Reliability Analysis Update

Transmission Expansion Advisory Committee

August 8, 2019

Proposal Window Exclusion Definitions

- The following definitions explain the basis for excluding flowgates and/or projects from the competitive planning process and designating projects to the incumbent Transmission Owner.
- Flowgates/projects excluded from competition will include the underlined language on the corresponding slide.
  - Immediate Need Exclusion: Due to the immediate need of the violation (3 years or less), the timing required for an RTEP proposal window is infeasible. As a result, the local Transmission Owner will be the Designated Entity. - Operating Agreement, Schedule 6 § 1.5.8(m)
  - Below 200kV Exclusion: Due to the lower voltage level of the identified violation(s), the driver(s) for this project are excluded from the competitive proposal window process. As a result, the local Transmission Owner will be the Designated Entity - Operating Agreement, Schedule 6 § 1.5.8(n)
  - FERC 715 (TO Criteria) Exclusion: Due to the violation need of this project resulting solely from FERC 715 TO Reliability Criteria, the driver(s) for this project are excluded from the competitive proposal window process. As a result, the local Transmission Owner will be the Designated Entity - Operating Agreement, Schedule 6 § 1.5.8(o)
  - Substation Equipment Exclusion: Due to identification of the limiting element(s) as substation equipment, the driver(s) for this project are excluded from the competitive proposal window process. As a result, the local Transmission Owner will be the Designated Entity - Operating Agreement, Schedule 6 § 1.5.8(p)

2019 RTEP Analysis Update

May 22, 2019

– Preliminary 2024 results posted

- Summer Baseline and N-1 Thermal
- Summer Generator Deliverability

July 3, 2019

– 2019 Proposal Window No.1 opened

Friday, September 6, 2019

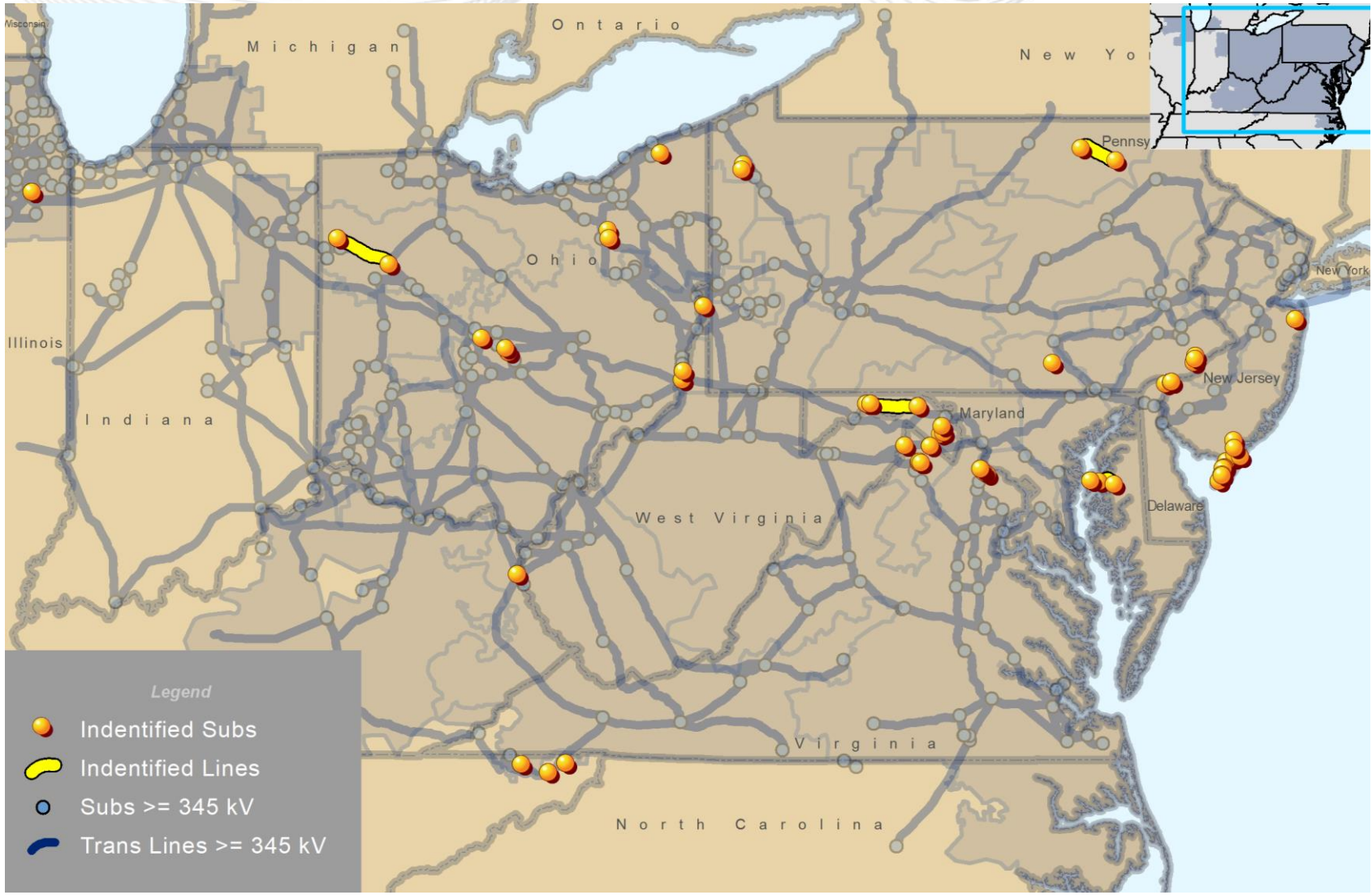
– 2019 Proposal Window No.1 closes

Analysis of 2024 - Violations

Overview of 2024 Results

Total of 136 flowgates identified

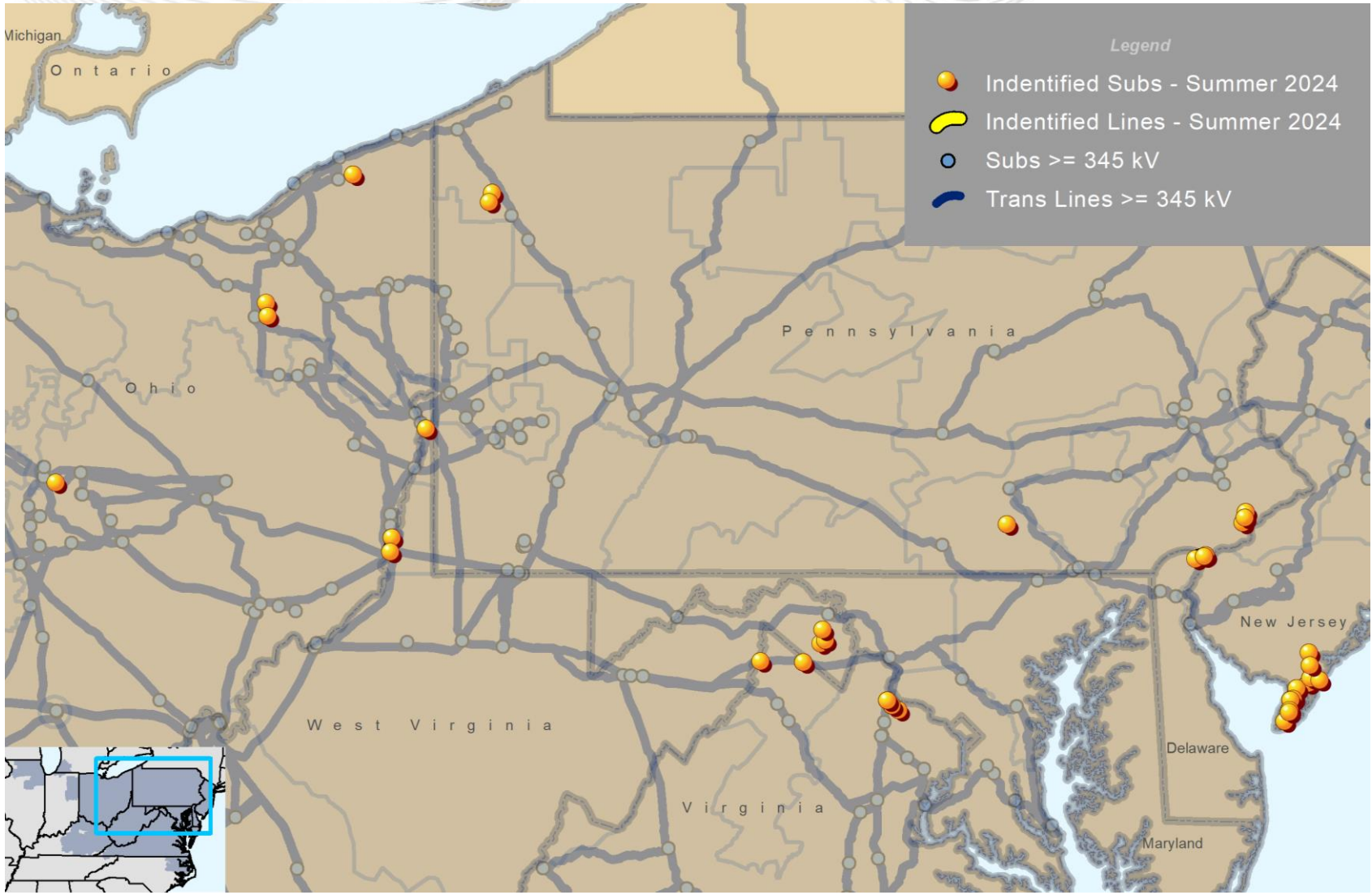
- 102 to be included in the window
  - 63 in the PJM Mid-Atlantic Region
  - 33 in PJM West Region
  - 6 in the PJM South Region
- 34 flowgates excluded
  - 9 due to the below 200 kV exclusion
  - 25 due to the substation equipment exclusion
- 19 require additional review



Analysis of 2024 - Violations

2024 Summer conditions

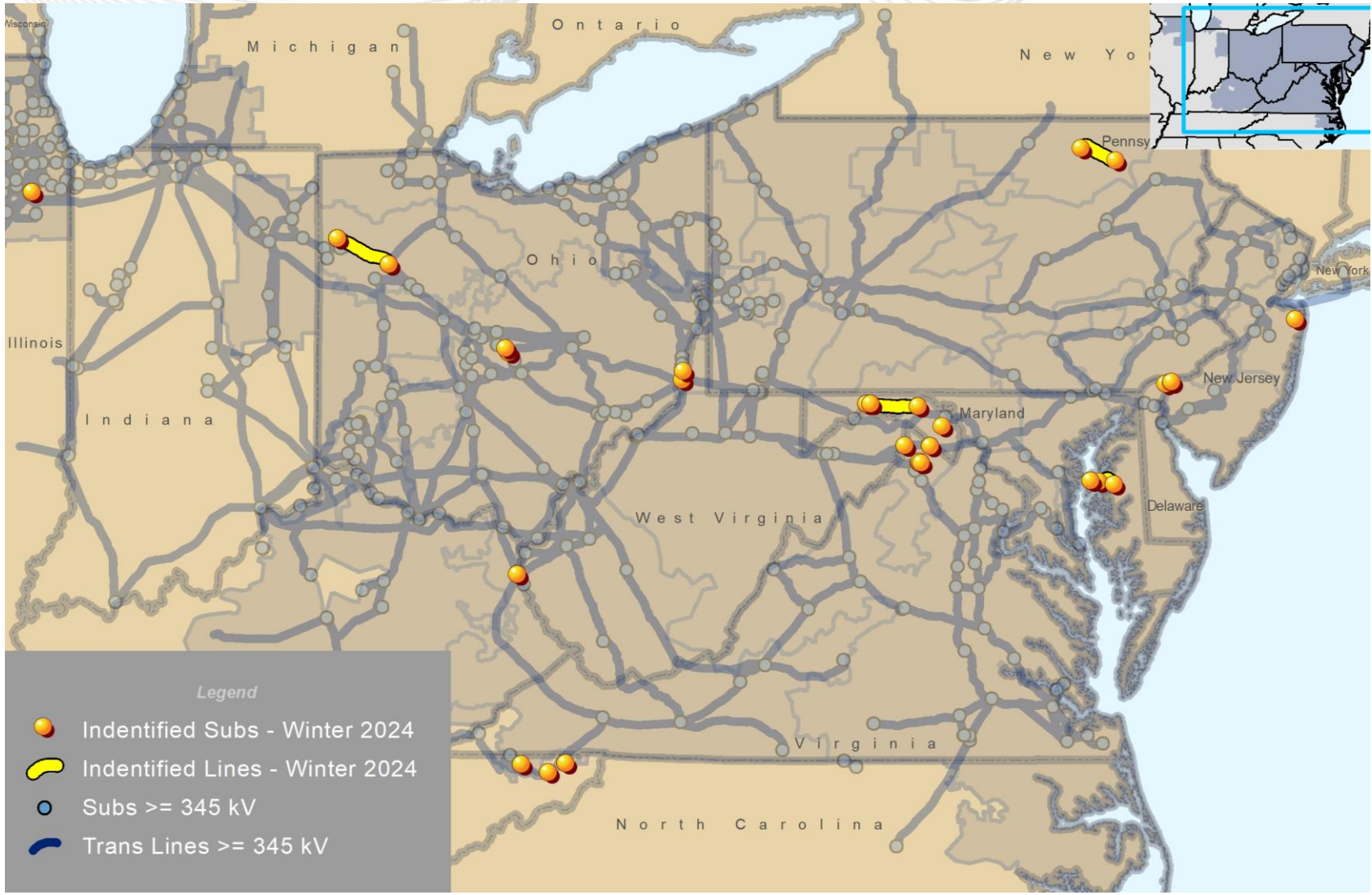
- 67 included violations
  - 45 baseline and single contingency
  - 6 generation deliverability
  - 16 N-1-1



Analysis of 2024 - Violations

2024 Winter conditions

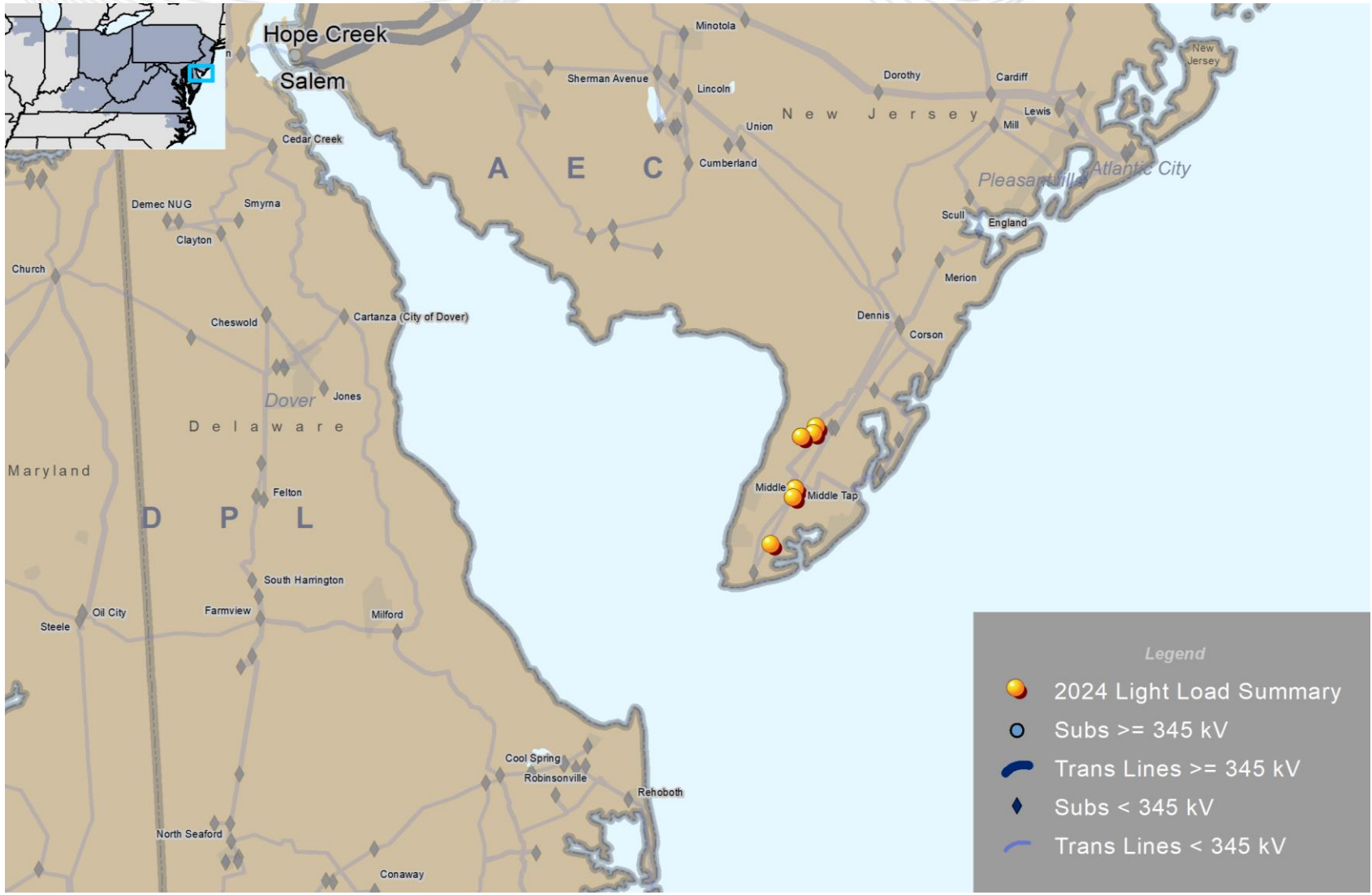
- 22 included violations
  - 6 generation deliverability
  - 16 N-1-1



Analysis of 2024 - Violations

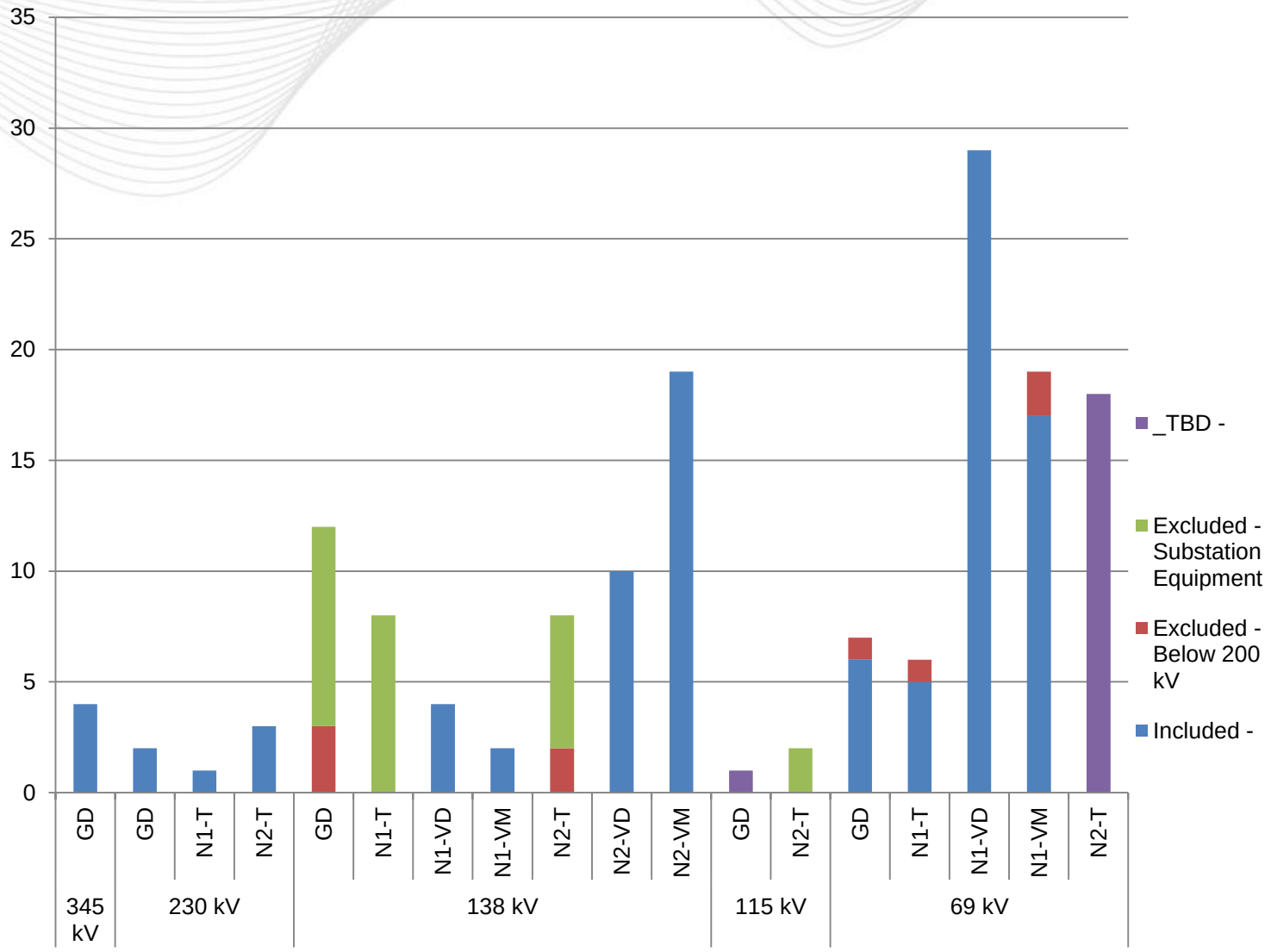
2024 Light Load conditions

- 13 N-1 Voltage Drop violations



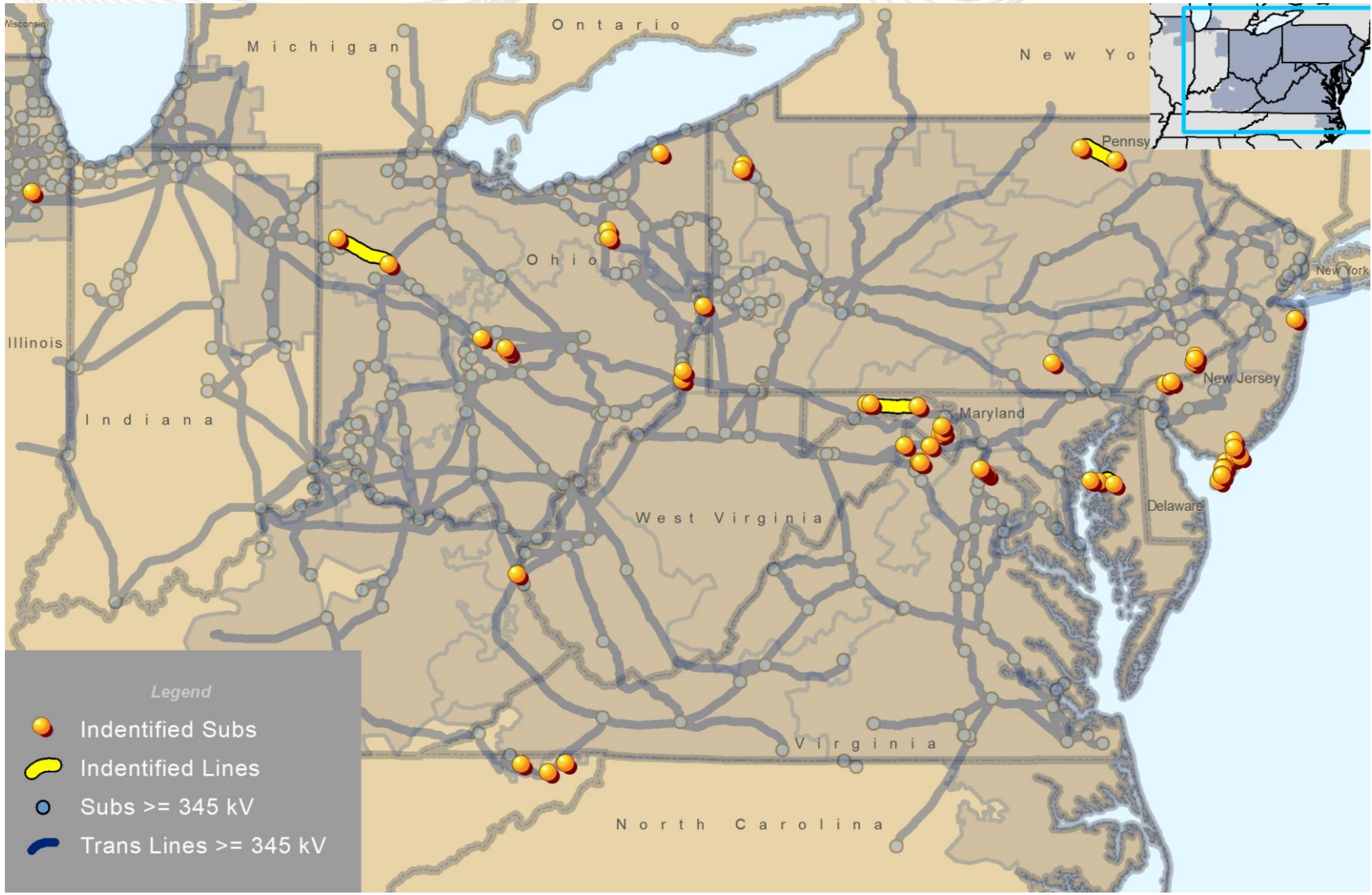
2024 Analysis Violations

Voltage / Region	Window Status: TBD	Included	Below 200 kV Exclusion	Substation Equipment Exclusion
69 kV				
PJM MA		57	4	
PJM South	6			
PJM West	12			
115 kV				
PJM MA				2
PJM South	1			
138 kV				
PJM MA		6		
PJM West		29	5	23
230 kV				
PJM South		6		
345 kV				
PJM West		4		
Grand Total	**19**	**102**	**9**	**25**



2019 RTEP Proposal Window 1 - Violations

102 flowgates are window eligible



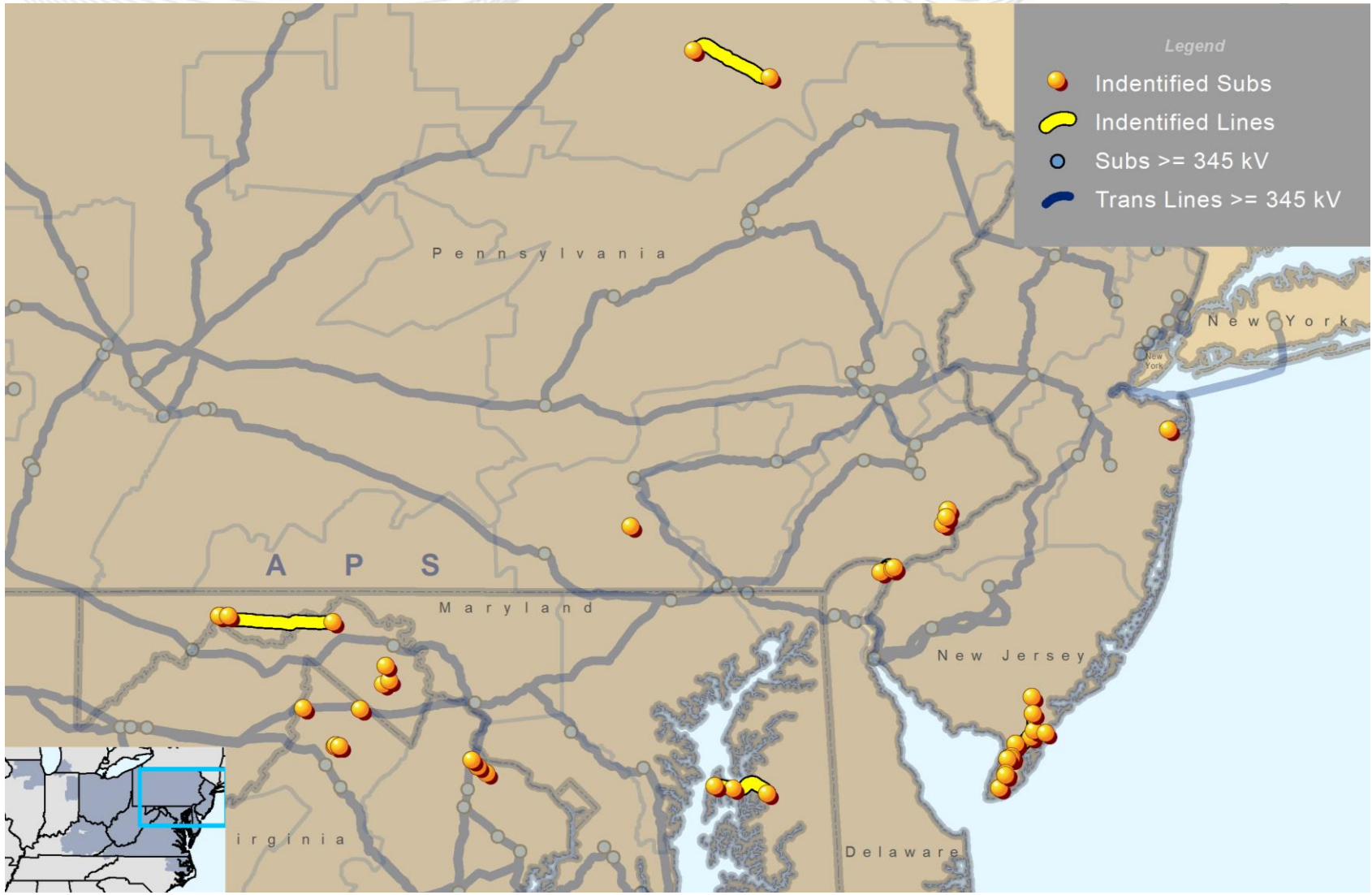
2019 RTEP Proposal Window 1 – Mid-Atlantic Results

63 Eligible Flowgates

- 5 Thermal
- 6 Generation Deliverability
- 52 Voltage

6 Flowgates Excluded from Window

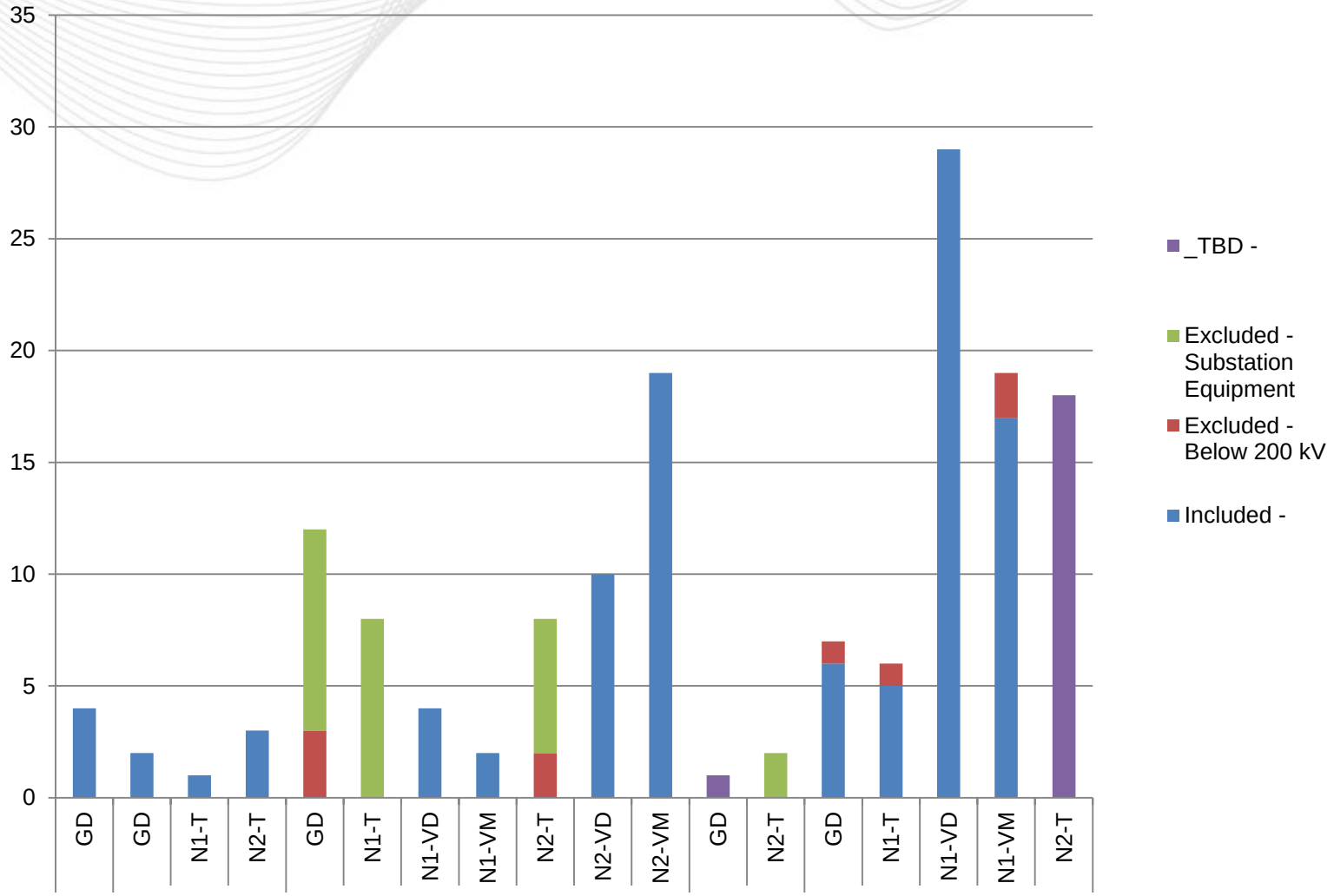
- 4 Below 200kV
- 2 Substation Equipment



2019 RTEP Proposal Window 1 – Mid-Atlantic Results

PJM Mid-Atlantic Region

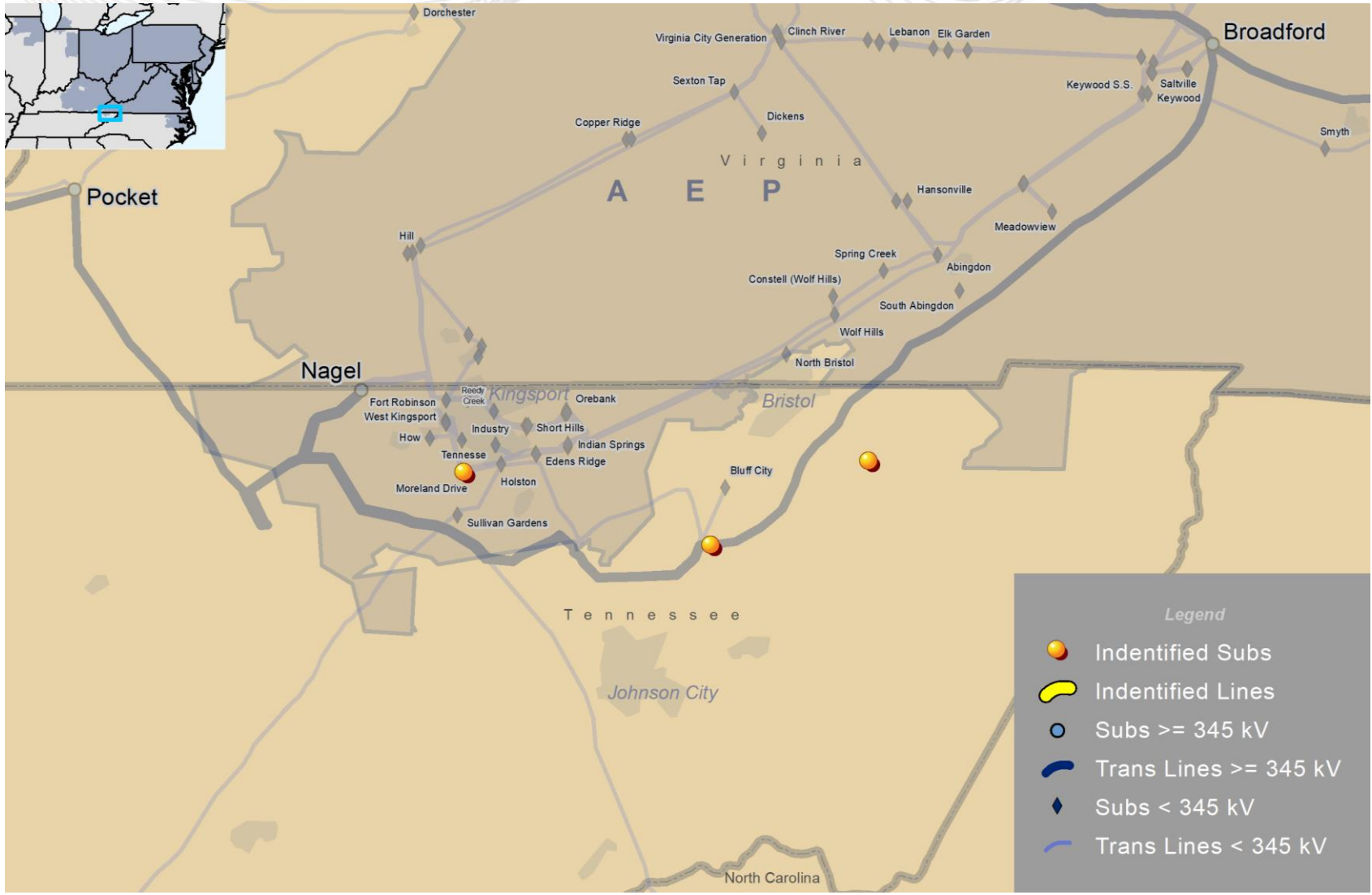
Voltage Class / Criteria Test	Proposal Window Status: Included	Below 200 kV Exclusion	Substation Equipment Exclusion
69 kV	**57**	**4**	
GD	6	1	
N1-T	5	1	
N1-VD	29		
N1-VM	17	2	
115 kV			**2**
N2-T			2
138 kV	**6**		
N1-VD	4		
N1-VM	2		
Grand Total	**63**	**4**	**2**



2019 RTEP Proposal Window 1 – South Results

6 Eligible Flowgates
- On the 230 kV system
- 2 Generation Deliverability
- 4 Thermal

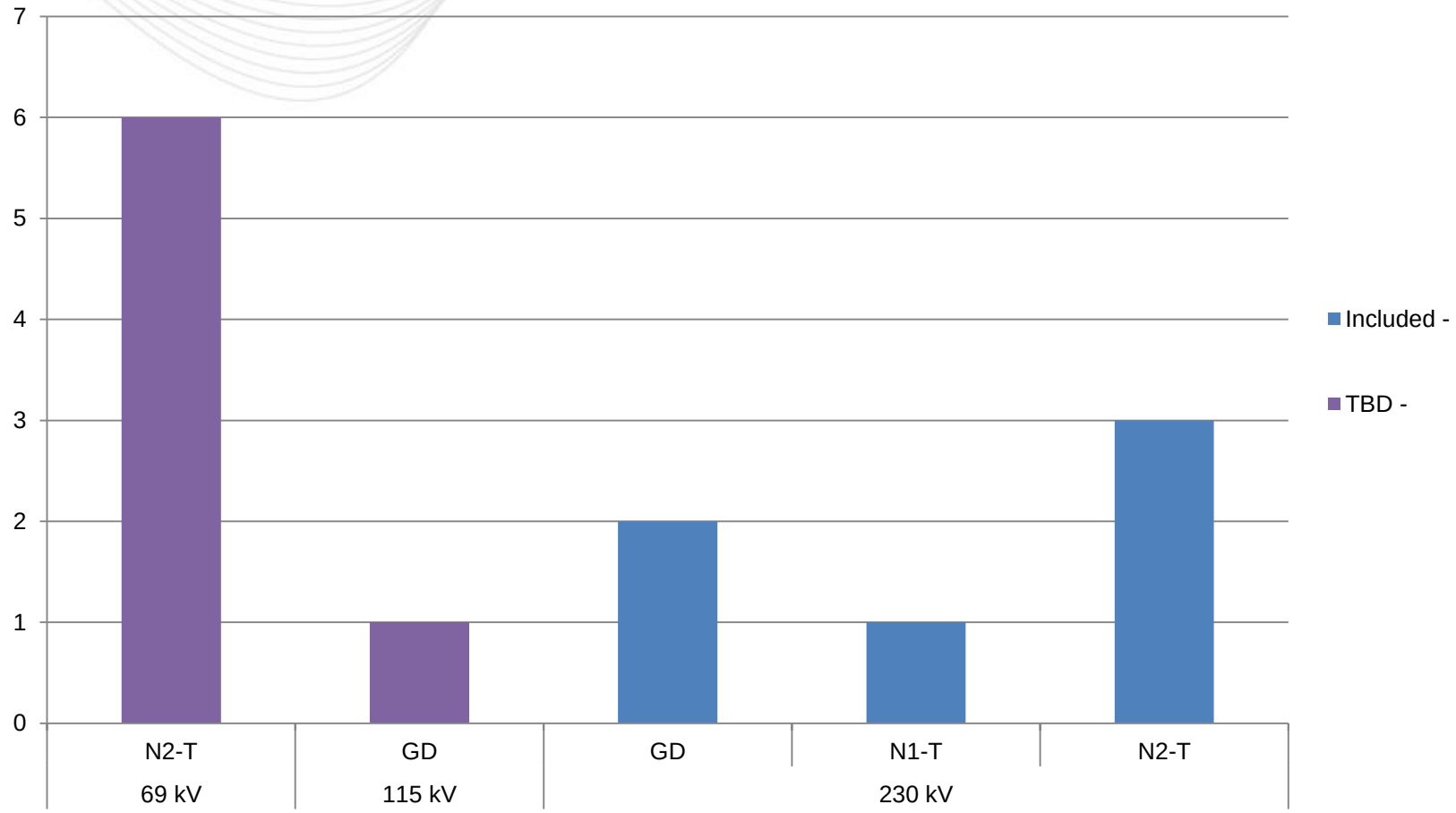
7 Flowgates Pending Review
- 6 Thermal
- 1 Generation Deliverability



2019 RTEP Proposal Window 1 – South Results

PJM South Region

Voltage Class / Criteria Test	Proposal Window Status: Included	TBD
69 kV		**6**
N2-T		6
115 kV		**1**
GD		1
230 kV	**6**	
GD	2	
N1-T	1	
N2-T	3	
Grand Total	**6**	**7**

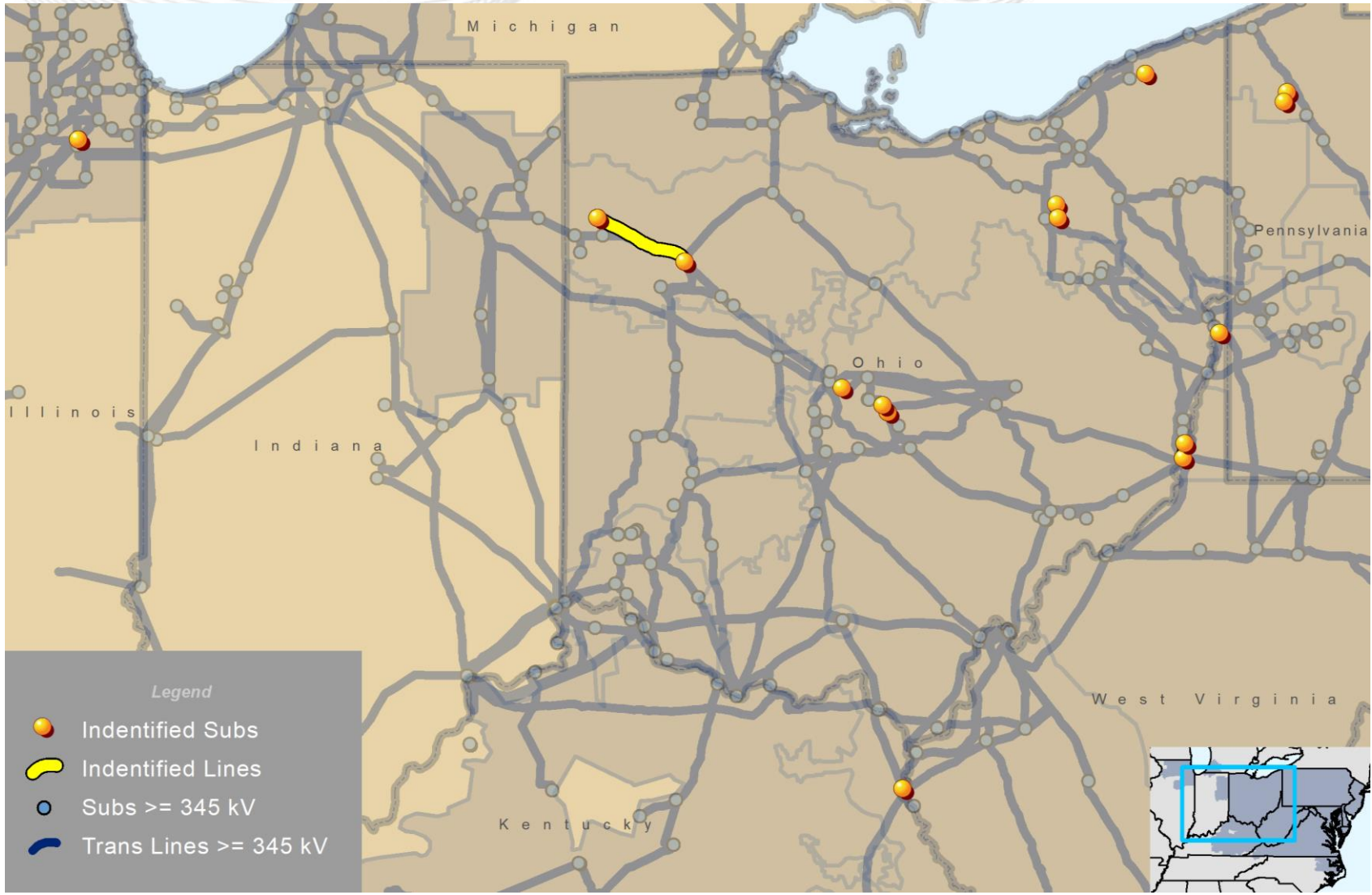


2019 RTEP Proposal Window 1 – West Results

33 Eligible Flowgates
- All on the 230 kV system
- All 4 Thermal

28 Excluded Flowgates
- 5 Below 200 kV
- 23 Substation Equipment

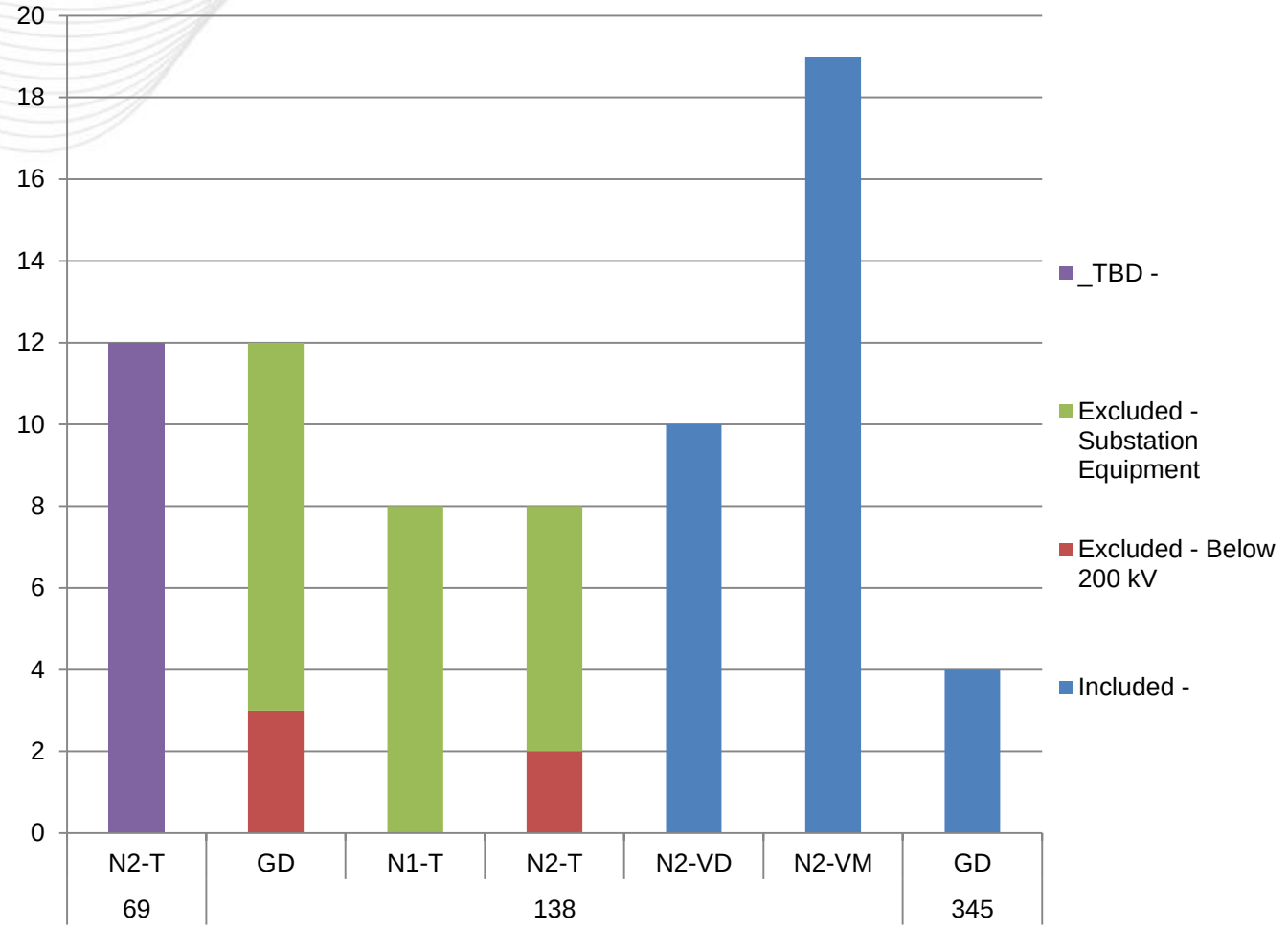
12 Flowgates Pending Review
- 6 Thermal
- 1 Generation Deliverability



2019 RTEP Proposal Window 1 – West Results

PJM West Region

Voltage Class / Criteria Test	Proposal Window Status: Included	Below 200 kV Exclusion	Substation Equipment Exclusion	TBD
69				**12**
N2-T				12
138	**29**	**5**	**23**	
GD		3	9	
N1-T			8	
N2-T		2	6	
N2-VD	10			
N2-VM	19			
345	**4**			
GD	4			
Grand Total	**33**	**5**	**23**	**12**



Dominion End of Life Criteria

Dominion Transmission Zone: Baseline Line #569 Rebuild (End of Life Criteria)

Process Stage: First Review

Criteria: End of Life

Assumption Reference: FERC 715

Model Used for Analysis: 2018 Series 2023 Summer RTEP

Proposal Window Exclusion: FERC 715 (TO Criteria)

Problem Statement:
The 500 kV Line #569, from Loudoun to Morrisville, is approximately 32 miles long and 1.3 miles of this line is constructed on CORTEN structures. A third party study (Quanta) has determined that these structures are at the end of their useful life.

Reliability studies indicate that retiring Line #569 will result in thermal overloads in accordance with P6 NERC criteria violations.

Proposed Solution:
Rebuild the 1.3 mile section of Line #569 with single-circuit 500 kV structures at the current 500 kV standard. This will increase the rating of Line #569 to 3424 MVA.

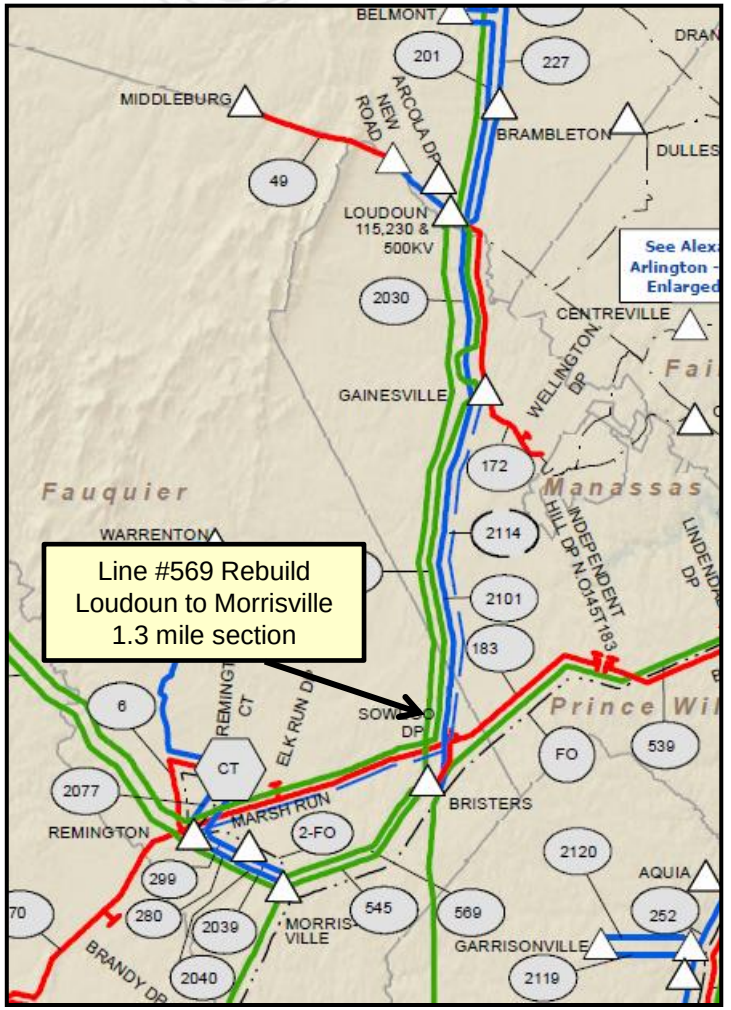
Alternative: No feasible alternatives.

Estimated Project Cost: $4.5 M

Required In-Service Date: As Soon As Possible
Projected In-Service Date: 12/31/2024

Project Status: Conceptual

COLOR	VOLTAGE	TRANSMISSION LINE NUMBER
	500 KV.	500 thru 599
	230 KV.	200 thru 299 & 2000 thru 2099
	115 KV.	1 thru 199
	138 KV.	AS NOTED
	69 KV.	AS NOTED



First Review

Baseline Reliability Projects

Re-evaluation of the B1690 (MCRP) Project

B1690 (MCRP) project timeline:

- The B1690 was initially proposed – 3Q of 2011.
- The B1690 filing with the New Jersey Board of Public Utilities – 3Q of 2016
- B1690 Evidentiary Hearings with the New Jersey Office of Administrative Law – 2Q - 3Q of 2017
- New Jersey Office of Administrative Law decision – 1Q of 2018
- New Jersey Board of Public Utilities decision – 2Q of 2018
- PJM Re-evaluation of need – 3Q of 2018 (presented at September 2018 TEAC)
- PJM and FirstEnergy development of Alternatives – 4Q 2018 through 1Q 2019
- FirstEnergy meetings with Federal, State, and Local stakeholders – 2Q through 3Q of 2019

JCP&L Transmission Zone: Baseline Monmouth County 34.5 kV Solution

Process Stage: First Review

Criteria: PJM and FirstEnergy Planning Criteria

Assumption Reference: Voltage Drop, Voltage Magnitude, and Loss of Load

Model Used for Analysis: 2018 Series 2021 and 2023 Summer RTEP

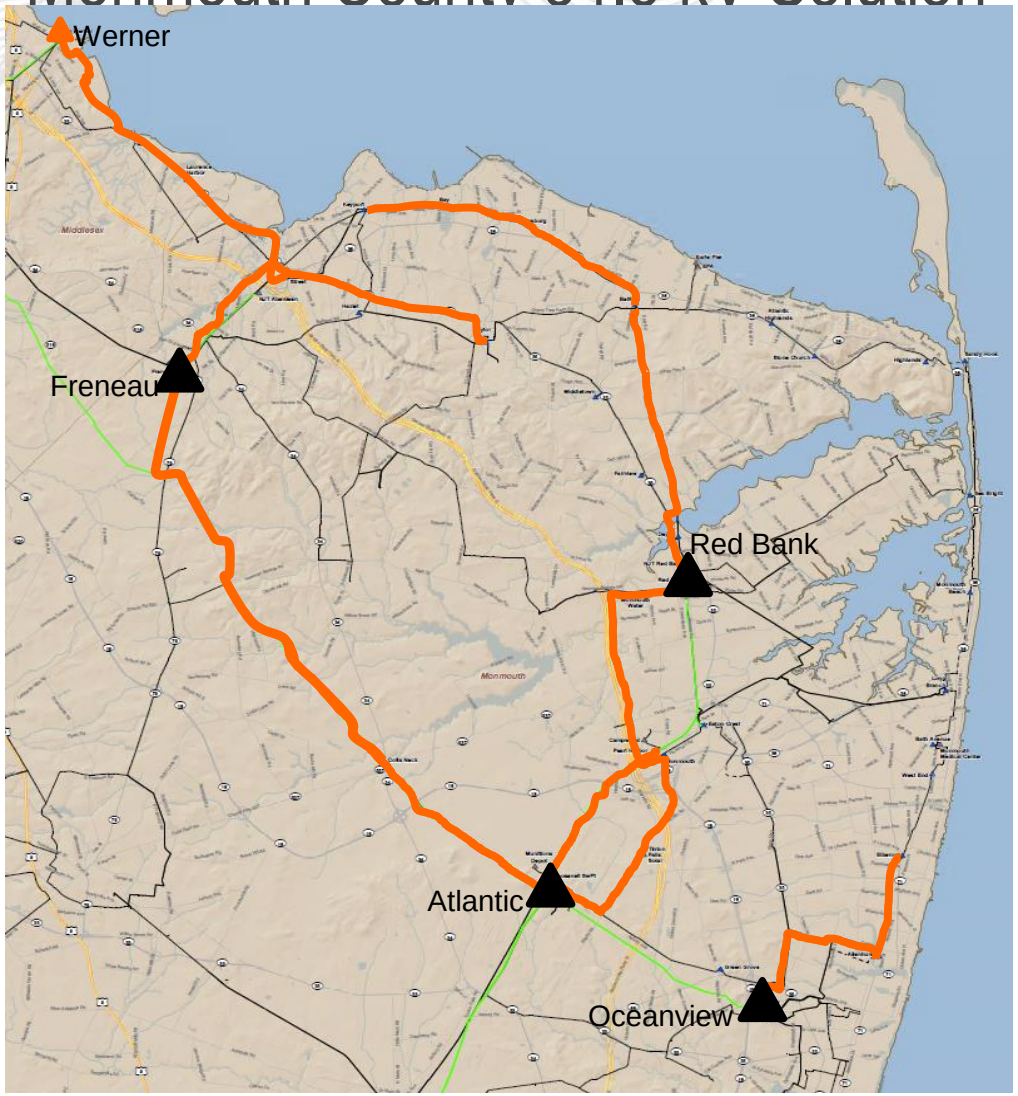
Proposal Window Exclusion: Immediate Need

Problem Statement:

- Severe voltage drop violation on the Red Bank bus for towerline outage loss of Atlantic – Red Bank 230 kV (T2020 & S1033) circuits.
- Severe voltage drop violation on the Red Bank bus for N-1-1 contingency loss of Atlantic – Red Bank 230 kV (T2020 & S1033) circuits.
- Several JCP&L 34.5 kV lines severely overloaded for the towerline outage loss of Atlantic – Red Bank 230 kV (T2020 & S1033) circuits requiring dynamic cascade analysis.
    - FirstEnergy performed dynamic cascade analysis
    - The dynamic cascade analysis resulted in tripping significant number of 34.5 kV lines and loss of >520 MW load due to voltage collapse.

Existing Facility Rating: N/A

Continued on next slide…



JCP&L Transmission Zone: Baseline Monmouth County 34.5 kV Solution

Proposed Solution:
Construct seven new 34.5 kV circuits on existing pole lines (total of 53.5* miles):

- Oceanview to Allenhurst 34.5 kV (4.0 Miles) – b1690.1
- Atlantic to Red Bank 34.5 kV (12.0 Miles) – b1690.2
- Freneau to Taylor Lane 34.5 kV (6.5 Miles) – b1690.3
- Keyport to Belford 34.5 kV (6.0 Miles) – b1690.4
- Red Bank to Belford 34.5 kV (5.0 Miles) – b1690.7
- Werner to Clark Street (7.0 Miles) – b1690.8
- Atlantic to Freneau (13.0 Miles) – b1690.9

Rebuild/Reconductor two 34.5 kV circuits (total of 5.5 miles):

- Atlantic to Camp Woods Switch Point (3.5 Miles) – b1690.5
- Allenhurst to Elberon (2.0 Miles) – b1690.6

Install 2nd 115-34.5 kV Transformer at Werner Substation – b1690.10

Estimated Project Total Cost: $175M

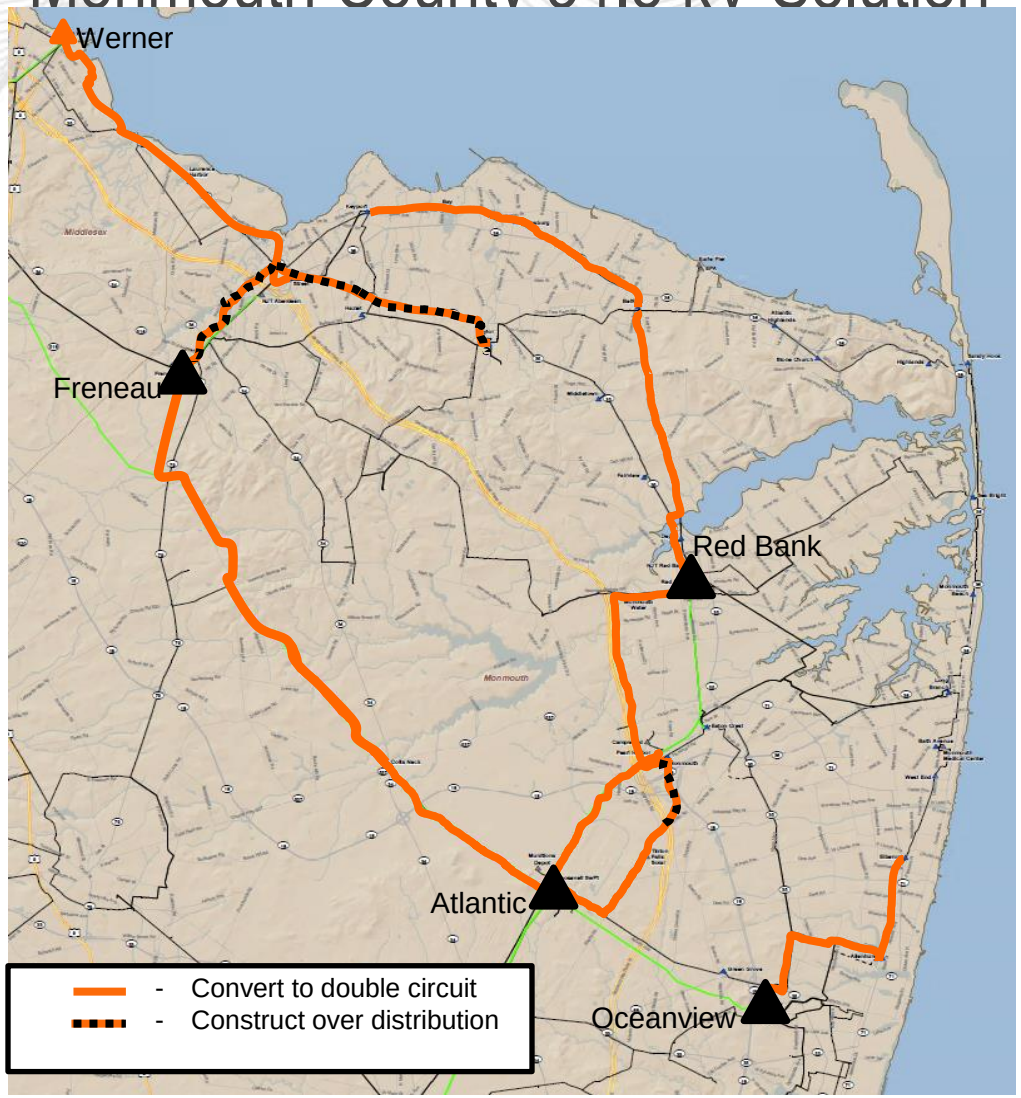
Alternatives:

1. 230 kV Transmission Line with Steel Monopoles:
   - Along Garden State Parkway - Estimated Cost $284M
   - Along NJ Route 35 - Estimated Cost $329M
2. 34.5 kV Transmission Line construction with:
   - Remedial Action Scheme (RAS) - Estimated Cost $303M
   - Battery Installations - Estimated Cost $401M

Required In-Service: Immediate Need

Project Status: Conceptual

* - 44.1 miles will be converting existing single circuit to double circuit 34.5 kV construction; 9.4 miles will be adding 34.5 kV circuit to existing distribution pole lines



2019 RTEP Next Steps

- Preliminary discussion of proposals received

Questions?

Upcoming TEAC Meetings

2019

- TEAC meetings are the following Thursdays in 2019
- 1/10, 2/7, 3/7, 4/11, 5/16, 6/13, 7/11, 8/8, **9/12, 10/17, 11/14, 12/12.**

Revision History

- V1 – 08/01/2019 – Original slides posted
- V2 – 08/02/2019 – Added Reliability Analysis slides #4 through #16