

# Transmission: Building the Right Stuff

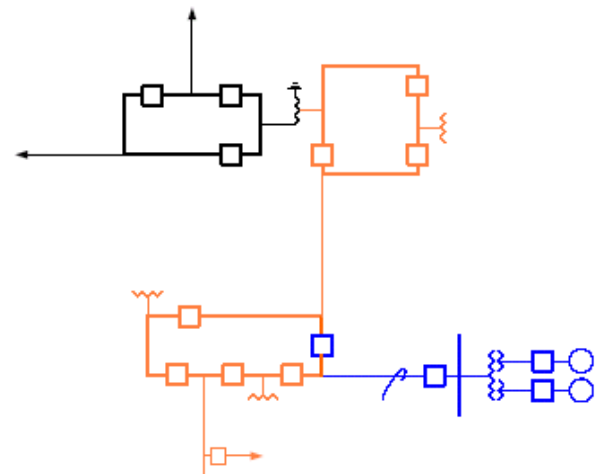
**EEI Transmission, Distribution  
and Metering**

**Future of Big Transmission**

**April 13, 2016**

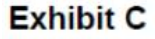
**Steve Huntoon**

**[www.energy-counsel.com](http://www.energy-counsel.com)**







# Key Points

- ◆ Big Transmission (at least 500 kV and 250 miles): The wrong stuff.
  - Nothing proposed over the last 10 years has been or is likely to be built.
  - No Big Transmission *should* be built.
- ◆ Incremental Expansion: The right stuff.
  - Tens of billions in grid expansion.
  - Rational processes.
  - Reasonably objective drivers.

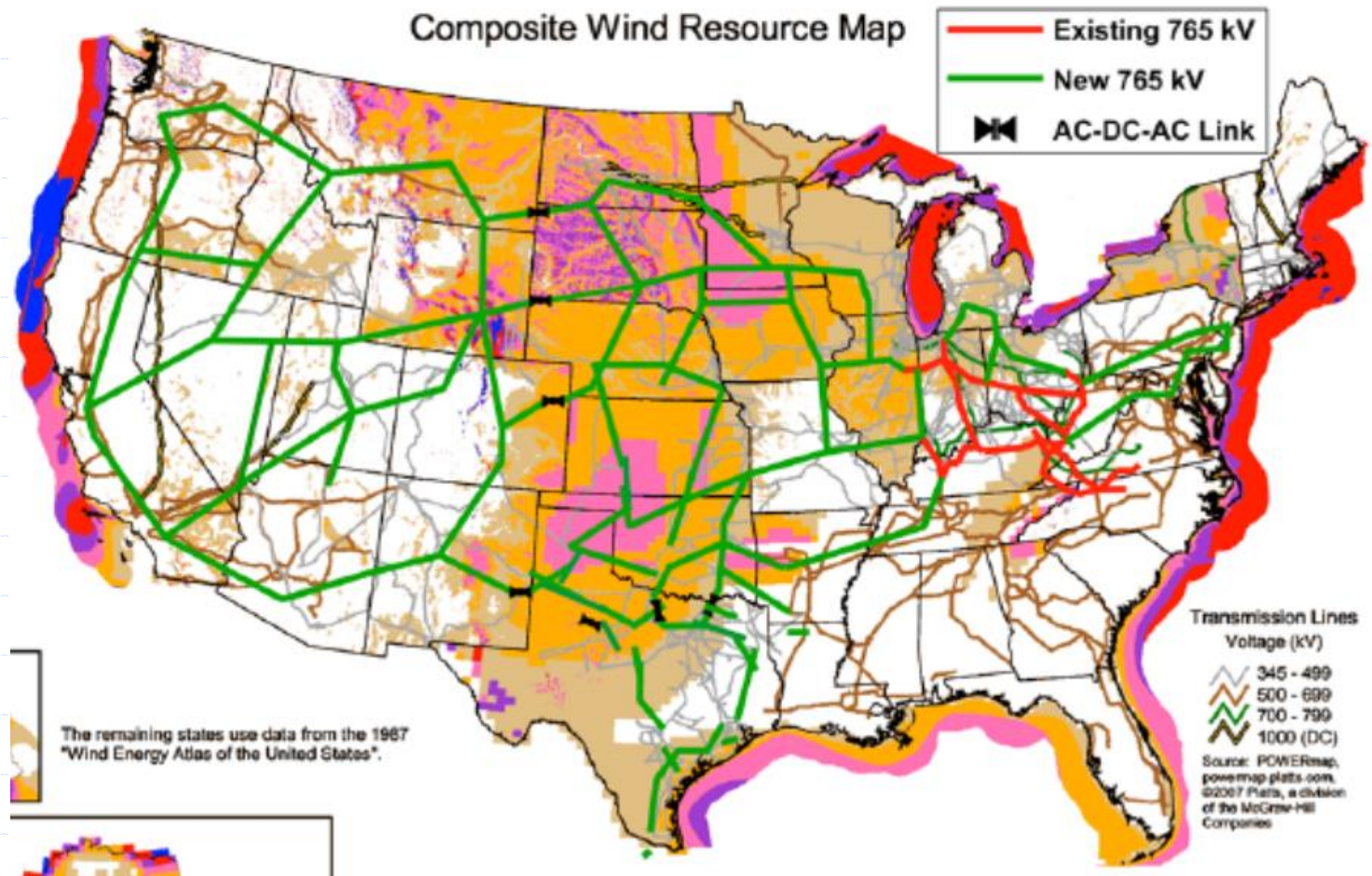


### Major Transmission Corridors

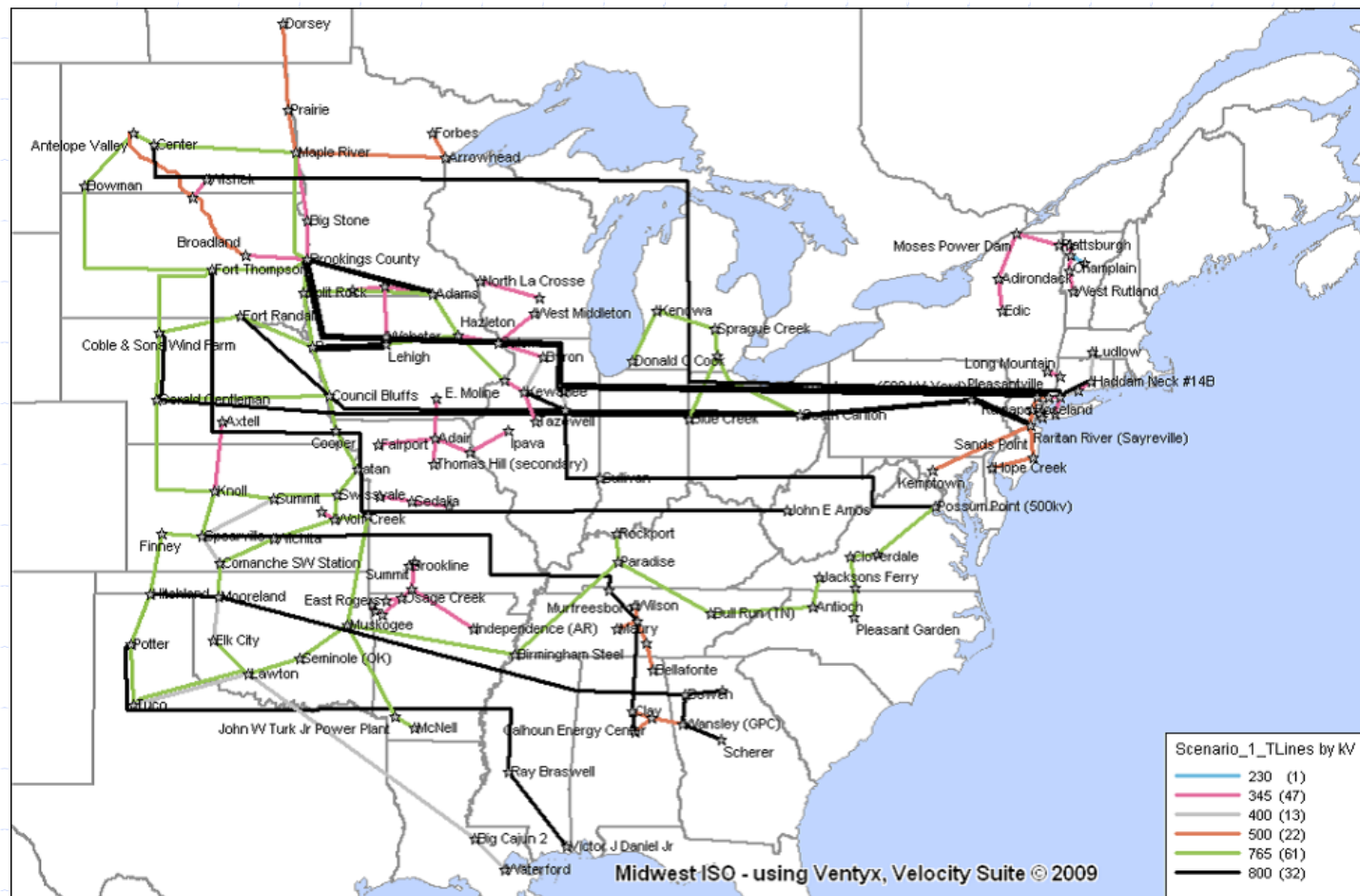
-  Proposed Corridors  
 345 kV  
 500 kV  
 765 kV



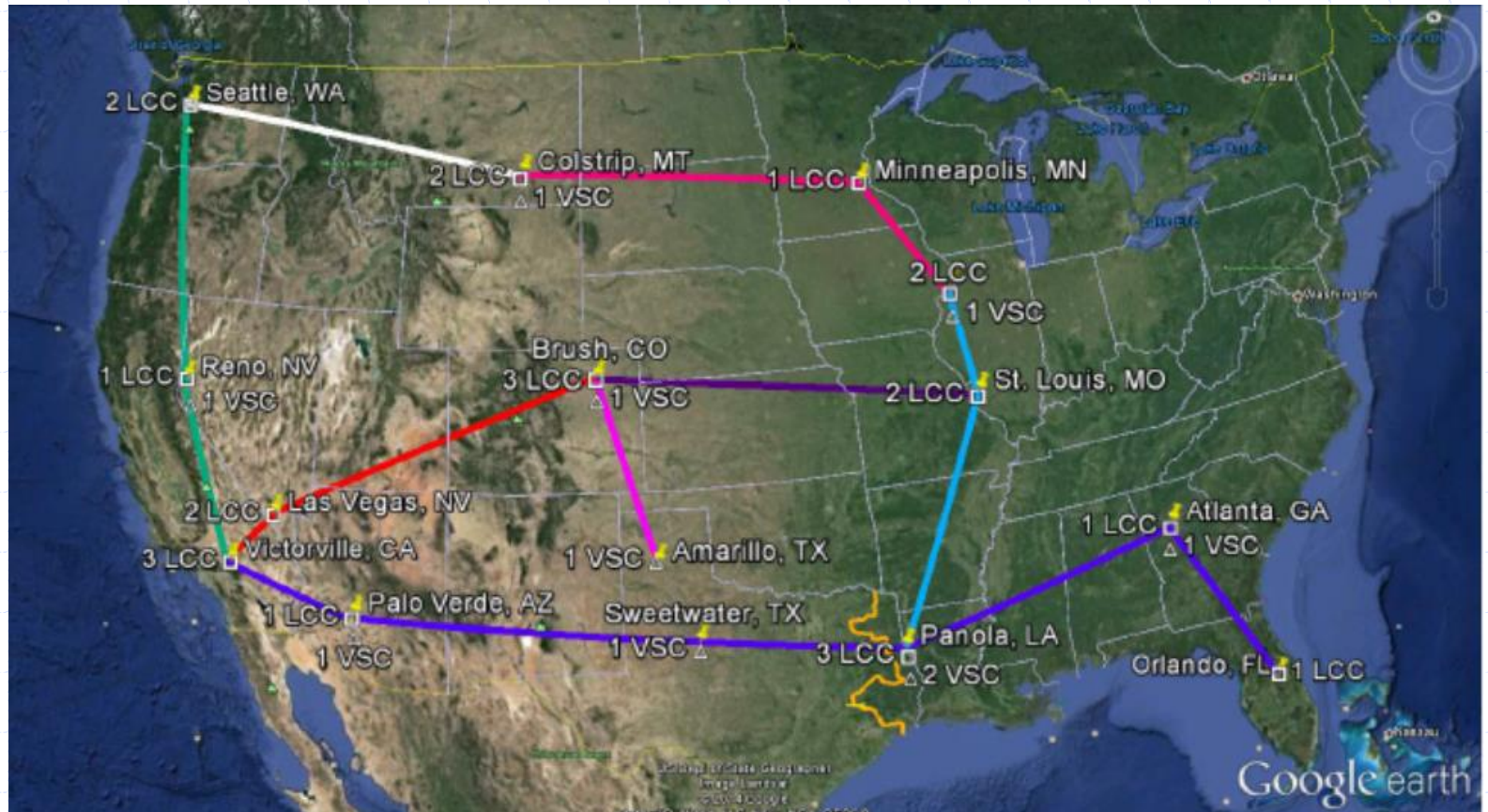
# FERC Gets On Board in 2008



# MISO in 2009: Go East

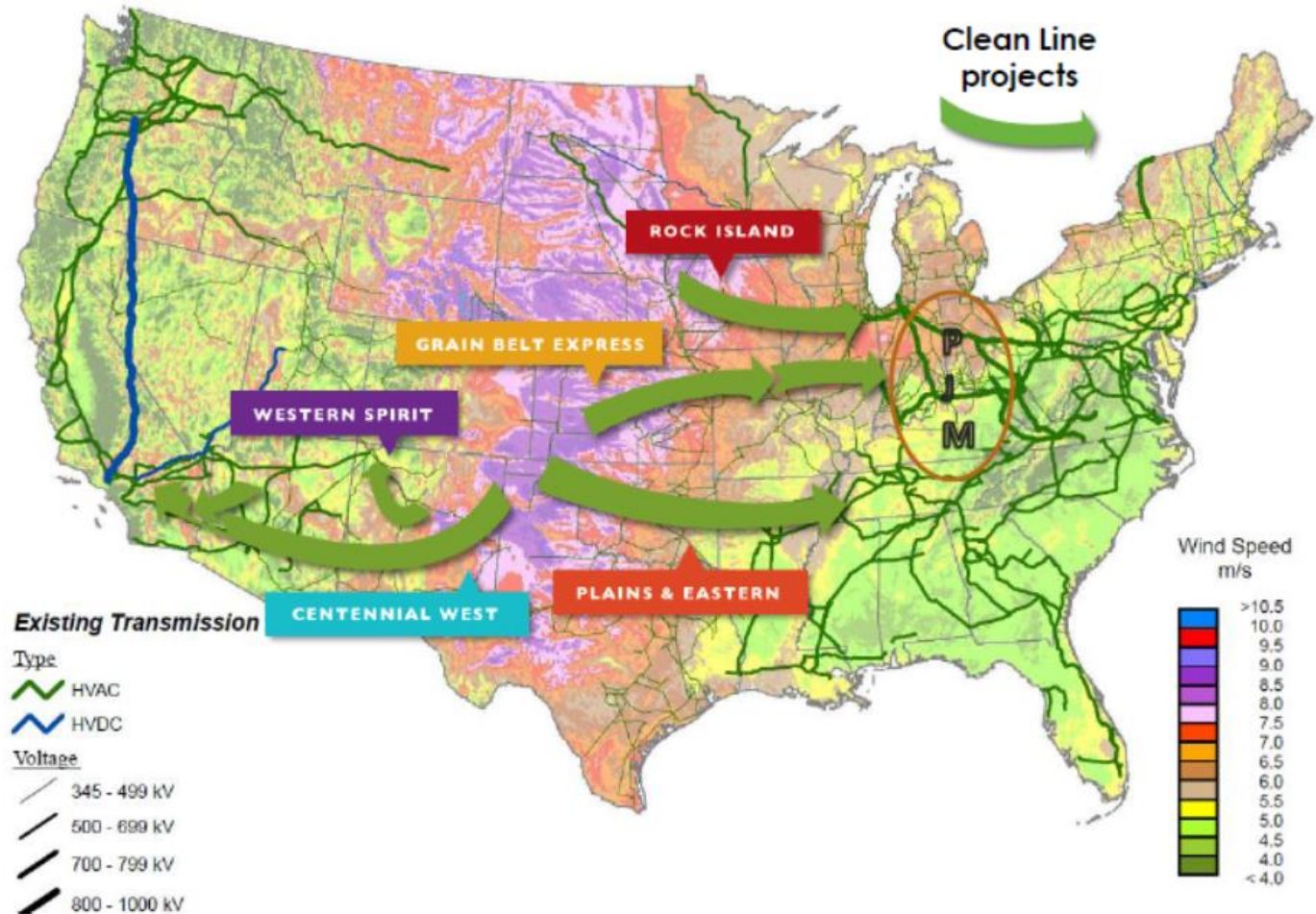


# MISO in 2014: Go West and South





# Clean Line: Go East and West



# Atlantic Wind: Go Way East

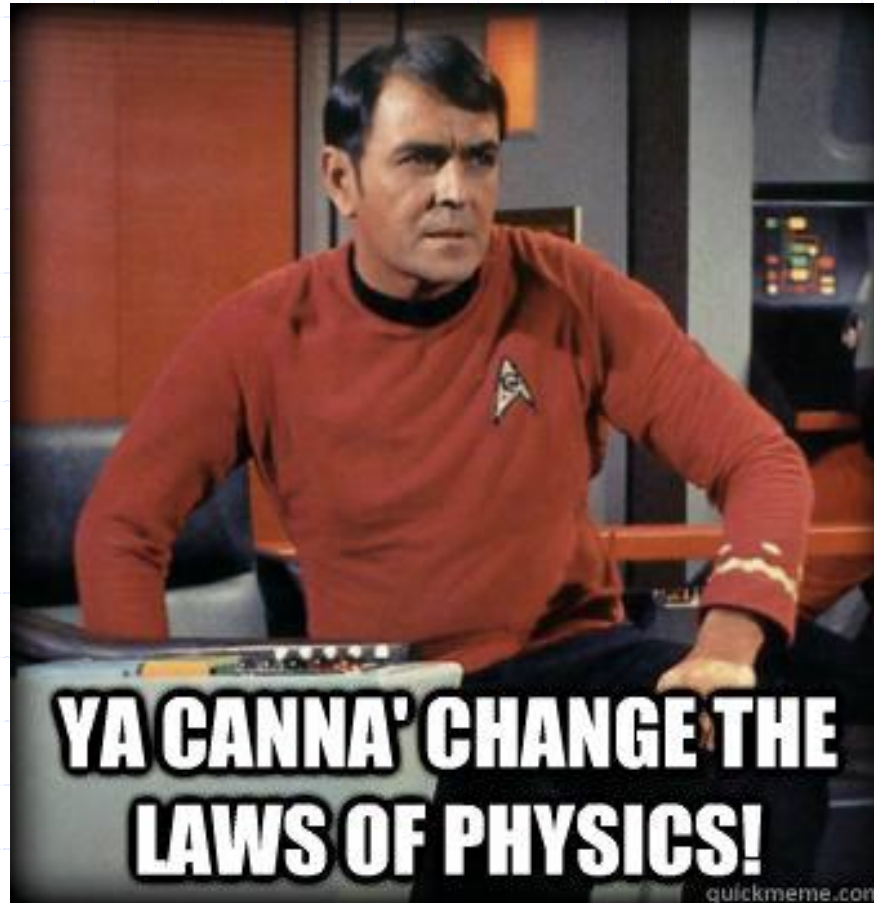




# Fall of Big Transmission

- ◆ After 10 years no Big Transmission has been built or approved to be built in the future.
- ◆ Big Transmission has never made sense.
  - the laws of physics,
  - more reliability risk,
  - contingency limits on operations,
  - lumpiness and investment risk,
  - rigidity of source and sink, and
  - superior, incremental alternatives.

# The Laws of Physics



# Implications of Physics

- ◆ Electricity flows as an electromagnetic wave (not electrons) in all possible paths (disproportionately in the paths of lesser resistance) – not from A to B in a single path.
- ◆ Thus the most efficient way to “move” more electricity a long distance from A to B is to reinforce the existing network with incremental upgrades, not to build a new transmission line from A to B.



# More Reliability Risk

- ◆ Electricity is dispatched across transmission lines when economic to do so.
- ◆ Any price difference between source and sink of Big Transmission results in line loading.
- ◆ Big Transmission is inherently a Big Target for adverse weather (by far the biggest single cause of transmission outages).
- ◆ The grid would be relying on an inherently more vulnerable transmission line.

# More Operating Limits

- ◆ The grid must be able to survive the loss of any single element (“contingency”) without overloading other elements.
- ◆ Big Transmission, by virtue of its size relative to the other transmission lines it is interconnected with, poses a large overload potential for interconnected lines.
- ◆ This can mean limits on operation below otherwise full utilization and/or reinforcement (at additional cost) at source/sink.

# Lumpiness and Investment Risk

- ◆ Big Transmission entails big and lumpy cost.
- ◆ Example: TransWest Express: \$3 billion with annualized transmission cost of \$29/MWh.
- ◆ If reliability-based, criteria still must be met before Big Transmission goes in service, so on in-service date the system is likely overbuilt.
- ◆ If market-based, project must lock in generators, purchasers and investors for decades of commitment (and to the exclusion of all alternatives). Tough sell.



# Rigidity of Source and Sink

- ◆ Big Transmission is inherently rigid in source and sink.
- ◆ Reinforcements may be required at both of these points, at significant additional cost.
- ◆ Problem is particularly acute with DC transmission because each AC-DC converter station can cost hundreds of millions of dollars, making it prohibitively expensive to locate substations along the route.

# Incremental Expansion: *The Right Stuff*

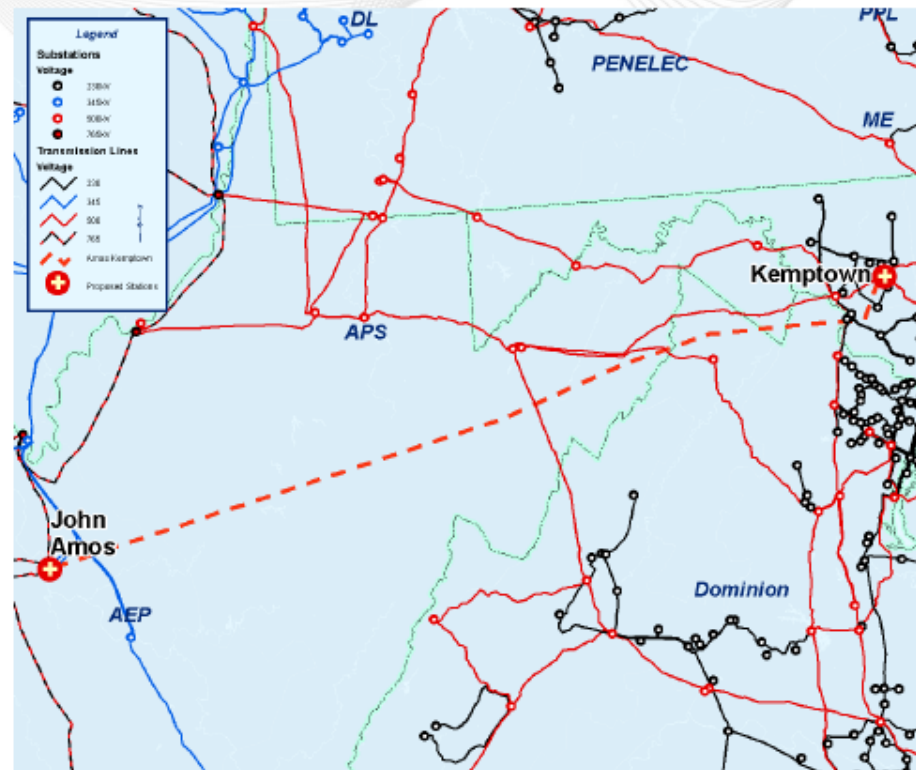
- ◆ PJM has approved \$25.6 billion in new transmission, MISO \$20.2 billion, and Southwest Power Pool \$8.8 billion.
- ◆ But not a dollar for Big Transmission.
- ◆ Transmission becoming more robust.
  - Pressure and transparency of RTO stakeholder process.
  - Increased competition among sophisticated transmission providers.

# PATH v. MTS-DOU Rebuild

PATH project selected in successive PJM plans.



- Previous analysis identified several overloads on 500 kV facilities across the central Pennsylvania / Allegheny Mountain corridor
- Results of the March 2009 retool of 2013 show that without the Amos to Kemptown project there are no thermal overloads in 2013 through the same area
- This assumed the TRAIL line is placed in-service as retool analysis continues to demonstrate the need for the line by June 2011
- Based on the PJM analysis of 2014, the Amos – Kemptown project is required to resolve numerous thermal and reactive problems starting June 1, 2014
- The following slides detail the violations





# PATH v. MTS-DOU Rebuild (2)

Dominion later identified alternatives.



## Dominion Alternative #1

- Rebuild Mt. Storm – Doubs
- 50% series compensation on Meadow Brook end of Trail
- Rebuild Mt. Storm – Pruntytown

## Dominion Alternative #2

- Rebuild Mt. Storm – Doubs
- 50% series compensation on Meadow Brook end of Trail
- Build a portion of PATH stopping at Mt. Storm (requires a new 765/500 kV transformer)

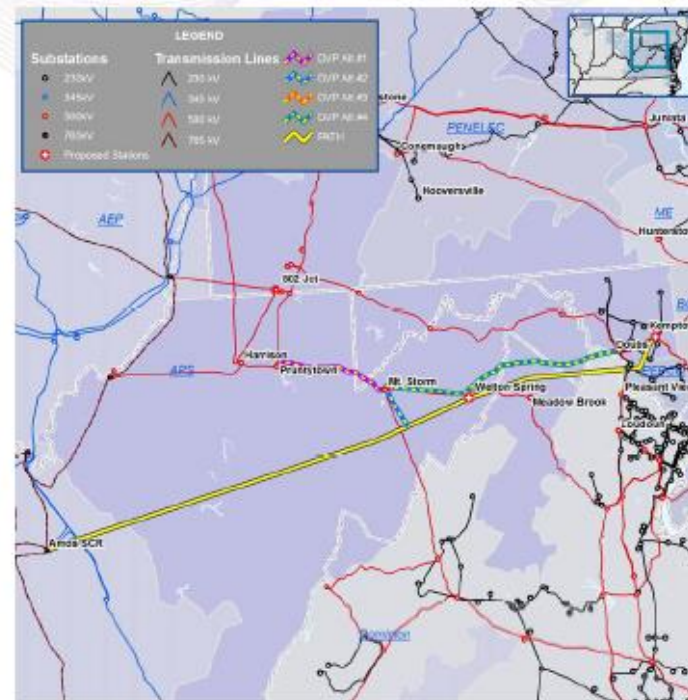
## Dominion Alternative #3

- Rebuild Mt. Storm – Doubs
- 50% series compensation on Meadow Brook end of Trail
- Build a portion of PATH stopping at Welton Spring (requires new 765/500 kV transformer)

## Dominion Alternative #4

- Rebuild Mt. Storm – Doubs
- Build PATH proposal

## MAAC Alternative Analysis



\* All Dominion alternatives include 900 MVAR SVC's at Loudoun 230 kV and T157 Tap 500 kV and 900 MVAR of static capacitors at other locations

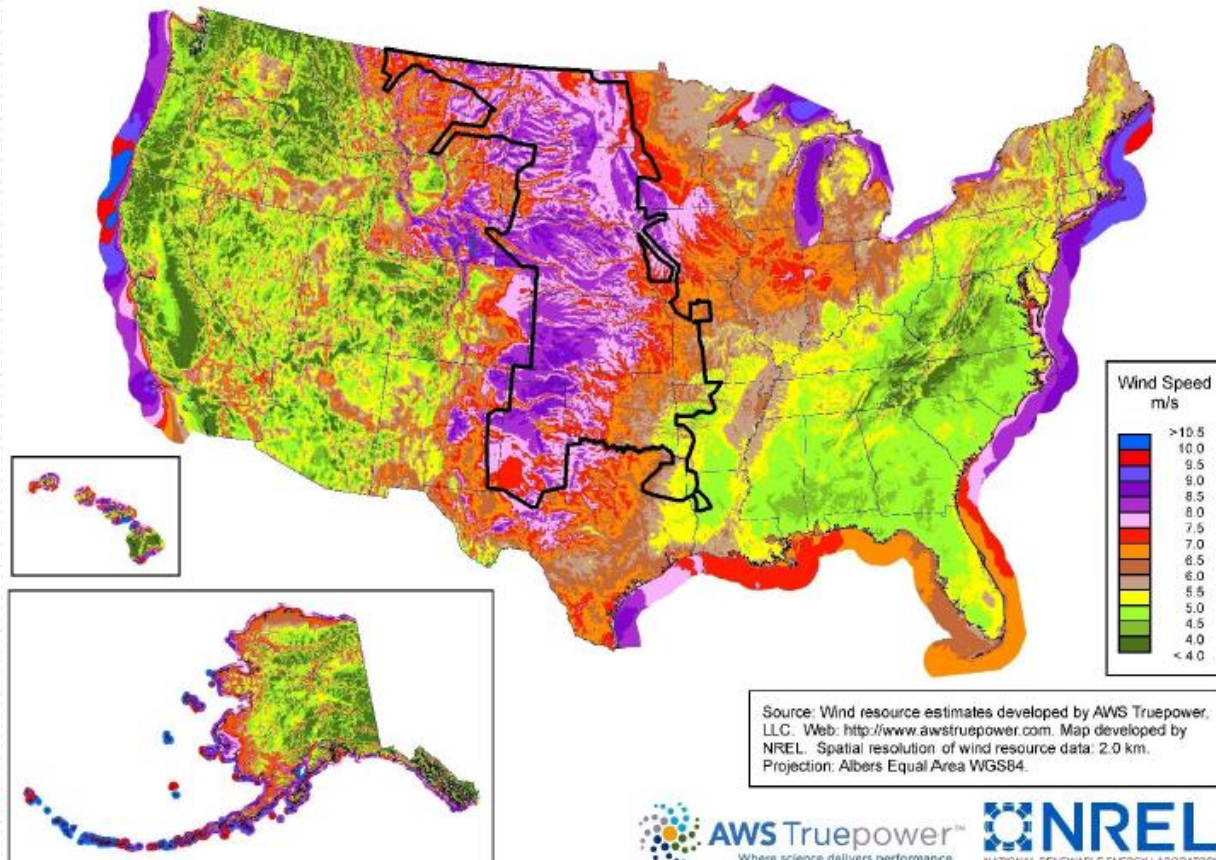
# PATH v. MTS-DOU Rebuild (3)

Dominion Alt. #1 at \$0.62 billion ultimately supplants PATH at \$2.1 billion (and avoids 156 miles of greenfield 765 kV transmission).

	Mileage			Number of States	Cost (\$B)
	Existing ROW	New ROW	Total		
PATH	121.2 (adjacent to existing ROW)	156.1	277.3*	MD, VA, WV	\$2.10
Revised Liberty	Estimated 270 - 300 (40 - 50% estimated to be parallel to existing transmission ROW)			PA, MD, VA	\$1.34
Dominion Alt #1	99 - Rebuild of existing transmission	0	99	MD, VA, WV	\$0.62
Dominion Alt #2					\$1.32 (includes \$0.9 for portion of PATH)
Dominion Alt #3					\$1.32 (includes \$0.9 for portion of PATH)
Dominion Alt #4					\$2.52 (includes \$2.1 for entire PATH)

# SPP: Build Out for Wind

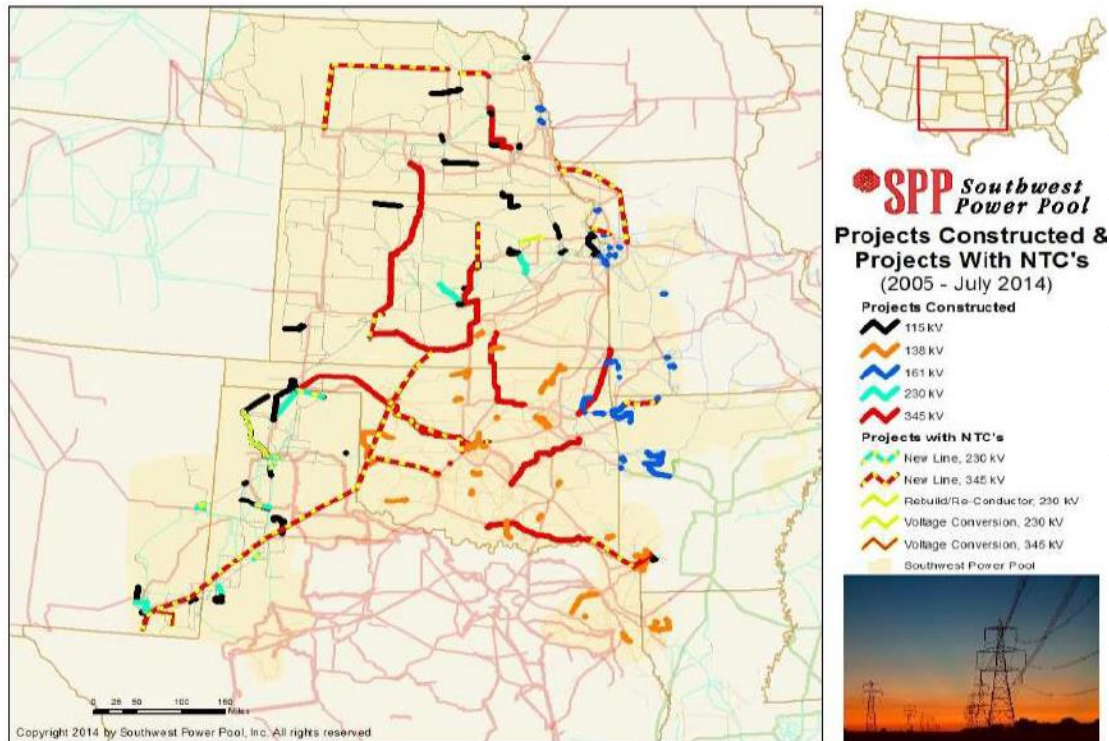
SPP enormous wind resources (60-90 GW?).





# SPP: Build Out for Wind (2)

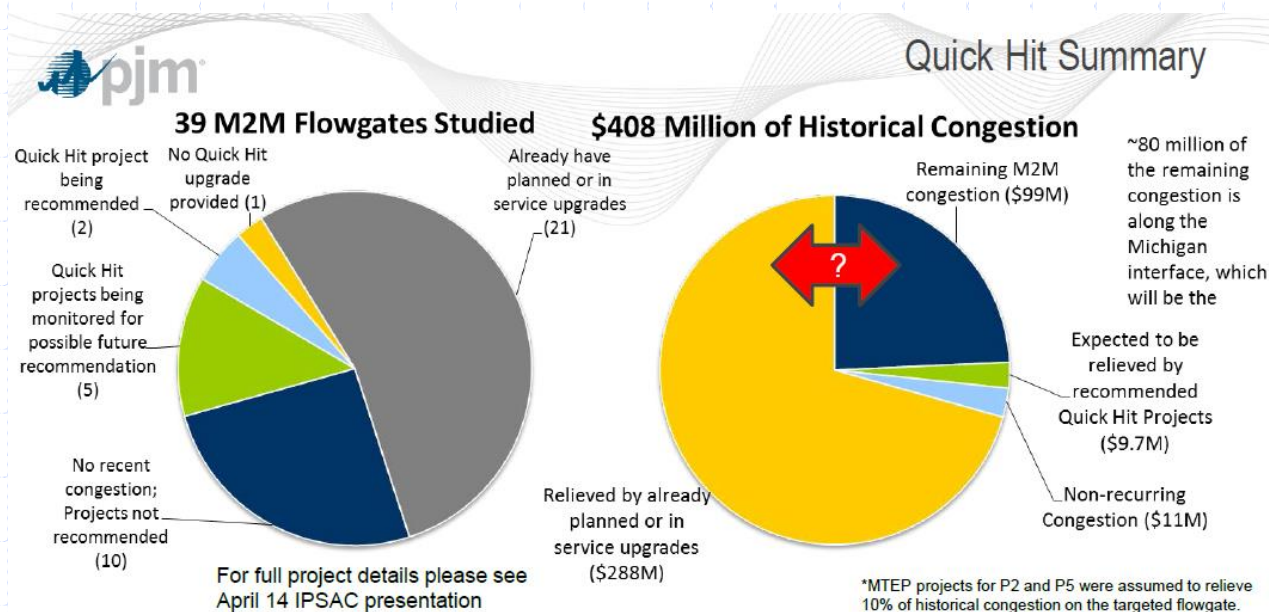
SPP incremental build out largely for wind with 9,700 MW interconnected thus far.





# Seams: *Intra*-Regional Fixes

- ◆ Seams between regions have been a major focus of transmission planning reform.
- ◆ Surprisingly, *intra*-regional upgrades seem to be largely relieving *inter*-regional seams.



# Order 1000: Encouraging/Revealing

- ◆ Amazing volume and diversity of proposals in response to Order 1000 windows (Appendix).
- ◆ And amazing range of benefit/cost ratios:



Summary: Recommended Projects

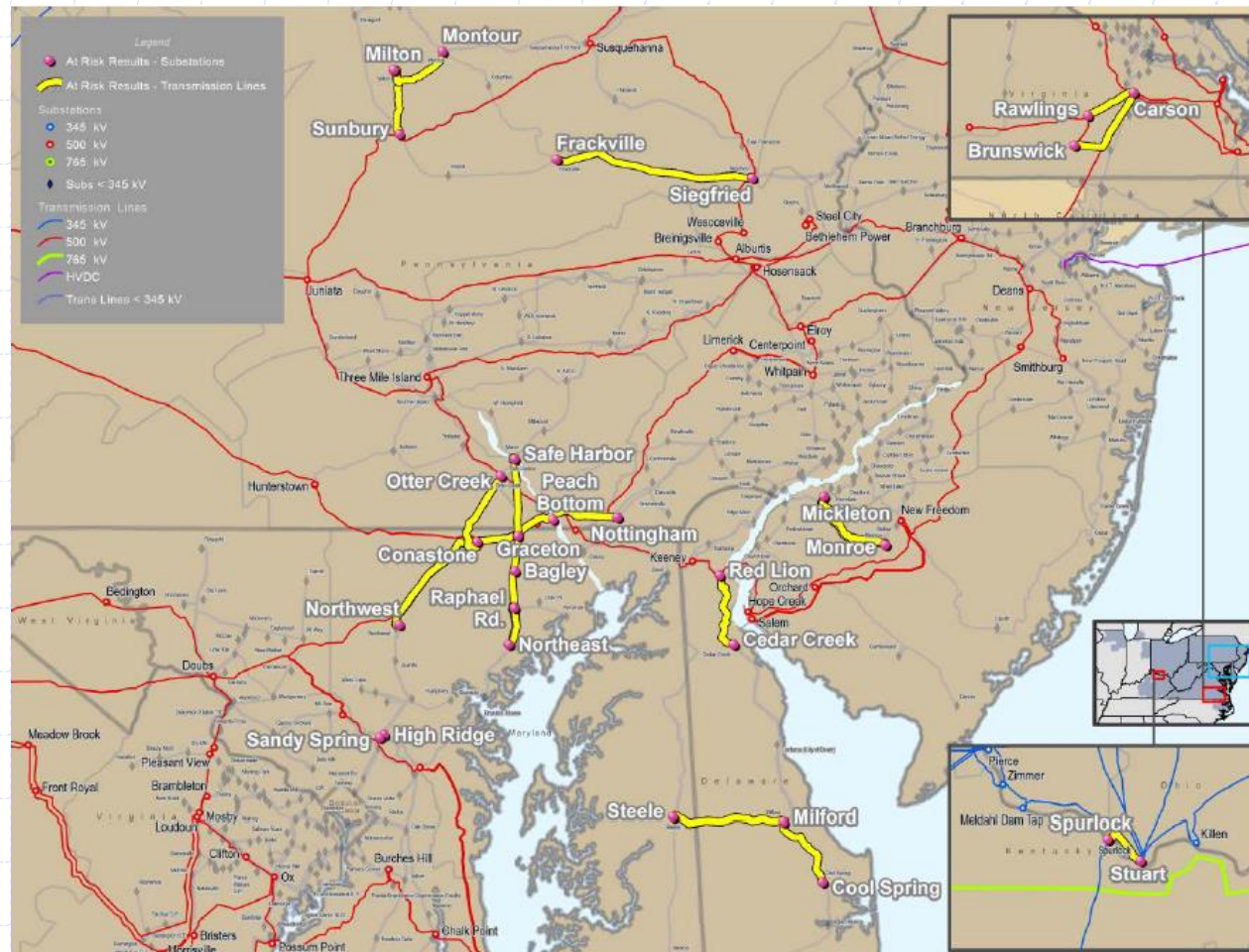
Group	PJM Window Project ID	Area	Constraint	Cost (\$millions)	Type	In-service date	B/C 2014 Base	B/C 2015 Sensitivity	Does Project address congestion on Driver?
Group 4	201415_1-18G	APS	Taneytown to Carroll 138 kV	5.2	Upgrade	2019	55.7	90.1	Yes
Group 5	201415_1-12A	DUQ	Dravosburg to West Mifflin 138 kV	11.18	Upgrade	2018	5.8	2.0	Yes
Group 8	201415_1-2A	PPL - BGE	Safe Harbor to Graceton 230 kV	1.1	Upgrade	2019	4.3	14.4	Yes
Group 8	201415_1-2B	ME - PPL	Brunner Island to Yorkana 230 kV	3.1	Upgrade	2019	73.3	22.2	Yes
Group 9	201415_1-10J	COMED	Cordova to Nelson 345 kV	24.6	Upgrade	2019	1.7	1.9	Yes
Group 10	201415_1-10B	COMED	Wayne to South Elgin 138 kV	0.1	Upgrade	2019	7.2	6.4	Yes
Group 11	201415_1-11H	PECO	Peach Bottom 500 kV	9.7	Upgrade	2019	2.6	3.0	Yes
Group 14	201415_1-13E	DPL	Worcester to Ocean Pines (I) 69 kV	2.4	Upgrade	2019	82.7	65.3	Yes
Group 15	201415_1-18I	APS/ATSI	Krendale to Shanor Manor 138 kV	0.6	Upgrade	2019	35.8	123.4	Yes
Group 18	201415_1-4I	AEP	Fieldale to Thornton 138 kV	0.75	Upgrade	2019	114.2	101.2	Yes
Group 19	201415_1-4J	AEP	Jacksons Ferry to Cloverdale 765 KV	0.5	Upgrade	2019	15.8	62.0	Yes

- ◆ What were we missing before Order 1000?

# CPP: To Be Taken in Stride

- ◆ Brattle: “Transmission planning processes are adequate due to the significant build out expected regardless of CPP standards.”
- ◆ CPP Final Rule: “The potential range of new transmission construction is within historical investment magnitudes.”
- ◆ MISO and PJM studies so far:
  - MISO: Compliance primarily with redispatch.
  - PJM: Small transmission need under worst-case generation retirement of 32 GW.

# PJM Reliability Need for CPP Is Small.



# Notes on NERC CPP Study

- ◆ Saying a new 500 kV line can take 15 years is answering the wrong question: Incremental grid expansion is the right stuff.
- ◆ Reconductoring a 100 mile, 230+ kV line can take four, not seven, years (*e.g.*, MTS-DOU).
- ◆ Changes in power flows do not necessarily require additional transmission.
  - If PJM East changes from net importer to net exporter then flow on ~8,000 MW of transfer capability just changes direction.



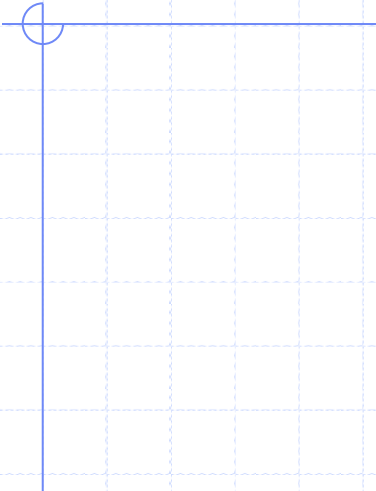
# Conclusions

- ◆ Big Transmission has not been, and should not be, built.
- ◆ Past supposed drivers of Big Transmission have not materialized.
- ◆ RTOs, under FERC oversight and prodding, continue to improve with incremental transmission expansions that make sense.
- ◆ CPP is not a game changer.



# Thank You!

Full article in *Fortnightly* available here,  
<http://www.energy-counsel.com/docs/The-Rise-and-Fallof-BigTransmission-Fortnightly-September2015.pdf>



# Appendix: PJM 2014-2015 RTEP Long Term Proposals

# PJM 2014/15 RTEP Long Term Proposal Window Tracking Spreadsheet

Proposal Window	RTEP Long Term Proposal Window
Window Opening	October 30, 2014
Window Closing	February 27, 2015
Window Duration	120 Days
Current Spreadsheet	V2

Market Efficiency Constraints Identified	Upgrade/Greenfield	Reliability/Market Efficiency	Proposing Entity	Cost (\$M)	Target Zone	kV Level	Analysis Type	Major Components
AP SOUTH L/O BED-BLA	Greenfield	Market Efficiency	Nextera	15.70	Dominion	230	Market Efficiency/ Reactive	Build new Cochran Mill 230 kV switchyard with 400 MVAR Capacitors, and a new 230 kV line from Cochran Mill - Pleasant View 230 kV
AP SOUTH L/O BED-BLA	Greenfield	Market Efficiency	Nextera	16.50	Dominion	230	Market Efficiency/ Reactive	Build new Cochran Mill 230 kV switchyard with 600 MVAR Capacitors, and a new 230 kV line from Cochran Mill - Pleasant View 230 kV
AP SOUTH L/O BED-BLA	Greenfield	Market Efficiency	PPL	33.95	PPL	500	Market Efficiency/ Reactive	Install 500kV -100/4500 MVAR SVC addition and associated terminal hardware at New Juniata SVC Substation Yard with Approx. 300ft of 500kV transmission linking the existing Juniata Substation to the new SVC yard
AP SOUTH L/O BED-BLA	Greenfield	Market Efficiency	Nextera	36.40	Dominion	230	Market Efficiency/ Reactive	Build new Cochran Mill 230 kV switchyard with 200MVAR SVC, 200 MVAR Capacitors, and a new 230 kV line from Cochran Mill - Pleasant View 230 kV
AP SOUTH L/O BED-BLA	Greenfield	Market Efficiency	Nextera	41.00	Dominion	230	Market Efficiency/ Reactive	Build new Cochran Mill 230 kV switchyard with 300MVAR SVC, 300 MVAR Capacitors, and a new 230 kV line from Cochran Mill - Pleasant View 230 kV
AP SOUTH L/O BED-BLA	Greenfield	Market Efficiency	DATC	47.14	PECO/Meted/APS	500	Market Efficiency/ Reactive	A hybrid series capacitor and thyristor controlled series capacitor near the midpoint of Conemaugh to Hunterstown 500 kV line in southern Pennsylvania. Add a phase angle regulator on the Messick to Morgan 138 kV line and close the circuit in Maryland.
AP SOUTH L/O BED-BLA	Greenfield	Market Efficiency	FirstEnergy	66.00	Dominion/APS	500	Market Efficiency/ Reactive	Install series capacitors on the Doubts-Mt. Storm 500 kV line
AP SOUTH L/O BED-BLA AEP-DOM L/O BED-BLA	Greenfield	Market Efficiency	Ameren	46.56	APS/AEP/DOM	500	Market Efficiency/ Reactive	Construct a +400MVAR/-250 MVAR Static VAR Compensator (SVC) adjacent to the 500 kV Doms Substation located in the Dominion Virginia Power service territory. The SVC will be connected at Doms Substation utilizing an existing 500 kV breaker position. This proposal has Dominion building the 500' 500 kV line from the SVC to Doms.
AP SOUTH L/O BED-BLA AEP-DOM L/O BED-BLA	Greenfield	Market Efficiency	Ameren	46.56	APS/AEP/DOM	500	Market Efficiency/ Reactive	Construct a +400MVAR/-250 MVAR Static VAR Compensator (SVC) adjacent to the 500 kV Doms Substation located in the Dominion Virginia Power service territory. The SVC will be connected at Doms Substation utilizing an existing 500 kV breaker position. This proposal has Ameren building the 500' 500 kV line from the SVC to Doms.
AP SOUTH L/O BED-BLA AEP-DOM L/O BED-BLA BED-BLA L/O MTS-DOU Fieldale to Thornton 138 kV Conastone to Northwest 230 kV Pleasant View to Ashburn 230 kV	Greenfield	Market Efficiency	ITC	156.00	APS/Dominion	500	Market Efficiency/ Reactive	Construct approximately 50 miles of new 500kV single-circuit overhead line from the existing Black Oak substation (First Energy) to the existing Meadow Brook substation (First Energy).
AP SOUTH L/O BED-BLA AEP-DOM L/O BED-BLA BED-BLA L/O MTS-DOU Fieldale to Thornton 138 kV Conastone to Northwest 230 kV Pleasant View to Ashburn 230 kV	Greenfield	Market Efficiency	ITC	190.20	APS/Dominion	500	Market Efficiency/ Reactive	New 58-mile 500 kV line from the existing Black Oak substation to existing Front Royal substation. Add Doms Cap.
AP SOUTH L/O BED-BLA AEP-DOM L/O BED-BLA BED-BLA L/O MTS-DOU Fieldale to Thornton 138 kV Conastone to Northwest 230 kV Pleasant View to Ashburn 230 kV	Greenfield	Market Efficiency	ITC	202.50	APS/Dominion	500	Market Efficiency/ Reactive	New 58-mile 500 kV line from the existing Black Oak substation to existing Front Royal substation. Add New Station
AP SOUTH L/O BED-BLA AEP-DOM L/O BED-BLA BED-BLA L/O MTS-DOU Fieldale to Thornton 138 kV Conastone to Northwest 230 kV Pleasant View to Ashburn 230 kV	Greenfield	Market Efficiency	ITC	205.20	APS/Dominion	500	Market Efficiency/ Reactive	New 58-mile 500 kV line from the existing Black Oak substation to existing Front Royal substation. Install a new 240 MVAR capacitor bank at Doms 500kV Substation. Add Doms Cap and New Station

AP SOUTH L/O BED-BLA AEP-DOM L/O BED-BLA BED-BLA L/O MTS-DOU Fieldale to Thornton 138 kV Miami Fort to Willey 138 kV Brunner Island to Yorkana 230 kV	Greenfield	Market Efficiency	ITC	158.70	APS/Dominion	500	Market Efficiency/ Reactive	Construct approximately 50 miles of new 500kV single-circuit overhead line from the existing Black Oak substation (First Energy) to the existing Meadow Brook substation (First Energy). Add Dooks Cap
AP SOUTH L/O BED-BLA AEP-DOM L/O BED-BLA BED-BLA L/O MTS-DOU Fieldale to Thornton 138 kV Miami Fort to Willey 138 kV Brunner Island to Yorkana 230 kV	Greenfield	Market Efficiency	ITC	171.00	APS/Dominion	500	Market Efficiency/ Reactive	Construct approximately 50 miles of new 500kV single-circuit overhead line from the existing Black Oak substation (First Energy) to the existing Meadow Brook substation (First Energy). Add New Station
AP SOUTH L/O BED-BLA AEP-DOM L/O BED-BLA BED-BLA L/O MTS-DOU Fieldale to Thornton 138 kV Miami Fort to Willey 138 kV Brunner Island to Yorkana 230 kV	Greenfield	Market Efficiency	ITC	173.70	APS/Dominion	500	Market Efficiency/ Reactive	Construct approximately 50 miles of new 500kV single-circuit overhead line from the existing Black Oak substation (First Energy) to the existing Meadow Brook substation (First Energy). Add Dooks Cap and New Station.
AP SOUTH L/O BED-BLA AEP-DOM L/O BED-BLA Other Interfaces Danville to East Danville 138 kV Fieldale to Thornton 138 kV	Greenfield	Market Efficiency	Dominion/Trans ource	317.00	AEP/Dominion	765	Market Efficiency/ Reactive	Construct a new single circuit 765kV line between AEP's Axton Station to Dominions Clover Station approximately 60 miles away. Install 4-765kV breakers in a ring configuration and a shunt reactor at Axton Station. Install 9-500 kV breakers, 1-765kV breaker, and a 765/500 kV transformer at Clover Station. Additional upgrades in AEP will also be included in this proposal. The Axton and Clover substations will be expanded to accommodate the new circuit. Complete sag remediation on the Fieldale - Thornton - Franklin 138 kV line. Replace terminal equipment on the Danville - East Danville 138 kV line and at the Carson and Rawlings substations. Replace the relay on the Cloverdale-Jackson's Ferry 765kV line. Install one 350 MVAR cap bank at Jackson's Ferry and Broadford 765 kV stations. Install one 151.54 MVAR cap bank at Liberty and Cannon Branch 230 kV stations. Install two 151.54 MVAR cap banks at Shellhorn, Dooks, and Morrisville 230 kV stations.
AP SOUTH L/O BED-BLA AEP-DOM L/O BED-BLA Other Interfaces Danville to East Danville 138 kV Fieldale to Thornton 138 kV	Greenfield	Market Efficiency	Dominion/Trans ource	384.00	AEP/Dominion	765	Market Efficiency/ Reactive	Construct a new 500 kV station called "Palmyra" that will tap the existing North Anna - Midlothian 500 kV line and the Cunningham - Elmont 500 kV line approximately where the two lines cross. Include a 765/500 kV transformer in the new station, which will be built as breaker-and-a-half. Construct a new 75 mile single circuit 765 kV line between Palmyra station and Joshua Falls 765 kV station. Install additional 765 kV breakers at The Joshua Falls station will be expanded to accommodate the new line to Palmyra. Install one 350 MVAR cap bank at Jackson's Ferry and Broadford 765 kV stations. Install one 151.54 MVAR cap bank at Liberty and Cannon Branch 230 kV stations. Install two 151.54 MVAR cap banks at Shellhorn, Dooks, and Morrisville 230 kV stations. Replace the relay on the Cloverdale - Jackson's Ferry 765 kV line. Complete sag remediation on the Fieldale - Thornton - Franklin 138 kV line. Replace terminal equipment on the Danville - East Danville 138 kV line.
AP SOUTH L/O BED-BLA AEP-DOM L/O BED-BLA Other Interfaces Fieldale to Thornton 138 kV	Greenfield	Market Efficiency	Dominion/Trans ource	181.00	Dominion	230	Market Efficiency/ Reactive	Build a double circuit 230kV AC overhead line from Joshua Falls - Farmville substations, build a 765/230kV TX at Joshua Falls, and build five (5) capacitor banks in DVP zone to alleviate AP South and AEP-DOM congestions
AP SOUTH L/O BED-BLA AEP-DOM L/O BED-BLA Other Interfaces Fieldale to Thornton 138 kV	Greenfield	Market Efficiency	Dominion/Trans ource	222.00	AEP/Dominion	500	Market Efficiency/ Reactive	Build a single circuit 500kV AC overhead line from Axton - Clover substations, build a 765/500kV TX at Axton, and build five (5) capacitor banks in DVP zone to alleviate AP South and AEP-DOM congestions
AP SOUTH L/O BED-BLA AEP-DOM L/O BED-BLA Other Interfaces Fieldale to Thornton 138 kV	Greenfield	Market Efficiency	Dominion/Trans ource	293.00	AEP/Dominion	500	Market Efficiency/ Reactive	Construct a new 500 kV station called "Palmyra" that will tap the existing North Anna - Midlothian 500 kV line and the Cunningham - Elmont 500 kV line approximately where the two lines cross. Construct a new 75 mile single circuit 500 kV line between Palmyra station and Joshua Falls 765 kV station. Install a 765/500 kV transformer at Joshua Falls station. Install additional 765 kV breakers at The Joshua Falls station will be expanded to accommodate the new circuit transformer. Install one 151.54 MVAR cap bank at Liberty and Cannon Branch 230 kV stations. Install two 151.54 MVAR cap banks at Shellhorn, Dooks, and Morrisville 230 kV stations.



AP SOUTH L/O BED-BLA BED-BLA L/O MTS-DOU 50045005 L/O RCKSPG-KEENY Safe Harbor to Graceton 230 kV Conastone to Northwest 230 kV Peach Bottom 500 kV	Greenfield	Market Efficiency	Northeast Transmission Development	<b>48.60</b>	Pepco/BGE	230	Market Efficiency/ Reactive	Build 500/230 kV Substation (Keysers Run) Interconnecting Conastone-Brighton 500 kV Line to Northwest 230 kV Substation.
AP SOUTH L/O BED-BLA BED-BLA L/O MTS-DOU 50045005 L/O RCKSPG-KEENY Taneytown to Carroll 138 kV Conastone to Northwest 230 kV Peach Bottom 500 kV Jacksons Ferry to Cloverdale 765 KV 765 kV	Greenfield	Market Efficiency	Northeast Transmission Development	<b>104.50</b>	Meted/Penelec	230	Market Efficiency/ Reactive	Approximately 26-mile 230 kV Line from Ringgold to a new 500/230 kV substation on the Conemaugh-Hunterstown 500 kV Line ("Green Ridge").
AP SOUTH L/O BED-BLA BED-BLA L/O MTS-DOU 50045005 L/O RCKSPG-KEENY Taneytown to Carroll 138 kV Conastone to Northwest 230 kV Peach Bottom 500 kV Jacksons Ferry to Cloverdale 765 KV 765 kV	Greenfield	Market Efficiency	Northeast Transmission Development	<b>432.50</b>	APS/Dominion	500	Market Efficiency/ Reactive	Approximately 99-mile 500 kV Line from Harrison to Bath County.
AP SOUTH L/O BED-BLA BED-BLA L/O MTS-DOU Conastone to Northwest 230 kV	Greenfield	Market Efficiency	Northeast Transmission Development	<b>53.70</b>	Dominion	500	Market Efficiency/ Reactive	Build 750 MVAR Static VAR Compensation (Harpers Run) Interconnected to Morrisville 500 kV Substation.
AP SOUTH L/O BED-BLA BED-BLA L/O MTS-DOU Fieldale to Thornton 138 kV Brunner Island to Yorkana 230 kV Lorreto to Wilton CTR 345 kV Safe Harbor to Graceton 230 kV	Greenfield	Market Efficiency	ITC	<b>187.50</b>	APS/Dominion	500	Market Efficiency/ Reactive	New 58-mile 500 kV line from the existing Black Oak substation to existing Front Royal substation.
AP SOUTH L/O BED-BLA BED-BLA L/O MTS-DOU Taneytown to Carroll 138 kV Conastone to Northwest 230 kV Peach Bottom 500 kV	Greenfield	Market Efficiency	Northeast Transmission Development	<b>38.90</b>	Meted/Penelec	138	Market Efficiency/ Reactive	Approximately 6-mile 138 kV Line from Grand Point to a new 500/138 kV substation on the Conemaugh-Hunterstown 500 kV Line ("Green Ridge")
AP SOUTH L/O BED-BLA BED-BLA L/O MTS-DOU Taneytown to Carroll 138 kV Conastone to Northwest 230 kV Peach Bottom 500 kV Jacksons Ferry to Cloverdale 765 KV 765 kV	Greenfield	Market Efficiency	Northeast Transmission Development	<b>41.90</b>	Meted/Penelec	138	Market Efficiency/ Reactive	Approximately 6-mile 138 kV Line from Grand Point to a new 500/138 kV substation on the Conemaugh-Hunterstown 500 kV Line ("Green Ridge") with a series reactor at Green Ridge.
AP SOUTH L/O BED-BLA Brunner Island to Yorkana 230 kV Safe Harbor to Graceton 230 kV	Greenfield	Market Efficiency	Nextera	<b>76.20</b>	PECO	500	Market Efficiency/ Reactive	Build new Conastone - Peach Bottom 500 kV line
AP SOUTH L/O BED-BLA Brunner Island to Yorkana 230 kV Safe Harbor to Graceton 230 kV	Greenfield	Market Efficiency	Nextera	<b>86.30</b>	PECO	500	Market Efficiency/ Reactive	Build new Atom 500 kV substation, Build new Conastone - Peach Bottom 500 kV line, Loop Yorkana - Peach Bottom 500 kV line into Atom
AP SOUTH L/O BED-BLA Brunner Island to Yorkana 230 kV Taneytown to Carroll 138 kV Safe Harbor to Graceton 230 kV	Greenfield	Market Efficiency	Nextera	<b>297.00</b>	PECO	500	Market Efficiency/ Reactive	Build new Hunterstown - Brighton 500 kV line, Build new Conastone - Peach Bottom 500 kV line

AP SOUTH L/O BED-BLA Other Interfaces	Upgrade	Market Efficiency	Dominion Virginia Power	25.00	Dominion	500	Market Efficiency/ Reactive	Build one 500kV Thyristor Controlled Series Capacitors (TCSC) at Mt Storm substation on the Mt Storm - Pruntytown (554) transmission line to reduce congestion on AP South and other PJM interfaces
AP SOUTH L/O BED-BLA Other Interfaces	Upgrade	Market Efficiency	Dominion Virginia Power	25.00	Dominion	500	Market Efficiency/ Reactive	Build one 500kV Thyristor Controlled Series Capacitors (TCSC) at Loudoun substation on the Loudoun - Meadowbrook line to reduce congestion on AP South and other PJM interfaces
AP SOUTH L/O BED-BLA Other Interfaces	Upgrade	Market Efficiency	Dominion Virginia Power	39.06	Dominion	500	Market Efficiency/ Reactive	Build one 500kV Thyristor Controlled Series Capacitor (TCSC) at Loudoun substation on the Loudoun - Meadowbrook (535) line and build five (5) 230 kV capacitor banks at five (5) DVP substations to alleviate congestion on AP South and other PJM interfaces
AP SOUTH L/O BED-BLA Other Interfaces	Greenfield	Market Efficiency	Dominion Virginia Power	42.70	Dominion	500	Market Efficiency/ Reactive	Build a new 500kV station (Palmyra) by connecting at the intersection of two (2) 500kV lines of North Anna - Midlothian 500kV line and Cunningham - Elmont 500kV line and build five (5) capacitor banks in DVP zone to alleviate AP South and AEP-DOM congestions
AP SOUTH L/O BED-BLA Other Interfaces	Greenfield	Market Efficiency	Dominion/Trans ource	193.00	Dominion	230	Market Efficiency/ Reactive	Build a single circuit 230kV AC overhead line from Joshua Falls - Farmville substations, build a 765/230kV TX at Joshua Falls, upgrade portions of the 84 line, and build five (5) capacitor banks in DVP zone to alleviate AP South and AEP-DOM congestions
AP SOUTH L/O BED-BLA Other Interfaces Brunner Island to Yorkana 230 kV Taneytown to Carroll 138 kV Safe Harbor to Graceton 230 kV Conastone to Northwest 230 kV	Greenfield	Market Efficiency	Dominion Virginia Power/Transour ce	269.00	Peco/Dominion/AE P	230	Market Efficiency/ Reactive	Tap the Conemaugh - Hunterstown 500 kV line with a new station named "Rice" and construct a new 230 kV double circuit line between Rice and Ringgold stations. Tap the Peach Bottom - Three Mile Island 500 kV line with a new station named "Furnace Run" and construct a new 230 kV double circuit line between Furnace Run and Conastone stations. Add three 86.4 MVAR cap banks to Jackson's Ferry and Broadford 138 kV stations. Add one 175 MVAR cap bank to Lexington and Dooks 230 kV stations. Add two 175 MVAR cap banks to Ashburn and Brambleton 230 kV stations. Rebuild the Conastone - Northwest 230 kV double circuit corridor.
AP SOUTH L/O BED-BLA Other Interfaces Danville to East Danville 138 kV Fieldale to Thornton 138 kV	Greenfield	Market Efficiency	Transource	139.00	AEP	765	Market Efficiency/ Reactive	Construct a new double circuit 230 kV line between AEP's Axton Station to AEP's East Danville Station approximately 25 miles away. Install 3-765kV breakers in a ring configuration, 2-230 kV breakers, and a 765/230 kV transformer at Axton Station. Install 4-230 kV breakers in a ring configuration at East Danville Station. Additional upgrades in AEP will also be included in this proposal. The 765kV Axton and 230kV East Danville substations will both be expanded to accommodate the new circuits. 1,550 MVARs of new capacitance will also be installed with 350 MVAR of capacitor banks each at Brambleton and Ashburn stations, 175 MVAR each at Lexington and Dooks stations and 250 MVAR each at Jackson's Ferry and Broadford substations.
AP SOUTH L/O BED-BLA Other Interfaces Taneytown to Carroll 138 kV	Greenfield	Market Efficiency	Transource	210.00	AEP	500	Market Efficiency/ Reactive	Construct a new 500 kV line between Meadowbrook Station to Dooks Station approximately 50 miles away. Install a single 500 kV breaker in the existing ring arrangement at Meadow Brook Station. Connect the 500 kV line into the existing breaker and a half arrangement at Dooks Station. Additional upgrades in AEP will also be included in this proposal. The Meadowbrook and Dooks substations will both be expanded to accommodate the new circuits. 1,750 MVARs of new capacitance will also be installed with 350 MVAR of capacitor banks each at Brambleton, Loudoun, Lexington, Jackson's Ferry and Broadford substations.
AP SOUTH L/O BED-BLA Other Interfaces Taneytown to Carroll 138 kV	Greenfield	Market Efficiency	Transource	237.00	AEP	230	Market Efficiency/ Reactive	Construct a new double circuit 230 kV line between Meadowbrook Station and Dooks Station approximately 50 miles away. Additional upgrades in AEP will also be included in this proposal. The 500kV Meadowbrook and 230kV Dooks substations will both be expanded to accommodate the new circuits. 1,550 MVARs of new capacitance will also be installed with 350 MVAR of capacitor banks each at Brambleton and Ashburn stations, 175 MVAR each at Lexington and Dooks stations and 250 MVAR each at Jackson's Ferry and Broadford substations.
Black River-Lorain	Upgrade	Market Efficiency	FirstEnergy	9.60	ATSI	138	Market Efficiency	b2559 Reconnector the Black River-Lorain 138kV line and upgrade Black River and Lorain substation terminal end equipment. (once the Baseline RTEP projects are completed. No additional Upgrades are required.)
Brunner Island to Yorkana 230 kV	Upgrade	Market Efficiency	PPL	3.10	PPL/Meted	230	Market Efficiency	Reconnector three spans limiting the Brunner Island - Yorkana 230kV line, add 2 breakers to Brunner Island Switchyard, upgrade associated terminal equipment

Brunner Island to Yorkana 230 kV	Upgrade	Market Efficiency	PPL/FE	40.20	PPL/Meted	500	Market Efficiency	Expand existing Yorkana substation in Met-Ed. Install 500/230 kV transformer, construct a 500 kV ring bus, install two 230 kV breakers and loop TMI-Peach Bottom 500 kV line into new 500 kV ring bus.
CLEVELAND INTERFACE	Upgrade	Market Efficiency	FirstEnergy	22.40	ATSI	345	Market Efficiency/ Reactive	b2557 At Avon substation, replace the existing 345/138kV 448MVA #92 transformer with a 560MVA unit., b2559 Reconnector the Black River-Lorain 138kV line and upgrade Black River and Lorain substation terminal end equipment, b2560 Construct second 138kV line between West Fremont and Hayes substation on open tower position of the West Fremont - Groton - Hayes 138kV line (RTEP Upgrade b1959) (once the Baseline RTEP projects are completed. No additional Upgrades are required.)
Cordova to Nelson 345 kV	Upgrade	Market Efficiency	ComEd	2.00	ComEd	345	Market Efficiency	Reconnector Cordova to Nelson 345kV line and replace station conductor. NOTE: This project (s0704) is scheduled to complete on March 13, 2015
Cordova to Nelson 345 kV	Upgrade	Market Efficiency	ComEd	15.50	ComEd	345	Market Efficiency	Replace station equipment at three stations and reconnector Cordova to Nelson 345kV line. NOTE: Component 1 of this project (s0704) is scheduled to complete on March 13, 2015
Cordova to Nelson 345 kV	Upgrade	Market Efficiency	ComEd	24.60	ComEd	345	Market Efficiency	Replace station equipment at three stations and upgrade conductor rating of three lines by re-conductoring and mitigating sag limitations. NOTE: Component 1 of this project (s0704) is scheduled to complete on March 13, 2015
Crestwood to Astor 138 kV	Upgrade Requ	Market Efficiency	FirstEnergy	N/A	ATSI	138	Market Efficiency	No upgrade required. The rating utilized in the model was incorrect. (once the Baseline RTEP projects are completed. No additional Upgrades are required.)
Dravosburg to West Mifflin 138 kV Woodville to 15USAP 138 kV	Upgrade	Market Efficiency	Duquesne Light	11.18	DUQ	138	Market Efficiency	Reconnector approximately 7 miles of the Woodville-Peters (Z-117) 138kV circuit, reconfigure the West Mifflin-USS Clairton (Z-15) 138kV circuit to establish the Dravosburg-USS Clairton (Z-14) 138kV circuit and the West Mifflin-Wilson (Z-15) 138kV circuit.
Dravosburg to West Mifflin 138 kV Woodville to 15USAP 138 kV	Greenfield	Market Efficiency	ITC	64.30	APS/DUQ	138	Market Efficiency	Construct approximately 29 miles of new 138kV single-circuit overhead line from the existing Karns City substation in Pennsylvania to the existing McDowell substation in Pennsylvania.
Dravosburg to West Mifflin 138 kV Woodville to 15USAP 138 kV Krendale to Shanor Manor 138 kV	Greenfield	Market Efficiency	Northeast Transmission Development	9.20	APS/DUQ	138	Market Efficiency	Build 138 kV Switching Station (Renton) Interconnecting Plum-Cheswick 138 kV Line and Springdale-Huntingdon 138 kV Line.
Dravosburg to West Mifflin 138 kV Woodville to 15USAP 138 kV Taneytown to Carroll 138 kV	Greenfield	Market Efficiency	ITC	14.40	APS/DUQ	138	Market Efficiency	Construct approximately 3.6 miles of new 138kV single-circuit overhead line from the existing Enlow substation in Pennsylvania (First Energy) to the existing Findlay substation in Pennsylvania (DQE).
Fieldale to Thornton 138 kV	Greenfield	Market Efficiency	ITC	19.00	AEP	138	Market Efficiency	Construct approximately 5 miles of new 138kV single-circuit overhead line from the proposed Diamond Ave. substation in Virginia (ITC) to the existing Blaine substation in Virginia (AEP).
Fieldale to Thornton 138 kV Danville to East Danville 138 kV	Upgrade	Market Efficiency	AEP	0.75	AEP	138	Market Efficiency	Mitigate all violations identified by the sag study to operate the Fieldale - Thornton - Franklin overhead 138 kV line conductor at its maximum operating temperature. Preliminary study results have identified 6 potential distribution/utility line crossings to be addressed. Also, replace terminal equipment at AEP's Danville and East Danville substations to improve the thermal capacity of Danville - East Danville 138 kV circuit.
Jacksons Ferry to Cloverdale 765 KV 765 kV	Upgrade	Market Efficiency	AEP	0.50	AEP	765	Market Efficiency	Replace relays at AEP's Cloverdale and Jackson's Ferry substation to improve the thermal capacity of Cloverdale - Jackson's Ferry 765 kV line
Krendale to Shanor Manor 138 kV	Upgrade	Market Efficiency	FirstEnergy	0.60		138	Market Efficiency	Upgrade 138 kV substation equipment at Butler, Shanor Manor, and Krendale substations. New rating of the line will be 353 MVA summer normal and 422 MVA summer emergency
Lorreto to Wilton CTR 345 kV	Upgrade	Market Efficiency	ComEd	11.50	ComEd	345	Market Efficiency	Mitigate sag limitations on Loretto-Wilton Center Line, and replace station conductor at Wilton Center.
Lorreto to Wilton CTR 345 kV	Upgrade	Market Efficiency	ComEd	14.00	ComEd	345	Market Efficiency	Loretto to Wilton Center Sag Mitigation and Station Conductor Replacement; Pontiac Midpoint to Dresden Station Conductor Replacement
Lorreto to Wilton CTR 345 kV	Upgrade	Market Efficiency	ComEd	17.40	ComEd	345	Market Efficiency	Mitigate sag limitations on Loretto-Wilton Center Line and replace station conductor and circuit breakers at Wilton Center.
Lorreto to Wilton CTR 345 kV	Upgrade	Market Efficiency	ComEd	19.90	ComEd	345	Market Efficiency	Loretto to Wilton Center Sag Mitigation, Station Conductor Replacement, Circuit breaker replacements at Wilton Center and Replace station conductor at Pontiac Midpoint and Dresden

Lorretto to Wilton CTR 345 kV	Upgrade	Market Efficiency	ComEd	25.90	ComEd	345	Market Efficiency	Loretto to Wilton Center Sag Mitigation, Station Conductor Replacement at Wilton Center, Circuit breaker replacements at Wilton Center and Pontiac Midpoint, and Replace station conductor at Pontiac Midpoint and Dresden.
Lorretto to Wilton CTR 345 kV	Greenfield	Market Efficiency	ComEd	37.80	ComEd	345	Market Efficiency	The solution consists of the installation of a new ~14.5 mile 345 kV single circuit overhead transmission line from ComEd's existing Loretto 345kV substation to ComEd's existing Katydid 345kV substation. Additionally, 345 kV L0303 from ComEd's Powerton to Goodings Grove 345 kV substations would be brought into and split at Katydid.
Lorretto to Wilton CTR 345 kV	Greenfield	Market Efficiency	Northeast Transmission Development	42.90	ComEd	345	Market Efficiency	Approximately 22-mile 345 kV Line from Pontiac Midpoint to Katydid Road.
Lorretto to Wilton CTR 345 kV	Greenfield	Market Efficiency	Nipsco	290.00	AEP/CE/NIPS	345	Market Efficiency	Double Circuit 345 kV line section from Pontiac to Reynolds (~100 miles)
Miami Fort to Willey 138 kV	Greenfield	Market Efficiency	DATC	11.35	DEOK	138	Market Efficiency	Build a new 345 kV substation in Northern Kentucky to tie together the Miami Fort – Tanners Creek 345 kV line and the Miami Fort – Terminal 345 kV line
Miami Fort to Willey 138 kV	Greenfield	Market Efficiency	ITC	16.90	DEOK	345	Market Efficiency	Construct the new 345kV/138kV "Hamilton" substation near the existing Willey substation (Duke) in Hamilton County, Ohio. Cut the adjacent Woodsdale – Miami Fort 345kV line (Duke) into the new Hamilton substation. Connect the new Hamilton substation 138kV bus to the existing Willey 138kV switchyard.
Miami Fort to Willey 138 kV	Greenfield	Market Efficiency	ITC	25.00	AEP/DEOK	138	Market Efficiency	Build approximately 11 miles of new 138kV single-circuit overhead line from a new substation near the existing Drewersburg substation in Indiana (AEP) to the existing Willey substation in Ohio (DEO&K).
Miami Fort to Willey 138 kV	Greenfield	Market Efficiency	PSEG	47.80	ATSI	138	Market Efficiency	Build new 138kV line from Miami Fort to Willey
Miami Fort to Willey 138 kV	Greenfield	Market Efficiency	Ameren	56.04	DEOK	345	Market Efficiency	Build a new 345 kV switching station (West Buffington) about 7 miles west of the existing Buffington substation. Loop in the existing Clifty Creek – Buffington 345 kV line. Build a new 345 kV line from East Bend to the new West Buffington switching station, approximately 12 miles. Upgrade existing circuit from West Buffington to Buffington
Miami Fort to Willey 138 kV	Greenfield	Market Efficiency	Ameren	91.26	DEOK	345	Market Efficiency	Construct a new 345 kV substation adjacent to the existing Willey 138 kV substation. Loop the Miami Fort – Woodsdale and Miami Fort West Milton 345 kV lines into the new substation. Also install a 345/138 kV transformer. Expand existing Willey 138 kV substation to include a loop in of the Morgan Fairfield 138 kV line and a new Willey 345/138 kV transformer connection. Upgrade existing double circuit line from Willey to Fairfield. Build a new 345 kV switching station (West Buffington) about 7 miles west of the existing Buffington substation. Loop in the existing Clifty Creek – Buffington 345 kV line. Build a new 345 kV line from East Bend to the new West Buffington switching station, approximately 12 miles. Upgrade existing circuit from West Buffington to Buffington.
Miami Fort to Willey 138 kV	Greenfield	Market Efficiency	Ameren	91.26	DEOK	345	Market Efficiency	Expand existing Willey 138 kV substation to include a loop in of the Morgan Fairfield 138 kV line and a new Willey 345 kV substation. Create a 5 position 345 kV ring bus which would consist of a 345/138 kV transformer, a loop in of the Miami Fort – Woodsdale 345 kV line, and a loop in of the Miami Fort – West Milton 345 kV line. Upgrade existing double circuit line from Willey to Fairfield. Build a new 345 kV switching station (West Buffington) about 7 miles west of the existing Buffington substation. Loop in the existing Clifty Creek – Buffington 345 kV line. Build a new 345 kV line from East Bend to the new West Buffington switching station, approximately 12 miles. Upgrade existing circuit from West Buffington to Buffington.
Miami Fort to Willey 138 kV Miami Fort to 08HEBTAP 138 kV	Greenfield	Market Efficiency	Northeast Transmission Development	18.60	DEOK	345	Market Efficiency	Build 345 kV Switching Station (Garrison Creek) Interconnecting Miami Fort-Tanners Creek 345 kV Line and Miami Fort-Terminal 345 kV Line.
None Specified	Upgrade	Market Efficiency	Nipsco	81.16	AEP/CE/NIPS	345	Market Efficiency	Burnham-Munster 345 kV (Munster Ring Bus), Burnham-Sheffield 345kV (ComEd CT's), Dumont-Stillwell 345kV (AEP Resag and AEP/NIPS wavetraps and drops), Michigan City-LaPorte 138 kV (Operating Temp, CT's, 500 MCM CU and Conductor Drop), Rebuild Michigan City – Trail Creek 138 kV (Remove Terminal Limits: Copper, MC&TC CT's), Rebuild Trail Creek – New Carlisle 138 kV (Remove Terminal Limits: TC CT's), Rebuild Maple-New Carlisle 138 kV (Remove Terminal Limits: Copper and Maple CT's)
None Specified	Greenfield	Market Efficiency	Nipsco	240.00	AEP/CE/NIPS	345	Market Efficiency	Wilton Center to Reynolds Single Circuit 345 kV and a 765/345 kV Xfmr at Gwynneville by Splitting Greentown to Jefferson 765 kV line at Gwynneville to form a new 765 kV Substation with 765/345 kV Xfmr

Oglesby to Mazon 138 kV	Upgrade	Market Efficiency	ComEd	0.70	ComEd	138	Market Efficiency	Replace relays at Mazon substation
Peach Bottom 500 kV	Upgrade	Market Efficiency	PECO	0.20	PECO	230	Market Efficiency	Increase ratings of Peach Bottom 500-230 kV transformer to 1245 MVA normal / 1387 MVA emergency
Peach Bottom 500 kV	Upgrade	Market Efficiency	PECO	9.70	PECO	230	Market Efficiency	Increase ratings of Peach Bottom 500-230 kV transformer to 1479 MVA normal / 1839 MVA emergency
Peach Bottom 500 kV	Upgrade	Market Efficiency	PECO	21.10	PECO	230	Market Efficiency	Install a 2nd 500-230 kV transformer at Peach Bottom substation
Peach Bottom to Conastone 500 kV	Upgrade	Market Efficiency	PECO	1.80	PECO	500	Market Efficiency	Increase ratings of 5012 Peach Bottom-Conastone 500 kV line to 2490 MVA normal / 2815 MVA emergency
Peach Bottom to Conastone 500 kV	Upgrade	Market Efficiency	PECO	8.70	PECO	500	Market Efficiency	Increase ratings of 5012 Peach Bottom-Conastone 500 kV line to 2826 MVA normal / 3525 MVA emergency
Roseland-Cedar Grove-Clifton 230 kV corridor	Upgrade	Market Efficiency	PSEG	2.80	PSEG	230	Market Efficiency/ RPM	Reconfigure Clifton Source
Roseland-Cedar Grove-Clifton 230 kV corridor	Greenfield	Market Efficiency	ITC	102.70	PSEG	138	Market Efficiency/ RPM	Construct approximately 6 miles of underground transmission line from the existing West Orange substation in New Jersey to the existing Cook Road substation in New Jersey.
Roseland-Cedar Grove-Clifton 230 kV corridor	Greenfield	Market Efficiency	GridAmerica	125.00	PSEG	230	Market Efficiency/ RPM	The Project consists of a new approximately six-mile underground 230 kV 5000 kcmil transmission line between the West Orange 230 kV Substation in West Orange Township, New Jersey to the Cook Road 230 kV Substation in Nutley Township, New Jersey. The underground 230 kV line will be connected to the Cook Road 230 kV bus "C" which is electrically connected to the Athenia 230 kV Substation and the Kings Land 230 kV Substation
Safe Harbor to Graceton 230 kV	Upgrade	Market Efficiency	PPL	1.10	PPL/BGE	230	Market Efficiency	Reconductor two spans of the Graceton-Safe Harbor 230kV transmission line. Includes termination point upgrades
Safe Harbor to Graceton 230 kV	Upgrade	Market Efficiency	BGE	5.60	BGE/PPL	230	Market Efficiency	Rebuild BGE portion of line, approximately 1.4 miles of the Graceton-Safe Harbor 230kV line with 1590kcm 45/7 ACSR conductor in conjunction with the project being submitted by PPL for this same tie line. BGE and PPL projects together will achieve a combined tie line facility ratings of 648/802 MVA SN/SE and 746/903 MVA WN/WE
Taneytown to Carroll 138 kV	Upgrade	Market Efficiency	FirstEnergy	5.20	APS/Meted	138	Market Efficiency	Upgrade terminal equipment on the Lincoln - Carroll 115/138kV path.
Taneytown to Carroll 138 kV	Greenfield	Market Efficiency	DATC	21.11	Meted	115	Market Efficiency	The project cuts into the Germantown - Straban 115 kV line near Germantown. It loops 11 miles of double circuit 115 kV from the cut-in section to Fairview substation and back, tying in to the 115 kV line up to Straban (using the existing circuit).
Taneytown to Carroll 138 kV	Upgrade	Market Efficiency	FirstEnergy	58.00	APS/Meted	138	Market Efficiency	Rebuild and Reconductor the Lincoln - Carroll 115/138kV path. Line will be constructed for future 230kV operation.
Taneytown to Carroll 138 kV	Greenfield	Market Efficiency	Ameren	107.20	APS/Meted	230	Market Efficiency	Construct approximately 25 miles of new 230 kV line between Hunterstown and Carroll substations. Upgrade 12 miles of 230 kV line between Carroll and Mt. Airy substations. Upgrade 18 miles of 230 kV line between Jackson and Three Mile Island substations.
Taneytown to Carroll 138 kV Brunner Island to Yorkana 230 kV Safe Harbor to Graceton 230 kV	Greenfield	Market Efficiency	ITC	70.80	APS/Dominion	138	Market Efficiency	Construct approximately 26.5 miles of new 138kV single-circuit overhead line from the existing Germantown substation to the existing Ringgold substation.
Wayne to South Elgin 138 kV	Upgrade	Market Efficiency	ComEd	0.10	ComEd	138	Market Efficiency	Replace L7815 B phase line trap at Wayne substation
Worcester to Ocean Pines (I) 69 kV	Upgrade	Market Efficiency	PHI	2.40	DPL	69	Market Efficiency	Rebuild Worcester - Ocean Pine 60 kV ckt 1 to 1400A capability summer emergency
N/A - Reliability	Upgrade	Reliability	AEP	0.30	AEP/OVEC	345	15 Year Thermal Single	Six Wire Kyger - Sporn No.1 and No.2 Circuits Together
N/A - Reliability	Upgrade	Reliability	FirstEnergy	3.60	JCPL	230	15 Year Thermal Tower	Reconductor Red Oak - Raritan River 230 kV line and upgrade terminal equipment
N/A - Reliability	Upgrade	Reliability	PHI	4.18	AE	230	15 Year Thermal Tower	Rebuild Mickelton - Monroe 230 ckt 2 to 2000A capability summer emergency
N/A - Reliability	Upgrade	Reliability	FirstEnergy	5.30	JCPL	230	15 Year Thermal Tower	Reconductor Parlin - Williams 230 kV line and upgrade terminal equipment
N/A - Reliability	Upgrade	Reliability	FirstEnergy	6.20	JCPL/PSEG	230	15 Year Thermal Tower	Reconductor Raritan River - Kilmer 230 kV line and upgrade terminal equipment
N/A - Reliability	Upgrade	Reliability	FirstEnergy	9.80	JCPL	230	15 Year Thermal Tower	Reconductor Williams - Freneau 230 kV line and upgrade terminal equipment
N/A - Reliability	Upgrade	Reliability	AEP	10.00	AEP	345	15 Year Thermal Single	Reconductor Dequine-Meadow Lake 345 kV ckt #1 and ckt #2. Upgrade wavetraps at Dequine and Meadow Lake stations to ensure that the new conductor sets the ratings for these circuits
N/A - Reliability	Upgrade	Reliability	AEP	15.50	AEP/OVEC	345	15 Year Thermal Single	Reconductor Kyger - Sporn No.2 circuit
N/A - Reliability	Greenfield	Reliability	AEP	17.60	AEP/OVEC	345	15 Year Thermal Single	Construct 3.2 miles of new 1590 ACSR 345kV line between Kyger Creek 345kV and Gavin 138kV stations and install a 345/138kV transformer at Gavin



N/A - Reliability	Upgrade	Reliability	AEP	21.30	AEP/OVEC	345	15 Year Thermal Single	Reconductor Kyger - Sporn No.1 and No.2 circuit
N/A - Reliability	Upgrade	Reliability	PHI	21.60	DPL	230	15 Year Thermal Single	Rebuild Milford - Cool Spring 230 kV ckt 1 to 2000A capability summer emergency
N/A - Reliability	Greenfield	Reliability	PSEG	22.90	DPL	230	15 Year Thermal Single	Loop the 230kV between Red Lion and Cartanza in and out of Cedar Creek and reconductor the existing and looped 230kV lines between Cedar Creek and Red Lion
N/A - Reliability	Upgrade	Reliability	PHI	24.80	DPL	230	15 Year Thermal Single	Rebuild Red Lion - Cedar Creek 230 kv Ckt 1 to 2000A capability summer emergency
N/A - Reliability	Upgrade	Reliability	AEP	25.00	AEP	345	15 Year Thermal Single	Rebuild Dequine-Meadow Lake 345 kV ckt #1 and ckt #2. Also install OPGW. Upgrade relay trip settings at Dequine station on Dequine-Meadow Lake 345 kV #1. Upgrade relay trip settings at Meadow Lake on Dequine-Meadow Lake 345 kV #2. Dequine-Meadow Lake 345 kV ckt 1 and ckt 2 will be on fiber for communications. Retire wavetraps on both circuits.
N/A - Reliability	Greenfield	Reliability	AEP	25.00	AEP	345	15 Year Thermal Single	Construct Dequine-Meadow Lake 345 kV ckt #3. Install a 3000 A (cont. current) 63 kA (intr. current) 345 kV circuit breaker at Dequine station to complete breaker and half string "A". Swing Fowler Ridge (IPP), Meadow Lake #1, and Meadow Lake #2 to new positions. Terminate Meadow Lake #3 between breaker C1 and C. Install a 3000 A (cont. current) 63 kA (intr. current) 345 kV circuit breaker at Meadow Lake station to complete breaker and half string "D". Swing Dequine #1 and #2 to new positions. Terminate Dequine #3 between breaker C and C1. Dequine-Meadow Lake ckt #1 and ckt #2 will continue to be on carrier communications whereas; ckt #3 will be on fiber communications.
N/A - Reliability	Greenfield	Reliability	PECO	32.50	AE/PSEG	230	15 Year Thermal Single; 15 Year Thermal Tower	Build new 230 kV transmission line connecting Penrose substation and Eagle Point substation
N/A - Reliability	Upgrade	Reliability	PHI	37.49	AE	230	15 Year Thermal Tower	Rebuild Mickelton - Monroe 230 ckt 1 to 2000A capability summer emergency
N/A - Reliability	Greenfield	Reliability	PECO	43.50	AE/PSEG	230	15 Year Thermal Single; 15 Year Thermal Tower	Build new 230 kV transmission line connecting Eddystone substation and Mickelton substation
N/A - Reliability	Greenfield	Reliability	PECO	44.50	AE/PSEG	230	15 Year Thermal Single; 15 Year Thermal Tower	Build new 230 kV transmission line connecting Penrose substation and Thorofare substation
N/A - Reliability	Upgrade	Reliability	AEP	62.48	AEP/OVEC	345	15 Year Thermal Single	Rebuild Kyger - Sporn No.1 and No.2 circuit
N/A - Reliability	Greenfield	Reliability	PSEG	63.00	DPL	230	15 Year Thermal Single	Build a new 230 kV line from Milford to Cool Springs
N/A - Reliability	Greenfield	Reliability	PSEG	73.80	DPL	230	15 Year Thermal Single	Build a new 230 kV line from RL to Cedar CK
N/A - Reliability	Greenfield	Reliability	PSEG	75.00	PSEG	230	15 Year Thermal Single	Build new 230-kV U/G circuit from Gloucester to Cuthbert
N/A - Reliability	Greenfield	Reliability	PECO	81.00	AE/PSEG	230	15 Year Thermal Single; 15 Year Thermal Tower	Build new 230 kV transmission line connecting Waneeta substation and Eagle Point substation
N/A - Reliability	Greenfield	Reliability	PSEG	100.70	AE/PSEG	230	15 Year Thermal Single; 15 Year Thermal Tower	Build new 230-kV U/G circuit from new station at Eagle Point to Penrose
N/A - Reliability	Upgrade	Reliability	EKPC	0.72*	EKPC	69	Long Term EKPC Criteria	Upgrade the Denny - Gregory Road Tap 69-kV line facility. *\$720,000 Cost includes an upgrade of the entire Denny 69 kV bus and associated equipment at Denny.