Reliability Analysis Update

Transmission Expansion Advisory Committee

July 12, 2018

2018 RTEP Analysis Update

2018 RTEP Progress Update

April 27, 2018

– Preliminary 2023 results posted

- Summer Baseline and N-1 (thermal and voltage)
- Summer Generator Deliverability

July 2, 2018

– 2018 Proposal Window #1 Opened

Friday, August 31, 2018

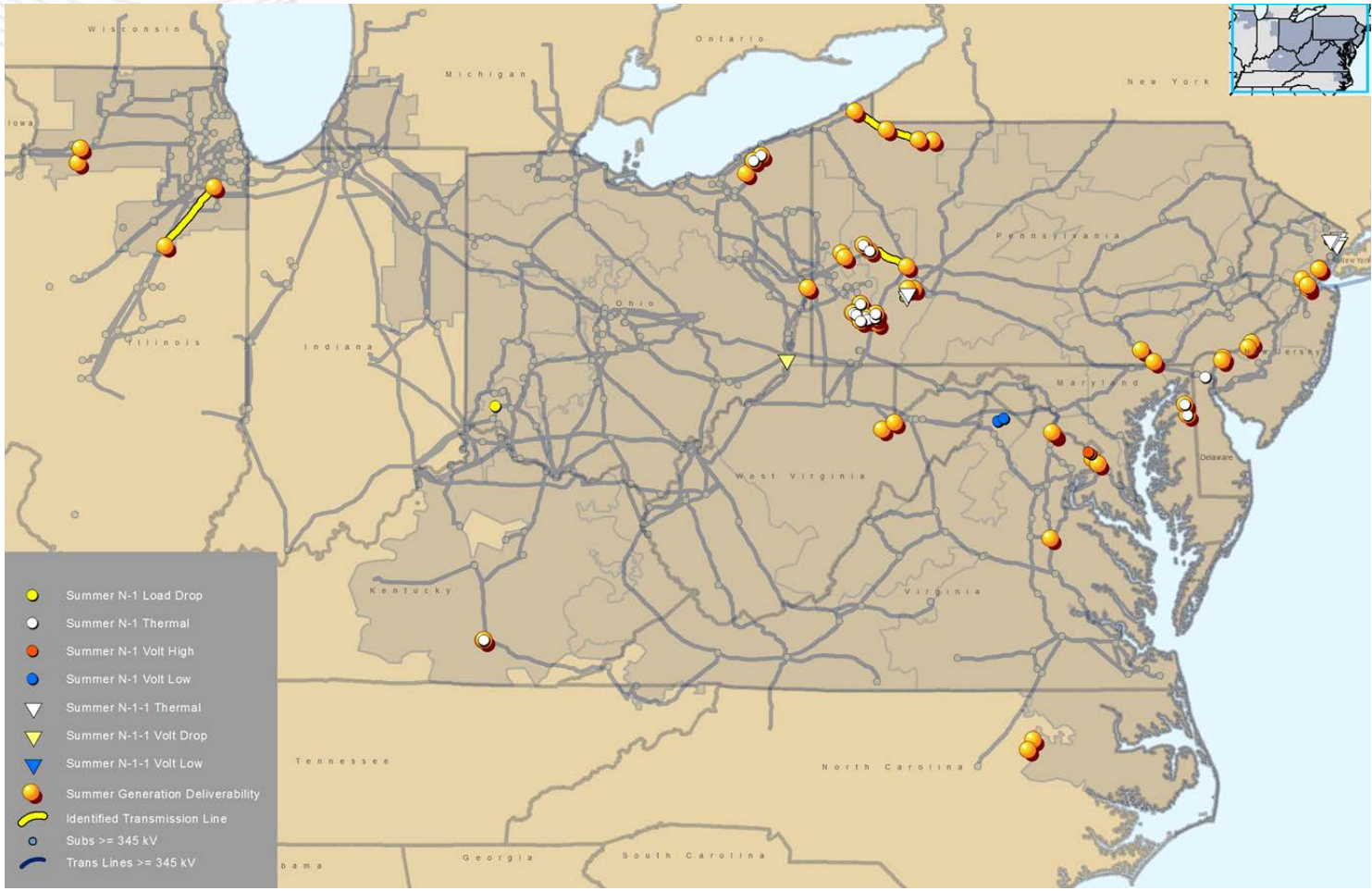
– 2018 Proposal Window #1 Will Close

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: 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): 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: 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)

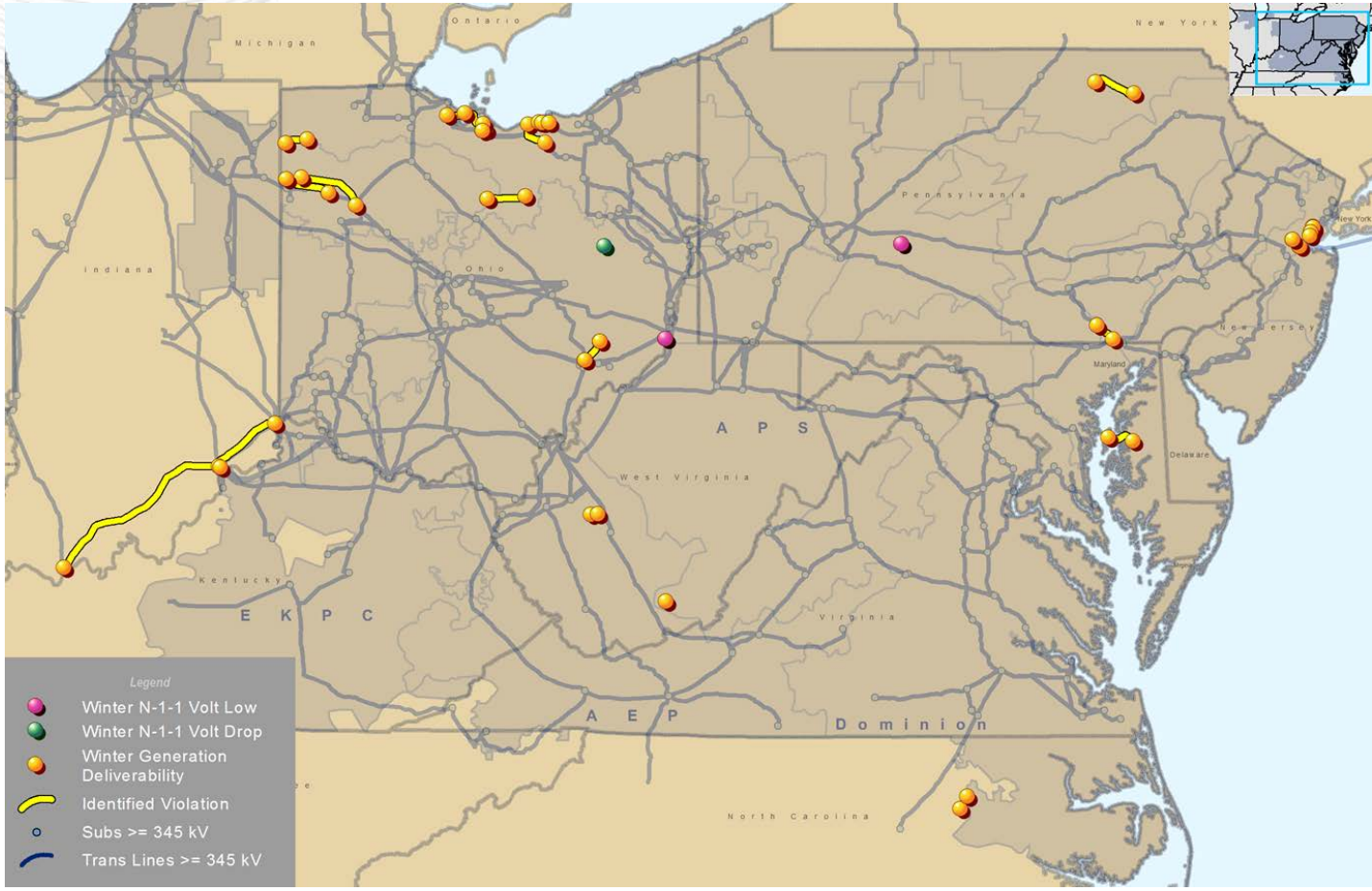
Analysis of 2023 - Violations

- Summer 2023 conditions
- Includes voltage and thermal violations



Analysis of 2023 - Violations

- Winter 2023 conditions
- Includes voltage and thermal violations



Overview of 2023 Results

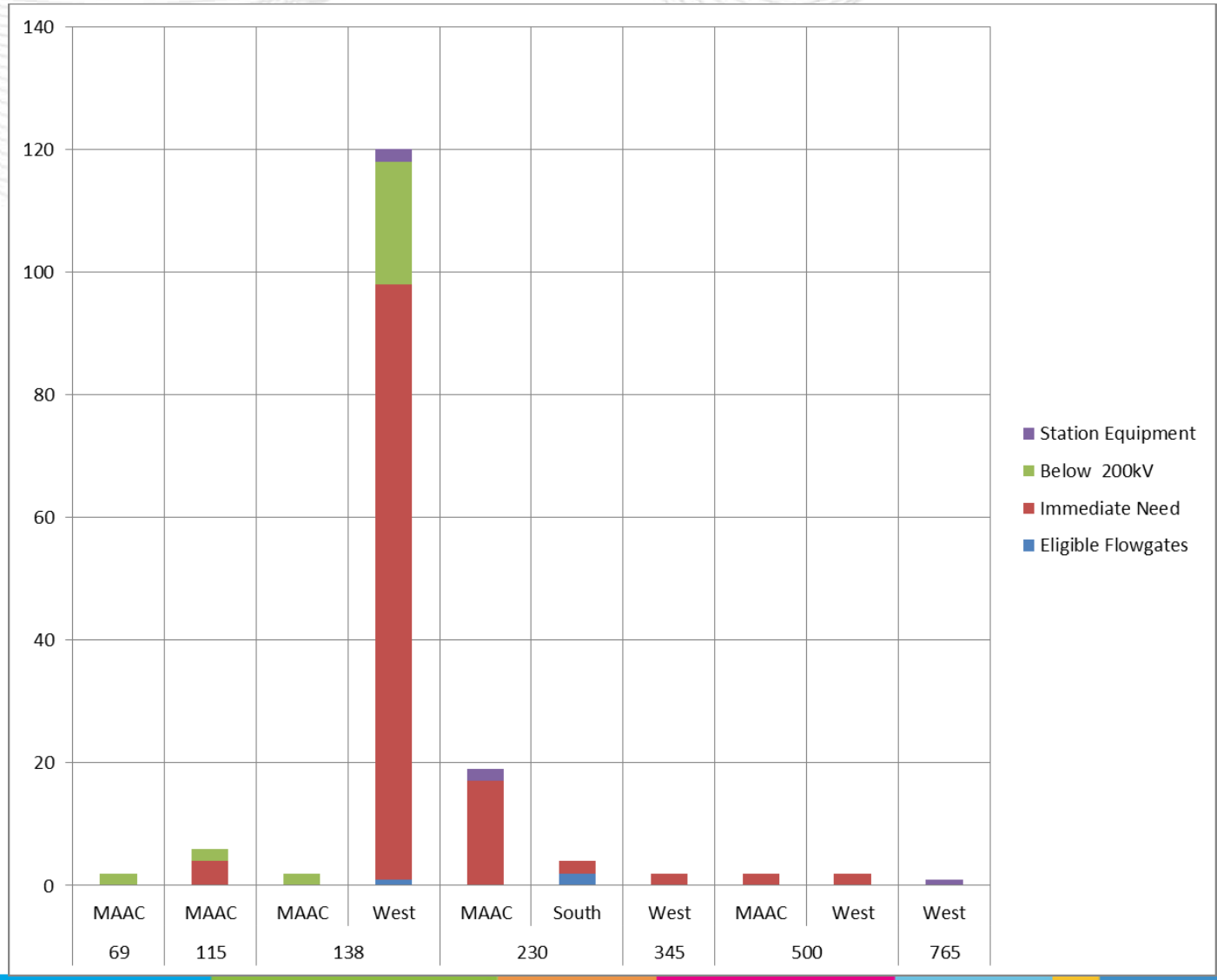
Total of 160 flowgates identified

– 3 to be included in the window
  - 1 in West region
  - 2 in the South region

– 157 flowgates excluded
  - 126 due to Immediate Need (PJM OA 1.5.8(m)) (Includes Retired Generator related)
  - 26 Below 200kV (PJM OA 1.5.8(n))
  - 5 Substation Equipment (PJM OA 1.5.8(p))

2023 Analysis Violations

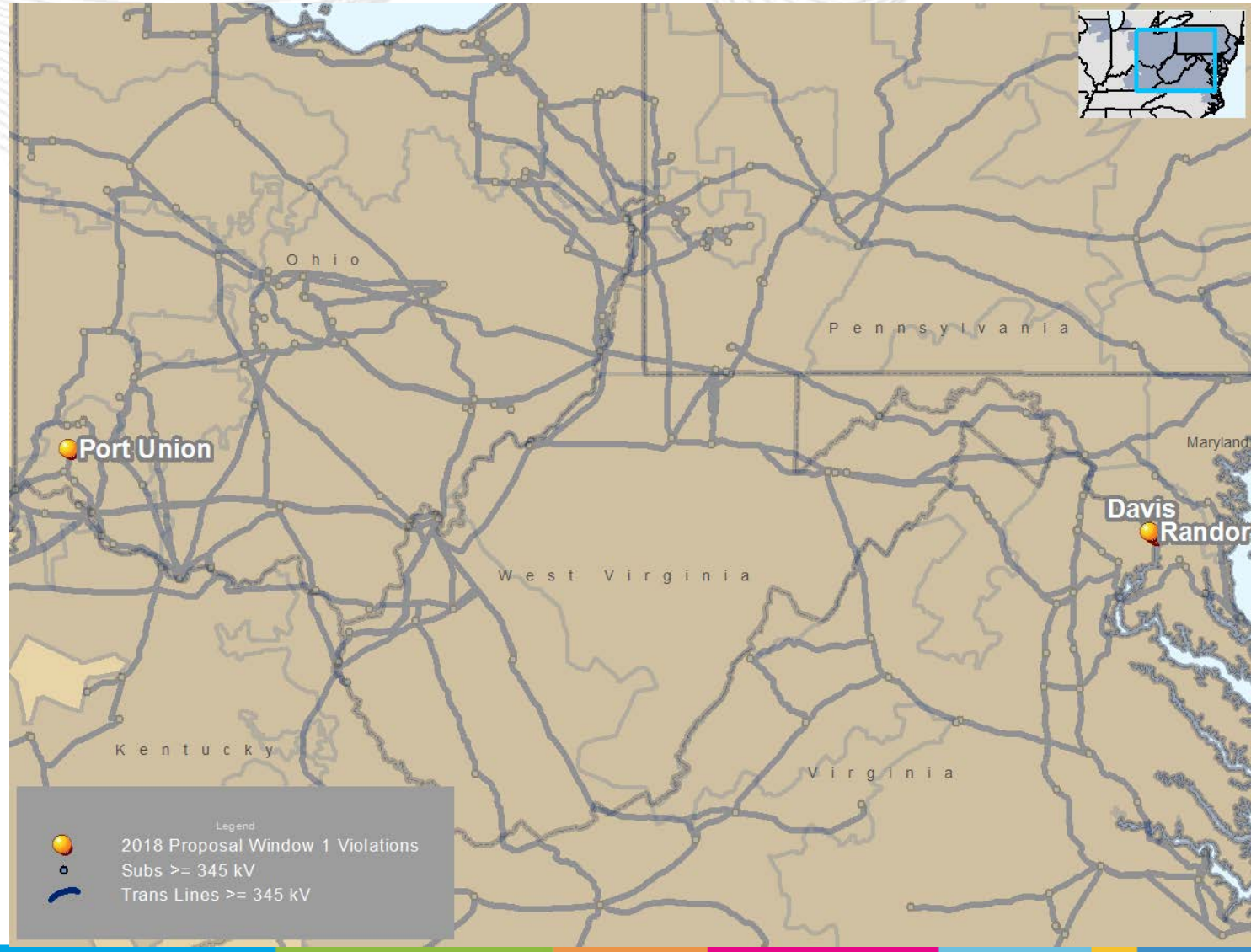
Count of Flowgates	Eligible Flowgates	Immediate Need	Below 200kV	Station Equipment
69			**2**	
MAAC			2	
115		**4**	**2**	
MAAC		4	2	
138	**1**	**97**	**22**	**2**
MAAC			2	
West	1	97	20	2
230	**2**	**19**		**2**
MAAC		17		2
South	2	2		
345		**2**		
West		2		
500		**4**		
MAAC		2		
West		2		
765				**1**
West				1
Grand Total	**3**	**126**	**26**	**5**



2018 RTEP Proposal Window 1 - Violations

3 flowgates are window eligible

- Two Voltage (DOM)
- One Load Drop (DEOK)

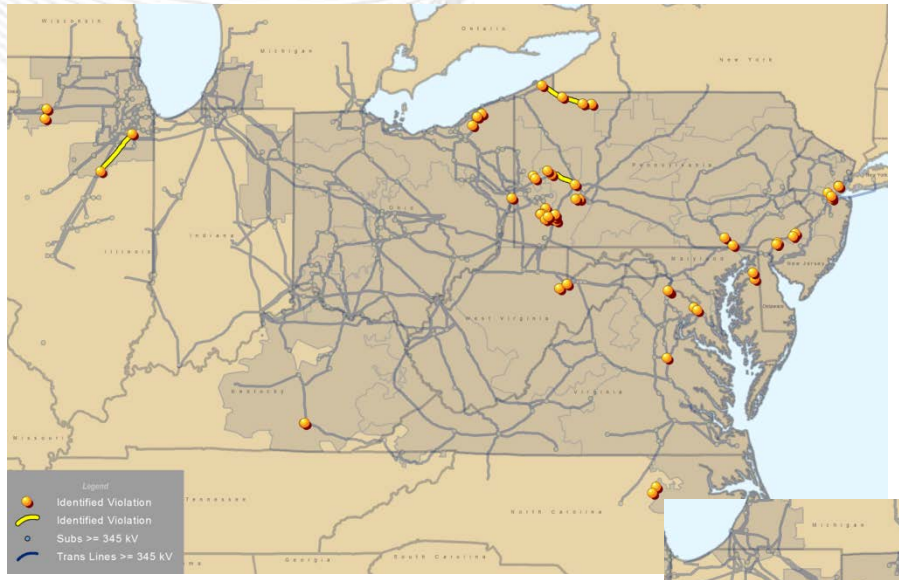


2018 RTEP Proposal Window 1 – MAAC Results

No Eligible Flowgates

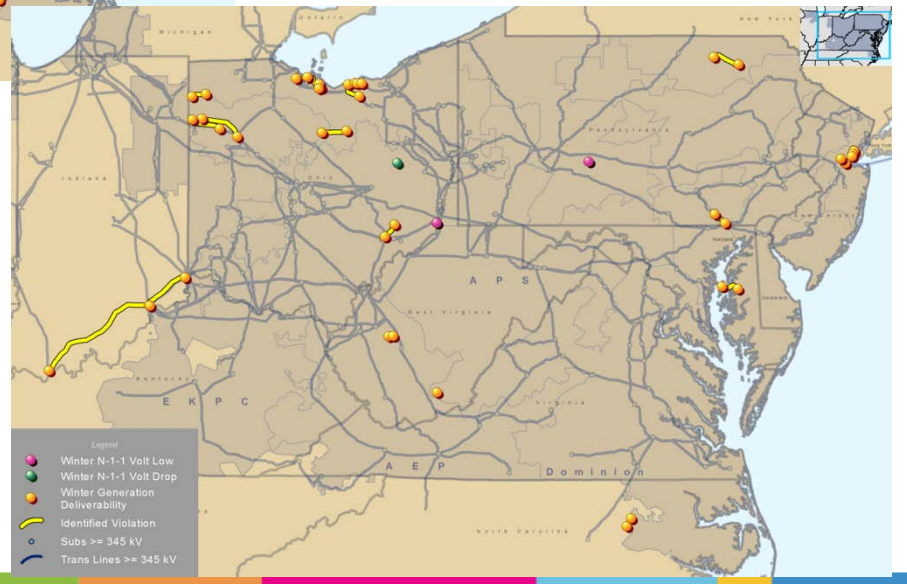
31 Flowgates Excluded from Window

- 23 Immediate Need
  - 11 due to Gen Deactivation
  - 11 due to retool of 2021 case
- 6 Below 200kV
- 2 Station Equipment



Summer Case

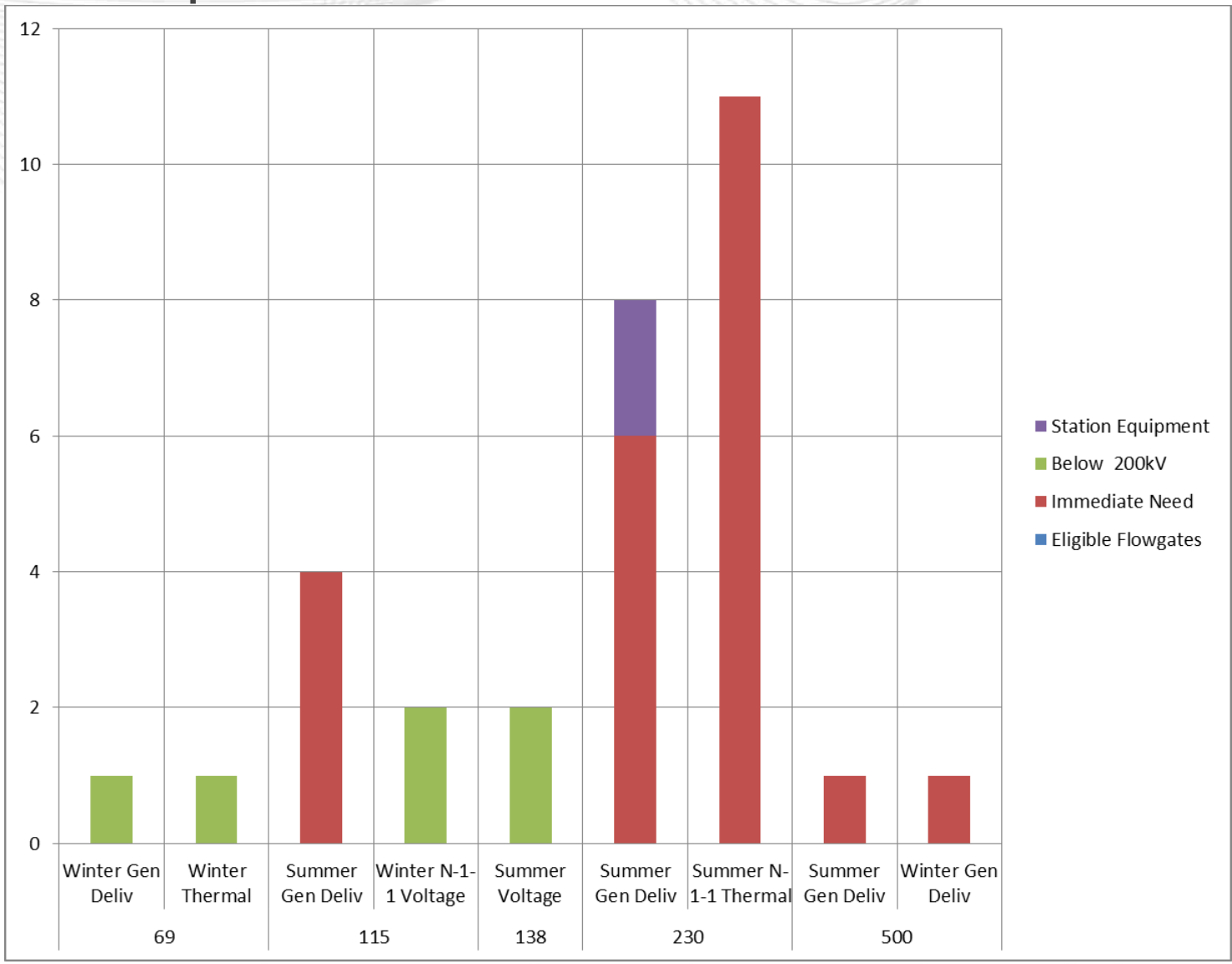
Winter Case



2018 RTEP Proposal Window 1 – MAAC Results

Region	MAAC

Count of Flowgates	Eligible Flowgates	Immediate Need	Below 200kV	Station Equipment
69			2	
Winter Gen Deliv			1	
Winter Thermal			1	
115		4	2	
Summer Gen Deliv		4		
Winter N-1-1 Voltage			2	
138			2	
Summer Voltage			2	
230		17		2
Summer Gen Deliv		6		2
Summer N-1-1 Thermal		11		
500		2		
Summer Gen Deliv		1		
Winter Gen Deliv		1		
Grand Total		23	6	2



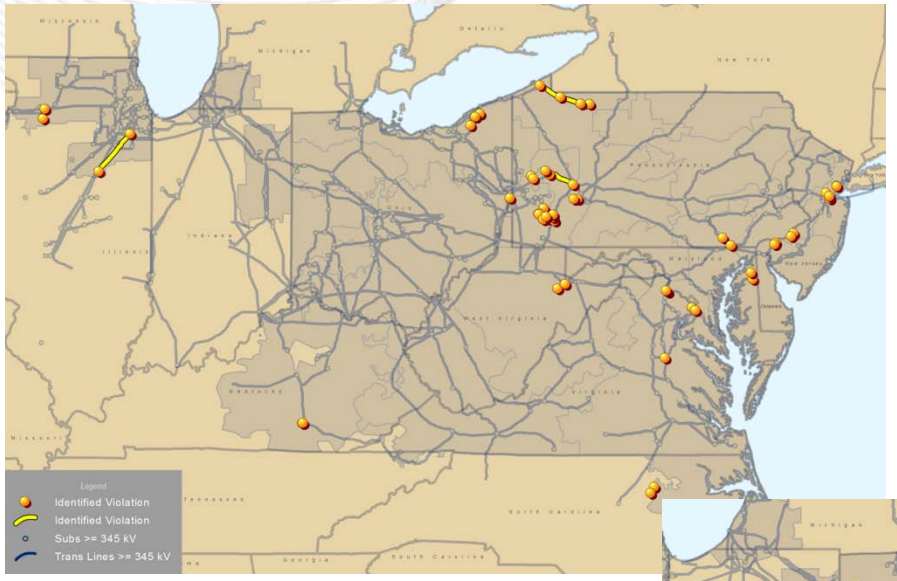
2018 RTEP Proposal Window 1 – South Results

2 Eligible Flowgates

- Summer High Voltage (DOM Zone)

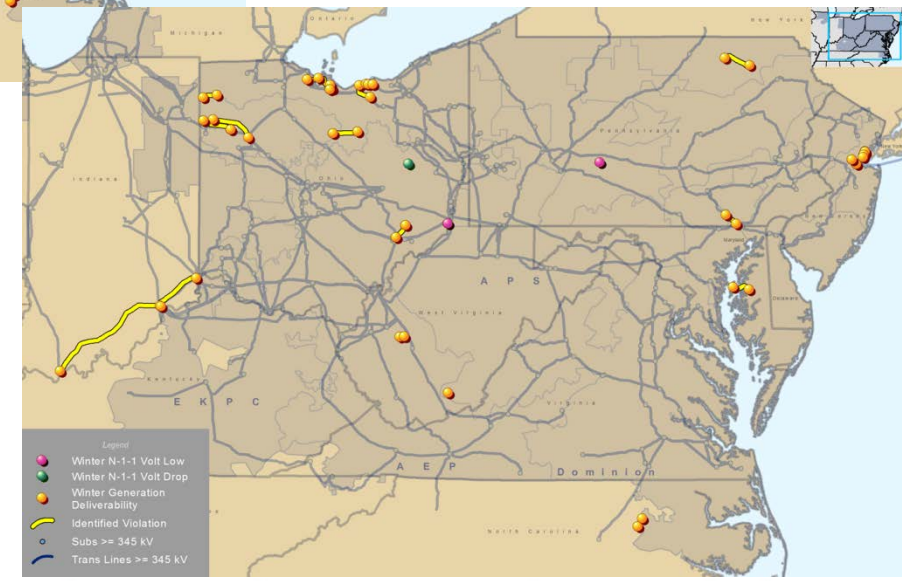
2 Flowgates Excluded from Window

- Both Immediate Need



Summer Case

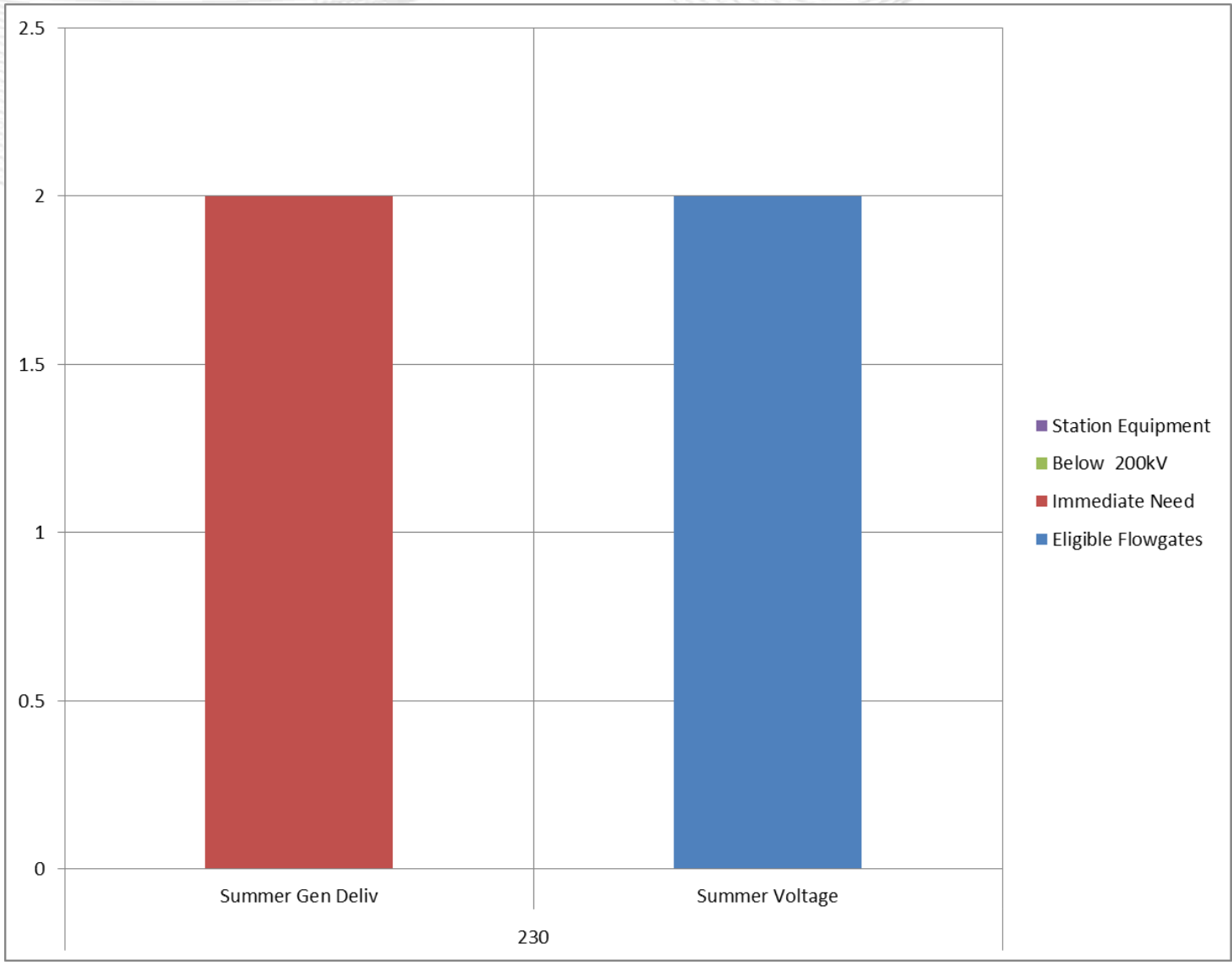
Winter Case



2018 RTEP Proposal Window 1 – South Results

Region	South

Count of Flowgates	Eligible Flowgates	Immediate Need	Below 200kV	Station Equipment
230	2	2		
Summer Gen Deliv		2		
Summer Voltage	2			
Grand Total	2	2		



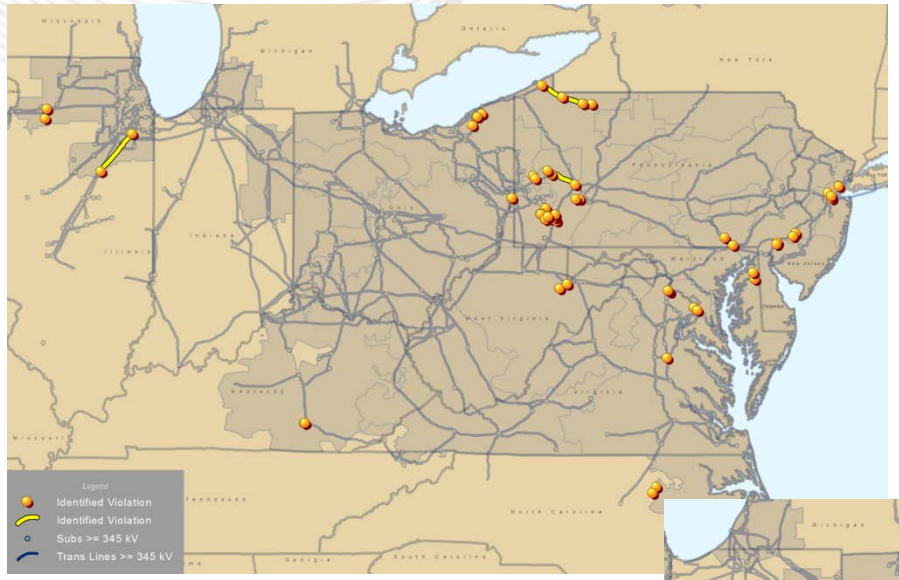
2018 RTEP Proposal Window 1 – West Results

1 Eligible Flowgate

- Summer Load Drop (DEOK Zone)

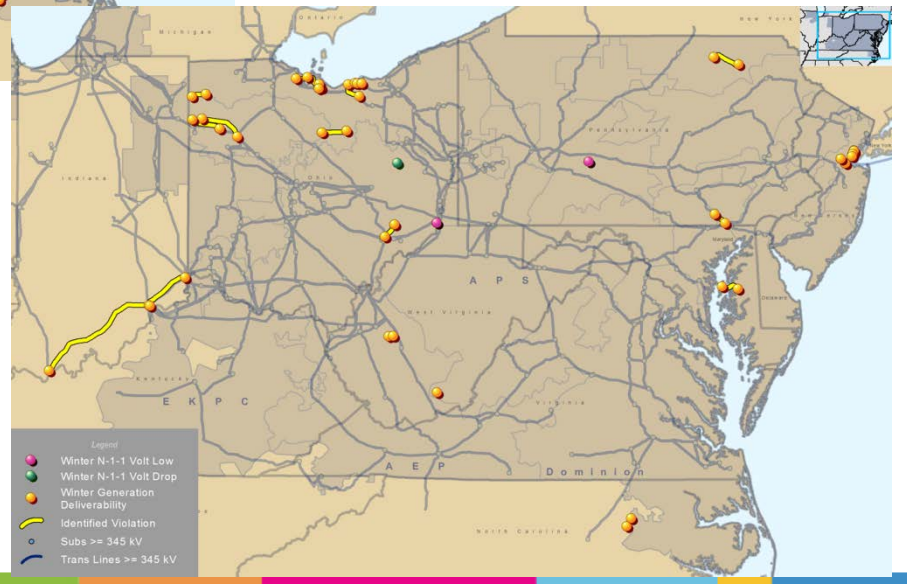
124 Flowgates Excluded from Window

- 101 Immediate Need
  - 92 due to generation retirements
  - 7 due to retool of 2021 case
  - 2 due to queue projects
- 20 Below 200kV
- 3 Station Equipment



Summer Case

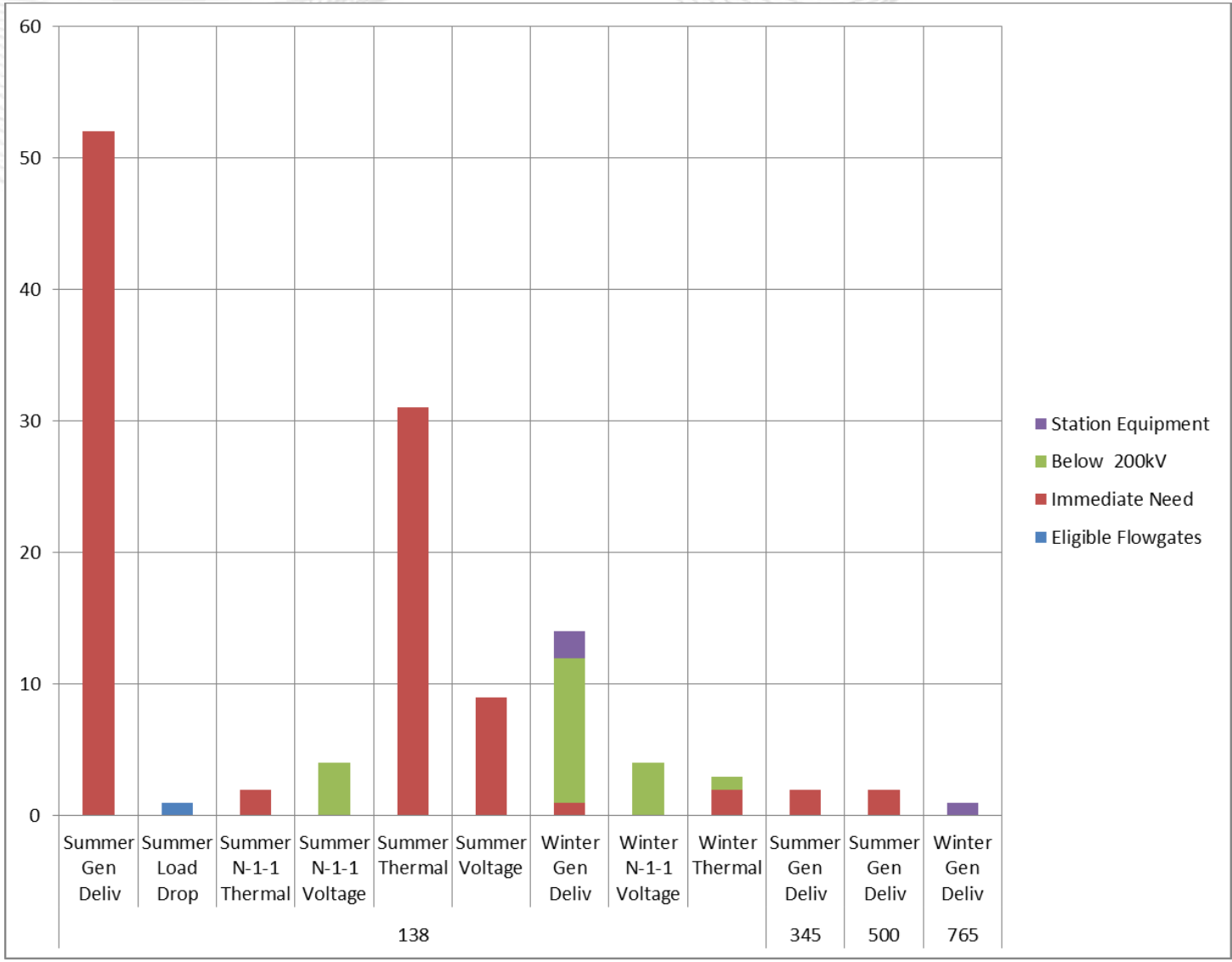
Winter Case



2018 RTEP Proposal Window 1 – West Results

Region	West

Count of Flowgates	Eligible Flowgates	Immediate Need	Below 200kV	Station Equipment
138	1	97	20	2
Summer Gen Deliv		52		
Summer Load Drop	1			
Summer N-1-1 Thermal		2		
Summer N-1-1 Voltage			4	
Summer Thermal		31		
Summer Voltage		9		
Winter Gen Deliv		1	11	2
Winter N-1-1 Voltage			4	
Winter Thermal		2	1	
345		2		
Summer Gen Deliv		2		
500		2		
Summer Gen Deliv		2		
765				1
Winter Gen Deliv				1
Grand Total	1	101	20	3



Dominion End of Life Criteria

Dominion Transmission Zone Baseline Project

Existing b2960 Cost Increase

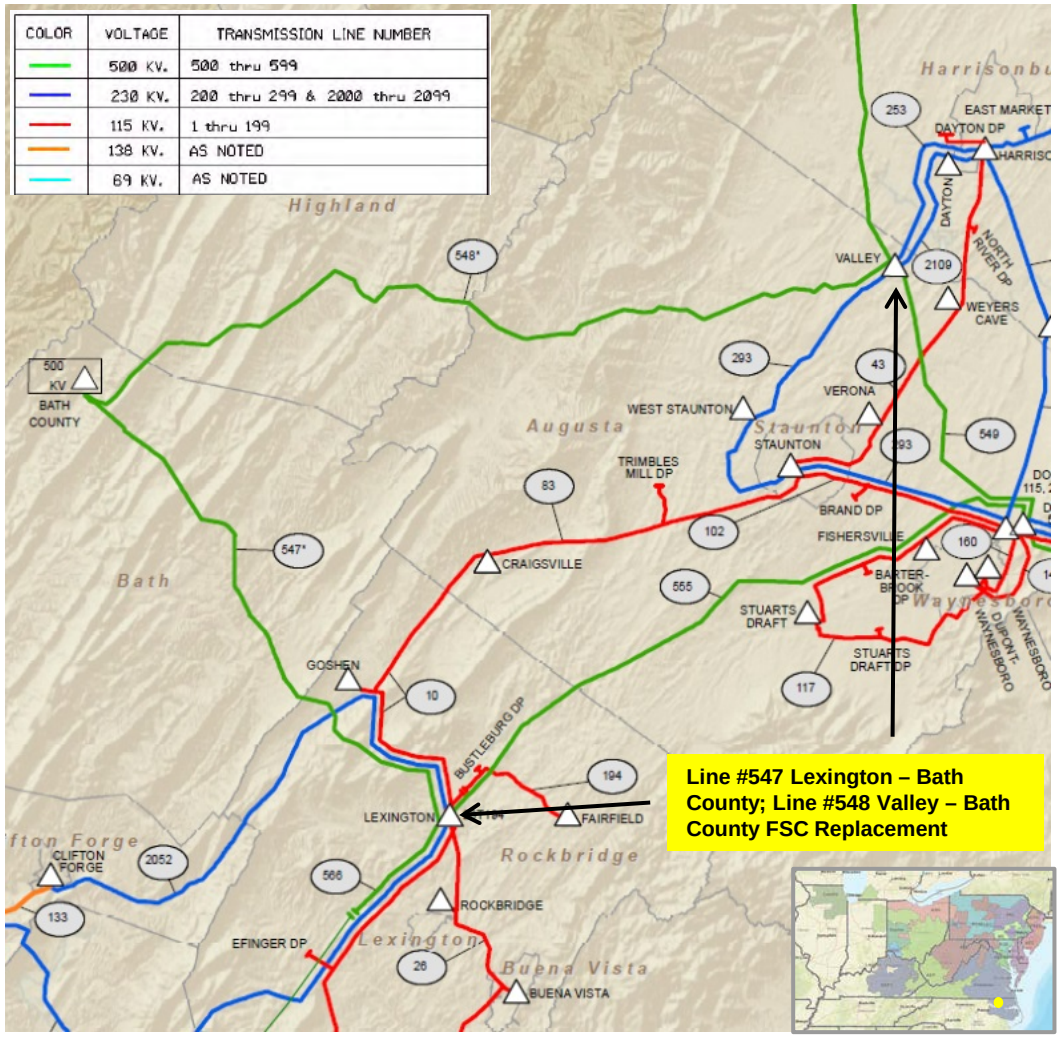
Baseline Reliability - TO Criteria Violation

Replacement of Fixed Series Capacitors on Line #547 Lexington–Bath County & Line #548 Valley–Bath County

Date Project Last Presented: 10/12/2017 TEAC & 11/02/2017 TEAC

Problem Statement: Dominion "End of Life Criteria"

- The fixed series capacitors (FSC) on 500kV Line #547 at Lexington and on 500kV Line #548 at Valley were constructed in 2000/2001 to mitigate the Bath County angular stability issue. These two series capacitors need to be rebuilt to current standards based on Dominion's "End of Life" criteria. The existing summer emergency rating (Rating B) of the FSCs is 3118 MVA. The existing summer emergency rating for the line segments is 3954 MVA.
- Replacement is needed because:
  - Existing series capacitor units run out of spare parts, manufacturer no longer produce parts for legacy models.
  - The breaker module of the capacitor has a current rating of 3000 Amps, which makes the FSCs the thermal limiting factor (normal operation rating 2858 MVA; emergency rating 3118 MVA) to the transmission line (normal operation rating 3954 MVA ; emergency rating 3954 MVA).



Continued on next slide…

Dominion Transmission Zone Baseline Project

Existing b2960 Cost Increase

Baseline Reliability - TO Criteria Violation

Replacement of Fixed Series Capacitors on Line #547 Lexington–Bath County & Line #548 Valley–Bath County

Date Project Last Presented: 10/12/2017 TEAC & 11/02/2017 TEAC

Recommended (Board Approved) Solution:

- Replace the existing FSCs with newer models of the same size. The current rating on the device will be increased from 3kA to 4kA for normal operation to provide higher thermal capacity. **(b2960) (Original Estimated Project Cost: $28.9M)**

Reason for Cost Increase:

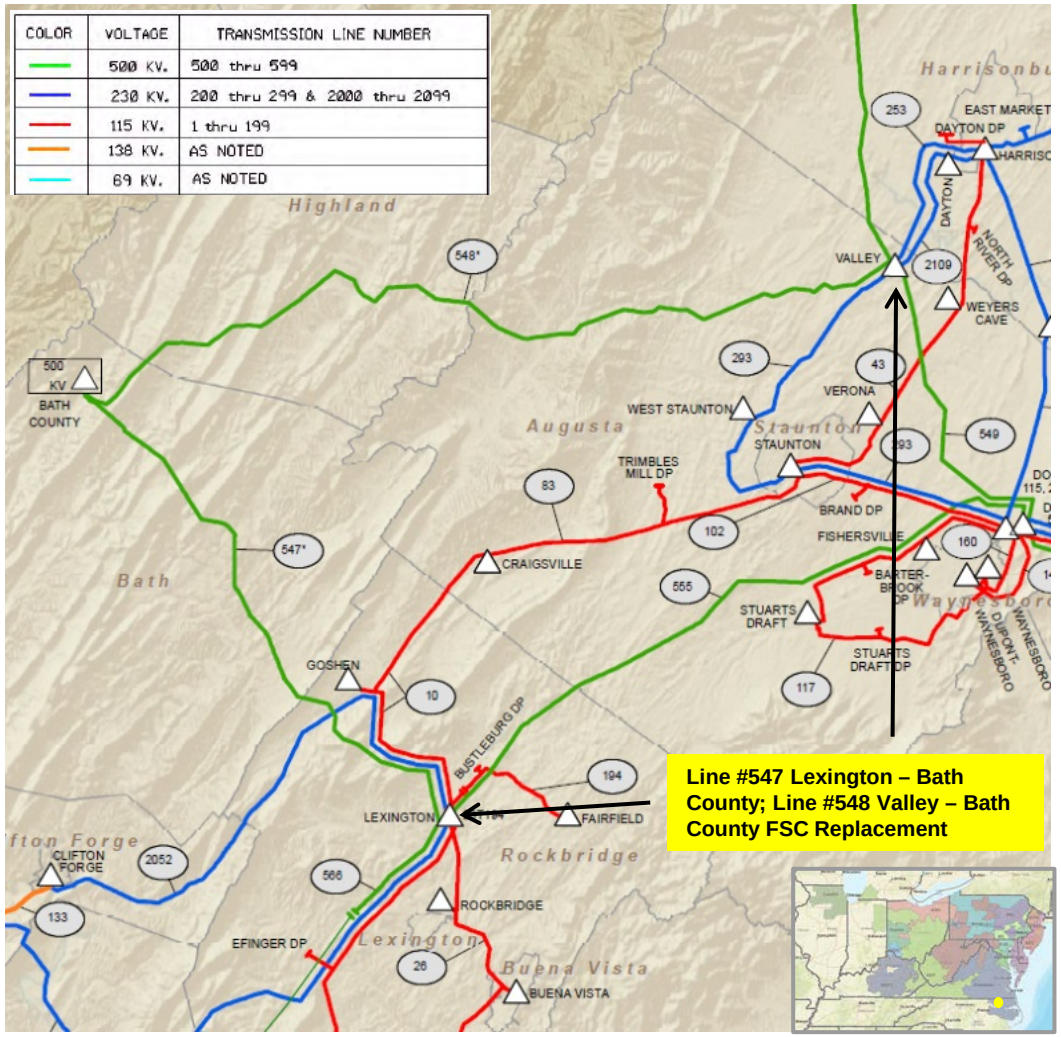
- Refined, detailed cost estimate updates including the fixed series capacitor bank devices, materials, construction, engineering, land acquisition and development.

Revised Estimated Project Cost:

FSC on Line #547 at Lexington substation	**$ 21 M**
FSC on Line #548 at Valley substation	**$ 23 M**
Total:	**$ 44 M**

Projected IS Date: 4/1/2020

Project Status: Engineering



2018 RTEP Next Steps

RTEP@pjm.com to Be Retired

- PJM will retire the RTEP@pjm.com email address as of September 1, 2018. Stakeholders with questions about planning updates or planning windows should use the Planning Community.
- PJM is enhancing the way we communicate to follow industry standards and maintain its standing as an industry leader.
- The Planning Community is a vital avenue for PJM members and staff to collaborate on planning updates, including RTEP windows, and get their questions answered.

Upcoming TEAC Meetings

2018

- TEAC meetings are the following Thursdays in 2018
- 1/11, 2/8, 3/8, 4/5, 5/3, 6/7, 7/12, **8/9, 9/13, 10/11, 11/8, 12/13**

Revision History

- V1 – 7/6/2018 – Original Slides Posted