Transmission Expansion Advisory Committee

March 10, 2011
Issues Tracking
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- Open Issues
  - None

- New Issues
Baseline Reliability Update
• Based on the 2010 RTEP the required in-service date for the project is June 1, 2015

• PJM staff needed to perform updated need analysis based on the 2011 RTEP assumptions to support the various CPCN proceedings for the project.

• The following slides summarize the initial findings from this analysis.
Initial Baseline Analysis

• Initial efforts focused on analysis required to support PATH CPCN application

• Studies included:
  – Generation Deliverability
  – MAAC Load Deliverability
  – SWMAAC Load Deliverability
  – EMAAC Load Deliverability
  – PEPCO Load Deliverability
  – Dominion Load Deliverability

• Studies primarily monitored 500 kV and above facilities
• 2017 Study Year with 2011 RTEP Assumptions

• All analyses assumed existing configuration for Mt Storm - Doubs

• Several sensitivity studies included beyond the baseline analysis:
  – Proposed Warren Generation
  – Global Insights load forecast
  – Renewable Portfolio Standards
  – “At-Risk” Generation
  – State DR/EE Goals
Proposed Warren Generation

- Approximately 1400 MW gas fired combined cycle plant
- Dominion transmission zone
- Interconnected to the Meadow Brook to Morrisville 500 kV line
- ISA Status
- Construction Status
Global Insight Load Forecast Comparison
Eastern Mid-Atlantic 2011 Load Forecasts

Eastern MAAC

- Eastern MAAC - 2011 Load Forecast
- Eastern MAAC - Global Insight, Dec 2010
South West Mid-Atlantic 2011 Load Forecasts

South-West MAAC

- Blue line: South-West MAAC - 2011 Load Forecast
- Red line: South-West MAAC - Global Insight, Dec 2010


Load: 13,000, 13,500, 14,000, 14,500, 15,000, 15,500, 16,000, 16,500, 17,000, 17,500, 18,000
## 2017 CETOs for Base Case & Sensitivities

<table>
<thead>
<tr>
<th>LDA</th>
<th>Base Case</th>
<th>Base Case + Warren</th>
<th>Global Insight</th>
<th>Global Insight + Warren</th>
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<tbody>
<tr>
<td>MAAC</td>
<td>4170</td>
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<td>SWMAAC</td>
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<td>VAP</td>
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<td>1796</td>
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<td>EMAAC</td>
<td>6750</td>
<td>6750</td>
<td>7380</td>
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• First thermal violation on Mt Storm – Doubs assumed the rating of the existing facility (i.e. not the rebuilt line)
• Assuming the line is rebuilt the next limiting facility is Pruntytown – Mt Storm
• Loading on Pruntytown – Mt Storm is reduced by the Warren generation
### Initial Baseline and Sensitivity Analysis Reactive Summary

#### CETL (MW)

<table>
<thead>
<tr>
<th>LDA</th>
<th>Base Case</th>
<th>Base Case + Warren</th>
<th>Global Insight</th>
<th>Global Insight + Warren</th>
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<tr>
<td>MAAC</td>
<td>3400</td>
<td>5600</td>
<td>2800</td>
<td>5000</td>
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<tr>
<td>SWMAAC</td>
<td>&lt; CETO</td>
<td>&gt; CETO</td>
<td>&lt; CETO</td>
<td>&lt; CETO</td>
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<tr>
<td>VAP</td>
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<td>&gt; CETO</td>
<td>&lt; CETO</td>
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<tr>
<td>PEPCO</td>
<td>&lt; CETO</td>
<td>&gt; CETO</td>
<td>&lt; CETO</td>
<td>&lt; CETO</td>
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<tr>
<td>EMAAC</td>
<td>8150</td>
<td>8350</td>
<td>7380</td>
<td>7780</td>
</tr>
</tbody>
</table>

#### CETL (% of CETO)

<table>
<thead>
<tr>
<th>LDA</th>
<th>Base Case</th>
<th>Base Case + Warren</th>
<th>Global Insight</th>
<th>Global Insight + Warren</th>
</tr>
</thead>
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<tr>
<td>MAAC</td>
<td>82%</td>
<td>134%</td>
<td>49%</td>
<td>88%</td>
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<tr>
<td>SWMAAC</td>
<td>&lt; 100%</td>
<td>&gt; 100%</td>
<td>&lt; 100%</td>
<td>&lt; 100%</td>
</tr>
<tr>
<td>VAP</td>
<td>&lt; 100%</td>
<td>&gt; 100%</td>
<td>&lt; 100%</td>
<td>&lt; 100%</td>
</tr>
<tr>
<td>PEPCO</td>
<td>&lt; 100%</td>
<td>&gt; 100%</td>
<td>&lt; 100%</td>
<td>&lt; 100%</td>
</tr>
<tr>
<td>EMAAC</td>
<td>121%</td>
<td>124%</td>
<td>100%</td>
<td>105%</td>
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</tbody>
</table>
Reliability Analysis Update – Voltage Analysis Summary

• Base case reactive violations were identified for Mid-Atlantic, Southwest Mid-Atlantic, PEPCo and Virginia load deliverability test in 2017 using the PJM load forecast.

• All base case voltage violations were resolved in 2017 with the addition of the Warren generation.

• Base case reactive violations were identified in 2017 for the same areas noted above using the Global Insights load forecast.

• Reactive violations in 2017 using the Global Insights load forecast with the Warren Generation included were comparable to those found in the base case using the PJM load forecast without the Warren Generation.
• Continue to evaluate the on-going need for and required in-service date for previously approved RTEP projects

• 2016 Base Case development almost complete.
  – Case is circulating with transmission owners for final review
Short Circuit Upgrades
• The Northeast 230 kV breaker "2317/315" is overstressed
• Significant Driver: Replace the existing Northeast 230/115 kV transformer #3 with 500 MVA (b1253)
• Proposed Solution: Replace the Northeast 230 kV breaker "2317/315" (b1253.1)
• Estimated Project Cost: $550 K
• Expected IS Date: 6/01/2015
The Ox 230 kV breakers “24342” and “243T2097” are overstressed.

Previously identified as being driven overdutied by V1-031:
- V1-031 projected in-service date 4/1/2016

Proposed Solution: Advance n1752 and n1753 to replace the Ox 230 kV breakers “24342” and “243T2097” with 63kA breakers (b1536 & b1537)

Project Advancement Cost: $25 K per breaker

Expected IS Date: 6/01/2015
- The Loudoun 230 kV breaker "29552" is overstressed
- Proposed Solution: Replace the Loudoun 230 kV breaker '29552" (b1538)
- Estimated Project Cost: $210 K
- Expected IS Date: 6/01/2015
• The Chalk Point 230 kV breakers „4C“, „5C“, „6C“, and „7C“ are overstressed

• Proposed Solution: Replace the Chalk Point 230 kV breakers „4C“, „5C“, „6C“, and „7C“ (b0864-b0867)

• Estimated Project Cost: $2 M per breaker

• Expected IS Date: 12/31/2014
• The Raritan River 230 kV breaker „BK15“ is overstressed

• Proposed Solution: Upgrade or replace the Raritan River 230 kV breaker „BK15“ (b1520)

• Estimated Project Cost: $200 K

• Expected IS Date: 6/01/2013
The Whippany 230 kV breaker „JB“ is overstressed

Significant Driver: Convert the West Orange 138 kV substation, the two Roseland – West Orange 138 kV circuits, and the Roseland – Sewaren 138 kV circuit from 138 kV to 230 kV (b1154)

Proposed Solution: Upgrade the Whippany 230 kV breaker „JB“ (b1154.1)

Estimated Project Cost: $258.2 K

Expected IS Date: 6/01/2014
• The Whippany 230 kV breaker „QJ“ is overstressed
• Significant Driver: Convert the 138 kV path from Aldene –Springfield Rd. - West Orange to 230 kV (b1399)
• Proposed Solution: Upgrade the Whippany 230 kV breakers „QJ“ (b1399.1)
• Estimated Project Cost: $258.2 K
• Expected IS Date: 6/01/2014
The Red Oak 230 kV breaker „G1047“ is overstressed

Significant Driver: Build a new 230 kV circuit from Branchburg to Middlesex Sw. Rack (b1155)

Proposed Solution: Upgrade the Red Oak 230 kV breaker „G1047“ (b1155.1)

Estimated Project Cost: $156.3 K

Expected IS Date: 6/01/2014
• The Red Oak 230 kV breaker "T1034" is overstressed
• Significant Driver: Build a new 230 kV circuit from Branchburg to Middlesex Sw. Rack. (b1155)
• Proposed Solution: Upgrade the Red Oak 230 kV breaker "T1034" (b1155.2)
• Estimated Project Cost: $100.6 K
• Expected IS Date: 6/01/2014
The Croydon 230 kV breaker „135“ is overstressed

Significant Driver: Build two new parallel underground circuits from Gloucester to Camden (via Cuthbert Blvd) (b1398)

Proposed Solution: Replace the Croydon 230 kV breaker „135“ (b1398.9)

Estimated Project Cost: $500 K

Expected IS Date: 6/01/2015
The Croydon 230 kV breaker „315“ is overstressed

Significant Driver: Build two new parallel underground circuits from Gloucester to Camden (via Cuthbert Blvd) (b1398)

Proposed Solution: Upgrade the Croydon 230 kV breaker „315“ (b1398.10)

Estimated Project Cost: $100 K

Expected IS Date: 6/01/2015
• The Croydon 230 kV breaker "335" is overstressed
• Significant Driver: Build two new parallel underground circuits from Gloucester to Camden (via Cuthbert Blvd) (b1398)
• Proposed Solution: Replace the Croydon 230 kV breaker "335" (b1398.11)
• Estimated Project Cost: $500 K
• Expected IS Date: 6/01/2015
• The Grays Ferry 230 kV breaker „115“ is overstressed
• Significant Driver: Build two new parallel underground circuits from Gloucester to Camden (via Cuthbert Blvd) (b1398)
• Proposed Solution: Replace the Grays Ferry 230 kV breaker „115“ (b1398.12)
• Estimated Project Cost: $500 K
• Expected IS Date: 6/01/2015
• The Whitpain 230 kV breaker “105” is overstressed

• Significant Driver: Build two new parallel underground circuits from Gloucester to Camden (via Cuthbert Blvd) (b1398)

• Proposed Solution: Replace the Whitpain 230 kV breaker “105” (b1398.14)

• Estimated Project Cost: $500 K

• Expected IS Date: 6/01/2015
• The Peach Bottom 500 kV breaker „225“ is overstressed
• Significant Driver: Build two new parallel underground circuits from Gloucester to Camden (via Cuthbert Blvd) (b1398)
• Proposed Solution: Upgrade the Peach Bottom 500 kV breaker „225“ (b1398.13)
• Estimated Project Cost: $250 K
• Expected IS Date: 6/01/2015
The Bergen 230 kV breakers „GSU1“, „GSU2“, and „GSU3“ are overstressed.

- **Proposed Solution:** Replace the Bergen 230 kV breakers „GSU1“, „GSU2“, and „GSU3“ (b1521-b1523)
- **Estimated Project Cost:** $1.0 M per breaker
- **Expected IS Date:** 6/01/2014
Supplemental Projects
• Replace two 345 kV circuit breakers at Goodings Grove TSS 116 on lines 11601 & 11602 with breakers with faster clearing times. (s0266)

• Estimated cost: $ 4.6 M

• Required IS Date: 6/1/2012
• Replace four 345 kV circuit breakers at Lockport TSS 108 on lines 10805 & 10806 with breakers with faster clearing times. (s0267)

• Estimated cost: $8.0 M

• Required IS Date: 6/1/2012
• Deteriorated Equipment
• PPL Recommended Solution:
  Replace Sunbury 500kV gas insulated switchgear (S0269).
• Estimated Project Cost: $19.48 M
• Expected IS Date: 10/31/2015
• Reduce probability of load shed for the loss of Sunbury-Montour 230kV line and Sunbury-Milton 69kV line.

• PPL Recommended Solution: Install new 230kV motor operated air break switch on the Sunbury-Montour 230kV line near the Milton tap (S0270).

• Estimated Project Cost: $0.941 M

• Expected IS Date: 10/31/2013
• Elimsport 230kV switchyard control cubicle had fire damage.
• PPL Recommended Solution: Replace Elimsport 230kV switchyard control cubicle (S0271).
• Estimated Project Cost: $1.51 M
• Expected IS Date: 01/31/2012
• Supplemental Projects:
  • Deteriorated Equipment; Hosensack – Wescosville # 3 230 kV Line.
  • PPL Recommended Solution:
    Rebuild Hosensack – Wescosville # 3 230 kV line (S0273).
• Estimated Project Cost: $16 M
• Expected IS Date: 04/29/2013
• Supplemental Projects:
  • Deteriorated Equipment; Martins Creek – Siegfried # 2 230 kV Line.
  • PPL Recommended Solution:
    Rebuild Martins Creek – Siegfried # 2 230 kV line (S0274).
  • Estimated Project Cost: $17 M
  • Expected IS Date: 05/20/2013
Supplemental Projects:
Deteriorated Equipment; Whitpain – Buxmont 230 kV Line.

PPL Recommended Solution:
Rebuild Whitpain – Buxmont 230 kV line (S0275).

Estimated Project Cost:
$15 M

Expected IS Date:
04/14/2014
• PSEG recommendation for the Linden 230 kV Phase Angle Regulator (PAR) due to age and condition.
• Proposed Solution: Replace the Linden 230 kV PAR (S0283).
• Estimated Project Cost: $ 15 M
• Expected IS Date: 12/31/2011
PSE&G Transmission Zone

- PSE&G recommendation due to age and condition.
- The age of the New Freedom 500-4 and Deans 500-2 transformers approaching 50 years.
- Proposed Solution: Replace the New Freedom 500-4 transformer phase 1 and phase 2 (S0286). Replace Deans 500-2 transformer all three phases (S0287).
- Estimated Project Cost: $9.2 M $14.2 M
- Expected IS Date: 12/31/2012
• PSE&G recommendation due to equipment age and condition
• Aging equipments at Salem and Hope Creek 500 kV.
• Proposed Solution:
  Replace the Salem 5-6 and 9-10 circuit breakers.
  Replace Hope Creek 1-5, 1-3, 2-6 and 5-6 circuit breakers and associated equipments (S0296).
• Estimated Project Cost:
  $25 M
• Expected IS Date:
  12/31/2015
Email RTEP@pjm.com with any comments
Next Steps
Review Issues Tracking