Market Efficiency RTEP Proposal Window
Market Efficiency RTEP Proposal Window Status

- Window opened on 8/12/2013
- Closed on 9/26/2013
- 17 individual proposals addressing congestion from Market Efficiency Analysis
- 6 entities

Project Naming Convention
- Project Identification Taxonomy: 2013_1-1A
<table>
<thead>
<tr>
<th>Project ID</th>
<th>Proposing Company</th>
<th>Project Description</th>
<th>Zone</th>
<th>Voltage Level</th>
<th>Expected In-Service Date</th>
<th>Estimated Project Costs (Millions)</th>
<th>Identified Constraint Relief</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013_2-1A</td>
<td>Commonwealth Edison (Exelon)</td>
<td>Re-sag transmission line; Zion Energy Center 345 kV to Zion 345 kV</td>
<td>COMED</td>
<td>345 kV</td>
<td>2015</td>
<td>0.9</td>
<td>Zion 345 kV to Zion 345 kV</td>
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<tr>
<td>2013_2-1B</td>
<td>Commonwealth Edison (Exelon)</td>
<td>Upgrade switch on L11323 between Haumesser Rd 138 kV and West Dekalb Tap 138 kV</td>
<td>COMED</td>
<td>138 kV</td>
<td>2015</td>
<td>0.2</td>
<td>Haumesser Road 138 kV to West Dekalb Tap 138 kV</td>
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<tr>
<td>2013_2-1C</td>
<td>Commonwealth Edison (Exelon)</td>
<td>Re-sag transmission line; Loretto 345 kV to Wilton Center 345 kV</td>
<td>COMED</td>
<td>345 kV</td>
<td>2015</td>
<td>6.1</td>
<td>Streator Cayuga Ridge Wind Farm 345 kV to Wilton CTR 345 kV</td>
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<tr>
<td>2013_2-2A</td>
<td>Dominion Virginia Power</td>
<td>Install a Thyristor-controlled series capacitor on Loudoun 500 kV to Meadow Brook 500 kV line at Loudoun</td>
<td>DOM</td>
<td>500 kV</td>
<td>2017</td>
<td>24.6</td>
<td>AP South</td>
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<tr>
<td>2013_2-2B</td>
<td>Dominion Virginia Power</td>
<td>Install a Thyristor-controlled series capacitor on Morrisville 500 kV to Front Royal 500 kV at Morrisville</td>
<td>DOM</td>
<td>500 kV</td>
<td>2017</td>
<td>20.1</td>
<td>AP South</td>
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<tr>
<td>2013_2-2C</td>
<td>Dominion Virginia Power</td>
<td>Install a Thyristor-controlled Series Capacitor on Mt. Storm 500 kV to Meadow Brook 500 kV at Mt. Storm</td>
<td>DOM</td>
<td>500 kV</td>
<td>2017</td>
<td>24.7</td>
<td>AP South</td>
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<tr>
<td>2013_2-3A</td>
<td>Duke-ATC</td>
<td>Install a new DATC 8 345 kV substation; Install a new DATC 8 to Woodsdale 345 kV line</td>
<td>DEOK</td>
<td>345 kV</td>
<td>2020</td>
<td>25.0</td>
<td>Miami Fort 345/138 kV transformer; Pierce = Beckjord 138 kV, Miami Fort = Hebron 138 kV</td>
</tr>
<tr>
<td>2013_2-4A</td>
<td>First Energy</td>
<td>Install 800 MVAR series capacitors on Jacks Mt - Keystone 500 kV &amp; Jacks Mt - Conemaugh 500 kV; and 400 MVAR series capacitors on each (2) Jacks Mt - Juniata 500 kV lines</td>
<td>PENELC</td>
<td>500 kV</td>
<td>2017</td>
<td>54.3</td>
<td>AP South; Hunterstown 230/115 kV; Pruntytown to Mt Storm 500 kV</td>
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<tr>
<td>2013_2-4B</td>
<td>First Energy</td>
<td>Install 2nd Hunterstown 230/115 kV transformer; Recondor Hunterstown - Oxford 115 kV line</td>
<td>METED</td>
<td>230 kV</td>
<td>2017</td>
<td>8.0</td>
<td>Hunterstown 230/115 kV</td>
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<td>2013_2-4C</td>
<td>First Energy</td>
<td>Install +240/-150 MVAR SVC designed with 100 MVAR static capacitor bank at Lakeshore substation</td>
<td>ATSI</td>
<td>138 kV</td>
<td>2017</td>
<td>61.7</td>
<td>Cleveland Interface</td>
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<tr>
<td>Project ID</td>
<td>Proposing Company</td>
<td>Project Description</td>
<td>Zone</td>
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<td>Estimated Project Costs ($millions)</td>
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<tr>
<td>2013_2-6A</td>
<td>Northeast Transmission Development (LS Power)</td>
<td>Install new Erie West - Ashtabula 345 kV line and new 345/138 kV transformer at Ashtabula</td>
<td>PENELEC/ATSI</td>
<td>345 kV</td>
<td>2018</td>
<td>44.9</td>
<td>Cleveland Interface</td>
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<tr>
<td>2013_2-6B</td>
<td>Northeast Transmission Development (LS Power)</td>
<td>Install new Hunterstown - Cumberland 230 kV line and substation improvements</td>
<td>METED/PPL</td>
<td>230 kV</td>
<td>2018</td>
<td>63.9</td>
<td>Hunterstown 230/115 kV Transformer; Three Mile Island – Jackson 230 kV Line</td>
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<tr>
<td>2013_2-6C</td>
<td>Northeast Transmission Development (LS Power)</td>
<td>Install new series compensation station on the existing Steele-Vienna 230 kV transmission line</td>
<td>DPL</td>
<td>230 kV</td>
<td>2016</td>
<td>10.6</td>
<td>Wye Mills – Longwoods 69 kV Line; Milford – Cool Springs 230 kV Line</td>
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<tr>
<td>2013_2-6D</td>
<td>Northeast Transmission Development (LS Power)</td>
<td>Install a new 500/138 kV substation on the existing Conemaugh-Hunterstown 500 kV line; Install a new 138 kV substation: Install a new approximately 6-mile double-circuit transmission line connecting these two new substations.</td>
<td>PN/ME/APS</td>
<td>138 kV</td>
<td>2018</td>
<td>61.7</td>
<td>AP South; Hunterstown 230/115 kV Transformer</td>
</tr>
<tr>
<td>2013_2-6A</td>
<td>Transource Energy</td>
<td>Install a new 500 kV substation with series capacitors to compensate the Mt. Storm – Doubs 500 kV line. Upgrade of control systems for the series capacitors at the Kanawha River station on the Kanawha River – Matt Funk 345 kV line.</td>
<td>AEP</td>
<td>500 kV</td>
<td>2018</td>
<td>39.3</td>
<td>AP South; AEP-DOM Interface</td>
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<tr>
<td>2013_2-6B</td>
<td>Transource Energy</td>
<td>Install a new 138 kV substation in the vicinity of Pleasant Valley substation that connects two of the four 138 kV lines between the Pleasant Valley and Juniper substations. This substation would include a 100 MVAR capacitor bank and a +350/-0 MVAR SVC.</td>
<td>ATSI</td>
<td>138 kV</td>
<td>2018</td>
<td>32.9</td>
<td>Cleveland Interface</td>
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<tr>
<td>2013_2-6C</td>
<td>Transource Energy</td>
<td>Install a new 500 kV substation with series capacitors to compensate the Mt. Storm – Doubs 500 kV line. Upgrade of control systems for the series capacitors at the Kanawha River station on the Kanawha River – Matt Funk 345 kV line. Additionally include series compensation for Mt. Storm-Meadowbrook 500 kV line.</td>
<td>AEP</td>
<td>500 kV</td>
<td>2018</td>
<td>63.3</td>
<td>AP South; AEP-DOM Interface</td>
</tr>
</tbody>
</table>
• Post Redacted Proposals: November 2013
• Review Results: December 2013 – January 2014
• Recommendations to PJM Board: February 2014
• Begin 2014/2015 Market Efficiency Cycle: February 2014
Market Efficiency Proposal Results
Market Efficiency Projects

ATSI Area
Market Efficiency Proposal 2013_2-4C

- **Description**
  - ATSI Zone
  - Install +240/-150 MVAR SVC designed with 100 MVAR static capacitor bank at Lakeshore substation

- **Project Details:**
  - Proposed by: First Energy
  - Expected ISD: 2017
  - Estimated Project Cost: $61.7 M

- **Posted constraints targeted:**
  - Cleveland Interface

- **Results:**
  - Updated generation and RTEP model eliminates need for project
    - Cleveland Interface congestion removed
• **Description**
  - PENELEC/ATSI Zone
  - Install new Erie West - Ashtabula 345 kV line and new 345/138 kV transformer at Ashtabula

• **Project Details:**
  - Proposed by: Northeast Transmission Development (LS Power)
  - Expected ISD: 2018
  - Estimated Project Cost: $44.9 M

• **Posted constraints targeted:**
  - Cleveland Interface

• **Results:**
  - Updated generation and RTEP model eliminates need for project
    - Cleveland Interface congestion removed
Market Efficiency Proposal 2013_2-9B

• Description
  • ATSI Zone
  • Install a new 138 kV substation in the vicinity of Pleasant Valley substation that connects two of the four 138 kV lines between the Pleasant Valley and Juniper substations. This substation would include a 100 MVAr capacitor bank and a +350 / -0 MVAr SVC

• Project Details:
  • Proposed by: TRANSOURCE
  • Expected ISD: 2018
  • Estimated Project Cost: $32.87 M

• Posted constraints targeted:
  • Cleveland Interface

• Results:
  • Updated generation and RTEP model eliminates need for project
    • Cleveland Interface congestion removed
Market Efficiency Projects
ComEd Area
Market Efficiency Proposal 2013_2-1A

- Description
  - ComEd Zone
  - Re-sag transmission line: Zion Energy Center 345 kV to Zion 345 kV

- Project Details:
  - Proposed by: Exelon
  - Expected ISD: 2015
  - Estimated Project Cost: $0.915 M

- Posted constraints targeted:
  - Zion 345 kV to Zion 345 kV

- Results:
  - Base congestion associated with a modeled double contingency not valid for this internal facility and eliminates need for project
• Description
  ➢ ComEd Zone
  ➢ Upgrade switch on L11323 between Haumesser Rd 138 kV and West Dekalb Tap 138 kV

• Project Details:
  ➢ Proposed by: Exelon
  ➢ Expected ISD: 2015
  ➢ Estimated Project Cost: $0.19 M

• Posted constraints targeted:
  ➢ Haumesser Road 138 kV to West Dekalb Tap 138 kV

• Results:
  ➢ Approved 2012 RTEP project eliminates need for project
    ➢ B2128: Reconductor 8.9 miles of 138 kV line 1323 from Waterman to Glidden, replace two spans of conductor between Haumesser Road and Waterman also on line 11323.
Market Efficiency Proposal 2013_2-1C

- Description
  - ComEd Zone
  - Re-sag transmission line: Loretto 345 kV to Wilton Center 345 kV

- Project Details:
  - Proposed by: Exelon
  - Expected ISD: 2015
  - Estimated Project Cost: $6.1 M

- Posted constraints targeted:
  - Streator Cayuga Ridge Wind Farm 345 kV to Wilton Center 345 kV

- Results:
  - Benefit/Cost Ratio = 1.00
    - B/C <1.25: Not Recommended
    - Results do not reflect removal of recently withdrawn queued generation in area which will further reduce benefit
Market Efficiency Projects
AEP/Dominion Area
Market Efficiency Proposal 2013 2-2A

- **Description**
  - **Dominion Zone**
  - Install a Thyristor-controlled series capacitor on Loudoun 500 kV to Meadow Brook 500 kV Line at Loudoun

- **Project Details:**
  - Proposed by: Dominion Virginia Power
  - Expected ISD: 2017
  - Estimated Project Cost: $24.57 M

- **Posted constraints targeted:**
  - ApSouth

- **Results:**
  - **Benefit/Cost Ratio = -1.05**
  - B/C <1.25: Not Recommended
  - Benefit reduced because of change in value of ARR credits
• Description
  - Dominion Zone
  - Install a Thyristor-controlled series capacitor on Morrisville 500 kV to Front Royal 500 kV at Morrisville

• Project Details:
  - Proposed by: Dominion Virginia Power
  - Expected ISD: 2017
  - Estimated Project Cost: $20.07 M

• Posted constraints targeted:
  - ApSouth

• Results:
  - Benefit/Cost Ratio = .51
    - B/C <1.25: Not Recommended
    - Benefit reduced because of change in value of ARR credits
• Description
  ➢ Dominion Zone
  ➢ Install a Thyristor-controlled series capacitor on Mt. Storm 500 kV to Meadow Brook 500 kV at Mt. Storm

• Project Details:
  ➢ Proposed by: Dominion Virginia Power
  ➢ Expected ISD: 2017
  ➢ Estimated Project Cost: $24.73 M

• Posted constraints targeted:
  ➢ ApSouth

• Results:
  ➢ Benefit/Cost Ratio = .74
    ➢ B/C <1.25: Not Recommended
    ➢ Benefit reduced because of change in value of ARR credits
Market Efficiency Proposal 2013_2-9A

- **Description**
  - AEP Zone
  - Install a new 500 kV substation with series capacitors to compensate the Mt. Storm – Doubs 500 kV line. Upgrade of control systems at the Kanawha River station to enable series compensation off the Kanawha River – Matt Funk 345 kV line

- **Project Details**:
  - Proposed by: TRANSOURCE
  - Expected ISD: 2018
  - Estimated Project Cost: $39.3 M

- **Posted constraints targeted**:
  - AP South; AEP-DOM Interface

- **Results**:
  - Benefit/Cost Ratio = -2.27
  - B/C <1.25: Not Recommended
Market Efficiency Proposal 2013 2-9C

• Description
   AEP Zone
   Same as project 2013_2-9A but with additional series compensation for Mt. Storm-Meadowbrook 500 kV Line.

• Project Details:
   Proposed by: TRANSOURCE
   Expected ISD: 2018
   Estimated Project Cost: $63.3 M

• Posted constraints targeted:
   AP South; AEP-DOM Interface

• Results:
   Benefit/Cost Ratio = 0.39
     B/C <1.25 : Not Recommended
Market Efficiency Projects
DEOK Area
Market Efficiency Proposal 2013 2-3A

• Description
  - DEOK Zone
  - Install a new DATC 8 345 kV substation; Install a new DATC 8 to Woodsdale 345 kV line

• Project Details:
  - Proposed by: Duke-ATC
  - Expected ISD: 2020
  - Estimated Project Cost: $25 M

• Posted constraints targeted:
  - Miami Fort 345/138 kV transformer; Pierce – Beckjord 138 kV; Miami Fort – Hebron 138 kV

• Results:
  - Benefit/Cost Ratio = .08
    - B/C <1.25: Not Recommended
    - Project provides minimal benefit to Market Efficiency congestion
Market Efficiency Projects
DPL Area
• Description
  ➢ DPL Zone
  ➢ Install new series compensation station on the existing Steele-Vienna 230 kV transmission line
• Project Details:
  ➢ Proposed by: Northeast Transmission Development (LS Power)
  ➢ Expected ISD: 2016
  ➢ Estimated Project Cost: $10.6 M
• Posted constraints targeted:
  ➢ Wye Mills – Longwoods 69 kV Line; Milford – Cool Springs 230 kV Line
• Results:
  ➢ Benefit/Cost Ratio = 0.97
    ➢ B/C <1.25: Not Recommended
    ➢ Merchant project Y1-082 (Wye Mills Substation and switch replacement) with signed CSA will further reduce benefits
Market Efficiency Projects
PENELEC/PPL/METED/APS Areas
Market Efficiency Proposal 2013_2-4A

- Description
  - PENELEC Zone
  - Install 600 MVAR series capacitors on Jacks Mtn - Keystone 500 kV & Jacks Mtn - Conemaugh 500 kV; and 400 MVAR series capacitors on each (2) Jacks Mtn - Juniata 500 kV lines

- Project Details:
  - Proposed by: First Energy
  - Expected ISD: 2017
  - Estimated Project Cost: $54.28 M

- Posted constraints targeted:
  - AP South; Hunterstown 230/115 kV; Pruntytown to Mt Storm 500 kV

- Results:
  - Benefit/Cost Ratio = 0.01
  - B/C <1.25: Not Recommended
  - Project dependent on Jacks Mountain (b0284) which is being evaluated for removal from RTEP
Market Efficiency Proposal 2013 2-4B

- **Description**
  - METED Zone
  - Install 2nd Hunterstown 230/115 kV transformer; Reconductor Hunterstown - Oxford 115 kV line

- **Project Details:**
  - Proposed by: First Energy
  - Expected ISD: 2017
  - Estimated Project Cost: $8 M

- **Posted constraints targeted:**
  - Hunterstown 230/115 kV

- **Results:**
  - Benefit/Cost Ratio = 6.14
    - B/C >1.25
    - Low cost solution
    - See comparison table with other projects in this area
• Description
  - METED/PPL Zone
  - Install new Hunterstown - Cumberland 230 kV line and substation improvements

• Project Details:
  - Proposed by: Northeast Transmission Development (LS Power)
  - Expected ISD: 2018
  - Estimated Project Cost: $63.9 M

• Posted constraints targeted:
  - Hunterstown 230/115 kV Transformer; Three Mile Island – Jackson 230 kV Line

• Results:
  - Benefit/Cost Ratio = 1.31
    - B/C >1.25
    - See comparison table with other projects in this area
Market Efficiency Proposal 2013_2-6D

- **Description**
  - PENELEC/METED/APS Zones
  - Install a new 500/138 kV substation on the existing Conemaugh-Hunterstown 500 kV line; Install a new 138 kV substation; Install a new approximately 6-mile double-circuit transmission line connecting these two new substations

- **Project Details:**
  - Proposed by: Northeast Transmission Development (LS Power)
  - Expected ISD: 2018
  - Estimated Project Cost: $61.7 M

- **Posted constraints targeted:**
  - AP South; Hunterstown 230/115 kV Transformer

- **Results:**
  - Benefit/Cost Ratio = 1.54
    - B/C >1.25
    - See comparison table with other projects in this area
Observations

- Project 2013_2-4B has highest B/C ratio under all sensitivities
- Cost has major impact on results
- All projects provide benefit
- All projects pass B/C threshold with future generation scaling removed in local area
- All projects pass B/C threshold if in-service year delayed one year
- Reliability Impact - in progress

<table>
<thead>
<tr>
<th>Developer</th>
<th>Description</th>
<th>Benefit/Cost Ratio</th>
<th>Project Costs ($ millions)</th>
<th>In-service year</th>
<th>Type</th>
<th>Benefit/Cost Ratio for Sensitivity Runs</th>
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<tbody>
<tr>
<td>Noreast Transmission Development (LS Power)</td>
<td>Install new Hunterstown-Cumberland 230 kV line</td>
<td>1.32</td>
<td>63.9</td>
<td>2018</td>
<td>Lower Voltage</td>
<td>1.51</td>
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<tr>
<td>Noreast Transmission Development (LS Power)</td>
<td>Install a new 500/138 kV substation on the existing Connemaugh-Hunterstown 500 kV line, a new 138 kV substation and a new, approximately 6-mile double-circuit transmission line connecting these two new substations</td>
<td>1.54</td>
<td>61.7</td>
<td>2018</td>
<td>Lower Voltage</td>
<td>1.8</td>
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<table>
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<tr>
<th>Gas price increased by $1</th>
<th>2013_2-4B</th>
<th>2013_2-6B</th>
<th>2013_2-6D</th>
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<tbody>
<tr>
<td>6.12</td>
<td>1.51</td>
<td>1.8</td>
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<tr>
<th>Load increased by 2%</th>
<th>2013_2-4B</th>
<th>2013_2-6B</th>
<th>2013_2-6D</th>
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<tbody>
<tr>
<td>5.91</td>
<td>1.42</td>
<td>1.78</td>
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</table>
If project 2013_2-4B was approved, would either project 2013_2-6B or 2013_2-6D be beneficial?

- Not recommended to combine Projects
2013 Market Efficiency proposal window observations

- **Stakeholder Feedback**
  - Base Promod model and preliminary results need to be posted at least one month before proposal window opens
  - Facility rating and topology updates should be reported back to PJM before proposal window opens

- **Benefit /Cost Calculation**
  - Stakeholders would benefit on an education on how calculation is done
  - ARR values
  - Topology used for each year
Market Efficiency Next Steps

- Complete Reliability impact on Hunterstown area projects: January 2014
- Review Final Results and Recommendations for Hunterstown Area: January 2014
- Recommendations to PJM Board: February 2014
- Coordinate with Interregional group for Joint PJM/MISO study
• 12/9/2013 v1: Original version distributed to PJM TEAC

• 12/9/2013 v2: Slide 31 updated to reflect the projects were studied as incremental to project 2012_2-4B and not combined.