Transmission Expansion Advisory Committee

June 5, 2014
Interregional Planning Update
• 2014 Scenario Analysis - update
  • Scenario A - Update rollup case
  • Scenario B - Severe Heat and Drought
  • May – July - target assumptions and model builds
  • July Stakeholder WebEx
  • June – August - target analysis
  • Sept – Oct - target draft report
  • November - target Stakeholder WebEx
• Beyond 2014 discussions
  – Winter Scenario
  – Production Cost Analysis
  – DOE Congestion Report Support
  – Synergies between Planning Coordinator MOD standard activities and EIPC model building
Interregional Planning Studies (not including JCM)

- **NCTPC - update**
  - Study requested by NCUC
  - Reliability and Economic impact of BRA resources
  - Reliability and Economic Scopes Approved
  - 2014 target completion

- **PJM/MISO Joint Planning Study**
  - Futures 1, 2, 3 analysis is complete
  - Stakeholder comments have been incorporated
  - 3 Proposals under further joint review - JOA metric B/C > 1.25
  - Further discussion of lessons learned

- **Northeast Protocol Activities**
2014 RTEP Proposal Windows Update
• Early May 2014
  – 2019 Power Flow and contingency files posted to window participants
  – 2019 Thermal Baseline N-0 & N-1 results posted to window participants

• Mid May 2014
  – 2019 Generator Deliverability results posted

• Late May 2014
  – 2019 Load Deliverability results distributed

• Early June 2014
  – 2019 Thermal N-1-1 results to be distributed

• Early July 2014
  – Anticipate opening 2014 RTEP proposal window
  – Included in scope: Baseline N-0 & N-1, Generator Deliverability, Load Deliverability, N-1-1
• 2019 Summer Thermal Analysis
  – Basecase Analysis Result
    • 12 potential thermal violations
  – Generation Deliverability Analysis Result
    • 42 potential thermal violations
  – Load Deliverability Analysis Result
    • One potential voltage violation
  – N-1-1 Analysis Result
    • Several potential thermal violations
Reliability Analysis Update
• Driver: Block load addition in the APS zone
• Lead time: less than 24 months

• Low voltage and voltage drop violations at West Union, Varner, Mountwood, Lamberton, and Sherwood 138kV buses for various contingencies

• Construct a new line between Oak Mound 138kV Substation and Waldo Run 138kV Substation. (B2475)

• Estimated Project Cost: $38M

• Projected IS Date: 12/31/2015
• Add Additional upgrades to existing project scope to address required work in neighboring transmission zones
• The existing B2006 upgrade establishes Lauschtown 500/230/69 kV stations and loops TMI – Hosensack 500 kV into the new 500 kV stations. (Estimated Project Cost: $95 M)
• Add additional upgrades (B2006.1.1 and B2006.2.1) to address the required MetEd/FirstEnergy work that is required as part of the existing B2006 upgrade.

• **B2006.1.1:** Build new sections to loop the 5026 (TMI – Hosensack 500 kV) line into the Lauschtown substation and upgrade relay at TMI 500 kV.
  • **Estimated Project Cost:** $5.25 M
  • **Required IS Date:** 6/1/2017

• **B2006.2.1:** Upgrade relay at South Reading, on the 1072 230 kV line.
  • **Estimated Project Cost:** $0.25 M
  • **Required IS Date:** 5/1/2016
Winter Peak Study Update
2014 RTEP Winter Study Update – Load Flow Model

- PJM Winter Study case update
  - PJM topology - 2019 Summer Peak RTEP model
  - External world model is updated to the MMWG 2019 winter model
  - Winter rating and Winter load profile applied
  - PJM Winter load forecast applied
• **Base case dispatch**
  
  – Pumped storage will be in generating mode
  
  – Similar to the PJM Light Load Reliability criteria, the generator fuel type will be considered in the initial base case dispatch
  
  – Average Capacity Factors (CF) by fuel type during the winter peak hours are used for the base case generating levels as shown in the following table (initial generator output = AVG CF* ICAP)
  
  – Target area interchange reflects all yearly long term firm (LTF) transmission service
  
  – Coal Units will be scaled to maintain the interchange
  
  – ProMOD study underway to predict the future CF for different fuel type of generator
    
    • The results of the ProMOD run will determine if additional sensitivity studies are needed

<table>
<thead>
<tr>
<th>FUEL TYPE</th>
<th>Solar</th>
<th>Coal (&lt;500MW)</th>
<th>Black Liquor</th>
<th>Distillate Fuel Oil</th>
<th>Kerosene</th>
<th>Landfill Gas</th>
<th>Municipal Solid Waste</th>
<th>Natural Gas</th>
<th>Nuclear</th>
<th>Other Biomass Gas</th>
<th>Other Solid</th>
<th>Petroleum Coke</th>
<th>Residual Fuel Oil</th>
<th>Water</th>
<th>Waste Coal</th>
<th>Wood Waste</th>
<th>Wind</th>
<th>Coal (&gt;500MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVG CF (2008-2013)</td>
<td>0.05</td>
<td>0.51</td>
<td>0.74</td>
<td>0.01</td>
<td>0.00</td>
<td>0.46</td>
<td>0.79</td>
<td>0.25</td>
<td>0.98</td>
<td>1.11</td>
<td>0.19</td>
<td>0.75</td>
<td>0.02</td>
<td>0.38</td>
<td>0.75</td>
<td>0.66</td>
<td>0.33</td>
<td>0.73</td>
</tr>
</tbody>
</table>
• Similar to the Generator Deliverability, Common Mode Outage and Light Load reliability criteria, generation will be ramped from their base values

• Deliverability test
  – Wind will be ramped up to 80% for single contingencies
  – The ramping limit for the remaining generators of all fuel types will be 100%

• Contingencies
  – NERC Category A, B, C (except N-1-1)
• Critical Conditions:
  – Forced outage rates
  – Natural gas contingency
• Capacity Emergency Condition Simulation
• PJM Resource Adequacy is currently calculating Winter CETO values
• PJM Developing a list of target LDAs for load deliverability simulation
• PJM Developing gas contingency definitions
Next Steps

- Finalize base case
- Perform generator ramping study
- Define gas related contingencies
- Determine Locational Deliverability Areas (LDAs) to study
  - Calculate CETO values for LDAs
- Begin Load Deliverability Analysis
Generation Deactivation Notification

Update
<table>
<thead>
<tr>
<th>Unit(s)</th>
<th>Transmission Zone</th>
<th>Requested Deactivation Date</th>
<th>PJM Reliability Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>- UPDATED Sunbury 1-4 (382MWs total)</td>
<td>PPL</td>
<td>7/18/2014 (Previous 6/1/2015)</td>
<td>Impacts identified and will be presented at July TEAC</td>
</tr>
<tr>
<td>- UPDATED Riverside 4 (76MWs)</td>
<td>BGE</td>
<td>6/1/2015 (Previous 6/1/2016)</td>
<td>Reliability analysis complete. No violations identified</td>
</tr>
<tr>
<td>- UPDated Chalk 1, 2 &amp; Dickerson 1-3 (1224MWs)</td>
<td>PEPCO</td>
<td>5/31/2018 (Previous 5/31/2017)</td>
<td>Impacts identified and will be presented at July TEAC</td>
</tr>
</tbody>
</table>
Yorktown 1 & 2

- Yorktown 1 & 2 scheduled to deactivate 12/31/2014
- Skiffe’s Creek reinforcement identified as upgrade for deactivation of Yorktown 1 & 2 (b1905)
  - Construction schedule delayed and an updated schedule is being finalized
- Yorktown 1 & 2 have been requested to remain available beyond requested deactivation date and have indicated they will discuss continued operation
- PJM & Dominion currently working to resolve construction schedule in order to inform discussion with Yorktown 1 & 2
Generation Deactivation At Risk Analysis
Deactivation At Risk Analysis

- BL England diesel: 8 MW
- BL England unit 2: 155MW
- BL England unit 3: 148.9MW
  - ACE Transmission Zone
  - 288 MW Total
  - Deactivation date: 06/01/2015

- BL England unit1 was modeled offline in this study as it was already studied for deactivation
• N-1-1 Violation
  • The DENNIS 230/138kV transformer is overloaded to 119.35% and DENNIS – CORSON 2 138kV line is overloaded to 114.37% for the loss of the New Freedom to Cardiff 230 kV line (\textit{CONTINGENCY 'NEWFDM-CARD')} followed by the loss of Corson 3 – Union 138kV line (\textit{CONTINGENCY 'CORSON-UNION')}.
  • The MDLE TP – BLE 138kV line is overloaded to 102.81% for the loss of New Freedom – Cardiff 230 kV line followed by the loss of Oyster Creek – Cedar 230 kV line.
  • Install new Dennis 230/69kV transformer (b2476).
  • Cost Estimate: $15.2M
  • Required IS Date: 6/1/2015
  • Expected IS Date: 6/01/2016

At Risk – BL England Units 2,3, and diesel
• N-1-1 Violation
• The CORSON 2 - CORSON 1 138kV line is overloaded to 115.97% for the loss of the New Freedom to Cardiff 230 kV line (CONTINGENCY ‘NEWFDM-CARD’) followed by the loss of Corson 2 – MDLE TP kV 138kV line (‘228107(CORSON 2)-228111(MDLE TP)_1’)
• The CORSON 2 - MDLE TP 138kV line is overloaded to 114.31% for the loss of New Freedom – Cardiff 230 kV line followed by the loss of Corson 1 – Corson 2 138kV line (CONTINGENCY ‘228106(CORSON 1)-228107(CORSON 2)_1’)
• Upgrade 138kV and 69kV breakers at Corson substation (b2477)
• Cost Estimate: $0.8M
• Required IS Date: 6/1/2015
• Expected IS Date: 6/01/2016
• N-1-1 Violation
• The SHRMAN#3 - LINCOLN 138kV line is overloaded to 103.22% for the loss of the Dennis – Corson 2 138kV (CONTINGENCY 'DENN-COR') followed by the loss of Union – Cumberland 138kV line (CONTINGENCY '228210(UNION)-228262(CUMB)_1')
• Reconductor 2.74 miles Sherman-Lincoln 138 kV line (b2478)
• Sherman substation work (b2490)
  – Cost Estimate: $0.11M
• Lincoln substation work (b2491)
  – Cost Estimate: $0.11M
• Cost Estimate: $4.0M
• Required IS Date: 6/1/2015
• Expected IS Date: 6/01/2016
Multiple N-1-1 Thermal and N-1-1 Voltage magnitude and drop violations in ACE area are addressed by this set of upgrades

- IS Date 6/1/2015
- Expected IS Date: 6/01/2017-06/01/2018
- New Orchard – Cardiff 230kV line (Remove, rebuild and reconfigure existing 138 kV) (b2479)
  - Cost Estimate: $57.0M
- New Upper Pittsgrove – Lewis 138kV line (b2480)
  - Cost Estimate: $28.0M
- New Cardiff – Lewis #2 138kV line (b2481)
  - Cost Estimate: $3.5M
- Orchard substation work to accommodate new Orchard – Cardiff 230kV line (b2482)
  - Cost Estimate: $3.6M
- Upper Pittsgrove substation work (b2483)
  - Cost Estimate: $0.05M

Continues on the next slide…
Continued from the previous slide:

- Landis substation work to convert Landis to a ring bus and connect 3 lines to it (b2484)
  - Cost Estimate: $13.4M
- Dorothy substation work – replace two switches with breakers (b2485)
  - Cost Estimate: $4.0M
- Cardiff substation work to accommodate new Orchard – Cardiff 230kV line and new Cardiff – Lewis 138kV line (b2486)
  - Cost Estimate: $16.4M
- Lewis substation work (b2487)
  - Cost Estimate: $0.1M
- Environmental (b2488)
  - Cost Estimate: $2M

Note: These upgrades will use existing ROW and will also address significant existing age and condition issue of 40 mile 138 kV double circuit tower line.
• Short term solution to multiple N-1-1 Voltage Violation in ACE area is to install a 100 MVAR capacitor at BLE (b2489)

• Cost Estimate: $4.0M

• Required IS Date: 6/1/2015
• Expected IS Date: 6/1/2016
- **Generator Deliverability Violation**
- Croydon – Burlington 230kV line is overloaded to 107.61% for the loss of Neshameny 138kV bus (CONTINGENCY ‘130-25/* $ BUCKS $ 130-25 $ L’)
- **Existing baseline upgrades b1197 and b1197.1 – reconductor Croydon – Burlington 230kV line**
  - Cost Estimate: $8.6M
  - Required IS Date: 6/1/2015
  - Expected IS Date: 6/1/2015
• Current unit status
  – Unit 1 – Deactivated
  – Unit 2 – Under consent order to shut down in 2015 due to environmental concerns
  – Unit 3 – available for operations

• New Service Request exists for repowering facility
  – Natural gas facility requiring pipeline
  – New Jersey Pinelands Commission has denied the proposal to build pipeline

• Concerns exist as to the violations which will exist if BL England deactivates
  – Sufficient lead time is not available to construct the necessary upgrades

• PJM staff will recommend the upgrades to the PJM Board for inclusion in the RTEP
• The need for the upgrades will be re-evaluated if assumptions regarding the status of the BL England generation change
Artificial Island Update
• **Monday, May 19th** Artificial Island TEAC
  - 3 hour stakeholder technical meeting
  - In-person at PJM CTC
• **Monday, June 2nd** – Due date for stakeholder comment/feedback (14 day comment period)
• **Today - June 5th** TEAC
• **Monday, June 16th** – PJM review of stakeholder comment/feedback and final recommendation meeting
  - TEAC WebEx / Teleconference
• **Comment Period to the PJM Board** (36 days for comment period)
• **July 10th** TEAC
• **Tuesday, July 22nd** – PJM Board meeting
  - Artificial Island solution recommendation to the PJM Board
2014 RTEP Next Steps
• Open a single proposal window for Baseline N-1, Generator Deliverability, Load Deliverability and N-1-1

• Complete 2019 Summer Voltage Analysis

• Review 15 Year Analysis Results with the TEAC

• Develop Year 8 (2022) Base Case

• Consider additional at-risk generation to evaluate
Questions?

Email: RTEP@pjm.com
• V1 – 6/3/2014 – Original version distributed to the PJM TEAC