Reliability Analysis Update

Transmission Expansion Advisory Committee
May 12, 2016
2016 RTEP Timeline
2016 RTEP Timeline

• Cases
  – 2016 RTEP summer case finalized
  – 2016 RTEP winter case sent to TO for modeling updates
  – 2016 RTEP light load case sent to TO for modeling updates

• Analysis
  – Completed and validated the N-1, generation deliverability analysis and common mode outage analysis, preliminary results are posted.
  – Currently working to complete the preliminary load deliverability and N-1-1 analysis

• Windows
  – 2016 RTEP Window #2 anticipated opening date at the end of June 2016
2016 RTEP Proposal Window #1
Proposal Review and Recommendations
2016 RTEP Proposal Window #1 Timeline

- **February 2016**
  - Preliminary violations reviewed with the PJM TEAC
- **March - April 2016**
  - 2016 RTEP Window 1 Proposal evaluations
- **April 20, 2016**
  - Preliminary 2016 RTEP Proposal Window #1 Webcast posted to PJM.com
- **May 12, 2016**
  - Recommendation to PJM TEAC
- **July 2016**
  - Seek PJM Board Approval
2016 RTEP Proposal Window #1

- **Scope**
  - Generator Deliverability and Common Mode Outage Violations
  - End of life facilities
- Preliminary Files Released: 2/5/2016
- Window Opened: 2/16/2016
- Window Closed: 3/17/2016 – Proposal definitions, simulation data and planning cost estimate due
- Detailed Project Costs due: 4/1/2016 – Additional 15 days to develop and provide detailed cost data – See the window documentation for additional information
13 flow gates addressed
25 Proposals from 7 entities
- 3 Transmission Owner Upgrades
  - Cost range of $7.7M to $48.5M
- 21 Greenfield Projects
  - Cost range of $15.6M - $111.5 M
• Factors considered when selecting a proposal
  – Performance
  – Mitigation of applicable criteria violations
    • End of Life
  – Cost
  – Risk
Chesterfield – Messer Road – Charles City Road
230kV
2016 RTEP Proposals Submitted for Window #1

- Generation Deliverability and Common Mode Outage (FG# 60, 61, 62, 66, 68, 70, 71, 72, 76, 78, 248, 249)
  - The Chesterfield – Messer Road – Charles City Road 230kV circuit is overloaded for several contingencies
    - This facility is also a Dominion local transmission owner End of Life criterion violation in the near term planning horizon

- Proposals Considered

<table>
<thead>
<tr>
<th>Proposal Id</th>
<th>Cost Estimate</th>
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<tbody>
<tr>
<td>2016_1-3B</td>
<td>$22 M</td>
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<tr>
<td>2016_1-3F*</td>
<td>$58.8 M</td>
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<tr>
<td>2016_1-3G</td>
<td>$7.7 M</td>
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<td>2016_1-5A</td>
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<tr>
<td>2016_1-5B</td>
<td>$15.6 M</td>
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<td>2016_1-5C</td>
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https://www.pjm.com
## 2016 RTEP Proposals Submitted for Window #1

### New 500/230kV Facilities
- 2016_1-5A, 2016_1-5B, 2016_1-5C, 2016_1-3F

### 230kV Upgrade
- 2016_1-3G

### Rebuild of Existing Infrastructure
- 2016_1-3B

<table>
<thead>
<tr>
<th>New 500/230kV Facilities</th>
<th>230kV Upgrade</th>
<th>Rebuild of Existing Infrastructure</th>
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<td>2016_1-5A, 2016_1-5B,</td>
<td>2016_1-3G</td>
<td>2016_1-3B</td>
</tr>
<tr>
<td>2016_1-5C, 2016_1-3F</td>
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</tbody>
</table>

- Doesn’t address End of Life facility
- New ROW
- Caused additional violations in combination with 500kV solutions
- The proposed rebuild of existing infrastructure fixes the reliability criteria violation
- Significant Margin
- Existing ROW
- Addresses End of Life
- Generation Deliverability and Common Mode Outage (FG# 60, 61, 62, 66, 68, 70, 71, 72, 76, 78, 248, 249) & DOM End of Life Facility
  - The Chesterfield – Messer Road – Charles City Road 230kV circuit

- Recommended Solution:
  - Rebuild 21.32 miles of existing line between Chesterfield and Lakeside 230 kV. (B2745)

- Estimated Project Cost: $ 22 M

- Required IS Date: 6/1/2020
Carson – Rogers Road 500 kV
2016 RTEP Proposals Submitted for Window #1

- **Generation Deliverability (FG# 102)**
- The Carson – Rogers Rd 500 kV circuit is overloaded for single contingency loss of the Carson – Rawlings 500 kV circuit.

- **Proposals Considered**

<table>
<thead>
<tr>
<th>2016_1-1A</th>
<th>2016_1-1B</th>
<th>2016_1-2A</th>
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<td>2016_1-7D</td>
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</tr>
</tbody>
</table>

- **Cost Estimates:** ($24 M to $115 M)
### 2016 RTEP Proposals Submitted for Window #1

<table>
<thead>
<tr>
<th>2nd 500kV Circuit</th>
<th>230kV Clubhouse Option</th>
<th>Rebuild of Existing Infrastructure</th>
</tr>
</thead>
</table>

- All 2nd 500 kV Proposals mitigated the 500 kV reliability criteria violation
- Caused additional violations in 2021 analysis
- Significant New ROW

- All 230 kV Clubhouse Proposals mitigated the 500 kV reliability criteria violation
- Line loading exceeds 90% for all Clubhouse Proposals in the year 2020 analysis

- The proposed rebuild of existing infrastructure fixes the reliability criteria violation
- Significant Margin
- Existing ROW
- Addresses long-term End of Life need
Dominion Transmission Zone

- **Generation Deliverability Violation (FG# 102)**
  - The Carson – Rogers Rd 500 kV circuit.

- **Recommended Solution:**
  - Rebuild the Carson – Rogers Rd 500kV circuit. (B2744)

- **Estimated Project Cost:** $48.5 M

- **Required IS Date:** 6/1/2020
Artificial Island Update
Artificial Island Update

- Consideration of increased cost estimates for the current approved scope of work

- Examining configuration changes to terminate the planned Silver Run – Salem 230 kV transmission line at Hope Creek

- Continue to develop current design in parallel with the investigation into alternative configurations
Artificial Island Update

- Ongoing Activities
- Conducted discussions with PSE&G and LS Power and identified several alternative line routing and substation location options for interconnection at Hope Creek
  - Considerations for options being reviewed
    - Electrical performance
    - ROW – use of existing easements or obtaining new easements
    - Impacts to Artificial Island plans for site
    - Permitting Impacts in vicinity of AI site
    - Physical Site constraints
    - Cost
    - Schedule
Artificial Island Update

- Complete work to identify viable alternatives to interconnect at Hope Creek
  - Determine if alternate routes/substation locations are viable
  - Complete analysis of electrical performance
  - Develop cost estimate(s)
  - Assess constructability impacts
- Provide recommendation for AI interconnection
- Process scope change to project if appropriate
Supplemental Projects
AEP Transmission Zone

- **Supplemental Project**
  - Loop in the Meadow Lake - Olive 345 kV circuit into NIPSCo’s Reynolds 765/345kV station (S1141)
  - Part of MISO MVP project
  - Estimated Project Cost: $2M
  - Projected IS Date: 5/1/2017
Questions?

Email: RTEP@pjm.com
• Revision History
  – V1 - Original version posted to PJM.com – 5/10/2016
  – V2 – Added baseline upgrade ID #’s and removed slide– 5/11/2016
  – V3 Removed slide from supplemental projects section – 5/11/2016