Issues Tracking
• Open Issues
  – None

• New Issues
PATH Project Analysis Update
## 2010 RTEP Thermal Violations

<table>
<thead>
<tr>
<th>From Bus</th>
<th>To Bus</th>
<th>Voltage</th>
<th>First Thermal Violation Date</th>
<th>Load Deliverability Area Violation(s)</th>
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<tbody>
<tr>
<td>Lexington</td>
<td>Dooms</td>
<td>500 kV</td>
<td>2017</td>
<td>Dominion Load Deliverability</td>
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<td>Mt. Storm T157 Tap</td>
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<td>500 kV</td>
<td>2015</td>
<td>MAAC Load Deliverability, PEPCO Load Deliverability, SWMAAC Load Deliverability</td>
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<tr>
<td>T157 Tap</td>
<td>Dooms</td>
<td>500 kV</td>
<td>2015</td>
<td>MAAC Load Deliverability, SWMAAC Load Deliverability</td>
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<tr>
<td>Pruntytown</td>
<td>Mt. Storm</td>
<td>500 kV</td>
<td>2020</td>
<td>Dominion Load Deliverability, PEPCO Load Deliverability, SWMAAC Load Deliverability, MAAC Load Deliverability</td>
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<tr>
<td>Jacks Mountain</td>
<td>Juniata #1</td>
<td>500 kV</td>
<td>2018</td>
<td>EMAAC Load Deliverability</td>
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<tr>
<td>Jacks Mountain</td>
<td>Juniata #2</td>
<td>500 kV</td>
<td>2020</td>
<td>TMAAC Load Deliverability</td>
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<tr>
<td>Greenland Gap</td>
<td>Meadow Brook</td>
<td>500 kV</td>
<td>2025</td>
<td>MAAC Load Deliverability</td>
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<tr>
<td>Mt. Storm</td>
<td>Greenland Gap</td>
<td>500 kV</td>
<td>&gt;2025</td>
<td>MAAC Load Deliverability</td>
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<tr>
<td>Bath County</td>
<td>Valley</td>
<td>500 kV</td>
<td>2022</td>
<td>Dominion Load Deliverability</td>
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<td>Keystone</td>
<td>Jacks Mountain</td>
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<td>2022</td>
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<tr>
<td>Keystone</td>
<td>Conemaugh</td>
<td>500 kV</td>
<td>2025</td>
<td>EMAAC Load Deliverability</td>
</tr>
</tbody>
</table>
2010 RTEP - Previous Reliability Violations

• 2010 RTEP MAAC Load Deliverability Voltage TEST
  – Over 40 non-converged contingency pairs for the 2010 RTEP MAAC load deliverability voltage test

Non-Converged Contingencies

Bath County – Valley
Bedlington – Dobs
Bedlington Cap
Black Oak – Bedington
Black Oak - Black Oak SV:
Brighton – Conastone
Brighun – Puls
Brister – Chancellor
Brister – Ox
Burches Hill - Possum Point
Cabot – Cranberry
Calvert Cliffs - Waugh Chapel
Calvert Cliffs #1 generator
Calvert Cliffs #2 generator
Conemaugh – Hunterstown
Conemaugh - Jacks Mountain
Conemaugh – Keystone
Cunningham – Dooms
Cunningham – Elmont
Doubs Cap
Elmont – Ladysmith
Fort Martin – Ronco
Hatfield’s Ferry - Black Oak
Hatfield’s Ferry - Brown Run
Hatfield’s Ferry - Fort Martin
Hatfield’s Ferry – Ronco
Hunterstown – Conastone
Jacks Mountain - Juniata #1
Jacks Mountain - Juniata #2
Keystone - Jacks Mountain
Keystone - South Bend
Ladysmith – Chancellor
Loudoun - Meadow Brook
Loudoun - Morrisville
Loudoun - Pleasant View
Med Meadows – Greenland Gap
Midlothian - Noon Anna
Morrisesville Cap
Mt. Storm - Greenland Gap
Mt. Storm - Meadow Brook
Mt. Storm - T157_Tap
T157_Tap – Doubs
T157_Tap - Brown Run
Tyree Ridge – Cranberry
Yukon - South Bend
Yukon - T174_Tap
• Assumption:
  – PATH and MAPP not modeled

• Result
  – 2012 RTEP 15 Year Thermal Analysis Result
    ✓ All previous thermal overloads resolved
    ✓ No thermally overloaded 500 kV facilities in years 2013 – 2027
  – 2017 Load Deliverability
    – Thermal and Voltage
    – All contingencies converged
    – CETL > CETO
  – 2017 N-1-1 Analysis
    – No thermal or voltage violations identified for 500 kV contingencies
MAAC PV Result

- Conemaugh 500 kV voltage for the loss of the Keystone - Juniata 500 kV
- Doubs 500 kV voltage for the loss of Beddington - Black Oak 500 kV
- 2017 MAAC CETO

MAAC 2017 CETO = 1100 MW
2012 RTEP Analysis – Sensitivity Analysis

• At Risk Generators sensitivity analysis
  – At-risk generation
  – HEDD generation (in addition to at-risk above, also considered to be at-risk)
  – Potential new generation

• Sensitivity study of MAAC voltage analysis
MAAC Voltage Violation Sensitivity Study

- Calculate load deliverability voltage test margin in 2017
  - Margin = CETL – CETO

- Consider sensitivity factors
  - Load growth
  - At-risk generation
  - Potential new generation

- Determine sensitivity year voltage violation

- Consider potential voltage mitigation
  - SVC, synchronous condenser, etc.
MAAC Voltage Violation Sensitivity Study

**First Voltage Violation Year Sensitivity**

<table>
<thead>
<tr>
<th>Generation (MW)</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
<th>2026</th>
<th>2027</th>
<th>2027+</th>
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<td></td>
<td>2027+</td>
<td>2027+</td>
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</tbody>
</table>

- MAAC (not including HEDD) at-risk generation is approximately 2,500 MW
- HEDD at-risk generation is an additional approximate 2,500 MW
- MAAC FSA generation is approximately 4,700 MW
• PJM staff will be recommending to the PJM Board at their Friday, August 24th, 2012 meeting to cancel the PATH project

• Provide any written comments to RTEP@pjm.com by Monday, August 20th
MAPP Project Analysis Update
• Previous 2010 RTEP
  – EMAAC load deliverability voltage violations

• Current 2012 RTEP
  – No EMAAC load deliverability voltage violations
    • Worst contingency is Keeney – Rock Springs 500 kV
  – CETL > CETO
    • What is the CETL margin?
  – No 15 Year thermal violations
  – No N-1-1 thermal or voltage violation for 500 kV contingencies
EMAAC PV Result

EMAAC 2017 CETO = 5010 MW
EMAAC Voltage Violation Sensitivity Study

- EMAAC (not including HEDD) at-risk generation is approximately 2,000 MW
- HEDD at-risk generation is an additional approximate 2,500 MW
- EMAAC FSA generation is approximately 2,300 MW
• PJM staff will be recommending to the PJM Board at their Friday, August 24\textsuperscript{th}, 2012 meeting to cancel the MAPP project

• Provide any written comments to
\texttt{RTEP@pjm.com} by Monday, August 20\textsuperscript{th}
Stage 1A 10-Year ARR Analysis
Upgrades - Stage 1A 10-Year ARR analysis

- COMED Zone
  - Following projects were studied
    - New Byron - Wayne 345 kV circuit
    - New Byron - Cherry Valley - Pleasant Valley 345 kV circuit
    - New Byron - Cherry Valley 345 kV circuit
    - New Cherry Valley - Pleasant Valley 345 kV circuit
    - New Byron - Pleasant Valley 345 kV circuit
    - New Byron – Pleasant Valley 345 kV circuit + Tampico – Normandy 345 kV
  
  - At the June TEAC, Byron-Wayne 345 kV was identified as the most optimal project to fix 10-Year ARR violations.
    - Eliminates all COMED violations
  
  - Since then PJM staff has been evaluating the reliability impacts
Reliability Evaluation – Preliminary Results

• Byron – Wayne 345 kV
  – Preliminary results suggest no additional facilities needed due to reliability

• Byron – Pleasant Valley 345 kV, new Silver Lake 345/138 kV transformer and uprate of Pleasant Valley – Silver Lake 345 kV
  – Preliminary results suggest an overload of Byron – Cherry Valley “Blue” 345 kV and an overload of the Pleasant Valley 345/138 kV TR #81
June 2012 – LS Power proposes Byron – Pleasant Valley 345 kV, new Silver Lake 345/138 kV transformer and uprate of Pleasant Valley – Silver Lake 345 kV

July 2012 – LS Power modifies proposal to include Tampico – Normandy 345 kV

August 2012 – LS Power modifies proposal to include second Pleasant Valley 345/138 kV transformer

August 2012 – LS Power modifies proposal to remove Tampico – Normandy 345 kV and switch the proposed Byron – Pleasant Valley 345 kV termination at Byron from the red bus to the blue bus
Next Steps

• Reliability evaluations

• Cost evaluation
  – Independent feasibility study and cost estimate for Byron – Wayne is in-progress

• Finalize 10-year ARR Infeasibility Analysis
Generation Deactivation Notification (Retirements) Update
• Cost allocation posted to PJM.com

• http://www.pjm.com/planning/generation-retirements/~/media/planning/gen-retire/niles-1-and-elrama-4-zonal-cost-allocation-for-2012.ashx
Ohio Area Deactivation Upgrade Alternative Analysis
• New Beaver Valley - Leroy Center 345kV + Mansfield - Leroy Center 345kV lines
• Estimated Project Cost: $393M
• Proposed in-service date: 6-1-2018
• Short term: Temporary Operating Procedure to Open Cloverdale-Barberton 138kV until 345kV lines are built
• Status: Alternative Evaluation in progress
• Marysville – South Amherst 765 kV
  - Also includes 2-5 miles of 345 kV from South Amherst – Beaver 345 kV
• Trivalley – South Amherst 765 kV
  - Trivalley will intersect Kammer – Vassell 765 kV near Conesville 345 kV
  - Also includes 2-5 miles of 345 kV from South Amherst – Beaver 345 kV
• Conesville – Beaver 345 kV
• Conesville – Harmon 345 kV
• Beaver Valley - Leroy Center 345kV + Mansfield – Leroy Center 345kV line
• Case creation complete for each of the 5 alternatives

• Analysis
  – N-1-1 thermal is underway
  – Baseline contingency analysis, generator deliverability analysis, and common mode outage analysis are complete. PJM staff is preparing to distribute results and coordinate feedback.
  – Load deliverability thermal/voltage and N-1-1 voltage will begin soon
Supplemental Projects
• Upgrade the 500kV wave trap at Carson on Tie Line #570 to 4000 amp to make Dominion’s segment of the line rating 3454 MVA.

• Projected IS Date: Oct 2013

• Estimated cost $ 100,000
Dominion Transmission Zone

- Upgrade the Dominion segment of Tie Line #296 Person to Halifax 230 kV (20.4 miles) to a minimum of 712 MVA which matches the rating of Progress’s segment of Line #296. Reconductoring with 477 ACSS and matching the existing sag will minimize structure work. Preliminary review shows 35 of 176 structures will need to be replaced.

- Projected IS Date: Feb 2015

- Estimated cost $ 12.0 M
Short Circuit
• The Tanner Creek 345 kV breakers ‘P’, ‘P2’, and ‘Q1’ are overstressed
• Proposed Solution: Replace Tanner Creek 345 kV breakers with 63kA rated breakers (b2084 - b2086)
• Estimated Project Cost: $1.3 M per breaker
• Expected IS Date: 06/01/2013
• The Wylie Ridge 345 kV breakers 'WK-1' through ‘WK-6’ are overstressed

• Proposed Solution: Replace Wylie Ridge 345 kV breakers with 63kA rated breakers (b2106-b2110, b2112)

• Estimated Project Cost: $808 K per breaker

• Expected IS Date: 06/01/2017
Cancelled upgrade: Advance n0666.5, n0666.3, and n0666.10 (Replace Hudson 230kV breakers ‘1HB’, ‘2HA’, and ‘2HB’ with 80kA breakers) (b1750-b1752)

Reason for cancellation: Fault current levels decrease as a result of the Hudson Unit 1 retirement
RTEP Next Steps

- Stage 1A 10-Year ARR Analysis
- Ohio Area alternative analysis
- High voltage evaluation
- RTEP reliability analysis
- Scenario analysis
Questions?

Email: RTEP@pjm.com