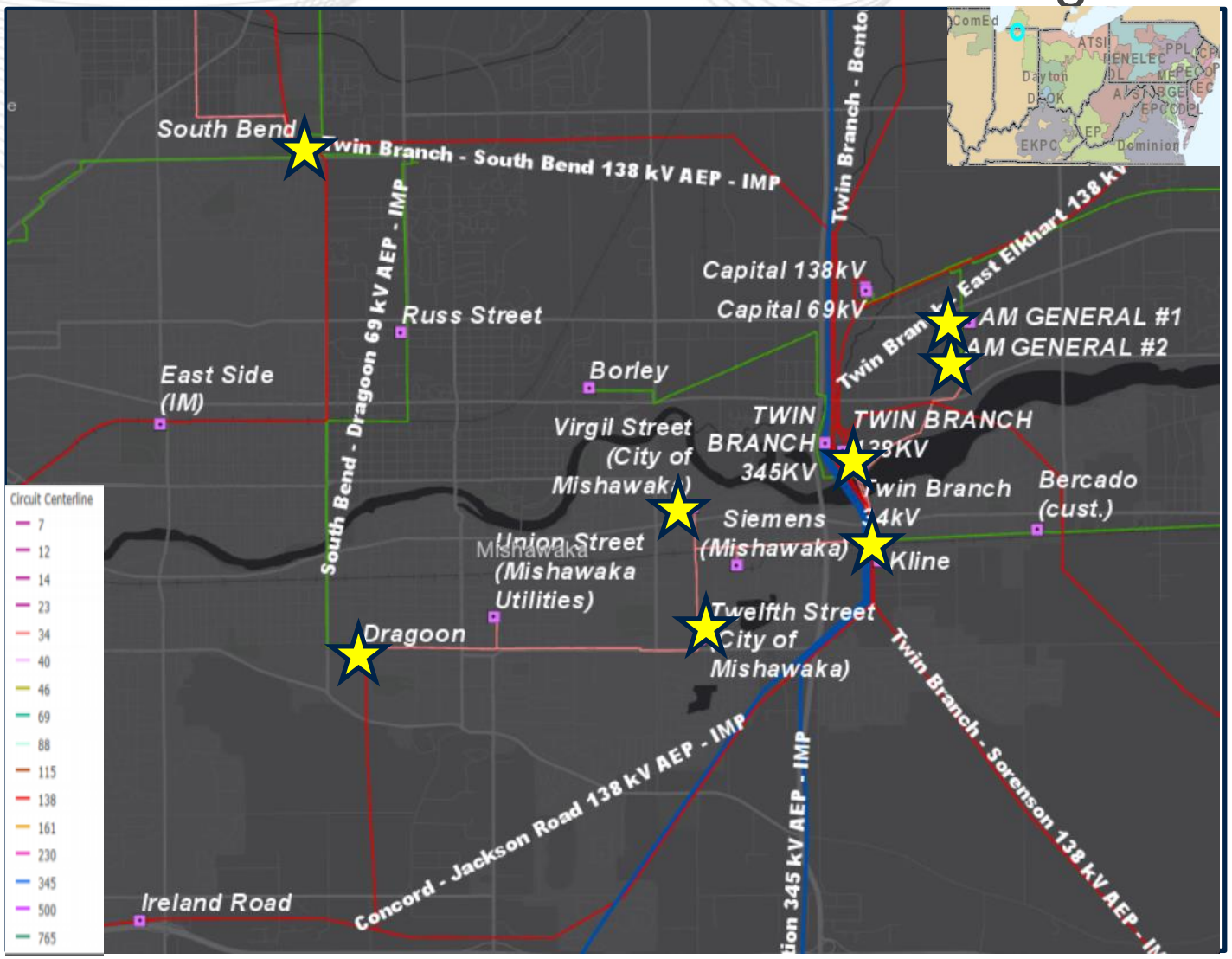
Model Used for Analysis: 2025 Summer case and 2025 Winter case

Proposal Window Exclusion: None

Problem Statement:

AEP-T7,AEP-T8,AEP-T9,AEP-T10,AEP-T11,AEP-T220,AEP-T224,AEP-T235,AEP-T236,AEP-T241,AEP-T242,AEP-T245,AEP-T246,AEP-T247,AEP-T248,AEP-T249,AEP-T254,AEP-T255,AEP-T263,AEP-T264,AEP-T275,AEP-T276,AEP-T282,AEP-T283,AEP-T378,AEP-T379,AEP-T382,AEP-T383,AEP-T386,AEP-T387,AEP-T392,AEP-T393,AEP-T394,AEP-T395,AEP-T396,AEP-T397,AEP-T400,AEP-T401,AEP-T402,AEP-T408,AEP-T411,AEP-T417,AEP-T419,AEP-T420,AEP-T427,AEP-T428,AEP-T435,AEP-T436,AEP-T439,AEP-T440,AEP-T441,AEP-T461,AEP-T462,AEP-T463,AEP-T465

The AM General #2– AM General #1, AM General #2– Twin Branch2, Beiger – Virgil S, BEIGER-Kline, CAP AV – AM General #1, Dodge SS -12th St, 12th ST – Virgil, Dragoon – Railroad, Grape Rd – South Bend 34.5kV lines and Kline and South Ben 138/69/34.5 kV transformers are overloaded for multiple N-1-1 contingency pairs.



AEP Transmission Zone: Baseline Dragoon

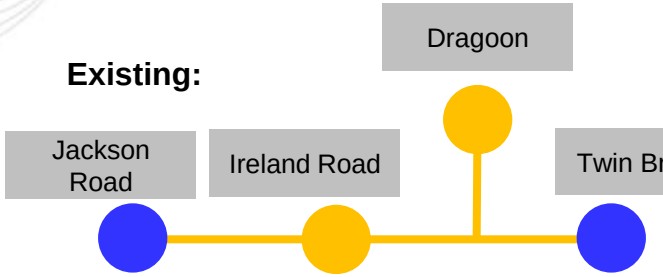
Existing Facility Rating:

Branches	SN/SE (MVA)	WN/WE (MVA)
05AM GENRL_2 -05AM GENRL_1 34.5KV	55/62	69/76
05AM GENRL_2 - 05TWIN BRCH2 34.5KV	55/62	69/76
05BEIGER - 05VIRGIL S 34.5KV	76/76	98/98
05BEIGER - 05KLINE 34.5KV	76/76	98/98
05CAP AV - 05AM GENRL_1 34.5KV	62/62	78/78
05DODGE SS - 0512TH ST 34.5KV	41/45	53/57
05DRAGOON - 05RAILROAD 34.5KV	56/56	70/70
05GRAPE RD -05SOUTHBEN 34.5KV	62/62	78/78
05VIRGIL S - 0512TH ST 34.5KV	41/45	53/57
05KLINE (138/69/34.5KV)	60/60	60/60
05SOUTHBEN (138/69/34.5KV)	55/55	55/55

Preliminary Facility Rating:

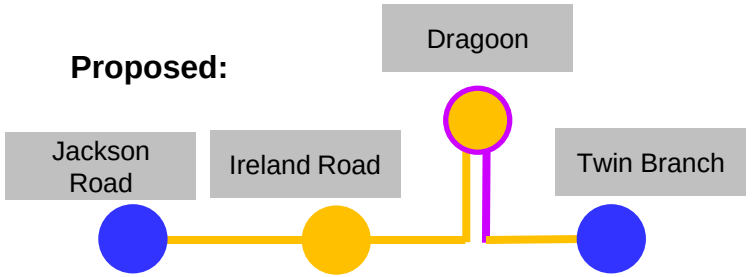
Branches	SN/SE (MVA)	WN/WE (MVA)
05DRAGN – 05IRELAN 138kV	219/251	277/303
05DRAGN – 05TWIN B 138kV	219/251	277/303
05DRAGN – 05DRAGOON 138/34.5kV	114/128	132/132

Existing:



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

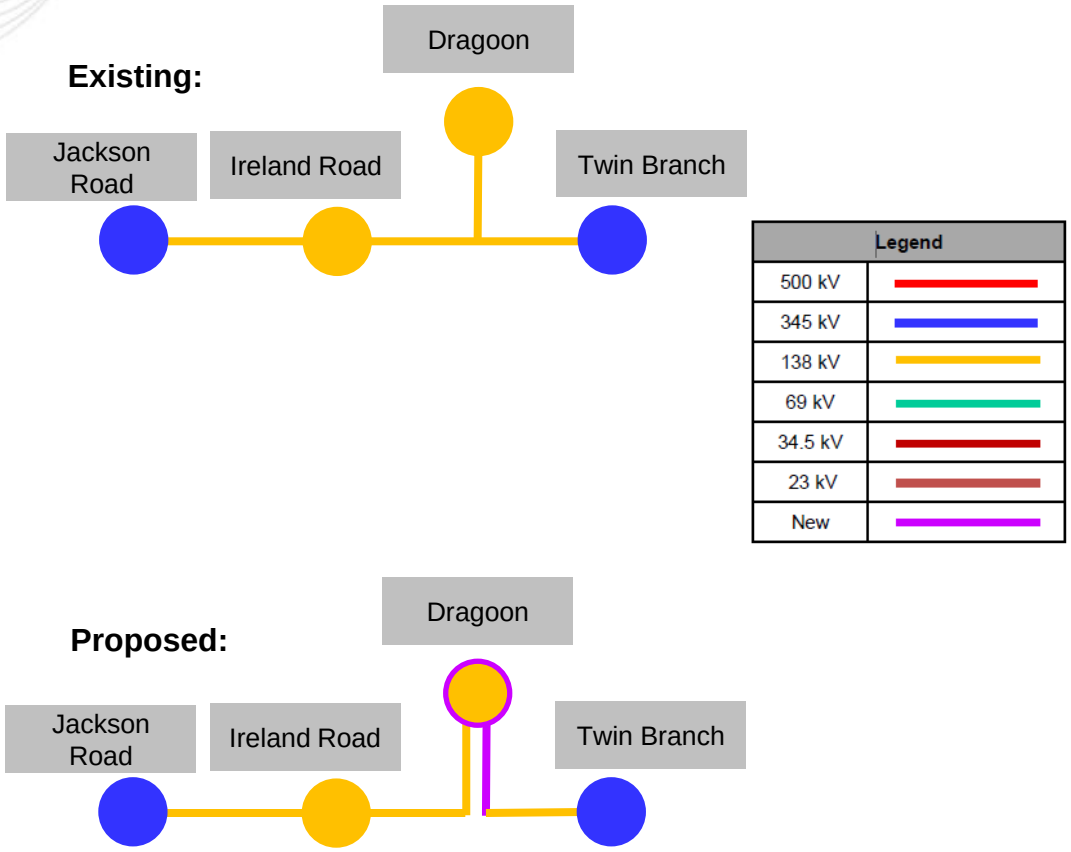
Proposed:



AEP Transmission Zone: Baseline Dragoon

Recommended Solution:
Proposal #2020_1-308: Install 1.7 miles of 795 ASCR 138kV conductor along the other side of Dragoon Tap 138 kV line, which is currently double circuit tower with one position open. Additionally, install a 2nd 138/34.5kV transformer at Dragoon, install a high side circuit switcher on the current transformer at Dragoon Station, and install 2-138kV line breakers on the Dragoon-Jackson 138kV and Dragoon-Twin Branch 138kV lines. The Dragoon-Jackson 138kV branch ratings will be (219/251/277/303). The Dragoon-Twin Branch 138kV ratings will be(219/251/277/303). (**B3270**)
Estimated Cost: $4.894M
In PJM's DNH study, Dragoon 34.5kV Breakers B, C, D (22KA) are identified to overdutied due to B3270. Additional scope is added:
Replace Dragoon 34.5kV Breakers B, C, D with 40kA breakers (**B3270.1**)
Estimated Cost: $2M

Note: Dragoon 34.5kV Breakers C and D replacement were part of supplemental project S2197. These portion of S2197 is converted to baseline

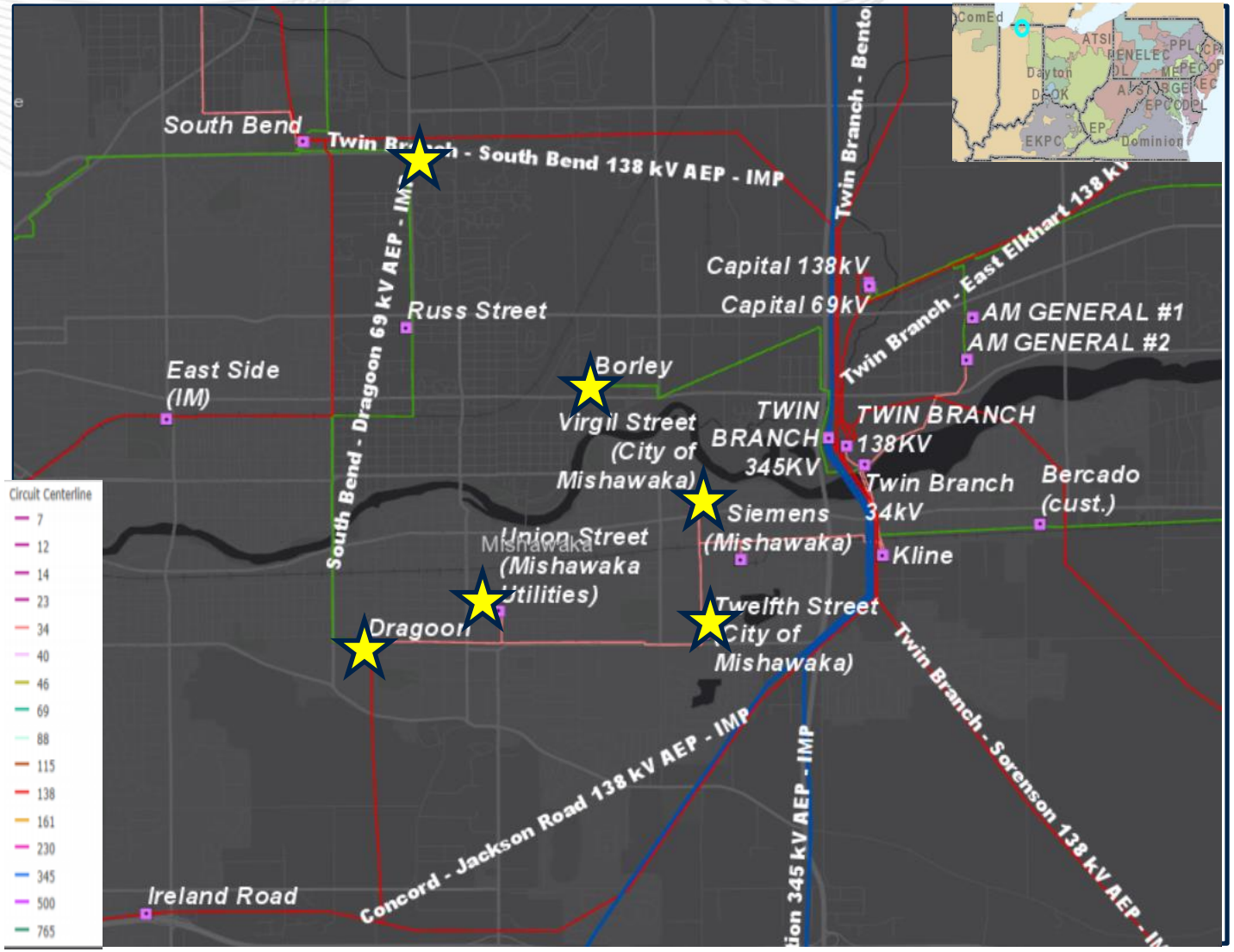


AEP Transmission Zone: Baseline Dragoon

Additional Benefits: this project also solves FG# AEP-VM623,AEP-VM624,AEP-VM625,AEP-VM626,AEP-VM629,AEP-VM636,AEP-VM637,AEP-VM641,AEP-VM642,AEP-VM643,AEP-VM644,AEP-VM678,AEP-VM680,AEP-VM684,AEP-VM685,AEP-VM686,AEP-VM687,AEP-VM688,AEP-VM689,AEP-VM690,AEP-VM691,AEP-VM692,AEP-VM693,AEP-VM694,AEP-VM695,AEP-VM696,AEP-VM697,AEP-VM698,AEP-VM699,AEP-VM706,AEP-VM715,AEP-VM716,AEP-VM717,AEP-VM718,AEP-VM719,AEP-VM720,AEP-VM731,AEP-VM749,AEP-VM750,AEP-VM751,AEP-VM752,AEP-VM753,AEP-VM754,AEP-VM755,AEP-VM756,AEP-VM757,AEP-VM758,AEP-VM759,AEP-VM760,AEP-VM765,AEP-VM766,AEP-VM767,AEP-VM768,AEP-VM769,AEP-VM770,AEP-VM771,AEP-VM772,AEP-VM773,AEP-VM774,AEP-VM775,AEP-VM776,AEP-VM777,AEP-VM778,AEP-VM779,AEP-VM780,AEP-VM781,AEP-VM782,AEP-VM784,AEP-VM785,AEP-VM786,AEP-VM787,AEP-VM788,AEP-VM793,AEP-VM794,AEP-VM795,AEP-VM797,AEP-VM798,AEP-VM799,AEP-VD684,AEP-VD700,AEP-VD701,AEP-VD725,AEP-VD728,AEP-VD729,AEP-VD730,AEP-VD731,AEP-VD733,AEP-VD735,AEP-VD736,AEP-VD737,AEP-VD755,AEP-VD770,AEP-VD776,AEP-VD777,AEP-VD781,AEP-VD795,AEP-VD800,AEP-VD801,AEP-VD810,AEP-VD811,AEP-VD863,AEP-VD868,AEP-VD869,AEP-VD872,AEP-VD891,AEP-VD893,AEP-VD956,AEP-VD962,AEP-VD963,AEP-VD964,AEP-VD965,AEP-VD966,AEP-VD967,AEP-VD968,AEP-VD969,AEP-VD970, which are voltage magnitude and voltage drop violations at buses 12TH ST 34.5kV, BEIGER 34.5kV, BORLEY 34.5kV, GRAPE RD 34.5kV, LOGAN ST 34.5kV, MILES MISH 34.5KV, RAILROAD 34.5kV, RUSS ST 34.5KV, UNION 34.5kV, VIRGIL S 34.5KV.

Proposal Window Exclusion: Below 200kV Exclusion

Required In-Service: 6/1/2025



AEP Transmission Zone: Baseline
Niles Area

Process Stage: Recommended Solution
Criteria: TO Planning Criteria
Assumption Reference: FERC 715
Model Used for Analysis: 2024 RTEP Summer
Proposal Window Exclusion: FERC 715 and Below 200kV
Problem Statement:

For N-1-1 loss of the Pokagon - Lake Street and South Bend – Niles 69 kV lines:

- Pletcher – Buchanan 69kV line overloads to 117% of the 75MVA rating (336 ACSR)
- The area experiences voltage violations with voltages as low as .89 pu and voltage drops as high as 8.5% at the Niles and Lake Street 34.5 kV buses and affects the following load serving buses. Lakehead 69kV, Lake Street 69kV, Lake Street 34.5kV, National Standard 69kV, Simplicity 34.5kV, Niles 69kV, Niles 34.5kV.

For N-1 loss of the Niles 69/34 transformer, Niles 69kV bus or any of the Niles 69kV breakers the following overload occurs.

- Niles – Simplicity 34.5kV line overloads to up to 103% of the 68MVA rating (600A breaker)

For N-1-1 loss of the Niles 69/34.5kV transformer (which takes out the 69kV bus) and the Pokagon 138/69kV transformer:

- The area experiences voltage violations with voltages as low as .79 pu and voltage drops as high as 18.2% at the Niles 34.5 kV bus and affects the following load serving buses. Barrett 69kV, Calvin 69kV, Dailey 69kV, Lakehead 69kV, Lake Street 69kV, Lake Street 34.5kV, National Standard 69kV, Simplicity 34.5kV, Niles 69kV, Niles 34.5kV, Pokagon 69kV, Stone Lake 69kV and Wolverine 69kV station.

For N-1-1 loss of the Lake Street 69/34kV XFR (takes out 69kV bus) and South Bend – Niles 69kV line:

- The area experiences voltage violations with voltages as low as .85 pu and voltage drops as high as 9.0% at the Niles, Simplicity and Lake Street 34.5 kV buses

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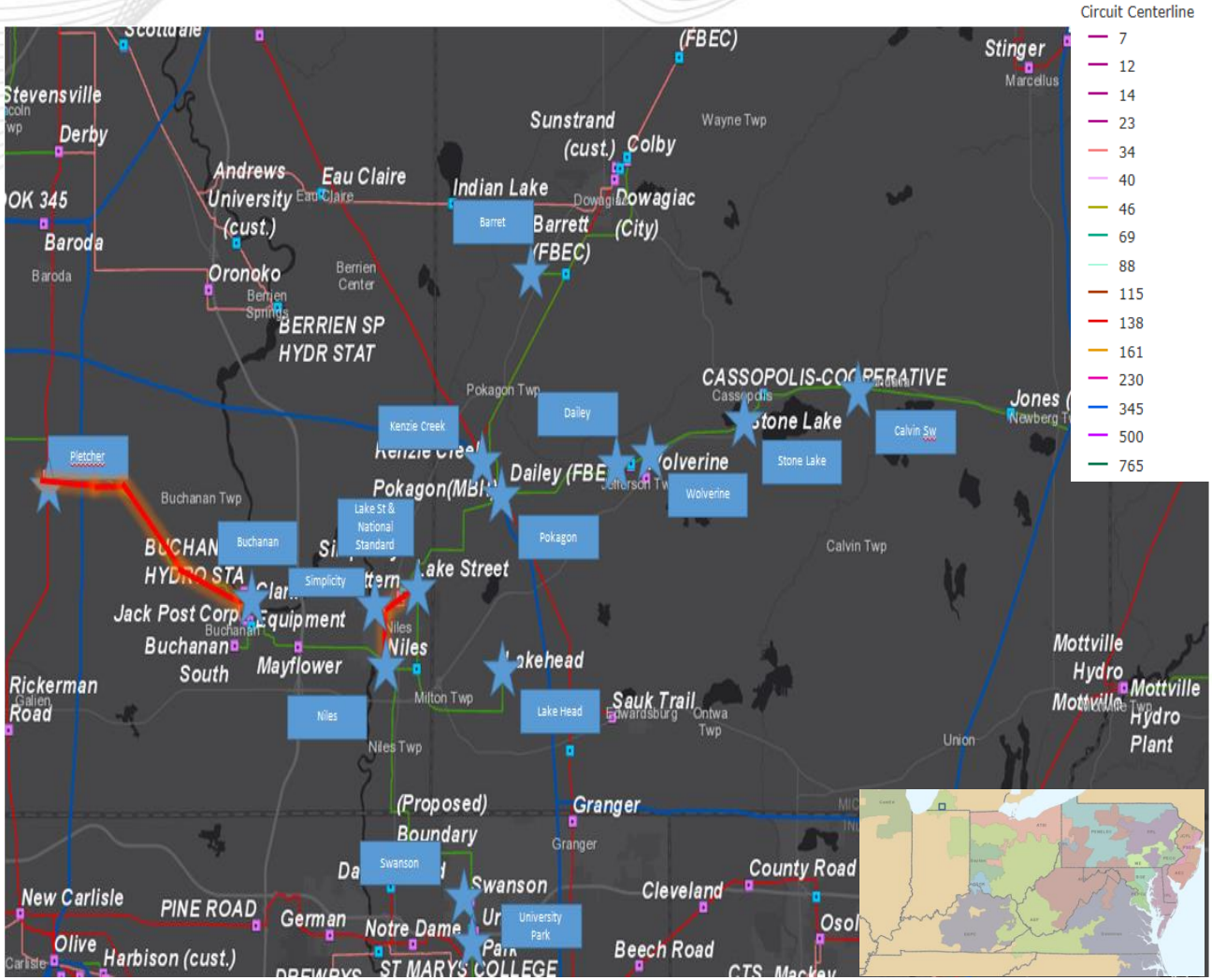
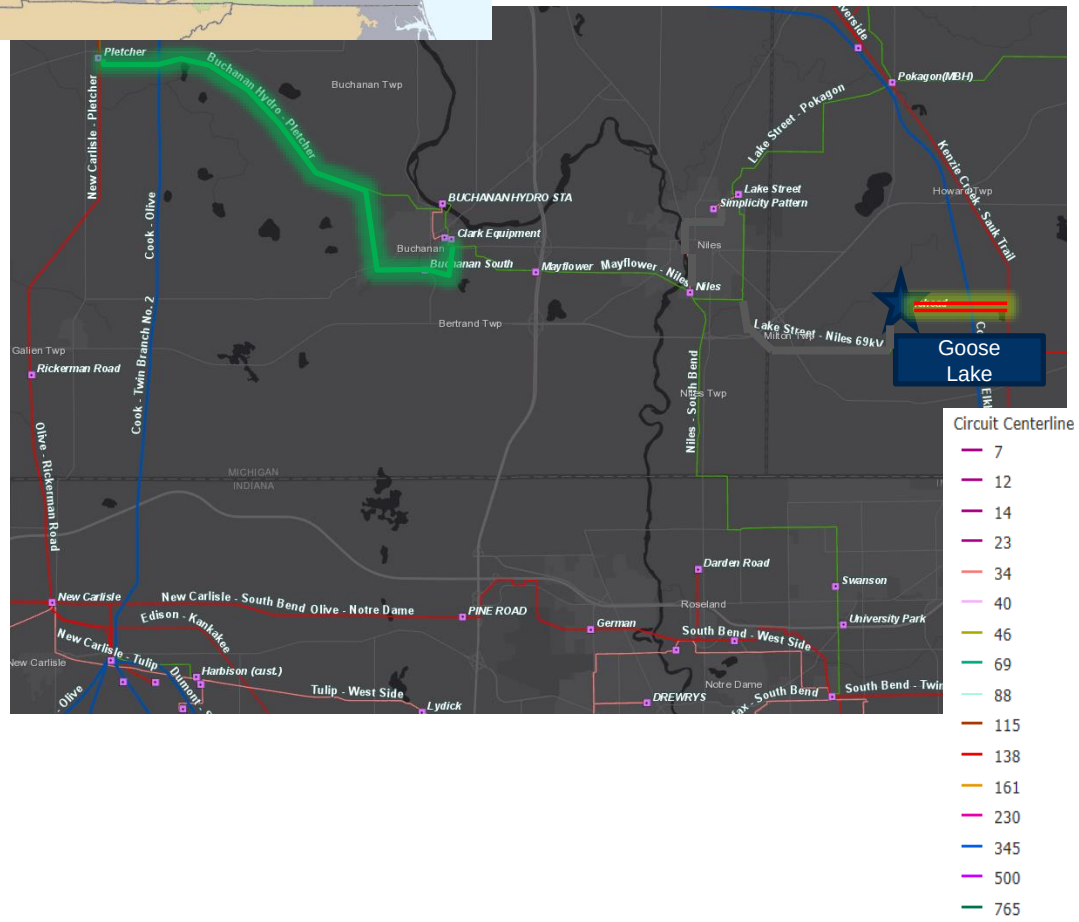


AEP Transmission Zone: Baseline Niles Area



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Existing Facility Ratings:
Pletcher – Buchanan 69kV line: 68/75/90/94 MVA for SN/SE/WN/WE
Sauk Trail – Pakagon 138kV line: 296/380/375/375 for SN/SE/WN/WE

Preliminary Facility Ratings:
Pletcher – Buchanan South 69kV line: 128/128/162/162 MVA for SN/SE/WN/WE
Buchanan South – Buchanan 69kV line: 68/86/90/103 MVA for SN/SE/WN/WE
Sauk Trail – Lakehead 138kVline: 296/398/375/452 for SN/SE/WN/WE
Pokagon – Lakehead 138KV line: 296/398/375/452 for SN/SE/WN/WE
Lake Head 138/69kV transformer: 20/20/20/20 for SN/SE/WN/WE

AEP Transmission Zone: Baseline Niles Area

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Proposed Solution:

Construct a ~2.4 mile double circuit 138kV Extension using 1033 ACSR to connect Lake Head to the 138kV network. **(B3160.1)**

Estimated Cost: $6M

Retire the ~2.5 mile 34.5kV Niles – Simplicity Tap line. **(B3160.2)**

Estimated Cost: $1.2M

Retire the ~4.6 mile Lakehead 69kV Tap **(B3160.3)**

Estimated Cost: $1.4M

Build new 138/69kV drop down station to feed Lakehead with a 138kV CB, 138kV Switcher, 138/69kV XFR and a 138kV MOAB **(B3160.4)**

Estimated Cost: $4M

Rebuild the ~8.4 mile 69kV Pletcher – Buchanan Hydro line as the ~9 mile Pletcher – Buchanan South 69kV line using 795 ACSR. **(B3160.6)**

Estimated Cost: $20M

Rebuild the ~1.2 mile Buchanan South 69kV Radial Tap using 795 ACSR **(B3160.5)**

Estimated Cost: $3M

Install a PoP switch at Buchanan South station with 2 line Moabs. **(B3160.7)**

Estimated Cost: $0.6M

Total Estimated Transmission Baseline Cost: $36.2M

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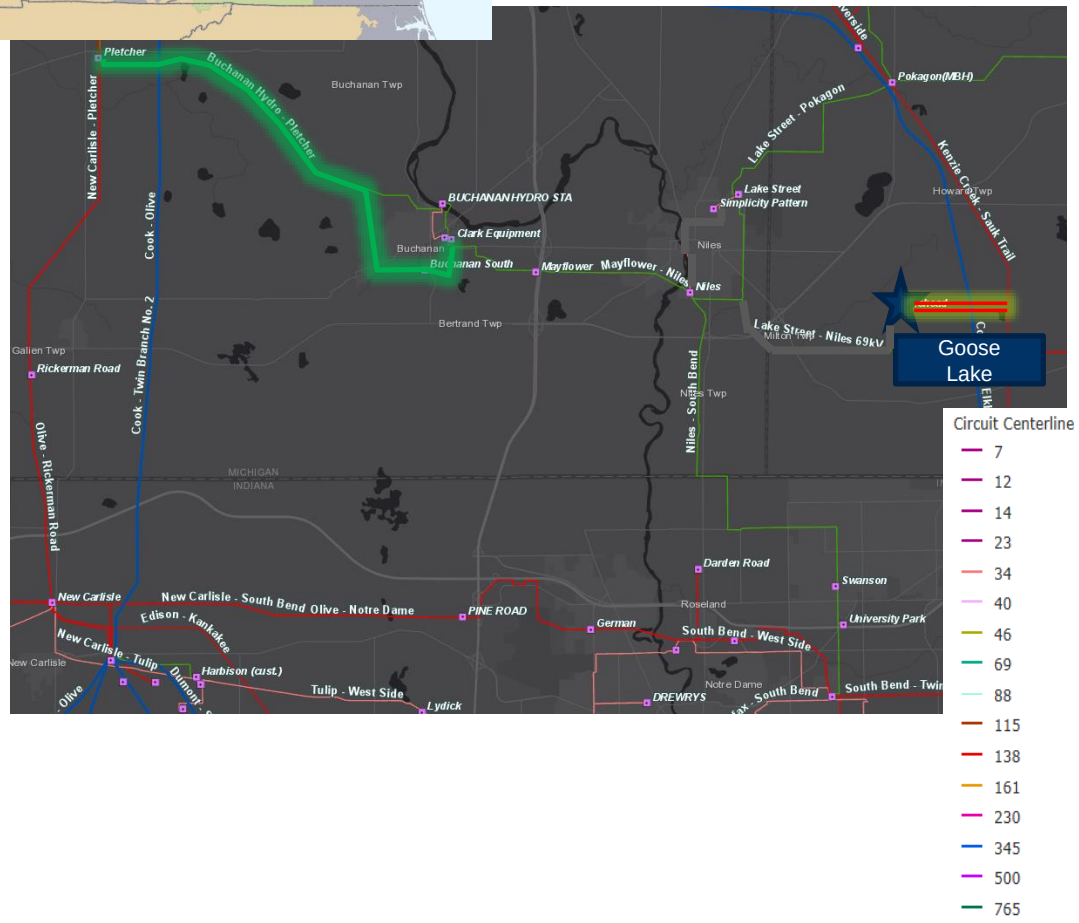
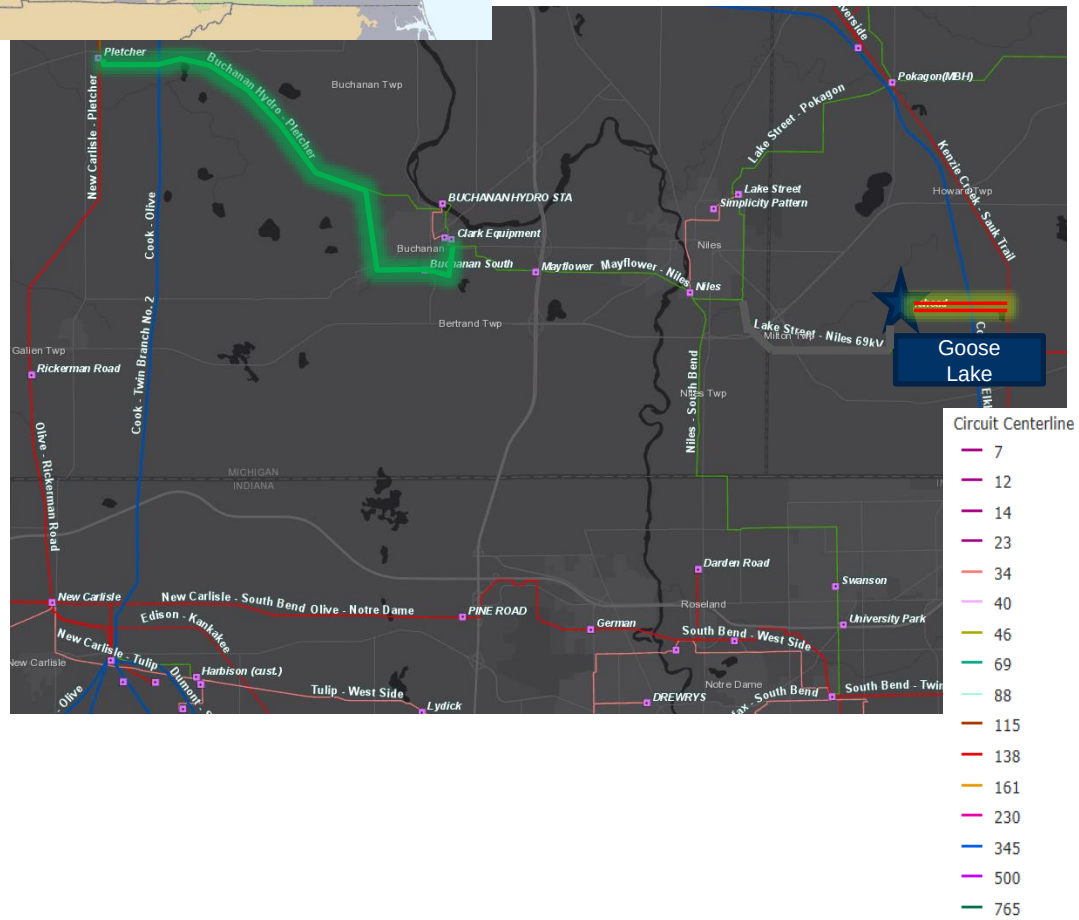


AEP Transmission Zone: Baseline Niles Area



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Ancillary Benefits:

The proposed solution also addresses these supplemental needs:
Lake St – Niles 34.5kV line:
1965 Wood line with cap and pin insulators. Submitted in AEP-2018-IM002

Lakehead Pumping 69kV Tap:
1960's wood crossarm construction. Part of asset submitted in AEP-2018-IM002

Pletcher – Buchanan 69kV line:
1963 wood line. Submitted in AEP-2019-IM047

Buchanan South Side 69kV Tap:
1970 wood radial line. Submitted in AEP-2019-IM047

Required IS Date: 6/1/2024
Proposed IS Date: 6/1/2022
Previously Presented: 12/18/2019 SRRTEP

Planned Projects: Supplemental

Solutions of the M-3 Process

Solutions

Stakeholders must submit any comments within 10 days of this meeting in order to provide time necessary to consider these comments prior to the next phase of the M-3 process

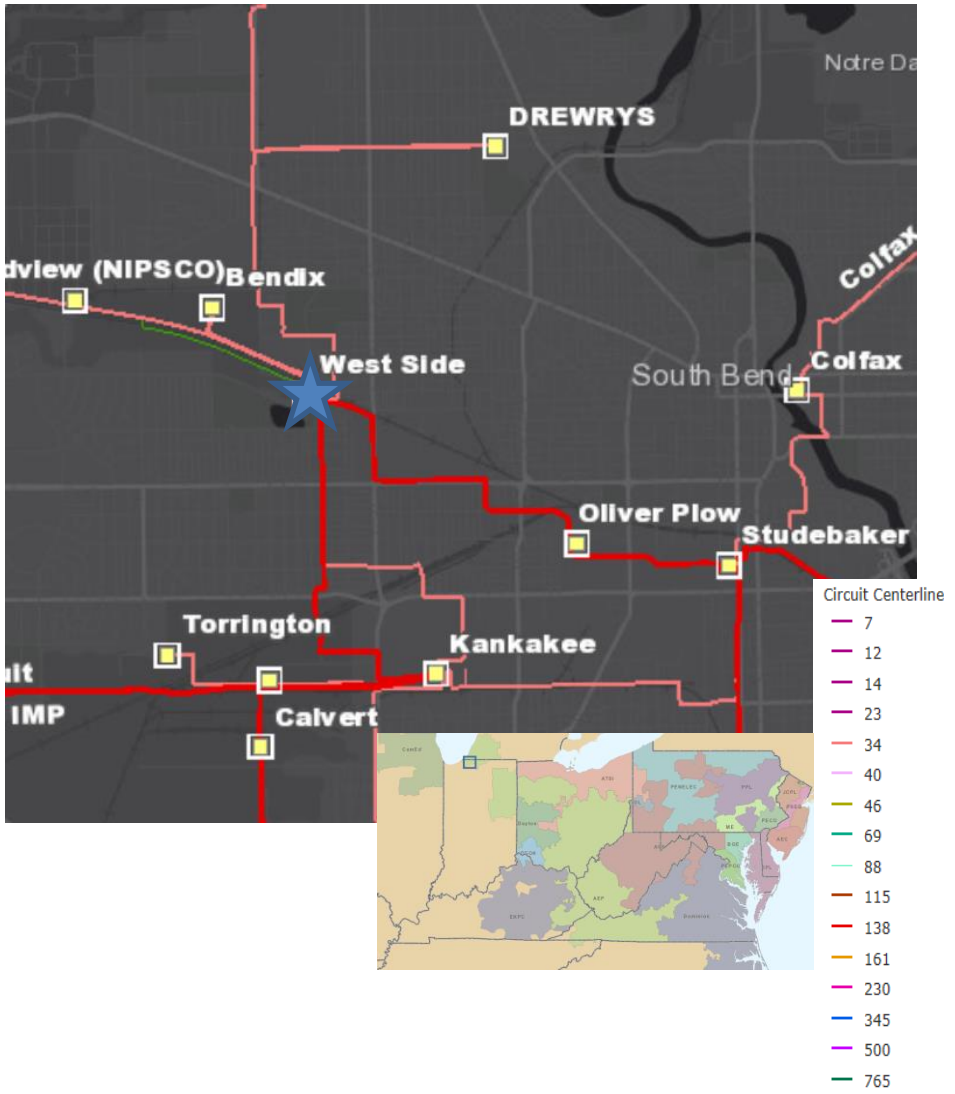
AEP Transmission Zone: Supplemental Ameriplex Station Solution

Need Number: AEP-2019-IM039
Process Stage: Solutions Meeting 02/21/2020
Previously Presented: Needs Meeting 10/25/2019
Supplemental Project Driver: Customer Service
Specific Assumptions Reference: AEP Interconnection Guidelines (AEP Assumptions Slide 7)

Problem Statement:
South Bend-Olive 138kV line-

- New 1.5MVA block load addition to the Ameriplex complex and new delivery point request from I&M distribution.
- Expected loading of 14MVA at Ameriplex distribution station. Future plans to double initial distribution configuration to allow for up to 25MVA load.

Model: 2024 RTEP



AEP Transmission Zone: M-3 Process
Ameriplex Station Solution

Need Number: AEP-2019-IM039
Process Stage: Solutions Meeting 02/21/2020

Proposed Solution

Cut into the existing South Bend-New Carlisle 138kV line and install tap structures for the Ameriplex extension.
Estimated Cost: $0.7M

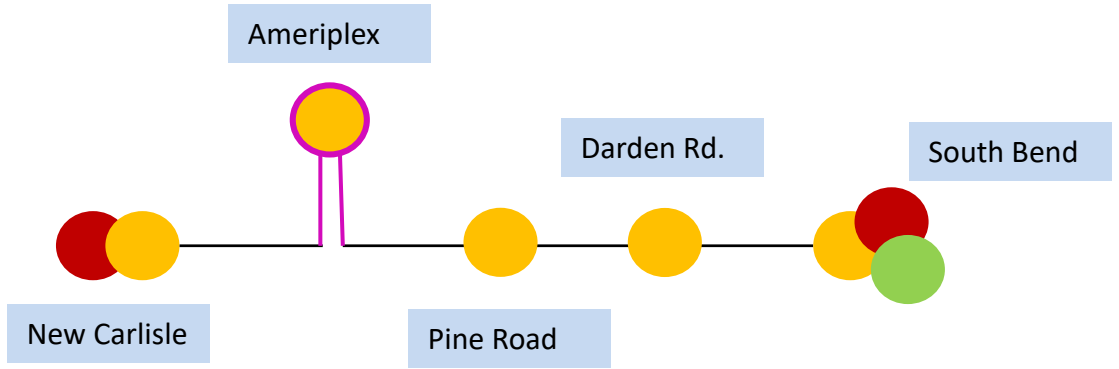
Install 1.75 miles of double circuit 138kV, 795 ACSR, off of the New Carlisle-South Bend 138kV line between New Carlisle and Pine road to serve new Ameriplex station.
Estimated Cost: $6.8M

Install new greenfield station Ameriplex on new greenfield Ameriplex 138kV tap off of the New Carlisle-South Bend 138kV line. The transmission through path consists of one 138kV breaker, one MOAB and one 138kV bus.
Estimated Cost: $2.1M

Total Estimated Transmission Cost: $9.6M

Alternatives Considered:
There were 2 greenfield locations closer to the 138kV line for the new station however these locations were not chosen due to the airport restrictions in the area.

Projected In-Service: 06/01/2021
Project Status: Scoping



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

EKPC Transmission Zone M-3 Process
Cincinnati/Northern KY Airport Area Customer Service

Need Number: EKPC-2020-002

Process Stage: Solutions Meeting – April 20, 2020

Needs Meeting – March 19, 2020

Supplemental Project Driver:

Customer Service

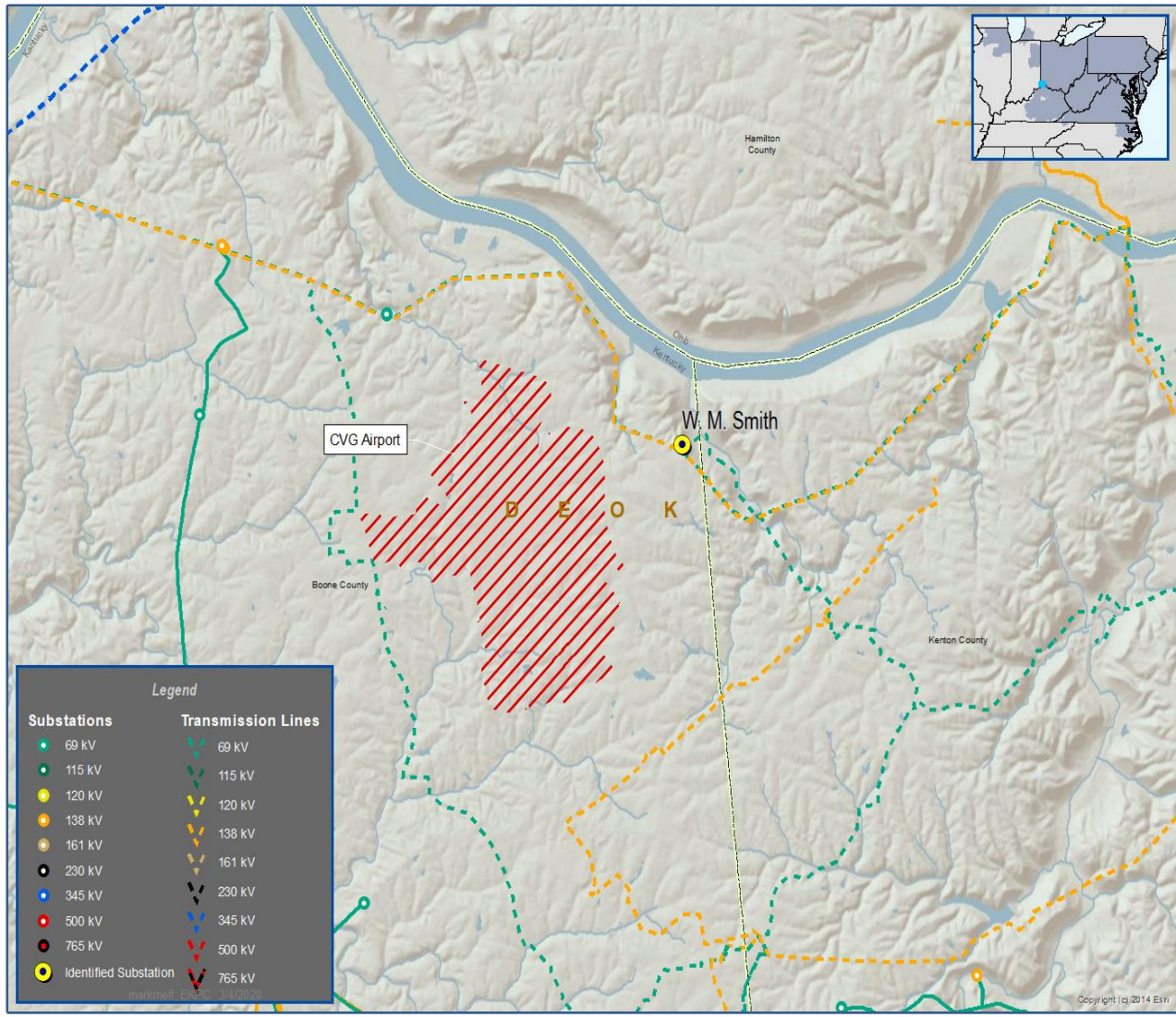
Specific Assumption Reference:

EKPC Assumptions Presentation Slide 11

Problem Statement:

The distribution cooperative serving the area in the vicinity of the Cincinnati/Northern Kentucky International Airport has requested that EKPC develop a solution to improve service reliability to customers, provide back-feed capability, and add substation transformer capacity for expected load growth in the area. This area is currently served by EKPC's W.M. Smith distribution substation. The footprint of that substation is compressed, and future expansion is not possible at that location. Additionally, the existing substation is located on the fringe of the load pocket and is not adjacent to the airport, where the growth is expected to occur.

Model: N/A



Cincinnati/Northern KY Airport Area Customer Service (continued)

Need Number: EKPC-2020-002

Process Stage: Solutions Meeting April 20, 2020

Proposed Solution:

Build a new 138/12.5 KV 30 MVA distribution station (Mineola Pike) and associated 0.9-mile 138 kV radial line connecting to DEOK's Constance 138 kV substation.

Transmission Cost: None

Distribution Cost: $10.0M

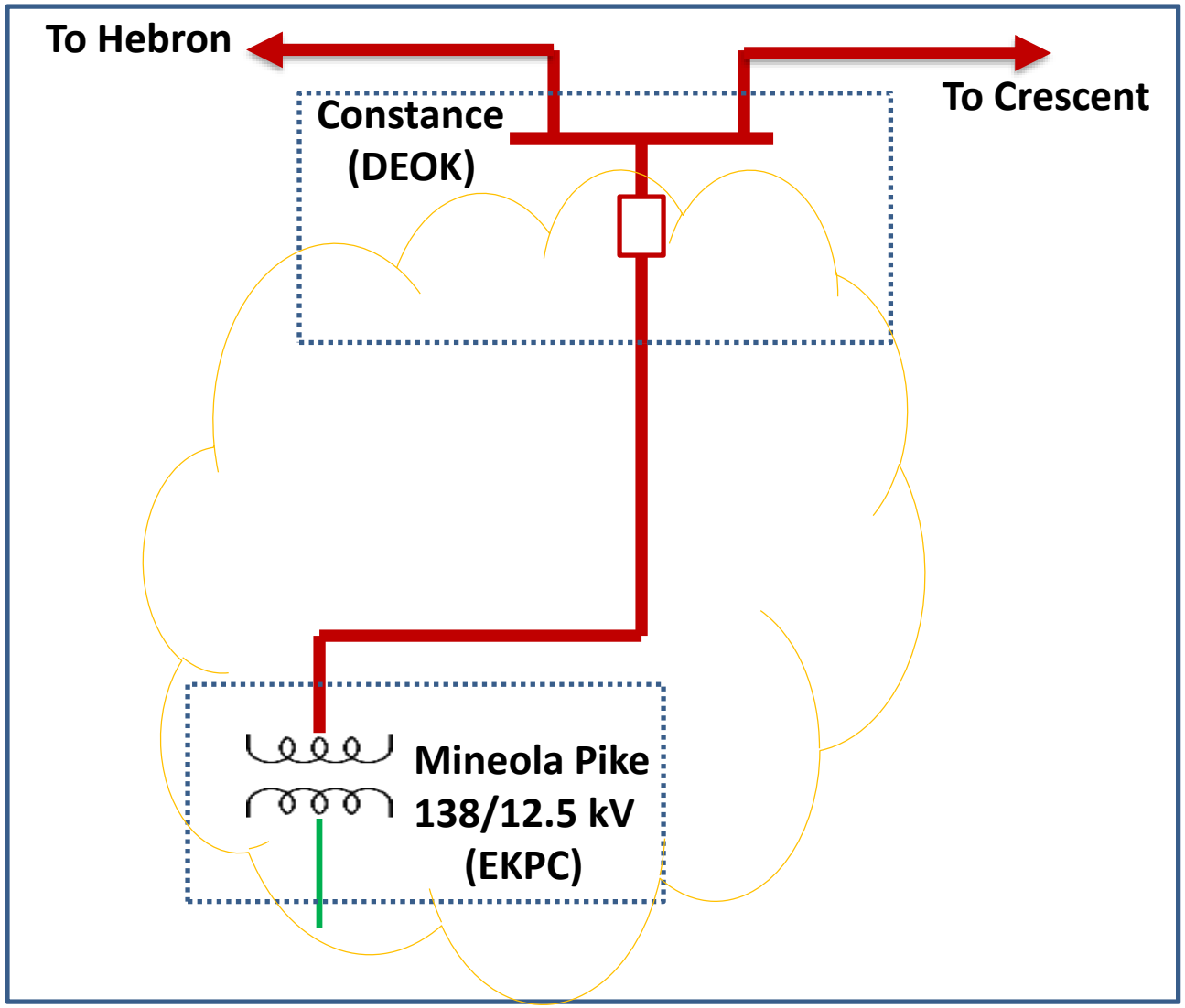
Ancillary Benefits:

Alternatives Considered:

No feasible alternatives

Projected In-Service: 12/1/2022

Project Status: Engineering



AEP Transmission Zone M-3 Process
Madison-Pendleton 138kV Line Rebuild

Need Number: AEP-2020-IM005

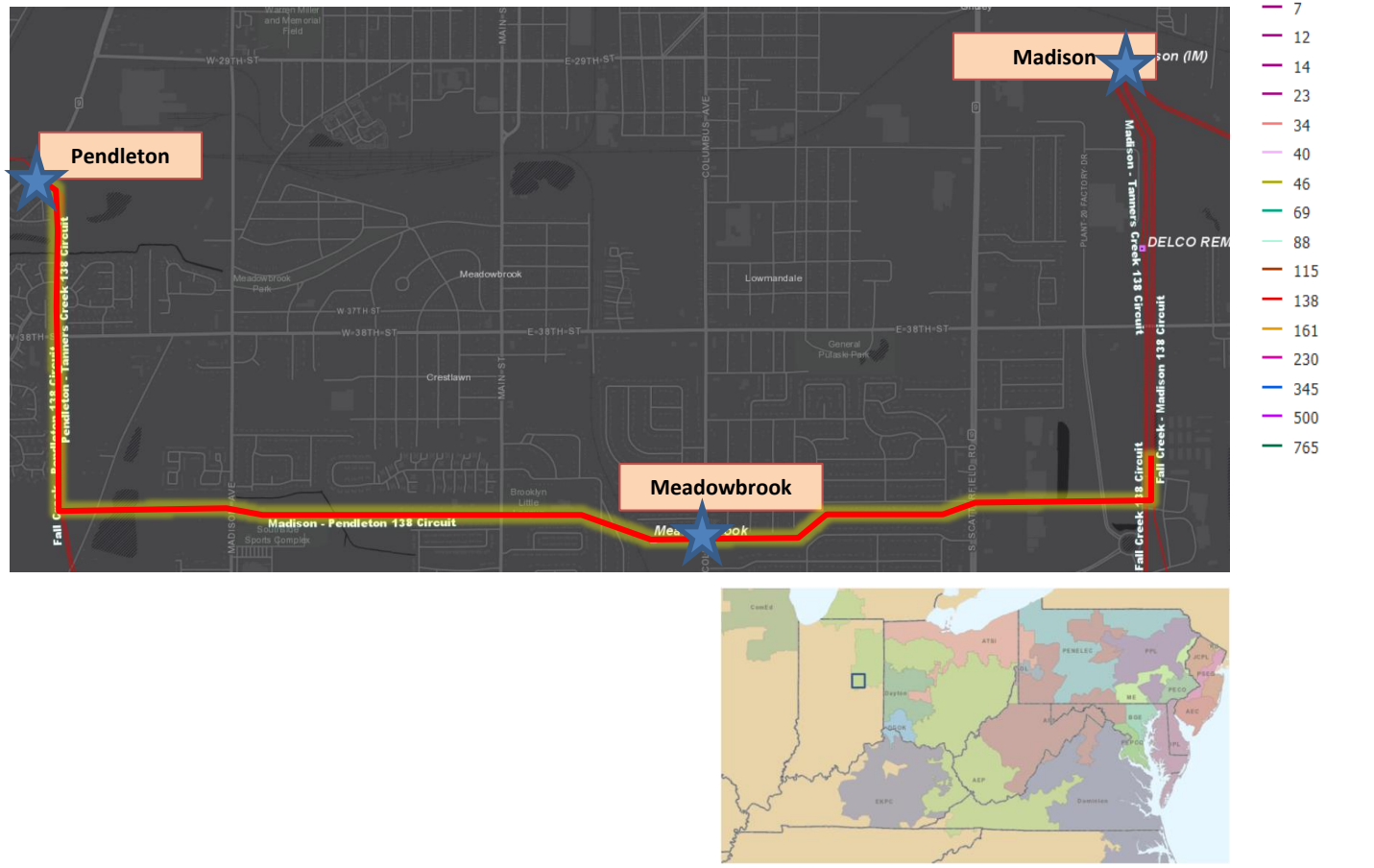
Process Stage: Solutions Meeting 05/22/2020

Previously Presented: Needs Meeting 02/21/2020
Supplemental Project Driver: Equipment Material/Condition/Performance/Risk/Operational
Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

Problem Statement:

Madison – Pendleton 138kV Line (~4.2 Miles)
- 1967 vintage wood pole, H-Frame construction
- There are currently 16 open conditions on this line (9 structures with at least one open condition or 24% of the line).
- Open conditions include: Rotting or bowed crossarms or poles, broken shield wires, and stolen ground lead wires.

Meadowbrook 138/34.5kV station
- Three-terminal line and overlapping zones of protection on the bus, line, and transformer.



AEP Transmission Zone M-3 Process
Madison-Pendleton 138kV Line Rebuild

Need Number: AEP-2020-IM005
Process Stage: Solutions Meeting 05/22/2020

Proposed Solution:

Rebuild a 4.17 mile portion of the Madison – Pendleton 138kV single circuit line with DRAKE 795 ACSR 26/7. **Estimated Cost: $7.7M**

At Meadowbrook station, install 2 138kV circuit breakers to eliminate the 3 terminal line. **Estimated Cost: $2.8M**

Total Estimated Transmission Cost: $10.5M

Alternatives Considered:
Due to the location of Meadowbrook Station, a new line route wouldn't be prudent, nor is retirement an option. Madison, Pendleton, and Meadowbrook serve as three delivery points feeding the IMPA system.

Projected In-Service: 05/01/2023
Project Status: Scoping