Issues Tracking
• Open Issues
  – None

• New Issues
2011 RTEP Voltage Analysis
Existing Reactive Upgrades

- Whippany
- Branchburg
- Kt
- Jacks Mountain
- Keys
tone
- West Shore
- Johnstown
- Conemaugh
- Kemptown
- Cox’s Corner

PJM©2011
• Study Year: 2016

• Test Procedure: NERC category C3 N-1-1 Voltage Test (voltage magnitude and voltage drop)

• PATH and MAPP not modeled in the base case

• Non-convergence for multiple EHV “N-1-1” combinations

• Potential for violations in 2015 and earlier years
  – Potomac River Generation
• Meadow Brook 500kV
• Loudoun 500kV
• Doubs 500kV
• Hunterstown 500kV
• Raystown 230kV
• Mansfield 345kV
• Juniata 500kV
• T157 500kV
• Jacks Mountain 500kV
• To be finalized at November 2011 TEAC

✓ Locations

✓ Magnitude

✓ Technology

  ▪ Static Capacitors
  ▪ SVC
• **B1254 – Emory Grove**
  - Construct a 500/230 kV Emory Grove station with a 500 kV double breaker configuration by tapping the Conastone – Brighton 500 kV and Conastone – Northwest 230 kV.
  - Rebuild Emory Grove to the Northwest circuits to separate pole-lines with bundled conductor)

• Added to the RTEP to address multiple thermal and reactive criteria violations with a 6/1/15 required in-service date

• Updated analyses using 2011 RTEP assumptions indicate the required in-service date can be deferred to 6/1/2017
• B1154 - Convert the following facilities from 138 kV to 230 kV
  – West Orange 138 kV substation
  – The Roseland – West Orange two 138 kV circuits (S-1319 & T-1320).
• Original baseline upgrade was originally identified to resolve N-1-1 voltage violation in the West Orange area of the PSEG transmission zone in 2014.
• Retool analysis using the 2011 RTEP assumptions continues to show criteria violations in 2014.
• Based on these results the required in-service date remains 6/1/2014.
• See next slide for additional details
## West Orange N-1-1 Voltage Drop Violations - Retool with the 2011 Load Forecast

<table>
<thead>
<tr>
<th>Name</th>
<th>KV</th>
<th>Vdrop (%) 2014 (Without S-R)</th>
<th>Vdrop (%) 2015 (With S-R)</th>
<th>N-1 Contingency</th>
<th>N-1-1 Contingency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Springfield Rd</td>
<td>138</td>
<td>5.17</td>
<td>10.34</td>
<td>ROSE_XFMR2</td>
<td>ROSE_XFMR1</td>
</tr>
<tr>
<td>West Orange</td>
<td>138</td>
<td>5.61</td>
<td>11.25</td>
<td>ROSE_XFMR2</td>
<td>ROSE_XFMR1</td>
</tr>
<tr>
<td>West Caldwell &quot;D&quot;</td>
<td>138</td>
<td>5.03</td>
<td>NA</td>
<td>ROSE_XFMR1</td>
<td>ROSE_XFMR2</td>
</tr>
<tr>
<td>West Caldwell &quot;G&quot;</td>
<td>138</td>
<td>5.03</td>
<td>NA</td>
<td>ROSE_XFMR1</td>
<td>ROSE_XFMR2</td>
</tr>
<tr>
<td>Laurel Ave.</td>
<td>138</td>
<td>5.69</td>
<td>11.43</td>
<td>ROSE_XFMR2</td>
<td>ROSE_XFMR1</td>
</tr>
<tr>
<td>Marion Drive</td>
<td>138</td>
<td>5.61</td>
<td>11.27</td>
<td>ROSE_XFMR2</td>
<td>ROSE_XFMR1</td>
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<tr>
<td>Roseland</td>
<td>138</td>
<td>5.76</td>
<td>11.55</td>
<td>ROSE_XFMR2</td>
<td>ROSE_XFMR1</td>
</tr>
<tr>
<td>Aldene</td>
<td>138</td>
<td>4.96</td>
<td>9.92</td>
<td>ROSE_XFMR2</td>
<td>ROSE_XFMR1</td>
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<tr>
<td>Fanwood</td>
<td>138</td>
<td>NA</td>
<td>11.86</td>
<td>ROSE_XFMR2</td>
<td>ROSE_XFMR1</td>
</tr>
<tr>
<td>New Dover</td>
<td>138</td>
<td>NA</td>
<td>5.98</td>
<td>ROSE_XFMR2</td>
<td>ROSE_XFMR1</td>
</tr>
</tbody>
</table>
PJM Light Load Reliability Analysis
• Defined in PJM Manual 14B: PJM Region Transmission Planning
  – Attachment D-2: Light Load Reliability Analysis
  – Approved by the MRC at their June meeting
  – Effective July 20, 2011
• Potential Light Load Criteria Violation

• The Cloverdale 500/345KV transformer 6A is overloaded for each of the following single contingencies:
  – Mt. Storm – Valley 500KV
  – Bath – Valley 500KV
  – North Anna unit #1
  – North Anna unit #2
• Potential Light Load Criteria Violation

• The Cloverdale 500/345KV transformer 6B is overloaded for each of the following single contingencies:
  – Mt. Storm – Valley 500KV
  – Bath – Valley 500KV
  – North Anna unit #1
  – North Anna unit #2
• Potential Light Load Criteria Violation

• The Cloverdale – Lexington 500KV line is overloaded for each of the following single contingencies:
  – Mt. Storm – Valley 500KV
  – Bath – Valley 500KV
  – North Anna unit #1
  – North Anna unit #2
• Potential Light Load Criteria Violation

• The Cloverdale 765/345KV transformer is overloaded for each of the following single contingencies:
  - Mt. Storm – Valley 500KV
  - Bath – Valley 500KV
  - North Anna unit #1
• Potential Light Load Criteria Violation

• The Claytor – Edgemont 138KV circuit is overloaded for the stuck breaker contingency of Cloverdale – Jackson Ferry 765KV with a stuck breaker at the Jackson Ferry 765kV bus
• Potential Light Load Criteria Violation

• Turner – Ruth 138KV is overloaded for the tower outage of the Amos – Kanawha 345kV and Kanawha – Sporn 345kV lines
• Potential Light Load Criteria Violation

• Peak Creek – Wurno 138KV is overloaded for the loss of the Cloverdale – Jackson Ferry 765KV line with the stuck breaker at Jackson Ferry 765kV bus
• Potential Light Load Criteria Violation

• The Nelson – Electric Junction 345 kV line is overloaded for the loss of Cherry Valley – Silver Lake “Red” 345 kV line

• Potential Solution:
  – Reconductor approximately 16 miles from Nelson to Electric Junction 345kV
  – Replace associated terminal equipment
• Potential Light Load Criteria Violation

• The East Frankfort – Crete “Blue” 345kV line is overloaded for the loss of the Wilton – Dumont 765kV line

• Potential Solution:
  – Pending additional review of sag limitations
    • either reconductor approximately 12.51 miles of East Frankfort – Crete 345 kV line 6607
    • Alternatively raise tower structures
• Potential Light Load Criteria Violation

• The Crete – St. John 345 kV line is overloaded for the loss of the Wilton - Dumont 765 kV line

• Potential Solution:
  – Pending additional review of sag limitations, reconductor approximately 11.75 miles of Crete – St. John 345kV
  – Reconductor approximately 1 mile of Crete – St. John 345kV in NIPS/MISO. Further coordination with NIPS/MISO is necessary
• Potential Light Load Criteria Violation

• The Lakeview – Zion 138 kV line is overloaded for the Zion – Pleasant Prairie 345 kV line and the Zion – Arcadian 345 kV line

• There is a planned 345kV line from Pleasant Prairie to Zion EC that is expected to resolve this criteria violation
• Potential Light Load Criteria Violation

• Zion – Waukegan; B 138 kV line is overloaded for the tower outage of the Zion – Pleasant Prairie 345 kV line and the Zion – Arcadian 345 kV line

• There is a planned 345kV line from Pleasant Prairie to Zion EC that is expected to resolve this criteria violation
• Potential Light Load Criteria Violation

• Marengo; RT – Pleasant Valley; R 138 kV line is overloaded for the loss of Cherry Valley – Silver Lake “Red” 345 kV line.

• Potential Solution:
  – Reconductor 10.7 miles of Marengo – Pleasant Valley 138kV
  – Replace associated terminal and protective equipment
• Potential Light Load Criteria Violation

• McGirr Road – H440; RT 138 kV line is overloaded for the loss of the Nelson – P20 “Blue” 345 kV line or the P20 – Electric Junction “Blue” 345 kV line.
• Potential Light Load Criteria Violation

• Marengo; BT– Woodstock; B 138 kV line is overload for the loss of the Cherry Valley – Silver Lake “Red” 345 kV line.

• Potential Solution:
  – Reconductor approximately 11.5 miles
  – Replace associated terminal equipment
• Potential Light Load Criteria Violation

• The Steward TSS 186 – Haumesser Road “Blue” 138 kV line is overload for the loss of the Nelson – P20 “Blue” 345 kV line or the P20 – Electric Junction “Blue” 345 kV line.
• Potential Light Load Criteria Violation

• Kickapoo Creek; B – Marseilles Tap On Lasalle - Streator Line L6102; T 138 kV line is overload for the loss of the La salle – Kickapoo “Blue” 138 kV line.
• Single Contingency Violation – Dominion Criteria
  • An outage of Line #2090 (Ladysmith CT – Mine Rd 230 kV) overloads Line #47 (Four Rivers – Kings Dominion 115 kV) (P PT5 off line)
  • An outage of Fredericksburg – Slabtown 115 kV cause low voltage at Slabtown (Four Rivers off line)

• Potential Solution:
  • Uprate or rebuild Line #47
  • Install capacitors
  • Convert load from 115 kV System to 230 kV System

• Potential IS Date: 6/1/2016
Supplemental Projects
Supplemental Project

At the Star 345kV Substation, add (2) 150MVAr cap banks (300MVAR total)

S0333

Projected IS date: 06/01/2012
- Supplemental Project
- Hanna 345kV Substation - Add (2) 150MVAr cap banks (300MVAr total) (S0334)
- Estimate Cost: $*M
- Projected IS date: 06/01/2012
Short Circuit Upgrades
- The Morrisville 500kV breakers ‘H1T573’, and ‘H1T545’ are overstressed
- Proposed Solution: Upgrade nameplate rating at Morrisville 500kV breakers ‘H1T573’, and ‘H1T545’ (b1647 & b1648)
- Estimated Project Cost: $2 K per breaker
- Expected IS Date: 06/1/2016
Email RTEP@pjm.com with any comments or questions