Transmission Expansion Advisory Committee

May 8, 2014
Interregional Planning Update
EIPC non-grant 2014 Analysis

• 2014 Scenario Analysis
  • 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
Interregional Planning Studies (not including JCM)

• NCTPC
  – Study requested by NCUC
  – Reliability and Economic impact of BRA resources
  – Reliability Scope complete
  – Economic Scope under development
  – 2014 target completion

• PJM/MISO Joint Planning Study
  – Futures 1, 2, 3 analysis is complete
  – Stakeholder comments have been incorporated
  – Results under review

• Northeast Protocol Studies Update – NCSP posted
2014 RTEP Proposal Windows Update
• 2014 RTEP Approach
  – 2019 Summer Baseline N-1 Thermal result
    • Posted to the 2014 RTEP proposal window participants www.pjm.com
  – 2019 Summer Generator Deliverability and Common Mode Outage result
    • Quality control check with TOs is in progress
    • To be distributed upon completion of quality control check
  – 2019 Summer Load Deliverability results
    • Analytical study in progress at PJM
  – 2019 Summer NERC Category C3 “N-1-1” result
    • To begin following load deliverability
Reliability Analysis Update
Operational Performance

Midlothian 500kV Ring Bus

Midlothian is the last remaining substation on the Dominion system that has a 500/230kV transformer that is tapped directly to a 500kV line and has motor operated switches. This does not meet Dominion’s minimum operating standards for 500kV.

Proposed Solution: At Midlothian, replace 500kV breaker 563T576 and motor operated switches with a 3 breaker 500kV ring bus. Also, terminate Lines #563 Carson to Midlothian and #576 Midlothian to North Anna and Transformer #2 in the new ring.

Projected IS Date: Nov 2015

Estimated cost $ 9 M
• **Baseline Project b1912 scope update**
  - Project B1912 was established due to the Chesapeake Units #1-4 Retirement
  - Re-consider scope due to electrical and physical considerations

• Existing Problem: Voltage collapse in the Va Beach area for an N-1-1 outage of Suffolk-Yadkin 500 kV Line and the Yadkin – Fentress 500 kV Line

• Previous Proposed Solution: (B1912) – Install a 500 MVAr SVC at Landstown.
  - Re-consider this solution due to electrical and physical considerations

• Previous Estimated Project Cost: $60 M.
• Projected IS Date: 06/01/2016
  Continued on the next slide.....
Dominion Transmission Zone

...continued from the previous slide

- **Chesapeake Units #1-4 Retirement - Revised Solution**
  - **Existing solution:** Install a 500 MVAr SVC at Landstown.
  - Estimated Project Cost: $67 M
  - **New recommended solution:** Install three smaller +/- 125 MVAr STATCOM at three different Substations (Landstown, Yadkin, Fentress)
    - New Estimated Project Cost $70 M
  - New recommended solution benefits:
    - Three smaller distributed resources, instead of a single larger resource
    - Improved reliability in coastal environment due to the indoor configuration of a STATCOM
    - Less acoustic noise in urban areas
    - Three locations provide better physical security and a smaller foot print
    - Device response
    - Located closer to load centers
  - Projected IS Date: 06/01/2016
Supplemental Projects
• **Supplemental Project**

• To improve reliability and operability in the ComEd Western zone by addressing constraints consistently observed in real-time and day-ahead studies.

• Reconductor 0.4 miles of 345 kV line 15503 from Cordova to Nelson and replace breaker leads at Nelson. (S0704)

• Estimated Project Cost: $1.0 M

• Projected IS Date: 6/1/2015
Winter Peak Study Update
2019 Winter Study Update

- **PJM Winter Study Model**
  - Topology - based on 2019 RTEP Summer Peak case
  - External model – 2019 MMWG winter model
  - Facility Ratings - winter thermal ratings
  - Forecast - PJM Winter load forecast
  - Demand - Winter load profile submitted by TOs
  - Dispatch
  - Area interchange is the net PJM Long Term Firm commitments

- **In progress**
  - Examination of pumped hydro modeling during winter peak
  - Continue to examine winter generation outage rates
  - Capacity Factor calculation from a 2019 market efficiency study
• Winter Peak Hours Capacity Factors

<table>
<thead>
<tr>
<th>FUEL TYPE</th>
<th>Solar</th>
<th>Coal (&lt;500MW)</th>
<th>Landfill Gas</th>
<th>Natural Gas</th>
<th>Nuclear</th>
<th>WAT Run of River</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>0.46</td>
<td>0.25</td>
<td>0.98</td>
<td>0.38</td>
<td>0.33</td>
<td>0.73</td>
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</tbody>
</table>

• Capacity Factor Comparison between Summer and Winter (all hours)

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Solar</th>
<th>Coal (&lt;500MW)</th>
<th>Landfill Gas</th>
<th>Natural Gas</th>
<th>Nuclear</th>
<th>WAT Run of River</th>
<th>Wind</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUMMER CF</td>
<td>0.20</td>
<td>0.52</td>
<td>0.52</td>
<td>0.13</td>
<td>0.94</td>
<td>0.33</td>
<td>0.16</td>
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<tr>
<td>Winter CF</td>
<td>0.09</td>
<td>0.63</td>
<td>0.46</td>
<td>0.22</td>
<td>0.98</td>
<td>0.1</td>
<td>0.34</td>
</tr>
</tbody>
</table>

• Capacity Factor Next Steps
  – Evaluate the capacity factor data to determine appropriate base case and ramping values for generation by fuel type
Changes might impact capacity factors in the next several years
  – Significant coal generation retirement
  – Gas price change

ProMOD Study to predict the future CF for different type of generators

Analytical studies to perform
  – Contingencies

Potential next steps
  – Deliverability test similar to light load test with different ramping level using the uniform dispatched case
    • Ramping of hydro
    • Ramping of wind
    • Similar to other deliverability tests, the ramping limit for the remaining generators will be 100%
  – Sensitivity to change of the generator dispatch in base case
• Next Steps
  – ProMOD Study to predict the future CF is targeted to be done in June
  – The initial deliverability test will start in June
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>Dale Units 1-4 (193MWs total)</td>
<td>EKPC</td>
<td>4/16/2015</td>
<td>Reliability analysis complete. No impacts identified.</td>
</tr>
<tr>
<td>- UPDATED Sunbury 1-4 (382MWs total)</td>
<td>PPL</td>
<td>7/18/2014 (Previous 6/1/2015)</td>
<td>Reliability analysis underway</td>
</tr>
<tr>
<td>- UPDATED Riverside 4 (76MWs)</td>
<td>BGE</td>
<td>6/1/2015 (Previous 6/1/2016)</td>
<td>Reliability analysis underway</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>Reliability analysis underway</td>
</tr>
</tbody>
</table>
At-Risk Generation 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 unit 1 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 (CONTINGENCY 'NEWFDM-CARD') followed by the loss of Corson 3 – Union 138kV line (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
  • Cost Estimate: $15.2M
  • Required IS Date: 6/1/2015
  • Expected IS Date: 6/01/2016
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

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')
• Recondutor 2.74 miles Sherman-Lincoln 138 kV line
• Sherman substation work  
  – Cost Estimate: $0.11M
• Lincoln substation work  
  – 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)
  - Cost Estimate: $57.0M
- New Upper Pittsgrove – Lewis 138kV line
  - Cost Estimate: $28.0M
- New Cardiff – Lewis #2 138kV line
  - Cost Estimate: $3.5M
- Orchard substation work to accommodate new Orchard – Cardiff 230kV line
  - Cost Estimate: $3.6M
- Upper Pittsgrove substation work
  - 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
  - Cost Estimate: $13.4M
- **Dorothy substation work** – replace two switches with breakers
  - Cost Estimate: $4.0M
- **Cardiff substation work** to accommodate new Orchard – Cardiff 230kV line and new Cardiff – Lewis 138kV line
  - Cost Estimate: $16.4M
- **Lewis substation work**
  - Cost Estimate: $0.1M
- **Environmental**
  - 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

• 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 Neshaminy 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
Deactivation At Risk Analysis

- **Study Assumptions**
  - Oyster Creek Nuclear unit: 614.5 MW
    - Deactivation date: 06/01/2017
  - BL England Units deactivated
  - Upgrades noted on the previous slides in-service
- **Results** – No new problems in southern NJ
- **Following slides include potential issues and solutions outside southern NJ for this scenario**
• N-1 Common Mode violation
• Elko to Carbon Center Junction 138 kV line is overloaded to 115.95% of its emergency rating (132 MVA) for the outage of Elko to Squab Hollow 230 kV line and Elko 230/138 kV transformer for the stuck breaker failure at Elko 230kV TR#1 (‘AP_SB_442’).
• New Upgrade: Reconductor 138 kV bus at Elko. New Rating: 160 MVA (SN) 192 MVA (SE)
• Cost Estimate: $150,000
• Required IS Date: 6/1/2017
- Generation Deliverability Violation
- Frackville to Siegfried 230 kV line is overloaded to 106.42% of its emergency rating (628.63 MVA) for the outage of Sunbury 500/230 kV transformer #24, Sunbury unit 4 for the stuck breaker at Sunbury 230 kV 5S (‘PL101002’).
- Existing Upgrade: b2282 - Rebuild the Siegfried-Frackville 230 kV line
- Cost Estimate: $84.5 M
- Required IS Date: 6/1/2018
Next Steps

- Study of other generation which may be at risk for deactivation due to economics, environmental regulations, etc.
Artificial Island Update
Artificial Island Area Network

KEY

Gen Bus

1000 km

Peach Bottom
Rock Springs
Keeny
Red Lion
Cedar Creek
Cartanza

Deans
Smithburg
East Windsor
New Freedom
Orchard
Hope Creek
Salem

23030
23031
23032
5014
5025
5036
5015
5019
5014
5020
5022
5038
5039
5023
5024
5021
5037
5007
5007
to Branchburg
- 26 proposed solutions
- Approximate cost range of $100 M to $1,550 M
- Technology includes transmission at both 500 kV and 230 kV, new transformation, substations and associated equipment, additional circuit breakers, system reconfiguration, dynamic reactive, dynamic series compensation
- Diversity of project risk, requirements and timelines

### Artificial Island Proposals - Overview

<table>
<thead>
<tr>
<th>Project ID</th>
<th>TO</th>
<th>Cost ($)</th>
<th>Major Components</th>
<th>Supporting info</th>
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<tbody>
<tr>
<td>P2601-1A</td>
<td>Virginia Electric and Power Corp.</td>
<td>$130</td>
<td>500 kV NY-PJ CORR</td>
<td>Two (2) Thyristor Controlled Series Compensation (TCSC) Devices</td>
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<tr>
<td>P2601-1B</td>
<td>Virginia Electric and Power Corp.</td>
<td>$136</td>
<td>500 kV New Line from Salem, new Substation in Delaware</td>
<td>New 500 kV Line in Delaware that taps existing Cedar Creek - Pinedale 345 kV and Salem - Red Lion 230 kV</td>
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<tr>
<td>P2601-1C</td>
<td>Virginia Electric and Power Corp.</td>
<td>$232</td>
<td>600 kV New Line from Hope Creek, new Substation in Delaware</td>
<td>Install new 500 kV Line from Hope Creek - Red Lion; New Salem - Hope Creek 500 kV Line</td>
</tr>
<tr>
<td>P2601-2A</td>
<td>Transource</td>
<td>$210 - 240</td>
<td>Salem - Cedar Creek 230 kV</td>
<td>Two (2) 500 kV Transformer near Salem; Loop in Red Lion - Pinedale - Cartasus - Cedar Creek</td>
</tr>
<tr>
<td>P2601-2B</td>
<td>Transource</td>
<td>$145 - 240</td>
<td>Salem - North Cedar Creek (new) 230 kV</td>
<td>New Salem - Hope Creek 600 kV line and new 500/230 kV Substation east of Salem</td>
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<tr>
<td>P2601-2C</td>
<td>Transource</td>
<td>$122 - 146</td>
<td>Pinedale - Red Lion 500 kV</td>
<td>Two (2) 500 kV Transformers near Salem and Loop in Pinedale - Cartasus - Red Lion - Cedar Creek (230 kV)</td>
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<tr>
<td>P2601-3A</td>
<td>FirstEnergy</td>
<td>$789 - 894</td>
<td>New Freedom - Lumbar - North Smithburg (new) 500 kV line</td>
<td>New Salem - Hope Creek 600 kV line and new 500/230 kV Substation east of Salem</td>
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<tr>
<td>P2601-4A</td>
<td>PHI Electric</td>
<td>$475</td>
<td>Peach Bottom - Kem Vinyl - Pinedale - Salem 500 kV Line</td>
<td>Peach Bottom - Kem Vinyl - Pinedale 230 kV; Reconduct 230 round Hay Path, Reconduct 138 kV Hay Chapel St.</td>
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<tr>
<td>P2601-5A</td>
<td>LS Power</td>
<td>$160.3M - $160.8M</td>
<td>Salem - Silver Rive (new) 230 kV, Salem 500/230 kV Transformer</td>
<td>New 230 kV station that taps existing Cedar Creek - Red Lion 230 kV and Salem - Red Lion 500 kV</td>
</tr>
<tr>
<td>P2601-5B</td>
<td>LS Power</td>
<td>$170</td>
<td>Salem - Pinedale 500 kV</td>
<td></td>
</tr>
</tbody>
</table>
Artificial Island Preliminary Cost Allocation Examples

- Example allocation for project proposal P2013_1-4A

- P2013_1-4A
  - Build a new Peach Bottom - Keeney - Red Lion - Salem 500 kV

- See Schedule 12 of the PJM Tariff for the cost allocation method

<table>
<thead>
<tr>
<th>Transmission Zone</th>
<th>Load Ratio Share Allocation Portion</th>
<th>&quot;DFAX&quot; Allocation Portion</th>
<th>Resulting Combined Allocation</th>
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</thead>
<tbody>
<tr>
<td>AEC</td>
<td>1.70%</td>
<td>38.08%</td>
<td>19.69%</td>
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<tr>
<td>AEP</td>
<td>14.18%</td>
<td>0%</td>
<td>7.09%</td>
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<td>APS</td>
<td>5.39%</td>
<td>0%</td>
<td>2.70%</td>
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<tr>
<td>ATSI</td>
<td>8.16%</td>
<td>0%</td>
<td>4.08%</td>
</tr>
<tr>
<td>BGE</td>
<td>4.24%</td>
<td>0%</td>
<td>2.12%</td>
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<tr>
<td>ComEd</td>
<td>13.82%</td>
<td>0%</td>
<td>6.91%</td>
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<td>ConEd</td>
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<td>Dayton</td>
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<td>1.06%</td>
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<td>DEOK</td>
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<td>1.60%</td>
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<tr>
<td>DL</td>
<td>1.83%</td>
<td>0%</td>
<td>0.92%</td>
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<tr>
<td>Dominion</td>
<td>11.65%</td>
<td>0%</td>
<td>5.83%</td>
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<tr>
<td>DPL</td>
<td>2.49%</td>
<td>4.46%</td>
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<td>ECP**</td>
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<td>HTP***</td>
<td>0.01%</td>
<td>1.21%</td>
<td>0.61%</td>
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<td>JCPL</td>
<td>3.96%</td>
<td>50.73%</td>
<td>27.35%</td>
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<tr>
<td>ME</td>
<td>1.87%</td>
<td>0%</td>
<td>0.94%</td>
</tr>
<tr>
<td>NEPTUNE*</td>
<td>0.42%</td>
<td>5.40%</td>
<td>2.91%</td>
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<tr>
<td>PECO</td>
<td>5.35%</td>
<td>0%</td>
<td>2.68%</td>
</tr>
<tr>
<td>PENELC</td>
<td>1.92%</td>
<td>0%</td>
<td>0.96%</td>
</tr>
<tr>
<td>PEPCO</td>
<td>4.05%</td>
<td>0%</td>
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<td>PPL</td>
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<td>0%</td>
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<tr>
<td>PSEG</td>
<td>6.46%</td>
<td>0%</td>
<td>3.23%</td>
</tr>
<tr>
<td>RECO</td>
<td>0.27%</td>
<td>0%</td>
<td>0.14%</td>
</tr>
</tbody>
</table>

*Neptune Regional Transmission System, LLC
**East Coast Power, LLC
***Hudson Transmission Partners, LLC
Artificial Island Conceptual Cost Allocation Examples

- Example allocation for project proposal P2013_1-5A
- P2013_1-5A
  - P2013_1-5A
  - Salem - Silver Run (new station) 230 kV
  - Salem 500/230 kV Transformer
  - New 230 kV Silver Run station that taps existing Cedar Creek - Red Lion 230kV and Catanza - Red Lion 230kV

<table>
<thead>
<tr>
<th>Transmission Zone</th>
<th>Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>DPL</td>
<td>100.00%</td>
</tr>
</tbody>
</table>
• Market Efficiency Analysis Sensitivity Study
• Two scenarios
  – Scenario #1 – New 500 kV path from the AI to Red Lion
    • Result: Approximate benefit to cost ratio of 0.15
  – Scenario #2 – New path from the AI to Delaware (on the Cedar Creek - Catanza / Red Lion – Catanza path)
    • Result: Approximate benefit to cost ratio of 0.25
# Artificial Island Technical Summary

<table>
<thead>
<tr>
<th>Southern Crossing Lines (Submarine)</th>
<th>Southern Crossing Lines (Overhead)</th>
<th>Red Lion to Artificial Island Lines</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LS Power 5A - Submarine Option</strong></td>
<td><strong>LS Power 5A - Overhead</strong></td>
<td><strong>From Salem</strong></td>
</tr>
<tr>
<td><strong>Transource 2B - North Cedar Creek</strong></td>
<td><strong>Dominion 1B - 500kV Overhead</strong></td>
<td><strong>From Hope Creek</strong></td>
</tr>
<tr>
<td><strong>Transource 2A - Cedar Creek Expansion</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>From Salem</strong></td>
<td><strong>From Hope Creek</strong></td>
<td></td>
</tr>
<tr>
<td><strong>LS Power 5B - Red Lion to Salem</strong></td>
<td><strong>Dominion 1C - Red Lion to Hope Creek</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Transource 2C - Red Lion to Salem</strong></td>
<td><strong>PSE&amp;G 7K - Red Lion to Hope Creek</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Dominion 1B - 500kV Overhead</strong></td>
<td></td>
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</tr>
<tr>
<td><strong>PHL/Exelon 4A - Red Lion to Salem</strong></td>
<td></td>
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</tr>
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## Technical Analysis Criteria

<table>
<thead>
<tr>
<th>Stability</th>
<th>Maximum angle swing range of 80 - 112 degrees, dependant on solution and SVC location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal</td>
<td>Preliminary analysis indicates no thermal overloads</td>
</tr>
<tr>
<td>Market Efficiency Results</td>
<td>Approximate $92 M cost savings over 15 Years</td>
</tr>
<tr>
<td>Short Circuit</td>
<td>Three overdutied 500 kV breakers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stability</th>
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</tr>
</thead>
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<tr>
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<tr>
<th>Stability</th>
<th>Maximum angle swing range of 77 - 102 degrees, dependant on solution and SVC location</th>
</tr>
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<tr>
<td>Thermal</td>
<td>Preliminary analysis indicates no thermal overloads</td>
</tr>
<tr>
<td>Market Efficiency Results</td>
<td>Approximate $57 M cost savings over 15 Years</td>
</tr>
<tr>
<td>Short Circuit</td>
<td>No overdutied breakers</td>
</tr>
</tbody>
</table>

## Summary

- **Stability**: The maximum angle swing range varies depending on the solution and SVC location.
- **Thermal**: Preliminary analysis indicates no thermal overloads.
- **Market Efficiency Results**: Approximate $92 M cost savings over 15 Years.
- **Short Circuit**: Three overdutied 500 kV breakers.
• Additional stability analysis
  – Evaluating the scenario of Hope Creek – Red Lion 500 kV without a second tie between Hope Creek – Salem plus an SVC
  – Stakeholder suggestion that a Salem – Peach Bottom 500 kV line without an SVC would satisfy the Artificial Island problem statement
• PJM analysis indicates that this configuration does not meet applicable stability testing criteria without an SVC
TEAC Notification for special TEAC Artificial Island Meetings on 5/19 & 6/16
<table>
<thead>
<tr>
<th>Criteria</th>
<th>Proposal</th>
<th>Southern Crossing 230kV Lines (Submarine)</th>
<th>Southern Crossing Lines (Overhead)</th>
<th>Red Lion to Salem 500kV Lines</th>
<th>Red Lion to Hope Creek 500kV Lines</th>
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<tr>
<td></td>
<td>Sub-Criteria</td>
<td>LS Power SA - Submarine Option</td>
<td>Transource 2B - North Cedar Creek</td>
<td>Transource 2A - Cedar Creek Expansion</td>
<td>LS Power SA - Dominion 18 - 500kV Overhead</td>
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<td>Technical Analysis</td>
<td>Stability</td>
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<td>Route Diversity</td>
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<td>Cost Factors</td>
<td>Permitting</td>
<td>Property Acquisition</td>
<td>Construction</td>
<td>Long Lead Time Materials</td>
<td>Outages</td>
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<tr>
<td>Project Schedule</td>
<td>Project Complexity</td>
<td>Line Crossings</td>
<td>Outage Requirements</td>
<td>Modification of Red Lion Sub</td>
<td>Modification of other Transmission Facilities</td>
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<tr>
<td>RoW and Land Acquisition</td>
<td>No Eminent Domain in Delaware</td>
<td>New Right of Way Required</td>
<td>Substation Land Required</td>
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<tr>
<td>Siting and Permitting</td>
<td>Wetlands Impact</td>
<td>Public Opposition Risk</td>
<td>Historic and Scenic Highway</td>
<td>Delaware River Crossing</td>
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<tr>
<td>Operational Impact</td>
<td>Impact to Artificial Island Facility</td>
<td>Blackstart</td>
<td>Operational Performance</td>
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</table>
May 19th Special TEAC Artificial Island Meeting

• Artificial Island Technical Review
• 09:00 – 12:00 at the PJM CTC and WebEx/Teleconference
• PJM Review of analytical and constructability progress
• Stakeholder Q&A
Artificial Island Timeline

- **Monday, May 19\(^{th}\) Special TEAC**
  - 3 hour stakeholder technical meeting
  - In-person at PJM CTC
- **Monday, June 2\(^{nd}\) – Due date for stakeholder comment/feedback (14 day comment period)**
- **June 5\(^{th}\) TEAC**
- **Monday, June 16\(^{th}\) – PJM review of stakeholder comment/feedback and final decision meeting**
  - Webex / Teleconference
- **Comment Period to the PJM Board (36 days for comment period)**
- **July 10\(^{th}\) TEAC**
- **Tuesday, July 22\(^{nd}\) – PJM Board meeting**
  - Artificial Island solution recommendation to the PJM Board
Questions?

Email: RTEP@pjm.com
Revision History

- Version 1 – 5/6/2014 – Original Version Distributed to PJM TEAC
- Version 2 – 5/6/2014 – Updated slide #43 – AI evaluation categories
- Version 3 – 5/7/2014 – Updated slide #6 to 2019 study year & updated slides 39 and 40 regarding Market Efficiency
  - Added slides 8-10 for the Dominion Transmission Zone to the Reliability Analysis Update section
  - Updated Slide 31 contingency and costs
- Version 4 – 5/9/2014 – Updated with feedback received at the 5/8/2014 TEAC meeting