Transmission Expansion Advisory Committee Meeting

2011 Market Efficiency Analysis Results

September 8, 2011

- 2010 project review updates
  - COMED Area
  - PPL, METED, and PENELEC Area
  - Dominion and AEP Areas

Market Efficiency Projects

COMED AREA

COMED Area Proposed Projects

Project Number	Description	Expected ISD	Voltage	Estimated Costs ($ millions)	Benefit/Cost
MEP-A-1	Byron-Cherry Valley-Pleasant Valley 345 KV	2016	345	112.5	0.75
MEP-A-2	Byron-Pleasant Valley 345 KV	2016	345	105	0.96
MEP-A-3	Cherry Valley - Pleasant Valley 345 KV	2016	345	67.5	2.74
MEP-A-4	Byron - Charter Grove- Wayne 345 KV, Charter Grove 345/138 KV TX.	2016	345	275	0.24
MEP-A-5	Byron - Wayne 345 KV	2016	345	175	0.41

MEP-A-3 project moves congestion to Byron-Cherry Valley 345 KV Ckt.

Summary COMED Area Proposed Upgrades

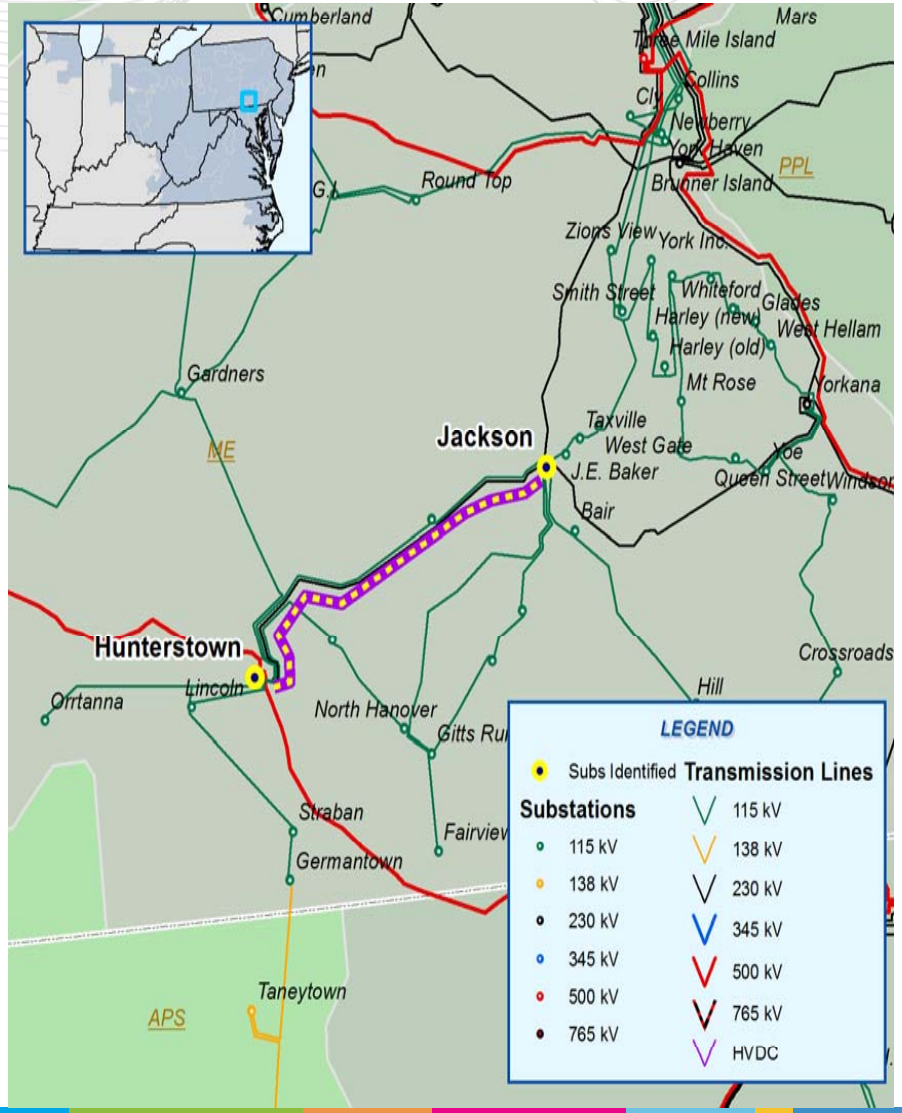
- Next Steps
  - Independent Cost Review currently being conducted
  - Coordination with Light Load study
  - Coordination with Regional Planning Process Task Force (RPPTF) developments

Market Efficiency Projects

METED, PPL, PENELEC Area

Market Efficiency New Proposed Project: METED Area

- Project MEP-B-6: Hunterstown – Jackson
  - New Single 230 KV circuit from Hunterstown to Jackson
  - New transformer at Hunterstwon 500/230 KV.
- Project creates reliability and market concerns on lower voltage system
  - Hunterstown 230/115 KV transformer
- Modified project to add additional 230/115 KV transformer at Hunterstown.
- Expected ISD: 6/1/2016
- Estimated project Costs.
  - $75 million
- Results:
  - Benefit/Cost ratio=.85
  - .85 <1.25 - Fail



METED, PPL, PENELEC Area Proposed Projects

Project Number	Description	Expected ISD	Voltage	Estimated Costs ($ millions)	Benefit/Cost
MEP-A-6	New Hunterstown 500 kV Tx, New single circuit Hunterstown-Conewago 230 kV line, New Conewago 230 kV substation connecting the Jackson - Three Mile Island 230 kV and West Shore - Brunner Island 230 kV transmission lines near their intersection in York County	2016	230	99.4	1.09
MEP-A-7	Two new Hunterstown 500 kV Tx, New Double circuit Hunterstown-Conewago 230 kV line, New Conewago 230 kV substation connecting the Jackson - Three Mile Island 230 kV and West Shore - Brunner Island 230 kV transmission lines near their intersection in York County	2016	230	134.1	0.74
MEP-A-8	New 230 kV transmission line from Keystone to Shawville	2015	230	137.5	0.34
MEP-B-6	New 500/230 Transformer at Hunterstown with a new Hunterstown to Jackson 230 kV circuit plus a new 230/115 transformer at Hunterstown.	2016	230	75	0.85

Summary METED, PPL, PENELEC Area Proposed Upgrades

- Next Steps
  - Independent Cost Review currently being conducted

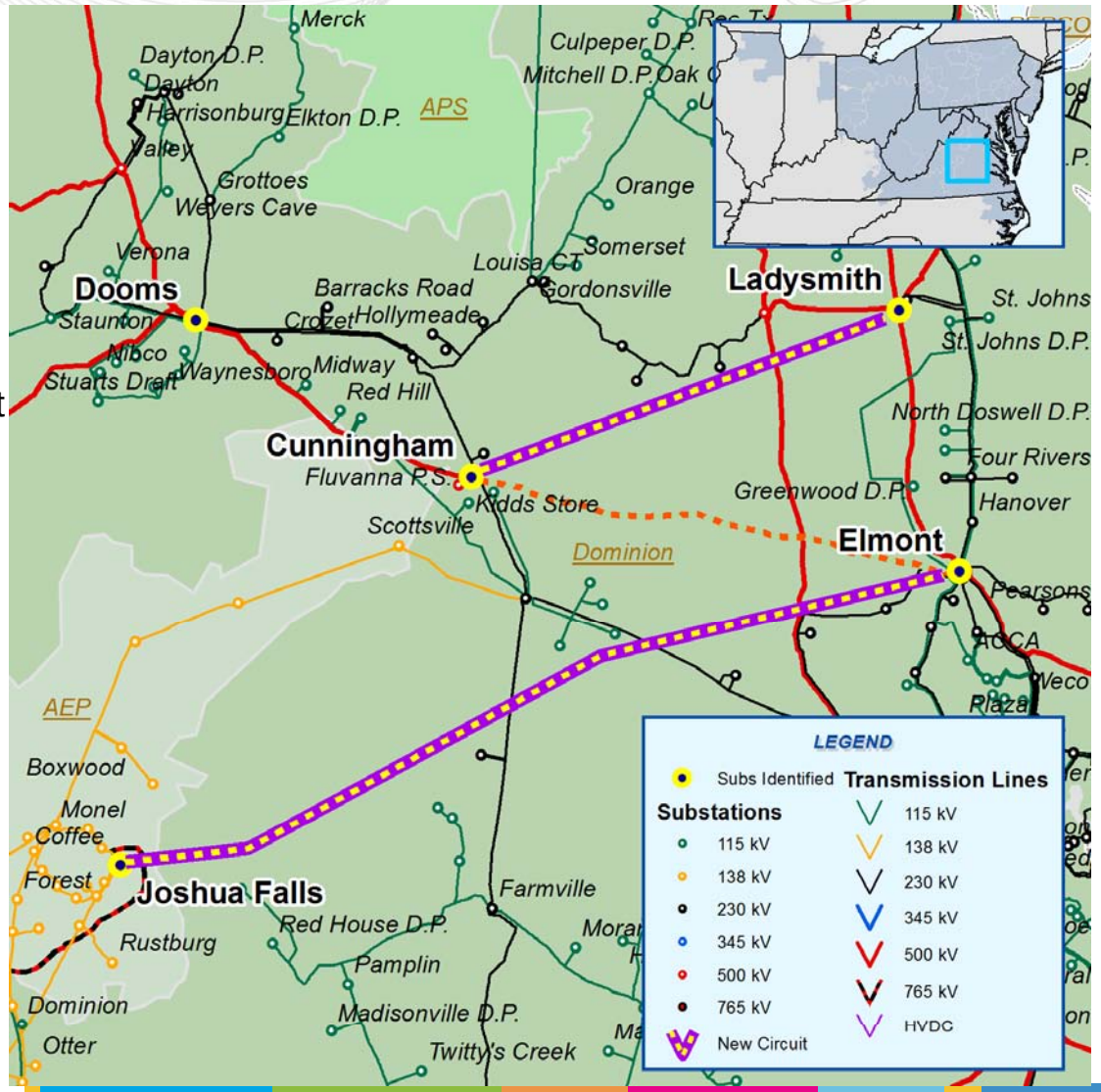
Market Efficiency Projects

Dominion and AEP Area

Market Efficiency New Proposed Project: AEP/Dominion Area

- Project MEP-B-1
- Install a 765/500 kV transformer at Joshua Falls station and construct an approximately 85-mile 500 kV line from Joshua Falls station to the existing Dooms - Elmont 500 kV line. Construct an approximately 30-mile 500 kV line from the Dooms - Elmont 500 KV line to Ladysmith station. Split the Dooms - Elmont 500 kV line to create separate Joshua Falls - Elmont and Dooms - Ladysmith 500 kV circuits.

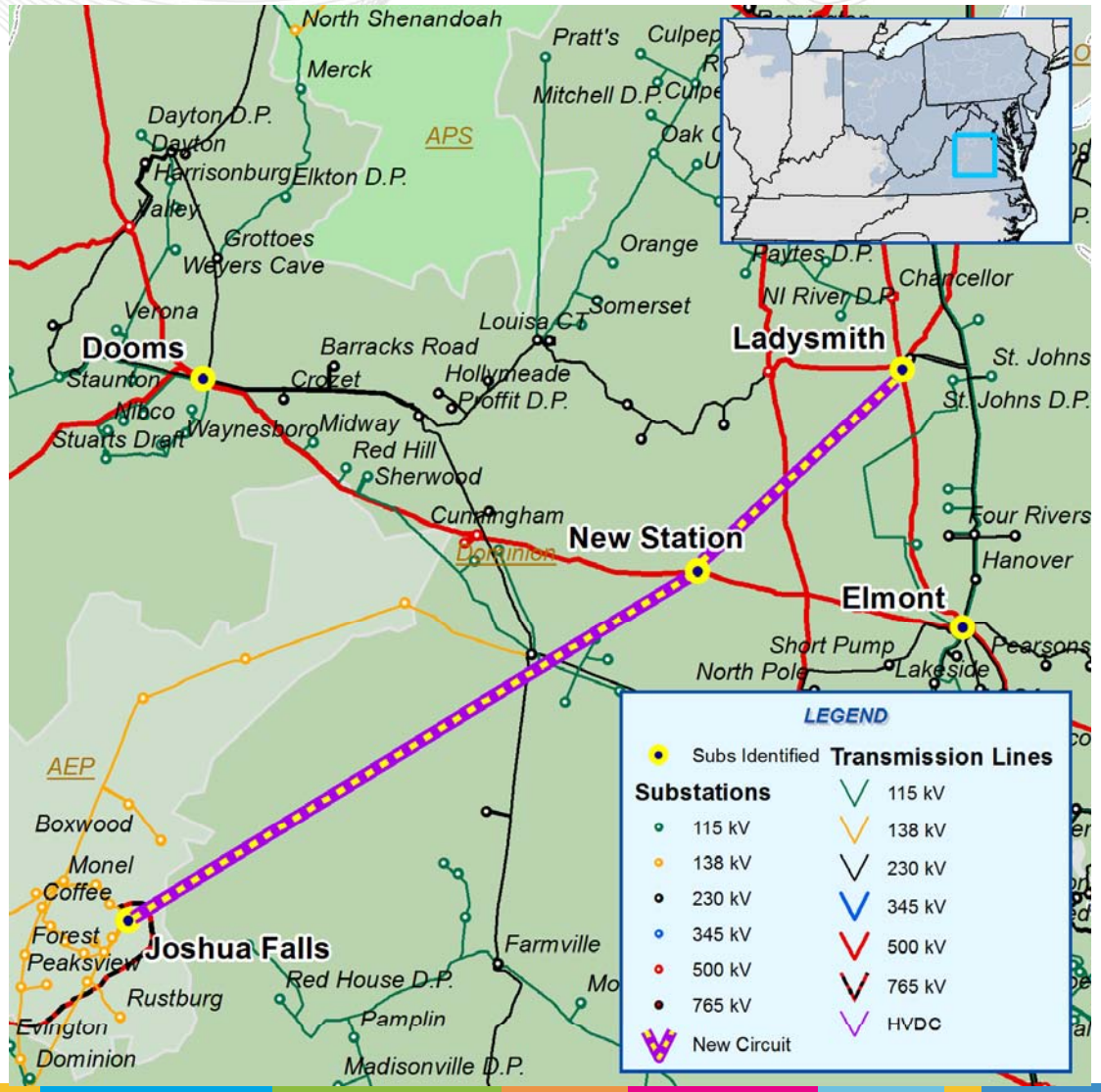
- Expected ISD: 6/1/2017
- Estimated project Costs.
  - $300 million
- Results:
  - Benefit/Cost ratio= -.13
  - -.13 <1.25 - Fail



Market Efficiency New Proposed Project: AEP/Dominion Area

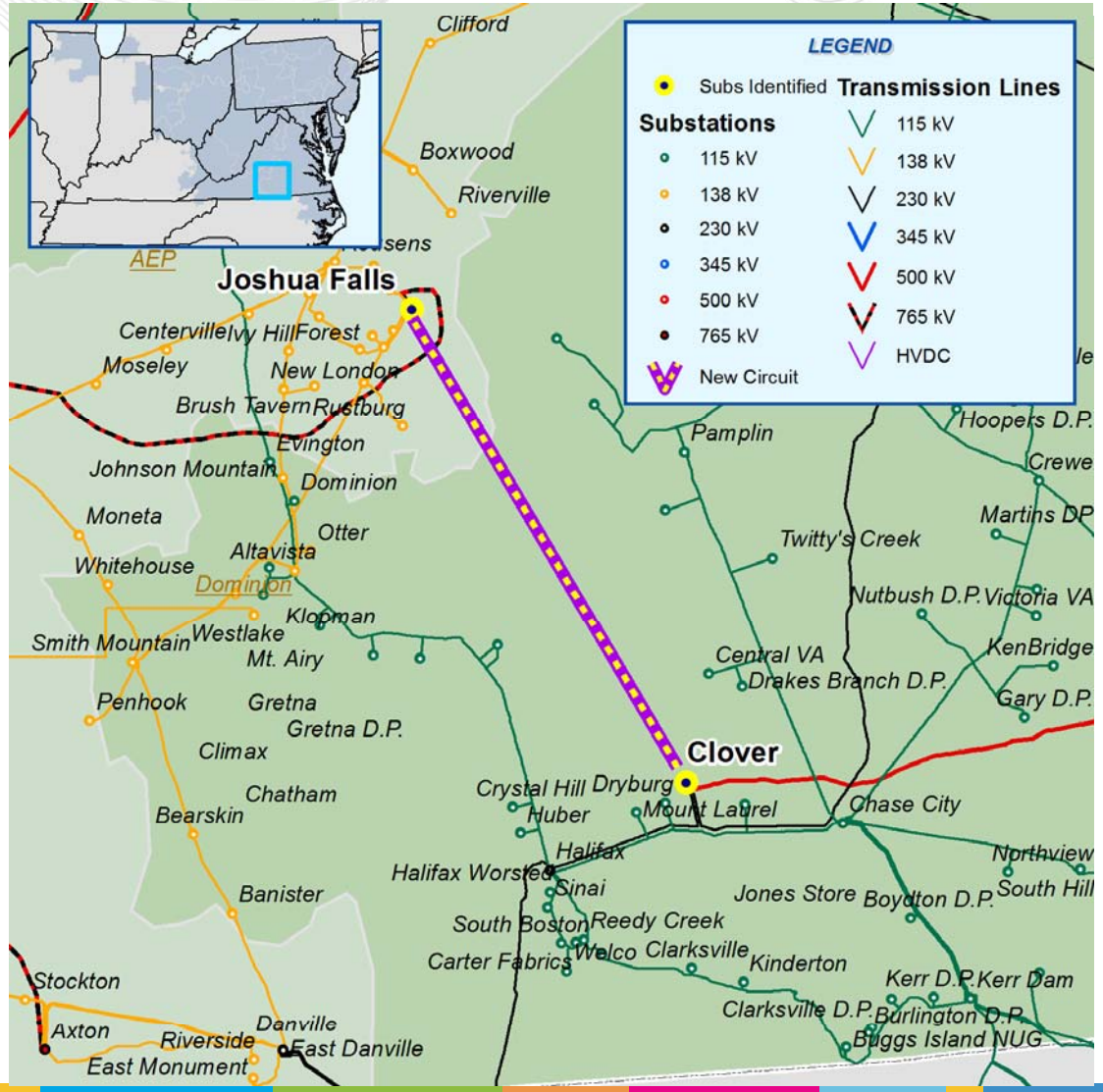
- Project MEP-B-2
- Install a 765/500 kV transformer at Joshua Falls station and construct a new 500 kV station on the existing Dooms - Elmont 500 kV line. Construct an approximately 85-mile 500 kV line from Joshua Falls station to the new station. Construct an approximately 30-mile 500 kV line from the new station to Ladysmith station

- Expected ISD: 6/1/2017
- Estimated project Costs.
  - $330 million
- Results:
  - Benefit/Cost ratio= -.13
  - -.13 <1.25 - Fail



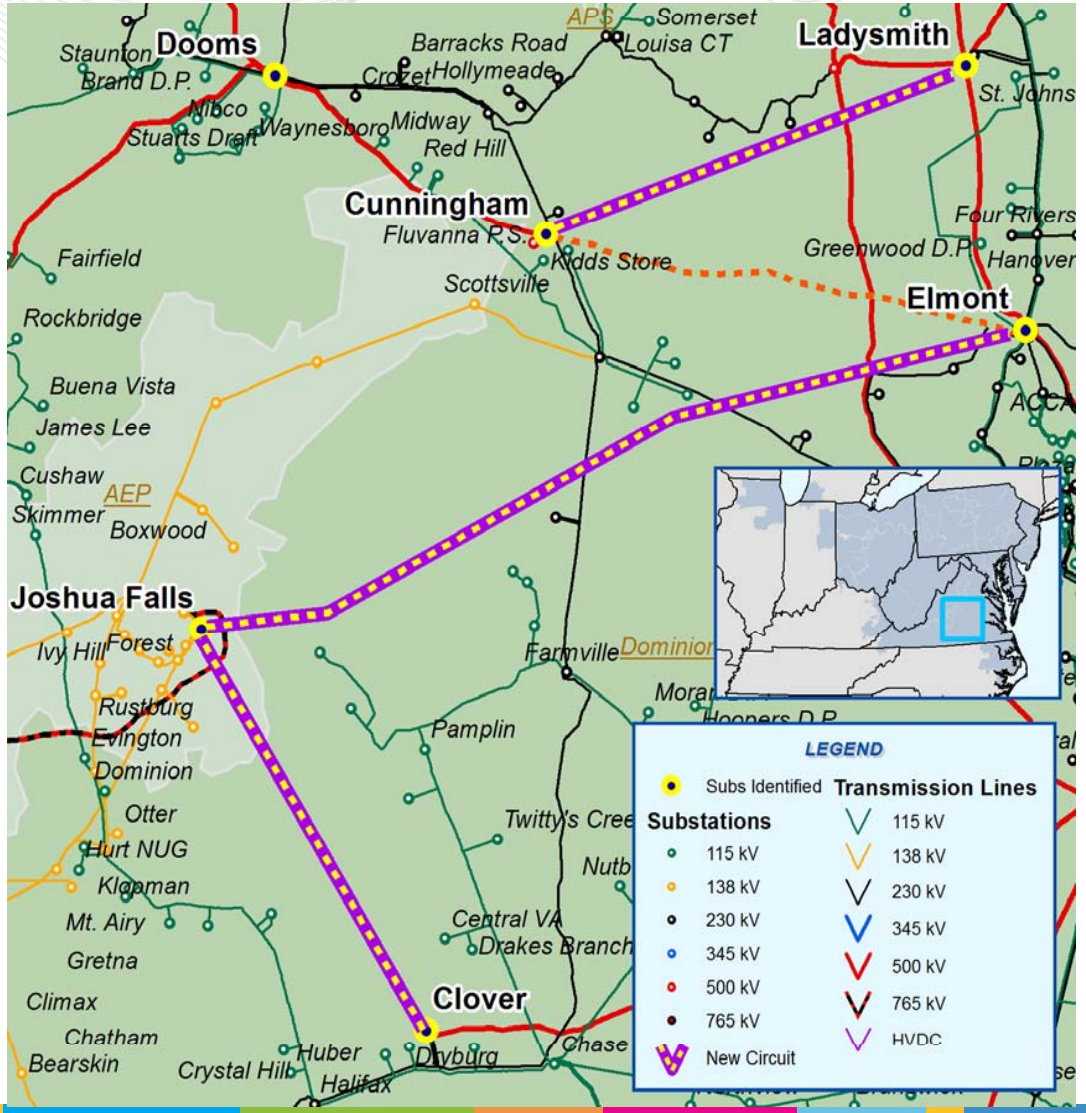
Market Efficiency New Proposed Project: AEP/Dominion Area

- Project MEP-B-3
- Install a 765/500 kV transformer at Joshua Falls station and construct an approximately 50-mile 500 kV line from Joshua Falls station to Clover station.
- Expected ISD: 6/1/2017
- Estimated project Costs.
  - $170 million
- Results:
  - Benefit/Cost ratio= -.07
  - -.07 <1.25 - Fail



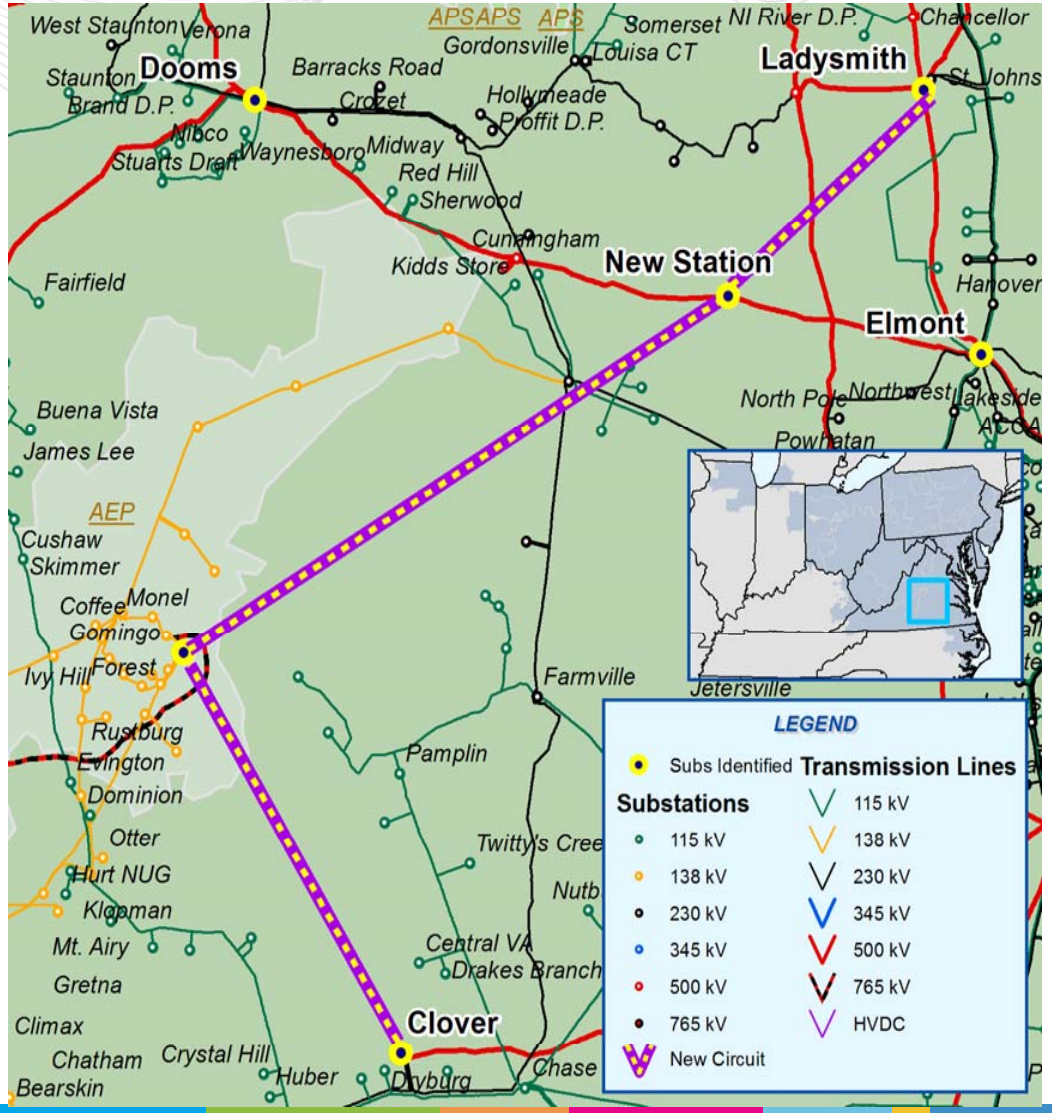
Market Efficiency New Proposed Project: AEP/Dominion Area

- Project MEP-B-4 (MEP-B-1/MEP-B-3)
- Install a 765/500 kV transformer at Joshua Falls station and construct an approximately 85-mile 500 kV line from Joshua Falls station to the existing Dooms - Elmont 500 kV line. Construct an approximately 30-mile 500 kV line from the Dooms - Elmont 500 KV line to Ladysmith station. Split the Dooms - Elmont 500 kV line to create separate Joshua Falls - Elmont and Dooms - Ladysmith 500 kV circuits.
- Install a 765/500 kV transformer at Joshua Falls station and construct an approximately 50-mile 500 kV line from Joshua Falls station to Clover station
- Expected ISD: 6/1/2017
- Estimated project Costs.
  - $410 million
- Results:
  - Benefit/Cost ratio= -.03
  - -.03 <1.25 - Fail



Market Efficiency New Proposed Project: AEP/Dominion Area

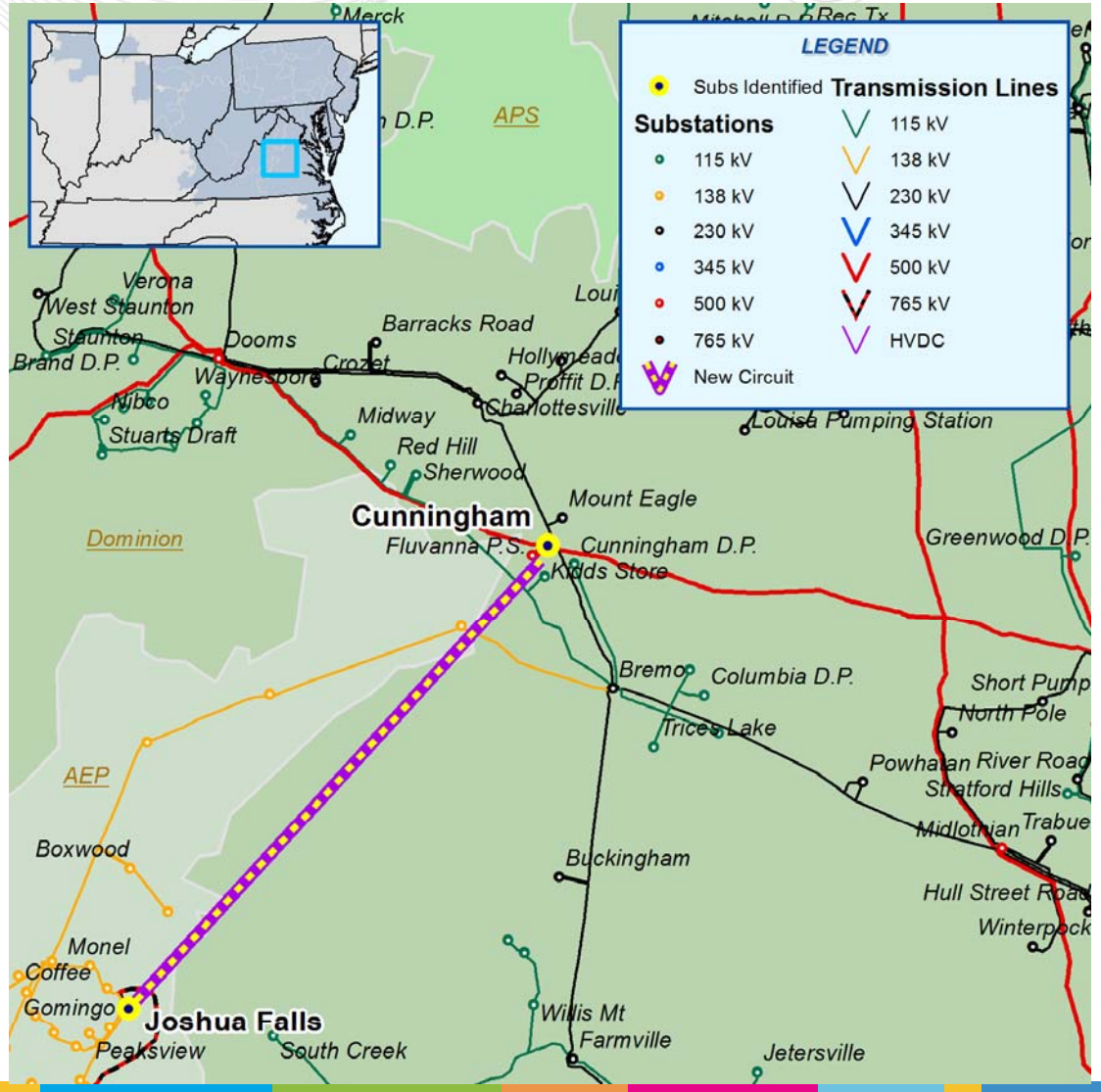
- Project MEP-B-5 (MEP-B-2/MEP-B-3)
- Install a 765/500 kV transformer at Joshua Falls station and construct a new 500 kV station on the existing Dooms - Elmont 500 kV line. Construct an approximately 85-mile 500 kV line from Joshua Falls station to the new station. Construct an approximately 30-mile 500 kV line from the new station to Ladysmith station.
- Install a 765/500 kV transformer at Joshua Falls station and construct an approximately 50-mile 500 kV line from Joshua Falls station to Clover station
- Expected ISD: 6/1/2017
- Estimated project Costs.
  - $440 million
- Results:
  - Benefit/Cost ratio= -.25
  - -.25 <1.25 - Fail



Market Efficiency New Proposed Project: AEP/Dominion Area

- Project MEP-B-7
- Install a 765/500 kV transformer at Joshua Falls station and construct a 500 kV line from Joshua Falls to Cunningham Station.

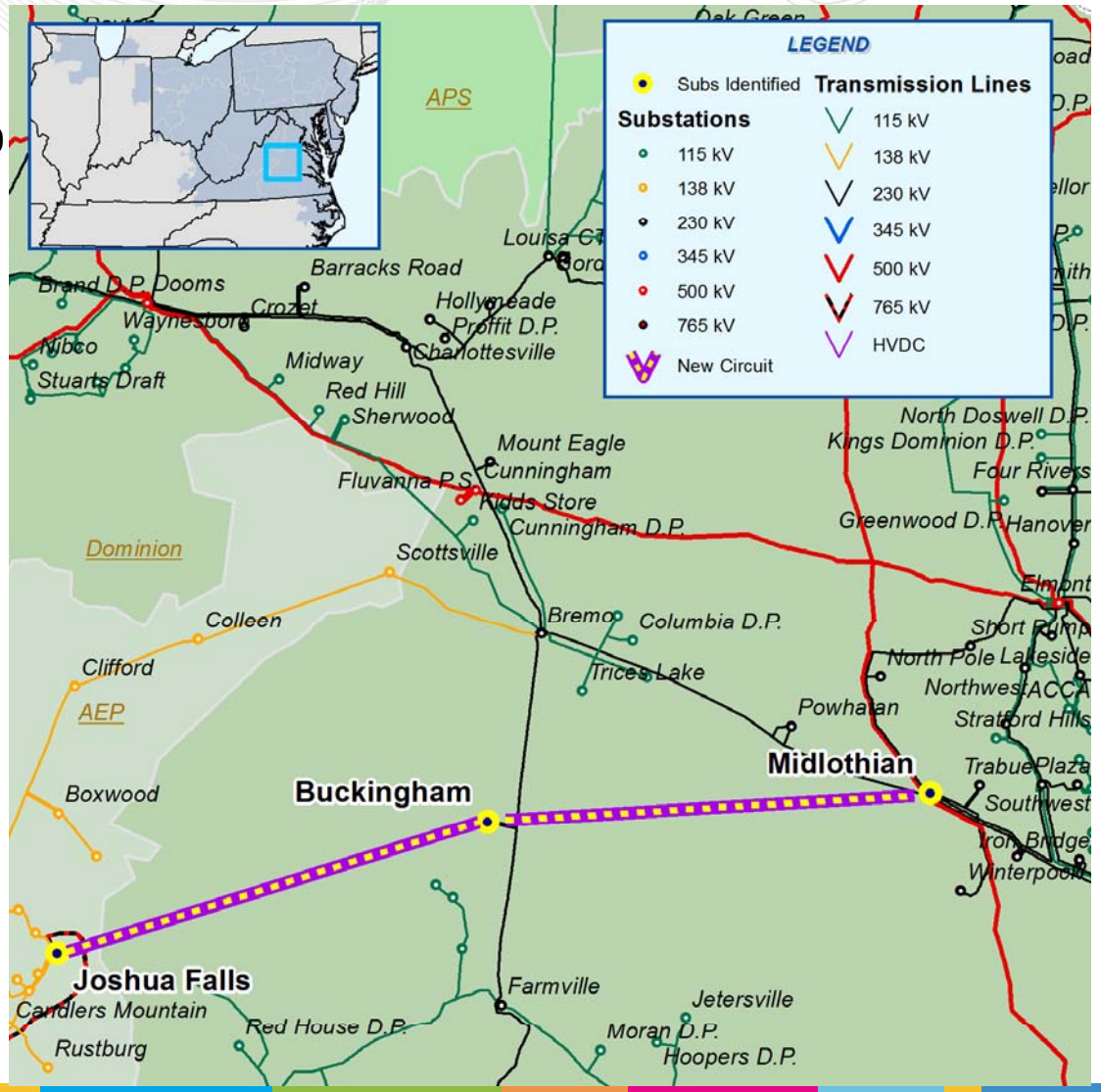
- Expected ISD: 6/1/2017
- Estimated project Costs.
  - $375 million
- Results:
  - Benefit/Cost ratio= .01
  - .01 <1.25 - Fail



Market Efficiency New Proposed Project: AEP/Dominion Area

- Project MEP-B-8
- Install a 765/230 kV transformer at Joshua Falls Station and construct a 230 kV line from Joshua Falls to Midlothian Station via Buckingham Station.

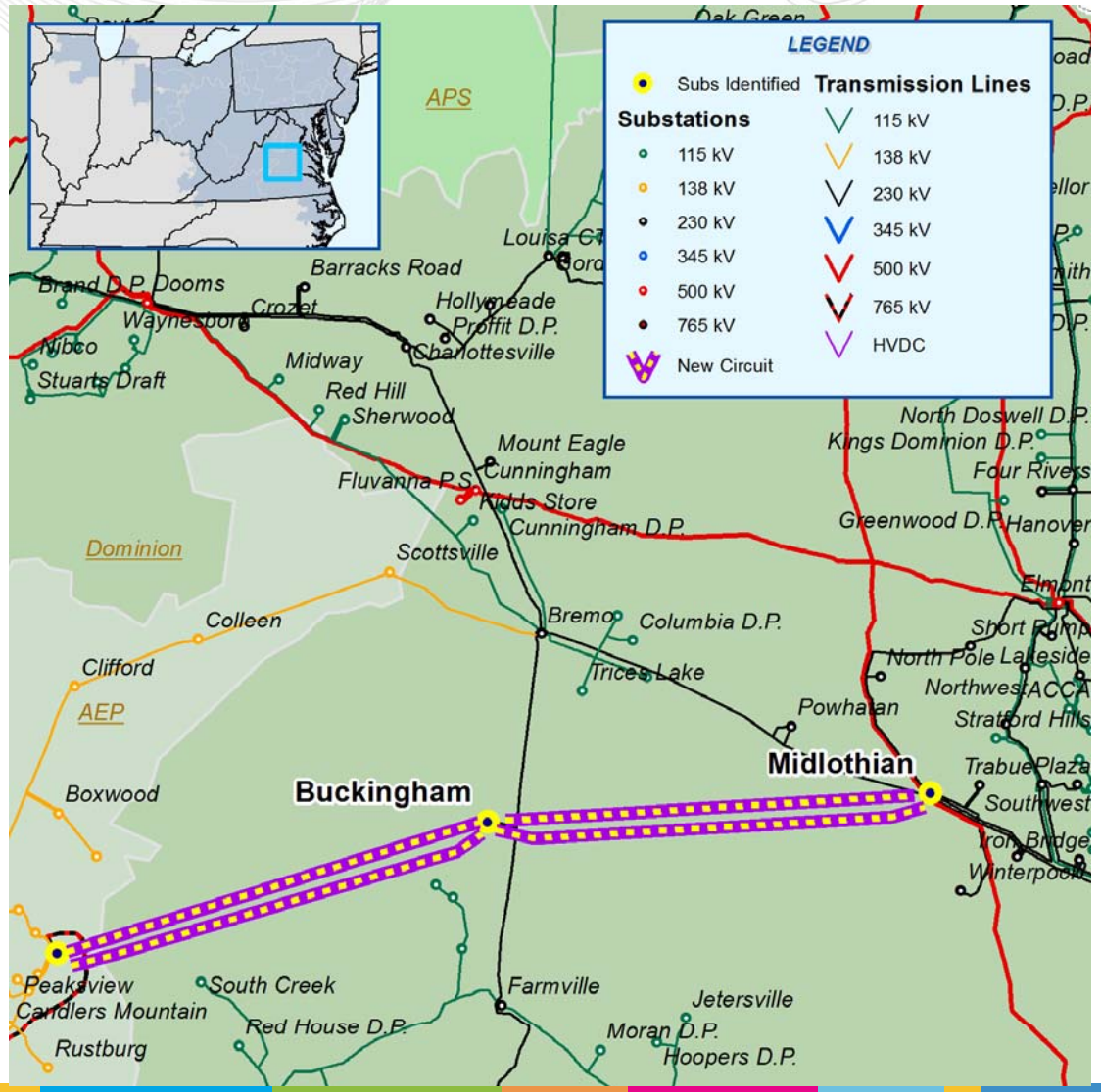
- Expected ISD: 6/1/2017
- Estimated project Costs.
  - $220 million
- Results:
  - Benefit/Cost ratio= 1.07
  - 1.07 <1.25 - Fail



Market Efficiency New Proposed Project: AEP/Dominion Area

- Project MEP-B-9
- Install a 765/230 kV transformer at Joshua Falls station and construct a 230 kV double circuit line from Joshua Falls to Midlothian station via Buckingham Station.

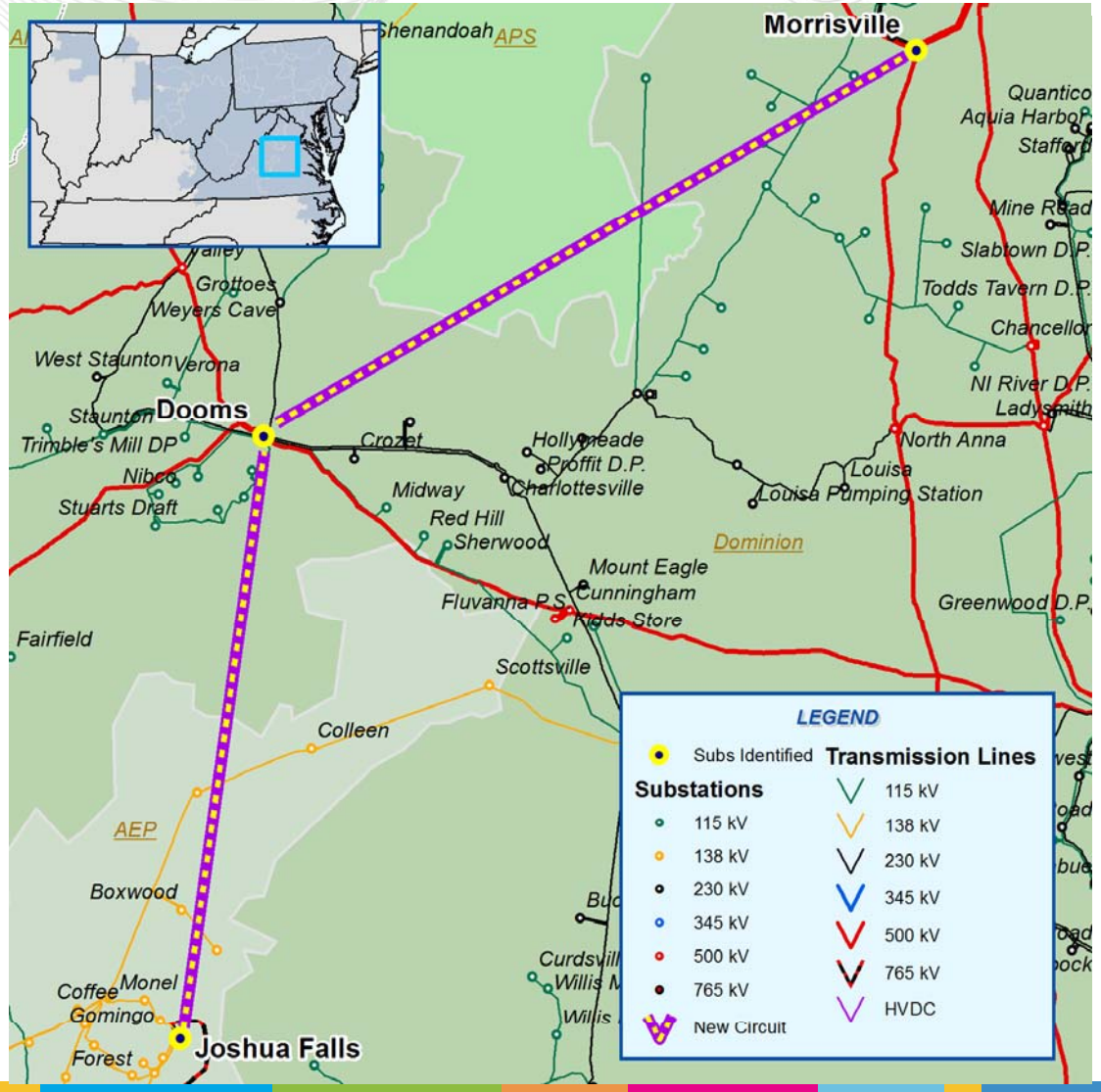
- Expected ISD: 6/1/2017
- Estimated project Costs.
  - $280 million
- Results:
  - Benefit/Cost ratio= 1.88
  - 1.88 >1.25 - Pass



Market Efficiency New Proposed Project: AEP/Dominion Area

- Project MEP-B-10
- Install a 765/345kV transformer at Joshua Falls Station, Install a new 500/345 kV transformer at both Dooms and Morrisville stations. Construct an approximately 133-mile 345 kV line from Joshua Falls to Dooms to Morrisville stations.

- Expected ISD: 6/1/2017
- Estimated project Costs.
  - $533 million
- Results:
  - Benefit/Cost ratio= 1.68
  - 1.68 >1.25 - Pass



Dominion and AEP Area Proposed Upgrades (Table 1 of 2)

Project Number	Description	Expected ISD	Voltage	Estimated Costs ($ millions)	Benefit/Cost	15 year Net Present Value of Benefit ($ millions)	Below 500 KV Method 15 year Net Present Value of Benefit ($ millions)
MEP-A-9	Install a 500/345 kV transformer at Bath County station and construct a 345 kV line from Kanawha River station to Bath County station.	2017	345	$260.5	4.03	$1,639.1	-
MEP-A-10	Install two 500/345 kV transformers at Bath County station and construct 345 kV line from Kanawha River station to Bath County station.	2017	345	$275	4.36	$1,869.6	-
MEP-A-11	Install two 500/345 kV transformers at Bath County station and construct a double circuit 345 kV line from Kanawha River station to Bath County station.	2017	345	$386.2	3.90	$2,349.1	-
MEP-B-1	Install a 765/500 kV transformer at Joshua Falls station and construct an approximately 85-mile 500 kV line from Joshua Falls station to the existing Dooms - Elmont 500 kV line. Construct an approximately 30-mile 500 kV line from the Dooms - Elmont 500 KV line to Ladysmith station. Split the Dooms - Elmont 500 kV line to create separate Joshua Falls - Elmont and Dooms - Ladysmith 500 kV circuits.	2017	500	$300	(0.13)	($61.0)	$956.1
MEP-B-2	Install a 765/500 kV transformer at Joshua Falls station and construct a new 500 kV station on the existing Dooms - Elmont 500 kV line. Construct an approximately 85-mile 500 kV line from Joshua Falls station to the new station. Construct an approximately 30-mile 500 kV line from the new station to Ladysmith station.	2017	500	$330	(0.13)	($66.8)	$1,024.7
MEP-B-3	Install a 765/500 kV transformer at Joshua Falls station and construct an approximately 50-mile 500 kV line from Joshua Falls station to Clover station.	2017	500	$170	(0.07)	($17.3)	$349.5

Dominion and AEP Area Proposed Upgrades (Table 2 of 2)

Project Number	Description	Expected ISD	Voltage	Estimated Costs ($ millions)	Benefit/Cost	15 year Net Present Value of Benefit ($ millions)	Below 500 KV Method 15 year Net Present Value of Benefit ($ millions)
MEP-B-4	Project MEP-B-1 and MEP-B-3	2017	500	$410	(0.03)	($18)	$971.9
MEP-B-5	Project MEP-B-2 and MEP-B-3	2017	500	$440	(0.25)	($173)	$897.1
MEP-B-7	Install a 765/500 kV transformer at Joshua Falls station and construct a 500 kV line from Joshua Falls to Cunningham Station.	2017	500	$375	0.01	$3.2	$393.2
MEP-B-8	Install a 765/230 kV transformer at Joshua Falls Station and construct a 230 kV line from Joshua Falls to Midlothian Station via Buckingham Station.	2017	230	$220	1.07	$366.5	-
MEP-B-9	Install a 765/230 kV transformer at Joshua Falls station and construct a 230 kV double circuit line from Joshua Falls to Midlothian station via Buckingham Station.	2017	230	$280	1.88	$822.4	-
MEP-B-10	Install a 765/345kV transformer at Joshua Falls Station, Install a new 500/345 kV transformer at both Dooms and Morrisville stations. Construct an approximately 133-mile 345 kV line from Joshua Falls to Dooms to Morrisville stations.	2017	345	$533	1.68	$1,395.4	-

Dominion and AEP Area Proposed Upgrades Summary

- Several Projects show Large Market Benefits
- Benefit calculated different depending on type of project.

  Annual Benefit = (.7)(Δ System Production Cost)+(.3)(Δ Load Energy Payment)
  - Δ System Production Cost is change in system generation variable cost (fuel costs, variable O&M costs and emissions costs) associated with total PJM energy production
  - Δ Load Energy Payment is change in net load energy payment (change in gross load payment minus change in transmission right credit
    - For projects that have costs allocated regionally (500 kV and up), the load energy payment for all PJM zones is considered
    - For projects that have costs allocated using a flow-based methodology (below 500 kV) , the load energy payment for only those PJM zones that show a decrease in load energy payment is considered.
- Proposed Market Efficiency Regional Projects difficult to pass1.25 Benefit/Cost Threshold
  - Projects that provide large Net Benefits may be dismissed because of type of project (Regional vs. below 500 KV)
  - Consider changing calculation for regional to be same as below 500 KV projects.
    - Zones in which project shows no load benefit or increase in net load energy payments have no cost allocation
    - Zones in which project shows load benefit or decrease in net load energy payments will have a cost allocation

Summary Dominion/AEP Area Proposed Upgrades

- Next Steps
  - Independent Cost Review currently being conducted
  - Incorporate pending reliability baseline projects
    - Rerun Studies as appropriate
  - Reliability Analysis review for all passing projects
  - Sensitivity analysis for Key input assumptions
  - Variations to be considered