

### Reliability Analysis Update

Sami Abdulsalam Director, Transmission Planning – PJM

Transmission Expansion Advisory Committee December 8, 2025

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- Schedule Update 2025 RTEP Window 1
- Scenarios Studied, Problem Statement and High-Level Summary of Needs
- Recommended Solutions (Second Reads) 2025 Window 1
- Proposed Solutions (First Reads) 2025 Window 1 Regional Clusters
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  - West
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- 2025 Window 1 Cost Summary
- Scope Changes & Cost Updates
- TPL-001.5 P5: Submitted CAPs Recommended Solutions (Second Read)
- 2025 RTEP: 2032 Scenario 5 & 6 Update



### 2025 RTEP Window 1 – Schedule Update

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### 2025 RTEP Window 1 – Timeline

Initial 2025 RTEP Modelling Assumptions Nov 2024 – Feb

2025

2025 RTEP Window 1 Opens June 18, 2025

2025 RTEP Window 1 Evaluations Sept. 2025 2025 RTEP
Window 1
Selections
1st /2nd Read and Short List
Nov 2025

2025 RTEP Window 1 Selections 2<sup>nd</sup> Read Jan 2026





















2025 RTEP Window 1 Baseline Studies May 2025

2025 RTEP Window 1 Closes Aug 18, 2025 RTEP 2025 Window 1 Summary Oct 2025 2025 RTEP
Window 1
Selections
1st and 2nd Read
Dec 2025

2025 RTEP Window 1 – Board Approval Q1 2026





# Scenarios Studied, Problem Statement and High-Level Summary of Needs

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## 2025 RTEP - Scenarios Considered Covering Uncertainties and key Considerations

- 5 Year (2030) Analysis
  - Scenario 1 (2030 Base case): Existing generation, GIA/ISA generation, Suspended ISA generation, Fast
     Lane Queue, CVOW and Chesterfield plants
  - Scenario 2: 2030 Base case + TC1 queue + (Remove) Q1 deactivations + (Remove) withdrawn queues + without NJ/DE OSW
- 7 Year (2032) Analysis
  - Scenario 3 (2032 Base case): Existing generation, GIA/ISA generation, Suspended ISA generation, Fast Lane Queue, TC1 queue, TC2 queue (with RRI), 7500MW NJ OSW, (Remove) Q1 deactivations, (Remove) withdrawn queues
  - Scenario 4: 2032 Base case + Removing NJ/DE OSW
  - Scenario 5: 2032 Base case + Policy deactivations (may be combined with Scenario 6)
  - Scenario 6: 2032 base case with Battery dispatched

(Informational Study)



### 2025 RTEP – 2030 Horizon Need Analysis Summary (June 2025 TEAC)

- All previously planned backbone transmission enhancements continue to perform well up to and including 2030.
- The forecasted queued generation (up to Fast Lane + CVOW and Chesterfield) do not drive major regional transfer needs;
  - Generation developing in these areas efficiently serves the zonal load needs and offset regional imports
- MAAC/PPL which have relatively small amount of new generation added, will require additional transfer capability (enhance the import capability into MAAC/PPL).
  - The details on how the western generation may materialize will have minimal impact on this need given the level of generation forecasted in the west.
- The 2025 RTEP provides guidance to not only how the load reliability needs will be met, but also to where generation could materialize most efficiently

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### 2025 RTEP – 2032 Horizon Need Analysis Summary (June 2025 TEAC)

- All previously planned backbone transmission enhancements continue to perform well up to and including 2032.
- There could be need to reinforce the NW AEP 765 kV transfer path
  - This need will depend on how generation in ComEd and NW PJM materializes.
- With the strong generation interconnection interest in Southern Dominion, and to enable this generation to serve load (mainly in Summer Months);
  - There will be a need to reinforce the Dominion 500kV backbone in Southern Dominion.
- The 2032 results affirm the need to enhance PPL/MAAC West-East transfer path.
- 2025 RTEP W1 will focus on addressing near term (5-year needs);
  - 2032 (longer-term) results will only be used to right-size needs already showing up in 2030.
  - Special cases may arise if longer term needs are confirmed and require long lead development.

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## Problem Statement As summarized in June and July TEAC Meetings

 No major regional transfer needs in the 2030 analysis. For 2032, several clusters showing EHV backbone overloads along the extremities of the upgraded bulk backbone transmission network that was reinforced as part of the PJM 2022 RTEP W3 and 2024 RTEP W1 competitive transmission windows.

#### Needs:

- MAAC 500 kV system:
  - ➤ In 2032, multiple 500 kV facilities are overloaded due to terminal equipment constraints. However, the violations can be mitigated without long lead-time solutions.
  - > Due to NJ offshore wind, the Rock Springs–Bramah 500 kV line exceeds its conductor rating. Scenario 4 study results confirm that without NJ OSW, this line is not overloaded, therefore PJM is not currently seeking proposals for the violations on the line.

#### PPL Zone:

- > Several 230kV facilities overloaded in PPL zone in 2030, and these issues worsened in the 2032 analysis.
- > Additional overloads are identified in 2032 as the load continues to grow.
- > PJM expects that solutions proposed for the PPL area will address both the 2032 violations and account for potential future load growth (and resource mix evolution) in the region.
- ATSI 138 & 115 kV (2030 RTEP) and 345 kV (2032) regional transfer overloads
  - > PJM is seeking proposals to address these violations holistically and for the longer-term.



## As summarized in June and July TEAC Meetings

#### AEP Columbus area:

- Two main 765 kV regional transfer lines supplying the western region. Under N-1-1 conditions and due to load increase, various contingency pairs cause wide-spread system voltage violations which are expected to worsen with forecasted load increase through 2032 and beyond.
- All the related thermal and voltage issues in 2030 are posted and open to competition. Solutions need to consider the longer term needs to ensure efficient and cost-effective mitigation.

#### Dominion / PJM South:

- > PJM will be addressing the 2032 needs to reinforce the southern 500 kV backbone. This 500kV corridor includes multiple North-South 500kV elements.
- ➤ Violations associated with and/or impacted by CVOW (Coastal Virginia Offshore Wind) will be deferred until the network upgrades associated with the project are finalized.
- 230kV Lines Chesterfield Basin & Chesterfield Hopewell will be addressed as part of the 2030 set of violations.



## PJM is requesting stakeholder feedback on 2025 RTEP Window 1 Proposed Selections

- As demonstrated in the slide deck, the PJM team has conducted extensive assessment of the needs and submitted proposals
- PJM appreciates the efforts and diligence put forth by the 2025 RTEP Window 1 participants leading to such high-quality portfolio of projects to support the 2025 RTEP Window 1 process.
- PJM is requesting and encouraging stakeholder feedback related to the selected proposals
- PJM staff will be happy to address any questions to further clarify the conducted analysis and the rationale behind the selections.

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### Recommended Solutions (Second Reads) – 2025 Window 1

Baseline Reliability Projects

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Process Stage: Recommended Solution

Criteria: FERC 715 Criteria

**Assumption Reference**: 2025 RTEP assumptions

Model Used for Analysis: 2025 Series RTEP 2030 Summer

and Light Load base case

Proposal Window Exclusion: None

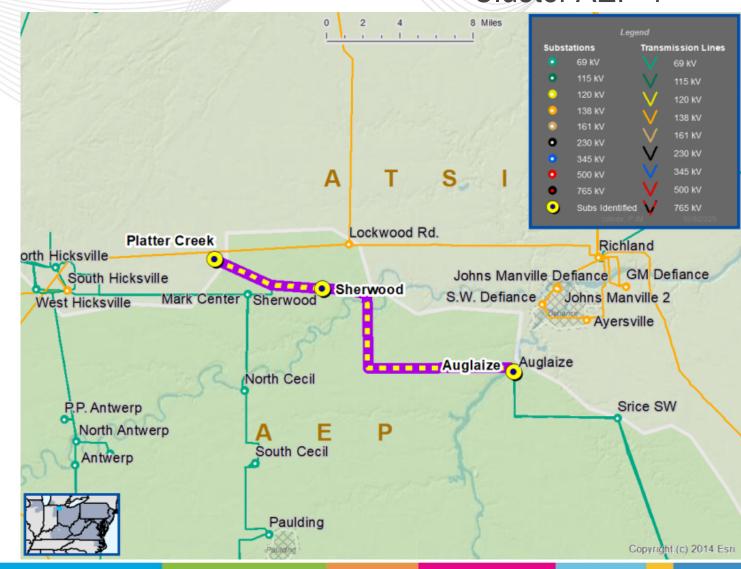
**Problem Statement:** 

FG: 2025W1-AEP-T1, 2025W1-AEP-T2, 2025W1-AEP-T3, 2025W1-AEP-T4, 2025W1-AEP-T5, 2025W1-AEP-T6.

In the 2030 RTEP Summer and Light Load case, 69 kV Platter Creek-Sherwood-Auglaize lines are overloaded in FERC 715 study for N-1 outages.

#### **Existing Facility Rating:**

Branch	SN/SE/WN/WE (MVA)
Platter Creek - Sherwood 69 kV	47/47/59/59
Sherwood – Auglaize 69 kV	47/47/59/59





As part of the 2025 RTEP Window 1, the projects listed in the table below were proposed to address Cluster AEP-1

Proposal ID #	Project Type	Entity	Project Title	Project Description	kV Level	Estimated Cost (\$M)
385	UPGRADE	AEP	Platter Creek 69kV Station Reconfiguration	Reconfigure 69kV lines at Platter Creek to mitigate breaker contingency violation.	69	\$1.646
724	UPGRADE	AEP	Platter Creek-Sherwood-Auglaize 69kV Line Rebuild	Rebuild approximately 14.6 miles of the Platter Creek-Sherwood and Sherwood-Auglaize 69kV circuits with single circuit steel poles.	69	\$28.679

• The line asset associated with the Platter Creek proposal was originally installed in the 1920s. If not ordered as a baseline rebuild project, that line would need to be addressed for asset renewal reasons in the near future. Thus, compared to station reconfiguration (proposal 385), rebuild (proposal 724) is the preferred path moving forward.



#### Recommended Solution: (2025-W1-724)

- Rebuild approximately 3.5 miles of 69kV line from Platter Creek to Sherwood station. (b4026.1)
- Rebuild approximately 11.1 miles of 69kV line from Sherwood to Auglaize station. (b4026.2)

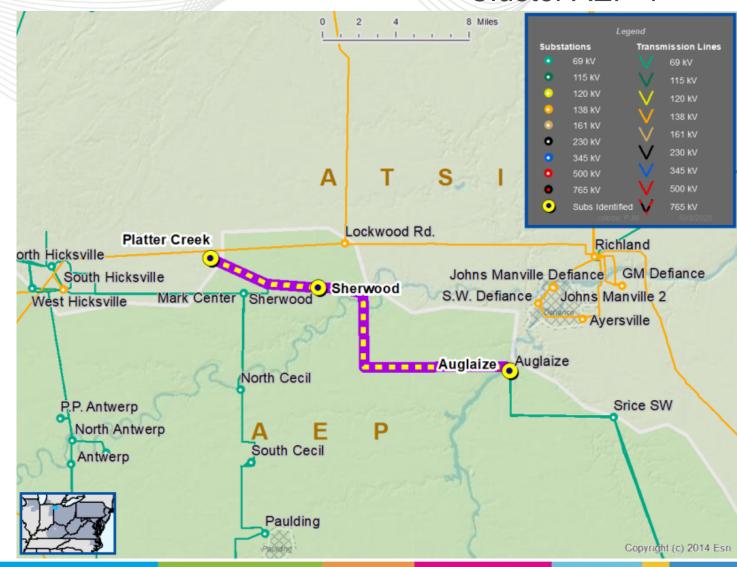
**Total Estimated Cost: \$28.7M** 

**Preliminary Facility Rating:** 

Branch	SN/SE/WN/WE (MVA)
Platter Creek - Sherwood 69 kV	82/90/107/113
Sherwood – Auglaize 69 kV	82/90/107/113

Required In-Service: 4/15/2030

Projected IS Date: 2/28/2030





Process Stage: Recommended Solution

**Criteria:** Generator Deliverability

**Assumption Reference**: 2025 RTEP assumptions

Model Used for Analysis: 2025 Series RTEP 2030 Summer

base case

Proposal Window Exclusion: None

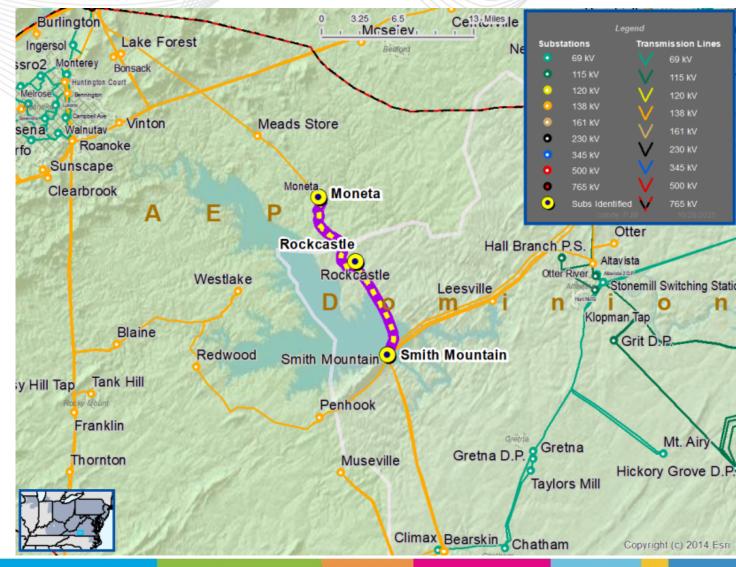
**Problem Statement:** 

FG: 2025W1-GD-S480, 2025W1-GD-S488.

In the 2030 RTEP Summer case, the 138 kV Smith Mountain – Rockcastle - Moneta line is overloaded for a N-2 contingency in generator deliverbility test.

**Existing Facility Rating:** 

Branch	SN/SE/WN/WE (MVA)
Smith Mountain – Rockcastle 69 kV	358/409/453/501
Rockcastle – Moneta 69 kV	409/409/516/516





• As part of the 2025 RTEP Window 1, the projects listed in the table below were proposed to address Cluster AEP-5

Proposal ID #	Project Type	Entity	Project Title	Project Description	kV Level	Estimated Cost (\$M)
63	UPGRADE	AEP	Smith Mountain - Rockcastle - Moneta 138 kV Rebuild	Rebuild 12.2 miles of the Smith Mountain - Rockcastle - Moneta 138 kV line and replace station conductor at Smith Mountain station.	138	\$39.402
689	UPGRADE	AEP	Smith Mountain - Rockcastle - Moneta 138 kV Sag Study	Perform a sag study on the Smith Mountain - Rockcastle - Moneta 138 kV line and construct mitigations to raise emergency ratings of the line. Replace station conductor at Smith Mountain station.	138	\$9.879



#### Recommended Solution: (2025-W1-689)

- Sag Study the Smith Mountain Moneta 138 kV line.
   Approximately 14 structures will need to be added in existing Rights of Way to increase the sag along the existing centerline such that the higher requested ampacity can be achieved along the corridor and maintain safety clearances. (b4027.1)
- Replace the 2" IPS Sch. 40 conductor with 4" IPS Sch. 40 conductor at Smith Mountain station on the Smith Mountain-Rock Castle branch allowing the branch to exceed a summer emergency rating of 1765 A. (b4027.2)

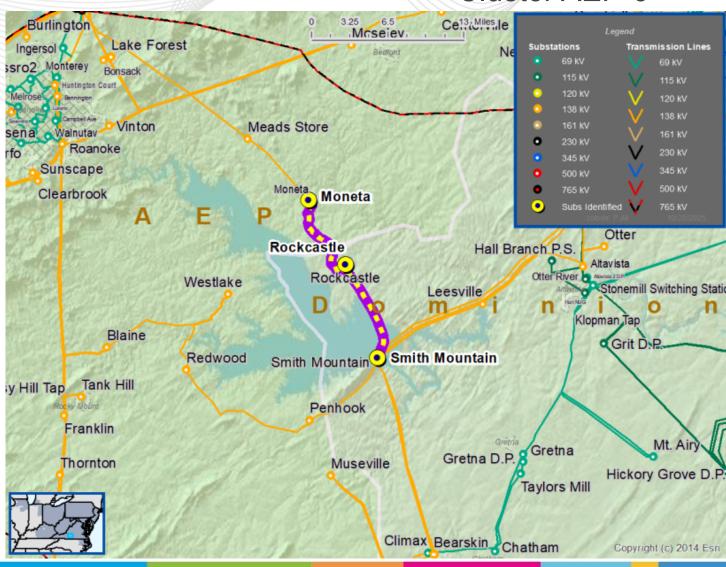
**Total Estimated Cost:** \$9.879M

#### **Preliminary Facility Rating:**

Branch	SN/SE/WN/WE (MVA)
Smith Mountain – Rockcastle 69 kV	409/481/517/597
Rockcastle – Moneta 69 kV	409/481/516/604

Required In-Service: 06/01/2030

**Projected IS Date:** 06/01/2029





## Dominion Transmission Zone: Baseline Hopewell – Chesterfield – Basin 230 kV

Process Stage: Recommended Solution

Criteria: Summer/Winter/Light Load Gen Deliv, Summer/Light

Load IPD, Summer/Light Load N-1

**Assumption Reference**: 2025 RTEP assumptions

Model Used for Analysis: 2025 Series RTEP 2030 RTEP

Summer/Winter/Light Load Base Case

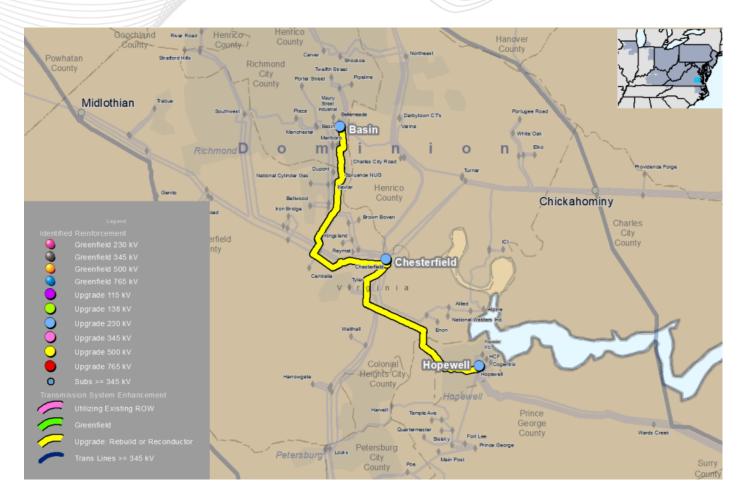
Proposal Window Exclusion: None

**Problem Statement:** 

In the 5-year 2030 RTEP summer/winter/light load case, the Chesterfield – Basin and Chesterfield – Hopewell 230kV lines are overloaded in the gen deliv, IPD, and N-1 tests for multiple contingencies.

#### **Existing Facility Rating:**

Branch (230kV)	SN/SE/WN/WE (MVA)
Chesterfield – Basin	705/705/782/782
Chesterfield – Hopewell	1046/1046/1160/1160





## Dominion Transmission Zone: Baseline Hopewell – Chesterfield – Basin 230 kV

#### Recommended Solution (2025-W1-911):

- Rebuild approximately 12.5 miles of 230kV line with larger conductor between Chesterfield and Basin. Estimated Cost: \$100.3M (B4030.1)
- Rebuild approximately 3 miles of 230kV line with larger conductor between Chesterfield and Hopewell. Estimated Cost: \$6.3M (B4030.2)
- Uprate all Line #259 terminal equipment, line leads, and bus at Basin substation to be rated to 4000A. Estimated Cost: \$1.95M (B4030.3)
- Uprate all Line #259 terminal equipment, line leads, and bus at Chesterfield substation to be rated to 4000A. Estimated Cost: \$3.5M (B4030.4)
- Install new 230kV circuit breaker at Chesterfield Substation Estimated Cost:
   \$1.5M (B4030.5)

**Total Estimated Cost:** \$113.55 M

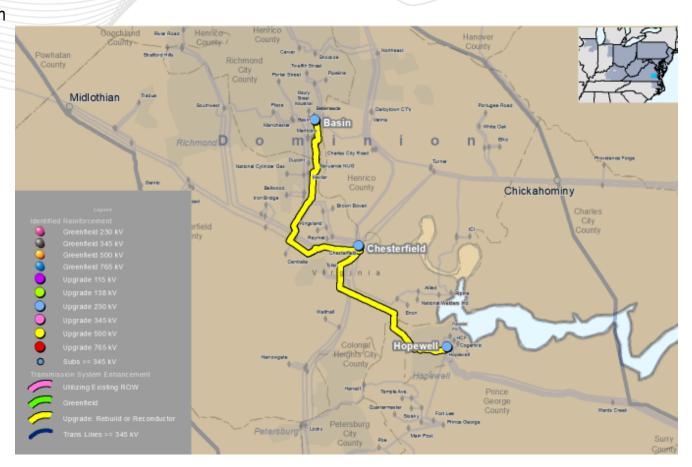
**Preliminary Facility Rating:** 

Branch (230kV)	SN/SE/WN/WE (MVA)
Chesterfield – Basin	1572/1572/1648/1648
Chesterfield – Hopewell	1573/1573/1648/1648

**Alternatives:** N/A

**Required In-Service Date:** 6/1/2030

**Projected In-Service Date:** 6/1/2030





## Dominion Transmission Zone: Baseline 500kV Line #565 Rebuild (End of Life Criteria)

Process Stage: Recommended Solution

Criteria: Dominion's FERC 715 Planning Criteria (C.2.9 –

End of Life Criteria)

**Assumption Reference**: FERC 715 Planning Criteria

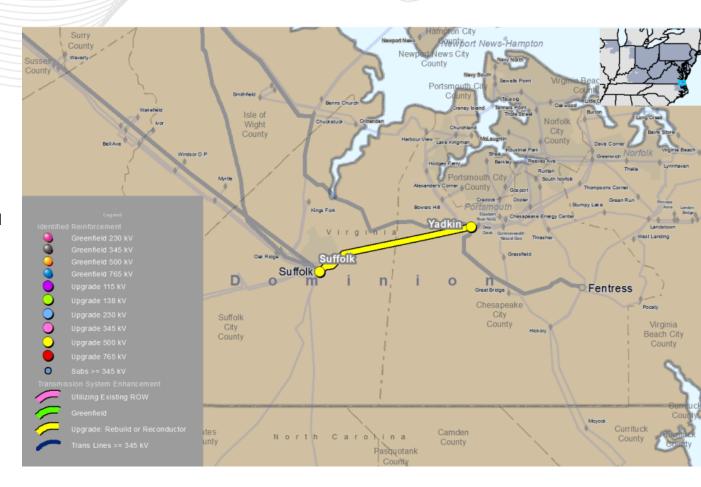
Model Used for Analysis: 2025 Series RTEP 2030 base cases

#### **Problem Statement:**

- The 565 line is approximately 13.43 miles of 500 kV transmission line from Suffolk to Yadkin. The line is a combination of weathering-steel 5-series towers and aluminum guyed-Y towers. These structures were installed in 1970 and are approaching the end of their service life.
- Weathering-steel 5-series towers have been problematic for many years and are
  experiencing packout and deterioration. They were extensively rehabbed in 2020.
  They have fallen into the observed pattern where Dominion can expect to return for
  future maintenance if the line is not rebuilt by the requested target date.
- The porcelain insulators along this line have deteriorated significantly, and several have failed in recent years. Due to the location of this line, access to the structures is limited which increases the time and complexity of repairs and restoration. (2025W1-DOM-EOL1)

#### Existing Facility Rating:

Branch (500kV)	SN/SE/WN/WE (MVA)
Suffolk - Yadkin	2552/2598/2987/3013





## Dominion Transmission Zone: Baseline 500kV Line #565 Rebuild (End of Life Criteria)

#### Recommended Solution (2025-W1-911):

 Rebuild approximately 13.2 miles of 500kV line #565 between Septa and Yadkin. Estimated Cost: \$68.8M (B4030.6)

Uprate Line 565 equipment at Suffolk substation to 5000. Estimated
 Cost: \$5.3M (B4030.7)

Uprate Line 565 equipment at Yadkin substations to 5000A. Estimated
 Cost: \$0.2M (B4030.8)

**Total Estimated Cost: \$74.3 M** 

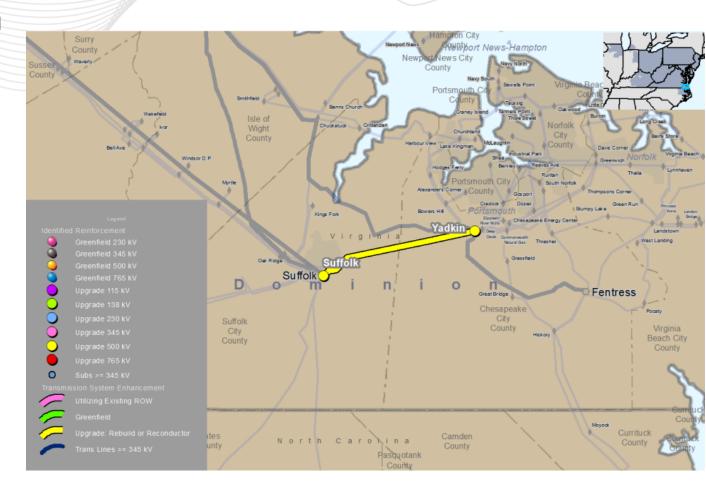
**Preliminary Facility Rating:** 

Branch (500kV)	SN/SE/WN/WE (MVA)
Suffolk – Yadkin	4357/4357/5155/5155

Alternatives: N/A

Required In-Service Date: 6/1/2030

**Projected In-Service Date:** 6/1/2030





## Dominion Transmission Zone: Baseline Charlottesville – Fork Union – Bremo 230 kV

Process Stage: Recommended Solution

Criteria: Light Load Gen Deliv, Light Load IPD

**Assumption Reference**: 2025 RTEP assumptions

Model Used for Analysis: 2025 Series RTEP 2030 Light Load

**Base Case** 

**Proposal Window Exclusion:** None

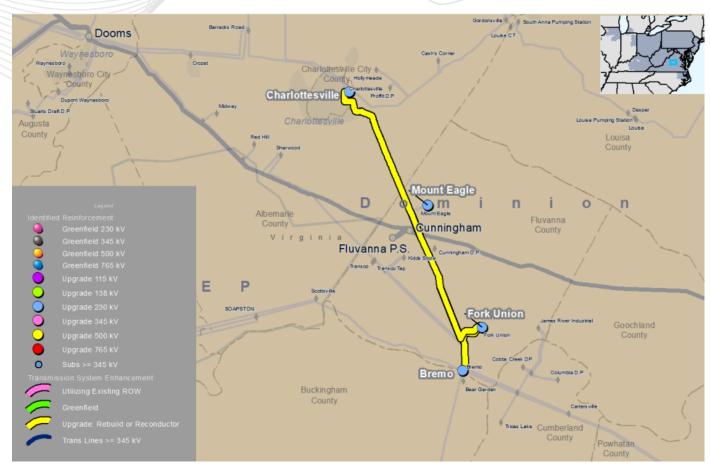
**Problem Statement:** 

2025W1-GD-LL13, 2025W1-GD-LL25, 2025W1-IPD-LL43, 2025W1-GD-LL1NEW, 2025W1-GD-LL33

In the 5-year 2030 RTEP light load case, the Charlottesville – Fork Union - Bremo 230kV lines are overloaded in the gen deliv and IPD tests for multiple contingencies.

#### **Existing Facility Rating:**

Branch (230kV)	SN/SE/WN/WE (MVA)
Charlottesville – Fork Union	703/703/890/890
Fork Union – Bremo	721/721/913/913





## Dominion Transmission Zone: Baseline Charlottesville – Fork Union – Bremo 230 kV

#### Recommended Solution (2025-W1-911):

- Rebuild approximately 24 miles of 230kV line with larger conductor between Charlottesville and Fork Union. Estimated Cost: 106.6M (B4030.9)
- Rebuild approximately 1.74 miles of 230kV line with larger conductor between Fork Union and Bremo.
   Estimated Cost: 10.8M (B4030.10)
- Uprate all Line #2028 terminal equipment, line leads, and bus at Charlottesville substation to be rated to 4000A. **Estimated Cost: \$3.35M** (**B4030.11**)
- Uprate all Line #2028 terminal equipment, line leads, and bus at Fork Union substation to be rated to 4000A. Estimated Cost: \$2.25M (B4030.12)
- Uprate all Line #2193 terminal equipment, line leads, and bus at Fork Union substation to be rated to 4000A. **Estimated Cost: \$1.6M** (**B4030.13**)
- Uprate all Line #2193 terminal equipment, line leads, and bus at Bremo substation to be rated to 4000A. Estimated Cost: \$1.8M (B4030.14)
- Upgrade disconnect switches 202809 and 202806 at Mt. Eagle Tap to 4000A. Estimated Cost: \$0.65M (B4030.15)

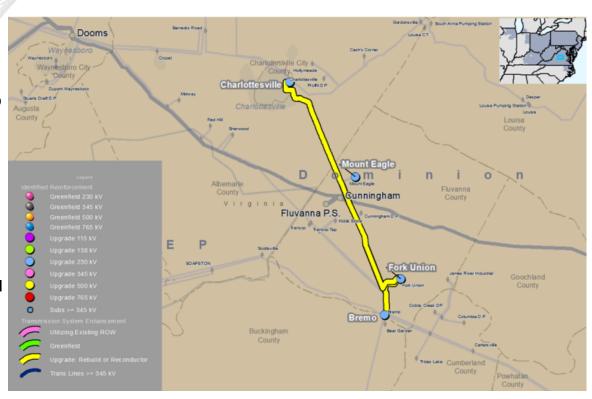
Estimated Cost: \$127.05 M

**Preliminary Facility Rating:** 

Branch (230kV)	SN/SE/WN/WE (MVA)
Charlottesville – Fork Union	1573/1573/1648/1648
Fork Union – Bremo	1573/1573/1648/1648

Alternatives: Additional 230kV scope provided in proposal 975

Required In-Service Date: 6/1/2030 Projected In-Service Date: 6/1/2030





## DOM Transmission Zone: Baseline 2030 Baseline Solutions

As part of the 2025 RTEP Window 1, the projects listed in the table below were proposed to address DOM 2030 flowgates

Proposal ID #	Project Type	Entity	Project Title	Project Description	kV Level	Estimated Cost (\$M)
911	UPGRADE	DOM	2030 Solution	This proposal includes the following projects: 1. 993189 - Line 2028 Rebuild - Charlottesville - Fork Union. 2. 993418 - Line 259 Uprate - Chesterfield to Basin. 3. 993450 - Line 2193 Rebuild - Bremo to Fork Union 4. 993584 - Lines 211 & 228 Uprate - Chesterfield to Hopewell. 5. 993584 - Line 565 Rebuild - Suffolk to Yadkin	230	314.90
975	GREENFIELD	DOM	2030 Western Solution	This Proposal is an alternate option for the following components in the 2030 Solution Proposal (PJM ID: 911):  1. 993189 - Line 2028 Rebuild - Charlottesville to Fork Union  2. 993450 - Line 2193 Rebuild - Bremo to Fork Union  Wreck and Rebuild Line#2193 Bremo – Fork Union. Disconnect 230 kV Line #2111 Bear Garden- Bremo at the Bremo terminal and extend Line #2111 approximately 1.6 miles to Fork Union. The extension should not share circuit structures with Line #2193. Terminate line #2111 at Fork Union to create a Bear Garden – Fork Union 230 kV line.  Rebuild line 2028 using double circuit structures. Build a new 230kV line from Fork Union station to Gordonsville, bypassing Charlottesville. This new line will share the double circuit structures with Line #2028, Line #2054 (Charlottesville-Hollymead Junction, coordinate with Project 993132) and Line #2135 (Hollymead Junction – Gordonsville coordinate with Project 993133).  Build a new double-circuit 230 kV from Gordonsville to Southall and a new double-circuit 230 kV from Southall to North Anna. Coordination with project 993097 is needed.	230	318.16

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### MAAC PPL Cluster Recommended Proposals (Second Read)

**Baseline Reliability Projects** 

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Process Stage: Recommended Read

Criteria: Baseline Load Growth Deliverability & Reliability

**Assumption Reference**: 2025 RTEP Assumption

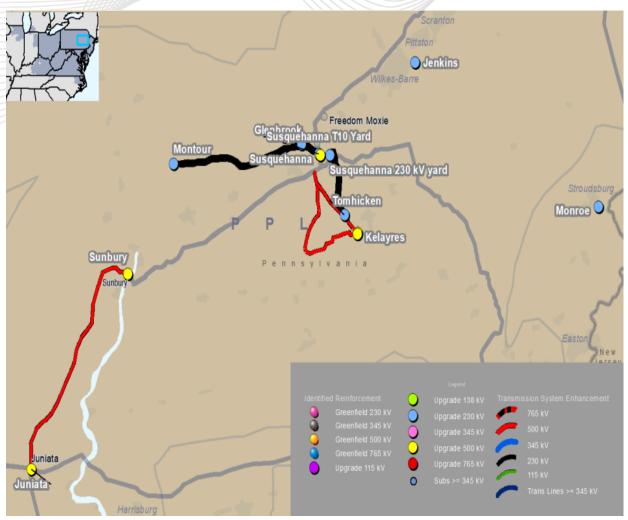
Model Used for Analysis: 2025 Series RTEP 2030 and

2032 RTEP base cases

Proposal ID: 2025-W1-558

**Problem Statement:** In the 2030 RTEP analysis, multiple overloads in the Susquehanna and Juniata area of PPL are present. The violations were posted as part of the 2025 Window 1.

### PPL Transmission Zone: Baseline MAAC PPL Cluster





Process Stage: Recommended Read

Selected Solution: 2025-W1-558 + Component from 2025-W1-853 (Kelayres 3<sup>rd</sup>

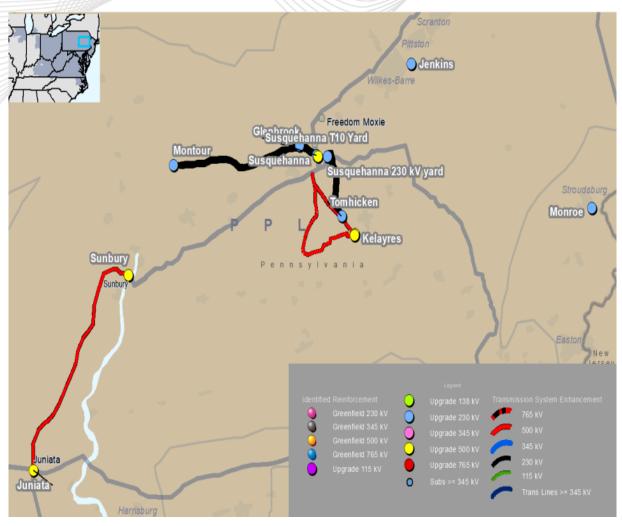
500/230 kV transformer)

Individual Proposal ID	High Level Description	Baseline ID
	Susq-Sunbury 500kV loop into the new Kelayres	Daseille ID
	with additional 13 miles line	B4029.1,b4029.34
	Reconductor Susquehanna - Tomhicken 230 kV	
824	1 & 2 DCT lines	B4029.5
	Monroe 230kV and 138kV reconfiguration and	
688	2nd Monroe 230/138 kV transformer	B4029.67
	Rebuild an existing 500 kV (Juniata-Sunbury)	B4029.8
16	with SCT	D4029.0
	Reconductor/rebuild the remaining scope of the	
	M3 project (s2373 - 19 miles) - Montour - Glen	
958	Brook 230 kV 1 & 2 DCT line is about 6 miles	B4029.910
	Station reconfiguration (Jenkins 230/69 kV	
	Substation)	B4029.1112
	Reconductor the remaining scope of the M3	
	project (s2373) - Glen Brook - Susquehanna	
	T10 1 & 2 DCT and New 230 kV line	
	(Susquehanna T10 - Susquehanna -2.7 miles)	B4029.1317
	Add Third 500/230 kV transformer at the new	
853	Kelayres	B4029.2

**Estimated Total Cost: \$565.4M** 

Projected ISD: 6/1/2030

### PPL Transmission Zone: Baseline MAAC PPL Cluster





# Proposed Solutions (First Reads) – 2025 Window 1 Regional Clusters Baseline Reliability Projects

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# MAAC Cluster Regional Transfers – Proposed Solutions (First Read) Baseline Reliability Projects



### 2025 RTEP Window 1 - MAAC/PPL Needs Overview

#### **PPL Load Growth:**

- PPL zonal load in the year 2030 increased by approximately 5 GW from the 2024 to the 2025 load forecast
  - The load growth is primarily driven by data center demand and trends indicate this growth will continue beyond 2030
  - PPL submitted additional ~3.5 GWs not included in the 2025 load forecast

#### **NJOSW In-service Delay Impact:**

- The scenario with the removal of the 7.5 GW NJOSW in-service increases the transfer need to the Mid-Atlantic region
- The need for regional transfer to MAAC from West and South increased, resulting in additional overload on five 500 kV transmission lines.
- These lines primarily support power flows from the west and south toward the Mid-Atlantic region
  - The 500 kV Keystone Juniata circuit is overloaded regardless of NJOSW or the additional PPL Load (West to East flows)

#### NJOSW In-service Delay + PPL (~3.5GWs) Load

- The removal of the NJOSW combined with the additional PPL (~3.5 GWs) load further increased the need for transfer to Mid-Atlantic region.
- This increase represents the increase in the short term (due to NJOSW delays) or for the further timeframe (due to forecasted MAAC load increase/retirements)



### 2025 Window 1 – Mid-Atlantic Region Analysis Overview

#### 2032 Year Analysis:

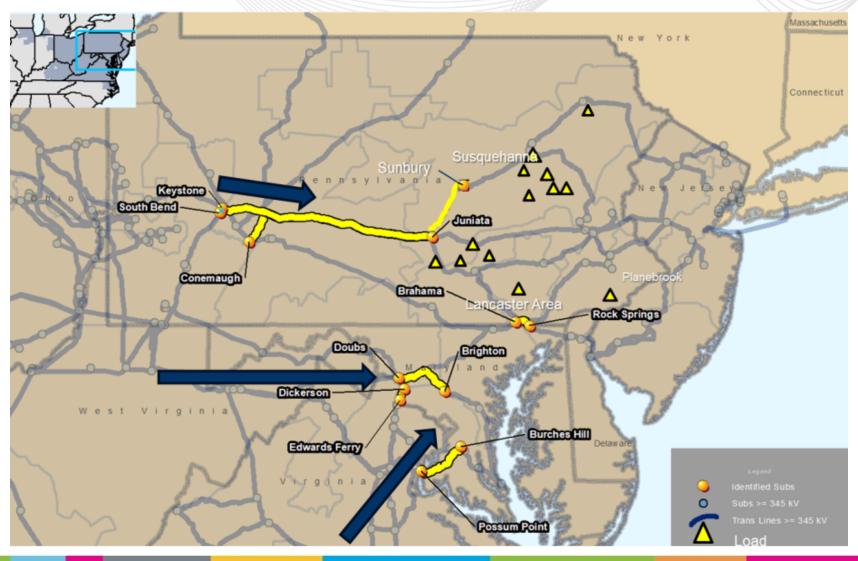
Multiple Scenarios were analyzed in the proposal evaluation process

- In 2032 base case with the NJOSW in-service:
  - Two 500 kV violations
  - The Rock Springs Bramah 500 kV is impacted by the NJOSW and will be revisited as needed in the future
- In 2032 base case with the NJOSW (7500 MWs) offline (Scenario 4):
  - Six 500kV transmission lines are overloaded
  - These lines primarily support power flows from the west and south toward the Mid-Atlantic region
  - Several 230 kV facilities identified with thermal violations (The majority located in PPL zone).
  - Voltage collapse for several regional facilities including the loss of the recently approved 765 kV line from Amos – Rocky Point.
- 2032 Scenario 4 with future PPL data center load (-3.5GW not included in the 2025 load forecast + NJOSW delayed)
  - Increase the loading on the 500 kV lines listed in the Scenario 4
  - Increase the regional transfer to the Mid-Atlantic from West and South

2032 MAAC 500 kV Violations							
Overloaded Facility	2032 Base Scenario	2032 Scenario 4 (2032 Base and NJOSW Removed)					
Rock Springs - Bramah 500 kV	Х						
Keystone - Juniata 500 kV	X	X					
Keystone - Conemaugh 500 kV		X					
South Bend - Keystone 500 kV		X					
Conemaugh - Juniata 500 kV		X					
Doubs - Brighton 500 kV		X					
Possum Point - Burches Hill 500 kV		X					



### MAAC Regional Needs Overview (2032)





#### 2025 RTEP Window 1

MAAC Regional Transfer Proposals Overview

### All proposals submitted to address MAAC Regional West – East Transfer Needs:

Several proposals attempt to address the regional transfer needs and as further impacted by (i) the additional PPL load growth and (ii) the anticipated delay of the NJOSW

- Two proposals recommend variations of 765 kV development from Kammer to Juniata in the PPL Transmission Zone
  - Reinforces the entire West East Corridor from the current 765 kV system edge at Kammer through the MAAC region terminating at Juniata and/or Spicewood (PPL Datacenter ally)
  - Proposal #237 (222 mi) and #687 (321 mi 765 kV and 26 mi 500 kV) by NextEra/Exelon
- Multiple proposals recommend variants of Keystone -Susquehanna area 500 kV development.
  - Proposal #493, #578, #826, and #838 by MAIT (FirstEnergy)
- The MAIT proposals and the NextEra/Exelon proposal #237 overlap about 50% (~100 miles) of their proposed routes

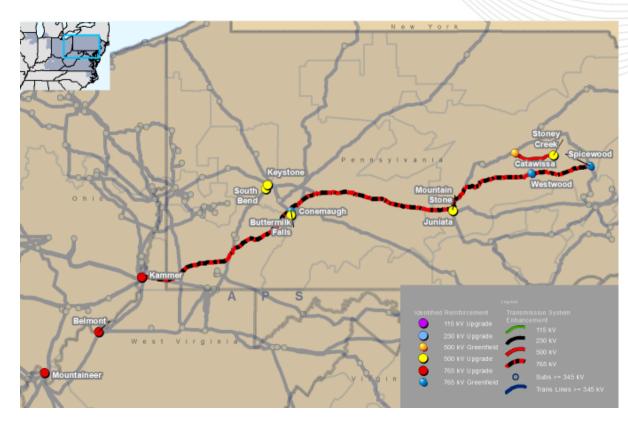


### MAAC Regional Transfer Proposed Solutions Evaluation Progress

MAAC Regional Cluster Proposals					
Proposing Entity	Proposal ID	High Level Description	Total Cost (\$ M)		
		Construct No. 1 500 kV circuit Keystone - Susquehanna (~200 miles) Construct No. 2 500 kV circuit Keystone - Susquehanna (~200 miles)	\$2,252		
MAIT (FirstEnergy)	2025-W1-826	Keystone - Susquehanna 500 kV Double Circuit - Build a new 500 kV double circuit Line from Keystone Substation to Susquehanna Substation (~200 miles)	\$1,155		
MAIT (FirstEnergy)		Build Jacks Mountain Substation with STATCOM +/- 500 MVAR Keystone - Jacks Mountain No. 1 and No. 2 500 kV Lines Double Circuit (~86 miles) Jacks Mountain - Susquehanna No. 1 and No. 2 500 kV Lines Double Circuit (~114 miles)	\$1,515		
MAIT (FirstEnergy)	2025-W1-578	Build Jacks Mountain Substation with STATCOM +/- 500 MVAR Keystone - Jacks Mountain No. 1 500 kV Line (~86 miles) and Jacks Mountain - Susquehanna No. 1 500 kV Line (~114 miles) Keystone - Jacks Mountain No. 2 500 kV Line (~86 miles) and Jacks Mountain - Susquehanna No. 2 500 kV Line (~114 miles)	\$2,418		
NextEra/Exelon	2025-W1-237	Construct one 765 kV line from Kammer - Juniata. The new line is 114 miles from Kammer to new 765/500 kV substation (Buttermilk Falls - loop in to the Keystone - Conemaugh 500 kV) and continue for 108 miles to new 765/500 kV substation (Mountain Stone) and connect to Juniata 500	\$1,739		
NextEra/Exelon	2025-W1-687	Proposal 687 is a combination of 237 and 771 plus additional scope. The additional scope includes 62 miles of new 765 kV line from Mountain Stone to new Westwood Sub 765/230 kV (230 kV will be connected to Frackville Sub). Continue the 765 kV line (38 miles) from Westwood to new Spicewood 765/500/230 kV, the 500 kV will loop into the Susquehanna - Wescosville 500 kV and the 230 kV will loop into the Slykerville - Siegfried and Slykerville - East Palmerton lines.	\$3,239		



### MAAC Regional Transfer Proposed Solutions Map



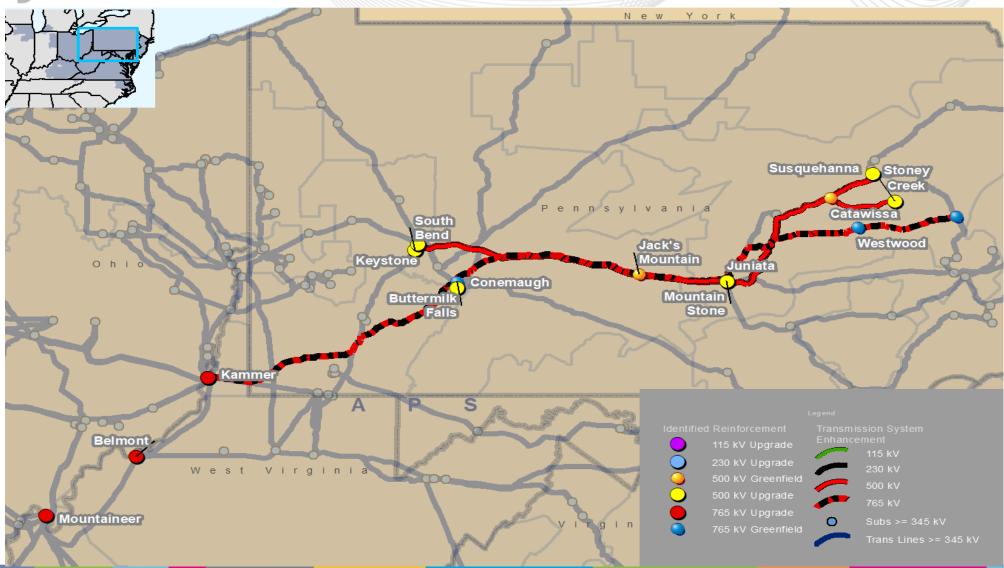


2025-W1-687 & 2025-W1-237

2025-W1-493, 2025-W1-578, 2025-W1-826, 2025-W1-838



## MAAC Regional Transfer Proposed Solutions Map Overlay





### All proposals submitted to address MAAC Regional West – East Transfer Needs:

Evaluated
Individual and
Combined
Proposals to
Address the
MAAC Regional
Needs

- Four MAIT proposals concept are similar, that is a variation of 2 x 500 kV transmission lines from Keystone to Susquehanna
  - ➤ Further evaluation focused on the proposal 826 (\$1.15 billion), which is the least expensive project (double circuit tower 500 kV)
- Two NextEra/Exelon proposals are similar with one of them been longer and terminating in the middle of PPL datacenter.
  - ➤ Proposal #237 is \$1.7 billion and is 99 miles shorter than #687 and is sufficient to address current regional transfer needs in the timeframe studied. Proposal #687 was not considered as the extension beyond Juniata could be advanced separately as need arises.
  - ➤ Further evaluation focused on the proposal 237 (\$1.7 billion), Kammer –Buttermilk Juniata 765 kV



#### All proposals submitted to address MAAC Regional West – East Transfer Needs:

Evaluated
Individual and
Combined
Proposals to
Address the
MAAC Regional
Needs

- Multiple proposal combinations were evaluated in addition to the individual proposals
  - 765 kV + a single 500 kV component
    - NextEra/Exelon 765 kV Kammer Juniata and a MAIT component, a single 500 kV circuit Keystone Susquehanna
  - Single 500 kV component
    - ➤ A single 500 kV Keystone Susquehanna circuit; a component of MAIT #826
  - 765kV + 500 kV circuit in PPL
    - NextEra/Exelon 765 kV Kammer Juniata and PPL 500 kV Juniata Sunbury Kelayres
- The 765kV+ 500kV option address the identified violations and provides strong regional transfer
  - This option is the most expensive and requires additional greenfield
- The single 500 kV Keystone Susquehanna circuit option didn't mitigate the 500 kV violations and results in lower West to East transfer level
- The PPL 500 kV from Juniata Sunbury Kelayres doesn't provide additional benefit to the regional transfer, mainly focuses on sourcing the PPL data center load



## MAAC Regional Cluster Evaluation Summary

Proposal Analysis	Complete				
<b>Evaluation Progress</b>	<ul> <li>The regional transfer reinforcement are not required in the 2032 base case</li> <li>The need for the Regional West – East transfer is observed with the NJOSW offline in the Scenario 4 model</li> <li>The need is further observed with the additional data center load in PPL</li> <li>Either the delay of the NJOSW integration or the PPL additional load growth (not in the 2025 load forecast) triggers the need for West - East regional transfer reinforcements</li> </ul>				
Portfolio Analysis	<ul> <li>2032 Scenario 4 Base Case and 2032 Scenario 4 + PPL Load Analysis Result</li> <li>The initial screening shows both the NextEra/Exelon #237 (765 kV Kammer – Juniata 765) and MAIT #826 (500 kV Keystone – Susquehanna) have comparable performance, with the loading on the 500 kV the Mid-Atlantic region tie lines slightly higher in the MAIT #826 proposal</li> <li>The base case flow on the tie lines from the PJM West and the Southern region into the Mid-Atlantic region are reduced significantly with the NextEra proposal #237 compared to the MAIT proposal #826 <ul> <li>Detailed in the table in the next slide</li> </ul> </li> </ul>				



#### 2032 Base case + NJOSW Removed + PPL Load

#### MAIT #826 (500 kV) and NextEra #237 Base Flow Comparison

							MAIT #826 Keystone - Susquehanna 500 kV			ra #237 uniata 765 kV
BUS#	NAME	BASE KV	BUS	NAME	BASE KV	СКТ	MW	MVAR	MW	MVAR
200011	KEYSTONE	500	235104	01CABOT	500	1	-939.5	222	-92.3	74.1
200011	KEYSTONE	500	235118	01SOBEND	500	1	-2438.8	320.6	-1585.4	162.3
200599	26ERIE W	345	239082	02S8-ATT	345	1	-32.1	35.1	69.3	22.2
200078	CHAN	500	237804	01ROCKYPOINT	500	1	-861.8	181.2	-723.5	97.7
200003	BRIGHTON	500	235105	01DOUBS	500	1	-2282.9	313.8	-2171.4	251.9
223938	DICKH230	230	235456	01AQUEDT	230	1	-371.9	110.5	-373.6	111
223938	DICKH230	230	235459	01DOUBS	230	1	-389	110.8	-390.4	111.1
200019	BURCHES	500	314922	8POSSUM	500	1	-1631.8	500.3	-1561.7	460.4
223938	DICKH230	230	314290	6EDFERRY	230	1	-577.3	99.1	-545.9	73
		TOTA	L Mid-Atlant	ic import			-9525.1	1893.4	-7374.9	1363.7

Note: The negative sign shows an import to Mid-Atlantic

• The 765 kV proposal preserves noticeable room on the existing 500 kV and 230 kV transmission



# Transfer Capability Analysis

# Assumptions: Source:

West Source (765 kV) – (100%)

#### Sink:

PPL Load 1 – (100%)
PPL Load 2 – (100%)
PPL Load 3 – (PPL Load 1&250/50%)

#### PJM conducted West to East Transfer Capability analysis for key proposals

- The source is assumed to be on the PJM West 765 kV
- The sink is set on the PPL zone

#### **<u>2030 Summer base case</u>** - Two sets of scenarios performed

- 1) Without the PPL cluster solution:
  - MAIT Proposal ID #826
  - NextEra/Exelon Proposal ID #237
- 2) With the PPL Cluster solution (PPL Proposal ID #558):
  - MAIT Proposal ID #826
  - NextEra/Exelon Proposal ID #237
  - Combinations of Proposal #237 and one 500kV line from Keystone Susquehanna
  - Single 500kV line from Keystone Susquehanna (Component from MAIT proposals)

#### 2032 Summer base case

- Proposal #826, #558 and #616 (Dominion)
- Proposal #237, #558, and #616 (Dominion)
- Combinations of proposal #237, one 500kV line from Keystone Susquehanna, and #616
- Proposal #558, single 500kV line from Keystone Susquehanna, and #616



## MAAC Regional Cluster Transfer Analysis

# Transfer Comparison For MAAC Regional + PPL Proposals Proposals Based on the 2030 Summer





## MAAC Regional Cluster Transfer Analysis

# Transfer Comparison For MAAC Regional + PPL Proposals + Dominion Proposals Based on the 2032 Summer



NextEra 765 kV MAIT (FE) 500 kV



### MAAC Regional Cluster Evaluation Summary

# Transfer Capability Analysis

#### **Assumptions:**

#### Source:

West 1 (765 kV)
West 2 (APS 500 kV)
West 3 (765 & 345 kV)
West 4 (All PJM West Region)

#### Sink:

PPL Load 3 – (PPL Load 1&2-50/50%)

#### PJM conducted additional Transfer Capability analysis with alternate Sources.

- The source is assumed to be:
  - West 1 765 kV buses on PJM West
  - West 2 500 kV buses on APS system
  - West 3 765 kV and 345 kV buses on PJM West
  - West 4 Entire PJM West region
- The sink is set on the PPL zone

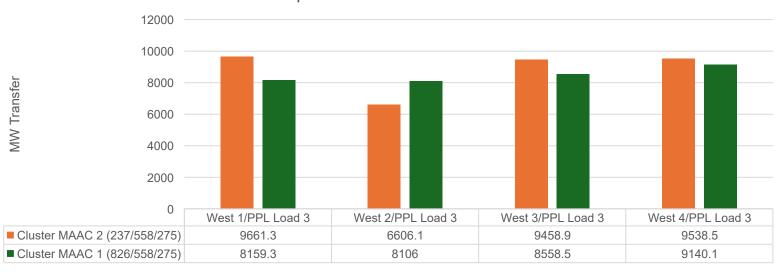
#### 2032 Summer base case

- Proposal #826, #558 and #275
- Proposal #237, #558, and #275



## MAAC Regional Cluster Transfer Analysis

Transfer Comparison For MAAC Regional + PPL Proposals + Dominion Proposals Based on the 2032 Summer Multiple Sources and One Sink



■ Cluster MAAC 2 (237/558/275) ■ Cluster MAAC 1 (826/558/275)

NextEra 765 kV MAIT (FE) 500 kV



### MAAC Regional Cluster Evaluation Summary

# Transfer Capability Analysis

# Assumptions: Source:

West 4 (All PJM West Region)

#### Sink:

PPL Load 1 – (100%)
PPL Load 2 – (100%)
PPL Load 3 – (PPL Load 1&250/50%)

#### PJM conducted additional Transfer Capability analysis with alternate Sinks.

- The source is assumed to be:
  - West 4 Entire PJM West region
- The sink is set on the PPL zone

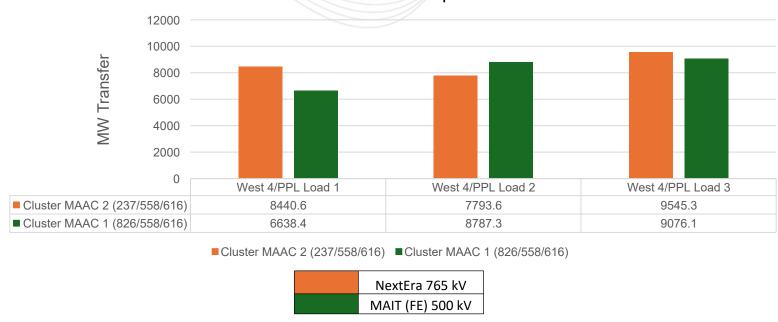
#### 2032 Summer base case

- Proposal #826, #558 and #616
- Proposal #237, #558, and #616



## MAAC Regional Cluster Transfer Analysis

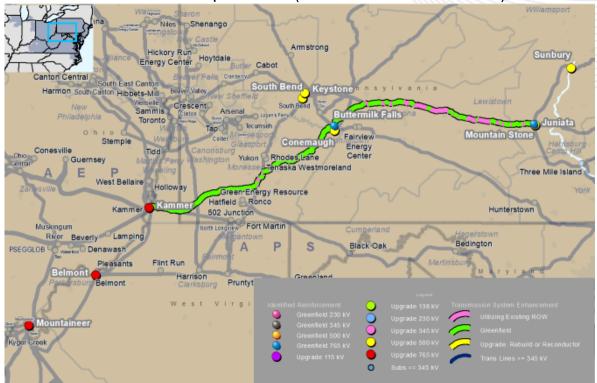
Transfer Comparison For MAAC Regional + PPL Proposals + Dominion Proposals Based on the 2032 Summer One Source and Multiple Sinks



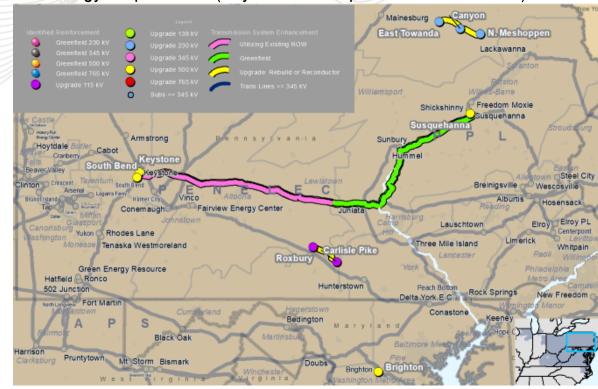


## MAAC Regional Cluster Shortlist Risk Assessment

NextEra/Exelon Proposal 237 (Kammer – Juniata 765 kV)



FirstEnergy Proposal 826 (Keystone – Susquehanna DCT 500 kV)



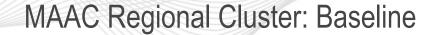
Proposal ID	Proposing Entity	Proposal Description	Proposal Cost Estimate (\$M)	Independent Cost Estimates (\$M)	Cost Estimate Risk	Cost Containmen t Risk	Schedule Risk	Constructa bility Risk	Acquisition	Coordina		Rick	Proposed ISD	New 765 kV Ckt. Miles	New 500 kV Ckt. Miles	Ckt.	New EHV Ckt. (Greenfield Miles)
237	NextEra/ Exelon	Kammer to Juniata	\$1,738.59	\$ 1,797.32	Low-Medium	Medium	Medium	Medium	Medium-High	Low	Low-Medium	Medium	6/1/2031	222	1.2	223.2	223.2
826	FirstEnergy (MAIT)	PPL Load Addition Proposal: Keystone - Susquehanna 500 kV Double Circuit	\$ 1,348.91	\$ 1,491.28	Low	Medium-High	Medium-High	Medium	Medium-High	Medium	Low	Medium	6/1/2030	0	204	204	204



### MAAC Regional Cluster Evaluation Summary

#### **Result Summary and Conclusion:**

- MAIT proposal #826 (200 mi) consisting of constructing double circuit 500 kV lines Keystone Susquehanna
  - > Reinforces the regional system within Mid-Atlantic area offering additional transfer capability into MAAC.
- NextEra/Exelon Proposal #237 (222 mi) consisting of constructing of 765 kV development from Kammer to Juniata
  - Reinforces the entire West East Corridor from the current 765 kV system edge at Kammer through the MAAC region terminating at Juniata
- Both #826 and #237 proposals mitigate the 500 kV overloads at varying degrees
- PJM is recommending proposal #237 for development
  - Provides a stronger support to the Mid-Atlantic region including load growth in PPL and MAAC area in general, delays in OSW development, future generation retirements in MAAC or any combination of these factors
  - A natural expansion of the existing 765 kV backbone into the PJM eastern region. This allows for more flexibility in utilizing resources across the interconnection to serve load
  - Offers ~2 GW more import to Mid-Atlantic than proposal #826 and preserves existing 500 kV capacity.
  - Offers the highest transfer capability regardless of Source/Sink combination
  - > PJM will work with the Project Proponent, and incumbent Transmission Owner(s) to enhance and finalize project details based on feedback received





Process Stage: First Read

Criteria: Baseline Load Growth Deliverability & Reliability

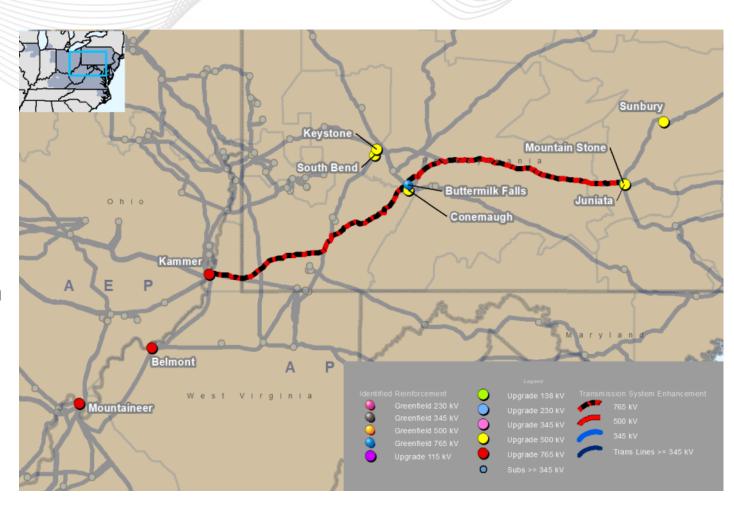
**Assumption Reference**: 2025 RTEP Assumption

Model Used for Analysis: 2025 Series RTEP 2032 base

cases

Proposal ID: 2025-W1-237

**Problem Statement:** In the 2032 RTEP analysis, multiple 500 kV transmission lines sourcing the Mid-Atlantic region are overloaded, and voltage collapse is observed for several regional facilities.





## MAAC Regional Cluster: Baseline

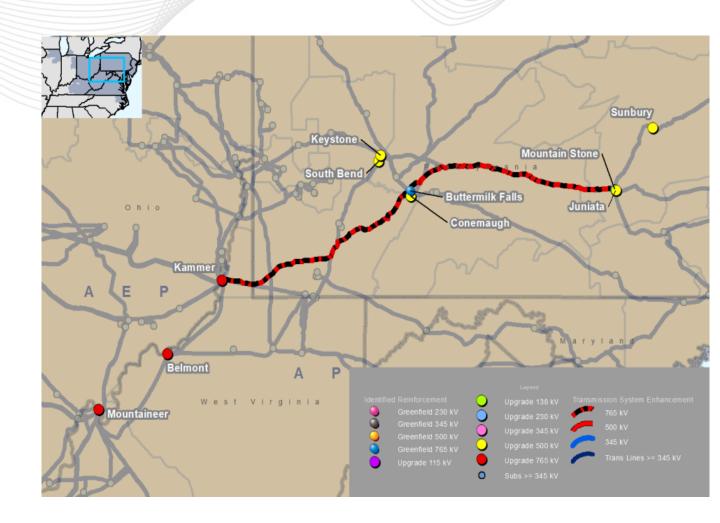
Process Stage: First Read

**Proposed Solution:** 2025-W1-237

PJM Proposal ID	Component title
237	B-30-A) South Bend - Keystone 500kV terminal equipment upgrade
237	B-32-A) Keystone-Juniata 500 kV terminal equipment upgrade
237	B-33-A) Mountaineer-Belmont 765 kV terminal equipment upgrade
237	B-01-A) Kammer substation upgrade
237	B-07-A) Juniata substation upgrade
237	B-31-A) Sunbury 500 kV substation upgrades
237	B-34-A) Conemaugh circuit breaker upgrades
237	B-20-A) Kammer - Buttermilk Falls 765kV
237	B-21-A) Buttermilk Falls - Mountain Stone 765kV
237	B-24-A) Mountain Stone-Juniata 500kV
237	B-06-A) Mountain Stone 765kV Substation
237	B-19-B) Buttermilk Falls 765kV Substation

**Estimated Total Cost: \$1738.6M** 

Projected ISD: 6/1/2031





# 2025 Window 1 RTEP Exelon/PEPCO Cluster Proposal Summary

Proposed Solutions (First Read)



#### 2025 RTEP SWMAAC and PEPCO/Dominion Tie Need and Solutions summary:

- The need for regional transfer to MAAC from West and South increased in the 2030 and 2032 base cases
- The increase in transfer to MAAC attributes to the load increase mainly in PPL (approximately 5 GW), and the delay of NJOSW generation development in MAAC. This import is forecasted to be supplied from surplus generation in Western and Southern PJM as informed by the future, queued projects and developer interest.
- The increase in the transfer from South to MAAC impact the three tie lines to SWMAAC or PEPCO significantly.
  - Doubs Brighton 500 kV
  - Burches Hill Possum Point 500 kV
  - Edwards Ferry Dickerson 230 kV
- The flow on these tie lines is exasperated by the NJOSW delay as well as the additional 3.5 GW load from PPL (not included in the 2025 load forecast)

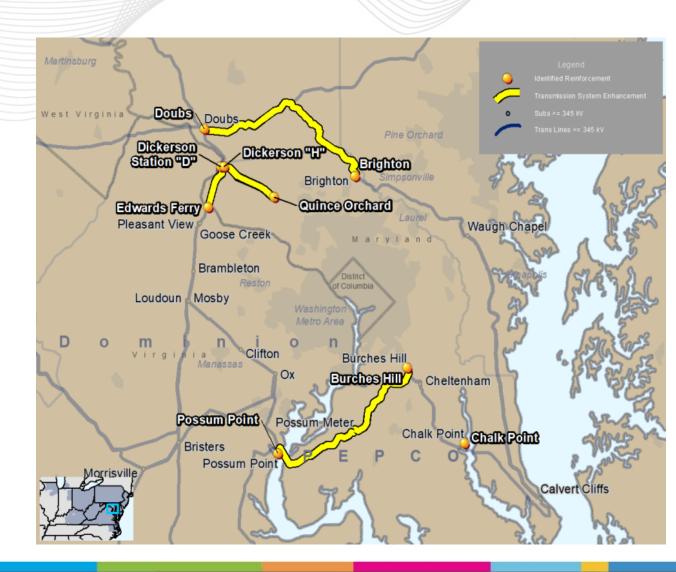


## PEPCO Proposed Solutions and Evaluation Progress

#### SWMAAC and PEPCO/Dominion Needs:

- 2030 Base case:
  - No violations identified
- 2032 Base case/2032 Scenario 4:
  - The following overloads identified

Monitored Facility			kVs	Areas
314922 8POSSUM	500 200019 BURCHES	500 1	500	233/345
223938 DICKH230	230 223937 DICK 230	230 2	230	233
200018 CHALK PT	500 223983 CHALK230	230 2	500/230	233
235105 01DOUBS	500 200003 BRIGHTON	500 1	500	233/201
314290 6EDFERRY	230 223938 DICKH230	230 1	230	233/345
223938 DICKH230	230 223939 QUINC032	230 1	230	233
223938 DICKH230	230 223940 QUINC034	230 1	230	233





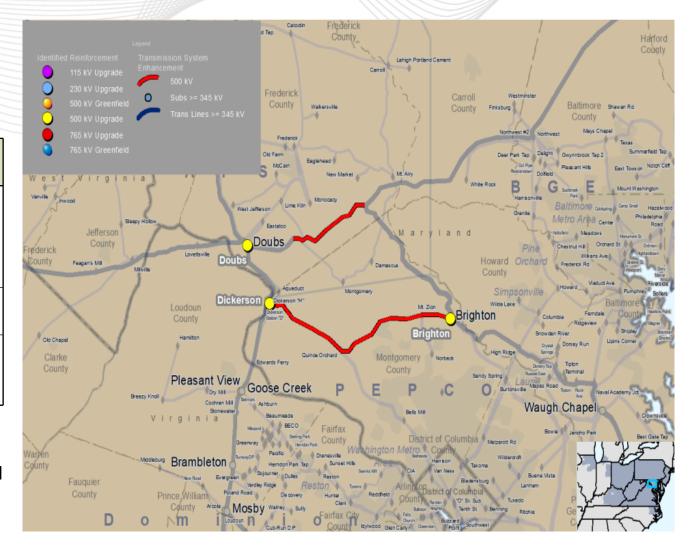
## PEPCO Proposed Solutions and Evaluation Progress

#### Only Exelon/PEPCO submitted proposals for this cluster

 PEPCO submitted three proposals to address needs identified in the South PEPCO vicinity including ties between Dominion and PEPCO.

Proposal ID	Total Cost (\$ M)	High Level Description
371	857.22	New 500 kV substation (Dickerson) by cutting into the Aspen - Rocky Point 500 kV line. New 500 kV line (Dickerson - Brighton (25 miles) - mix of greenfield and brownfield). One Dickerson 500/230 kV transformer.
851	101.86	Rebuilding the BGE portion of the Doubs – Brighton line 500kV (approximately ~11 miles)
919	257.61	New 500 kV substation (Dickerson) by cutting into the Aspen - Rocky Point 500 kV line installing two new 500/230kV transformers.

 This area is impacted by reinforcements in the MAAC and Dominion regions, and final evaluation for this cluster is performed with the MAAC regional and Dominion solutions modeled





#### PJM Analysis and Results:

- With the Dominion and Mid-Atlantic regional solutions, some of the overloaded facilities are either mitigated or the overloads are less.
- Remaining overload are:

Monitored Facility		kVs	Areas
223938 DICKH230	230 223937 DICK 230 230 2	230	233
235105 01DOUBS	500 200003 BRIGHTON 500 1	500	233/201
314290 6EDFERRY	230 223938 DICKH230 230 1	230	233/345
223938 DICKH230	230 223939 QUINC032 230 1	230	233
223938 DICKH230	230 223940 QUINC034 230 1	230	233

- All three proposals by PEPCO(Exelon) evaluated, including components from proposal #919 (series reactor on the Edwards Ferry –
  Dickerson 230 kV line and relocation of the Dickerson Quince Orchard ckt 23035 from Dickerson D to Dickerson H
  - ➤ Components from proposal #919 (series reactor on the Edwards Ferry Dickerson 230 kV line and relocation of the Dickerson Quince Orchard ckt 23035 from Dickerson D to Dickerson H) addresses the Needs, however, the flow on the Edwards Ferry Dickerson 230 kV diverted to the Doubs Brighton 500kV parallel line plus the Doubs station resulting in an overload of the Doubs 500/230 kV transformers.



#### **Result Summary and Conclusion:**

- Proposal #851: (reconductor the BGE portion of Doubs Brighton 500 kV, \$102 M)
  - ➤ Does not address all the violations in the area, only mitigates overload on 500 kV Doubs Brighton
- Proposal #371: (build 500/230 kV station and 500 kV line from Dickerson-Brighton, \$857 M)
  - Proposal 371 offer stronger transfer capability to the SWMAAC area
  - However, the project is the most expensive and requires a greenfield
  - With the regional MAAC solution in place, the need for the 500 kV line is eliminated
- Proposal #919: (New Dickerson 500/230 kV station by tapping the 500 kV Aspen Rocky Point, \$282 M) + additional upgrades
  - Addresses the needs and provides a source to the PEPCO zone
  - Supports the Doubs 230 kV area by reducing the flow from Doubs Dickerson
  - The project is scalable for future 500kV line proposed in 371
  - Proposal 919 is selected by PJM as the more efficient or cost-effective solution



# PEPCO Transmission Zone: Baseline Exelon/PEPCO Cluster

Process Stage: First Read

Criteria: Baseline Load Growth Deliverability & Reliability

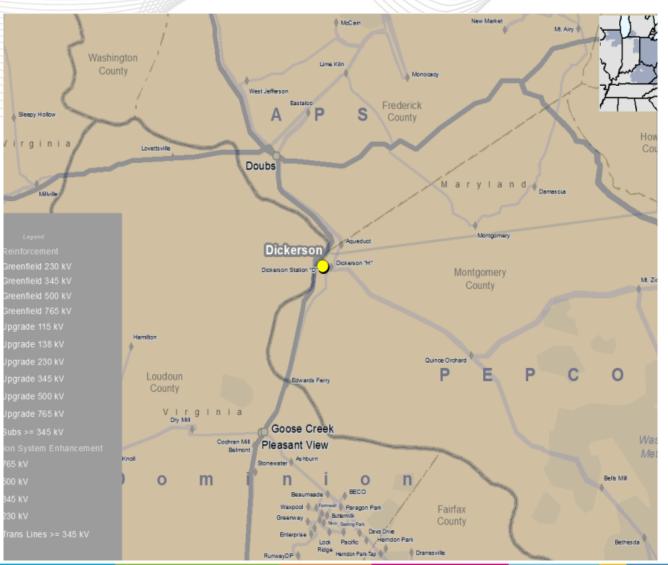
**Assumption Reference**: 2025 RTEP Assumption

Model Used for Analysis: 2025 Series RTEP 2032 base

cases

Proposal ID: 2025-W1-919

**Problem Statement:** Multiple 500kV and 230 kV facilities overloaded in the PEPCO and PEPCO/Dominion tie, in the 2032 RTEP base case and the overload on these facilities worsens with the NJOSW delay as well as the additional 3.5 GW load from PPL (not included in the 2025 load forecast)





# PEPCO Transmission Zone: Baseline Exelon/PEPCO Cluster

Process Stage: First Read

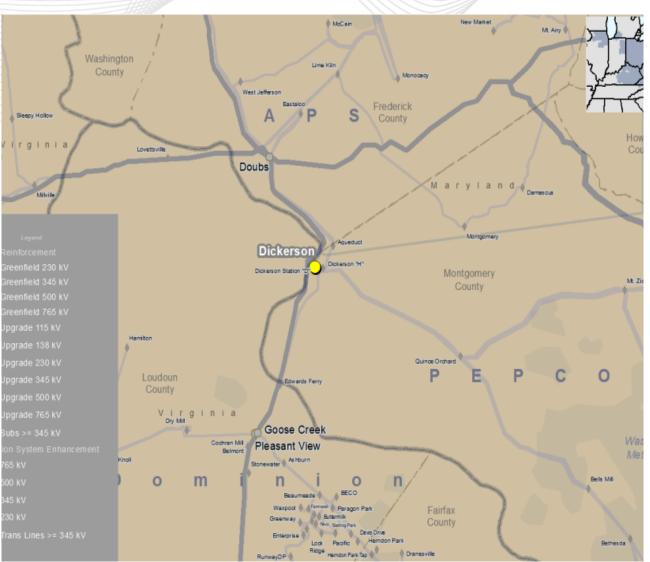
**Proposal ID:** 2025-W1-919

Proposed Solution (2025-W1-919):

Proposal ID	Project Description	Total Cost (\$M)
	New 500 kV substation (Dickerson) by cutting into the	
	Aspen - Rocky Point 500 kV line installing two new	
919	500/230kV transformers.	257.61
	Replace 2- Breakers, 1- Bushing CT, 1- Stranded Bus	
Additional Upgrade	Conductor, 4- Disconnect Switches at Brighton 500 kV	
(component from 851)	Substation	8
	Replace 1- Stranded Bus Conductor, 3- Thermal Relay,	
	2- Disconnect Switches at Quince Orchard 230 KV	
Additional Upgrade	Substation	3.75
	Replace Bells Mill T3 XF with new PEPCO standard 260	
Additional Upgrade	MVA 230/138 kV Transformer	12.8
Total		282.16

Estimated Total Cost: \$282.16 M

Projected ISD: 6/1/2031





## Southern Cluster

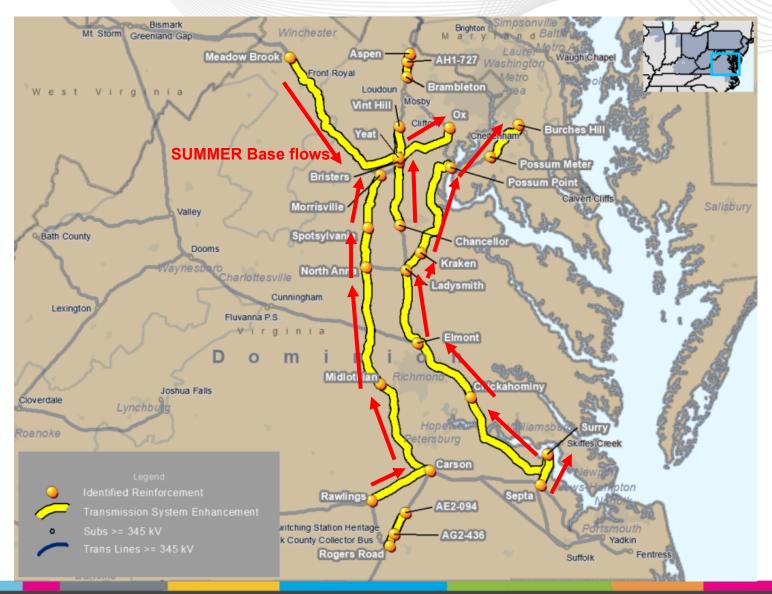
Regional Transfers – Proposed Solutions (First Read)



- The Dominion area has multiple 500kV violations along its primary South -North corridor in 2032
  - Violations are predominantly being driven by:
    - The need to deliver the southern generation in Dominion to the northern Dominion (NOVA) and central Dominion loads.
    - Increases in load with a heavier concentration in the NOVA area
    - Further increase in PJM load overall currently, an increase in data center load external to Dominion
  - These needs require long-lead, backbone enhancements requiring more than 5 years to develop



### 2032 Dominion Violations – 500 kV





#### 2025 RTEP Window 1

**Proposals Overview** 

# All proposals submitted to address Dominion 2032 regional flows recommend 765 kV, 500kV or HVDC developments:

All proposals offer additional south to north paths to transfer power from planned generation in the south to load centers in the north.

- 4 Dominion proposals recommend a +/- 525 kV HVDC link variants from Heritage to Mosby.
- Multiple proposals offer 765 kV developments with one or more lines heading to the Morrisville area.
- A couple of proposals focus on 500 kV developments with some additional 230 kV reinforcements in the northern Virginia area.



## 2025 RTEP Window 1

**Proposals Overview** 

		Dominion Regional Cluster Proposals – 2032	
<b>Proposing Entity</b>	Proposal ID	High Level Description	Total Cost (\$ M)
Dominion	2025-W1-275 (1A - HVDC)	<ul> <li>New HVDC Transmission Link from Heritage to Mosby (~185 miles), new 500kV line Elmont-Kraken, various 500kV rebuilds, new 765/500kV switching station &amp; various substation equipment upgrades.</li> </ul>	\$4819.51
Dominion	2025-W1-326 (1B - HVDC)	<ul> <li>New HVDC Transmission Link from Heritage to Mosby (~185 miles), new 500kV line Chickahominy-Kraken, new 500kV line Skiffes</li> <li>Creek-Chickahominy, various 500kV rebuilds, new 765/500kV switching station &amp; various substation equipment upgrades.</li> </ul>	\$5009.03
Dominion	2025-W1-547 (1C - HVDC)	<ul> <li>New HVDC Transmission Link from Heritage to Mosby (~185 miles), new 500kV line Vontay-Kraken, various 500kV rebuilds, new 765/500kV switching station &amp; various substation equipment upgrades.</li> </ul>	\$4904.5
Dominion	2025-W1-352 (1D - HVDC)	<ul> <li>New HVDC Transmission Link from Heritage to Mosby (~185 miles), new 500kV line North Anna-Vontay, various 500kV rebuilds, new 765/500kV switching station &amp; various substation equipment upgrades.</li> </ul>	\$5013.97
Dominion	2025-W1-705 (2A – 765kV)	<ul> <li>New 765kV line from Heritage to Yeat (~152 miles), new 500kV line Chickahominy-Kraken, new 500kV line Skiffes Creek- Chickahominy, various 500kV rebuilds, new 765/500kV switching station &amp; various substation equipment upgrades.</li> </ul>	\$2864.73
Dominion	2025-W1-848 (2B – 765kV)	<ul> <li>New 765kV line from Heritage to Yeat (~152 miles), new 500kV line Vontay-Kraken, various 500kV rebuilds, new 765/500kV switching station &amp; various substation equipment upgrades.</li> </ul>	\$2969.05
Dominion	2025-W1-352 (2C – 765kV)	• New 765kV line from Heritage to Yeat (~152 miles), various 500kV rebuilds & various substation equipment upgrades.	\$2273.85
Dominion	2025-W1-616 (3A – 616)	<ul> <li>New 500kV line from Heritage-Morrisville, new 500kV line Finneywood-Cunningham, new 500kV line Morrisville-Cunningham, various 500kV rebuilds, new 765/500kV switching station &amp; various substation equipment upgrades.</li> </ul>	\$2349.26
Transource	2025-W1-331 (2-765kV)	<ul> <li>Construct Bagpipe 765kV, Vontay 765kV, Durandal 765/500kV, Starfruit 765/230kV, Lodi 765/500kV, and Kaladin 500/230kV substations. Construct Bagpipe–Vontay, Joshua Falls–Durandal 765kV, Durandal–Starfruit 765kV, Starfruit–Lodi 765kV, Lodi–Cunningham 500kV, Lodi–Kaladin 500kV, Kaladin–North Anna 500kV, and Kaladin–Morrisville 500kV lines.</li> </ul>	\$2895.32
Transource	2025-W1-781 (1-765kV)	<ul> <li>Construct Durandal 765/500kV, Starfruit 765/230kV, Lodi 765/500kV &amp; Kaladin 500/230kV substations. Construct Joshua Falls— Durandal 765kV, Durandal—Starfruit 765kV, Starfruit—Lodi 765kV, Lodi—Cunningham 500kV, Lodi—Kaladin 500kV, Kaladin—North Anna 500kV, and Kaladin—Morrisville 500kV lines.</li> </ul>	\$1986.45
TRAIL	2025-W1-938 (765kV)	• New Lea Anna 765 kV, Ladysmith 765 kV, Rogers Rd 765 kV, Centerville Rd 765 kV, Perkins Rd 765 kV, Creekward 500 kV Switchyards, substation expansions at the following locations: Bristers 500 kV, Morrisville 500 kV, Rogers Rd 500 kV, Carson 500 kV, new substations at the following locations: Bristers 765/500 kV, Morrisville 765/500 kV, Lea Anna 765/500 kV, Ladysmith 765/500 kV, Rogers Rd 765/500 kV, Perkins Rd 765/500 kV, new transmission lines: Lea Anna - Ladysmith 765 kV, Ladysmith - Bristers 765 kV, Lea Anna - Morrisville 765 kV, Centerville Rd - Rogers Rd 765 kV, Rogers Rd - Perkins Rd 765 kV, Perkins Rd - Lea Anna 765 kV, Carson - Creekward 500 kV Line & relay setting revisions at Ladysmith	\$3426.93
LS Power	2025-W1-260 (500kV)	<ul> <li>New 765/500kV Middle Fork, 500kV South Fork and 500kV Turkey Creek Substations, Substation expansions at the following locations: Warrenton, Wheeler, Brickyard, Vint Hill, Cunningham, Morrisville, Rawlings, Carson Expansion, new 500kV lines: Front Royal - Vint Hill, Cunningham - Middle Fork #1 &amp; #2, Middle Fork - Morrisville #1 &amp; 2 and Rawlings - South Fork.</li> </ul>	\$2207.36



# Dominion Regional Result Summary

Portfolio/ Combination #	Entity	2032 Base Performance	2032 S4 + PPL Load	Cost \$	Notes
275 (1A-HVDC)	Dominion	0 - 500kV violations > 100% 2 - 500 kV loadings > 90%	0 - 500kV violations > 100% 3 - 500 kV loading > 90%	\$4,820	
326 (1B-HVDC)	Dominion	0 - 500kV violations > 100% 0 - 500 kV loading > 90%	N/A	\$5,009	
547 (1C-HVDC)	Dominion	0 - 500kV violations > 100% 1 - 500 kV loading > 90%	N/A	\$4,905	
352 (1D-HVDC)	Dominion	0 - 500kV violations > 100% 2 - 500 kV loadings > 90%	N/A	\$5,014	
705 (2A-765kV)	Dominion	0 - 500kV violations > 100% 2 - 500 kV loadings > 90%	1 - 500kV violation > 100% 2 - 500 kV loading > 90%	\$2,865	
848 (2B-765kV)	Dominion	0 - 500kV violations > 100% 2 - 500 kV loadings > 90%	0 - 500kV violations > 100% 2 - 500 kV loading > 90%	\$2,969	
474 (2C-765kV)	Dominion	1 - 500kV violation > 100% 1 - 500 kV loading > 90%	N/A	\$2,274	
616 (3-500kV)	Dominion	0 - 500kV violations > 100% 1 - 500 kV loading > 90%	0 - 500kV violations > 100% 3 - 500 kV loading > 90%	\$2,349	
260	LS Power	6 - 500kV violations > 100% 2 - 500 kV loadings > 90%	N/A	\$2,207	
331 (2-765kV)	Transource	0 - 500kV violations > 100% 2 - 500 kV loadings > 90%	3 - 500kV violation > 100% 2 - 500 kV loading > 90%	\$2,895	500kV LN #574 Elmont - Ladysmith currently being reconductored to 4330 MVA (b3020). Loaded to ~97% under single contingency in 2032 Base. Overloaded in S4+PPL Load scenario: ~102%.
781 (1-765kV)	Transource	6 - 500kV violations > 100% 4 - 500 kV loadings > 90%	N/A	\$1,986	
938	Trail	7 - 500kV violations > 100%	N/A	\$3,427	

Note: Unique monitored EHV lines in Dominion only



# Southern Cluster – Shortlisting Factors, Criteria, and Approach

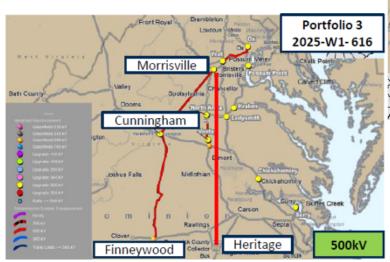
- All HVDC proposals have similar configuration and cost.
- All 765 kV solutions follow similar routes and reinforce the South North corridor and will require heavy greenfield development.
- 500 kV option(s) considered in view of offered capacity vs ROW greenfield impact introduced by 765kV developments.
- Narrow down and consequently shortlist a front runner HVDC option and HVAC option for final evaluation/selection (shortlist).
  - Dominion Proposal #275 HVDC
  - Transource Proposal #331 765 kV Circuits

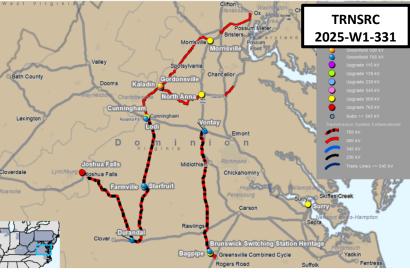


# Focusing on Short-listed proposals offering "similar" Transfer-Capability merits

- Proposal #275 provides for a +/- 525 kV HVDC link from Heritage in the south to a termination point further north of Morrisville at Mosby.
  - A new 500 kV line from Elmont to Kraken is also part of the proposal.
- Proposal #331 provides for another 765 kV source from AEP (Joshua Falls) to a station called Durandal in Dominion before heading north towards Cunningham and stepping down to a 500 kV line as it heads towards Morrisville.
  - An additional 765 kV line development is also part of the proposal starting around Heritage and terminating at Vontay.
  - A couple of additional Dominion upgrades added to the scope.
- Proposal #616 offers 2 new 500 kV line reinforcements with additional 500 kV upgrades.
  - Finneywood Cunningham Morrisville
  - Heritage Morrisville









# Common merits among Preliminary Shortlisted Proposals

- All shortlisted proposals offer additional backbone paths from southern Dominion "towards" the Morrisville 500 kV Station
  - Direct path to connect generation in the south to the load center in the north
- While all preliminary short-listed proposals meet the posted need (at varying degrees), some offer more complete and even additional benefits / robustness merits such as:
  - Higher transfer capability from south to north
  - Direct injection of power closer to the data center alley area in Northern Virginia
  - More operational flexibility between north and south transfers
  - Minimizing short circuit issues that are already present in Dominion
  - Land use, environmental, social and constructability risk mitigation



# Incremental Transfer Capability Analysis 2032SUM Base

Sink Definition

Sub System	Sink A
DOM1 (NOVA area)	100%

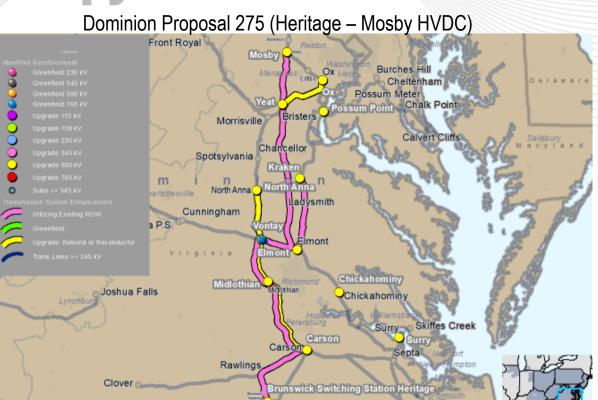
 Source Definition (West/South)

Source 1	Source 2
50%/50%	0%/100%

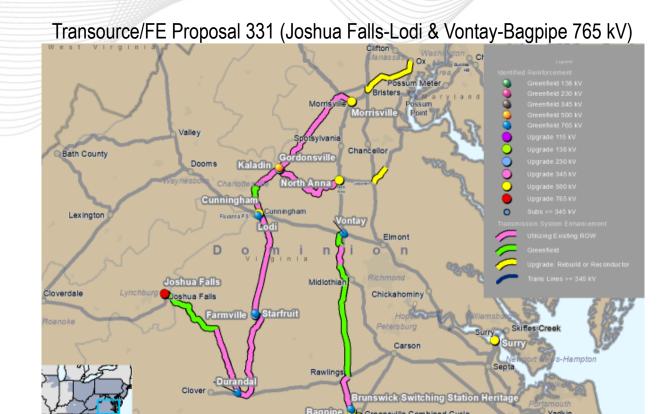




## South Regional Cluster Shortlist Risk Assessment



Rogers Road



Proposal ID	Proposing Entity	Proposal Description		Independent Cost Estimates	Estimate	Cost Containment Risk	Schedule Risk		ROW/Land Acquisition Risk	Coordinatio n Risk	Proposing Entity Experience & Capability Risk	Regulatory Risk	Proposed ISD	New HVDC Miles	New 765 kV Miles	New 500 kV Miles	New EHV (Total Miles)	New EHV (Greenfield Miles)
275	VEPCO	HVDC backbone - Portfolio 1A	\$4,819.51	\$5,013.49	Low	Medium-High	Low-Medium	Low-Medium	Low	Medium	Medium-High	Medium	6/1/2032	185	0	32.05	217.05	0
331	Transource /FE	Virginia Area Seven Year Solution 1	\$2,895.32	\$3,156.93	Low	Medium	Medium-High	Medium-High	Medium-High	Medium	Low	Medium	6/1/2031	0	211.2	100.5	311.7	311.7



## PJM is recommending the HVDC-based Proposal #275 for development

- Proposal is the technically superior solution
  - Offers 500 ~ 1000 MWs higher South North transfer capability
  - Significantly lower area impact than 765 kV overhead solution (use of Dominion existing rights-of-way and underground routing of the HVDC line)
  - Operational flexibility
  - Short circuit level mitigation (major concern in Dominion / Northern and Central VA)
- Next leading solution is Transource Proposal #331 aided with a few Dominion 500 kV local fixes
- HVDC proposal #275 is approximately \$2Bn more expensive compared to proposal #331
  - Preliminary cost allocation analysis shows Dominion Zone carrying 50% of the cost (approximately)



Dominion Transmission Zone: Baseline Regional Solution: 2025-W1-275 Portfolio

Process Stage: First Read

**Criteria:** Generator Deliverability

**Assumption Reference**: 2025 RTEP assumptions

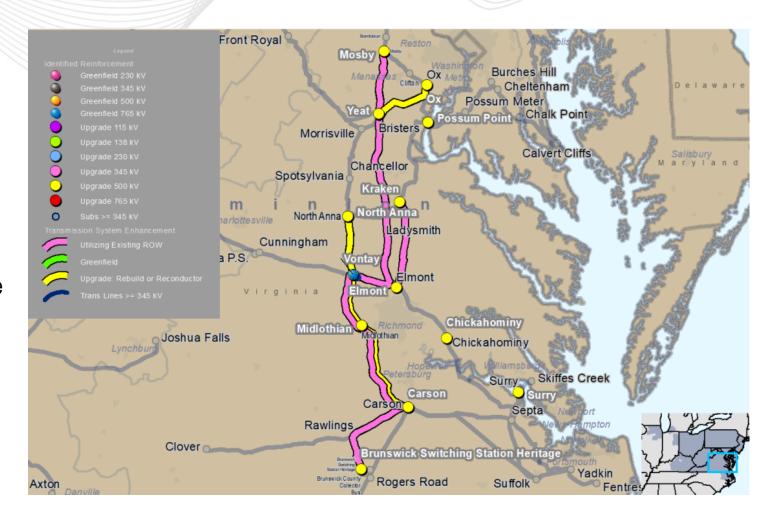
Model Used for Analysis: 2025 Series RTEP 2032

summer, winter, & light load base cases

Proposal Window Exclusion: None

**Problem Statement:** 

In the 2032 RTEP summer, winter and light load base cases, various Dominion 500kV transmission lines are overloaded under single and common mode contingencies.





## Dominion Transmission Zone: Baseline Regional Solution: 2025-W1-275 Portfolio Components

Proposal ID #	Project Title	Cost (\$M)
2025-W1-9	Line 576 Partial Rebuild - Vontay to Midlothian	\$104.86
2025-W1-117	Line 539 Rebuild - Yeat to Ox	\$125.25
2025-W1-126	Line 567 Terminal Upgrade Chickahominy & Surry	\$2.49
2025-W1-238	Line 563 Rebuild - Carson to Midlothian	\$237.06
2025-W1-243	Carson Substation Equipment Upgrade	\$12.44
2025-W1-247	New 765/500kV Switching Station - Vontay	\$239.49
2025-W1-253	Line 5008 Cut-in into Mosby Substation	\$16.25
2025-W1-306	New 500kV Line - Elmont to Kraken	\$180.30
2025-W1-339	Line 576 Partial Rebuild - North Anna to Vontay	\$104.86
2025-W1-815	New HVDC Transmission Link from Heritage to Mosby	\$3790.85
2025-W1-916	Line 560 Rebuild - Possum Point to Burches Hill	\$3.89
N/A	Scope Change: Yeat - Vint Hill Uprate	\$0
		\$4817.73

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## Dominion Transmission Zone: Baseline 2025-W1-9: Line 576 Vontay to Midlothian Rebuild

#### Proposed Solution (2025-W1-9):

- Rebuild 500 kV line 576 from Vontay Substation to Midlothian Substation. The
  existing structures shall be replaced within the existing ROW in-line using
  primarily 500/230kV 5-2KT tangent lattice towers, 500/230 kV 5-2 MA running
  angle lattice towers, and 500/230 kV 3-pole dead-end structures. The line will
  be rebuilt with 3-phase 3-1351 ACSS/TW/HS285 conductor and two (2) DNO10100 OPGW wire.
- Upgrade/install 6000A equipment at substation to support the new conductor termination.

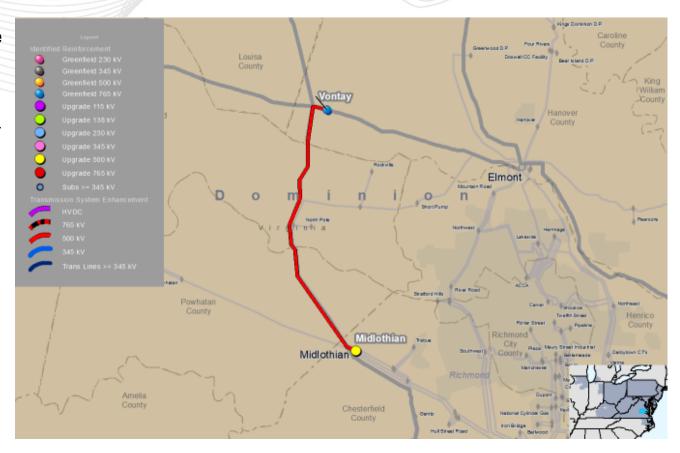
#### **Existing Facility Rating:**

#	Branch	SN/SE/SLDWN/WE/WLD (MVA)
1	500kV Line Vontay– Midlothian	3396/3425/3939/3983/4018/4759

#### **Preliminary Facility Rating:**

#	Branch	SN/SE/SLDWN/WE/WLD (MVA)
1	500kV Line Vontay– Midlothian	5109/5268/6057/5691/5867/6748

Total Estimated Cost: \$104.86 M Required In-Service Date: 6/1/2032 Projected In-Service Date: 6/1/2032





#### Proposed Solution (2025-W1-117):

- Rebuild existing 500kV Line 539 on double circuit structures with the option of adding a 230 kV line at a later time. Rebuild approximately 20 miles of transmission line from the existing structure, outside of Yeat Substation, to the Ox substation to current 500 kV / 230 kV double circuit standards. The conductor and shield wire to be used will be triple bundled 1351.5 ACSS/TW/HS285 145°C MOT and dual 619 DNO-10100 OPGW respectively.
- Upgrade equipment at Ox substation to support the new conductor rating.
- Upgrade equipment at Yeat substation to support the new conductor rating.

#### **Existing Facility Rating:**

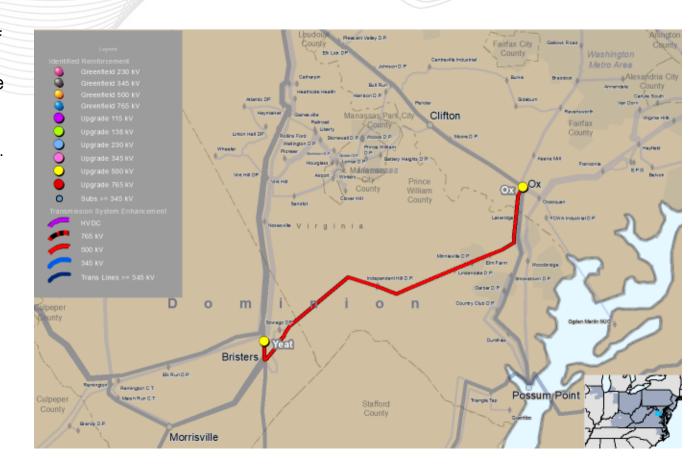
#	Branch	SN/SE/SLDWN/WE/WLD (MVA)
1	500kV Line Yeat – Ox	3396/3425/3939/3983/4018/4759

#### **Preliminary Facility Rating:**

#	Branch	SN/SE/SLDWN/WE/WLD (MVA)
1	500kV Line Yeat – Midlothian	5109/5268/6057/5691/5867/6748

**Total Estimated Cost:** \$125.25 M **Required In-Service Date:** 6/1/2032 **Projected In-Service Date:** 6/1/2032

## Dominion Transmission Zone: Baseline 2025-W1-117: Line 539 Yeat to Ox Rebuild





## Dominion Transmission Zone: Baseline 2025-W1-126: Line 567 Chickahominy to Surry Uprate

#### Proposed Solution (2025-W1-126):

- Uprate Line 567 associated terminal equipment at Chickahominy to 5000A standards.
- Uprate Line 567 associated terminal equipment at Surry to 5000A standards.

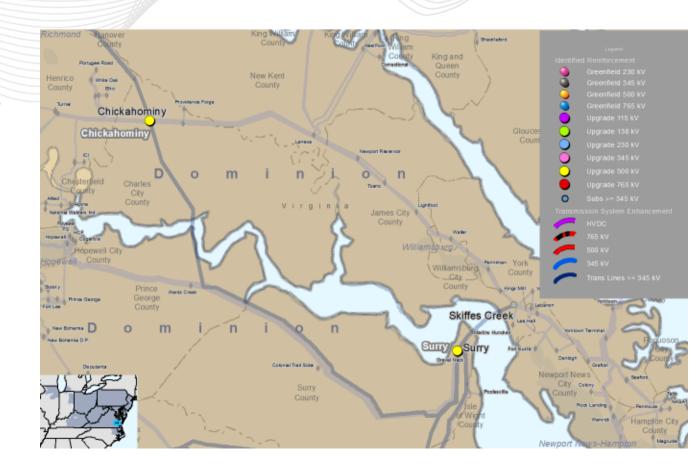
#### **Existing Facility Rating:**

#	Branch	SN/SE/SLDWN/WE/WLD (MVA)
1	500kV Line Chickahominy – Surry	2538/2598/2931/2987/3013/3523

#### **Preliminary Facility Rating:**

#	Branch	SN/SE/SLDWN/WE/WLD (MVA)
1	500kV Line Chickahominy – Surry	3322/3425/3939/4191/4376/5032

Total Estimated Cost: \$2.49 M Required In-Service Date: 6/1/2032 Projected In-Service Date: 6/1/2032





## Dominion Transmission Zone: Baseline 2025-W1-238: Line 563 Carson to Midlothian Rebuild

#### Proposed Solution (2025-W1-238):

- This project serves to wreck and rebuild 500kV line 563 from Carson Substation to Midlothian Substation in Chesterfield and Dinwiddie County, VA. The existing line consists mainly of 500 kV SC Steel Suspension Towers built in 1981. The proposed structures to be installed are mainly 500/230kV Double Circuit V-String Suspension Towers. The 230kV circuit position will be vacant at the completion of this project but serves to accommodate a future 230kV line.
- Uprate terminal equipment at Carson to 5000 A.
- Uprate terminal equipment at Midlothian to 5000 A.

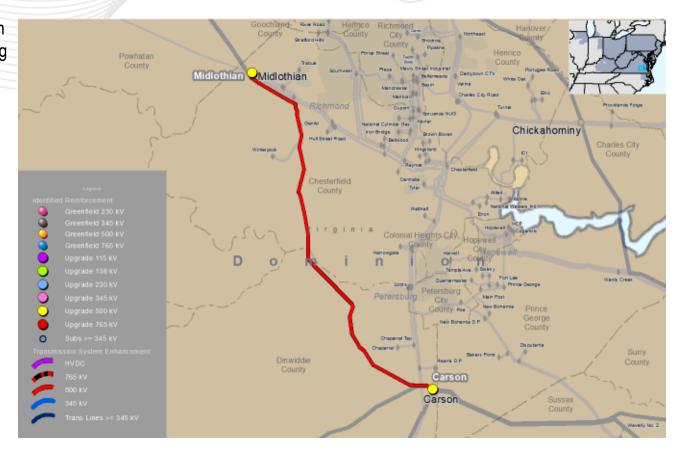
#### **Existing Facility Rating:**

#	Branch	SN/SE/SLDWN/WE/WLD (MVA)
1	500kV Line Carson – Midlothian	3425/3425/3939/3983/4018/5030

#### **Preliminary Facility Rating:**

#	Branch	SN/SE/SLDWN/WE/WLD (MVA)
1	500kV Line Carson – Midlothian	4357/4357/5011/5155/5155/5928

Total Estimated Cost: \$237.06 M Required In-Service Date: 6/1/2032 Projected In-Service Date: 6/1/2032



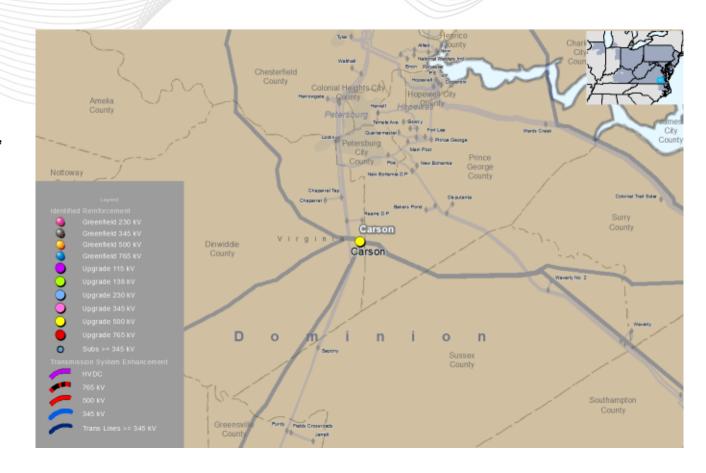


## Dominion Transmission Zone: Baseline 2025-W1-243: Carson Substation 500kV Upgrades

#### Proposed Solution (2025-W1-243):

- Replace the following 500kV substation equipment at Carson with 5000A equipment:
  - Breakers: 51172, 58572, 58572-2 (W72)
  - Switches and disconnects: 56274, 56275, 56278, 56378, 54474, 54475, 54478, 51178, 51175, 51174, 58574-1, 58575, 58578, 58570, 58574-2 (W74)
  - Leads: if they are less than 4000A

Total Estimated Cost: \$12.44 M Required In-Service Date: 6/1/2032 Projected In-Service Date: 6/1/2032





## Dominion Transmission Zone: Baseline 2025-W1-247: New 765/500kV Vontay Substation

#### Proposed Solution (2025-W1-247):

- Construct a new 765/500kV Vontay substation
- Loop 500 kV Line #553 into the new Vontay substation, which will result in two (2)
   500 kV lines: Cunningham Vontay and Vontay Elmont
- Loop 500 kV Line #576 into the new Vontay substation, which will result in two (2)
   500 kV lines: from North Anna Vontay and Vontay Midlothian
- Loop 765kV Joshua Falls Yeat into the new Vontay substation, which will result in two (2) 765 kV lines: from Joshua Falls to Vontay and from Vontay to Yeat
- Replace CBs (54265 and 553T564) and all associated equipment to Line #553 including Switches and CT with 5000A equipment at Cunningham substation

Total Estimated Cost: \$239.49 M Required In-Service Date: 6/1/2032 Projected In-Service Date: 6/1/2032





## Dominion Transmission Zone: Baseline 2025-W1-253: Line 5008 Cut-in to Mosby Substation

#### Proposed Solution (2025-W1-253):

- Cut and loop Line #5008 into Mosby substation, which will result in two (2) 500 kV lines: Line #5008 Morrisville Mosby and Line #9573 Mosby Wishing Star Sub. The proposed structures to be installed are two (2) single circuit engineered steel double dead-end 3-pole structures and one (1) single circuit steel A-frame backbone structure.
- Install two (2) 500kV breakers and all associated terminal equipment in the available bay adjacent to existing breaker XT590 to achieve a redundant breaker arrangement. Upgrade existing terminal equipment to 500kV 5000A, 63 kAIC standards including breaker (XT590), disconnect switches (59078, X74), leads, and buswork.

Brambleton Loudoun Mosby

**Total Estimated Cost:** \$16.25 M **Required In-Service Date:** 6/1/2032 **Projected In-Service Date:** 6/1/2032



## Dominion Transmission Zone: Baseline 2025-W1-306: New 500 kV Line - Elmont to Kraken

#### Proposed Solution (2025-W1-306):

- Construct a new 500 kV line 5X1 from Elmont Substation to Kraken Substation in Hanover and Caroline counties, VA. The new line will primarily consist of double circuit 500kV-230kV monopoles throughout this greenfield 32.05 mile corridor. The conductor and shield wire to be used will be triple bundled 1351 ACSS/TW/HS285 and dual DNO-10100 OPGW respectively. The new 230kV line position on the double circuit structures will remain vacant for future use.
- Construct one (1) new 500kV line terminal position at the existing Elmont substation.
- Construct one (1) new 500kV line terminal position at the proposed Kraken substation.

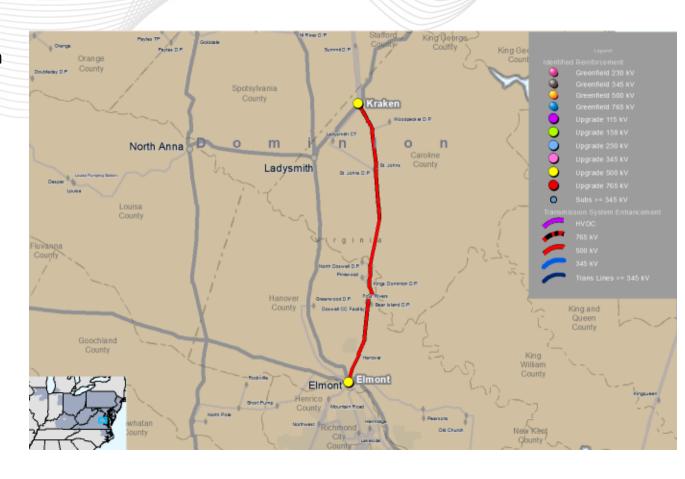
#### **Existing Facility Rating:**

#	Branch	SN/SE/SLDWN/WE/WLD (MVA)
1	500kV Line Elmont – Kraken	NA

#### **Preliminary Facility Rating:**

#	Branch	SN/SE/SLDWN/WE/WLD (MVA)
1	500kV Line Elmont – Kraken	4357/4357/5011/5155/5155/5928

Total Estimated Cost: \$180.3 M Required In-Service Date: 6/1/2032 Projected In-Service Date: 6/1/2032





#### Proposed Solution (2025-W1-339):

- Rebuild 500 kV line 576 from North Anna Substation to Vontay Substation.
  The existing structures shall be replaced within the existing ROW in-line using primarily 500/230kV 5-2KT tangent lattice towers, 500/230 kV 5-2 MA running angle lattice towers, and 500/230 kV 3-pole dead-end structures. The line will be rebuilt with 3-phase 3-1351 ACSS/TW/HS285 conductor and two (2) DNO-10100 OPGW wire.
- Upgrade/install 6000A equipment at substation to support the new conductor termination.

#### **Existing Facility Rating:**

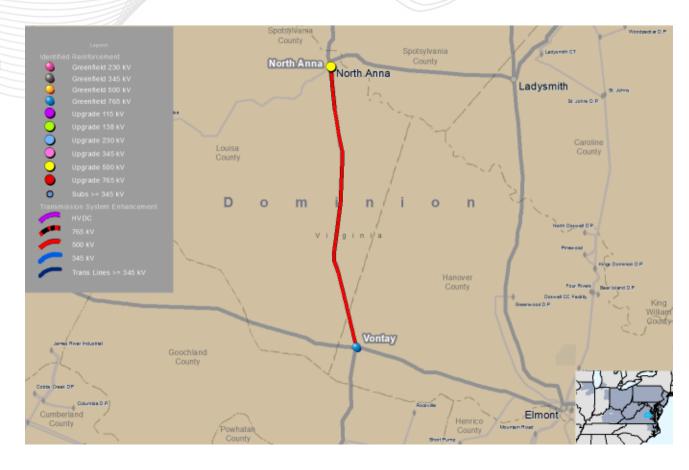
#	Branch	SN/SE/SLDWN/WE/WLD (MVA)
1	500kV Line North Anna – Vontay	3396/3425/3939/3983/4018/4759

#### **Preliminary Facility Rating:**

#	Branch	SN/SE/SLDWN/WE/WLD (MVA)
1	500kV Line North Anna – Vontay	5109/5268/6057/5691/5867/6748

Total Estimated Cost: \$104.86 M Required In-Service Date: 6/1/2032 Projected In-Service Date: 6/1/2032

## Dominion Transmission Zone: Baseline 2025-W1-339: Line 576 North Anna to Vontay





## Dominion Transmission Zone: Baseline Transmission Link from Heritage to Moshy

### 2025-W1-815: New HVDC Transmission Link from Heritage to Mosby

#### Proposed Solution (2025-W1-815):

- Construct a new bipolar +/- 525kV HVDC link connecting Heritage and Mosby Substations, where the link has a capability of transmitting 3000MW.
- Design and construct a new Voltage Source Converter (VSC) HVDC station at Heritage substation.
- Design and construct a new Voltage Source Converter (VSC) HVDC station at Mosby substation.

Burches Hil Cheltenham Chalk Point Bristers Possum Point Calvert Cliffs Valley Spotsylvania Ladysmith Cunningham Fluvanna P.S Elmont Midlothia Joshua Falls Chickahomin Surry Skiffes Creek Carson Rawlings Brunswick Rogers Road Suffolk Yadkin

Total Estimated Cost: \$3790.85 M Required In-Service Date: 6/1/2032 Projected In-Service Date: 6/1/2032



## Dominion Transmission Zone: Baseline 2025-W1-916: Line 560 Possum Point to Burches Hill Rebuild

#### Proposed Solution (2025-W1-916):

- Rebuild 500kV line 560 from Possum Point Substation (structure 560/1A) to Burches Interconnection (structure 560/1F). The existing line consists of one (1) 500kV single circuit steel suspension H-frame structure. The proposed structure to be installed is a 500kV single circuit steel suspension H-frame structure. This project will not require any additional right of way due to the entire project being on Dominion property.
- Uprate Line 560 terminal equipment at Possum Point substation so as not to limit the conductor rating.

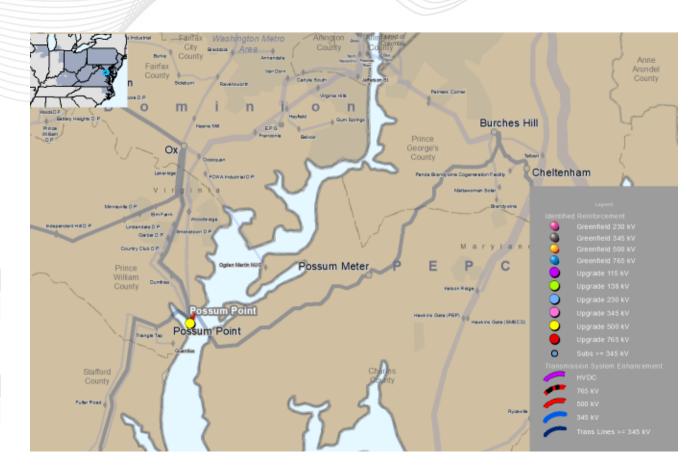
#### **Existing Facility Rating:**

#	Branch	SN/SE/SLDWN/WE/WLD (MVA)
1	500kV Line Possum Point – Burches Hill	3803/3803/4373/4832/4832/5287

#### **Preliminary Facility Rating:**

#	Branch	SN/SE/SLDWN/WE/WLD (MVA)
1	500kV Line Possum Point – Burches Hill	4087/4357/5011/4673/5155/5928

Total Estimated Cost: \$3.89 M Required In-Service Date: 6/1/2032 Projected In-Service Date: 6/1/2032





# Dominion Transmission Zone: Baseline Scope Change: 500kV Line Yeat – Vint Hill Uprate

#### Scope Change (2022W3 - b3800.313):

Reconductor existing 500kV line from Yeat to Vint Hill to 6000A.

#### **Existing Facility Rating:**

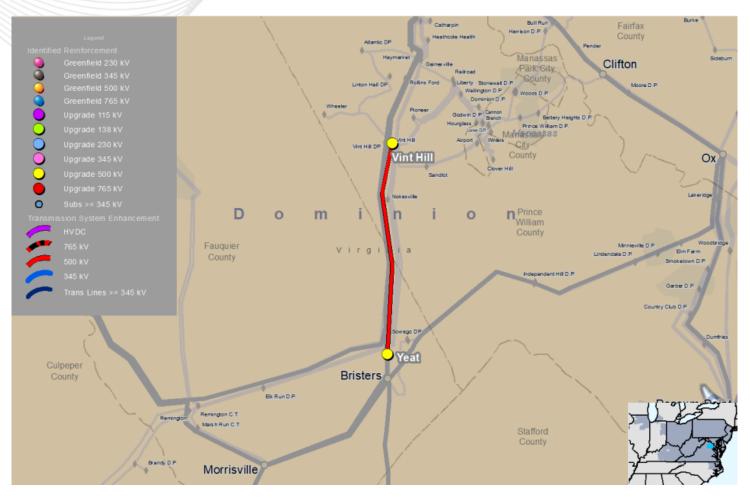
#	Branch	SN/SE/SLDWN/WE/WLD (MVA)
1	500kV Line Yeat – Vint Hill	4357/4357/5011/5155/5155/5929

#### **Preliminary Facility Rating:**

#	Branch	SN/SE/SLDWN/WE/WLD (MVA)
1	500kV Line Yeat – Vint Hill	5109/5268/6057/5691/5867/6748

**Total Estimated Cost: \$0 M** 

Required In-Service Date: 6/1/2032 Projected In-Service Date: 6/1/2032





## West Cluster (AEP/DATYON/ATI/DEOK)

Regional Transfers – Proposed Solutions (First Read)



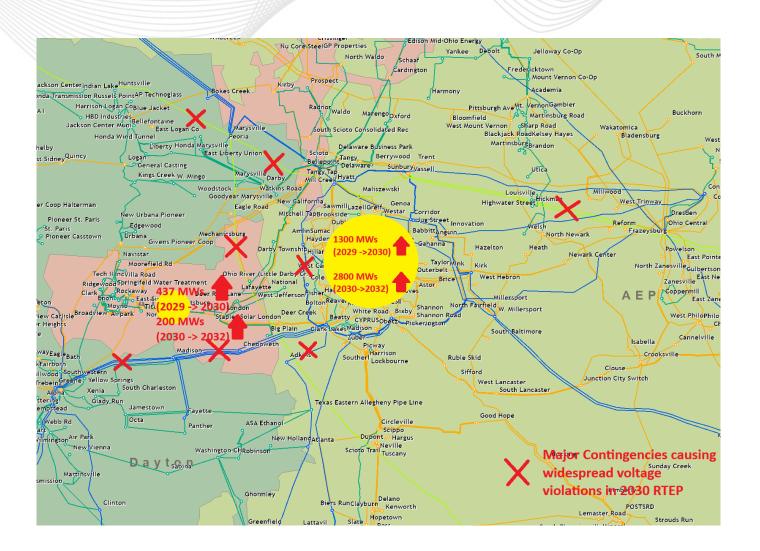
#### **Drivers**

- Load increase in Columbus area
- Load increase at Melissa area

#### **Violations**

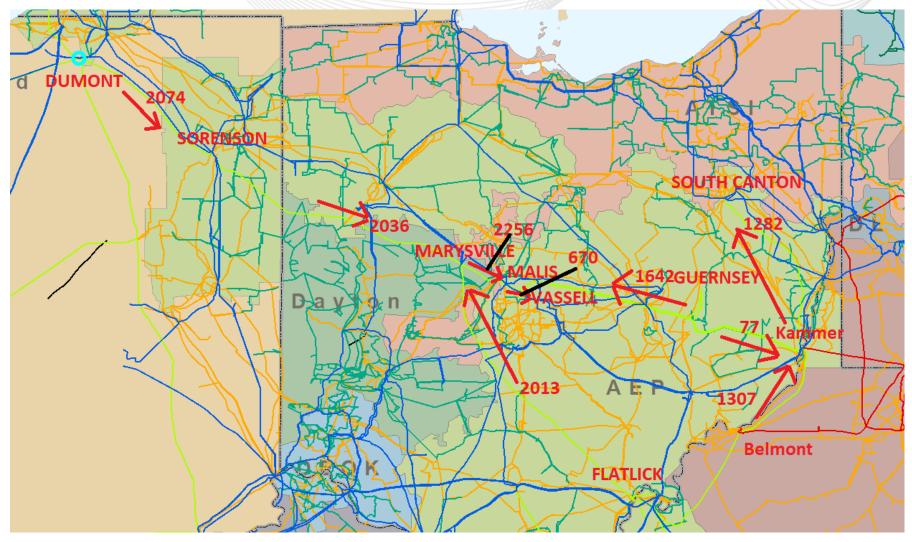
- Thermal overloads in AEP/Dayton/ATSI
- Widespread voltage issues in AEP/Dayton/ATSI/DEOK

### Western Cluster - Needs Overview



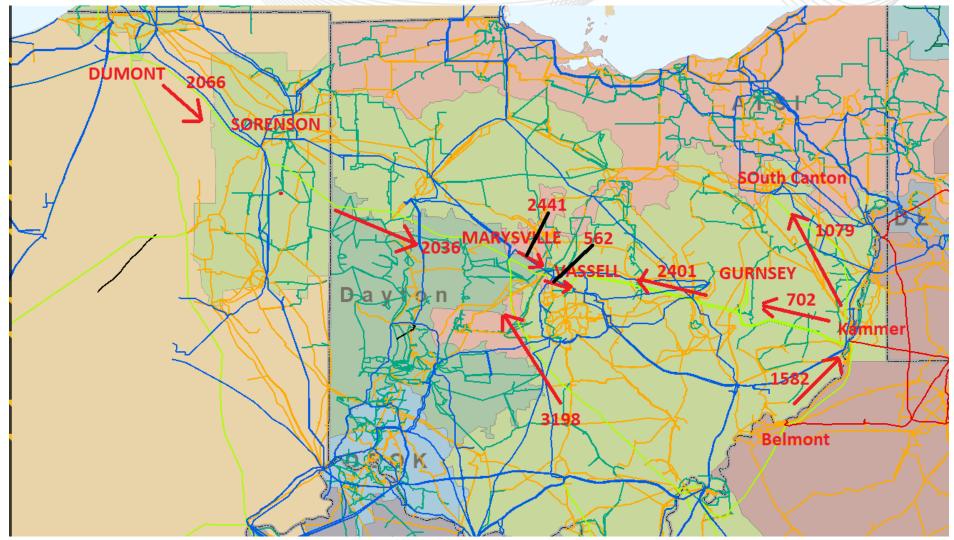


### 2030 SUM Base Case Flows on AEP 765 kV lines





### 2032 SUM Base Case Flows on AEP 765 kV lines





### Western Cluster – Submitted Proposals Summary

- A total of 29 proposals, from five different proposing entities, were proposed to address violations in the West Cluster:
  - Eleven of the proposals are for new 765kV and/or 345kV transmission projects targeting solving the regional needs
  - Four of the proposals are adding STATCOMs at various 765 and 345kV substations mainly to address voltage violation needs
  - Thirteen of the proposals are for local transmission upgrades by the incumbent Transmission Owners addressing local violations
  - One proposal (a new 345KV line) from a non-incumbent addressing a local thermal violation



## **Western Cluster - Regional Proposals**

Proposal ID #	Proposing Entity	Total Cost (\$)	Target area	Projected ISD
543	CNTLTM	121,407,651	Melissa area	06/2030
239	TRNSRC/FE	1,492,405,528	Melissa area/Columbus area	06/2030
334	TRNSRC/FE	1,690,256,560	Melissa area/Columbus area	06/2030
423	PSEGRT/AES Ohio/PPL	475,107,434	Melissa area	06/2031
60	PSEGRT/AES Ohio/PPL	1,333,608,268	Columbus area	03/2032
907	PSEGRT/AES Ohio/PPL	1,841,181,553	Melissa area/Columbus area	03/2032
619	PSEGRT/AES Ohio/PPL	1,942,649,642	Melissa area/Columbus area	03/2032
51	TRNSRC/FE	1,051,220,541	Melissa area/Columbus area	10/2030
570	TRNSRC/FE	2,775,191,200	Melissa area/Columbus area	10/2031*
152	NXTMID	2,921,116,446	Melissa area/Columbus area	12/2031
109	NXTMID	3,321,996,359	Melissa area/Columbus area	06/2031

<sup>\*</sup> Updated date from TRNSRC



### Western Cluster - STATCOM Proposals

Adding STATCOMs at various 765 and 345 Substations (241 needs to be combined with most of the PSEG proposals), while AEP STATCOM proposals mainly address the voltage issues in the Columbus area.

Proposal ID #	D# Proposing Entity Total Cost (\$)		Projected ISD
241	PSEGRT/AES Ohio/PPL	143,361,000	03/2032
749	AEP	589,740,053	05/2030
517	AEP	736,606,322	05/2030
981	AEP	976,340,801	05/2030



## **Local Proposals in the West Cluster**

### Local proposals to fix the thermal overloads in AEP zone

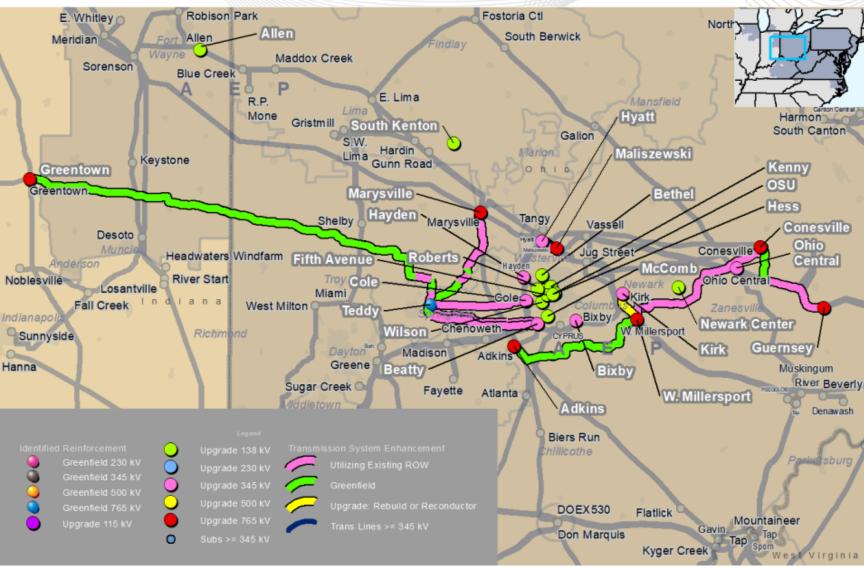
Proposal ID #	Proposing Entity	Total Cost (\$)	Target area	Projected ISD
515	AEPSCT	\$35,744,507	AEP/Columbus area Local	11/2029
662	AEPSCT	\$14,816,619	AEP/Columbus area Local	01/2029
298	AEPSCT	\$7,814,003	AEP/Columbus area Local	08/2029
996	AEPSCT	\$70,644,239	AEP/Columbus area Local	04/2030
341	AEPSCT	\$37,375,449	AEP/Columbus area Local	04/2030
672	CNTLTM	\$105,924,602	AEP/Columbus area Local	06/2030
626	AEPSCT	\$7,366,906	AEP/Columbus area Local	05/2030
980	AEPSCT	\$7,274,968	AEP/Columbus area Local	03/2029
377	AEPSCT	\$29,625,065	AEP/Columbus area Local	09/2029
757	AEPSCT	\$63,200,332	AEP/Columbus area Local	04/2030
873	AEPSCT	\$58,565,111	AEP/Columbus area Local	05/2030
459	AEPSCT	\$27,284,855	AEP/Columbus area Local	05/2030
354	AEPSCT	\$15,786,044	AEP/Columbus area Local	04/2030
439	AEPSCT	\$15,174,096	AEP/Columbus area Local	01/2030



### **Shortlist:** Presented in Nov. TEAC

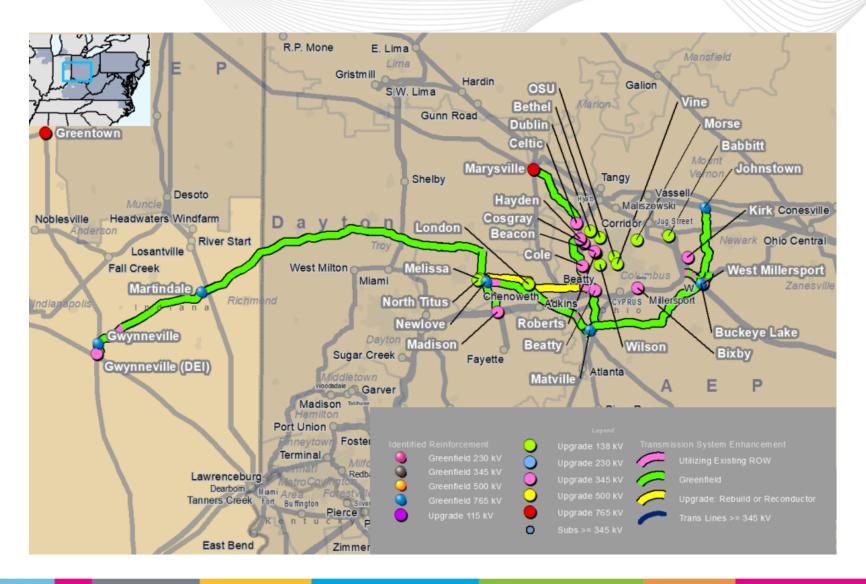
- 1. Proposal #570
- 2. Proposal #152
- 3. Proposal #239



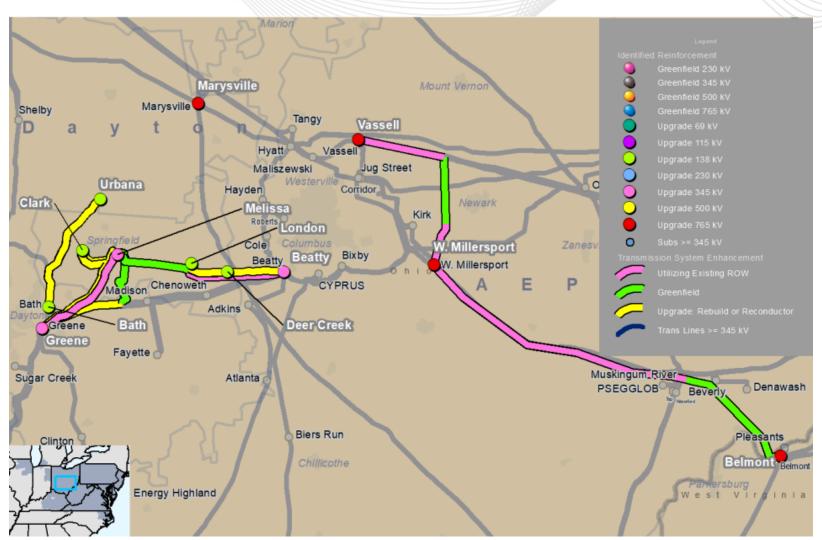














### 2030 Gen Deliv Results

Proposal ID #	Proposing Entity	Proposal Cost (\$M)	# of Remaining overloads (14 total)	Approximate cost to resolve remaining Violations (\$M)	# of New overloads	Projected Cost (\$M)	Projected ISD
220	TDNSDC/FF	1 400 41	2	406.20	0	4 500 70	2020
239	TRNSRC/FE	1,492.41	2	106.38	0	1,598.79	2030
570	TRNSRC/FE	2,775.19	0	0	0	2,775.19	2031
51 (Part of 570)	TRNSRC/FE	1,097.75	4	290.46	0	1,341.68	2030
152	NXTMID/Exelon	2,921.12	0	0	0	2,921.12	2031
152 (2030 Components)	NXTMID	1,465.75	1	70.64	1 (765KV terminal)	1,536.39+	2030

+ Unsolved overloads (related solution cost is not available)

## 2030 N-1 Voltage Results review

#### 2030 N-1 Voltage Performance in PJM West (AEP, ATSI, Dayton, DEOK)

Proposal ID	Submitter	Solve existing voltage issue?	Create new voltage issue?
152	NXTMID	YES	NO
152 (2030 components)	NXTMID	YES	NO
51 (Part of 570)	TRNSRC/FE	YES	NO
570	TRNSRC/FE	YES	NO
239	TRNSRC/FE	YES	NO



### 2030 N-1-1 Thermal Results

Proposal ID #	Proposing Entity	Known issue unsolved if any	New facility issues
51 (Part of 570)	TRNSRC/FE	05KENNY05ROBERT 138kV 05INNOVATION05INNOVAT2EQ/1EQ 345/138KV	none
570	TRNSRC/FE	No issue	none
152	NXTMID/Exelon	No issue	05CANAL-05CYPRUS12 138KV
239	TRNSRC/FE	05MALIS05POLARS 138KV	none
152 (2030 components)	NXTMID/Exelon	No issue	05CANAL-05CYPRUS12 138KV

## 2030 N-1-1 Voltage Results

#### 2030 N-1-1 Voltage Performance in PJM West (AEP, ATSI, Dayton, DEOK)

Proposal ID	Submitter	Solve existing voltage issue?	Create new voltage issue?	Note
239	TRNSRC/FE	Yes	No	
51 (Part of 570)	TRNSRC/FE	Yes	No	
570	TRNSRC/FE	Yes	No	
152	NXTMID/Exelon	Yes	No	
152 (2030 Components)	NXTMID/Exelon	No		Not solve existing voltage drop issue at Marysville, Vassell, etc. New voltage drop issue at proposed 765 kV substations Mateville, Buckeye Lake, etc



#### 2032 Generator Deliverability Performance in PJM West (AEP, ATSI, Dayton, DEOK)

Proposal ID	Submitter	Unsolved issues 765 kV 345 kV		Create new issues 765 kV 345 kV		Performance
152	NXTMID	0	17	0	0	high
570	TRNSRC/FE	0	17	0	0	high
239	TRNSRC/FE	0	33	0	1	Mid-high



## 2032 N-1 Voltage Results review

#### 2032 N-1 Voltage Performance in PJM West (AEP, ATSI, Dayton, DEOK)

Proposal ID	Submitter	Solve existing voltage issue?	Create new voltage issue?	
152	NXTMID	Yes	No	
570	TRNSRC/FE	Yes	No	
239	TRNSRC/FE	Yes	No	



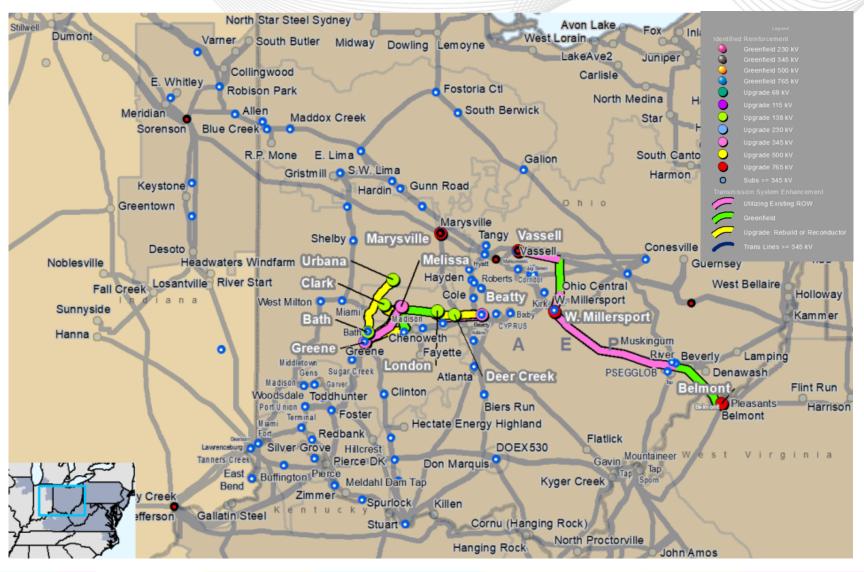
## 2032 N-1-1 Voltage Results review

#### 2032 N-1-1 Voltage Performance (765KV and 345KV only) in PJM West (AEP, ATSI, Dayton, DEOK)

Proposal ID	Submitter		of Volt Drop lation	Number of Volt Magnitude Violation		Number of New Non-Convergent	Note
		765 kV	345 kV	765 kV	345 kV		
2025-W1-239	Transource/FE	1030	2452	2536	2649	0	Voltage drop and magnitude issues in massive PJM west area
2025-W1-152	NXTMID/Exelon	363	1226	192	268	0	Voltage drop and magnitude issues in wide PJM west area
2025-W1-570	Transource/FE	0	0	0	0	0	



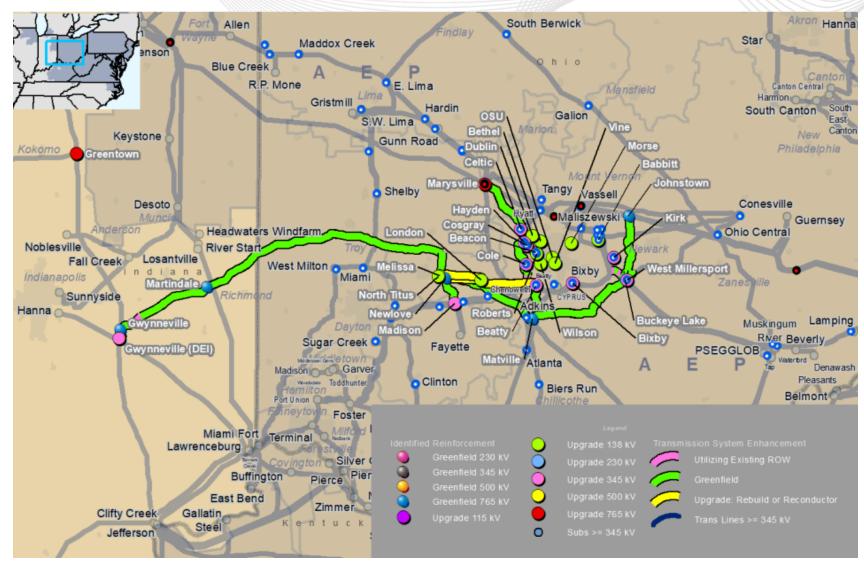
### N-1-1 Voltage Violation for 765kV and 345kV Subs in 2025-W1-239



- 345kV Voltage Violation
- 765kV Voltage Violation



### N-1-1 Voltage Violation for 765kV and 345kV Subs in 2025-W1-152



- 345kV Voltage Violation
- 765kV Voltage Violation

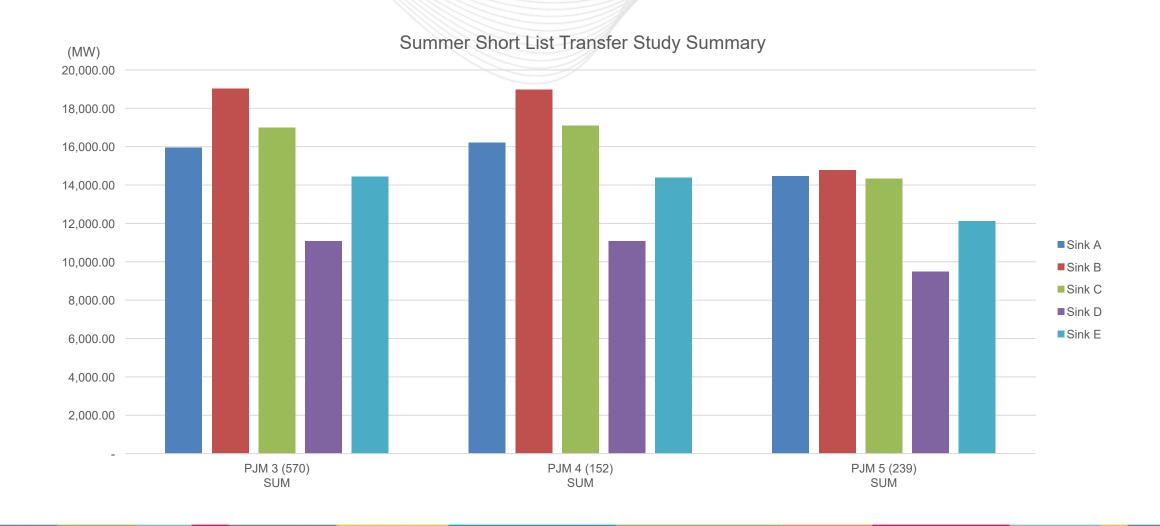




- Source: AEP Generation
- Sink:
  - A: AEP-59.79%, Dayton-14.70%, DEOK-22.61%, ATSI-2.9%
  - B: AEP-39.67%, Dayton-9.75%, DEOK-15.0%, ATSI-1.92%, PPL-13.46%, PECO-10.1%, PSEG-10.1%
  - C: AEP-46.67%, Dayton-11.47%, ATSI-2.26%, PPL-15.84%, PECO-11.88%, PSEG-11.88%
  - D: Dayton-21.51, ATSI-4.24%, PPL-29.71, PECO-22.27%, PSEG-22.27%
  - E: AEP-25.93 ,Dayton-15.93% , ATSI-3.14%, PPL-22%, PECO-16.5%, PSEG-16.5%



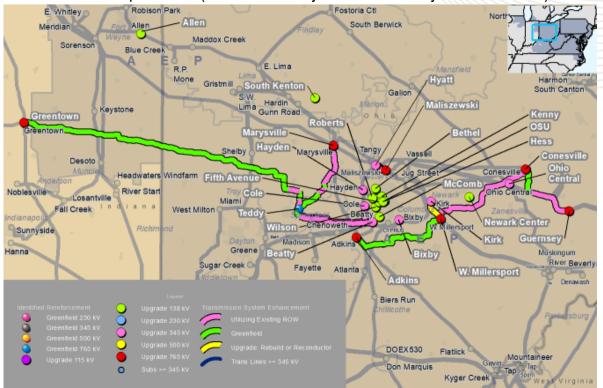
#### Transfer study (345KV and Above)



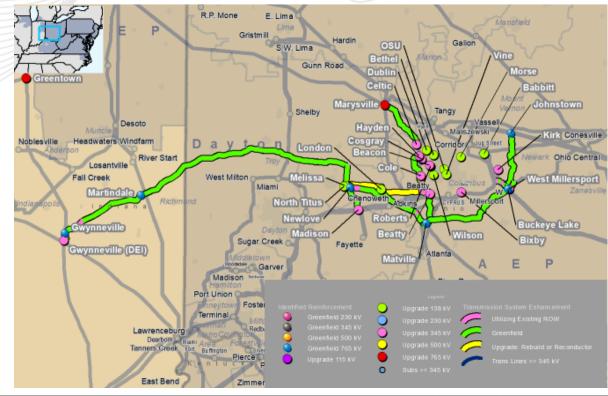


#### West Regional Cluster Shortlist Risk Assessments

#### Transource/FE Proposal 570 (Greentown-Marysville & Guernsey-Adkins 765 kV)

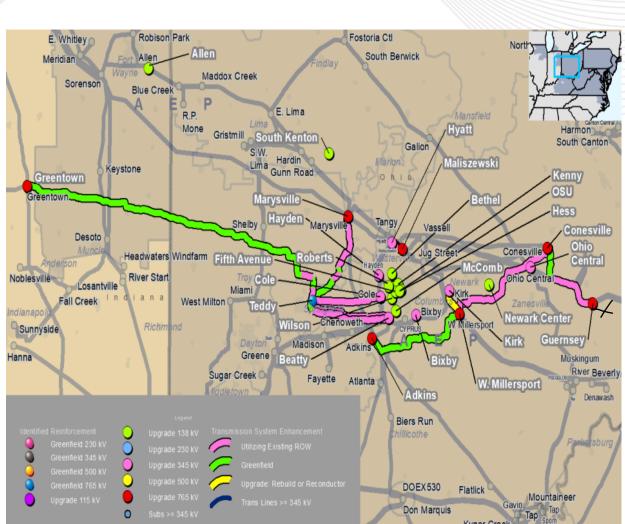


#### NextEra/Exelon Proposal 152 (Gwynneville-Johnstown 765 kV)



Proposal ID	Proposing Entity	Proposal Description	Proposal Cost Estimate (\$M)	Independent Cost Estimate (\$M)	Cost Estimate Risk	Cost Containment Risk	Schedule Risk	T OBSTRUCTABILITY	ROW/Land Acquisition Risk	Coordination Risk	Proposing Entity Experience & Capability Risk		Proposed ISD	New 765 kV Ckt. Miles	New 345 kV Ckt. Miles	New EHV Ckt. (Total Miles)	New EHV Ckt. (Greenfield Miles)
570	Transource /FE	Ohio Seven Year Solution	\$2,775.19	\$3,418.68	Medium	Medium	Medium	Medium	Medium- High	Low	Low	Medium	10/1/2031	291.5	35	326.5	277.4
152	NextEra/ Exelon	Gwynneville - Johnstown 765kV	\$2,921.12	\$4,087.27	Medium	Medium	Medium- High	Medium-High	High	Low	Low-Medium	High	12/1/2031	216	65	281	281





#### Selected Solution: Modified Proposal 570 Required IS Date: 6/1/2030

#### **PJM Recommends Transource Proposal #570**

- Technically superior to other proposals with significantly better voltage performance under N-1-1 conditions
- More cost effective: Approx. ~\$600M less than proposal #152 based on independent cost
- Lower constructability and regulatory risk and higher utilization of existing ROWs.



## Detailed Component List (570)

10100					
Component Description	Estimated Cost(\$)	Projected IS Date			
Greentown Substation Expansion:					
Create a new 765KV line position with three 100 Mvar single-phase reactors. Install two 765 kV circuit					
breakers.	45,294,123	10/31/2031			
Greentown - Teddy 765 kV Line:					
Construct a 137 mile long 765kV AC overhead transmission line between the existing Greentown 765					
kV substation and the proposed Teddy 765 kV Substation.	633,786,609	10/31/2031			
Teddy 765/345 kV Substation:					
Construct a new 765/345KV greenfield substation interconnecting the new 765KV Marysville line and					
the new 765KV Greentown line with three 100 MVar single-phase reactors on each 765 kV line. Install					
nine 765 kV circuit breakers. Install two 765/345KV, 2250MVA transformer. Install nine 345 kV circuit					
breakers. Install two 345KV capacitor banks.	228,334,882	10/31/2030			
Teddy - Marysville 765 kV:					
Construct a 35.4 mile long 765kV AC overhead transmission line between the proposed 765 kV Teddy					
substation and the existing 765 kV Marysville substation.	176,458,033	10/31/2030			
Marysville Substation Upgrade:					
Create a new 765KV line position. Install two 765KV circuit breakers. Create a new 765KV line position					
to relocate the existing 765KV Sorenson line. Install one 765KV circuit breaker. Add one 765KV					
500MVAR STATCOM. Add one 765/345KV, 2250MVA transformer. Add two 345KV 2-261.9 MVAR	004 000 004	40/04/0000			
capacitor banks.	281,829,324	10/31/2030			
Teddy - Beatty DCT 345 kV:					
Construct a new 32 mile long double circuit 345 kV line between the proposed Teddy 345 kV	475 405 040	40/24/2020			
substation and existing Beatty 345 kV substation.	175,185,619	10/31/2030			
Cole Substation Upgrade:					
Create a new 345KV line position to interconnect the new 345KV Teddy line.	1,000,000	10/31/2030			
Beatty Substation Upgrade:					
Create a new 345KV line position to interconnect the new 345KV Teddy line. Install two 345KV circuit	0.057.400	40/04/0000			
breakers.	3,857,100	10/31/2030			



Component Description	Estimated Cost(\$)	Projected IS Date
Guernsey Substation Upgrade: Create a new 765KV line position to interconnect the new 765KV Conesville line. Install one		
765KV circuit breaker.	5,541,762	10/31/2030
Guernsey - Conesville 765 kV:		
Construct a new 32 mile long single circuit 765 kV AC overhead transmission line between the existing Guernsey 765 kV Substation and the new 765 kV Conesville Substation.	166,168,865	10/31/2030
West Millersport Substation Upgrade:		
Construct a new 765 kV West Millersport yard. Install four circuit breakers. Install one 765/345KV, 2250MVA transformer. Install one 345 kV circuit breaker.	118,108,319	10/31/2031
Bixby - West Millersport 345 kV:		
Retire a segment of the Bixby to Ohio Central 345 kV line and install approximately 3 miles of greenfield single circuit 345 kV line from structure 284 to West Millersport substation.	12,000,001	10/31/2031
Bixby Station Upgrade:		
New relaying at Bixby 345 kV substation.	75,000	10/31/2031
West Millersport - Adkins 765 kV: Construct a new 38 mile long single circuit 765kV AC overhead transmission line between		
the new 765 kV West Millersport substation and the new 765 kV Adkins substation.	201,833,315	10/31/2031
West Millersport - Kirk 345 kV: Rebuild 6.37 mile section of the double circuit Muskingum River - Ohio Central 345kV line	24,300,000	10/31/2031
Hyatt - Maliszewski Double Circuit 345 kV:	24,300,000	10/31/2031
Rebuild 5.25 mile section of the double circuit Ohio Central - East Lima 345 kV line from Hyatt Station to Maliszewski Station.	34,125,000	10/31/2031



Component Description	Estimated Cost(\$)	Projected IS Date
<b>Hayden - Cole 345 kV:</b> Rebuild 7.89 mile of Beatty - Hayden 345 kV line.	37,872,000	10/31/2031
Newark Center Station Upgrade: Replace wavetrap and limiting bus conductor at Newark Center substation. Ohio Central Extension:	700,000	10/31/2031
Extend existing Ohio Central 345kV Extension by one span to cut into the existing Conesville - Kirk 138kV line to loop the existing Conesville - Kirk 138kV Line into Ohio Central Station by installing four new 3-pole steel pole structures.	3,500,001	10/31/2031
Allen Substation Upgrade: Replace bus conductor at Allen station.	50,000	10/31/2031
Roberts - Kenny 138kV Rebuild: Retire existing 3.18 miles long Roberts - Kenny 138kV underground line and install new underground cable for increased require ratings.	66,364,219	10/31/2031
Wilson - Fifth Avenue 138kV line: Perform sag remediation on the Wilson - Fifth Avenue 138 kV line.  McComb Substation Upgrades:	18,255,715	10/31/2031
Install one 138/13 kV transformer at McComb substation. Install two 138kV breakers. Install one 13kV breaker. Perform 13kV bus work and install one 13kV bus-tie breaker.	<del>7,187,418</del>	<u> </u>
Bethel Substation Upgrade: Replace one 138KV circuit breaker.	500,000	10/31/2031



Component Description	Estimated Cost(\$)	Projected IS Date
OSU Station Upgrade: Replace one 138KV circuit breaker.	500,000	10/31/2031
Hess 138 kV Substation Upgrade: Replace one 138KV circuit breaker to alleviate CT thermal limit.	700,000	10/31/2031
South Kenton Substation: Replace line side disconnect switches and bus tie switch on East Lima line at South Kenton substation.	110,000	10/31/2031
Meadow Lake Substation Circuit Breaker: Replace four 345 kV circuit breakers.	4,000,000	10/31/2031
<b>Teddy - Cole 345 kV #2 Circuit:</b> Install second circuit on the vacant side of the existing 9.7 mile long 345kV AC overhead transmission line between the existing Cole 345 kV Substation and the existing Beatty 345 kV Substation.	21,630,661	10/31/2030
Conesville Station Expansion: Upgrade the existing Conesville substation to include a 765 kV yard and expand the 345 kV yard. Install six 765 kV circuit breakers. Install one 765/345KV, 2250MVA transformer. Install one circuit 345 kV circuit breaker. Replace Wavetrap and circuit switcher in 138 kV yard.	140,968,702	10/31/2030
Conesville - West Millersport 765 kV: Construct a new 49.1 mile long single circuit 765kV AC overhead transmission line between the new Conesville 765 kV substation and the new West Millersport 765 kV substation.	248,977,454	10/31/2031
Adkins Station Expansion: Construct a 765KV yard at Adkins Substation. Install seven 765 kV circuit breakers. Install three 100MVar single-phase reactors on each 765 kV line.	102,977,072	10/31/2031



Component Description	Estimated Cost(\$)	Projected IS Date
Ohio Central Station Upgrade: Install two new 138 kV circuit breakers.	3,000,000	10/31/2031
Kammer- Dumont Structures:	3,000,000	10/31/2031
Lower the existing Kammer to Dumont 765 kV line between structure 169 and 170 to facilitate crossing the proposed Conesville to Guernsey 765kV Line.	2,000,000	10/31/2030
Ohio Central - Fostoria Central Structure:		
Remove structure 10 and replace with lower structure to lower the line.	1,000,000	10/31/2031
Gavin - Marysville Structures:		
Raise the existing Gavin to Marysville 765kV line between structures 358 and 359 to facilitate crossing the proposed Teddy to Beatty 345kV Line.	3,000,000	10/31/2030
East Springfield - London Structures:		
Lower the existing First Energy East Springfield 138kV line between structures 29 and 30 on the proposed Teddy - Beatty 345kV Line.	1,000,000	10/31/2030
Beatty - Hayden Structures:		
Lower the existing Beatty - Hayden 345kV line between structures 2 and 3 to facilitate crossing the proposed Teddy – Beatty 345kV Line.	3,000,000	10/31/2030
Total	<mark>2,775,191,194</mark> 2,768,003,776	



#### Proposed Solution: Modified Proposal 570

Circuit	Existing Ratings (SN/SE/WN/WE) (MVA)	Preliminary Ratings (SN/SE/WN/WE) (MVA)
Greentown - Teddy 765 kV line	N/A	8197/8197/10350/10350
Teddy - Marysville 765 kV line	N/A	6625/6625/6625
Teddy 765/345 kV Transformer 1	N/A	2240/2523/2565/2664
Teddy 765/345 kV Transformer 2	N/A	2240/2523/2565/2664
Marysville 765/345 KV Transformer 1	N/A	2240/2523/2240/2523
Teddy - Beatty 345 kV line	N/A	1894/2254/2103/2390
Teddy - Cole 345 kV line	N/A	1385/1385/1750/1750
Guernsey - Conesville 765 kV line	N/A	5300/5300/5300
Conesville - West Millersport 765 kV line	N/A	5300/5300/5300
Conesville 765/345 kV Transformer 1	N/A	2240/2523/2565/2664
West Millersport 765/345 kV Transformer 1	N/A	2240/2523/2565/2664
West Millersport - Adkins 765 kV line	N/A	6600/6600/6625/6625
Meadowbrook - Reynolds 345 kV line 1	1868/1868/2315/2315	1859/2246/2347/2387
Meadowbrook - Reynolds 345 kV line 2	1868/1868/2315/2315	1868/2246/2315/2315
Kenny - Roberts 138 kV line	213/311/221/318	282/377/356/429
Newark Center - Conesville 138 kV line	N/A	348/407/431/477
Bixby - West Millersport 345KV line	N/A	1385/1841/1750/2092
West Millersport - Kirk 345 kV line	1132/1132/1437/1437	1385/1790/1750/1790
Wilson - Fifth Ave 138 kV line	219/223/227/281	223/310/281/349
Fifth Ave - Hess South 138 kV line	187/207/207	187/240/247/285
Hayden - Cole 345 kV line	1409/1409/1781/1781	1385/1503/1750/2092
Hyatt - HyattSW2 345 kV line	971/1419/1234/1585	1385/1841/1750/2092
HyattSW2 - Maliszewski 345 kV line	1483/1690/1875/2137	1483/1841/1875/2092
Allen - Tillman 138 kV line	293/341/370/406	323/451/408/506
South Kenton - Lynn 138 kV line	164/180/185/185	185/185/185



## Short Circuit Update 2025W1 – Regional Cluster



2025W1 – Regional Cluster Preferred Solution: Breaker Upgrades

Process Stage: First Read

Criteria: Short Circuit

**Assumption Reference:** 2025 RTEP assumptions

Model Used for Analysis: 2030 RTEP Short Circuit base case + Preliminary

preferred solution

Proposal Window Exclusion: None

**Problem Statement:** 

In the 2030 RTEP Short Circuit base case that includes the preliminary case for preferred solution, a total of 20 breakers were identified to be over duty, 1 in AEP, 6 in PPL & 13 in Dominion.

#### **Proposed Solution:**

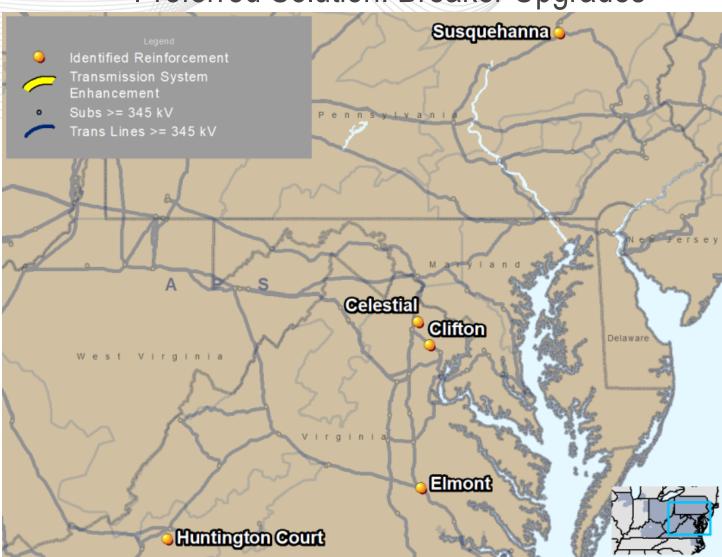
Replace all over duty breakers with higher capacity breakers as outlined on the next set of slides.

Note: Final selection of circuit breaker upgrades will be adjusted based on short circuit analysis results of the final selected solution.

Estimated Cost: \$18.5 M

Required IS Date: 6/1/2030

Projected IS Date: 6/1/2030





#### Preliminary Preferred Solution Short Circuit Evaluation

- Posted window case based on 2030 topology
- Considered impacts to existing breakers in entire PJM footprint

		(	Over Dut	ty Bus (Qt	v)		Over Duty CBs		Ma	ximum Fa	ult Duty (I	(A)		
Scenario Description	69 kV	138 kV	230 kV		500 kV	765 kV	Total	69 kV	138 kV	230 kV	345 kV	500 kV	765 kV	Comment
2025 W1 Regional Cluster Preferred Solutions	1	0	18	0	1	0	20	48.3	NA	76.2	NA	55.8	ΝΔ	Brambleton 230kV bus and Mars 230kV bus operating below the 80kA rated capability

TO	Breaker Qty	Cost (\$M)
AEP	1	1.0
PPL	6	4.5
Dominion	13	13.0
Total	20	18.5



#### AEP Area - Short Circuit Upgrades

Item	BUS	Breaker Qty	Existing Rating (kA)	Proposed Rating (kA)	Cost (\$M)
1	Huntington Court 69.kV	1	25	40	1.0
					1.0

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#### PPL Area - Short Circuit Upgrades

Item	BUS	Breaker Qty	Existing Rating (kA)	Proposed Rating (kA)	Cost (\$M)
1	Susquehanna 230.kV	6	50	63	4.5
					4.5

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#### Dominion Area - Short Circuit Upgrades

Item	BUS	Breaker Qty	Existing Rating (kA)	Proposed Rating (kA)	Cost (\$M)
1	Clifton Sub 230.kV	3	63kA	80kA	3
2	Clifton Sub 500.kV		40kA	63kA	1
3	Elmont Sub 230.kV	7	63kA	80kA	7
4	Celestial Sub 230.kV	2	63kA	80kA	2
		13			13

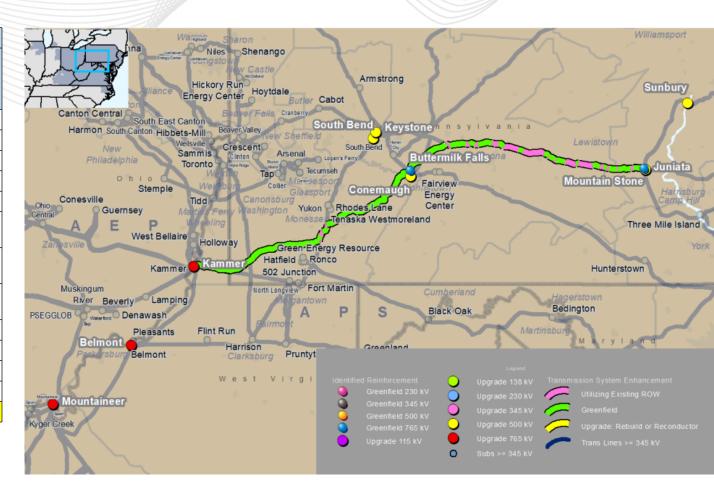


## 2025 Window 1 Cost Summary



#### MAAC Regional Cluster Solution

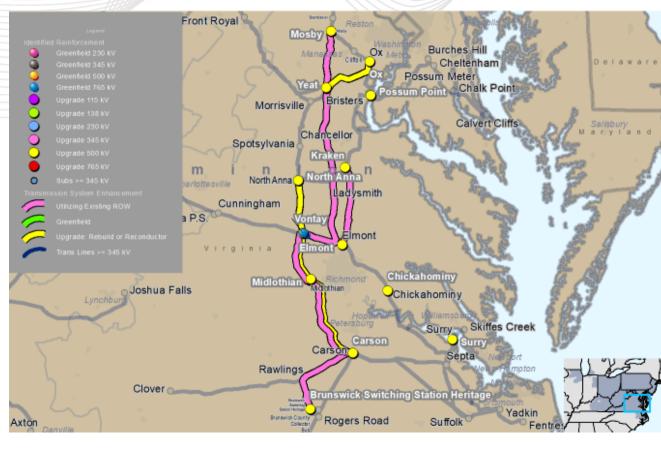
ľ	MAAC Regional Cluster Solution - NextEra/Exelon Proposal 2025-W1-237					
PJM Proposa I ID	Component Title	Proposed Cost (\$M)	Independent Cost (\$M)			
237	Kammer - Buttermilk Falls 765kV	\$694.72	\$718.20			
237	Buttermilk Falls - Mountain Stone 765kV	\$633.35	\$680.40			
237	Mountain Stone-Juniata 500kV	\$5.32 \$6.84				
237	Mountain Stone 765kV Substation	\$166.94 \$134.01				
237	Buttermilk Falls 765kV Substation	\$170.29	\$178.88			
237	South Bend - Keystone 500kV terminal equipment upgrade	\$4.68	\$4.39			
237	Keystone-Juniata 500 kV terminal equipment upgrade	\$4.68	\$4.39			
237	Mountaineer-Belmont 765 kV terminal equipment upgrade	\$6.75	\$6.35			
237	Kammer substation upgrade	\$13.50	\$14.56			
237	Juniata substation upgrade	\$9.95 \$20.96				
237	Sunbury 500 kV substation upgrades	\$4.98 \$7.43				
237	Conemaugh circuit breaker upgrades	\$23.42	\$20.92			
	Total Cost Estimate	\$1,738.59	\$1,797.32			





#### South Regional Cluster Solution

South Regional Cluster Solution - Dominion Portfolio Proposal 2025-W1-275				
Sub-			Indonesident Coet	
Proposal	Component Title	Proposed Cost (\$M)	Independent Cost (\$M)	
ID			(SIAI)	
9	Line 576 Rebuild - Vontay to Midlothian	\$102.70	\$126.45	
9	Midlothian Equipment Upgrade	\$2.16	\$3.37	
117	Line 539 Rebuild - Yeat to Ox	\$122.66	\$127.50	
117	Ox Substation Terminal Equipment Upgrade	\$2.25	\$2.58	
117	Yeat Substation Terminal Equipment Upgrade	\$0.33	\$0.74	
126	Chickahominy Substation Line Terminal Upgrade	\$0.03	\$0.21	
126	Surry Substation Line Terminal Upgrade (993592 Alt_1)	\$2.46	\$3.03	
238	Line 563 Rebuild - Carson to Midlothian (99-3597)	\$228.48	\$205.77	
238	Carson Terminal Equipment Uprate (993597)	\$6.15	\$8.69	
238	Midlothian Terminal Equipment Uprate (993597)	\$2.43	\$3.37	
243	Carson Substation 500 KV Equipment Upgrade	\$12.44	\$13.90	
247	New 765/500kV Switching Station - Vontay	\$217.76	\$170.39	
247	500 kV Cut-In - Cunningham to Elmont	\$6.69	\$4.89	
247	500 kV Cut-In - North Anna to Midlothian	\$6.69	\$4.89	
247	765 kV Cut-In - Joshua Falls to Yeat	\$8.36	\$5.58	
253	Line 5008 Cut-in to Mosby Substation	\$6.69	\$5.40	
253	Mosby Substation Equipment Upgrade	\$9.56	\$20.30	
306	New 500 kV Line - Elmont to Kraken	\$165.65	\$189.49	
306	Elmont Substation Line Terminal	\$6.04	\$11.59	
306	Kraken Substation Line Terminal	\$8.61	\$15.85	
339	Line 576 Rebuild - North Anna to Vontay	\$102.70	\$114.05	
339	North Anna Equipment Upgrade	\$2.16	\$2.56	
815	New HVDC Line - Heritage to Mosby	\$2,271.70	\$2,220.00	
815	Heritage Substation – HVDC Converter Station Scope	\$773.73	\$879.49	
815	Mosby Substation - HVDC Converter Station Scope	\$745.42	\$865.09	
916	Line 560 Rebuild - Possum Point to Burches Hill	\$3.49	\$5.75	
916	Possum Point Substation Equipment Upgrade	\$0.40	\$1.04	
N/A	Scope Change: Yeat - Vint Hill Uprate	\$0.00	\$0.00	
	Total Cost Estimate	\$4,817.73	\$5,011.96	

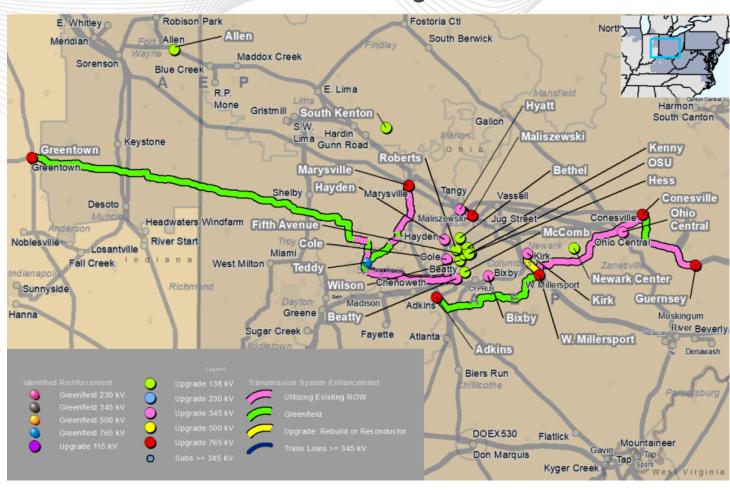




#### West Regional Cluster Solution - Transource/FE Proposal 2025-W1-570 (Modified)

Component Title	Proposed Cost (\$M)	Independent Cost (\$M)
Greentown Station Expansion	\$45.29	\$45.29
Greentown - Teddy 765 kV Line	\$633.79	\$863.10
Teddy 765/345 kV Station	\$228.33	\$265.15
Teddy - Marysville 765 kV	\$176.46	\$223.02
Marysville Station Upgrade	\$281.83	\$309.52
Teddy - Beatty DCT 345 kV	\$175.19	\$246.46
Cole Station Upgrade	\$1.00	\$2.26
Beatty Station Upgrade	\$3.86	\$4.71
Guernsey Station Upgrade	\$5.54	\$22.93
Guernsey - Conesville 765 kV	\$166.17	\$201.60
West Millersport Station Upgrade	\$118.11	\$114.52
Bixby - West Millersport 345 kV	\$12.00	\$17.67
Bixby Station Upgrade	\$0.08	\$0.14
West Millersport - Adkins 765 kV	\$201.83	\$263.97
West Millersport - Kirk 345 kV	\$24.30	\$35.85
Hyatt - Maliszewski Double Circuit 345 kV	\$34.13	\$30.21
Hayden - Cole 345 kV	\$37.87	\$36.04
Newark Center Station Upgrade	\$0.70	\$0.70
Ohio Central Extension	\$3.50	\$3.07
Allen Station Upgrade	\$0.05	\$0.07
Roberts - Kenny 138kV Rebuild	\$66.36	\$44.05
Wilson - Fifth Avenue 138kV line	\$18.26	\$1.23
Bethel Station Upgrade	\$0.50	\$0.88
OSU Station Upgrade	\$0.50	\$0.88
Hess 138 kV Station Upgrade	\$0.70	\$1.25
South Kenton Station	\$0.11	\$0.96
Meadow Lake Station Circuit Breaker	\$4.00	\$5.48
Teddy - Cole 345 kV #2 Circuit	\$21.63	\$6.30
Conesville Station Expansion	\$140.97	\$150.86
Conesville - West Millersport 765 kV	\$248.98	\$309.33
Adkins Station Expansion	\$102.98	\$188.15
Ohio Central Station Upgrade	\$3.00	\$1.87
Kammer Dumont Structures	\$2.00	\$6.07
Ohio Central - Fostoria Central Structure	\$1.00	\$0.86
Gavin - Marysville Structures	\$3.00	\$2.21
East Springfield - London Structures	\$1.00	\$1.96
Beatty - Hayden Structures	\$3.00	\$2.04
Total Cost Estimate	\$2,768.00	\$3,410.66

#### West Regional Cluster Solution







Category	Proposal Cost Estimate (\$M)	Independent Cost Estimate (\$M)
In-Zone Related Total	\$2,298.10	N/A
West Regional Cluster Solution	\$2,768.00	\$3,410.66
MAAC Regional Cluster Solution	\$1,738.59	\$1,797.32
South Regional Cluster Solution	\$4,817.73	\$5,011.96
Short Circuit Upgrades	\$18.5	\$18.5
Regional Transfer Related Total	\$9,342.83	\$10,238.44
2025 RTEP Total	\$11,640.92	



# Scope Change & Cost Updates Baseline Reliability Projects



#### Dominion Transmission Zone: Baseline New Mars – Lockridge – Golden 230kV Lines New Mars – Golden 500kV Line

Scope change for B3800.210 – B3800.212 (230kV Line Mars – Lockridge – Golden & 500kV Line Mars – Golden)

Part of the recommended solution for 2022 Window 3 (2022-W3-692) is to construct a new 230kV line from Mars – Lockridge – Golden and a new 500kV line from Mars – Golden.

#### **Original Solution:**

- Build a new 230kV line approximately 5.2 miles from Mars Lockridge on 500/230kV double circuit structures to achieve a summer rating of 1573 MVA. Install 230kV equipment at Mars and Lockridge substations. (B3800.210) \$57.95M
- Build a new 230kV line approximately 2.9 miles from Lockridge Golden on 500/230kV double circuit structures to achieve a summer rating of 1573 MVA. Install 230kV equipment at Golden and Lockridge substations. (B3800.211) \$56.93M
- Build a new 500kV line approximately 8.3 miles from Mars substation to Golden substation on 500/230kV double circuit structures to achieve a summer normal rating of 4357 MVA. Install 500kV equipment at Golden and Mars substations. (B3800.212)
   \$228.04M

**Transmission Estimated Cost:** \$342.92M

Required in-service date: 6/1/2027

Projected in-service date: 6/1/2027

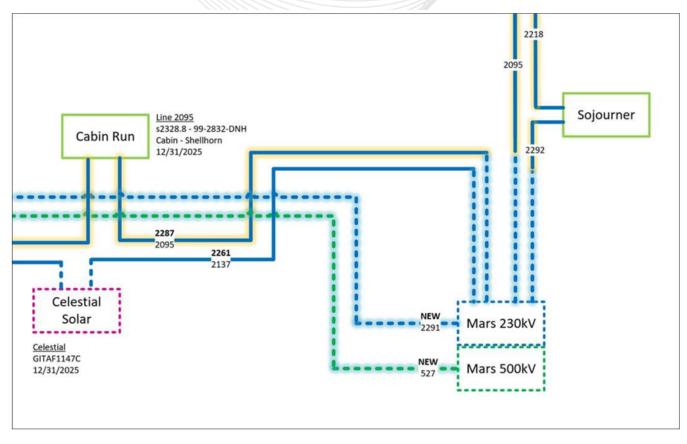
Previously Presented: 12/5/2023

Pleasant View

B3800.210 - B3800.212 part of solution 2022-W3-692



#### Dominion Transmission Zone: Baseline New Mars – Lockridge – Golden 230kV Lines New Mars – Golden 500kV Line



Transmission Arrangement for area surrounding Mars before addition of Golden-Mars 5-2 project (after completion of Wishing Star – Mars project)



#### Revised Solution (Presented at 4/1/2025 TEAC):

- Remove 230kV line #2095 Mars Shellhorn and 230kV line #2292 Mars Sojourner in the existing transmission corridor between Sojourner and Mars substations so that they can be re-routed to the south side of Mars substation, adding approximately 2 miles of new conductor. This is to allow for termination of the 5-2 Golden Mars circuits into Mars substation.
- Cut 230kV line #2095 Mars Shellhorn into Sojourner substation, creating 230kV line #2427 (Mars - Sojourner) and 230kV line #2095 (Sojourner -Shellhorn).
- Upgrade 4 230kV breakers at Sojourner substation from 63kA to 80kA

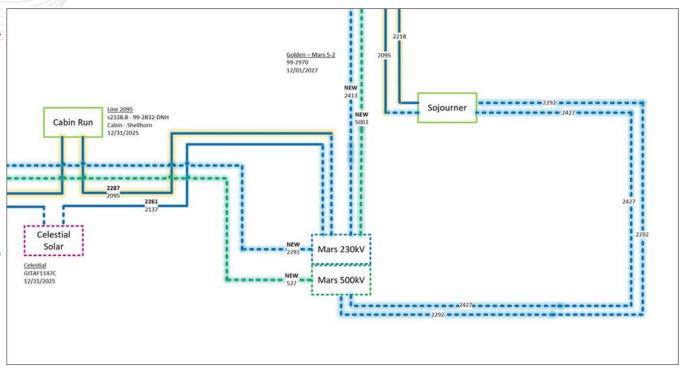
#### **Reason for Scope Change & Cost Update:**

- The new Golden Mars 230kV & 500kV lines will intersect with the existing transmission corridor containing the 230kV lines Mars-Shellhorn Line #2095, Mars-Sojourner Line #2292, Celestial-Mars Line #2161, and Cabin Run-Mars Line #2287 just east of the Old Ox/Carters School Road Intersection. Spatial and FAA constraints along these existing lines would prevent installation of the Golden Mars lines along any of the alternative routes.
- Cost increase due to additional 2 miles of transmission line and real estate required to reroute line #2095 Mars – Shellhorn & line #2292 Mars – Sojourner.

Additional Cost Estimate: \$97M (B3800.210 \$49M + B3800.212 \$48M)

**Total Proposed Cost Estimate: \$439.92M** 

## Dominion Transmission Zone: Baseline New Mars – Lockridge – Golden 230kV Lines New Mars – Golden 500kV Line

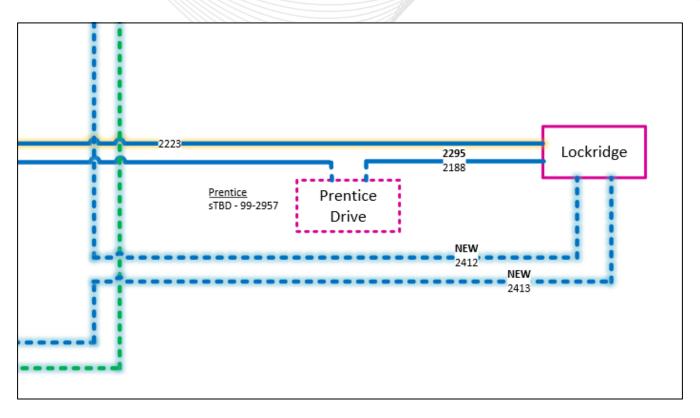


**Transmission Arrangement for area surrounding Mars with proposed changes** 

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## Dominion Transmission Zone: Baseline New Mars – Lockridge – Golden 230kV Lines



Proposed Transmission Arrangement for area surrounding Lockridge with addition of Golden-Mars 5-2 project



#### Additional Revised Solution:

- The 230kV Golden to Mars line was originally cut and terminated into Lockridge substation. Instead terminate the 230kV Golden to Mars line into nearby Prentice Drive substation
- Remove the two 230kV 80kA circuit breakers and associated terminal equipment from Lockridge substation and install at Prentice Drive substation

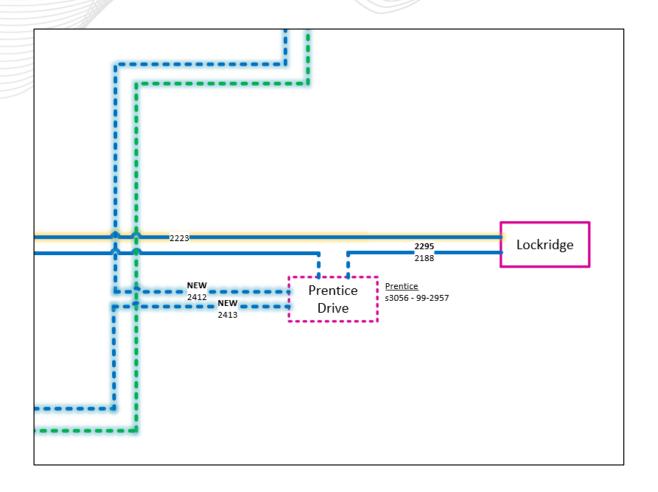
#### **Reason for Scope Change & Cost Update:**

- Requires less right-of-way and reduces Transmission Line material costs
- Avoids heavily constrained areas near Prentice with underground utilities and eliminates crossings of Lockridge Road and a distribution line
- Prentice allows alternating outages, unlike Lockridge, which would require a full substation outage or temporary configurations

Additional Cost Estimate: -\$8.3M (B3800.210 -\$4.15M + B3800.211 -\$4.15M)

**Total Proposed Cost Estimate: \$431.62M** 

## Dominion Transmission Zone: Baseline New Mars – Lockridge – Golden 230kV Lines





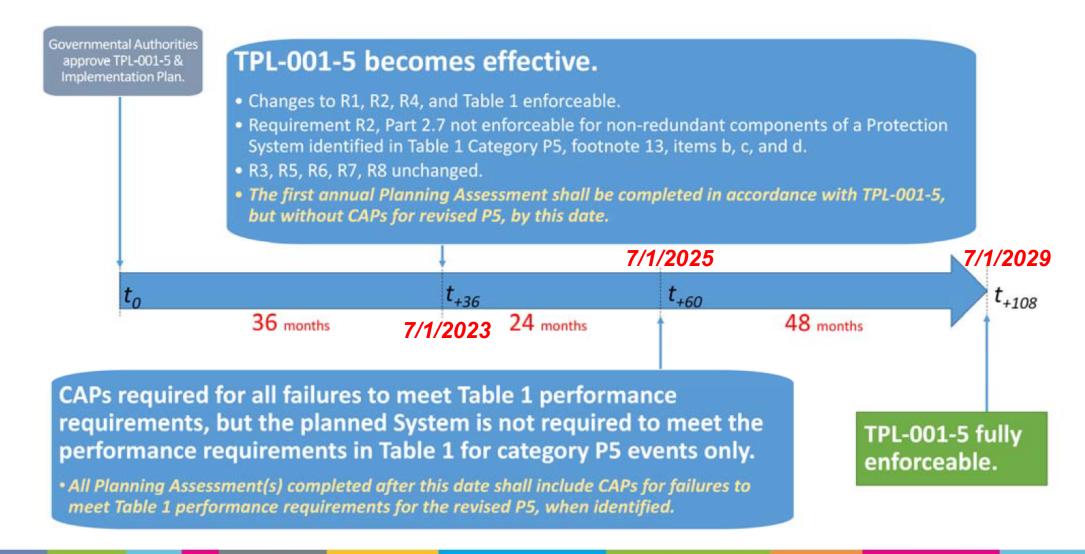
# TPL-001.5 P5: Submitted CAPs Recommended Solutions (Second Read)



- As previously presented during the August 2024 TEAC, PJM has determined that the P5 CAPs will be exempted as reliability violations on transmission substation equipment (OA, Schedule 6, section 1.5.8(p)). The construction responsibility for and ownership of each project shall be designated to the respective incumbent Transmission Owner.
- The solution to the violations resulting from lack of redundancy, lack of alarming, or DC supply issues including monitoring and alarming, is to incorporate local redundancy or implement needed alarms/protection/DC supply enhancements within existing substation equipment.
- PJM is presenting here a summary of P5 CAPs which were identified by TOs to mitigate violations from the 2024 Series RTEP (2029 SUM/WIN/LL cases).
  - PJM does not intend to post detailed contingency and substation information regarding the violations and CAPs due to CEII considerations.
- All expected P5 CAPs have been submitted by PJM Transmission Owners by the July 1<sup>st</sup> deadline.
   PJM is presenting the second and final batch of CAPs from the 2024 Series RTEP for first read today.
- The NERC Implementation Plan involving the development of CAPs for Category P5 planning events is provided on the following slide.



#### TPL-001-5.1 Implementation Plan Timeline





## ACE/APS/ATSI/BGE/DPL/JCPL/ME/PECO/PENELEC/ComEd

P5 CAPs: Baseline

Process Stage: Second Read

**Criteria:** Baseline Analysis

**Assumption Reference:** 2029 RTEP assumption

Model Used for Analysis: 2024 Series RTEP 2029 Summer, Winter & LL cases

Proposal Window Exclusion: Substation Exclusion

Problem Statement: In 2024 Series RTEP 2029 Summer, Winter & LL cases, multiple

thermal and voltage violations are observed due to multiple P5 contingencies.

#### **Proposed Solution:**

 TOs have submitted P5 mitigation projects that include upgrades listed below designed to eliminate the P5 contingency:

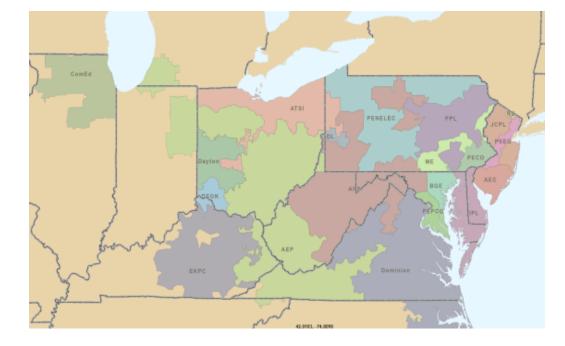
- Battery Monitoring
- Relay Upgrades
- Trip Coil Monitoring

**Transmission Estimated Cost:** \$35.759M

Ancillary Benefits: Installation of redundant equipment will prevent outage scenarios and

improve reliability of the transmission system.

Required in-service date: 6/1/2029 Projected in-service date: 7/1/2029





# ACE/APS/ATSI/BGE/DPL/JCPL/ME/PECO/PENELEC/ComEd P5 CAPs: Baseline

то		Total Cost (\$)	# of Substations By kV level				
		Total Cost (\$)		138	230	345	500
AEC	\$	120,000.00		5	2		1
APS	\$	12,789,217.06		6			7
ATSI	\$	2,345,681.00				3	
BGE	\$	340,000.00	3		2		2
DPL	\$	150,000.00		3	6		1
JCPL	\$	5,035,000.00			7		
ME	\$	4,450,500.00	1		4		2
PECO	\$	525,000.00		3	13		3
PENELEC	\$	9,303,672.04	2		4	2	1
ComEd	\$	700,000.00				6	



## 2025 RTEP:

2032 Scenario 5 & 6 Update

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- Introduction to Scenario 5 and Scenario 6 of year 2032
- Key takeaways
- Scenario 5:
  - Capacity Expansion
  - Powerflow model and study resutls
- Scenario 6: Powerflow model and study results



## Scenario 5 & 6: Background

## At the May 2025 TEAC, PJM agreed to analyze the following 7-Year (2032) scenarios.

Scenarios 5 and 6 are the focus of this update.

Scenario 3	Existing generation, GIA/ISA generation, Suspended ISA generation, Fast Lane Queue, TC1 queue, TC2 queue (with RRI), 7500MW NJ OSW, (Remove) Q1 deactivations, (Remove) withdrawn queues
Scenario 4	2032 base case + remove NJ/DE OSW (assume delays beyond 2032)
Scenario 5	2032 base case + policy deactivations
Scenario 6	2032 base case with batteries dispatched



## Scenario 5 & 6: Background

	Objectives	Compare
Scenario	<ul> <li>Assess reliability impact due to</li> </ul>	The reliability of 2032 base case
5	<ul> <li>Potential generation deactivation due to state and federal policies</li> </ul>	(Scenario 3)
	<ul><li>State RPS</li></ul>	
	<ul> <li>Economic capacity expansion needed to meet resource adequacy of 1 in 10</li> </ul>	
	Informational GenDeliv study of SUM, WIN and LL	
Scenario 6	<ul> <li>Assess reliability impact of battery dispatch in base case due to generation emergency</li> <li>Remainder of PJM Generation scaled down to keep</li> </ul>	<ul><li>The reliability of 2032 base case (Scenario 3)</li></ul>
	power balance Informational GenDeliv study of SUM and WIN	

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#### 2032 Scenario 5

- Due to policy-driven generation changes, forecasted load growth, and to meet resource adequacy requirements:
  - Significant new generation is needed in the PJM footprint by 2032.
  - Most of the forecasted generation expansion is in the Western Region.
  - Most of the forecasted generation being added are of fuel types gas and solar.
- The forecasted generation results in higher West-East transfer than 2032 base case.
- The resulting generation mix has an impact on the PJM transmission system.
- The proposed 2025 RTEP will help address the higher West-East transfer of 2032 Scenario 5.
- However, additional West-East transmission reinforcements are likely required.

#### **2032 Scenario 6**

Dispatching battery storage did not impact reliability significantly based on the currently low penetration level.

# 2032 Scenario 5: Capacity Expansion Study

### 2032 generation forecast based on a capacity expansion study

# Load assumption: 2025 PJM load forecast report

Resource adequacy: 1 in 10

### Policy assumptions:

- State and federal policy deactivation (federal GHG polices excluded as subject to repeal)
- States' RPS
- Resource-specific targets including 7,500 MW NJ OSW and 8,500 MW MD OSW by 2032



# 2032 Scenario 5: Capacity Expansion Study

## **Starting Resource Mix:**

Consistent with 2025 RTEP model-year 2030:

Existing generation, GIA/ISA generation, Suspended ISA generation, Queue, Fast Lane, CVOW and Chesterfield plants.

#### **Build limits:**

- Minimum build limit: TC1 and TC2 (with RRI) by 2032 from Generation Interconnection Queue
- Maximum build limit: 2x (2030 ML\* + Queue) for renewable, battery, hybrid and gas generation builds by 2032

Capacity Expansion horizon: 15 years (2031–2045)

Using the results of 2032 from the 15-year horizon

\*Machine List

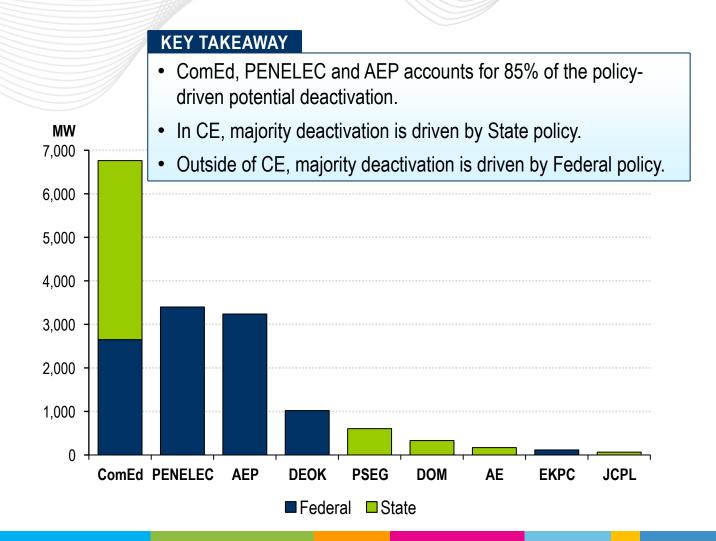


#### **State Grand Total** Area **Federal** ComEd 4,112 6,762 2,650 PENELEC 3,400 3,400 AEP 3,238 3,238 DEOK 1,020 1,020 **PSEG** 605 605 331 DOM 331 AE 169 169 **EKPC** 116 116 65 **JCPL Grand Total** 10,424 5,283 15,706

Type of Policy	riving Retirement
ř.	Ę.

	Policy Driving Retirement
Federal	EPA Coal Combustion Residuals (CCR)
reuerai	EPA Effluent Limitation Guidelines (ELG)
	Illinois, CEJA
State	Virginia, Clean Economy Act
	New Jersey, CO2 Emissions Rule

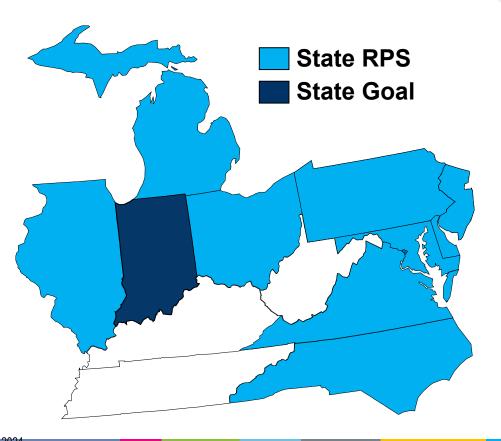
# 2032 Scenario 5: Policy Deactivation





# PJM State RPS Targets

State Renewable Portfolio Standards (RPS) require suppliers to utilize renewable resources to serve an increasing percentage of total demand.



### State RPS Targets\*

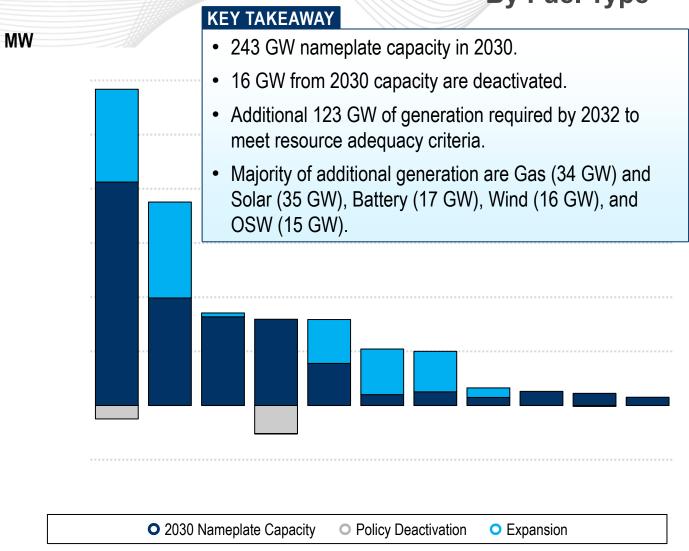
<b>VA:</b> 100% by 2045/2050 (IOUs)
C: 12.5% by 2021 (IOUs)
OH: 8.5% by 2026
MI: 60% by 2035
IN: 10% by 2025***

- Minimum solar requirement
- \* Targets may change over time; these are recent representative snapshot values.
- \*\* RPS also requires an additional 2.5% of Class II resources each year.
- \*\*\* Includes nonrenewable "alternative" energy resources



# 2032 Scenario 5: Capacity Expansion Summary By Fuel Type

Resource Type	2030 Nameplate (MW)	Policy Deactivation (MW)	Capacity Expansion (MW)	Total
Gas	87,438	-4,952	34,250	116,736
Solar	39,699	0	35,410	75,108
Nuclear	32,742	0	1,423	34,165
Coal	42,265	-10,423	-6	31,836
Onshore	15,537	0	16,210	31,747
Battery	4,030	0	16,822	20,852
Offshore	5,054	0	14,952	20,006
Hybrid	2,976	0	3,528	6,504
Pumped- Hydro	5,225	0	0	5,225
Other	4,825	-331	153	4,647
Hydro	3,052	0	13	3,065
Total	242,843	-15,706	122,754	349,890





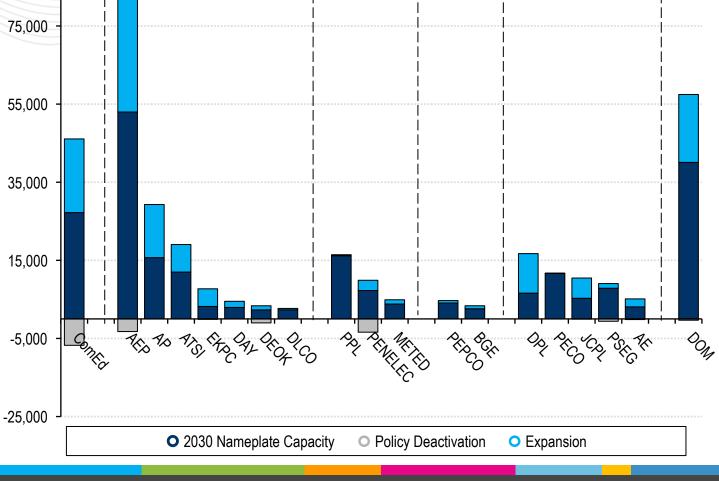
#### 2032 Scenario 5: Capacity Expansion Summary By TO/Region MW

Region	2030 Nameplate (MW)	Policy Deactivation (MW)	Capacity Expansion (MW)	Total
ComEd	33,986	-6,762	18,862	46,085
West (W/O CE)	95,799	-4,374	62,554	153,980
WMACC	30,667	-3,400	3,966	31,234
SWMACC	6,672	0	1,399	8,071
EMACC	35,313	-839	18,584	53,057
South	40,405	-331	17,389	57,463
Total	242,843	-15,706	122,754	349,890

# West ¬ CE 95,000 75,000 55,000 35,000 15,000 -5,000

#### **KEY TAKEAWAY**

- ComEd and West accounts for 66% (81 GW) of 123 GW of capacity expansion.
- Most of the expansion is forecasted in AEP (34 GW), CE (19 GW), DOM (17 GW), AP (14 GW) and DPL (10 GW).



**WMACC** 

**SWMACC** 

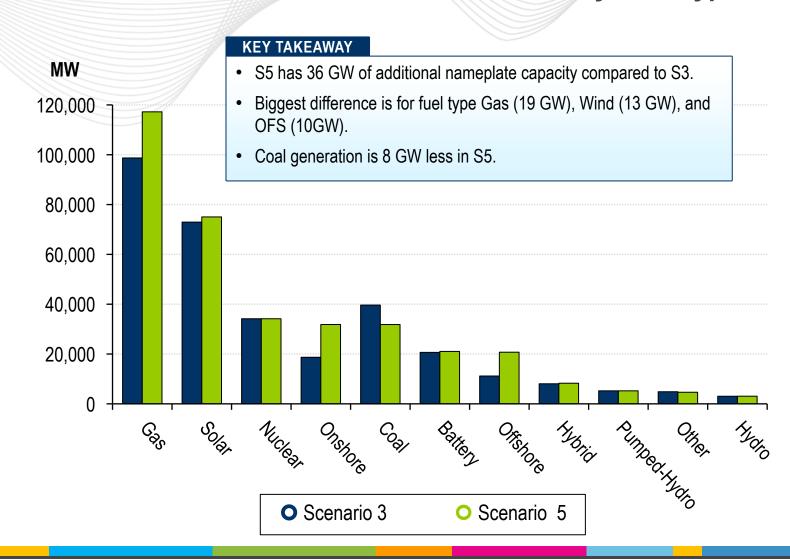
**EMACC** 

South



# Nameplate Capacity: Scenario 3 vs. Scenario 5 By Fuel Type

MW Capacity by Fuel Type	Scenario 3	Scenario 5
Gas	98,713	117,226
Solar	72,952	75,037
Nuclear	34,165	34,165
Onshore	18,694	31,848
Coal	39,648	31,837
Battery	20,658	21,045
Offshore	11,170	20,728
Hybrid	8,059	8,279
Pumped-Hydro	5,225	5,225
Other	4,861	4,653
Hydro	3,045	3,066
Grand Total	317,190	353,108



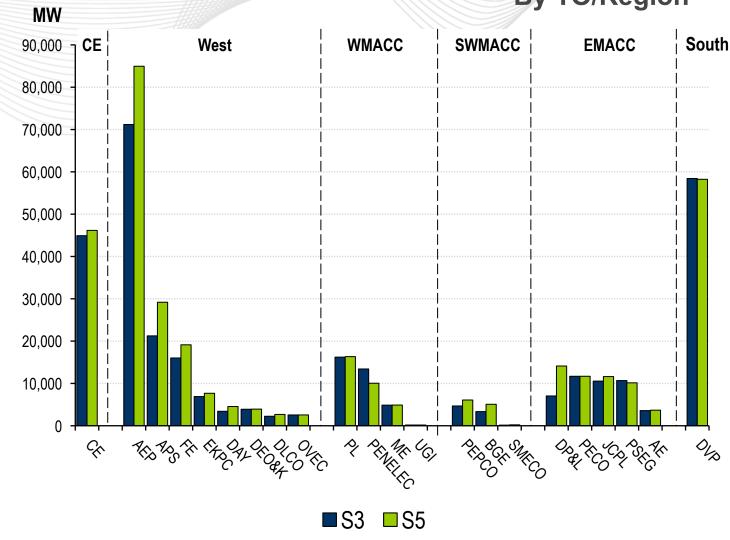


# Nameplate Capacity: Scenario 3 vs. Scenario 5 By TO/Region

MW Capacity by region	Scenario 3	Scenario 5
CE	44,913	46,166
West	127,461	154,641
WMACC	34,673	31,443
SWMACC	8,166	11,372
EMACC	43,547	51,251
South	58,431	58,236
Grand Total	317,190	353,108

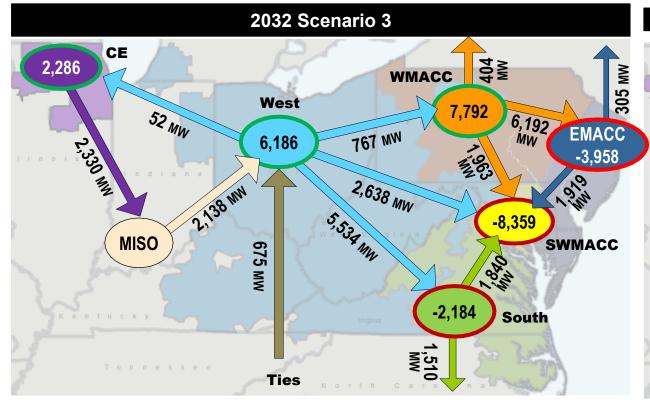
#### **KEY TAKEAWAY**

- In CE, despite policy-driven deactivation of 6.8 GW, net capacity in S5 is higher than S3 due to addition of forecasted generation in S5.
- In S5, capacity is mostly higher in West region (27 GW), EMACC (8 GW) and SWMACC (3 GW) regions.
- In West region capacity is mostly higher in AEP (14 GW), APS(8 GW) and FE (3 GW) in S5.
- In S5, installed capacity is less in WMACC region (by 3 GW) compared to S3 due to policy-driven deactivation.





# Summer: Regional Gen/Flow in S3/S5



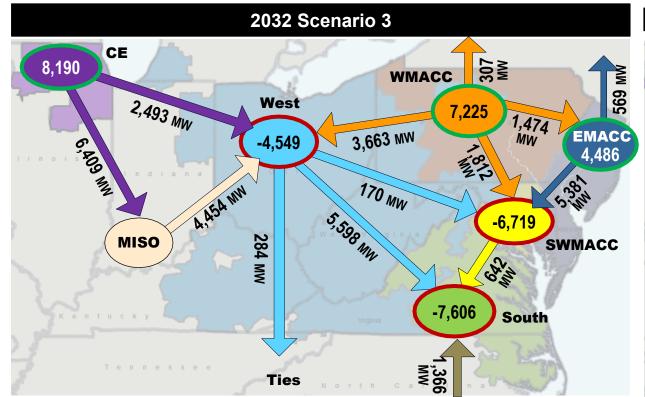
	2032 Scenario 5	
1,228 <b>CE</b> 286 MW	West 14,575 5,468 MW	2,140 5,262 EMACC -2,919
MISO 1,051	2,786 MW 2,786 MW 499 MW	-8,070 SWMACC
Tennessee	Ties North Car	South

In Scenario 5:	<b>Net Generation</b>
West	8.4 GW <b>►</b>
EMACC	1 GW <b>下</b>
WMACC	5.6 GW <b>7</b>
South	3 GW <b>7</b>
CE	1 GW 7

In Scenario 5:	Regional Transfer
West-WMACC	4.7 GW <b>►</b>
West-South	2 GW <b>下</b>
WMACC-EMACC	1 GW 7



## Winter: Regional Gen/Flow in S3/S5



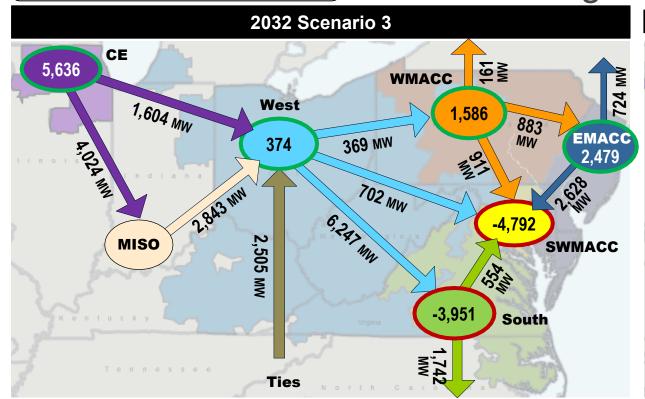
	2032 Scenari	io 5	
5,822 <b>CE</b>		MWVCC 424 MWW	462 mW
1,752 MW	6,626 1,4 <sup>5</sup>	2,209 1,62 MW	1 EMACC
A.063 MM		758 MW	4,043 5 in
MISO	7 mm 885	-7,063	SWMACC
	WW	-9.837 South	
Tennessee		Sout 2,011	
	Ties No. 1	1 0 a 0 0	73

In Scenario 5:	<b>Net Generation</b>
West	11 GW <b>下</b>
WMACC	5.0 GW <b>7</b>
South	2.2 GW <b>7</b>
CE	3 GW <b>7</b>

In Scenario 5:	Regional Transfer								
West-South	1.7 GW <b>△</b>								
West-WMACC	5.1 GW <b>△</b>								



## Light Load: Regional Gen/Flow in S3/S5



	2032 Scenari	o 5	
5,460 CE	West	WMACC (2)	729 1
1,483 MW		582 MW	239 MW EMACC 3,999
MISO 2,6A?	2,283 MW	206 MW	2,675 SWMACC
Kentucky		-7,211	South
Tennessee	Ties	1,251 MW	30

In Scenario 5:	<b>Net Generation</b>
SWMACC	2 GW <b>下</b>
EMACC	1.5 GW <b>下</b>
South	3.2 GW <b>7</b>

In Scenario 5:	Regional Transfer
West-South	1.2 GW <b>►</b>
West-SWMACC	1 GW <b>7</b>
West-WMACC	1 GW <b>7</b>
South-SWMACC	1.5 GW <b>7</b>

# Overall: S3/S5 Unique Overloaded Facilities

#### 2032 Base Scenario (S3)

	230–3	45 kV	500-7	65 kV	
Area	Line	Xfmr	Line	Xfmr	Total
AP	1				1
ATSI	9				9
AEP	35		6	1	42
OVEC	3				3
DAY	2				2
DEO&K	4				4
DLCO	1				1
ComEd	28	28 4		32	
PENELEC	2	2		2	
METED	2				2
JCPL	1		1		2
PPL	12			1	13
PECO	11		2		13
PSEG	7				7
BGE				1	1
PEPCO	2		1	1	3
AE	2				2
DP&L	3		1		4
EKPC	1				1
Dominion	95		13	10	118
Total	217	0	22	18	257

#### 2032 Deactivation Scenario (S5)

	230–3	45 kV	500-7	65 kV	
Area	Line	Xfmr	Line	Xfmr	Total
AP	3		8	3	14
ATSI	13				13
AEP	54		20	3	77
OVEC	3				3
DAY	3				3
DEO&K	5				5
DLCO	2				2
ComEd	34		1	4	39
PENELEC	7		3	1	11
METED	3			1	4
JCPL	10	2	1		13
PPL	14		1	1	16
PECO	17		2		19
PSEG	14			1	15
BGE	3		2	2	7
PEPCO	8		4	2	13
AE	2				2
DP&L	22		3	2	26
EKPC	1				1
Dominion	102		19	12	133
Total	318	2	61	31	412

# Summer: S3/S5 Unique Overloaded Facilities

#### **KEY TAKEAWAYS**

- Top three areas with new violations are in AEP, DP&L and DOM.
- Significant number of new violations on PJM BES.
- Increase in number of facility violations may be attributed to change of generation dispatch within regions and change in inter-regional flows.

#### **Changes in S5 Compared to S3**

	230–3	845 kV	500–7	'65 kV	
Area	Line	Transformer	Line	Transformer	Total
AEP	24	0	12	2	38
DP&L	20	0	2	1	22
Dominion	14	0	6	0	20
AP	2	0	8	3	13
PENELEC	5	0	3	1	9
PECO	6	0	2	0	8
PEPCO	5	0	2	1	8
PSEG	6	0	0	1	7
ComEd	4	0	0	2	6
BGE	3	0	1	2	6
ATSI	5	0	0	0	5
PPL	2	0	1	0	3
METED	1	0	0	1	2
JCPL	2	0	0	0	2
DEO&K	2	0	0	0	2
DLCO	1	0	0	0	1
OVEC	1	0	0	0	1
DAY	1	0	0	0	1
AE	0	0	0	0	0
EKPC	0	0	0	0	0
Total	102	0	35	13	150



#### Addition of 123 GW generation

forecasted between 2030 and 2032 under following consideration:

Potential generation deactivation due to state and federal policies

State RPS

Resource specific targes by states

Resource adequacy of 1 in 10

Based on the economical generation forecast:

#### **Considerable:**

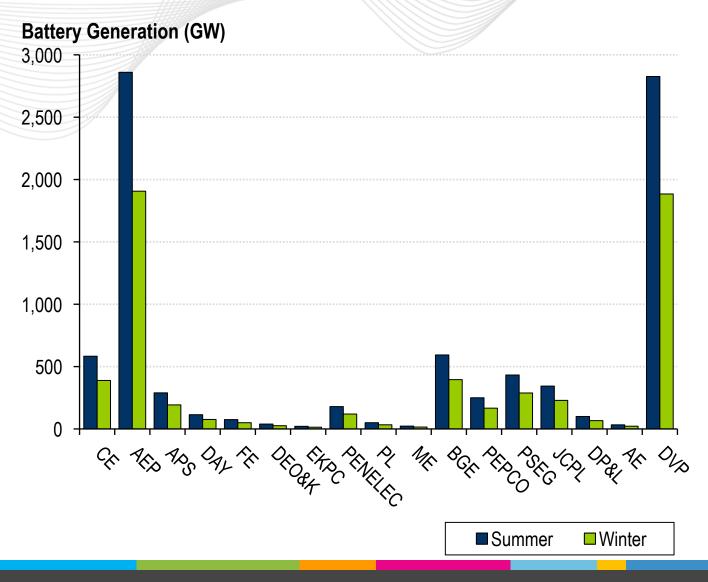
- Generation nameplate capacity would be added in West.
- Gas and solar generation nameplate capacity would be added to PJM.

There will be significant reliability impact on BES due to change in regional capacity.



# 2032 Scenario 6: Battery Dispatched

- 2032 base cases (S3) modified by dispatching batteries
  - Summer: over 8,000 MW (based on battery CIR MWs available for 8 hours)
  - Winter: over 5,000 MW (based on battery CIR MWs available for 12 hours)
- Remainder of PJM Generation scaled down to maintain power balance.
- Gen Deliv test was performed.





# Overall: S3/S6 Unique Overloaded Facilities

		230–345	kV			500–7		111111				
		Line	,		Line			Transfor	mer		Total	
Area	No Impact	Relieved	Aggravated									
CE	20	6	0	0	0	0	3	1	0	23	7	0
APS	1	0	0	0	0	0	0	0	0	1	0	0
FE	1	0	10	0	0	0	0	0	0	1	0	10
AEP	23	3	8	3	1	3	1	0	0	27	4	11
OVEC	1	0	2	0	0	0	0	0	0	1	0	2
DAY	2	0	0	0	0	0	0	0	0	2	0	0
DEO&K	3	0	1	0	0	0	0	0	0	3	0	1
DLCO	1	0	0	0	0	0	0	0	0	1	0	0
EKPC	1	0	0	0	0	0	0	0	0	1	0	0
PENELEC	2	0	2	0	0	1	0	0	0	2	0	2
ME	2	0	0	0	0	0	0	0	0	2	0	0
PL	10	0	2	0	0	1	0	0	1	10	0	3
BGE	0	0	0	0	0	0	0	1	0	0	1	0
PEPCO	1	1	0	0	0	1	1	0	0	2	1	1
JCPL	1	0	0	1	0	0	0	0	0	2	0	0
PECO	10	0	2	1	1	0	0	0	0	11	1	2
PSEG	7	0	0	0	0	0	0	0	0	7	0	0
AE	2	0	0	0	0	0	0	0	0	2	0	0
DP&L	1	0	2	0	1	0	0	0	0	1	1	2
DVP	30	32	22	3	5	4	7	1	2	40	38	28
Total	116	41	49	8	7	8	12	3	3	136	51	60

#### **KEY TAKEAWAY**

- No new violations on BES were observed.
- Majority of the S3 violations were not impacted.
- Overload on some facilities in S3 were reduced in S6, and overload on comparable number of facilities were aggravated in S6.

**No Impact:** The difference in the facility's maximum loading between S3 and S6 is less than 2%.

**Relieved:** Facility's maximum loading in S6 is reduced more than 2% compared to S3.

**Aggravated:** Facility's maximum loading in S6 is increased more than 2% compared to S3.



# Scenario 6: Summary

- Scenario 6 evaluated reliability impacts of dispatching battery storage in base case.
- Dispatching battery storage did not impact reliability significantly due to low battery storage penetration in 2032.
- The future impact on reliability due to battery storage would depend on location and size of new battery storage facilities.



# Scenario 5 and Scenario 6: Concluding Remarks

#### **SUMMARY**

- PJM completed studies of Scenario 5 and Scenario 6.
- These are information studies, and PJM will not seek solutions to reliability violations found in the studies.
- Presently, no further activities are planned for Scenario 5 or Scenario 6.

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#### Facilitator:

Eric Hsia, <a href="mailto:Eric.Hsia@pjm.com">Eric.Hsia@pjm.com</a>

#### Secretary:

Joshua Stephenson, <u>Joshua.Stephenson@pjm.com</u>

#### SME:

Matthew Wharton, Matthew.Wharton@pjm.com

Wenzheng Qiu, Wenzheng.Qiu@pjm.com

### **Reliability Analysis Update**



#### Member Hotline

(610) 666 - 8980

(866) 400 - 8980

custsvc@pjm.com



Version No.	Date	Description
1	Dec. 3, 2025	Initial slides posted
2	Dec. 5, 2025	<ul> <li>Corrected date for version 1, updated title slide for Scenario 5 &amp; 6, updated RTEP window costs</li> <li>Slides #6 and #142, updated the description</li> </ul>



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# **Appendix 1:**

2025 RTEP Window 1 Preliminary Constructability and Cost Risk Assessments

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## Risk Assessment Criteria

#### **PJM Risk Assessment Criteria**

Risk Assessment	Cost Estimate Risks	Cost Containment Risk	Schedule Risks	Constructability Risks	ROW/Land Acquisition Risk	Outage Coordination Risk	Proposing Entity Experience & Capability Risks
Low	Proposal is within 0-20% of Independent Estimate	Hard Cost Cap (Project cost capped with no cost recovery above binding cost cap) with minimal exclusions.			Pure Brownfield Rebuild/Reconductor/New Build within existing ROW (or property already owned by entity)		Entity has demonstrated significant experience & capability of developing and operating proposed facilities
Low-Medium	Proposal is within 21-30% of Independent Estimate	Mix of Hard/Soft caps on Project components	Ratings assessed based on independent assessment of	Ratings assessed based on independent assessment of	Mostly brownfield with some greenfield (i.e. Uses/Overlaps existing ROW but requires expansion or some new greenfield)	Ratings assessed based on PJM's assessment of	Entity has demonstrated limited experience & capability of developing and operating proposed facilities
Medium	Proposal is within 31-40% of Independent Estimate	Soft Caps (No direct cap on Project costs, but indirect caps via reductions to ROE, and/or incentives for cost overruns).	proposed in-service dates, and assessment of significant schedule risks such as such as permitting and constraint mitigation, long-lead material procurement,	the number and severity of constructability risks assessed for the proposed project scope, such as permitting and constraint mitigation, land/ROW	Moderate Mix of Green and Brownfield (i.e. Uses/Overlaps existing ROW but requires expansion or some new greenfield)	complexity, impact and duration of outages required for development, including consideration of outage coordination plans proposed.	Entity has no experience operating proposed facilities, but has demonstrated some experience with developing proposed facilities.
Medium-High	Proposal is within 41-50% of Independent Estimate	Minimal cost caps and/or excessive exclusions	land/ROW acquisition, construction complexity.	acquisition, construction complexity.	Mostly Greenfield with some Brownfield (i.e. Uses/Overlaps existing ROW but requires expansion or some new greenfield) OR Parallels existing ROW for entire alignment with no overlaps.		Entity has no experience developing and operating proposed facilities, but has provided a detailed & effective plan
High	Proposal is greater than 50% of Independent Estimate	No cost containment			Pure Greenfield		Entity has no experience developing and operating proposed facilities and has not provided a detailed & effective plan

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# South Regional Cluster Projects

#### South Regional Projects - Preliminary Constructability Risk Assessment

Proposal ID	Proposing Entity	Proposal Description	Proposal Cost Estimates	Independent Cost Estimates	Cost Estimate Risks	Cost Containment Risks	Schedule Risks	Constructability Risks	ROW/Land Acquisition Risks	Outage Coordination Risks	Proposing Entity Experience & Capability Risk	Proposed ISD	New HVDC (Miles)	New 765 kV (Miles)	New 500 kV (Miles)	New EHV Total (Miles)	New EHV Greenfield (Miles)
275	VEPCO	HVDC backbone - Portfolio 1A	\$ 4,819,506,867.00	\$5,013,610,621.06	Low	Medium-High	Low-Medium	Low-Medium	Low	Medium	Medium-High	6/1/2032	185	0	32.05	217.05	0
705	VEPCO	765kV backbone - Portfolio 2A	\$ 2,864,733,308.00	\$2,532,935,577.59	Low	Medium-High	Medium-High	Medium-High	High	Medium	Medium	6/1/2032	0	152.3	95.01	247.31	210.8
616	VEPCO	500kV backbone - Portfolio 3	\$ 2,349,256,319.00	\$2,169,827,586.97	Low	Medium-High	Medium	Medium	Medium	Low-Medium	Low	6/1/2032	0	0	266.58	266.58	135.21
260	LS Power	Virginia Transmission Project	\$ 3,515,948,928.00	\$3,180,564,543.79	Low	Medium	High	High	High	Low	Low	6/1/2030	0	0	468.8	468.8	468.8
331	Transource/ FE	Virginia Area Seven Year Solution 1	\$ 2,895,324,611.26	\$3,156,930,795.42	Low	Medium	Medium-High	Medium-High	Medium-High	Medium	Low	6/1/2031	0	211.2	100.5	311.7	311.7
781	Transource/ FE	Virginia Area Seven Year Solution 2	\$ 1,986,446,707.70	\$2,128,125,256.29	Low	Medium	Medium-High	Medium-High	Medium-High	Low-Medium	Low	10/1/2032	0	137.6	100.5	238.1	238.1
938	Transource/ FE	Dominion Regional Solution	\$ 3,426,930,565.00	\$3,600,488,746.56	Low	Medium	High	Medium-High	High	Low	Low	6/1/2030	0	374	36	410	410



# MAAC - PPL Cluster Projects

#### MAAC - PPL Cluster Projects - Preliminary Constructability Risk Assessment

Proposal ID	Proposing Entity	Proposal Description	Proposal Cost Estimates	Independent Cost Estimates	Cost Estimate Risks	Cost Containment Risks	Schedule Risks	Constructability Risks	ROW/Land Acquisition Risks	Outage Coordination Risks	Proposing Entity Experience & Capability Risk	Proposed ISD	New HVDC Ckt. Miles	New 765 kV Ckt. Miles	New 500 kV Ckt. Miles	New EHV Ckt. (Total Miles)	New EHV Ckt. (Greenfield Miles)
853	PPL	Portfolio Proposal 3: Year 2032 + 4 GW Area 229 Essential Reliability Solution	\$ 797,944,850.73	\$ 917,204,057.00	Low-Medium	Low	Low	Low	Low-Medium	Low-Medium	Low	6/1/2030	0	0	93	93	42
290	PPL	Siegfried - Drakestown 500 kV line (PA segment)	\$ 88,163,848.17	\$ 32,437,177.00	Low	Low	Low	Low	Low	Low	Low	5/1/2030	0	0	24	24	0
552	PPL Translink	Siegfried - Drakestown 500 kV line (brownfield NJ segment route)	\$ 194,253,314.23	\$ 185,174,055.00	Low	High	Medium	Medium	Medium-High	Low	Low	5/1/2030	0	0	20	20	20
771	NextEra	Montour to Slykerville Reinforcement	\$ 539,254,404.00	\$ 637,670,232.00	Low-Medium	Medium	Medium	Medium	Medium-High	Low	Low	12/1/2030	0	0	26	26	26
871	NextEra	Blockhouse Creek to Susquehanna and Montour to Stoney Creek	\$ 1,136,379,661.00	\$1,408,256,348.08	Low-Medium	Medium	Medium	Medium	High	Low	Low	12/1/2030	0	0	65	65	65
20	LS Power	Tri-Segment 500kV Transmission Project	\$ 494,286,189.00	\$ 691,715,465.00	Medium	Medium	Medium	Medium	Medium-High	Low	Low	6/1/2030	0	0	46.3	46.3	46.3



# MAAC Regional Cluster Projects

MAAC Regional Projects - Preliminary Constructability Risk Assessment																	
Proposal ID	Proposing Entity	Proposal Description	Proposal Cost Estimate	Independent Cost Estimates	Cost Estimate Risks	Cost Containment Risks	Schedule Risks	Constructability Risks	ROW/Land Acquisition Risks	Outage Coordination Risks	Proposing Entity Experience & Capability Risk	Proposed ISD	New HVDC (Miles)	New 765 kV (Miles)	New 500 kV (Miles)	New EHV Total (Miles)	New EHV Greenfield (Miles)
237	NextEra/ Exelon	Kammer to Juniata	\$ 1,738,591,455.00	\$2,005,587,077.59	Low-Medium	Medium	Medium	Medium	Medium-High	Low	Low-Medium	6/1/2031	0	222	1.2	223.2	223.2
687	NextEra/ Exelon	Kammer to Juniata to Spicewood 765 kV	\$ 3,238,741,727.00	\$3,861,778,316.00	Low-Medium	Medium	Medium-High	Medium-High	Medium-High	Low	Low-Medium	12/1/2031	0	322	27.2	349.2	349.2
578	MAITLIT	PPL Load Addition Proposal - Keystone - Susquehanna Dual 500 kV Single Circuits with Jack's Mt.	\$ 2,418,261,233.00	\$2,594,335,957.31	Low	Medium-High	Medium-High	Medium-High	Medium-High	Medium	Low	6/1/2030	0	0	408	408	408



# West Regional Cluster Projects

West Regional Projects - Preliminary Constructability Risk Assessment																	
Proposal ID	Proposing Entity	Proposal Description	Proposal Cost Estimate	Independent Cost Estimate	Cost Estimate Risks	Cost Containment Risks	Schedule Risks	Constructability Risks	ROW/Land Acquisition Risks	Outage Coordination Risks	Proposing Entity Experience & Capability Risk	Proposed ISD	New HVDC (Miles)	New 765 kV (Miles)	New 345 kV (Miles)	New EHV Total (Miles)	New EHV Greenfield (Miles)
239	Transource/ FE	345 kV Solution Phase 1 and Phase 2	\$ 1,492,405,528.34	\$2,002,917,563.00	Medium	Medium	Medium	Medium	Medium-High	Low	Low	6/1/2030	0	119	69.6	188.6	132.5
334	Transource/ FE	West Glade Run 765/345 kV Solution	\$ 1,690,256,560.00	\$2,359,183,232.00	Medium	Medium	Medium	Medium	Medium-High	Low	Low	6/1/2030	0	119	97.3	216.3	177.2
570	Transource/ FE	Ohio Seven Year Solution	\$ 2,775,191,200.08	\$4,025,991,290.00	Medium-High	Medium	Medium	Medium	Medium-High	Low	Low	10/1/2031	0	291.5	35	326.5	277.4
109	NextEra/ Exelon	Muckshaw - Johnstown 765kV	\$ 3,321,996,359.00	\$4,704,550,478.00	Medium	Medium	Medium-High	Medium-High	High	Low	Low-Medium	6/1/2031	0	290	61.5	351.5	351.5
152	NextEra/ Exelon	Gwynneville - Johnstown 765kV	\$ 2,921,116,446.00	\$4,539,278,605.00	Medium-High	Medium	Medium-High	Medium-High	High	Low	Low-Medium	12/1/2031	0	216	65	281	281
619 &241	PSEGRT/AES Ohio/PPL	345kV Solution + 765kV Solution (Alternative) + STATCOM Solution (Add-on)	\$ 2,086,010,642.45	\$2,377,558,024.00	Low-Medium	Low-Medium	Medium	Medium-High	High	Low-Medium	Medium	6/1/2032	0	145.8	28.7	174.5	174.5



# **Appendix 2:** Proposal Maps

Note: These maps are only intended to illustrate the general electrical connectivity of the projects and should not be relied upon for exact geographical substation locations, line routes, or scope of work.

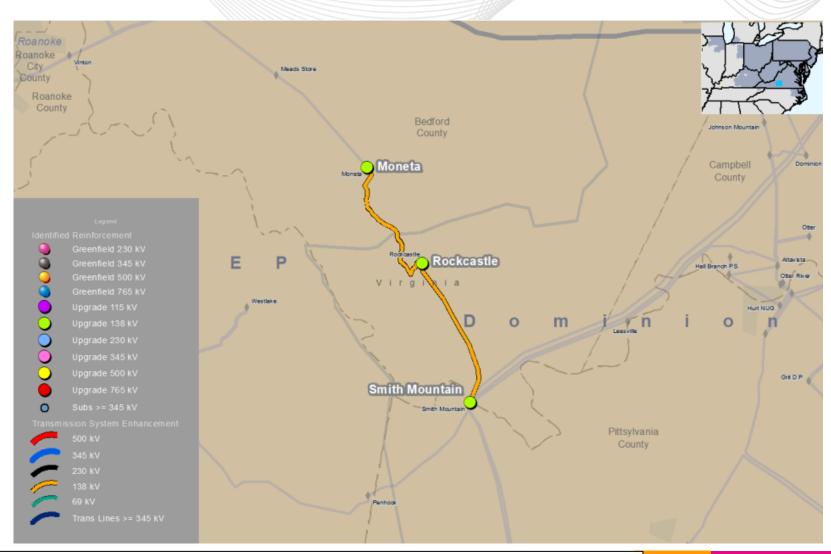
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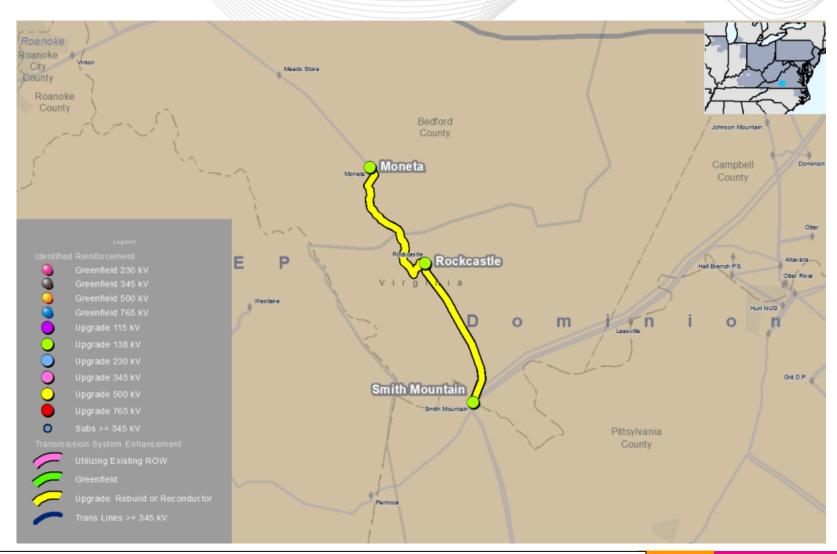
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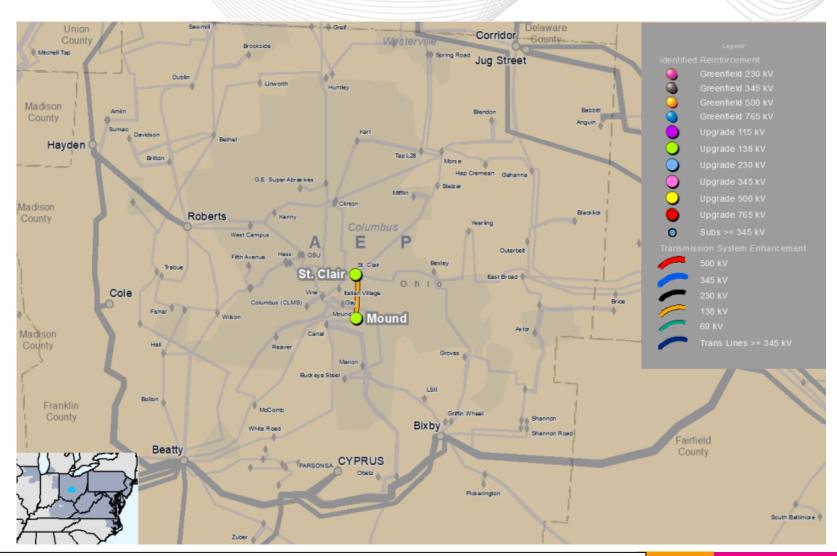




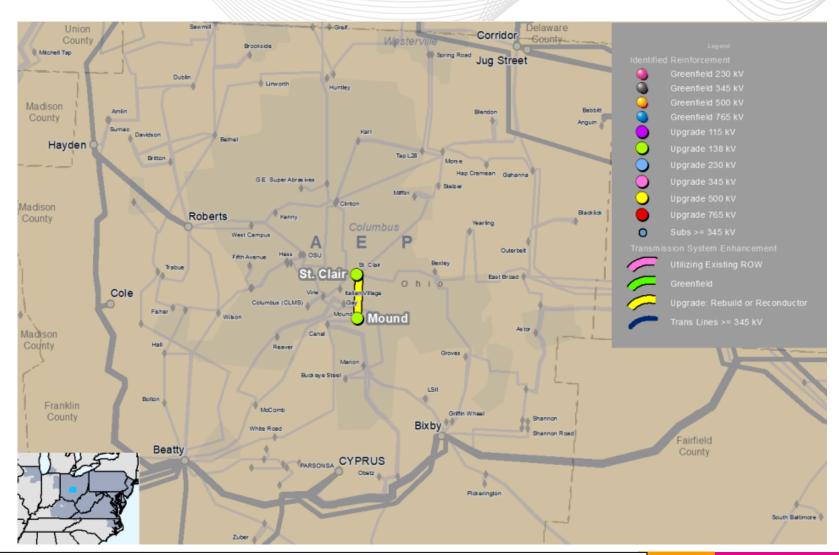




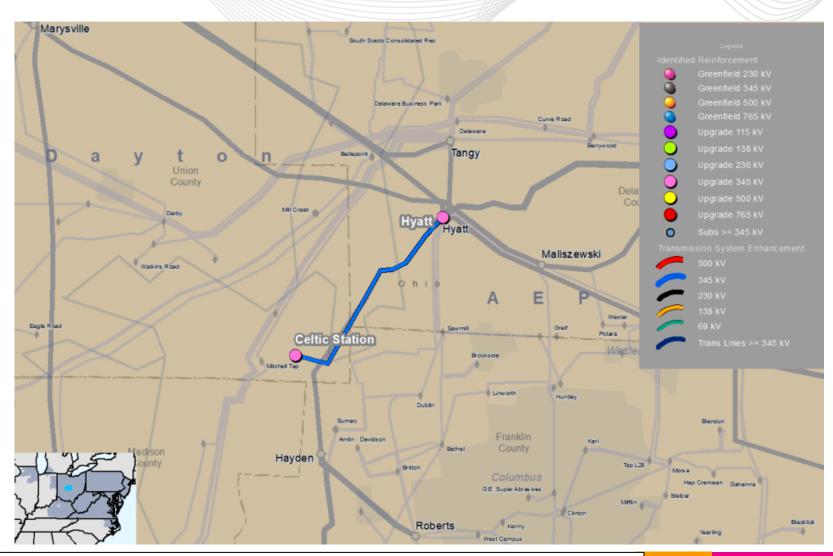




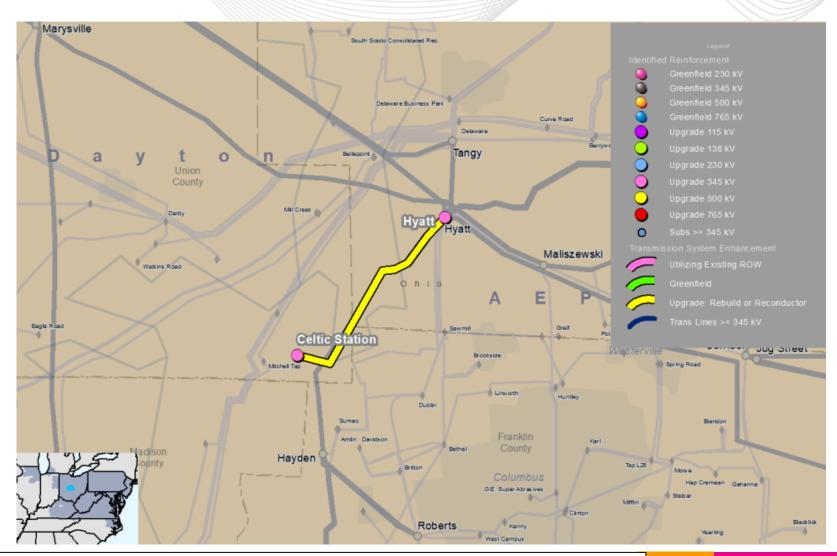










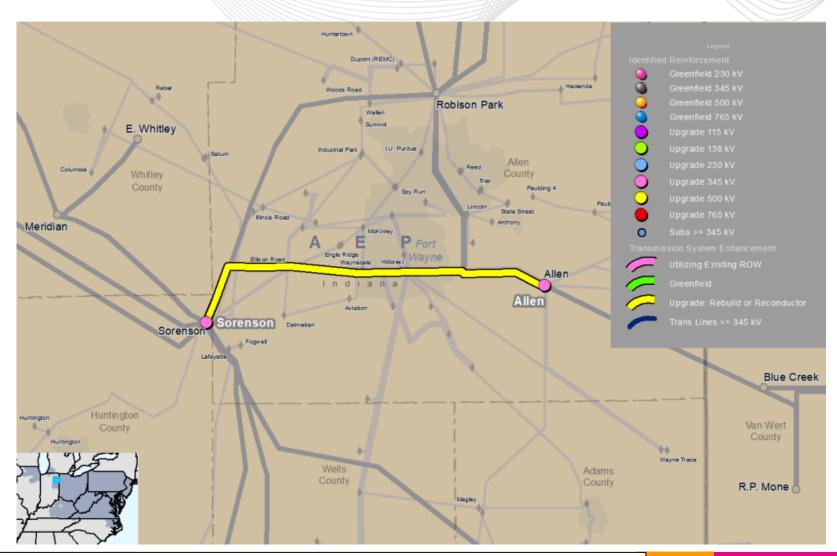




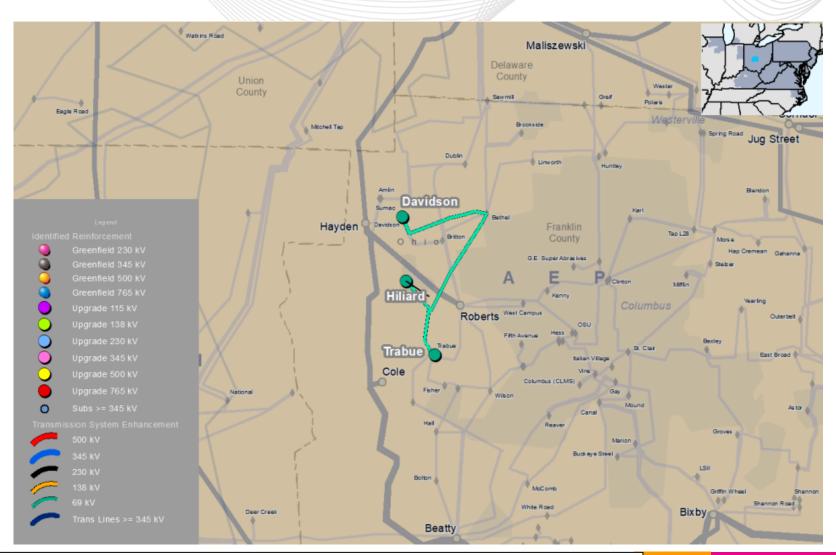




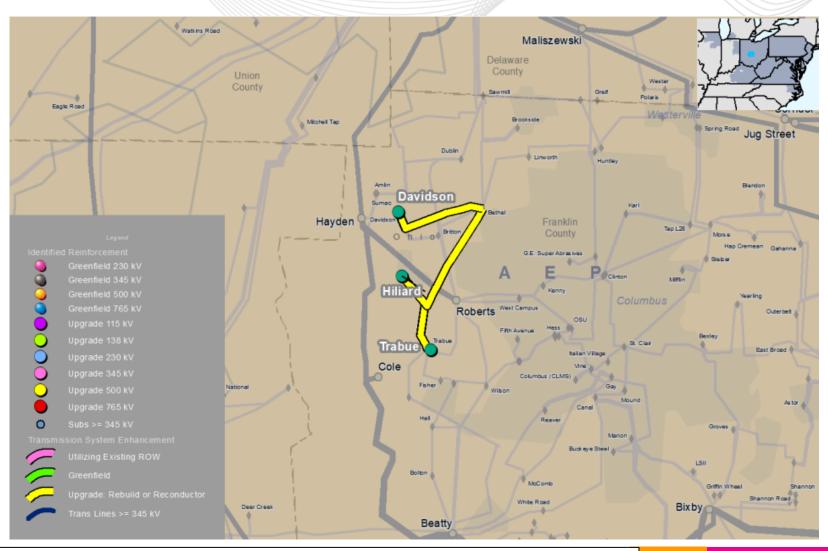






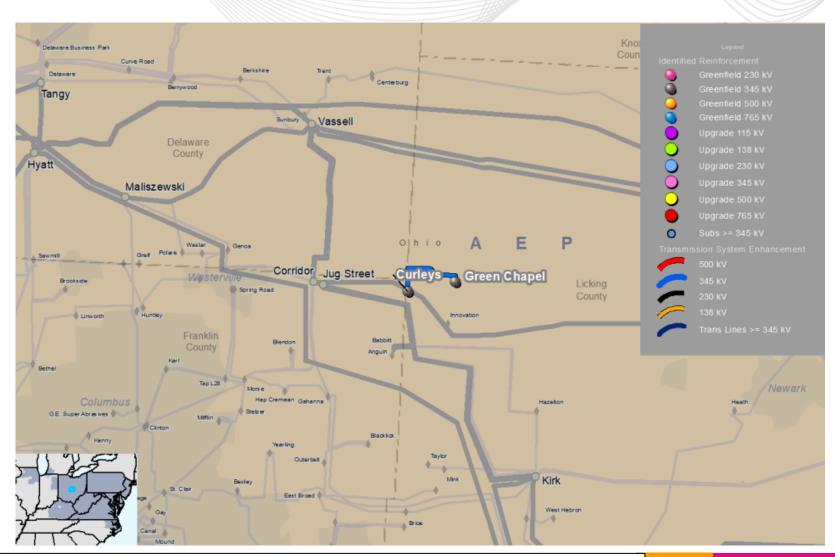




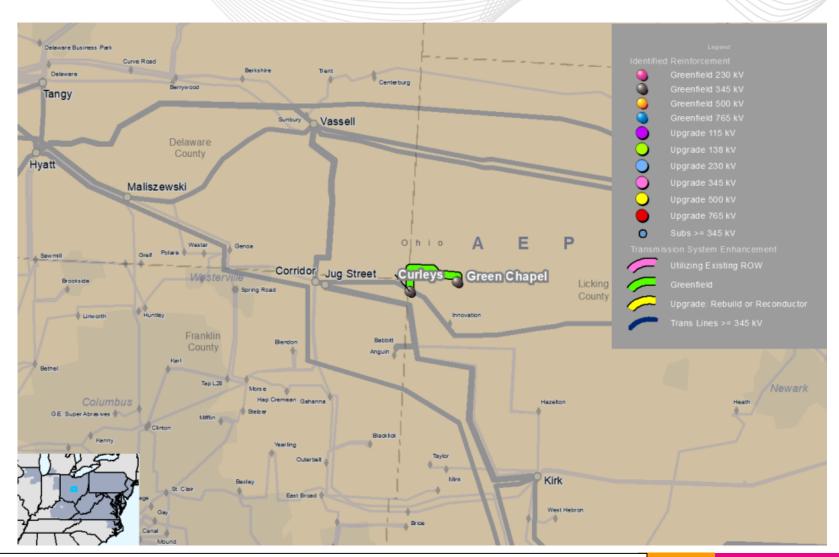


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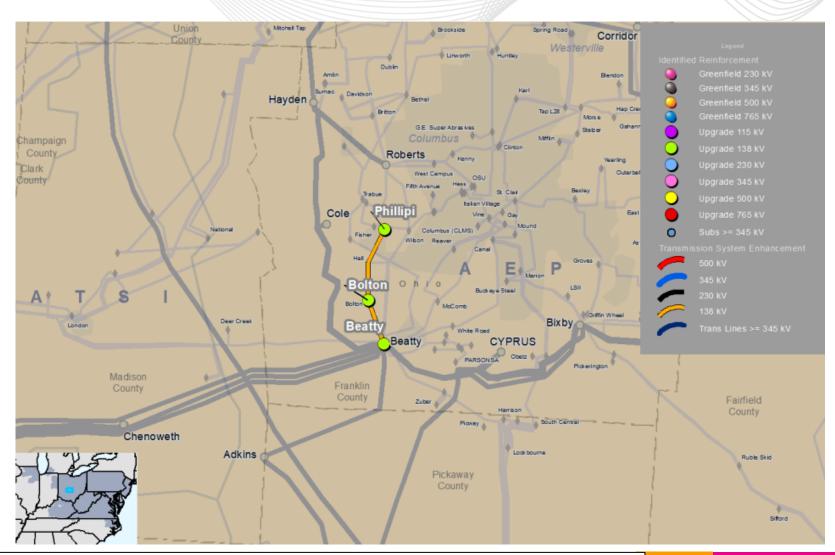




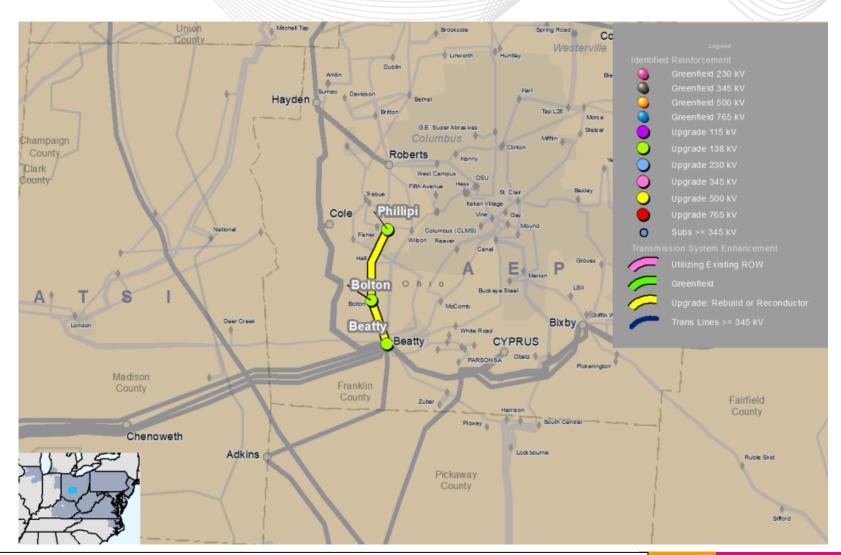




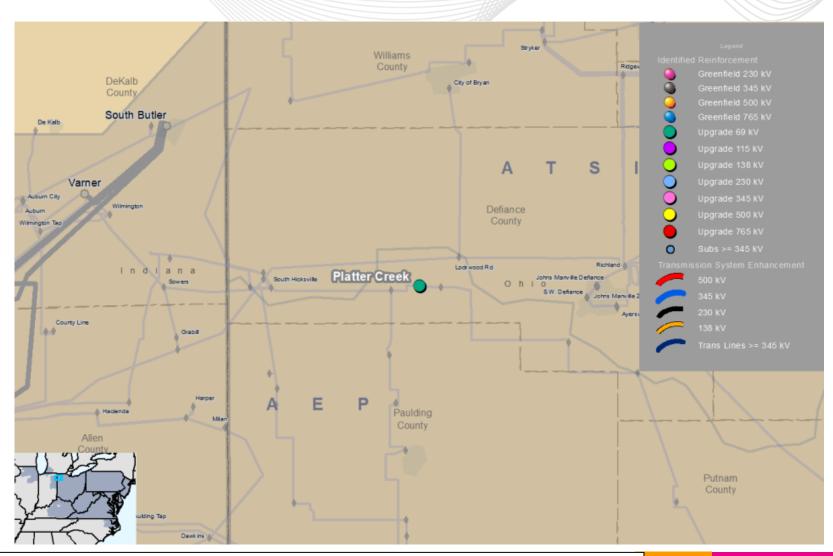




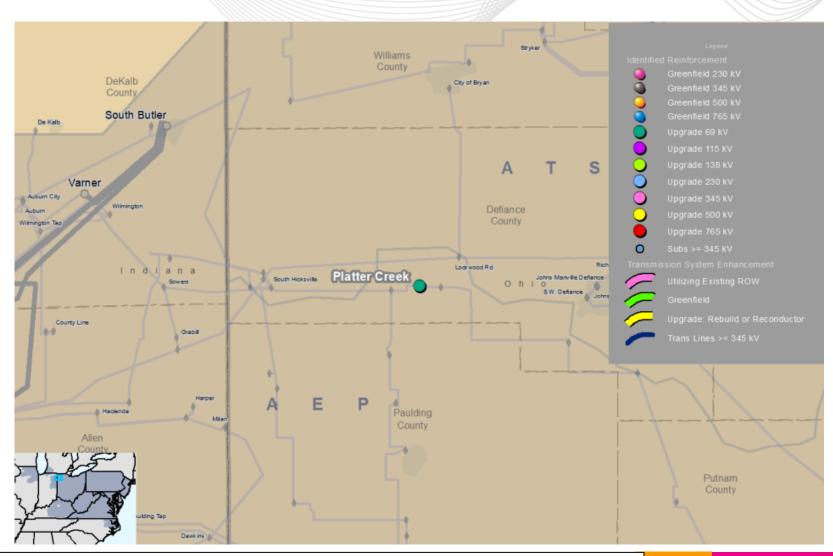




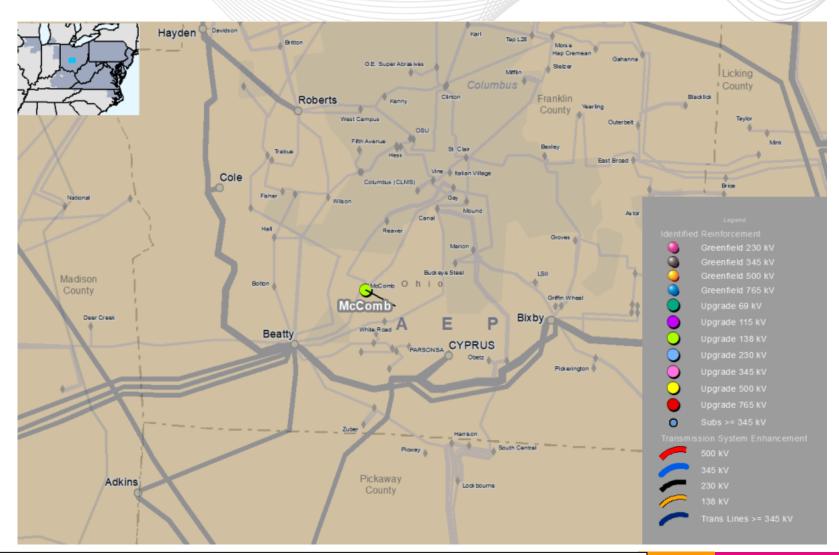




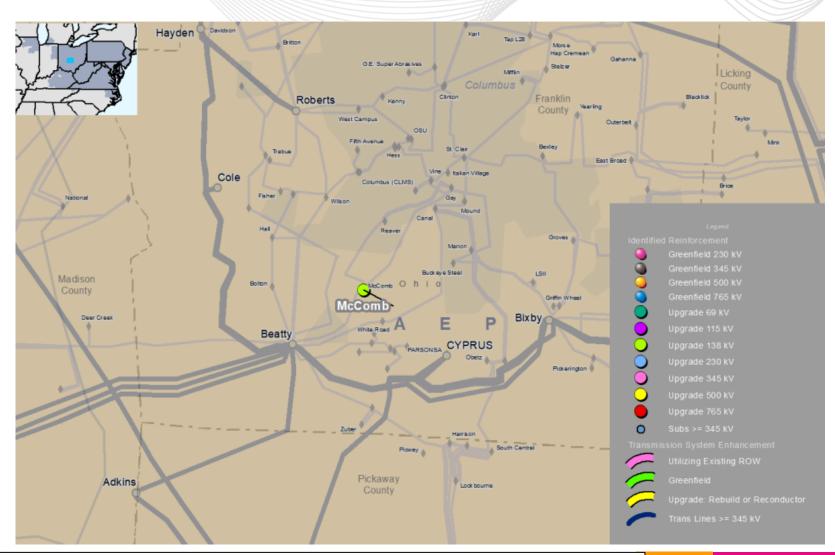






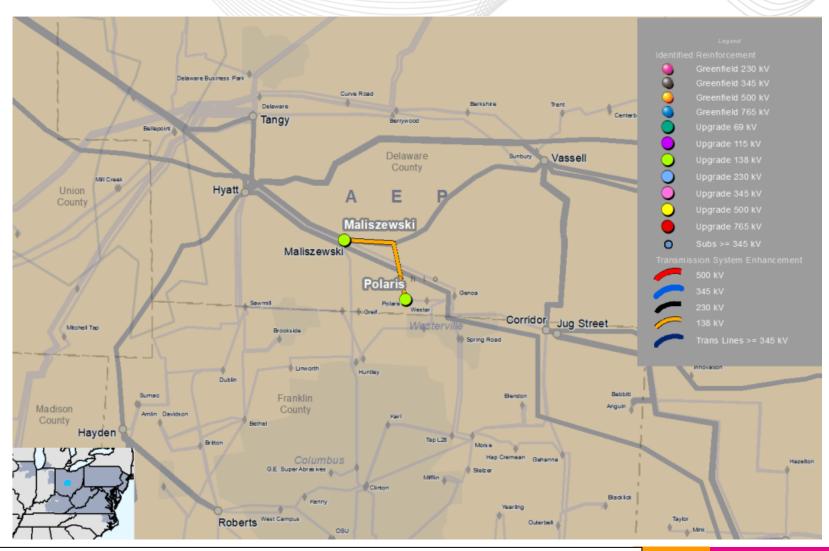




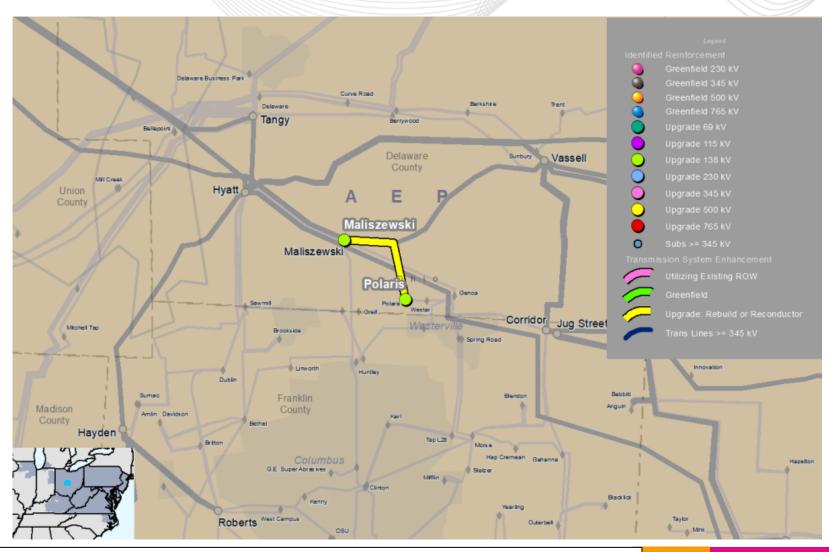


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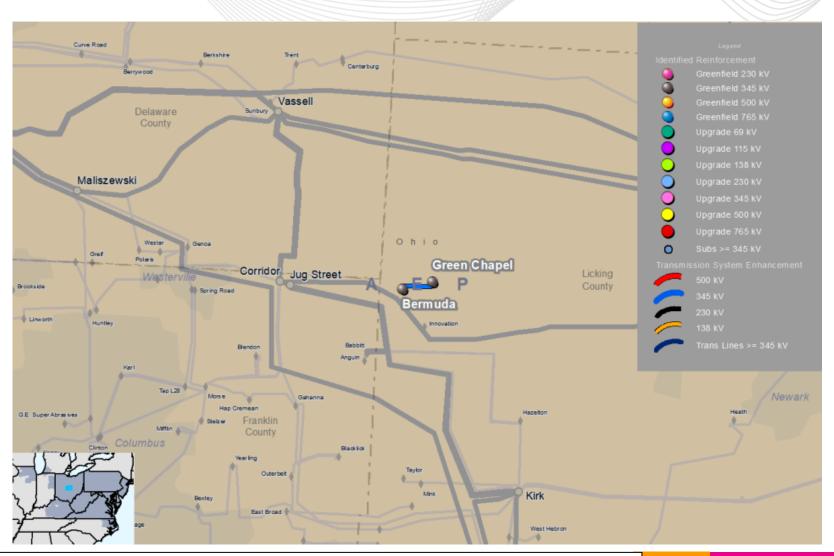




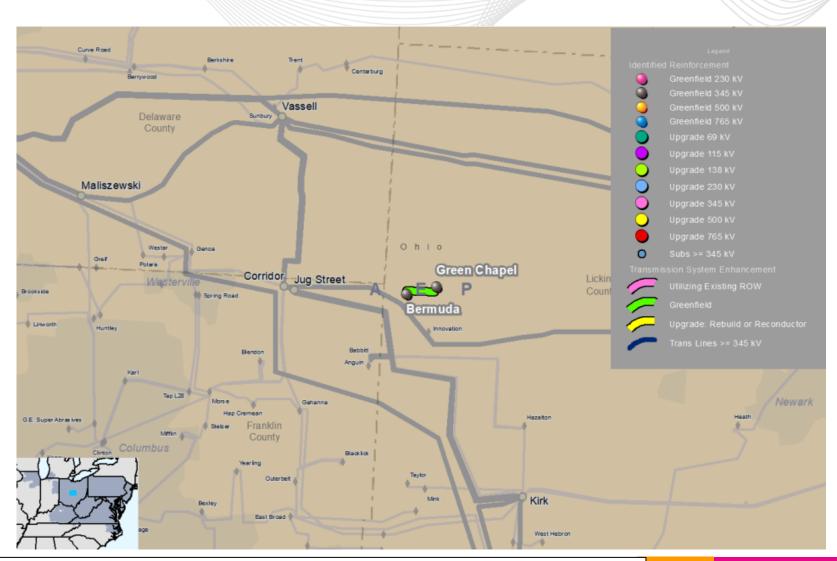






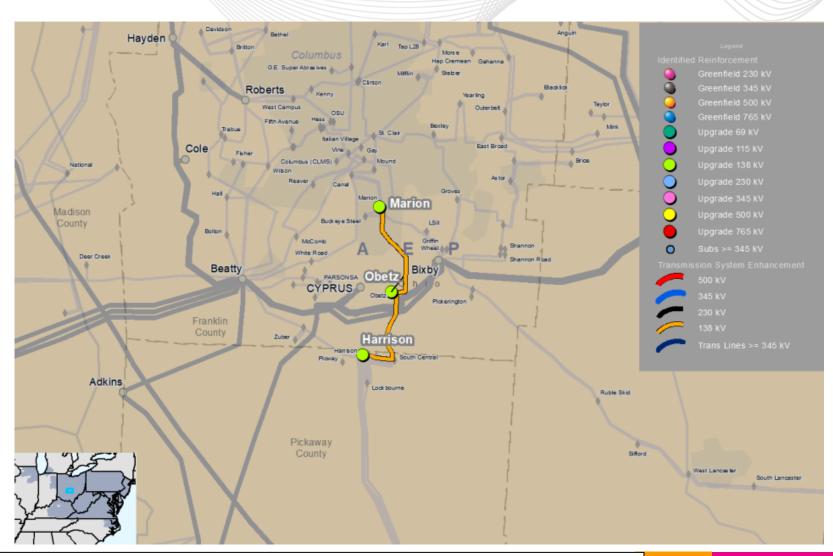






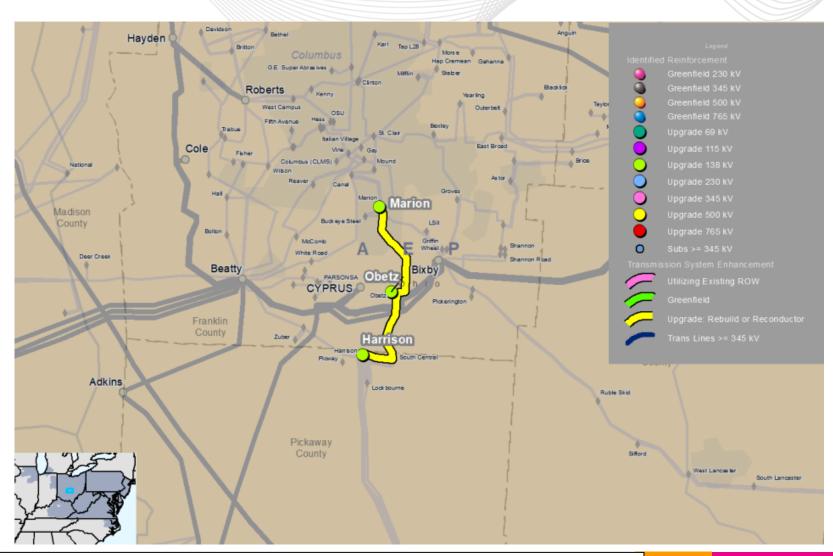




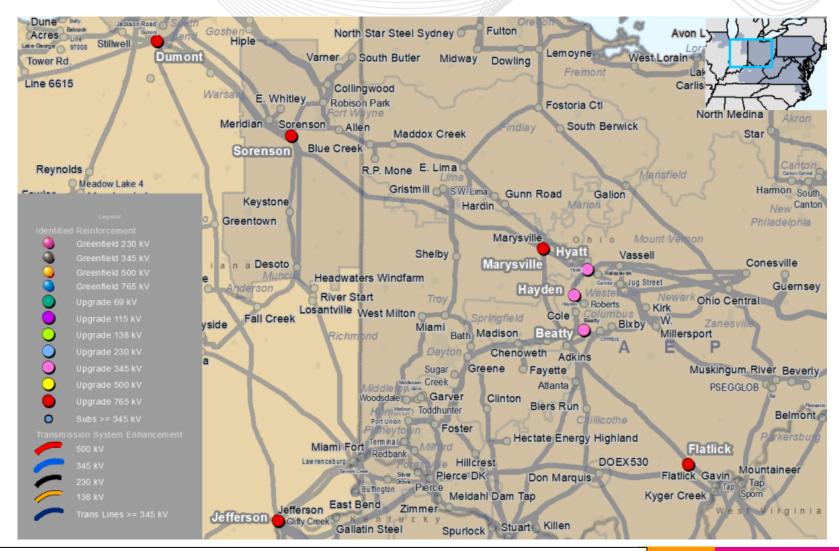




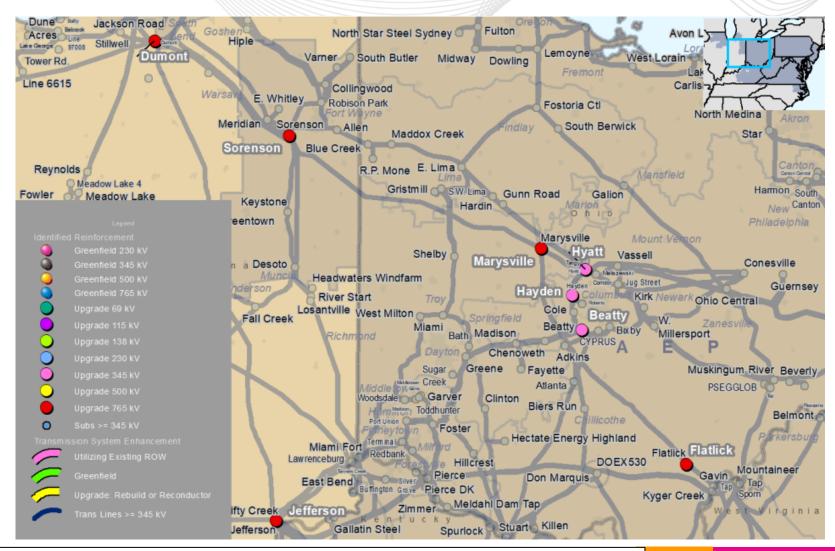




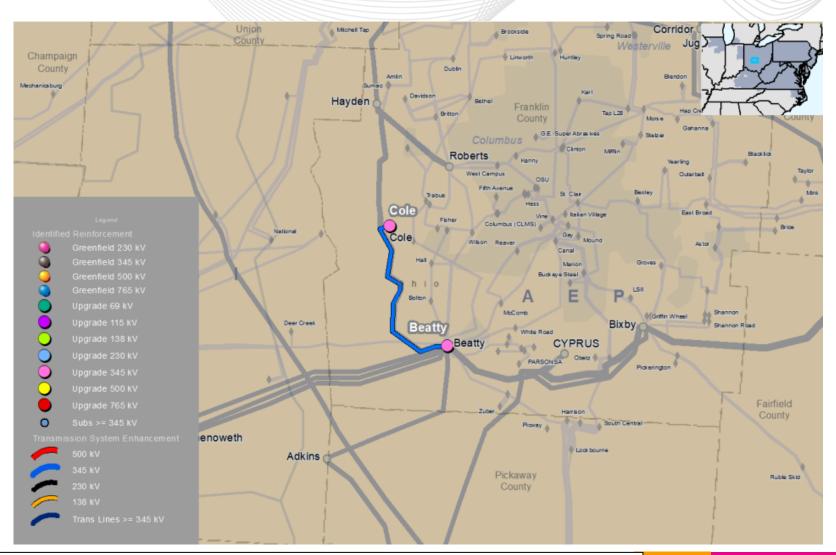




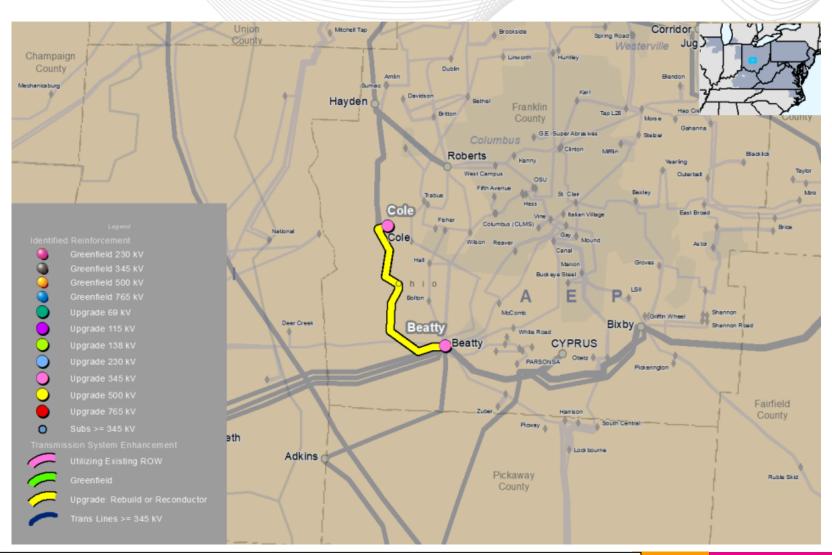




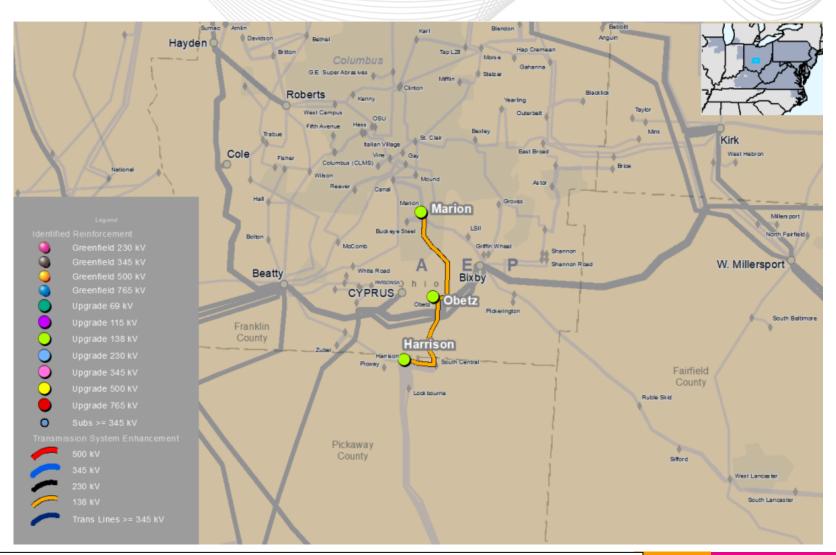




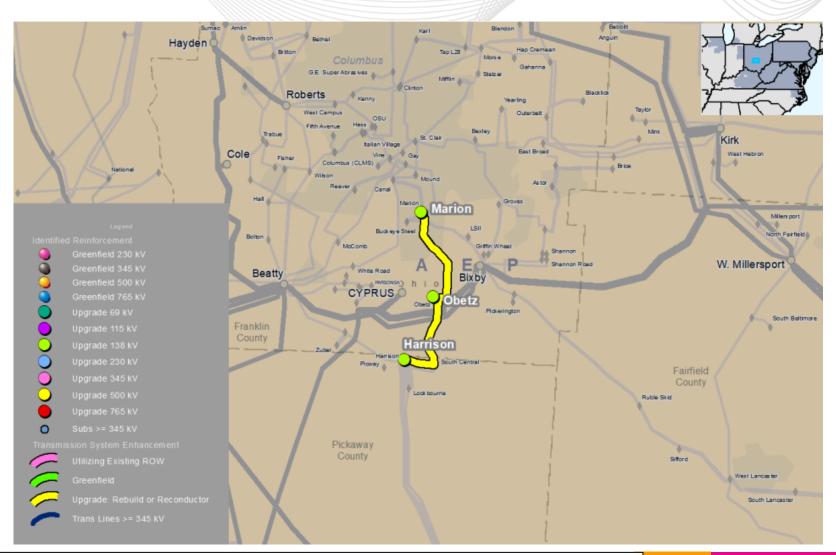




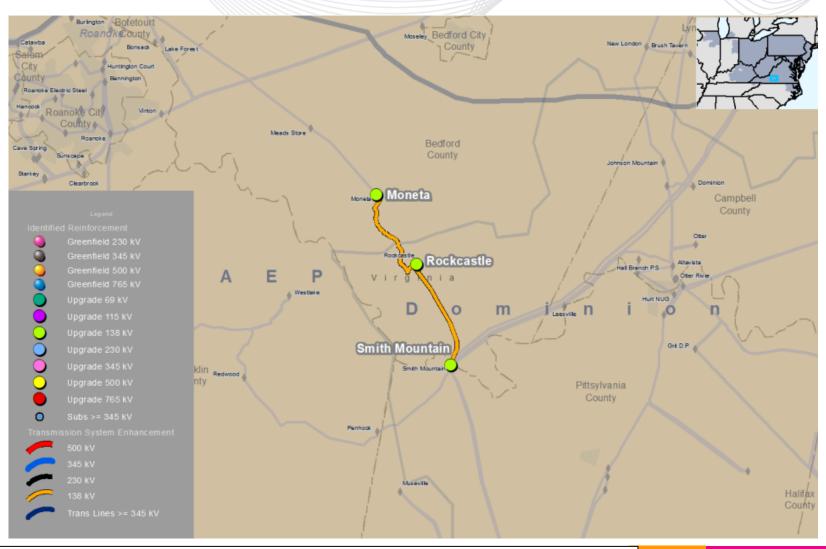




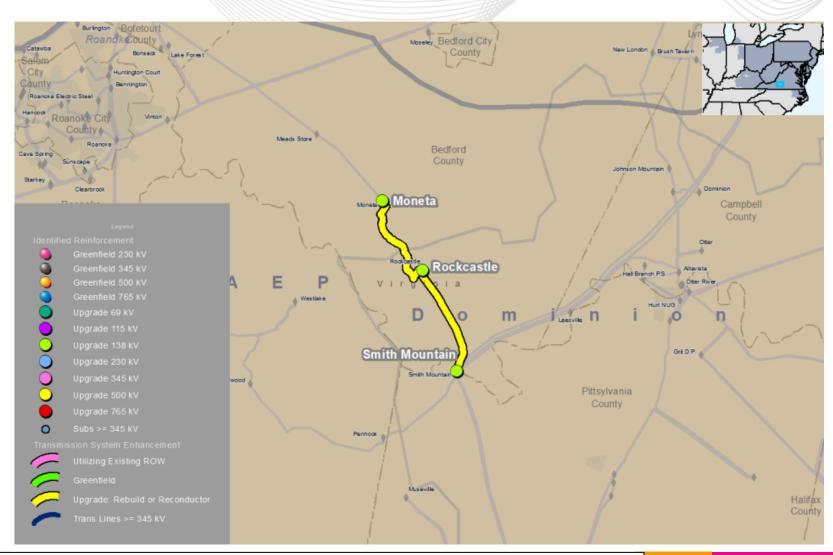






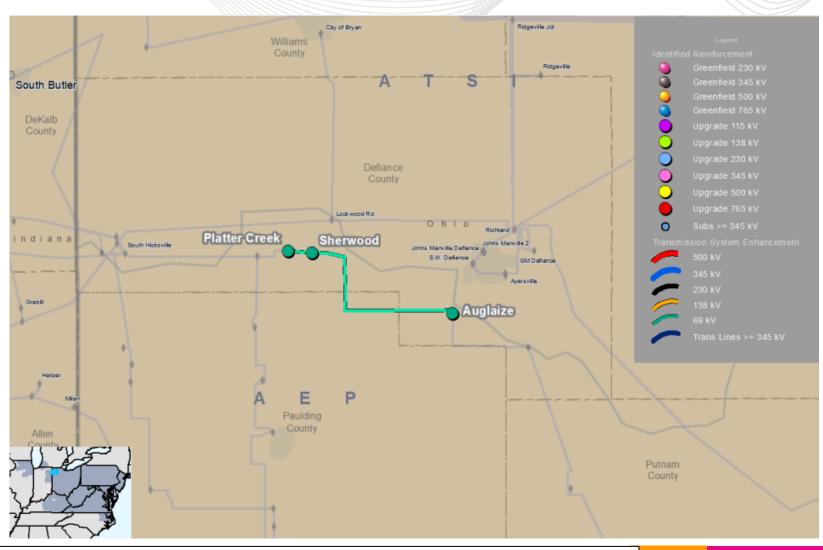




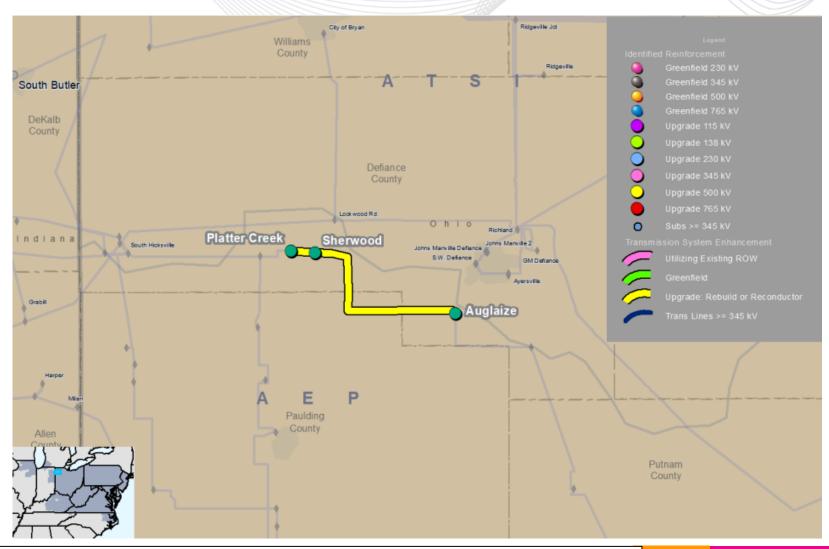




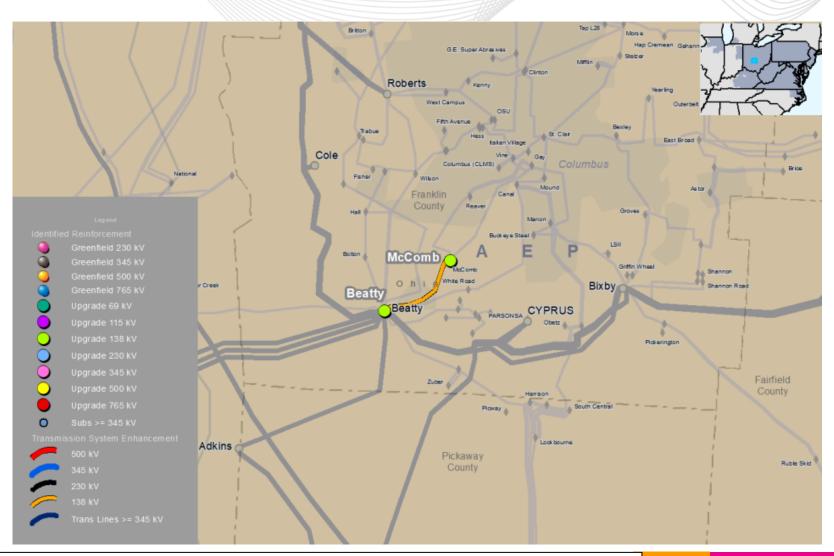




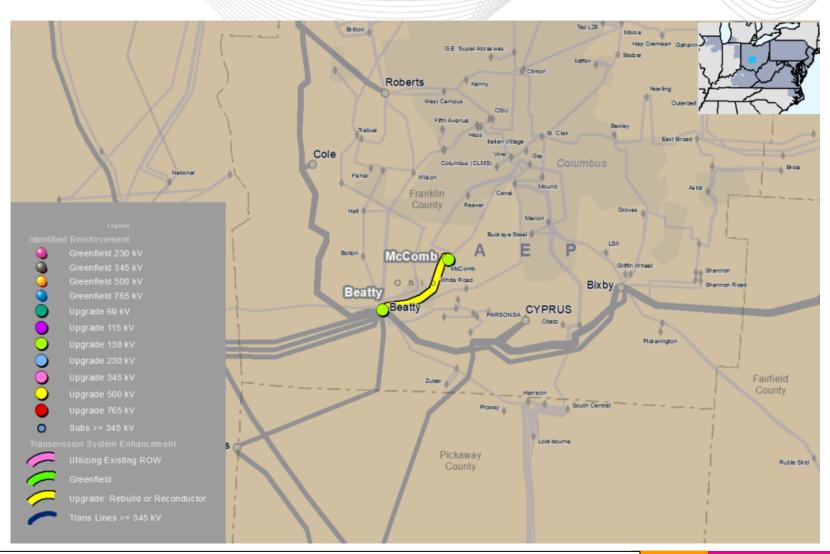




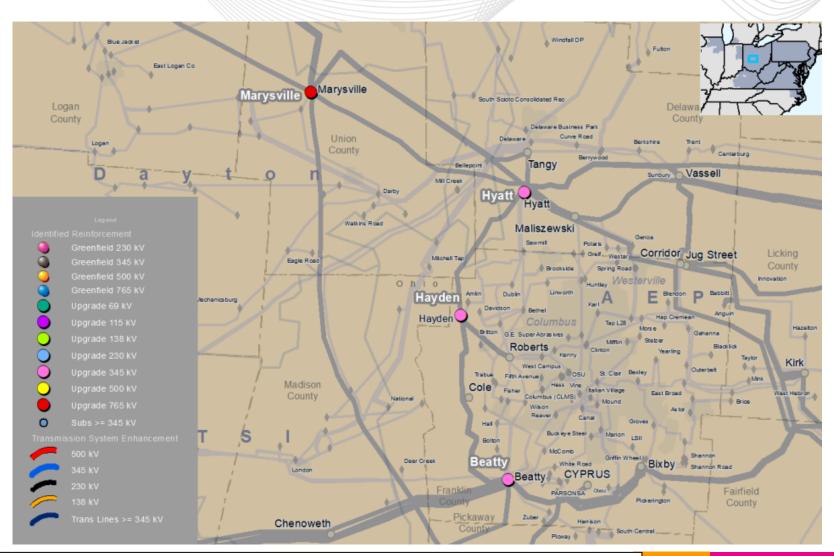




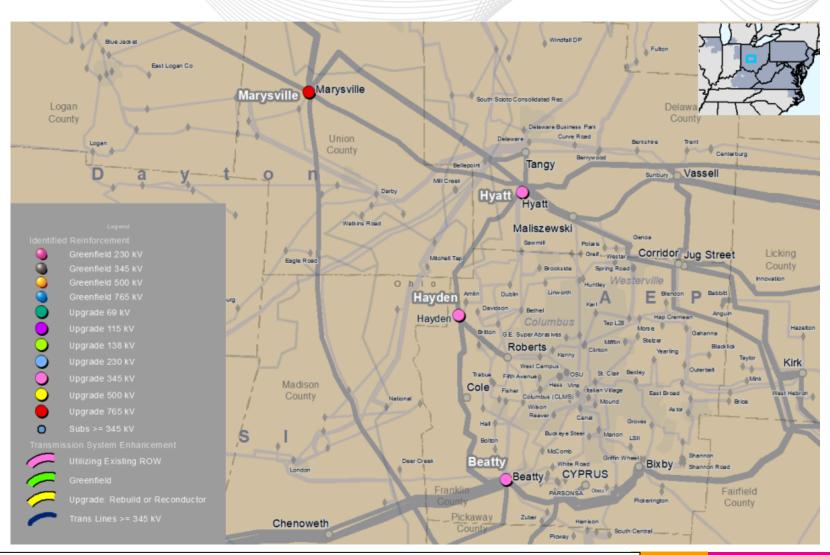






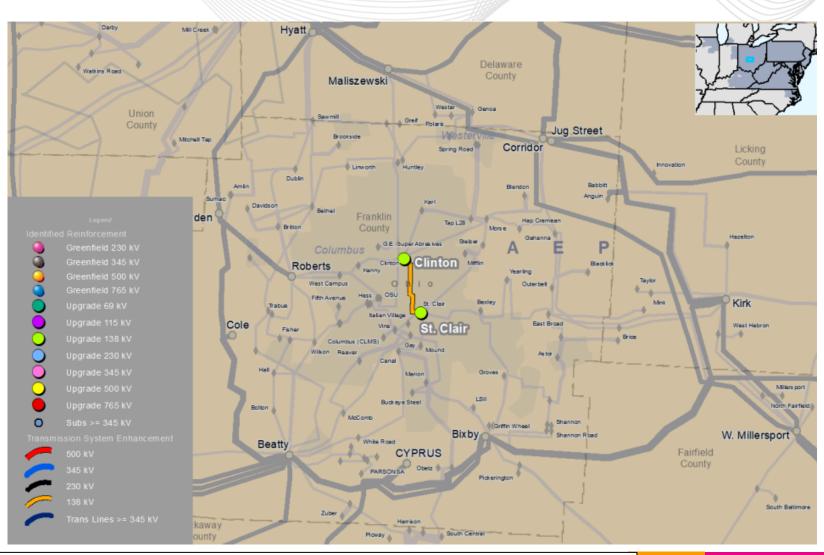






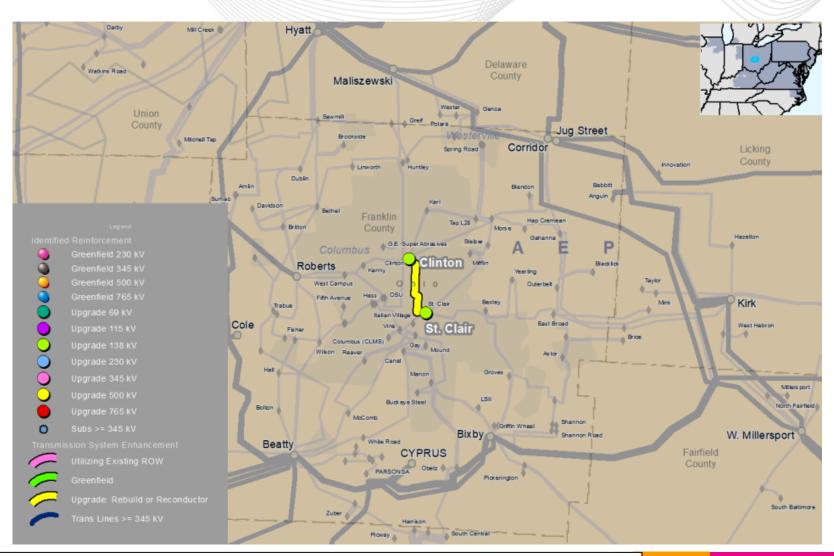
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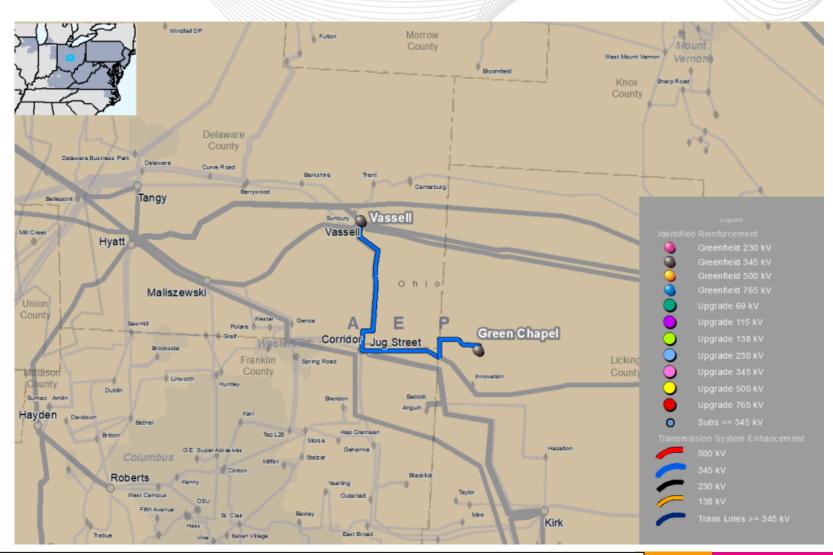


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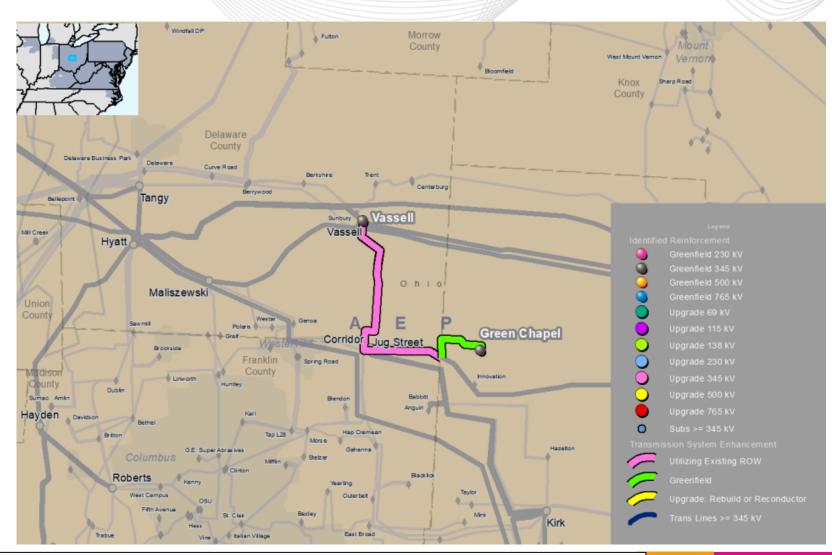






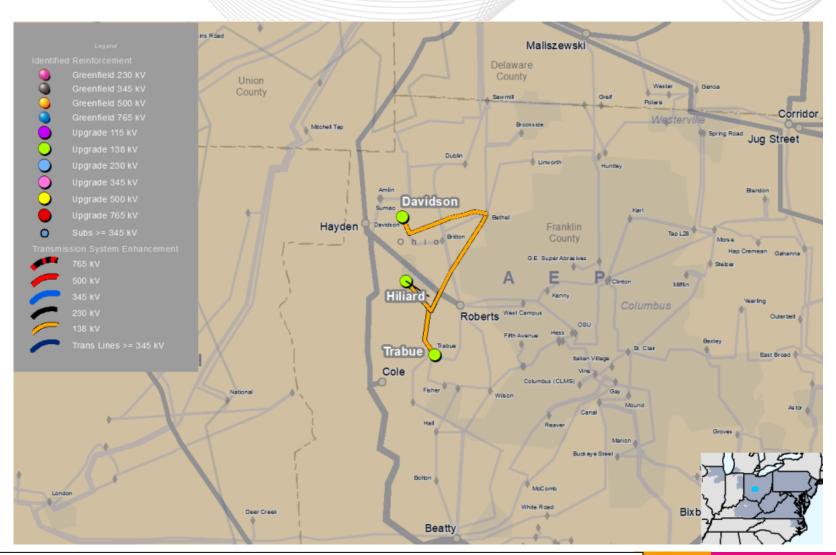
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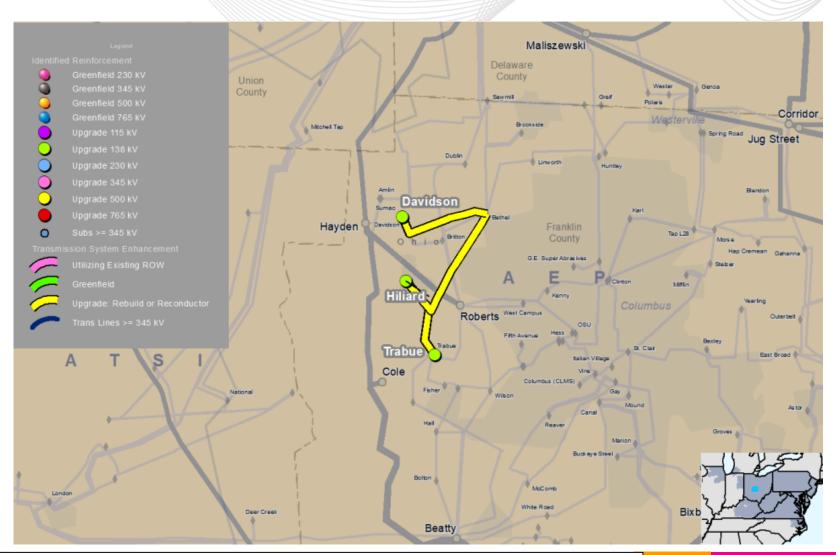


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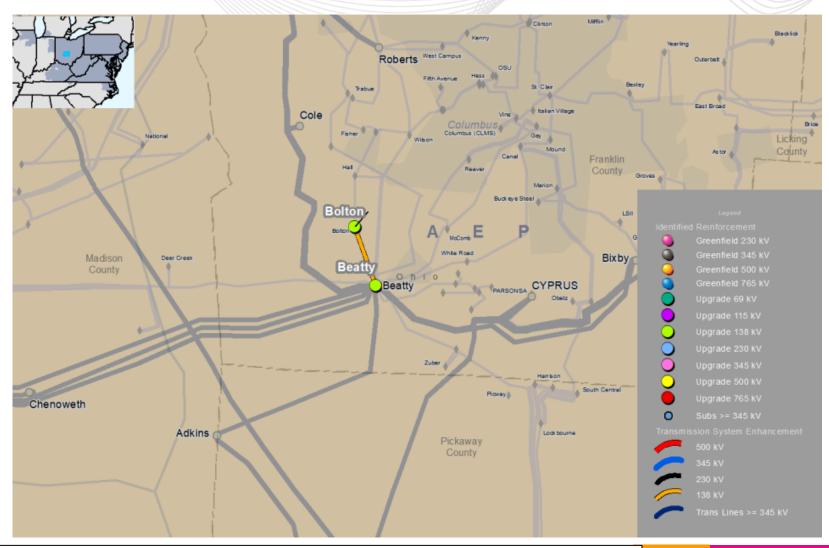




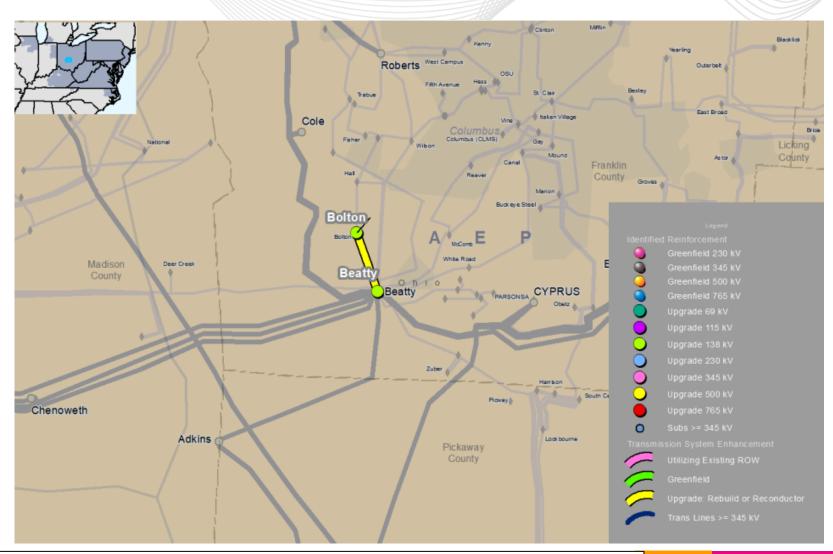




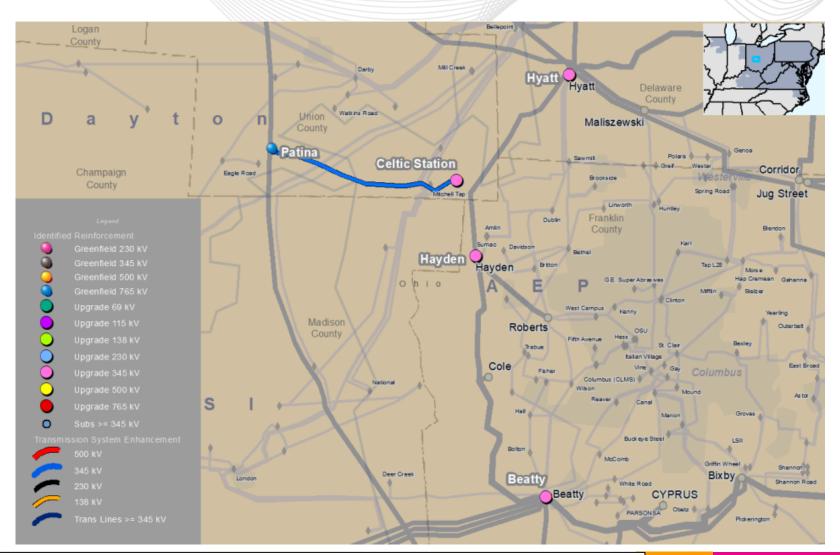




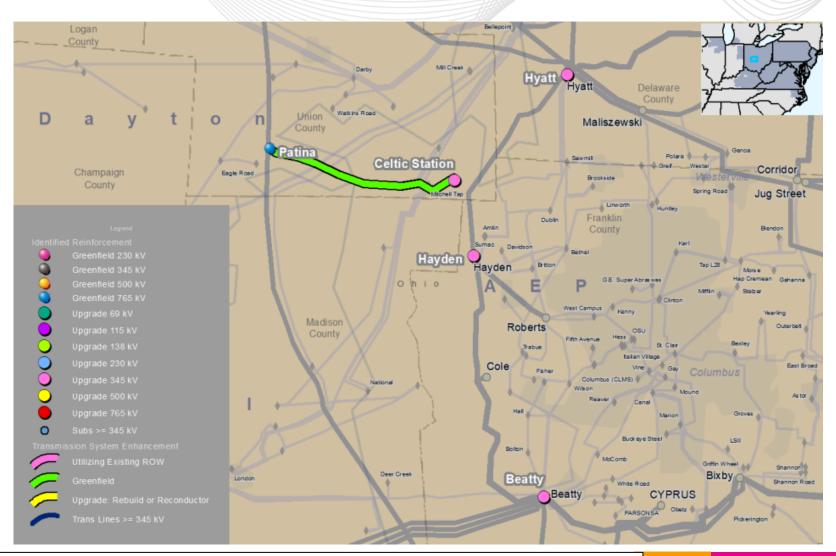




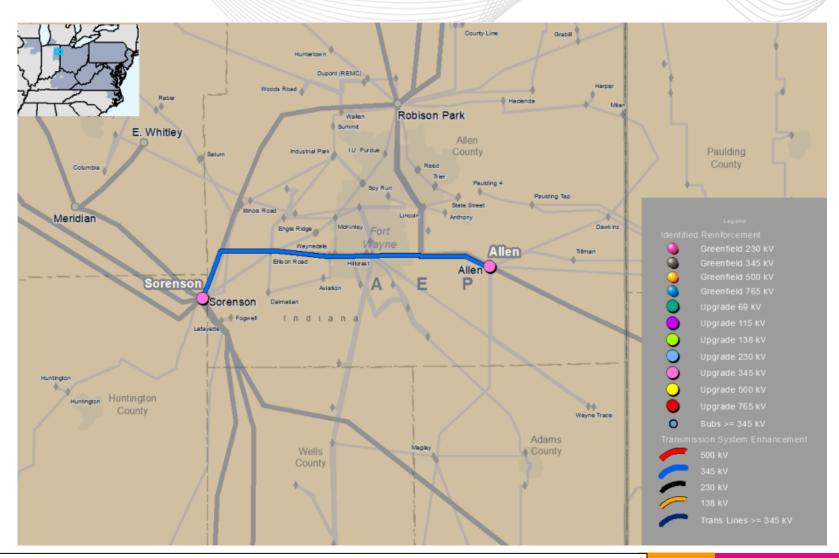












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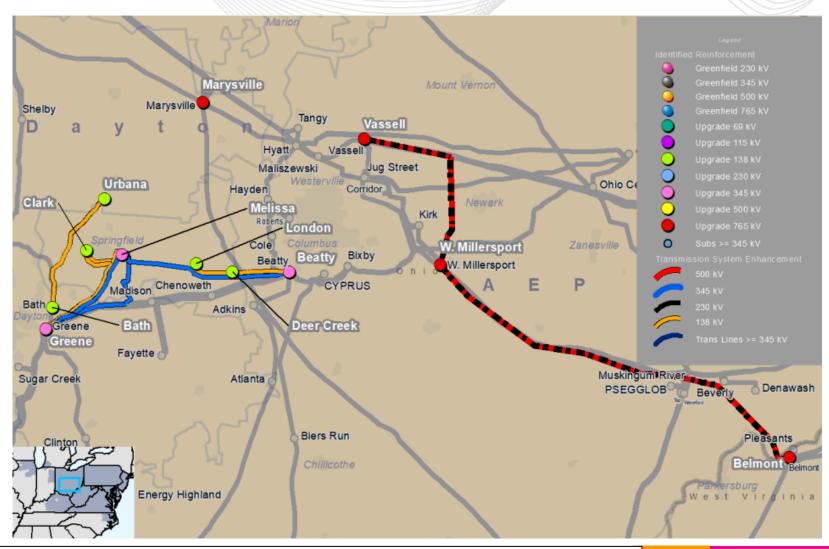




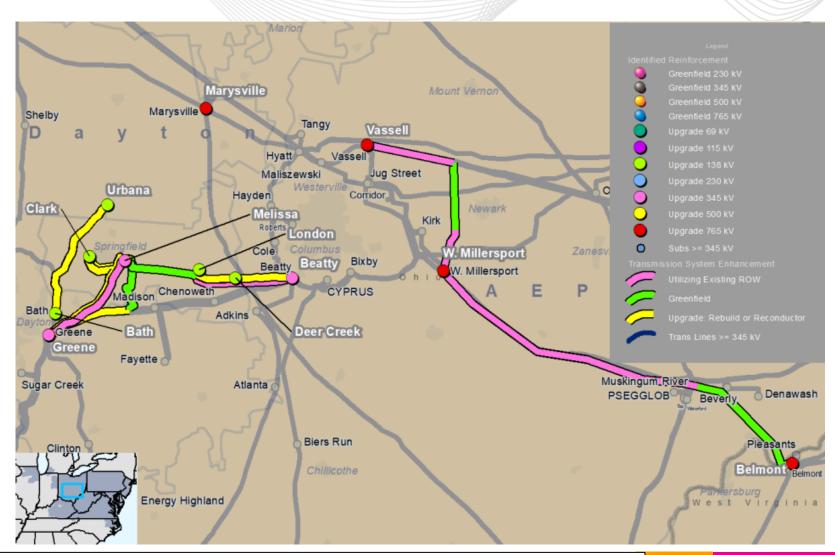


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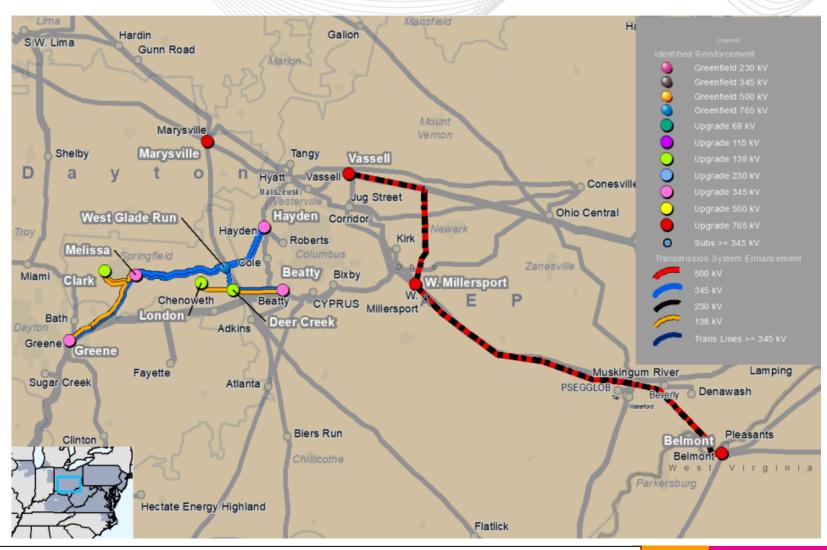




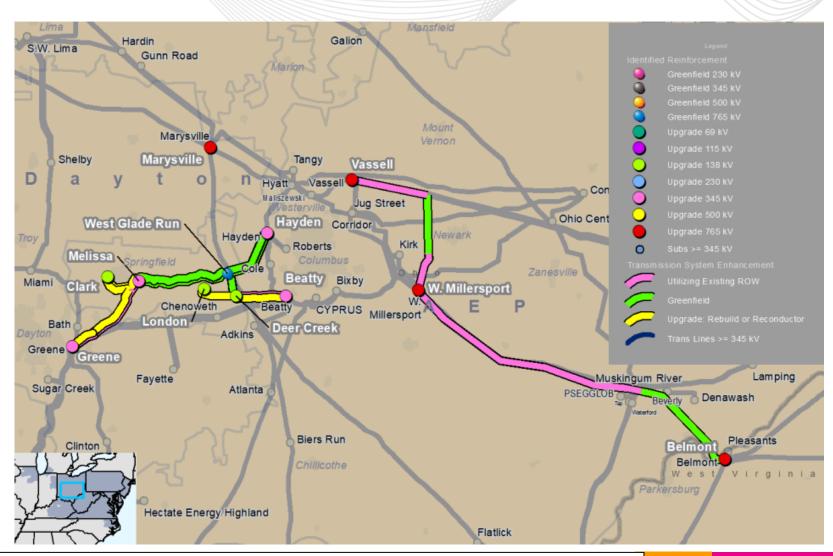








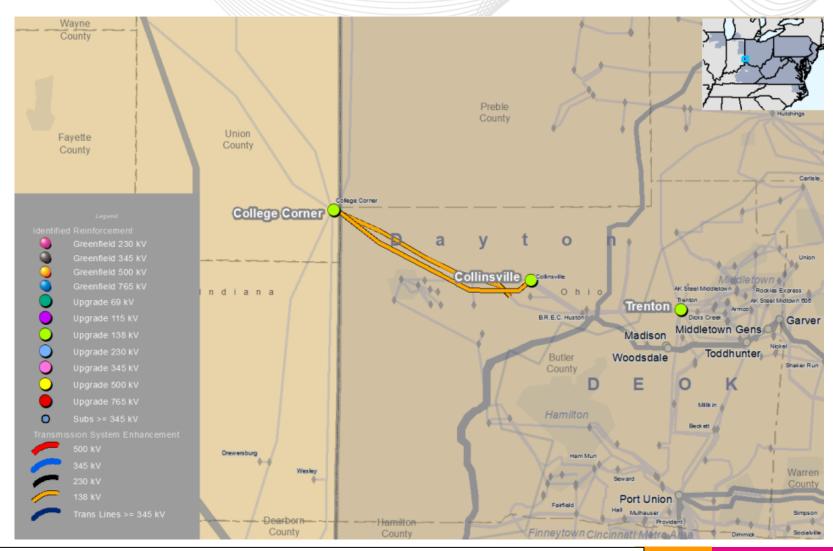




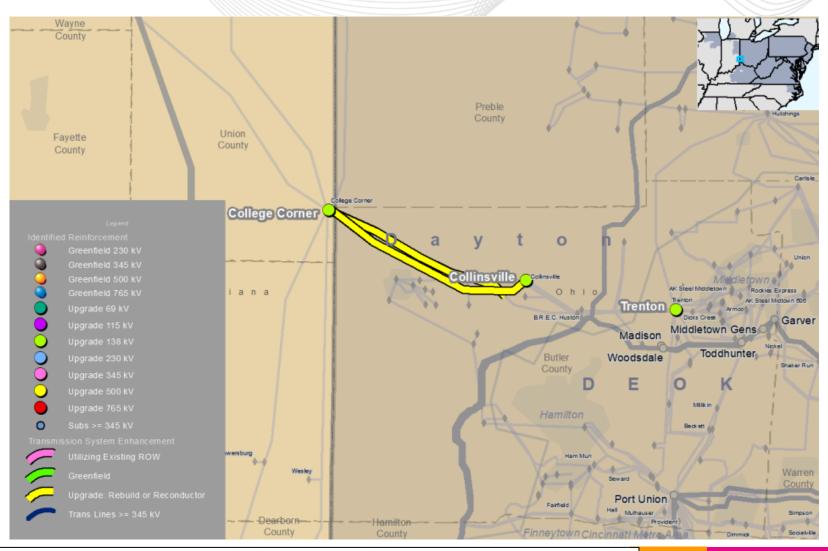


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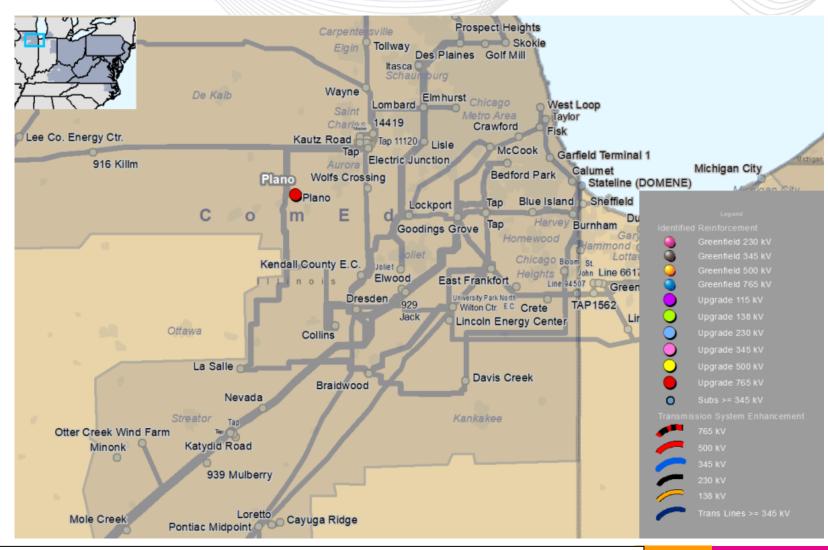


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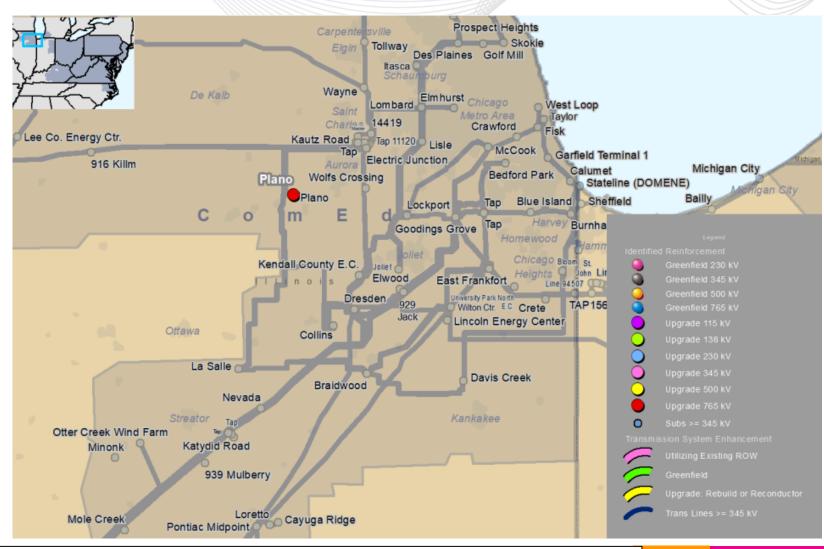


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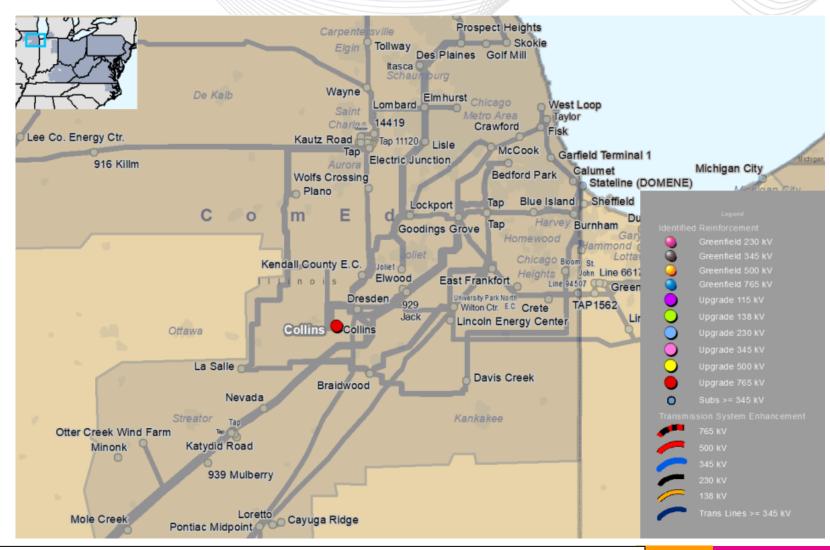




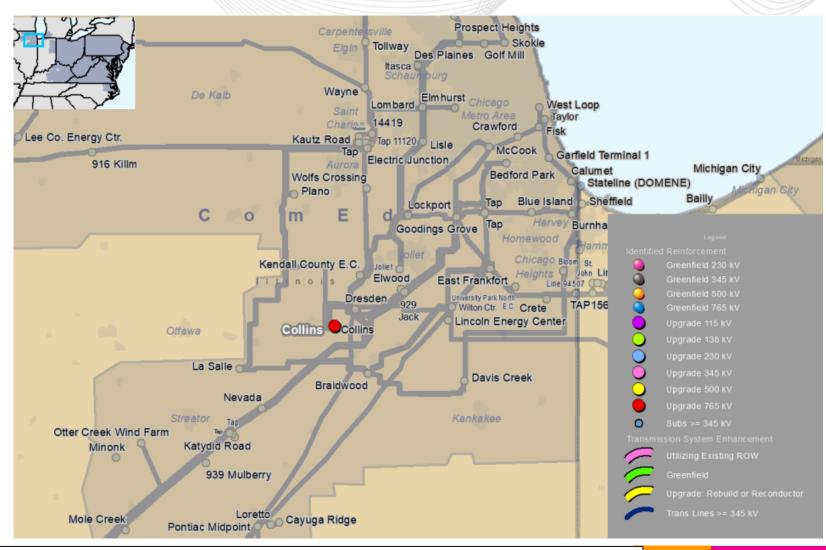




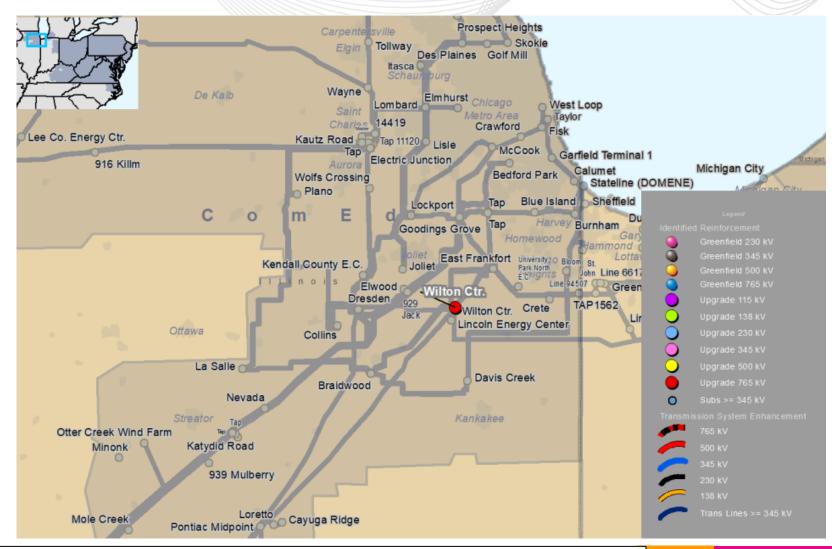




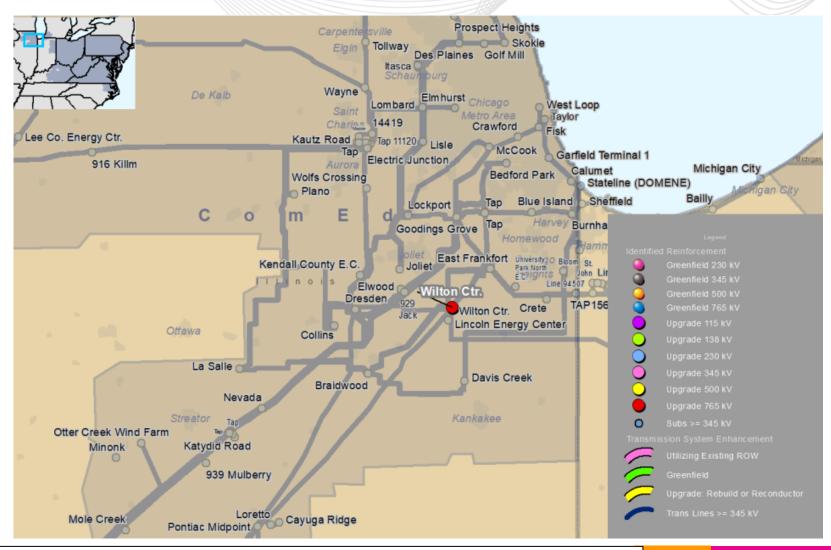








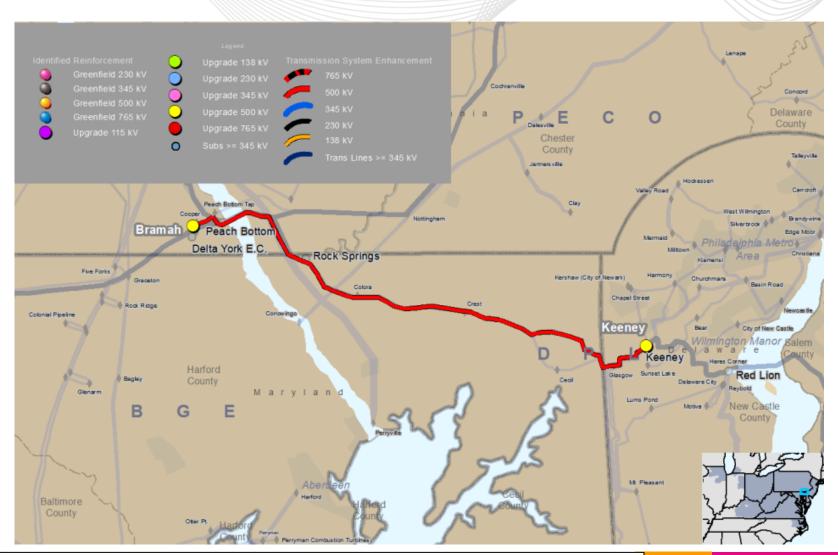




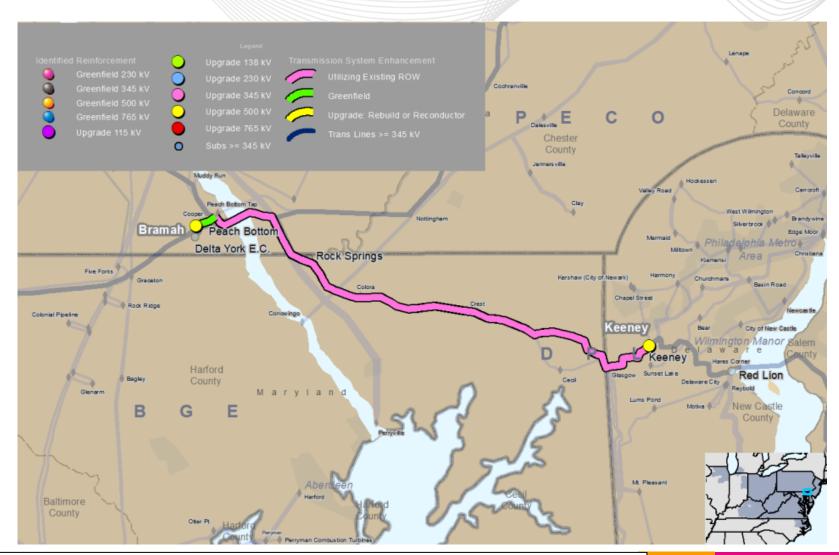


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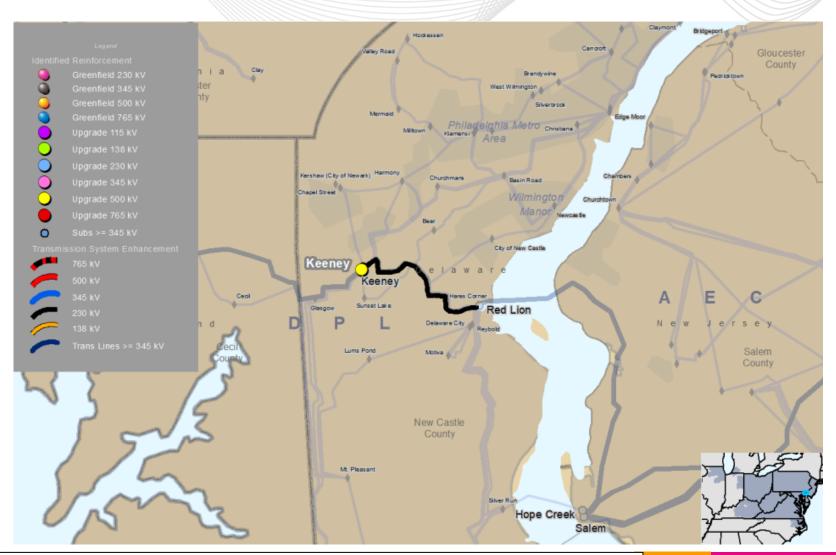




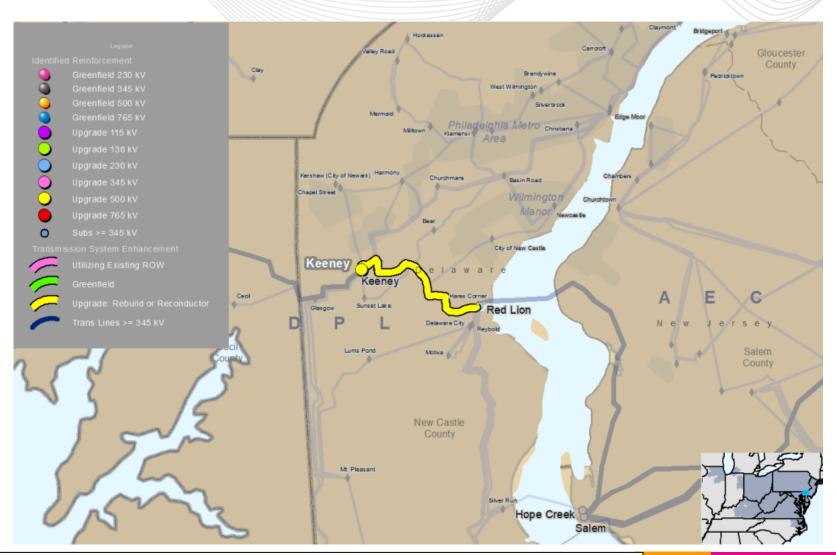








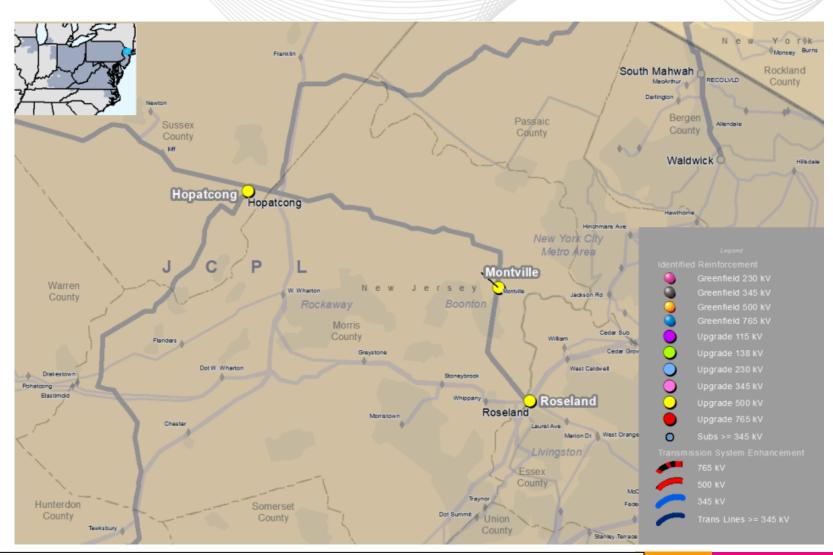




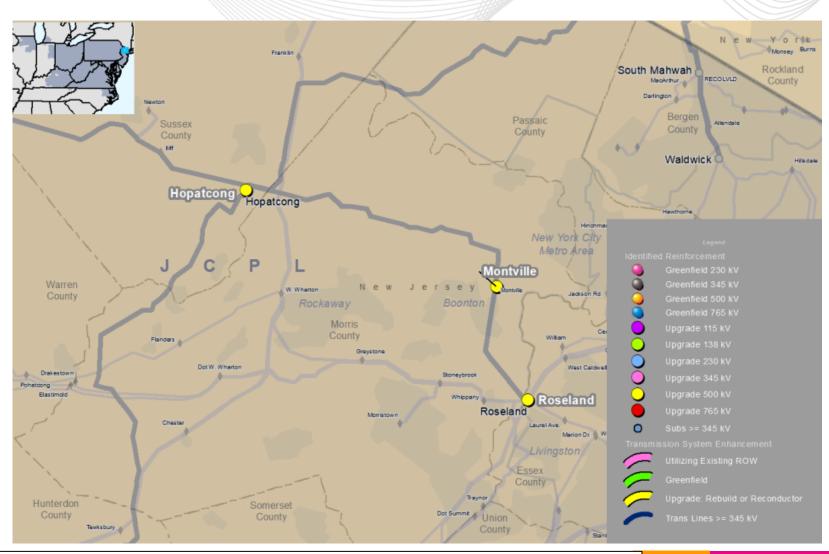


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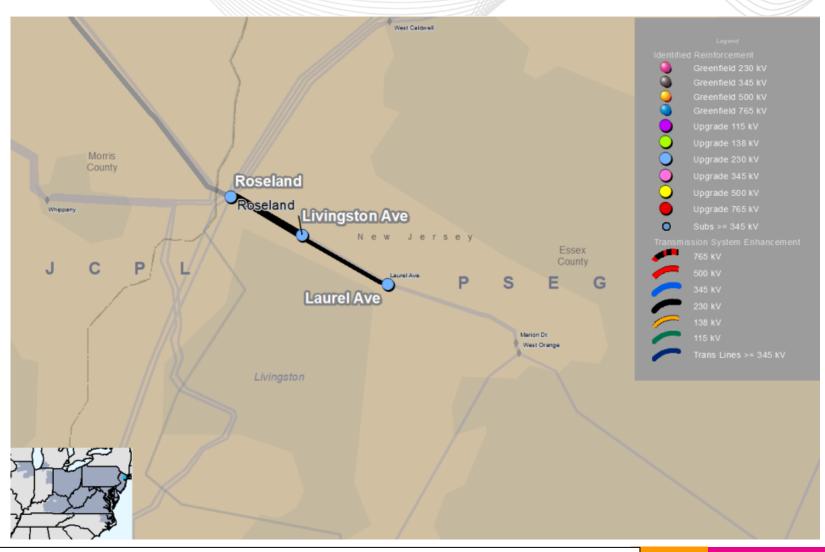




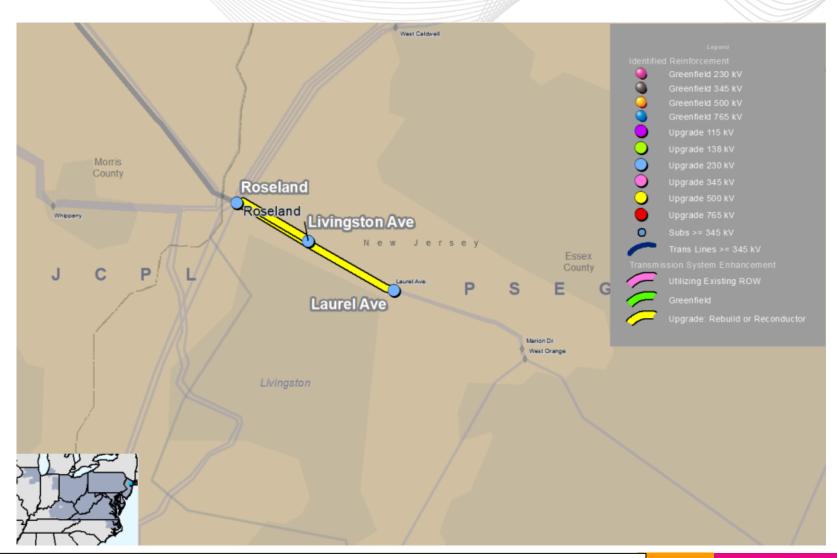
#### **PSEG**









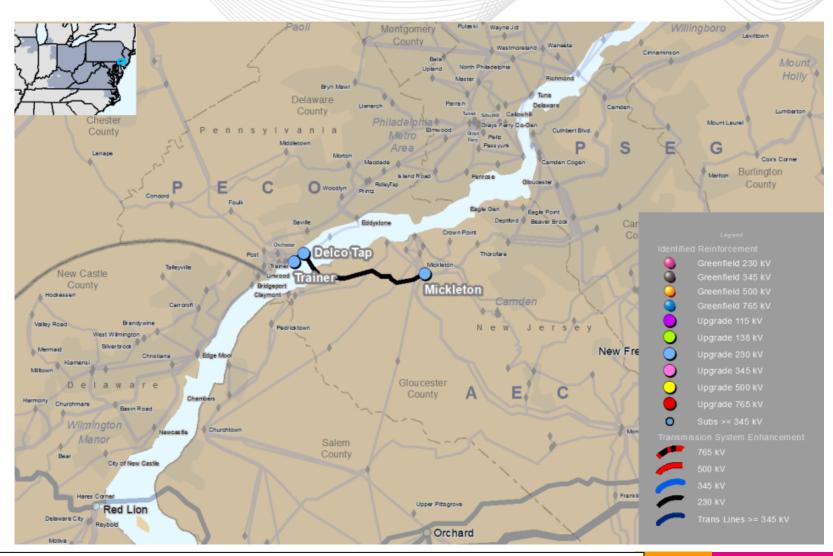




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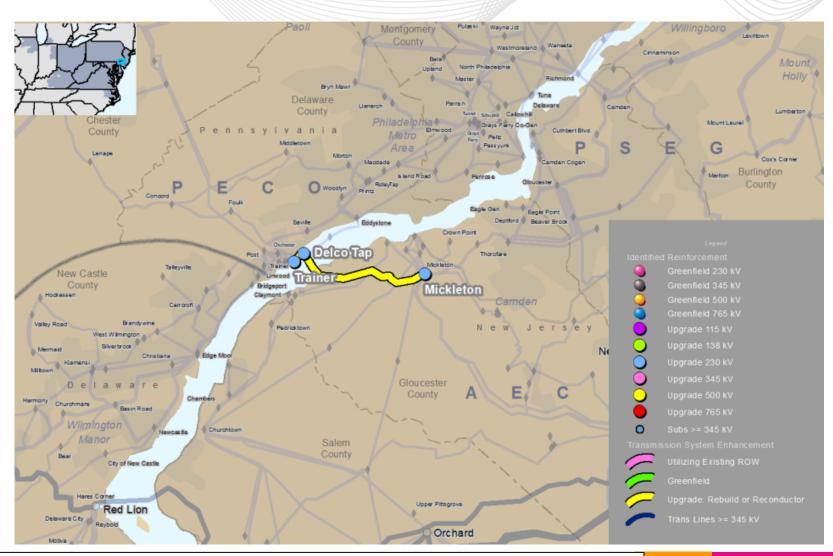






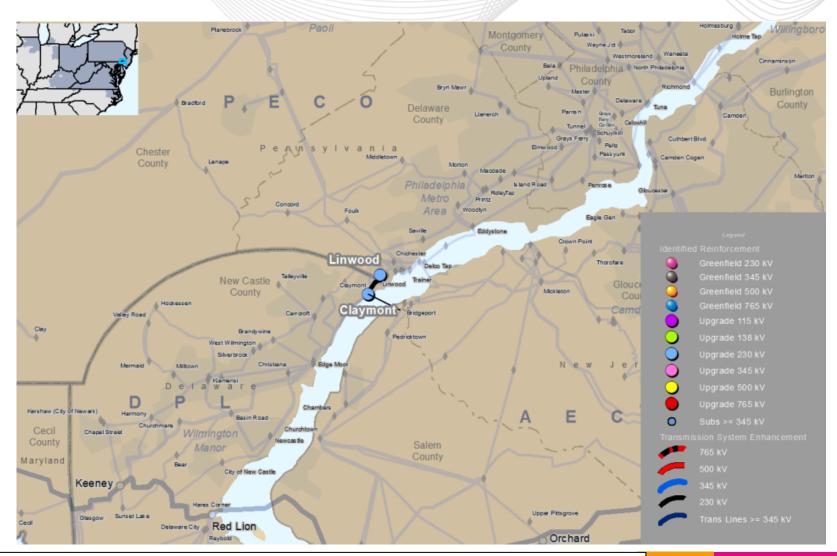




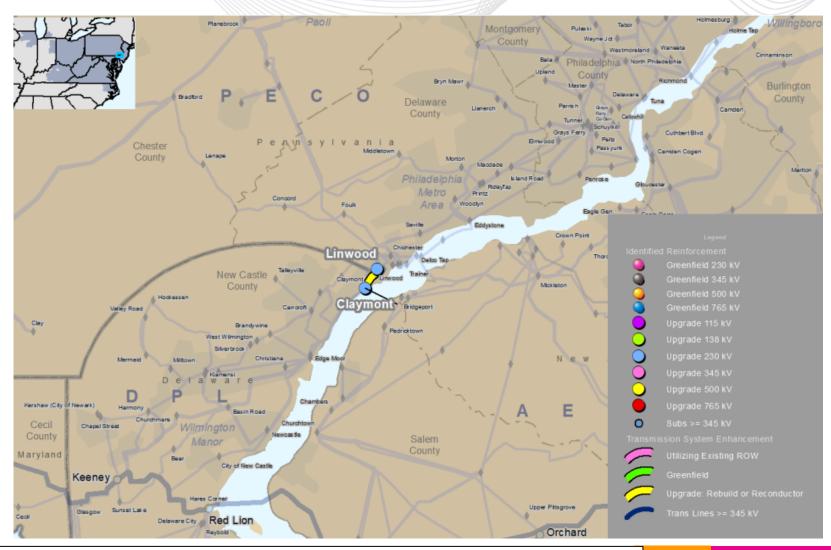






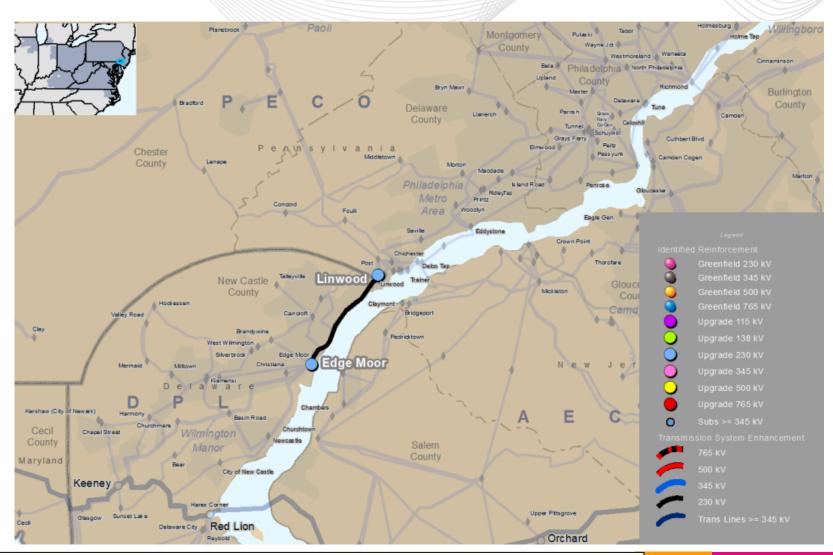






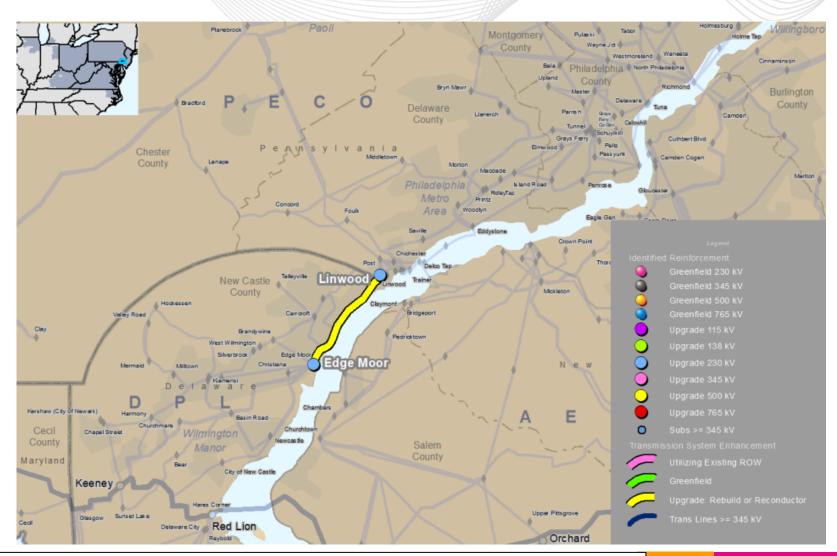






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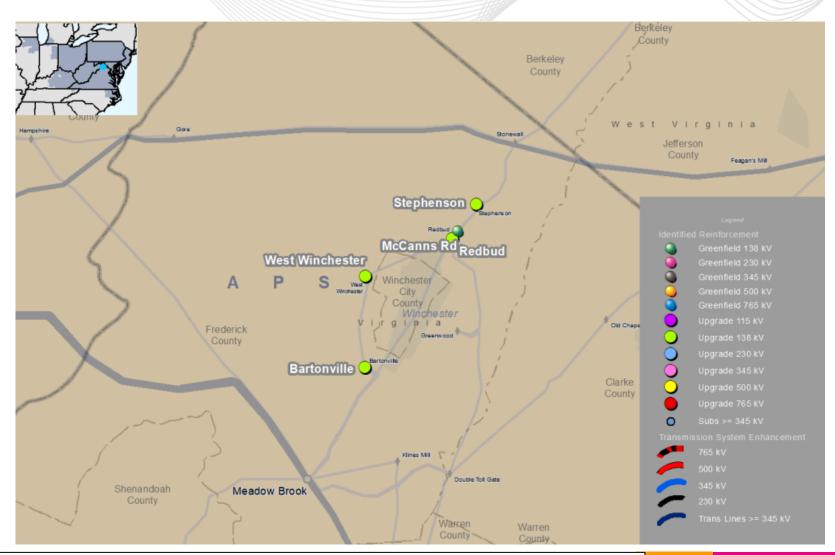




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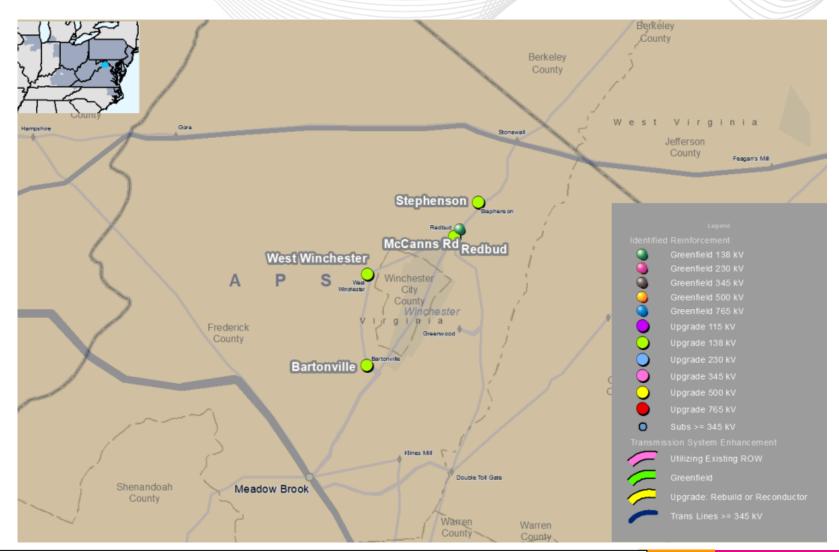
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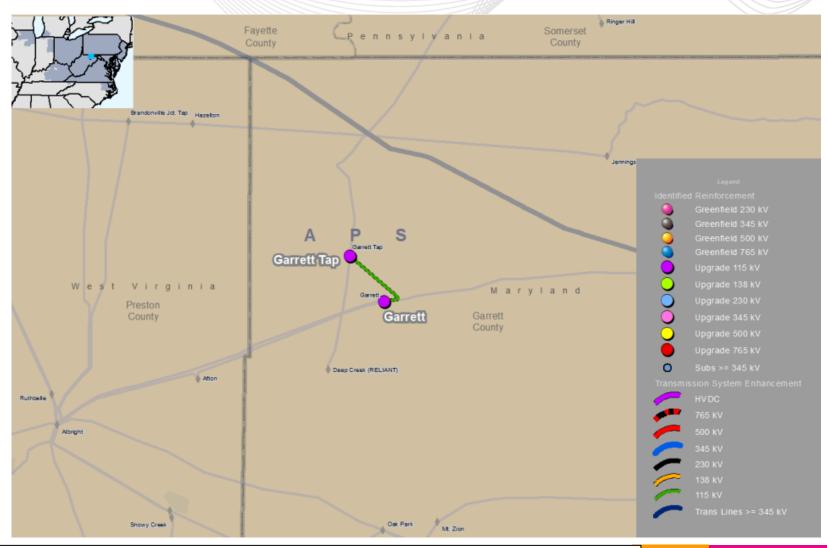
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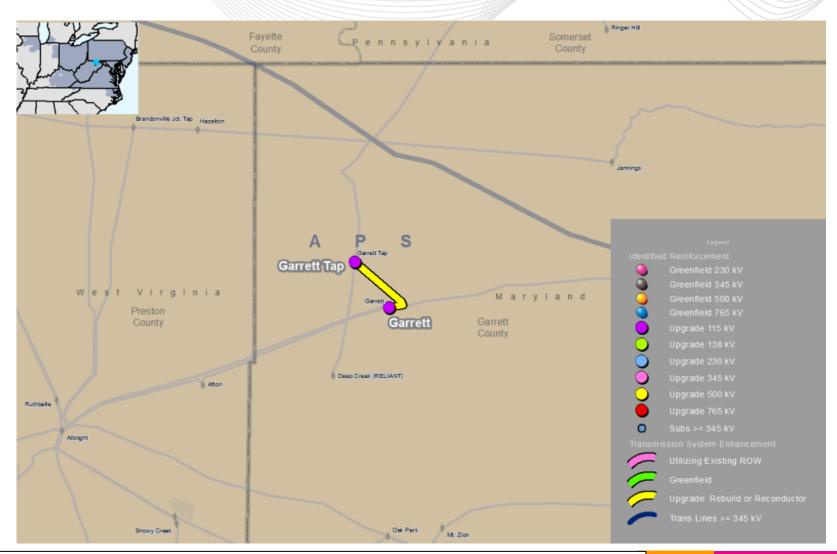


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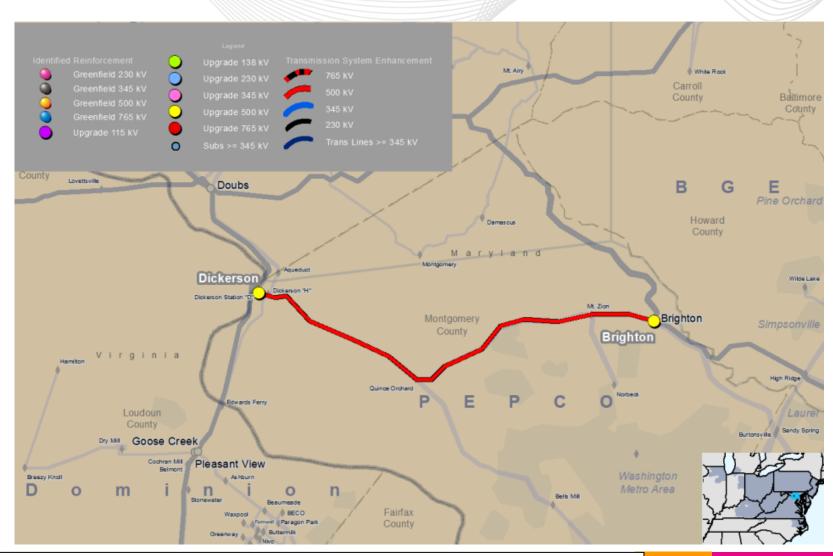
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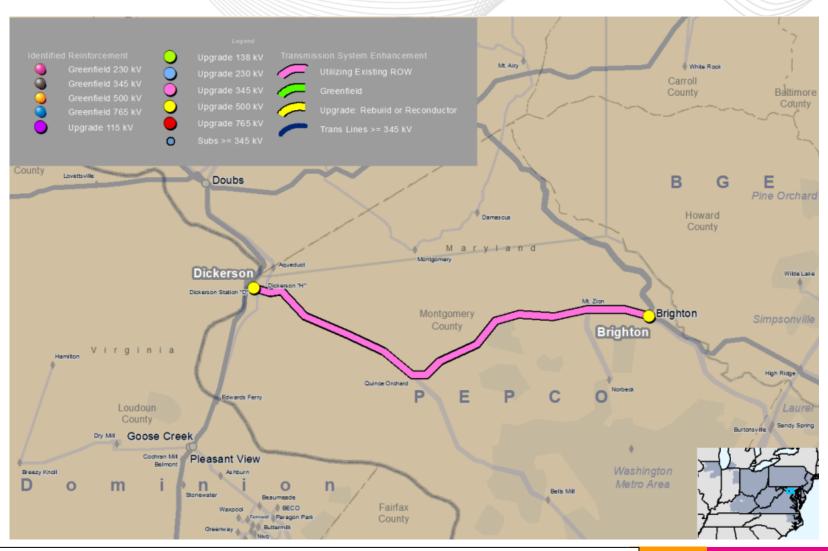
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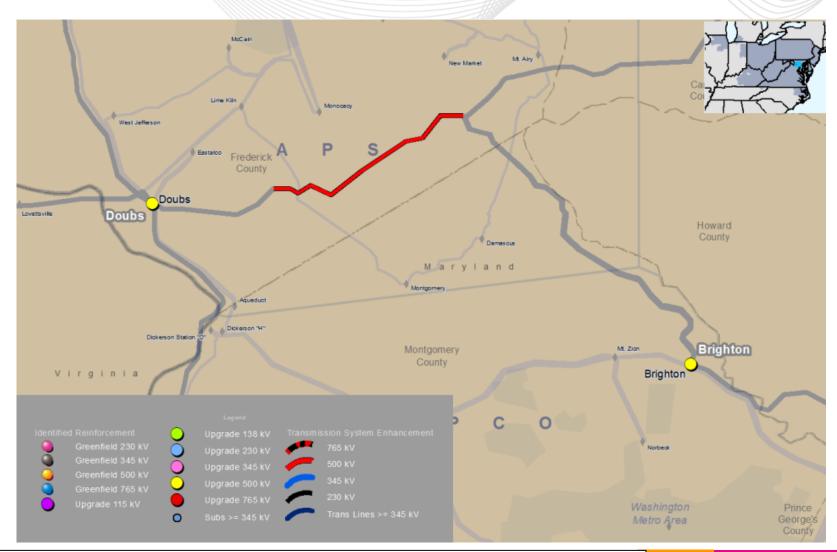






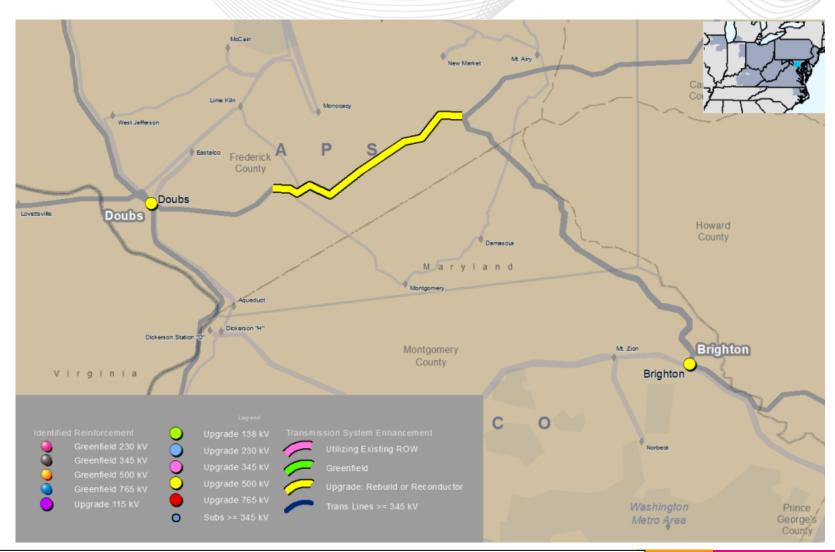






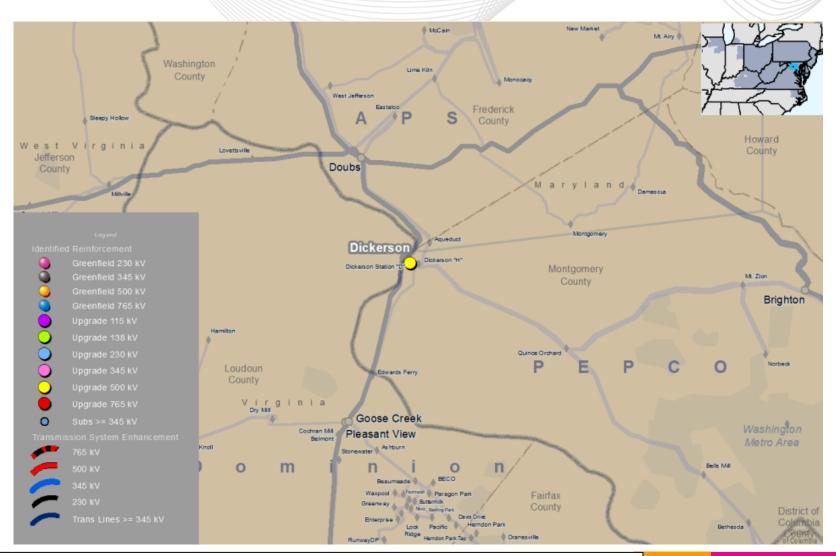
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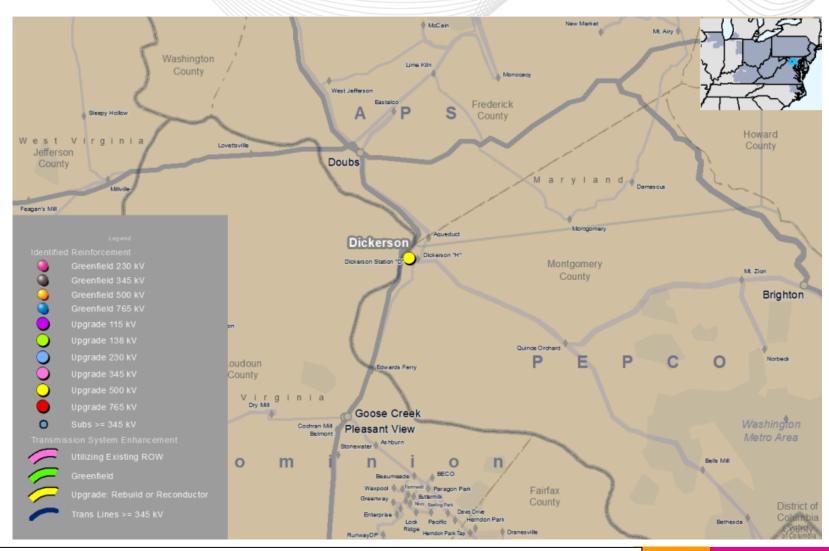


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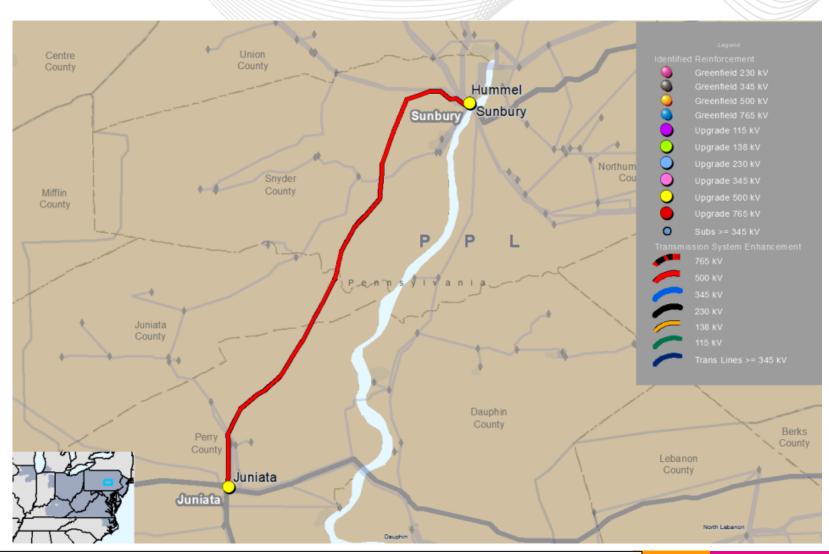
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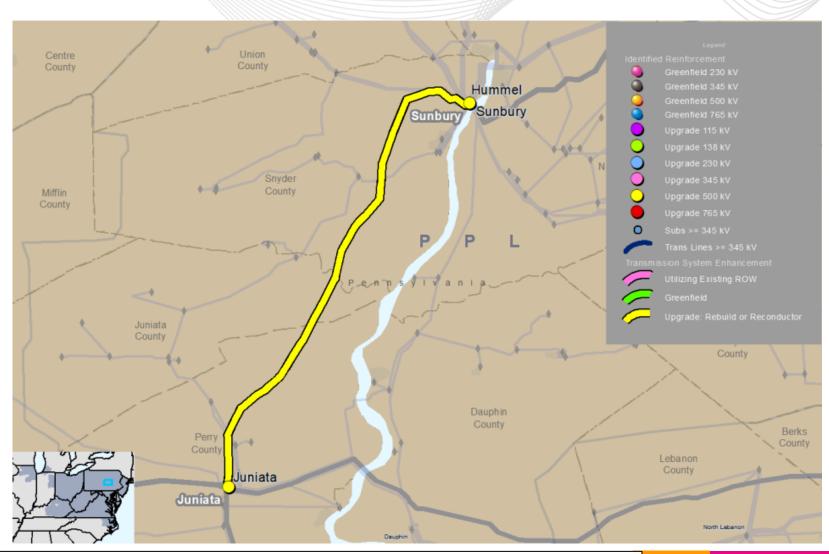
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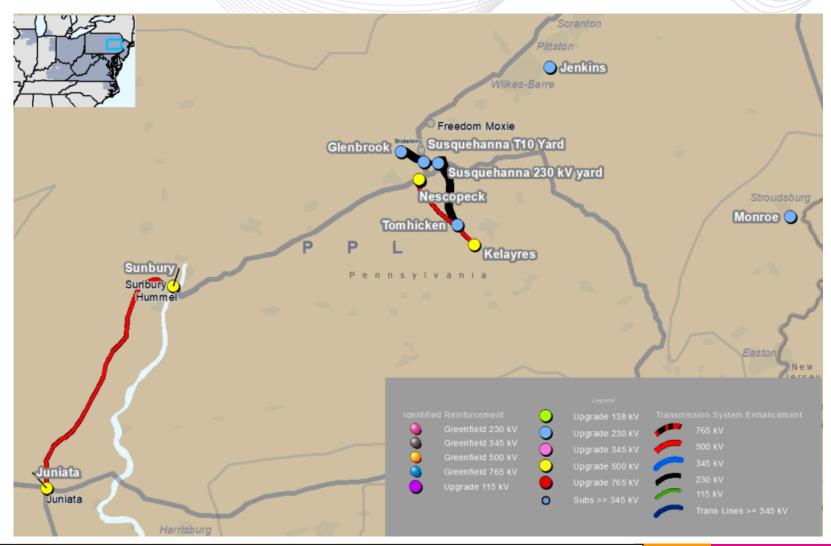
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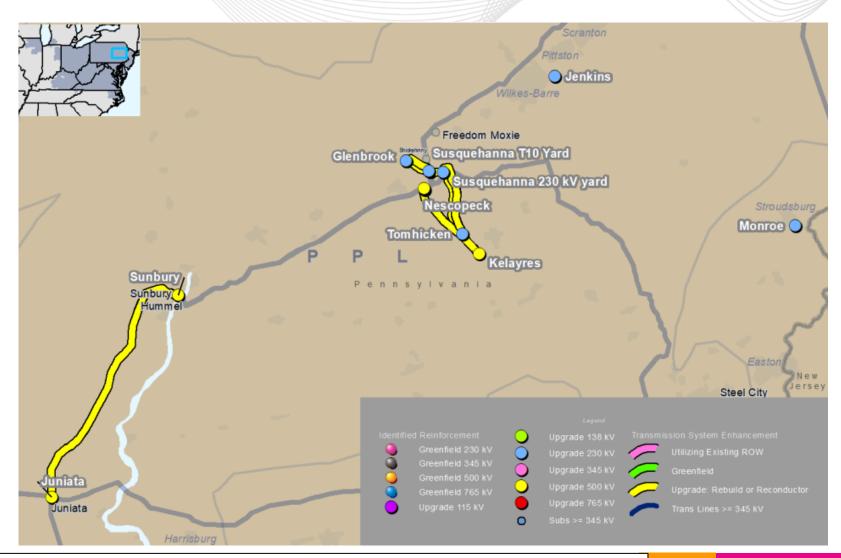
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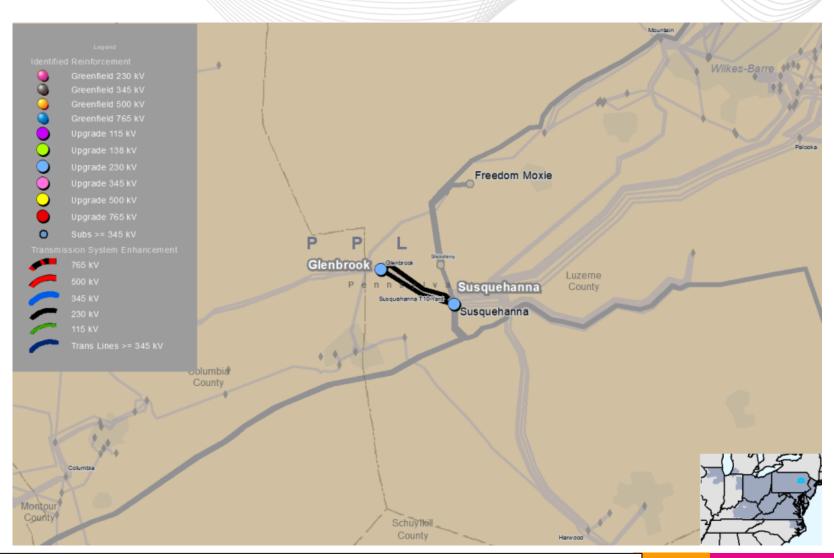
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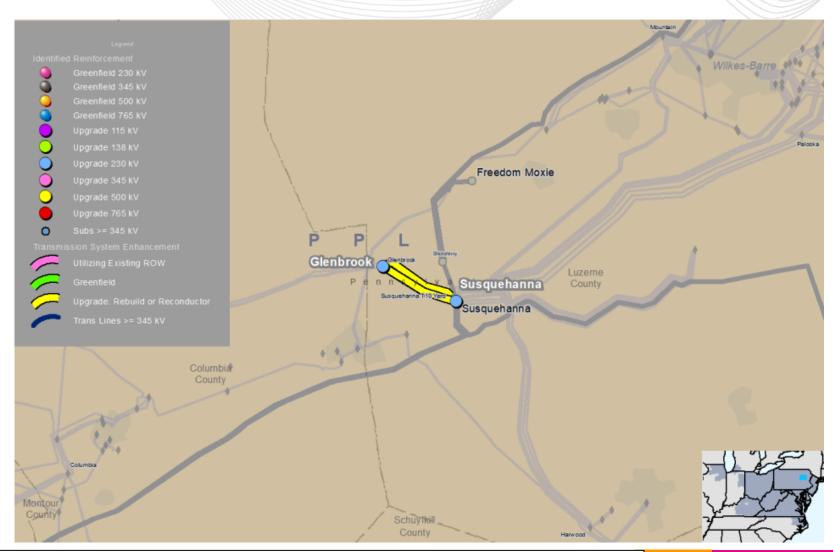
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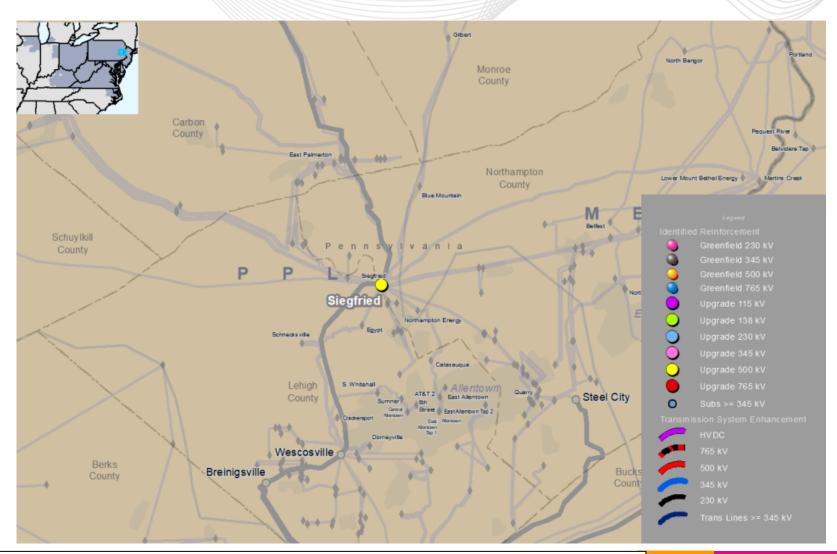




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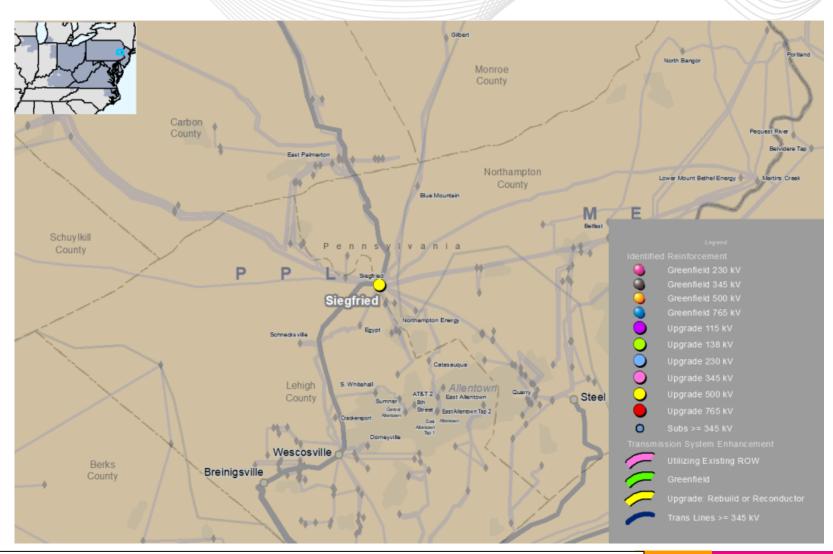




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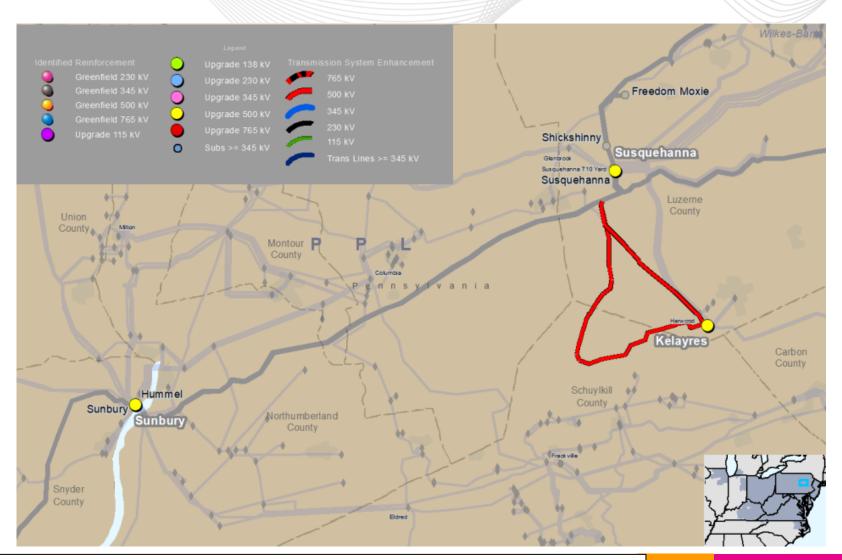






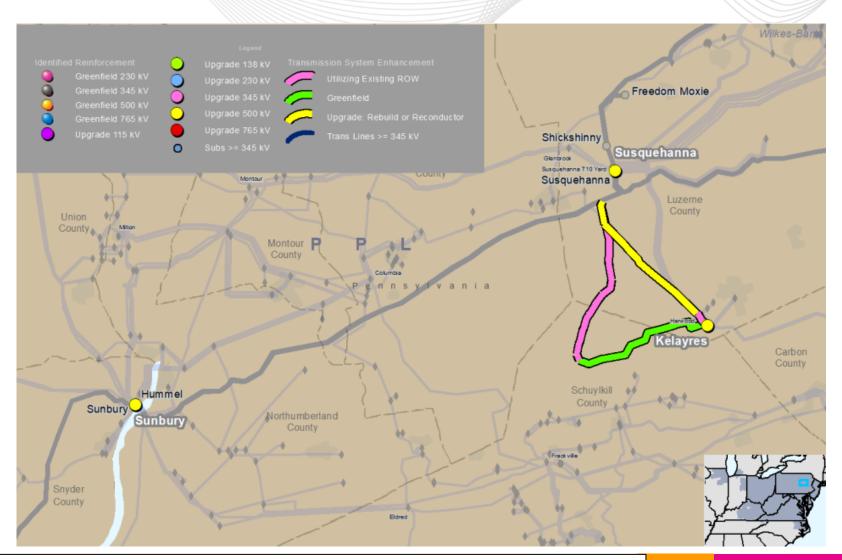
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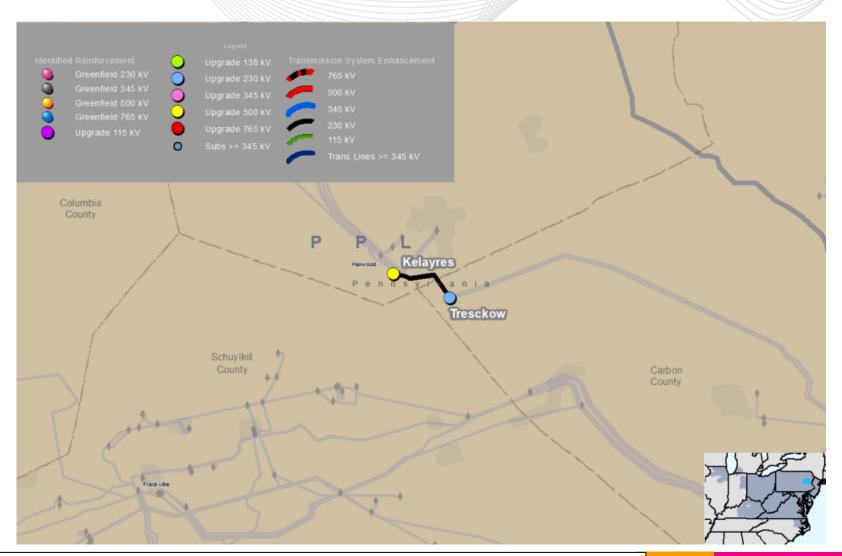
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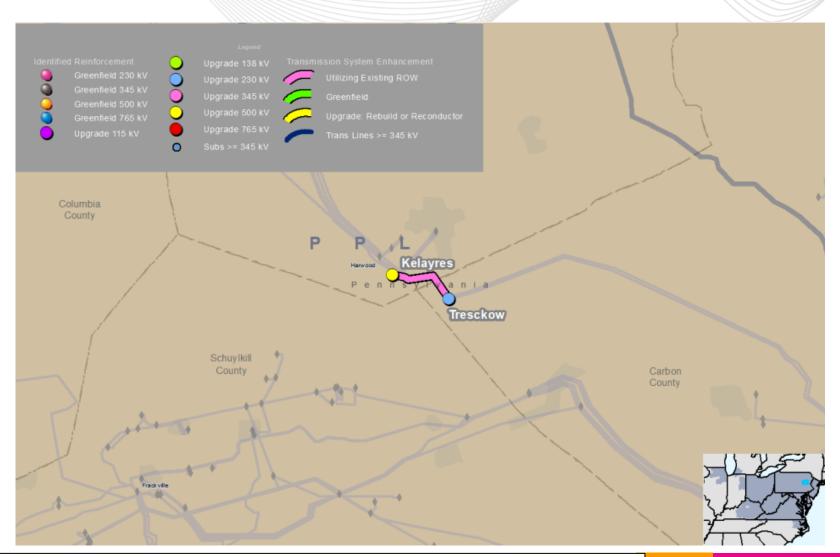
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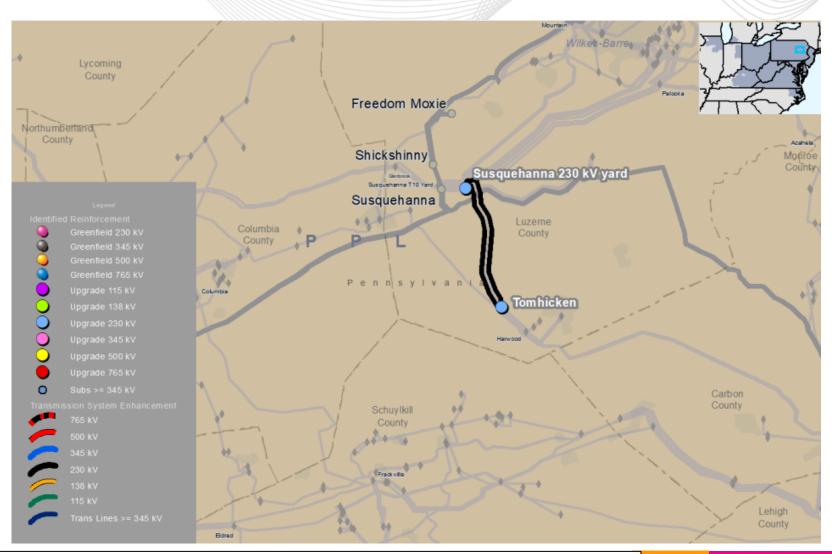
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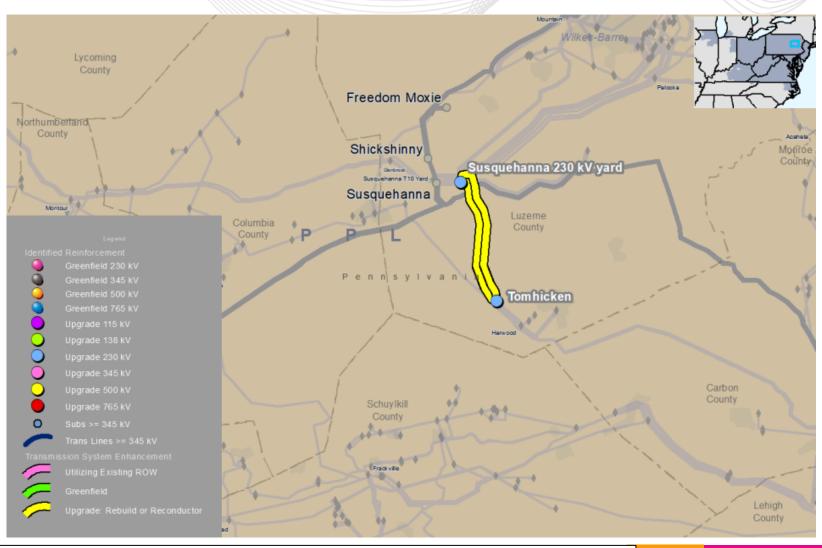
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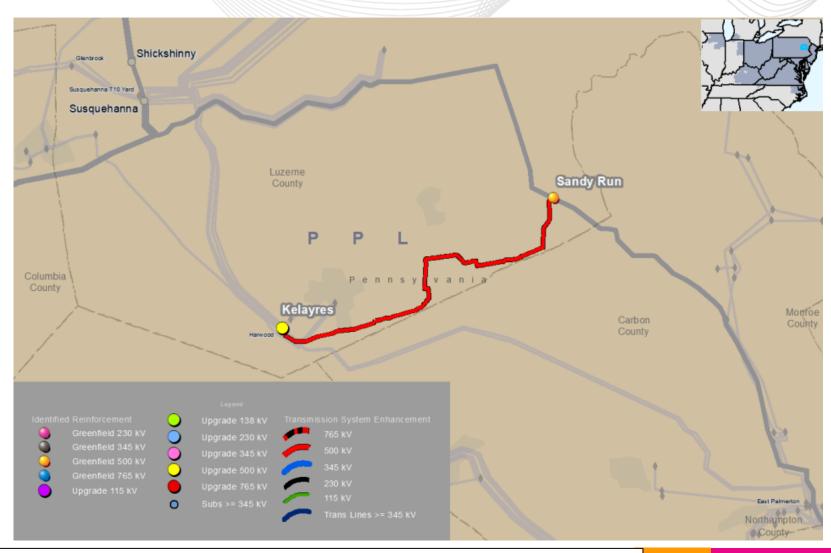
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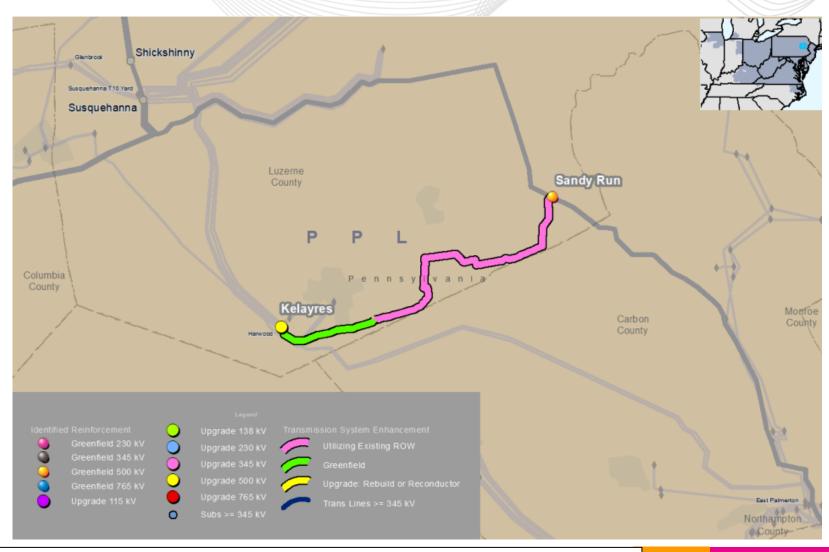




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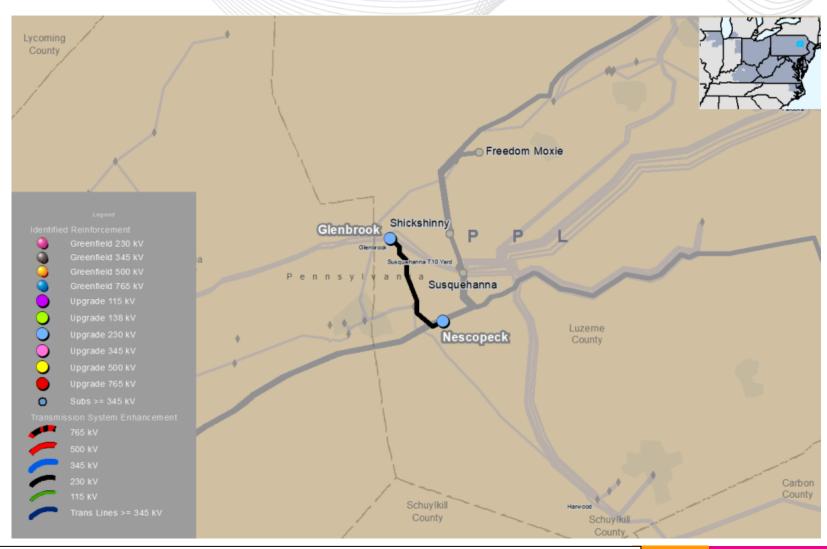




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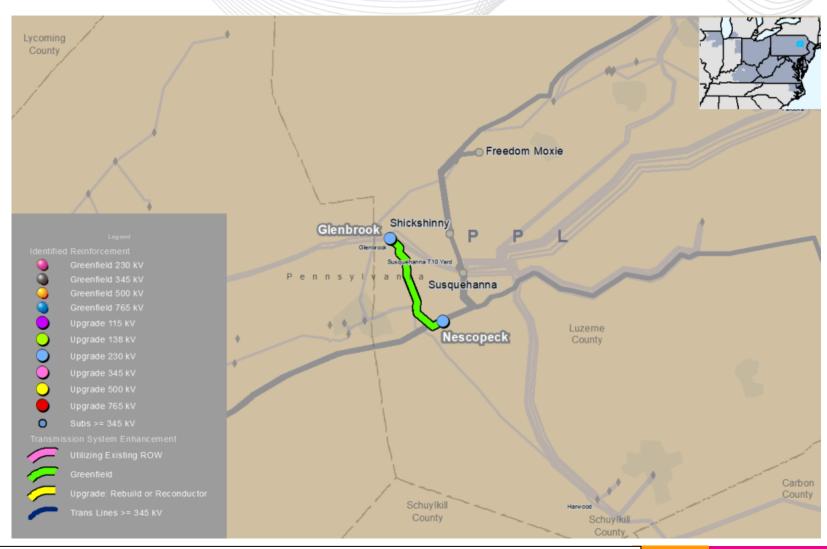
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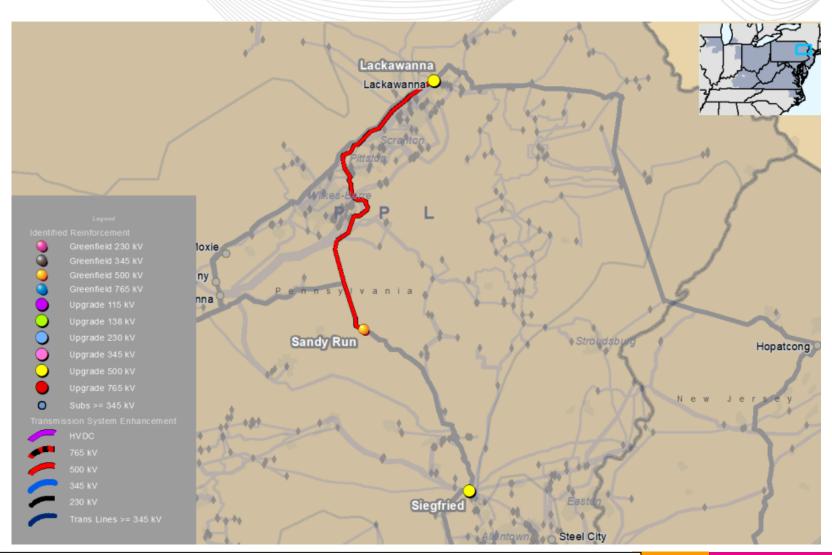
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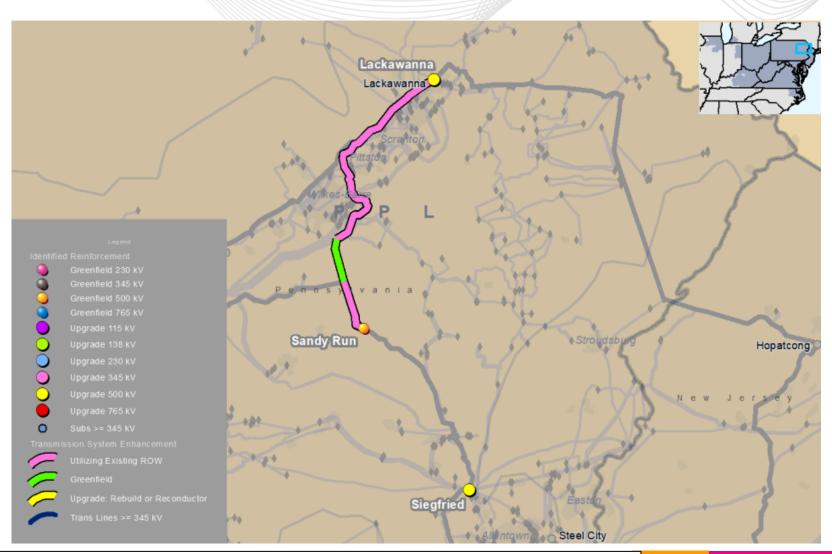
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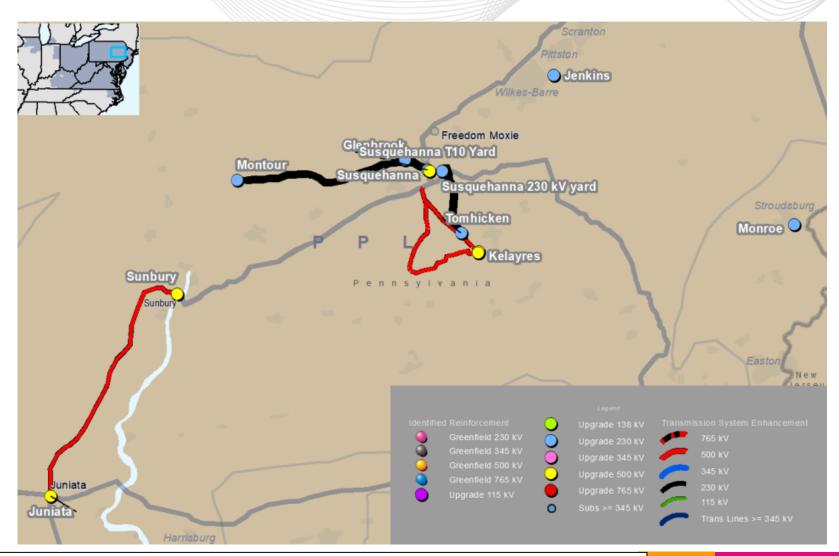
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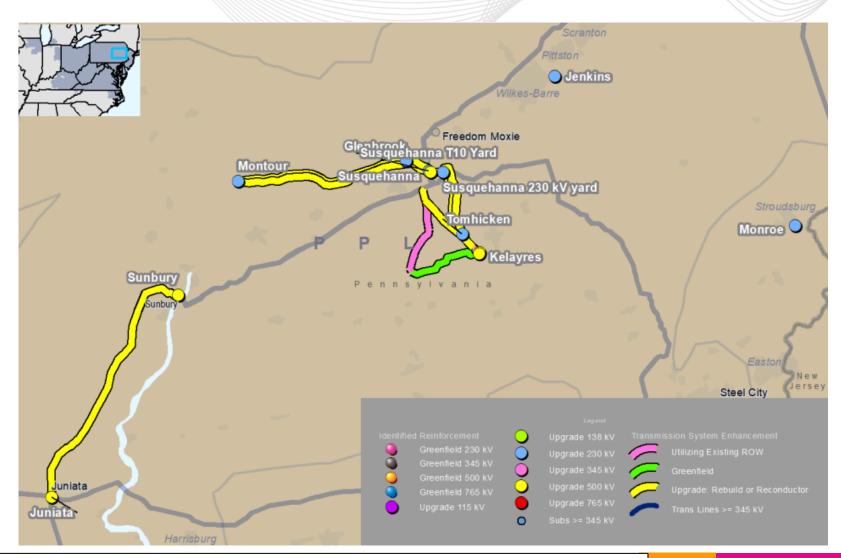
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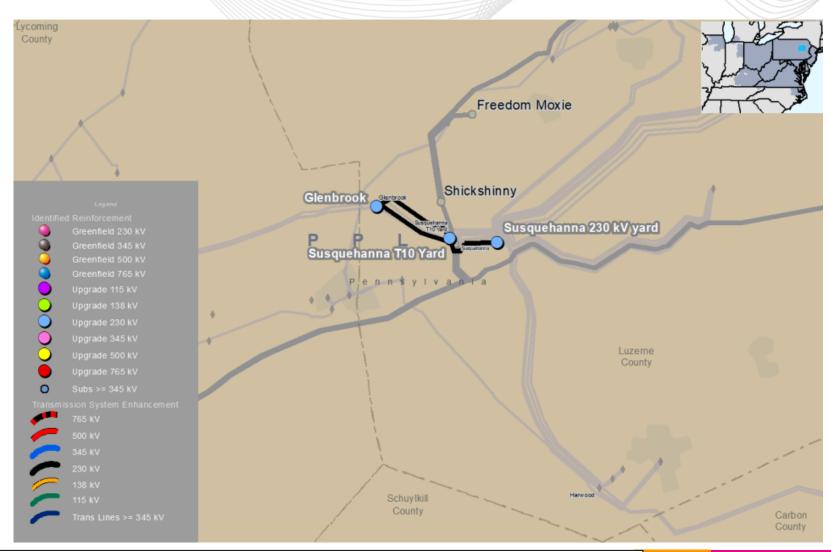
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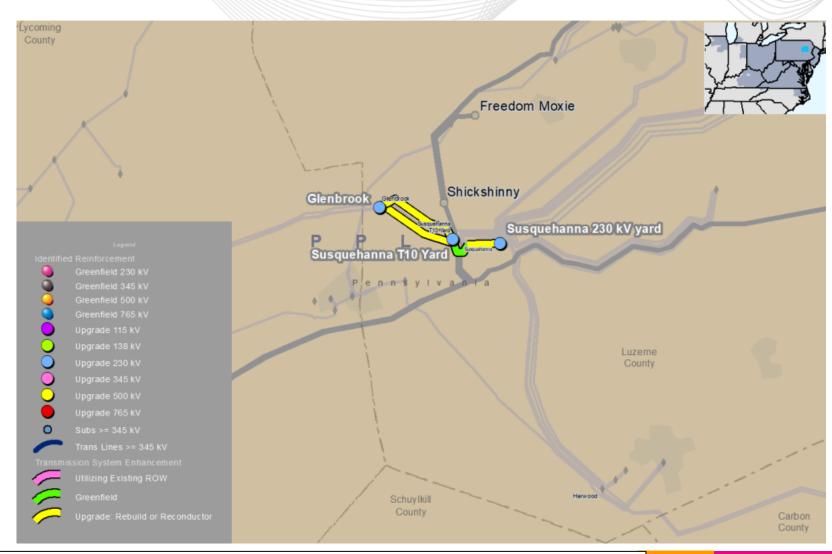
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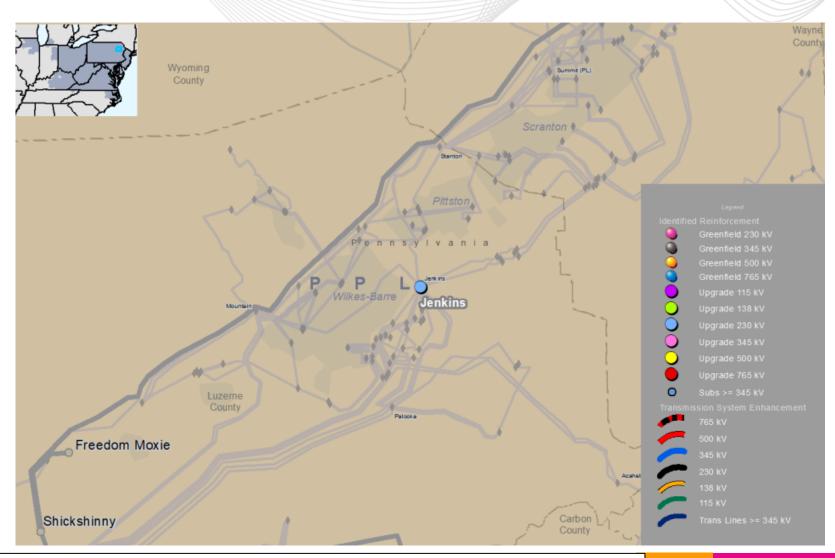
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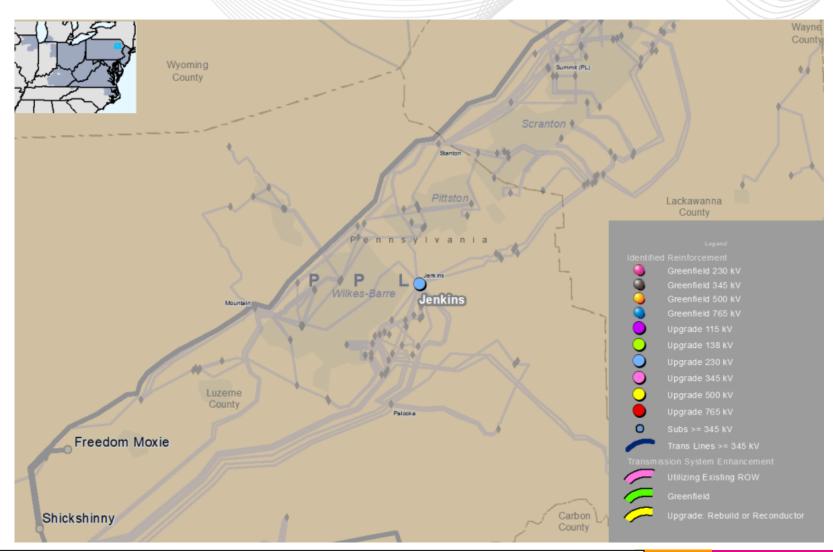
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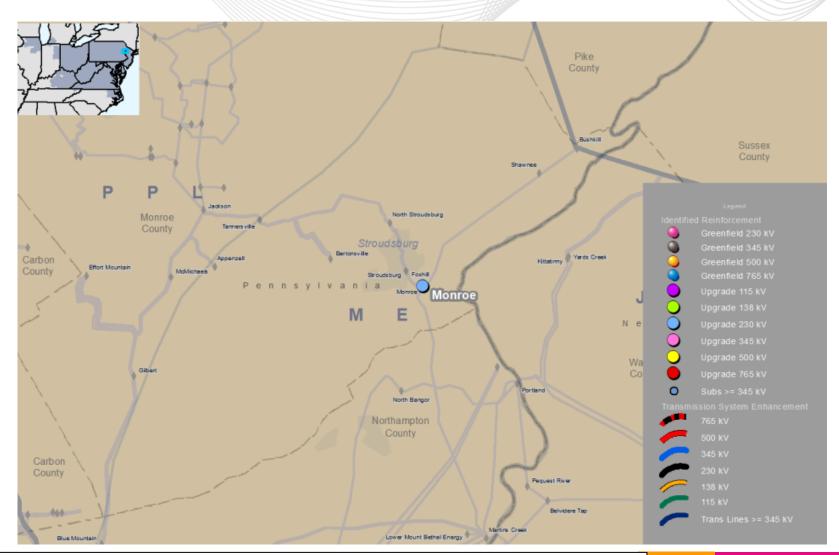
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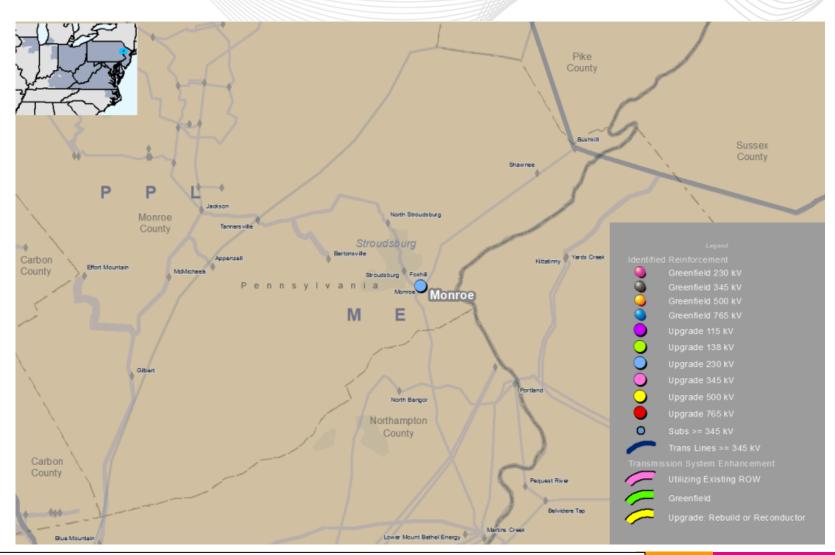


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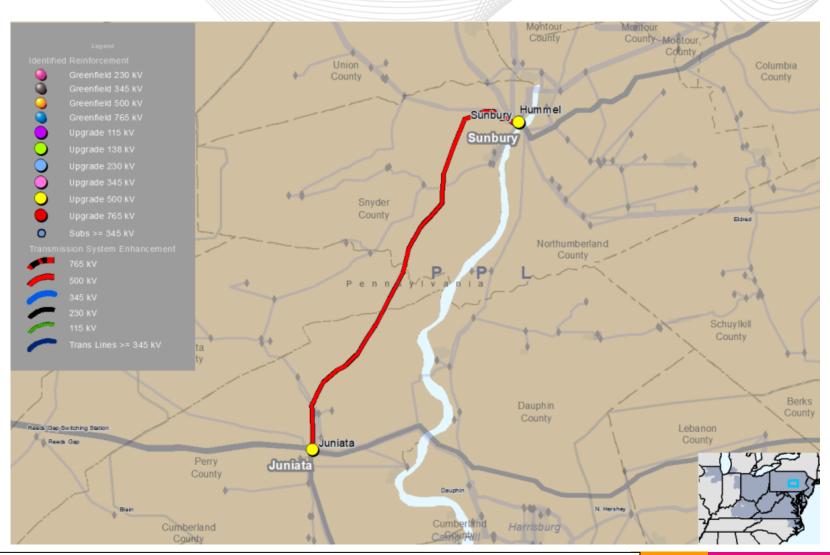






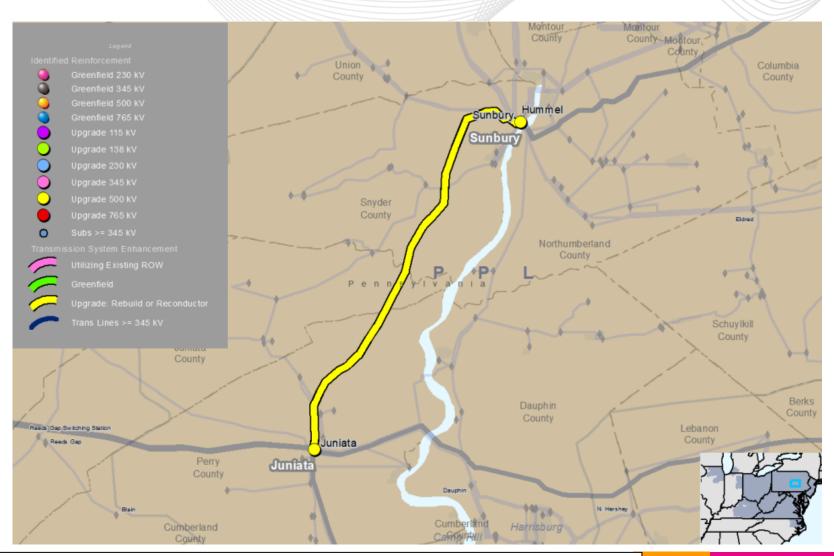
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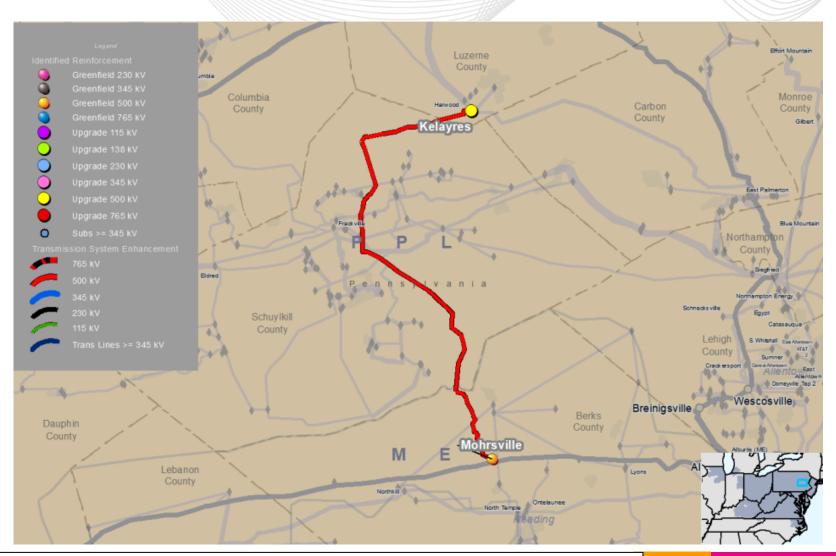


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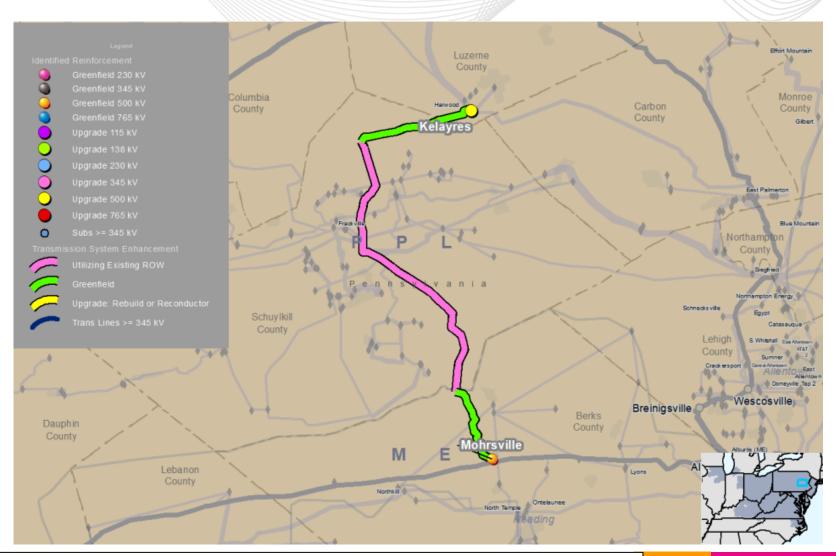








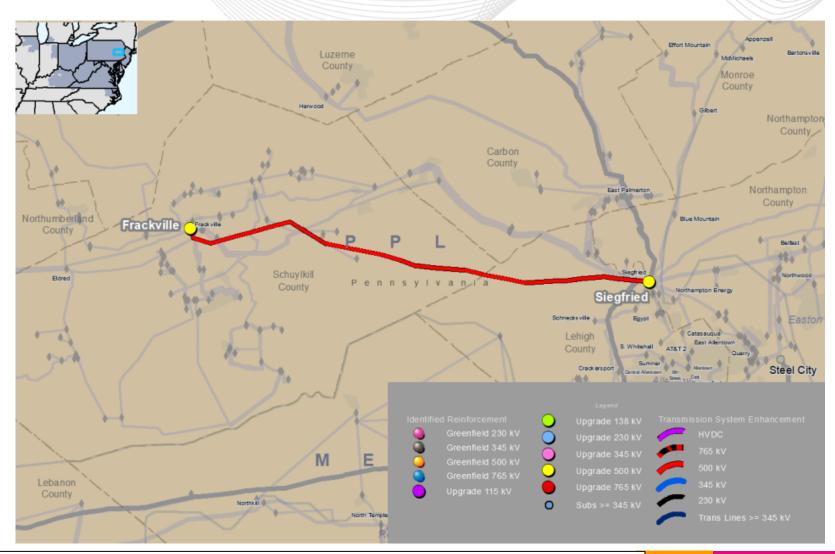




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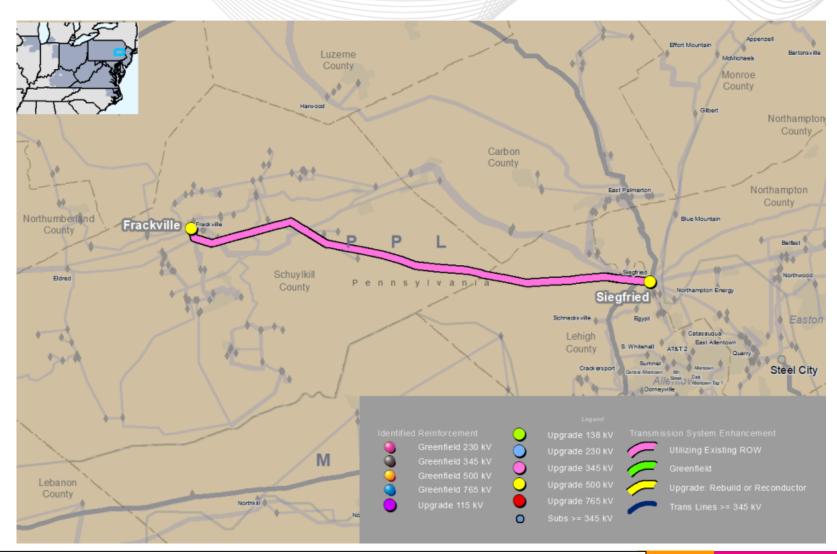




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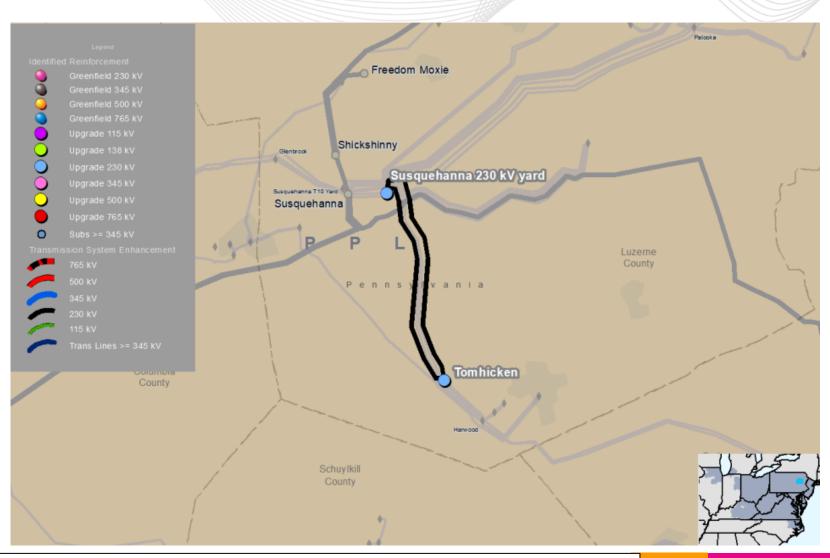






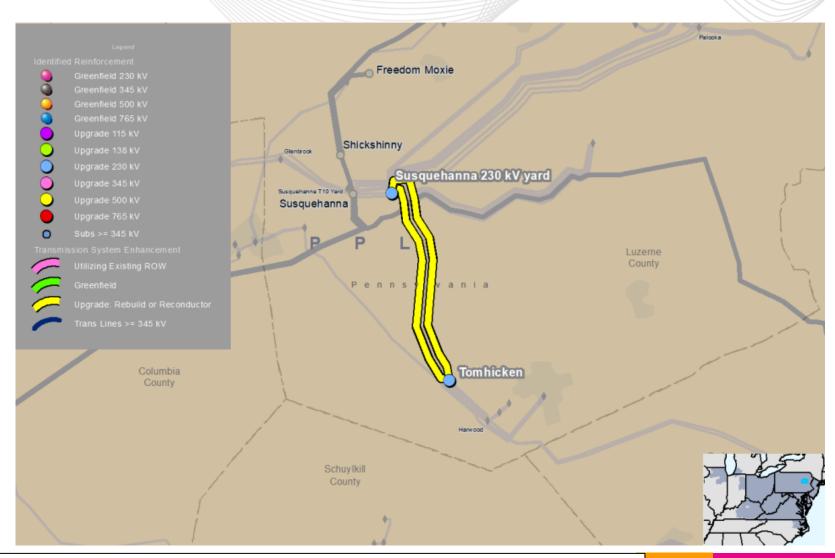
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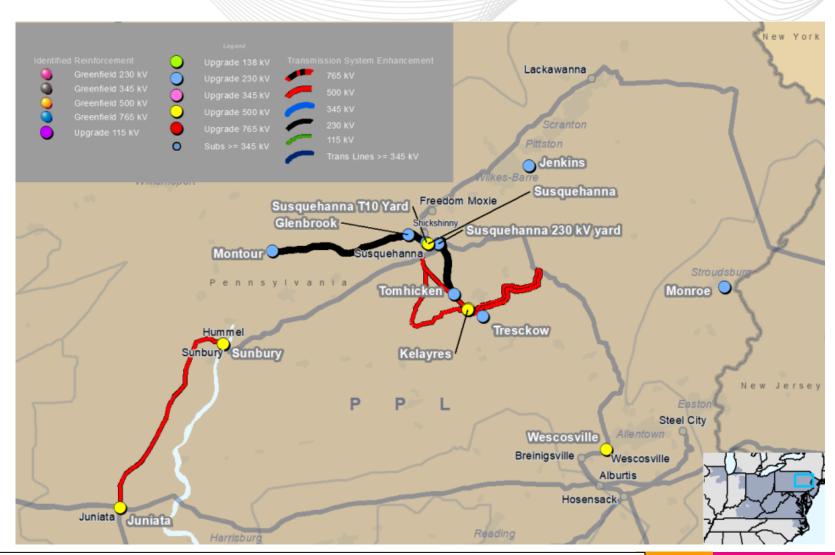
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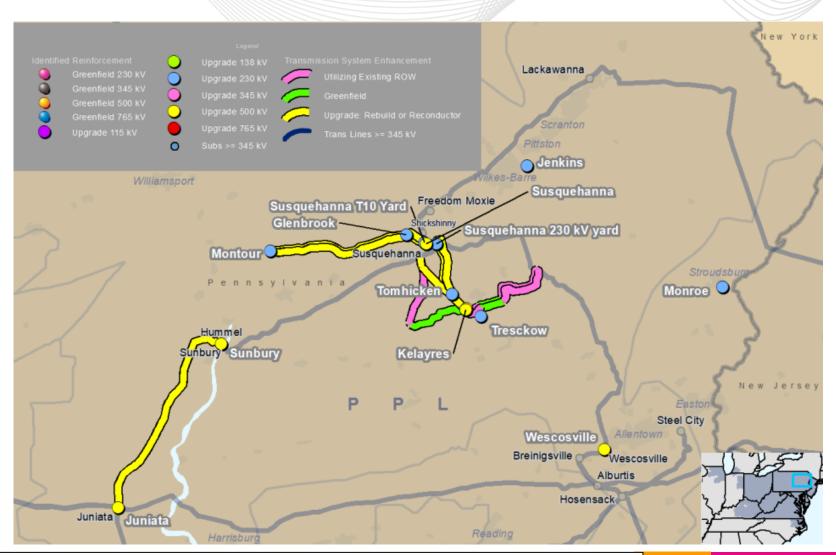


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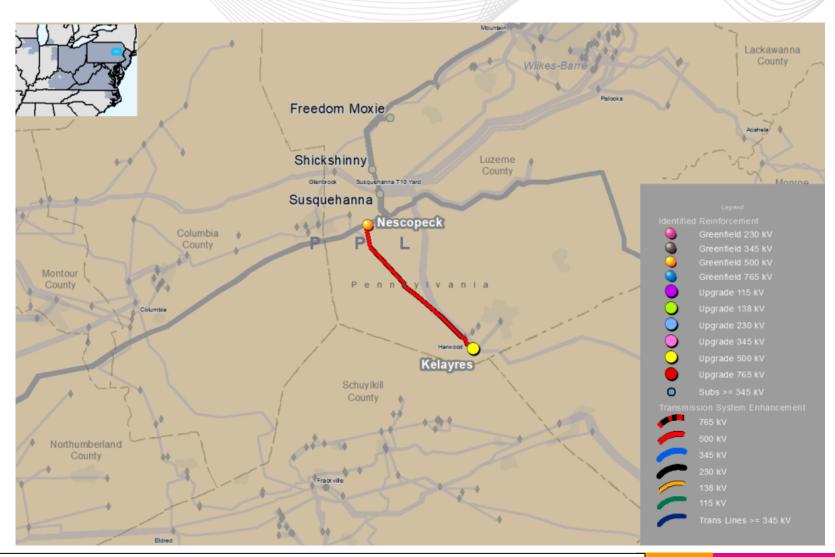






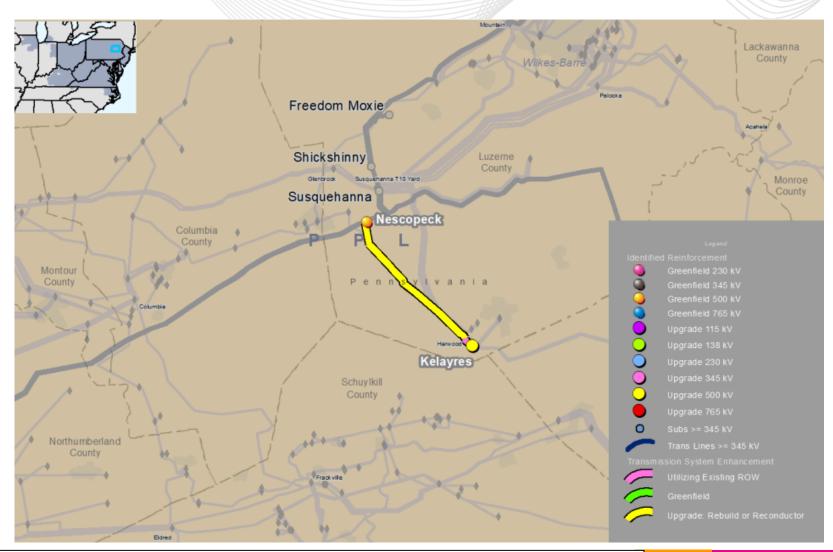
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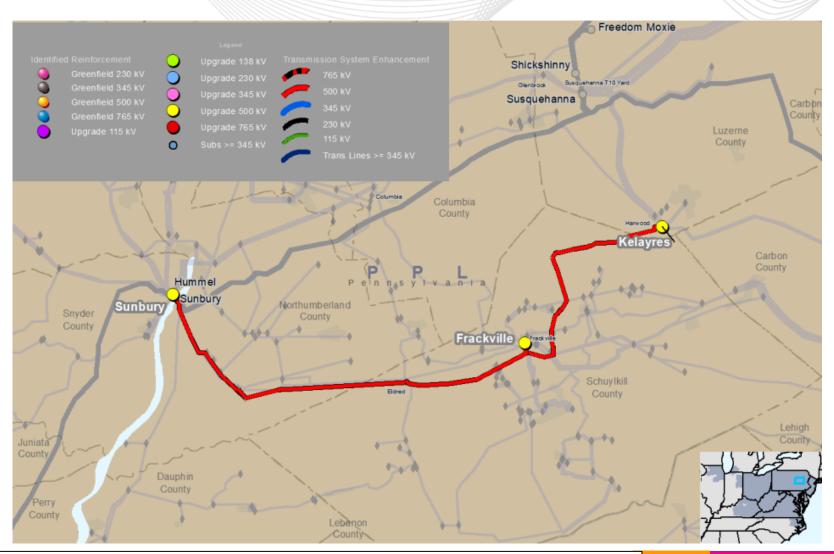
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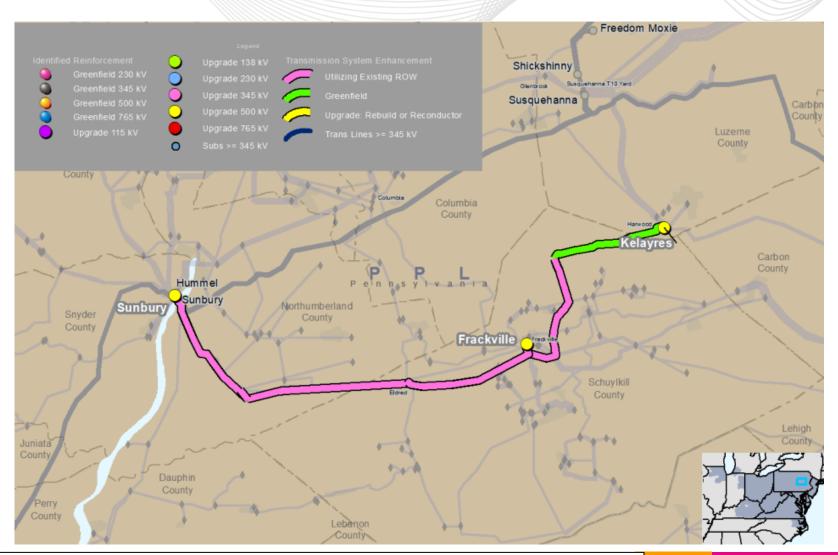


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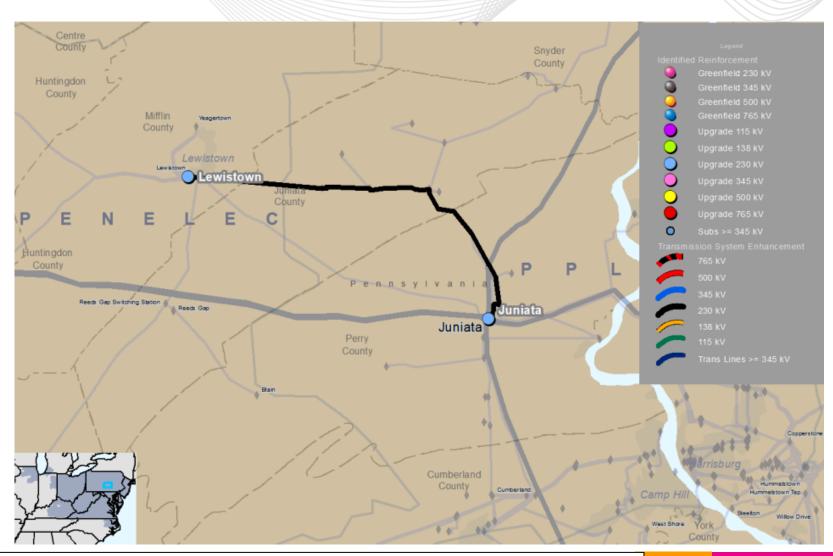




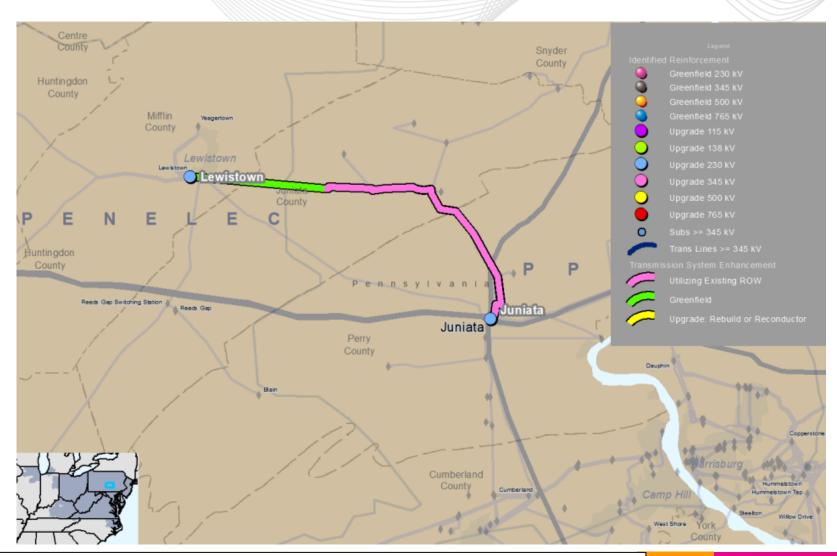


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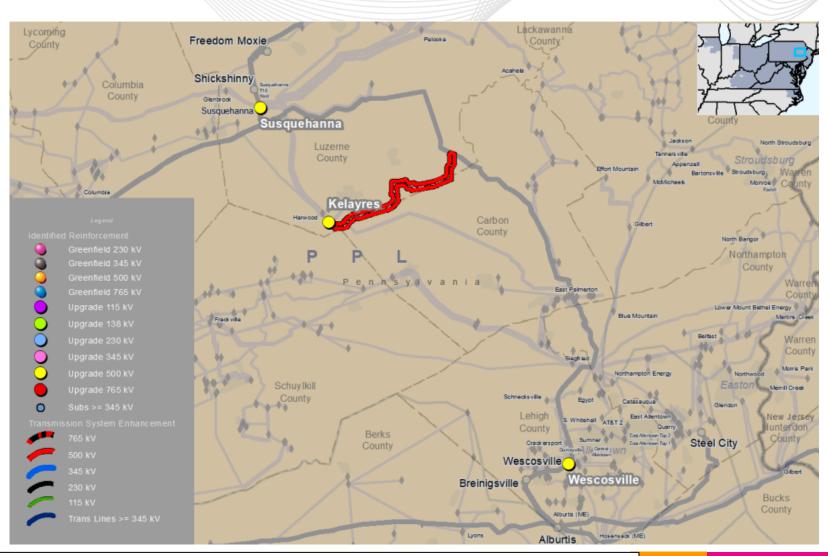






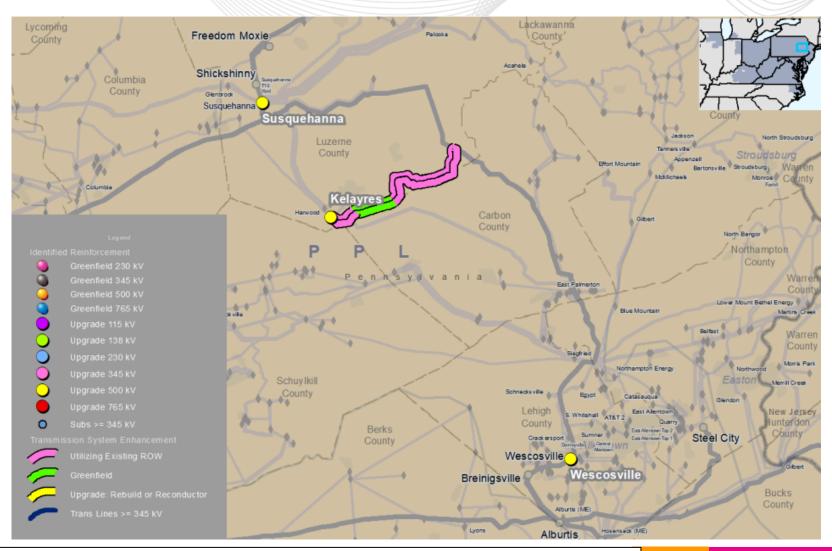
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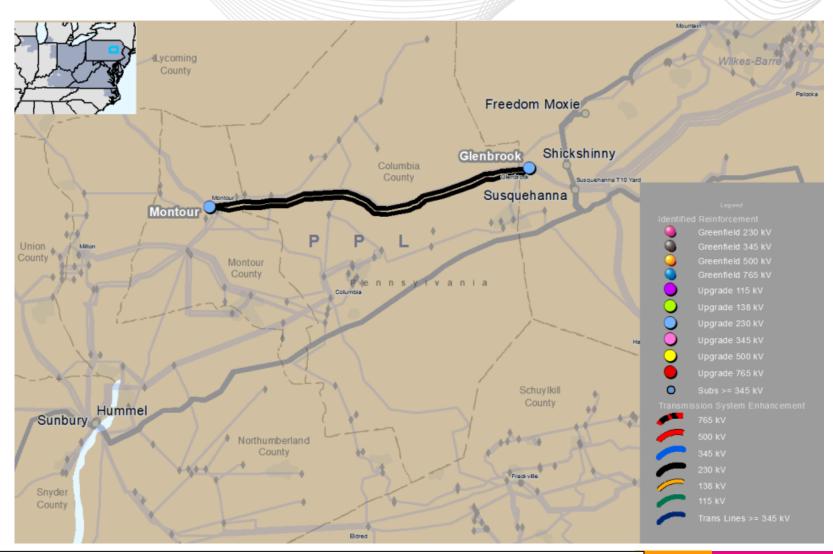
This map is only intended to illustrate the general electrical connectivity of the projects and should not be relied upon for exact geographical substation locations or line routes.





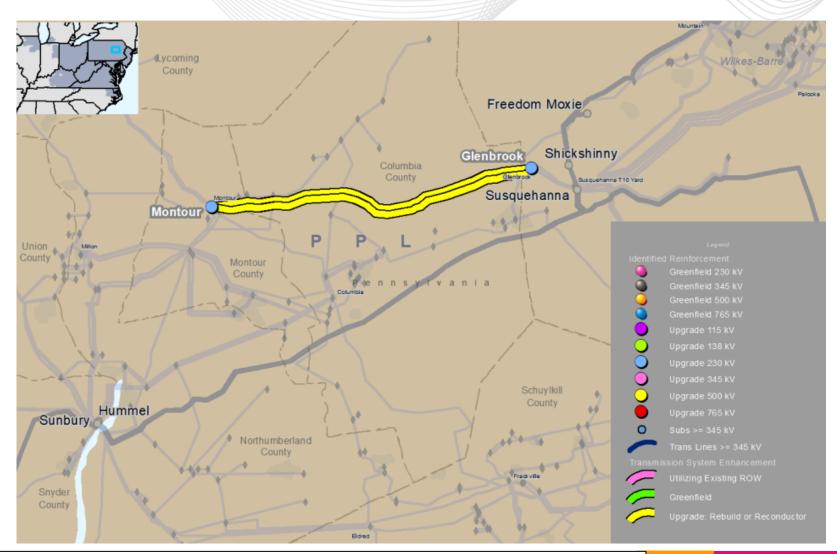
This map is only intended to illustrate the general electrical connectivity of the projects and should not be relied upon for exact geographical substation locations or line routes.





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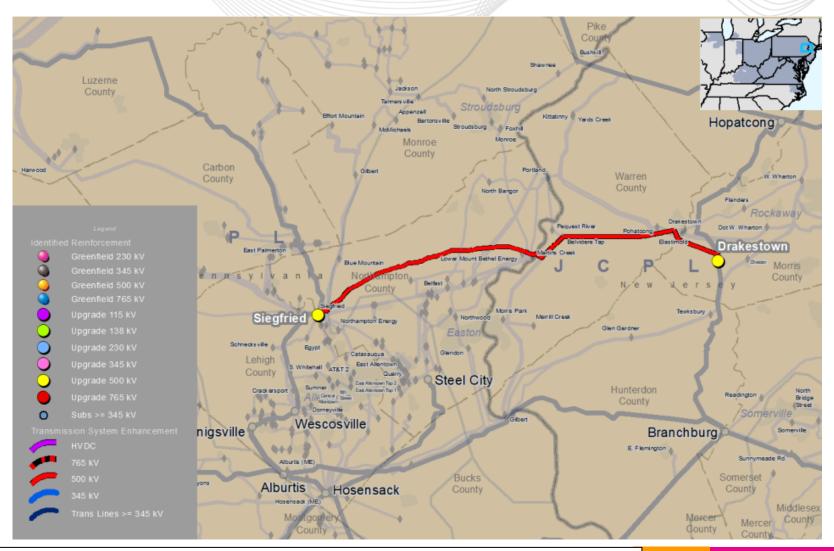


# PPLTO & TRNSLK (Connected Proposals by PPL and Translink)

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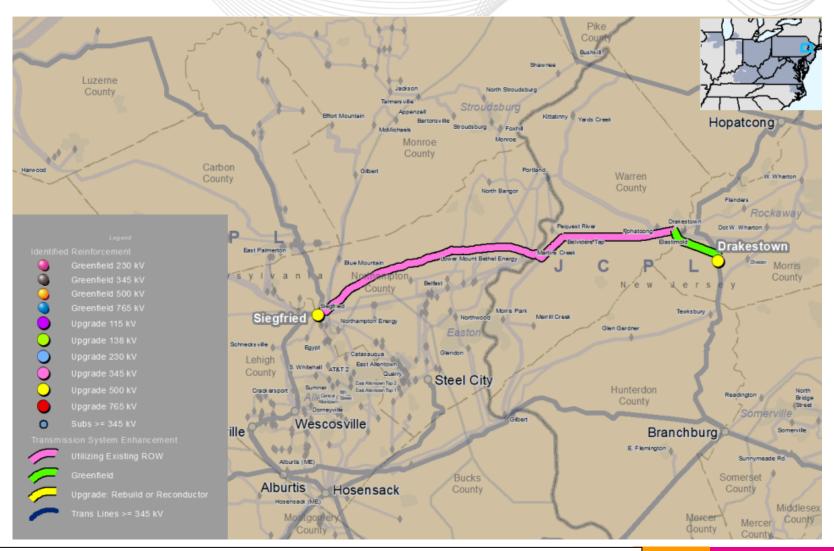
#### 2025-W1-552 & 2025-W1-290



This map is only intended to illustrate the general electrical connectivity of the projects and should not be relied upon for exact geographical substation locations or line routes.



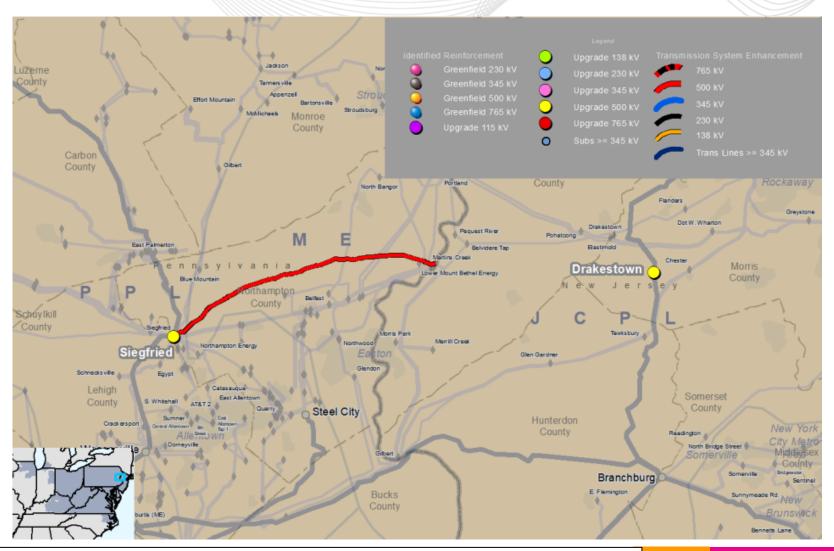
#### 2025-W1-552 & 2025-W1-290



This map is only intended to illustrate the general electrical connectivity of the projects and should not be relied upon for exact geographical substation locations or line routes.



## 2025-W1-290 - PPLTO Portion

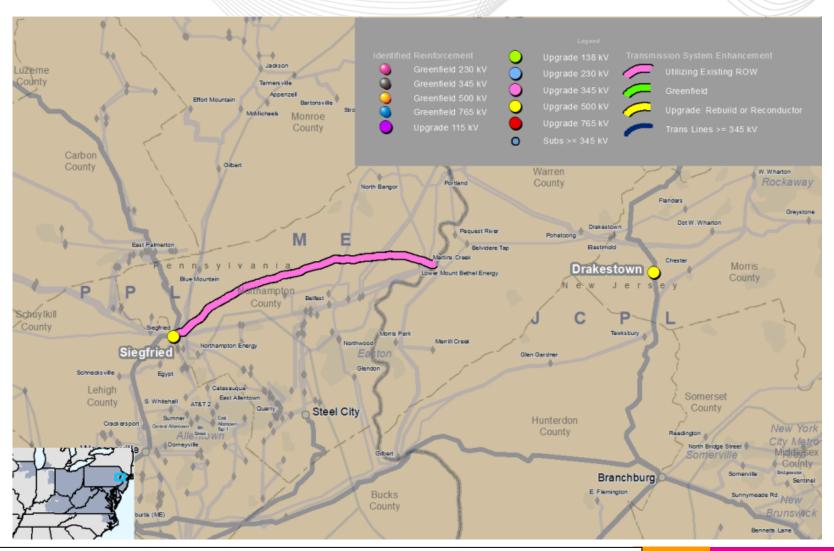


This map is only intended to illustrate the general electrical connectivity of the projects and should not be relied upon for exact geographical substation locations or line routes.

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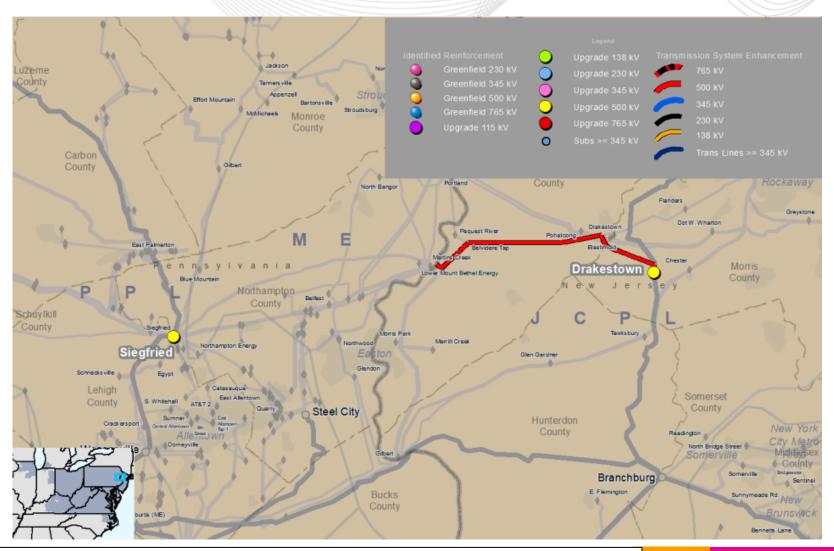
#### 2025-W1-290 - PPLTO Portion



This map is only intended to illustrate the general electrical connectivity of the projects and should not be relied upon for exact geographical substation locations or line routes.



## 2025-W1-552 – TRNSLK Portion

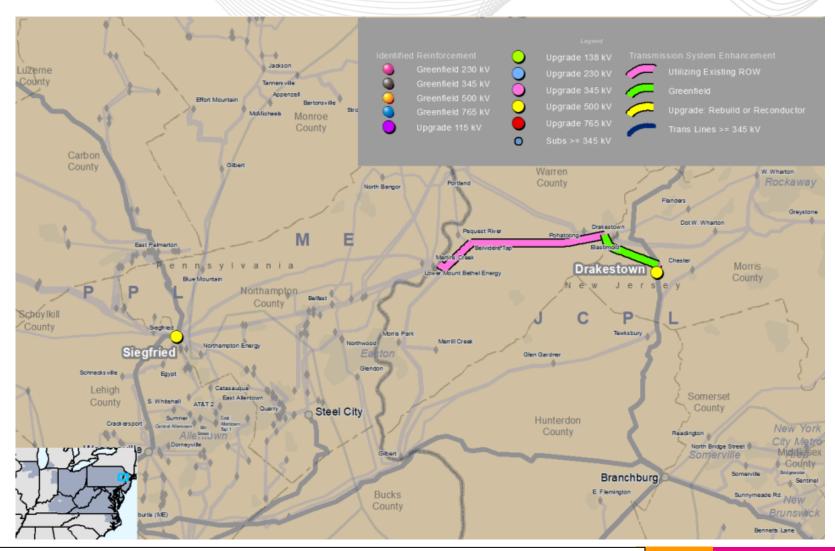


This map is only intended to illustrate the general electrical connectivity of the projects and should not be relied upon for exact geographical substation locations or line routes.

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## 2025-W1-552 – TRNSLK Portion



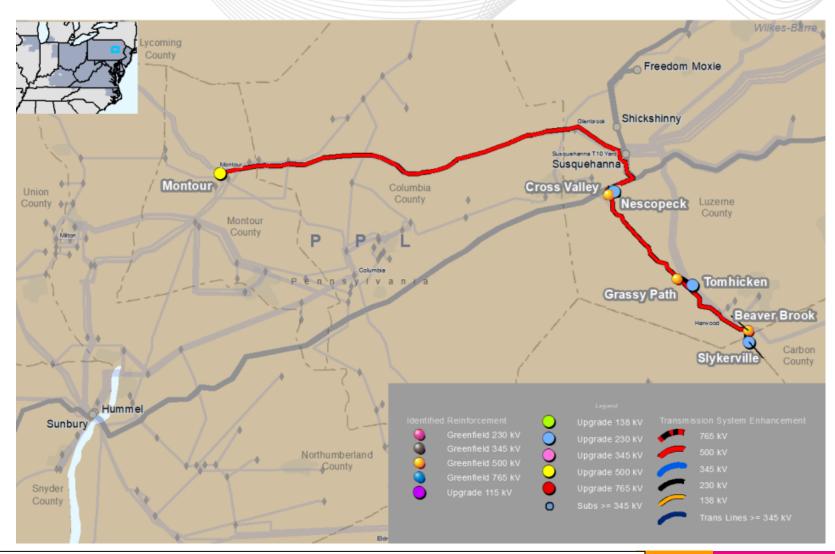
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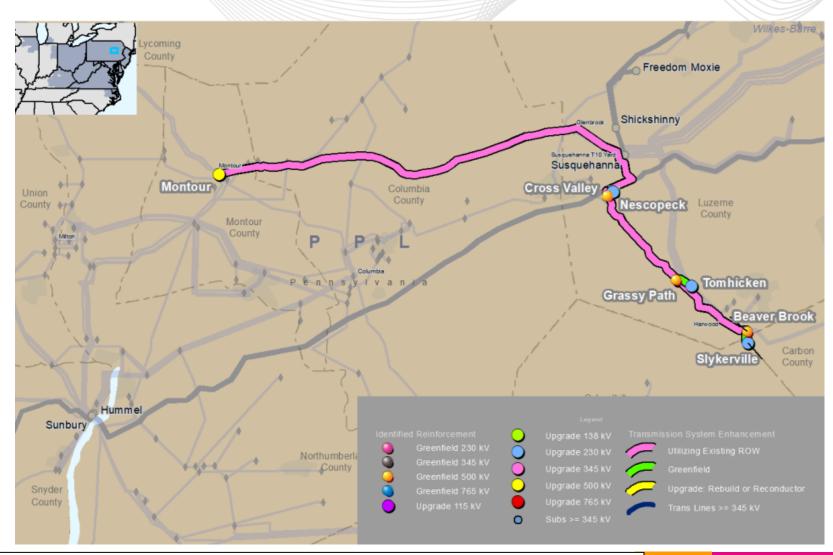


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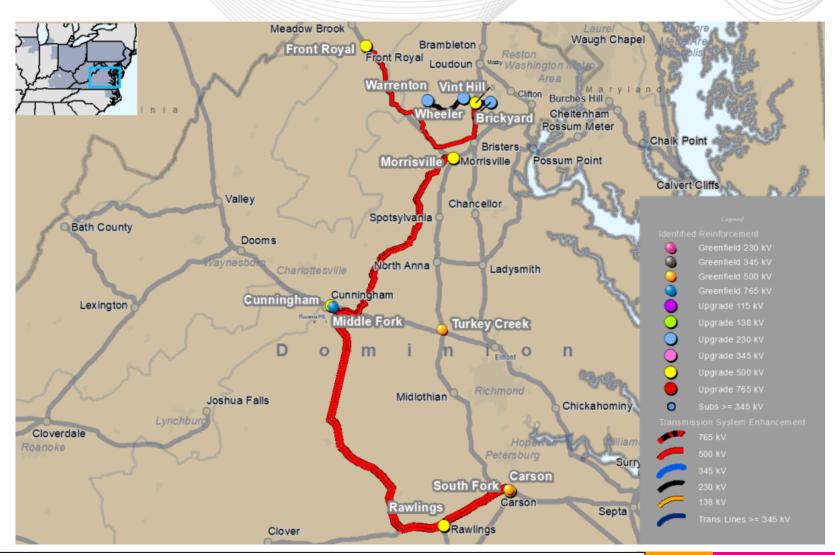




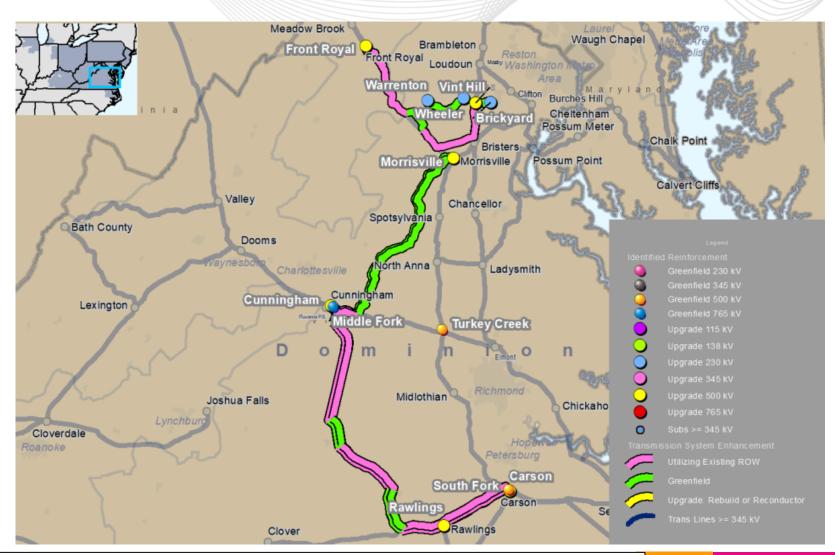




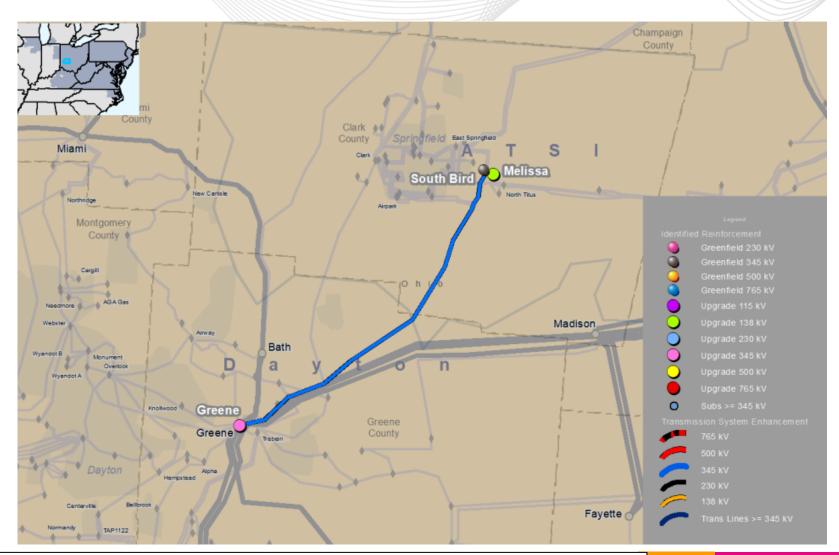




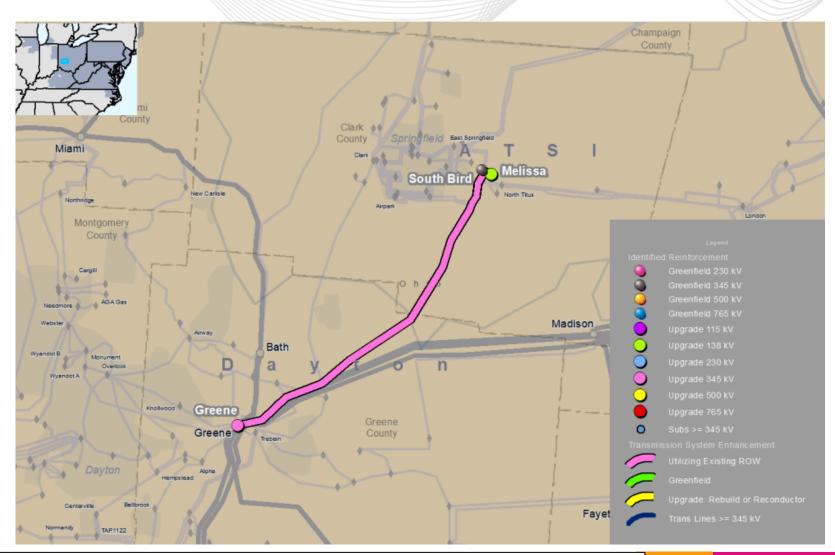




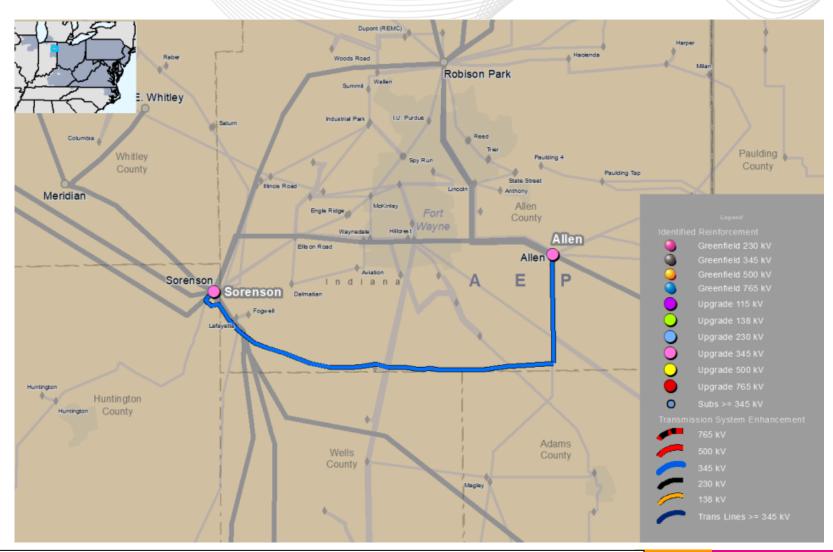




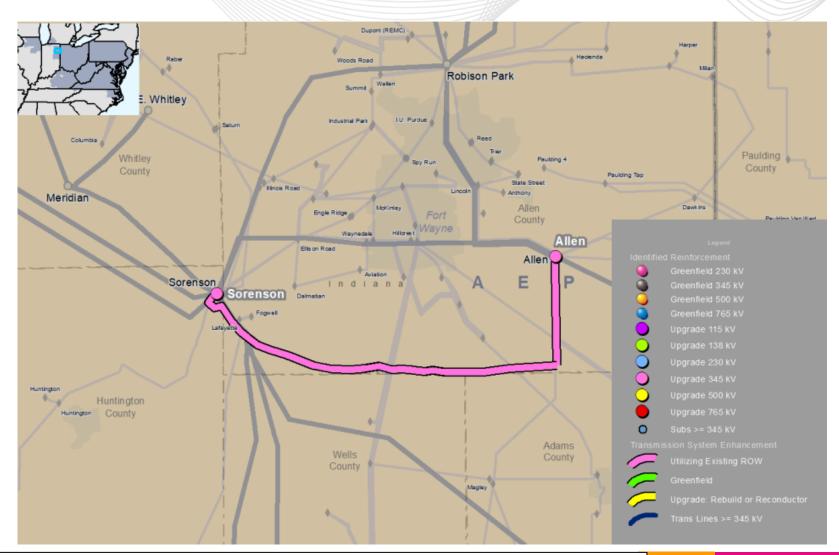








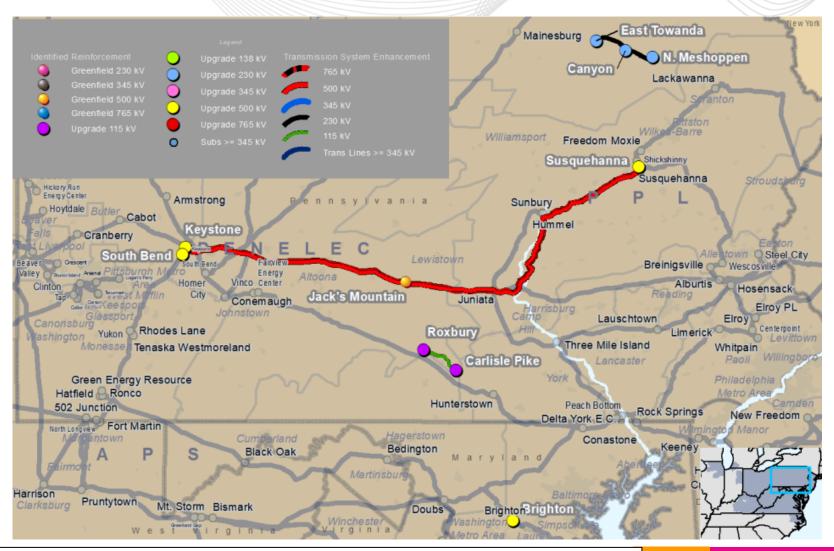




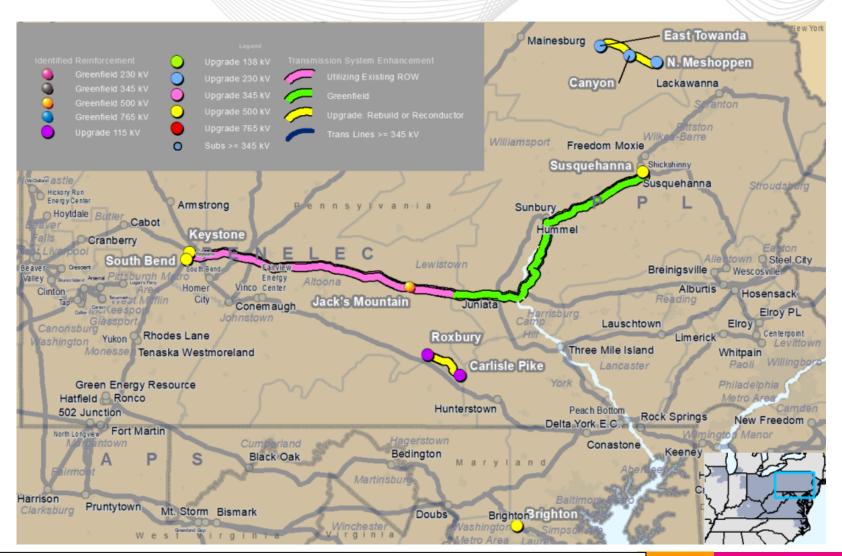


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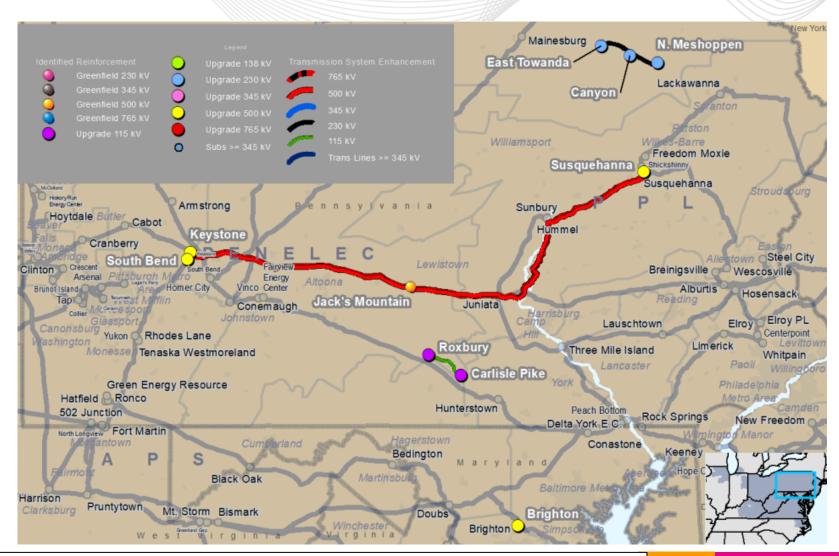




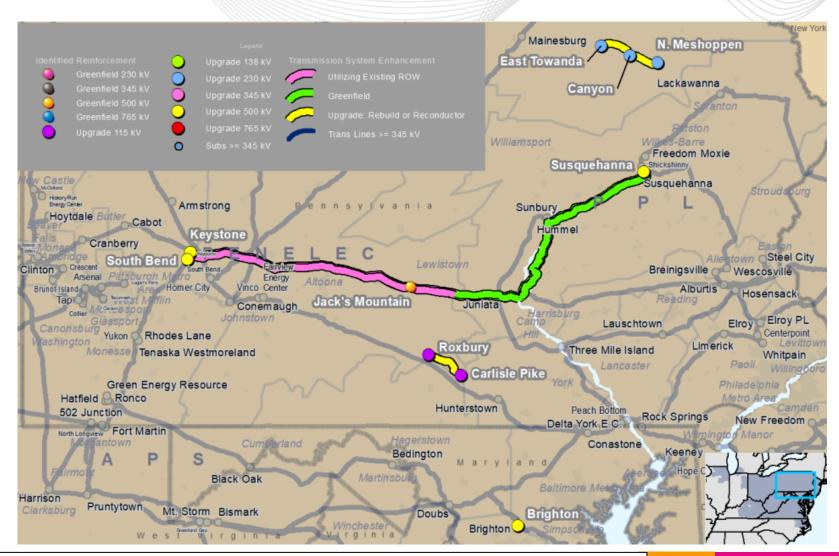




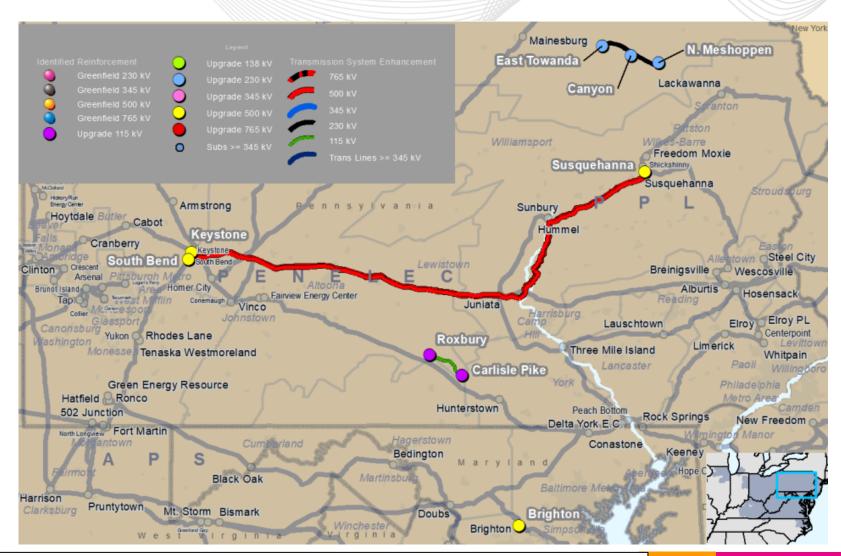




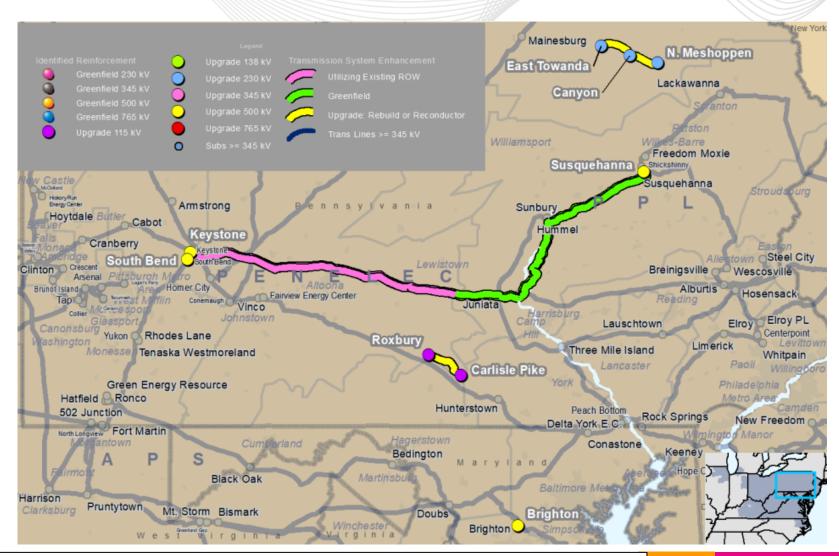




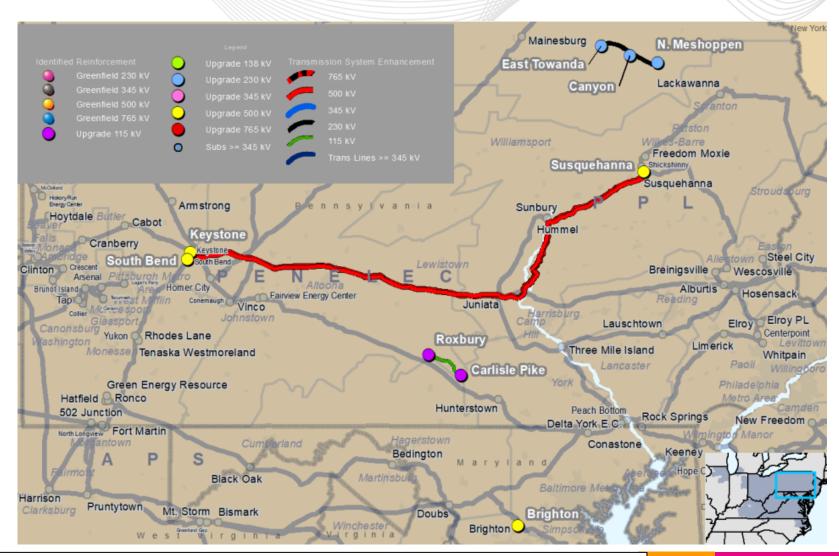




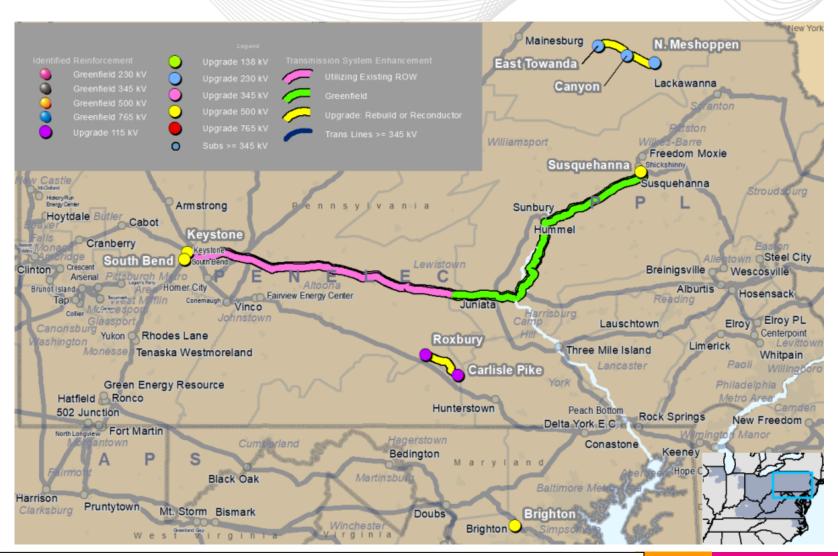








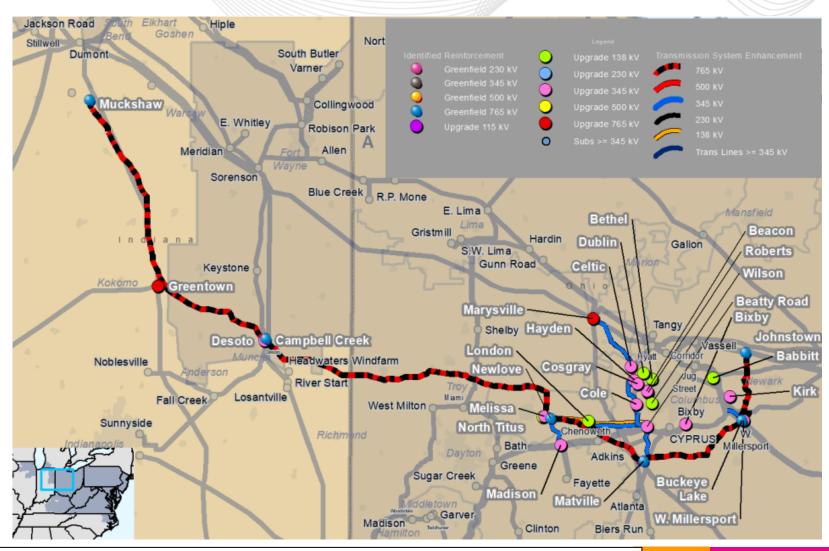




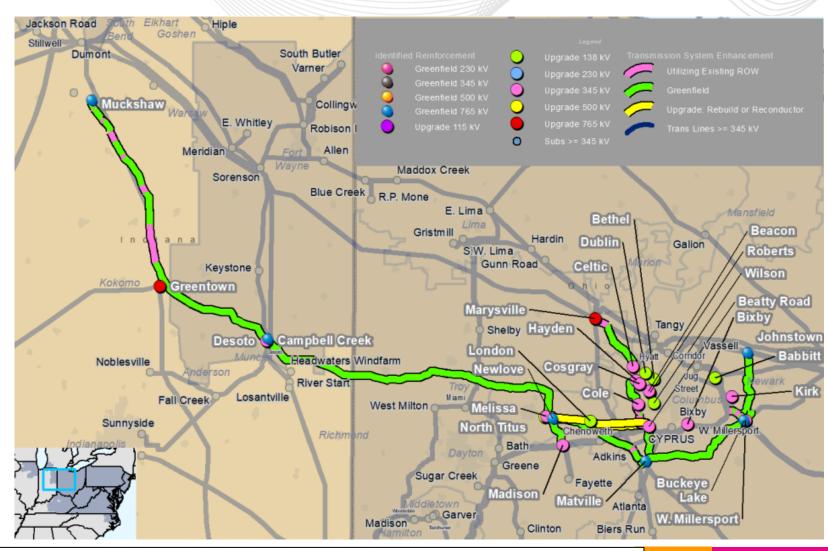


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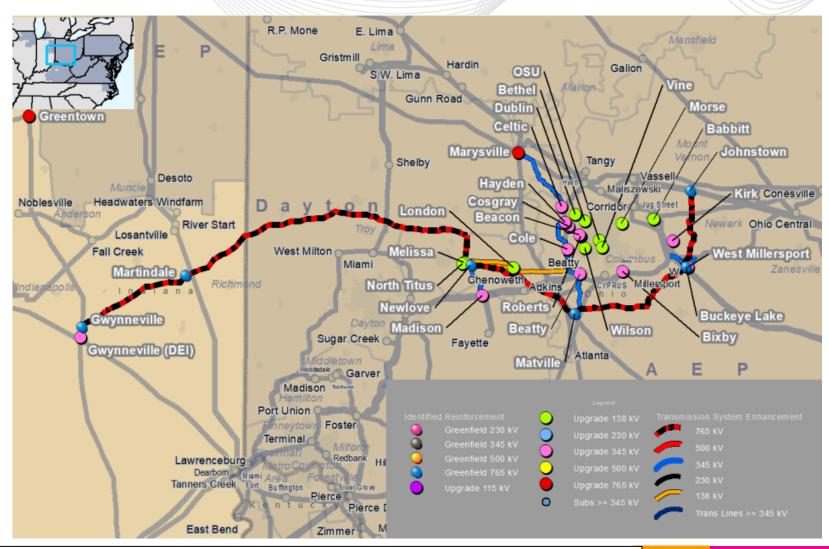




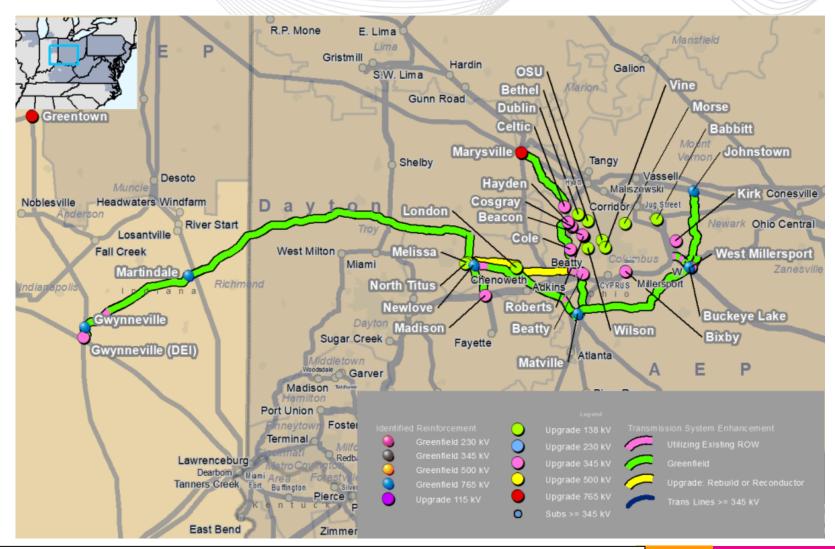




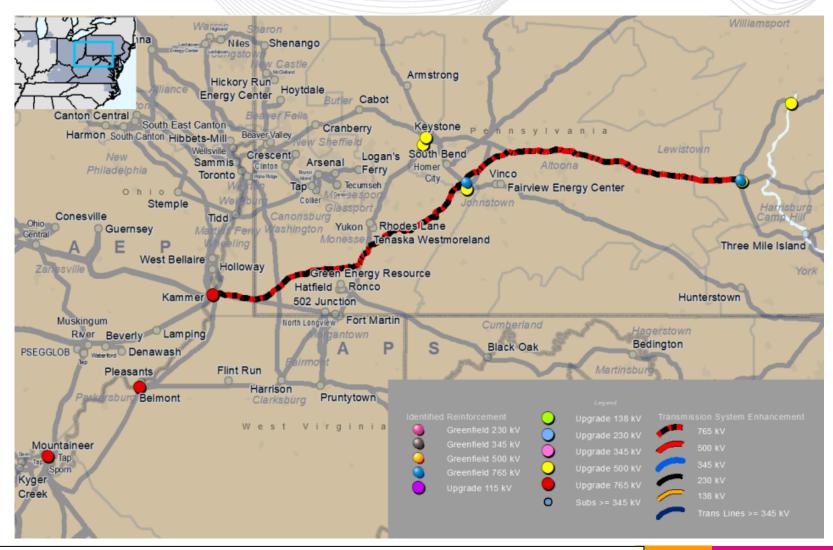




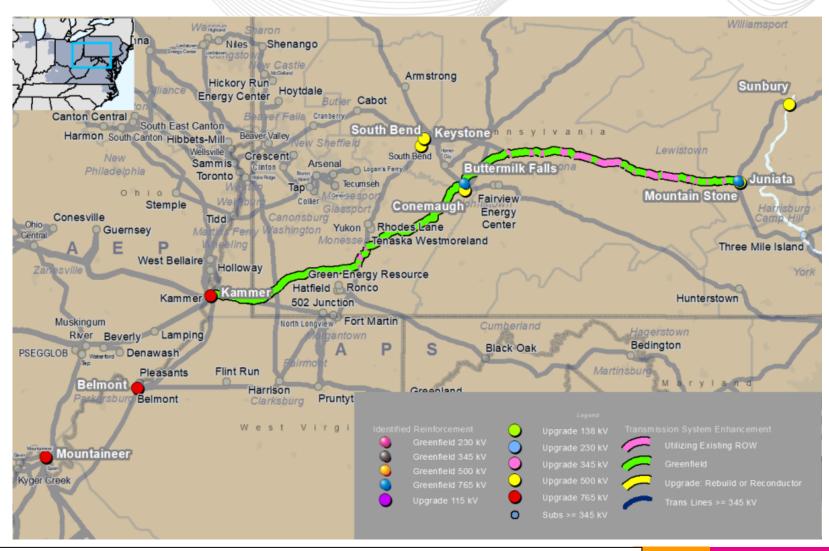




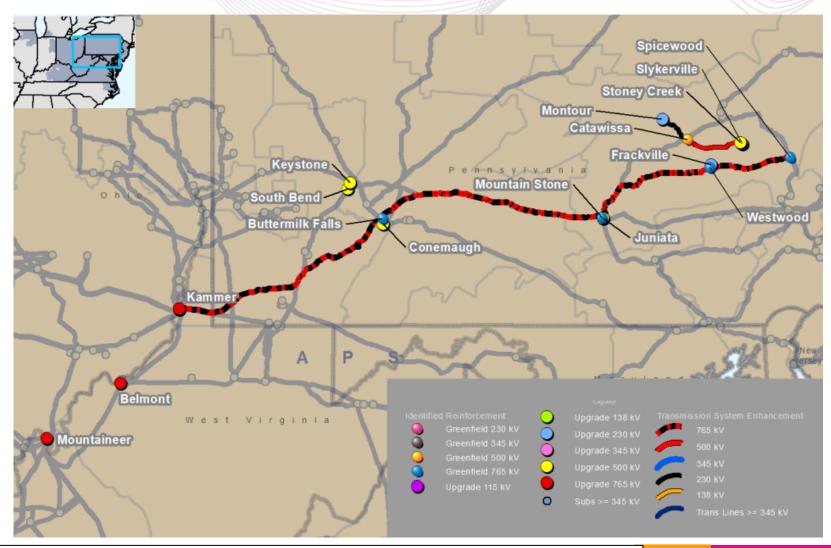




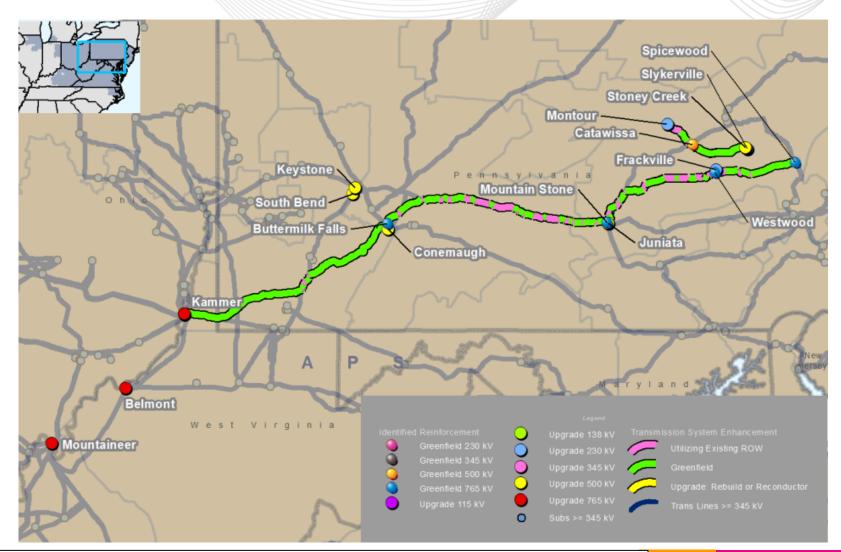






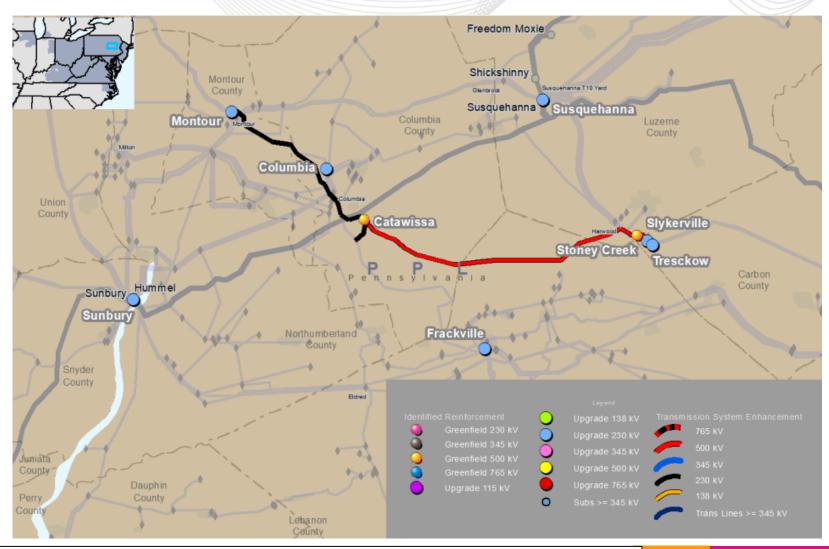






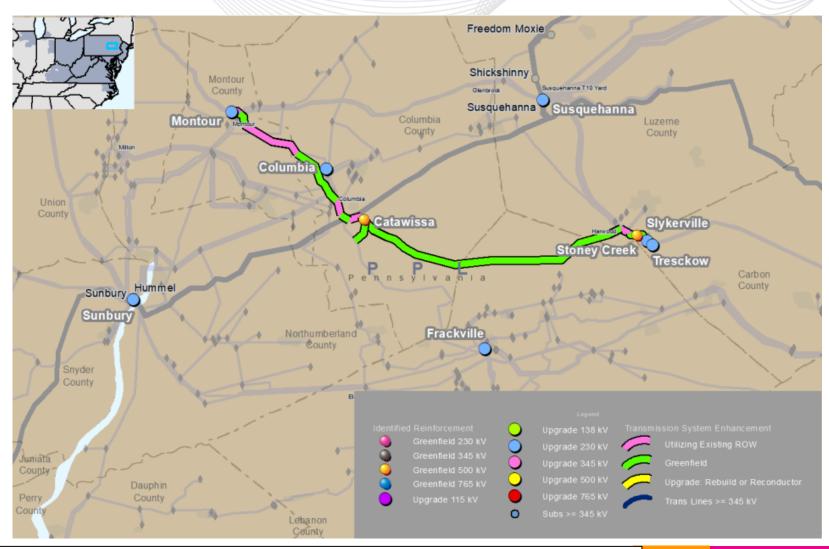




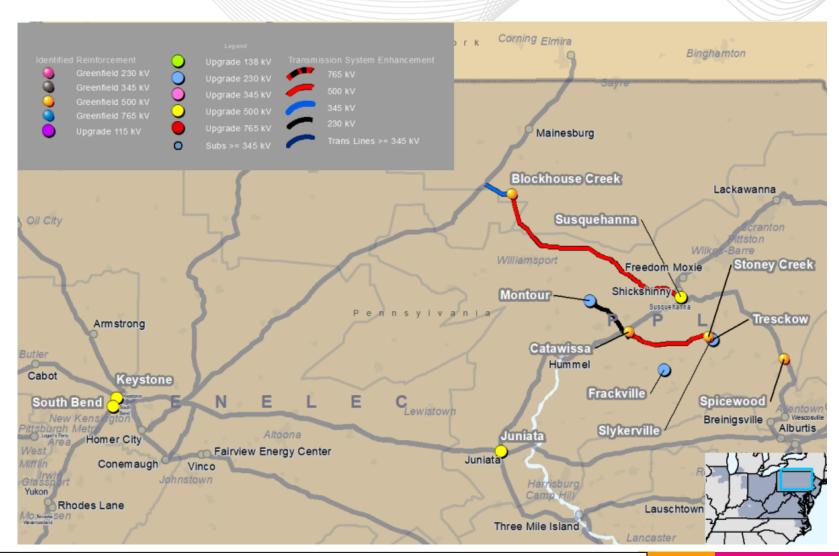




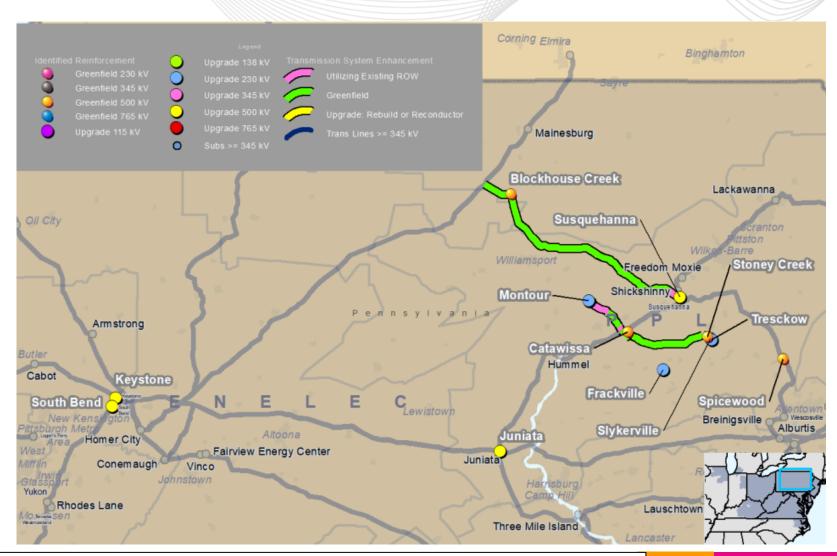




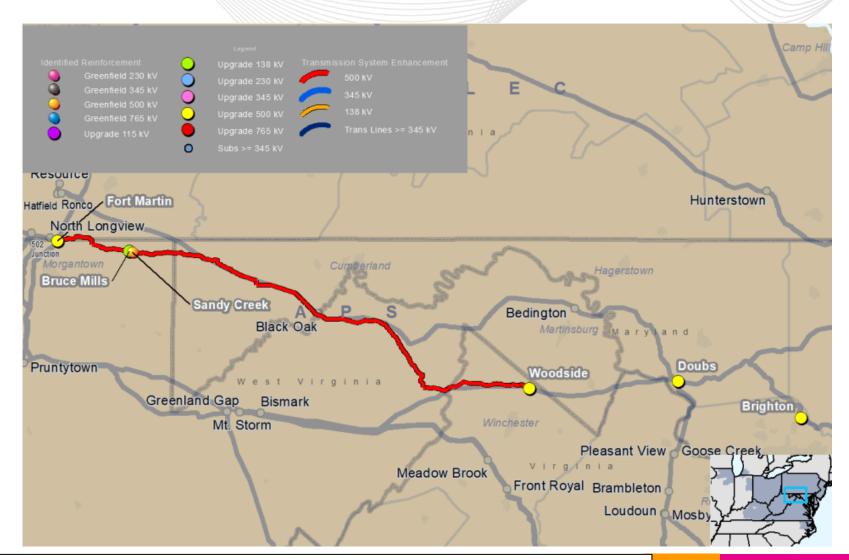




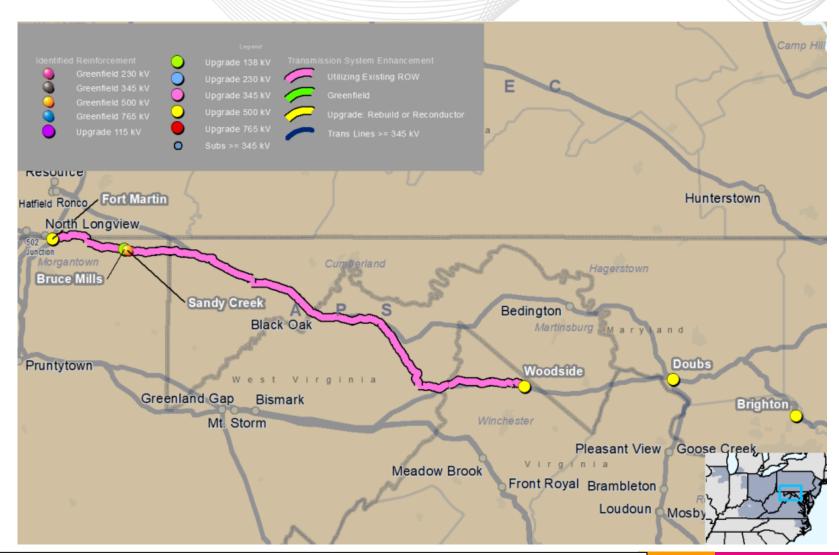




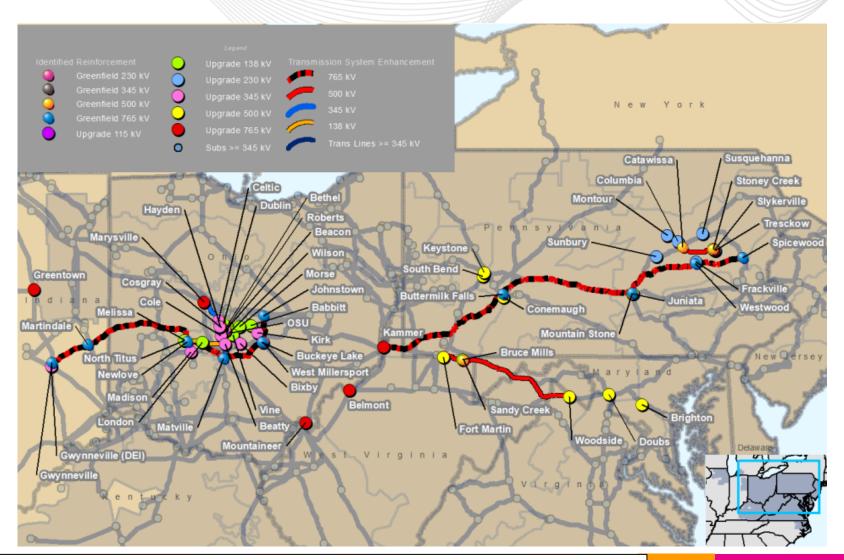




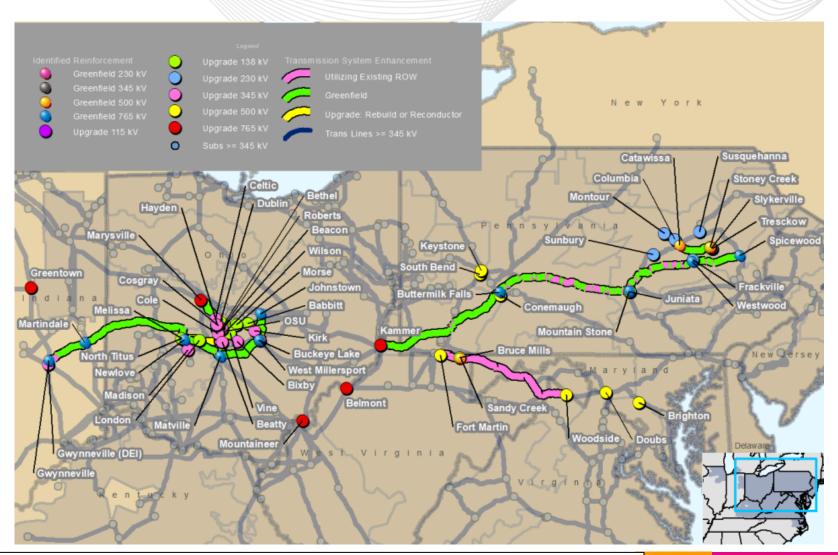








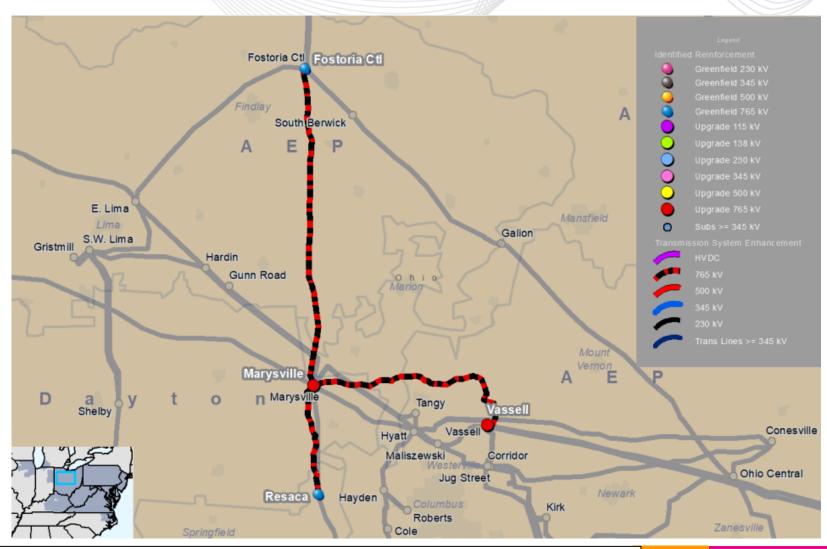




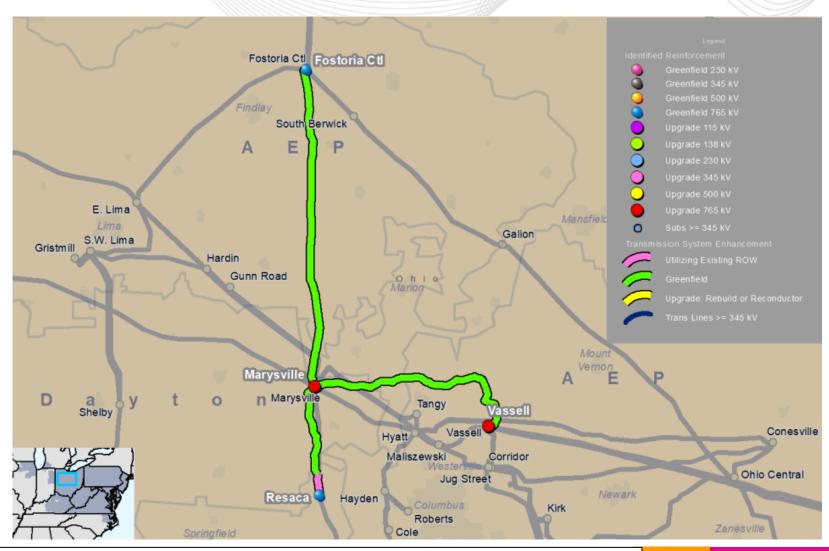


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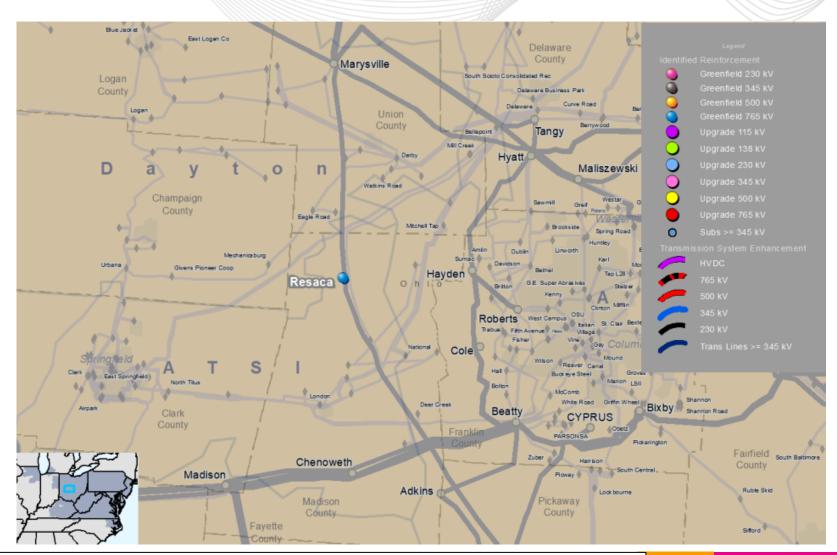




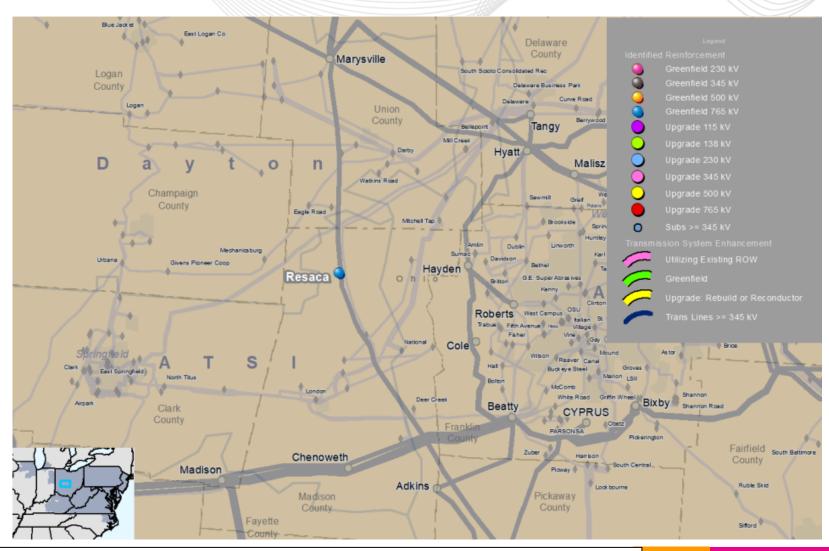




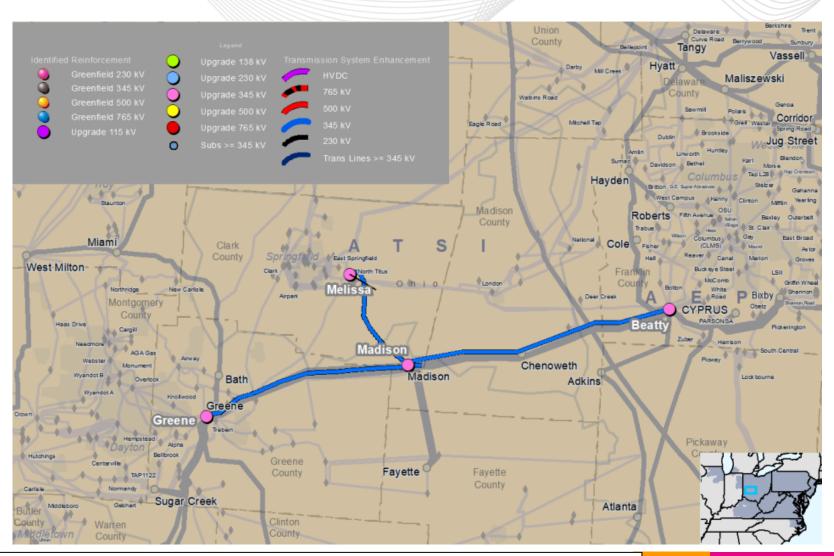






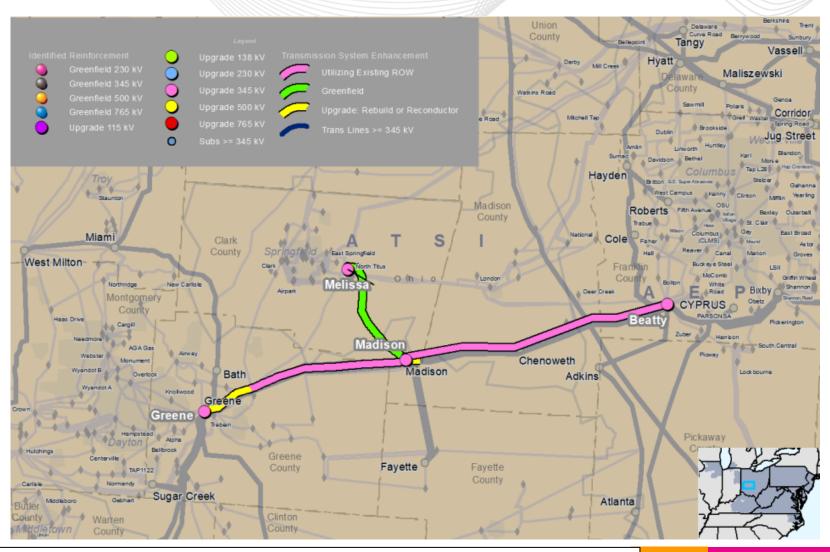






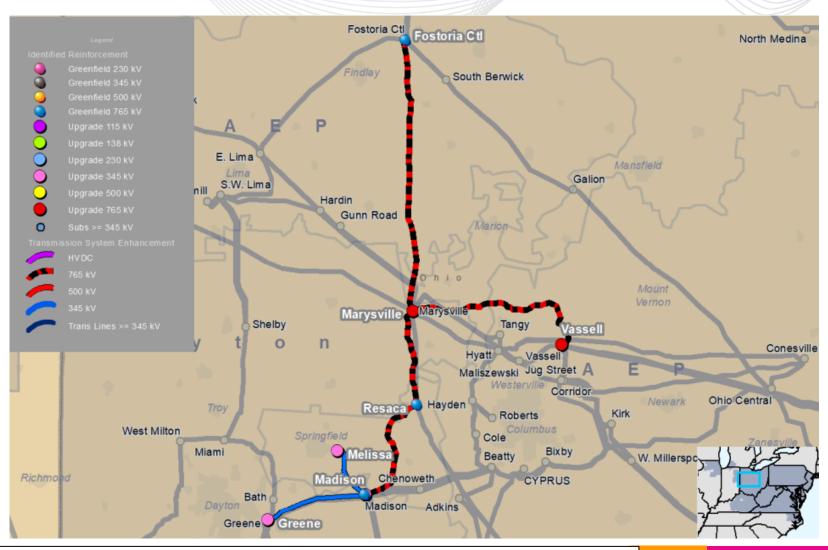
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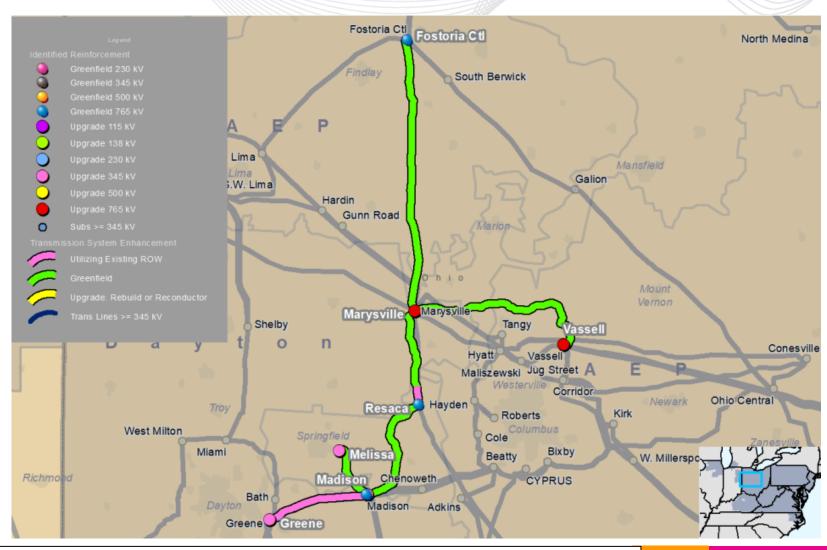


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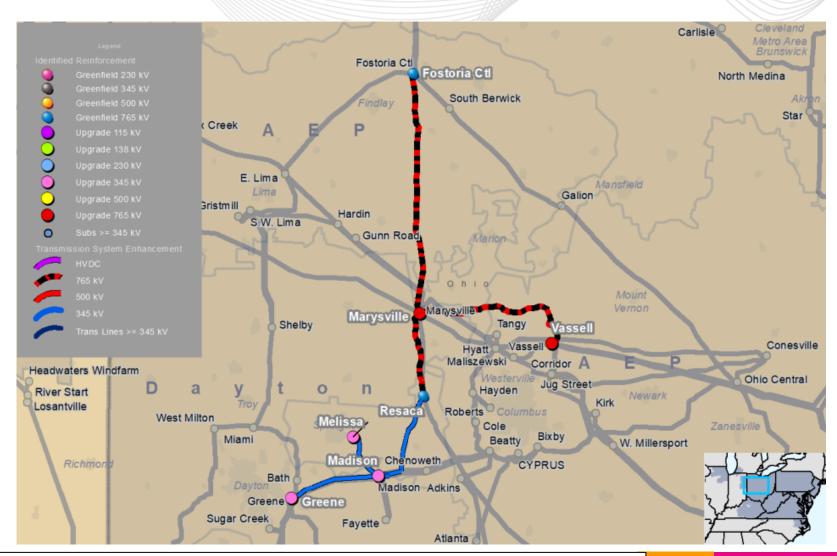




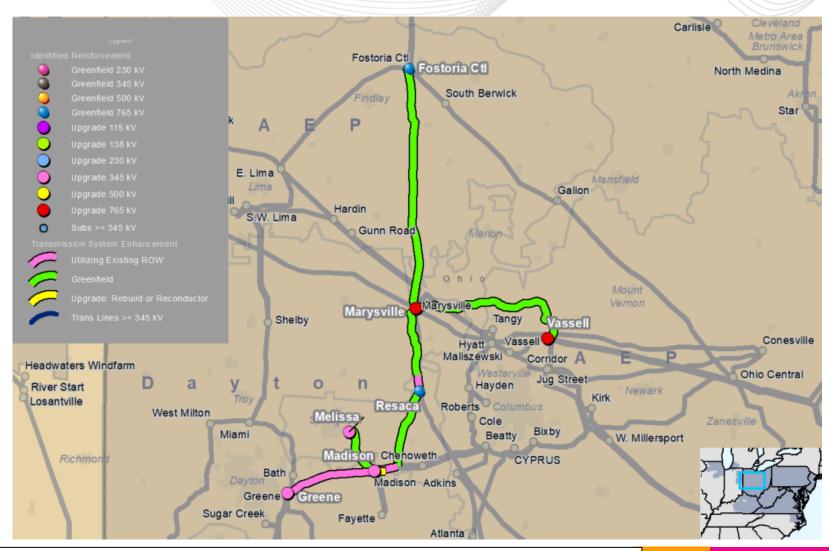










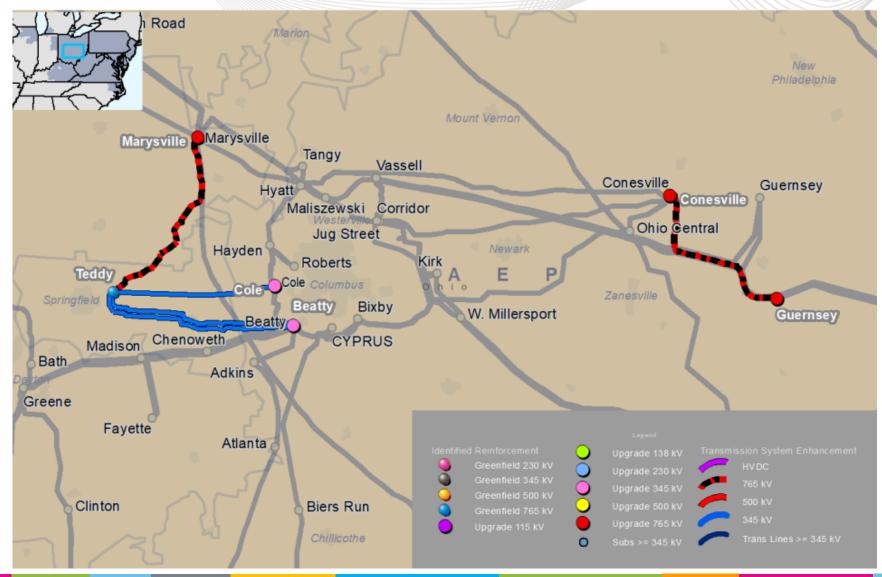




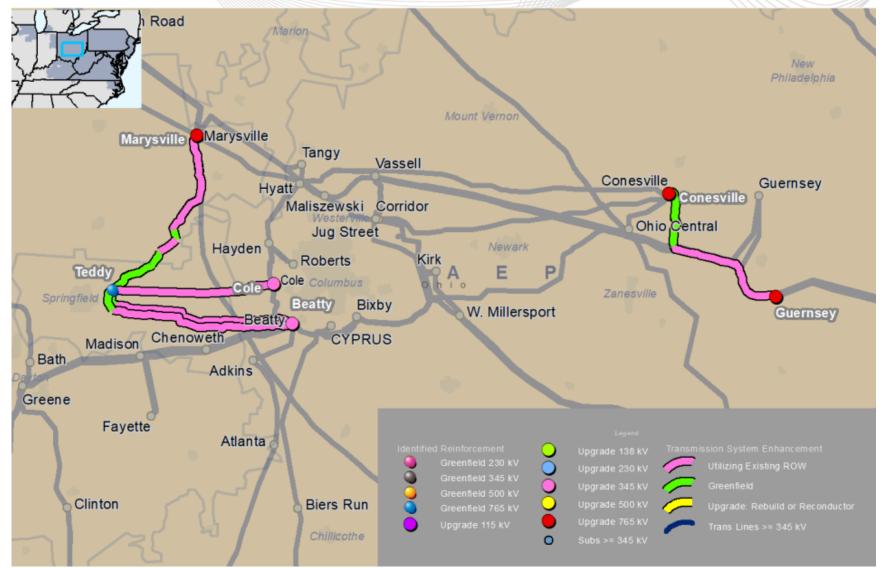
## TRNSRC (Transource)

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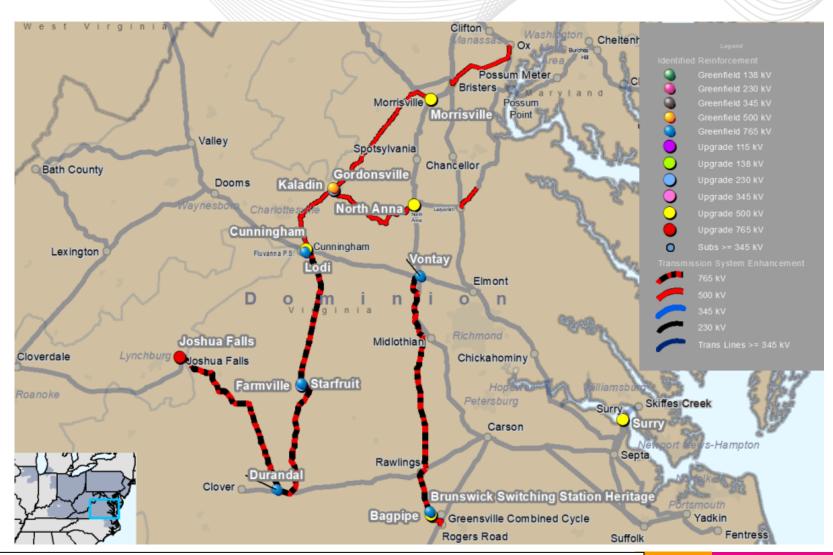




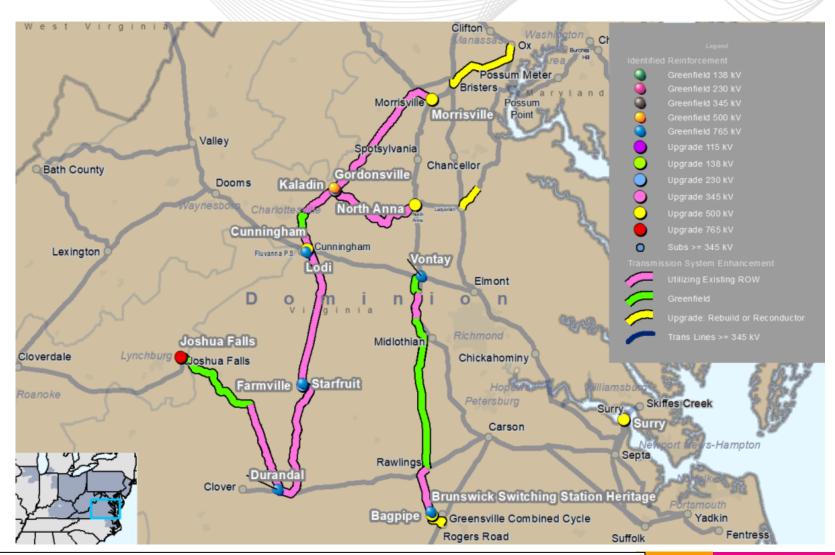




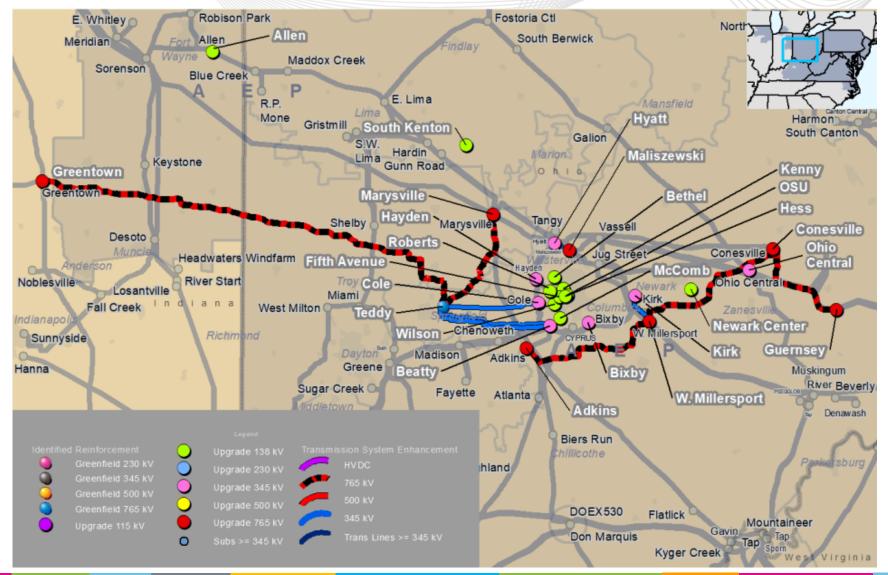




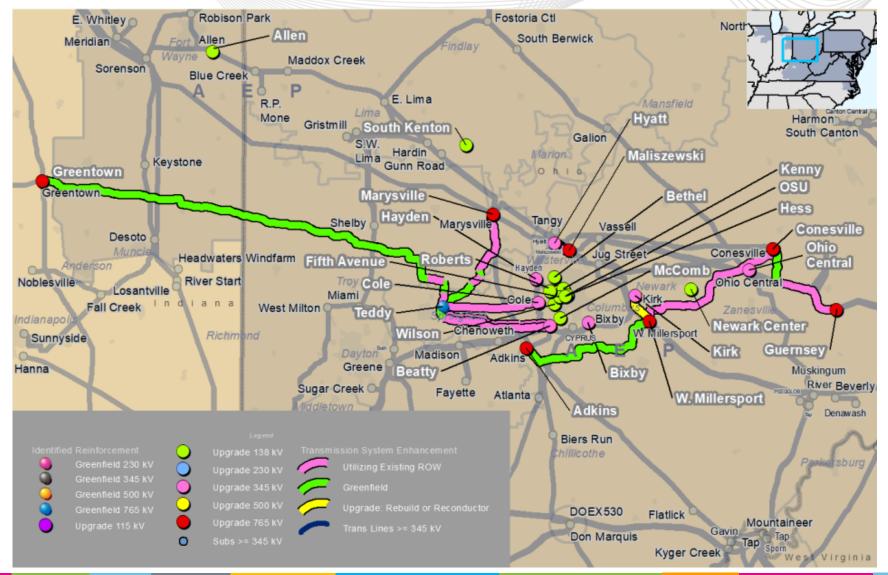




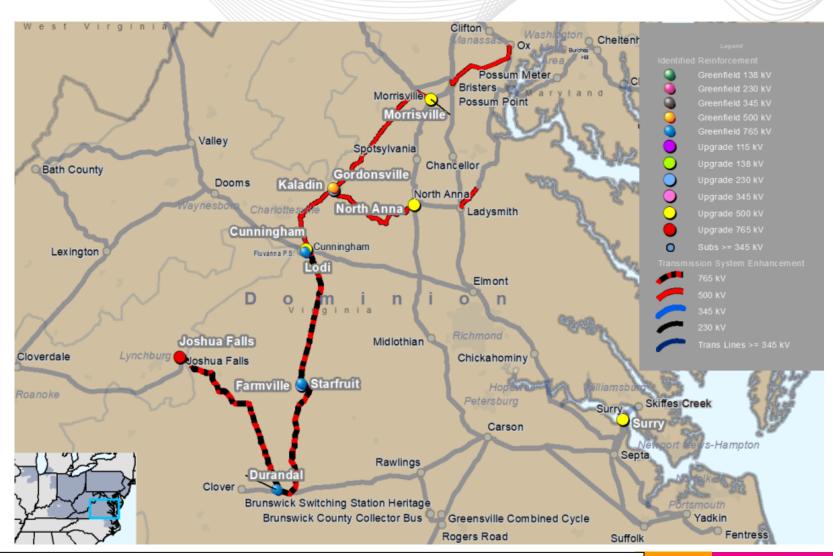




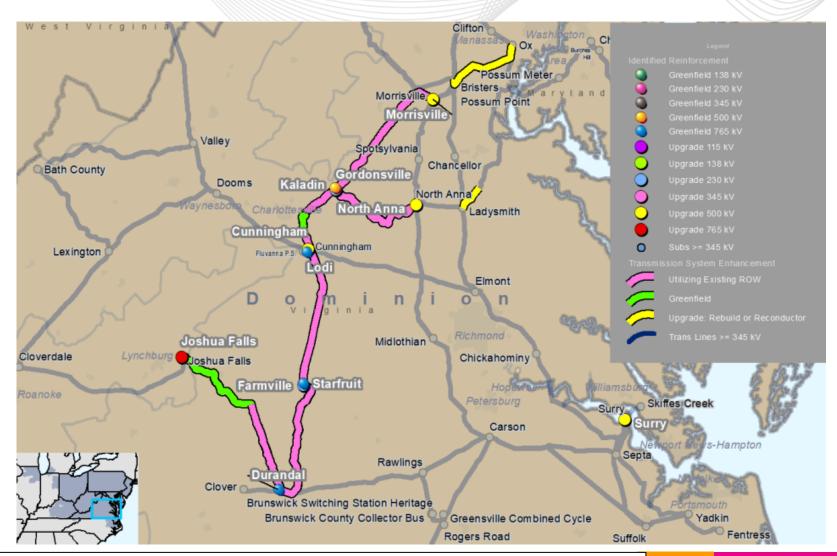










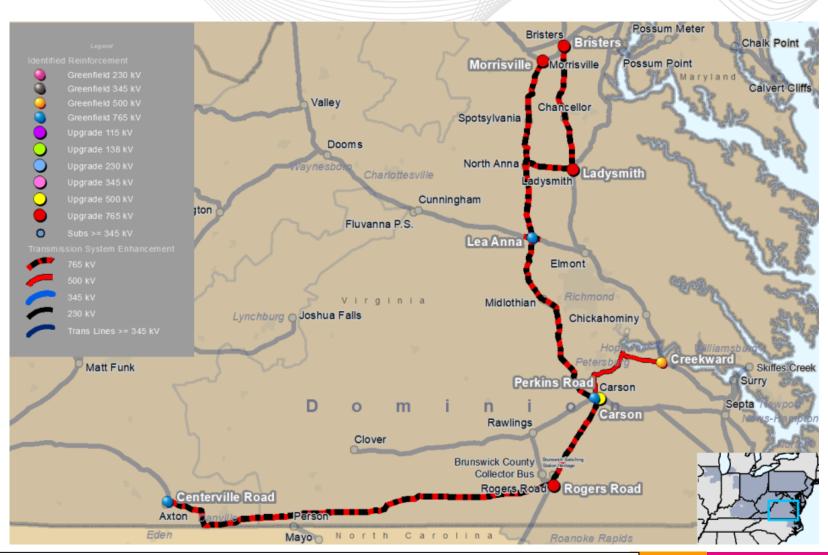




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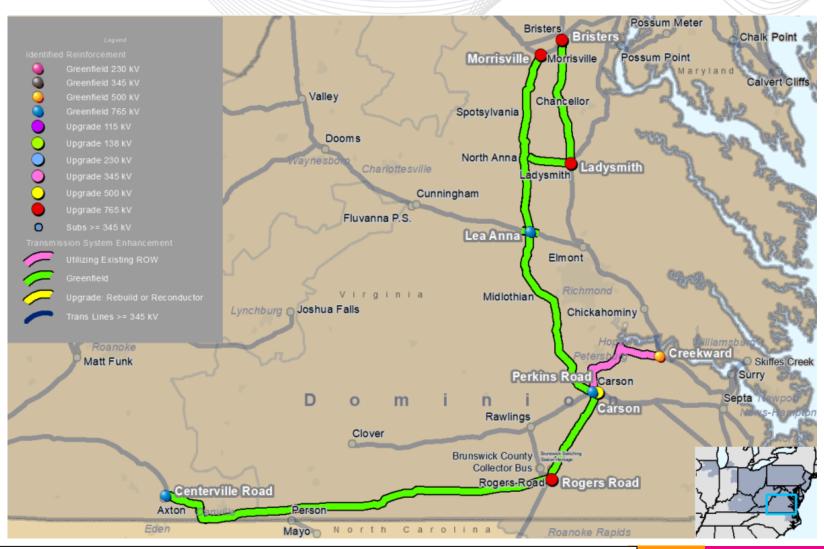
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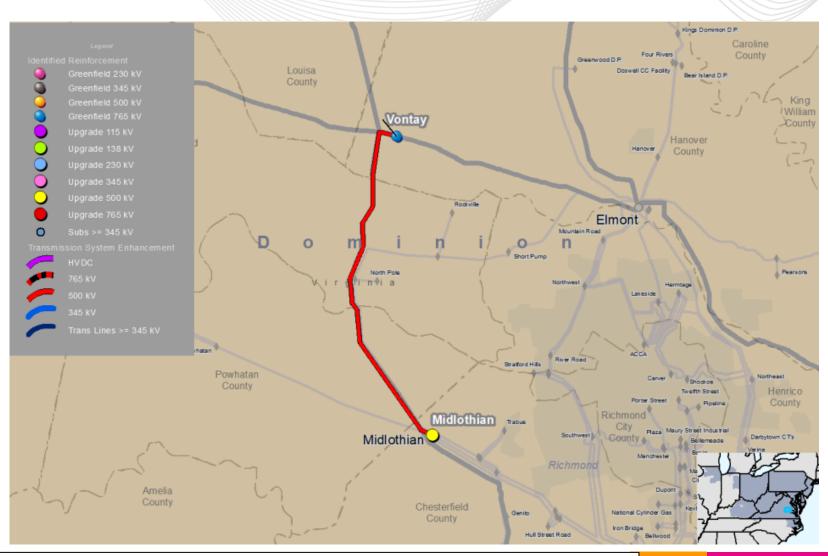




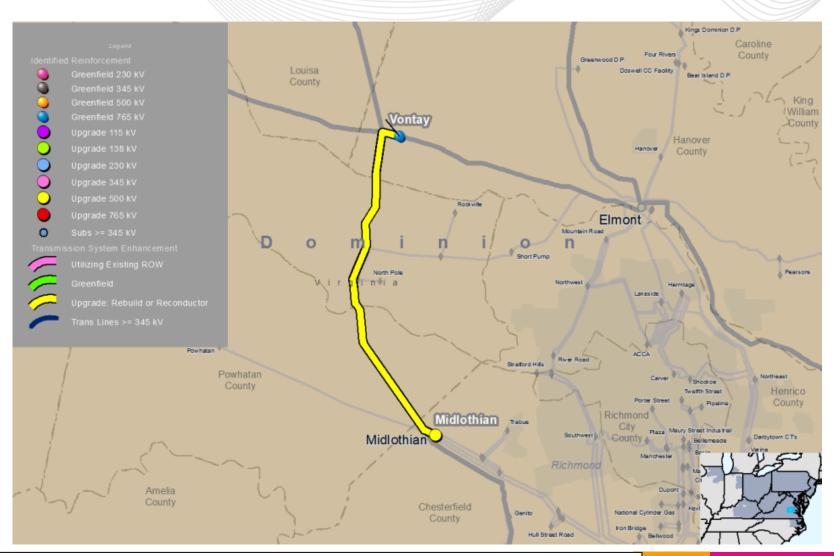
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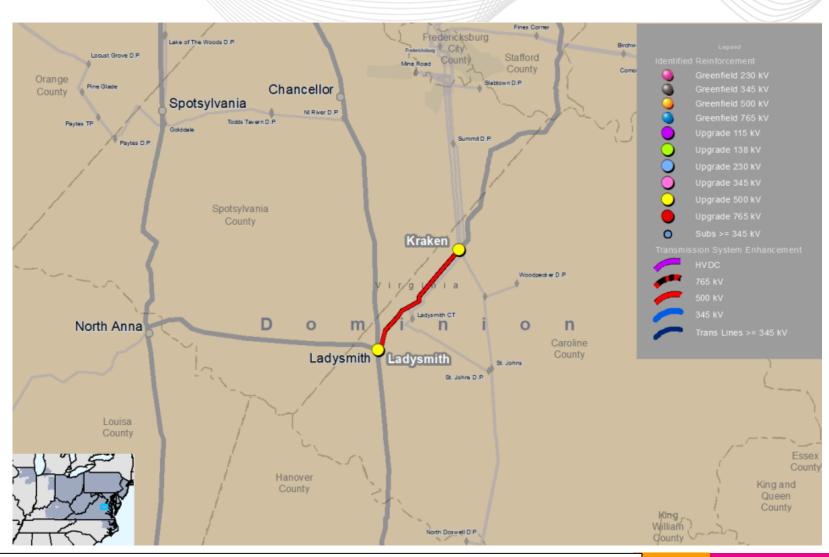




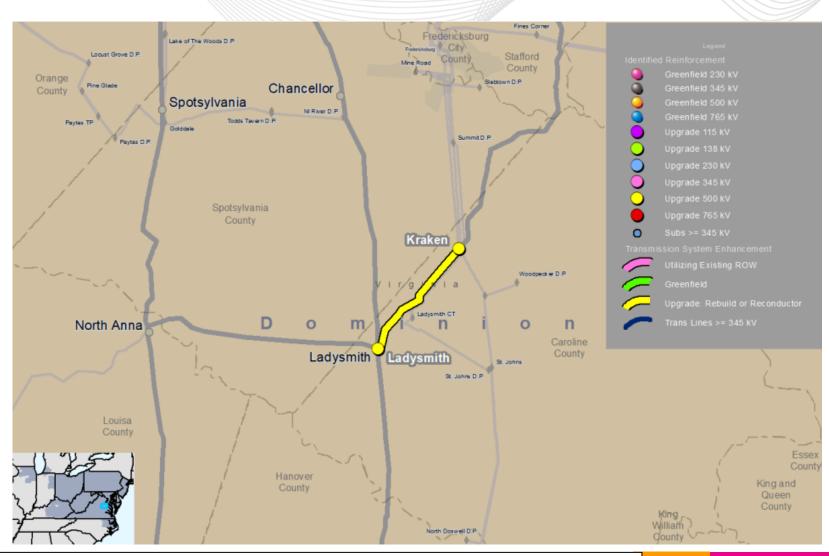




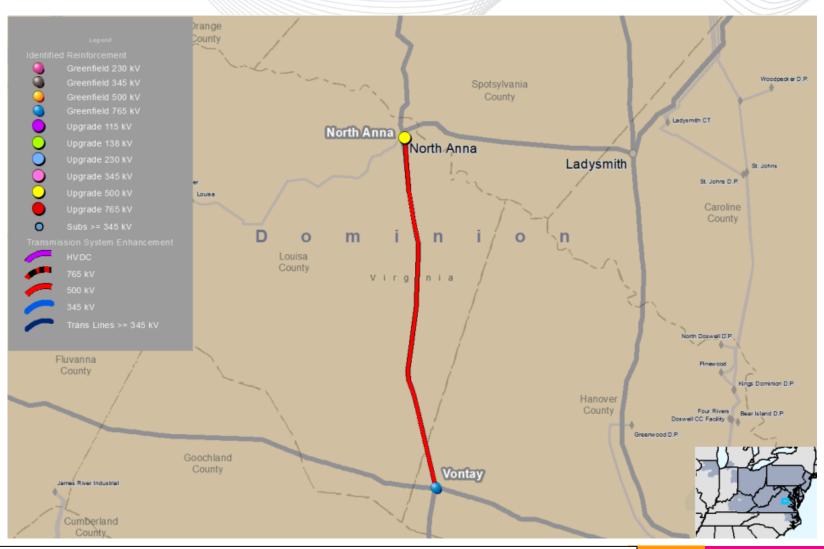






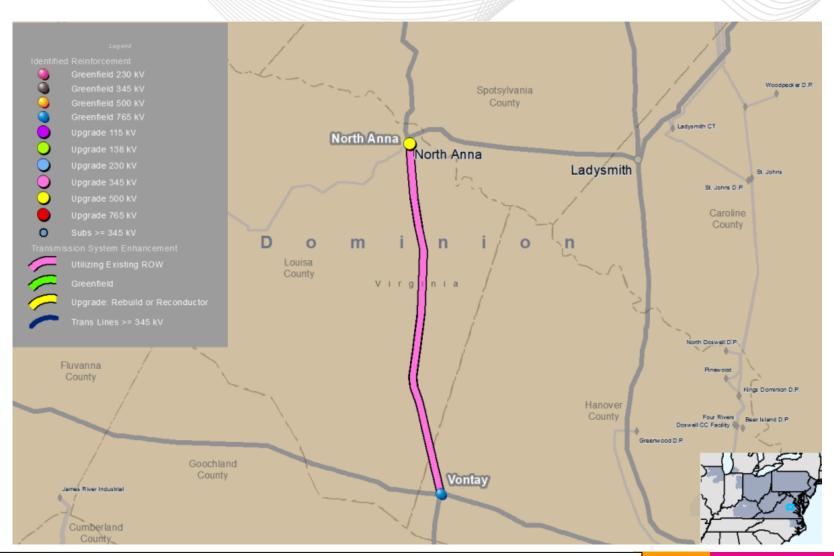




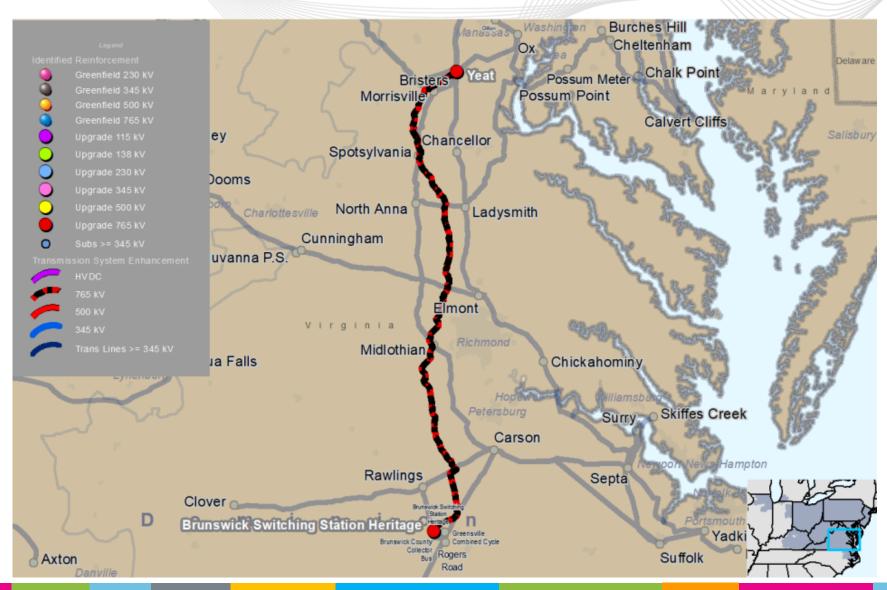


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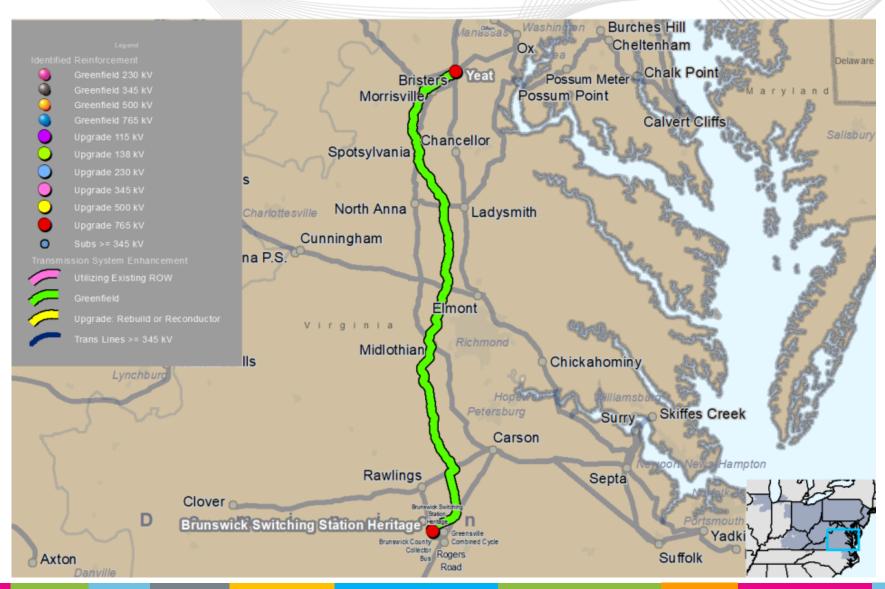




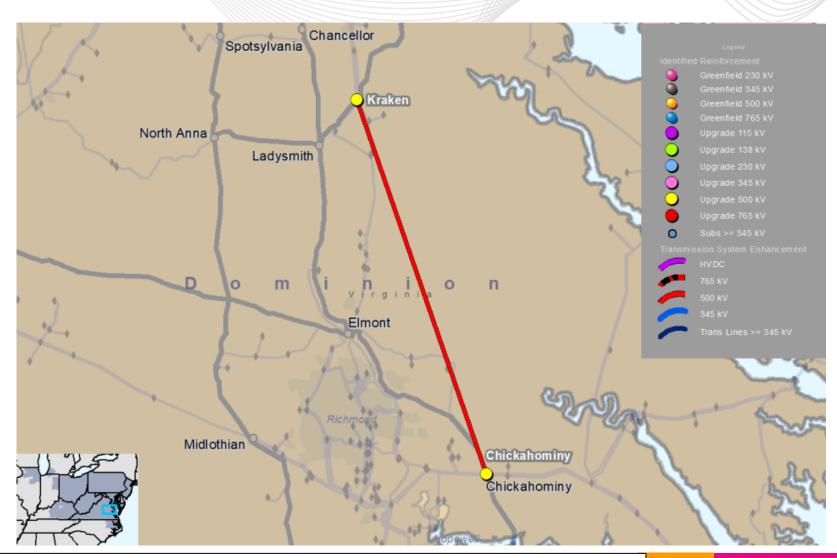






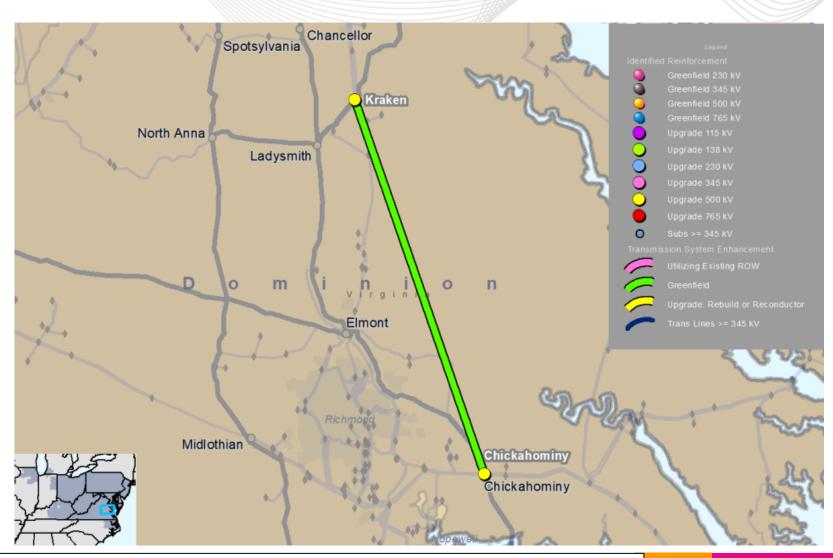




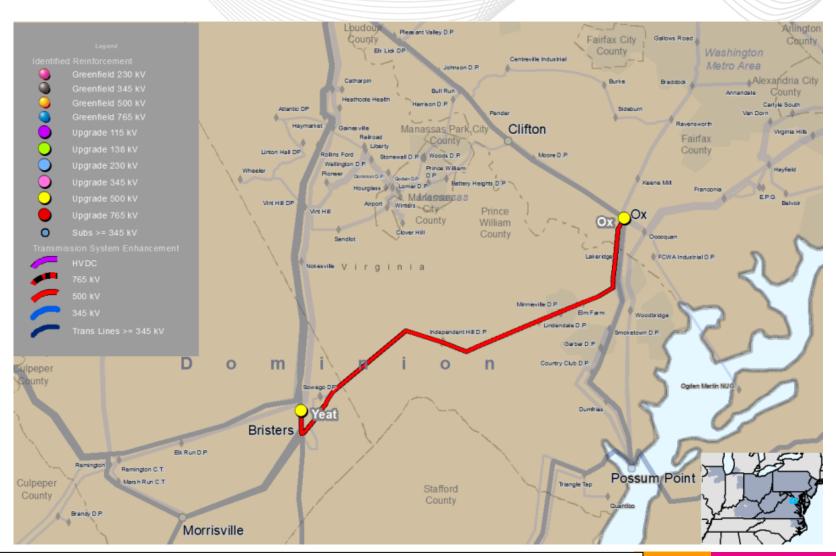


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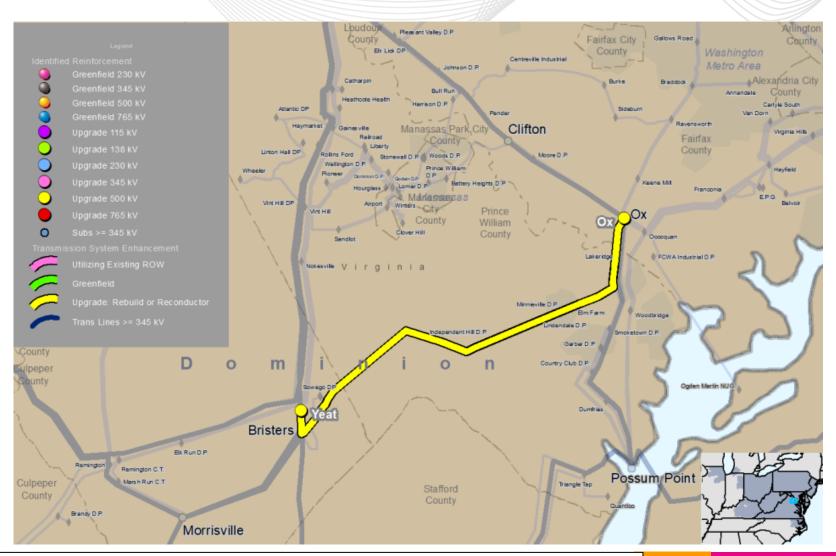




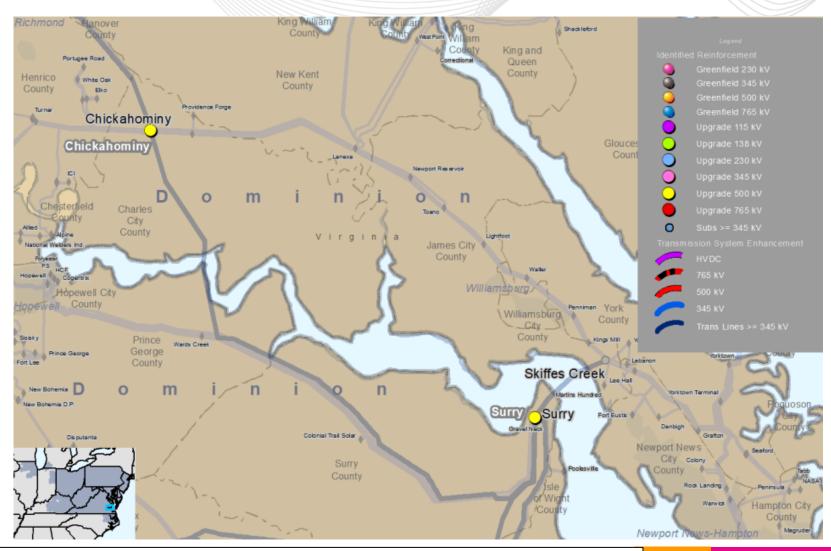




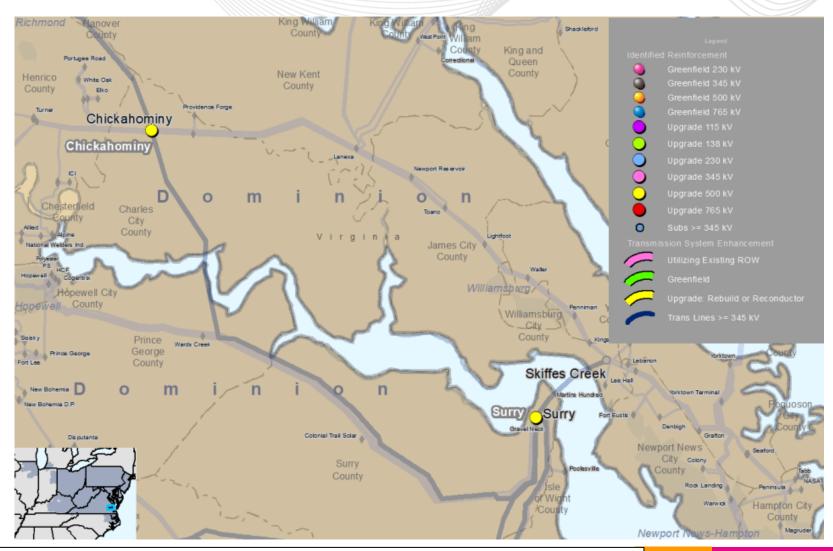




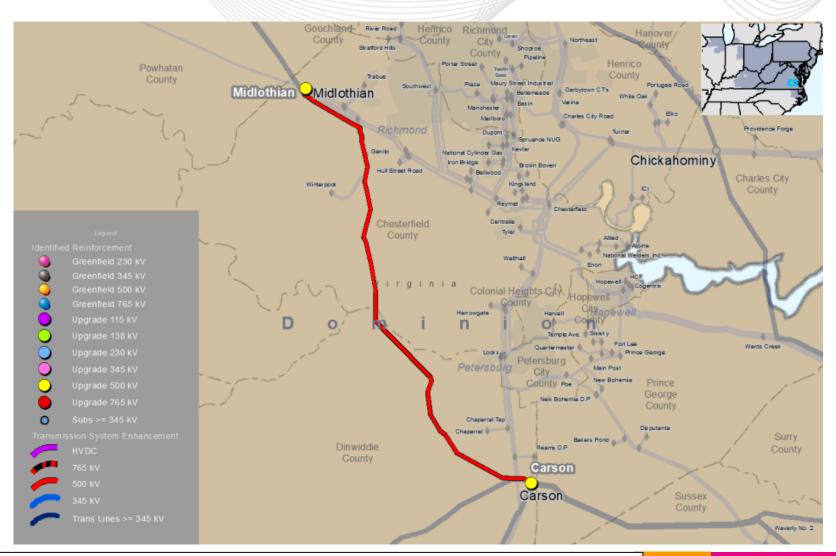




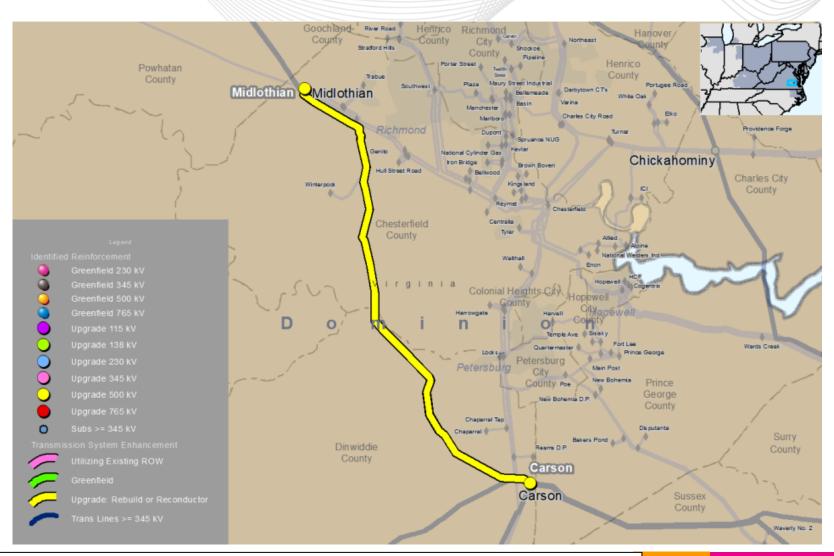




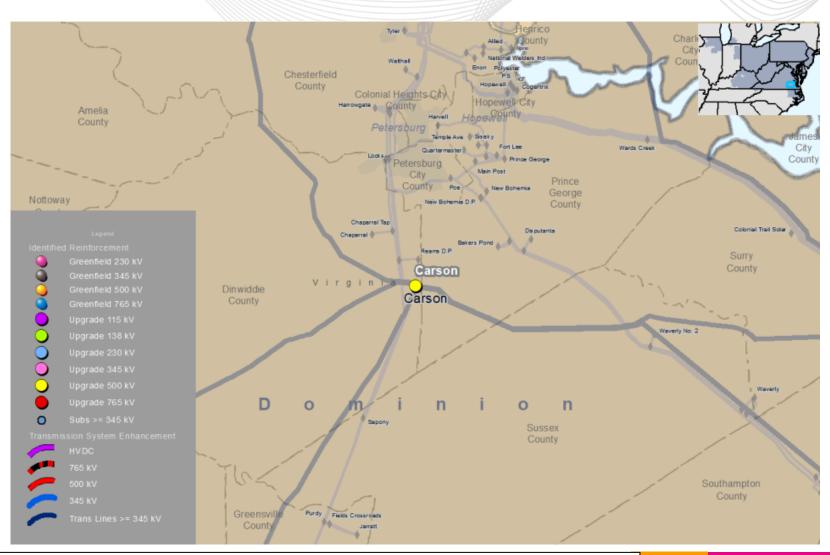




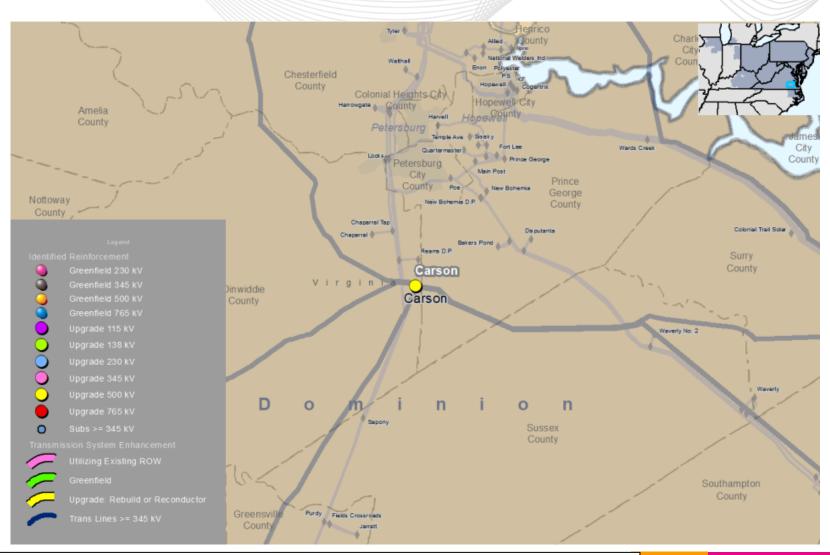




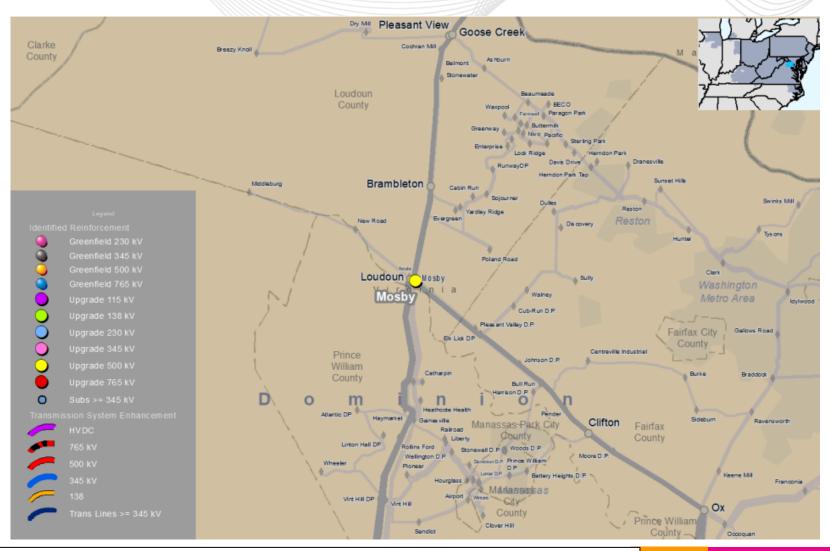




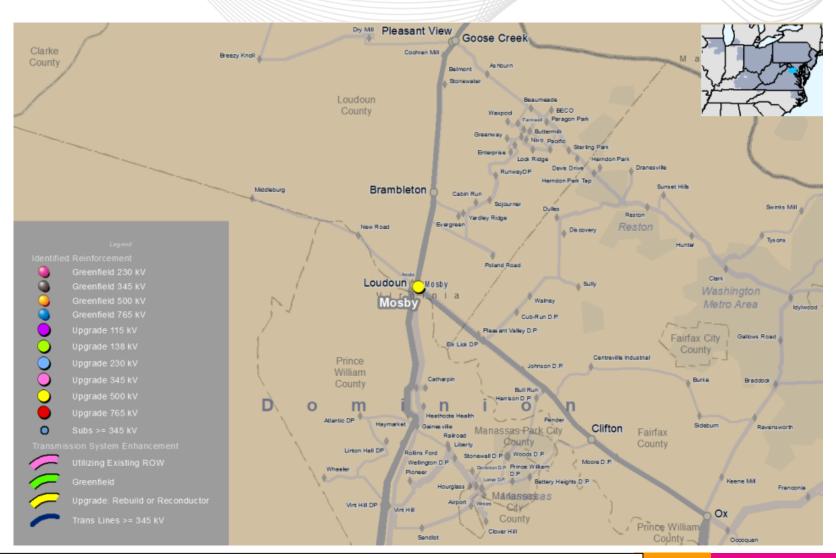






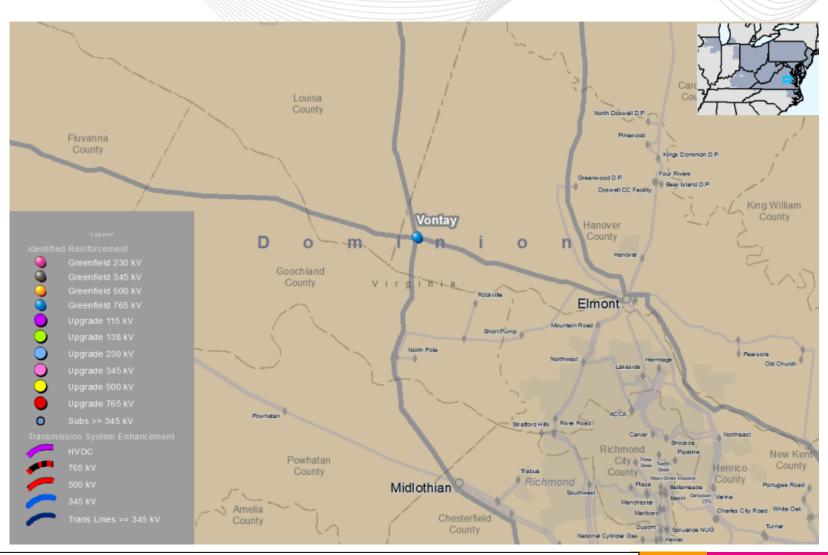




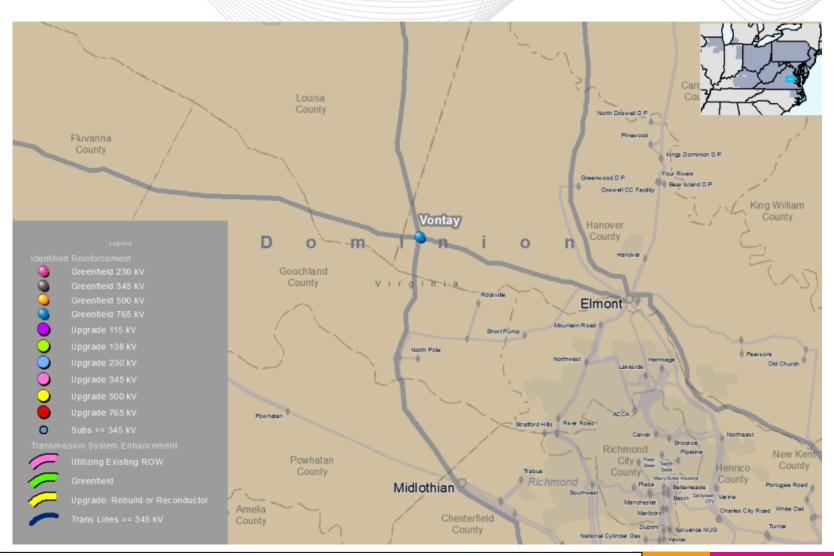


This map is only intended to illustrate the general electrical connectivity of the projects and should not be relied upon for exact geographical substation locations or line routes.





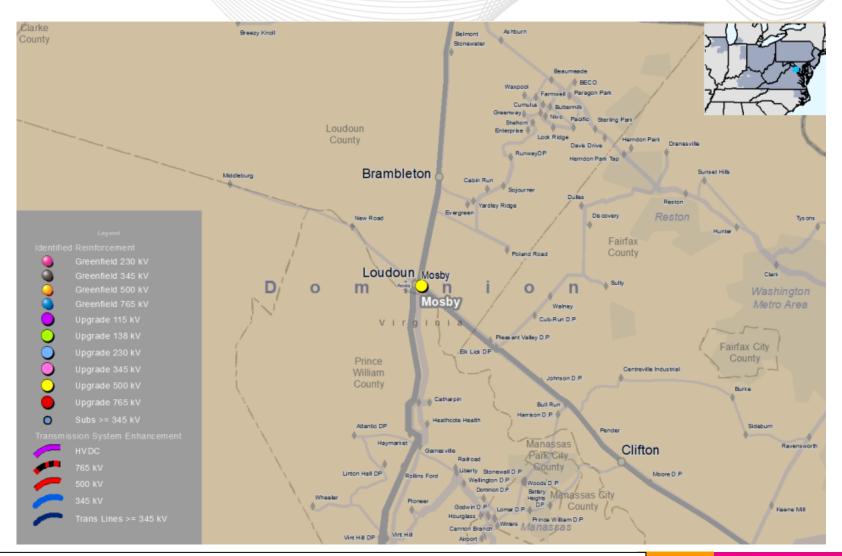




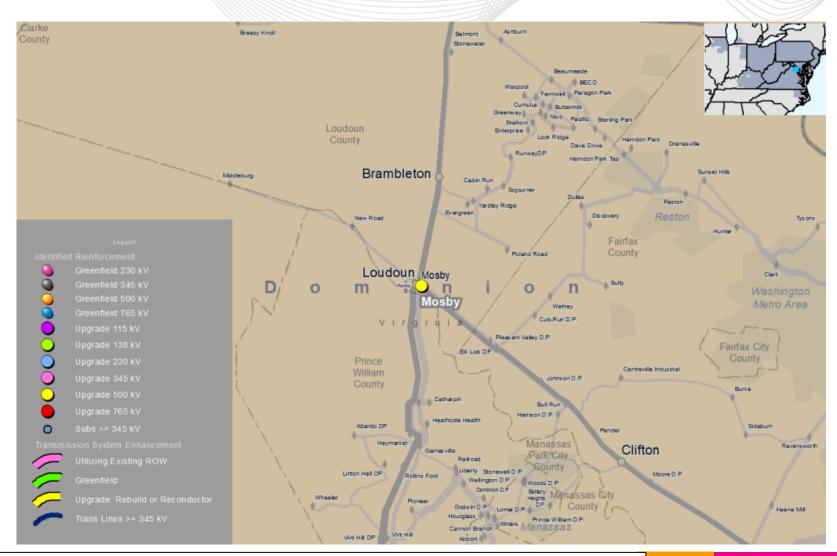
This map is only intended to illustrate the general electrical connectivity of the projects and should not be relied upon for exact geographical substation locations or line routes.

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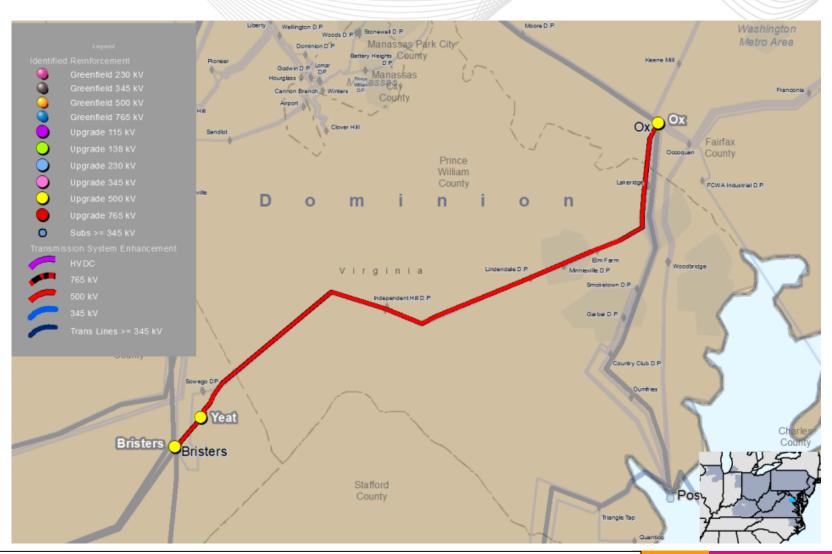




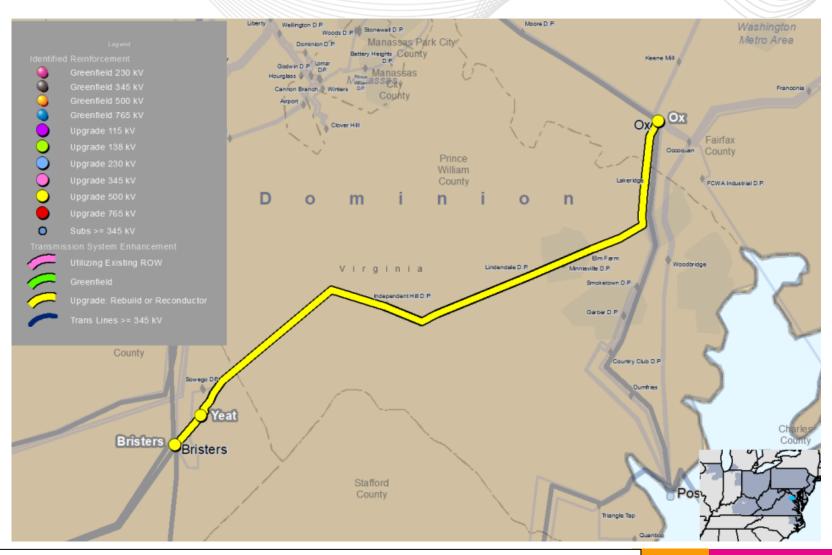




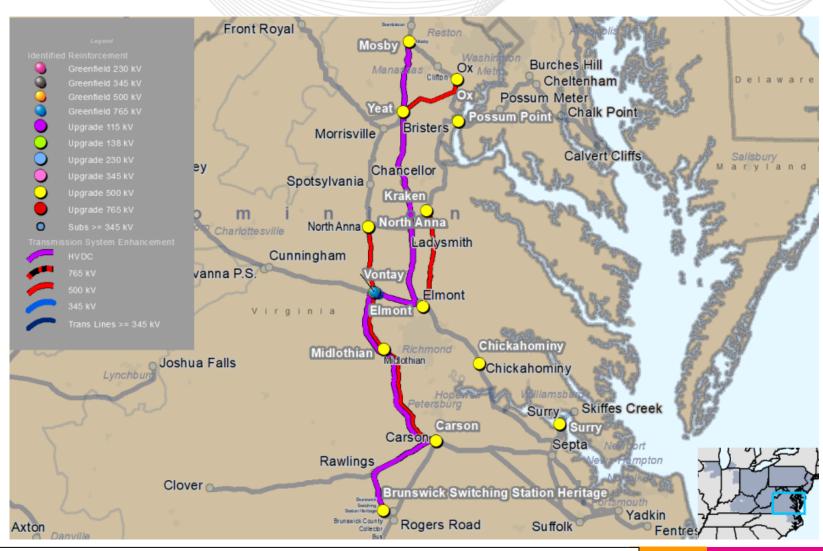




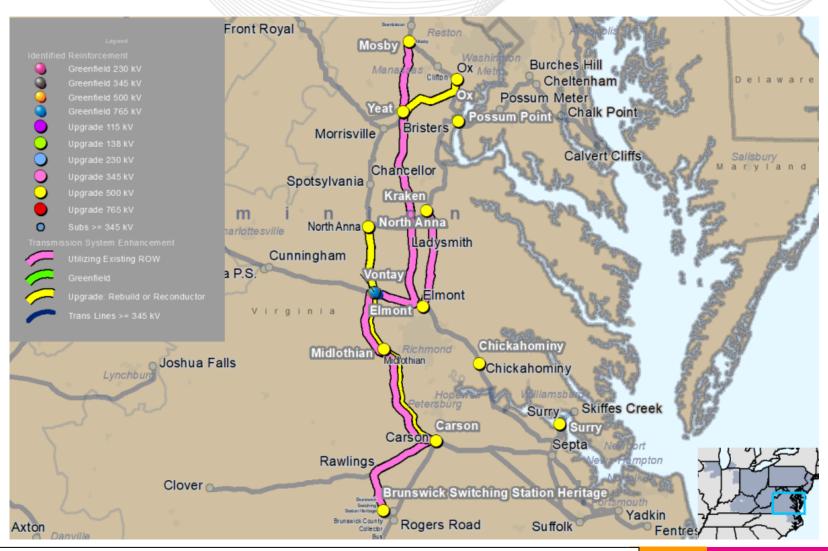




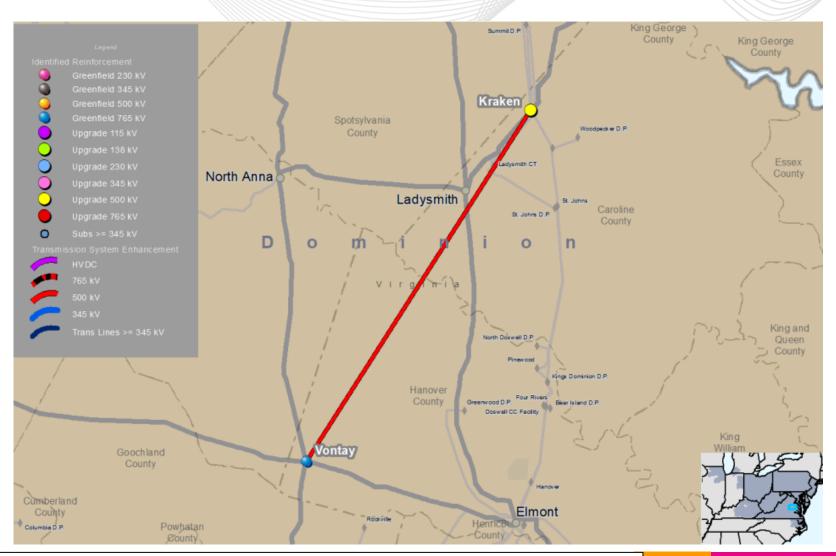




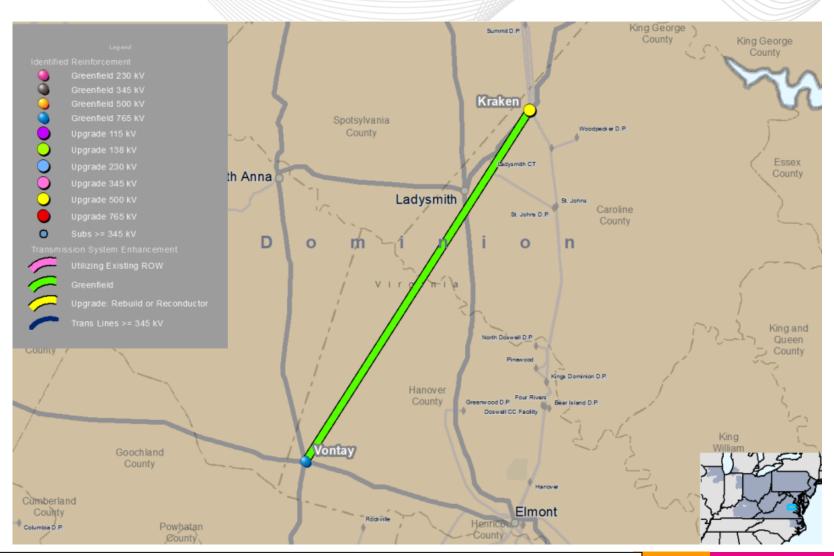




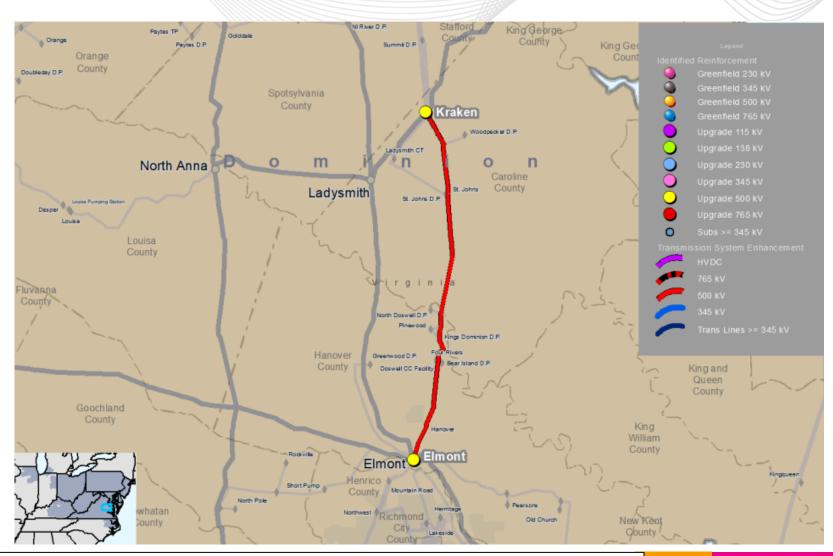




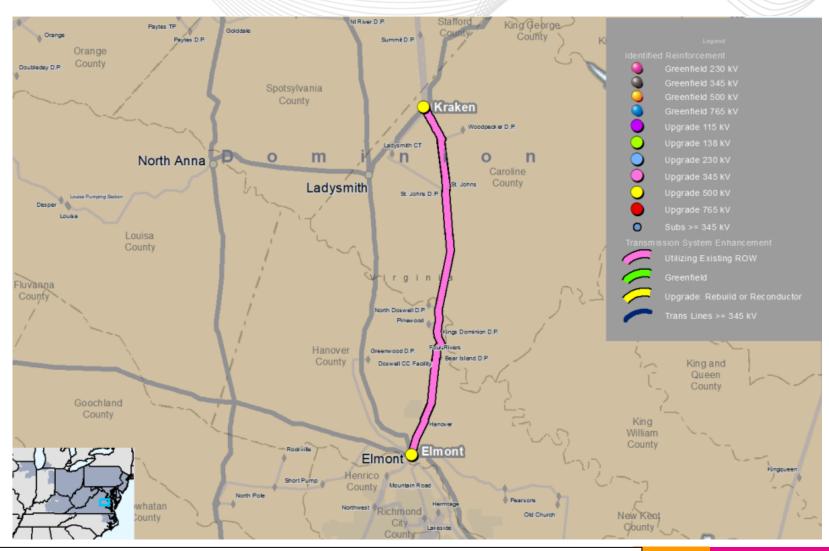








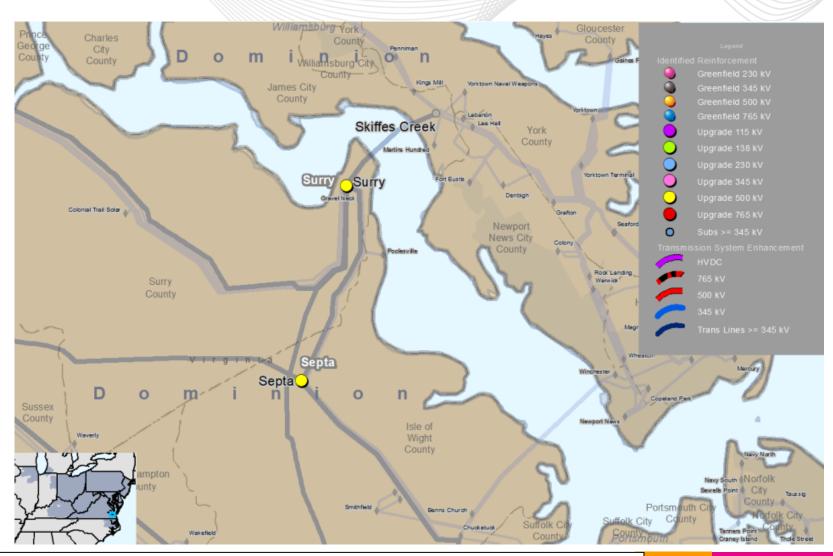




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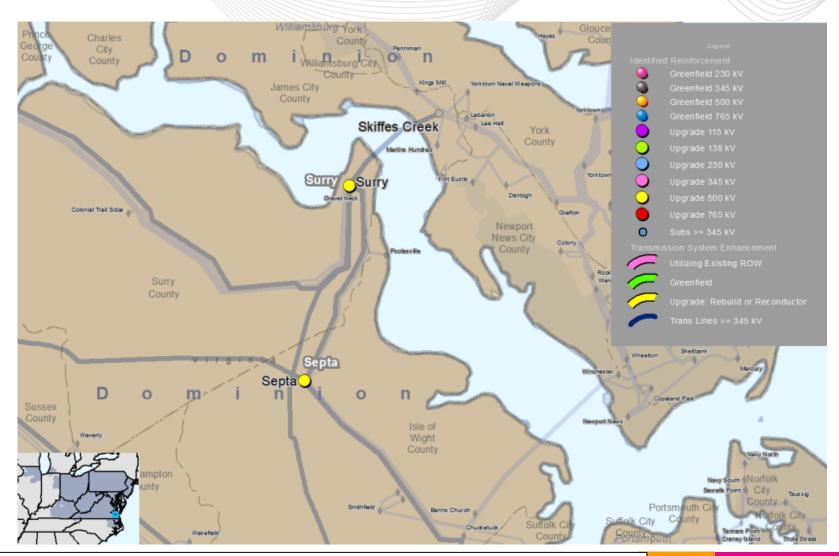




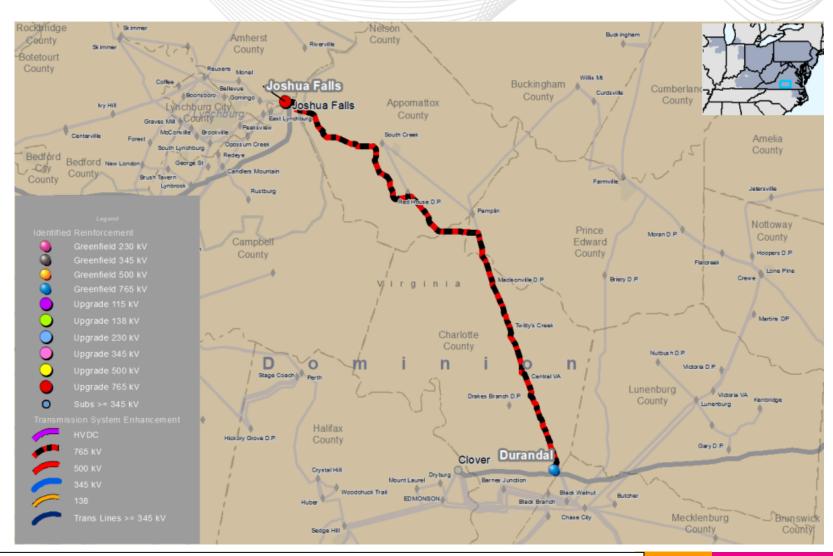






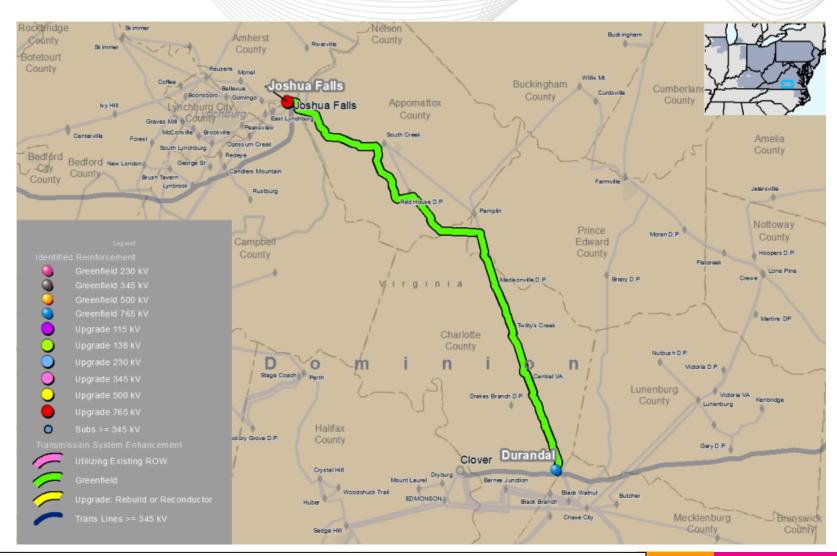




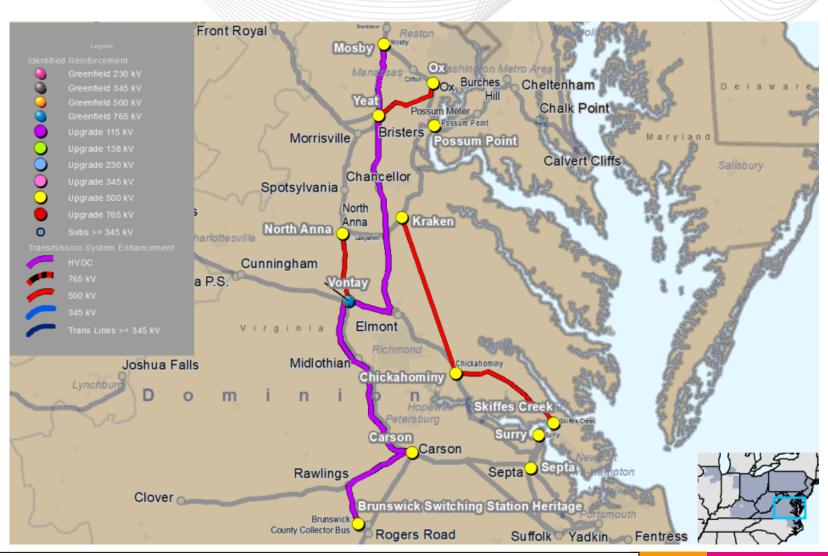


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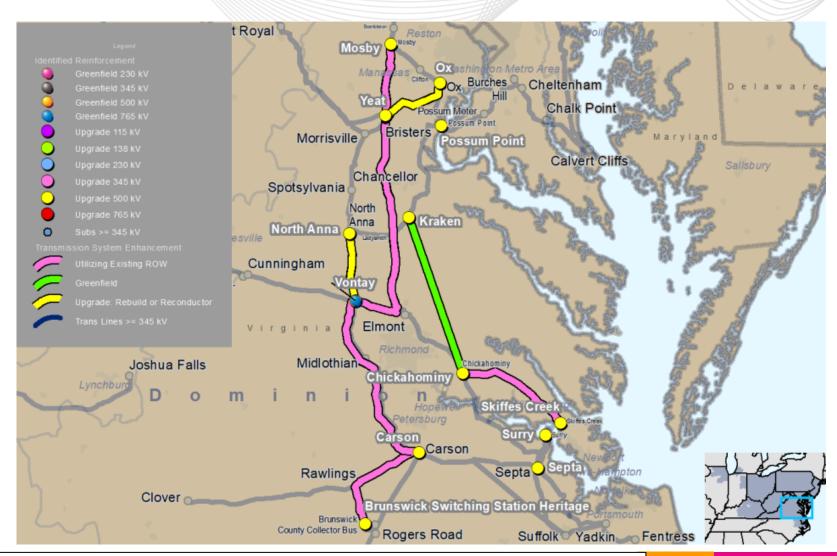




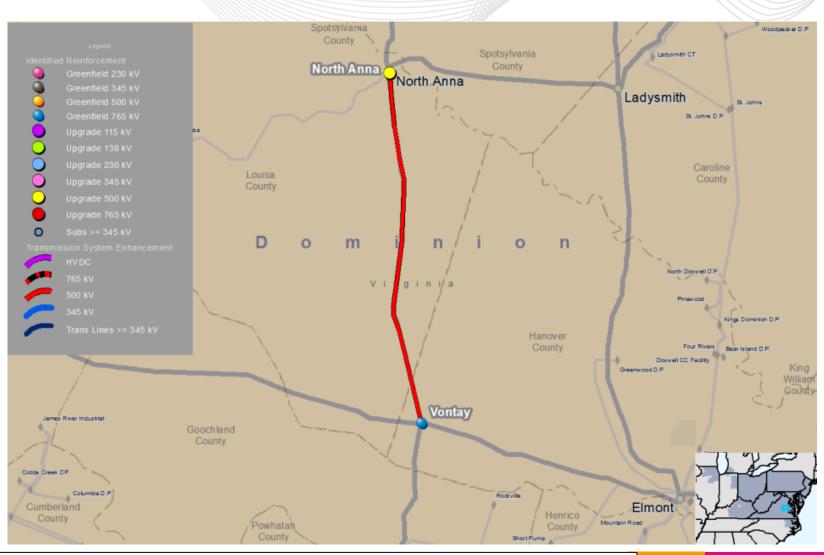




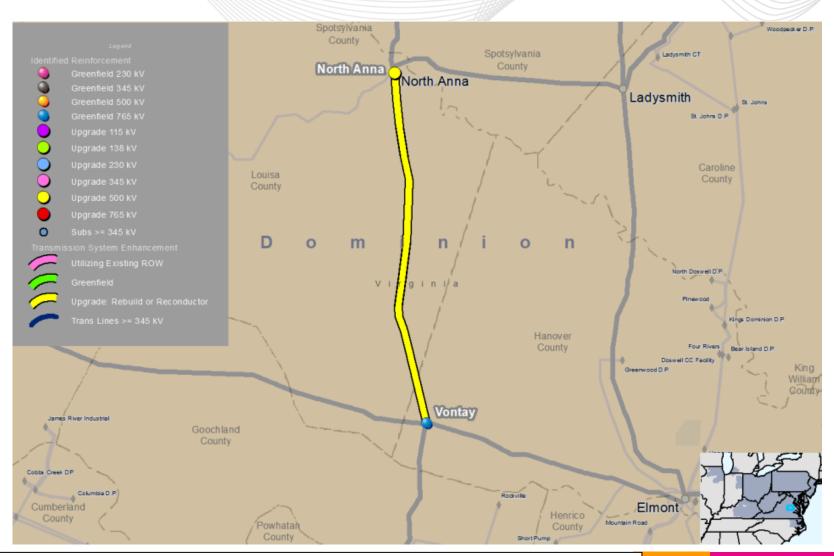






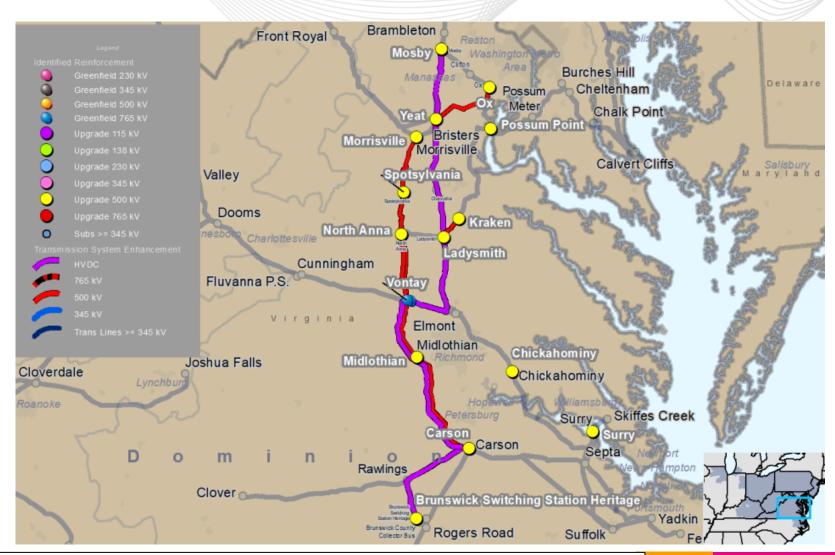




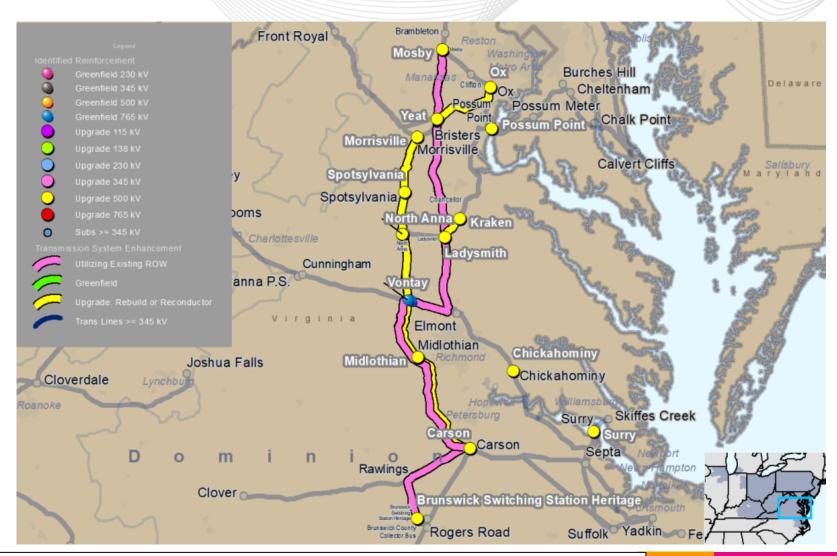


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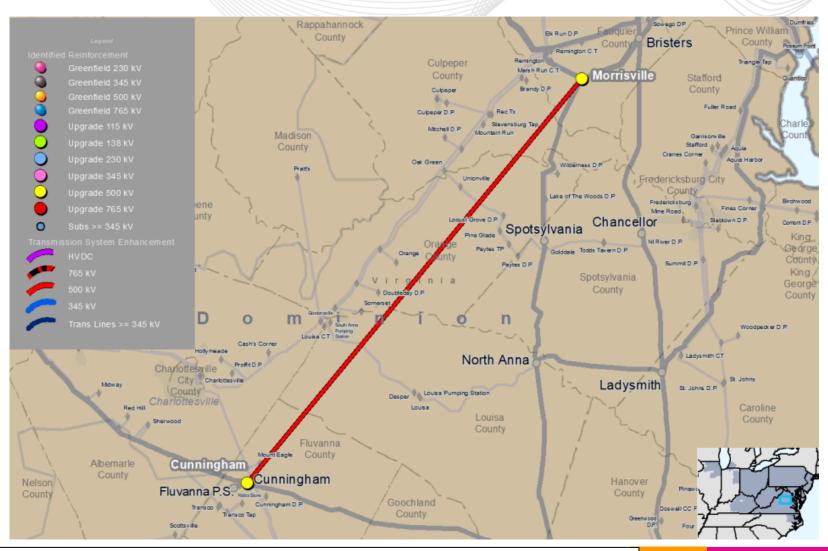




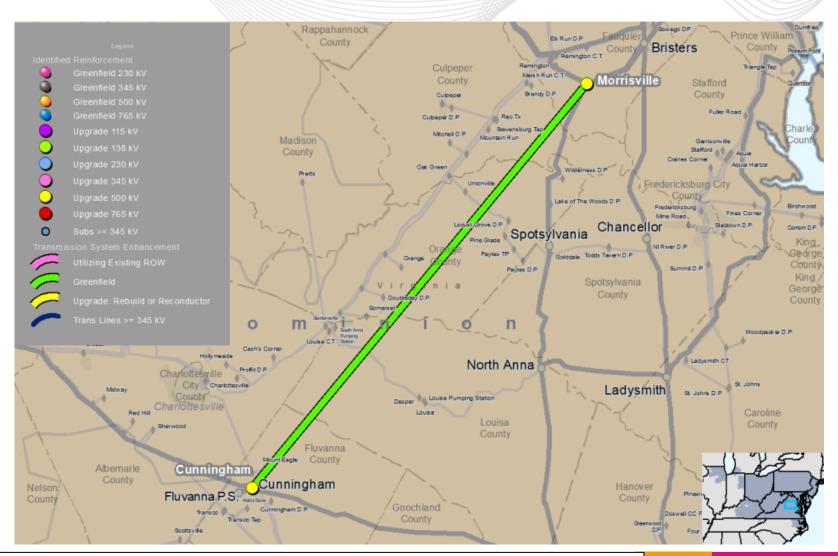




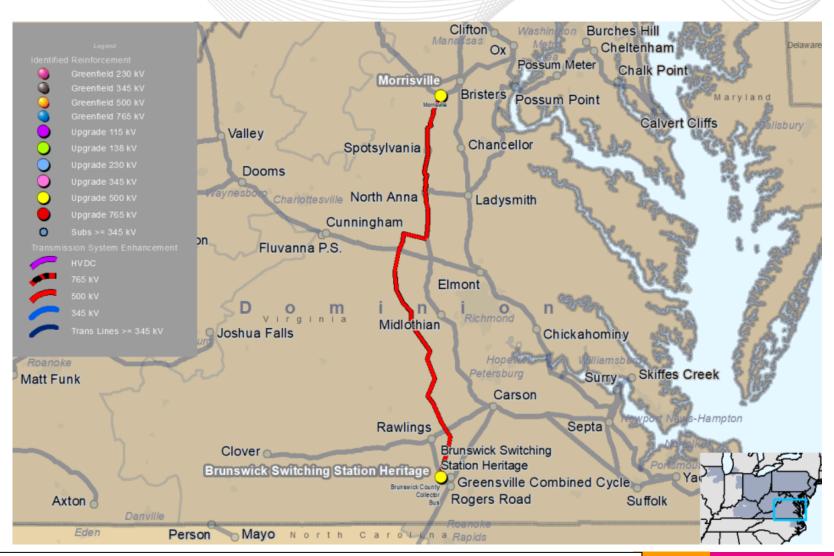




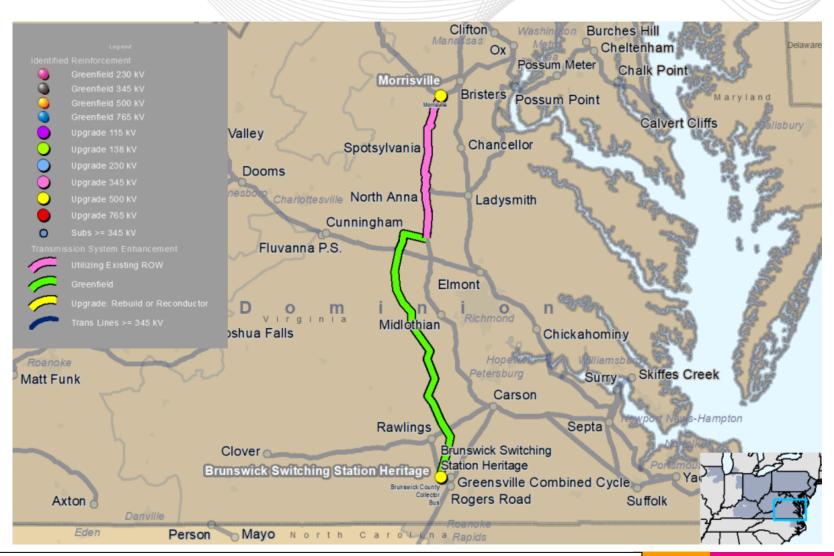




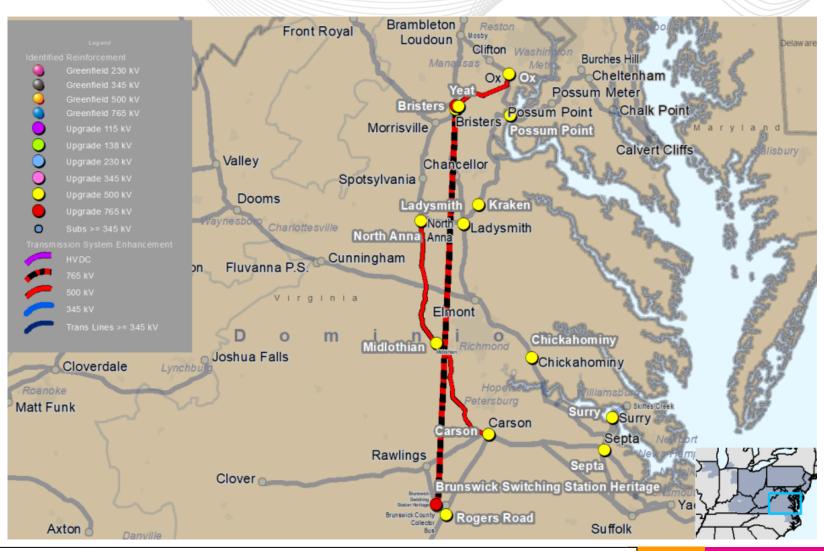




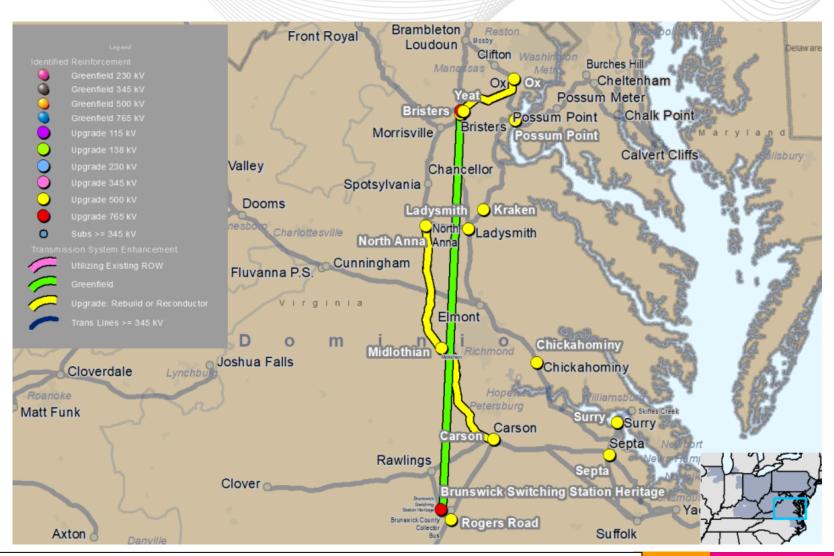




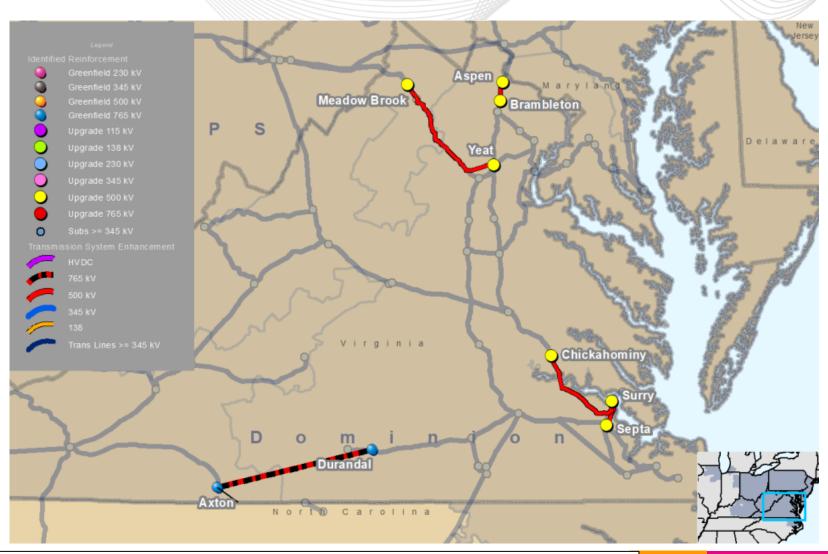




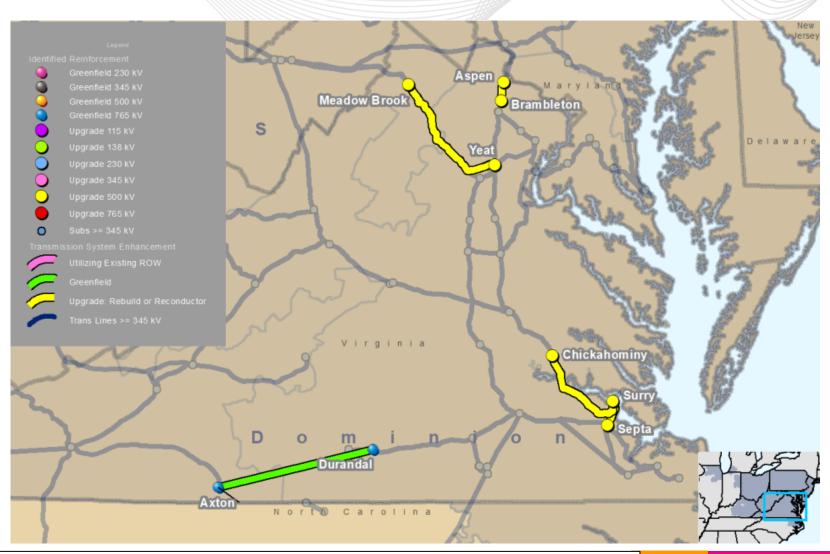






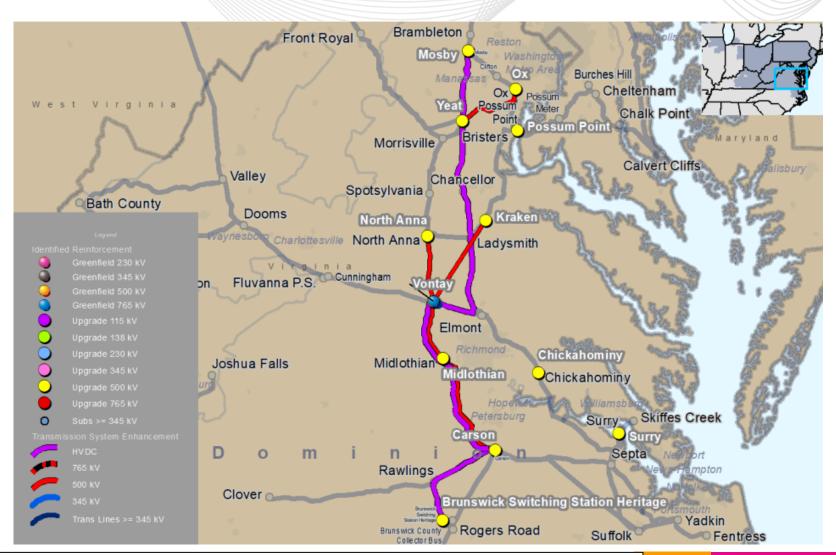




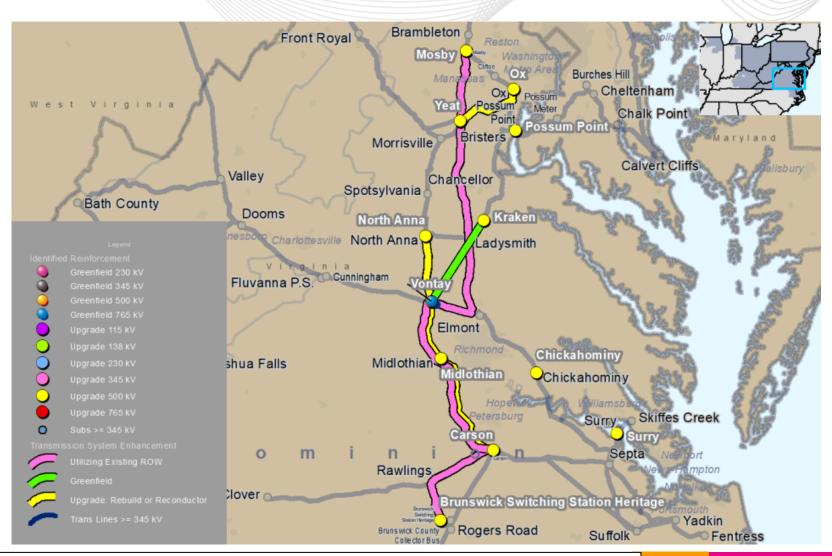


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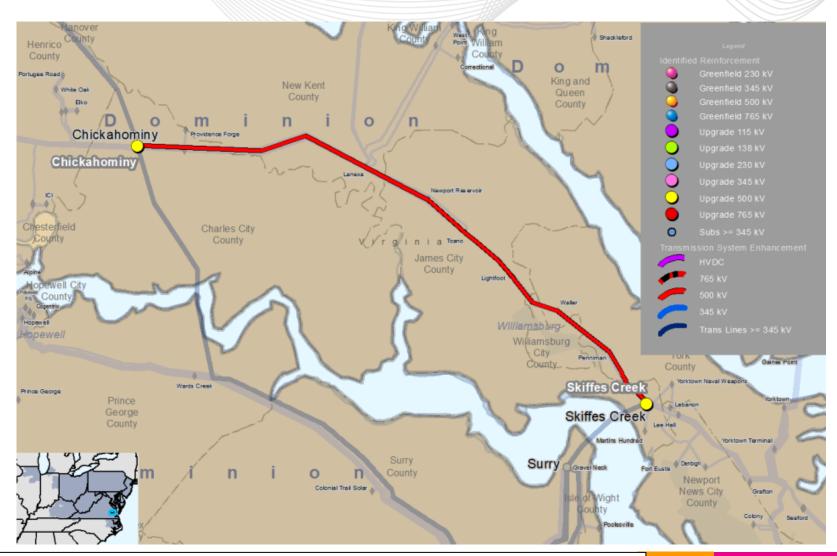




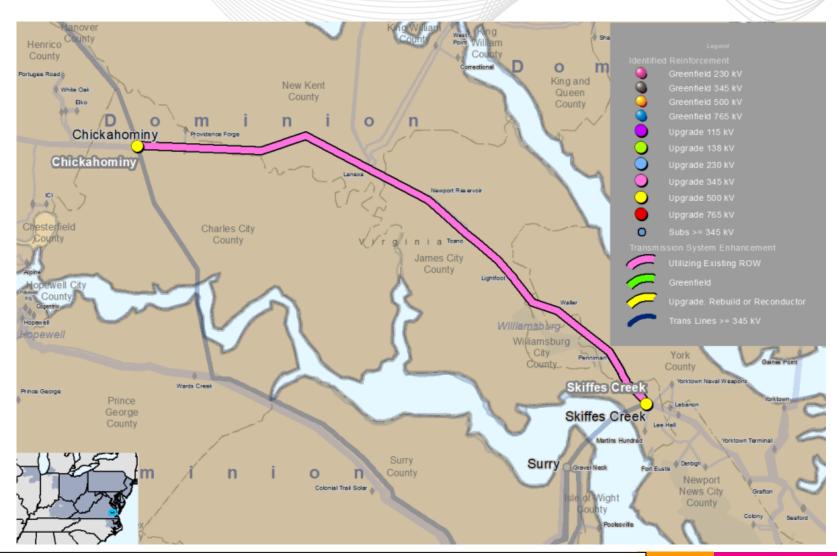




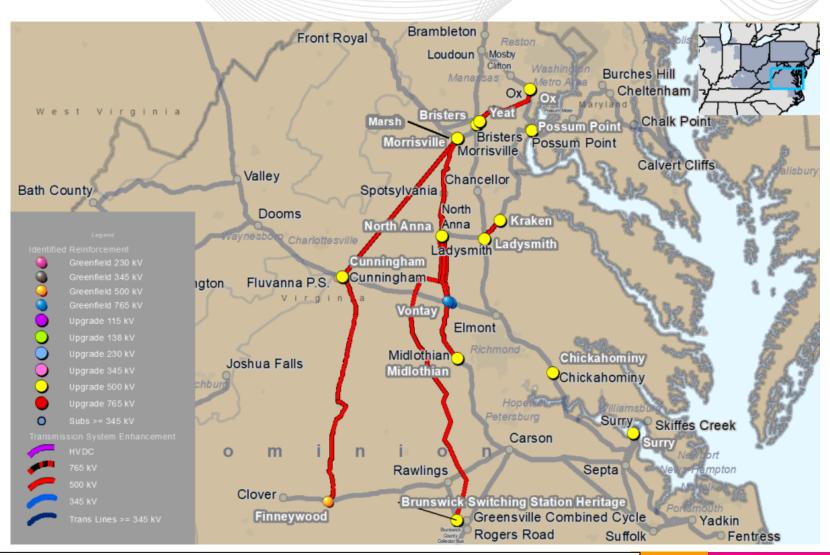






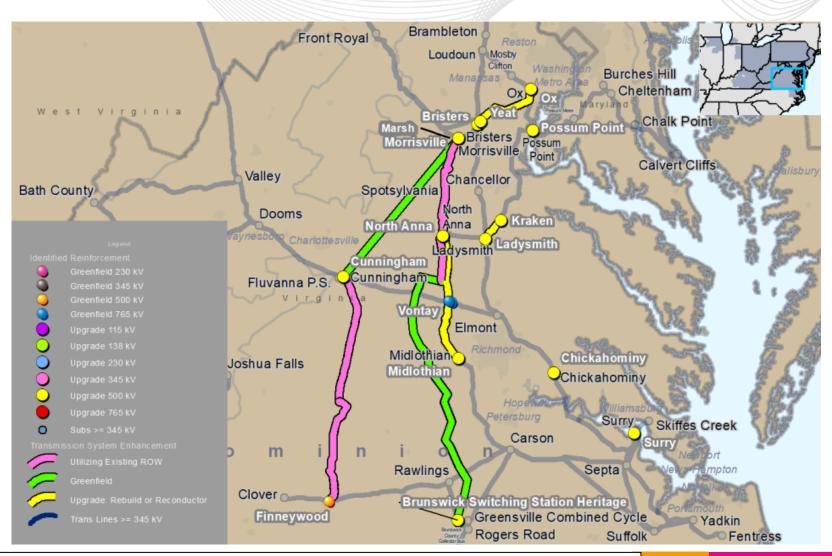




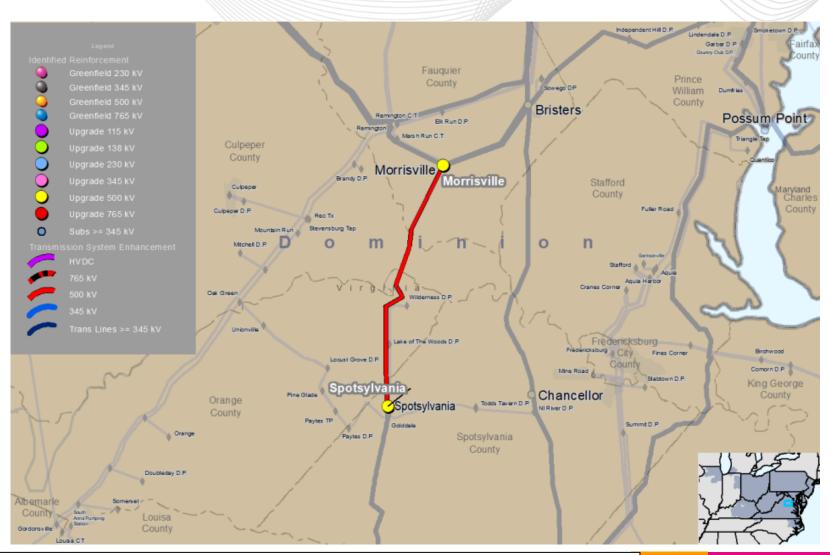


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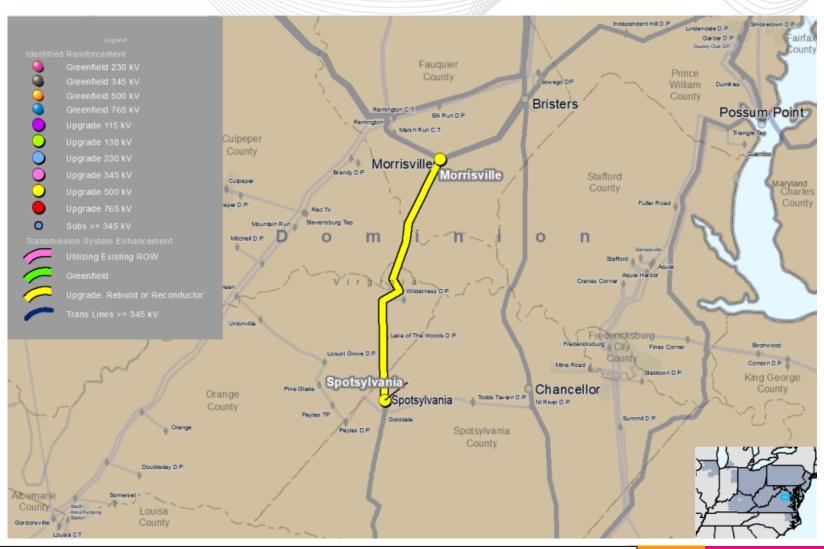




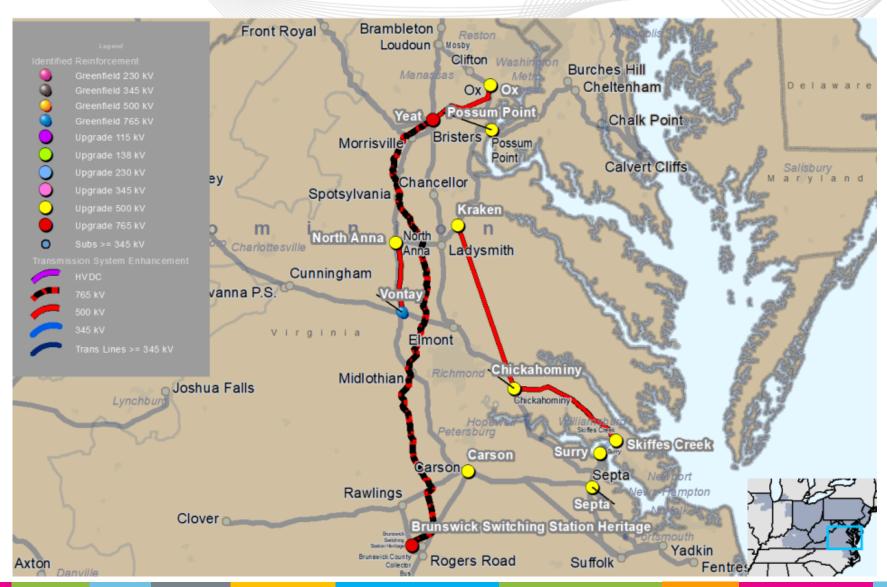




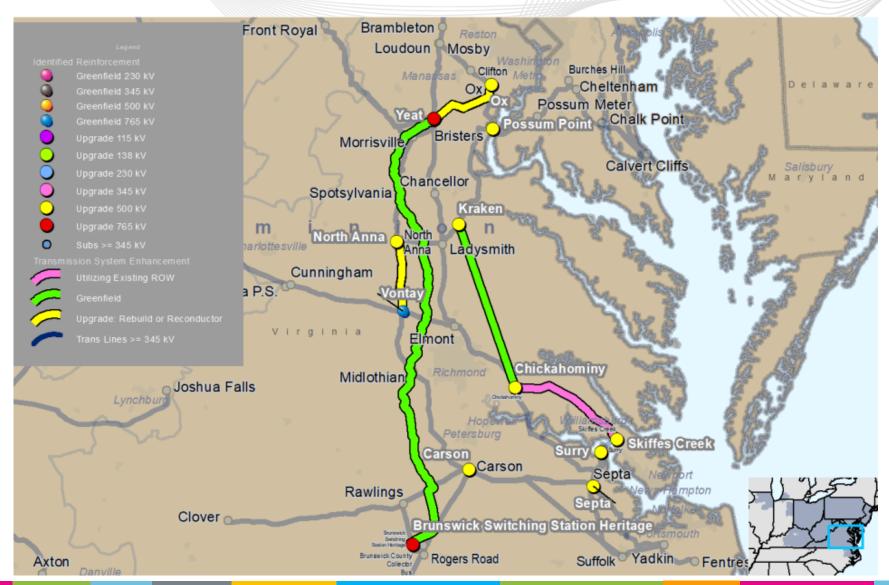




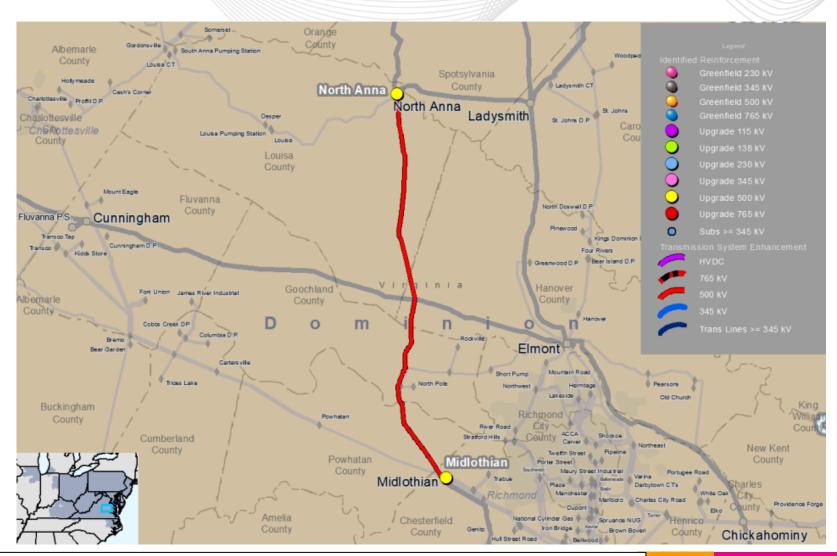




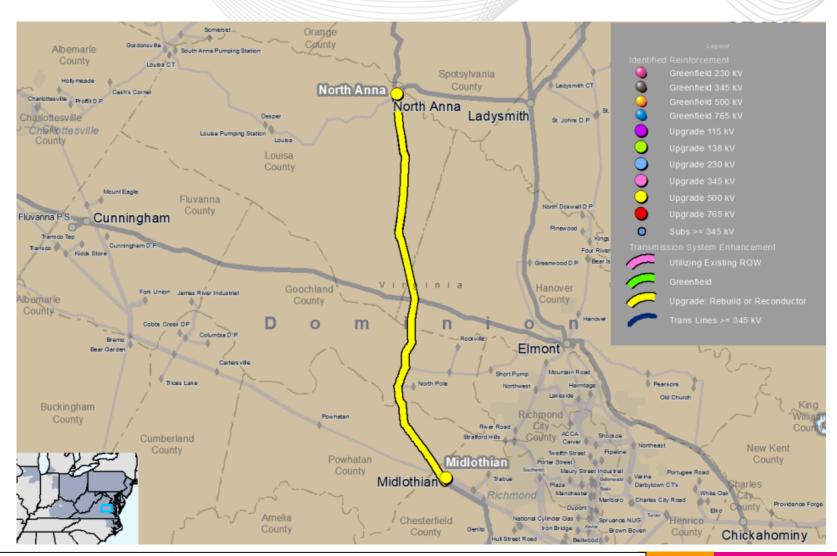




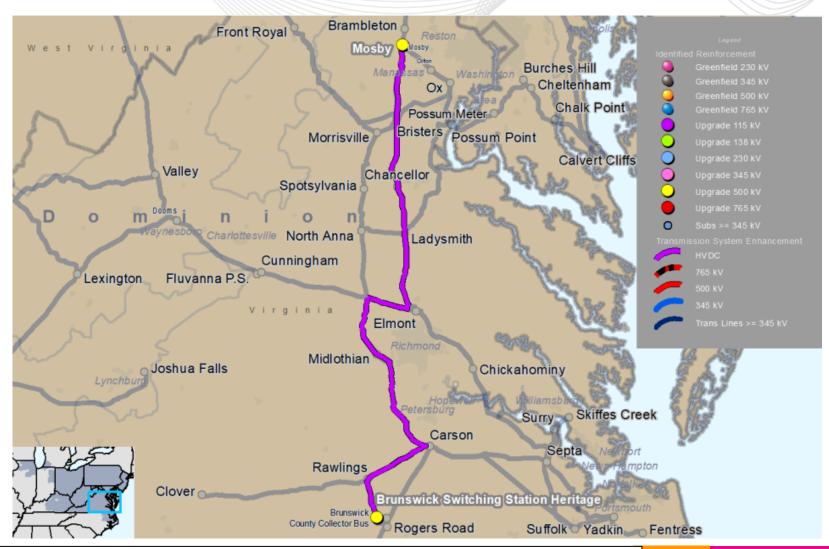




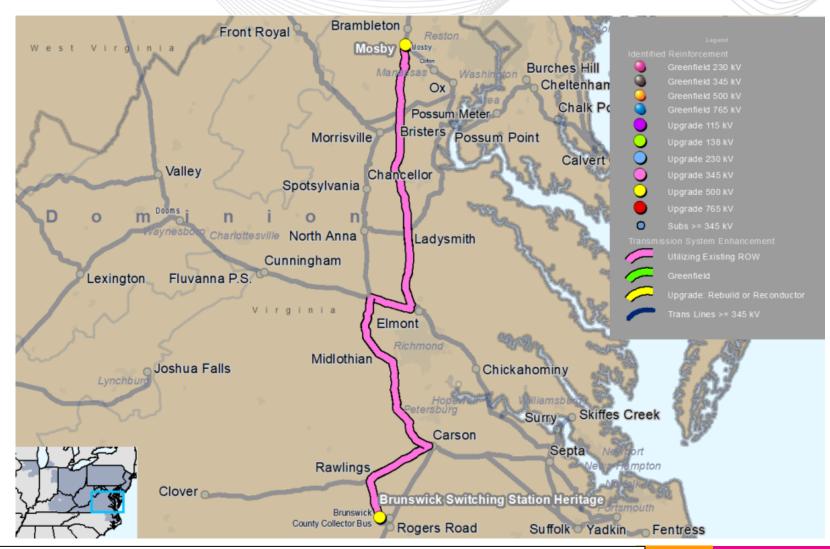




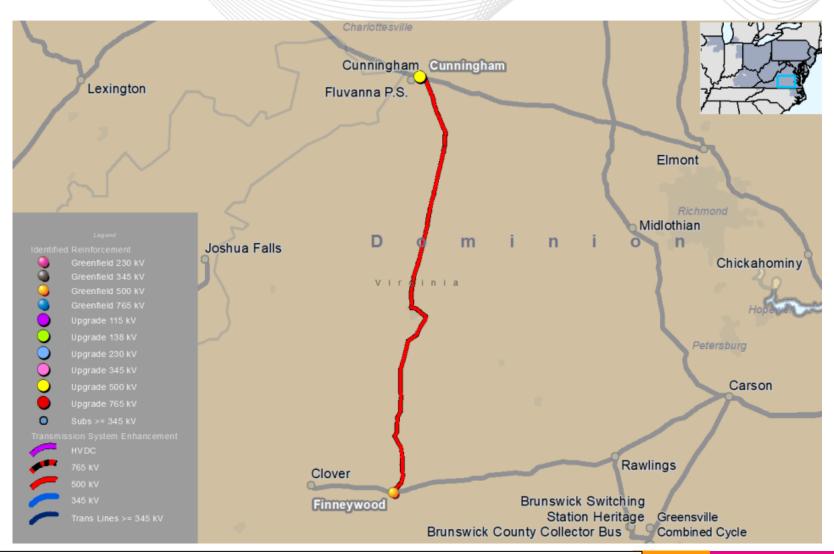




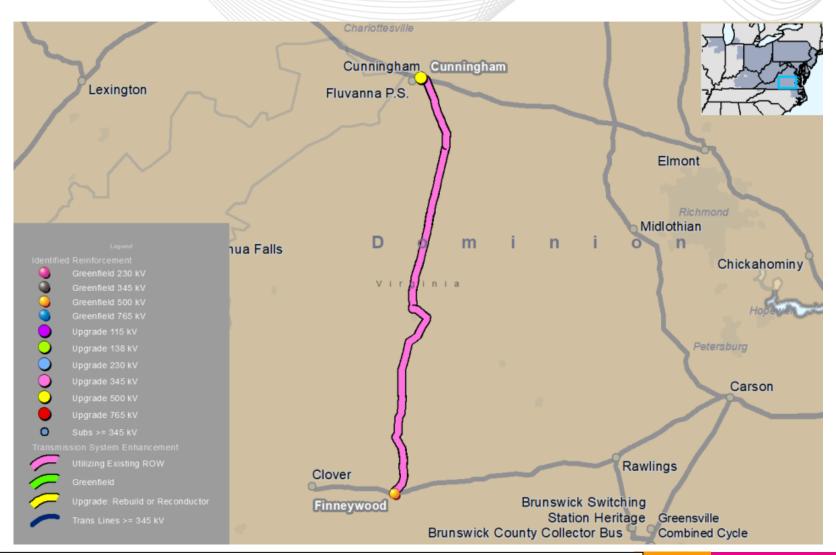




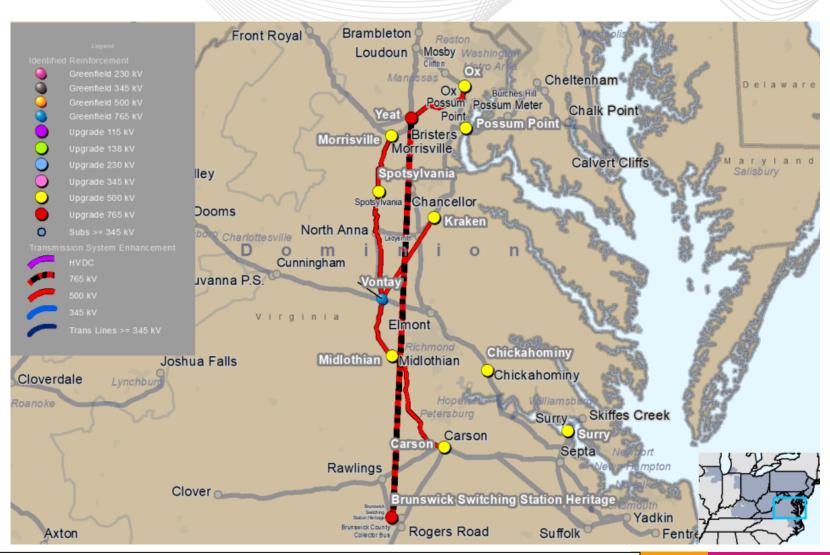




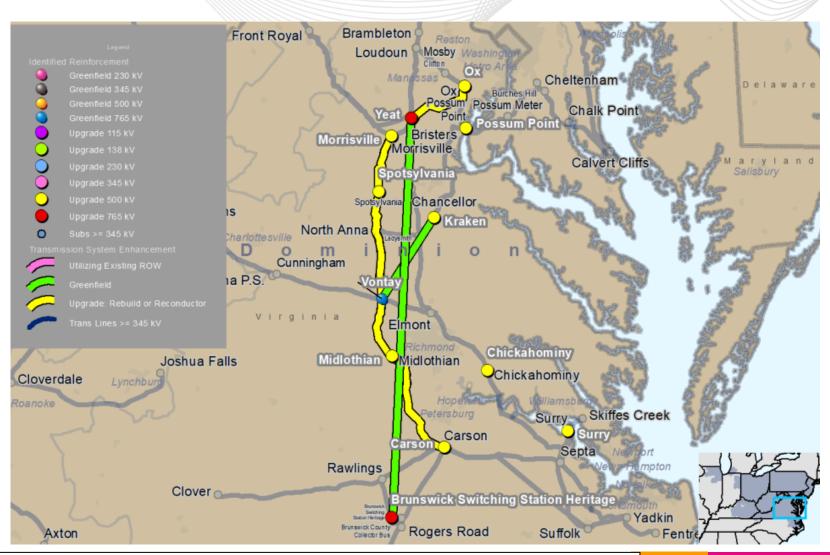






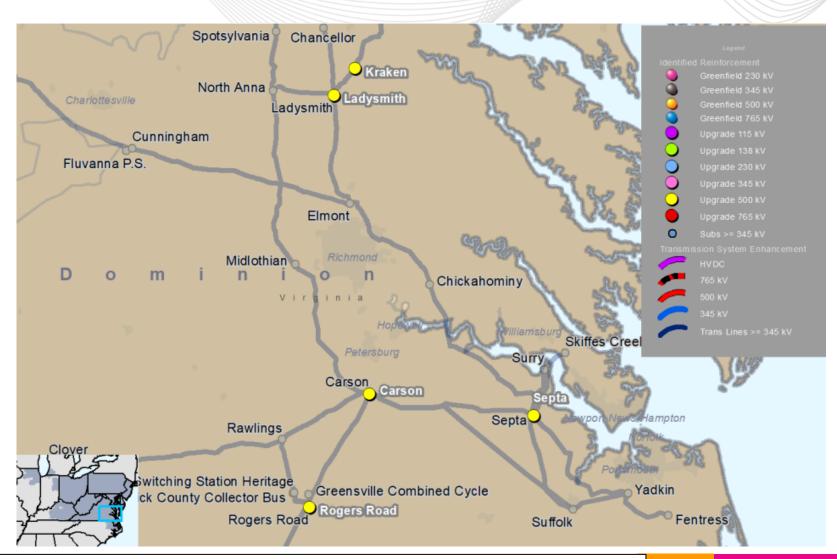






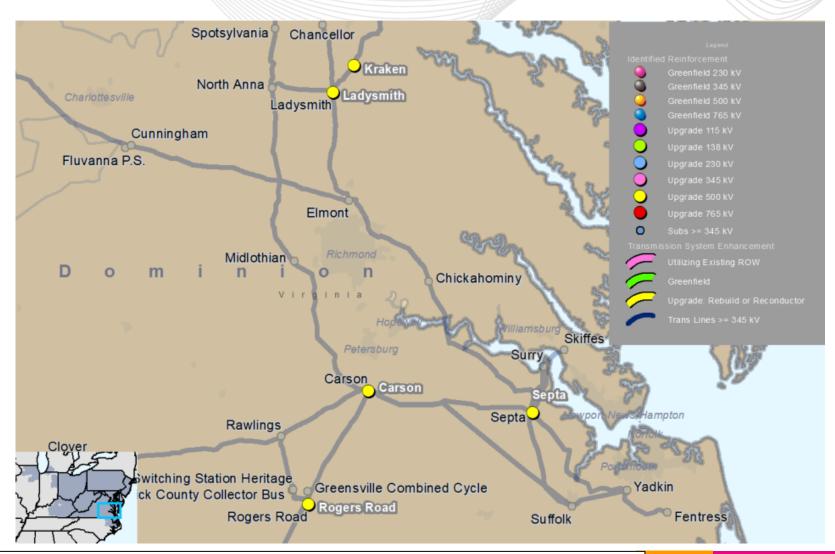
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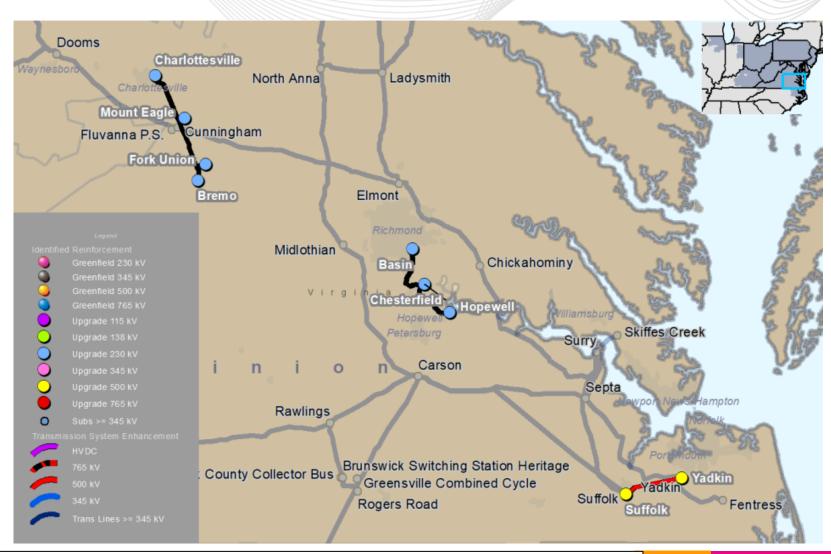
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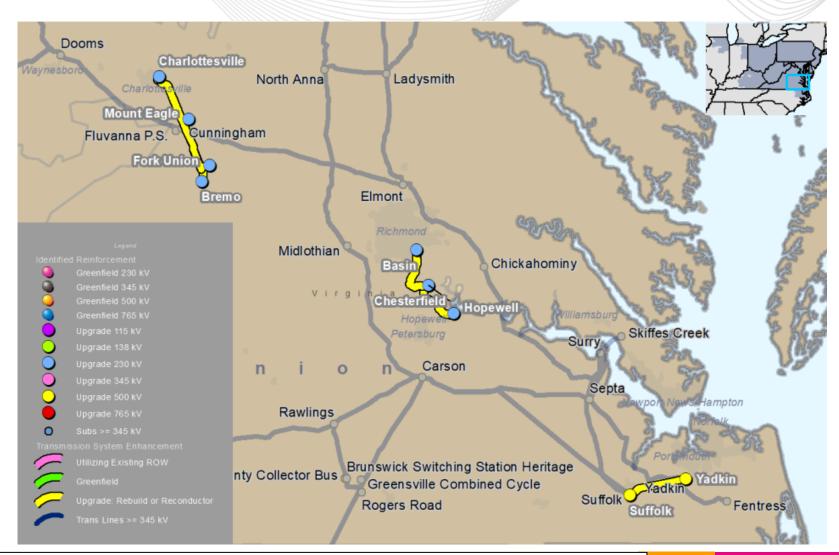


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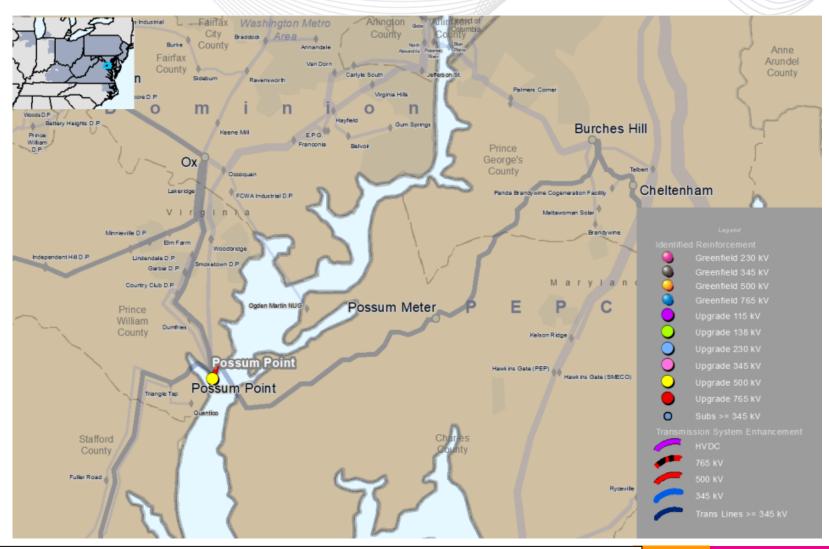




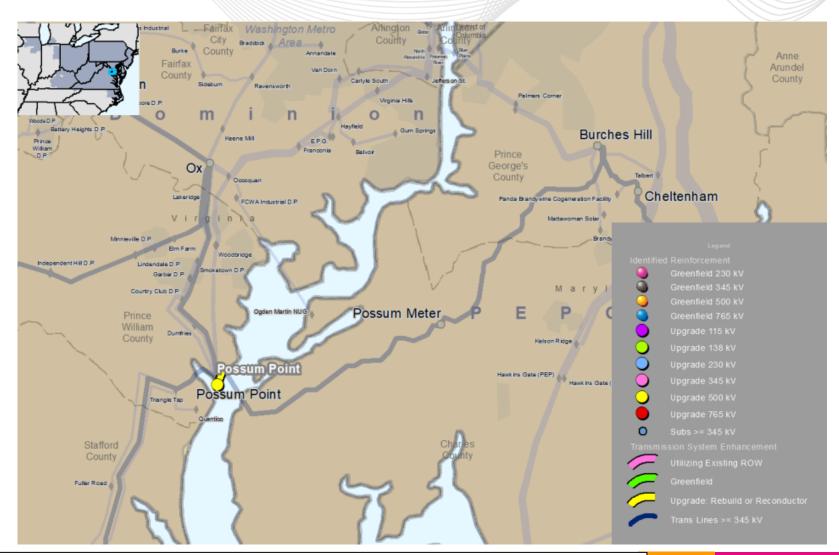


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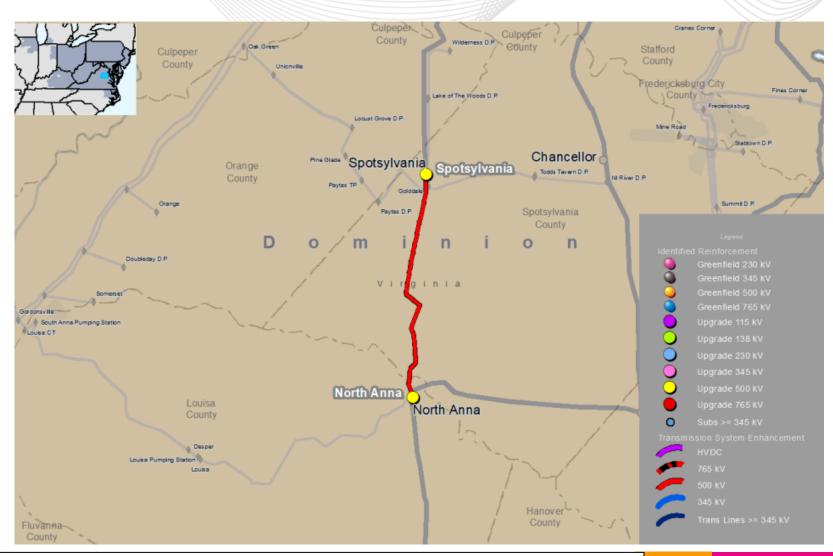




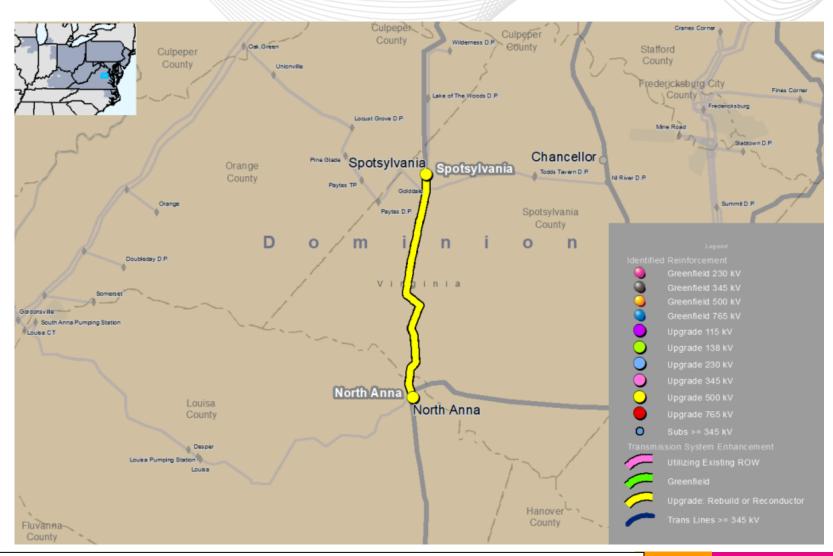


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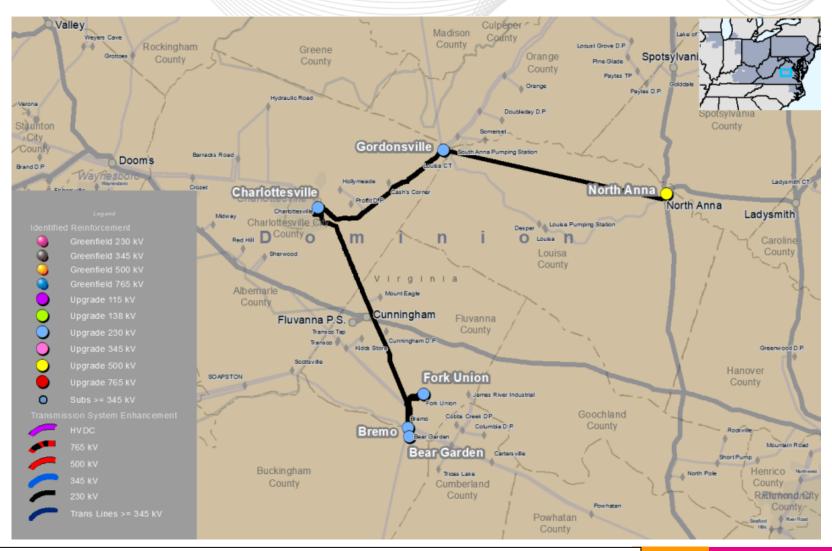




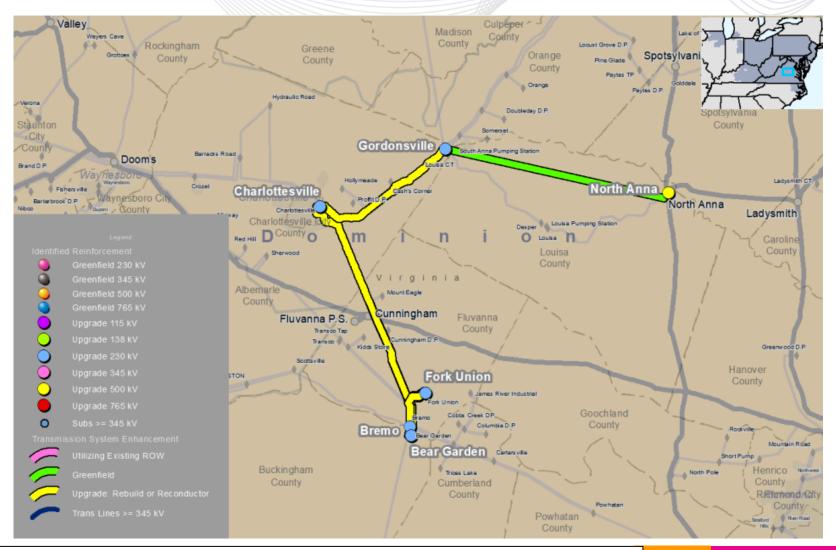


This map is only intended to illustrate the general electrical connectivity of the projects and should not be relied upon for exact geographical substation locations or line routes.









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# **Appendix**

# Scenario 5 and Scenario 6

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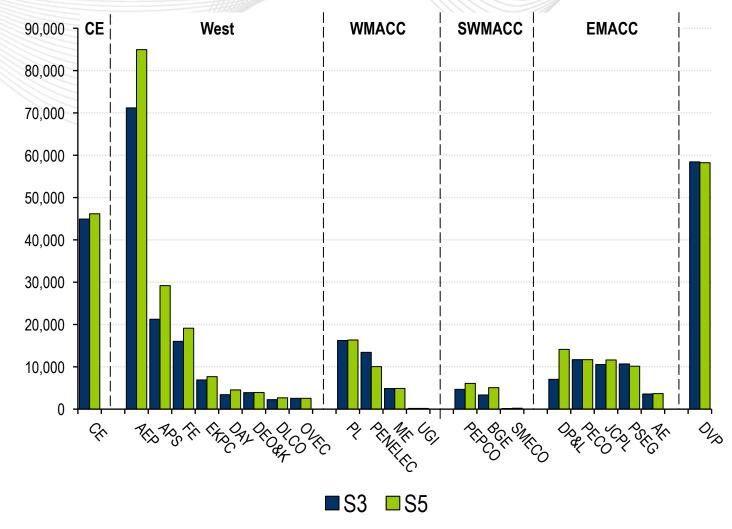


Nameplate Capacity (MW)

Area			<b>S</b> 3		S5
CE		44,913		46,166	
	AEP		71,187		84,952
	APS		21,240		29,187
	FE		16,016		19,126
	EKPC		6,903		7,674
	DAY		3,416		4,541
	DEO&K		3,900		3,930
	DLCO		2,243		2,675
	OVEC		2,555		2,555
West		127,461		154,641	
	PL		16,216		16,336
F	PENELEC		13,420		10,049
	ME		4,868		4,888
	UGI		170		170
WMACC		34,673		31,443	
	PEPCO		4,674		6,082
	BGE		3,344		5,074
	SMECO		148		215
SWMACC		8,166		11,372	
	DP&L		7,040		14,118
	PECO		11,692		11,692
	JCPL		10,551		11,620
	PSEG		10,680		10,144
	AE		3,583		3,677
EMACC		43,547		51,251	
DVP		58,431		58,236	
Grand Total			317,190		353,108

# Nameplate Capacity: S3 vs. S5

By TO/Region

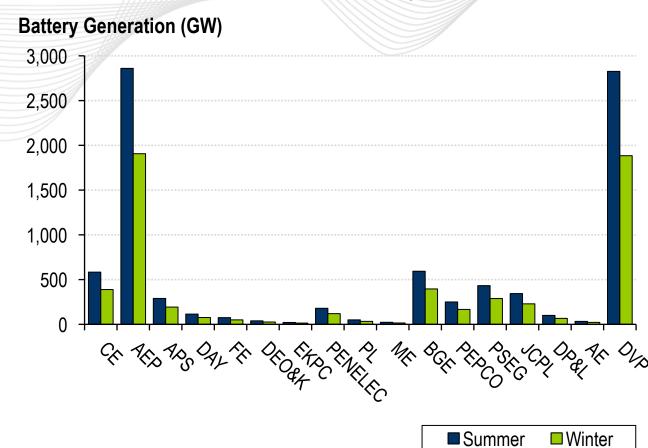




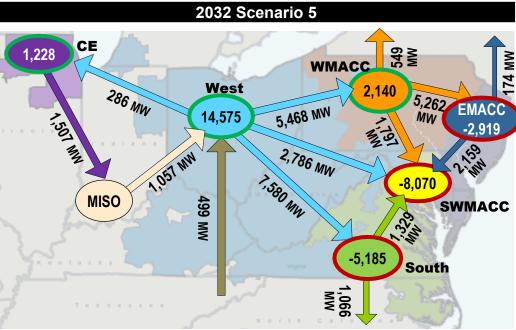
### **Battery Dispatch (MW)**

Area Name	Summer	Winter
CE	583	389
AEP	2,860	1,907
APS	289	193
DAY	114	76
FE	75	50
DEO&K	39	26
EKPC	21	14
PENELEC	179	120
PL	50	33
ME	23	15
BGE	593	396
PEPCO	250	167
PSEG	433	288
JCPL	344	229
DP&L	100	67
AE	33	22
DVP	2,826	1,884
<b>Grand Total</b>	8,813	5,875

# 2032 Scenario 6: Battery Dispatched



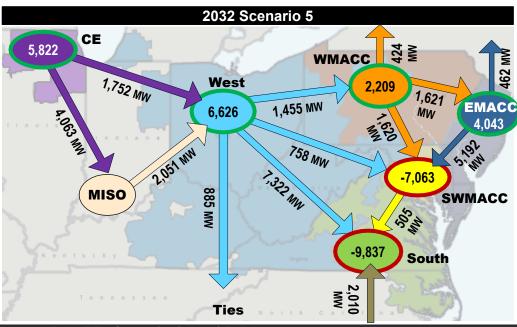
# 2032 Scenario 3 WMACC 7,792 6,192 EMACC -3,958 WISO 7,792 6,192 EMACC -3,958 SWMACC -2,184 South



# Summer: Gen/Load Profile in S3/S5

	Pgen (MW)		Load+Losse	es (MW)	Net (MW)		
Area	S3	<b>S</b> 5	S3	S5	<b>S</b> 3	<b>S</b> 5	
APS	15,170	19,485	10,571	10,824	4,599	8,660	
FE	11,857	14,276	15,546	15,629	-3,689	-1,353	
AEP	45,156	47,721	39,928	39,994	5,228	7,727	
OVEC	2,214	1,843	39	38	2,175	1,805	
DAY	1,869	2,073	3,719	3,725	-1,850	-1,651	
DEO&K	3,348	2,816	5,674	5,678	-2,326	-2,862	
DLCO	2,080	2,434	2,752	2,757	-672	-323	
CE	25,338	24,290	23,052	23,062	2,286	1,228	
PENELEC	9,255	5,323	3,118	3,164	6,137	2,158	
ME	3,653	3,656	3,437	3,441	215	215	
JCPL	4,949	4,934	6,159	6,140	-1,211	-1,205	
PL	14,235	12,596	12,713	12,747	1,522	-152	
PECO	10,899	10,789	9,227	9,243	1,672	1,546	
PSEG	8,400	8,111	11,487	11,502	-3,087	-3,391	
BGE	2,016	2,383	6,778	6,784	-4,761	-4,401	
PEPCO	2,576	2,483	5,456	5,463	-2,880	-2,980	
AE	1,516	1,458	2,644	2,650	-1,128	-1,193	
DP&L	4,243	5,775	4,037	4,040	206	1,735	
UGI	119	119	201	201	-82	-82	
RECO	0	0	411	411	-411	-411	
SMECO	29	58	746	746	-717	-689	
EKPC	4,796	4,652	2,074	2,082	2,723	2,570	
DVP	35,751	32,776	37,934	37,961	-2,184	-5,185	
Total	209,468	210,052	207,704	208,284	1,764	1,768	

### 2032 Scenario 3 CE 8,190 307 MW WMACC 569 | 2,493 MW West 7,225 1,474 3,663 MW **EMACC** 6,409 MM -4,549 4,486 170 MW **MISO** SWMACC South 1,366 MW Ties



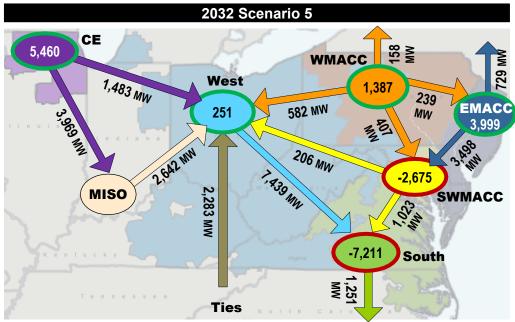
## WIN: Gen/Load Profile in S3/S5

	Pgen (M	W)	Load+Losse	s (MW)	Net (MV	V)
Area	<b>S</b> 3	<b>S</b> 5	<b>S</b> 3	S5	<b>S</b> 3	<b>S</b> 5
APS	14,271	19,343	11,265	11,470	3,006	7,873
FE	11,603	12,763	13,850	13,934	-2,247	-1,171
AEP	35,761	42,460	40,247	40,401	-4,486	2,060
OVEC	2,100	2,100	50	51	2,050	2,048
DAY	1,103	1,610	3,317	3,341	-2,214	-1,731
DEO&K	3,404	2,185	4,936	4,942	-1,532	-2,757
DLCO	2,255	2,486	2,089	2,094	165	392
CE	27,835	24,803	18,925	18,980	8,910	5,822
PENELEC	8,388	4,363	2,988	2,986	5,401	1,377
ME	3,644	3,602	3,209	3,202	436	400
JCPL	6,472	6,495	5,549	5,551	923	944
PL	14,446	13,510	12,985	12,993	1,462	517
PECO	10,812	10,862	7,402	7,407	3,410	3,454
PSEG	9,665	8,615	10,412	10,421	-747	-1,805
BGE	2,010	2,570	6,374	6,363	-4,364	-3,793
PEPCO	3,279	2,358	4,959	4,957	-1,680	-2,599
AE	2,152	2,053	2,069	2,071	84	-17
DP&L	5,009	5,653	3,905	3,898	1,104	1,754
UGI	161	119	205	205	-43	-85
RECO	0	0	287	287	-287	-287
SMECO	3	7	677	677	-674	-671
EKPC	3,558	2,768	2,848	2,856	710	-88
DVP	30,833	28,660	38,439	38,497	-7,606	-9,837
	198,765	199,384	196,989	197,584	1,776	1,801

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### 2032 Scenario 3 CE 5,636 WMACC West 1,604 MW 883 MW **EMACC** 369 MW A,024 MW 374 2,479 702 MW 2,505 MW MISO SWMACC -3,951 South



# LL: Gen/Load Profile in S3/S5

	Pgen (MW)		Load+Los	ses (MW)	Net (MW)	
Area	<b>S</b> 3	<b>S</b> 5	<b>S</b> 3	<b>S</b> 5	<b>S</b> 3	<b>S</b> 5
APS	8,074	5,913	6,673	6,662	1,400	-749
FE	9,091	8,893	9,607	9,631	-516	-737
AEP	28,133	30,619	28,251	28,229	-118	2,390
OVEC	271	130	30	24	240	106
DAY	1,035	1,146	1,808	1,820	-773	-674
DEO&K	882	1,790	2,896	2,909	-2,013	-1,119
DLCO	1,975	1,776	1,556	1,558	419	218
CE	19,119	18,923	13,483	13,463	5,636	5,460
PENELEC	3,288	3,710	1,561	1,547	1,726	2,163
ME	3,573	2,768	1,723	1,720	1,850	1,048
JCPL	1,325	3,309	3,011	3,012	-1,686	297
PL	7,313	7,594	9,321	9,319	-2,007	-1,724
PECO	7,554	8,401	4,830	4,831	2,724	3,569
PSEG	6,764	5,447	6,263	6,221	501	-773
BGE	1,786	2,567	3,665	3,671	-1,879	-1,104
PEPCO	104	1,427	2,678	2,688	-2,574	-1,262
AE	1,258	756	1,439	1,427	-181	-670
DP&L	3,352	3,901	1,997	2,090	1,356	1,810
UGI	119	0	103	100	16	-100
RECO	0	0	234	234	-234	-234
SMECO	29	60	368	369	-339	-309
EKPC	2,884	1,939	1,150	1,123	1,734	816
DVP	22,849	19,344	26,800	26,555	-3,951	-7,211
	130,778	130,412	129,446	129,202	1,332	1,211

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# Summer: S3/S5 Unique Overloaded Facilities

### 2032 Base Scenario (S3)

	230–3	45 kV	500-7		
Area	Line	Xfmr	Line	Xfmr	Total
AP	1				1
ATSI	9				9
AEP	28		6	1	35
OVEC	3				3
DAY	2				2
DEO&K	4				4
DLCO	1				1
ComEd	9				9
PENELEC	2				2
METED	2				2
PPL	12			1	13
PECO	11				11
PSEG	5				5
PEPCO	2		1	1	3
AE	1				1
DP&L	2				2
EKPC	1				1
Dominion	82		12	8	102
Total	173	0	18	11	202

### 2032 Deactivation Scenario (S5)

	230–3	45 kV	500–765 kV		
Area	Line	Xfmr	Line	Xfmr	Total
AP	3		8	3	14
ATSI	13				13
AEP	52		18	3	73
OVEC	3				3
DAY	3				3
DEO&K	5				5
DLCO	2				2
ComEd	12			2	14
PENELEC	7		3	1	11
METED	3			1	4
JCPL	2				2
PPL	14		1	1	16
PECO	17		2		19
PSEG	11			1	12
BGE	3		1	2	6
PEPCO	7		2	2	11
AE	1				1
DP&L	22		2	1	24
EKPC	1				1
Dominion	96		18	8	122
Total	275	0	53	24	352

### **Changes in S5 Compared to S3**

	230–345 kV		500–7	500–765 kV		
Area	Line	Xfmr	Line	Xfmr	Total	
AP	2	0	8	3	13	
ATSI	5	0	0	0	5	
AEP	24	0	12	2	38	
OVEC	1	0	0	0	1	
DAY	1	0	0	0	1	
DEO&K	2	0	0	0	2	
DLCO	1	0	0	0	1	
ComEd	4	0	0	2	6	
PENELEC	5	0	3	1	9	
METED	1	0	0	1	2	
JCPL	2	0	0	0	2	
PPL	2	0	1	0	3	
PECO	6	0	2	0	8	
PSEG	6	0	0	1	7	
BGE	3	0	1	2	6	
PEPCO	5	0	2	1	8	
AE	0	0	0	0	0	
DP&L	20	0	2	1	22	
EKPC	0	0	0	0	0	
Dominion	14	0	6	0	20	
Total	102	0	35	13	150	

# WIN: S3/S5 Unique Overloaded Facilities

### 2032 Base Scenario (S3)

	230–345 kV		500–765 kV		
Area	Line	Xfmr	Line	Xfmr	Total
ATSI	1				1
AEP	12		2	1	15
DAY	1				1
DEO&K	1				1
ComEd	20			4	24
METED	2				2
JCPL	1		1		2
PPL	4				4
PECO	3		2		4
PSEG	4				4
BGE				1	1
PEPCO	1				1
AE	1				1
DP&L	1		1		2
Dominion	26			3	29
Total	75	0	5	9	89

### 2032 Deactivation Scenario (S5)

	230–3	45 kV	500–7	65 kV	
Area	Line	Xfmr	Line	Xfmr	Total
AP			2		2
ATSI	4				4
AEP	22		8	3	32
OVEC	2				2
DAY	1				1
DEO&K	2				2
ComEd	28		1	4	33
PENELEC			1		1
METED	2				2
JCPL	9	2	1		12
PPL	7				7
PECO	15		2		17
PSEG	8				8
BGE			2	1	3
PEPCO	6		4	2	11
AE	2				2
DP&L	20		3	1	24
Dominion	43		8	7	57
Total	168	2	28	18	216

### **Changes in S5 Compared to S3**

	230–345 kV		500-7	500–765 kV		
Area	Line	Xfmr	Line	Xfmr	Total	
AP	0	0	2	0	2	
ATSI	3	0	0	0	3	
AEP	10	0	6	2	18	
OVEC	2	0	0	0	2	
DAY	0	0	0	0	0	
DEO&K	1	0	0	0	1	
ComEd	9	0	1	0	9	
PENELEC	0	0	1	0	1	
METED	0	0	0	0	0	
JCPL	8	2	0	0	10	
PPL	3	0	0	0	3	
PECO	13	0	0	0	13	
PSEG	4	0	0	0	4	
BGE	0	0	2	0	2	
PEPCO	5	0	4	2	11	
AE	1	0	0	0	1	
DP&L	19	0	2	1	22	
Dominion	17	0	8	4	29	
Total	94	2	23	9	128	



# LL: S3/S5 Unique Overloaded Facilities

**Xfmr =** Transformer

### 2032 Base Scenario (S3)

	230–345 kV		500–765 kV		
Area	Line	Xfmr	Line	Xfmr	Total
ATSI	1				1
AEP	12		1		13
OVEC	2				2
ComEd	13				13
METED	2				2
JCPL	1				1
PPL	3			1	4
PSEG	1				1
Dominion	64		5	7	76
Total	98	0	6	8	112

### 2032 Deactivation Scenario (S5)

	230–345 kV		500–765 kV		
Area	Line	Xfmr	Line	Xfmr	Total
ATSI	1				1
AEP	20		1	1	22
OVEC	2				2
DEO&K	1				1
ComEd	24			2	26
METED	2				2
JCPL	1				1
PPL	2			1	3
PECO			1		1
PSEG	1				1
DP&L	8				8
Dominion	55		5	7	67
Total	115	0	7	11	133

### **Changes in S5 Compared to S3**

	230–345 kV		500–765 kV		
Area	Line	Xfmr	Line	Xfmr	Total
ATSI	0	0	0	0	0
AEP	8	0	0	1	9
OVEC	-1	0	0	0	-1
DEO&K	1	0	0	0	1
ComEd	12	0	0	2	14
METED	0	0	0	0	0
JCPL	0	0	0	0	0
PPL	-1	0	0	0	-1
PECO	0	0	1	0	1
PSEG	0	0	0	0	0
DP&L	8	0	0	0	8
Dominion	-9	0	0	0	-9
Total	17	0	1	3	21