Reliability Analysis Update

Aaron Berner, Manager

Transmission Expansion Advisory Committee
August 04, 2020
First Review
Baseline Reliability Projects
Dominion Transmission Zone: Baseline
Clifton 230kV Breaker “201182” and “XT2011” Replacements

Process Stage: First Review
Criteria: Over Duty Breaker
Assumption Reference: none
Model Used for Analysis: 2024 short circuit model
Proposal Window Exclusion: FERC 715 (TO Criteria)
Baseline Reliability: TO Criteria Violation (FERC 715 (TO Criteria) Exclusion)
*This project inherits the exclusion of its parent project.

Problem Statement:
The Clifton 230kV breakers “201182” and “XT2011” are overdutied.
Existing Facility Rating: 50kA interrupting duty
Significant Driver:
• b3110: Rebuild Line #2008 between Loudoun to Dulles Junction. Retire Line #156 from Loudoun to Bull Run. Cut and loop Line #265 (Clifton – Sully) into Bull Run Substation. Add three (3) 230kV breakers at Bull Run to accommodate the new line and upgrade the substation. (Dominion “End of Life Criteria”)

Proposed Solution:
Replace the Clifton 230kV breakers “201182” and “XT2011” with 63kA breakers

Estimated Cost: $0.934M ($0.467M each)
Alternatives: None
Required In-Service: 12/31/2021
2020 RTEP Analysis Update
Window 1

May 15, 2020
  – Preliminary 2025 results posted
    • Summer Baseline and N-1 Thermal
    • Summer Generator Deliverability

July 1, 2020
  – Proposal Window No.1 opened

August 31, 2020
  – Proposal Window No.1 closes

Window 2

July 1, 2020
  – Proposal Window No.2 opened

July 31, 2020
  – Proposal Window No.2 closes
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 no harm studies
  - 6 Non PJM Facility
  - 3 suspended queue generator
2025 Summer conditions

- 26 included violations
- 22 N-1-1
- 4 generation deliverability
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 Dominion Local TO Criterion for End of Life

- 1 C2.9 End of Life Criteria
## 2025 Analysis Violations

### Table: Window Excluded

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Baseline Project</th>
<th>Below 200 kV exclusion</th>
<th>Immediate Need</th>
<th>Non PJM Facility</th>
<th>Substation Equipment exclusion</th>
<th>Supplemental Project</th>
<th>Suspended Queue Generator</th>
<th>Window Included</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;69 kV</td>
<td>345</td>
<td>642</td>
<td>40</td>
<td>4</td>
<td>10</td>
<td>76</td>
<td></td>
<td>1,103</td>
<td></td>
</tr>
<tr>
<td>69 kV</td>
<td>163</td>
<td>898</td>
<td>1</td>
<td>55</td>
<td>10</td>
<td>87</td>
<td></td>
<td>1,217</td>
<td></td>
</tr>
<tr>
<td>115 kV</td>
<td>37</td>
<td>585</td>
<td>12</td>
<td>3</td>
<td>41</td>
<td>2</td>
<td></td>
<td>635</td>
<td></td>
</tr>
<tr>
<td>138 kV</td>
<td>2</td>
<td>47</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>30</td>
<td></td>
<td>83</td>
<td></td>
</tr>
<tr>
<td>230 kV</td>
<td>2</td>
<td>47</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td></td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>345 kV</td>
<td>1</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>500 kV</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>765 kV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>545</td>
<td>2,226</td>
<td>10</td>
<td>6</td>
<td>122</td>
<td>11</td>
<td>3</td>
<td>207</td>
<td>1,228</td>
</tr>
</tbody>
</table>

### Graph: Voltage Exclusions

- **<69 kV**
- **69 kV**
- **115 kV**
- **138 kV**
- **230 kV**
- **345 kV**
- **500 kV**
- **765 kV**

- Baseline Project
- Below 200 kV exclusion
- Immediate Need
- Non PJM Facility
- Substation Equipment exclusion
- Supplemental Project
- Suspended Queue Generator
- Included
207 flowgates are eligible for Window 1
1 flowgate is eligible for Window 2
11 Eligible Flowgates
• 9 Voltage
• 2 Generation Deliverability

156 Flowgates Excluded from Window
• 152 Below 200kV
• 4 Substation Equipment
2020 RTEP Proposal Window 1 – Mid-Atlantic Results

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Window Excluded</th>
<th>Window Included</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Below 200 kV exclusion</td>
<td>Substation Equipment exclusion</td>
<td></td>
</tr>
<tr>
<td>&lt;69 kV</td>
<td>56</td>
<td></td>
<td>56</td>
</tr>
<tr>
<td>69 kV</td>
<td>68</td>
<td></td>
<td>68</td>
</tr>
<tr>
<td>115 kV</td>
<td>26</td>
<td>3</td>
<td>31</td>
</tr>
<tr>
<td>138 kV</td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>230 kV</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>345 kV</td>
<td></td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>152</td>
<td>4</td>
<td>167</td>
</tr>
</tbody>
</table>
30 Eligible Flowgates
• 2 Generation Deliverability
• 23 Thermal
• 5 Load Drop

180 Flowgates Excluded from Window
• 68 Below 200kV
• 108 Immediate Need
• 1 Non PJM Facility
• 3 Suspended Queue Generator
1 Eligible Flowgates

- End of Life Criteria
## 2020 RTEP Proposal Window 1 & 2 – South Results

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Window Excluded</th>
<th>Window Included</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Below 200 kV exclusion</td>
<td>Immediate Need</td>
<td>Non PJM Facility</td>
</tr>
<tr>
<td>115 kV</td>
<td>63</td>
<td>61</td>
<td>1</td>
</tr>
<tr>
<td>138 kV</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>230 kV</td>
<td>47</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>500 kV</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>108</td>
<td>1</td>
</tr>
</tbody>
</table>

### Chart

- **115 kV**
  - Below 200 kV exclusion
  - Immediate Need
  - Non PJM Facility
  - Suspended Queue Generator

- **138 kV**
  - Immediate Need
  - Non PJM Facility
  - Suspended Queue Generator

- **230 kV**
  - Immediate Need
  - Non PJM Facility
  - Suspended Queue Generator

- **500 kV**
  - Immediate Need
  - Non PJM Facility
  - Suspended Queue Generator

- **Total**
  - Below 200 kV exclusion
  - Immediate Need
  - Non PJM Facility
  - Suspended Queue Generator

- **Window Included**
  - Immediate Need
  - Non PJM Facility
  - Suspended Queue Generator
  - Included

- **Total**
  - Immediate Need
  - Non PJM Facility
  - Suspended Queue Generator
  - Included

- **Voltage**
  - Total

- **>= 345 kV**
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

### Table: 2020 RTEP Proposal Window 1 – West Results

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Window Excluded</th>
<th>Window Included</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline Project</td>
<td>Below 200 kV exclusion</td>
<td>Non PJM Facility</td>
</tr>
<tr>
<td>&lt;69 kV</td>
<td>345</td>
<td>586</td>
<td>40</td>
</tr>
<tr>
<td>69 kV</td>
<td>163</td>
<td>830</td>
<td>55</td>
</tr>
<tr>
<td>115 kV</td>
<td>10</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>138 kV</td>
<td>37</td>
<td>578</td>
<td>12</td>
</tr>
<tr>
<td>230 kV</td>
<td>2</td>
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<td></td>
</tr>
<tr>
<td>345 kV</td>
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<td>1</td>
<td>10</td>
</tr>
<tr>
<td>765 kV</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>545</td>
<td>2,006</td>
<td>118</td>
</tr>
</tbody>
</table>

### Graph: 2020 RTEP Proposal Window 1 – West Results

The graph visualizes the distribution of projects across different voltage levels (<69 kV, 69 kV, 115 kV, 138 kV, 230 kV, and >= 345 kV) with categories for Baseline Project, Below 200 kV exclusion, Non PJM Facility, Substation Equipment exclusion, Supplemental Project, and Included.
• 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
• Competitive Planner Tool Updates at Tech Change Forum
Reliability Analysis Update
Questions?
• TEAC meetings are the following Tuesdays or Wednesday in 2020
  • 1/7, 2/4, 3/10, 4/14, 5/12, 6/2, 7/7, 8/4, 9/1, 10/6, 11/4 (Wednesday), 12/1.
• V1 – 7/30/2020 – Original slides posted