



Constructability & Cost Analysis Report

2025 RTEP Window 1

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The information contained herein is based on information provided in project proposals submitted to PJM by third parties through its 2025 RTEP Window 1. PJM analyzed such information for the purpose of identifying potential solutions for the 2025 RTEP Window 1. Any decision made using this information should be based upon independent review and analysis and shall not form the basis of any claim against PJM. The maps contained in this report are 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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INTRODUCTION

Window Objective

PJM presented the 2025 Regional Transmission Expansion Plan (RTEP) assumptions at the January, March, April and May 2025 [Transmission Expansion Advisory Committee](#) (TEAC) meetings together with modeling and analysis criteria and anticipated 2025 RTEP Cycle timeline. To that end, PJM developed a 5-year (2030) and 7-year (2032) base case suite in order to analyze the effects of high-impact transmission, load and generation drivers on system performance and to ensure long-term reliability criteria violations are identified and solved. In summary, 2025 RTEP cycle analysis identified the following:

- 113 transmission line thermal overloads at all voltage levels, 69 kV through 765 kV, reaching as high as 185% loading
- 24 transformer thermal overloads at all voltage levels, reaching as high as 143% loading
- 783 voltage violations at all voltage levels in six transmission owner zones

The 2030 and 2032 base case suite included the following notable high-impact parameters:

- Substantial data center load additions in the AEP, PPL and Dominion zones, consistent with the 2025 Load Forecast released in January 2025
- Approximately 3 GW of generation deactivations
- Addition of suspended ISA generation, Fast Lane, TC1 and TC2 (including RRI) generation in order to meet the required load levels in the cases
- Consideration of NJ and DE offshore wind (OSW) impacts
- Approximately 3.5 GW of additional load in PPL expected to be added to the 2026 Load Forecast was provided for consideration to window participants

All of the previously planned backbone transmission enhancements continue to perform well, and PJM does not see major regional transfer issues in the 2030 analysis. In the 2032 analysis, there are several clusters showing EHV backbone overloads primarily 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. The following provides a brief rationale on whether a specific cluster is considered or not as part of the 2025 RTEP W1 window:

- Dominion / PJM South:
 - PJM will be addressing the 2032 needs to reinforce the southern 500 kV backbone. This 500 kV corridor includes multiple North-South 500 kV 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.
 - The 230 kV lines Chesterfield-Basin and Chesterfield-Hopewell will be addressed as part of the 2030 set of violations.
- 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. The scenario 4 study confirmed that without NJ OSW, this line is not overloaded, therefore PJM did not seek proposals for the violations on the line.
- PPL Zone:
 - Several 230 kV facilities are overloaded in PPL zone in 2030, and these issues are 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.
- ComEd/AEP 765 kV transfer path: Wilton Center – Dumont – Sorenson – Marysville
 - Not considered in the window
 - The majority of this path is terminal equipment limited. For the Sorenson - Marysville line overload, the contingency, which causes the thermal violations is a line with stuck breaker contingency, which can be potentially addressed by local substation upgrade measures in the longer term (7-year horizon).
- AG1-125 – Marysville 765 kV line
 - Not considered in the window
 - The line is terminal-equipment limited
- AEP Columbus area
 - There are two major backbone (765/345 kV) EHV sources that currently serve the load pocket. Multiple thermal overloads are showing in the area. In the N-1-1 test, various contingency pairs cause the wide-spread local system voltage issues which are expected to worsen with forecasted load increase through 2032 and beyond. All the related thermal and voltage issues in 2030 were posted and open to competition. Solutions were sought to consider the longer term needs to ensure efficient and cost-effective mitigation.
- ATSI 138 and 115 kV Area (2030 RTEP): East Springfield-Melissa-London Path
 - PJM is experiencing load growth in Central Ohio, part of ATSI territory causing multiple thermal and voltage violations under various contingencies. These violations spread through several reliability analyses affecting neighboring TO zones such as AEP and Dayton. PJM anticipates a holistic proposal to address the need, preferably an EHV solution.
 - PJM sought proposal(s) address these violations holistically and for the longer-term.
- ATSI 345 kV Overloads (2032 RTEP): North to South and West to East
 - PJM has been experiencing increased loadings on the 345 kV backbone in the northern Ohio ATSI territory. As part of the 2024 RTEP Window 1, PJM selected a 138 kV rebuild solution for several facilities. PJM performed sensitivity analysis by upgrading the 138 kV lines to 345 kV and conducted additional studies incorporating both the 345 kV upgrade and the 2024 RTEP Window 1 138 kV recommended solution and determined that the overloads remain, even if the line is upgraded to 345 kV.
 - The 2032 Summer case shows additional flow from north to south [Lallendorf, Lemoyne and into Foster (AEP)] and west to east (Bayshore, Davis Besse and Beaver). These flows are more

regional transfer-based and do not conflict with the rebuild of the existing 138 kV scope assigned by PJM in 2024 RTEP Window 1.

- PJM has decided not to seek proposals to resolve the EHV violations but will continue to monitor the area closely moving forward.

PJM sought proposals to resolve identified reliability criteria violations identified in the RTEP 2030 model year analysis as well as those identified in the 2032 model year requiring long-lead time transmission solutions. The objective is to develop holistic and robust solutions to address the identified criteria violations. The large number of violations seen in the 2025 RTEP were driven by a number of factors. Heavy transmission interface flows are observed west to east on the system and is driven by large load increases in the Dominion zone and eastern PJM footprint. There is a 10 GW and 15 GW load increase for 2030 and 2032 between the load forecasts used for the 2022 and 2025 RTEPs, respectively. The significant load growth is attributed primarily to data centers, some electrification and electric vehicle developments. While the proposed reinforcements recommended through the 2022 RTEP Window 3 and the 2023 RTEP Windows 1 and 2 are performing well, there are additional load pockets in the AEP, ATSI, Dominion, PECO, BGE, and PPL transmission zones that need to be addressed primarily due to a shift in generation flow as a result of overall system load increase and over 2 GW of generator deactivations.

Proposals Submitted to PJM

The 2025 RTEP Window 1 opened on June 18, 2025, and closed on Aug. 18, 2025. PJM received 134 proposals from 19 different entities as part of this window. PJM received 77 upgrade proposals, 57 greenfield proposals and 15 joint proposals (parent projects representing combinations of select proposals submitted to the window). **Figure 1** and **Figure 2** provide high-level statistical information regarding the submitted proposals. Proposals range from simple facility upgrades to new extra-high-voltage transmission lines and facilities and grid enhancing technologies such as underground HVDC or advanced conductors. Cost containment commitments are included for 90 proposals, and some are even hard-capped.

Figure 1. 2025 RTEP Window 1: Number of Proposals by kV Level

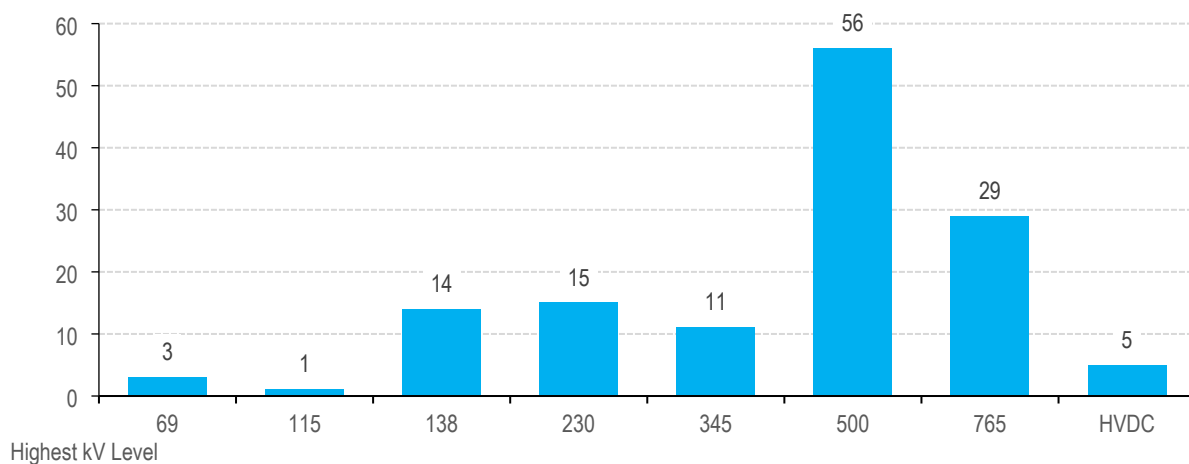


Figure 2. 2025 RTEP Window 1: Total Proposal Costs by kV Level

Proposal Clusters/Groupings

The magnitude of proposals concentrated in a number of focus areas, including those that focus on the regional need along with more targeted proposals to address zonal violations, are shown in **Table 1**. The focus areas were named, and numbered where appropriate based on the TO zone in which the targeted flowgates reside. Where the focus area indicates “No Competition,” this means that the proposal was the only one submitted to address the targeted flowgates. In other words, no competing proposals were submitted. Where the focus area indicates “N/A” this means that the submitted proposal did not address a PJM assigned FG (it could have been proposed for PJM’s consideration to address for example, a solution to address potential needs in 2032).

For this window there are three main regional focus areas, one in the western region (ATSI/AEP/DAYTON), one in the Mid-Atlantic region (MAAC Regional) and one in the southern region [DOM2032_1 (Regional)]. The larger regional clusters were assigned to proposals that are more of a holistic solution or portfolio, typically including 500 kV and 765 kV solutions that improve regional transfer or address a larger set of violations caused by the large load pockets. These regional proposals and clusters are shown in **0**. Furthermore, the regional focus areas could potentially influence the outcome of the zonal clusters, as their far reaching impact could mitigate the need for zone-specific solutions.

Table 1. 2025 RTEP Window 1 Submitted Proposals

#	ID	Proposing Entity	Focus Area	Project Title	Submitted Cost (\$M)
1	63	AEP SCT	AEPC5	Smith Mountain - Rockcastle - Moneta 138 kV Rebuild	\$39.40
2	195		No Competition	Mound Street-St Clair 138 kV Underground Line Rebuild	\$41.59
3	298		No Competition	Hyatt-Celtic 345 kV Re-Rate	\$7.81

#	ID	Proposing Entity	Focus Area	Project Title	Submitted Cost (\$M)
4	341		AEPC4	Allen-Sorenson 345 kV Sag Study	\$37.38
5	348		AEPC2	Trabue-Hilliard-Davidson 69 kV Rebuild & Relay Upgrades	\$16.23
6	354		AEPC8	Green Chapel-Curleys 345 kV Circuit	\$15.79
7	377		AEPC6	Beatty-Bolton-Phillipi 138 kV Line	\$29.63
8	385		AEPC1	Platter Creek 69 kV Station Reconfiguration	\$1.65
9	431		No Competition	McComb 138 kV Station Reconfiguration	\$3.23
10	439		No Competition	Maliszewski-Polaris 138 kV Circuit Rebuild	\$15.17
11	459		AEPC8	Green Chapel-Bermuda 345 kV Circuit	\$27.28
12	515		AEPC3	Harrison-Obetz-Marion Road 138 kV Line Rebuild	\$35.74
13	517		AEPSTATCOM	Central OH STATCOM Installations & Station Upgrades	\$736.61
14	626		AEPC6, AEPC7	Beatty-Cole 345 kV Circuit #2	\$31.04
15	662		AEPC3	Harrison-Obetz-Marion Rd 138 kV Line Sag Study & Terminal Equipment Upgrades	\$14.82
16	689		AEPC5	Smith Mountain - Rockcastle - Moneta 138 kV Sag Study	\$9.88
17	724		AEPC1	Platter Creek-Sherwood-Auglaize 69 kV Line Rebuild	\$28.68
18	729		No Competition	Beatty-McComb 138 kV Line	\$10.42
19	749		AEPSTATCOM	Central OH STATCOM Installations	\$589.74
20	757		AEPC7	Clinton-St Clair 138 kV UG Line	\$63.20
21	873		AEPC8	Green Chapel-Vassell 345 kV Circuit #2	\$58.57
22	940		AEPC2	Trabue-Hilliard-Davidson 138 kV Conversion	\$79.26
23	980		AEPC6	Beatty-Bolton 138 kV Line	\$7.27
24	981		AEPSTATCOM	Patina 765/345 kV Station & UG Line Rebuilds	\$976.34
25	996		AEPC4	Allen-Sorenson 345 kV Line Rebuild	\$70.64
26	239	ATSI	ATSI/AEP/DAYTON	345 kV Solution Phase 1 and Phase 2	\$1,492.41
27	334		ATSI/AEP/DAYTON	West Glade Run 765/345 kV Solution	\$1,690.26
28	156	CINSI	No Competition	College Corner - Collinsville 138 kV Rebuild	\$58.47
29	20	CNTLTM	PPL	Tri-Segment 500 kV Transmission Project	\$494.29
30	260		DOM2032_1 (Regional)	Virginia Transmission Project	\$2,207.36
31	543		ATSI/AEP/DAYTON	Greene - South Bird Transmission Project	\$121.41
32	672		AEPC4	Allen to Sorenson Transmission Project	\$105.92
33	402	COMED	N/A	Install new 765/345 kV TR at Plano	\$87.90
34	457		N/A	Install new 765/345 kV TR at Collins	\$66.30
35	906		No Competition	Install new 765/345 kV TR 91 at Wilton Center	\$45.81
36	465	DPL	No Competition	New 500 kV Circuit Keeney (DPL) - Bramah	\$491.16

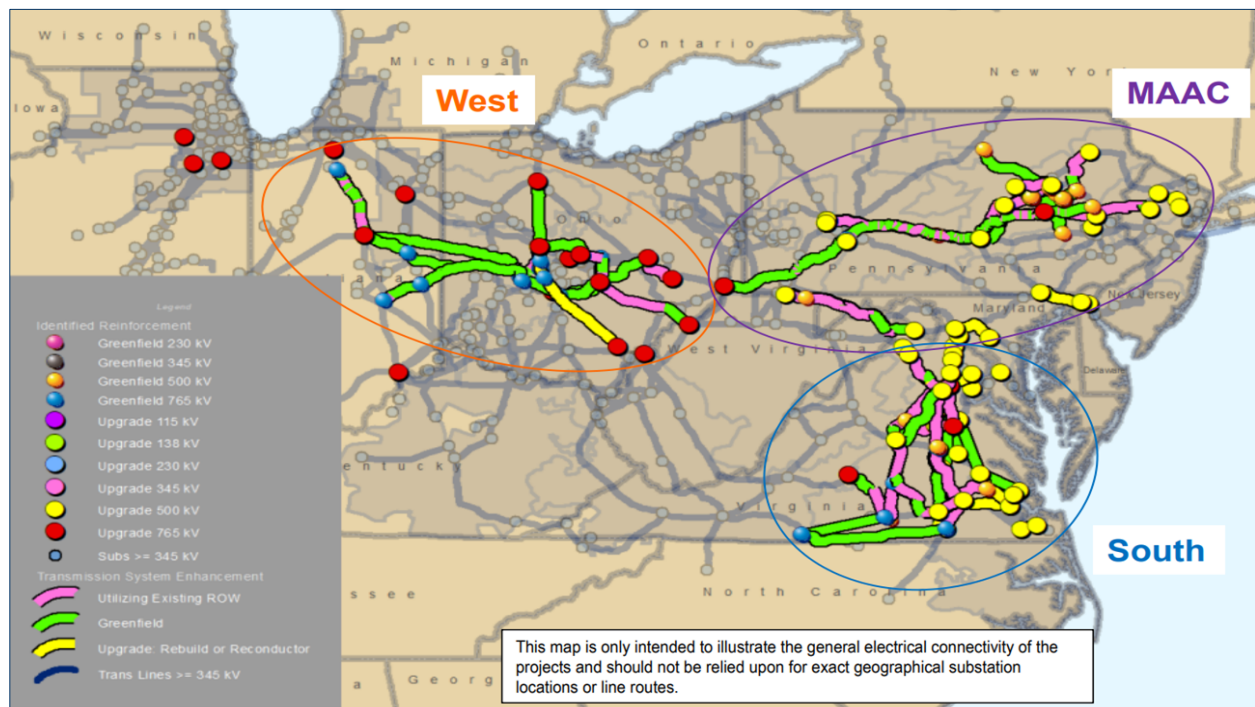
#	ID	Proposing Entity	Focus Area	Project Title	Submitted Cost (\$M)
37	823		No Competition	Red Lion - Keeney Facility Upgrades	\$90.70
38	140	JCPL	No Competition	Montville 500/230 kV Transformer Installation and Associated Upgrades	\$66.83
41	493	MATLIT	MAAC Regional	PPL Load Addition Proposal - Keystone - Susquehanna Dual 500 kV Double Circuit with Jack's Mt.	\$1,515.23
42	578		MAAC Regional	PPL Load Addition Proposal - Keystone - Susquehanna Dual 500 kV Single Circuits with Jack's Mt.	\$2,418.26
46	826		MAAC Regional	PPL Load Addition Proposal: Keystone - Susquehanna 500 kV Double Circuit	\$1,348.91
48	838		MAAC Regional	PPL Load Addition Proposal: Keystone - Susquehanna Dual 500 kV Single Circuits	\$2,251.95
39	237	NXTMID	MAAC Regional	Kammer to Juniata	\$1,738.59
43	109		ATSI/AEP/DAYTON	Muckshaw - Johnstown 765 kV	\$3,322.00
44	152		ATSI/AEP/DAYTON	Gwynneville - Johnstown 765 kV	\$2,921.12
45	687		MAAC Regional	Kammer to Juniata to Spicewood 765 kV	\$3,238.74
47	771		PPL	Montour to Slykerville Reinforcement	\$539.25
50	987		Scenario	Combined solution	\$6,731.58
54	871		MAAC Regional	Blockhouse Creek to Susquehanna and Montour to Stoney Creek	\$1,136.38
55	896		MAAC Regional	Fort Martin - Woodside Double Circuit 500 kV	\$571.70
51	125	PE	No Competition	Trainer (PECO) - Delco Tap (PECO) - Mickleton (ACE)	\$67.58
52	579		No Competition	220-84 Linwood-Claymont 230 kV Tie-Line Facility Upgrade	\$10.60
53	758		No Competition	220-85 Linwood-Edgemoor 230 kV Tie-Line Facility Upgrade	\$76.85
40	371	PEPCO	MAAC-PEPCO	Dickerson 500 kV Substation & New Dickerson - Brighton 500 kV Line	\$857.22
49	851			Brighton - Doubs 500 kV Rebuild	\$101.86
56	919			Dickerson 500 kV Substation	\$257.61
57	631	POTOED	No Competition	McCanns Rd 138 kV Switching Station	\$23.87
58	692		No Competition	Garrett Tap - Garrett 115 kV Line Rebuild	\$9.15
59	16	PPLTO	PPL	Juniata - Sunbury 500 kV line EOL SCT rebuild	\$162.89
60	158		PPL	Portfolio Proposal 1: Year 2030 Area 229 Essential Reliability Solution	\$415.07
61	190		PPL	Glen Brook - Susquehanna T10 - Susquehanna 230 kV 1 & 2 DCT line rebuild	\$40.64
62	199		PPL	Siegfried 500/230 kV Substation expansion project	\$124.27
63	290		PPL	Siegfried - Drakestown 500 kV line (PA segment)	\$88.16

#	ID	Proposing Entity	Focus Area	Project Title	Submitted Cost (\$M)
64	317		PPL	Sunbury - Susquehanna 500 kV line bifurcation and reroute through Kelayres 500 kV Station	\$227.42
65	333		PPL	Kelayres - Tresckow 230 kV # 3 line	\$20.13
66	422		PPL	Susquehanna - Tomhicken 230 kV 1 & 2 separated lines with reconductors	\$60.82
67	434		PPL	Sandy Run - Kelayres 500 kV line project	\$184.73
68	491		PPL	Glen Brook - Nescopeck 230 kV line	\$32.58
69	556		PPL	Lackawanna - Sandy Run - Siegfried 500 kV line project	\$464.86
70	558		PPL	Portfolio Proposal 2: Year 2032 Area 229 Essential Reliability Solution	\$536.39
71	588		PPL	Glen Brook - Susquehanna T10 1 & 2 DCT line reconductor and Susquehanna T10 - Susquehanna # 3 line	\$27.31
72	647		PPL	Jenkins 230/69 kV Substation transformers re-termination	\$10.17
73	688		PPL	Monroe 230/138 kV Substation upgrade	\$39.21
74	756		PPL	Juniata - Sunbury 500 kV line EOL DCT rebuild	\$217.93
75	769		PPL	Mohrsville - Kelayres 500 kV line	\$418.11
76	794		PPL	Frackville - Siegfried 500 kV line	\$253.50
77	824		PPL	Susquehanna - Tomhicken 230 kV 1 & 2 DCT line reconductor	\$29.73
78	853		PPL	Portfolio Proposal 3: Year 2032 + 4 GW Area 229 Essential Reliability Solution	\$797.94
79	855		PPL	Nescopeck - Kelayres 500 kV line project	\$145.75
80	918		PPL	Sunbury - Kelayres 500 kV line	\$347.99
81	945		PPL	Juniata - Lewistown 230 kV # 2 line	\$159.08
82	946		PPL	Susquehanna - Wescosville 500 kV line bifurcation and reroute through Kelayres 500 kV Station	\$181.32
83	958		PPL	Montour - Glen Brook 230 kV 1 & 2 DCT line reconductor or rebuild	\$39.65
84	656	PSEG	No Competition	Roseland - Livingston & Roseland - Laurel 230 kV Reconductoring	\$9.93
85	60	PSEGRT	ATSI/AEP/DAYTON	765 kV Standalone Solution	\$1,333.61
86	241		ATSI/AEP/DAYTON	STATCOM Solution	\$143.36
87	423		ATSI/AEP/DAYTON	345 kV Standalone Solution	\$475.11
88	619		ATSI/AEP/DAYTON	345 kV Solution + 765 kV Solution (Alternative)	\$1,942.65
89	907		ATSI/AEP/DAYTON	345 kV/765 kV Combined Project	\$1,841.18
90	938	TRAIL	DOM2032_1 (Regional)	Dominion Regional Solution	\$3,426.93

#	ID	Proposing Entity	Focus Area	Project Title	Submitted Cost (\$M)
91	552	TRNSLK	PPL	Siegfried - Drakestown 500 kV line (brownfield NJ segment route)	\$194.25
92	51	TRNSRC	ATSI/AEP/DAYTON	Ohio Five Year Solution	\$1,051.22
93	331		DOM2032_1 (Regional)	Virginia Area Seven Year Solution 1	\$2,895.32
94	570		ATSI/AEP/DAYTON	Ohio Seven Year Solution	\$2,775.19
95	781		DOM2032_1 (Regional)	Virginia Area Seven Year Solution 2	\$1,986.45
96	9		DOM2032_2 (Components)	Line 576 Partial Rebuild - Vontay to Midlothian	\$104.86
97	24	VEPCO	DOM2032_2 (Components)	Line 568 Partial Rebuild - Ladysmith to Kraken	\$48.59
98	48		DOM2032_2 (Components)	New 500 kV Line - North Anna to Vontay	\$121.09
99	55		DOM2032_2 (Components)	New 765 kV Line - Heritage to Yeat	\$1,665.29
100	98		DOM2032_2 (Components)	New 500 kV Line - Chickahominy to Kraken	\$414.94
101	117		DOM2032_2 (Components)	Line 539 Rebuild - Yeat to Ox	\$125.25
102	126		DOM2032_2 (Components)	Line 567 Terminal Upgrade Chickahominy & Surry	\$2.49
103	238		DOM2032_2 (Components)	Line 563 Rebuild - Carson to Midlothian	\$237.06
104	243		DOM2032_2 (Components)	Carson Substation Equipment Upgrade	\$14.21
105	245		DOM2032_2 (Components)	Line 5008 Cut-in into Mosby Substation	\$16.25
106	247		DOM2032_2 (Components)	New 765/500 kV Switching Station - Vontay	\$239.49
107	253		DOM2032_2 (Components)	Line 5008 Cut-in into Mosby Substation	\$16.25
108	264		DOM2032_2 (Components)	Line 539 Rebuild - Bristers to Ox	\$132.37
109	275		DOM2032_1 (Regional)	HVDC backbone - Portfolio 1A	\$4,819.51
110	302		DOM2032_2 (Components)	New 500 kV Line - Vontay to Kraken	\$265.29
111	306		DOM2032_2 (Components)	New 500 kV Line - Elmont to Kraken	\$180.30
112	311		DOM2032_2 (Components)	Line 578 (Septa-Surry) Terminal Equipment Upgrade	\$3.90
113	321		DOM2032_4	New 765 kV line from Joshua Falls to Durandal	\$545.00
114	326		DOM2032_1 (Regional)	HVDC backbone - Portfolio 1B	\$5,009.03
115	339		DOM2032_2 (Components)	Line 576 Partial Rebuild - North Anna to Vontay	\$104.86
116	352		DOM2032_1 (Regional)	HVDC backbone - Portfolio 1D	\$5,013.97
117	409		DOM2032_2 (Components)	New 500 kV Line Morrisville - Cunningham	\$539.55
118	458		DOM2032_2 (Components)	New 500 kV Line - Heritage to Morrisville	\$794.27
119	474		DOM2032_1 (Regional)	765 kV backbone - Portfolio 2C	\$2,273.85
120	476		DOM2032_3 (Safety)	Safety Solutions	\$1,441.10
121	547		DOM2032_1 (Regional)	HVDC backbone - Portfolio 1C	\$4,904.50
122	557		DOM2032_2 (Components)	New 500 kV Line - Skiffes Creek to Chickahominy	\$292.89
123	616		DOM2032_1 (Regional)	500 kV backbone - Portfolio 3	\$2,349.26
124	627		DOM2032_2 (Components)	Line 597 Rebuild - Spotsylvania to Morrisville	\$102.05
125	705		DOM2032_1 (Regional)	765 kV backbone - Portfolio 2A	\$2,864.73

#	ID	Proposing Entity	Focus Area	Project Title	Submitted Cost (\$M)
126	755		DOM2032_2 (Components)	Line 576 Rebuild - North Anna to Midlothian	\$210.99
127	815		DOM2032_2 (Components)	New HVDC Transmission Link from Heritage to Mosby	\$3,790.85
128	825		DOM2032_2 (Components)	New 500 kV Line - Finneywood to Cunningham	\$483.74
129	848		DOM2032_1 (Regional)	765 kV backbone - Portfolio 2B	\$2,969.05
130	868		DOM2032_2 (Components)	Topology Changes at Ladysmith, Kraken, and Carson substations	\$10.03
131	911		DOM2030_1	2030 Solution	\$314.91
132	916		DOM2032_2 (Components)	Line 560 Rebuild - Possum Point to Burches Hill	\$3.89
133	948		DOM2032_2 (Components)	Line 573 Rebuild - North Anna to Spotsylvania	\$103.03
134	975		DOM2030_2	2030 Western Solution	\$318.17

Map 1. 2025 RTEP Window 1: Regional Clusters/Groupings



Proposals Selected for Detailed Constructability Evaluations – TPPM

South Regional Cluster Proposals

Three entities submitted competitive proposals to address the South Regional needs. PJM's Transmission Policy & Project Management (TPPM) team selected a subset of representative proposals for detailed constructability evaluations, which are provided in **Table 2** below.

Table 2. South Regional Cluster Proposals for Detailed Evaluation

#	Sub-Proposals for Portfolio Projects	Proposal ID	Proposing Entity	Focus Area	Project Title	Submitted Cost
1	9,117, 126, 238, 243, 247, 253, 306, 339, 815, 916	275	VEPCO	Dominion	HVDC backbone - Portfolio 1A	\$4,819,506,867
2	55, 98, 117, 243, 247, 311, 339, 557, 916	705	VEPCO	Dominion	765kV backbone - Portfolio 2A	\$2,864,733,308
3	9, 24, 458, 126, 247, 264, 339, 409, 825, 916	616	VEPCO	Dominion	500kV backbone - Portfolio 3	\$2,349,256,319
4	N/A	260	LS Power	Dominion	Virginia Transmission Project	\$2,207,361,965
5	N/A	331	Transource/FE	Dominion	Virginia Area Seven Year Solution 1	\$2,895,324,611
6	N/A	781	Transource/FE	Dominion	Virginia Area Seven Year Solution 2	\$1,986,446,708
7	N/A	938	Transource/FE	Dominion	Dominion Regional Solution	\$3,426,930,565

MAAC PPL Cluster Proposals

Four entities submitted competitive proposals to address the MAAC PPL needs. PJM's Transmission Policy & Project Management (TPPM) team selected a subset of representative proposals for detailed constructability evaluations, which are provided in **Table 4** below.

Table 3. MAAC PPL Cluster Proposals for Detailed Evaluation

#	Sub-Proposals for Portfolio Projects	Proposal ID	Proposing Entity	Focus Area	Project Title	Submitted Cost
1	16, 317, 333, 422, 588, 647, 688, 946, 958	853	PPL	PPL	Portfolio Proposal 3: Year 2032 + 4 GW Area 229 Essential Reliability Solution	\$797,944,851
2	Proposals 290 & 552 are two segments of same project	290	PPL	PPL	Siegfried - Drakestown 500 kV line (PA segment)	\$88,163,848
3		552	PPL Translink	PPL	Siegfried - Drakestown 500 kV line (brownfield NJ segment route)	\$194,253,314
4	N/A	771	NextEra/Exelon	PPL	Montour to Slykerville Reinforcement	\$539,254,404
5	N/A	871	NextEra/Exelon	PPL	Blockhouse Creek to Susquehanna and Montour to Stoney Creek	\$1,136,379,661
6	N/A	20	LS Power	PPL	Tri-Segment 500kV Transmission Project	\$494,286,189

MAAC Regional Cluster Proposals

Three entities submitted proposals to address the MAAC Regional needs. PJM's Transmission Policy & Project Management (TPPM) team selected a subset of representative proposals for detailed constructability evaluations, which are provided in **Table 4** below.

Table 4. MAAC Regional Cluster Proposals for Detailed Evaluation

#	Sub-Proposals for Portfolio Projects	Proposal ID	Proposing Entity	Focus Area	Project Title	Submitted Cost (\$M)
1	N/A	237	NextEra/Exelon	MAAC	Kammer to Juniata	\$1,738,591,455
2	N/A	687	NextEra/Exelon	MAAC	Kammer to Juniata to Spicewood 765 kV	\$3,238,741,727
3	N/A	578	MAITLIT	MAAC	PPL Load Addition Proposal - Keystone - Susquehanna Dual 500 kV Single Circuits with Jack's Mt.	\$2,418,261,233

MAAC Additional Regional Cluster Proposals

Two entities submitted proposals to address MAAC Additional Regional needs. PJM's Transmission Policy & Project Management (TPPM) team selected a subset of representative proposals for detailed constructability evaluations, which are provided in **Table 45** below.

Table 5. MAAC Additional Regional Cluster Proposals for Detailed Evaluation

#	Sub-Proposals for Portfolio Projects	Proposal ID	Proposing Entity	Focus Area	Project Title	Submitted Cost (\$M)
1	N/A	896	NextEra/Exelon	MAAC Additional	Fort Martin - Woodside Double Circuit 500 kV	\$571,700,393
2	N/A	371	PEPCO	MAAC Additional	Dickerson 500kV Substation & New Dickerson - Brighton 500kV Line	\$857,220,583

West Regional Cluster Proposals

Three entities submitted proposals to address the West (ATSI/AEP/DAYTON) Regional needs. PJM's Transmission Policy & Project Management (TPPM) team selected a subset of representative proposals for detailed constructability evaluations, which are provided in **Table 46** below.

Table 6. West Regional Cluster Proposals for Detailed Evaluation

#	Sub-Proposals for Portfolio Projects	Proposal ID	Proposing Entity	Focus Area	Project Title	Submitted Cost (\$M)
1	N/A	239	Transource/FE	West	345 kV Solution Phase 1 and Phase 2	\$1,492,405,528
2	N/A	334	Transource/FE	West	West Glade Run 765/345 kV Solution	\$1,690,256,560
3	N/A	570	Transource/FE	West	Ohio Seven Year Solution	\$2,775,191,200
4	N/A	109	NextEra/Exelon	West	Muckshaw - Johnstown 765kV	\$3,321,996,359
5	N/A	152	NextEra/Exelon	West	Gwynneville - Johnstown 765kV	\$2,921,116,446
6	Proposal 619 with 241 added on	619 & 241	PSEGRT/AES Ohio/PPL	West	345kV Solution + 765kV Solution (Alternative) + STATCOM Solution (Add-on)	\$1,942,649,642/ \$143,361,000
7	N/A	543	LS Power	West	Greene - South Bird Transmission Project	\$121,407,651

West Additional AEP Cluster Proposals

Two entities submitted proposals to address West Additional AEP needs. PJM's Transmission Policy & Project Management (TPPM) team selected a subset of representative proposals for detailed constructability evaluations, which are provided in **Table 47** below.

Table 7. West Additional AEP Cluster Proposals for Detailed Evaluation

#	Sub-Proposals for Portfolio Projects	Proposal ID	Proposing Entity	Focus Area	Project Title	Submitted Cost (\$M)
1	N/A	672	LS Power	West Additional AEP	Allen to Sorenson Transmission Project	\$105,924,602
2	N/A	341	AEP	West Additional AEP	Allen-Sorenson 345kV Sag Study	\$37,375,449
3	N/A	996	AEP	West Additional AEP	Allen-Sorenson 345kV Line Rebuild	\$70,644,239

CONSTRUCTABILITY ANALYSIS

Approach

PJM performs an in-depth review of the constructability of the project. This review will typically include an evaluation of project scope, complexity and constructability factors that impact the project cost and/or schedule including but not limited to ROW acquisition, land acquisition, siting and permitting requirements, project complexity, project coordination complexity, outage coordination, and project schedule. This window introduced an additional category on proposing entity experience and capability. The following is an outline of PJM and its consultants' approach for detailed constructability analysis of the selected projects:

1 | *Environmental (Regulatory) Analysis:* Examine each project utilizing available public-sector data, aerial photographs and internet-based real estate records to determine if the project is feasible and to identify potential regulatory permitting risks. The following is a list of the subtasks that are performed as part of this task:

- (a) Conduct a desktop review to identify significant barriers that might add additional risk to the project, and determine whether the proposed project area (a study area that is defined for each project) can support the economical construction of the electric transmission and/or substation facilities.

The following target information will be referenced by as required and as allowable by available public data sources:

National Wetland Inventory mapping from United States Fish and Wildlife Service (USFWS), which will include counts and acreages of:

Total Non-Tidal Wetlands	– Total Wetlands
Wetlands of Special State Concern	– Non-Tidal (Non-Forested) Wetlands
Subaqueous Lands	– Non-Tidal (Forested) Wetlands

Mapping of specially designated wetlands, streams or rivers, which will include:

Non-Tidal Waterbodies (Count/Acres)	– Outstanding and Exceptional Waters (Count)
100-Year Flood Plain (Acres)	– Wild and Scenic Rivers (Count)
Watershed Boundaries (Count)	– United States Geologic Survey Blue Line Streams (Count)

United States Department of Agriculture(USDA)/The Natural Resources Conservation Service (NRCS) Land Cover mapping, which will include acreages of:

Sub-Aquatic Vegetation	– Unforested Uplands
Forested Uplands	– Agricultural Lands

Land-Use mapping, which will include:

Residences within 100 feet (Count)	– Parcels Crossed (Count)
Residences within 250 feet (Count)	– Green Infrastructure/Green Acres program (Acres)
Land Zoned Conservation (Acres)	– National Estuarine Research Reserve Project Areas (Acres & Count)
Rural Legacy (Acres)	

Program Open Space (Acres)	- Natural Heritage Areas (Acres & Count)
Private Conservation Easements (Acres & Count)	- Environmental Trust Easements (Acres & Count)
Public Land (Acres & Count)	- Forest Legacy Easements (Acres & Count)
	- Tidelands

Public Lands mapping review, which will include the types, counts and acreages of the following:

State/National Forests	- Game Lands
Natural Areas	- Recreation Areas
Preserves	

- Cultural Resources mapping review, including the count of previously identified resources, which will include the types, counts, and acreages of the following:

Listed and Eligible Historic Structures
Listed and Eligible Historic Districts
Listed and Eligible Archeological Sites

Aquatic Resource mapping, including the count of Submerged Historic Resources (if applicable)

Online distribution data of rare, threatened and endangered species within a 0.5-mile radius of the study area

Major utility and transportation (roads and rail lines) corridors

- (b) Identify those permits and agency consultations that are complex and require long lead times, therefore, potentially significantly affecting the project in-service date. Specifically, evaluate federal and state authorizations required for potential impacts to sensitive environmental resources such as wetlands; rivers and streams; coastal zone management areas; critical habitats; wildlife refuges; conservation land; and rare, threatened and endangered species. The assessment will result in a preliminary list of potential siting issues and permits that could impact cost and/or schedule, including estimated agency review times. Anticipated permit requirements may include the following:

U.S. Army Corps of Engineers (USACE) – Section 404 Clean Water Act and Section 10 Rivers and Harbors Act	Fisheries Service – Magnuson-Stevens Fishery Conservation and Management Act (MSA)
U.S. Fish and Wildlife Service (USFWS) – Section 7 Endangered Species Act, Migratory Bird Treaty Act, and Bald and Golden Eagle Protection Acts	U.S. Bureau of Ocean Energy Management
U.S. Forest Service – National Forest Special Use Permit and Archaeological Protection Resources Act	U.S. Bureau of Land Management – ROW Grant and Archaeological Protection Resources Act
National Oceanic and Atmospheric Administration (NOAA) National Marine	Federal Aviation Administration (FAA) – Obstruction Determination and FAA Hazard Evaluation
	U.S. Coast Guard – Aids to Navigation

State Commission approvals

State Agency – Rare, threatened, and endangered species issues and clearance requirements

State Historic Preservation Office (SHPO) and clearance requirements

State Department of Transportation and clearance requirements

State Agency – Section 401 Water Quality Certifications and other applicable water permits

State Agency – National Pollutant Discharge Elimination System permit

Local and/or State floodplain permit requirements

(c) Identify potential high-level risks and items that may require protracted permitting time frames or that may raise serious issues during the permitting process.

- 2 | *Transmission Line Analysis*: Review of transmission line modifications proposed based on desktop reviews investigating routing, conductor size and length, rights of way (ROWs) and easements, structures, and construction required
- 3 | *Substation Analysis*: Review of substation modifications proposed based on industry practices to estimate the equipment, bus and general layout required
- 4 | *Construction Schedule*: Prepare a preliminary project schedule for each project. The project schedule will be broken into four project phases: engineering; siting and major permit acquisition; long-lead equipment procurement; and construction and commissioning. Any significant risks to the project schedule will be discussed.
- 5 | *Cost Review*: Prepare preliminary estimate for each project based on engineering expertise and the most recent material and equipment costs. Costs will be broken into eight categories, as required: materials and equipment; engineering and design; construction and commissioning; permitting/routing/siting; right of-way (ROW)/land acquisition; construction management; company overheads and other miscellaneous costs; and project contingency (30%).

Analysis Results

The following sections outline the results of PJM and its consultants' detailed constructability evaluations performed on select proposals and their components organized into the Regional Clusters defined by PJM. These results are also the basis for the Constructability Risk Assessment matrices that are included in **Appendix A – Constructability Matrices** of this report.

South Regional Cluster Proposals

Portfolio Proposal 275 – VEPCO

Portfolio 275 (HVDC Portfolio 1A) was submitted by Dominion Energy (VEPCO) to ultimately develop an HVDC backbone in Virginia using a 525kV HVDC underground transmission line as the primary component of this backbone. In addition to the HVDC underground line, there are a number of line rebuilds and substation upgrades that would be completed to support the integration of the HVDC line as well as (2) HVDC Converter Stations.

This portfolio traverses the counties of Stafford, Surry, Hanover, Powhatan, Goochland, Fauquier, Prince William, Charles City, Dinwiddie, Louisa, Fairfax, Loudoun, Spotsylvania, Chesterfield, Brunswick, Caroline in Virginia.

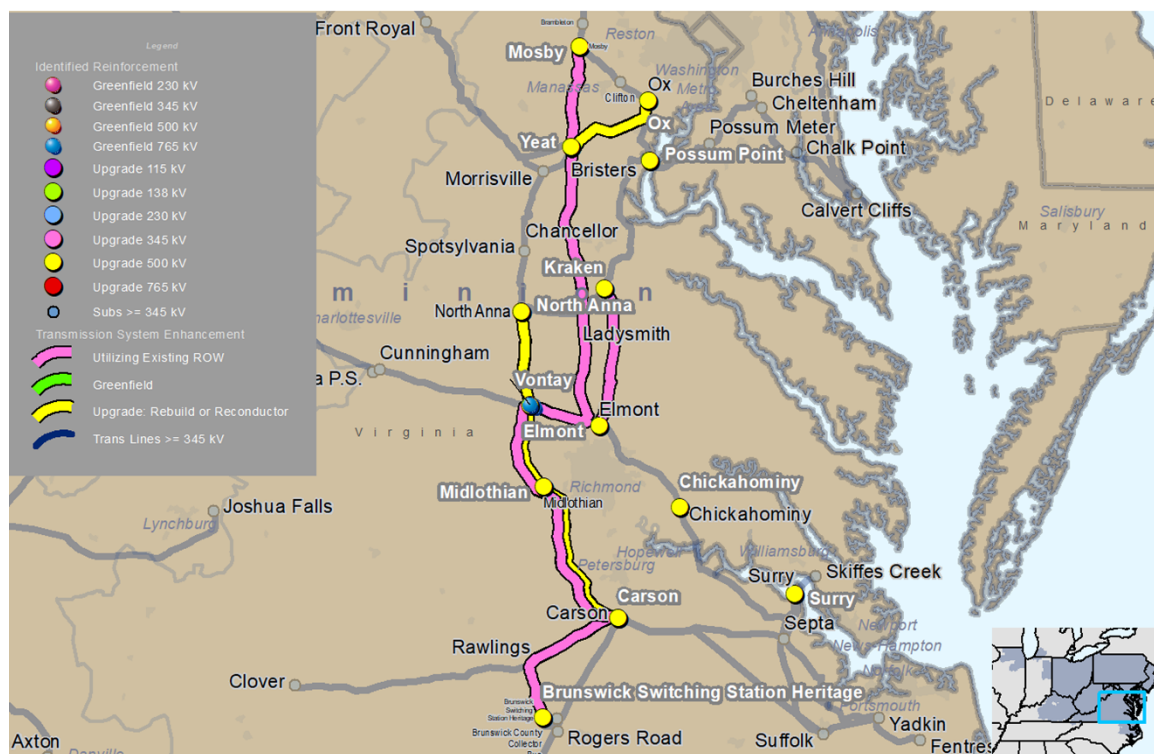
Portfolio Components Overview

Portfolio Proposal 275 includes the following subproposals and components:

- Subproposal 9, Component 1: Line 576 Rebuild - Vontay to Midlothian
- Subproposal 9, Component 2: Midlothian Equipment Upgrade
- Subproposal 117, Component 1: Line 539 Rebuild - Yeat to Ox
- Subproposal 117, Component 2: Ox Substation Terminal Equipment Upgrade
- Subproposal 117, Component 3: Yeat Substation Terminal Equipment Upgrade
- Subproposal 126, Component 1: Chickahominy Substation Line Terminal Upgrade
- Subproposal 126, Component 2: Surry Substation Line Terminal Upgrade
- Subproposal 238, Component 1: Line 563 Rebuild - Carson to Midlothian
- Subproposal 238, Component 2: Carson Terminal Equipment Uprate
- Subproposal 238, Component 3: Midlothian Terminal Equipment Uprate
- Subproposal 243, Component 1: Carson Substation 500 KV Equipment Upgrade - Alternative 1
- Subproposal 243, Component 2: Carson Substation 500 KV Equipment Upgrade - Alternative 2
- Subproposal 247, Component 1: New 765/500kV Switching Station - Vontay
- Subproposal 247, Component 2: 500 kV Cut-In - Cunningham to Elmont
- Subproposal 247, Component 3: 500 kV Cut-In - North Anna to Midlothian
- Subproposal 247, Component 4: 765 kV Cut-In - Joshua Falls to Yeat
- Subproposal 253, Component 1: Line 5008 Cut-in to Mosby Substation

- Subproposal 253, Component 2: Mosby Substation Equipment Upgrade
- Subproposal 306, Component 1: New 500 kV Line - Elmont to Kraken
- Subproposal 306, Component 2: Elmont Substation Line Terminal
- Subproposal 306, Component 3: Kraken Substation Line Terminal
- Subproposal 339, Component 1: Line 576 Rebuild - North Anna to Vontay
- Subproposal 339, Component 2: North Anna Equipment Upgrade
- Subproposal 815, Component 1: New HVDC Line - Heritage to Mosby_Alt 1 (Primary Alternative)
- Subproposal 815, Component 2: New HVDC Line - Heritage to Mosby Phase 1_Alt 2
- Subproposal 815, Component 3: New HVDC Line - Heritage to Mosby Phase 2_Alt 2
- Subproposal 815, Component 4: Heritage Substation – HVDC Converter Station Scope
- Subproposal 815, Component 5: Mosby Substation - HVDC Converter Station Scope
- Subproposal 916, Component 1: Line 560 Rebuild - Possum Point to Burches Hill
- Subproposal 916, Component 2: Possum Point Substation Equipment Upgrade

Map 2 displays the routes proposed for Proposal 275.

Map 2. Portfolio Proposal 275

NOTE: 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.

Constructability Review

Right-of-Way/Land Acquisition Risk Analysis

Subproposal 247 - Component 1: New 765/500kV Switching Station - Vontay

This component is a greenfield substation located in Hanover County, Virginia and will require a new land parcel. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

The proposed site seems adequate to house the component; however, 765kV substations can generate public interest and opposition due to the high voltage and large size of the equipment.

Subproposal 306 - Component 1: Elmont – Kraken 500kV Greenfield

The Elmont – Kraken line is a 32.05-mile 500kV, single-circuit line, which will be built in central Virginia between the existing Kraken Station and the existing Elmont Station. This line will traverse Hanover and Caroline Counties. The line will be built adjacent to existing lines but will not require additional ROW.

Subproposal 815 - Component 1: New HVDC Line - Heritage to Mosby_Alt 1 (Primary Alternative)

This project involves constructing a new 185-mile underground 525kV HVDC transmission line between the Heritage and Mosby Substations. The line primarily follows the existing overhead right-of-way (ROW), minimizing the need for new land acquisition. However, dedicated underground ROW is required in areas where the route diverges from the existing OH ROW. This component represents the primary line route selected by VEPCO.

Land acquisition is a concern in sections where the route diverges from the existing OH ROW, particularly impacting private and public properties. This poses the main challenge for acquisition. However, underground lines are generally favored by the public overhead lines, which is anticipated to garner more community support for the project.

Subproposal 815 - Component 2: New HVDC Line - Heritage to Mosby Phase 1_Alt 2

This project involves constructing a new 185-mile underground 525kV HVDC transmission line between the Heritage and Mosby Substations. It is an alternative approach to Subproposal 815 - Component 1, split into two project phases, with this component addressing Phase 1. The line primarily follows the existing overhead right-of-way (ROW), minimizing the need for new land acquisition. However, dedicated underground ROW is required in areas where the route diverges from the existing OH ROW. This component will be phase 1 of the project involving most of the civil construction, with phase 2 being in the following component mainly concerning the electrical installations.

Land acquisition is a concern in sections where the route diverges from the existing OH ROW, particularly impacting private and public properties. This poses the main challenge for acquisition. However, underground lines are generally favored by the public overhead lines, which is anticipated to garner more community support for the project.

Subproposal 815 - Component 3: New HVDC Line - Heritage to Mosby Phase 2_Alt 2

This Phase 2 component involves installing additional phases of underground conductor into the conduits installed under the previous Phase 1 component between the Heritage and Mosby Substations.

Subproposal 815 - Component 4: Heritage Substation – HVDC Converter Station Scope

Heritage is an existing substation located in Brunswick County, Virginia. The proposing entity appears to own the land on which the expansion will happen.

Subproposal 815 - Component 5: Mosby Substation - HVDC Converter Station Scope

Mosby is an existing substation located in Loudoun County, Virginia. The proposing entity appears to own the land on which the expansion will happen.

Overall, due to the predominant use of Dominion's existing rights-of-way for the projects in this proposal, a **Low** ROW/Land Acquisition risk is assessed for Portfolio proposal 275.

Environmental Risk Analysis*Subproposal 815 - Component 1: New HVDC Line - Heritage to Mosby_Alt 1 (Primary Alternative)*

The proposed route intersects 3 recorded Historical Sites/Structures/Districts. Proposed route intersects 87 FEMA High-Risk Flood Zones(100-Year Floodplain). There are 5 flood ways present. Proposed route intersects waters

subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. The proposed route intersects woodlands. Tree removal restriction will apply due likelihood of the presence of listed endangered species. The proposed route intersects with 1 recorded Underground Storage Tank (UST's). A file review of State records to determine the current status of the review, a subsurface Soil Characterization investigation may be necessary to determine if contamination is present and the extent of contamination originating from UST's. The proposed route intersects Karst Zones. Geological studies are needed to verify subsurface conditions before digging and or/ trenching. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed route intersects designated Critical Habitat. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. The proposed route intersects designated Scenic Rivers/Scenic Trails. Coordination is required. The proposed route intersects Natural Areas/ Reserves/ Wildlife Refuge. Coordination is required. Desktop analysis indicates that the proposed route intersects with farmland. Verification in the field would be completed. Proposed route intersects streams that the State of Virginia had designated as Special Trout Waters. These streams include: Clarkes Lake, Lake Chesdin, Lake Devolia, Swamp Creek Pond. Coordination with the USACE and the VA Dept. of Wildlife resource (DWR) is needed.

This component intersects 6 railroads; 4 Norfolk Southern Railway Company, 1 Buckingham Branch Railroad Company and 1 unknown owner. There are approximately 396 road crossings; 5 road crossings and 4 highway crossings in Loudoun County, 32 road crossings and 7 highway crossings in Prince William County, 10 road crossings Fauquier County, 15 road crossings in Stafford County, 42 road crossings and 4 highway crossings in Spotsylvania County, 16 road crossings in Caroline County, 49 road crossings and 2 highway crossings in Hanover County, 5 road crossings and 4 highway crossings in Goochland, 7 road crossings in Powhatan County, 49 road crossings and 12 highway crossings in Chesterfield County, 105 road crossings and 10 highway crossings in Dinwiddie County. 13 road crossings and 5 highway crossings in Brunswick County. There are approximately 178 transmission lines identified; 156 owned by VIRGINIA ELECTRIC & POWER CO and 22 unknown owners. The proposed route intersects 10 pipelines; 2 owned by Columbia Gas Trans Co, 1 owned by Transcontinental Gas PL, 2 owned by COLONIAL PIPELINE CO 4 owned by Virginia Natural Gas Co and 1 owned by kinder morgan. Also the proposed route intersects 1 public land. Lastly, the proposed route intersects 15 easements owned by PVT and 1 owned by City of Fredericksburg; 6 park (fee) 2 owned by County, 2 owned by NGO, 2 owned by NPS. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from the 12 counties in VA. State Approval of Electric Transmission Lines, and DOT utility permits are required.

Subproposal 815 - Component 4: Heritage Substation – HVDC Converter Station Scope

Proposed substation footprint intersects 1 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Brunswick County, VA. Proposed substation footprint intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. Permit authorization may take 12 months to complete. The proposed substation footprint intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed substation footprint intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Designated Trout Waters Not Present.

It is anticipated that the proposal will require permits, consultations, and authorizations from Brunswick County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits may be required.

Subproposal 247 - Component 1: New 765/500kV Switching Station - Vontay

Proposed substation footprint intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take 12 months to complete. The proposed substation footprint intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed substation footprint intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination.

The component crosses over 2 road crossings (4 entrances) in Hanover County; 2 transmission line crossings owned by Virginia Electric & Power Co. It is anticipated that the proposal could require permits, consultations, clearances and authorization from Hanover County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Transmission Line Risk Analysis

Subproposal 815 - Component 1: New HVDC Line - Heritage to Mosby_Alt 1 (Primary Alternative)

This project involves constructing a new bipolar underground 525kV HVDC transmission link between the Heritage and Mosby Substations, spanning 185 miles, with a transmission capacity of 3,000 MW. The cables specified cannot be verified against the ratings in the profile without thermal resistivity data. Due to the project's size, multiple construction crews will work concurrently on different segments, but the tight timeline for design and procurement presents significant challenges. Utilizing existing overhead (OH) right-of-way (ROW) minimizes land acquisition concerns, though a dedicated underground (UG) ROW is required. Challenges are expected at road/highway crossings, trenchless sections, and areas near substations.

Access is generally feasible, and much of the route is rural. Trenchless sections will be required in some areas, particularly HDD areas crossing highways, rivers, and lakes, pose challenges. High thermal resistivity areas may necessitate additional bi-pole circuits, increasing the duct bank size and trenchless footprint. There are 16 minor crossings and 14 major crossings.

Procurement lead times present a risk, especially given the need to manufacture cable lengths before the route is fully finalized for the 185-mile stretch, adding complexity to procurement and construction processes. There is a significant amount of 5000 kcmil enameled coated copper cable required for the circuit in addition to almost 400 manholes being expected for splicing. With this first alternative, there is no room for expansion in the future without designing and installing an entirely new line.

Outages will be necessary to connect each converter station to existing substations, potentially affecting overhead sections since the route follows the OH ROW.

Subproposal 815 - Component 2: New HVDC Line - Heritage to Mosby Phase 1_Alt 2

This project involves constructing a new bipolar underground 525kV HVDC transmission link between the Heritage and Mosby Substations, spanning 185 miles, with a transmission capacity of 3,000 MW. It is identical to Component 1 as this is an alternative to that component with the ability to add a second circuit. The cables specified cannot be

verified against the ratings in the profile without thermal resistivity data. Due to the project's size, multiple construction crews will work concurrently on different segments, but the tight timeline for design and procurement presents significant challenges. Utilizing existing overhead (OH) right-of-way (ROW) minimizes land acquisition concerns, though a dedicated underground (UG) ROW is required. Challenges are expected at road/highway crossings, trenchless sections, and areas near substations.

Access is generally feasible, and much of the route is rural. Trenchless sections will be required in some areas, particularly HDD areas crossing highways, rivers, and lakes, pose challenges. High thermal resistivity areas may necessitate additional bi-pole circuits, increasing the duct bank size and trenchless footprint. There are 16 minor crossings and 14 major crossings. All of these items are increased in risk and execution due to the larger size, with respect to Component 1.

Procurement lead times present a risk, especially given the need to manufacture cable lengths before the route is fully finalized for the 185-mile stretch, adding complexity to procurement and construction processes. There is a significant amount of 5000 kcmil enameled coated copper cable required for the circuit, equal to component 1, in addition to almost 400 manholes being expected for splicing. For this alternative, the conduit, concrete, and other material volumes will be doubled to allow for phase 2 to occur. But with this alternative the ability for a low-impact expansion in the future is available, which provides significant upside.

Outages will be necessary to connect each converter station to existing substations, potentially affecting overhead sections since the route follows the OH ROW.

Subproposal 815 - Component 3: New HVDC Line - Heritage to Mosby Phase 2_Alt 2

The project moves into Phase 2 of Component 2, focusing solely on the electrical installation for the new bipolar underground 525kV HVDC transmission link between the Heritage and Mosby Substations. With civil work completed in Phase 1, electrical installation presents fewer challenges. The primary concern arises if there are failures in cable installation, potentially requiring modifications to the existing civil work.

Land and ROW acquisition are not concerns, as these were addressed during Phase 1. However, procurement lead times remain a risk, particularly due to the need for manufacturing cable lengths without the route being fully finalized over the 185-mile stretch.

Constructability risks are minimized for cable installation, assuming civil work is already in place. Challenges may still arise with trenchless sections and the requirement for large cable lengths. Cables will be pulled and jointed inside the previously installed manholes, ensuring a streamlined installation process. Outage coordination risks remain consistent with previous phases, as connections to existing substations are necessary.

Subproposal 306 - Component 1: Elmont – Kraken 500kV Greenfield

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 3-bundle 1351.5 kcmil ACSS “Martin” Conductor arrangement and double circuit steel monopoles on foundations. The conductors support the ratings outlined in the proposal**. These structure types are standard and do not pose any issues with design/construction.

Regarding the route, there should be no concerns with vehicle access due to the terrain and location. However, the alignment impacts a number of large businesses and warehouse type structures on the south end as well as a neighborhood in the town of Bagdad. As noted in an earlier section, we feel the route will need to be changed to

avoid these areas. There are a number of crossings along the route including four high-voltage lines, a number of substations, three highways, three railroads, ten creeks/ivers, and several ponds. While this is a fair amount of crossings, we don't see this as overly concerning for a line of this size.

The line is being designed as future double-circuit, allowing the line to be expanded upon in the future, if needed, without increasing the footprint of the project. We did not observe any future maintenance issues with this line and as a greenfield line within its own expanded ROW, it does not create impacts on other circuits or require significant demolition.

From a procurement perspective, the line will require (180) structures that will be required and over 280 miles of conductor needed. This is a large quantity of material to procure, but most of the material should not carry procurement risks outside of typical EHV hardware lead times.

Finally, the mostly flat and rural nature of the route does not provide any terrain concerns. While some lower-lying wetlands may require unique foundations, there are not a lot of these identified along the route. We would not expect heavy restrictions on noise and pollution for most of the line but in the southern section, there will be restrictions in the more congested areas. Outage requirements for the construction of this line should not be of any concern as this is a greenfield line in a new portion of ROW.

Substation Risk Analysis

Subproposal 247 - Component 1: New 765/500kV Switching Station - Vontay

The project involves constructing a major new 765/500 kV substation equipped with three single-phase 765/500 kV, 750-MVA transformer units, two 765 kV SF6 breakers, a full set of 765 kV vertical-break switches, CCVTs, surge arresters, and a 150-MVAR shunt reactor. The 500 kV yard will include six 63-kA, 5000-amp SF6 breakers, twelve 5000-amp double-end-break switches, twelve CCVTs, and associated station-class surge arresters. Approximately 7,100 feet of 6-inch aluminum bus and connectors will be installed to integrate the high-voltage equipment across both voltage levels. Major civil work includes extensive foundations, steel structures, a full ground grid meeting Dominion Energy standards, an oil-containment system for the transformer and reactor banks, roughly 2,600 feet of cable trench with conduit and control cable, and full site grading and stormwater systems. Security upgrades include 5,000 feet of Level-One security fencing with integrated monitoring infrastructure.

Protection, control, and operational systems will be housed in two 24'x50' control enclosures containing relay, communication, and infrastructure panels, along with a 14'x25' security enclosure. New station batteries, chargers, and a dual-source AC station-service system—including a tertiary-fed source and a local distribution backup—will be provided. The project includes all conductor, connectors, insulators, grounding components, and ancillary hardware needed to meet Dominion Energy standards, as well as installation and integration of all relaying, monitoring, and communications equipment. Comprehensive testing and commissioning will be performed across transformers, breakers, reactor systems, and protection schemes to ensure the substation is fully functional and ready for energization at both 765 kV and 500 kV levels.

This is a 765kV greenfield site. There are concerns about the availability of the equipment and the acquisition of the land required to build it. No major problems are anticipated, however.

Subproposal 815 - Component 4: Heritage Substation – HVDC Converter Station Scope

The project includes a major expansion of the existing 500 kV air-insulated switchyard, incorporating sixteen new 500 kV, 5000-amp double-end-break switches, twelve relay-accuracy CCVTs, and eighteen 396 kV station-class surge arresters. Approximately 5,000 feet of new 6-inch Schedule 80 aluminum bus, along with all required conductor, connectors, foundations, steel structures, conduit, control cable, and grounding components, will be installed in accordance with Dominion Energy standards. The work also includes construction of a new ground grid for the expanded station, plus full site preparation consisting of grading, drainage, and stormwater-management enhancements to support the larger 500 kV footprint.

The protection and control package consists of installing eight SEL-2411 annunciators, eight SEL-351 dual-scheme breaker-reclosing panels, breaker CT makeup boxes, breaker condition monitors, and BCM fiber-optic interface modules. Two SEL-411L line-protection panels and two SEL-587Z/351A bus-protection panels will provide high-speed relay protection for the expanded yard. Additional CCVT potential-makeup boxes will be installed to support accurate voltage signaling across the new equipment lineup. Integration will include all new control wiring, panel terminations, settings development, and functional testing to ensure seamless performance of all protection and communication systems.

The project also includes the development of a 525 kV, 3000 MW VSC-based bipole HVDC converter station. The scope covers full HVDC system and product engineering; project management of the converter-station work; procurement and manufacturing of converter equipment; delivery logistics; and supervised installation of all converter hardware. AC yard equipment will be installed from the converter building to the AC-breaker connection point, and the vendor will provide civil-work guide drawings for Dominion's construction of the converter building. The converter system will undergo comprehensive equipment testing, subsystem verification, and full commissioning. The HVDC scope includes required spare parts, including converter-transformer spares, and installation of a full-station ground grid along with site preparation, grading, and stormwater-management infrastructure to support long-term, reliable HVDC operation.

There are schedule related concerns with this project. Due to the complexity of the HVDC equipment, there are concerns about whether they may be procured in time to meet the proposed construction schedule of this component. To address these concerns, Dominion has indicated that they have secured procurement slots with vendors to keep the project on schedule.

Subproposal 815 - Component 5: Mosby Substation - HVDC Converter Station Scope

The project includes a substantial expansion of the existing 500 kV substation by installing four new 500 kV, 5000-amp, 63-kA circuit breakers; eight 500 kV, 5000-amp double-end-break switches; six relay-accuracy CCVTs; and six 396 kV, 318 kV MCOV station-class lightning arresters. A major portion of the work involves installing approximately 3,400 feet of new gas-insulated bus (GIB), along with all necessary connections, conductors, connectors, foundations, steel structures, conduit, control cable, and grounding materials, in accordance with Dominion Energy engineering standards. The expansion also includes constructing a new ground grid for the enlarged station footprint and performing full site preparation, grading, and stormwater-management improvements to support the upgraded 500 kV yard.

The protection and control upgrades include installing four SEL-2411 annunciators, four SEL-351 dual-scheme transmission-breaker panels, CT makeup boxes, breaker-condition monitors, and BCM fiber-optic interface equipment. Two SEL-411L dual-scheme line-protection panels and CCVT potential makeup boxes will provide

accurate high-speed communication and relaying functions for the expanded switchyard. This scope also includes all required wiring, conduit, panel terminations, settings updates, and functional testing. Together, the new equipment will modernize the station's protection architecture, improve breaker monitoring and diagnostics, and ensure compatibility with Dominion's remote-control and SCADA systems.

The project also incorporates a new 525 kV, 3,000 MW VSC-based bipole HVDC converter station. The HVDC scope includes full system engineering, project management, procurement, and manufacturing of the converter equipment, and delivery logistics for all components. It also covers installation supervision, AC-yard equipment connecting the converter building to the AC breaker line side, subsystem and equipment testing, and complete commissioning of the HVDC system. The vendor will provide civil-work guide drawings for Dominion's construction of the converter building and supply mandatory spare parts, including spare converter transformers, for a three-year performance period. A full ground grid will be installed for the converter station, along with required site preparation, grading, and stormwater-management systems. Once complete, the combined AC expansion and HVDC facility will serve as a high capacity, modernized transmission hub supporting future growth and long-distance power delivery.

There are schedule related concerns with this project. Due to the complexity of the HVDC equipment, there are concerns about whether they may be procured in time to meet the proposed construction schedule of this component. To address these concerns, Dominion has indicated that they have secured procurement slots with vendors to keep the project on schedule.

Constructability Summary

This HVDC portfolio proposal is significantly derisked by utilizing existing ROW, in comparison to other competing solutions. Both the HVDC line (proposal 815) and the new Elmont-Kraken 500 kV line (proposal 306) will be constructed entirely within existing ROW. In addition, the 185 mile HVDC line is fully underground in the existing ROW, so it creates no new visual impacts. Because the HVDC line is in existing R/W, Dominion feels the project is more constructable and less risky than the overhead greenfield alternatives. One of the greatest risks for timely project approval and completion are public backlash against new overhead transmission infrastructure and the process of acquiring new R/W. It is anticipated that the state approval process will be less risky and less time-consuming, given that the time-intensive process of routing and right-of-way acquisition that are typically needed for greenfield projects has been minimized.

And while it mitigates a lot of risk by utilizing existing ROW, the HVDC route may encounter issues with trenchless sections and obstructions in general route area, particularly the HDD areas crossing highways and rivers/lakes. If there are high thermal resistivity areas, additional bi-pole circuits may be needed which may present the need for a bigger duct bank and wider trenchless footprint.

Across most of the listed substation components, constructability risk is driven more by routine outage coordination and equipment replacement than by site or engineering challenges. The bulk of the work—at Midlothian, Ox, Yeat, Chickahominy, Surry, Carson, Mosby, Elmont, Kraken, North Anna, and Possum Point—consists of conventional 500 kV yard upgrades: swapping out breakers and switches for higher-ampacity units, replacing tube bus, adding or replacing wave traps, CCVTs, arresters, and CTs, and modernizing relaying with SEL panels and fiber. These are standard brownfield activities using familiar construction methods and well-understood sequencing. A few components (e.g., Mosby, Elmont, Kraken) note minor concerns around 500 kV breaker procurement, but those are characterized as “slight” and not expected to materially impact constructability or schedule.

Elevated substation constructability risk is largely concentrated in the Vontay 765/500 kV greenfield station and the two HVDC converter station projects at Heritage and Mosby. Vontay introduces full greenfield 765/500 kV infrastructure—multiple large transformers, breakers, a shunt reactor, extensive bus, civil foundations, trenching, oil containment, and a large security footprint—which increases exposure to equipment lead times and land/acquisition uncertainties. The Heritage and Mosby HVDC scopes present the highest risk, both involving 3,000 MW, 525 kV VSC-based bipole converter stations on top of major 500 kV yard expansions. For these, the main constructability concern is HVDC equipment procurement risk, with potential long manufacturing and delivery windows for converter hardware and associated transformers. To address these concerns, Dominion has indicated that they have secured procurement slots with HVDC manufacturers to keep the project on schedule, and there have been indications from these manufacturers of a recent demand drop in HVDC equipment due to offshore wind cancellations, that have resulted in improved procurement lead times.

Overall, due to the mitigated risk with the HVDC equipment procurement windows, the portfolio's constructability risk is rated as **Low-Medium**.

Outage Review

Due to the multiple 500 kV line rebuilds associated with portfolio 275, and the anticipated lengthy outages required to complete these rebuilds, there are concerns about the potential schedule impacts of outage coordination.

To mitigate these concerns, Dominion has shared additional details about the outages needed for portfolio proposal 275.

- Construct HVDC line from Heritage to Mosby: Short outages of a few weeks needed at Heritage Sub and Mosby sub to integrate the feeds from the HVDC converter stations into the existing AC substations. No significant outages needed, all HVDC cable can be installed without line outages.
- Construct new 500 kV line from Elmont – Kraken: This line will utilize existing ROW. An outage will be taken on Dominion's existing 115 kV lines (47 and 73 lines) to rebuild them as a 500/230 kV line. These outages have already been planned as Dominion was initially intending to rebuild this corridor into a double-circuit 230 kV line, with the new scope of the planned rebuild now involving a 500/230 kV monopole. Additionally, outages that impact the 115 kV system are the lowest-impact outages on Dominion's system.
- Rebuild the 563 line between Carson – Midlothian 500 kV: This outage is already planned as this project was part of the Transition Cycle 1 portfolio.
- Rebuild the 576 line (Midlothian – North Anna) – No significant outages are needed, we will build the new structures parallel to the existing structures in DE's existing R/W. A small outage of a few weeks will be needed to cut the line into the station. This outage is already planned as this project was part of the Transition Cycle 1 portfolio.
- Cut 500 kV line 5008 into Mosby Sub: Minor outage at Mosby to add terminal equipment, no significant outage work needed
- Rebuild the Dominion section of the Possum Point – Burches Hill line: Dominion's portion of this rebuild falls within the larger project rebuild (no separate DE outages needed)

Overall, the portfolio's outage coordination risk is rated as **Low-Medium**.

Cost Review

A high-level cost estimate was created for each proposal to assess the cost component for potential omissions or under-estimating. Cost estimates were broken into eight categories, including Engineering & Design, Permitting/Routing/Siting, ROW/Land Acquisition, Materials & Equipment, Construction & Commissioning, Construction Management, Overheads and Miscellaneous, and Risk Contingency (30%). The cost comparison for this proposal, broken down by component, is outlined below.

Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
9-1	Line 576 Rebuild - Vontay to Midlothian	\$102.70	\$126.45
9-1	Midlothian Equipment Upgrade (Westwood)	\$2.16	\$3.37
117-1	Line 539 Rebuild - Yeat - Ox	\$122.66	\$127.50
117-2	Ox Substation Terminal Equipment Upgrade	\$2.25	\$2.58
117-3	3. Yeat Substation Terminal Equipment Upgrade	\$0.33	\$0.74
126-1	Chickahominy Substation Line Terminal Upgrade	\$0.03	\$0.21
126-2	2. Surry Substation Line Terminal Upgrade	\$2.46	\$3.03
238-1	Line 563 Rebuild - Carson - Midlothian	\$228.48	\$205.77
238-2	Carson Terminal Equipment Uprate	\$6.15	\$8.69
238-3	Midlothian Terminal Equipment Uprate	\$2.43	\$3.37
243-1	Carson Substation 500kV Equipment Upgrade - Alt 1	\$12.44	\$13.90
243-2	Carson Substation 500kV Equipment Upgrade - Alt 2	\$1.77	\$1.53
247-1	New 765/500kV Switching Station - Vontay	\$217.76	\$170.39
247-2	500 kV Cut-In - Cunningham to Elmont	\$6.69	\$4.89
247-3	500 kV Cut-In - North Anna to Midlothian	\$6.69	\$4.89
247-4	765 kV Cut-In - Joshua Falls to Yeat	\$8.36	\$5.58

253-1	Line 5008 Cut-in to Mosby Substation	\$6.69	\$5.40
253-2	Mosby Substation Equipment Upgrade	\$9.56	\$20.30
306-1	Elmont - Kraken	\$165.65	\$189.49
306-2	Elmont Substation Line Terminal	\$6.04	\$11.59
306-3	Kraken Substation Line Terminal	\$8.61	\$15.85
339-1	Line 576 Rebuild - North Anna to Vontay	\$102.70	\$114.05
339-2	North Anna Equipment Upgrade	\$2.16	\$2.56
815-1	Heritage - Mosby_Alt 1 (Primary Alternative)	\$2,271.70	\$2,220.00
815-2	Heritage - Mosby Phase 1_Alt 2	\$-	\$0.00
815-3	Heritage - Mosby Phase 2_Alt 2	\$-	\$0.00
815-4	Heritage Substation – HVDC Converter Station Scope	\$773.73	\$879.49
815-5	Mosby Substation - HVDC Converter Station Scope	\$745.42	\$865.09
916-1	Line 560 Rebuild - Possum Point to Burches Hill	\$3.49	\$5.75
916-2	Possum Point Substation Equipment Upgrade	\$0.40	\$1.04
Total		\$4,819.51	\$5,013.49

The proposer estimate is within 10% of the independent cost estimate, and so the overall cost estimate of this portfolio proposal is rated **Low** risk.

Schedule Review

This proposal has a projected in-service date of June 1, 2032.

Due to Dominion's derisking of the HVDC project by routing it underground and within their existing right-of-way, schedule risks associated with permitting and land acquisition risks are significantly mitigated.

However, as previously noted in the Constructability sections, there are concerns with procurement of the HVDC components of this portfolio. HVDC equipment lead times may be up to 5 years based on industry trends, making it difficult to meet the project dates listed in this proposal. However, as Dominion has indicated that they have secured procurement slots to achieve their target dates for the proposed project, the schedule risk assessment is **Low-Medium**.

Proposing Entity Experience and Capability Review

Dominion does not have experience with constructing and operating HVDC transmission. However, Dominion has shared detailed plans for their project development and future operations, which PJM has reviewed in great detail and was comfortable with. The proposing entity experience and capability risk is considered **Medium-High**.

Portfolio Proposal 705 – VEPCO

Portfolio 705 (765kV portfolio 2A) was submitted by Dominion Energy (VEPCO) to ultimately develop a 765kV backbone in Virginia using a new 765kV overhead line from Heritage to Yeat and then building additional 500kV lines (rebuild and greenfield) and making upgrades to numerous Substations in the area to support the buildout.

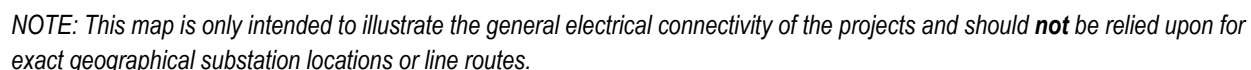
This portfolio proposal traverses the Counties of James City, Surry, Hanover, Powhatan, Goochland, Orange, King William, Isle of Wight, Fauquier, New Kent, Prince William, Charles City, Sussex, Greensville, Dinwiddie, Amelia, Williamsburg, Louisa, Fairfax, York, Culpeper, Spotsylvania, Chesterfield, Brunswick, and Caroline in Virginia.

Portfolio Components Overview

Portfolio Proposal 705 includes the following subproposals:

- Subproposal 55, Component 1: New 765 kV Line - Heritage to Yeat
- Subproposal 55, Component 2: Heritage Substation Expansion
- Subproposal 55, Component 3: Yeat Substation Termination
- Subproposal 98, Component 1: New 500 kV Line - Chickahominy to Kraken
- Subproposal 98, Component 2: Chickahominy Substation Line Terminal Equipment
- Subproposal 98, Component 3: Kraken Substation Expansion
- Subproposal 117, Component 1: Line 539 Rebuild - Yeat to Ox
- Subproposal 117, Component 2: Ox Substation Terminal Equipment Upgrade
- Subproposal 117, Component 3: Yeat Substation Terminal Equipment Upgrade
- Subproposal 243, Component 1: Carson Substation 500 KV Equipment Upgrade - Alternative 1
- Subproposal 243, Component 2: Carson Substation 500 KV Equipment Upgrade - Alternative 2
- Subproposal 247, Component 1: New 765/500kV Switching Station - Vontay
- Subproposal 247, Component 2: 500 kV Cut-In - Cunningham to Elmont
- Subproposal 247, Component 3: 500 kV Cut-In - North Anna to Midlothian
- Subproposal 247, Component 4: 765 kV Cut-In - Joshua Falls to Yeat
- Subproposal 311, Component 1: Surry Substation Line 578 Terminal Upgrade
- Subproposal 311, Component 2: Septa Substation Line 578 Terminal Upgrade
- Subproposal 339, Component 1: Line 576 Rebuild - North Anna to Vontay
- Subproposal 339, Component 2: North Anna Equipment Upgrade
- Subproposal 557, Component 1: New 500 kV Line - Skiffes Creek to Chickahominy
- Subproposal 557, Component 2: Skiffes Creek Substation Expansion
- Subproposal 557, Component 3: Chickahominy Substation Equipment Upgrade
- Subproposal 916, Component 1: Line 560 Rebuild - Possum Point to Burches Hill
- Subproposal 916, Component 2: Possum Point Substation Equipment Upgrade

Map 3 displays the routes proposed for Proposal 705.



Right-of-Way/Land Acquisition Risk Analysis

The Heritage – Yeat Greenfield line is a 153-mile 765kV, single-circuit line, which will be built in central Virginia between the Heritage and Yeat Stations. This line will traverse Brunswick, Dinwiddie, Amelia, Caroline, Chesterfield, Goochland, Hanover, Spotsylvania, Powhatan, Stafford, and Fauquier Counties. The entire route will use new routes. New ROW will be required throughout the entire route.

Proposal indicated 200ft ROW width. At a width of 200ft, the new ROW required will be approximately 3709 acres. The majority of the route is very rural and impacts few structures and populations. However, there are a number of suburban impacts that may need to be navigated, and several very obvious issues with the route, such as crossing over very high-value properties.

The Chickahominy – Kraken greenfield line is a 58.5-mile 500kV, single-circuit line (future double circuit), which will be built in central Virginia between the Chickahominy and Kraken Stations. This line will traverse Caroline, King

William, Henrico, Charles City, New Kent, and Hanover Counties. The entirety of the route will utilize new routes. New ROW will be required throughout the entire route.

The proposal indicated 150ft ROW width. At a width of 150ft, the new ROW required will be approximately 1064 acres. This is narrow for this configuration of line, and we would expect 200ft. The majority of the route is very rural and impacts few structures and populations.

Subproposal 247 - Component 1: New 765/500kV Switching Station - Vontay

This component is a greenfield substation located in Hanover County, Virginia and will require a new land parcel. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

The proposed site seems adequate to house the component; however, 765kV substations can generate public interest and opposition due to the high voltage and large size of the equipment.

Subproposal 557 - Component 1: New 500 kV Line - Skiffes Creek to Chickahominy

The Skiffes Creek – Chickahominy greenfield line is a 36.51-mile 500kV, single-circuit line (future double circuit), which will be built in southeast Virginia between the proposed the Skiffes Creek and Chickahominy Stations. This line will traverse Charles City, James City, and Williamsburg Counties. Most of the route will utilize existing ROW by rebuilding the circuits.

The proposal indicated 150ft ROW width in areas requiring expansion, which we feel is sufficient as it parallels existing. While half the route is pretty rural, the southern half is quite populated, and the rebuild within existing ROW will be required.

Overall, due to the high greenfield nature of the proposed projects, a **High** ROW/Land Acquisition risk is assessed for Portfolio proposal 705.

Environmental Risk Analysis

Subproposal 55 - Component 1: Heritage to Yeat

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, and wetlands subject to USACE Section 404 and/or Section 10 permitting. In addition, the route intersects with streams designated as Special Trout Waters which will require coordination with the VA Dept. of Wildlife Resources (DWR). The proposed route also intersects woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Impacts to these resources will require coordination with the appropriate county floodplain administer; coordination with state wildlife agencies, USACE and USFWS. Proposed route intersects with designated Critical Habitat for the Atlantic Pigtoe (Mussel) and may impact other federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species.

This component crosses over 5 railroads owned by Buckingham Branch Railroad, CSXT and Norfolk Southern Railway; 220 road and highways(440 entrances) across Amelia County, Brunswick County, Chesterfield County, Culpeper County, Dinwiddle County, Fauquier County, Goochland County, Greensville County, Hanover County, Orange County, Powhatan County, Spotsylvania County, Sussex County; 20 transmission lines owned by Virginia Electric & Power Co and no owner available; 5 pipelines owned by Kinder Morgan, Colonial Pipeline Co., Columbia

Gas Trans Co. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Amelia County, Brunswick County, Chesterfield County, Culpeper County, Dinwiddie County, Fauquier County, Goochland County, Greensville County, Hanover County, Orange County, Powhatan County, Spotsylvania County, Sussex County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Subproposal 98 - Component 1: New 500 kV Line - Chickahominy to Kraken

The proposed route intersects with the following recorded Historical Sites/Structures/Districts: Ruffin, Edmund Plantation. Coordination with the VA SHPO is required. Proposed route intersects 24 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Caroline; King William; Charles City; New Kent and Hanover counties, Virginia. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval will take 12 months. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching. The proposed route intersects Tribal Lands. Coordination with the following tribal representatives is required: Chickahominy TDSA The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Field surveys, permit preparation, submittal and approval will require 12 months. Proposed route does not intersect designated Critical Habitat. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 7 conservation easements. Coordination with the following easement holder(s) is required: Ever Green Team ; Virginia Outdoors Foundation Proposed route intersects streams that the State of Virginia has designated as Special Trout Waters. These streams include: Free flowing portions of the Mattaponi and Pamunkey Rivers. Coordination with the USACE and the VA Dept. of Wildlife Resources (DWR) is needed.

There are approximately 3 railroad crossings, 2 with CSXT, and 1 with Norfolk Southern Railway Company. There are approximately 103 road and highway crossings (206 entrances), across 5 counties. Charles City, New Kent, Hanover, King William, and Caroline Counties. There are approximately 14 transmission line crossings, 12 owned by Virginia Electric And Power Co., and 2 owner not available. There are approximately 4 pipeline crossings, 3 owned by Virginia Natural Gas Co., and 1 owned by Kinder Morgan. Desktop analysis indicates that the proposed route intersects with farmland. Verification in the field would need to be completed. It is anticipated that the proposal requires permits, consultations, clearances and authorization from 2 counties in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Subproposal 557 - Component 1: New 500 kV Line - Skiffes Creek to Chickahominy

The proposed component has the potential to impact environmental resources including FEMA floodplains, coastal floodplains, floodways, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting; woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Impacts to these resources will require coordination with the appropriate county floodplain administrator; coordination with state wildlife agencies, USACE and USFWS. Proposed route does not intersect designated Critical Habitats. However, there are

federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species and critical habitats. Proposed route intersects 3 conservation easements. Coordination with easement holders, Virginia Department of Wildlife Resources, The College of William and Mary, and the US National Park Service will be required. Proposed route intersects mapped karst geology. Geotechnical studies are needed to verify subsurface conditions prior to digging or trenching.

The component crosses approximately 204 roads and highways (408 entrances) in 3 cities (Charles City, City of Williamsburg, James City); approximately 3 transmission lines owned by VIRGINIA ELECTRIC & POWER CO; and approximately 2 pipelines, owned by Virginia Natural Gas Co. There is 1 national park crossing, Colonial National Historical Park. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from 3 cities in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Transmission Line Risk Analysis

Subproposal 55 - Component 1: Heritage to Yeat

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 6 Bundled – 795 kcmil (45/7 Strand) ACSR “Tern” conductor arrangement on single-circuit lattice structures. The conductors support the ratings outlined in the proposal.** These types of structures are inherently complex vs. steel monopoles and less-bundled conductors but are common for 765kV lines. It should be noted that 765kV AC Transmission lines are not historically common in America but are increasingly being developed across the country. We would expect some utilities and contractors to have limited experience accordingly. The route is generally flat with few obstructions.

Regarding the route, there should be no concerns with vehicle access due to the terrain and location. While the south and north end of the line interacts with few structures, the portion of the route that passes west of Richmond has numerous issues that will need to be fixed to make it feasible. There are a number of crossings along the route including eleven high-voltage lines, two railroads, nine highways, 42 creeks/rivers, and a couple of ponds/lakes. This is a large amount of crossings, but it is also a very long route. Depending on modifications to the route, some spans will be quite large at crossings.

We did not observe any future maintenance issues with this line. As a 765kV line, we would not expect a design considering future double-circuit and as a greenfield line within its own ROW, it does not create impacts on other circuits or requires significant demolition.

From a procurement perspective, there are a significant number of structures (816) that will be required and over 2700 miles of conductor needed. This is a significant amount of material to procure in the schedule outlined. Some 765kV hardware may carry some larger lead times.

Finally, the mostly flat and rural nature of the route does not provide any terrain concerns. We would expect heavy restrictions on noise and pollution in some of the areas along the route. A complex sequencing of outages will not be required since the line is entirely greenfield.

Subproposal 98 - Component 1: New 500 kV Line - Chickahominy to Kraken

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 3-bundle 1351.5 kcmil ACSS “Martin” Conductor arrangement and a combination of three pole dead end structures and lattice structures. The conductors

support the ratings outlined in the proposal**. These types of structures are inherently more complex than steel monopoles but are not uncommon at this voltage.

Regarding the route, there should be no concerns with vehicle access due to the terrain and location, and the alignment interacts with very few structures. There are a number of crossings along the route including eight high-voltage lines, three railroads, five highways, twenty-two creeks/ivers, and several ponds. While this is a large quantity of creeks and rivers, this is not overly concerning for a line of this size.

The line is being designed using structures designed for a future double circuit, which will allow for expansion. We do not anticipate any future maintenance issues with this line since it will be built within a new ROW. Though we feel the width is narrow for this voltage.

From a procurement perspective, there are (270) structures that will be required and about 530 miles of conductor needed. This is a large quantity of material to procure, but most of the material should not carry procurement risks outside of typical EHV line hardware lead times.

Finally, the mostly flat and rural nature of the route does not provide any terrain concerns. We would not expect heavy restrictions on noise and pollution due to the limited population along the route and a complex sequencing of outages will not be required since the line is entirely greenfield.

Subproposal 557 - Component 1: New 500 kV Line - Skiffes Creek to Chickahominy

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 3-bundle 1351.5 kcmil ACSS "Martin" Conductor and a 2-bundled 768.2 (20/7 Strand) ACSS "Maumee" Conductor for the rebuild circuit. This would be on double-circuit monopoles. The conductors support the ratings outlined in the proposal**.

Regarding the route, there should be limited concerns with vehicle access for most of the line. In the tighter corridor section, there may be some difficult access ways as the line is sandwiched between highways, wetlands, and other structures. There are a number of crossings along the route including six high-voltage lines, five substations, seven highways, three railroads, four creeks/ivers, and several lakes/ponds. This is a larger quantity for a line of this size which is to be expected in the more suburban areas.

Expansion of much of the circuit will not be feasible. The corridor for half of the line is very tight between many structures and obstacles, and the rebuild overtakes an existing line, effectively making expansion impossible. As noted, some areas will require more difficult access. About 35 miles of the existing line will need to be demolished to rebuild.

From a procurement perspective, there are (193) structures that will be required and over 330 miles of conductor needed. This is a large quantity of material to procure, but most of the material should not carry procurement risks outside of typical EHV hardware lead times.

Finally, the mostly flat and rural nature of part of the route does not provide any terrain concerns. The more populated area pushes the line closer to wetlands than is ideal. We would expect restrictions on noise and pollution in the more populated areas. Rebuild of the existing circuit, in place, would require long-term outages on the existing circuit to execute.

Substation Risk Analysis

Subproposal 247 - Component 1: New 765/500kV Switching Station - Vontay

The project involves constructing a major new 765/500 kV substation equipped with three single-phase 765/500 kV, 750-MVA transformer units, two 765 kV SF6 breakers, a full set of 765 kV vertical-break switches, CCVTs, surge arresters, and a 150-MVAR shunt reactor. The 500 kV yard will include six 63-kA, 5000-amp SF6 breakers, twelve 5000-amp double-end-break switches, twelve CCVTs, and associated station-class surge arresters. Approximately 7,100 feet of 6-inch aluminum bus and connectors will be installed to integrate the high-voltage equipment across both voltage levels. Major civil work includes extensive foundations, steel structures, a full ground grid meeting Dominion Energy standards, an oil-containment system for the transformer and reactor banks, roughly 2,600 feet of cable trench with conduit and control cable, and full site grading and stormwater systems. Security upgrades include 5,000 feet of Level-One security fencing with integrated monitoring infrastructure.

Protection, control, and operational systems will be housed in two 24'x50' control enclosures containing relay, communication, and infrastructure panels, along with a 14'x25' security enclosure. New station batteries, chargers, and a dual-source AC station-service system—including a tertiary-fed source and a local distribution backup—will be provided. The project includes all conductor, connectors, insulators, grounding components, and ancillary hardware needed to meet Dominion Energy standards, as well as installation and integration of all relaying, monitoring, and communications equipment. Comprehensive testing and commissioning will be performed across transformers, breakers, reactor systems, and protection schemes to ensure the substation is fully functional and ready for energization at both 765 kV and 500 kV levels.

This is a 765kV greenfield site. There are concerns about the availability of the equipment and the acquisition of the land required to build it. No major problems are anticipated, however.

Constructability Summary

For portfolio proposal 705, the majority of the risk of this proposal is generated by the greenfield transmission lines, especially Heritage to Yeat 765 kV line route in sub-proposal 55. The line route runs through an area with residential properties and also crosses over very large solar farms, and it is anticipated that there may be significant opposition to land acquisition. Similarly, sub-proposal 98 has a significant amount of land acquisition, although it is in very rural areas. For the scope requiring transmission rebuilds or building new lines within existing rights-of-way, the risk will be entirely driven by the ability of the existing lines to take extensive outages.

Across this portfolio, most of the substation projects present low constructability risk because they are conventional brownfield upgrades inside existing 500 kV yards. Work at Midlothian, Ox, Yeat, Carson (both alternatives), Surry, Septa, Skiffes Creek (apart from breaker lead time), North Anna, Bristers, Possum Point, and the Kraken/Chickahominy/Ox terminal upgrades largely consists of replacing switches, bus, CCVTs, wave traps, arresters, CTs, and adding or refreshing SEL-based protection and communications. These scopes rely on standard construction methods, familiar outage sequencing, and do not introduce unusual sites, access, or civil challenges.

Elevated but still manageable risk shows up in the greenfield substation builds and the larger 500 kV expansions, which are rated Low–Medium primarily due to equipment procurement, not constructability complexity. The new Heritage 765/500 kV greenfield station and the Vontay 765/500 kV switching station both involve large numbers of 765/500 kV autotransformers, EHV breakers, extensive bus, foundations, trenching, fencing, and site development, plus some uncertainty around land acquisition and 765 kV equipment lead times—hence the Low–Medium rating.

Similarly, new or expanded 500 kV bays at Chickahominy, Skiffes Creek, and a few others are flagged Low–Medium because of concern with the procurement window for high-duty 500 kV breakers, even though no major site or engineering obstacles are identified.

Overall, due to the anticipated risks of land acquisition for the EHV line routes, and the constraints identified, the portfolio 705 constructability risk is deemed to be **Medium-High**.

Outage Review

Due to the multiple 500 kV line rebuilds associated with portfolio 705, and the anticipated lengthy outages required to complete these rebuilds, **Medium** risk is assessed for outage coordination.

Cost Review

A high-level cost estimate was created for each proposal to assess the cost component for potential omissions or under-estimating. Cost estimates were broken into eight categories, including Engineering & Design, Permitting/Routing/Siting, ROW/Land Acquisition, Materials & Equipment, Construction & Commissioning, Construction Management, Overheads and Miscellaneous, and Risk Contingency (30%). The cost comparison for this proposal, broken down by component, is outlined below.

Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
55-1	Heritage - Yeat	\$1,384.59	\$966.91
55-2	Heritage Substation Expansion	\$231.28	\$305.47
55-3	Yeat Substation Termination	\$49.43	\$41.65
98-1	Chickahominy - Kraken	\$400.29	\$331.35
98-2	Chickahominy Substation Line Terminal Equipment	\$6.04	\$10.70
98-3	Kraken Substation Expansion	\$8.61	\$18.77
117-1	Line 539 Rebuild - Yeat to Ox	\$122.66	\$127.50
117-2	Ox Substation Terminal Equipment Upgrade	\$2.25	\$3.26
117-3	Yeat Substation Terminal Equipment Upgrade	\$0.33	\$0.97
243-1	Carson Substation 500 KV Equipment Upgrade - Alternative 1	\$12.44	\$13.90
243-2	Carson Substation 500 KV Equipment Upgrade - Alternative 2	\$1.77	\$1.53
247-1	New 765/500kV Switching Station - Vontay	\$217.76	\$170.39
247-2	500 kV Cut-In - Cunningham to Elmont	\$6.69	\$4.89

247-3	500 kV Cut-In - North Anna to Midlothian	\$6.69	\$4.89
247-4	765 kV Cut-In - Joshua Falls to Yeat	\$8.36	\$5.58
311-1	Surry Substation Line Terminal Upgrade	\$3.38	\$3.75
311-2	Septa Substation Line Terminal Upgrade (993591)	\$0.51	\$1.07
339-1	Line 576 Rebuild - North Anna to Vontay	\$102.70	\$114.05
339-2	North Anna Equipment Upgrade	\$2.16	\$2.56
557-1	Skiffes Creek - Chickahominy	\$283.33	\$379.46
557-2	Skiffes Creek Substation Expansion	\$5.19	\$10.32
557-3	Chickahominy Substation Equipment Upgrade	\$4.37	\$8.87
916-1	Line 560 Rebuild - Possum Point to Burches Hill	\$3.49	\$5.75
Total		\$2,864.73	\$2,534.62

The proposal cost estimate is within 10% of the independent cost estimate. The cost estimate risk is considered **Low** risk.

Schedule Review

This portfolio proposal has a projected in-service date of June 1, 2032. From a substation equipment procurement perspective, all components are achievable within the proposed project timelines. Similarly, procurement for the transmission line components are all achievable within the project schedule.

The greatest schedule risks to this project are associated with the permitting and land acquisition risks, with significant risk of opposition to the greenfield scope. Overall, we deem the overall Schedule risk to be **Medium-High**.

Proposing Entity Experience and Capability Review

VEPCO does not experience operating 765 kV transmission but has recently partnered with Transource and FirstEnergy as part of a joint venture (Valley Link) that was designated responsibility to build and operate 765 kV transmission projects in Virginia. Based on this, proposing entity experience and capability risk is considered **Medium**.

Portfolio Proposal 616 – VEPCO

Portfolio 616 (500kV Portfolio 3A) was submitted by Dominion Energy (VEPCO) to ultimately develop a 500kV backbone in Virginia through the rebuild of various 500kV lines, the installation of new 500kV greenfield lines, and

various substation upgrades. In addition to the HVDC underground line, there are a number of line rebuilds and substation upgrades that would be completed to support the integration of the HVDC line as well as (2) HVDC Converter Stations.

This portfolio proposal traverses the Counties of Surry, Hanover, Buckingham, Powhatan, Goochland, Orange, Lunenburg, Fauquier, Prince William, Charles City, Cumberland, Albemarle, Dinwiddie, Amelia, Fluvanna, Prince, Edward, Louisa, Fairfax, Culpeper, Spotsylvania, Chesterfield, Brunswick, Caroline, and Mecklenburg in Virginia.

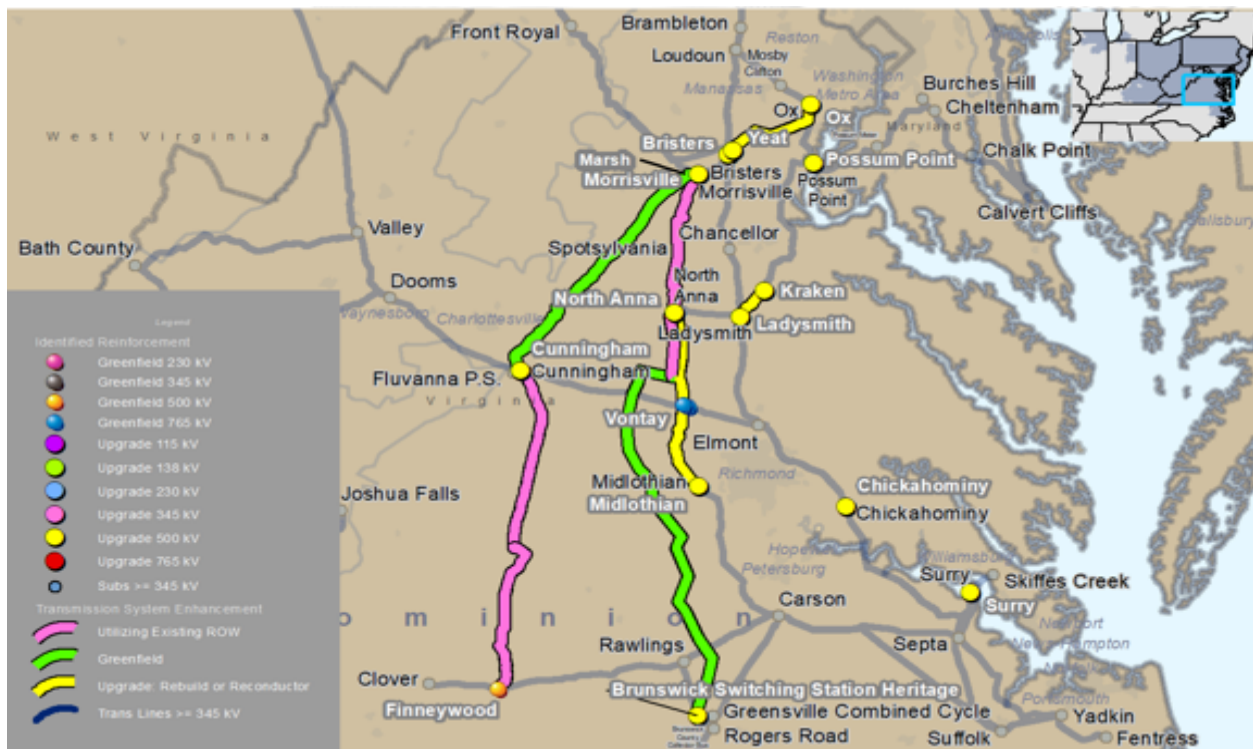
Portfolio Component Overview

Portfolio Proposal 616 includes the following subproposals:

- Subproposal 9, Component 1: Line 576 Rebuild - Vontay to Midlothian
- Subproposal 9, Component 2: Midlothian Equipment Upgrade
- Subproposal 24, Component 1: Line 568 Rebuild - Ladysmith to Kraken
- Subproposal 126, Component 1: Chickahominy Substation Line 567 Terminal Upgrade
- Subproposal 126, Component 2: Surry Substation Line 567 Terminal Upgrade
- Subproposal 247, Component 1: New 765/500kV Switching Station - Vontay
- Subproposal 247, Component 2: 500 kV Cut-In - Cunningham to Elmont
- Subproposal 247, Component 3: 500 kV Cut-In - North Anna to Midlothian
- Subproposal 247, Component 4: 765 kV Cut-In - Joshua Falls to Yeat
- Subproposal 264, Component 1: Line 539 Rebuild - Bristers to Ox
- Subproposal 264, Component 2: Bristers Substation Terminal Equipment Upgrade
- Subproposal 264, Component 3: Ox Substation Terminal Equipment Upgrade
- Subproposal 264, Component 4: Yeat Substation Terminal Equipment Upgrade
- Subproposal 339, Component 1: Line 576 Rebuild - North Anna to Vontay
- Subproposal 339, Component 2: North Anna Equipment Upgrade
- Subproposal 409, Component 1: New 500 KV Line - Morrisville to Cunningham
- Subproposal 409, Component 2: Morrisville Substation Line Terminal Upgrade
- Subproposal 409, Component 3: Cunningham Substation Line Terminal Upgrade
- Subproposal 458, Component 1: 500kV Line - Heritage to Morrisville
- Subproposal 458, Component 2: Heritage Substation 500kV Expansion
- Subproposal 458, Component 3: Morrisville Substation 500 KV Expansion
- Subproposal 825, Component 1: New 500 kV Line - Finneywood and Cunningham
- Subproposal 825, Component 2: Finneywood Substation Expansion
- Subproposal 825, Component 3: Cunningham Substation Expansion
- Subproposal 916, Component 1: Line 560 Rebuild - Possum Point to Burches Hill
- Subproposal 916, Component 2: Possum Point Substation Equipment Upgrade

Map 4 displays the routes proposed for Proposal 616.

Map 4. Portfolio Proposal 616



NOTE: 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.

Constructability Review

Right-of-Way/Land Acquisition Risk Analysis

Sub-proposal 247 - Component 1: New 765/500kV Switching Station - Vontay

This component is a greenfield substation located in Hanover County, Virginia and will require a new land parcel. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

The proposed site seems adequate to house the component; however, 765kV substations can generate public interest and opposition due to the high voltage and large size of the equipment.

Sub-proposal 409 - Component 1: New 500 KV Line - Morrisville to Cunningham

The Morrisville – Cunningham greenfield line is a 61.8-mile 500kV, double-circuit line, which will be built in central Virginia between the Morrisville and Cunningham Stations. This line will be located in Fluvanna, Louisa, Orange, Culpeper, and Fauquier Counties. The line will utilize a new route to traverse between the two substations. New ROW will be required throughout the line.

Sub-proposal 458 - Component 1: Heritage to Morrisville

The Heritage – Cunningham greenfield/rebuild line is a 137-mile 500kV, single-circuit line (future double-circuit), which will be built in central Virginia between the Morrisville and Heritage Stations. This line will be located in Amelia, Orange, Chesterfield, Dinwiddie, Brunswick, Powhatan, Goochland, Hanover, Louisa, Spotsylvania, Culpeper, and Fauquier Counties. The line will utilize a new route to traverse between the two substations for 91.2 miles, and for 47.2 miles it will utilize existing ROW with rebuild on centerline. A new ROW will be required for the 91.2-mile section.

Sub-proposal 825 - Component 1: New 500 kV Line - Finneywood and Cunningham

The Finneywood – Cunningham Greenfield line is a 77.77-mile 500kV, single-circuit (future double circuit), which will be built in central Virginia between the Finneywood and Cunningham Stations. This line will traverse Lunenburg, Mecklenburg, Prince Edward, Nottoway, Amelia, Cumberland, Buckingham and Fluvanna Counties. The scope of this proposal indicates to install a new line within an existing corridor.

Overall, due to half the total mileage of the 500 kV line routes in this portfolio proposed within existing Dominion rights-of-way, with the remainder greenfield construction, a **Medium** risk is assessed for ROW/Land Acquisition

Environmental Risk Analysis

Sub-proposal 247 - Component 1: New 765/500kV Switching Station - Vontay

Proposed substation footprint intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take 12 months to complete. The proposed substation footprint intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed.

The proposed substation footprint intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination.

The component crosses over 2 road crossings (4 entrances) in Hanover County; 2 transmission line crossings owned by Virginia Electric & Power Co. It is anticipated that the proposal could require permits, consultations, clearances and authorization from Hanover County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Sub-proposal 409 - Component 1: New 500 KV Line - Morrisville to Cunningham

Proposed route intersects 20 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Fluvanna; Louisa; Orange; Culpepper; Fauquier and Albemarle counties in VA. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed route intersects 9 conservation easements. Coordination with easement holder(s) is required. Proposed route intersects streams that the State of Virginia has designated as Special Trout Waters. These streams include: portions of the Rivanna River and its tributaries; James River and its tributaries; Mechunk Creek and its tributaries; Mattaponi and its tributaries; Pamunkey River and its tributaries; and the Rappahannock River and its tributaries. Coordination with the USACE and the VA Dept. of Wildlife Resources (DWR) is needed.

There is approximately 1 railroad crossing with Buckingham Branch Railroad Company. There is approximately 154 road and highway crossings (308 entrances) across 6 counties. There is approximately 10 transmission line crossings with VIRGINIA ELECTRIC & POWER CO. There is approximately 6 pipeline crossings, 4 with Transcontinental Gas PL, 1 with Columbia Gas Trans Co, and 1 with COLONIAL PIPELINE CO. There is 1 state-owned park within the proposed route; Fluvanna Ruritan Lake Public Fishing Lake. It is anticipated that the proposal requires permits, consultations, clearances and authorization from 6 counties in VA. State CPCN and DOT utility, driveway and right of way permits may be required.

Sub-proposal 458 - Component 1: Heritage to Morrisville

Proposed route intersects 31 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: VA_Brunswick, VA_Dinwiddie, VA_Amelia, VA_Chesterfield, VA_Powhatan, VA_Goochland, VA_Louisa, VA_Spotsylvania, VA_Orange, VA_Culpeper, VA_Fauquier. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered

bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects with 1 recorded Underground Storage Tank (UST's). A file review of State records to determine the current status of the UST's is recommended. Based on the results of the review, a subsurface Soil Characterization investigation may be necessary to determine if contamination is present and the extent of contamination originating from UST's. The proposed route intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed route intersects designated Critical Habitat for the following species: Atlantic pigtoe (mussel). Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 2 conservation easements. Virginia Department of Conservation and Recreation; Capital Region Land Conservancy. Coordination with easement holder(s) is required. Proposed route intersects streams that the State of Virginia has designated as Special Trout Waters. These streams include: portions of the Meherrin River and its tributaries; Nottoway River and its tributaries; Appomattox River and its tributaries; and the James River and its tributaries. Coordination with the USACE and the VA Dept. of Wildlife Resources (DWR) is needed.

There are approximately 3 railroad crossings, 1 with CSXT, and 2 with Norfolk Southern Railway Company. There are approximately 195 road and highway crossings (390 entrances) across 11 counties. There are approximately 6 transmission line crossings, 3 with VIRGINIA ELECTRIC & POWER CO, and 3 with no owner available. There is approximately 3 pipeline crossings, with Columbia Gas Trans Co, COLONIAL PIPELINE CO, and KINDER MORGAN. It is anticipated that the proposal requires permits, consultations, clearances and authorization from 11 counties in VA. State CPCN and DOT utility, driveway and right of way permits may be required.

Sub-Proposal 825 - Component 1: New 500 kV Line - Finneywood and Cunningham

The proposed route intersects with the following recorded Historical Sites/Structures/Districts: Farmville Historic District. Coordination with the WV SHPO is required. Proposed route intersects 24 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Lunenburg; Prince Edward; Cumberland; Buckingham; Fluvanna; and Mecklenburg counties in VA. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed route intersects 26 conservation easements. Coordination with easement holder(s) is required. Proposed route intersects streams that the State of Virginia has designated as Special Trout Waters. These streams include: portions of the Rivanna River and its tributaries; James River and its tributaries; Mechunk Creek and its tributaries; Mattaponi and its tributaries; Pamunkey River and its tributaries; and the Rappahannock River and its tributaries. Coordination with the USACE and the VA Dept. of Wildlife Resources (DWR) is needed.

There is approximately 4 rail road crossings, 2 with CSXT, 1 with Buckingham Branch Railroad Company, and 1 with Norfolk Southern Railway Company. There is approximately 174 road and highway crossings (348 entrances) across 6 counties. There is approximately 14 transmission line crossings, 10 with VIRGINIA ELECTRIC & POWER CO, and 4 with no owner available. There is approximately 3 pipeline crossings, 2 with COLONIAL PIPELINE CO, and 1 with KINDER MORGAN. There are 3 parks within the proposed route, High Bridge Trail State Park, Riverside Park, and High Bridge Trail State Park. It is anticipated that the proposal requires permits, consultations, clearances and authorization from 6 counties in VA. State CPCN and DOT utility, driveway and right of way permits may be required.

Transmission Line Risk Analysis

Sub-proposal 409 - Component 1: New 500 KV Line - Morrisville to Cunningham

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 3-bundle 1351.5 kcmil ACSS “Martin” Conductor arrangement and a combination of double-circuit three pole dead end structures and lattice structures. The conductors support the ratings outlined in the proposal**. Lattice structures are more complex vs. steel monopoles but are not uncommon for this voltage level.

Regarding the route, we would expect ROW to be wider than the 150ft indicates and would expect 200ft to be used for a line of this configuration. There should be no concerns with vehicle access due to the terrain and location, and the alignment interacts with very few structures. There are a number of crossings along the route including six high-voltage lines, one highway, thirteen creeks/rivers, and one pond. For a 61.8-mile route, it is a reasonable quantity of crossings which lends to the very rural nature of the area.

We did not observe any future maintenance issues with this line. The line is designed as double-circuit and as a greenfield line within its own ROW; it does not create impacts on other circuits or require significant demolition. The double-circuit design allows for future expansion.

From a procurement perspective, there are a significant number of structures (300) that will be required and 550 miles of conductor needed. This is a large quantity of material to procure, but most of the material should not carry procurement risks outside of typical EHV hardware lead times. We do think that procurement will be tough in the allotted schedule.

Finally, the mostly flat and rural nature of the route does not provide any terrain concerns. No heavy restrictions on noise and pollution are anticipated due to the limited population along the route and complex sequencing of outages will not be required since the line is entirely greenfield.

Sub-proposal 458 - Component 1: Heritage to Morrisville

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 3-bundle 1351.5 kcmil ACSS “Martin” Conductor arrangement and a combination of double-circuit three pole dead end structures, double-circuit steel monopoles, and lattice structures. The conductors support the ratings outlined in the proposal**. Lattice structures are more complex vs. steel monopoles but are not uncommon for this voltage level.

Regarding the route, we would expect ROW to be wider than the 150ft indicates and would expect 200ft to be used for a line of this configuration. There should be no concerns with vehicle access due to the terrain and location. The greenfield route will need to be changed from what is shown in some areas. There are a number of crossings along the route including six high-voltage lines, two railroads, seven highways, 19 creeks/rivers, and several lakes/ponds.

For a 137-mile route, it is an expected number of crossings. In the area of Lake Anna, there will be large spans required. Similar concerns to other components that use this corridor.

We did not observe any future maintenance issues with this line other than the structures that are located within Lake Anna. This is a common concern for the various components that have chosen to use this corridor. The line is designed as double-circuit and as a greenfield line within its own ROW, as well as a rebuild in an existing ROW. There are no impacts on other circuits that require significant demolition within the greenfield portion. The rebuild portion will include the demolition of 47.2 miles of 500kV structures and cables.

From a procurement perspective, there are a significant number of structures (668) that will be required and 1200 miles of conductor needed. This is a significant quantity of material to procure, but most of the material should not carry procurement risks outside of typical EHV hardware lead times. We do feel that this will be difficult in the time allotted in the proposal.

Finally, the mostly flat and rural nature of the route does not provide any terrain concerns. There will be issues in the area of Lake Anna and there may be some restrictions on noise and pollution due to the limited population in that area. Long-term outages will be required at the north end of the line. While we cannot confirm the feasibility of this outage, this assessment assumes it is feasible. If this outage were not achieved, the line would need to be offset, which would greatly increase the risk to the project.

Sub-proposal 825 - Component 1: New 500 kV Line - Finneywood and Cunningham

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 3-bundle 1351.5 kcmil ACSS “Martin” Conductor arrangement and a combination of double-circuit three pole dead end structures and lattice structures. The conductors support the ratings outlined in the proposal**. Lattice structures are more complex vs. steel monopoles but are not uncommon for this voltage level.

Regarding the route, an expansion of the existing corridor by 150 feet is expected since it does not appear the new line could fit within the existing corridor. There should be no concerns with vehicle access due to the terrain and location. The expansion will impact a fair amount of structures, but there is room to improve on the route. There are a number of crossings along the route including three high-voltage lines, four substations, two railroads, two highways, 19 creeks/rivers, and several lakes/ponds. For a 77.77-mile route, it is a reasonable number of crossings and shouldn't be of concern.

The line is designed as double-circuit and as a greenfield line within its own ROW expanded off an existing corridor, from what we can tell. If the plan is to overtake the existing circuit, it was not clearly defined in the proposal. That approach would require substation demolition and outages.

From a procurement perspective, there are a large number of structures (387) that will be required and 700 miles of conductor needed. This is a large quantity of material to procure, but most of the material should not carry procurement risks outside of typical EHV hardware lead times.

Finally, the mostly flat and rural nature of the route does not provide any terrain concerns. No heavy restrictions on noise and pollution are anticipated due to the limited population along the route and complex sequencing of outages will not be required for the greenfield line.

Substation Risk Analysis

Sub-Proposal 247 - Component 1: New 765/500kV Switching Station - Vontay

The project involves constructing a major new 765/500 kV substation equipped with three single-phase 765/500 kV, 750-MVA transformer units, two 765 kV SF6 breakers, a full set of 765 kV vertical-break switches, CCVTs, surge arresters, and a 150-MVAR shunt reactor. The 500 kV yard will include six 63-kA, 5000-amp SF6 breakers, twelve 5000-amp double-end-break switches, twelve CCVTs, and associated station-class surge arresters. Approximately 7,100 feet of 6-inch aluminum bus and connectors will be installed to integrate the high-voltage equipment across both voltage levels. Major civil work includes extensive foundations, steel structures, a full ground grid meeting Dominion Energy standards, an oil-containment system for the transformer and reactor banks, roughly 2,600 feet of cable trench with conduit and control cable, and full site grading and stormwater systems. Security upgrades include 5,000 feet of Level-One security fencing with integrated monitoring infrastructure.

Protection, control, and operational systems will be housed in two 24'x50' control enclosures containing relay, communication, and infrastructure panels, along with a 14'x25' security enclosure. New station batteries, chargers, and a dual-source AC station-service system—including a tertiary-fed source and a local distribution backup—will be provided. The project includes all conductor, connectors, insulators, grounding components, and ancillary hardware needed to meet Dominion Energy standards, as well as installation and integration of all relaying, monitoring, and communications equipment. Comprehensive testing and commissioning will be performed across transformers, breakers, reactor systems, and protection schemes to ensure the substation is fully functional and ready for energization at both 765 kV and 500 kV levels.

This is a 765kV greenfield site. There are concerns about the availability of the equipment and the acquisition of the land required to build it. However, no major problems are anticipated.

Constructability Summary

For most of the transmission components, the risk is entirely driven by the ability of the existing lines to take extensive outages. If this is achievable, building on centerline should limit the risk significantly. But if this is not achievable, the new lines will need to be offset from the existing lines, which will significantly increase the risk. Proposal 409 and 825 are greenfield lines that pass near residential areas in some points. As greenfield lines, it is inherently less risky from a pure constructability perspective. Risks will be associated with land acquisition and permitting, primarily. It is worth noting that proposal 825 has obvious re-route options should there be opposition to the current route, limiting the risk. For proposal 458, the risk associated with the transmission line varies. No concerns with the greenfield section other than the quantity of crossings. The rebuild section is of an existing 500kV line on the existing centerline. As such, a full outage will be required. As we don't have the ability to understand the feasibility of that outage, the success of the project will be entirely based on acquiring this outage. There are also areas where it passes through substations which may require significant work and outage coordination depending on the approach at these locations.

Across most of the substation components, constructability risk is driven primarily by routine brownfield substation work using well-understood methods. Components at Midlothian, Chickahominy, Surry, Bristers, Ox, Yeat, North Anna, and Possum Point are largely standard equipment replacements or terminal upgrades—swapping switches, CTs, wave traps, CCVTs, arresters, and limited bus, plus relay panel changes and settings updates. These scopes occur within existing 500 kV yards, rely on conventional construction techniques, and do not introduce unusual civil, access, or outage constraints. As a result, they present minimal schedule or constructability risks.

Elevated—but still manageable—risk appears in the larger 500 kV bay additions and the single 765/500 kV greenfield site. The Vontay 765/500 kV Switching Station (Sub-Proposal 247) is a new EHV greenfield build with multiple large transformers, significant bus work, foundations, trenching, oil containment, and site development, plus some uncertainty around major equipment availability and land acquisition.

Overall, the constructability risk of the portfolio proposal 616 is assessed as **Medium**.

Outage Review

Due to the minimal number of line rebuilds and existing facility outages associated with this portfolio proposal, the overall outage coordination risk is assessed as **Low-Medium**.

Cost Review

A high-level cost estimate was created for each proposal to assess the cost component for potential omissions or under-estimating. Cost estimates were broken into eight categories, including Engineering & Design, Permitting/Routing/Siting, ROW/Land Acquisition, Materials & Equipment, Construction & Commissioning, Construction Management, Overheads and Miscellaneous, and Risk Contingency (30%). The cost comparison for this proposal, broken down by component, is outlined below.

Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
9-1	Line 576 Rebuild - Vontay - Midlothian	\$102.70	\$126.45
9-1	Midlothian Equipment Upgrade	\$2.16	\$3.37
24-1	Line 568 Rebuild - Ladysmith - Kraken	\$48.59	\$47.72
126-1	Chickahominy Substation Line Terminal Upgrade (993592 Alt_1)	\$0.03	\$0.21
126-2	Surry Substation Line Terminal Upgrade (993592 Alt_1)	\$2.46	\$3.03
247-1	New 765/500kV Switching Station - Vontay	\$217.76	\$170.39
247-2	500 kV Cut-In - Cunningham to Elmont	\$6.69	\$4.89
247-3	500 kV Cut-In - North Anna to Midlothian	\$6.69	\$4.89
247-4	765 kV Cut-In - Joshua Falls to Yeat	\$8.36	\$5.58
264-1	Line 539 Rebuild - Bristers to Ox	\$129.12	\$119.44
264-2	Bristers Substation Terminal Equipment Upgrade	\$0.67	\$1.08
264-3	Ox Substation Terminal Equipment Upgrade	\$2.25	\$2.20
264-4	Yeat Substation Terminal Equipment Upgrade	\$0.33	\$0.75

339-1	Line 576 Rebuild - North Anna to Vontay	\$102.70	\$114.05
339-2	North Anna Equipment Upgrade	\$2.16	\$2.56
409-1	Morrisville - Cunningham (993593)	\$514.93	\$361.17
409-2	Morrisville Substation Line Terminal Upgrade (993593)	\$18.10	\$11.52
409-3	Cunningham Substation Line Terminal Upgrade (993593)	\$6.52	\$17.47
458-1	Heritage to Morrisville	\$785.17	\$666.93
458-2	Heritage Substation 500kV Expansion	\$4.76	\$7.52
458-3	Morrisville Substation 500 KV Expansion	\$4.34	\$13.33
825-1	Finneywood - Cunningham	\$459.08	\$442.59
825-2	Finneywood Substation Expansion	\$9.27	\$15.77
825-3	Cunningham Substation Expansion	\$15.38	\$19.99
916-1	Line 560 Rebuild - Possum Point to Burches Hill	\$3.49	\$5.75
916-2	Possum Point Substation Equipment Upgrade	\$0.40	\$1.04
Total		\$2,454.11	\$2,169.69

The proposal cost estimate is within 10% of the independent cost estimate. The cost estimate risk is considered **Low** risk.

Schedule Review

This portfolio proposal has a projected in-service date of June 1, 2032. From a substation equipment procurement perspective, all components are achievable within the proposed project timelines. Similarly, procurement for the transmission line components are all achievable within the project schedule.

The greatest schedule risks to this project are associated with the permitting and land acquisition risks, which is mitigated to a moderate degree by Dominion's proposed use of their ROW for the proposed projects. Overall, we deem the overall Schedule risk to be **Medium**.

Proposing Entity Experience and Capability Review

VEPCO has significant experience constructing and operating 500 kV transmission which represents the significant scope for Proposal 616. The proposing entity experience and capability risk is considered **Low**.

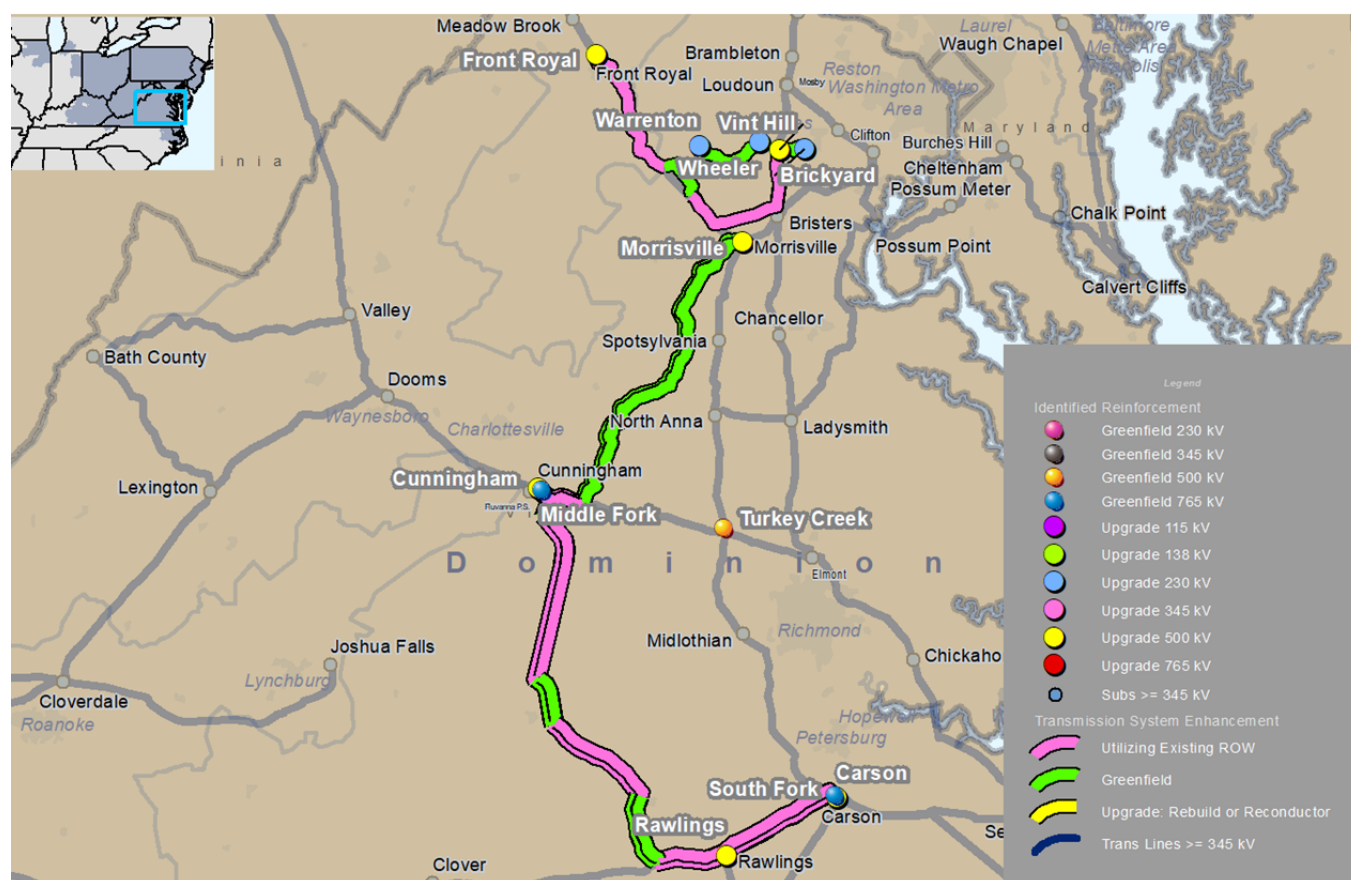
Proposal 260 – Virginia Transmission Project (CNTLTM)

The Virginia Transmission Project includes two new 765/500kV substations with a 765kV line connecting the two as well as various 500kV connections to strengthen the 500kV backbone in Virginia. The project also includes various 230kV connections. This project will traverse 7 counties (Fauquier, Prince William, Warren, Fluvanna, Brunswick, Dinwiddie, Hanover) throughout the state of Virginia.

This proposal has a total of 25 components, including 8 substation upgrade components, 3 greenfield substation components, 11 greenfield transmission line components, and 3 substation loop-ins.

Map 5 displays the routes proposed for Proposal 260.

Map 5. Proposal 260



NOTE: 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.

Project Overview

- Component 1: Middle Fork Substation
- Component 2: South Fork Substation
- Component 3: Turkey Creek Substation
- Component 4: Warrenton Expansion
- Component 5: Wheeler Expansion
- Component 6: Brickyard Expansion
- Component 7: Vint Hill Expansion
- Component 8: Cunningham Expansion
- Component 9: Morrisville Expansion
- Component 10: Rawlings Expansion
- Component 11: Carson Expansion
- Component 12: Warrenton to Wheeler 230kV Overhead and Underground Transmission Line
- Component 13: Vint Hill to Brickyard 230 kV Underground Transmission Line
- Component 14: Front Royal - Vint Hill 500kV
- Component 15: Cunningham - Middle Fork #1 500kV Transmission Line

Proposal 2025-W1-260 includes the following components:

- Component 16: Cunningham - Middle Fork #2 500kV Transmission Line
- Component 17: Middle Fork - Morrisville #1 500kV Transmission Line
- Component 18: Middle Fork - Morrisville #2 500kV Transmission Line
- Component 19/20: Rawlings - South Fork 500kV Greenfield Line
- Component 21: South Fork - Carson 500kV Greenfield Line
- Component 22: Middle Fork - South Fork #1 500kV Greenfield Line
- Component 23: Middle Fork - South Fork #2 500kV Greenfield Line
- Component 24: Joshua Falls - Yeat 765kV Substation Loop-in
- Component 25: Elmont - Cunningham 500kV Substation Loop-in
- Component 26: Midlothian - North Anna 500kV Substation Loop-in

Constructability Review**Right-of-Way/Land Acquisition Risk Analysis****Component 1: Middle Fork Substation**

This component is a greenfield substation located in Fluvanna County, Virginia, and will require a new land parcel. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

The proposed site seems adequate to house the component; however, 765kV substations can generate public interest and opposition due to the high voltage and large size of the equipment.

Component 2: South Fork Substation

This component is a greenfield substation located in Dinwiddie County, Virginia, and will require a new land parcel. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

The proposed site seems adequate to house the component; however, 765kV substations can generate public interest and opposition due to the high voltage and large size of the equipment.

Component 3: Turkey Creek Substation

This component is a greenfield substation located in Hanover County, Virginia, and will require a new land parcel. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

The proposed site seems adequate to house the component; however, 765 substations can generate public interest and opposition due to the high voltage and large size of the equipment.

Component 12: Warrenton - Wheeler 230kV Greenfield Line

The Warrenton to Wheeler 230kV Greenfield Line is an 8-mile long, single-circuit line in northern Virginia, and will be constructed from the existing Warrenton substation in Fauquier County, VA to the existing Wheeler substation in Prince William County, VA. The line will traverse 2 counties (Fauquier, Prince William) in Virginia. The total route is 8 miles with all new ROW. 4 miles of the line will be overhead and the other 4 miles will be underground.

Component 13: Vint Hill - Brickyard 230kV Greenfield Line

The Vint Hill to Brickyard 230kV underground line is 5-miles long, single-circuit, in northern Virginia, and will be constructed from the existing Vint Hill substation in Prince William County, VA to the existing Brickyard substation in Prince William County, VA. The line will traverse 1 county (Prince William) in Virginia. The total route is 5 miles with all new ROW. All of the line will be underground.

Component 14: Front Royal - Vint Hill 500kV Greenfield Line

The Front Royal - Vint Hill 500kV Line is a 64-mile long, single-circuit line, in northern Virginia, and will be constructed from the existing Front Royal substation in Warren County, VA to the existing Vint Hill substation in Prince William County, VA. The line will traverse 5 counties (Warren, Fauquier, Rappahannock, Culpeper, Prince William) in Virginia. The total route is 64 miles with roughly 41.5 miles of the line paralleling existing ROW. The remaining 22.5 miles of new ROW traverses from one ROW parallel section to another or travels areas with no existing ROW to avoid structures & residences.

Component 15: Cunningham - Middle Fork #1 500kV Greenfield Line

The Cunningham - Middle Fork #1 500kV Line is 0.85-mile long, single-circuit line in central Virginia, and will be constructed from the existing Cunningham substation in Fluvanna County, VA to the proposed Middle Fork substation in Fluvanna County, VA. The line will traverse 1 county (Fluvanna) in Virginia. The total route is 0.85 miles with 50% new ROW and 50% parallel to the existing ROW.

Component 16: Cunningham - Middle Fork #2 500kV Greenfield Line

The Cunningham - Middle Fork #2 500kV Line is 0.85-mile long, single-circuit line in central Virginia, and will be constructed from the existing Cunningham substation in Fluvanna County, VA to the proposed Middle Fork substation in Fluvanna County, VA. The line will traverse 1 county (Fluvanna) in Virginia. The total route is 0.85 miles with 50% new ROW and 50% parallel to the existing ROW.

Component 17: Middle Fork - Morrisville #1 500kV Greenfield Line

The Middle Fork - Morrisville #1 500kV Line is 71.1-mile long single-circuit line in central Virginia, and will be constructed from the proposed Middle Fork substation in Fluvanna County, VA to the existing Morrisville substation in Fauquier County, VA. The line will traverse 5 counties (Fluvanna, Louisa, Orange, Culpeper, Fauquier) in Virginia. The total route is 71.1 miles with roughly 63 miles of new ROW and limited (8.1 miles) length that parallels various existing ROW.

Component 18: Middle Fork - Morrisville #2 500kV Greenfield Line

The Middle Fork - Morrisville #2 500kV Line is 71.1-mile long single-circuit line in central Virginia, and will be constructed from the proposed Middle Fork substation in Fluvanna County, VA to the existing Morrisville substation in Fauquier County, VA. The line will traverse 5 counties (Fluvanna, Louisa, Orange, Culpeper, Fauquier) in Virginia. The total route is 71.1 miles with roughly 63 miles of new ROW and limited (8.1 miles) length that parallels various existing ROW.

Component 19/20: Rawlings - South Fork 500kV Greenfield Line

The Rawlings - South Fork 500kV Line is 22.5-mile long single-circuit line in southern Virginia, and will be constructed from the existing Rawlings substation in Brunswick County, VA to the proposed South Fork substation in Dinwiddie County, VA. The line will traverse 2 counties (Brunswick, Dinwiddie) in Virginia. The total route is 22.5 miles with the entire route paralleling an existing ROW, save for some small bump-outs to avoid existing infrastructure.

Component 21: South Fork - Carson 500kV Greenfield Line

The South Fork - Carson 500kV Line is a 0.4-mile long single-circuit line in southern Virginia and will be constructed from the proposed South Fork substation to the existing Carson substation. The line is situated in Dinwiddie County. The total route is 0.4 miles with all parallel to the existing ROW.

Component 22: Middle Fork - South Fork #1 500kV Greenfield Line

The Middle Fork to South Fork #1 500 kV Line is 116-mile long single-circuit line in southern Virginia, and will be constructed from the proposed Middle Fork substation in Fluvanna County, VA to the proposed South For substation in Dinwiddie County, VA. The line will traverse 8 counties (Fluvanna, Buckingham, Cumberland, Prince Edward, Nottoway, Lunenburg, Brunswick, Dinwiddie) in Virginia. The total route is 116 miles with about 50% paralleling existing ROW while the remaining 50% charts new pathways and breaks from the existing ROWs to avoid structures. Due to the offset of the line from existing ROW, which may be an artifact of the exhibit provided, it could be argued that a vast majority of the path is true greenfield and does not exactly parallel existing.

Component 23: Middle Fork - South Fork #2 500kV Greenfield Line

The Middle Fork to South Fork #2 500 kV Line is 116-mile long single-circuit line in southern Virginia, and will be constructed from the proposed Middle Fork substation in Fluvanna County, VA to the proposed South For substation in Dinwiddie County, VA. The line will traverse 8 counties (Fluvanna, Buckingham, Cumberland, Prince Edward, Nottoway, Lunenburg, Brunswick, Dinwiddie) in Virginia. The total route is 116 miles with about 50% paralleling existing ROW while the remaining 50% charts new pathways and breaks from the existing ROWs to avoid structures.

Overall, due to the high greenfield nature of the proposed projects, a **High** ROW/Land Acquisition risk is assessed for proposal 260.

Environmental Risk Analysis

Middle Fork Substation

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting. Impacts to these resources will require coordination with the USACE and appropriate Floodplain Administrators. The proposed route intersects woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Tree removal restrictions may apply due to the likelihood of the presence of listed bat species. Field verification of suitable bat habitat is recommended to determine presence. Proposed route does not intersect designated Critical Habitat. However, the potential for federally listed endangered/threatened species to occur within the route corridor does exist. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects streams that the State of Virginia has designated as Special Trout Waters. These streams include: 19721. Coordination with the USACE and the VA Dept. of Wildlife Resources (DWR) is needed.

Dirt roads present on the north portion of the proposed substation. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Fluvanna County in VA. State CPCN and DOT utility, driveway and right of way permits may be required.

South Fork Substation

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting. Impacts to these resources will require coordination with the USACE and appropriate Floodplain Administrators. The proposed route intersects woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Tree removal restrictions may apply due to the likelihood of the presence of listed bat species. Field verification of suitable bat habitat is recommended to determine presence.

It is anticipated that the proposal will require permits, consultations, and authorizations from Dinwiddie County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits may be required.

Turkey Creek Substation

The proposed substation footprint intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed.

It is anticipated that the proposal could require permits, consultations, clearances and authorization from Hanover County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Warrenton to Wheeler 230kV Overhead and Underground Transmission Line

The proposed route intersects with the following recorded Historical Sites/Structures/Districts: Auburn Battlefield. Coordination with the VA SHPO is required. Proposed route intersects 2 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Fauquier and Prince William counties, VA.

The component crosses approximately 40 roads and highways (80 entrances) across Prince William County and Fauquier County; 1 transmission line owned by VIRGINIA ELECTRIC & POWER CO; and 1 pipeline owned by Columbia Gas Trans Co (at two separate locations). It is anticipated that the proposal requires permits, consultations, clearances and authorization from Prince William County and Fauquier County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Vint Hill to Brickyard 230 kV Underground Transmission Line

Proposed route intersects 2 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Prince William County, VA and Manassas City, VA. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. Permit authorization may take up to 12-months to complete. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Virginia Designated Trout Waters include: Not Present.

The component crosses approximately 1 railroad owned by Norfolk Southern Railway Company; 31 roads and highways (62 entrances) in Prince William County and Manassas City; 2 transmission lines owned by VIRGINIA ELECTRIC & POWER CO; and 3 pipelines owned by Dominion Transmission Co, COLONIALPIPELINE CO, and Transcontinental Gas PL. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Prince William County and Manassas City in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Front Royal - Vint Hill 500kV

Proposed route intersects Historic Districts: Pilgrim's Rest and Bristersburg Historic District. Coordination with VA SHPO is required. Proposed route intersects 24 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Prince William; Fauquier; Culpepper; Rappahannock and Warren counties, VA. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed route intersects designated Critical Habitat for the following species: Yellow Lance. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 107 conservation easements. Coordination with the following easement holder(s) is required: Fauquier County, VA; Chesapeake Bay Foundation; VA Board of Historic Resources; VA Outdoors Foundation; NRCS; Northern Virginia Conservation Trust and Rockland Park.. The

proposed route intersects designated Scenic Rivers/Scenic Trails. Coordination with the following agencies is required: Appalachian National Scenic Trail Proposed route intersects streams that the State of Virginia has designated as Special Trout Waters. These streams include: portions of the Rappahannock River, Shenandoah and Occoquan River. Coordination with the USACE and the VA Dept. of Wildlife Resources (DWR) is needed.

This component crosses over 7 railroads owned by Norfolk Southern Railway; 111 road and highways (222 entrances) across Prince William County, Culpeper County, Rappahannock County, Fauquier County, Warren County; 29 transmission lines owned by Virginia Electric & Power Co and no owner available; 5 pipelines owned by Transcontinental Gas PL, Colonial Pipeline Co., Columbia Gas Trans Co. This component crosses over 1 Park crossing, Rockland Park, 1 trail crossing, Appalachian National Scenic Trail, 8 Conservation area crossing, Virginia Outdoors Foundation Easement, 17 Conservation Easement crossing, Fauquier Easement, 1 Conservation Easement, NRCS Easement, 1 Conservation Easement, NVCT Easement, 1 Easement crossing owned by VA Bd Hist Resources admin. by VA DHR. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Prince William County, Culpeper County, Rappahannock County, Fauquier County, Warren County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Cunningham - Middle Fork #1 500kV Transmission Line

The proposed component does not have the potential to impact environmental resources including FEMA floodplains or wetlands, but does have the potential to impact streams subject to USACE Section 404 and/or Section 10 permitting; woodlands with the potential to serve as suitable habitat for federally listed Threatened & Endangered Species. Impacts to these resources will require coordination with state wildlife agencies, USACE and USFWS. Proposed route does not intersect designated Critical Habitats. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species and critical habitats. Proposed route does not intersect conservation easements. Coordination with easement holders will not be required. Proposed route does not intersect mapped karst geology.

The component crosses approximately 2 roads (4 entrances) in Fluvanna County. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Fluvanna County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Cunningham - Middle Fork #2 500kV Transmission Line

The proposed component does not have the potential to impact environmental resources including FEMA floodplains or wetlands but does have the potential to impact streams subject to USACE Section 404 and/or Section 10 permitting; woodlands with the potential to serve as suitable habitat for federally listed Threatened & Endangered Species. Impacts to these resources will require coordination with state wildlife agencies, USACE and USFWS. Proposed route does not intersect designated Critical Habitats. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species and critical habitats. Proposed route does not intersect conservation easements. Coordination with easement holders will not be required. Proposed route does not intersect mapped karst geology.

The component crosses approximately 1 road (2 entrances) in Fluvanna County. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Fluvanna County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Middle Fork - Morrisville #1 500kV Transmission Line

The proposed route intersects with the following recorded Historical Sites/Structures/Districts: Green Springs Historic District. Coordination with the VA SHPO is required. Proposed route intersects 25 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Fauquier, Culpeper, Orange, Louisa, and Fluvanna, VA. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed route intersects designated Critical Habitat for the following species: Yellow Lance. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 23 conservation easements. Coordination with the following easement holder(s) is required: Fauquier County, VA; Fluvanna County, VA; Virginia Board of Historic Resources; Virginia Outdoors Foundation; US National Park Service and Piedmont Environmental Council. Proposed route intersects streams that the State of Virginia has designated as Special Trout Waters. These streams include Portions of the James River, Mattaponi River, Pamunkey River and Rappahannock River. Coordination with the USACE and the VA Dept. of Wildlife Resources (DWR) is needed.

The component crosses approximately 1 railroad owned by Buckingham Branch Railroad Company. There are approximately 124 road and highway crossings (248 entrances) across 5 counties; 9 transmission line crossings with VIRGINIA ELECTRIC & POWER CO; 8 pipeline crossings, 5 with COLONIAL PIPELINE CO, 2 with Transcontinental Gas PL, 1 with Columbia Gas Trans Co. It is anticipated that the proposal requires permits, consultations, clearances and authorization from 5 counties in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Middle Fork - Morrisville #2 500kV Transmission Line

Proposed route intersects Historic Districts: Green Spring Historic District. Coordination with VA SHPO is required. Proposed route intersects 25 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Fauquier, Culpepper, Orange, Louisa and Fluvanna counties, VA. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of

wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed route intersects designated Critical Habitat for the following species: Yellow Lance. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 31 conservation easements. Coordination with the following easement holder(s) is required: Fauquier County, VA; Virginia Board of Historic Resources; VA Outdoors Foundation; VA Dept of Forestry; US National Park Service and Piedmont Environmental Council. Proposed route intersects streams that the State of Virginia has designated as Special Trout Waters. These streams include Portions of James River, Mattaponi, Pamunkey and Rappahannock rivers. Coordination with the USACE and the VA Dept. of Wildlife Resources (DWR) is needed.

The component crosses approximately 1 railroad owned by Buckingham Branch Railroad Company. There are approximately 126 road and highway crossings (252 entrances) across 5 counties; 9 transmission line crossings with VIRGINIA ELECTRIC & POWER CO; 8 pipeline crossings, 5 with COLONIAL PIPELINE CO, 2 with Transcontinental Gas PL, 1 with Columbia Gas Trans Co. It is anticipated that the proposal requires permits, consultations, clearances and authorization from 5 counties in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Rawlings - South Fork

The proposed component has the potential to impact environmental resources including FEMA floodplains, wetlands, and streams subject to USACE Section 404 and/or Section 10 permitting; woodlands with the potential to serve as suitable habitat for federally listed Threatened & Endangered Species. Impacts to these resources will require coordination with state wildlife agencies, USACE and USFWS. Proposed route intersects 2 designated Critical Habitats, the Atlantic Pigtoe and Yellow Lance. Additionally, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species and critical habitats. Proposed route does intersect 12 conservation easements. Coordination with easement holders will be required. Proposed route does not intersect mapped karst geology.

This component crosses over 60 road and highways (120 entrances) across Brunswick County, and Dinwiddie County; 6 transmission lines owned by Virginia Electric & Power Co and no owner available; 1 pipeline owned by Columbia Gas Trans Co. This component crosses over 2 easements owned by VA Dept of Forestry and 2 military lands, Reams Station Battlefield. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Brunswick County, and Dinwiddie County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Middle Fork to South Fork 500 kV Transmission Line #1

The proposed route intersects with the following recorded Historical Sites/Structures/Districts: Inverness Historic District; and Bremo Plantation. Coordination with the VA SHPO is required. Proposed route intersects 39 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Dinwiddie County, Brunswick; Lunenburg; Nottoway; Prince Edward; Cumberland; Buckingham and Fluvania counties in Virginia. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of

listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed route intersects designated Critical Habitat for the following species: Yellow Lance and Atlantic pigtoe. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 32 conservation easements. Coordination with the following easement holder(s) is required: Ever Green Team; Va Dept of Conservation and Recreation; Virginia Board of Historic Resources; Virginia Dept of Forestry; Prince Edward County and American Battlefield Trust. The proposed route intersects designated Scenic Rivers/Scenic Trails. High Bridge Trail. Coordination with the following agencies is required: VA Dept of Conservation and Recreation. Proposed route intersects streams that the State of Virginia has designated as Special Trout Waters. These streams include portions of the Nottoway River and its free-flowing tributaries; Appomattox and its free-flowing tributaries; and the James River and its tributaries. Coordination with the USACE and the VA Dept. of Wildlife Resources (DWR) is needed.

This component crosses over 4 railroads owned by CSXT and Norfolk Southern Railway; 165 road and highways(330 entrances) across Fluvanna County, Buckingham County, Cumberland County, Prince Edward County, Nottoway County, Lunenburg County, Brunswick County, Dinwiddie County; 15 transmission lines owned by Virginia Electric & Power Co and no owner available; 4 pipelines owned by Kinder Morgan, Colonial Pipeline Co., Columbia Gas Trans Co. This component crosses over 2 trail state park crossings, High Bridge Trail State Park; 6 open space crossings, Conservation area crossing owned by VA Dept of Forestry, Easement crossings owned by Ever Green Team, Reservoir Crossing, Sandy River Reservoir, Easement crossing owned by VA Bd Hist Resources admin. by VA DHR; 4 military land crossings, Reams Station battlefield and military easements. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Fluvanna County, Buckingham County, Cumberland County, Prince Edward County, Nottoway County, Lunenburg County, Brunswick County, Dinwiddie County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

South Fork to Carson 500 kV

The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed.

The component crosses approximately 1 road (2 entrances) in Dinwiddie County; and 1 transmission line with no owner available. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Dinwiddie County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Middle Fork to South Fork 500 kV Transmission Line #2

The proposed route intersects with the following recorded Historical Sites/Structures/Districts: Breemo Plantation. Coordination with the VA SHPO is required Proposed route intersects 37 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Dinwiddie County, Brunswick; Lunenburg; Nottoway; Prince Edward; Cumberland; Buckingham and Fluvanna counties in Virginia.VA. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects

Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed route intersects designated Critical Habitat for the following species: Yellow Lance and Atlantic pigtoe. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 29 conservation easements. Coordination with the following easement holder(s) is required: Ever Green Team; Va Dept of Conservation and Recreation; Virginia Board of Historic Resources; Virginia Dept of Forestry; Prince Edward County; Civil War Trust; and American Battlefield Trust. The proposed route intersects Natural Areas/Reserves/Wildlife Refuge. Coordination with the following agencies is required: Virginia Dept of Conservation; American Battlefield Trust; and Prince Edward County, VA. Proposed route intersects streams that the State of Virginia has designated as Special Trout Waters. These streams include portions of the Nottoway River and its free-flowing tributaries; Appomattox River and its free-flowing tributaries and the James River and its free-flowing tributaries. Coordination with the USACE and the VA Dept. of Wildlife Resources (DWR) is needed.

The proposed route intersects 4 railroads: 3 owned by Norfolk Southern Railway Company and 1 unknown owner. There are approximately 169 road crossings. 11 road crossings and 3 highway crossings in Fluvanna County; 12 road crossings in Buckingham County; 19 road crossings in Cumberland County; 8 road crossings and 2 highway crossings in Prince Edward County ; 17 road crossings and 6 highway crossings in Nottoway County; 10 road crossings in Lunenburg County; 17 road crossings and 1 highway crossing in Brunswick County; and 43 road crossings and 3 highway crossing in Dinwiddle County. There are approximately 17 transmission lines identified: 7 unknown owners and 9 owned by VIRGINIA ELECTRIC & POWER CO. The route intersects 5 pipelines: 4 owned by COLONIAL PIPELINE CO and 1 owned by KINDER MORGAN. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from the 7 counties (Fluvanna, Buckingham, Cumberland, Prince Edward, Nottoway, Lunenburg, Brunswick and Dinwiddie) in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Transmission Line Risk Analysis

Component 12: Warrenton - Wheeler 230kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the overhead portion of the line utilizes a 2-bundle 1272 kcmil ACSS “Pheasant” conductor arrangement and tubular steel monopole structures that are self-supporting on foundations. The underground portion utilizes 5000 kcmil enameled coated copper cable. The conductor supports the ratings outlined in the proposal** while the underground portion cannot be verified for capacity without thermal resistivity testing.

The 125ft wide ROW for the overhead portion is a bit tight, as we would typically expect 150ft for a 230kV line with 900ft+ spans. Additionally, the underground ROW width of 5ft will not be wide enough. There should be no concerns with vehicle access due to the terrain and location. There are no crossings on the overhead portion of the line. The underground portion is within a residential road which will lead to some access restrictions requiring lane closures. The design is feasible due to flat terrain, although trenchless crossings require a wider right-of-way (ROW), and staggered splice vaults could increase complexity.

Larger ROWs may be needed at manholes for maintenance. The route covers 9.7 acres and traverses a narrow two-lane road with residential areas. Future maintenance would require lane closures and traffic control. This project aligns with typical line design practices, otherwise the overhead portion creates no unique hazards to maintenance. It is a single-circuit-only design, which limits future upgrades that could be had by utilizing a vertical future-double-circuit design. The public may prefer an underground line over overhead lines.

From a procurement perspective, there are (22) structures that will be required and 32 miles of conductor needed. This is a modest quantity of material to procure. Additionally, some riser structure components are currently carrying very long lead times. Procurement lead times are contingent on manufacturer availability, with enameled cable having longer manufacturing times compared to Millikin cable. This dependency adds risk to the procurement timeline.

Finally, the mostly flat and rural nature of the overhead route does not provide any terrain concerns. We would not expect heavy restrictions on noise and pollution due to the limited population along the overhead route and a complex sequencing of outages will not be required since the line is entirely greenfield. The underground portion is much closer to the community and will likely require restrictions during construction.

Component 13: Vint Hill - Brickyard 230kV Greenfield Line

The Vint Hill - Brickyard 230kV Greenfield Line involves constructing an underground transmission line with various challenges. While design and construction can proceed within the timeline, the integration of all components presents risks, particularly due to potential roadblocks with private properties and trenchless construction. Horizontal directional drilling (HDD) and jack and bore (J&B) operations contribute to the risk level for constructability and feasibility. The railroad crossing poses a additional risk for both feasibility and permitting, and the river crossing introduces moderate design complexity. Additionally, overhead lines along Nokesville Road may complicate underground operations.

Land and ROW acquisition risks are present, with a total of 12.1 acres affected. The need to access private corridors and land parcels, especially for railroad crossings, presents risk. While public ROW areas are less problematic, they

still pose challenges. However, the preference for underground lines over overhead lines by the public helps mitigate some risks.

Procurement lead times depend on manufacturer availability, with enameled cable typically requiring longer manufacturing times compared to Millikin cable. This dependency adds risk to the procurement timeline.

Outage coordination may involve crossing existing underground lines, requiring outages. There is a minor concern regarding outages at substation terminations.

Component 14: Front Royal - Vint Hill 500kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the overhead portion of the line utilizes a 3-bundle 954 kcmil ACSS “Cardinal” arrangement and tubular steel monopole structures that are self-supporting on foundations. The conductor supports the ratings outlined in the proposal.** Though it should be noted that the provided P&Ps list a Bittern ACSS, contradicting the proposal.

The ROW width of 175ft will be sufficient for a line of this configuration. Vehicle access may be difficult at some locations due to the steep terrain near the beginning of the line. There are a number of crossings along the route including eight high-voltage lines, five railroads, four highways, two major waterbodies, and three swamp/marshland areas. For a 64-mile route, it is an expected quantity of crossings. One of the river crossings will require a span in excess of 2500ft.

We did not observe any future maintenance issues with this line outside of possibly the first two spans due to the congested substation area. This project aligns with typical line design practices, otherwise. It is a single-circuit-only design, which limits future upgrades that could be had by utilizing a vertical future-double-circuit design.

From a procurement perspective, there are a significant number of structures (381) that will be required and over 700 miles of conductor needed. This is a large quantity of material to procure, but most of the material should not carry procurement risks beyond typical EHV hardware lead times.

While some lower-lying wetlands may require unique foundations, there are not a lot of these identified along the route. We would not expect heavy restrictions on noise and pollution due to the limited population along the route. There may be some limitations near Vint Hill as the line approaches the population. A complex sequencing of outages will not be required since the line is entirely greenfield.

Component 15: Cunningham - Middle Fork #1 500kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the overhead portion of the line utilizes a 3-bundle 954 kcmil ACSS “Cardinal” arrangement and tubular steel monopole structures that are self-supporting on foundations. The conductor supports the ratings outlined in the proposal.**

The ROW width of 175ft will be sufficient for a line of this configuration. There should be no concerns with vehicle access due to the terrain and location of the line. There are no crossings along the route.

We did not observe any future maintenance issues with this line. This project aligns with typical line design practices and will create no unique hazards for maintenance. It is a single-circuit-only design, which limits future upgrades.

This component and component 16 could reasonably have been combined on to double-circuit monopoles to reduce footprint and allow for further expansion in the future.

From a procurement perspective, there are a small number of structures (4) that will be required and not a lot of conductor required. This is a modest quantity of material to procure, and most of the material should not carry procurement risks beyond typical EHV hardware lead times.

Finally, the mostly flat and rural nature of the route does not provide any terrain concerns. We would not expect heavy restrictions on noise and pollution due to the limited population along the route and a complex sequencing of outages will not be required since the line is entirely greenfield.

Component 16: Cunningham - Middle Fork #2 500kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the overhead portion of the line utilizes a 3-bundle 954 kcmil ACSS “Cardinal” arrangement and tubular steel monopole structures that are self-supporting on foundations. The conductor supports the ratings outlined in the proposal.**

The ROW width of 175ft will be sufficient for a line of this configuration. There should be no concerns with vehicle access due to the terrain and location of the line. There are no crossings along the route.

We did not observe any future maintenance issues with this line. This project aligns with typical line design practices and will create no unique hazards for maintenance. It is a single-circuit-only design, which limits future upgrades. This component and component 15 could reasonably have been combined onto double-circuit monopoles to reduce footprint and allow for further expansion in the future.

From a procurement perspective, there are a small number of structures (4) that will be required and not a lot of conductor required. This is a modest quantity of material to procure, and most of the material should not carry procurement risks beyond typical EHV hardware lead times.

Finally, the mostly flat and rural nature of the route does not provide any terrain concerns. We would not expect heavy restrictions on noise and pollution due to the limited population along the route and a complex sequencing of outages will not be required since the line is entirely greenfield.

Component 17: Middle Fork - Morrisville #1 500kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the overhead portion of the line utilizes a 3-bundle 1351.5 kcmil ACSS “Martin” arrangement and tubular steel monopole structures that are self-supporting on foundations. The conductor supports the ratings outlined in the proposal.**

The ROW width of 175ft will be sufficient for a line of this configuration. There should be no concerns with vehicle access due to the terrain and structure locations. There are a number of crossings along the route including five high-voltage lines, three highways, one railroad, and three major water bodies. For a 71.1-mile route, it is a low-quantity of crossings which lends to the very rural nature of the area.

We did not observe any future maintenance issues with this line. This project aligns with typical line design practices and will create no unique hazards for maintenance. It is a single-circuit-only design, which limits future upgrades. This component and component 18 could have been combined onto double-circuit monopoles to reduce footprint and

allow for further expansion in the future. However, it is reasonable to take the approach used due to the size and height of double-circuit 500kV structures, which see limited use in this country.

From a procurement perspective, there are a significant number of structures (328) that will be required and over 780 miles of conductor needed. This is a large quantity of material to procure in the defined schedule. Most of the material should not carry procurement risks beyond typical EHV hardware lead times.

Finally, the mostly flat and rural nature of the route does not provide any terrain concerns. We would not expect heavy restrictions on noise and pollution due to the limited population along the route and a complex sequencing of outages will not be required since the line is entirely greenfield.

Component 18: Middle Fork - Morrisville #2 500kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the overhead portion of the line utilizes a 3-bundle 1351.5 kcmil ACSS “Martin” arrangement and tubular steel monopole structures that are self-supporting on foundations. The conductor supports the ratings outlined in the proposal.**

The ROW width of 175ft will be sufficient for a line of this configuration. There should be no concerns with vehicle access due to the terrain and structure locations. There are a number of crossings along the route including five high-voltage lines, three highways, one railroad, and three major water bodies. For a 71.1-mile route, it is a low-quantity of crossings which lends to the very rural nature of the area.

We did not observe any future maintenance issues with this line. This project aligns with typical line design practices and will create no unique hazards for maintenance. It is a single-circuit-only design, which limits future upgrades. This component and component 17 could have been combined onto double-circuit monopoles to reduce footprint and allow for further expansion in the future. However, it is reasonable to take the approach used due to the size and height of double-circuit 500kV structures, which see limited use in this country.

From a procurement perspective, there are a significant number of structures (283) that will be required and over 780 miles of conductor needed. This is a large quantity of material to procure in the defined schedule. Most of the material should not carry procurement risks beyond typical EHV hardware lead times.

Finally, the mostly flat and rural nature of the route does not provide any terrain concerns. We would not expect heavy restrictions on noise and pollution due to the limited population along the route and a complex sequencing of outages will not be required since the line is entirely greenfield.

Component 19/20: Rawlings - South Fork 500kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the overhead portion of the line utilizes a 3-bundle 954 kcmil ACSS “Cardinal” arrangement and tubular steel monopole structures that are self-supporting on foundations. The conductor supports the ratings outlined in the proposal.**

The ROW width of 175ft will be sufficient for a line of this configuration. There should be no concerns with vehicle access due to the terrain and location of the line. There are a number of crossings along the route including six high-voltage lines and one highway. For a 22.5-mile route, it is a low-quantity of crossings which lends to the very rural nature of the area.

We did not observe any future maintenance issues with this line. This project aligns with typical line design practices and will create no unique hazards for maintenance. It is a single-circuit-only design, which limits future upgrades. It was noted that some modifications to existing facilities may be required at the crossings near South Fork where it is more congested.

From a procurement perspective, there are a significant number of structures (97) that will be required and over 240 miles of conductor needed. This is a large quantity of material to procure, but most of the material should not carry procurement risks beyond typical EHV hardware lead times.

Finally, the mostly flat and rural nature of the route does not provide any terrain concerns. We would not expect heavy restrictions on noise and pollution due to the limited population along the route and a complex sequencing of outages will not be required since the line is entirely greenfield.

Component 21: South Fork - Carson 500kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the overhead portion of the line utilizes a 3-bundle 954 kcmil ACSS “Cardinal” arrangement and tubular steel monopole structures that are self-supporting on foundations. The conductor supports the ratings outlined in the proposal.**

The ROW width of 175ft will be sufficient for a line of this configuration. There should be no concerns with vehicle access due to the terrain and location of the line. There is one high-voltage line crossing but otherwise, there are no obstacles on this short route.

We did not observe any future maintenance issues with this line. This project aligns with typical line design practices and will create no unique hazards for maintenance. It is a single-circuit-only design, which limits future upgrades.

From a procurement perspective, there are a small number of structures (3) that will be required and not much conductor needed. We see no concerns with procuring this material in the schedule outlined.

Finally, the mostly flat and rural nature of the route does not provide any terrain concerns. We would not expect heavy restrictions on noise and pollution due to the limited population along the route and a complex sequencing of outages will not be required since the line is entirely greenfield.

Component 22: Middle Fork - South Fork #1 500kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the overhead portion of the line utilizes a 3-bundle 1351.5 kcmil ACSS “Martin” arrangement and tubular steel monopole structures that are self-supporting on foundations. The conductor supports the ratings outlined in the proposal.**

The ROW width of 175ft will be sufficient for a line of this configuration. There should be no concerns with vehicle access due to the terrain and locations. There are a number of crossings along the route including nine high-voltage lines, two railroads, three highways, three major water bodies, and two swamps/marshland areas. For an 116-mile route, it is a low-quantity of crossings which lends to the very rural nature of the area. There are a couple of line crossings that don't appear necessary and could be reduced with refinement of the route.

We did not observe any future maintenance issues with this line. This project aligns with typical line design practices and will create no unique hazards for maintenance. It is a single-circuit-only design, which limits future upgrades. This component and component 23 could have been combined onto double-circuit monopoles to reduce footprint and allow for further expansion in the future. However, it is reasonable to take the approach used due to the size and height of double-circuit 500kV structures, which see limited use in this country.

From a procurement perspective, there are a significant number of structures (517) that will be required and over 1275 miles of conductor needed. This is a large quantity of material to procure in the defined schedule. Most of the material should not carry procurement risks beyond typical EHV hardware lead times.

Finally, the mostly flat and rural nature of the route does not provide any terrain concerns. While some lower-lying wetlands may require unique foundations, there are not a lot of these identified along the route. We would not expect heavy restrictions on noise and pollution due to the limited population along the route and a complex sequencing of outages will not be required since the line is entirely greenfield.

Component 23: Middle Fork - South Fork #2 500kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the overhead portion of the line utilizes a 3-bundle 1351.5 kcmil ACSS “Martin” arrangement and tubular steel monopole structures that are self-supporting on foundations. The conductor supports the ratings outlined in the proposal.**

The ROW width of 175ft will be sufficient for a line of this configuration. There should be no concerns with vehicle access due to the terrain and locations. There are a number of crossings along the route including nine high-voltage lines, two railroads, three highways, three major water bodies, and two swamps/marshland areas. For an 116-mile route, it is a low-quantity of crossings which lends to the very rural nature of the area. There are a couple of line crossings that don’t appear necessary and could be reduced with refinement of the route.

We did not observe any future maintenance issues with this line. This project aligns with typical line design practices and will create no unique hazards for maintenance. It is a single-circuit-only design, which limits future upgrades. This component and component 23 could have been combined onto double-circuit monopoles to reduce footprint and allow for further expansion in the future. However, it is reasonable to take the approach used due to the size and height of double-circuit 500kV structures, which see limited use in this country.

From a procurement perspective, there are a significant number of structures (531) that will be required and over 1275 miles of conductor needed. This is a large quantity of material to procure in the defined schedule. Most of the material should not carry procurement risks beyond typical EHV hardware lead times.

Finally, the mostly flat and rural nature of the route does not provide any terrain concerns. While some lower-lying wetlands may require unique foundations, there are not a lot of these identified along the route. We would not expect heavy restrictions on noise and pollution due to the limited population along the route and a complex sequencing of outages will not be required since the line is entirely greenfield.

Substation Risk Analysis

Component 1: Middle Fork Substation

The Middle Fork Substation project will establish a major new extra-high-voltage transmission hub designed to strengthen regional grid reliability and enhance system capacity within the 765 kV and 500 kV networks. The facility will include a 4-position, double-breaker double-bus 765 kV yard providing full operational flexibility and redundancy for high-voltage transmission interconnections. Two (2) 765/500 kV autotransformers will provide voltage transformation between the 765 kV and 500 kV systems, enabling efficient bulk power transfer and system stability. The substation will also feature an 8-position breaker-and-a-half 500 kV yard configured for reliability, maintainability, and future expansion. Additionally, two (2) 500 kV fixed series capacitor banks will be installed to improve system voltage support and enhance power transfer capability on the connected transmission corridors. The Middle Fork Substation will serve as a key node in the high-voltage transmission network, integrating robust design, advanced protection systems, and operational flexibility to support long-term regional energy delivery needs.

There are some major concerns with the procurement window for 765kV transformers as well as the procurement of the site due to high voltage and large size of the equipment. Current scheduled projects show that this substation will not be able to go into service until almost 2 years after the proposal's stated in service date.

Component 2: South Fork Substation

The South Fork Substation project will establish a new 500 kV transmission facility designed to enhance grid reliability, operational flexibility, and power transfer capability within the regional network. The substation will feature a 4-position breaker-and-a-half 500 kV yard configured to provide high reliability, maintenance flexibility, and uninterrupted service during equipment outages. The design will also include two (2) 500 kV fixed series capacitor banks to improve voltage stability, optimize power flow, and increase transmission efficiency across interconnected lines. The South Fork Substation will serve as a critical reinforcement point within the 500 kV system, incorporating modern protection, control, and monitoring systems consistent with current Dominion Energy engineering and operational standards.

Component 3: Turkey Creek Substation

The Turkey Creek Substation project will establish a new 500 kV transmission facility designed to improve system reliability, operational flexibility, and regional transmission capacity. The substation will feature a 4-position breaker-and-a-half 500 kV yard configured to provide high reliability and flexibility for system operation, allowing maintenance or switching activities to be performed without interrupting service. The new yard will be constructed in accordance with current Dominion Energy design and protection standards and will incorporate modern high-voltage equipment, protection, control, and communication systems to ensure safe and efficient operation. Once complete, the Turkey Creek Substation will serve as a key node in the 500 kV network, supporting future system growth and enhancing overall grid stability.

Constructability Summary

From a substation perspective, constructability risk profile for this proposal is driven primarily by the extra-high-voltage components—specifically the 765 kV and 500 kV greenfield or major-equipment-intensive substations. The Middle Fork 765/500 kV Substation represents the highest risk due to long procurement windows for 765 kV transformers, and the size and complexity of the site. The lower voltage substation components—Warrenton, Wheeler, Brickyard, Cunningham, Morrisville, Rawlings, and Carson—carry lower constructability risks.

This proposal includes a significant amount of greenfield transmission lines (about 477 miles, in total) which carry the most risk with regard to procurement of right-of-way and general siting of the lines. The Warrenton-Wheeler 230 kV project is notable due to the known opposition to transmission projects within Fauquier county, and although somewhat mitigated with about half of its alignment routed underground, still poses concerns from the siting and land acquisition perspective.

The overall constructability risk of this proposal is rated as **High**, primarily driven by the large quantity of land acquisition required for this major greenfield project, and anticipated opposition to some of its components.

Outage Review

Due to the primary greenfield nature of this project, only short outages to existing facilities to tie in the new transmission facilities, and therefore no significant existing facility outages are anticipated. Overall outage coordination risk is deemed **Low**.

Cost Review

A high-level cost estimate was created for each proposal to assess the cost component for potential omissions or under-estimating. Cost estimates were broken into eight categories, including Engineering & Design, Permitting/Routing/Siting, ROW/Land Acquisition, Materials & Equipment, Construction & Commissioning, Construction Management, Overheads and Miscellaneous, and Risk Contingency (30%). The cost comparison for this proposal, broken down by component, is outlined below.

Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
1	Middle Fork Substation	\$294.77	\$265.27
2	South Fork Substation	\$115.45	\$78.18
3	Turkey Creek Substation	\$39.57	\$53.15
4	Warrenton Expansion	\$5.33	\$12.89
5	Wheeler Expansion	\$3.05	\$5.80
6	Brickyard Expansion	\$5.33	\$6.75
7	Vint Hill Expansion	\$13.49	\$14.04
8	Cunningham Expansion	\$20.80	\$24.16
9	Morrisville Expansion	\$20.80	\$27.81
10	Rawlings Expansion	\$8.92	\$4.60
11	Carson Expansion	\$8.92	\$19.60
12	Warrenton - Wheeler	\$127.11	\$125.64
13	Vint Hill - Brickyard	\$143.75	\$171.44
14	Front Royal - Vint Hill	\$464.45	\$378.42
15	Cunningham - Middle Fork #1	\$4.80	\$7.37

16	Cunningham - Middle Fork #2	\$4.80	\$7.37
17	Middle Fork - Morrisville #1	\$399.76	\$376.82
18	Middle Fork - Morrisville #2	\$399.76	\$361.49
19/20	Rawlings - South Fork	\$126.51	\$119.77
21	South Fork - Carson	\$2.40	\$5.63
22	Middle Fork - South Fork #1	\$649.96	\$604.70
23	Middle Fork to South Fork #2	\$649.96	\$610.17
24	Joshua Falls to Yeat	\$2.09	\$6.73
25	Elmont - Cunningham	\$2.09	\$5.91
26	Midlothian - North Anna	\$2.09	\$5.91
Total		\$3,515.95	\$3,299.64

The proposal cost estimate is within 10% of the independent cost estimate. The cost estimate risk is considered **Low** risk.

Schedule Review

This proposal projects an in-service date of June 1, 2030.

Overall, the primary schedule risks for this proposal are driven by the anticipated lengthy process for the land acquisition, permitting and siting of the proposed greenfield line routes. **High** schedule risks are assessed for this project.

Proposing Entity Experience and Capability Review

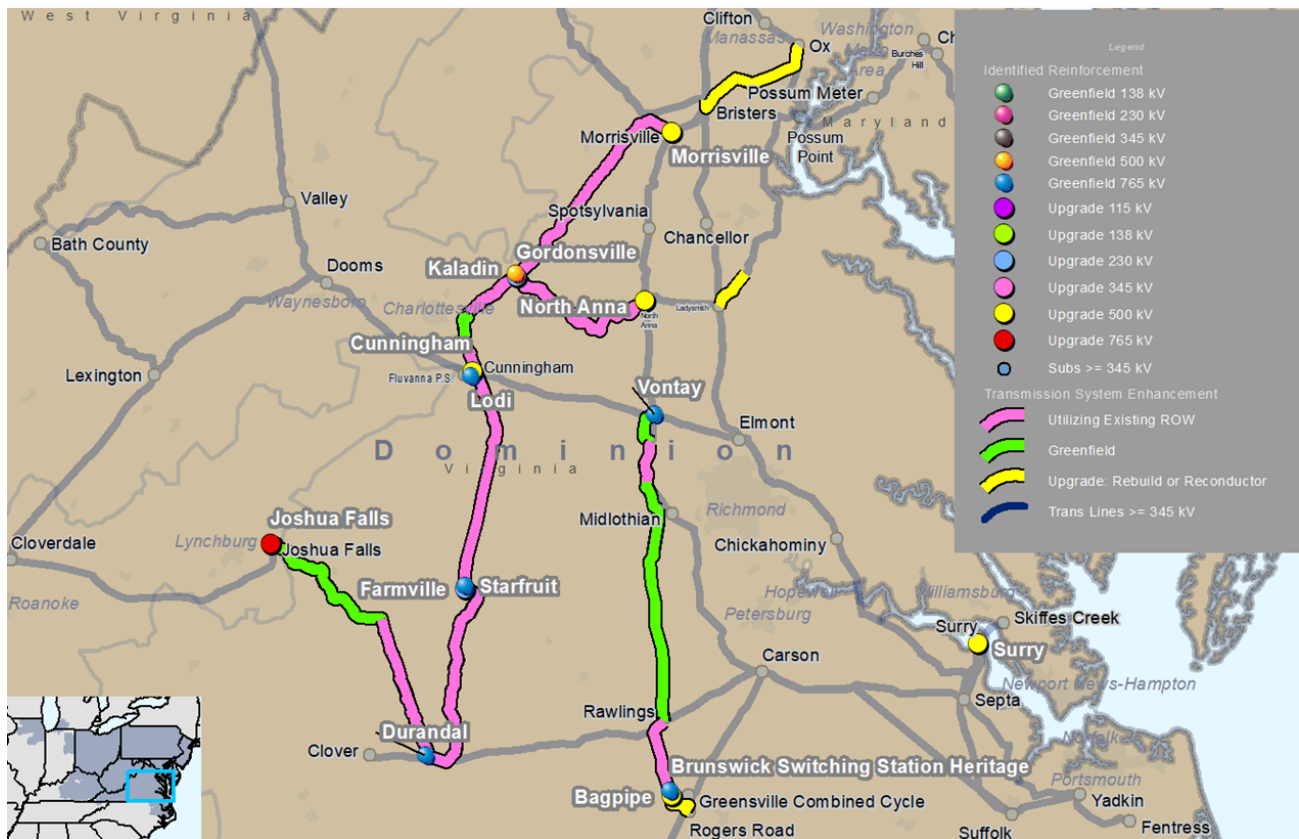
LS Power has significant experience constructing and operating 500 kV transmission which represents the significant scope for Proposal 260. The proposing entity experience and capability risk is considered **Low**.

Proposal 331 – Virginia Area Seven Year Solution 1 (Transsource/FE)

The purpose of this project is to address violations identified in PJM's 2032 model for the Virginia area by constructing several 765kV Greenfield lines, 765/500/230kV Greenfield Substations, expanding other area substations, and rebuilding multiple 500kV lines. This proposal will traverse numerous counties throughout the state of Virginia, stretching from the Washington, DC suburbs down to within 15 miles of the North Carolina state line, and as far west as Lynchburg. This proposal has a total of 29 components, including 8 substation upgrade components, 6 greenfield substation components, 8 greenfield transmission line components, 4 Substation Cut-in components, and 3 transmission line rebuild components.

Map 6 displays the routes proposed for Proposal 331.

Map 6. Proposal 331



NOTE: 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.

Project Overview

Proposal 331 includes the following components:

- Component 1: Joshua Falls - Durandal 765kV Greenfield Line
- Component 2: Durandal - Starfruit 765kV Greenfield Line

- Component 3: Starfruit - Lodi 765kV Greenfield Line
- Component 4: Kraken - Ladysmith 500kV Rebuild
- Component 5: Yeat – Ox 500kV Rebuild
- Component 6: Surry Station Upgrade
- Component 7: Joshua Falls 765 kV Station Expansion
- Component 8: Durandal Greenfield Station
- Component 9: Starfruit 765/230 kV Greenfield Station
- Component 10: Lodi 765/500 kV Greenfield Station
- Component 11: Kaladin 500/230 kV Greenfield Station
- Component 12: Cunningham Station Expansion
- Component 13: North Anna 500 kV Station Expansion
- Component 14: Morrisville 500 kV Station Upgrades
- Component 15: Cunningham - Lodi 500kV Greenfield Line
- Component 16: Kaladin - Lodi 500kV Greenfield Line
- Component 17: Kaladin - North Anna 500kV Greenfield Line
- Component 18: Kaladin - Morrisville 500kV Greenfield Line
- Component 19: Farmville Station Upgrade
- Component 20: Durandal 500kV Substation Cut-ins
- Component 21: Gordonsville Station upgrade
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- Component 28: Bagpipe - Heritage 500kV Substation Cut In
- Component 29: Vontay - North Anna 500kV Rebuild

Constructability Review

Right-of-Way/Land Acquisition Risk Analysis

Component 1: Joshua Falls - Durandal 765kV Greenfield Line

The Joshua Falls – Durandal Greenfield line is a 55-mile 765kV, single-circuit line, which will be built in southern Virginia between the existing Joshua Falls Station and the proposed Durandal Station. This line will traverse Campbell, Appomattox, Prince Edward, and Charlotte Counties. Approximately 35 miles of the route will parallel existing transmission line Right-of-Way with periodic breaks along the route to avoid structures and residences.

Approximately 20 miles of the route will utilize new routes to traverse from one ROW parallel section to another or travel areas with no existing ROW. New ROW will be required throughout regardless of expansion or new ROW.

The proposal indicated 180ft ROW width. At a width of 200ft, the new ROW required will be approximately 1348 acres (1213 acres at 180ft wide). The entire route is very rural and impacts few structures and populations.

Component 2: Durandal - Starfruit 765kV Greenfield Line

The Durandal – Starfruit Greenfield line is a 40-mile 765kV, single-circuit line, which will be built in southern Virginia between the proposed Durandal Station and the proposed Starfruit Station. This line will traverse Prince Edward, Lunenburg, Mecklenburg, and Charlotte Counties. The entire route will parallel existing transmission line Right-of-Way with periodic breaks along the route to avoid structures and residences. New ROW will be required regardless of expansion or new ROW.

At a width of 200ft, the new ROW required will be approximately 975 acres. The entire route is very rural and impacts few structures and populations.

Component 3: Starfruit - Lodi 765kV Greenfield Line

The Starfruit - Lodi Greenfield line is a 42-mile 765kV, single-circuit line, which will be built in central Virginia between the proposed Starfruit Station and the proposed Lodi Station. This line will traverse Fluvanna, Buckingham, Cumberland, and Prince Edward Counties. The entire route will parallel existing transmission line Right-of-Way with periodic breaks along the route to avoid structures and residences. New ROW will be required regardless of expansion or new ROW.

The proposal indicated 180ft ROW width. We do not feel that is enough for a line of this configuration, and this proposal uses 200ft for other components that is more appropriate. At a width of 200ft, the new ROW required will be approximately 1013 acres (912 acres at 180ft wide). The entire route is very rural and impacts more structures than the previous two components.

Component 8: Durandal Greenfield Station

This component is a greenfield substation located in Charlotte County, Virginia and will require a new land parcel. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

The proposed site seems adequate to house the component; however, 765kV substations can generate public interest and opposition due to the high voltage and large size of the equipment.

Component 9: Starfruit 765/230 kV Greenfield Station

This component is a greenfield substation located in Cumberland County, Virginia, and will require a new land parcel. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

Component 10: Lodi 765/500 kV Greenfield Station

This component is a greenfield substation located in Fluvanna County, Virginia, and will require a new land parcel. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

Component 11: Kaladin 500/230 kV Greenfield Station

This component is a greenfield substation located in Albemarle County, Virginia, and will require a new land parcel. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

Component 15: Cunningham - Lodi 500kV Greenfield Line

The Cunningham – Lodi Greenfield line is a 1.2-mile 500kV, single-circuit line, which will be built in central Virginia between the existing Cunningham Station and the proposed Lodi Station. This line will sit entirely within Fluvanna County. The entire route will parallel existing transmission line Right-of-Way or be contained within substation properties. New ROW will be required for the route regardless of expansion or new ROW.

The proposal indicated 175ft ROW width, which parallels existing ROW and totals 42 acres of land acquisition. This acquisition takes place on what appears to be only a handful of properties and wooded areas. The route is very rural and has no impact on existing structures.

Component 16: Kaladin - Lodi 500kV Greenfield Line

The Kaladin - Lodi Greenfield line is a 22.5-mile 500kV, single-circuit line, which will be built in central Virginia between the proposed Kaladin Station and the proposed Lodi Station. This line will traverse Albemarle and Buckingham Counties. Most of the route will parallel existing transmission line Right-of-Way with periodic breaks along the route to avoid structures and residences and a 5.2-mile section in the middle that traverses from one existing ROW to another. New ROW will be required.

Component 17: Kaladin - North Anna 500kV Greenfield Line

The Kaladin – North Anna Greenfield line is a 32.5-mile 500kV, single-circuit line, which will be built in central Virginia between the proposed Kaladin Station and the existing North Anna Station. This line will traverse Louisa County. Most of the route will parallel existing transmission line Right-of-Way with periodic breaks along the route to avoid structures and residences and a 4.4-mile section in the middle that breaks a good distance from the existing ROW to avoid some obstacles and a 3.2-mile section at the end that is opposite the railroad from the existing ROW.

Component 18: Kaladin - Morrisville 500kV Greenfield Line

The Kaladin – Morrisville Greenfield line is a 43.5-mile 500kV, single-circuit line, which will be built in Northern Virginia between the proposed Kaladin Station and the existing Morrisville Station. This line will traverse Spotsylvania and Fauquier Counties. Much of the route will parallel existing transmission line Right-of-Way with periodic breaks along the route to avoid structures and residences. There is a 7-mile section and a 2.3-mile section along the route that breaks into pure greenfield routes to traverse between various existing ROW. A good portion of the 7-mile section parallels a railroad.

Component 23: Bagpipe 765/500 kV Greenfield Station

This component is a greenfield substation located in Brunswick County, Virginia, and will require a new land parcel. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

Component 24: Vontay 765/500 kV Greenfield Station

This component is a greenfield substation located in Hanover County, Virginia and will require a new land parcel. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

Component 26: Bagpipe - Vontay 765kV Greenfield Line

The Bagpipe – Vontay Greenfield line is a 73.6-mile 765kV, single-circuit line, which will be built in southern and central Virginia between the proposed Bagpipe Station and the proposed Vontay Station. This line will traverse Hanover, Goochland, Powhatan, Chesterfield, Amelia, Dinwiddie, and Brunswick Counties. Only approximately 20 miles of the route will parallel existing transmission line Right-of-Way with periodic breaks along to avoid structures and residences. The remainder of the line travels an entirely independent route through rural land. As the line approaches Richmond, it begins to hit more populated areas with the northernmost 28-miles being considered the “Exurbs” of Richmond. New ROW will be required throughout regardless of expansion or new ROW.

At a width of 200ft, the new ROW required will be approximately 1784 acres. While much of the route is rural, it becomes more populated as the route enters the Richmond area and approximately 8 miles of the route could be considered light-suburban area.

Overall, a **Medium-High** risk is assessed for ROW/Land Acquisition due to the mix of greenfield and paralleling existing ROW for the alignment of the proposed projects.

*Environmental Risk Analysis**Joshua Falls - Durandal 765kV line*

Proposed route does not intersect designated Critical Habitat. However, the potential for federally listed endangered/threatened species to occur within the route corridor does exist. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species.

The component crosses approximately 4 railroads owned by Norfolk Southern Railway Company; 100 roads and highways (200 entrances) across 4 counties (Charlotte, Prince Edward, Appomattox, and Campbell County); 3 transmission lines, 1 owned by APPALACHIAN POWER CO, 1 owned by VIRGINIA ELECTRIC & POWER CO, 1 owned by an unknown company; and 3 pipelines, 1 owned by KINDER MORGAN, 1 owned by COLONIALPIPELINE CO, 1 owned by Transcontinental Gas PL. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from 4 counties in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Durandal - Starfruit 765kV line

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting. Desktop analysis indicates that the proposed route intersects with farmland. Verification in the field would need to be completed. Proposed route intersects 9 easements owned by PVT and 2 parks (fee), owned by City of Farmville and VA Drpt of Conservation and Recreation. However, the proposed route is almost entirely parallel to existing ROW which would likely ease permitting.

The proposed route intersects 3 railroads; 1 owned by Norfolk Southern Railway Company and 2 owned by Buckingham Branch Railroad Company. There are approximately 35 road crossings. 4 road crossings and 1 highway crossings in Mecklenburg County, 14 road crossings and 1 highway crossings in Lunenburg County, 13 road crossings and 2 highway crossings in Prince Edward County. There are Approximately 7 transmission lines identified; 4 unknown owners, 3 owned by VIRGINIA ELECTRIC & POWER CO. The proposed route intersects 1 pipeline owned by Kinder Morgan. The proposed route intersects 2 parks (fee), owned by City of Farmville and VA Drpt of Conservation and Recreation. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from the 5 counties (Charlotte, Cumberland, Mecklenburg, Lunenburg and Prince Edward) in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Starfruit - Lodi 765kV line

The proposed route intersects with the following recorded Historical Sites/Structures/Districts: Bremo Plantation. Coordination with the VA SHPO is required Proposed route intersects 16 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Fluvanna; Buckingham; Cumberland and Prince Edward counties, VA. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. Permit authorization may take up to 12-months to complete. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed route intersects designated Critical Habitat for the following species: Atlantic pigtoe (mussel). Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 12 conservation easements. Coordination with the following easement holder(s) is required: Ever Green Team; VA Dept of Forestry; and VA Outdoors Foundation. Proposed route intersects streams that the State of Virginia has designated as Special Trout Waters. These streams include: James River and its free flowing tributaries; Appomattox and its tributaries. Coordination with the USACE and the VA Dept. of Wildlife Resources (DWR) is needed.

This component crosses over 2 railroads owned by CSXT; 50 road and highways(100 entrances) across Fluvanna, Buckingham and Cumberland County; 7 transmission lines owned by Virginia Electric & Power Co and no owner available; 2 pipelines owned by Colonial Pipeline Co. This component crosses over 1 Conservation Easement crossing owned by VA Outdoors Foundation, 1 Easement crossing owned by VA Bd Hist Resources admin. by VA DHR, 1 Conservation Easement owned by VA Dept of Forestry, 1 Easement crossing owned by Ever Green Team. It

is anticipated that the proposal requires permits, consultations, clearances and authorization from Fluvanna, Buckingham and Cumberland County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Durandal Greenfield Station

The proposed route intersects woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Tree removal restrictions may apply due to the likelihood of the presence of listed bat species. Field verification of suitable bat habitat is recommended to determine presence. The proposed substation footprint intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination.

There is one existing dirt road crossing the proposed substation in Charlotte County. It is anticipated that the proposal could require permits, consultations, clearances and authorization from Charlotte County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Starfruit 765/230 kV Greenfield Station

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting. Impacts to these resources will require coordination with the USACE and appropriate Floodplain Administrators. Proposed route intersects 1 conservation easements. Coordination with easement holders will be required.

The proposed component crosses over 1 conservation easement owned by the VA Dept of Conservation and Recreation. The substation does not intersects any crossings. The proposal may require permits, consultations, and authorizations from Cumberland County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits may be required.

Lodi 765/500 kV Greenfield Station

The proposed route intersects woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Tree removal restrictions may apply due to the likelihood of the presence of listed bat species. Field verification of suitable bat habitat is recommended to determine presence. Proposed route intersects 7 conservation easements. Coordination with easement holders will be required.

The substation does not intersects any crossings. The proposal may require permits, consultations, and authorizations from Fluvanna County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits may be required.

Kaladin 500/230 kV Greenfield Station

Desktop analysis indicates that the proposed route intersects with farmland. Verification in the field would need to be completed. Historical Feature is likely but not guaranteed to be extant. Feature was created as part of batch process from NRIS and status needs to be confirmed individually, Object ID 182.

The proposed substation intersects approximately 1 utility line owned by VIRGINIA ELECTRIC & POWER CO & 1 park easement owned by Albemarle County. The proposal may require permits, consultations, and authorizations

from Albemarle County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits may be required.

Cunningham - Lodi 500 kV

The proposed route does not have the potential to impact any mapped wetland areas, floodplains/floodways, lakes/reservoirs, critical habitats, natural areas, or karst topography. The primary permitting risk lies in intersecting 4 wooded areas and agricultural land; however, the route is parallel to an existing ROW which will likely ease permitting with relevant entities.

The component crosses approximately 2 roads (4 entrances) in Fluvanna County. There are 5 transmission line crossings, 3 with VIRGINIA ELECTRIC & POWER CO, and 2 with an unknown company. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Fluvanna County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Kaladin - Lodi 500 kV

The proposed route intersects with the following recorded Historical Sites/Structures/Districts: Southern Albemarle Rural Historic District, East Belmont, Southwest Mountains Rural Historic District. Proposed route intersects 12 FEMA High Risk Flood (100 Year Floodplain). 2 Floodway present. The proposed route intersects woodlands. Tree removal restrictions will apply. Proposed route intersects streams that the State of Virginia has designated as special trout waters. These streams include Rivanna River and James river.

The proposed route intersects 1 railroad owned by Buckingham Branch Railroad Company. There are approximately 35 road crossings. 2 road crossings in Fluvanna County. 30 road crossings and 3 highway crossings in Charlottesville County. There are approximately 9 transmission lines identified; all owned by VIRGINIA ELECTRIC & POWER CO. The proposed route intersects 2 pipelines ; 1 owned by Transcontinental Gas PL and 1 owned by Columbia Gas Trans Co. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from the 7 counties (Fluvanna and Charlottesville) in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Kaladin - North Anna 500 kV Greenfield

The proposed route intersects with the following recorded Historical Sites/Structures/Districts: Southwest Mountains Rural Historic District. Coordination with the VA SHPO is required Proposed route intersects 8 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Louisa and Albemarle counties, VA. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed route does not intersect designated Critical Habitat. However, there are

federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 12 conservation easements. Coordination with the following easement holder(s) is required: American Battlefield Trust; Albemarle County, VA; Virginia Dept of Forestry; Virginia Outdoors Foundation; US National Park Service. Proposed route intersects streams that the State of Virginia has designated as Special Trout Waters. These streams include: portions of Mattaponi, and Pamunkey rivers and their tributaries. Coordination with the USACE and the VA Dept. of Wildlife Resources (DWR) is needed.

This component crosses over 2 railroads owned by Buckingham Branch Railroad Company; 40 road and highways (80 entrances) across Albemarle and Louisa county; 4 transmission lines owned by Virginia Electric & Power Co; 2 pipelines owned by Colonial Pipeline Co., Transcontinental Gas PL. This component crosses over 1 Conservation Easement crossings owned by Albemarle County, 2 Conservation Easement crossings owned by VA Outdoors Foundation, 1 Conservation Easement crossing owned by US National Park Service, 1 Conservation Easement crossing owned by VA Dept of Forestry. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Albemarle and Louisa county in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Kaladin - Morrisville 500 kV Greenfield

The route intersects many conservation easements under various management, including federal easements held by NRCS, NPS, USFWS, USFS, USACE, and a Department of Defense training reservation. While there is the potential for the route to impact waterways, floodplains, and wetlands, many of the intersected floodplains and wetlands are small and/or linear which may allow them to be avoided. The route additionally intersects several wooded areas which have the potential to provide habitat to sensitive species such as bats, though no critical habitat is intersected.

The component crosses approximately 1 railroad owned by Buckingham Branch Railroad Company, including a parallel encroachment spanning approximately 4 miles. There are 88 roads and highways crossings (176 entrances) across 4 counties (Albemarle, Orange, Culpeper, and Fauquier); 6 transmission line crossings with VIRGINIA ELECTRIC & POWER CO; and 2 pipeline crossings, 1 with Transcontinental Gas PL, and 1 with COLONIALPIPELINE CO. It is anticipated that the proposal requires permits, consultations, clearances and authorization from 4 counties in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Bagpipe 765/500 kV Greenfield Station

The proposed route intersects woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Tree removal restrictions may apply due to the likelihood of the presence of listed bat species. Field verification of suitable bat habitat is recommended to determine presence.

There are 3 dirt roads that interacts with the proposed substation in Brunswick County. It is anticipated that the proposal could require permits, consultations, clearances and authorization from Brunswick County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Vontay 765/500kV Greenfield Station

The proposed route intersects woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Tree removal restrictions may apply due to the likelihood of the presence of listed bat species. Field verification of suitable bat habitat is recommended to determine presence. Proposed substation footprint intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. Permit authorization may take 12-months to complete.

The substation does not intersect any crossings. The proposal may require permits, consultations, and authorizations from Hanover and Louisa County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits may be required.

Bagpipe - Vontay 765 kV Greenfield

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting. Impacts to these resources will require coordination with the USACE and appropriate Floodplain Administrators. The proposed route intersects woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Tree removal restrictions may apply due to the likelihood of the presence of listed bat species. Field verification of suitable bat habitat is recommended to determine presence. Proposed route does not intersect designated Critical Habitat. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 14 conservation easements. Coordination with easement holders will be required. Proposed route intersects mapped karst geology. Geotechnical studies are needed to verify subsurface conditions prior to digging or trenching.

This component crosses over 3 railroads owned by CSXT and Norfolk Southern Railway; 104 road and highway crossings (208 entrances) across Brunswick County, Dinwiddie County, Amelia County, Chesterfield County, Powhatan County, Goochland County, Louisa County, Hanover County; 7 transmission line owned by Virginia Electric & Power Co; 3 pipeline crossings owned by Kinder Morgan, Colonial Pipeline Co, Columbia Gas Trans Co. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Brunswick County, Dinwiddie County, Amelia County, Chesterfield County, Powhatan County, Goochland County, Louisa County, Hanover County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Transmission Line Risk Analysis*Component 1: Joshua Falls - Durandal 765kV Greenfield Line*

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 6-bundle 795 kcmil ACSR “Tern” arrangement and lattice structures. The conductors support the ratings outlined in the proposal.** Some lattice structures will be guyed V-Type while others will be self-supporting on foundations. These types of structures are inherently complex vs. steel monopoles and less-bundled conductors but are common for 765kV lines. It should be noted that 765kV AC Transmission lines are not historically common in America but are increasingly being developed

across the country. We would expect some utilities and contractors to have limited experience accordingly. The route is generally flat with few obstructions.

From a procurement perspective, there are a significant number of structures (224) that will be required and over 1000 miles of conductor needed. This is a large quantity of material to procure, but most of the material, outside of some 765kV hardware, should not carry procurement risks outside of typical EHV line builds.

Finally, the mostly flat and rural nature of the route does not provide any terrain concerns. While some lower-lying wetlands may require unique foundations, there are not a lot of these identified along the route. We would not expect heavy restrictions on noise and pollution due to the limited population along the route and a complex sequencing of outages will not be required since the line is entirely greenfield.

Component 2: Durandal - Starfruit 765kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 6-bundle 795 kcmil ACSR “Tern” arrangement and lattice structures. The conductors support the ratings outlined in the proposal.** Some lattice structures will be guyed V-Type while others will be self-supporting on foundations. These types of structures are inherently complex vs. steel monopoles and less-bundled conductors but are common for 765kV lines.

Regarding the route, there should be no concerns with vehicle access due to the terrain and location, and the alignment interacts with very few structures. There are a number of crossings along the route including four high-voltage lines, two railroads, two highways, four creeks/rivers, and several ponds.

From a procurement perspective, there are a significant number of structures (184) that will be required and over 700 miles of conductor needed. This is a large quantity of material to procure, but most of the material, outside of some 765kV hardware, should not carry procurement risks outside of typical EHV line builds.

The mostly flat and rural nature of the route does not provide any terrain concerns. While some lower-lying wetlands may require unique foundations, there are not a lot of these identified along the route. We would not expect heavy restrictions on noise and pollution due to the limited population along the route and a complex sequencing of outages will not be required since the line is entirely greenfield.

Component 3: Starfruit - Lodi 765kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 6-bundle 795 kcmil ACSR “Tern” arrangement and lattice structures. The conductors support the ratings outlined in the proposal.** Some lattice structures will be guyed V-Type while others will be self-supporting on foundations. These types of structures are inherently complex vs. steel monopoles and less-bundled conductors but are common for 765kV lines.

Regarding the route, we would expect ROW to be wider than the 180ft indicated and would expect 200ft to be used for a line of this configuration, particularly with the guyed V-structures. There should be no concerns with vehicle access due to the terrain and locations, and the alignment interacts with very few structures. There are a number of crossings along the route including one high-voltage line, two rivers, and several ponds/swamps. This is not a large quantity for a line of this size.

From a procurement perspective, there are a significant number of structures (180) that will be required and over 740 miles of conductor needed. This is a large quantity of material to procure, but most of the material, outside of some 765kV hardware, should not carry procurement risks outside of typical EHV line builds.

The mostly flat and rural nature of the route does not provide any terrain concerns. While some lower-lying wetlands may require unique foundations, there are not a lot of these identified along the route. We would not expect heavy restrictions on noise and pollution due to the limited population along the route and a complex sequencing of outages will not be required since the line is entirely greenfield.

Component 15: Cunningham - Lodi 500kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 3-Bundled 1,351 kcmil ACSR “Dipper” conductor” arrangement and lattice structures. The conductors DO NOT support the ratings outlined in the proposal.

The line is being designed as single-circuit only, which does not allow for future doubling or the addition of smaller circuits as underbuild or parallel. So, there is a limiting factor to the design that could be improved. We did not observe any future maintenance issues with this line and as a greenfield line within its own ROW, it does not create impacts on other circuits or require significant demolition.

From a procurement perspective, there are only (14) structures that will be required and 18 miles of conductor needed. Some 500kV hardware may carry longer leads, but that should not carry procurement risks outside of typical EHV line builds.

Component 16: Kaladin - Lodi 500kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 3-Bundled 1,351 kcmil ACSR “Dipper” conductor” arrangement and lattice structures. The conductors DO NOT support the ratings outlined in the proposal. A 4-bundle falcon approach was utilized on another 500kV components and suspect that would be appropriate here as well. Or perhaps a 3-bundle Falcon approach. Some lattice structures will be guyed V-Type while others will be self-supporting on foundations. These types of structures are more complex vs. steel monopoles, which would also be an acceptable alternative for a 500kV line and would utilize a smaller footprint.

Regarding the route, 175ft is a reasonable width since this circuit parallels existing. Wider ROW may be needed at some areas that don't parallel. There should be no concerns with vehicle access due to the terrain and location, and the alignment interacts with very few structures for most of the line. There is one particular section that crosses a river, railroad, highway, and quarry in a short distance. Placement of structures will drive difficulty of access in this area. There are a number of crossings along the route including three high-voltage lines, one highway, one railroad, and one river. None of these crosses are particularly concerning.

The line is being designed as single-circuit only, which does not allow for future doubling or the addition of smaller circuits as underbuild or parallel. So, there is a limiting factor to the design that could be improved. We did not observe any future maintenance issues with this line and as a greenfield line within its own ROW, it does not create impacts on other circuits or require significant demolition.

From a procurement perspective, there are only (111) structures that will be required and 203 miles of conductor needed. This is on the larger side but is not overly concerning for EHV lines. Some 500kV hardware may carry longer leads, but that should not carry procurement risks outside of typical EHV line builds.

Component 17: Kaladin - North Anna 500kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 3-Bundled 1,351 kcmil ACSR “Dipper” conductor” arrangement and lattice structures. The conductors DO NOT support the ratings outlined in the proposal.** We noticed that a 4-bundle falcon approach was utilized on another 500kV components and suspect that would be appropriate here as well. Or perhaps a 3-bundle Falcon approach. Some lattice structures will be guyed V-Type while others will be self-supporting on foundations. These types of structures are more complex vs. steel monopoles, which would also be an acceptable alternative for a 500kV line and would utilize a smaller footprint.

Regarding the route, 175ft is a reasonable width since this circuit parallels existing. Wider ROW may be needed at some areas that don’t parallel. There should be no concerns with vehicle access due to the terrain and location, and the alignment interacts with very few structures. There are a number of crossings along the route including two high-voltage lines, one highway, one railroad, and five identified creeks. None of these crosses are particularly concerning.

The line is being designed as single-circuit only, which does not allow for future doubling or the addition of smaller circuits as underbuild or parallel. So, there is a limiting factor to the design that could be improved. We did not observe any future maintenance issues with this line and as a greenfield line within its own ROW, it does not create impacts on other circuits or require significant demolition.

From a procurement perspective, there are only (147) structures that will be required and 293 miles of conductor needed. This is on the larger side but is not overly concerning for EHV lines. Some 500kV hardware may carry longer leads, but that should not carry procurement risks outside of typical EHV line builds.

Component 18: Kaladin - Morrisville 500kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 3-Bundled 1,351 kcmil ACSR “Dipper” conductor” arrangement and lattice structures. The conductors DO NOT support the ratings outlined in the proposal.** We noticed that a 4-bundle falcon approach was utilized on another 500kV components and suspect that would be appropriate here as well. Or perhaps a 3-bundle Falcon approach. Some lattice structures will be guyed V-Type while others will be self-supporting on foundations. These types of structures are more complex vs. steel monopoles, which would also be an acceptable alternative for a 500kV line and would utilize a smaller footprint.

Regarding the route, 175ft is a reasonable width since this circuit parallels existing. Wider ROW may be needed at some areas that don’t parallel. There should be no concerns with vehicle access for most of the line, but there is a section that parallels a railroad corridor which could lead to some access restrictions. The route also passes through a neighborhood near the town of Orange, and we would expect that route to require changes from the current design. There are a number of crossings along the route including four high-voltage lines, three highways, one railroad (and parallel section), and two rivers. None of these crosses are particularly concerning.

The line is being designed as single-circuit only, which does not allow for future doubling or the addition of smaller circuits as underbuild or parallel. So, there is a limiting factor to the design that could be improved. We did not

observe any future maintenance issues with this line and as a greenfield line within its own ROW, it does not create impacts on other circuits or require significant demolition.

From a procurement perspective, there are only (200) structures that will be required and 392 miles of conductor needed. This is definitely pushing to the larger side which could pose some issues within the defined project schedule. Some 500kV hardware may carry longer leads, but that should not carry procurement risks outside of typical EHV line builds.

Component 26: Bagpipe - Vontay 765kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 6-bundle 795 kcmil ACSR “Tern” arrangement and lattice structures. The conductors support the ratings outlined in the proposal.** Some lattice structures will be guyed V-Type while others will be self-supporting on foundations. These types of structures are inherently complex vs. steel monopoles and less-bundled conductors but are common for 765kV lines. It should be noted that 765kV AC Transmission lines are not historically common in America but are increasingly being developed across the country. We would expect some utilities and contractors to have limited experience accordingly. The route is generally flat with few obstructions.

Regarding the route, the proposal calls for 200ft of ROW, which is reasonable for this type of line. There should be limited concerns with vehicle access due to the terrain and location of the line. However, the line does interact with quite a few houses, and we would expect the route will be changed from what is proposed as a result. There may also be the need to place a structure on the island in the James River which would obviously restrict access to that structure quite a bit. There are a number of crossings along the route including three high-voltage lines, two railroads, five highways, two river crossings, and some swamps/marshlands. For a 73.6-mile route, there are a reasonable number of crossings. The only crossing of concern is the James River crossing which either requires a structure within the island or will require a very long span in excess of 2500ft.

From a procurement perspective, there are a significant number of structures (324) that will be required and over 1300 miles of conductor needed. This is a large quantity of material to procure, and it may be difficult in the schedule outlined. Most of the material, outside of some 765kV hardware, should not carry procurement risks outside of typical EHV line builds.

Substation Risk Analysis

Component 7: Joshua Falls 765 kV Station Expansion

The project includes installation of a new 5,000-amp 765 kV line breaker, a 765 kV line reactor, and three additional 765 kV circuit breakers to support the greenfield Joshua Falls–Durandal transmission line. Work will involve constructing new foundations and steel structures, installing and terminating high-voltage bus conductors, integrating the reactor and breaker assemblies, and completing all associated protection, control, and SCADA wiring. Final scope includes functional testing, commissioning, and outage coordination to place the new 765 kV facilities safely into service.

Component 8: Durandal 765/500 kV Station

The project consists of constructing a new greenfield Durandal Substation featuring both 765 kV and 500 kV switchyards. Each yard will utilize a double-breaker, double-bus configuration to provide high reliability, operational flexibility, and robust maintenance options. A single 765/500 kV autotransformer will link the two yards, requiring new foundations, oil containment systems, high-voltage bus connections, and extensive protection and control integration. The work also includes installation of a 765 kV line reactor with its associated reactor breaker, along with the steel structures, grounding, conduit, control cables, and station service systems needed to support the equipment.

Site development will include grading, access roads, stormwater controls, and the full civil buildout needed for a long-lived extra-high-voltage facility. Integration with remote control centers, relay protection schemes, SCADA systems, and communication networks will be part of the commissioning effort. The finished station will serve as a major backbone node for the Joshua Falls–Durandal 765 kV line and the regional 500 kV network, providing the capacity and resilience expected of a new strategic transmission hub.

This is a 765kV greenfield site. There are concerns with the availability of the equipment, plus the acquisition of the land required to build it. No major problems are anticipated, however.

Component 9: Starfruit 765/230 kV Greenfield Station

The project involves constructing a new greenfield 765/230 kV substation configured as a double-breaker, double-bus station to provide high reliability and operational flexibility. The 765 kV yard will include four new 765 kV circuit breakers arranged to support the future transmission paths toward the proposed Durandal Station and the existing Farmville Station. A new 765/230 kV autotransformer will link the extra-high-voltage yard to a new 230 kV yard, requiring dedicated foundations, oil containment systems, high-voltage bus work, and coordinated protection and control systems. The buildout will also include structural steel, conductor installations, grounding, station service systems, and SCADA integration.

Site development will require grading, access roads, stormwater controls, and the full civil infrastructure needed for long-term reliable operation. The project will include installation of all conduit, cable trench, control wiring, and relay panels necessary to interconnect the new station with existing system controls. Extensive functional testing and commissioning will be performed to ensure proper integration with Farmville, Durandal, and the broader transmission network. The completed facility will provide a high-capacity, highly reliable node supporting regional growth and future EHV expansion.

This is a 765kV greenfield site. There are concerns about the availability of the equipment, plus the acquisition of the land required to build it. No major problems are anticipated, however.

Component 10: Lodi 765/500 kV Greenfield Station

The project involves constructing a new greenfield 765/500 kV substation that will serve as a major interconnection point between the existing Cunningham 500 kV station and the proposed Starfruit station. The 500 kV yard will be built in a breaker-and-a-half configuration using five new 500 kV circuit breakers, providing strong operational flexibility, fault isolation capability, and future expandability. A new 765/500 kV autotransformer will tie the two voltage levels together, requiring dedicated foundations, oil containment, high-voltage bus connections, and an expanded protection and control scheme. The scope also includes installation of a 765 kV line breaker and the associated steel structures, conductor systems, grounding grid extensions, and station service infrastructure.

Site development will include grading, access road construction, stormwater management, and the full civil buildout needed for long-term operation of a high-capacity EHV station. The project also incorporates conduit and trench systems, control cable installation, relay panels, and SCADA integration to link the new station to system operators and neighboring facilities. Testing and commissioning will ensure proper transformer operation, breaker sequencing, and coordinated protection between the Cunningham and Starfruit interconnections. When complete, the station will serve as a high-reliability backbone node supporting regional transmission expansion and future 765 kV growth.

This is a 765kV greenfield site. There are concerns about the availability of the equipment, plus the acquisition of the land required to build it. No major problems are anticipated, however.

Component 11: Kaladin 500/230 kV Greenfield Station

The project involves constructing a new 500/230 kV greenfield substation that will serve as a strategic interconnection point between the existing North Anna 500 kV system and the Gordonsville 230 kV network. The 500 kV yard will use a two-breaker-and-a-half configuration with four new 500 kV circuit breakers, providing high operational flexibility, strong fault-isolation performance, and ample room for future system expansion. A new 500/230 kV autotransformer will bridge the two voltage levels, requiring heavy foundations, oil containment, structural steel, and high-voltage bus work, along with coordinated protection, control, and metering systems. Supporting work includes installation of grounding, conductor systems, station service equipment, and SCADA connections.

Site development will include grading, access roads, stormwater controls, and the full civil and electrical infrastructure needed for long-term reliability. The project also requires construction of raceways, cable trench, conduit systems, and installation of relay panels and control wiring to integrate the new station into Dominion's existing operational network. Comprehensive testing and commissioning will verify transformer performance, breaker timing, protection-scheme coordination, and communication links with North Anna and Gordonsville. Once energized, the station will strengthen regional reliability and enhance transfer capability across both the 500 kV and 230 kV systems.

This is a 765kV greenfield site. There are concerns about the availability of the equipment and the acquisition of the land required to build it. No major problems are anticipated.

Component 24: Vontay 765/500 kV Greenfield Station

The project involves constructing a new greenfield 765/500 kV substation featuring separate 765 kV and 500 kV yards linked by two new 765/500 kV autotransformers. The 765 kV yard will be built in a double-breaker, double-bus

configuration using ten 765 kV circuit breakers, providing high reliability, flexible switching options, and substantial capacity for future system expansion. The 500 kV yard will mirror this configuration with twelve 500 kV breakers, creating a highly redundant and operationally resilient footprint capable of supporting multiple transmission paths and transformer positions. Major equipment installations will include transformer foundations and containment, high-voltage bus systems, steel structures, grounding grid extensions, conductor work, and a full suite of protection, control, and metering equipment.

Site development will require extensive grading, stormwater management, and construction of access roads and cable-trench systems to support a station of this size. The project will implement comprehensive protection and control upgrades, including relay panels, fiber-optic communication systems, SCADA integration, and coordinated protection schemes across both voltage levels. Testing and commissioning will verify autotransformer energization, breaker timing, communication links, and protection-system performance. Once complete, the station will serve as a major EHV hub, strengthening regional reliability and providing the backbone infrastructure for future growth of the 765 kV and 500 kV systems.

This is a 765kV greenfield site. There are concerns about the availability of the equipment and the acquisition of the land required to build it. No major problems are anticipated.

Constructability Summary

Across the full set of substation components, the overall risk profile divides cleanly between simple expansions of existing stations and large greenfield builds at 500 kV and 765 kV. The upgrade and expansion projects at existing stations such as Surry, Cunningham, North Anna, Morrisville, Farmville, and Gordonsville carry low risk, driven by straightforward scopes, established access, known soil conditions, and minimal structural or civil impacts. By contrast, the new 765 kV and 765/500/230 kV greenfield stations—including Durandal, Starfruit, Lodi, Kaladin, Bagpipe, and Vontay have a higher risk category. These projects introduce meaningful uncertainties tied to land acquisition, large-scale site development, and the long lead times associated with EHV transformers, reactors, and breakers.

The transmission scope of this proposal contains over 365 miles of EHV line, including both 765kV and 500kV greenfield and rebuilds. The 765kV work utilizes lattice towers, so these particular components will be more challenging and require engineers and contractors with expertise in this area.

All components are feasible to be permitted; however, certain components are at risk for long consultation, review, and processing times. Wetland/waterway, protected area, and infrastructure crossings are areas of concern for some components. Additionally, the Quantico Marine Corps Base crossing and potential impacts a USACE levee elevate the constructability risks for environmental and permitting. Avoiding sensitive resources, early environmental studies, and early consultation may reduce the elevated risk of certain components.

The overall constructability risk of this proposal is rated as **Medium-High**, primarily driven by the large quantity of land acquisition and the constraints encountered by the proposed greenfield line routes.

Outage Review

Due to the multiple 500 kV line rebuilds associated with proposal 331, and the anticipated lengthy outages required to complete these rebuilds, **Medium** risk is assessed for outage coordination.

Cost Review

A high-level cost estimate was created for each proposal to assess the cost component for potential omissions or under-estimating. Cost estimates were broken into eight categories, including Engineering & Design, Permitting/Routing/Siting, ROW/Land Acquisition, Materials & Equipment, Construction & Commissioning, Construction Management, Overheads and Miscellaneous, and Risk Contingency (30%). The cost comparison for this proposal, broken down by component, is outlined below.

Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
1	Joshua Falls - Durandal	\$297.69	\$311.12
2	Durandal - Starfruit	\$194.64	\$238.95
3	Starfruit - Lodi	\$224.68	\$234.98
4	Kraken - Ladysmith 500kV Rebuild	\$33.00	\$36.96
5	Yeat – Ox 500 kV Rebuild	\$87.00	\$100.48
6	Surry 500kV Station Upgrade	\$14.00	\$11.63
7	Joshua Falls 765 kV Expansion	\$25.25	\$21.78
8	Durandal 765/500kV Greenfield Station	\$165.10	\$255.83
9	Starfruit 765/230kV Greenfield	\$140.10	\$107.65
10	Lodi 765/500 kV Greenfield	\$130.10	\$144.17
11	Kaladin 500/230 kV Greenfield	\$98.18	\$125.82
12	Cunningham Station Expansion	\$15.00	\$7.18
13	North Anna 500 kV Station Expansion	\$3.50	\$4.76
14	Morrisville 500 kV Station Upgrades	\$3.50	\$6.60
15	Cunningham - Lodi	\$10.80	\$15.57
16	Kaladin - Lodi	\$129.60	\$119.99
17	Kaladin - North Anna	\$151.20	\$158.98
18	Kaladin - Morrisville	\$226.80	\$204.56
19	Farmville 230kV Upgrade	\$1.50	\$5.64
20	Durandal 500kV Cut-Ins	\$4.30	\$7.99
21	Gordonsville Station Upgrade	\$2.00	\$3.29
22	Kaladin - Gordonsville 230kV Cut-In	\$1.50	\$4.19
23	Bagpipe 765/500 kV Greenfield	\$184.53	\$178.57
24	Vontay 765/500kV Greenfield	\$233.74	\$297.36
25	Heritage 500 kV Upgrade	\$2.50	\$8.89
26	Bagpipe - Vontay	\$420.77	\$433.00
27	Starfruit – Farmville	\$1.50	\$4.65
28	Bagpipe - Heritage	\$5.69	\$10.18
29	Vontay - North Anna	\$87.15	\$96.16
	Total	\$2895.32	\$3,156.93

The proposal cost estimate is within 10% of the independent cost estimate. The cost estimate risk is considered **Low** risk.

Schedule Review

This proposal projects an in-service date of October 1, 2032.

Overall, the primary schedule risks for this proposal are driven by the anticipated lengthy process for the land acquisition, permitting and siting of the proposed transmission lines are somewhat mitigated by their paralleling existing transmission corridors for majority of the project. **Medium-High** schedule risks are assessed for this project.

Proposing Entity Experience and Capability Review

Transource, as an affiliate of AEP Transmission, has significant experience constructing and operating 765 kV transmission which represents the significant scope for Proposal 331. The proposing entity experience and capability risk is considered **Low**.

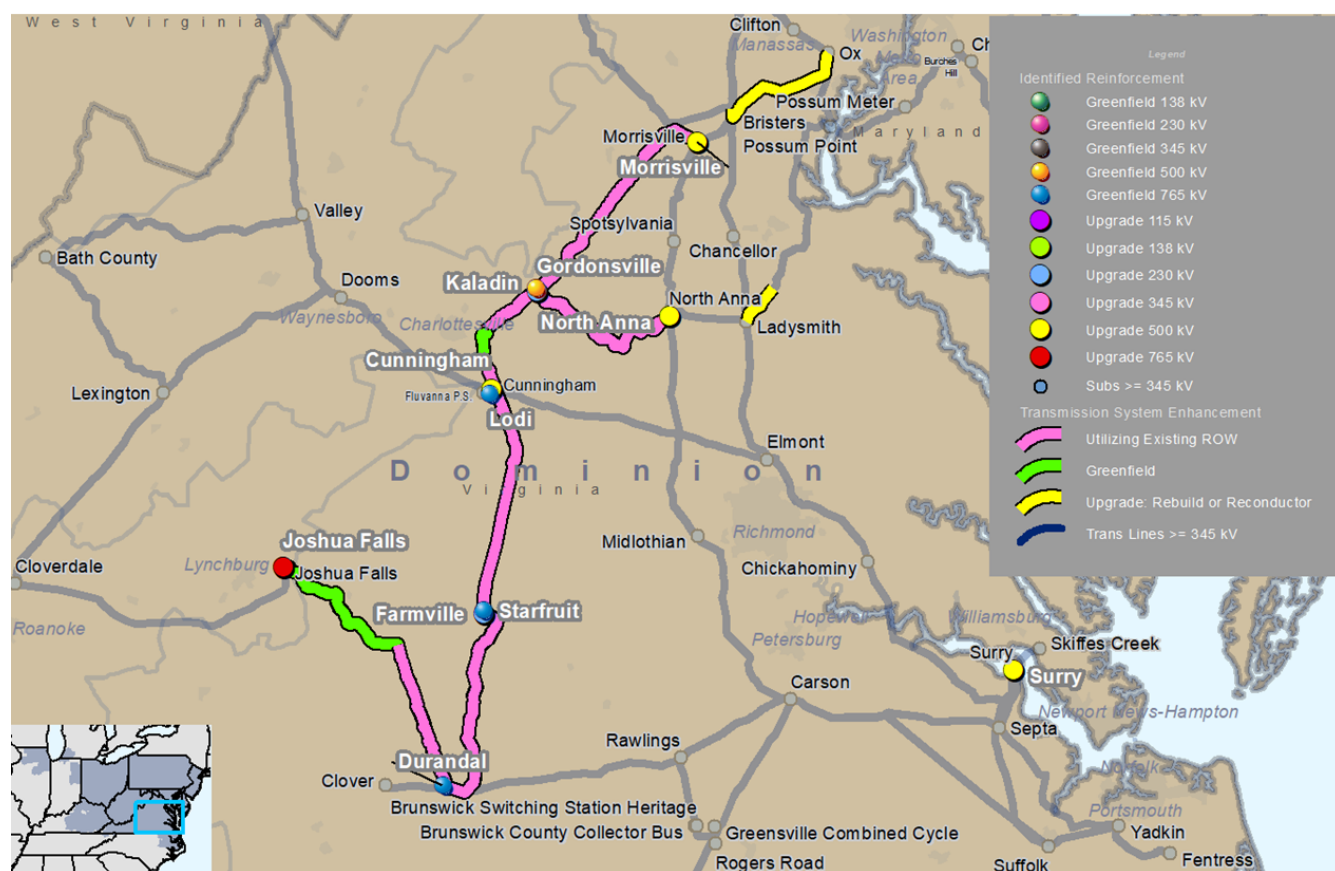
Proposal 781 – Virginia Area Seven Year Solution 2 (Transource/FE)

The purpose of this project is to address violations identified in PJM's 2032 model for the Virginia area by constructing several 765kV Greenfield lines, 765/500/230kV Greenfield Substations, expanding other area substations, and rebuilding multiple 500kV lines. This proposal will traverse numerous counties throughout the state of Virginia, stretching from the Washington, DC suburbs down to within 15 miles of the North Carolina state line, and as far west as Lynchburg.

This proposal has a total of 22 components, including 7 substation upgrade components, 4 greenfield substation components, 7 greenfield transmission line components, 2 Substation Cut-in components, and 2 transmission line rebuild components.

Map 7 displays the routes proposed for Proposal 781.

Map 7. Proposal 781



NOTE: 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.

Project Overview

Proposal 2025-W1-781 includes the following components:

- Component 1: Joshua Falls - Durandal 765kV Greenfield Line
- Component 2: Durandal - Starfruit 765kV Greenfield Line
- Component 3: Starfruit - Lodi 765kV Greenfield Line
- Component 4: Kraken - Ladysmith 500kV Rebuild
- Component 5: Yeat – Ox 500kV Rebuild
- Component 6: Surry Station Upgrade
- Component 7: Joshua Falls 765 kV Station Expansion
- Component 8: Durandal Greenfield Station
- Component 9: Starfruit 765/230 kV Greenfield Station
- Component 10: Lodi 765/500 kV Greenfield Station
- Component 11: Kaladin 500/230 kV Greenfield Station
- Component 12: Cunningham Station Expansion
- Component 13: North Anna 500 kV Station Expansion
- Component 14: Morrisville 500 kV Station Upgrades
- Component 15: Cunningham - Lodi 500kV Greenfield Line
- Component 16: Kaladin - Lodi 500kV Greenfield Line
- Component 17: Kaladin - North Anna 500kV Greenfield Line
- Component 18: Kaladin - Morrisville 500kV Greenfield Line
- Component 19: Farmville Station Upgrade
- Component 20: Durandal 500kV Substation Cut-ins
- Component 21: Kaladin - Gordonsville 230kV Substation Cut-in
- Component 22: Gordonsville Station upgrade

Constructability Review

Right-of-Way/Land Acquisition Risk Analysis

Component 1: Joshua Falls - Durandal 765kV Greenfield Line

The Joshua Falls – Durandal Greenfield line is a 55-mile 765kV, single-circuit line, which will be built in southern Virginia between the existing Joshua Falls Station and the proposed Durandal Station. This line will traverse Campbell, Appomattox, Prince Edward, and Charlotte Counties. Approximately 35 miles of the route will parallel existing transmission line Right-of-Way with periodic breaks along the route to avoid structures and residences.

Approximately 20 miles of the route will utilize new routes to traverse from one ROW parallel section to another or travel areas with no existing ROW. New ROW will be required regardless of expansion or new ROW.

Component 2: Durandal - Starfruit 765kV Greenfield Line

The Durandal – Starfruit Greenfield line is a 40-mile 765kV, single-circuit line, which will be built in southern Virginia between the proposed Durandal Station and the proposed Starfruit Station. This line will traverse Prince Edward, Lunenburg, Mecklenburg, and Charlotte Counties. The entire route will parallel existing transmission line Right-of-Way with periodic breaks along the route to avoid structures and residences. New ROW will be required regardless of expansion or new ROW.

Component 3: Starfruit - Lodi 765kV Greenfield Line

The Starfruit - Lodi Greenfield line is a 42-mile 765kV, single-circuit line, which will be built in central Virginia between the proposed Starfruit Station and the proposed Lodi Station. This line will traverse Fluvanna, Buckingham, Cumberland, and Prince Edward Counties. The entire route will parallel existing transmission line Right-of-Way with periodic breaks along the route to avoid structures and residences. New ROW will be required regardless of expansion or new ROW.

The proposal indicated 180ft ROW width. At a width of 200ft, the new ROW required will be approximately 1013 acres (912 acres at 180ft wide). The entire route is very rural and impacts more structures than the previous two components. The reroutes that may be required could utilize the uninhabited space along the route to allow alignment adjustments according to any opposition found along the way.

Component 15: Cunningham - Lodi 500kV Greenfield Line

The Cunningham – Lodi Greenfield line is a 1.2-mile 500kV, single-circuit line, which will be built in central Virginia between the existing Cunningham Station and the proposed Lodi Station. This line will sit entirely within Fluvanna County. The entire route will parallel existing transmission line Right-of-Way or be contained within substation properties. New ROW will be required for the route regardless of expansion or new ROW.

The proposal indicated 175ft ROW width. This totals 42 acres of land acquisition. This acquisition takes place on what appears to be only a handful of properties and wooded areas. The route is very rural and has no impact on existing structures.

Component 16: Kaladin - Lodi 500kV Greenfield Line

The Kaladin - Lodi Greenfield line is a 22.5-mile 500kV, single-circuit line, which will be built in central Virginia between the proposed Kaladin Station and the proposed Lodi Station. This line will traverse Albemarle and Buckingham Counties. Most of the route will parallel existing transmission line Right-of-Way with periodic breaks along the route to avoid structures and residences and a 5.2-mile section in the middle that traverses from one existing ROW to another. New ROW will be required regardless of expansion or new ROW.

The proposal indicated 175ft ROW width is acceptable given the parallelling of existing ROW. It may need to be wider in the pure-greenfield section. At 175ft wide, the new ROW required will be approximately 520 acres. The entire route is very rural with few structures along the route. There is one section that runs through a Quarry, a railroad, a river, and a highway all in a very short section which may be a little more difficult. Any reroutes that may

be required could utilize the uninhabited space along the route to allow alignment adjustments according to any opposition found along the way, other than in the area noted above which has limited options.

Component 17: Kaladin - North Anna 500kV Greenfield Line

The Kaladin – North Anna Greenfield line is a 32.5-mile 500kV, single-circuit line, which will be built in central Virginia between the proposed Kaladin Station and the existing North Anna Station. This line will traverse Louisa County. Most of the route will parallel existing transmission line Right-of-Way with periodic breaks along the route to avoid structures and residences and a 4.4-mile section in the middle that breaks a good distance from the existing ROW to avoid some obstacles and a 3.2-mile section at the end that is opposite the railroad from the existing ROW.

The proposal indicated 175ft ROW width, which is acceptable given the paralleling of existing ROW. It may need to be wider in the pure-greenfield section. At 175ft wide, the new ROW required will be approximately 689 acres. The entire route is relatively rural with few structures and a golf course along the route. It also approaches Louisa High School and some more populated areas in that vicinity.

Component 18: Kaladin - Morrisville 500kV Greenfield Line

The Kaladin – Morrisville Greenfield line is a 43.5-mile 500kV, single-circuit line, which will be built in Northern Virginia between the proposed Kaladin Station and the existing Morrisville Station. This line will traverse Spotsylvania and Fauquier Counties. Much of the route will parallel existing transmission line Right-of-Way with periodic breaks along the route to avoid structures and residences. There is a 7-mile section and a 2.3-mile section along the route that breaks into pure greenfield routes to traverse between various existing ROW. A good portion of the 7-mile section parallels a railroad.

The proposal indicated 175ft ROW width, which we feel is acceptable given the paralleling of existing ROW. It may need to be wider in the pure-greenfield section. At 175ft wide, the new ROW required will be approximately 923 acres. A good portion of the route is rural but is not far from populated.

Overall, a **Medium-High** risk is assessed for ROW/Land Acquisition due to the mix of greenfield and paralleling existing ROW for the alignment of the proposed projects.

Environmental Risk Analysis

Joshua Falls - Durandal 765kV line

While the proposed route intersects several features generating environmental permitting risk, a large section of the route is parallel to existing ROW, which will likely ease permitting through wooded areas, floodplains, water bodies and wetlands. The VA DWR, USACE, and any relevant floodplain district administrations will still be needed to be contacted regarding permitting, especially since the route passes through one floodway. Additionally, though the route is shown as intersecting two trout waters, one of these intersections is with a small, non-connected pond, and therefore likely does not generate the same risk as a river habitat.

The component crosses approximately 4 railroads owned by Norfolk Southern Railway Company; 100 roads and highways (200 entrances) across 4 counties (Charlotte, Prince Edward, Appomattox, and Campbell County); 3 transmission lines, 1 owned by APPALACHIAN POWER CO, 1 owned by VIRGINIA ELECTRIC & POWER CO, 1 owned by an unknown company; and 3 pipelines, 1 owned by KINDER MORGAN, 1 owned by COLONIAL PIPELINE CO, 1 owned by Transcontinental Gas PL. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from 4 counties in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Durandal - Starfruit 765kV line

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting. Desktop analysis indicates that the proposed route intersects with farmland. Verification in the field would need to be completed. Proposed route intersects 9 easements owned by PVT and 2 parks (fee), owned by City of Farmville and VA Drpt of Conservation and Recreation. However, the proposed route is almost entirely parallel to existing ROW which would likely ease permitting.

The proposed route intersects 3 railroads; 1 owned by Norfolk Southern Railway Company and 2 owned by Buckingham Branch Railroad Company. There are approximately 35 road crossings. 4 road crossings and 1 highway crossings in Mecklenburg County, 14 road crossings and 1 highway crossings in Lunenburg County, 13 road crossings and 2 highway crossings in Prince Edward County. There are Approximately 7 transmission lines identified; 4 unknown owners, 3 owned by VIRGINIA ELECTRIC & POWER CO. The proposed route intersects 1 pipeline owned by Kinder Morgan. The proposed route intersects 2 parks (fee), owned by City of Farmville and VA Drpt of Conservation and Recreation. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from the 5 counties (Charlotte, Cumberland, Mecklenburg, Lunenburg and Prince Edward) in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Starfruit - Lodi 765kV line

The proposed route intersects with the following recorded Historical Sites/Structures/Districts: Bremo Plantation. Coordination with the VA SHPO is required Proposed route intersects 16 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Fluvanna; Buckingham; Cumberland and Prince Edward counties, VA. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404

and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. Permit authorization may take up to 12-months to complete. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed route intersects designated Critical Habitat for the following species: Atlantic pigtoe (mussel). Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 12 conservation easements. Coordination with the following easement holder(s) is required: Ever Green Team; VA Dept of Forestry; and VA Outdoors Foundation. Proposed route intersects streams that the State of Virginia has designated as Special Trout Waters. These streams include: James River and its free flowing tributaries; Appomattox and its tributaries. Coordination with the USACE and the VA Dept. of Wildlife Resources (DWR) is needed.

This component crosses over 2 railroads owned by CSXT; 50 road and highways(100 entrances) across Fluvanna, Buckingham and Cumberland County; 7 transmission lines owned by Virginia Electric & Power Co and no owner available; 2 pipelines owned by Colonial Pipeline Co. This component crosses over 1 Conservation Easement crossing owned by VA Outdoors Foundation, 1 Easement crossing owned by VA Bd Hist Resources admin. by VA DHR, 1 Conservation Easement owned by VA Dept of Forestry, 1 Easement crossing owned by Ever Green Team. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Fluvanna, Buckingham and Cumberland County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Cunningham - Lodi 500 kV

The proposed route does not have the potential to impact any mapped wetland areas, floodplains/floodways, lakes/reservoirs, critical habitats, natural areas, or karst topography. The primary permitting risk lies in intersecting 4 wooded areas and agricultural land; however, the route is parallel to an existing ROW which will likely ease permitting with relevant entities.

The component crosses approximately 2 roads (4 entrances) in Fluvanna County. There are 5 transmission line crossings, 3 with VIRGINIA ELECTRIC & POWER CO, and 2 with an unknown company. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Fluvanna County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Kaladin - Lodi 500 kV

The proposed route intersects with the following recorded Historical Sites/Structures/Districts: Southern Albemarle Rural Historic District, East Belmont, Southwest Mountains Rural Historic District. Proposed route intersects 12 FEMA High Risk Flood (100 Year Floodplain). 2 Floodway present. The proposed route intersects woodlands. Tree removal restrictions will apply. Proposed route intersects streams that the State of Virginia has designated as special trout waters. These streams include Rivanna River and James river.

The proposed route intersects 1 railroad owned by Buckingham Branch Railroad Company. There are approximately 35 road crossings. 2 road crossings in Fluvanna County. 30 road crossings and 3 highway crossings in Charlottesville County. There are approximately 9 transmission lines identified; all owned by VIRGINIA ELECTRIC &

POWER CO. The proposed route intersects 2 pipelines ; 1 owned by Transcontinental Gas PL and 1 owned by Columbia Gas Trans Co. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from the 7 counties (Fluvanna and Charlottesville) in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Kaladin - North Anna 500 kV Greenfield

The proposed route intersects with the following recorded Historical Sites/Structures/Districts: Southwest Mountains Rural Historic District. Coordination with the VA SHPO is required Proposed route intersects 8 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Louisa and Albemarle counties, VA. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed route does not intersect designated Critical Habitat. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 12 conservation easements. Coordination with the following easement holder(s) is required: American Battlefield Trust; Albemarle County, VA; Virginia Dept of Forestry; Virginia Outdoors Foundation; US National Park Service. Proposed route intersects streams that the State of Virginia has designated as Special Trout Waters. These streams include: portions of Mattaponi, and Pamunkey rivers and their tributaries. Coordination with the USACE and the VA Dept. of Wildlife Resources (DWR) is needed.

This component crosses over 2 railroads owned by Buckingham Branch Railroad Company; 40 road and highways (80 entrances) across Albermale and Louisa county; 4 transmission lines owned by Virginia Electric & Power Co; 2 pipelines owned by Colonial Pipeline Co., Transcontinental Gas PL. This component crosses over 1 Conservation Easement crossings owned by Albemarle County, 2 Conservation Easement crossings owned by VA Outdoors Foundation, 1 Conservation Easement crossing owned by US National Park Service, 1 Conservation Easement crossing owned by VA Dept of Forestry. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Albermale and Louisa county in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Kaladin - Morrisville 500 kV Greenfield

The route intersects many conservation easements under various management, including federal easements held by NRCS, NPS, USFWS, USFS, USACE, and a Department of Defense training reservation. While there is the potential for the route to impact waterways, floodplains, and wetlands, many of the intersected floodplains and wetlands are small and/or linear which may allow them to be avoided. The route additionally intersects several wooded areas which have the potential to provide habitat to sensitive species such as bats, though no critical habitat is intersected.

The component crosses approximately 1 railroad owned by Buckingham Branch Railroad Company, including a parallel encroachment spanning approximately 4 miles. There are 88 roads and highways crossings (176 entrances) across 4 counties (Albemarle, Orange, Culpeper, and Fauquier); 6 transmission line crossings with VIRGINIA ELECTRIC & POWER CO; and 2 pipeline crossings, 1 with Transcontinental Gas PL, and 1 with COLONIAL PIPELINE CO. It is anticipated that the proposal requires permits, consultations, clearances and authorization from 4 counties in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Transmission Line Risk Analysis

Component 1: Joshua Falls - Durandal 765kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 6-bundle 795 kcmil ACSR “Tern” arrangement and lattice structures. The conductors support the ratings outlined in the proposal.** Some lattice structures will be guyed V-Type while others will be self-supporting on foundations. These types of structures are inherently complex vs. steel monopoles and less-bundled conductors but are common for 765kV lines. It should be noted that 765kV AC Transmission lines are not historically common in America but are increasingly being developed across the country. We would expect some utilities and contractors to have limited experience accordingly. The route is generally flat with few obstructions.

Regarding the route, expect ROW to be wider than the 180ft indicated and would expect 200ft to be used for a line of this configuration, particularly with the guyed V-structures. There should be no concerns with vehicle access due to the terrain and location, and the alignment interacts with very few structures. There are a number of crossings along the route including four high-voltage lines, one railroad, two highways, and some swamps/marshlands associated with Roanoke Creek. For a 55-mile route, it is a low-quantity crossing which lends to the very rural nature of the area.

As a 765kV line, considering future double-circuit and a greenfield line within its own ROW, it does not create impacts on other circuits or require significant demolition.

From a procurement perspective, there are a significant number of structures (224) that will be required and over 1000 miles of conductor needed. This is a large quantity of material to procure, but most of the material, outside of some 765kV hardware, should not carry procurement risks outside of typical EHV line builds.

Finally, the mostly flat and rural nature of the route does not provide any terrain concerns. While some lower-lying wetlands may require unique foundations, there are not a lot of these identified along the route. We would not expect heavy restrictions on noise and pollution due to the limited population along the route and a complex sequencing of outages will not be required since the line is entirely greenfield.

Component 2: Durandal - Starfruit 765kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 6-bundle 795 kcmil ACSR “Tern” arrangement and lattice structures. The conductors support the ratings outlined in the proposal.** Some lattice structures will be guyed V-Type while others will be self-supporting on foundations. These types of structures are inherently complex vs. steel monopoles and less-bundled conductors but are common for 765kV lines.

Regarding the route, there should be no concerns with vehicle access due to the terrain and location, and the alignment interacts with very few structures. There are a number of crossings along the route including four high-

voltage lines, two railroads, two highways, four creeks/rivers, and several ponds. We don't feel this is overly concerning for a line of this size.

From a procurement perspective, there are a significant number of structures (184) that will be required and over 700 miles of conductor needed. This is a large quantity of material to procure, but most of the material, outside of some 765kV hardware, should not carry procurement risks outside of typical EHV line builds.

Finally, the mostly flat and rural nature of the route does not provide any terrain concerns. While some lower-lying wetlands may require unique foundations, there are not a lot of these identified along the route. We would not expect heavy restrictions on noise and pollution due to the limited population along the route and a complex sequencing of outages will not be required since the line is entirely greenfield.

Component 3: Starfruit - Lodi 765kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 6-bundle 795 kcmil ACSR "Tern" arrangement and lattice structures. The conductors support the ratings outlined in the proposal.** Some lattice structures will be guyed V-Type while others will be self-supporting on foundations. These types of structures are inherently complex vs. steel monopoles and less-bundled conductors but are common for 765kV lines.

There should be no concerns with vehicle access due to the terrain and locations, and the alignment interacts with very few structures. There are a number of crossings along the route including one high-voltage line, two rivers, and several ponds/swamps. This is not a large quantity for a line of this size.

From a procurement perspective, there are a significant number of structures (180) that will be required and over 740 miles of conductor needed. This is a large quantity of material to procure, but most of the material, outside of some 765kV hardware, should not carry procurement risks outside of typical EHV line builds.

Component 15: Cunningham - Lodi 500kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 3-Bundled 1,351 kcmil ACSR "Dipper" conductor" arrangement and lattice structures. The conductors DO NOT support the ratings outlined in the proposal.** We noticed that a 4-bundle falcon approach was utilized on another 500kV components and suspect that would be appropriate here as well. Or perhaps a 3-bundle Falcon approach. All lattice structures will be self-supporting on foundations according to the report. These types of structures are more complex vs. steel monopoles, which would also be an acceptable alternative for a 500kV line and would utilize a smaller footprint.

Regarding the route, 175ft is a reasonable width since this circuit parallels existing. Wider ROW may be needed at some areas that don't parallel. There should be no concerns with vehicle access due to the terrain and location, and the alignment interacts with very few structures. There is only one high-voltage line crossing on this route.

From a procurement perspective, there are only (14) structures that will be required and 18 miles of conductor needed. Some 500kV hardware may carry longer leads, but that should not carry procurement risks outside of typical EHV line builds.

Component 16: Kaladin - Lodi 500kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 3-Bundled 1,351 kcmil ACSR “Dipper” conductor” arrangement and lattice structures. The conductors DO NOT support the ratings outlined in the proposal.**

Regarding the route, 175ft is a reasonable width since this circuit parallels existing. Wider ROW may be needed at some areas that don’t parallel. There should be no concerns with vehicle access due to the terrain and location, and the alignment interacts with very few structures for most of the line. There is one particular section that crosses a river, railroad, highway, and quarry in a short distance. Placement of structures will drive difficulty of access in this area. There are a number of crossings along the route including three high-voltage lines, one highway, one railroad, and one river. None of these crosses are particularly concerning.

From a procurement perspective, there are only (111) structures that will be required and 203 miles of conductor needed. This is on the larger side but is not overly concerning for EHV lines. Some 500kV hardware may carry longer leads, but that should not carry procurement risks outside of typical EHV line builds.

Component 17: Kaladin - North Anna 500kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 3-Bundled 1,351 kcmil ACSR “Dipper” conductor” arrangement and lattice structures. The conductors DO NOT support the ratings outlined in the proposal.** We noticed that a 4-bundle falcon approach was utilized on another 500kV components and suspect that would be appropriate here as well. Or perhaps a 3-bundle Falcon approach. Some lattice structures will be guyed V-Type while others will be self-supporting on foundations. These types of structures are more complex vs. steel monopoles, which would also be an acceptable alternative for a 500kV line and would utilize a smaller footprint.

Regarding the route, 175ft is a reasonable width since this circuit parallels existing. Wider ROW may be needed at some areas that don’t parallel. There should be no concerns with vehicle access due to the terrain and location, and the alignment interacts with very few structures. There are a number of crossings along the route including two high-voltage lines, one highway, one railroad, and five identified creeks. None of these crosses are particularly concerning.

From a procurement perspective, there are only (147) structures that will be required and 293 miles of conductor needed. This is on the larger side but is not overly concerning for EHV lines. Some 500kV hardware may carry longer leads, but that should not carry procurement risks outside of typical EHV line builds.

Component 18: Kaladin - Morrisville 500kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 3-Bundled 1,351 kcmil ACSR “Dipper” conductor” arrangement and lattice structures. The conductors DO NOT support the ratings outlined in the proposal.** We noticed that a 4-bundle falcon approach was utilized on another 500kV components and suspect that would be appropriate here as well. Or perhaps a 3-bundle Falcon approach. Some lattice structures will be guyed V-Type while others will be self-supporting on foundations. These types of structures are more complex vs. steel monopoles, which would also be an acceptable alternative for a 500kV line and would utilize a smaller footprint.

Regarding the route, 175ft is a reasonable width since this circuit parallels existing. Wider ROW may be needed at some areas that don’t parallel. There should be no concerns with vehicle access for most of the line, but there is a

section that parallels a railroad corridor which could lead to some access restrictions. The route also passes through a neighborhood near the town of Orange, and we would expect that route to require changes from the current design. There are a number of crossings along the route including four high-voltage lines, three highways, one railroad (and parallel section), and two rivers. None of these crosses are particularly concerning.

From a procurement perspective, there are only (200) structures that will be required and 392 miles of conductor needed. This is definitely pushing to the larger side which could pose some issues within the defined project schedule. Some 500kV hardware may carry longer leads, but that should not carry procurement risks outside of typical EHV line builds.

Substation Risk Analysis

Component 7: Joshua Falls 765 kV Station Expansion

The project includes installation of a new 5,000-amp 765 kV line breaker, a 765 kV line reactor, and three additional 765 kV circuit breakers to support the greenfield Joshua Falls–Durandal transmission line. Work will involve constructing new foundations and steel structures, installing and terminating high-voltage bus conductors, integrating the reactor and breaker assemblies, and completing all associated protection, control, and SCADA wiring. Final scope includes functional testing, commissioning, and outage coordination to place the new 765 kV facilities safely into service.

This project involves installing major new equipment, and the site's hilly terrain may introduce grading challenges.

Component 8: Durandal 765/500 kV Station

The project consists of constructing a new greenfield Durandal Substation featuring both 765 kV and 500 kV switchyards. Each yard will utilize a double-breaker, double-bus configuration to provide high reliability, operational flexibility, and robust maintenance options. A single 765/500 kV autotransformer will link the two yards, requiring new foundations, oil containment systems, high-voltage bus connections, and extensive protection and control integration. The work also includes installation of a 765 kV line reactor with its associated reactor breaker, along with the steel structures, grounding, conduit, control cables, and station service systems needed to support the equipment.

Site development will include grading, access roads, stormwater controls, and the full civil buildout needed for a long-lived extra-high-voltage facility. Integration with remote control centers, relay protection schemes, SCADA systems, and communication networks will be part of the commissioning effort. The finished station will serve as a major backbone node for the Joshua Falls–Durandal 765 kV line and the regional 500 kV network, providing the capacity and resilience expected of a new strategic transmission hub.

Component 9: Starfruit 765/230 kV Greenfield Station

The project involves constructing a new greenfield 765/230 kV substation configured as a double-breaker, double-bus station to provide high reliability and operational flexibility. The 765 kV yard will include four new 765 kV circuit breakers arranged to support the future transmission paths toward the proposed Durandal Station and the existing Farmville Station. A new 765/230 kV autotransformer will link the extra-high-voltage yard to a new 230 kV yard, requiring dedicated foundations, oil containment systems, high-voltage bus work, and coordinated protection and

control systems. The buildout will also include structural steel, conductor installations, grounding, station service systems, and SCADA integration.

Site development will require grading, access roads, stormwater controls, and the full civil infrastructure needed for long-term reliable operation. The project will include installation of all conduit, cable trench, control wiring, and relay panels necessary to interconnect the new station with existing system controls. Extensive functional testing and commissioning will be performed to ensure proper integration with Farmville, Durandal, and the broader transmission network. The completed facility will provide a high-capacity, highly reliable node supporting regional growth and future EHV expansion.

Component 10: Lodi 765/500 kV Greenfield Station

The project involves constructing a new greenfield 765/500 kV substation that will serve as a major interconnection point between the existing Cunningham 500 kV station and the proposed Starfruit station. The 500 kV yard will be built in a breaker-and-a-half configuration using five new 500 kV circuit breakers, providing strong operational flexibility, fault isolation capability, and future expandability. A new 765/500 kV autotransformer will tie the two voltage levels together, requiring dedicated foundations, oil containment, high-voltage bus connections, and an expanded protection and control scheme. The scope also includes installation of a 765 kV line breaker and the associated steel structures, conductor systems, grounding grid extensions, and station service infrastructure.

Site development will include grading, access road construction, stormwater management, and the full civil buildout needed for long-term operation of a high-capacity EHV station. The project also incorporates conduit and trench systems, control cable installation, relay panels, and SCADA integration to link the new station to system operators and neighboring facilities. Testing and commissioning will ensure proper transformer operation, breaker sequencing, and coordinated protection between the Cunningham and Starfruit interconnections. When complete, the station will serve as a high-reliability backbone node supporting regional transmission expansion and future 765 kV growth.

Component 11: Kaladin 500/230 kV Greenfield Station

The project involves constructing a new 500/230 kV greenfield substation that will serve as a strategic interconnection point between the existing North Anna 500 kV system and the Gordonsville 230 kV network. The 500 kV yard will use a two-breaker-and-a-half configuration with four new 500 kV circuit breakers, providing high operational flexibility, strong fault-isolation performance, and ample room for future system expansion. A new 500/230 kV autotransformer will bridge the two voltage levels, requiring heavy foundations, oil containment, structural steel, and high-voltage bus work, along with coordinated protection, control, and metering systems. Supporting work includes installation of grounding, conductor systems, station service equipment, and SCADA connections.

Site development will include grading, access roads, stormwater controls, and the full civil and electrical infrastructure needed for long-term reliability. The project also requires construction of raceways, cable trench, conduit systems, and installation of relay panels and control wiring to integrate the new station into Dominion's existing operational network. Comprehensive testing and commissioning will verify transformer performance, breaker timing, protection-scheme coordination, and communication links with North Anna and Gordonsville. Once energized, the station will strengthen regional reliability and enhance transfer capability across both the 500 kV and 230 kV systems.

Constructability Summary

Most of the identified substation projects present lower constructability risk, driven primarily by conventional scope and the use of readily available high-voltage equipment. The Surry breaker replacements, Cunningham, North Anna, Morrisville, Farmville, and Gordonsville expansions all involve familiar like-for-like work or single-breaker additions with well-understood outage coordination requirements—no major schedule or material risks are anticipated. The Joshua Falls, Durandal, Starfruit, Lodi, and Kaladin projects introduce more work complexity due to the installation of new 765 kV equipment and, in some cases, substantial site preparation. However, the anticipated challenges—grading work, sequencing around greenfield civil development, and long-lead procurement—are manageable with early planning and are not expected to threaten constructability.

The transmission scope of this proposal contains about 270 miles of EHV line, including both 765kV and 500kV greenfield and rebuilds. The 765kV work utilizes lattice towers, so these particular components will be more challenging and require engineers and contractors with expertise in this area. Given the volume that is being proposed, we feel that it presents a challenge in resources. Overall, the routes are rural and do not impact significant structures. In areas with conflicts, there are obvious reroute options.

All components are feasible to be permitted; however, certain components are at risk for long consultation, review, and processing times. Wetland/waterway, protected area, and infrastructure crossings are areas of concern for some components. Additionally, the Quantico Marine Corps Base crossing and potential impacts a USACE levee elevate the constructability risks for environmental and permitting. Avoiding sensitive resources, early environmental studies, and early consultation may reduce the elevated risk of certain components.

The overall constructability risk of this proposal is rated as **Medium-High**, primarily driven by the large quantity of land acquisition and the constraints encountered by the proposed greenfield line routes.

Outage Review

Due to the minimal number of line rebuilds and existing facility outages associated with this portfolio proposal, the overall outage coordination risk is assessed as **Low-Medium**.

Cost Review

A high-level cost estimate was created for each proposal to assess the cost component for potential omissions or under-estimating. Cost estimates were broken into eight categories, including Engineering & Design, Permitting/Routing/Siting, ROW/Land Acquisition, Materials & Equipment, Construction & Commissioning, Construction Management, Overheads and Miscellaneous, and Risk Contingency (30%). The cost comparison for this proposal, broken down by component, is outlined below.

Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
1	Joshua Falls - Durandal	\$297.69	\$311.12
2	Durandal - Starfruit	\$194.64	\$238.95
3	Starfruit - Lodi	\$224.68	\$234.98
4	Kraken - Ladysmith 500kV Rebuild	\$33.00	\$36.96
5	Yeat – Ox 500 kV Rebuild	\$87.00	\$100.48
6	Surry 500kV Station Upgrade	\$14.00	\$11.63
7	Joshua Falls 765 kV Expansion	\$25.25	\$21.78
8	Durandal 765/500kV Greenfield Station	\$165.10	\$255.83
9	Starfruit 765/230kV Greenfield	\$140.10	\$107.65
10	Lodi 765/500 kV Greenfield	\$130.10	\$144.17
11	Kaladin 500/230 kV Greenfield	\$98.18	\$125.82
12	Cunningham Station Expansion	\$15.00	\$7.18
13	North Anna 500 kV Station Expansion	\$3.50	\$4.76
14	Morrisville 500 kV Station Upgrades	\$3.50	\$6.60
15	Cunningham - Lodi	\$10.80	\$15.57
16	Kaladin - Lodi	\$129.60	\$119.99
17	Kaladin - North Anna	\$151.20	\$158.98
18	Kaladin - Morrisville	\$226.80	\$204.56
19	Farmville 230kV Upgrade	\$1.50	\$5.64
20	Durandal 500kV Cut-Ins	\$4.30	\$7.99
21	Kaladin - Gordonsville 230kV Cut-In	\$1.50	\$4.19
22	Gordonsville Station Upgrade	\$2.00	\$3.29
	Total	\$1,959.44	\$2,140.08

The proposal cost estimate is within 10% of the independent cost estimate. The cost estimate risk is considered **Low** risk.

Schedule Review

This proposal projects an in-service date of October 1, 2032.

Overall, the primary schedule risks for this proposal are driven by the anticipated lengthy process for the land acquisition, permitting and siting of the proposed transmission lines are somewhat mitigated by their paralleling existing transmission corridors for majority of the project. **Medium-High** schedule risks are assessed for this project.

Proposing Entity Experience and Capability Review

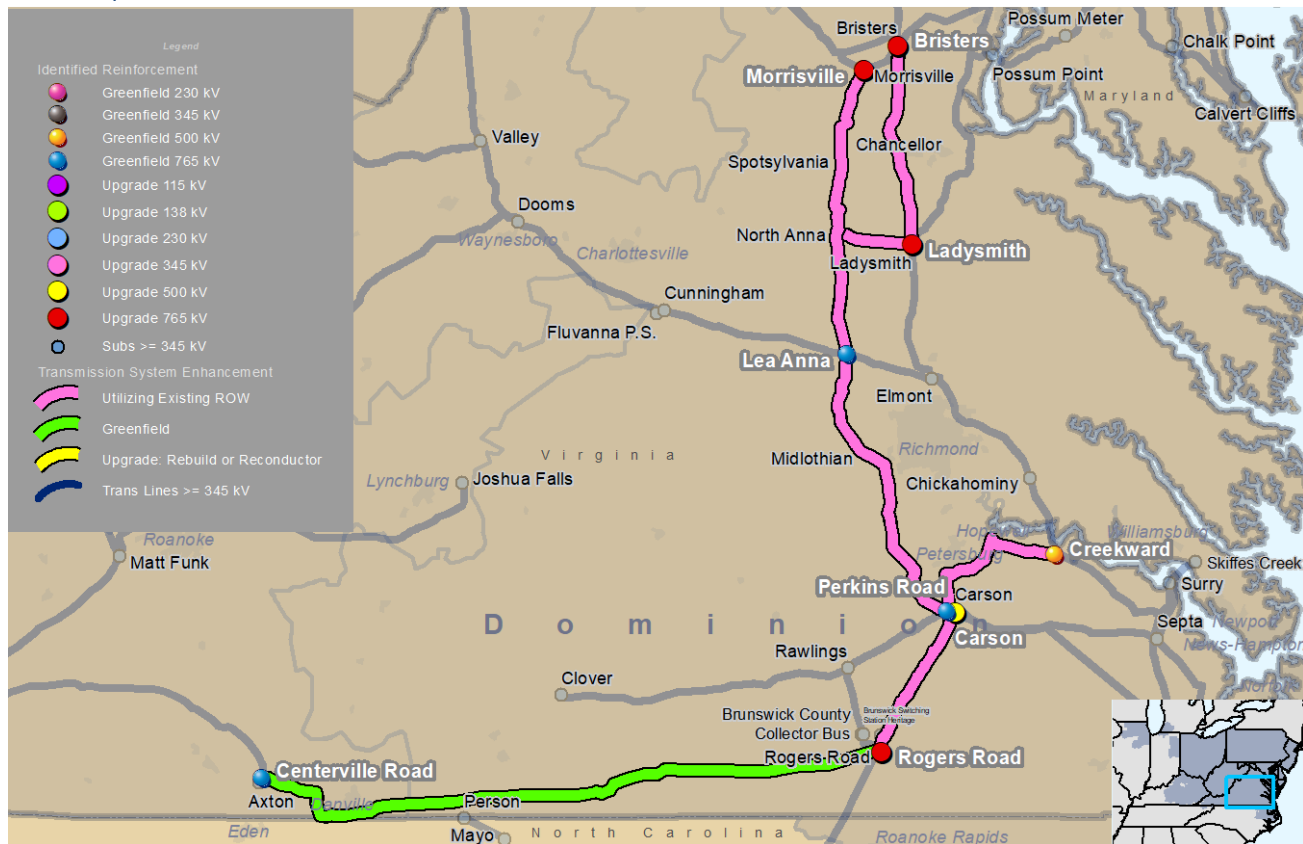
Transource, as an affiliate of AEP Transmission, has significant experience constructing and operating 765 kV transmission which represents the significant scope for Proposal 781. The proposing entity experience and capability risk is considered **Low**.

Proposal-938 – Virginia Area Seven Year Solution 1 (Transource/FE)

This proposal incorporates construction of multiple transmission lines and substations to provide a robust, expandable transmission solution to address the 2025 Open Window 1 violations identified in 2032 studies. This proposal will also ensure the PJM transmission system can safely and reliably accommodate future load growth. To do this, the proposal focuses on the Virginia Area by constructing several 765kV Greenfield lines, a 500kV line, several 765/500/230kV Greenfield Substations, and expanding other area substations. This proposal will traverse multiple counties throughout the state of Virginia, stretching from Northern Virginia down to the North Carolina state line, and as far west as Axton. This proposal has a total of 24 components, including 2 substation upgrade components, 15 greenfield substation components, and 7 greenfield transmission line components.

Map 8 displays the routes proposed for Proposal 938.

Map 8. Proposal 938



NOTE: 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.

Project Overview

Proposal 2025 – W1 - 938 includes the following components:

- Component 1: Lea Anna 765 kV Switchyard
- Component 2: Ladysmith 765 kV Switchyard
- Component 3: Lea Anna - Ladysmith 765 kV Line
- Component 4: Bristers 765/500 kV Substation
- Component 5: Bristers 500 kV Yard Expansion
- Component 6: Ladysmith - Bristers 765 kV Line
- Component 7: Morrisville 765/500 kV Substation
- Component 8: Morrisville 500 kV Yard Expansion
- Component 9: Lea Anna - Morrisville 765 kV Line
- Component 10: Rogers Rd 765 kV Switchyard
- Component 11: Centerville Rd 765 kV Switchyard
- Component 12: Centerville Rd - Rogers Rd 765 kV Line
- Component 13: Perkins Rd 765 kV Switchyard
- Component 14: Rogers Rd - Perkins Rd 765 kV Line
- Component 15: Perkins Rd - Lea Anna 765 kV Line
- Component 16: Lea Anna 765/500 kV Substation
- Component 17: Ladysmith 765/500 kV Substation
- Component 18: Ladysmith Substation: Revise Relay Settings
- Component 19: Rogers Rd 765/500 kV Substation
- Component 20: Rogers Rd 500 kV Yard Expansion
- Component 21: Perkins Rd 765/500 kV Substation
- Component 22: Creekward 500 kV Switchyard
- Component 23: Carson - Creekward 500 kV Line
- Component 24: Carson 500 kV Yard Expansion

Constructability Review

Right-of-Way/Land Acquisition Risk Analysis

Component 1: Lea Anna 765 kV Switchyard

This component is a greenfield substation located in Hanover County, Virginia, and will require a new land parcel. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

The proposed site seems adequate to house the component; however, 765kV substations can generate public interest and opposition due to the high voltage and large size of the equipment

Component 2: Ladysmith 765 kV Switchyard

This component is a greenfield substation located in Caroline County, Virginia, and will require a new land parcel. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

The proposed site seems adequate to house the component; however, 765kV substations can generate public interest and opposition due to the high voltage and large size of the equipment.

Component 3: Lea Anna - Ladysmith 765kV Greenfield Line

The Lea Anna – Ladysmith Greenfield line is a 43-mile 765kV, single-circuit line, and will be constructed from the proposed Lea Anna Switchyard in Hanover County, VA to the proposed Ladysmith Switchyard in Caroline County, VA. The line will traverse Hanover, Louisa, Spotsylvania, and Caroline counties in Virginia.

The total route is 43 miles, and it is assumed that the 765 kV line will parallel existing transmission ROW for most of the line except for deviations to avoid developed areas or other constraints. Most of the routes are rural except in the area of Lake Anna.

The specified width of the ROW is 200ft, which is sufficient for a 765kV circuit. Total acquisition is about 1091 acres with 42 acres of that being in areas with numerous residences. It should be noted that this component parallels the Lea Anna – Morrisville 765kV Line component #9 as well, leading to almost 400ft of ROW between the two. When considering this, we don't believe land acquisition will be feasible in the Lake Anna area due to the number of houses that will need to be condemned.

Component 4: Bristers 765/500 kV Substation

This component is a greenfield substation located in Fauquier County, Virginia, and will require a new land parcel. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

The proposed site seems adequate to house the component; however, 765kV substations can generate public interest and opposition due to the high voltage and large size of the equipment.

Component 5: Bristers 500 kV Yard Expansion

This component is related to component 4 and requires no additional land acquisition.

The Ladysmith – Bristers Greenfield line is a 37-mile 765kV, single-circuit line, and will be constructed from the proposed Ladysmith Switchyard in Caroline County, VA to the proposed Bristers Switchyard in Fauquier County, VA. The line will traverse Caroline, Spotsylvania, Stafford, and Fauquier counties in Virginia.

The total route is 37 miles, and it is assumed that the 765 kV line will parallel existing transmission ROW for most of the line except for deviations to avoid developed areas or other constraints. Much of the route is relatively rural, but it does approach the outer suburbs of Fredericksburg where it crosses through a significant volume of neighborhoods.

The specified width of the ROW is 200ft, which is sufficient for a 765kV circuit. Total acquisition is about 897 acres, with 170 acres in dense suburban areas. Due to the level of property condemnation that will be required, much of which takes place in dense suburban areas, this acquisition will be feasible.

Component 7: Morrisville 765/500 kV Substation

This component is a greenfield substation located in Fauquier County, Virginia, and will require a new land parcel. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

The proposed site seems adequate to house the component; however, 765kV substations can generate public interest and opposition due to the high voltage and large size of the equipment.

Component 8: Morrisville 500 kV Yard Expansion

This component is related to component 7 and requires no additional land acquisition.

Component 9: Lea Anna - Morrisville 765kV Greenfield Line

The Lea Anna – Morrisville Greenfield line is a 54-mile 765kV, single-circuit line, and will be constructed from the proposed Lea Anna Switchyard in Hanover County, VA to the proposed Morrisville Switchyard in Fauquier County, VA. The line will traverse Hanover, Louisa, Spotsylvania, Orange, Culpeper, and Fauquier counties in Virginia.

The total route is 54 miles, and it is assumed that the 765 kV line will parallel existing transmission ROW for most of the line except for deviations to avoid developed areas or other constraints. Much of this route is rural, but it does approach large neighborhoods at the northern end of the route as well as passing through the lakefront properties around Lake Anna.

The specified width of the ROW is 200ft, which is sufficient for a 765kV circuit. Total acquisition is about 1309 acres with 182 acres in denser housing areas. It should be noted that this component parallels the Lea Anna – Ladysmith 765kV Line component #3 as well, leading to almost 400ft of ROW between the two. When considering this, we don't believe land acquisition will be feasible in the Lake Anna area due to the number of houses that will need to be condemned.

Component 10: Rogers Rd 765 kV Switchyard

This component is a greenfield substation located in Greensville County, Virginia, and will require a new land parcel. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

The proposed site seems adequate to house the component; however, 765kV substations can generate public interest and opposition due to the high voltage and large size of the equipment.

Component 11: Centerville Rd 765 kV Switchyard

This component is a greenfield substation located in Henry County, Virginia, and will require a new land parcel. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

The proposed site seems adequate to house the component; however, 765kV substations can generate public interest and opposition due to the high voltage and large size of the equipment.

Component 12: Centerville Rd – Rogers Rd 765kV Greenfield Line

The Centerville Rd – Rogers Rd Greenfield line is a 152-mile 765kV, single-circuit line, and will be constructed from the proposed Centerville Rd Switching Station in Henry County, VA to the proposed Rogers Rd Switchyard in Greensville County, VA. The line will traverse Henry, Pittsylvania, Danville, Halifax, Mecklenburg, Brunswick, and Greensville counties in Virginia.

The total route is 152 miles, very little of which is in the vicinity of any existing ROW. While much of the route is rural, it does pass through a large quantity of residences as it spans the 152 miles, particularly near Danville.

The specified width of the ROW is 200ft, which is sufficient for a 765kV circuit. Total acquisition is about 3685 acres, with 242 acres in areas of houses.

Component 13: Perkins Rd 765 kV Switchyard

This component is a greenfield substation located in Dinwiddie County, Virginia, and will require a new land parcel. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

The proposed site seems adequate to house the component; however, 765kV substations can generate public interest and opposition due to the high voltage and large size of the equipment.

Component 14: Rogers Rd – Perkins Rd 765kV Greenfield Line

The Rogers Rd – Perkins Rd 765kV line is a 32-mile 765kV, single-circuit line, and will be constructed from the proposed Rogers Rd Switchyard in Dinwiddie County, VA to the proposed Perkins Rd Switchyard in Dinwiddie County, VA. The line will traverse Greensville, Sussex, and Dinwiddie counties in Virginia.

The total route is 32 miles, and it is assumed that the 765 kV line will parallel existing transmission ROW for most of the line except for small deviations to avoid developed areas or other constraints. The route is largely rural with few structures along the route that interact with the ROW

The specified width of the ROW is 200ft, which is sufficient for a 765kV circuit. Total acquisition is about 776 acres, almost entirely rural. Much of this line avoids populations and has routing around properties, leading us to believe there will not be much issue with land acquisition for this component.

Component 15: Perkins Rd – Lea Anna 765kV Greenfield Line

The Perkins Rd – Lea Anna 765kV line is a 56-mile 765kV, single-circuit line, and will be constructed from the proposed Perkins Rd Switchyard in Dinwiddie County, VA to the proposed Lady Smith Switchyard in Hanover County. The line will traverse Dinwiddie, Chesterfield, Powhatan, Goochland, and Hanover counties in Virginia.

The total route is 56 miles, and it is assumed that the 765 kV line will parallel existing transmission ROW for most of the line except for small deviations to avoid developed areas or other constraints. The route is mostly rural but also has a 9-mile section that crosses through the suburbs west of Richmond.

The specified width of the ROW is 200ft, which is sufficient for a 765kV circuit. Total acquisition is about 1358 acres, with 242 acres in dense suburban areas. Due to the level of property condemnation that will be required in the area west of Richmond, we do not believe that this line is feasible as shown.

Component 22: Creekward 500 kV Switchyard

This component is a greenfield substation located in Prince George County, Virginia, and will require a new land parcel. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

The proposed site seems adequate to house the component; however, 765kV substations can generate public interest and opposition due to the high voltage and large size of the equipment.

Component 23: Carson - Creekward 500kV Greenfield Line

The Carson – Creekward 500kV line is a 36-mile 765kV, single-circuit line, and will be constructed from the proposed Carson Substation in Dinwiddie County, VA to the proposed Creekward Switching Station in Prince George County, VA. The line will traverse Dinwiddie, Petersburg, and Prince George counties in Virginia.

The total route is 36 miles, and it is assumed that the 765 kV line will parallel existing transmission ROW for most of the line except for deviations to avoid developed areas or other constraints. The route is a fair mix of rural and relatively suburban areas. It also parallels a railroad for a portion of the line.

Overall, due to the high greenfield nature of the proposed projects, a **High** ROW/Land Acquisition risk is assessed for proposal 938.

Environmental Risk Analysis

Lea Anna 765 kV Switchyard

Proposed substation footprint intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. Permit authorization may take 12-months to complete. The proposed substation footprint intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed substation footprint intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Designated Special Trout Waters Not Present.

It is anticipated that the proposal could require permits, consultations, clearances and authorization from Hanover and Louisa County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Ladysmith 765 kV Switchyard

Proposed substation footprint intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. Permit authorization may take 12-months to complete. The proposed substation footprint intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed.

There are 2 road crossings (4 entrances) in Caroline County. There are 2 transmission line crossings, 1 owned by VIRGINIA ELECTRIC & POWER CO and 1 with no owner available. It is anticipated that the proposal will require permits, consultations, and authorizations from Caroline County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits may be required.

Lea Anna - Ladysmith 765 kV Line

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting; woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Impacts to these resources will require coordination with the appropriate county floodplain administrator; coordination with state wildlife agencies, USACE and USFWS. Proposed route does not intersect designated Critical Habitat. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 6 conservation easements. Coordination with the Virginia Outdoors Foundation will be required. In addition, the State of Virginia has designated some streams as Special Trout Waters. Coordination with the VA Dept. of Wildlife Resources (DWR) is needed.

This component crosses over 2 railroads owned by Buckingham Branch Railroad; 65 road and highways (130 entrances) across Caroline County, Spotsylvania County, Louisa County, Hanover County; 12 transmission lines owned by Virginia Electric & Power Co and no owner available. The proposed component crosses 2 easements,

Virginia Outdoors Foundation Easement and Virginia Outdoors Foundation Easement It is anticipated that the proposal requires permits, consultations, clearances and authorization from Caroline County, Spotsylvania County, Louisa County, Hanover County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Bristers 765/500 kV Substation

The proposed substation footprint intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed.

The component crosses over 2 transmission line crossings owned by Virginia Electric & Power Co. It is anticipated that the proposal could require permits, consultations, clearances and authorization from Fauquier County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Ladysmith - Bristers 765 kV Line

The proposed component has the potential to impact environmental resources such as FEMA floodplains, lakes and reservoirs, rivers and streams, wetlands, and trout waters. Subject to USACE Section 404 and/or Section 10 permitting. Impacts to these resources will require coordination with the appropriate counties floodplain administrator; coordination with state wildlife agencies, USACE and USFWS. Proposed route does not intersect designated Critical Habitat. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on species. Proposed route intersects 20 conservation easements. Coordination with easement holders and VA Division of Natural Resources will be required.

The proposed route would cross a historical site. There is approximately 117 road and highway crossings (234 entrances) across 4 counties Caroline, Spotsylvania, Stafford, and Fauquier. There are approximately 13 transmission line crossings, 11 owned by VIRGINIA ELECTRIC & POWER CO., and 2 with no owner available. There are approximately 4 pipeline crossings, owned by Virginia Natural Gas Co. It is anticipated that the proposal requires permits, consultations, clearances and authorization from 3 counties in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Morrisville 765/500 kV Substation

The proposed substation footprint intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. Designated Special Trout Waters Not Present.

There are approximately 2 transmission line crossings, both are owned by VIRGINIA ELECTRIC & POWER CO. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Fauquier County in VA. State CPCN and DOT utility, driveway and right of way permits may be required.

Lea Anna - Morrisville 765 kV Line

The permitting risk for the proposed route should be expected to be lessened since the route is parallel to a pre-existing ROW; however, the route intersects over 100 woodland areas which may pose a risk regarding T&E species such as bats. The route also intersects 12 designated trout waters, which will require coordination with the VA DWR

and USFWS. The route also intersects 23 conservation easements held by at least four entities (Virginia Outdoors Foundation, Fauquier County Open Space Easement, The Nature Conservancy, VA Dept. Wildlife Resources), which will need to be contacted as well.

The component crosses approximately 2 rail roads owned by Buckingham Branch Railroad Company; 175 roads and highways (250 entrances) across 6 counties (Hanover, Louisa, Spotsylvania, Orange, Culpeper, Fauquier); and 12 transmission lines owned by VIRGINIA ELECTRIC & POWER CO (approximately 2 separate parallel encroachment spanning approximately 50 miles). It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from 6 counties in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Rogers Rd 765 kV Switchyard

The proposed substation footprint intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed.

There is 1 roadway crossing (2 entrances). It is anticipated that the proposal will require permits, consultations, and authorizations from Brunswick County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits may be required.

Centerville Rd 765 kV Switchyard

Proposed substation footprint intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. Permit authorization may take 12-months to complete. The proposed substation footprint intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. Designated Special Trout Streams Not Present.

It is anticipated that the proposal will require permits, consultations, and authorizations from Henry County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits may be required.

Centerville Rd - Rogers Rd 765 kV Line

The following proposed route intersects with the following recorded Historical Sites/Structures/Districts: Boynton Historic District. Proposed route intersects 23 FEMA High Risk Zones (100-Year Floodplain). 3 Floodways present. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. The proposed route intersects is woodlands. Tree removal restrictions will apply. Karst zones present. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdiction determination. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands, Consultation with USACE will be required for jurisdictional determination.

The proposed route intersects the Danville Regional Airport. The proposed route intersects 6 railroads; 1 owned by Buckingham Branch Railroad Company and 5 owned by Norfolk Southern Railway Company. There are

approximately 169 road crossings. 3 road crossing in Henry County. 36 road crossings and 3 highway crossings in Pittsylvania County. 21 road crossings and 2 highway crossings in Danville County. 71 road crossings and 2 highway crossings in Halifax County. 42 road crossings and 10 highway crossings in Mecklenburg County. 22 road crossings and 1 highway crossings in Brunswick County. There are approximately 22 transmission lines identified; 8 unknown owners, 7 owned by VIRGINIA ELECTRIC & POWER CO, 1 owned by DUKE ENERGY PROGRESS - (NC) and 6 owned by APPALACHIAN POWER CO. The proposed route intersects 5 pipelines ; 3 owned by Transcontinental Gas PL, 1 owned by COLONIAL PIPELINE CO and 1 owned by KINDER MORGAN. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from the 7 counties (Henry, Pittsylvania, Danville, Halifax, Mecklenburg, Brunswick and Greenville) in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Perkins Rd 765kV switchyard

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting. Impacts to these resources will require coordination with the USACE and appropriate Floodplain Administrators.

There are 3 existing dirt roads on the proposed substation (6 entrances). It is anticipated that the proposal will require permits, consultations, and authorizations from Dinwiddie County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits may be required.

Rogers Rd - Perkins Rd 765 kV Line

The proposed route intersects woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Tree removal restrictions may apply due to the likelihood of the presence of listed bat species. Field verification of suitable bat habitat is recommended to determine presence.

This component crosses over 110 road and highway crossings (220 entrances) across 3 counties; 8 transmission lines owned by Virginia Electric & Power Co and where the owner is not available; 3 pipeline crossings owned by Columbia Gas Trans Co. The proposed route crosses Roanoke River Rails-to-Trails, Inc. and Reams Station Battlefield. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Dinwiddie County, Greenville County, Sussex County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Perkins Rd - Lea Anna 765 kV Line

"The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting. Impacts to these resources will require coordination with the USACE and appropriate Floodplain Administrators. The proposed route intersects woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Tree removal restrictions may apply due to the likelihood of the presence of listed bat species. Field verification of suitable bat habitat is recommended to determine presence. Proposed route does not intersect designated Critical Habitat. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 12 conservation easements. Coordination with easement holders will be required.

There are approximately 3 railroad crossings, 2 with Norfolk Southern Railway Company, and 1 with CSXT. There are approximately 222 road and highway crossings (444 entrances) in 5 counties. There are approximately 17 transmission line crossings, 10 owned by VIRGINIA ELECTRIC & POWER CO, and 7 with no owner available. There are approximately 3 pipeline crossings, 1 with Columbia Gas Trans Co., 1 with COLONIAL PIPELINE CO., and 1 with KINDER MORGAN. It is anticipated that the proposal requires permits, consultations, clearances and authorization from 2 counties in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Lea Anna 765/500 kV Substation

Proposed substation footprint intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. Permit authorization may take 12-months to complete. The proposed substation footprint intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed substation footprint intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed substation is nearby streams designated by the state as Special Trout Waters. Coordination with the USACE and the VA Dept. of Wildlife Resources (DWR) is needed.

It is anticipated that the proposal could require permits, consultations, clearances and authorization from Hanover and Louisa County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Perkins Rd 765/500 kV Substation

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting. Impacts to these resources will require coordination with the USACE and appropriate Floodplain Administrators.

There are 3 existing dirt roads on the proposed substation (6 entrances). It is anticipated that the proposal will require permits, consultations, and authorizations from Dinwiddie County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits may be required.

Creekward 500 kV Switchyard

The proposed route intersects woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Tree removal restrictions may apply due to the likelihood of the presence of listed bat species. Field verification of suitable bat habitat is recommended to determine presence.

It is anticipated that the proposal will require permits, consultations, and authorizations from Prince George County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits may be required.

Carson - Creekward 500 kV Line

Proposed route intersects 40 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Prince George; Petersburg; Dinwiddie and Hopewell

counties, VA. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects with 1 recorded Underground Storage Tank (UST's). A file review of State records to determine the current status of the UST's is recommended. Based on the results of the review, a subsurface Soil Characterization investigation may be necessary to determine if contamination is present and the extent of contamination originating from UST's. The proposed route intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed route does not intersect designated Critical Habitat. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 15 conservation easements. Coordination with the following easement holder(s) is required: Virginia Board of Historic Resources; Virginia Outdoors Foundation; US Fish and Wildlife Service; Department of Defense; City of St. Petersburg; American Battlefield Trust. The proposed route intersects Natural Areas/Reserves/Wildlife Refuge. Coordination with the following agencies is required: James River National Wildlife Refuge; Fort Lee; and Private Conservation Areas. Proposed route intersects streams that the State of Virginia has designated as Special Trout Waters. These streams include: Portions of Hatcher Run and its tributaries; and portions of Blackwater River and its free flowing tributaries. Coordination with the USACE and the VA Dept. of Wildlife Resources (DWR) is needed.

The component crosses approximately 9 railroads, 1 owned by NORFOLK DISTRICT CANAL DRIVE TO CREWE, 3 owned by CSXT, 5 owned by Norfolk Southern Railway Company. There are approximately 130 road and highway crossings (260 entrances) across 4 municipalities (Dinwiddie County, Prince George County, City of Hopewell, and City of Petersburg); 18 transmission line crossings, 13 with VIRGINIA ELECTRIC & POWER CO, 5 with no owner available, including multiple parallel encroachments; and 3 pipeline crossings with Columbia Gas Trans Co. There is 1 Federal Park, James River National Wildlife Refuge, owned by Fish and Wildlife Service. There are two local parks, Oakhurst Playground and Lee Memorial Park. There are 4 CWT Holding (Fee) owned by NGO American Battlefield Trust. There is 1 military area, Fort Lee, owned by Deployment Expeditionary Sustainment Group (DESG). It is anticipated that the proposal requires permits, consultations, clearances and authorization from 2 counties and 2 cities in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Transmission Line Risk Analysis

Component 3: Lea Anna - Ladysmith 765kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 6-bundle 795 kcmil ACSR "Tern" conductor on lattice structures. Some lattice structures will be guyed V-Type while others will be self-supporting on foundations. These types of structures are inherently complex vs. steel monopoles and less bundled conductors but are common for 765kV lines. It should be noted that 765kV AC Transmission lines are not historically common in America but are increasingly being developed across the country. We would expect some utilities and contractors to have limited experience accordingly. The conductors support the ratings of the proposal**.

Regarding the route, expect a ROW of 200ft to be used for a line of this configuration, particularly with the guyed V-structures. There should be no concerns with vehicle access due to the terrain and locations, and the alignment interacts with very few structures until it approaches Lake Anna. There are a number of crossings along the route including four high-voltage lines, one railroad, seven highways, one major river, and several crossings over Lake Anna. For a 43-mile route, this is not an unreasonable amount of crossings.

At Lake Anna, there are likely to be structures within the Lake, as there are now, unless excessively large spans are utilized. This will cause issues with future access and maintenance and will also require more complicated foundations.

From a procurement perspective, there are a significant number of structures (207) that will be required and over 770 miles of conductor needed. This is a large quantity of material to procure. Most of the material, outside of some 765kV hardware, should not carry procurement risks outside of typical EHV line builds.

Component 6: Ladysmith – Bristers 765kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 6-bundle 795 kcmil ACSR “Tern” conductor on lattice structures. Some lattice structures will be guyed V-Type while others will be self-supporting on foundations. These types of structures are inherently complex vs. steel monopoles and less bundled conductors but are common for 765kV lines. It should be noted that 765kV AC Transmission lines are not historically common in America but are increasingly being developed across the country. We would expect some utilities and contractors to have limited experience accordingly. The conductors support the ratings of the proposal**.

Regarding the route, we would expect a ROW of 200ft to be used for a line of this configuration, particularly with the guyed V-structures. There should be no concerns with vehicle access due to the terrain and locations. The route runs through several neighborhoods West of Fredericksburg which will be a challenge. There are a number of crossings along the route including three high-voltage lines, three highways, and three rivers. For a 37-mile route, it is a low-quantity of crossings which lends to the rural nature of the area.

From a procurement perspective, there are a significant number of structures (178) that will be required and over 660 miles of conductor needed. This is a large quantity of material to procure, but most of the material, outside of some 765kV hardware, should not carry procurement risks outside of typical EHV line builds.

Component 9: Lea Anna - Morrisville 765kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 6-bundle 795 kcmil ACSR “Tern” conductor on lattice structures. Some lattice structures will be guyed V-Type while others will be self-supporting on foundations. These types of structures are inherently complex vs. steel monopoles and less bundled conductors but are common for 765kV lines. It should be noted that 765kV AC Transmission lines are not historically common in America but are increasingly being developed across the country. We would expect some utilities and contractors to have limited experience accordingly. The conductors support the ratings of the proposal**.

Regarding the route, we would expect a ROW of 200ft to be used for a line of this configuration, particularly with the guyed V-structures. There should be no concerns with vehicle access due to the terrain and locations, and the alignment interacts with very few structures until it approaches Lake Anna. There are a number of crossings along the route including four-voltage lines, one railroad, one highway, three rivers, and several crossings over Lake Anna. For a 54-mile route, this is not an unreasonable amount of crossings.

At Lake Anna, there are likely to be structures within the Lake, as there are now, unless excessively large spans are utilized. This will cause issues with future access and maintenance and will also require more complicated foundations. As a 765kV line, we would not expect a design considering future double-circuit, so we see no concerns about future expansion. It should be expected that the expansion of ROW near the lake will face significant pushback.

From a procurement perspective, there are a significant number of structures (260) that will be required and over 970 miles of conductor needed. This is a large quantity of material to procure. Most of the material, outside of some 765kV hardware, should not carry procurement risks outside of typical EHV line builds.

Finally, the mostly flat and rural nature of the route does not provide any terrain concerns outside of the previously mentioned Lake Anna structures. While some lower-lying wetlands may require unique foundations, there are not a lot of these identified along the route.

Component 12: Centerville Rd – Rogers Rd 765kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 6-bundle 795 kcmil ACSR “Tern” conductor on lattice structures. Some lattice structures will be guyed V-Type while others will be self-supporting on foundations. These types of structures are inherently complex vs. steel monopoles and less bundled conductors but are common for 765kV lines. It should be noted that 765kV AC Transmission lines are not historically common in America but are increasingly being developed across the country. We would expect some utilities and contractors to have limited experience accordingly. The conductors support the ratings of the proposal**.

Regarding the route, we would expect a ROW of 200ft to be used for a line of this configuration, particularly with the guyed V-structures. There should be no concerns with vehicle access due to the terrain for most of the line, and the alignment interacts with very few structures, despite its length. There are some swamps and wetlands that may require access improvements. There are a number of crossings along the route including four high-voltage lines, one railroad, ten highways, and seven major rivers or waterbodies. For a 152-mile route, it is a low-quantity of crossings which lends to the very rural nature of the area.

Component 14: Rogers Rd – Perkins Rd 765kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 6-bundle 795 kcmil ACSR “Tern” conductor on lattice structures. Some lattice structures will be guyed V-Type while others will be self-supporting on foundations. These types of structures are inherently complex vs. steel monopoles and less bundled conductors but are common for 765kV lines. It should be noted that 765kV AC Transmission lines are not historically common in America but are increasingly being developed across the country. The conductors support the ratings of the proposal**.

Regarding the route, we would expect a ROW of 200ft to be used for a line of this configuration, particularly with the guyed V-structures. There should be no concerns with vehicle access due to the terrain and locations, and the alignment interacts with very few structures. There are a number of crossings along the route including three high-voltage lines, one highway, one railroad, and two rivers. For a 32-mile route, it is a low-quantity of crossings which lends to the very rural nature of the area.

From a procurement perspective, there are (141) structures that will be required and about 570 miles of conductor needed. This is a large quantity of material to procure, but most of the material, outside of some 765kV hardware, should not carry procurement risks outside of typical EHV line builds.

Component 15: Perkins Rd – Lea Anna 765kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 6-bundle 795 kcmil ACSR “Tern” conductor on lattice structures. Some lattice structures will be guyed V-Type while others will be self-supporting on foundations. These types of structures are inherently complex vs. steel monopoles and less bundled conductors but are common for 765kV lines. It should be noted that 765kV AC Transmission lines are not historically common in America but are increasingly being developed across the country. We would expect some utilities and contractors to have limited experience accordingly. The conductors support the ratings of the proposal**.

Regarding the route, we would expect a ROW of 200ft to be used for a line of this configuration, particularly with the guyed V-structures. There should be no concerns with vehicle access due to the terrain and locations. As mentioned previously, a portion of the line enters a very populated area that will make expansion of ROW by 200ft extremely difficult. There are a number of crossings along the route including sixteen high-voltage lines, three railroads, eleven highways, and three major rivers or waterbodies. This is a higher quantity of crossings, which lends to the more populated nature of the route. A very large span will be needed over the James River to avoid putting a structure on an island.

From a procurement perspective, there are a significant number of structures (247) that will be required and over 1000 miles of conductor needed. This is a large quantity of material to procure, but most of the material, outside of some 765kV hardware, should not carry procurement risks outside of typical EHV line builds.

Component 23: Carson - Creekward 500kV Greenfield Line

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 3-bundle 1113 kcmil ACSS “Finch” conductor on single-circuit steel monopoles. All structures will be on drilled shaft foundations. This is a pretty standard approach to line design and does not bring any complexity issues. The conductors support the ratings of the proposal**.

Regarding the route, expect a ROW of 200ft to be used for a line of this configuration. There are likely no concerns with vehicle access for most of the line, but it does parallel railroads for a period which will have restrictions. The alignment passes through the suburbs surrounding Petersburg, interacting with many structures. There are a number of crossings along the route including six high-voltage lines, three highways, five railroads, and some swampy wetlands.

From a procurement perspective, there are a large number of structures (173) that will be required and about 320 miles of conductor needed. This is a large quantity of material to procure, but most of the material, outside of some 500kV hardware, should not carry procurement risks outside of typical EHV line builds.

Substation Risk Analysis

Component 1: Lea Anna 765 kV Switchyard

The project consists of constructing the new Lea Anna 765 kV Switchyard at the approximate coordinates (37.7620, -77.7648) to serve as a major extra-high-voltage transmission hub on the regional grid. The switchyard will be built in a breaker-and-a-half configuration to provide high reliability, strong fault-isolation capability, and long-term operational flexibility for future transmission development. Initial construction will include new 765 kV foundations, structural steel, high-voltage aluminum bus, grounding grid expansion, and installation of protection-grade station service, control building facilities, and SCADA/communications infrastructure. The existing Joshua Falls – Yeat 765 kV transmission line will be looped into the switchyard, requiring installation of line terminals, 765 kV circuit breakers, disconnect switches, current transformers, wave traps or fiber communications equipment, conductor drops, and high-speed line-protection systems.

The scope also includes building the required substation interfaces to receive multiple additional future 765 kV lines—Lea Anna–Morrisville, Ladysmith–Lea Anna, and Lea Anna–Perkins Road—ensuring that their tie-ins can be completed with minimal rework once those facilities are constructed. Foundations, bus stubs, protection panels, spare conduits, and SCADA accommodations will be incorporated during initial construction to support these future interconnections. Final commissioning will include breaker timing and functional testing, relay and communication validation, SCADA, and EMS integration, and coordinated outage sequencing to safely energize the switchyard. Once complete, the Lea Anna 765 kV Switchyard will function as a major backbone node in the regional EHV network, increasing transfer capability, improving grid resilience, and enabling long-term strategic transmission expansion.

Component 2: Ladysmith 765 kV Switchyard

The project involves construction of a new Ladysmith 765 kV switchyard in a ring-bus configuration adjacent to the existing Ladysmith Substation at the approximate coordinates (38.0467, -77.5501). The new extra-high-voltage yard will be built to serve as a major transmission node supporting future network expansion and increased bulk-power transfer capability. Work will include installation of 765 kV foundations, structural steel, high-voltage bus systems, grounding grid extensions, and a control building with station service, relay panels, telecommunications, and SCADA systems. The ring-bus layout will provide full breaker-and-bay protection for each position and support high reliability, operational flexibility, and future station build-out.

The switchyard will be constructed with the capacity to accommodate multiple planned interconnections, including the Lea Anna – Ladysmith 765 kV line, the Ladysmith – Bristers 765 kV line, and the new 765/500 kV transformation at Ladysmith Substation. Provisions for these future tie-ins—such as bus stubs, conduits, protection and control accommodations, and space for future breaker positions—will be incorporated during the initial construction phase to minimize rework. Final commissioning will include breaker and protection system verification, communication, and SCADA integration, and coordinated outage planning to safely energize the new yard. Once complete, the Ladysmith 765 kV switchyard will significantly strengthen regional transmission reliability and create a backbone connection point for long-term grid expansion.

Component 4: Bristers 765/500 kV Substation

The project involves construction of a new Bristers 765 kV switchyard in a ring-bus configuration at the approximate coordinates (38.5629, -77.5954) to establish a major extra-high-voltage transmission node. The new 765 kV yard will include installation of structural steel, foundations, high-voltage aluminum bus systems, grounding grid expansion, station service equipment, a control enclosure, and full protection and communications infrastructure. The ring-bus layout will provide high reliability and fault-isolation capability, allowing any breaker or section of bus to be removed from service without interrupting power flow. Provisions for multiple 765 kV line positions will be included to support future regional transmission expansion.

In addition, two 765/500 kV autotransformers will be installed to interconnect the new switchyard with the existing Bristers Substation and support bulk power transfer between the 765 kV and 500 kV systems. Scope includes transformer foundations, oil containment, high-voltage bus work, breaker and disconnect installations, relay and metering systems, SCADA integration, and control-cable routing between the new and existing yards. Testing and commissioning activities—such as transformer acceptance testing, breaker timing, protection-scheme validation, and energized functional testing—will be performed prior to energization. Once complete, the Bristers 765 kV switchyard will function as a key backbone facility enhancing transfer capability, operational flexibility, and long-term grid resilience in the region.

Component 5: Bristers 500 kV Yard Expansion

This component is related to component 4 and adds the following scope:

The project involves expanding Bristers Substation to support the proposed 765/500 kV interconnection by installing one new 500 kV circuit breaker with the associated relaying and control systems. Work will include constructing the necessary foundation and steel support structures, extending the high-voltage bus to integrate the new breaker position, and installing disconnect switches, conductor connections, and grounding improvements. Protection and control modifications—including relay panel additions, control wiring, metering updates, and SCADA integration—will ensure proper fault isolation and coordination with the new 765/500 kV transformer connection. Final testing and commissioning will verify breaker timing, relay logic, and communication interfaces to safely energize the upgraded 500 kV bay.

Component 7: Morrisville 765/500 kV Substation

The project involves construction of the new Morrisville 765 kV switchyard in a ring-bus configuration at the approximate coordinates (38.5009, -77.7087), establishing a major extra-high-voltage node to strengthen regional transmission reliability and capacity. The 765 kV yard will include installation of new foundations, structural steel, high-voltage aluminum bus systems, grounding grid extensions, station service equipment, and a control building with relay panels, SCADA systems, metering, and telecommunications. The ring-bus layout will provide full breaker redundancy and fault-isolation capability, allowing any breaker or bus segment to be removed from service without interrupting power flow. The switchyard will also be constructed with space, conduits, and protection accommodations to support future 765 kV line additions without major rework.

In addition, two new 765/500 kV autotransformers will be installed to interconnect the new 765 kV switchyard with the existing Morrisville Substation, enabling bulk power transfers between the 765 kV and 500 kV networks. Scope includes transformer foundations, oil-containment infrastructure, high-voltage bus tie-ins on both voltage levels, and

installation of associated 765 kV and 500 kV breakers, disconnect switches, control wiring, and protection and metering systems. Grounding, raceways, and control-cable routing between the new and existing yards will be completed, followed by functional testing, transformer acceptance testing, protection-scheme validation, and SCADA integration. Once energized, the Morrisville 765 kV switchyard will operate as a critical backbone facility supporting increased transmission capability, greater operational flexibility, and long-term system growth in the region.

Component 10: Rogers Rd 765 kV Switchyard

The project consists of constructing a new 765 kV switchyard in a breaker-and-a-half configuration adjacent to the existing Rogers Rd Substation at the approximate coordinates (36.7231, -77.6554). The new switchyard will establish a major extra-high-voltage node to enhance backbone transmission capability and system reliability across the region. Construction will include installation of new foundations, structural steel, high-voltage aluminum bus, grounding-grid extensions, station service equipment, and a control building with relay panels, telecommunications, and SCADA infrastructure. The breaker-and-a-half layout will provide full operational redundancy and protection for every line position, ensuring that any single breaker or bus segment can be removed from service without reducing power-transfer capability.

The switchyard will be built to accommodate the planned interconnections of the Centerville–Rogers Rd 765 kV line, the Rogers Rd–Perkins Rd 765 kV line, and the future 765/500 kV transformation at Rogers Rd Substation. Space, bus stubs, conduits, and protection-system accommodations will be incorporated during initial construction to minimize rework as the additional components are installed. Final commissioning activities—including breaker timing tests, protection-scheme validation, SCADA and EMS integration, and outage coordination for energization—will be performed to place the switchyard safely into service. Once complete, the Rogers Rd 765 kV switchyard will function as a high-reliability backbone node, supporting expanded transfer capability and long-term strategic transmission growth.

Component 11: Centerville Rd 765 kV Switchyard

The project involves construction of the new Centerville Rd 765 kV Switchyard in a ring-bus configuration near the existing Axton Substation at the approximate coordinates (36.6489, -79.6998). The new extra-high-voltage facility will include installation of foundations, structural steel, high-voltage aluminum bus, grounding-grid expansion, station service infrastructure, and a control enclosure housing relay panels, SCADA equipment, metering, and communications systems. The ring-bus design will provide full breaker redundancy and strong fault-isolation capability, allowing any breaker or bus segment to be removed from service without interrupting transmission flow. As part of the initial buildout, the existing Jacksons Ferry – Axton 765 kV line will be looped into the new switchyard, requiring installation of 765 kV breakers, disconnect switches, current transformers, conductor drops, and high-speed line-protection systems.

The switchyard will be constructed with capacity and provisions to support the future Centerville Rd – Rogers Rd 765 kV transmission line. Space, bus stubs, conduit routes, and accommodations in the protection and control systems will be incorporated during initial construction to allow the additional 765 kV line to be tied in with minimal rework. Following completion of all electrical and civil construction, the project will undergo full functional testing, breaker timing verification, relay and communications validation, and coordinated outage planning to safely energize the new facility. Once placed in service, the Centerville Rd 765 kV Switchyard will operate as a key backbone node on the regional extra-high-voltage system, enhancing power-transfer capability, operational flexibility, and long-term grid resilience.

Component 13: Perkins Rd 765 kV Switchyard

The project consists of constructing the new Perkins Rd 765 kV Switchyard in a breaker-and-a-half configuration at the approximate coordinates (37.0890, -77.4334), creating a major extra-high-voltage node to support regional backbone transmission expansion. The 765 kV yard will include installation of structural steel, deep foundations, high-voltage aluminum bus systems, grounding-grid extensions, station service systems, and a control enclosure housing relay panels, SCADA, telecommunications, and metering infrastructure. The breaker-and-a-half layout will provide full redundancy and operational flexibility, ensuring that any single breaker or bus section can be isolated without impacting power-transfer capability. Initial construction will include the full protection, control, and communications architecture necessary to support immediate and future 765 kV line terminations.

The station will be built to support multiple planned interconnections: the Rogers Rd – Perkins Rd 765 kV Line, the Perkins Rd – Lea Anna 765 kV Line and the future 765/500 kV transformation at the Perkins Rd Switchyard. Provisions for these future tie-ins—including bus stubs, conduits and raceways, space for additional breakers, protection logic accommodations, and SCADA connectivity—will be incorporated during the initial buildout to minimize rework. Testing and commissioning activities will include breaker timing and functional testing, relay-scheme validation, end-to-end communications checks, and coordinated outage planning to safely energize the new switchyard. Once complete, the Perkins Rd 765 kV Switchyard will serve as a high-reliability backbone hub, enabling increased system capacity, improved grid resilience, and long-term transmission expansion across the 765 kV network.

Component 16: Lea Anna 765/500 kV Substation

This component is related to component 1 and adds the following scope:

The project entails construction of a new 500 kV switchyard in a breaker-and-a-half configuration at the approximate coordinates (37.7620, -77.7648), forming the 500 kV portion of the new Lea Anna Substation. The new yard will include installation of foundations, structural steel, high-voltage aluminum bus work, grounding grid extensions, station service equipment, and a control enclosure housing relay panels, metering, SCADA, and telecommunications systems. Two existing 500 kV transmission paths—the Cunningham–Elmont 500 kV line and the Midlothian–North Anna 500 kV line—will be looped into the new switchyard, requiring installation of 500 kV circuit breakers, disconnect switches, current transformers, wave traps or fiber-optic communications equipment, conductor drops, and high-speed line-protection systems. The breaker-and-a-half configuration will provide full protection redundancy and operational flexibility, enabling either breaker or any segment of bus to be isolated without interrupting power transfer.

The scope also includes installation of two new 765/500 kV autotransformers to interconnect the new 500 kV yard with the proposed Lea Anna 765 kV Switchyard. Work will include constructing transformer foundations and oil containment systems, installing the associated 765 kV and 500 kV breaker positions and disconnects, extending high-voltage bus work on both voltage levels, and integrating protection, metering, and control systems across the two switchyards. Relay configuration, communications testing, SCADA integration, and commissioning activities—including transformer acceptance testing and end-to-end protection checks—will be completed before energization. Once in service, the Lea Anna 500 kV Switchyard will operate as a major backbone facility, enabling high-capacity power transfers between the 765 kV and 500 kV networks while improving grid reliability and supporting long-term regional transmission growth.

Component 17: Ladysmith 765/500 kV Substation

This component is related to component 2 and adds the following scope:

The project involves installing two 765/500 kV autotransformers at the proposed Ladysmith 765 kV Switchyard (Component 2) and interconnecting them into the existing Ladysmith Substation to enable bulk power transfer between the 765 kV and 500 kV systems. Scope includes construction of transformer foundations and oil-containment systems, installation of associated 765 kV and 500 kV breaker positions and disconnect switches, extension of high-voltage bus work on both voltage levels, and routing of control cables and raceways between the new and existing facilities. Protection, control, and communications systems—including relay panels, metering, control wiring, and SCADA/EMS integration—will be configured to coordinate transformer operation and ensure proper interface with both yards. Final commissioning will include transformer acceptance testing, breaker timing and functional checks, and end-to-end protection validation to safely energize the transformed interconnection.

Component 19: Rogers Rd 765/500 kV Substation

This component is related to component 10 and adds the following scope:

The project involves interconnecting the proposed Rogers Rd 765 kV Switchyard with the existing Rogers Rd Substation by installing two new 765/500 kV autotransformers and all associated substation equipment required to bridge the extra-high-voltage and high-voltage systems. Scope includes constructing transformer foundations and oil-containment systems, adding 765 kV and 500 kV breaker positions with disconnect switches, extending high-voltage bus work on both voltage levels, and installing grounding, raceways, and control-cable routing between the new switchyard and the existing substation. Protection and control work will include transformer differential, bus protection, and breaker-failure logic, along with metering, communication links, and SCADA/EMS integration to ensure coordinated operation across both facilities. Commissioning activities—such as transformer acceptance testing, breaker timing checks, and end-to-end protection testing—will be completed before energizing the 765/500 kV interconnection.

Component 20: Rogers Rd 500 kV Yard Expansion

This component is related to component 10 and adds the following scope:

The project involves expanding the existing Rogers Rd Substation by installing two new 500 kV circuit breakers and associated relaying to accommodate the proposed 765/500 kV interconnection. Scope includes constructing breaker foundations and steel structures, extending the high-voltage bus to establish a fully protected breaker position, and installing disconnect switches, conductor drops, grounding upgrades, and metering connections. Protection and control work will include adding or modifying relay panels, updating control wiring and communication channels, and integrating the new equipment into SCADA and EMS systems for coordinated transformer and line protection. Final commissioning—such as breaker timing tests, relay logic validation, and functional and end-to-end protection checks—will ensure proper energization and reliable operation of the upgraded 500 kV bay.

Component 21: Perkins Rd 765/500 kV Substation

This component is related to component 13 and adds the following scope:

The project entails construction of a new Perkins Rd 500 kV switchyard in a breaker-and-a-half configuration at the approximate coordinates (37.0890, -77.4334), installation of two 765/500 kV autotransformers to interconnect with the proposed Perkins Rd 765 kV Switchyard, and looping in both the Carson–Midlothian and Carson–Rawlings 500 kV transmission lines. Scope includes installing foundations, structural steel, high-voltage bus work, breaker and disconnect positions, grounding, oil-containment systems for the transformers, and routing of raceways and control cables between the 500 kV and 765 kV yards. The two incoming 500 kV lines will be terminated into new breaker-and-a-half positions, requiring line protection, metering, and SCADA integration. Full protection and control coordination—including transformer differential, bus protection, breaker-failure logic, and line-protection settings—will be implemented, followed by functional testing, end-to-end communications checks, and energization sequencing to place the new 500 kV switchyard safely in service.

Component 22: Creekward 500 kV Switchyard

The project consists of constructing the new Creekward 500 kV Switchyard in a three-breaker ring-bus configuration at the approximate coordinates (37.2383, -77.0786) to establish a high-reliability transmission node on the 500 kV network. The scope includes installation of foundations, structural steel, high-voltage aluminum bus, grounding-grid expansion, station service equipment, and a control enclosure configured with relay panels, SCADA interfaces, metering, and telecommunications systems. The three-breaker ring-bus design will allow any breaker to be isolated while maintaining uninterrupted power transfer across the switchyard, providing strong operational flexibility and fault-isolation capability.

The existing Surry – Chickahominy 500 kV transmission line will be looped into the new switchyard, requiring installation of 500 kV circuit breakers, disconnect switches, current transformers, conductor drops, line traps or fiber communications equipment, and high-speed line-protection systems. Protection and control systems—including line differential, bus protection, and breaker-failure logic—will be programmed and coordinated with the remote terminals and system operators. Commissioning activities will include breaker timing tests, functional relay and control logic testing, SCADA validation, and end-to-end communications checks to safely energize the new facility. Once complete, the Creekward 500 kV Switchyard will enhance regional transmission reliability and support future growth on the 500 kV network.

Component 24: Carson 500 kV Yard Expansion

The project involves expanding the existing Carson Substation by installing one new 500 kV circuit breaker and associated relaying to accommodate the interconnection of the proposed Carson–Creekward 500 kV transmission line (Component 23). Scope includes constructing the required breaker foundation and steel supports, extending the 500 kV bus to create a new line position, and installing disconnect switches, conductor connections, grounding upgrades, and metering as needed. Protection and control work will include adding relay panels, updating control wiring and communications channels, and integrating the new position into SCADA and EMS systems to ensure proper line-protection coordination with remote terminals. Final breaker timing tests, relay logic validation, and functional testing will be completed prior to energizing the new 500 kV line termination.

Constructability Summary

Regarding the substation components, the most significant constructability risks are concentrated in the large 765 kV greenfield switchyards—particularly Bristers, Morrisville, and the 765/500 kV transformer components at Lea Anna, Ladysmith, Rogers Rd, and Perkins Rd. The dominant driver of risk is long-lead procurement of 765/500 kV autotransformers, which are expected to push construction completion past the proposed in-service dates due to current global manufacturing and delivery constraints. Several 765 kV switchyards also depend heavily on coordination with future transmission lines and multi-station buildouts, meaning delayed system inputs could affect commissioning sequencing. Although breaker-and-a-half and ring-bus construction methodologies are standard for EHV facilities, the scale of work, the dependence on procurement of specialized equipment, and the need for highly coordinated protection and SCADA integration all contribute to schedule pressure.

There are 7 Transmission components totaling over 400 miles of 765kV greenfield lines. Schedule and ROW procurement are the largest risks and will drive the challenges of this proposal. Much of the acquisition does not appear to be feasible without significant eminent domain. All components are feasible to be permitted; however, certain components are at risk for long consultation, review, and processing times. Wetland/waterway, protected area, and infrastructure crossings are areas of concern for some components. Additionally, the Fort Gregg-Adams crossing and potential impacts a USACE levee elevate the constructability risks for environmental and permitting. Avoiding sensitive resources, early environmental studies, and early consultation may reduce the elevated risk of certain components.

The overall constructability risk of this proposal is rated as **Medium-High**, primarily driven by the large quantity of land acquisition and the constraints encountered by the proposed greenfield line routes.

Outage Review

Due to the primary greenfield nature of this project, only short outages to existing facilities will be required to tie in the new transmission facilities, and therefore no significant existing facility outages are anticipated. Overall outage coordination risk is deemed **Low**.

Cost Review

A high-level cost estimate was created for each proposal to assess the cost component for potential omissions or under-estimating. Cost estimates were broken into eight categories, including Engineering & Design, Permitting/Routing/Siting, ROW/Land Acquisition, Materials & Equipment, Construction & Commissioning, Construction Management, Overheads and Miscellaneous, and Risk Contingency (30%). The cost comparison for this proposal, broken down by component, is outlined below.

Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
1	Lea Anna 765 kV Switchyard	\$97.37	\$135.37
2	Ladysmith 765 kV Switchyard	\$49.49	\$49.31
3	Lea Anna - Ladysmith	\$259.61	\$259.64
4	Bristers 765/500 kV Substation	\$92.91	\$143.66
5	Bristers 500 kV Yard Expansion	\$9.89	\$3.73
6	Ladysmith - Bristers	\$223.39	\$224.53
7	Morrisville 765/500 kV Substation	\$92.91	\$150.06
8	Morrisville 500 kV Yard Expansion	\$41.06	\$16.28
9	Lea Anna - Morrisville	\$326.03	\$328.64
10	Rogers Rd 765kV Switchyard	\$75.97	\$74.95
11	Centerville Rd 765 kV Switchyard	\$60.99	\$44.02
12	Centerville Rd - Rogers Rd	\$917.70	\$831.38
13	Perkins Rd 765 kV Switchyard	\$70.22	\$75.11
14	Rogers Rd - Perkins Rd	\$193.20	\$189.09
15	Perkins Rd - Lea Anna	\$338.10	\$340.39
16	Lea Anna 765/500 kV Substation	\$110.00	\$168.44
17	Ladysmith 765/500 kV Substation	\$59.46	\$91.69
18	Ladysmith Substation: Revise Relay Settings	\$0.08	\$0.01
19	Rogers Rd 765/500 kV Substation	\$54.93	\$82.09
20	Rogers Rd 500 kV Yard Expansion	\$5.23	\$9.86
21	Perkins Rd 765/500 kV Substation	\$107.13	\$124.75
22	Creekward 500 kV Switchyard	\$51.91	\$35.39
23	Carson - Creekward	\$185.23	\$218.41
24	Carson 500 kV Yard Expansion	\$4.14	\$3.69
	Total	\$3,426.93	\$3,600.49

The proposal cost estimate is within 10% of the independent cost estimate. The cost estimate risk is considered **Low** risk.

Schedule Review

This proposal projects an in-service date of June 1, 2030.

Overall, the primary schedule risks for this proposal are driven by the anticipated lengthy process for the land acquisition, permitting and siting of the proposed greenfield line routes. **High** schedule risks are assessed for this project.

Proposing Entity Experience and Capability Review

Transource, as an affiliate of AEP Transmission, has significant experience constructing and operating 765 kV transmission which represents the significant scope for Proposal 781. The proposing entity experience and capability risk is considered **Low**.

MAAC PPL Cluster Proposals

Portfolio Proposal 853 – PPL

PPL's portfolio Proposal 853 is the essential reliability solution to address all posted violations in the PPL footprint for the year 2032 series of base cases with 4 GW of additional data center load included in the PPL region. The project includes multiple components comprising of the rebuild of the existing 38-mile line of the Juniata-Sunbury 500 kV Transmission Line using a single circuit design spanning from Snyder County, Pennsylvania through to Perry County, Pennsylvania, then, a bifurcation of the existing Sunbury-Susquehanna 500 kV line and reroute through a new Kelayres 500 kV Station, which comprises of a 13-mile extension from the bifurcation point, a 24-mile long extension to Kelayres, and a substation expansion within Luzerne and Schuylkill Counties, Pennsylvania. Included in this proposal is the new construction of a new three mile Kelayres – Tresckow 230 kV #3 line and the expansion/upgrade of the Kelayres 230 kV Substation in Luzerne and Carbon County, Pennsylvania, the reconstruction of the 9.9-mile Susquehanna – Tomhicken 230 kV 1 & 2 lines within Luzerne County, Pennsylvania, the rebuild and reconductoring of 3.72-miles of the Glen Brook – Susquehanna T10 1 and 2 DCT line and the new construction of 2.7 miles of the same line in Luzerne County, Pennsylvania, the re-termination/upgrades of Jenkins 230/69 kV T2 and T4 transformer and Jenkins T4 transformer lead line in Luzerne County, Pennsylvania, the upgrade of the Monroe 230/138 kV substation in Monroe County, Pennsylvania, the 18 mile expansion of the Susquehanna-Wescosville 500 kV line and reroute through Kelayres 500 kV Station by 150 feet and Kelayres 500 kV yard expansion in Luzerne and Carbon Counties, Pennsylvania, and the reconductoring and rebuild of Montour-Glen Brook 230 kV 1 & 2 DCT line and Glen Brook 230/69 kV Substation MOD upgrades in Montour, Columbia, and Luzerne Counties, Pennsylvania.

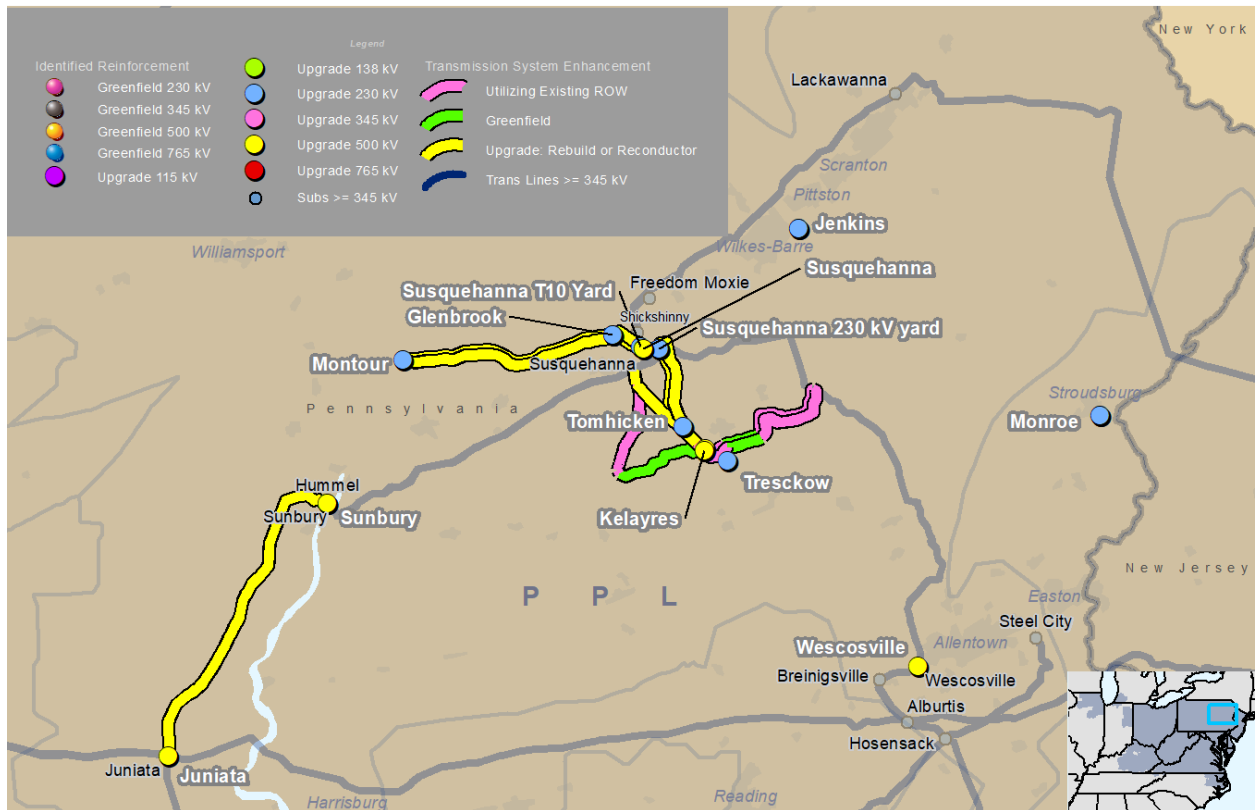
This proposal will traverse nine counties (Snyder, Perry, Juniata, Luzerne, Schuylkill, Carbon, Monroe, Montour, and Columbia) in Pennsylvania. This proposal has a total of twenty components, including eleven substation upgrade components, five greenfield transmission line components, and seven transmission line upgrade components.

Portfolio Component Overview

PPL Portfolio Proposal 853 includes the following sub-proposals:

- Subproposal 16, Component 1: Juniata - Sunbury 500 kV line EOL rebuild
- Subproposal 317, Component 1: Kelayres 500 kV yard expansion
- Subproposal 317, Component 2: Susquehanna - Kelayres 500 kV line
- Subproposal 317, Component 3: Sunbury - Kelayres 500 kV line
- Subproposal 333, Component 1: Kelayres 230 kV yard expansion
- Subproposal 333, Component 2: Kelayres - Tresckow 230 kV # 3 line
- Subproposal 422, Component 1: Susquehanna - Tomhicken 230 kV 1 & 2 separated lines with reconductors
- Subproposal 588, Component 1: Glen Brook - Susquehanna T10 1 & 2 DCT line reconductor
- Subproposal 588, Component 2: Susquehanna T10 - Susquehanna 230 kV # 3 line
- Subproposal 588, Component 3: Susquehanna T10 230 kV Station expansion
- Subproposal 588, Component 4: Susquehanna 230 kV Substation expansion
- Subproposal 588, Component 5: Glen Brook 230/69 kV Substation MOD upgrades
- Subproposal 647, Component 1: Jenkins 230/69 kV T2 and T4 transformer re-terminations
- Subproposal 647, Component 2: Jenkins T4 transformer lead line re-termination
- Subproposal 688, Component 1: Monroe 230/138 kV Substation upgrade
- Subproposal 688, Component 2: Monroe 230/138 kV Substation 230 kV line re-terminations
- Subproposal 946, Component 1: Susquehanna - Wescosville 500 kV line bifurcation and reroute through Kelayres 500 kV Station
- Subproposal 946, Component 2: Kelayres 500 kV yard expansion
- Subproposal 958, Component 1: Montour - Glen Brook 230 kV 1 & 2 DCT line reconductor or rebuild
- Subproposal 958, Component 2: Glen Brook 230/69 kV Substation MOD upgrades

Map 9 displays the components and routes proposed for Proposal 853.

Map 9. Proposal 853

NOTE: 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.

Constructability Review

Right-of-Way/Land Acquisition Risk Analysis

Subproposal 317, Component 3: Sunbury - Kelayres 500 kV line

The Sunbury-Kelayres 500 kV Transmission Line is an approximately 24-mile line that will be constructed from the existing Sunbury Substation, in Luzerne County, Pennsylvania to the proposed Kelayres Yard, in Luzerne County, Pennsylvania. The line will traverse one county (Luzerne) in Pennsylvania. The total route is 24 miles and 18 miles of the route will be within existing right-of-way. The remaining six miles of the route will be an expansion of existing right-of-way. The right-of-way is proposed to be 200 feet.

Land acquisition will be required for the new right-of-way. There are several residences near the proposed new line corridor, and eminent domain will not likely be possible. A proposed route also crossed the Catawissa Recreation Area.

Subproposal 946, Component 1: Susquehanna - Wescosville 500 kV line bifurcation and reroute through Kelayres 500 kV Station

Susquehanna-Wescosville 500 kV Line Bifurcation and Reroute Through Kelayres 500 kV Station is an approximately 18-mile line, from near the existing White Haven Substation, in Luzerne County, Pennsylvania to the proposed Kelayres Substation, in Luzerne County, Pennsylvania. The line will traverse two counties (Luzerne and Carbon) in Pennsylvania. The total route is 18 miles. The entire project will be a greenfield expansion of existing right-of-way. The new right-of-way is proposed to be 150 feet.

Land acquisition will be required for the new right-of-way. There are several residences near the proposed new line corridor, and eminent domain will not likely be possible. The line also crosses State Game Lands #149 and is near the North Branch Land Trust. The line also crosses near the Dreck Creek Reservoir and its associated dam.

Overall, this portfolio proposal is assessed a **Low-Medium** risk for ROW/Land Acquisition due to the significant use of brownfield development.

Environmental Risk Analysis

Subproposal 317, Component 3: Sunbury - Kelayres 500 kV line

Proposed route intersects 2 FEMA High-Risk Flood Zones (100-Year Floodplain). Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting any impact to these waters. Field delineation will be required to verify boundaries of all water resources. Permit authorization may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting any impact to these waters. Field delineation will be required to verify boundaries of all water resources. Permit authorization may take up to 12 months to complete. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed route intersects 11 conservation easements. Desktop analysis indicates that the proposed route intersects with farmland. Verification in the field would need to be completed.

There are approximately 17 road crossings: 14 road crossings and 3 highway crossings in Luzerne County. There are approximately 11 transmission lines identified: 1 owned by PPL ELECTRIC UTILITIES CORP and 6 unknown owners. Two easement crossings; 1 owned by PVT and 1 owned by OTHS. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from Luzerne county in PA. State Approval of Electric Transmission Lines, and DOT utility permits are required.

Subproposal 946, Component 1: Susquehanna - Wescosville 500 kV Line Bifurcation and Reroute Through Kelayres 500 kV Station

Proposed route intersects 4 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Luzerne County, PA. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams

that are subject to USACE Section 404 and/or Section 10 permit for any impact to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. The proposed route intersects Natural Areas/Reserves/Wildlife Refuge. Coordination with the following agencies is required: Pennsylvania Game Commission. Virginia Designated Trout Waters include: Not Present.

This component intersects 4 railroads owned by RBMN. There are approximately 18 road crossings: 2 access crossings, 13 road crossings and 13 highway crossings in Luzerne County. There are approximately 6 transmission lines identified owned by PPL ELECTRIC UTILITIES CORP. The proposed route intersects 1 pipeline owned by Sunoco. The proposed route intersects 1 park (fee) owned by OTHS. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from Luzerne County, PA. State Approval of Electric Transmission Lines, and DOT utility permits are required.

Transmission Line Risk Analysis

Subproposal 317, Component 3. Sunbury - Kelayres 500 kV line

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Procurement risk to securing over 140 steel poles and hardware components within the provided timeline.
- No electrical or underground utility crossings per available information, however, if encountered during construction would pose risk to the schedule.
- Railroad, highways, and local roads will require coordination with local governments and permitting.

Subproposal 946, Component 1. Susquehanna - Wescosville 500 kV line bifurcation and reroute through Kelayres 500 kV Station

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Procurement risk to securing over 90 steel poles and hardware components within the provided timeline.
- Approximately three electrical crossings above 69 kV pose risk to schedule due to coordinating outages.
- Seven miles of these traverses near a mining area, which could cause disruptions and potential schedule delays.

Substation Risk Analysis

The substation components of this portfolio proposal 853 are primarily focused on expansion or upgrades.

Constructability Summary

The proposal contains greenfield transmission lines and transmission line rebuilds, as well as substation expansion and upgrade components. The main constructability risks are land acquisition for the greenfield transmission line projects, rare, threatened, and endangered species impacts, and waterbody crossings and/or impacts. The proposal also contains components that cross environmentally sensitive areas. The proposal seems feasible, although unsuccessful land acquisition and the potential need to avoid environmentally sensitive

areas may require line reroutes. Due to the proposal's use of brownfield development for a significant portion of its scope, this portfolio proposal is assessed to have a **Low** constructability risk.

Outage Review

Due to the minimal number of line rebuilds and existing facility outages associated with this portfolio proposal, the overall outage coordination risk is assessed as **Low-Medium**.

Cost Review

As part of the detailed constructability analysis, an independent consultant prepared a high-level conceptual, independent cost estimate for the components of this proposal. The independent consultant assumes a level of effort and accuracy consistent with AACE International's Recommended Practice 17R-97, Cost Estimate Classification System, Class 3 with an expected accuracy of -20% to +40% from the base total estimate. Estimates will use available industry and materials. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering, and construction. The independent cost estimate includes a 30% contingency, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates is contained in Table 1.

Portfolio Proposal 853 Cost Review

Subproposal	Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
16	1	Juniata - Sunbury 500 kV line EOL rebuild	162.89	181.39
317	1	Kelayres 500 kV yard expansion	72.92	142.64
317	2	Susquehanna - Kelayres 500 kV line	20.87	39.17
317	3	Sunbury - Kelayres 500 kV line	133.64	157.96
333	1	Kelayres 230 kV yard expansion	2.93	2.51
333	2	Kelayres - Tresckow 230 kV # 3 line	17.20	17.76
422	1	Susquehanna - Tomhicken 230 kV 1 & 2 separated lines with reconductors	60.82	22.84
588	1	Susquehanna T10 - Susquehanna 230 kV # 3 line	14.33	1.95
588	2	Susquehanna T10 230 kV Station expansion	6.62	11.26
588	3	Susquehanna 230 kV Substation expansion	1.24	6.20
588	4	Glen Brook 230/69 kV Substation MOD upgrades	2.50	1.73
588	5	Glen Brook - Susquehanna T10 1 & 2 DCT line reconductor	2.63	2.46
647	1	Jenkins 230/69 kV T2 and T4 transformer re-terminations	8.71	5.21
647	2	Jenkins T4 transformer lead line re-termination	1.46	1.15
688	1	Monroe 230/138 kV Substation upgrade	30.95	31.09
688	2	Monroe 230/138 kV Substation 230 kV line re-terminations	8.27	1.53
853	2	Kelayres 500 kV yard expansion	29.02	43.12
946	1	Susquehanna - Wescosville 500 kV line bifurcation and reroute through Kelayres 500 kV Station	167.49	199.72

946	2	Kelayres 500 kV yard expansion	13.83	22.98
958	1	Montour - Glen Brook 230 kV 1 & 2 DCT line reconductor or rebuild	37.15	22.07
958	2	Glen Brook 230/69 kV Substation MOD upgrades	2.50	2.46
		Total	797.94	917.20

The proposal cost estimates are within 20% of the independent cost estimate. A **Low-Medium** risk is assessed for the cost estimate.

Schedule Review

The proposed in-service date for this proposal is June 2030.

Due to the derisking of the projects by routing a significant portion of it within existing ROW, a **Low** schedule risk is assessed for this portfolio proposal.

Proposing Entity Experience and Capability Review

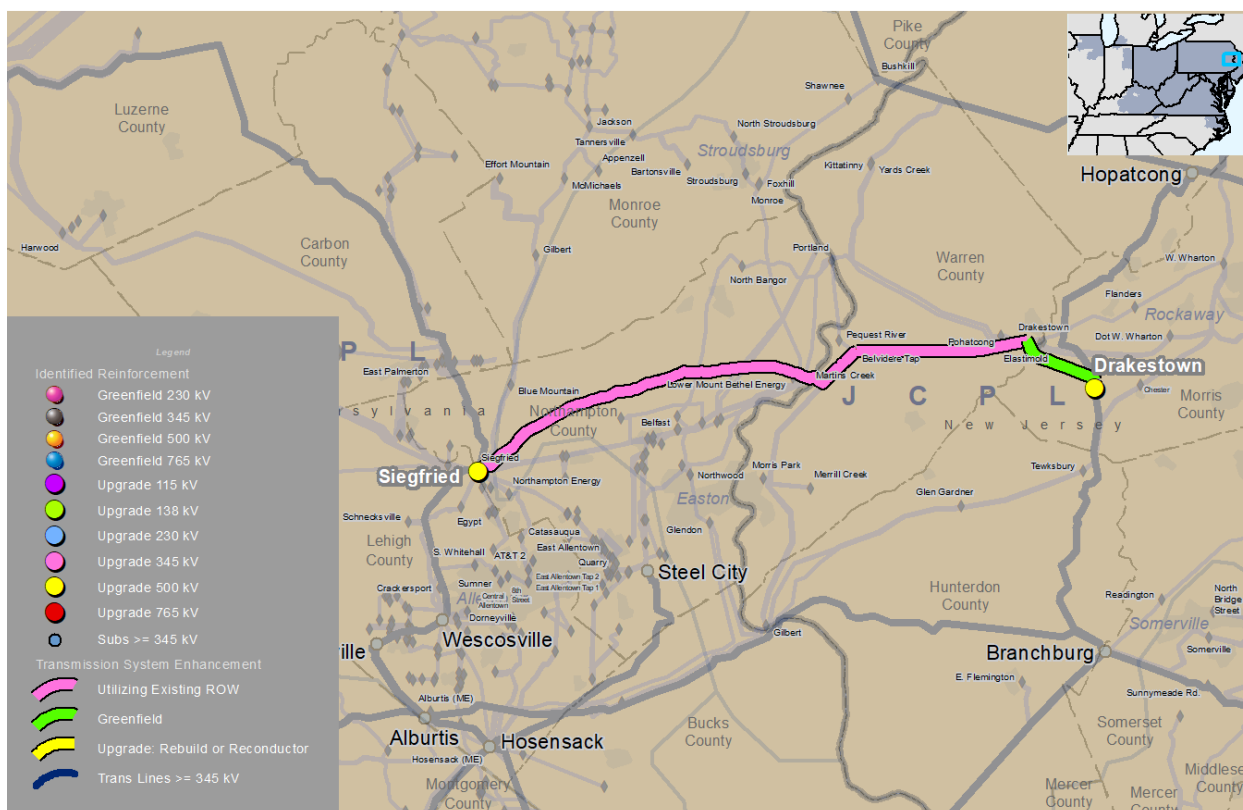
PPL has significant experience with the proposed equipment and the capabilities to construct Portfolio Proposal 853 as submitted. The proposing entity experience and capability risk is considered **Low**.

Proposal 290/552 – Siegfried - Drakestown 500 kV line PA segment (PPL)/ Brownfield NJ Segment (PPL TransLink)

The objective of the 290 project is to construct a 500 kV, 24.5 mile line from the existing Siegfried Substation in Northampton County, Pennsylvania, to the Drakestown Substation in Morris County, New Jersey, proposal 2025-W1-552. This project will traverse one county (Northampton) in Pennsylvania, and two counties (Warren, Morris) in New Jersey. This proposal has a total of two components, including one substation upgrade component and one transmission line upgrade component.

The objective of the 552 project is to construct a new 500 kV, 20-mile transmission line from outside Martins Creek Substation in Warren County, New Jersey to the new Drakestown 500 kV Switchyard in Morris County, New Jersey. This transmission line will be constructed in an already existing right of way adjacent to the existing JCPL 115 kV line, with the proposed expansion of the corridor to 150ft for the entirety of the route. This proposal also includes less than 1 mile of bifurcation of the already existing Hopatcong – Branchburg 500 kV line in Morris County, New Jersey. This project will traverse two counties (Warren and Morris) in New Jersey. This proposal has a total of three components, including one greenfield substation component, one brownfield transmission line component, and one transmission line upgrade component.

Map 10 displays the components and routes proposed for Proposals 290 and 552.

Map 10. Proposals 290 and 552

NOTE: 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.

Project Overview

The Siegfried - Drakestown 500 kV line Proposal 290 includes the following components:

- Component 1. Siegfried - Drakestown 500 kV line (Pennsylvania segment)
- Component 2. Siegfried 500 kV yard upgrade

The Siegfried – Drakestown 500 kV Line Proposal 552 includes the following components:

- Component 1: Pennsylvania Border-Drakestown 500 kV Line (NJ Brownfield Segment)
- Component 2: Hopatcong – Branchburg 500 kV Line Taps into New Drakestown 500 kV Yard
- Component 3: Drakestown 500 kV Switchyard

Constructability Review

Right-of-Way/Land Acquisition Risk Analysis

Proposal 290 Component 1 – Siegfried-Drakestown 500 kV Line (PA Segment)

The Siegfried-Drakestown 500 kV Line (Pennsylvania Segment) is an approximately 24.5-mile conversion of the existing Siegfried-Martin's Creek 230 kV line, from the existing Siegfried Substation, in Northampton County, Pennsylvania to the Pennsylvania-New Jersey border, in Northampton County, Pennsylvania. The line will traverse one county (Northampton) in Pennsylvania.

The total route is 24.5 miles. The entire project will be within the existing ROW.

Proposal 290 components are assessed a **Low** ROW/Land Acquisition risk rating given that land acquisition will not be required.

Proposal 552 Component 1: Pennsylvania Border – Drakestown 500 kV Line (NJ Brownfield Segment)

The proposed Pennsylvania Border – Drakestown 500 kV transmission line commences at the Martins Creek Substation in Northampton County, Pennsylvania, crossing the Delaware River and runs for approximately 20 miles across Warren and Morris counties to the proposed Drakestown 500 kV Switchyard in Morris County, New Jersey. The proposed 500 kV transmission line parallels the existing JCP&L transmission line, which will not be rebuilt. The proposed 150 foot ROW for the 500 kV transmission line will likely encounter encroachments from occupied residences, pools, and accessory structures, as well as a district landfill and commercial nurseries.

Proposal 552 Component 3: Drakestown 500 kV Switchyard

The proposed greenfield switchyard location is in Washington Township, Morris County, New Jersey. The switchyard will require a new land parcel, and no optimal parcel size was provided in the proposal. Presently, the area of the switchyard location is owned by Morris County and is immediately adjacent to a legacy agricultural operation (Ort Farms). The subject parcel is designated as County Open Space – Conservation and within the Highlands Preservation Area. Acquisition of the parcel and a land use change would likely encounter significant County and community resistance.

The ROW / Land Acquisition risk is assessed as **Medium-High** for proposal 552 components.

Environmental Risk Analysis

Proposal 290 Component 1. Siegfried - Drakestown 500 kV Line (Pennsylvania segment)

The proposed route has the potential to impact environmental resources, including FEMA floodplains, streams and wetlands subject to USACE Section 404 and/or Section 10 permitting. The proposed route crosses the Delaware River, as well as multiple Cold-Water Fisheries designated streams and forested wetlands. Impacts to these resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE, and USFWS. The proposed route intersects five easements. Coordination with easement holders – Bodnarczuk Preserve, Bushkill Conservation, Wildlands Conservation, Jacobsburg

Environmental Education Center, and Meadow Creek Open Space - will be required. The following component was found to have moderate to high environmental and permitting risks.

Proposal 552 Component 1: Pennsylvania Border- Drakestown 500 kV Line (NJ Brownfield Segment)

The proposed route has the potential to impact environmental resources, including FEMA floodplains, streams and wetlands subject to USACE Section 404 and/or Section 10 permitting. The proposed route crosses the Delaware River, South Branch Raritan River, Electric Book and Pohatcong Creek, as well as several large, forested wetlands. Two federally threatened and endangered species are also anticipated to be found along the route corridor, as well as critical habitat for a federally listed bat and reptile species. Impacts to these resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE, and USFWS. The proposed route intersects four easements. Coordination with easement holders – Patriots Path, Schooley's Mountain Park, Belvidere Sand and Gravel mine, and the Appalachian Trail - will be required.

The component was found to have high environmental and permitting risks.

Proposal 552 Component 3: Drakestown 500 kV Switchyard

The proposed switchyard parcel has the potential to impact environmental resources, including FEMA floodplains, streams and wetlands subject to USACE Section 404 and/or Section 10 permitting. The proposed switchyard parcel includes a section of the South Branch Raritan River, as well as several large, forested wetlands. Two federally threatened and endangered species are also anticipated to be found within the parcel, as well as critical habitat for a federally listed bat and reptile species. Impacts to these resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE, and USFWS. The proposed route intersects the Ot Farms easement. Coordination with the easement holder will be required, and the developer is anticipated to be met with significant public opposition

The component was found to have very high environmental and permitting risks.

Transmission Line Risk Analysis

Proposal 290 Component 1. Siegfried - Drakestown 500 kV Line (Pennsylvania segment)

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Power Capacity and MVA ratings are at high risk as the proposed wire type is 2-Bundle 2493 ACAR 54/37. However, the emergency rating 3566 MVA cannot be supported by this per phase wire configuration.
- Risk to existing structures regarding loading and clearances as the line is being uprated from 230 kV to 500 kV.
- Multiple underground utility crossings may require additional coordination for construction and impact the proposed locations for new structures.
- Crossing one 66 kV and one 69 kV transmission line crossings may pose schedule risk regarding outage coordination.
- Crossing one underground distribution line may pose schedule risk regarding outage coordination.

Proposal 552 Component 1. Pennsylvania border - Drakestown 500 kV line (NJ brownfield segment)

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- 500kV poses risk to securing over 170 steel poles and hardware components in the provided timeline.
- There is approximately 5 electrical crossing under 69 kV that may pose schedule risk regarding outage coordination.
- There are multiple underground utility crossings are assumed but unconfirmed that may require additional coordination for construction and impact the proposed locations for new structures which will pose risk to schedule, cost and design.

Substation Risk Analysis

Proposal 552 Component 3. Drakestown 500kV Switchyard

This project involves the installation of a new Drakestown 3 bay breaker and a half (future 5 bay) 500 kV switchyard.

Constructability Summary

The 290 proposal contains a transmission line rebuild and substation expansion. The main constructability risks are threatened and endangered Species impacts and waterbody crossings and/or impacts. The proposal also contains components that cross environmentally sensitive areas. The proposal seems feasible, although the permitting process in environmentally sensitive areas may be lengthy. This proposal was assessed to have a **Low** risk Constructability rating.

The 552 proposal is for one approximately 20-mile transmission line, a short, less than one mile, bifurcated 500 kV line within an existing ROW, and a new greenfield 500 kV switchyard. The proposal presents a mix of risks, as the 500 kV switchyard will likely encounter substantial opposition to acquisition due to its location and land use regulations; however, the bifurcated 500 kV transmission line will be in an existing ROW. The approximately 20-mile 500 kV transmission line roughly follows a JCP&L 115 kV transmission line, but there are numerous encroachments and crossings of a public park, regional trail system, and an active sand and gravel operation.

Medium constructability risks are assessed for the proposal 552 components due to the above concerns.

Outage Review

Due to the minimal number of line rebuilds and existing facility outages associated with proposals 290 and 552, the overall outage coordination risk is assessed as **Low**.

Cost Review

As part of the detailed constructability analysis, an independent consultant prepared a high-level conceptual, independent cost estimate for the components of this proposal. The independent consultant assumes a level of effort and accuracy consistent with AACE International's Recommended Practice 17R-97, Cost Estimate Classification System, Class 3 with an expected accuracy of -20% to +40% from the base total estimate. Estimates will use available industry and materials. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering, and construction. The independent cost estimate includes a 30% contingency, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates is contained in the tables below.

Proposal 290 Cost Review

Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
1	Siegfried - Drakestown 500 kV line (Pennsylvania segment)	75.68	28.09
2	Siegfried 500 kV yard upgrade	12.48	4.35
	Total	88.16	32.44

The proposal cost estimate is greater than the independent cost estimate and is considered **Low** risk.

Proposal 552 Cost Review

Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
1	Pennsylvania border - Drakestown 500 kV line (NJ brownfield segment)	116.60	122.10
2	Hopatcong - Branchburg 500 kV line taps into new Drakestown 500 kV yard)	15.95	5.38
3	Drakestown 500kV Switchyard	61.70	57.69
	Total	194.25	185.17

The proposal cost estimate is greater than the independent cost estimate and is considered **Low** risk.

Schedule Review

The proposed in-service date is June 2030. The major schedule risk identified for Proposal 290 includes the acquisition of EHV equipment, however due to land acquisition not being required for this proposal there is inherently less risk. The major schedule risk identified for Proposal 552 includes the acquisition of EHV equipment and potential construction delays due to land acquisition and constraints encountered for the proposed line route. The scheduling risk is assessed as **Low** for proposal 290 and **Medium** for proposal 552.

Proposing Entity Experience and Capability Review

PPL and PPL TransLink have significant experience with the proposed equipment and has the capability to construct proposals 290 and 552 as submitted. The proposing entity experience and capability risk is considered **Low**.

Proposal 771 – Montour to Slykerville Reinforcement (NextEra/Exelon)

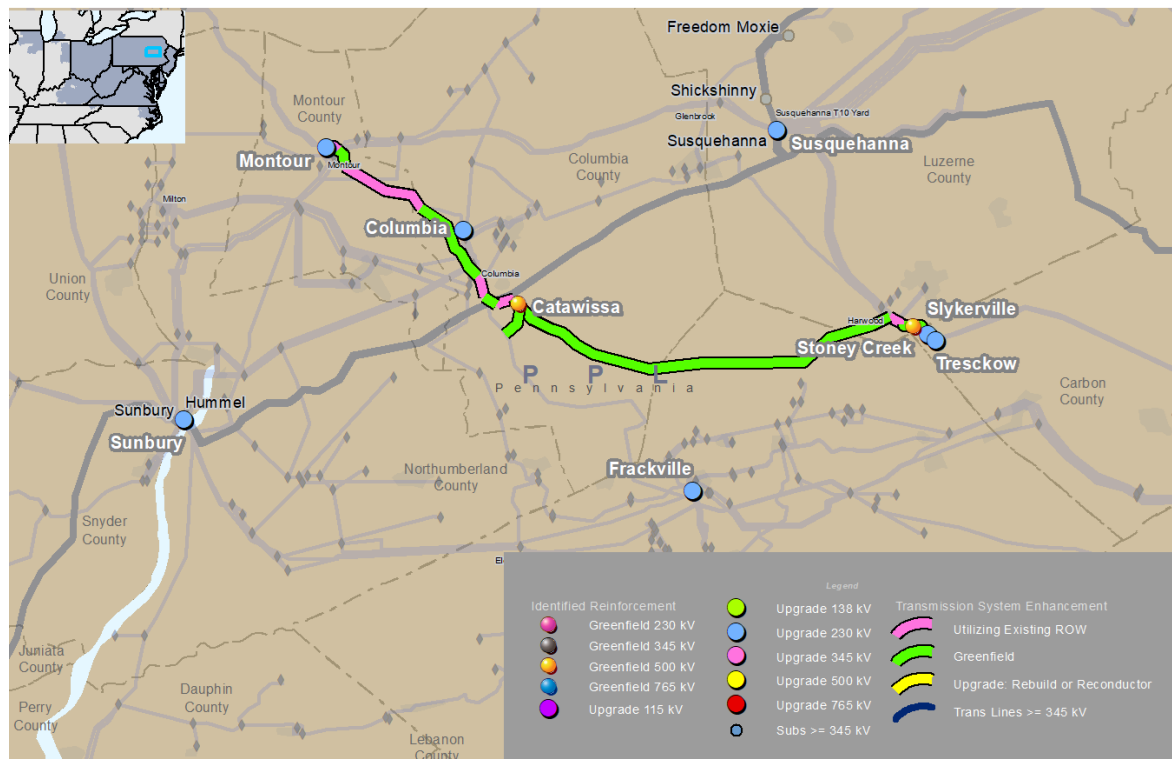
The main objective of NXTMID's Proposal No. 771 is to reinforce the Montour to Slykerville with new 230 and 500 kV lines from PPL's Montour 230 kV substation in Montour County, Pennsylvania, 16 miles to new Catawissa 500kV substation with a 2-mile Frackville loop-in located in Columbia County, Pennsylvania, then 26 miles to new Stoney Creek substation in Luzerne County, Pennsylvania, then one mile to existing Slykerville

substation and 0.7 miles from existing Tresckow substation to new Sykesville substation, also within Luzerne County, Pennsylvania. This project will traverse a total of six counties in Pennsylvania (Snyder, Montour, Columbia, Schuylkill, Luzerne, and Carbon).

This proposal has a total of fourteen components including 45.7 total miles of new transmission line within five of these components, two new substations, as well as upgrades/expansions to seven existing substations.

Map 11 displays the components and routes proposed for proposal 771.

Map 11. Proposal 771



NOTE: 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.

Project Overview

Proposal 771 includes the following components:

- Component 1: E-07-B) Stoney Creek - Slykerville 230 kV
- Component 2: E-18-B) Montour-Catawissa 230 kV
- Component 3: E-20-A) Catawissa - Stoney Creek 500 kV
- Component 4: E-28-B) Frackville/Columbia - Catawissa 230 kV Loop-In
- Component 5: E-29-A) Tresckow - Slykerville 230 kV

- Component 6: E-17-D) Catawissa 500 kV Substation
- Component 7: E-19-C) Stoney Creek 500 kV Substation
- Component 8: B-29-A) Susquehanna 230 kV circuit breaker replacement
- Component 9: B-31-A) Sunbury 500 kV substation upgrades
- Component 10: E-10-A) Slykerville (SLKY) substation upgrade
- Component 11: E-16-B) Montour substation upgrade
- Component 12: E-30-A) Tresckow (TRES) substation upgrade
- Component 13: E-33-A) Columbia 230 kV circuit breaker replacement
- Component 14: B-43-A) Frackville (New PPL) line termination modification

Constructability Risk Analysis

Right-of-Way/Land Acquisition Risk Analysis

Component 3 – E-20-A) Catawissa-Stoney Creek 500 kV

The Catawissa-Stoney Creek 500 kV Transmission Line is an approximately 26-mile line that will be constructed from the proposed Catawissa Substation, in Columbia County, Pennsylvania to the proposed Stoney Creek Substation, in Luzerne County, Pennsylvania. The line will traverse three counties (Columbia, Schuylkill, and Luzerne) in Pennsylvania.

The total route is 26 miles, with a proposed right-of-way of 200 feet. The proposed route will be an expansion of existing right-of-way for 5% of its length and greenfield for the remaining 95%.

Land acquisition will be required for the entire line. There are several residences in or near the proposed line corridor, and eminent domain will not likely be possible. The line also crosses the Catawissa Recreation Area. Large sections of the corridor will require tree clearing and there is limited public road access.

Component 6 – E-17-D) Catawissa 500 kV Substation

Catawissa 500 kV Substation is a greenfield substation in Columbia County, Pennsylvania. Acreage requirements have not been provided.

New land acquisition will be required; however, the proposed component site is in an undeveloped area, with no residences within the likely component area.

Component 7 – E-19-C) Stoney Creek 500 kV Substation

Stoney Creek 500 kV Substation is a greenfield substation in Luzerne County, Pennsylvania. Acreage requirements have not been provided.

New land acquisition will be required; however, the proposed component site is in an undeveloped, previously mined area, with no residences within the likely component area.

Overall, this proposal is assessed **Medium-High** risk rating for ROW/Land Acquisition due to the greenfield scope and minimal use of existing ROW for its construction.

Environmental Risk Analysis

Component 3: E-20-A) Catawissa - Stoney Creek 500 kV

Proposed route intersects 4 FEMA High-Risk Flood Zones (100-Year Floodplain). Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. Permit authorization may take up to 12 months to complete. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Desktop analysis indicates that the proposed route intersects with farmland. Verification in the field would need to be completed.

The proposed component crosses 33 road and highway crossings (66 entrances) across Luzerne, Schuylkill and Columbia County; 1 pipeline crossing owned by SUNOCO. The proposed component crosses over 1 recreation area, Crawissa Recreation Area. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from Luzerne, Schuylkill and Columbia County, PA. State Approval of Electric Transmission Lines, and DOT utility permits are required.

Component 6: E-17-D) Catawissa 500 kV Substation

There are no environmental or permitting risks associated with this substation; this component appears to have low environmental or permitting risks.

Component 7: E-19-C) Stoney Creek 500 kV Substation

There are no environmental or permitting risks associated with this substation; this component appears to have low environmental or permitting risks.

Transmission Line Risk Analysis

Component Name: 3. E-20-A) Catawissa - Stoney Creek 500 kV

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- The 500 kV line includes over 200 steel poles, posing a moderate risk to the schedule due to procurement and hardware availability.
- Multiple underground utility crossings may require additional coordination for construction and impact the proposed locations for new structures.

- The route includes highway crossings and environmentally sensitive areas, requiring coordination with local agencies and potentially causing delays.

Substation Risk Analysis

Component Name: 7. E-19-C) Stoney Creek 500 kV Substation

This project involves constructing the new Stoney Creek 500/230 kV substation. Work includes construction of one 500 kV double-bus, double-breaker bay with installation of four 500 kV circuit breakers, along with two 500/230 kV transformers rated 1,500/2,000 MVA (summer N/E). On the 230 kV side, three double-bus, double-breaker bays will be developed, incorporating eight 230 kV breakers to serve line positions and capacitor bank terminations. The project also includes installation of a ± 500 MVAR STATCOM on string #1 and two 150 MVAR capacitor banks on buses #1 and #2 to enhance system stability and reactive support.

Long-lead procurement for the 500/230 kV transformers and the 500 kV STATCOM extends into the construction window, creating potential schedule pressures and exposure to manufacturing or delivery delays. Our current schedule projections show that this project will not be able to be completed within the stated timeframe. Additional risk arises from the need for remote-end work on existing facilities, which may introduce coordination challenges and outage-schedule constraints. The site's hilly terrain will require extensive grading, increasing construction complexity, cost uncertainty, and potential erosion or stability concerns. Given the station's proximity to a nearby town, careful control of noise, traffic, dust, and general construction impacts will be necessary to maintain compliance and community acceptance.

Constructability Summary

The proposal contains greenfield transmission lines and substations, as well as substation expansion and upgrade components. The main constructability risks are land acquisition, rare, threatened, and endangered species impacts, and waterbody crossings and/or impacts. The proposal also contains components that cross numerous environmentally sensitive areas.

This proposal was assessed a **Medium** risk Constructability rating.

Outage Review

Due to the primary greenfield nature of this project, only short outages to existing facilities will be required to tie in the new transmission facilities, and therefore no significant existing facility outages are anticipated. Overall outage coordination risk is deemed **Low**.

Cost Review

As part of the detailed constructability analysis, an independent consultant prepared a high-level conceptual, independent cost estimate for the components of this proposal. The independent consultant assumes a level of effort and accuracy consistent with AACE International's Recommended Practice 17R-97, Cost Estimate Classification System, Class 3 with an expected accuracy of -20% to +40% from the base total estimate. Estimates will use available industry and materials. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous

experience with substation engineering, transmission line engineering, and construction. The independent cost estimate includes a 30% contingency, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates is contained in Table 1.

Proposal 771 Cost Review

Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
1	E-07-B) Stoney Creek - Slykerville 230 kV	7.46	4.93
2	E-18-B) Montour-Catawissa 230 kV	66.70	67.11
3	E-20-A) Catawissa - Stoney Creek 500 kV	130.56	171.10
4	E-28-B) Frackville/Columbia - Catawissa 230 kV Loop-In	16.79	8.46
5	E-29-A) Tresckow - Slykerville 230 kV	4.20	4.03
6	E-17-D) Catawissa 500 kV Substation	117.29	153.06
7	E-19-C) Stoney Creek 500 kV Substation	165.94	199.50
8	B-29-A) Susquehanna 230 kV circuit breaker replacement	11.41	8.73
9	B-31-A) Sunbury 500 kV substation upgrades	4.98	7.35
10	E-10-A) Slykerville (SLKY) substation upgrade	6.65	5.01
11	E-16-B) Montour substation upgrade	2.28	2.58
12	E-30-A) Tresckow (TRES) substation upgrade	2.28	2.58
13	E-33-A) Columbia 230 kV circuit breaker replacement	2.28	2.58
14	B-43-A) Frackville (New PPL) line termination modification	0.43	0.64
Total		539.25	637.66

The proposal cost estimate is within 20% of the independent cost estimate and is rated **Low-Medium** risk.

Schedule Review

The proposed in-service date for this project is December 1, 2030.

The major schedule risks identified for Proposal 771 are associated with the ROW/Land acquisition for the greenfield scope of the project, procurement of the STATCOM component for the greenfield Stoney Creek substation. **Medium** schedule risks are assessed for this proposal.

Proposing Entity Experience and Capability Review

NextEra/Exelon have significant experience with the proposed equipment and have the capability to construct proposal 771 as submitted. The proposing entity experience and capability risk is considered **Low**.

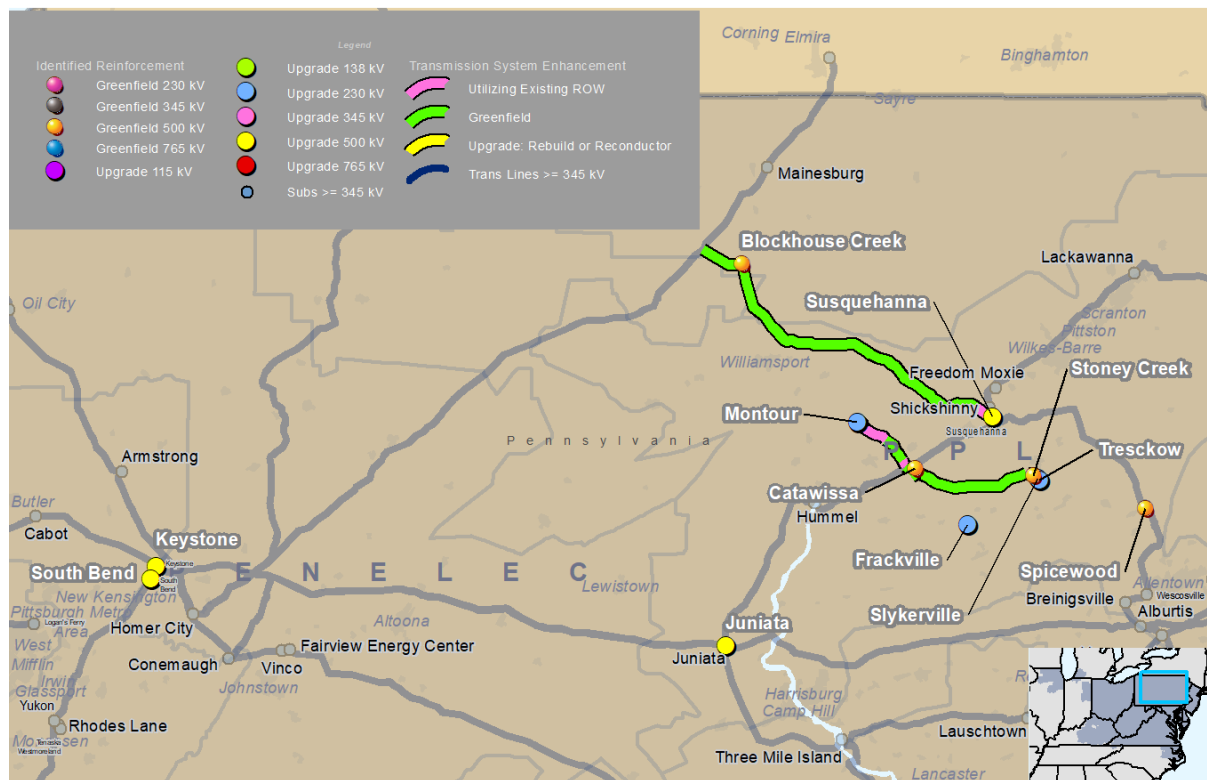
Proposal 871 - Blockhouse Creek to Susquehanna and Montour to Stoney Creek (NextEra/Exelon)

The main objective of this project is to reinforce the PPL system by adding 500 and 230kV transmission and substations to strengthen the transmission network. This includes constructing 500, 345, and 230kV greenfield transmission lines, building new substations, and upgrading existing substations. This project will traverse 7 counties including Luzerne, Carbon, Tioga, Lycoming, Columbia, Montour, and Schuylkill in PA.

This proposal has a total of 20 components, including 9 substation upgrade components, 4 greenfield substation components, and 7 greenfield transmission line components.

Map 12 displays the components and routes proposed for proposal 871.

Map 12. Proposal 871



NOTE: 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.

Project Overview

NextEra Proposal 871 includes the following components:

- Component 1: E-07-B) Stoney Creek - Slykerville 230kV
- Component 2: E-25-A) Homer City / Mainesburg 345kV line - Blockhouse Creek Loop-In

- Component 3: E-27-B) Blockhouse Creek - Susquehanna 500kV
- Component 4: E-18-B) Montour-Catawissa 230kV
- Component 5: E-20-A) Catawissa - Stoney Creek 500kV
- Component 6: E-28-B) Frackville/Columbia - Catawissa 230kV Loop-In
- Component 7: E-29-A) Tresckow - Slykerville 230kV
- Component 8: E-17-D) Catawissa 500kV Substation
- Component 9: E-19-C) Stoney Creek 500kV Substation
- Component 10: Component 1: E-26-A) Blockhouse Creek 500kV Substation
- Component 11: E-36-B) Spicewood 500kV Substation
- Component 12: B-30-A) South Bend - Keystone 500kV terminal equipment upgrade
- Component 13: B-32-A) Keystone-Juniata 500 kV terminal equipment upgrade
- Component 14: E-10-A) Slykerville (SLKY) substation upgrade
- Component 15: E-16-B) Montour substation upgrade
- Component 16: E-30-A) Tresckow (TRES) substation upgrade
- Component 17: E-33-A) Columbia 230 kV circuit breaker replacement
- Component 18: E-24-A) Susquehanna 230 kV circuit breaker replacement
- Component 19: E-38-A) Susquehanna 500 kV substation upgrade
- Component 20: B-43-A) Frackville (New PPL) line termination modification

Constructability Review

Right-of-Way/Land Acquisition Risk Analysis

E-27-B) Blockhouse Creek - Susquehanna 500kV

The Blockhouse Creek - Susquehanna 500kV Line is a 61-mile single-circuit line to be constructed from the proposed Blockhouse Creek Substation in Lycoming County, PA to the existing Susquehanna Substation in Luzerne County. The line will traverse 3 counties (Lycoming, Columbia, and Luzerne) in Pennsylvania.

Approximately 3 miles is paralleling existing ROW, while the remainder of the line is true greenfield ROW. The proposal states that the ROW will be 200ft, which is sufficient for this line. At 200ft, the amount of land that will need to be acquired is approximately 1484 acres of rural land.

E-20-A) Catawissa - Stoney Creek 500kV

The Catawissa - Stoney Creek 500kV Line is a 26-mile single-circuit line to be constructed from the proposed Catawissa Substation in Columbia County, PA to the proposed Stoney Creek Substation in Schuylkill County. The line will traverse 2 counties (Columbia and Schuylkill) in Pennsylvania.

Only about 1 mile of the route is parallel to existing ROW with the remainder of the line being true greenfield routes. The proposal states the ROW will be 200ft which is reasonable for this circuit. At 200ft ROW, the amount of land to be acquired is approximately 630 acres. Where the line passes near houses that may require re-routing, there are logical paths for re-routing available.

E-17-D) Catawissa 500kV Substation

The greenfield site, which has not been acquired, is located in Columbia County, Pennsylvania. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

The proposed site seems adequate to house the component; however, 500kV substations can generate public interest and opposition due to the high voltage and large size of the equipment.

E-19-C) Stoney Creek 500kV Substation

The Greenfield site, which has not been acquired, is located in Luzerne County, Pennsylvania. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

The proposed site seems adequate to house the component; however, 500kV substations can generate public interest and opposition due to the high voltage and large size of the equipment.

E-26-A) Blockhouse Creek 500kV Substation

The Greenfield site, which has not been acquired, is located in Lycoming County, Pennsylvania. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

The proposed site seems adequate to house the component; however, 500kV substations can generate public interest and opposition due to the high voltage and large size of the equipment.

E-36-B) Spicewood 500kV Substation

The Greenfield site, which has not been acquired, is located in Carbon County, Pennsylvania. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

The proposed site seems adequate to house the component; however, 500kV substations can generate public interest and opposition due to the high voltage and large size of the equipment. Also, in a populated area, which may generate more opposition.

Overall, **High** risks for ROW/Land Acquisition are assessed due to the significant greenfield scope of this proposal.

Environmental Risk Analysis

E-27-B) Blockhouse Creek - Susquehanna 500kV

Proposed route intersects 11 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Lycoming; Columbia and Luzerne

counties in PA. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Designated Trout Waters Not Present.

The permitting risk for this proposed component is medium. There is approximately 90 road and highway crossing (180 entrances) across 3 counties. There is approximately 5 transmission line crossings, 2 with PPL ELECTRIC UTILITIES CORP, and 3 with no owner available. There is approximately 2 pipeline crossings, 1 with Transcontinental Gas PL, and 1 with SUNOCO. It is anticipated that the proposal requires permits, consultations, clearances and authorization from 3 counties in PA. State CPCN and DOT utility, driveway and right of way permits may be required.

E-20-A) Catawissa - Stoney Creek 500kV

Proposed route intersects 4 FEMA High-Risk Flood Zones (100-Year Floodplain). Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. Permit authorization may take up to 12-months to complete. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Desktop analysis indicates that the proposed route intersects with farmland. Verification in the field would need to be completed. The permitting risk for this component is low. The proposed component crosses 33 road and highway crossings (66 entrances) across Luzerne, Schuylkill and Columbia County; 1 pipeline crossing owned by SUNOCO. The proposed component crosses over 1 recreation area, Crawissa Recreation Area. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from Luzerne, Schuylkill and Columbia County, PA. State Approval of Electric Transmission Lines, and DOT utility permits are required.

E-26-A) Blockhouse Creek 500kV Substation

The proposed substation footprint intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. Desktop analysis indicates that the proposed route intersects with farmland. Verification in the field would need to be completed.

The permitting risk for this proposed component is low. It is anticipated that the proposal would require permits, consultations, clearances, and authorizations from Lycoming County in PA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits may be required.

E-36-B) Spicewood 500kV Substation

Desktop analysis indicates that the proposed route intersects with farmland. Verification in the field would need to be completed. The permitting risk for this proposed component is low. It is anticipated that the proposal would require permits, consultations, clearances, and authorizations from Carbon County in PA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits may be required.

Transmission Line Risk Analysis

E-27-B) Blockhouse Creek - Susquehanna 500kV

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 3-bundle 1780 kcmil 84/19 ACSS “Chuckar” arrangement on lattice structures. The conductors support the ratings outlined in the proposal. Virtually all of the structures are expected to be self-supporting on foundations. These types of structures are more complex vs. steel monopoles but are not uncommon for 500kV lines.

The ROW width of 200 feet that was proposed will be adequate for this structure type and line voltage. The route is long with much of it in rough terrain that may create tough access routes. If special easements are acquired to gain access to some more rural and remote areas and are no longer able to use for future maintenance, those remote areas may prove difficult to get to for crews. The route goes through state game lands which may have special permitting. There are houses that are very close to the route that may pose issues for acquisition and routing. There is 1 high-voltage line crossing, three highway crossings, and four creeks observed. Mountainous terrain may require large spans to gap valleys.

Future expansion would require widening the ROW. The line is being designed as a single-circuit, horizontal configuration which will not allow for double-circuiting. As a greenfield line, there is not much impact on existing facilities. However, the Susquehanna area is very crowded and there has been data center build-out in this area. It is expected that replacement of some facilities will be required entering this area.

From a procurement perspective, there are large number of structures (270) that will be required and over 550 miles of conductor needed. This is a higher quantity of material to procure in the schedule outlined. Most of the material, outside of some 500kV hardware, should not carry procurement risks outside of typical EHV line builds.

Finally, noting some rough terrain with minimal access and some areas being on state lands, the route has some terrain concerns. Heavy restrictions on noise and pollution is not expected due to the limited population along the route and a complex sequencing of outages will not be required since the line is entirely greenfield.

E-20-A) Catawissa - Stoney Creek 500kV

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 3-bundle 1780 kcmil 84/19 ACSS “Chuckar” arrangement and lattice structures. The conductors support the ratings outlined in the proposal. Some lattice structures will be guyed V-Type while others will be self-supporting on foundations. These types of structures are more complex than steel monopoles but are not uncommon for 500kV lines.

The route has no major concerns beyond some houses and a stretch that is more suburban in nature. Line does go through state game lands which would need permitting. Most of the terrain is rolling hills of farmland and

forest. Per the proposal, the ROW width is to be 200ft, which is satisfactory for this voltage and structure type. This line is easily accessible as there are many roads, and terrain will support building access. The route crosses 1 highway. The McDonald's airfield is located within 550 feet of the proposed route, which is a point of concern.

Some of the ROW near houses would probably pose risk to further expansion of the ROW. Future expansion would require widening the ROW. The line is being designed as single-circuit, horizontal configuration which will not allow for double-circuiting. As a greenfield line, there is not much impact on existing facilities.

From a procurement perspective, there are a large number of structures (115) that will be required and over 234 miles of conductor needed. This is a higher quantity of material to procure, but most of the material, outside of some 500kV hardware, should not carry outsized procurement risks.

Finally, terrain is mostly flat and rural with little concerns observed along the line. There may be restrictions near the McDonald's airfield, but minimal requirements for noise and pollution due to the limited population along the route. A complex sequencing of outages will not be required since the line is entirely greenfield.

Substation Risk Analysis

E-19-C) Stoney Creek 500kV Substation

This project involves constructing the new Stoney Creek 500/230 kV substation. Work includes construction of one 500 kV double-bus, double-breaker bay with installation of four 500 kV circuit breakers, along with two 500/230 kV transformers rated 1,500/2,000 MVA (summer N/E). On the 230 kV side, three double-bus, double-breaker bays will be developed, incorporating eight 230 kV breakers to serve line positions and capacitor bank terminations. The project also includes installation of a ± 500 MVAR STATCOM on string #1 and two 150 MVAR capacitor banks on buses #1 and #2 to enhance system stability and reactive support.

Long-lead procurement for the 500/230 kV transformers and the 500 kV STATCOM extends into the construction window, creating potential schedule pressures and exposure to manufacturing or delivery delays. Our current schedule projections show that this project will not be able to be completed within the stated timeframe. Additional risk arises from the need for remote-end work on existing facilities, which may introduce coordination challenges and outage-schedule constraints. The site's hilly terrain will require extensive grading, increasing construction complexity, cost uncertainty, and potential erosion or stability concerns. Given the station's proximity to a nearby town, careful control of noise, traffic, dust, and general construction impacts will be necessary to maintain compliance and community acceptance.

E-26-A) Blockhouse Creek 500kV Substation

The Blockhouse Creek project involves establishing a new 500/345 kV and 500/230 kV double-breaker, double-breaker substation. Work includes constructing one 500 kV double-bus, double-breaker bay with two new 500 kV breakers and installing both a 500/230 kV and a 500/345 kV transformer. At 345 kV, a three-breaker ring bus will be built to terminate the Mainesburg and Homer City lines. At 230 kV, a three-breaker ring bus will be established to tap Penelec's Marshall–Lobo 230 kV line and terminate the Marshall and Lobo ends. This installation will support system reliability and provide necessary interconnections across voltage levels.

The site is situated miles from the nearest transmission right-of-way, and although local distribution circuits appear available, the project would rely entirely on new greenfield transmission build-out to achieve a viable interconnection. Procurement lead times for major 500/230 kV and 500/345 kV transformers extend well into the

planned construction window, creating further risk of delays. Our current schedule projections show that this project will not be able to be completed within the stated timeframe. In addition, the site lacks access to rail for delivery of heavy equipment, though the local road network appears capable of supporting transport needs. Lastly, the terrain is highly sloped and may require retaining wall construction, adding engineering complexity and potential budget impacts.

E-36-B) Spicewood 500kV Substation

The project involves establishing the new 500/230kV Spicewood Substation. Work includes constructing two 500kV double-bus double-breaker bays, installing six 500kV circuit breakers, and adding two 500/230kV transformers. The nearby Susquehanna–Wescosville 500kV line will be looped into the new facility. On the 230kV side, the project includes building two breaker-and-a-half bays and installing a total of eight 230kV circuit breakers.

The procurement window for the 500/230 kV transformers extends into the construction period, creating schedule and coordination risks, especially with major updates required at the remote end. Our current schedule projections show that this project will not be able to be completed within the stated timeframe. The station's proximity to a nearby town also introduces community-impact concerns, requiring strong construction and safety controls.

Constructability Summary

The largest constructability risks are concentrated in the four major new 500 kV greenfield stations: Catawissa, Stoney Creek, Blockhouse Creek, and Spicewood. All four require extensive site development, multiple EHV transformers, and heavy foundation and steel scope, with steep or hilly terrain creating further grading and retaining wall complexity. Long-lead procurement represents the dominant schedule risk—500/230 kV and 500/345 kV transformers, and in Stoney Creek's case a ± 500 MVAR STATCOM, extends into or beyond the construction window. Each project also requires remote-end upgrades and outage coordination across existing high-voltage facilities, which increases sequencing complexity and reinforces schedule exposure.

The overall constructability risk of this proposal is rated as **Medium** primarily driven by the schedule concerns of the EHV equipment required by the greenfield substation components, as well as the large quantity of greenfield land acquisition required for the proposed transmission components.

Outage Review

Due to the primary greenfield nature of this project, only short outages to existing facilities will be required to tie in the new transmission facilities, and therefore no significant existing facility outages are anticipated. Overall outage coordination risk is deemed **Low**.

Cost Review

A high-level cost estimate was created for each proposal to assess the cost component for potential omissions or under-estimating. Cost estimates were broken into eight categories, including Engineering & Design, Permitting/Routing/Siting, ROW/Land Acquisition, Materials & Equipment, Construction & Commissioning, Construction Management, Overheads and Miscellaneous, and Risk Contingency (30%). The cost comparison for this proposal, broken down by component, is outlined below.

Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
1	Stoney Creek - Slykerville	\$7.46	\$7.18
2	Homer City / Mainesburg 345kV line - Blockhouse Creek Loop-In	\$36.62	\$49.20
3	Blockhouse Creek - Susquehanna	\$331.03	\$347.62
4	Montour - Catawissa	\$66.70	\$75.44
5	Catawissa - Stoney Creek	\$130.56	\$149.18
6	Frackville/Columbia - Catawissa 230kV Loop-In	\$16.79	\$14.31
7	Tresckow - Slykerville	\$4.20	\$6.35
8	Catawissa 500kV Substation	\$117.29	\$133.22
9	Stoney Creek 500kV Substation	\$165.94	\$296.71
10	Blockhouse Creek 500kV Substation	\$95.35	\$144.82
11	Spicewood 500kV Substation	\$115.15	\$126.20
12	South Bend - Keystone 500kV terminal equipment upgrade	\$4.68	\$4.39
13	Keystone-Juniata 500 kV terminal equipment upgrade	\$4.68	\$4.39
14	Slykerville (SLKY) Substation Upgrade	\$6.65	\$8.24
15	Montour Substation Upgrade	\$2.28	\$4.80
16	Tresckow (TRES) Substation Upgrade	\$2.28	\$3.48
17	Columbia 230 kV Circuit Breaker Replacement	\$2.28	\$2.51
18	Susquehanna 230 kV Circuit Breaker Replacement	\$13.70	\$15.12
19	Susquehanna 500 kV Substation Upgrade	\$12.29	\$14.66
20	Frackville (New PPL) Line Termination Modification	\$0.43	\$0.43
Total		\$1,136.38	\$1,408.26

The proposed cost estimate within 20% of the independent cost estimate. The cost estimate risk for this proposal is assessed as **Low-Medium**.

Schedule Review

The proposed in-service date for this project is December 1, 2030.

The major schedule risks identified for Proposal 771 are associated with the ROW/Land acquisition for the greenfield scope of the project, procurement of the STATCOM component for the greenfield Stoney Creek substation. **Medium** schedule risks are assessed for this proposal.

Proposing Entity Experience and Capability Review

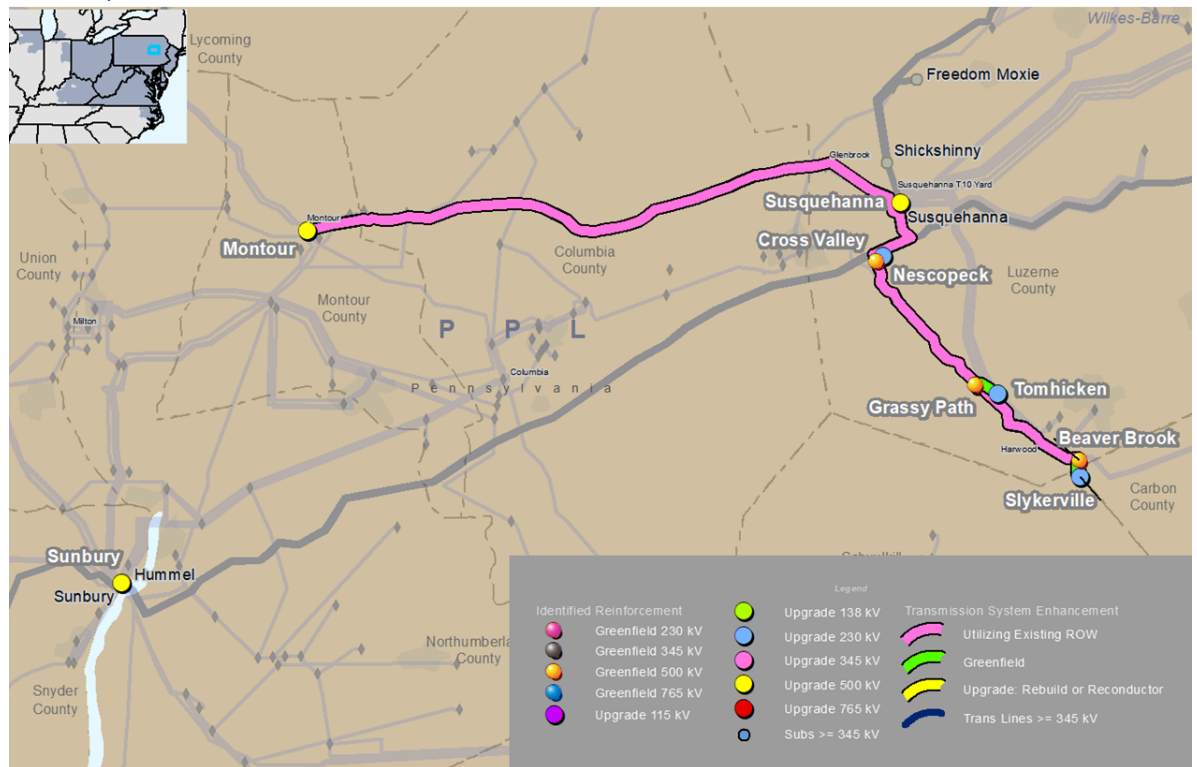
NextEra/Exelon have significant experience with the proposed equipment and have the capability to construct proposal 871 as submitted. The proposing entity experience and capability risk is considered **Low**.

Proposal 20 – Tri-Segment 500kV Transmission Project (CNTLTM)

The objective of this project is to construct a 500 kV, 48-mile line from the existing Montour Substation in Montour County, Pennsylvania to the new Cross Valley Substation in Luzerne County, Pennsylvania, to the new Grassy Path Substation in Luzerne County, Pennsylvania, and finally to the new Beaver Brook Substation in Luzerne County, Pennsylvania. This project will traverse three counties (Montour, Columbia, Luzerne) in Pennsylvania.

This proposal has a total of 15 components, including four substation upgrade components, three greenfield substation components, and eight greenfield transmission line components making up the entire 48 miles of line.

Map 13 displays the components and routes proposed for proposal 20.

Map 13. Proposal 20

NOTE: 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.

Project Overview

The Tri-Segment 500 kV Transmission Project Proposal W1-20 includes the following components:

- Component 1. Cross Valley Substation
- Component 2. Grassy Path Substation
- Component 3. Beaver Brook Substation
- Component 4. Montour Substation Upgrade
- Component 5. NESC Substation Upgrade
- Component 6. Tomhicken Substation Upgrade
- Component 7. Slykerville Substation Expansion
- Component 8. Montour - Cross Valley 500 kV Transmission Line
- Component 9. Cross Valley - Grassy Path 500 kV Transmission Line
- Component 10. Grassy Path - Beaver Brook 500 kV Transmission Line
- Component 11. Cross Valley - NESC 230 kV Transmission Line
- Component 12. Grassy Path - Tomhicken 230 kV Transmission Line
- Component 13. Beaver Brook - Slykerville #1 230 kV Transmission Line
- Component 14. Beaver Brook - Slykerville #2 230 kV Transmission Line
- Component 15. Sunbury - Susquehanna 500 kV Loop-In

Constructability Risk Analysis

Right-of-Way/Land Acquisition Risk Analysis

Component 8 – Montour-Cross Valley 500 kV Transmission Line

The Montour-Cross Valley 500 kV Transmission Line is an approximately 32.4-mile line that will be constructed from the existing Montour Substation, in Montour County, Pennsylvania to the proposed Cross Valley Substation, in Luzerne County, Pennsylvania. The line will traverse three counties (Montour, Columbia, and Luzerne) in Pennsylvania. The total route is 32.4 miles, with a proposed right-of-way of 175 feet. The entire line is greenfield.

Land acquisition will be required for the entire line. There are multiple residences near or within the proposed line corridor, and eminent domain will not likely be possible. The project also crosses State Game Lands 55. The terrain is reasonable.

Component 9 – Cross Valley-Grassy Path 500 kV Transmission Line

The Cross Valley-Grassy Path 500 kV Transmission Line is an approximately 7.6-mile line that will be constructed from the proposed Cross Valley Substation, in Luzerne County, Pennsylvania to the proposed Grassy Path Substation, in Luzerne County, Pennsylvania. The line will traverse one county (Luzerne) in Pennsylvania. The total route is 7.6 miles, with a proposed right-of-way of 175 feet. The entire line is greenfield.

Land acquisition will be required for the entire line. There are several residences near the proposed line corridor, and eminent domain will not likely be possible. The terrain is reasonable.

Component 10 – Grassy Path-Beaver Brook 500 kV Transmission Line

The Grassy Path-Beaver Brook 500 kV Transmission Line is an approximately 6.3-mile line that will be constructed from the proposed Grassy Path Substation, in Luzerne County, Pennsylvania to the proposed Beaver Brook Substation, in Luzerne County, Pennsylvania. The line will traverse one county (Luzerne) in Pennsylvania. The total route is 6.3 miles, with a proposed right-of-way of 175 feet. The entire line is greenfield.

Land acquisition will be required for the entire line. The proposed corridor crosses what appears to be a planned subdivision as well as multiple industrial buildings, and eminent domain will not likely be possible. The terrain is reasonable.

Component 1 – Cross Valley Substation

Cross Valley Substation is a greenfield substation in Luzerne County, Pennsylvania. Acreage requirements have not been provided. New land acquisition will be required for the component.

New land acquisition will be required; however, the proposed component site is in an undeveloped agricultural field, with no residences within the likely component area.

Component 2 – Grassy Path Substation

Grassy Path Substation is a greenfield substation in Luzerne County, Pennsylvania. Acreage requirements have not been provided. New land acquisition will be required for the component.

New land acquisition will be required; however, the proposed component site is in an undeveloped meadow, with no residences within the likely component area.

Component 3 – Beaver Brook Substation

Beaver Brook Substation is a greenfield substation in Luzerne County, Pennsylvania. Acreage requirements have not been provided. New land acquisition will be required for the component.

New land acquisition will be required; however, the proposed component site is in an undeveloped, previously surface-mined area, with no residences within the likely component area.

Overall, the ROW/Land Acquisition risk is deemed **Medium-High** to the project involving new land acquisition required for the entire route, adjacent to existing transmission ROW.

*Environmental Risk Analysis**Cross Valley Substation*

The proposed substation footprint intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed.

It is anticipated that the proposal would require permits, consultations, clearances, and authorizations from Luzerne County in PA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits may be required.

Grassy Path Substation

Proposed substation footprint intersects 1 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Luzerne County, PA. The proposed substation footprint intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed substation footprint intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Designated Trout Waters Not Present

There is approximately 1 transmission line owned by PPL ELECTRIC UTILITIES CORP. It is anticipated that the proposal would require permits, consultations, clearances, and authorizations from Luzerne County in PA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits may be required.

Beaver Brook Substation

The proposed substation footprint intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed.

It is anticipated that the proposal would require permits, consultations, clearances, and authorizations from Luzerne County in PA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits may be required.

Montour - Cross Valley 500kV Transmission Line

Proposed route intersects 6 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Montour; Columbia and Luzerne counties, PA. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed route intersects 5 conservation easements. Coordination with the following easement holder(s) is required: NRCS – Admin. State PA; Columbia County, PA; Northcentral Pennsylvania Conservancy and PA Game Commission. Virginia Designated Trout Waters include Not Present

This component intersects 4 railroads: 3 owned by Norfolk Southern Railway Company and 1 owned by North Shore Railroad. There are approximately 37 road crossings. 3 road crossings in Montour County. 25 road crossings and 2 highway crossings in Columbia County. 5 road crossings and 2 highway crossings in Luzerne County. There are approximately 8 transmission lines identified: 5 owned by PPL ELECTRIC UTILITIES CORP and 3 unknown owners. The Proposed route intersects 1 easement owned by PVT and 1 park (fee) owned by OTHS. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from the 3 counties in PA. State Approval of Electric Transmission Lines, and DOT utility permits are required.

Cross Valley - Grassy Path 500kV Transmission Line

Proposed route intersects 2 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Luzerne County, PA. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. Permit authorization may take up to 12 months to complete. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands.

Consultation with USACE will be required for jurisdictional determination. Proposed route intersects 3 conservation easements. Coordination with the following easement holder(s) is required: Luzerne County, PA Virginia Designated Trout Waters.

There are approximately 18 road and highway crossings (36 entrances) in Luzerne County. There are 16 road crossings (32 entrances), and 2 highway crossings (4 entrances). There is approximately 4 transmission line crossings owned by PPL ELECTRIC UTILITIES CORP. Luzerne County may require their own permits in addition to the state level permits. Proper research and due diligence. Pennsylvania Public Utility Commission (PUC) requires Application for PUC Approval and Certificate of Public Convenience and Necessity (CPCN). Pennsylvania Department of Transportation (PDOT) requires Utility Permits, and Driveway/Local Road Permits.

Grassy Path - Beaver Brook 500kV Transmission Line

Proposed route intersects 3 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Luzerne County, PA. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval will take 12 months. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval will take 12 months. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed route does not intersect designated Critical Habitat. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Virginia Designated Trout Waters.

There are approximately 18 road and highway crossings (36 entrances) in Luzerne County. There are 16 road crossings (32 entrances), and 2 highway crossings (4 entrances). There are approximately 4 transmission line crossings owned by PPL ELECTRIC UTILITIES CORP. Luzerne County may require their own permits in addition to the state level permits. Proper research and due diligence. Pennsylvania Public Utility Commission (PUC) requires Application for PUC Approval and Certificate of Public Convenience and Necessity (CPCN). Pennsylvania Department of Transportation (PDOT) requires Utility Permits, and Driveway/Local Road Permits.

Transmission Line Risk Analysis

Component Name: 8. Montour - Cross Valley 500 kV Transmission Line

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- This 500 kV line route poses moderate risk to securing towers over 150 structures and hardware components in the provided timeline.
- Multiple crossings with 69 kV to 230 kV transmission lines pose moderate risk to construction and outage schedules.

- Multiple underground utility crossings may require additional coordination for construction and impact the proposed locations for new structures.

Component Name: 9. Cross Valley - Grassy Path 500 kV Transmission Line

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- This 500 kV line route poses moderate risk to securing towers over 40 structures and hardware components in the provided timeline.
- Multiple crossings with 69 kV transmission lines pose low to moderate risk to construction and outage schedules.
- Multiple underground utility crossings may require additional coordination for construction and impact the proposed locations for new structures.

Component Name: 10. Grassy Path - Beaver Brook 500 kV Transmission Line

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- This 500 kV line route poses moderate risk to securing towers over 30 structures and hardware components in the provided timeline.
- Multiple crossings with 69 kV transmission lines pose low to moderate risk to construction and outage schedules.
- Multiple underground utility crossings may require additional coordination for construction and impact the proposed locations for new structures.

Substation Risk Analysis

Component Name: 1. Cross Valley Substation

This project involves installation of a greenfield substation with 500 kV breaker and a half configuration with five (5) positions, eight (8) circuit breakers, a 500/230 kV transformer, and associated equipment.

Component Name: 2. Grassy Path Substation

This project involves installation of a greenfield substation with 500 kV ring bus configuration with three (3) positions, three (3) circuit breakers, a 500/230 kV transformer, and associated equipment.

Component Name: 3. Beaver Brook Substation

This project involves installation of a greenfield substation with 500 kV ring bus configuration with three (3) positions, three (3) circuit breakers, two 500/230 kV transformers, and associated equipment.

Constructability Summary

The proposal contains greenfield transmission lines and substations, as well as substation expansion components. The main constructability risks are land acquisition, Threatened, and Endangered Species impacts, waterbody crossings and/or impacts, and substation equipment procurement.

This proposal was assessed a **Medium** risk Constructability rating.

Outage Review

Due to the primary greenfield nature of this project, only short outages to existing facilities will be required to tie in the new transmission facilities, and therefore no significant existing facility outages are anticipated. Overall outage coordination risk is deemed **Low**.

Cost Review

As part of the detailed constructability analysis, an independent consultant prepared a high-level conceptual, independent cost estimate for the components of this proposal. The independent consultant assumes a level of effort and accuracy consistent with AACE International's Recommended Practice 17R-97, Cost Estimate Classification System, Class 3 with an expected accuracy of -20% to +40% from the base total estimate. Estimates will use available industry and materials. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering, and construction. The independent cost estimate includes a 30% contingency, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates is shown below.

Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
1	Cross Valley Substation	68.11	107.68
2	Grassy Path Substation	41.36	76.33
3	Beaver Brook Substation	60.98	110.35
4	Montour Substation Upgrade	24.19	51.18
5	NESC Substation Upgrade	4.57	6.17
6	Tomhicken Substation Upgrade	4.57	6.17
7	Slykerville Substation Expansion	9.14	8.78
8	Montour - Cross Valley 500 kV Transmission Line	182.17	209.82
9	Cross Valley - Grassy Path 500 kV Transmission Line	50.79	55.62
10	Grassy Path - Beaver Brook 500 kV Transmission Line	36.60	48.39
11	Cross Valley - NESC 230 kV Transmission Line	2.51	2.30
12	Grassy Path - Tomhicken 230 kV Transmission Line	2.51	2.19
13	Beaver Brook - Slykerville #1 230 kV Transmission Line	2.51	2.19
14	Beaver Brook - Slykerville #2 230 kV Transmission Line	2.51	2.19
15	Sunbury - Susquehanna 500 kV Loop-In	1.74	3.49
Total		494.29	692.85

The proposed cost estimate is within 30% of the independent cost estimate and is assessed as **Medium** risk.

Schedule Review

This proposal has a projected in-service date of June 2030.

The major schedule risks identified for Proposal 20 are associated with the ROW/Land acquisition for the greenfield scope of the project. **Medium** schedule risks are assessed for this proposal.

Proposing Entity Experience and Capability Review

LS Power has significant experience with the proposed equipment and has the capability to construct proposal 20 as submitted. The proposing entity experience and capability risk is considered **Low**.

MAAC Regional Cluster Proposals

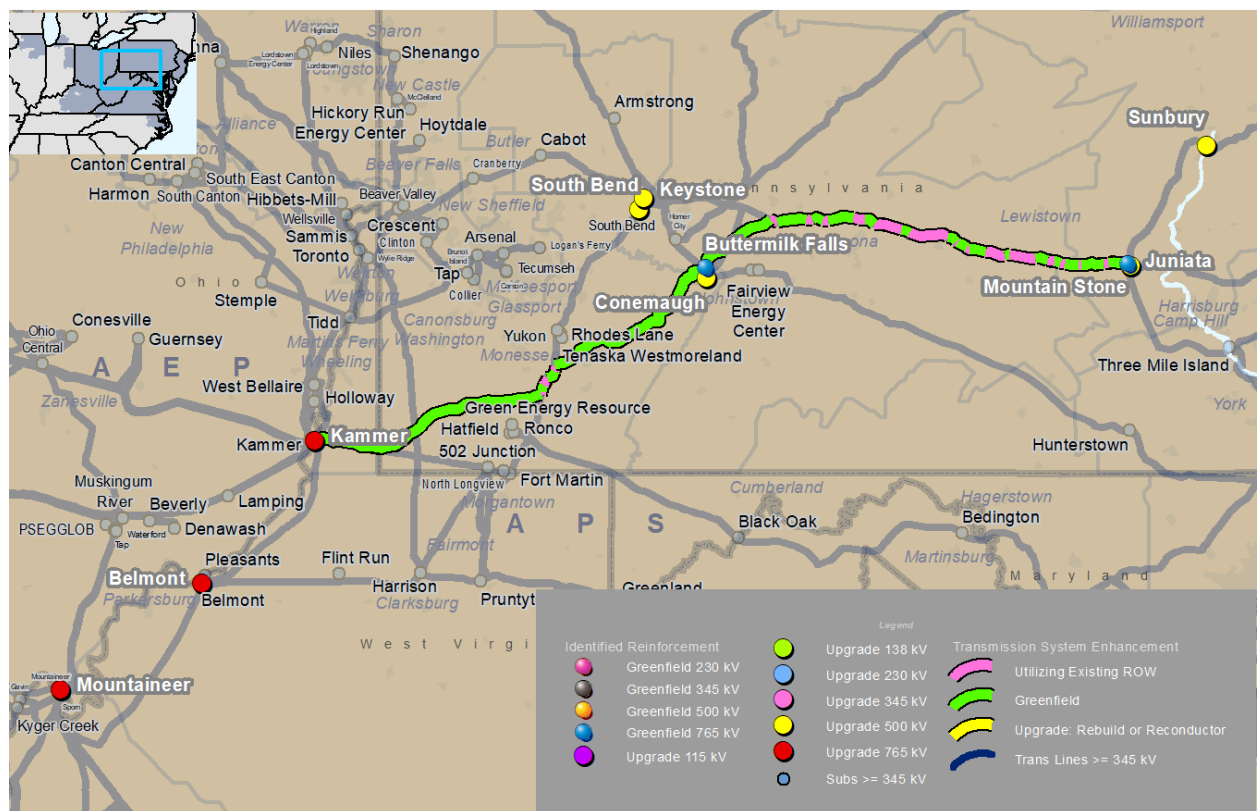
Proposal 237 – Kammer to Juniata (NextEra/Exelon)

The main objective of this project is to construct multiple 765kV voltage transmission lines to create a 765kV transmission pathway from the existing Kammer substation in Marshall County, West Virginia, to the existing Juniata substation in Perry County, Pennsylvania. This project will traverse 1 county Marshall County in the state of West Virginia, 9 counties Greene, Fayette, Westmoreland, Indiana, Cambria, Blair, Huntingdon, Mifflin, Juniata, and Perry County in Pennsylvania.

This proposal has a total of 12 components, including 7 substation upgrade components, 2 greenfield substation components, and 3 greenfield transmission line components.

Map 14 displays the components and routes proposed for proposal 237.

Map 14. Proposal 237



NOTE: 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.

Project Description

NextEra/Exelon Proposal 237 includes the following components:

- Component 1: B-20-A) Kammer - Buttermilk Falls 765kV
- Component 2: B-21-A) Buttermilk Falls - Mountain Stone 765kV
- Component 3: B-24-A) Mountain Stone-Juniata 500kV
- Component 4: B-06-A) Mountain Stone 765kV Substation
- Component 5: B-19-B) Buttermilk Falls 765kV Substation
- Component 6: B-30-A) South Bend - Keystone 500kV terminal equipment upgrade
- Component 7: B-32-A) Keystone-Juniata 500 kV terminal equipment upgrade
- Component 8: B-33-A) Mountaineer-Belmont 765 kV terminal equipment upgrade
- Component 9: B-01-A) Kammer substation upgrade
- Component 10: B-07-A) Juniata substation upgrade
- Component 11: B-31-A) Sunbury 500 kV substation upgrades
- Component 12: B-34-A) Conemaugh circuit breaker upgrades

Constructability Review

Right-of-Way/Land Acquisition Risk Analysis

B-20-A) Kammer- Buttermilk Falls 765 kV line:

The Kammer- Buttermilk Falls 765 kV line is a 114-mile greenfield single-circuit line to be constructed from the existing Kammer station in Marshall County, WV to the proposed Buttermilk Falls Substation in Indiana County, PA. The line will traverse 1 county in West Virginia (Marshall) and 4 counties in Pennsylvania (Greene, Fayette, Westmoreland, Indiana).

The total route is 114 miles with only about 3.8 miles paralleling existing ROW and the remainder being true greenfield routes. The proposal states that the new ROW is to be 200ft for most of the line with some congested areas being 175ft. At 200ft the amount of mostly-rural land to be acquired is 2,729 acres. Approximately 242 acres of that are a bit more populated. The large amount of land required for the line increases risk. Resistance is expected in some areas, but there is plenty of ability to reroute where resistance is encountered.

B-21-A) Buttermilk Falls - Mountain Stone 765kV

The Buttermilk Falls – Mountain Stone 765 kV line is a 108-mile greenfield single-circuit line to be constructed from the proposed Buttermilk Falls Substation in Indiana County, PA to the proposed Mountain Stone Substation in Perry County, PA. The line will traverse 6 counties in Pennsylvania (Indiana, Cambria, Blair, Huntingdon, Mifflin, Juniata, and Perry).

The total route is 108 miles with 42% (45 miles) paralleling existing ROW and the remaining 58% (62.5 miles) being true greenfield routes. The proposal states the ROW will be 200ft, which could be very tight for two parallel 500kV lines. It will likely need to be wider. At 200ft the amount of mostly-rural land to be acquired is 2,612 rural acres. There are very few structures or populated areas along the route, so less resistance or concerns are expected than other components.

B-24-A) Mountain Stone-Juniata 500kV

The Mountain Stone - Juniata 500 kV line is two parallel greenfield lines approximately 0.6-miles in length. These lines will be constructed from the proposed Mountain Stone Substation to the existing Juniata Substation in Perry County, PA.

The total route is 0.6 miles long and is mostly contained within the Juniata Substation property and the surrounding ROW for other circuits. A small amount of rural land will need to be acquired, 18 acres, approximately.

B-06-A) Mountain Stone 765kV Substation

This component is a greenfield substation located in Perry County, PA and will require a new land parcel. This property is not owned by the proposing party. Approximately 40 acres is required for the construction of this substation.

The proposed site seems adequate to house the component; however, 765kV substations can generate public interest and opposition due to the high voltage and large size of the equipment.

B-19-B) Buttermilk Falls 765kV Substation

This component is a greenfield substation located in Indiana County, PA and will require a new land parcel. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

The proposed site seems adequate to house the component; however, 765kV substations can generate public interest and opposition due to the high voltage and large size of the equipment.

Overall, **Medium-High** ROW/Land Acquisition risks are assessed for this proposal due to the combination of greenfield and paralleling existing ROW for the 765 kV line routes.

Environmental Risk Analysis*B-20-A) Kammer - Buttermilk Falls 765kV*

The proposed route intersects with the following recorded Historical Sites/Structures/Districts: Briar Hill. Coordination with the WV SHPO is required Proposed route intersects 23 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Marshall County, WV; Greene, Fayette, Westmoreland and Indiana counties in PA. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional

determination. Proposed route does not intersect designated Critical Habitat. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 12 conservation easements. Coordination with easement holder(s) is required. The proposed route intersects designated Scenic Rivers/Scenic Trails. Coordination with the following agencies is required: Indiana County; Regional Trail Corporation. The proposed route intersects Natural Areas/Reserves/Wildlife Refuge. Coordination with the following agencies is required: Buttermilk Falls Conservation Area. Designated Trout Waters Not Present

The proposed route crosses 1 Airport/Heliport under the Federal Aviation Administration (FAA), Powell Kaiser. There are approximately 9 railroad crossings, 1 with CSXT, 5 with Norfolk Southern Railway Company, 1 with Wheeling & Lake Erie Railway Company, and 2 with Southwest Pennsylvania Railroad Company. There are approximately 213 road and highway crossings (426 entrances) across 5 counties (Marshall, Greene, Westmoreland, Indiana and Fayette County.) 192 in PA, and 21 in WV. There are approximately 27 transmission line crossings, 1 with MONONGAHELA POWER CO, 8 with no owner available, 4 with OHIO POWER CO, 1 with PENNSYLVANIA ELECTRIC CO, 10 with WEST PENN POWER COMPANY, 3 with WHEELING POWER CO. There are approximately 28 pipeline crossings, 9 with Columbia Gas Trans Co, 2 with Dominion Transmission Co, 12 with Equitrans Inc, and 5 with Texas Eastern Trans Co. It is anticipated that the proposal requires permits, consultations, clearances and authorization from 5 counties in PA and WV. State CPCN and DOT utility, driveway and right of way permits may be required.

B-21-A) Buttermilk Falls - Mountain Stone 765kV

The proposed component has the potential to impact environmental resources including FEMA floodplains, wetlands, and streams subject to USACE Section 404 and/or Section 10 permitting; woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Impacts to these resources will require coordination with state wildlife agencies, USACE and USFWS. Proposed route intersects no designated Critical Habitats. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species and critical habitats. Proposed route does intersect 41 conservation easements and scenic rivers or trails. Coordination with easement holders will be required. Proposed route intersects mapped karst geology. Geotechnical studies are needed to verify subsurface conditions prior to digging or trenching.

There are approximately 6 railroad crossings, 2 owned by R. J. Corman Railroad Company/Pennsylvania Lines Inc., and 4 owned by Norfolk Southern Railway Company. There are approximately 149 road and highway crossings (298 entrances) across 7 counties. There are approximately 22 highway crossings (44 entrances) and 127 roadway crossings (254 entrances) across 7 counties. There is approximately 13 transmission line crossings, 10 owned by PENNSYLVANIA ELECTRIC CO, and 3 with owner not available. There are approximately 5 pipeline crossings. There are 2 owned by Texas Eastern Trans Co, 1 owned by ENTERPRISE PRODUCTS, 1 owned by BUCKEYE PARTNERS, and 1 owned by SUNOCO. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from 7 counties, PA. State Approval of Electric Transmission Lines, and DOT utility permits are required.

B-24-A) Mountain Stone-Juniata 500kV

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting. Impacts to these resources will require coordination with the USACE and appropriate Floodplain Administrators.

The component crosses 1 highway (2 entrances) in Perry County; 2 transmission lines where the owner is not available. It is anticipated that the proposal would require permits, consultations, clearances, and authorizations from Perry County in PA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits may be required.

B-06-A) Mountain Stone 765kV Substation

The proposed component has minimal environmental impact. The proposed substation footprint intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed substation footprint intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination.

The proposed substation footprint intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching. Perry County may require additional permits. Pennsylvania Department of Transportation (PDOT) requires utility permits and Driveway/Local Road Permits.

B-19-B) Buttermilk Falls 765kV Substation

The proposed substation footprint intersects woodlands. Tree removal restrictions will apply. Consultation with USFWS is needed. Desktop analysis indicates that the proposed route intersects with farmland. Verification in the field would need to be completed. The permitting risk for the proposed substation is low. There are approximately 2 pipeline crossings. Specific county where the substation is located in may require additional permits. Pennsylvania Department of Transportation (PDOT) requires Driveway/Local Road Permits.

Transmission Line Risk Analysis*B-20-A) Kammer - Buttermilk Falls 765kV*

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 6-bundle 715 kcmil ACSR “Redwing” conductor arrangement lattice structures. The conductors support the ratings outlined in the proposal. Some lattice structures will be guyed V-Type while others will be self-supporting on foundations. These types of structures are inherently complex vs. steel monopoles and less-bundled conductors but are common for 765kV lines. It should be noted that 765kV AC Transmission lines are not historically common in America but are increasingly being developed across the country. Some utilities and contractors are expected to have limited experience accordingly.

Regarding the route, the proposed 200ft ROW is what is expected to see with this type of line. Route risks involve dealing with homes near or in the ROW. Some modifications to the original suggested alignment may be required to obtain easement. Several areas throughout the line will have very steep hills to mountains that may prove to be difficult to navigate for the crew. Some matting will be needed in low residing areas particularly between Interstate 70 and Highway 981 as a wetland is present. The majority of the line has many roads that are

near making access to the line easy to maintain for future crews. There are a number of crossings along the route including 13 high-voltage lines, 8 railroads, 6 highways, and 5 water crossings. While this is a large quantity, it is reasonable for a line of this length. There are likely to be several crossings in excess of 2500ft due to the terrain present along this line.

From a procurement perspective, there are a significant number of structures (502) that will be required and over 2000 miles of conductor needed. This is a large quantity of material to procure in the schedule outlined. Most of the material, outside of some 765kV hardware, should not carry procurement risks outside of typical EHV line builds.

B-21-A) Buttermilk Falls - Mountain Stone 765kV

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 6-bundle 715 kcmil ACSR “Redwing” conductor arrangement lattice structures. The conductors support the ratings outlined in the proposal. Some lattice structures will be guyed V-Type while others will be self-supporting on foundations. These types of structures are inherently complex vs. steel monopoles and less-bundled conductors but are common for 765kV lines. It should be noted that 765kV AC Transmission lines are not historically common in America but are increasingly being developed across the country. Some utilities and contractors are expected to have limited experience accordingly.

Regarding the route, the proposed 200ft ROW is what would be expect to see with this type of line. Route risks involve dealing with homes near or in the ROW. Some modifications to the original suggested alignment may be required to obtain easement. Several areas throughout the line will have very steep hills to mountains that may prove to be difficult to navigate by crew as the line crosses the Appalachian mountain range. Some matting will be needed in low residing areas particularly between Interstate 70 and Highway 981 as a wetland is present. The majority of the line has many roads that are near making access to the line easy to maintain for future crews. There are a number of crossings along the route including 9 high-voltage lines, 7 railroads, 2 highways, and 3 water crossings. While this is a large quantity, it is reasonable for a line of this length. There are likely to be several crossings in excess of 2500ft due to the terrain present along this line.

From a procurement perspective, there are a significant number of structures (476) that will be required and over 1900 miles of conductor needed. This is a large quantity of material to procure in the schedule outlined. Most of the material, outside of some 765kV hardware, should not carry procurement risks outside of typical EHV line builds.

Finally, the steep hills to mountains and rural nature of the route does provide some terrain concerns as the line crosses the Appalachian Mountains. Access route improvement may be extensive for this line. While some lower-lying wetlands may require unique foundations, there are not a lot of these identified along the route.

B-24-A) Mountain Stone-Juniata 500kV

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 3-bundle 1780 kcmil ACSR 84/19 “Chukar” arrangement on single-circuit lattice structures. The conductors do not appear to support the ratings outlined in the proposal. Some complexity could be removed from the design by using steel monopoles, which is the preferred approach in this territory (PPL) anyway.

There are no concerns about this route other than the two EHV line crossings that will be required. These crossings are going to be necessary and are not an impossible feat. The terrain appears to be gradually sloped downhill, transitioning from woods to field making it an easy terrain to work on. The ROW is likely not wide enough for the two lines parallel, but there is room to expand here. Access and Maintenance should be easy at this location as it is near two substations with roads to them.

From a procurement perspective, there are only (16) structures expected and just over 10 miles of conductor needed. This is a small quantity and does not raise much concern. Material needed should not carry procurement risks outside of typical EHV hardware lead times. Finally, the flat and rural nature of the route doesn't provide some terrain concerns.

Substation Risk Analysis

B-06-A) Mountain Stone 765kV Substation

The project involves constructing a new greenfield 765/500 kV air-insulated substation built around a 765 kV double-breaker, double-bus (DBDB) switchyard. The 765 kV yard will include one DBDB bay with a single line terminal supported by five 765 kV, 5000-amp, 63-kA interrupting-duty circuit breakers to provide high reliability, strong fault-isolation capability, and ample operational flexibility. Major equipment installations will include a 300-MVAR 765 kV shunt line reactor and two 765/500 kV, 3,125-MVA autotransformer banks that will connect the extra-high-voltage network to the 500 kV system. The scope covers all associated foundations, structural steel, high-voltage bus work, grounding system expansion, station service upgrades, oil containment systems, and conduit/cable installations required to support this new EHV facility.

B-19-B) Buttermilk Falls 765kV Substation

The project consists of constructing a new greenfield 765/500 kV air-insulated substation featuring both a 765 kV breaker-and-a-half (BAAH) yard and a 500 kV double-breaker, double-bus (DBDB) yard. The 765 kV yard will include one BAAH bay supporting two line terminals and five 765 kV, 5000-amp, 63-kAIC circuit breakers arranged to provide strong fault-isolation capability and operational flexibility. Two 765 kV, 300-MVAR shunt line reactors will be installed to support system voltage performance, along with a single 765/500 kV, 3,125-MVA autotransformer bank to interconnect the extra-high-voltage system with the 500 kV network. Major work includes foundations, structural steel, high-voltage bus work, grounding grid extensions, oil containment, station service systems, and raceway installations for power and control cables. The 500 kV yard will be constructed in a DBDB configuration with three bays and three line terminals supported by six 500 kV, 5000-amp, 63-kAIC circuit breakers.

Constructability Summary

This proposal contains significant greenfield construction and will pose moderate challenges for acquisition of the required land for the line routes and substation parcels. The overall risk of this proposal is rated as **Medium Risk**.

Outage Review

Due to the primary greenfield nature of this project, only short outages to existing facilities will be required to tie in the new transmission facilities, and therefore no significant existing facility outages are anticipated. Overall outage coordination risk is deemed **Low**.

Cost Review

A high-level cost estimate was created for each proposal to assess the cost component for potential omissions or under-estimating. Cost estimates were broken into eight categories, including Engineering & Design, Permitting/Routing/Siting, ROW/Land Acquisition, Materials & Equipment, Construction & Commissioning, Construction Management, Overheads and Miscellaneous, and Risk Contingency (30%). The cost comparison for this proposal, broken down by component, is outlined below.

Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
1	Kammer - Buttermilk Falls	\$694.72	\$718.20
2	Buttermilk Falls - Mountain Stone	\$633.35	\$680.40
3	Mountain Stone - Juniata	\$5.32	\$6.84
4	Mountain Stone 765kV Substation	\$166.94	\$134.01
5	Buttermilk Falls 765kV Substation	\$170.29	\$178.88
6	South Bend - Keystone 500kV terminal equipment upgrade	\$4.68	\$4.39
7	Keystone-Juniata 500 kV terminal equipment upgrade	\$4.68	\$4.39
8	Mountaineer-Belmont 765 kV terminal equipment upgrade	\$6.75	\$6.35
9	Kammer Substation Upgrade	\$13.50	\$14.56
10	Juniata Substation Upgrade	\$9.95	\$20.96
11	Sunbury 500kV Substation Upgrades	\$4.98	\$7.43
12	Conemaugh Circuit Breaker Upgrades	\$23.42	\$20.92
Total		\$1,738.59	\$1,797.32

The proposal cost estimate is within 10% of the independent cost estimate and is considered **Low** risk.

Schedule Review

The in-service date of this proposal is June 2031.

The overall schedule risk for the proposal is driven by the permitting and land acquisition risks associated with the greenfield transmission lines and substation components. **Medium** schedule risk is assessed for this proposal.

Proposing Entity Experience and Capability Review

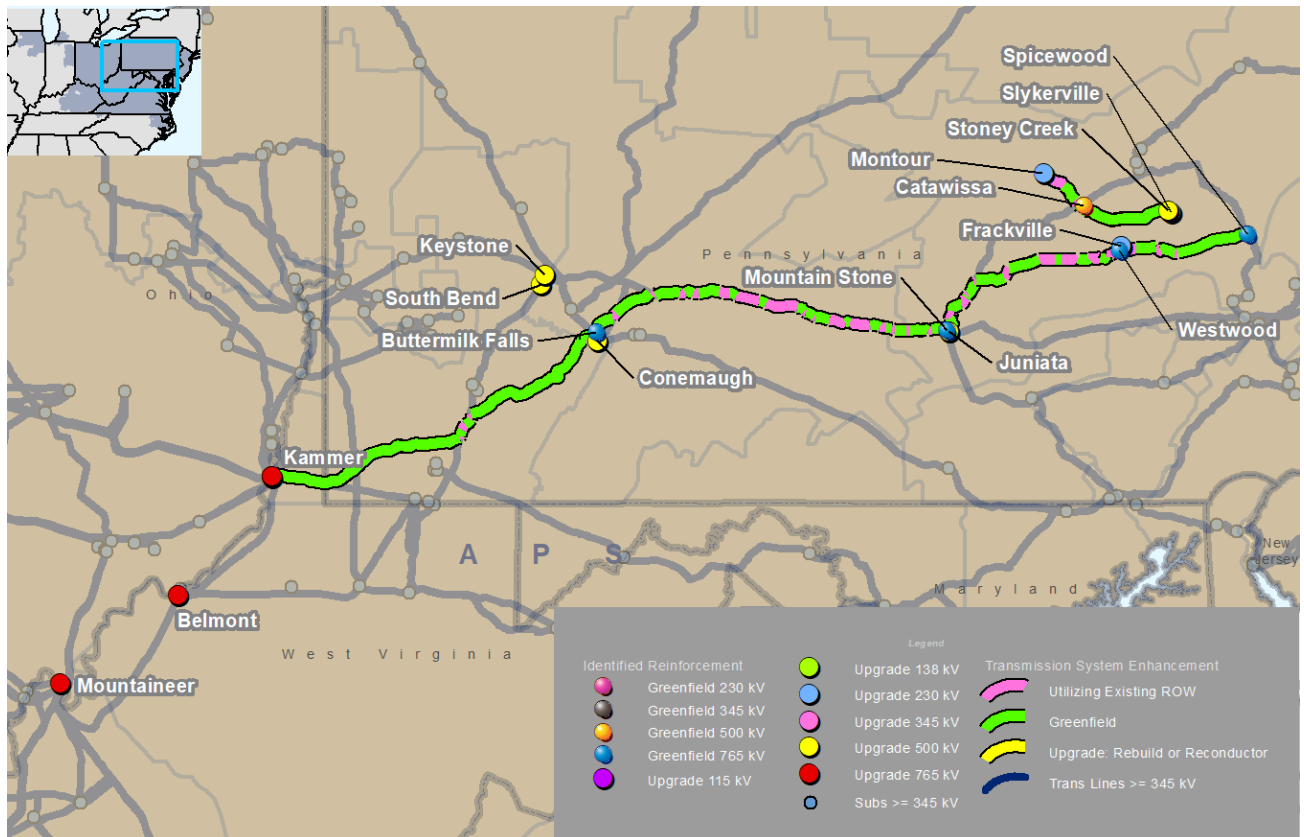
Exelon's affiliate ComEd, has experience operating and designing 765 kV transmission, which represents the most significant scope proposed for this project. Accordingly, the proposing entity experience and capability risk is assessed **Low-Medium**.

Proposal 687 – Kammer to Juniata to Spicewood 765 kV (NextEra/Exelon)

The objective of this project is to construct a new 230/500/750 kV, 326.6-mile transmission line from existing Kammer Substation in Marshal County, West Virginia to new Spicewood 765 kV Substation in Carbon County, Pennsylvania. A separate 230/500 kV 44-mile line is to be constructed from the existing Montour Substation in Montour County, Pennsylvania to the existing Slykerville Substation in Carbon County, Pennsylvania. Several substation upgrade components are included as well. The purpose of this proposal is to provide a solution to thermal overload issues, meet generation and load interconnection needs, and reinforce PPL's central region and west-to-east power transfer capability. This project will traverse 18 counties (Carbon, Luzerne, Schuylkill, Colombia, Montour, Greene, Fayette, Westmoreland, Indiana, Cambria, Blair, Huntingdon, Mifflin, Juniata, Perry, Snyder, Northumberland, Armstrong) in Pennsylvania and three counties (Marshall, Mason, Pleasants) in West Virginia.

This proposal has a total of 25 components, including six greenfield substation components, nine substation upgrade components, and ten brownfield transmission line components.

Map 15 displays the components and routes proposed for proposal 687.

Map 15. Proposal 687

*NOTE: 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.*

Project Overview

- The (Kammer to Juniata to Spicewood 765 kV) Proposal 687 includes the following components:
- Component 1: B-20-A) Kammer - Buttermilk Falls 765 kV
- Component 2: B-21-A) Buttermilk Falls - Mountain Stone 765 kV
- Component 3: B-24-A) Mountain Stone - Juniata 500 kV
- Component 4: E-07-B) Stoney Creek - Slykerville 230 kV
- Component 5: E-18-B) Montour-Catawissa 230 kV
- Component 6: E-20-A) Catawissa - Stoney Creek 500 kV
- Component 7: E-28-B) Frackville/Columbia - Catawissa 230 kV Loop-In
- Component 8: E-31-A) Mountain Stone - Westwood 765 kV
- Component 9: E-34-A) Westwood - Frackville 230 kV
- Component 10: E-35-A) Westwood - Spicewood 765 kV
- Component 11: B-19-B) Buttermilk Falls 765 kV Substation

- Component 12: B-06-C) Mountain Stone 765 kV Substation
- Component 13: E-17-D) Catawissa 500 kV Substation
- Component 14: E-19-C) Stoney Creek 500 kV Substation
- Component 15: E-32-A) Westwood 765 kV Substation
- Component 16: E-36-A) Spicewood 765 kV Substation
- Component 17: B-30-A) South Bend - Keystone 500 kV terminal equipment upgrade
- Component 18: B-32-A) Keystone-Juniata 500 kV terminal equipment upgrade
- Component 19: B-33-A) Mountaineer-Belmont 765 kV terminal equipment upgrade
- Component 20: B-01-A) Kammer substation upgrade
- Component 21: B-07-A) Juniata substation upgrade
- Component 22: B-34-A) Conemaugh circuit breaker upgrades
- Component 23: E-16-B) Montour substation upgrade
- Component 24: E-10-C) Slykerville (SLKY) substation upgrade
- Component 25: E-33-A) Frackville (New PPL) substation upgrade

Constructability Review

Right-of-Way/Land Acquisition Risk Analysis

Component 1 – B-20-A) Kammer-Buttermilk Falls 765 kV

The Kammer-Buttermilk Falls 765 kV Transmission Line is an approximately 114-mile line that will be constructed from the existing Kammer Substation, in Marshall County, West Virginia to the proposed Buttermilk Falls Substation, in Indiana County, Pennsylvania. The line will traverse one county (Marshall) in West Virginia and four counties (Greene, Fayette, Westmoreland, and Indiana) in Pennsylvania.

The total route is 114 miles, with a proposed right-of-way of 200 feet for 90% of the line and 175 feet for the remaining 10%. The proposed route will be an expansion of existing right-of-way for 43% of its length and greenfield for the remaining 57%.

Land acquisition will be required for the entire line. There are multiple residences near or within the proposed line corridor, and eminent domain will not likely be possible. The line corridor also crosses or is adjacent to several conservation easements and crosses the Buttermilk Falls Natural Area and State Game Lands #296. The corridor is also heavily forested in sections, and the terrain is aggressive, making potential access difficult.

Component 2 – B-21-A) Buttermilk Falls-Mountain Stone 765 kV

The Buttermilk Falls-Mountain Stone 765 kV Transmission Line is an approximately 108-mile line that will be constructed from the proposed Buttermilk Falls Substation, in Indiana County, Pennsylvania to the proposed Mountain Stone Substation, in Perry County, Pennsylvania. The line will traverse seven counties (Indiana, Cambria, Blair, Huntingdon, Mifflin, Juniata, and Perry) in Pennsylvania.

The total route is 108 miles, with a proposed right-of-way of 200 feet for 98% of the line and 175 feet for the remaining 2%. The proposed route will be an expansion of existing right-of-way for 42% of its length and greenfield for the remaining 58%.

Land acquisition will be required for the entire line. There are multiple residences near or within the proposed line corridor, and eminent domain will not likely be possible. The line corridor crosses the Blacklick Valley Natural Area, multiple State Game Lands, the Tuscarora State Forest, a conservation easement, the Bells Gap Railroad Trail, and Little Buffalo State Park. The corridor is also heavily forested in sections, and the terrain is aggressive, making potential access difficult.

Component 3 – B-24-A) Mountain Stone-Juniata 500 kV

The Mountain Stone-Juniata 500 kV Transmission Line is an approximately 0.6-mile line that will be constructed from the proposed Mountain Stone Substation, in Perry County, Pennsylvania to the existing Juniata Substation, in Perry County, Pennsylvania. The line will traverse one county (Perry) in Pennsylvania.

The total route is 0.6 miles, with a proposed right-of-way of 200 feet. The entire line will be greenfield.

Land acquisition will be required for the entire line. There is a single residence near the proposed line corridor, and eminent domain will not likely be possible.

Component 6 – E-20-A) Catawissa-Stoney Creek 500 kV

The Catawissa-Stoney Creek 500 kV Transmission Line is an approximately 26-mile line that will be constructed from the proposed Catawissa Substation, in Columbia County, Pennsylvania to the proposed Stoney Creek Substation, in Luzerne County, Pennsylvania. The line will traverse three counties (Columbia, Schuylkill, and Luzerne) in Pennsylvania.

The total route is 26 miles, with a proposed right-of-way of 200 feet. The proposed route will be an expansion of existing right-of-way for 5% of its length and greenfield for the remaining 95%.

Land acquisition will be required for the entire line. There are several residences in or near the proposed line corridor, and eminent domain will not likely be possible. The line also crosses the Catawissa Recreation Area. Large portions of the corridor will require tree clearing and there is limited public road access.

Component 8 – E-31-A) Mountain Stone-Westwood 765 kV

The Mountain Stone-Westwood 765 kV Transmission Line is an approximately 62-mile line that will be constructed from the proposed Mountain Stone Substation, in Perry County, Pennsylvania to the proposed Westwood Substation, in Schuylkill County, Pennsylvania. The line will traverse four counties (Perry, Juniata, Northumberland, and Schuylkill) in Pennsylvania.

The total route is 62 miles, with a proposed right-of-way of 200 feet for 99% of its length and 175 feet for the remaining 1%. The proposed route will be an expansion of existing right-of-way for 31% of its length and greenfield for the remaining 69%.

Land acquisition will be required for the entire line. There are several residences near the proposed line corridor, and eminent domain will not likely be possible. Significant tree clearing will also be required in portions of the corridor.

Component 10 – E-35-A) Westwood-Spicewood 765 kV

The Westwood-Spicewood 765 kV Transmission Line is an approximately 38-mile line that will be constructed from the proposed Westwood Substation, in Schuylkill County, Pennsylvania to the proposed Spicewood Substation, in Carbon County, Pennsylvania. The line will traverse two counties (Schuylkill and Carbon) in Pennsylvania.

The total route is 38 miles, with a proposed right-of-way of 200 feet. The proposed route will be an expansion of existing right-of-way for 13% of its length and greenfield for the remaining 87%

Land acquisition will be required for the entire line. There are several residences in or near the proposed line corridor, and eminent domain will not likely be possible. The line also crosses State Game Lands #257 and #326. Large portions of the corridor will require tree clearing. Also, large portions of the component will be constructed on side slopes or ridge tops.

Component 11 – B-19-B) Buttermilk Falls 765 kV Substation

Buttermilk Falls 765 kV Substation is a greenfield substation in Indiana County, Pennsylvania. Acreage requirements have not been provided.

New land acquisition will be required; however, the proposed component site is in an undeveloped area, with no residences within the likely component area.

Component 12 – B-06-C) Mountain Stone 765 kV Substation

Mountain Stone 765 kV Substation is a greenfield substation in Perry County, Pennsylvania. Acreage requirements have not been provided.

New land acquisition will be required; however, the proposed component site is in an undeveloped area, with no residences within the likely component area.

Component 13 – E-17-D) Catawissa 500 kV Substation

Catawissa 500 kV Substation is a greenfield substation in Columbia County, Pennsylvania. Acreage requirements have not been provided.

New land acquisition will be required; however, the proposed component site is in an undeveloped area, with no residences within the likely component area.

Component 14 – E-19-C) Stoney Creek 500 kV Substation

Stoney Creek 500 kV Substation is a greenfield substation in Luzerne County, Pennsylvania. Acreage requirements have not been provided.

New land acquisition will be required; however, the proposed component site is in an undeveloped, previously mined area, with no residences within the likely component area.

Component 15 – E-32-A) Westwood 765 kV Substation

Westwood 765 kV Substation is a greenfield substation in Schuylkill County, Pennsylvania. Acreage requirements have not been provided.

New land acquisition will be required; however, the proposed component site is in an undeveloped area, with no residences within the likely component area.

Component 16 – E-36-A) Spicewood 765 kV Substation

Spicewood 765 kV Substation is a greenfield substation in Carbon County, Pennsylvania. Acreage requirements have not been provided.

New land acquisition will be required; however, the proposed component site is in an undeveloped area, with no residences within the likely component area.

Overall, **Medium-High** ROW/Land Acquisition risks are assessed for this proposal due to the combination of greenfield and paralleling existing ROW for the 765 kV line routes.

Environmental Risk Analysis*Component 1. B-20-A) Kammer - Buttermilk Falls 765 kV*

The proposed route has the potential to impact environmental resources, including FEMA floodplains, streams and wetlands subject to USACE Section 404 and/or Section 10 permitting. The proposed route crosses South Fork Ten Mile Creek, Jacobs Creek, Fourmile Run, Two mile Run, Loyalhanna Creek, Tubmill Creek, Allison Reservoir, Brier Hill Reservoir, Latrobe Reservoir, several Section 10 Rivers, including the Youghiogheny River, Monongahela River, and Conemaugh River, as well as several ponds and large, forested wetlands. Thirteen federally threatened and endangered species are also anticipated to be found along the route corridor, as well as critical forested habitat for a federally listed bat species. Impacts to these resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE, and USFWS. The proposed route intersects eight easements. Coordination with easement holders – Pennsylvania Stage Game Land #296, Western Pennsylvania Conservation Easements #108, #128, #140, #143 and #112, Buttermilk Falls Natural Area, and Brier Hill National Historic District - will be required.

Component 2. B-21-A) Buttermilk Falls - Mountain Stone 765 kV

The proposed route has the potential to impact environmental resources, including FEMA floodplains, streams and wetlands subject to USACE Section 404 and/or Section 10 permitting. The proposed route crosses Blacklick Creek, Chest Creek, Clearfield Creek, Canoe Creek, Frankstown Branch Juniata River, Juniata River, Standing Stone Creek, and Buffalo Creek, as well as several large lakes and forested wetlands. Eleven federally threatened and endangered species are also anticipated to be found along the route corridor, as well as critical forested habitat for a federally listed bat species. Impacts to these resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE, and USFWS. The proposed route intersects fourteen easements. Coordination with easement holders – Pennsylvania Stage Game Land #184, #108, #116, #322, #112, Western Pennsylvania Conservation Easements #090, BlackLick Valley Natural Area, Bells Gap Railroad Trail, Huntingdon Agriculture Easement #003, Tuscarora State Forest, and Little Buffalo State Park - will be required.

Component 3. B-24-A) Mountain Stone-Juniata 500 kV

Four federally threatened and endangered species are anticipated to be found along the route corridor, as well as suitable forested habitat for a federally listed bat species. Consultation with USFWS and state wildlife agencies is needed to determine if the proposed project will have effects on protected species.

Component 4. E-07-B) Stoney Creek - Slykerville 230 kV

Three federally threatened and endangered species are anticipated to be found along the route corridor, as well as suitable forested habitat for a federally listed bat species. Consultation with USFWS and state wildlife agencies is needed to determine if the proposed project will have effects on protected species.

Component 5. E-18-B) Montour-Catawissa 230 kV

The proposed route has the potential to impact environmental resources, including FEMA floodplains, streams and wetlands subject to USACE Section 404 and/or Section 10 permitting. The proposed route crosses the Susquehanna River, a Section 10 River, Mahoning Creek, Montour Run, and Frozen Run. Six federally threatened and endangered species are also anticipated to be found along the route corridor, as well as suitable habitat for a federally listed bat and aquatic species. Impacts to these resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE, and USFWS. The proposed route intersects one easement. Coordination with the easement holder - Rishel Grove Conservation Easement - will be required.

Component 6. E-20-A) Catawissa - Stoney Creek 500 kV

The proposed route has the potential to impact environmental resources, including FEMA floodplains, streams and wetlands subject to USACE Section 404 and/or Section 10 permitting. The proposed route crosses several high-quality and trout stocking streams, as well as a large, forested wetland complex. Six federally threatened and endangered species are also anticipated to be found along the route corridor, as well as suitable habitat for a federally listed bat and aquatic species. Impacts to these resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE, and USFWS. The proposed route intersects one easement. Coordination with the easement holder – Catawissa Recreation Area - will be required.

Component 8. E-31-A) Mountain Stone - Westwood 765 kV

The proposed route has the potential to impact environmental resources, including FEMA floodplains, streams and wetlands subject to USACE Section 404 and/or Section 10 permitting. The proposed route crosses Buffalo Creek, Juniata River, West Branch Mahantango Creek, Mahatango Creek, Fiddlers Run, Mouse Creek, Middle Creek, Schwaben Creek, and the Susquehanna River, a Section 10 River, as well as several large, forested wetland complexes. Seven federally threatened and endangered species are also anticipated to be found along the route corridor, as well as suitable habitat for a federally listed bat and aquatic species. Impacts to these resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE, and USFWS. The proposed route intersects one easement. Coordination with the easement holder – Perry County Easement #001- will be required.

Component 10. E-35-A) Westwood - Spicewood 765 kV

The proposed route has the potential to impact environmental resources, including FEMA floodplains, streams and wetlands subject to USACE Section 404 and/or Section 10 permitting. The proposed route crosses Tar Run Reservoir, Mill Creek, Little Schuylkill River, and the Lehigh River, a State Scenic River, as well as several large, forested wetland complexes. Five federally threatened and endangered species are also anticipated to be found along the route corridor, as well as suitable habitat for a federally listed bat and aquatic species. Impacts to these

resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE, and USFWS. The proposed route intersects two Pennsylvania State Game Lands; SGL #326, and SGL #257. Coordination with the Pennsylvania Game Commission will be required.

Component 11. B-19-B) Buttermilk Falls 765 kV Substation

Two federally endangered bat species are anticipated to be found within the Substation Footprint, as well as potentially suitable forested habitat. Consultation with USFWS and state wildlife agencies is needed to determine if the proposed project will have effects on protected species.

Component 12. B-06-C) Mountain Stone 765 kV Substation

Two federally endangered bat species are anticipated to be found within the Substation Footprint, as well as potentially suitable forested habitat. Consultation with USFWS and state wildlife agencies is needed to determine if the proposed project will have effects on protected species.

Component 13. E-17-D) Catawissa 500 kV Substation

Two federally endangered bat species are anticipated to be found within the Substation Footprint, as well as potentially suitable forested habitat. Consultation with USFWS and state wildlife agencies is needed to determine if the proposed project will have effects on protected species.

Component 14. E-19-C) Stoney Creek 500 kV Substation

Three federally endangered bat species are anticipated to be found within the Substation Footprint, as well as potentially suitable forested habitat. Consultation with USFWS and state wildlife agencies is needed to determine if the proposed project will have effects on protected species.

Component 15. E-32-A) Westwood 765 kV Substation

The proposed substation has the potential to impact environmental resources, including one large, forested wetland. Three federally threatened and endangered bat species are also anticipated to be found in the substation footprint, as well as potentially suitable forested habitat. Impacts to these resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE, and USFWS, and consultation with USFWS and state wildlife agencies is needed to determine if the proposed project will have effects on protected species

Component 16. E-36-A) Spicewood 765 kV Substation

Four federally threatened and endangered species are anticipated to be found within the Substation Footprint, as well as potentially suitable forested habitat for federally listed bat species. Consultation with USFWS and state wildlife agencies is needed to determine if the proposed project will have effects on protected species.

Transmission Line Risk Analysis

B-20-A) Kammer - Buttermilk Falls 765kV

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 6-bundle 715 kcmil ACSR “Redwing” conductor arrangement lattice structures. The conductors support the ratings outlined in the proposal. Some lattice structures will be guyed V-Type while others will be self-supporting on foundations. These types of structures are inherently complex vs. steel monopoles and less-bundled conductors but are common for 765kV lines. It should be noted that 765kV AC Transmission lines are not historically common in America but are increasingly being developed across the country. Some utilities and contractors are expected to have limited experience accordingly.

Regarding the route, the proposed 200ft ROW is what is expected to see with this type of line. Route risks involve dealing with homes near or in the ROW. Some modifications to the original suggested alignment may be required to obtain easement. Several areas throughout the line will have very steep hills to mountains that may prove to be difficult to navigate for the crew. Some matting will be needed in low residing areas particularly between Interstate 70 and Highway 981 as a wetland is present. The majority of the line has many roads that are near making access to the line easy to maintain for future crews. There are a number of crossings along the route including 13 high-voltage lines, 8 railroads, 6 highways, and 5 water crossings. While this is a large quantity, it is reasonable for a line of this length. There are likely to be several crossings in excess of 2500ft due to the terrain present along this line.

From a procurement perspective, there are a significant number of structures (502) that will be required and over 2000 miles of conductor needed. This is a large quantity of material to procure in the schedule outlined. Most of the material, outside of some 765kV hardware, should not carry procurement risks outside of typical EHV line builds.

B-21-A) Buttermilk Falls - Mountain Stone 765kV

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 6-bundle 715 kcmil ACSR “Redwing” conductor arrangement lattice structures. The conductors support the ratings outlined in the proposal. Some lattice structures will be guyed V-Type while others will be self-supporting on foundations. These types of structures are inherently complex vs. steel monopoles and less-bundled conductors but are common for 765kV lines. It should be noted that 765kV AC Transmission lines are not historically common in America but are increasingly being developed across the country. Some utilities and contractors are expected to have limited experience accordingly.

Regarding the route, the proposed 200ft ROW is what would be expect to see with this type of line. Route risks involve dealing with homes near or in the ROW. Some modifications to the original suggested alignment may be required to obtain easement. Several areas throughout the line will have very steep hills to mountains that may prove to be difficult to navigate by crew as the line crosses the Appalachian mountain range. Some matting will be needed in low residing areas particularly between Interstate 70 and Highway 981 as a wetland is present. The majority of the line has many roads that are near making access to the line easy to maintain for future crews. There are a number of crossings along the route including 9 high-voltage lines, 7 railroads, 2 highways, and 3 water crossings. While this is a large quantity, it is reasonable for a line of this length. There are likely to be several crossings in excess of 2500ft due to the terrain present along this line.

From a procurement perspective, there are a significant number of structures (476) that will be required and over 1900 miles of conductor needed. This is a large quantity of material to procure in the schedule outlined. Most of the material, outside of some 765kV hardware, should not carry procurement risks outside of typical EHV line builds.

Finally, the steep hills to mountains and rural nature of the route does provide some terrain concerns as the line crosses the Appalachian Mountains. Access route improvement may be extensive for this line. While some lower-lying wetlands may require unique foundations, there are not a lot of these identified along the route.

B-24-A) Mountain Stone-Juniata 500kV

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 3-bundle 1780 kcmil ACSR 84/19 “Chukar” arrangement on single-circuit lattice structures. The conductors do not appear to support the ratings outlined in the proposal. Some complexity could be removed from the design by using steel monopoles, which is the preferred approach in this territory (PPL) anyway.

There are no concerns about this route other than the two EHV line crossings that will be required. These crossings are going to be necessary and are not an impossible feat. The terrain appears to be gradually sloped downhill, transitioning from woods to field making it an easy terrain to work on. The ROW is likely not wide enough for the two lines parallel, but there is room to expand here. Access and Maintenance should be easy at this location as it is near two substations with roads to them.

From a procurement perspective, there are only (16) structures expected and just over 10 miles of conductor needed. This is a small quantity and does not raise much concern. Material needed should not carry procurement risks outside of typical EHV hardware lead times. Finally, the flat and rural nature of the route doesn’t provide some terrain concerns.

Substation Risk Analysis

B-06-A) Mountain Stone 765kV Substation

The project involves constructing a new greenfield 765/500 kV air-insulated substation built around a 765 kV double-breaker, double-bus (DBDB) switchyard. The 765 kV yard will include one DBDB bay with a single line terminal supported by five 765 kV, 5000-amp, 63-kA interrupting-duty circuit breakers to provide high reliability, strong fault-isolation capability, and ample operational flexibility. Major equipment installations will include a 300-MVAR 765 kV shunt line reactor and two 765/500 kV, 3,125-MVA autotransformer banks that will connect the extra-high-voltage network to the 500 kV system. The scope covers all associated foundations, structural steel, high-voltage bus work, grounding system expansion, station service upgrades, oil containment systems, and conduit/cable installations required to support this new EHV facility.

B-19-B) Buttermilk Falls 765kV Substation

The project consists of constructing a new greenfield 765/500 kV air-insulated substation featuring both a 765 kV breaker-and-a-half (BAAH) yard and a 500 kV double-breaker, double-bus (DBDB) yard. The 765 kV yard will include one BAAH bay supporting two line terminals and five 765 kV, 5000-amp, 63-kAIC circuit breakers arranged to provide strong fault-isolation capability and operational flexibility. Two 765 kV, 300-MVAR shunt line reactors will be installed to support system voltage performance, along with a single 765/500 kV, 3,125-MVA autotransformer bank to interconnect the extra-high-voltage system with the 500 kV network. Major work includes foundations, structural steel, high-voltage bus work, grounding grid extensions, oil containment, station service systems, and raceway

installations for power and control cables. The 500 kV yard will be constructed in a DBDB configuration with three bays and three line terminals supported by six 500 kV, 5000-amp, 63-kAIC circuit breakers.

Constructability Summary

This proposal contains significant greenfield construction and will pose significant challenges for acquisition of the required land for the line routes and substation parcels. This proposal has a similar risk profile to proposal 237, with an additional 100 miles of 765 kV development, increasing the amount of land acquisition and constraints encountered. The overall risk of this proposal is rated as **Medium-High Risk**.

Cost Review

As part of the detailed constructability analysis, an independent consultant prepared a high-level conceptual, independent cost estimate for the components of this proposal. The independent consultant assumes a level of effort and accuracy consistent with AACE International's Recommended Practice 17R-97, Cost Estimate Classification System, Class 3 with an expected accuracy of -20% to +40% from the base total estimate. Estimates will use available industry and materials. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering, and construction. The independent cost estimate includes a 30% contingency, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates is provided below.

Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
1	B-20-A) Kammer - Buttermilk Falls 765kV	694.72	718.20
2	B-21-A) Buttermilk Falls - Mountain Stone 765kV	633.35	680.40
3	E-07-B) Stoney Creek - Slykerville 230kV	5.32	6.84
4	E-07-B) Stoney Creek - Slykerville 230kV	7.46	7.73
5	E-18-B) Montour-Catawissa 230kV	66.70	64.90
6	E-20-A) Catawissa - Stoney Creek 500kV	130.56	148.20
7	E-31-A) Mountain Stone - Westwood 765kV	16.79	14.63
8	E-31-A) Mountain Stone - Westwood 765kV	351.49	390.60
9	E-34-A) Westwood – Frackville 230kV	10.42	10.36
10	E-35-A) Westwood - Spicewood 765kV	209.40	239.40
11	B-19-B) Buttermilk Falls 765kV Substation	170.29	178.88
12	B-06-C) Mountain Stone 765kV Substation	214.96	203.21
13	E-17-D) Catawissa 500kV Substation	117.29	153.06
14	E-19-C) Stoney Creek 500kV Substation	165.94	199.43
15	E-32-A) Westwood 765kV Substation	134.21	191.87
16	E-36-A) Spicewood 765kV Substation	234.02	249.01
17	B-30-A) South Bend - Keystone 500kV terminal equipment upgrade	4.68	4.39

18	B-32-A) Keystone-Juniata 500 kV terminal equipment upgrade	4.68	4.39
19	B-33-A) Mountaineer-Belmont 765 kV terminal equipment upgrade	6.75	6.35
20	B-01-A) Kammer substation upgrade	13.50	14.56
21	B-07-A) Juniata substation upgrade	9.95	20.96
22	B-34-A) Conemaugh circuit breaker upgrades	23.42	20.92
23	E-16-B) Montour substation upgrade	2.28	2.44
24	E-10-C) Slykerville (SLKY) substation upgrade	4.45	4.01
25	E-33-A) Frackville (New PPL) substation upgrade	2.28	2.44
		3238.71	3,537.17

The proposal cost estimate is within 10% of the independent cost estimate and is considered **Low** risk.

Schedule Review

The in-service date of this proposal is December 2031.

The overall schedule risk for the proposal is driven by the significant permitting and land acquisition risks associated with the greenfield transmission lines and substation components. **Medium-High** schedule risk is assessed for this proposal.

Proposing Entity Experience and Capability Review

Exelon's affiliate ComEd, has experience operating and designing 765 kV transmission, which represents the most significant scope proposed for this project. Accordingly, the proposing entity experience and capability risk is assessed **Low-Medium**.

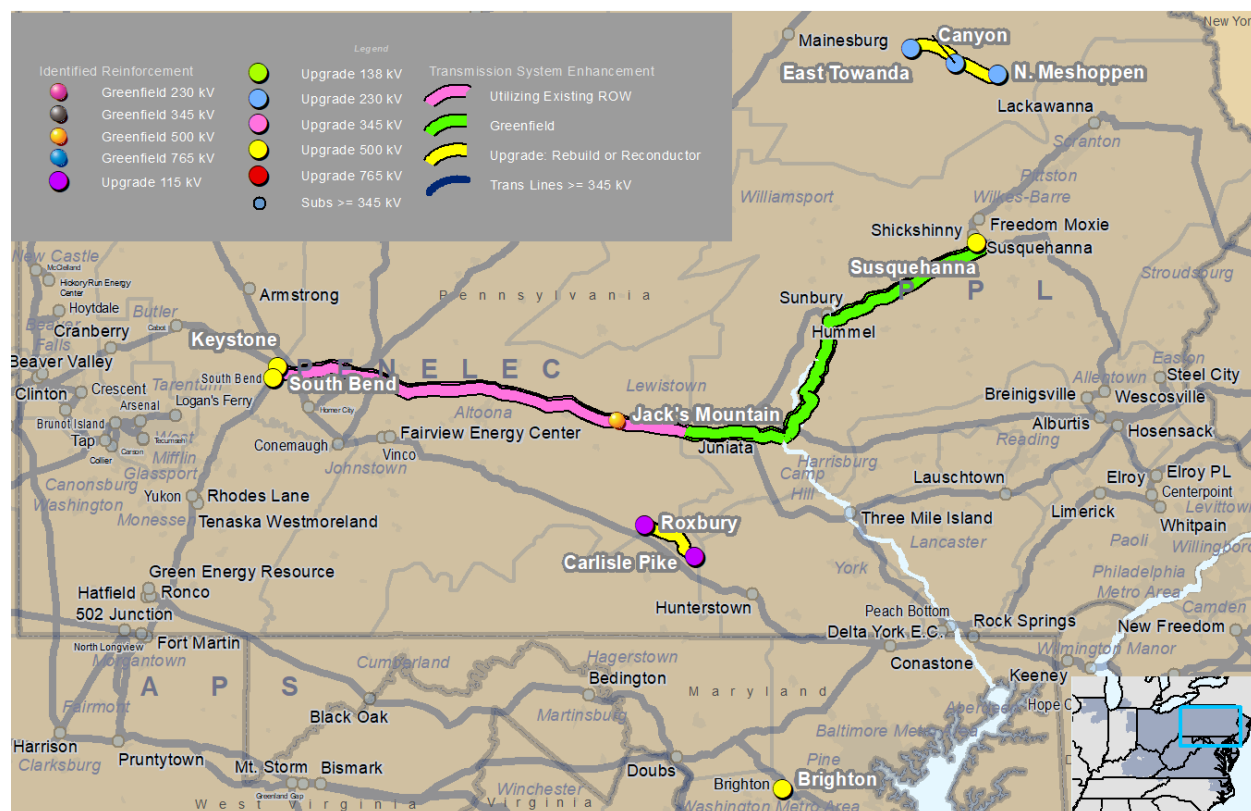
Proposal 578 – Keystone – Susquehanna Dual 500 kV Single Circuits with Jack's Mt. (MATLIT)

This project involves constructing two 86-mile and two 118-mile 500 kV lines, construction of a new reactive support station Jack's Mountain (MAIT), expanding other area substations, and rebuilding the East Towanda - Canyon - North Meshoppen 230 kV and Carlisle Pike - Roxbury 115 kV lines. This proposal will traverse numerous counties throughout the state of Pennsylvania, stretching from the Keystone Substation near the border of Armstrong and Indiana Counties, to the Susquehanna Substation in Luzerne County, with additional work North from East Towanda to North Meshoppen near the border of Susquehanna and Bradford County.

This proposal has 18 components, including 12 substation upgrade components, 4 greenfield transmission line components, and 2 transmission line rebuild components.

Map 16 displays the components and routes proposed for proposal 578.

Map 16. Proposal 578



*NOTE: 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.*

Project Overview

MAITLIT Proposal 578 includes the following components:

- Component 1: Keystone Substation Expansion (MAIT)
- Component 2: Susquehanna Substation Expansion
- Component 3: South Bend Substation Terminal Upgrade
- Component 4: Keystone Substation: Upgrade the South Bend 500 kV line terminal
- Component 5: Brighton Substation: Upgrade the Doubs 500 kV line terminal
- Component 6: East Towanda Substation: Upgrade the Canyon 230 kV line terminal
- Component 7: Canyon Substation: Upgrade the East Towanda and North Meshoppen 230 kV line terminals
- Component 8: North Meshoppen Substation: Upgrade the Canyon 230 kV line terminal
- Component 9: North Meshoppen Substation: Replace the #3 230/115 kV Transformer
- Component 10: East Towanda - Canyon - North Meshoppen 230 kV Line
- Component 11: Carlisle Pike - Roxbury 115 kV Line Rebuild
- Component 12: Keystone - Jack's Mountain 500 kV Line #1: Construct new Line
- Component 13: Keystone - Jack's Mountain 500 kV Line #2: Construct new Line
- Component 14: Carlisle Pike Substation: Upgrade the Roxbury 115 kV line terminal
- Component 15: Roxbury Substation: Upgrade the Carlisle Pike 115 kV line terminal
- Component 16: Jack's Mountain Station: Create a new 500 kV five breaker ring bus and install a 500 MVAR STATCOM
- Component 17: Jacks Mountain - Susquehanna #1 500 kV Line
- Component 18: Jacks Mountain - Susquehanna #2 500 kV Lin

Constructability Review

Right-of-Way/Land Acquisition Risk Analysis

Keystone - Jack's Mountain 500 kV Line #1: Construct new Line

The Keystone – Jack's Mountain line is an 86-mile, 500kV single-circuit line that will be built across Pennsylvania, between the proposed Keystone Substation, and existing Jack's Mountain Station. This line will traverse Armstrong, Indiana, Cambria, Blair, Huntingdon, and Mifflin Counties. The vast majority of the route will

parallel existing ROW with periodic breaks to avoid residences and other structures. New ROW will be required throughout regardless of expansion or new ROW.

At a width of 170ft, the new ROW required will be approximately 1,793 acres. The entire route is very rural but passes through about 21 acres of more populated land.

Keystone - Jack's Mountain 500 kV Line #2: Construct new Line

The Keystone – Jack's Mountain line is an 86-mile, 500kV single-circuit line that will be built across Pennsylvania, between the proposed Keystone Substation, and existing Jack's Mountain Station. This line will traverse Armstrong, Indiana, Cambria, Blair, Huntingdon, and Mifflin Counties. The vast majority of the route will parallel existing ROW with periodic breaks to avoid residences and other structures. New ROW will be required throughout regardless of expansion or new ROW.

At a width of 170ft, the new ROW required will be approximately 1,793 acres. The entire route is very rural but passes through about 21 acres of more populated land.

Jacks Mountain - Susquehanna #1 500 kV Line

The Jack's Mountain – Susquehanna line is an 118-mile, 500kV single-circuit line that will be built across Pennsylvania, between the existing Jack's Mountain Station and Susquehanna Substation. This line will traverse Armstrong, Indiana, Cambria, Blair, Huntingdon, Mifflin, Juniata, Perry, Dauphin, Northumberland, Montour, Columbia, and Luzerne Counties. About 50% of the route will parallel existing transmission line Right-of-Way with periodic breaks along the route to avoid structures and residences. There are significant breaks from the existing ROW to forge new greenfield routes. New ROW will be required regardless of expansion or new ROW.

At a width of 170ft, the new ROW required will be approximately 2,432 acres. The entire route is very rural and impacts few structures and populations.

Jacks Mountain - Susquehanna #2 500 kV Line

The Jack's Mountain – Susquehanna line is an 118-mile, 500kV single-circuit line that will be built across Pennsylvania, between the existing Jack's Mountain Station and Susquehanna Substation. This line will traverse Armstrong, Indiana, Cambria, Blair, Huntingdon, Mifflin, Juniata, Perry, Dauphin, Northumberland, Montour, Columbia, and Luzerne Counties. About 50% of the route will parallel existing transmission line Right-of-Way with periodic breaks along the route to avoid structures and residences. There are significant breaks from the existing ROW to forge new greenfield routes. New ROW will be required regardless of expansion or new ROW.

At a width of 170ft, the new ROW required will be approximately 2,432 acres. The entire route is very rural and impacts few structures and populations..

Overall, **Medium-High** ROW/Land Acquisition risks are assessed for this proposal due to the combination of greenfield and paralleling existing ROW for the 500 kV line routes.

Environmental Risk Analysis

Keystone - Jack's Mountain 500 kV Line #1 & #2 Lines

While the proposed route intersects several features generating environmental permitting risk including floodplains, wooded areas, and conservation easements, the majority of the route is parallel to existing ROW, which will likely ease permitting. The PA Game Commission, USACE, and any relevant floodplain district administrations will still be needed to be contacted regarding permitting.

There are approximately 9 railroad crossings, 6 with Norfolk Southern Railway Company, 1 with BPRR, and 2 with R. J. Corman Railroad Company/Pennsylvania Lines Inc.; 140 road and highway crossings (280 entrances) across 5 counties (Indiana, Cambria, Blair, Mifflin, Armstrong); 26 transmission line crossings, 5 with PENNSYLVANIA ELECTRIC CO, 1 with WEST PENN POWER CO, and 20 with no owner available; 2 pipeline crossings, 1 with ENTERPRISE PRODUCTS, and 1 with Columbia Gas Trans Co. There is 1 trail crossing, Bells Gap Railroad Trail. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from 5 counties, PA. State Approval of Electric Transmission Lines, and DOT utility permits are required.

Jack's Mountain Station: Create a new 500 kV five breaker ring bus and install a 500 MVAR STATCOM

There is environmental impacts involved with this proposed substation. Proposed substation footprint intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. Permit authorization may take 12-months to complete. The proposed substation footprint intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed substation footprint intersects with

wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination.

There are approximately 2 transmission line crossings, both with no owner available. Desktop analysis indicates that the proposed route intersects with farmland. Verification in the field would need to be completed. Mifflin county may require additional permits. Pennsylvania Department of Transportation (PDOT) requires Driveway/Local Road Permits.

Jacks Mountain - Susquehanna #1 & #2 500 kV Line

While the proposed route intersects many areas of environmental concern, including floodplains, conservation easements, and one critical habitat for the Green Floater, much of the route is parallel to existing ROW, and aquatic habitat is not expected to be impacted.

There are approximately 6 railroad crossings, 4 with Norfolk Southern Railway Company, 1 with Shamokin Valley Railroad Company, and 1 with North Shore Railroad; 222 road and highway crossings (444 entrances) across 8 counties (Luzerne, Columbia, Montou, Northumberland, Dauphin, Perry, Juniata, and Mifflin); 16 transmission line crossings, 1 with PENNSYLVANIA ELECTRIC CO, 11 with PPL ELECTRIC UTILITIES CORP, and 4 with no owner available; and 2 pipeline crossings, 1 with Texas Eastern Trans Co, and 1 with SUNOCO.

There is 1 are 2 parks, Wagner Community Park, Wiconsico Creek Park; 1 state forest, Tuscarora State Forest; 1 education area, Ned Smith Center; and 1 recreation area, Northumberland County Anthracite Outdoor Adventure Area. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from 8 counties, PA. State Approval of Electric Transmission Lines, and DOT utility permits are required.

Transmission Line Risk Analysis

Keystone - Jack's Mountain 500 kV Line #1 & 2: Construct new Line

From a Scope/Complexity/Technological/Feasibility perspective, the line utilizes a triple-bundled 1113 kcmil ACSS “Finch” conductor and single circuit steel monopole structures with a delta configuration. The conductors support the normal ratings outlined in the proposal but fail under emergency conditions. Based on the line information, it is assumed that all structures will be on concrete foundations.

There are some concerns with vehicle access due to several waterbody crossings that may require large access roads to be built. There are a number of crossings along the route including eleven high-voltage lines, seven railroads, four highways, two rivers, and several swamps/marshlands associated with creeks about the Appalachian Mountains. While expected of an 86-mile route, this is a large number of crossings. Large spans in excess of 2500ft may be required due to mountainous terrain and large water bodies.

From a procurement perspective, there are a significant number of structures (413) that will be required and over 700 miles of conductor needed. This is a significant quantity of material to procure, but most of the material should not carry procurement risks outside of typical EHV line builds.

Finally, the large mileage of mountainous terrain poses terrain concerns, and lower-lying wetlands may require unique foundations.

Jacks Mountain - Susquehanna #1 & #2 500 kV Line

From a Scope/Complexity/Technological/Feasibility perspective, the line utilizes a triple-bundled 1113 kcmil ACSS “Finch” conductor and single circuit steel monopole structures with a delta configuration. The conductors support the normal ratings outlined in the proposal but fail under emergency conditions. Based on the line information, it is assumed that all structures will be on concrete foundations.

There are some concerns with vehicle access due to several waterbody crossings that may require large access roads to be built. There are a number of crossings along the route including thirteen high-voltage lines, six railroads, four highways, four rivers, and several swamps/marshlands associated with creeks about the Appalachian Mountains. While expected of an 118-mile route, this is a significant number of crossings. Large spans in excess of 2500ft may be required due to mountainous terrain or large water bodies, and the route includes a Susquehanna River Crossing in excess of 3,000ft.

From a procurement perspective, there are a significant number of structures (567) that will be required and over 1,000 miles of conductor needed. While most of the material should not carry procurement risks outside of typical EHV line builds, the schedule outlined in the proposal is likely unachievable given the large scope of this procurement.

Finally, the large mileage of mountainous terrain poses terrain concerns, and lower-lying wetlands may require unique foundations. Due to the rural nature of the route, potential restrictions on noise and pollution are limited to the Susquehanna Plant.

Constructability Summary

Proposal 578 contains significant greenfield construction (over 400 miles for the four lines) although these represent two sets of parallel lines, and alternative versions of this proposal involve double circuit construction of the lines, reducing the amount of land acquisition required. The amount of greenfield construction creates obvious risks with regard to procurement of right-of-way and general siting of the lines. These lines pass through the Appalachian Mountains which will result in some large spans to cross land features, some structures that require heavy access improvements, and other typical concerns with mountainous terrain. It is also anticipated that there may be difficulties with the proposed termination into Susquehanna, with concerns about the ability to expand the Susquehanna substation, and outage coordination concerns with the Susquehanna nuclear facility.

The overall risk of this proposal is rated as **Medium-High** constructability, while the double circuit versions of this proposal (Proposals 493 and 826) are rated **Medium** constructability risk due to the reduced amount of land acquisition required.

Outage Review

Due to concerns with some of the required line rebuilds associated with this project, and outage coordination concerns with the Susquehanna nuclear facility, this proposal is assessed a **Medium** outage coordination risk.

Cost Review

A high-level cost estimate was created for each proposal to assess the cost component for potential omissions or under-estimating. Cost estimates were broken into eight categories, including Engineering & Design, Permitting/Routing/Siting, ROW/Land Acquisition, Materials & Equipment, Construction & Commissioning, Construction Management, Overheads and Miscellaneous, and Risk Contingency (30%). The cost comparison for this proposal, broken down by component, is outlined below.

Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
1	Keystone Substation Exp.	9.77	9.77
2	Susquehanna Substation Exp.	38.95	32.67
3	South Bend Substation Upgr.	0.76	0.76
4	Keystone Substation Upgrade	0.76	0.76
5	Brighton Substation Upgrade	2.97	3.86
6	East Towanda Upgr.	0.00	0.33
7	Canyon Substation Upgr.	0.00	0.92
8	North Meshoppen Upgr.	0.00	0.55
9	North Meshoppen Xfmr	4.69	5.54
10	East Towanda - Canyon - North Meshoppen	53.92	82.51
11	Carlisle Pike - Roxbury	53.76	27.60
12	Keystone - Jack's Mountain #1	442.48	488.55

13	Keystone - Jack's Mountain #2	442.48	488.55
14	Carlisle Pike Substation	0.00	1.80
15	Roxbury Substation	0.00	1.80
16	Jack's Mountain Station	166.28	186.31
17	Jacks Mountain - Susquehanna #1	586.55	657.95
18	Jacks Mountain - Susquehanna #2	586.55	657.95
Total		2389.93	2648.18

The proposal cost estimate is within 10% of the independent cost estimate and is considered **Low** risk.

Schedule Review

This proposal has a projected in-service date of June 2030.

The overall schedule risk for the proposal is driven by the significant permitting and land acquisition risks associated with the greenfield transmission lines and substation components. **Medium-High** schedule risk is assessed for this proposal.

Proposing Entity Experience and Capability Review

FirstEnergy (MAIT) has significant experience and capability to construct Proposal 578 as submitted. The proposing entity experience and capability risk is considered **Low**.

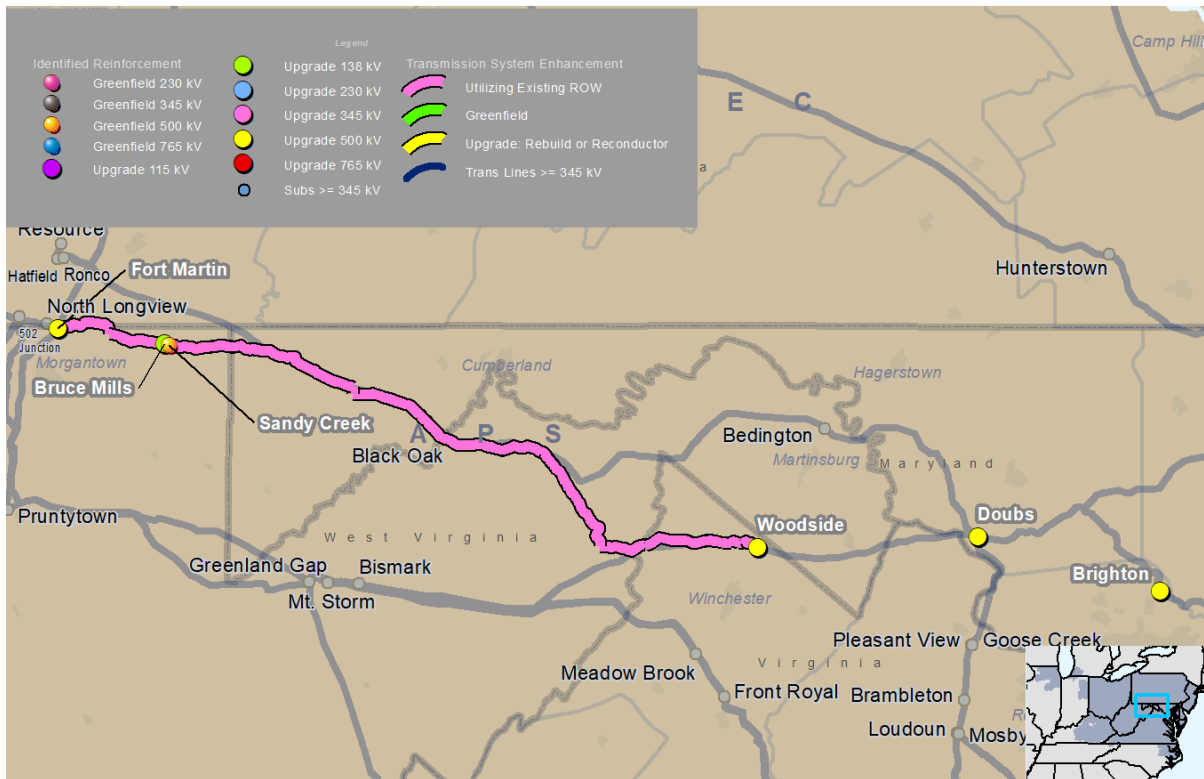
MAAC Additional Regional Cluster Proposals

Proposal 896 – Fort Martin - Woodside Double Circuit 500 kV (NextEra/Exelon)

The purpose of this project is to convert the 500kV single circuit 502 Junction – Woodside 500kV project under development (PJM Baseline Upgrade ID b3800.102) to a double circuit configuration between Fort Martin and the NEETMA/APS interconnection point in Frederick County, VA, to accommodate Circuit 1 (B3800.102: 502 Junction – Black Oak – Woodside 500kV) and Circuit 2 (Fort Martin – Sandy Creek – Woodside 500kV).

This proposal has a total of 10 components, including 5 substation upgrade components, 1 greenfield substation component, 1 Transmission upgrade component, and 3 greenfield transmission line components.

Map 17 displays the components and routes proposed for proposal 896.

Map 17. Proposal 896

NOTE: 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.

Project Overview

NextEra/Exelon Proposal 896 includes the following components:

- Component 1: Sandy Creek 500kV Substation
- Component 2: 502 Junction - NEETMA/APS Handoff
- Component 3: Woodside 500kV Substation upgrades
- Component 4: 01-106J (Bruce Mills 138kV Switchyard) substation upgrade
- Component 5: Fort Martin substation upgrade
- Component 6: Doubs substation upgrade
- Component 7: Brighton terminal equipment upgrades
- Component 8: b.3800.102 NEET/FE Interconnection - Woodside 500kV
- Component 9: Sandy Creek - 01-106J 138kV
- Component 10: 01-106J - Brandonville/01-106J - Albright #2 138kV

Constructability Review

Right-of-Way/Land Acquisition Risk Analysis

Sandy Creek 500kV Substation

This component is a greenfield substation located in Preston County, West Virginia and will require a new land parcel. This property is not owned by the proposing party. Approximately 40 acres are required for the construction of this substation.

The proposed site seems adequate to house the component; however, 500kV substations can generate public interest and opposition due to the high voltage and large size of the equipment.

b.3800.102 NEET/FE Interconnection - Woodside 500kV

The B.3800.102 NEET/FE Interconnection – Woodside line is a 17-mile, 500kV single circuit line that will be built in Northern Virginia between the B.3800.102 NEET/FE handoff point and the proposed Woodside Substation. This line will traverse Frederick County in Virginia.

The proposal indicated a 200ft wide ROW for the route, expanding upon the existing corridor, which is a reasonable width for this voltage. With that expansion, total acreage acquired will be 412 acres. About 24 acres of this appear to cut through expensive housing, opposition is expected to force a reroute in that area.

Transmission Line Component 2: 502 Junction – NEETMA/APS Handoff

The 502 Junction – NEETMA/APS Handoff is a 100-mile, 500kV single circuit line currently under development (PJM Baseline Upgrade ID b3800.102) that will be reconfigured as a double circuit line between Fort Martin and the NEET/FirstEnergy interconnection point in Frederick County, VA, to accommodate Circuit 1 (b3800.102: 502 Junction – Black Oak – Woodside 500kV) and Circuit 2 (Fort Martin – Sandy Creek – Woodside 500kV). This line will traverse Greene and Fayette Counties in Pennsylvania, Monongalia, Preston, Mineral, and Hampshire Counties in West Virginia, and Garrett County in Maryland.

Proposal indicates that the existing right-of-way for the approved PJM Baseline Upgrade ID b3800.102 project will be used for this component, and as such, no additional ROW will be required.

Overall, the ROW/Land Acquisition risk for this proposal is **Low-Medium** due to the majority of the new line constructed double-circuit within the existing MARL line ROW, with about 17 miles of the line built single circuit paralleling existing ROW.

Environmental Risk Analysis

Sandy Creek 500kV Substation

Desktop analysis indicates that the proposed route intersects with farmland. Verification in the field would need to be completed.

It is anticipated that the proposal would require permits, consultations, clearances, and authorizations from Preston County in PA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits may be required.

b.3800.102 NEET/FE Interconnection - Woodside 500kV

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting. Impacts to these resources will require coordination with the USACE and appropriate Floodplain Administrators. The proposed route intersects woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Tree removal restrictions may apply due to the likelihood of the presence of listed bat species. Field verification of suitable bat habitat is recommended to determine presence. Proposed route does not intersect designated Critical Habitat. However, the potential for federally listed endangered/threatened species to occur within the route corridor does exist. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects streams that the State of Virginia has designated as Special Trout Waters. Coordination with the USACE and the VA Dept. of Wildlife Resources (DWR) is needed.

Proposed route intersects 4 conservation easements. Coordination with easement holders will be required. Proposed route intersects mapped karst geology. Geotechnical studies are needed to verify subsurface conditions prior to digging or trenching.

The component crosses over 2 railroad crossings owned by Winchester & Western Railroad Company; 30 road and highway crossing (60 entrances) in Frederick County. This component crosses over 1 Conservation easement owned by Potomac Conservancy and 1 open space crossing owned by North-South Skirmish Association. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Frederick County in VA. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits are required.

Transmission Line Risk Analysis

b.3800.102 NEET/FE Interconnection - Woodside 500kV

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a triple-bundled 1780 kcmil ACSS “Chukar” conductor and self-supporting single-circuit lattice structures on foundations. The conductors support the ratings outlined in the proposal. These types of structures are inherently complex vs. steel monopoles and less-bundled conductors but are common for 500kV lines.

Regarding the route, the 200ft width of ROW indicated in the proposal is appropriate and typical of 500kV lines. There are no concerns about vehicle access due to terrain; however, the route interacts with various residences throughout the rural landscape. There are a number of crossings along the route including one high-voltage line, two railroads, two highways, and a few swamps/marshlands. This is a low-quantity of crossings which lends to the very rural nature of the area.

Future expansion is limited by both the route and horizontal phase configuration of the structures. A double-circuit future configuration would allow for future use of the ROW. No other facilities are impacted by this component, and no significant demolition is expected as the route is entirely greenfield.

From a procurement perspective, there are only (82) structures that will be required and about 150 miles of conductor needed. This is not a large quantity of material to procure, and most of the material should not carry procurement risks outside of typical EHV line builds.

Finally, the rural nature of the route provides only limited terrain concerns in mountainous areas. While some lower-lying wetlands may require unique foundations, there are not a lot of these identified along the route. Heavy restrictions on noise and pollution are not expected due to the limited population along the route. A complex sequencing of outages will not be required since the line is entirely greenfield.

Substation Risk Analysis

Sandy Creek 500kV Substation

The project entails the construction of a new air-insulated (AIS) 500/138 kV substation designed to establish a high-capacity transmission and transformation node for regional grid reliability and load-serving needs. The 500 kV yard will be built using a ring-bus configuration with three fully protected line terminals, enabling strong operational flexibility and fault-isolation capability. Three new 500 kV, 5,000-amp, 63-kAIC circuit breakers will be installed along with associated disconnect switches, steel structures, foundations, high-voltage bus work, and grounding. Termination of the incoming 500 kV transmission lines will include installation of current transformers, metering, line protection, SCADA integration, and communications infrastructure to enable remote monitoring and dispatch.

The project also includes installation of a new 500/138 kV transformer bank rated 485 MVA to step down bulk power for interconnection with the 138 kV system. Foundation construction, oil containment, cable trench/raceway installation, station service equipment, and all required protection and control components will be provided to integrate the transformer into the new substation. A new 138 kV connection will be constructed to interface the transformer with the local network, including bus extensions, switching devices, relay programming, and SCADA updates. Commissioning activities—such as functional testing, relay coordination, and energization sequencing—will complete the effort, resulting in a fully operational high-voltage facility capable of supporting future transmission expansion and load growth.

There is some risk associated with the acquisition window for a 500kV transformer, but the main driver of risk is the insufficient time allowed in the proposal to construct a large EHV greenfield substation. As a result, our current schedule projections indicate this project will enter service slightly after the proposed in-service date. However, this schedule can be improved as it is not driven by constructability concerns.

Constructability Summary

The highest constructability risks are driven by the new Sandy Creek 500 kV greenfield substation and new proposed single circuit greenfield segment from the NEET/FE interconnection point to Woodside.

The overall constructability of this proposal is rated as **Low-Medium**.

Outage Review

Due to the lack of line rebuild scope for this project, only short outages to existing facilities will be required to tie in the new transmission facilities, and therefore no significant existing facility outages are anticipated. Overall outage coordination risk is deemed **Low**.

Cost Review

A high-level cost estimate was created for each proposal to assess the cost component for potential omissions or under-estimating. Cost estimates were broken into eight categories, including Engineering & Design, Permitting/Routing/Siting, ROW/Land Acquisition, Materials & Equipment, Construction & Commissioning, Construction Management, Overheads and Miscellaneous, and Risk Contingency (30%). The cost comparison for this proposal, broken down by component, is outlined below.

Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
1	Sandy Creek 500kV Substation	70.12	67.35
2	502 Junction - NEETMA/APS Handoff	340.18	401.75
3	Woodside 500kV Substation upgrades	26.15	33.43
4	(Bruce Mills 138kV Switchyard) Substation Upgrade	4.56	9.08
5	Fort Martin Substation Upgrades	4.98	27.43
6	Doubs Substation Upgrade	5.85	3.86
7	Brighton Terminal Equipment Upgrades	2.93	3.86
8	NEET/FE Interconnection - Woodside 500kV	99.09	98.60
9	Sandy Creek - 01-106J	5.57	5.42
10	01-106J - Brandonville/01-106J - Albright #2	12.27	7.93
Total		571.70	658.71

The proposal cost estimate is within 11-20% of the independent cost estimate and is assessed **Low-Medium** risk.

Schedule Review

The proposal projects an in-service date of December 2031. Given that the current status of the ongoing MARL project, and the scope associated with this proposal, the projected in-service date seems reasonable. The scheduling risk is assessed as **Low-Medium**.

Proposing Entity Experience and Capability Review

NextEra/Exelon has significant experience with the proposed equipment and has the capability to construct Proposal 896 as submitted. The proposing entity experience and capability risk is considered **Low**.

Proposal 371 – Dickerson 500kV Substation & New Dickerson - Brighton 500kV Line (PEPCO)

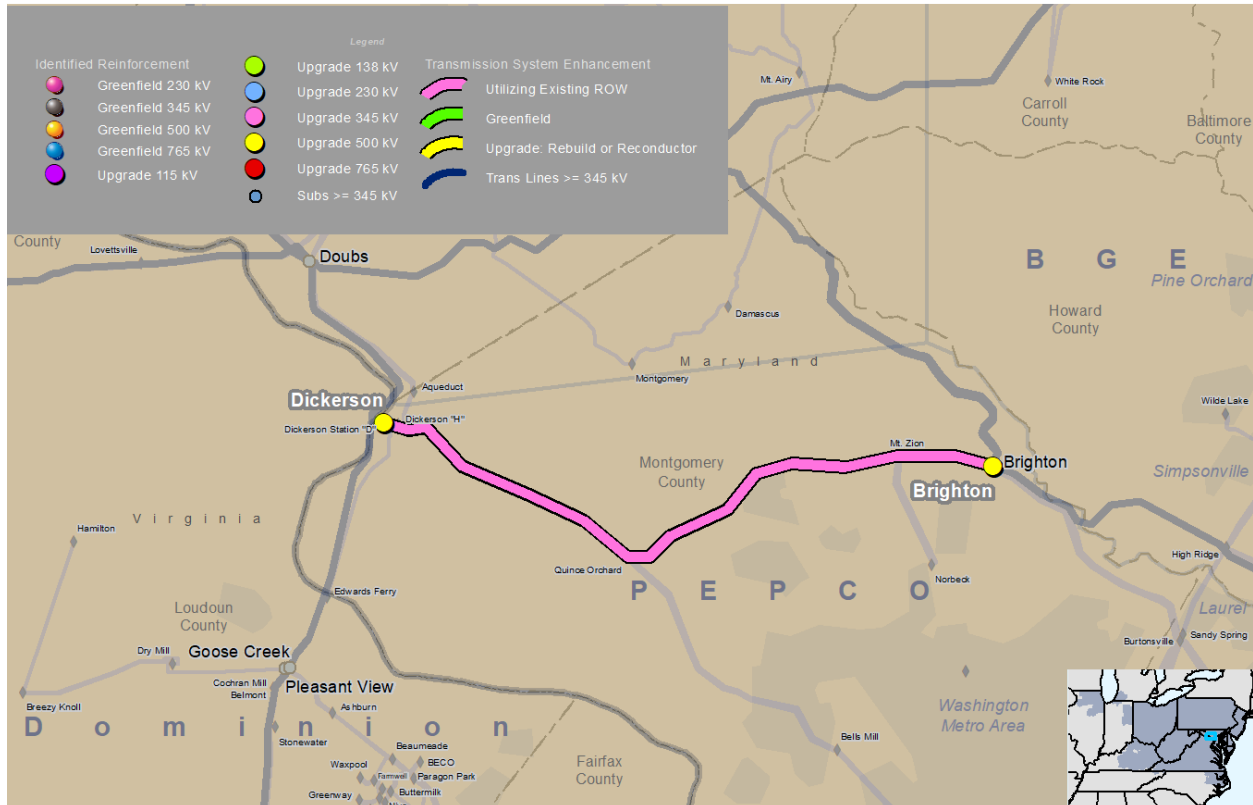
The purpose of this project is to address violations identified in PJM's 2032 model for the Virginia area by expanding the existing 230kV Dickerson Substation and building a new 500kV Dickerson – Brighton line approximately 25-miles

in length. This proposal is situated within Montgomery County, Maryland. Stretching from the Virginia border to the West, through various towns and suburbs, and ending near the eastern border of the county.

This proposal has a total of 2 components, including 1 substation upgrade component and 1 greenfield transmission line component.

Map 18 displays the components and routes proposed for proposal 371.

Map 18. Proposal 371



NOTE: 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.

Project Overview

Exelon Proposal 371 includes the following components:

- Component 1: Dickerson - Brighton 500kV Line
- Component 2: Dickerson 500kV Substation

Constructability Review

Right-of-Way/Land Acquisition Risk Analysis

Dickerson - Brighton 500kV Line

The Dickerson - Brighton Greenfield line is a 25-mile 500kV, single-circuit line, which will be built in Montgomery County, Maryland between the existing Dickerson Station and the existing Brighton Station. The intent is for the circuit to parallel the existing circuits that path between these two substations, for the entire route, within an expanded ROW of an undefined width.

The proposal is light on details with regard to the ROW expansion. It calls for a mix of brownfield and greenfield “likely” running parallel to the existing circuits. It provides a significant price for acquisition but does not indicate any width or length. Between Dickerson and Brighton, there are very heavily populated areas adjacent to the existing transmission lines, where expansions to the existing ROW to install a new circuit would be difficult.

Dickerson 500kV Substation

Dickerson is an existing 230 kV substation located in Montgomery County, Maryland. This component involves an expansion to include a 500 kV substation and assumes that sufficient space is available within the existing substation.

Overall, given the anticipated mix of brownfield and greenfield (paralleling existing ROW) for the proposed line route, and the substation expansion within the existing substation property, **Medium** ROW/Land Acquisition risk is assessed for this proposal.

Environmental Risk Analysis

Dickerson - Brighton 500kV Line

The proposed route intersects with the following recorded Historical Sites/Structures/Districts. Coordination with the state SHPO office is required. The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting. Impacts to these resources will require coordination with the USACE and appropriate Floodplain Administrators. The proposed route intersects woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Tree removal restrictions may apply due to the likelihood of the presence of listed bat species. Field verification of suitable bat habitat is recommended to determine presence. Proposed route does intersect designated Critical Habitat. The potential for federally listed endangered/threatened species to occur within the route corridor does exist. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 88 conservation easements. Coordination with easement holders will be required.

The proposed route intersects with 1 railroad owned by CSXT; 75 roads and highways (150 entrances) in Montgomery County; approximately 36 existing electric lines, 10 with no owner available, 25 with POTOMAC ELECTRIC POWER CO; 4 pipelines, 2 owned by Columbia Gas Trans Co, 1 by COLONIALPIPELINE CO and 1 by Dominion Transmission Co. The proposed route intersects with different classes of parks including State, Local, NPS, FS, Historic Park/Site, etc., USACE, Federal Lands. The proposed route intersects Recreation, Education/Schools, Athletic Fields, etc. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Montgomery County in MD. State CPCN and DOT utility, driveway and right of way permits may be required.

Transmission Line Risk Analysis

Dickerson - Brighton 500kV Line

From a Scope/Complexity/Technology/Feasibility perspective, the line utilizes a 3-bundle 959.6 kcmil ACSS “Suwanee” arrangement on single-circuit steel monopoles. The conductors support the ratings outlined in the proposal.**

Impacts to existing residences and businesses could be extensive if expansion is required into the heavily populated areas. There should be no concerns with vehicle access since the existing lines already have access available. There are a number of crossings along the route including one high-voltage line, two substations, one railroad, and three highways. We would expect many more crossings with high-voltage lines based on the previously mentioned ROW issues.

Substation Line Risk Analysis

Dickerson 500kV Substation

The Dickerson 500 kV Substation project will establish a new extra-high-voltage transmission hub designed and constructed in accordance with PEPCO Substation Configuration Standards and associated engineering guidelines. The 500 kV yard will be built in a breaker-and-a-half (BAAH) arrangement consisting of three full bays. Initial construction will include six 500 kV circuit breakers and associated disconnects, protection and control equipment, and foundations sized to accommodate three additional future breakers without major rework. The substation will create two new 500 kV circuit terminals by cutting into the new 5015 500 kV transmission line, enabling full operational flexibility and redundancy while enhancing regional grid reliability and system capacity.

To support bulk power transfer to the lower-voltage network, the project will include installation of a new 500/230 kV autotransformer connecting the new 500 kV facility to the adjacent Dickerson H 230 kV substation. The scope also includes expansion work in the existing 230 kV yard, including installation of two new 230 kV breakers to accommodate the transformer low-side connection and relocation of circuit 23104. Protection, controls, telecom, metering, SCADA, grounding, civil site development, and all associated integration with both substations will be included to ensure seamless energization and compliance with PEPCO operational requirements. The combined upgrades will enable improved transmission reliability, increased power-flow capability, and long-term system expandability for future load growth and interconnection needs.

Constructability Summary

The primary constructability risks with this proposal involve the transmission line route and the anticipated difficulty with expanding beyond the existing transmission corridor if necessary. **Medium** constructability risks are assessed accordingly.

Outage Review

Some significant outage coordination concerns are assessed for anticipated outages that may be required to construct the Dickerson – Brighton line and connect the new 500 kV Dickerson station. **Medium** outage coordination risks are assessed accordingly.

Cost Review

A high-level cost estimate was created for each proposal to assess the cost component for potential omissions or under-estimating. Cost estimates were broken into eight categories, including Engineering & Design, Permitting/Routing/Siting, ROW/Land Acquisition, Materials & Equipment, Construction & Commissioning,

Construction Management, Overheads and Miscellaneous, and Risk Contingency. For Risk Contingency, a scaled approach was employed, utilizing 5% for projects under \$10M, 10% for projects between \$10M and \$100M, and 15% for projects over \$100M. Cost differences may be large within the individual categories based on differences in assigning items to categories. But overall, the total component cost estimate should be a reasonable comparison. The cost comparison for this proposal, broken down by component, is outlined below.

Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
1	Dickerson 500kV Substation	\$257.61	\$145.73
2	Dickerson - Brighton 500kV Line	\$599.62	\$143.61
	Total	\$857.22	\$289.34

The independent cost estimate is significantly lower than the proposal cost estimate, likely due to conservative estimates by the proposing entity. Accordingly, the cost estimate risk for this proposal is **Low**.

Schedule Review

The proposed in-service date of June 2032 appears reasonable for the proposed 25 mile line scope of the project, and the new greenfield substation. The potential schedule risks are associated with those previously mentioned regarding land acquisition required to expand the corridor into constrained areas if necessary. **Medium** schedule risks are assessed for the proposal.

Proposing Entity Experience and Capability Review

Exelon has significant experience and capability to construct Proposal 371 as submitted. The proposing entity experience and capability risk is considered **Low**.

West Regional Cluster Proposals

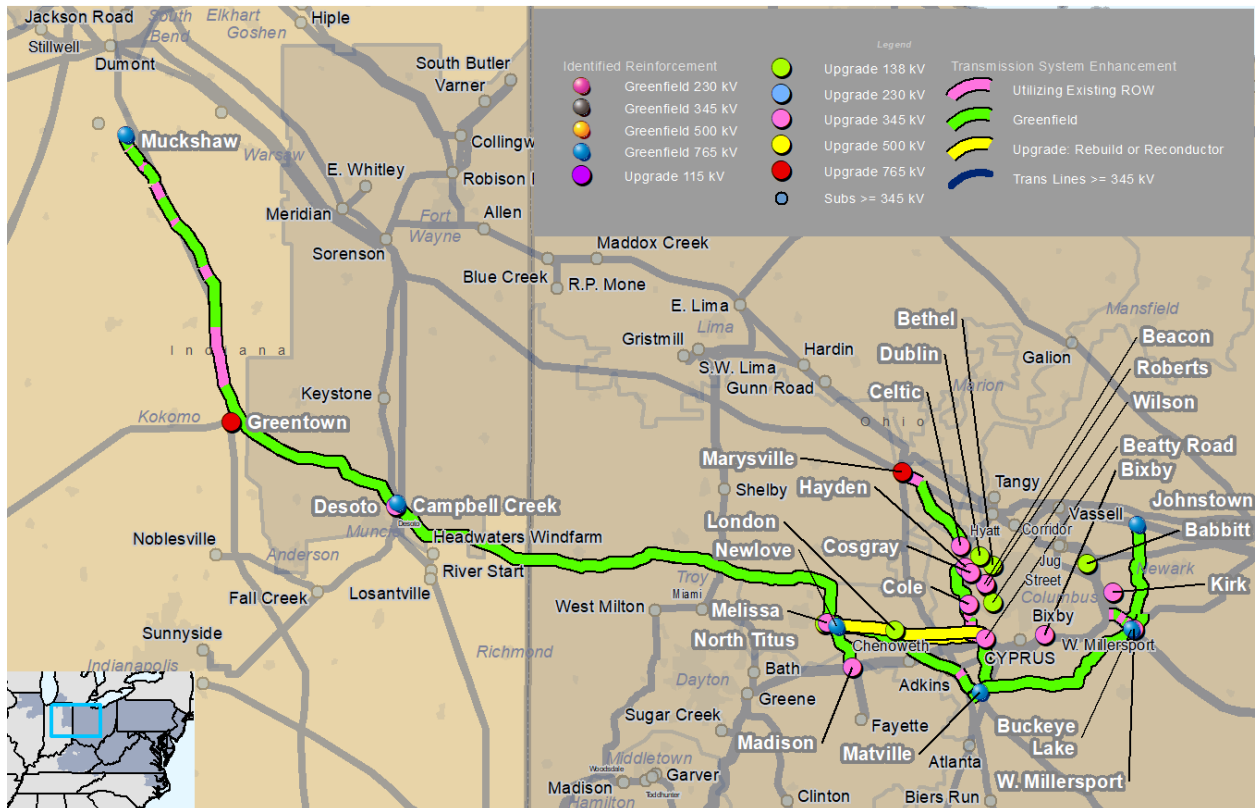
Proposal 109 – Muckshaw - Johnstown 765kV (NextEra/Exelon)

The objective of this project is to construct a 765 kV, 408.94 mile line from the existing Muckshaw Substation in Marshall County, Indiana to the existing Cambell Creek/Desoto Substation in Delaware County, Indiana to the new Springfield (Newlove) Substation in Clark County, Ohio to the new Matville Substation in Pickaway County, Ohio then to the new Buckeye Lake Substation in Fairfield County, Ohio, and then finally to the existing Johnstown Substation in Licking County, Ohio. This project will traverse eight counties (Marshall, Fulton, Miami, Howard, Grant, Madison, Delaware, Randolph) in Indiana and eight counties (Darke, Miami, Champaign, Clark, Madison, Pickaway, Fairfield, Licking) in Ohio.

This proposal has a total of 48 components, including 16 substation upgrade components, nine greenfield substation components, 22 greenfield transmission line components covering approximately 373.9 miles, and one transmission line upgrade component spanning approximately 35 miles.

Map 19 displays the components and routes proposed for proposal 109.

Map 19. Proposal 109



*NOTE: 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.*

Project Overview

NextEra/Exelon Proposal 109 includes the following components:

- Component 1. A-10-A) Campbell Creek - Newlove 765 kV (Indiana Portion)
- Component 2. A-10-B) Campbell Creek - Newlove 765 kV (Ohio Portion)
- Component 3. A-113-A) Newlove - Madison 345 kV
- Component 4. A-114-A) Matville - Biers Run 345 kV Loop-In
- Component 5. A-115-A) Matville - Bixby 345 kV Loop-In
- Component 6. A-126-C) Cole - Hayden 345 kV
- Component 7. A-127-B) Cole - Beatty 345 kV
- Component 8. A-12-A) Newlove - Matville 765kV
- Component 9. A-132-A) Celtic - Marysville 345 kV
- Component 10. A-134-A) Muckshaw - Campbell Creek 765 kV
- Component 11. A-136-A) Buckeye Lake - Johnstown 765 kV
- Component 12. A-136-B) Matville - Beatty 345 kV
- Component 13. A-140-B) Newlove - Melissa 138 kV
- Component 14. A-140-C) Newlove - Melissa 138 kV
- Component 15. A-17-B) Matville - Adkins 345 kV Loop-In
- Component 16. A-18-A) Matville - Buckeye Lake 765 kV
- Component 17. A-20-A) Bixby/Kirk - West Millersport 345 kV Loop-In
- Component 18. A-21-A) Bixby/Ohio Central - West Millersport 345 kV Loop-In
- Component 19. A-70-A) Matville - Atlanta 345 kV Loop-In
- Component 20. A-99-A) Campbell Creek - Desoto 345 kV
- Component 21. A-11-B) Newlove 765 kV Substation
- Component 22. A-135-A) Johnstown 765 kV Substation
- Component 23. A-19-B) Buckeye Lake 765 kV Substation
- Component 24. A-92-C) Muckshaw 765 kV Substation
- Component 25. A-98-C) Campbell Creek 765 kV Substation
- Component 26. A-13-E) Matville 765 kV Substation
- Component 27. A-103-A) North Titus Melissa - London 138 kV double circuit/London - Beatty 138 kV single circuit
- Component 28. A-14-A) Marysville - Matville 765 kV Loop-In
- Component 29. A-72-A) Matville - Flatlick 765 kV Loop-In
- Component 30. A-108-A) Melissa Substation upgrades
- Component 31. A-112-A) Madison Substation upgrades
- Component 32. A-118-C) West Millersport Substation upgrades
- Component 33. A-119-B) Bixby terminal equipment upgrades
- Component 34. A-124-B) Cole Substation upgrade
- Component 35. A-125-A) Hayden Substation upgrade
- Component 36. A-131-B) Celtic Substation upgrade
- Component 37. A-139-A) Cosgray 345 kV substation upgrade

- Component 38. A-150-A) Bethel circuit breaker replacement
- Component 39. A-151-A) Babbit circuit switcher replacement
- Component 40. A-15-B) Marysville Substation upgrade
- Component 41. A-23-A) Kirk Substation upgrade
- Component 42. A-149-A) Beacon Substation upgrade
- Component 43. A-97-A) Desoto Substation upgrade
- Component 44. A-158-A) Greentown Substation upgrade
- Component 45. A-159-A) Dublin reactor addition
- Component 46. A-160-B) Beatty Substation upgrades
- Component 47. A-161-A) Wilson series reactor addition
- Component 48. A-162-A) Roberts

Constructability Review

Right-of-Way/Land Acquisition Risk Analysis

A-10-A) Campbell Creek - Newlove 765kV (Indiana Portion)

The Campbell Creek – Newlove 765 kV (Indiana Portion) transmission line is approximately 30-miles long and will be constructed from the Campbell Creek Substation in Delaware County, Indiana to the Newlove Substation in Clark County, Ohio. The greenfield transmission line will traverse two counties (Delaware and Randolph) in Indiana. The proposed transmission line crosses rural and agricultural lands, crosses US 27 and two rail track, and generally avoids populated areas.

A-10-B) Campbell Creek - Newlove 765kV (Ohio Portion)

The Campbell Creek – Newlove 765 kV (Ohio Portion) transmission line is approximately 71-miles long and will be constructed from the Campbell Creek Substation in Delaware County, Indiana to the Newlove Substation in Clark County, Ohio. The greenfield transmission line will traverse three counties (Drake, Miami, and Clark) in Ohio. The proposed transmission line crosses the Elizabeth Township Rural Historic District, the US 40 National Historic Road, and the centerline is immediately adjacent to a Wetlands Reserve Program easement. The proposed line crosses two interstate highways and three US highways, seven railroad crossings, and the Stillwater River (State Scenic River).

A-113-A) Newlove - Madison 345kV

The Newlove – Madison 345 kV transmission line is approximately nine miles long and will be constructed from the Newlove Substation in Clark County, Ohio to the Madison Substation in Madison County, Ohio. The greenfield transmission line will traverse two (Clark and Madison) counties in Ohio, which are generally rural and agricultural. The proposed transmission line crosses two State Scenic Rivers (Little Miami River and the North Fork Little Miami River), Scioto Farms, and generally avoids congested developed areas.

A-114-A) Matville - Biers Run 345kV Loop-In

The Madison – Biers Run 345 kV transmission line is approximately 2.0 miles long and will be constructed from the Matville Substation in Pickaway County, Ohio to the existing Bixby – Biers Run 345 kV transmission line corridor in

Pickaway County, Ohio. The line will traverse one county (Pickaway) in Ohio. The proposed transmission line is in the vicinity of a private airport (WesMar Aerodrome).

A-115-A) Matville - Bixby 345kV Loop-In

Copy The Matville – Bixby 345 kV Loop-In is approximately 2.0 miles long and will be constructed from the Matville Substation in Pickaway County, Ohio to the existing Bixby – Biers Run 345 kV transmission line corridor in Pickaway County, Ohio. The line will traverse one county (Pickaway) in Ohio. The proposed transmission line is in the vicinity of a private airport (WesMar Aerodrome).

A-126-C) Cole - Hayden 345kV

The Cole – Hayden 345 kV transmission line is approximately ten miles long and will be constructed from the Cole Substation in Franklin County, Ohio to the Hayden Substation in Franklin County, Ohio. The line will traverse one county (Franklin) in Ohio. The proposed transmission line crosses one interstate highway and one rail track in a rural-suburban land use transition area.

A-127-B) Cole - Beatty 345kV

The Cole – Beatty 345 kV transmission line is approximately ten miles long and will be constructed from the Cole Substation in Franklin County, Ohio to the Beatty Substation in Franklin County, Ohio. The proposed transmission line will traverse one county (Franklin) in Ohio. The proposed transmission line crosses the US 40 National Historic Road and an area of rural-suburban transition land uses.

A-12-A) Newlove - Matville 765kV

The Cole – Beatty 765 kV transmission line is approximately 33 miles long and will be constructed from the Newlove Substation in Newlove County, Ohio to the Matville Substation in Pickaway County, Ohio. The greenfield transmission line will traverse three counties (Clark, Madison, and Pickaway) in Ohio. The proposed transmission line crosses an unknown local easement in London, Ohio, one interstate and US highway, and two State Scenic Rivers (Little Miami River, North Fork Little Miami River) in a generally rural and agricultural area.

A-132-A) Celtic - Marysville 345kV

The Celtic – Marysville 345 kV transmission line is approximately 20 miles long and will be constructed from the Celtic Substation in Franklin County, Ohio to the Marysville Substation in Union County, Ohio. The proposed transmission line parallels the Maliszewski – Marysville 765 kV corridor for four miles. The line will traverse two counties (Franklin and Union) in Ohio. The proposed transmission line crosses two US highways and Madison Field, a private grass airstrip in a generally rural and suburban area.

A-134-A) Muckshaw - Campbell Creek 765kV

The Muckshaw – Campbell Creek 765 kV transmission line is approximately 98 miles long and will be constructed from the Muckshaw Substation in Marshall County, Indiana to the Campbell Creek Substation in Delaware County, Indiana. The proposed ROW will be an expansion of existing transmission line corridors for approximately 17% of the route length and the remainder 83% will be greenfield ROW. The line will traverse seven counties (Marshall, Fulton,

Miami, Tipton, Grant, Madison, Delaware) in Indiana. The proposed transmission line ROW crosses several residences and accessory buildings, the Nickel Plate Trail and American Discovery Trail, Frances Slocum State Forest, Michigan Road Scenic Highway, and interstate highway and several US highways, and eight rail track crossings.

A-136-A) Buckeye Lake - Johnstown 765kV

The Buckeye Lake – Johnstown 765 kV transmission line is approximately 22 miles long and will be constructed from the Buckeye Lake Substation in Fairfield County, Ohio to the Johnstown Substation in Licking County, Ohio. The greenfield transmission line will traverse two counties (Fairfield and Licking) in Ohio. The proposed transmission line crosses over or is immediately adjacent to residences, crosses an interstate highway and US 40 National Historic Road, and one rail track crossing.

A-136-B) Matville - Beatty 345kV

The Matville – Beatty 345 kV transmission line is approximately 12 miles long and will be constructed from the Matville Substation in Pickaway County, Ohio to the Beatty Substation in Franklin County, Ohio. The line will traverse two counties (Pickaway and Franklin) in Ohio. The proposed transmission line crosses Big Darby Creek (National Wild and Scenic River), one interstate highway, one rail track, is in the vicinity of a private airport (WesMar Aerodrome), and within 100 feet of the Franklin County Sheriff's Department enclosed gun range.

A-17-B) Matville - Adkins 345kV Loop-In

The Matville – Adkins 345 kV Loop-In is approximately two miles long and will be constructed from the Matville Substation in Pickaway County, Ohio to the existing Altana – Adkins 345 kV transmission line point of connection in Pickaway County, Ohio. The proposed transmission line will traverse one county (Pickaway) in Ohio. The proposed transmission line crosses a rural and agricultural area, and within 350 feet of an agricultural outbuilding and settlement.

A-18-A) Matville - Buckeye Lake 765kV

The Matville – Buckeye Lake 765 kV transmission line is approximately 36 miles long and will be constructed from the Matville Substation in Pickaway County, Ohio to the Buckeye Lake Substation in Fairfield County, Ohio. The line will traverse two counties (Pickaway and Licking) in Ohio. The proposed greenfield transmission line crosses Big Darby Creek (National Wild and Scenic River), encroaches on two residences, and is 1200 feet from the Miller Farm private airstrip. The area is generally rural and agricultural, and skirts suburban areas.

A-20-A) Bixby/Kirk - West Millersport 345kV Loop-In

The Bixby/Kirk– West Millersport 345 kV Loop-In is approximately six miles long and will be constructed from the point of connection at the existing Bixby – Kirk 345 kV transmission line in Licking County, Ohio to the West Millersport Substation in Fairfield County, Ohio. The proposed transmission line will traverse two counties (Licking and Fairfield) in Ohio and consist of expanding the ROW for 68% of the route with the remainder as greenfield ROW. The proposed transmission line crosses a rural and agricultural area.

A-21-A) Bixby/Ohio Central - West Millersport 345kV Loop-In

The Bixby/Ohio Central – West Millersport 345 kV Loop-In is approximately four miles long and will be constructed from a point of connection with the existing Ohio Central – Bixby 345 kV in Licking County, Ohio to the West Millersport Substation in Fairfield County, Ohio. The proposed transmission line will traverse two counties (Licking and Fairfield) in Ohio. The proposed ROW will expand existing transmission line corridors for 33% of the route length, and the remainder 67%, will be greenfield. The proposed transmission line crosses a rural and agricultural area.

A-70-A) Matville - Altanta 345kV Loop-In

The Matville – Altana 345 kV Loop-In is approximately two miles long and will be constructed from the Matville Substation in Pickaway County, Ohio to a point of connection on the Altana – Adkins 345 kV transmission line in Pickaway County, Ohio. The greenfield transmission line will traverse one county (Pickaway) in Ohio. The proposed transmission line is in the vicinity of a private airport (WesMar Aerodrome) in a rural and agricultural area.

A-99-A) Campbell Creek - Desoto 345kV

The Campbell Creek – Desoto 345 kV transmission line is approximately 0.5 miles long and will be constructed from the Campbell Creek Substation in Delaware County, Indiana to the Desoto Substation in Delaware County, Indiana. The greenfield transmission line will traverse one county (Delaware) in Indiana. The proposed transmission line crosses a rural and agricultural area.

A-11-B) Newlove 765kV Substation

The Newlove Substation is located in Clark County, Ohio. The proposed substation is greenfield and located on a rural, agricultural parcel.

A-135-A) Johnstown 765kV Substation

The Johnstown 765 kV Substation is located in Licking County, Ohio. The proposed substation is greenfield and located on a rural, agricultural parcel.

A-19-B) Buckeye Lake 765kV Substation

The Buckeye Lake 765 kV Substation is located in Fairfield County, Ohio. The proposed substation is greenfield and located on a rural, agricultural parcel.

A-92-C) Muckshaw 765kV Substation

The Muckshaw 765 kV Substation is located in Marshall County, Indiana. The proposed substation is greenfield and located on a rural, agricultural parcel.

A-98-C) Campbell Creek 765kV Substation

The Campbell Creek 765 kV Substation is located in Delaware County, Indiana. The proposed substation is greenfield and located on a rural, agricultural parcel.

A-13-E) Matville 765kV Substation

The Matville 765 kV Substation is located in Pickaway County, Ohio. The proposed substation is greenfield and located on a rural, agricultural parcel.

A-103-A) North Titus Melissa – London 138 kV Double Circuit / London – Beatty 138 kV Single Circuit

The North Titus Melissa – London 138 kV double circuit / London - Beatty 138 kV single circuit transmission line rebuild is approximately 34.5 miles long and will be constructed from the North Titus Substation in Clark County, Ohio to the Beatty Substation in Franklin County, Ohio. The line will traverse three counties (Clark, Madison, and Franklin) in Ohio. The transmission line will be rebuilt in the existing ROW across rural and agricultural lands. The proposed transmission line rebuild will cross an interstate highway, the Big Darby Creek and the North Fork Little Miami River (State Scenic Rivers), and the Batelle-Darby Creek Metropark.

Overall, due to the high greenfield nature of the proposed projects, a **High** ROW/Land Acquisition risk is assessed for proposal 109.

Environmental Risk Analysis*A-10-A) Campbell Creek - Newlove 765kV (Indiana Portion)*

The permitting risk for this component is medium. This component will cross approximately 2 railroad crossings; 1 owned by Crossings CSXT Transportation Inc. and 1 owned by Norfolk Southern Railroad. There are approximately 39 road and highway crossings (78 entrances) spanning over 2 counties (Randolph and Delaware); approximately 2 transmission line crossings, 1 owned by INDIANA MICHIGAN POWER CO and 1 with an unknown owner; approximately 3 pipeline crossings, owned by ANR Pipeline Co and Texas Eastern Trans Co. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from 2 counties in IN. State CPCN and DOT occupancy and driveway permits are required.

The proposed route has the potential to impact environmental resources, including FEMA floodplains, streams, and wetlands subject to USACE Section 404 and/or Section 10 permitting, and woodlands with the potential to serve as suitable habitat for federally listed threatened and endangered species. Impacts to these resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE, and USFWS. The Proposed Route intersects critical habitat for Clubshell (*Pleurobema clava*). Consultation with USFWS is needed to determine if the proposed project will have effects on protected species.

A-10-B) Campbell Creek - Newlove 765kV (Ohio Portion)

The proposed route intersects with the following recorded Historical Sites/Structures/Districts: Elizabeth Township Rural Historic District. Coordination is required. Proposed route intersects 33 FEMA High-Risk Flood Zones(100-Year Floodplain). There are 5 Floodways present. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 13 months to complete. The proposed route intersects woodlands. Tree removal restrictions will apply due to likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with

USFWS is needed. The proposed route intersects with 1 recorded Underground Storage Tank (UST's). A file review of State records to determine the current status of UST's is recommended. Based on the results of the review, a subsurface Soil Characterization investigation may be necessary to determine if contamination is present and the extent of contamination originating from UST's. The proposed route intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/ or trenching. The proposed route intersects wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed route intersects 1 conservation easements. Coordination is required. Desktop analysis indicates that the proposed route intersects with farmland. Verification in the field would be need to be completed.

The permitting risk for this component is high. This component has approximately 5 railway crossings; 3 owned by Indiana & Ohio Railway, 1 owned by Norfolk Southern Railway Company and 1 owned by CSX Transportation. There are approximately 98 road crossings spanning over 3 counties (Darke, Miami and Clark); approximately 14 transmission lines owned by Dayton Power & Light Co, and an unknown owner; approximately 3 pipelines owned by Sunoco Enterprise Products, and Columbia Gas Trans Co. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from 3 counties in OH. State Approval of Electric Transmission Lines, and DOT utility permits are required.

The proposed route has the potential to impact environmental resources, including FEMA floodplains, streams, and wetlands subject to USACE Section 404 and/or Section 10 permitting. The proposed route crosses the Stillwater River, a State Scenic River, the Mad River, and the Great Miami River. Eight Federally threatened and endangered species are also anticipated to be found along the route corridor. Impacts to these resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE, and USFWS. The proposed route intersects the Elizabeth Township Rural Historic District and is adjacent to a Wetlands Reserve Program Easement and US 40, a National Historic Road. Coordination with easement holders will be required.

A-12-A) Newlove - Matville 765kV

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting; woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Impacts to these resources will require coordination with the appropriate county floodplain administrator; coordination with state wildlife agencies, USACE and USFWS. Proposed route does not intersect designated Critical Habitat. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects mapped karst geology. Geotechnical studies are needed to verify subsurface conditions prior to digging or trenching.

The permitting risk of this component is high. This component crosses over 1 railway owned by Indiana & Ohio Railway; 3 transmission lines owned by American Electric Power Co. Inc. and Dayton Power and Light Co.; 27 roads (54 entrances) in across Clark, Madison and Pickaway County. There is 1 Trail crossing, Camp Chase Trail. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Clark, Madison and Pickaway County in OH. State CPCN and DOT utility, driveway and right of way permits may be required.

The proposed route has the potential to impact environmental resources, including FEMA floodplains, streams and wetlands subject to USACE Section 404 and/or Section 10 permitting. The proposed route crosses the Little Miami River, and the North Fork Little Miami River, both of which are state scenic rivers. Nine Federally threatened and endangered species are also anticipated to be found along the route corridor. Impacts to these resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE, and USFWS. The proposed route intersects one unknown local easement. Coordination with easement holders will be required.

A-134-A) Muckshaw - Campbell Creek 765kV

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting; woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Impacts to these resources will require coordination with the appropriate county floodplain administrator; coordination with state wildlife agencies, USACE and USFWS. Proposed route intersects designated Critical Habitat for two species of mussels and the Round Hickory nut. Mussel relocation efforts may be required prior to construction. Other federally listed endangered/threatened species have the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species.

The permitting risk for this component is High. This component has approximately 8 railway crossings; 4 owned by Norfolk Southern Railway Company, 1 Central Railroad Company Of Indianapolis and 3 unknown. There are approximately 149 road crossings spanning over 7 counties (Marshall, Fulton, Miami, Howard, Grant, Madison & Delaware); approximately 16 transmission lines owned by Indiana Michigan Power Co, Duke Energy Indiana, and Unknown. There are approximately 14 pipelines owned by Bukeye Partners, Panhandle Eastern PL Co, Marathon Pipeline, and Texas Eastern Trans Co. Lastly, there is 1 forest crossing owned by Indiana DNR, Forestry Division. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from 7 counties in IN. State Approval of Electric Transmission Lines, and DOT utility permits are required.

The proposed route has the potential to impact environmental resources, including FEMA floodplains, streams and wetlands subject to USACE Section 404 and/or Section 10 permitting. The proposed route crosses the Tippecanoe River, the Eel River, Mississinewa River, and the Wabash River, as well as a large NWI wetland. Ten federally threatened and endangered species are also anticipated to be found along the route corridor, as well as suitable habitat for a federally listed aquatic and bat species. Impacts to these resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE, and USFWS. The proposed route intersects the Frances Slocum State Forest, Michigan Road Scenic Highway, the Nickel Plate Trail and the American Discovery Trail. Coordination with easement holders and appropriate agencies will be required.

A-136-A) Buckeye Lake - Johnstown 765kV

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting; woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Impacts to these resources will require coordination with the appropriate county floodplain administrator; coordination with state wildlife agencies, USACE and USFWS. Proposed route does not intersect designated Critical Habitat. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species.

The permitting risk for this component is high. This component has 1 railway crossings with an unknown owner. There are approximately 27 road crossings spanning over 2 counties (Fairfield & Licking). There are approximately 11 transmission lines owned by American Electric Power Co and Ohio Power Co. There are approximately 8 pipeline crossings owned Marathon Pipeline, Columbia Gas Trans Co, Rockies Express Pipeline, Dominion Transmission Co and Enterprise Products. Lastly, the line crosses a farm owned by PVT. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from 2 counties in OH. State Approval of Electric Transmission Lines, and DOT utility permits are required.

The proposed route has the potential to impact environmental resources, including FEMA floodplains, streams and wetlands subject to USACE Section 404 and/or Section 10 permitting. Four federally threatened and endangered species are also anticipated to be found along the route corridor, as well as suitable habitat for a federally listed bat species. Construction timelines will also have to be considered due to the possible presence of a federally listed rattlesnake. Impacts to these resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE and USFWS. The proposed route intersects with the Fairfield Land Preservation Association easement, as well as US 40 National Historic Road. Coordination with easement holders and the appropriate agencies will be required.

A-18-A) Matville - Buckeye Lake 765kV

The proposed route intersects 15 FEMA High Risk Flood. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 permitting. Permit submittal and approval may take up to 12 months to complete. The proposed route intersects woodlands. Tree restrictions will apply. The proposed route intersects with 1 recorded Underground Storage Tank (UST's). Based on the results of the review, a subsurface Soil Characterization investigation may be necessary to determine if contamination is present and the extent of contamination originating from UST's. The proposed route intersects Karst Zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching, The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination.

The permitting risk for this component is high. This component intersects 4 railroads; 1 unknown owner, 1 owned by Norfolk Southern Railway Company, 1 owned by Indiana & Ohio Railway and 1 owned by Kanawha River Railroad. There are approximately 38 road crossings. 18 road crossings and 6 highway crossings in Fairfield County. There are 3 road crossings and 12 highway crossings in Pickaway County. There are approximately 8 transmission lines identified; 4 owned by Ohio Power Co, 1 owned by AMERICAN ELECTRIC POWER CO., INC and 3 unknown owners. Approximately 8 pipeline crossings are identified; 2 owned by Dominion Transmission Co, 4 owned by ENTERPRISE PRODUCTS, 2 owned by Columbia Gas Trans Co. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from the 2 counties in OH. State Approval of Electric Transmission Lines, and DOT utility permits are required.

The proposed route has the potential to impact environmental resources, including FEMA floodplains, streams and wetlands subject to USACE Section 404 and/or Section 10 permitting. The proposed route crosses Big Darby Creek, a National Wild and Scenic River, Scioto River, Hocking River, and Walnut Creek. Ten federally threatened and endangered species are also anticipated to be found along the route corridor, as well as suitable habitat for a federally listed aquatic species. Impacts to these resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE, and USFWS.

A-11-B) Newlove 765kV Substation

Desktop analysis indicates that the proposed substation intersects with farmland. Verification in the field would need to be completed.

The permitting risk for this component is low. The proposed routes does not intersect any crossings. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from Clark County in OH. State Approval of Electric Transmission Lines, and DOT utility permits are required.

The proposed substation has the potential to impact environmental resources, including one NWI wetland. One federally threatened and endangered bad species is also anticipated to be found in the substation footprint. Impacts to these resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE, and USFWS.

A-135-A) Johnstown 765kV Substation

Desktop analysis indicates that the proposed substation intersects with farmland. Verification in the field would need to be completed.

The permitting risk for this proposed substation component is low. It is anticipated that the proposal would require permits, consultations, clearances, and authorizations from Licking County in OH. State PUCO Approval may be required, and DOT utility permits and driveway/local road permits are required.

The proposed substation has the potential to impact environmental resources, including one NWI wetland. One federally threatened and endangered bad species is also anticipated to be found in the substation footprint. Impacts to these resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE, and USFWS.

A-19-B) Buckeye Lake 765kV Substation

Desktop analysis indicates that the proposed substation intersects with farmland. Verification in the field would need to be completed.

The permitting risk for this component is low. It is anticipated that the proposal could require permits, consultations, clearances and authorization from Fairfield county in OH. State CPCN and DOT utility, driveway and right of way permits may be required.

The proposed substation has the potential to impact environmental resources, including one NWI wetland. Three federally threatened and endangered species are also anticipated to be found in the substation footprint. Impacts to these resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE, and USFWS.

A-92-C) Muckshaw 765kV Substation

Desktop analysis indicates that the proposed substation intersects with farmland. Verification in the field would need to be completed.

The permitting risk for this component is low. Marshall County may require specific permits. Indiana Department of Transportation (INDOT) requires Above Ground Occupancy Permit, Below Ground Occupancy Permits, and Driveway Permit. While Indiana Utility Regulatory Commission (IURC) requires Certificate of Public Convenience and Necessity (CPCN).

The proposed substation has the potential to impact environmental resources, including one NHD stream. Three federally threatened and endangered species are also anticipated to be found in the substation footprint. Impacts to these resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE, and USFWS.

A-98-C) Campbell Creek 765kV Substation

The proposed component has minimal environmental impact. The Proposed substation footprint intersects 1 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Delaware County. Proposed substation footprint intersects

streams/drainages/watercourses that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed substation footprint intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed.

The permitting risk for this component is low. Delaware County may require a building permit, and ROW use/driveway permit. Indiana Department of Transportation (INDOT) requires Above Ground Occupancy Permit, and below Ground Occupancy Permits, and driveway permit. Indiana Utility Regulatory Commission (IURC) requires Certificate of Public Convenience and Necessity (CPCN).

A-13-E) Matville 765kV Substation

Desktop analysis indicates that the proposed route intersects with farmland. Verification in the field would need to be completed.

The permitting risk for this component is low. The proposed component crosses over 1 pipeline owned by Dominion Transmission Co. It is anticipated that the proposal could require permits, consultations, clearances and authorization from Pickaway county in OH. State CPCN and DOT utility, driveway and right of way permits may be required.

The proposed substation has the potential to impact environmental resources, including one NWI wetland. Eight federally threatened and endangered species are also anticipated to be found in the substation footprint, as well as critical habitat for one federally listed aquatic species. Impacts to these resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE, and USFWS.

Transmission Line Risk Analysis

A-10-A) Campbell Creek - Newlove 765kV (Indiana Portion)

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Coordinating outages with multiple electrical crossings. Approximately ten are distribution below 69 kV and at least 2 are transmission above 69 kV.

A-10-B) Campbell Creek - Newlove 765kV (Ohio Portion)

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Coordinating outages with at least nine transmission lines between 69 kV and 230 kV may pose risk to the schedule.
- There are multiple underground utility crossings that may require additional coordination for construction and impact the proposed locations for new structures which will pose risk to schedule, cost, and design.

A-12-A) Newlove - Matville 765kV

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Approximately 15 electrical crossings below 69 kV pose risk to schedule due to coordinating outages.
- There are multiple underground utility crossings that may require additional coordination for construction and impact the proposed locations for new structures which will pose risk to schedule, cost, and design.

A-134-A) Muckshaw - Campbell Creek 765kV

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Approximately 15 electrical crossings below 69 kV pose risk to schedule due to coordinating outages.
- Approximately three electrical crossings above 69 kV pose risk to schedule due to coordinating outages.
- There are approximately 19 underground utility crossings that may require additional coordination for construction and impact the proposed locations for new structures which will pose risk to schedule, cost and design.

A-136-A) Buckeye Lake - Johnstown 765kV

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Approximately seven electrical crossings below 69 kV pose risk to schedule due to coordinating outages.
- Approximately three electrical crossings above 69 kV pose risk to schedule due to coordinating outages.
- There are two underground utility crossings that may require additional coordination for construction and impact the proposed locations for new structures which will pose risk to schedule, cost and design.

A-18-A) Matville - Buckeye Lake 765kV

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Approximately 18 electrical crossings below 69 kV and 2 above 69 kV may pose risk to schedule due to coordinating outages.
- There are about 12 underground utility crossings that may require additional coordination for construction and impact the proposed locations for new structures which will pose risk to schedule, cost and design.

A-103-A) North Titus Melissa – London 138 kV Double Circuit / London – Beatty 138 kV Single Circuit

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Concerns have been raised by the incumbent transmission owner about the proposed scope of this component to achieve greater than 1000 MVA ratings using 138 kV circuits. It was noted that the proposed thermal capacity of the rebuilt 138 kV circuit would be double the largest existing 138 kV facility within the incumbent transmission owner's zone

Substation Risk Analysis*A-11-B) Newlove 765kV Substation*

This project involves establishing a new 765/345/138 kV substation. Scope includes installation of five 765kV breakers arranged in a breaker and one-half configuration with two strings, installation of one 765/345kV transformer, one 765/138kV transformer, installation of five 345kV breakers arranged in a breaker and one-half scheme, and installation of two 345/138kV transformers.

Primary substation risks to this project involve procurement lead time required for the 765 kV equipment.

A-135-A) Johnstown 765kV Substation

This project involves establishing a new 765 kV substation. Scope includes installation of a new 765kV double bus double breaker configuration with six new 765kV breakers, and installation of a 300 MVAR switchable shunt reactor on the Buckeye Lake – Johnstown 765 kV line. Primary substation risks to this project involve procurement lead time required for the 765 kV equipment. Existing routes to site are rural roads, which may present issues transporting 765 kV equipment.

A-19-B) Buckeye Lake 765kV Substation

This project involves establishing a new 765/345 kV substation. Scope includes establishing a new 765kV four breaker double bus double breaker station, installing two 765/345kV transformers connected to 765kV buses, installing one 300MVAR switchable shunt reactor on Buckeye Lake - Johnstown 765kV line, and one 300MVAR switchable shunt reactor on Matville - Buckeye Lake 765kV line 345kV, and two 345 kV circuit breakers

Primary substation risks to this project involve procurement lead time required for the 765 kV equipment. Existing routes to site are rural roads, which may present issues transporting 765 kV equipment.

A-92-C) Muckshaw 765kV Substation

This project involves establishing a new 765/345 kV substation. Scope includes establishing a new six breaker double bus double breaker 765kV arrangement, installing two 765/345kV transformers connected to 765kV buses via circuit breakers, installing one 300MVAR switchable line shunt reactor on Muckshaw - Campbell Creek 765kV line, and establishing a new 345kV breaker and one half configuration with three bays and nine 345 kV CBs.

Primary substation risks to this project involve procurement lead time required for the 765 kV equipment. Existing routes to site are rural roads, which may present issues transporting 765 kV equipment.

A-98-C) Campbell Creek 765kV Substation

This project involves establishing a new 765/345 kV substation. Scope includes establishing a new six breaker double bus double breaker 765kV arrangement, installing two 765/345kV transformers connected to 765kV buses via circuit breakers, installing one 300MVAR switchable line shunt reactor on Muckshaw - Campbell Creek 765kV line, and establishing a new 345kV breaker and one half configuration with three bays and nine 345 kV CBs.

Primary substation risks to this project involve procurement lead time required for the 765 kV equipment. Existing routes to site are rural roads, which may present issues transporting 765 kV equipment. The proposed substation is also in close proximity to railroad, road, and homeowners.

A-13-E) Matville 765kV Substation

This project involves establishing a new 765/345 kV substation. Scope includes establishing a new seven breaker BAAH 765kV arrangement, installing one 765/345kV transformer, installing four 300MVAR switchable line shunt reactor 765 kV line terminations, and establishing a new 345kV BAAH configuration with three bays and nine 345 kV CBs. Primary substation risks to this project involve procurement lead time required for the 765 kV equipment. Existing routes to site are rural roads, which may present issues transporting 765 kV equipment.

Constructability Summary

The proposal contains significant greenfield construction and will pose significant challenges for acquisition of the required land for the line routes and substation parcels.

Besides the constructability concerns associated with proposal 109, there are additional significant regulatory concerns PJM has assessed for the project.

The proposed 765 kV line Muckshaw to Campbell Creek to New Love originates in MISO's region in Indiana with the developer's proposal assigning responsibility for the greenfield Indiana scope of the proposal, which includes the Muckshaw greenfield substation, the Muckshaw to Campbell Creek line, and the Indiana portion of the Campbell Creek to New Love line to AEP (due to Indiana's right of first refusal 'ROFR' regulations which require that incumbent transmission owners have responsibility for transmission projects in Indiana). Besides the additional complexity of navigating the ROFR in the project designation process, given that there was no collaboration with AEP on this proposal, the actual scope and cost estimations for any awarded greenfield Indiana scope (which would be based on AEP's estimates) are at risk of significant variance from the original proposal. Additionally, there are potential complications with the designation process by which PJM would assign responsibility for any scope of work that is required to be awarded to a MISO Transmission Owner.

Based on the above, PJM assesses **Medium-High** constructability risk, and additionally a **High** regulatory risk for this project.

Outage Review

Due to the primary greenfield nature of this project, only short outages to existing facilities will be required to tie in the new transmission facilities, and therefore no significant existing facility outages are anticipated. Overall outage coordination risk is deemed **Low**.

Cost Review

As part of the detailed constructability analysis, an independent consultant prepared a high-level conceptual,

independent cost estimate for the components of this proposal. The independent consultant assumes a level of effort and accuracy consistent with AACE International's Recommended Practice 17R-97, Cost Estimate Classification System, Class 3 with an expected accuracy of -20% to +40% from the base total estimate. Estimates will use available industry and materials. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering, and construction. The independent cost estimate includes a 30% contingency, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates is provided below.

Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
1	A-10-A) Campbell Creek - Newlove 765 kV (Indiana Portion)	148.89	189.00
2	A-10-B) Campbell Creek - Newlove 765 kV (Ohio Portion)	348.77	447.30
3	A-113-A) Newlove - Madison 345 kV	36.53	77.98
4	A-114-A) Matville - Biers Run 345 kV Loop-In	8.67	11.42
5	A-115-A) Matville - Bixby 345 kV Loop-In	9.67	11.42
6	A-126-C) Cole - Hayden 345 kV	36.83	55.35
7	A-127-B) Cole - Beatty 345 kV	37.50	54.21
8	A-12-A) Newlove - Matville 765 kV	168.16	207.90
9	A-132-A) Celtic - Marysville 345 kV	73.69	144.99
10	A-134-A) Muckshaw - Campbell Creek 765 kV	480.80	617.40
11	A-136-A) Buckeye Lake - Johnstown 765 kV	119.83	138.60
12	A-136-B) Matville - Beatty 345 kV	44.05	66.94
13	A-140-B) Newlove - Melissa 138 kV	13.17	13.45
14	A-140-C) Newlove - Melissa 138 kV	8.56	7.96
15	A-17-B) Matville - Adkins 345 kV Loop-In	9.93	14.78
16	A-18-A) Matville - Buckeye Lake 765 kV	200.71	226.80
17	A-20-A) Bixby/Kirk - West Millersport 345 kV Loop-In	26.42	45.04
18	A-21-A) Bixby/Ohio Central - West Millersport 345kV Loop-In	28.20	34.48
19	A-70-A) Matville - Atlanta 345kV Loop-In	11.84	16.87
20	A-99-A) Campbell Creek - Desoto 345kV	3.20	3.42
21	A-11-B) Newlove 765 kV Substation	234.77	262.57
22	A-135-A) Johnstown 765 kV Substation	116.26	130.52
23	A-19-B) Buckeye Lake 765 kV Substation	210.18	243.82
24	A-92-C) Muckshaw 765 kV Substation	303.59	253.94
25	A-98-C) Campbell Creek 765 kV Substation	234.77	262.57
26	A-13-E) Matville 765 kV Substation	255.82	330.02
27	A-103-A) North Titus Melissa - London 138 kV double circuit/London - Beatty 138 kV single circuit	57.19	91.66
28	A-14-A) Marysville - Matville 765 kV Loop-In	2.64	8.74
29	A-72-A) Matville - Flatlick 765 kV Loop-In	2.50	8.75
30	A-108-A) Melissa substation upgrades	4.56	3.80
31	A-112-A) Madison substation upgrades	6.65	9.06
32	A-118-C) West Millersport substation upgrades	19.94	15.06
33	A-119-B) Bixby terminal equipment upgrades	2.49	3.52
34	A-124-B) Cole substation upgrade	3.23	5.75

35	A-125-A) Hayden substation upgrade	13.35	18.05
36	A-131-B) Celtic substation upgrade	6.65	8.49
37	A-139-A) Cosgray 345 kV substation upgrade	3.54	5.11
38	A-150-A) Bethel circuit breaker replacement	1.52	1.14
39	A-151-A) Babbit circuit switcher replacement	0.76	0.88
40	A-15-B) Marysville substation upgrade	77.72	56.20
41	A-23-A) Kirk substation upgrade	2.49	3.52
42	A-149-A) Beacon substation upgrade	3.54	3.74
43	A-97-A) Desoto substation upgrade	3.32	4.89
44	A-158-A) Greentown substation upgrade	6.75	23.64
45	A-159-A) Dublin reactor addition	1.14	9.14
46	A-160-B) Beatty substation upgrades	9.50	5.98
47	A-161-A) Wilson series reactor addition	1.14	7.19
48	A-162-A) Roberts	1.14	7.19
Total		3402.57	4170.25

The proposal cost estimate is within 11-20% of the independent cost estimate and is considered **Low-Medium** risk.

Schedule Review

This proposal has a projected in-service date of June 2031.

The major schedule risks identified for Proposal 109 include the significant ROW/land acquisition risks, and regulatory risks assessed for the project. The scheduling risk is assessed as **Medium-High**.

Proposing Entity Experience and Capability Review

Exelon's affiliate ComEd, has experience operating and designing 765 kV transmission, which represents the most significant scope proposed. Accordingly, the proposing entity experience and capability risk is assessed **Low-Medium**.

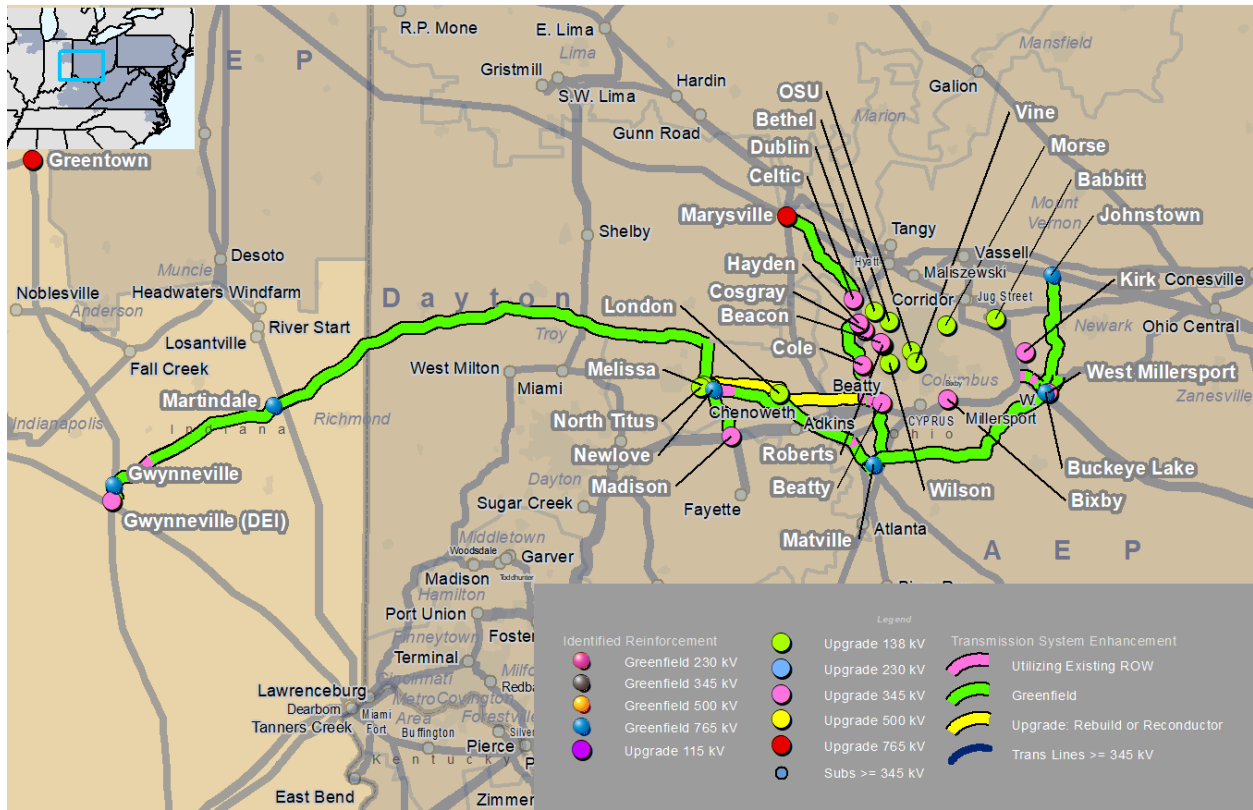
Proposal 152 – Gwynneville - Johnstown 765kV (NextEra/Exelon)

The objective of this project is to construct an 765 kV, 304.84 mile line from new Gwynneville Substation in Shelby County, Indiana to the existing Martindale Substation in Wayne County, Indiana then to the existing Newlove Substation in Clark County, Ohio to the existing Matville Substation in Pickaway County, Ohio then to the existing Buckeye Lake Substation in Fairfield County, Ohio, and finally to the Johnstown Substation in Licking County, Ohio. This project will traverse four counties (Shelby, Rush, Henry, and Wayne) in Indiana and ten counties (Darke, Miami, Champaign, Clark, Madison, Pickaway, Franklin, Union, Fairfield, and Licking) in Ohio.

This proposal has a total of 51 components, including 15 substation upgrade components, ten greenfield substation components, 20 greenfield transmission line components covering 303 miles, and six transmission line upgrade components spanning approximately 1.84 miles.

Map 20 displays the components and routes proposed for proposal 152.

Map 20. Proposal 152



NOTE: 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.

Project Overview

NextEra/Exelon Proposal 152 includes the following components:

- Component 1. A-113-A) Newlove - Madison 345 kV
- Component 2. A-114-A) Matville - Biers Run 345 kV Loop-In
- Component 3. A-115-A) Matville - Bixby 345 kV Loop-In
- Component 4. A-126-C) Cole - Hayden 345 kV
- Component 5. A-127-B) Cole - Beatty 345 kV
- Component 6. A-12-A) Newlove - Matville 765 kV
- Component 7. A-132-A) Celtic - Marysville 345 kV
- Component 8. A-136-A) Buckeye Lake - Johnstown 765 kV
- Component 9. A-136-B) Matville - Beatty 345 kV
- Component 10. A-140-B) Newlove - Melissa 138 kV
- Component 11. A-140-C) Newlove - Melissa 138 kV
- Component 12. A-143-A) Martindale - Newlove (Indiana Portion) 765 kV
- Component 13. A-143-B) Martindale - Newlove (Ohio Portion) 765 kV

- Component 14. A-145-A) New Gwynneville (765 kV Substation) - Gwynneville 345 kV Transmission Line
- Component 15. A-146-A) Gwynneville - Martindale 765 kV
- Component 16. A-17-B) Matville - Adkins 345 kV Loop-In
- Component 17. A-18-A) Matville - Buckeye Lake 765 kV
- Component 18. A-20-A) Bixby/Kirk - West Millersport 345 kV Loop-In
- Component 19. A-21-A) Bixby/Ohio Central - West Millersport 345 kV Loop-In
- Component 20. A-70-A) Matville - Atlanta 345 kV Loop-In
- Component 21. A-11-B) Newlove 765 kV Substation
- Component 22. A-142-B) Gwynneville 765 kV Substation
- Component 23. A-135-A) Johnstown 765 kV Substation
- Component 24. A-144-A) Martindale 765 kV Substation
- Component 25. A-19-B) Buckeye Lake 765 kV Substation
- Component 26. A-13-E) Matville 765 kV Substation
- Component 27. A-103-A) North Titus Melissa - London 138 kV Double Circuit/London - Beatty 138 kV Single Circuit
- Component 28. A-14-A) Marysville - Matville 765 kV Loop-In
- Component 29. A-72-A) Matville - Flatlick 765 kV Loop-In
- Component 30. A-155-A) Jefferson - Greentown 765 kV Loop-In
- Component 31. A-156-A) Tanners Creek - Desoto 345 kV Loop-In
- Component 32. A-157-A) Tanners Creek - Losantville 345 kV Loop- In
- Component 33. A-108-A) Melissa Substation Upgrades
- Component 34. A-112-A) Madison Substation Upgrades
- Component 35. A-118-C) West Millersport Substation Upgrades
- Component 36. A-119-B) Bixby terminal equipment Upgrades
- Component 37. A-124-B) Cole Substation Upgrade
- Component 38. A-125-A) Hayden Substation Upgrade
- Component 39. A-131-B) Celtic Substation Upgrade
- Component 40. A-139-A) Cosgray 345 kV Substation Upgrade
- Component 41. A-150-A) Bethel circuit breaker replacement
- Component 42. A-151-A) Babbit circuit switcher replacement
- Component 43. A-15-B) Marysville Substation Upgrade
- Component 44. A-23-A) Kirk Substation Upgrade
- Component 45. A-149-A) Beacon Substation Upgrade
- Component 46. A-154-A) Gwynneville (DEI) Substation Upgrade
- Component 47. A-158-A) Greentown Substation Upgrade
- Component 48. A-159-A) Dublin Reactor Addition
- Component 49. A-160-B) Beatty Substation Upgrades
- Component 50. A-161-A) Wilson Series Reactor Addition
- Component 51. A-162-A) Roberts

Constructability Review

Right-of-Way/Land Acquisition Risk Analysis

A-113-A) Newlove - Madison 345kV

The Newlove-Madison 345 kV Transmission Line is an approximately 9-mile line that will be constructed from the proposed Newlove Substation, in Clark County, Ohio to the existing Madison Substation, in Clark County, Ohio. The line will traverse one county (Clark) in Ohio. The total route is nine miles, with a proposed right-of-way of 150 feet for 99% of the line and 125 feet for the remaining 1%. The entire line is greenfield.

Land acquisition will be required for the entire line. The project also crosses the St. Charles Cemetery.

A-114-A) Matville - Biers Run 345kV Loop-In

The Matville-Biers Run 345 kV Loop-In is an approximately 2-mile line that will be constructed from the proposed Matville Substation, in Pickaway County, Ohio to the existing Bixby-Biers Run corridor, in Clark County, Ohio. The line will traverse one county (Pickaway) in Ohio. The total route is two miles, with a proposed right-of-way of 150 feet. The entire line is greenfield.

Land acquisition will be required for the entire line. The terrain is flat.

A-115-A) Matville - Bixby 345kV Loop-In

The Matville-Bixby 345 kV Loop-In is an approximately 2-mile line that will be constructed from the proposed Matville Substation, in Pickaway County, Ohio to the existing Bixby-Biers Run corridor, in Clark County, Ohio. The line will traverse one county (Pickaway) in Ohio. The total route is 2 miles, with a proposed right-of-way of 150 feet. The entire line is greenfield.

Land acquisition will be required for the entire line.

A-126-C) Cole - Hayden 345kV

The Cole-Hayden 345 kV Transmission Line is an approximately 10-mile line that will be constructed from the existing Cole Substation, in Franklin County, Ohio to the existing Hayden Substation, in Franklin County, Ohio. The line will traverse two counties (Franklin and Madison) in Ohio. The total route is 10 miles, with a proposed right-of-way of 150 feet. The entire line is greenfield.

Land acquisition will be required for the entire line.

A-127-B) Cole - Beatty 345kV

The Cole-Beatty 345 kV Transmission Line is an approximately 10-mile line that will be constructed from the existing Cole Substation, in Franklin County, Ohio to the existing Beatty Substation, in Franklin County, Ohio. The line will traverse one county (Franklin) in Ohio.

The total route is 10 miles, with a proposed right-of-way of 150 feet and 45% of the line will be an expansion of existing right-of-way, and the remaining 55% will be greenfield.

Land acquisition will be required along the entire length of the line. The line also crosses the National Road.

A-12-A) Newlove - Matville 765kV

The Newlove-Matville 765 kV Transmission Line is an approximately 33-mile line that will be constructed from the proposed Newlove Substation, in Clark County, Ohio to the proposed Matville Substation, in Pickaway County, Ohio. The line will traverse three counties (Clark, Madison, and Pickaway) in Ohio.

The total route is 33 miles, with a proposed right-of-way of 200 feet and 14% of the line will be an expansion of existing right-of-way, and the remaining 86% will be greenfield.

Land acquisition will be required along the entire length of the line. The line corridor is also adjacent to a private airstrip, WesMar Aerodrome.

A-132-A) Celtic - Marysville 345kV

The Celtic-Marysville 345 kV Transmission Line is an approximately 20-mile line that will be constructed from the proposed Celtic Substation, in Union County, Ohio to the existing Marysville Substation, in Union County, Ohio. The line will traverse one county (Union) in Ohio.

The total route is 20 miles, with a proposed right-of-way of 150 feet and 20% of the line will be an expansion of existing right-of-way, and the remaining 80% will be greenfield.

Land acquisition will be required along the entire length of the line. The line corridor is also adjacent to a private airstrip, Madison Field. The terrain is flat.

A-136-A) Buckeye Lake - Johnstown 765kV

The Buckeye Lake-Johnstown 765 kV Transmission Line is an approximately 22-mile line that will be constructed from the proposed Buckeye Lake Substation, in Fairfield County, Ohio to the proposed Johnstown Substation, in Licking County, Ohio. The line will traverse two counties (Fairfield and Licking) in Ohio.

The total route is 22 miles, with a proposed right-of-way of 200 feet. The entire line will be greenfield.

Land acquisition will be required along the entire line. The line corridor is also adjacent to a private airstrip, Madison Field.

A-136-B) Matville - Beatty 345kV

The Matville-Beatty 345 kV Transmission Line is an approximately 12-mile line that will be constructed from the proposed Matville Substation, in Pickaway County, Ohio to the existing Beatty Substation, in Franklin County, Ohio. The line will traverse two counties (Pickaway and Franklin) in Ohio.

The total route is 12 miles, with a proposed right-of-way of 150 feet. The entire line will be greenfield.

Land acquisition will be required along the entire line. The terrain is flat.

A-143-A) Martindale - Newlove (Indiana Portion) 765kV

The Martindale-Newlove (Indiana Portion) 765 kV Transmission Line is an approximately 20-mile line that will be constructed from the proposed Martindale Substation, in Wayne County, Indiana to the Indiana-Ohio border. The line will traverse one county (Wayne) in Indiana.

The total route is 20 miles, with a proposed right-of-way of 200 feet. The entire line will be greenfield.

Land acquisition will be required along the entire line.

A-143-B) Martindale - Newlove (Ohio Portion) 765kV

The Martindale-Newlove (Ohio Portion) 765 kV Transmission Line is an approximately 72-mile line that will be constructed from the Indiana-Ohio border to the proposed Newlove Substation, in Clark County, Ohio. The line will traverse four counties (Darke, Miami, Champaign, and Clark) in Ohio.

The total route is 72 miles, with a proposed right-of-way of 200 feet. The entire line will be greenfield.

Land acquisition will be required along the entire line, and the line crosses the Elizabeth Township Rural Historic District. It would not require a significant reroute to avoid this district. The line also crosses the National Road.

A-145-A) New Gwynneville (765kV substation) - Gwynneville 345kV T-Line

The New Gwynneville (765 kV Substation)-Gwynneville 345 kV Transmission Line is an approximately 4-mile line that will be constructed from the proposed New Gwynneville 765 kV Substation, in Shelby County, Indiana to the existing Gwynneville 345 kV Substation, in Shelby County, Indiana. The line will traverse one county (Shelby) in Indiana.

The total route is 4 miles, with a proposed right-of-way of 150 feet. The entire line will be greenfield.

Land acquisition will be required along the entire line.

A-146-A) Gwynneville - Martindale 765kV

The Gwynneville-Martindale 765 kV Transmission Line is an approximately 33-mile line that will be constructed from the proposed Gwynneville Substation, in Shelby County, Indiana to the proposed Martindale Substation, in Wayne County, Indiana. The line will traverse four counties (Shelby, Rush, Henry, and Wayne) in Indiana.

The total route is 33 miles, with a proposed right-of-way of 200 feet and 12% of the line will be an expansion of existing right-of-way, and the remaining 88% will be greenfield.

Land acquisition will be required along the entire line.

A-17-B) Matville - Adkins 345kV Loop-In

The Matville-Adkins 345 kV Loop-In is an approximately 2-mile line that will be constructed from the proposed Matville Substation, in Pickaway County, Ohio to the existing Atlanta-Adkins 345 kV Transmission Line, in Pickaway County, Ohio. The line will traverse one county (Pickaway) in Ohio.

The total route is 2 miles, with a proposed right-of-way of 150 feet. The entire line will be greenfield.

Land acquisition will be required along the entire line.

A-18-A) Matville - Buckeye Lake 765kV

The Matville-Buckeye Lake 765 kV Transmission Line is an approximately 36-mile line that will be constructed from the proposed Matville Substation, in Pickaway County, Ohio to the proposed Buckeye Lake Substation, in Fairfield County, Ohio. The line will traverse two counties (Pickaway and Fairfield) in Ohio. The total route is 36 miles, with a proposed right-of-way of 200 feet for 99% of the route and 175 feet for the remaining 1%. The entire line will be greenfield.

Land acquisition will be required along the entire line.

A-20-A) Bixby/Kirk - West Millersport 345kV Loop-In

The Bixby/Kirk-West Millersport 345 kV Loop-In is an approximately 6-mile line that will be constructed from the existing Bixby-Kirk 345 kV Transmission Line, in Fairfield County, Ohio to the existing West Millersport Substation, in Fairfield County, Ohio. The line will traverse one county (Fairfield) in Ohio.

The total route is 6 miles, with a proposed right-of-way of 150 feet and 68% of the line will be an expansion of existing right-of-way, and the remaining 32% will be greenfield.

Land acquisition will be required along the entire line.

A-21-A) Bixby/Ohio Central - West Millersport 345kV Loop-In

The Bixby/Ohio Central-West Millersport 345 kV Loop-In is an approximately 4-mile line that will be constructed from the existing Bixby-Ohio Central 345 kV Transmission Line, in Licking County, Ohio to the existing West Millersport Substation, in Fairfield County, Ohio. The line will traverse two counties (Licking and Fairfield) in Ohio.

The total route is 4 miles, with a proposed right-of-way of 150 feet and 33% of the line will be an expansion of existing right-of-way, and the remaining 67% will be greenfield.

Land acquisition will be required along the entire line.

A-70-A) Matville - Atlanta 345kV Loop-In

The Matville-Atlanta 345 kV Loop-In is an approximately two mile line that will be constructed from the proposed Matville Substation, in Pickaway County, Ohio to the existing Atlanta-Adkins 345 kV Transmission Line, in Pickaway County, Ohio. The line will traverse one county (Pickaway) in Ohio. The total route is two miles, with a proposed right-of-way of 150 feet. The entire line will be greenfield.

Land acquisition will be required along the entire line.

A-103-A) North Titus-Melissa-London 138 kV Double Circuit/London-Beatty 138 kV Single Circuit

The North Titus-Melissa-London 138 kV Double Circuit/London-Beatty 138 kV Single Circuit is an approximately 34-mile rebuild of the existing North Titus-Melissa-London 138 kV Double Circuit and London-Beatty 138 kV Single Circuit lines. The component will traverse two counties (Madison and Clark) in Ohio.

The total route is approximately 34 miles. The entire project will be within existing ROW. Land acquisition will not be required.

A-11-B) Newlove 765kV Substation

Newlove Substation is a greenfield substation in Clark County, Ohio. New land acquisition will be required; however, the proposed component site is in an undeveloped agricultural field, with no residences within the likely component area.

A-142-B) Gwynneville 765kV Substation

Gwynneville 765 kV Substation is a greenfield substation in Shelby County, Ohio. Acreage requirements have not been provided. New land acquisition will be required; however, the proposed component site is in an undeveloped agricultural field, with no residences within the likely component area.

A-135-A) Johnstown 765kV Substation

Johnstown 765 kV Substation is a greenfield substation in Licking County, Ohio. Acreage requirements have not been provided. New land acquisition will be required; however, the proposed component site is in an undeveloped agricultural field, with no residences within the likely component area.

A-144-A) Martindale 765kV Substation

Martindale 765 kV Substation is a greenfield substation in Wayne County, Ohio. Acreage requirements have not been provided. New land acquisition will be required; however, the proposed component site is in an undeveloped agricultural field, with no residences within the likely component area.

A-19-B) Buckeye Lake 765kV Substation

Buckeye Lake 765 kV Substation is a greenfield substation in Fairfield County, Ohio. Acreage requirements have not been provided. New land acquisition will be required; however, the proposed component site is in an undeveloped agricultural field, with no residences within the likely component area.

A-13-E) Matville 765kV Substation

Matville 765 kV Substation is a greenfield substation in Pickaway County, Ohio. Acreage requirements have not been provided. New land acquisition will be required; however, the proposed component site is in an undeveloped agricultural field, with no residences within the likely component area.

Overall, due to the high greenfield nature of the proposed projects, a **High** ROW/Land Acquisition risk is assessed for proposal 152.

Environmental Risk Analysis

A-12-A) Newlove - Matville 765kV

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting; woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Impacts to these resources will require coordination with the appropriate county floodplain administrator; coordination with state wildlife agencies, USACE and USFWS. Proposed route does not intersect designated Critical Habitat. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects mapped karst geology. Geotechnical studies are needed to verify subsurface conditions prior to digging or trenching.

This component crosses over 1 railway owned by Indiana & Ohio Railway; 3 transmission lines owned by American Electric Power Co. Inc. and Dayton Power and Light Co.; 27 roads (54 entrances) in across Clark, Madison and Pickaway County. There is 1 Trail crossing, Camp Chase Trail. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Clark, Madison and Pickaway County in OH. State CPCN and DOT utility, driveway and right of way permits may be required.

A-136-A) Buckeye Lake Johnstown 765kV

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting; woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Impacts to these resources will require coordination with the appropriate county floodplain administrator; coordination with state wildlife agencies, USACE and USFWS. Proposed route does not intersect designated Critical Habitat. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species.

This component has 1 railway crossings with an unknown owner. There are approximately 27 road crossings spanning over 2 counties (Fairfield & Licking). There are approximately 11 transmission lines owned by American Electric Power Co and Ohio Power Co. There are approximately 8 pipeline crossings owned Marathon Pipeline, Columbia Gas Trans Co, Rockies Express Pipeline, Dominion Transmission Co and Enterprise Products. Lastly, the line crosses a farm owned by PVT. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from 2 counties in OH. State Approval of Electric Transmission Lines, and DOT utility permits are required.

A-143-A) Martindale - Newlove (Indiana Portion) 765kV

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting. Impacts to these resources will require coordination with the USACE and appropriate Floodplain Administrators.

This component intersects one railroad owned by Southern Railway Company. Proposed line crosses 23 roads and 4 highways in Wayne County. Proposed line crosses 4 existing utility lines; 1 owned by Duke Energy Indiana & 3 unknown owners. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from the 2 counties in IN. State Approval of Electric Transmission Lines, and DOT utility permits are required.

A-143-B) Martindale - Newlove (Ohio Portion) 765kV

"The proposed route intersects with the following recorded Historical Sites/Structures/Districts. Coordination with the state SHPO office is required.

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting. Impacts to these resources will require coordination with the USACE and appropriate Floodplain Administrators.

The proposed route intersects woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Tree removal restrictions may apply due to the likelihood of the presence of listed bat species. Field verification of suitable bat habitat is recommended to determine presence.

Proposed route does not intersect designated Critical Habitat. However, the potential for federally listed endangered/threatened species to occur within the route corridor does exist. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species.

Proposed route intersects 1 conservation easements. Coordination with easement holders will be required.

Proposed route intersects mapped karst geology. Geotechnical studies are needed to verify subsurface conditions prior to digging or trenching."

There is approximately 5 railroad crossings, 1 owned by CSXT, 3 owned by Indiana & Ohio Railway, and 1 owned by Norfolk Southern Railway Company. There is approximately 109 roads and highways crossings in 3 counties (Darke, Miami, Clark). There is approximately 14 transmission line crossings, owned by DAYTON POWER & LIGHT CO. There is approximately 6 pipeline crossings, owned by Panhandle Eastern PL Co, ENTERPRISE PRODUCTS, SUNOCO, Texas Eastern Trans Co, ANR Pipeline Co, Columbia Gas Trans Co. It is anticipated that the proposal requires permits, consultations, clearances and authorization from 3 counties in OH. State CPCN and DOT utility, driveway and right of way permits may be required.

A-146-A) Gwynneville - Martindale 765kV

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting. Impacts to these resources will require coordination with the USACE and appropriate Floodplain Administrators.

The proposed route intersects 2 railroads; 1 owned by C & NC Railroad Corporation and 1 unknown owner. There are approximately 46 road crossings; 2 road crossings and 1 highway crossings in Shelby County, 22 road crossings and 1 highway crossings in Rush County, 8 road crossings and 2 highway crossings in Henry County, and 7 road crossings and 3 highway crossings in Wayne County. There are approximately 10 transmission lines identified owned by DUKE ENERGY INDIANA, LLC. It is anticipated that the proposal requires permits, consultations, clearances, and

authorizations from the 2 counties in IN. State Approval of Electric Transmission Lines, and DOT utility permits are required.

A-18-A) Matville - Buckeye Lake 765kV

Proposed route does not intersect designated Critical Habitat. However, the potential for federally listed endangered/threatened species to occur within the route corridor does exist. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species.

There is approximately 1 roadway crossing, (2 entrances) in Pickaway County. There are approximately 2 transmission line crossings, both are owned by AMERICAN ELECTRIC POWER CO., INC. There is approximately 1 pipeline crossing, owned by Columbia Gas Trans Co. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from Pickaway County, OH. State Approval of Electric Transmission Lines, and DOT utility permits are required.

A-11-B) Newlove 765kV Substation

Desktop analysis indicates that the proposed substation intersects with farmland. Verification in the field would need to be completed.

It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from Clark County in OH. State Approval of Electric Transmission Lines, and DOT utility permits are required.

A-142-B) Gwynneville 765kV Substation

Desktop analysis indicates that the proposed substation intersects with farmland. Verification in the field would need to be completed. The proposed substation intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching.

It is anticipated that the proposal would require permits, consultations, clearances, and authorizations from Shelby County in IN. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits may be required.

A-135-A) Johnstown 765kV Substation

Desktop analysis indicates that the proposed substation intersects with farmland. Verification in the field would need to be completed.

It is anticipated that the proposal would require permits, consultations, clearances, and authorizations from Licking County in OH. State PUCO Approval may be required, and DOT utility permits and driveway/local road permits are required.

A-144-A) Martindale 765kV Substation

Desktop analysis indicates that the proposed route intersects with farmland. Verification in the field would need to be completed.

It is anticipated that the proposal would require permits, consultations, clearances, and authorizations from Wayne County in IN. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits may be required.

A-19-B) Buckeye Lake 765kV Substation

Desktop analysis indicates that the proposed substation intersects with farmland. Verification in the field would need to be completed.

It is anticipated that the proposal could require permits, consultations, clearances and authorization from Fairfield county in OH. State CPCN and DOT utility, driveway and right of way permits may be required.

A-13-E) Matville 765kV Substation

Desktop analysis indicates that the proposed route intersects with farmland. Verification in the field would need to be completed.

It is anticipated that the proposal would require permits, consultations, clearances, and authorizations from Wayne County in IN. State PSC Approval, CPCN, and DOT utility permits and driveway/local road permits may be required.

Transmission Line Risk Analysis*A-12-A) Newlove - Matville 765kV*

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Approximately 15 electrical crossings below 69 kV pose risk to schedule due to coordinating outages.
- There are multiple underground utility crossings that may require additional coordination for construction and impact the proposed locations for new structures which will pose risk to schedule, cost, and design.

A-136-A) Buckeye Lake - Johnstown 765kV

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Approximately seven electrical crossings below 69 kV pose risk to schedule due to coordinating outages.
- Approximately three electrical crossings above 69 kV pose risk to schedule due to coordinating outages.
- There are two underground utility crossings that may require additional coordination for construction and impact the proposed locations for new structures which will pose risk to schedule, cost and design.

A-143-A) Martindale - Newlove (Indiana Portion) 765kV

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Approximately one electrical crossings below 69 kV pose risk to schedule due to coordinating outages.
- Approximately three electrical crossings above 69 kV pose risk to schedule due to coordinating outages.
- There are two underground utility crossings that may require additional coordination for construction and impact the proposed locations for new structures which will pose risk to schedule, cost and design.

A-143-B) Martindale - Newlove (Ohio Portion) 765kV

- Approximately twenty electrical crossings below 69 kV pose risk to schedule due to coordinating outages.
- Approximately seven electrical crossings above 69 kV pose risk to schedule due to coordinating outages.
- There are eight underground utility crossings that may require additional coordination for construction and impact the proposed locations for new structures which will pose risk to schedule, cost and design.

A-145-A) New Gwynneville (765kV substation) - Gwynneville 345kV T-Line

- Approximately two electrical crossings below 69 kV pose risk to schedule due to coordinating outages.
- Approximately two electrical crossings above 69 kV pose risk to schedule due to coordinating outages.

A-146-A) Gwynneville - Martindale 765kV

- Approximately ten electrical crossings below 69 kV pose risk to schedule due to coordinating outages.
- Approximately eight electrical crossings above 69 kV pose risk to schedule due to coordinating outages.
- There are seven underground utility crossings that may require additional coordination for construction and impact the proposed locations for new structures which will pose risk to schedule, cost and design.

A-18-A) Matville - Buckeye Lake 765kV

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Approximately 18 electrical crossings below 69 kV and 2 above 69 kV may pose risk to schedule due to coordinating outages.
- There are about 12 underground utility crossings that may require additional coordination for construction and impact the proposed locations for new structures which will pose risk to schedule, cost and design.

A-103-A) North Titus Melissa – London 138 kV Double Circuit / London – Beatty 138 kV Single Circuit

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Concerns have been raised by the incumbent transmission owner about the proposed scope of this component to achieve greater than 1000 MVA ratings using 138 kV circuits. It was noted that the proposed thermal capacity of the rebuilt 138 kV circuit would be double the largest existing 138 kV facility within the incumbent transmission owner's zone

Substation Risk Analysis*A-11-B) Newlove 765kV Substation*

This project involves establishing a new 765/345/138 kV substation. Scope includes installation of five 765kV breakers arranged in a breaker and one-half configuration with two strings, installation of one 765/345kV transformer, one 765/138kV transformer, installation of five 345kV breakers arranged in a breaker and one-half scheme, and installation of two 345/138kV transformers.

Primary substation risks to this project involve procurement lead time required for the 765 kV equipment.

A-142-B) Gwynneville 765kV Substation

This project involves establishing a new 765/345 kV substation. Scope includes installation of a new 765kV double bus double breaker configuration with six new 765kV breakers, two 765/345 kV transformers, and installation of a 300 MVAR switchable shunt reactor on the Gwynneville-Martindale 765 kV line, and two 345 kV CBs on the low side

of the transformers. Primary substation risks to this project involve procurement lead time required for the 765 kV equipment.

A-135-A) Johnstown 765kV Substation

This project involves establishing a new 765 kV substation. Scope includes installation of a new 765kV double bus double breaker configuration with six new 765kV breakers, and installation of a 300 MVAR switchable shunt reactor on the Buckeye Lake – Johnstown 765 kV line. Primary substation risks to this project involve procurement lead time required for the 765 kV equipment. Existing routes to site are rural roads, which may present issues transporting 765 kV equipment.

A-144-A) Martindale 765kV Substation

This project involves establishing a new 765/345 kV substation. Scope includes installation of a new 765kV four breaker ring, one 765/345 kV transformer, and installation of two 300 MVAR switchable shunt reactors on the Gwynneville – Martindale and Martindale – Newlove 765 kV lines, and establish a 345 kV BAAH configuration with eight 345 kV CBs. Primary substation risks to this project involve procurement lead time required for the 765 kV equipment.

A-19-B) Buckeye Lake 765kV Substation

This project involves establishing a new 765/345 kV substation. Scope includes establishing a new 765kV four breaker double bus double breaker station, installing two 765/345kV transformers connected to 765kV buses, installing one 300MVAR switchable shunt reactor on Buckeye Lake - Johnstown 765kV line, and one 300MVAR switchable shunt reactor on Matville - Buckeye Lake 765kV line 345kV, and two 345 kV circuit breakers

Primary substation risks to this project involve procurement lead time required for the 765 kV equipment. Existing routes to site are rural roads, which may present issues transporting 765 kV equipment.

A-13-E) Matville 765kV Substation

This project involves establishing a new 765/345 kV substation. Scope includes establishing a new seven breaker BAAH 765kV arrangement, installing one 765/345kV transformer, installing four 300MVAR switchable line shunt reactor 765 kV line terminations, and establishing a new 345kV BAAH configuration with three bays and nine 345 kV CBs. Primary substation risks to this project involve procurement lead time required for the 765 kV equipment. Existing routes to site are rural roads, which may present issues transporting 765 kV equipment.

Constructability Summary

The proposal contains significant greenfield construction and will pose significant challenges for acquisition of the required land for the line routes and substation parcels.

Besides the constructability concerns associated with proposal 152, there are additional significant regulatory concerns PJM has assessed for the project.

The proposed 765 kV line Gwynneville to Martindale to New Love originates in MISO's region in Indiana with the developer's proposal assigning responsibility for the greenfield Indiana scope of the proposal, which includes the Gwynneville greenfield substation, the Gwynneville to Martindale line, and the Indiana portion of the Martindale to New Love line to AEP (due to Indiana's right of first refusal 'ROFR' regulations which require that incumbent transmission owners have responsibility for transmission projects in Indiana). Besides the additional complexity of navigating the ROFR in the project designation process, given that there was no collaboration with AEP on this proposal, the actual scope and cost estimations for any awarded greenfield Indiana scope (which would be based on AEP's estimates) are at risk of significant variance from the original proposal. Additionally, there are potential complications with the designation process by which PJM would assign responsibility for any scope of work that is required to be awarded to a MISO Transmission Owner.

Based on the above, PJM assesses **Medium-High** constructability risk, and additionally a **High** regulatory risk for this project.

Outage Review

Due to the primary greenfield nature of this project, only short outages to existing facilities will be required to tie in the new transmission facilities, and therefore no significant existing facility outages are anticipated. Overall outage coordination risk is deemed **Low**.

Cost Review

As part of the detailed constructability analysis, an independent consultant prepared a high-level conceptual, independent cost estimate for the components of this proposal. The independent consultant assumes a level of effort and accuracy consistent with AACE International's Recommended Practice 17R-97, Cost Estimate Classification System, Class 3 with an expected accuracy of -20% to +40% from the base total estimate. Estimates will use available industry and materials. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering, and construction. The independent cost estimate includes a 30% contingency, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates is provided below.

	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
1	A-113-A) Newlove - Madison 345 kV	36.53	77.98
2	A-114-A) Matville - Biers Run 345 kV Loop-In	8.67	11.42
3	A-115-A) Matville - Bixby 345 kV Loop-In	9.67	11.42
4	A-126-C) Cole - Hayden 345 kV	36.83	55.35
5	A-127-B) Cole - Beatty 345 kV	37.5	54.21
6	A-12-A) Newlove - Matville 765 kV	168.16	207.9
7	A-132-A) Celtic - Marysville 345 kV	73.69	144.99
8	A-136-A) Buckeye Lake - Johnstown 765 kV	119.83	138.6
9	A-136-B) Matville - Beatty 345 kV	44.05	66.94
10	A-140-B) Newlove - Melissa 138 kV	13.17	13.45
11	A-140-C) Newlove - Melissa 138 kV	8.56	7.96
12	A-143-A) Martindale - Newlove (Indiana Portion) 765 kV	98.63	126
13	A-143-B) Martindale - Newlove (Ohio Portion) 765 kV	351.38	453.6

14	A-145-A) New Gwynneville (765kV substation) - Gwynneville 345 kV T-Line	19.09	36.45
15	A-145-A) New Gwynneville (765kV substation) - Gwynneville 345 kV T-Line	160.67	207.9
16	A-17-B) Matville - Adkins 345 kV Loop-In	9.93	14.78
17	A-18-A) Matville - Buckeye Lake 765 kV	200.71	226.8
18	A-20-A) Bixby/Kirk - West Millersport 345 kV Loop-In	26.42	45.04
19	A-21-A) Bixby/Ohio Central - West Millersport 345 kV Loop-In	28.2	34.48
20	A-70-A) Matville - Atlanta 345 kV Loop-In	11.84	16.87
21	A-11-B) Newlove 765 kV Substation	234.77	366.5
22	A-142-B) Gwynneville 765 kV Substation	223.09	339.57
23	A-135-A) Johnstown 765 kV Substation	116.26	130.52
24	A-144-A) Martindale 765 kV Substation	171.87	367.79
25	A-19-B) Buckeye Lake 765 kV Substation	210.18	210.18
26	A-13-E) Matville 765kV Substation	255.82	343.96
27	A-103-A) North Titus Melissa - London 138 kV double circuit/London - Beatty 138 kV single circuit	57.19	91.66
28	A-14-A) Marysville - Matville 765 kV Loop-In	2.64	12.7
29	A-72-A) Matville - Flatlick 765 kV Loop-In	2.5	12.41
30	A-155-A) Jefferson – Greentown 765 kV Loop-In	3.96	8.15
31	A-156-A) Tanners Creek - Desoto 345 kV Loop-In	2.61	3.04
32	A-157-A) Tanners Creek – Losantville 345 kV Loop-In	3.47	3.89
33	A-108-A) Melissa substation upgrades	4.56	3.62
34	A-112-A) Madison substation upgrades	6.65	8.89
35	A-118-C) West Millersport substation upgrades	19.94	15.96
36	A-119-B) Bixby terminal equipment upgrades	2.49	3.52
37	A-124-B) Cole substation upgrade	3.32	6
38	A-125-A) Hayden substation upgrade	13.35	19.31
39	A-131-B) Celtic substation upgrade	6.65	8.49
40	A-139-A) Cosgray 345 kV substation upgrade	3.54	5.11
41	A-150-A) Bethel circuit breaker replacement	1.52	1.32
42	A-151-A) Babbit circuit switcher replacement	0.76	0.95
43	A-15-B) Marysville substation upgrade	77.72	77.72
44	A-23-A) Kirk substation upgrade	2.49	3.52
45	A-149-A) Beacon substation upgrade	3.54	4.29
46	A-154-A) Gwynneville (DEI) substation upgrade	7.44	7.66
47	A-158-A) Greentown substation upgrade	6.75	23.64
48	A-159-A) Dublin reactor addition	1.14	9.03
49	A-160-B) Beatty substation upgrades	9.5	31.4
50	A-161-A) Wilson series reactor addition	1.14	7.19
51	A-162-A) Roberts	1.14	7.14
	Total	2921.53	4087.27

The proposal cost estimate is within 21-30% of the independent cost estimate and is considered **Medium** risk.

Schedule Review

This proposal has a projected in-service date of December 2031.

The major schedule risks identified for Proposal 152 include the significant ROW/land acquisition risks, and regulatory risks assessed for the project. The scheduling risk is assessed as **Medium-High**.

Proposing Entity Experience and Capability Review

Exelon's affiliate ComEd, has experience operating and designing 765 kV transmission, which represents the most significant scope proposed. Accordingly, the proposing entity experience and capability risk is assessed **Low-Medium**.

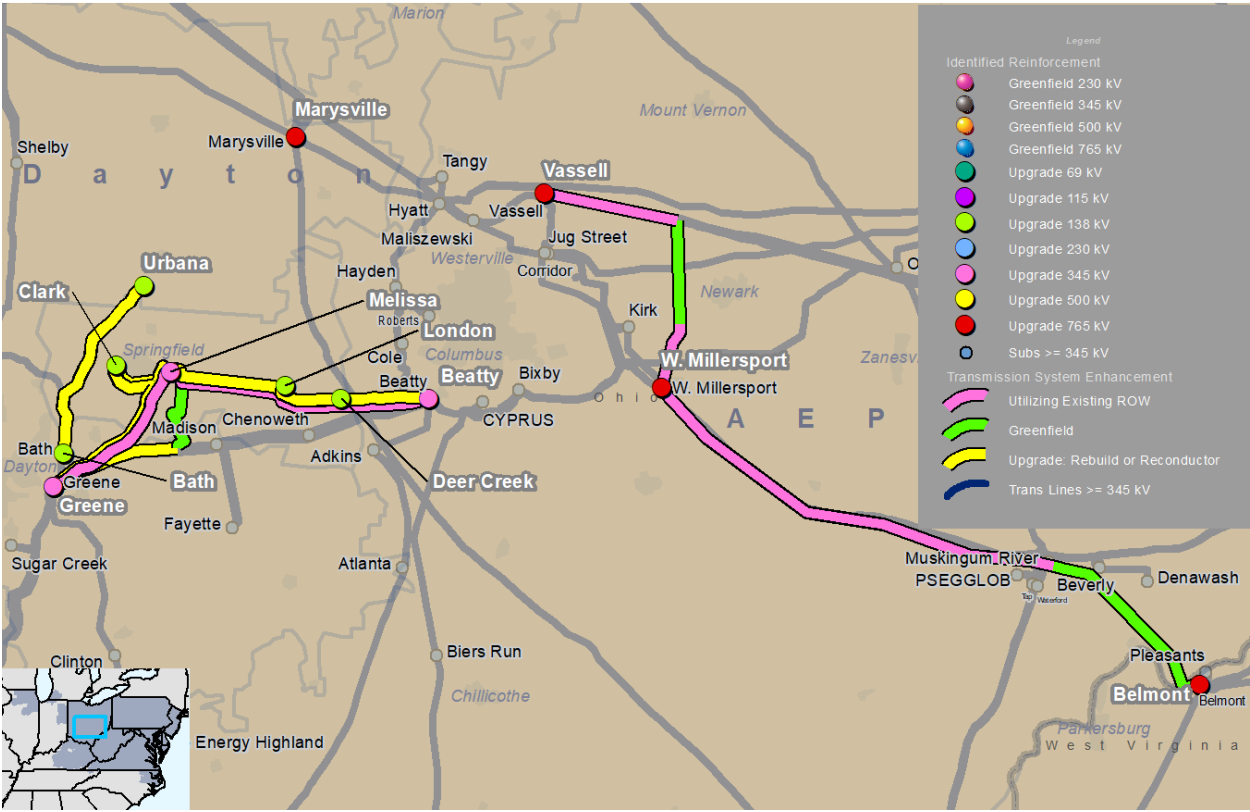
Proposal 239 – 345 kV Solution Phase 1 and Phase 2 (Transource/FE-ATSI)

The objective of this project is to construct multiple 345 kV transmission lines. The first line goes from the existing Bath Substation in Greene County, Ohio to the existing Urbana Substation in Champaign County, Ohio. The next transmission line goes from the existing Greene Substation in Greene County, Ohio to the new Melissa Substation in Clark County, Ohio. Then, finally, to the existing Beatty Substation in Franklin County, Ohio. The third and final line will go from the existing Vassell Substation in Delaware County, Ohio to the existing West Millersport Substation in Fairfield County, Ohio, and to the existing Belmont Substation in Pleasants County, West Virginia. This project will traverse 11 counties (Greene, Clark, Champaign, Madison, Franklin, Delaware, Licking, Fairfield, Perry, Morgan, Washington) in Ohio, and one county (Pleasants) in West Virginia.

This proposal has a total of 23 components, including eight substation upgrade components, two greenfield substation components, three greenfield transmission line components covering 132.5 miles, and ten transmission line upgrade components covering 154.5 miles.

Map 21 displays the components and routes proposed for proposal 239.

Map 21. Proposal 239



*NOTE: 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.*

Project Overview

ATSI Proposal 239 includes the following components:

- Component 1. Melissa Substation 345 kV Switchyard - Phase 1
- Component 2. Melissa Substation 345 kV Switchyard Expansion - Phase 2
- Component 3. Greene - Melissa 345 kV Line [Phase 1]
- Component 4. Greene - Clark 138 kV Line [Phase 1]
- Component 5. Melissa - Beatty 345 kV Line [Phase 1]
- Component 6. Beatty - Deer Creek 138 kV Line [Phase 1]
- Component 7. Deer Creek - London 138 kV Line [Phase 1]
- Component 8. Greene Substation (DP&L) 345 kV [Phase 1]
- Component 9. Beatty Substation (AEP) 345 kV [Phase 1]
- Component 10. Greene (DP&L) - Melissa - Madison (AEP) 345 kV Line [Phase 2]
- Component 11. Greene (DP&L) - Melissa - Madison (AEP) 345 kV Line - - Rebuild [Phase 2]
- Component 12. Greene Substation (DP&L) 345 kV [Phase 2]

Constructability Review

Right-of-Way/Land Acquisition Risk Analysis

Belmont - West Millersport 765 kV Line

The Belmont-West Millersport 765 Transmission Line is an approximately 81-mile line that will be constructed from the existing Belmont Substation, in Pleasants County, West Virginia to the existing West Millersport Substation, in Fairfield County, Ohio. The line will traverse one county (Pleasants) in West Virginia and four counties (Washington, Morgan, Perry, and Fairfield) in Ohio. The total route is 81 miles, with a proposed right-of-way of 200 feet. The entire line will be greenfield; however, the line will parallel existing right-of-way for the majority of the route.

Land acquisition will be required along the entire line. There are multiple residences with the proposed line corridor. The line corridor also crosses the Wayne National Forest, the Muskingum River Navigation Historic District, and the Wolf Creek Wildlife Area.

West Millersport - Vassell 765 kV Line

The West Millersport-Vassell 765 Transmission Line is an approximately 38-mile line that will be constructed from the existing West Millersport Substation, in Fairfield County, Ohio to the existing Vassell Substation, in Delaware County, Ohio. The line will traverse three counties (Fairfield, Licking, and Delaware) in Ohio. The total route is 38 miles, with a proposed right-of-way of 200 feet. The entire line will be greenfield; however, the line will parallel existing right-of-way for the majority of the route.

Land acquisition will be required along the entire line. There are numerous residences with the proposed line corridor. The line corridor also crosses directly over the Granville High School baseball field, the National Raceway, and the Rattlesnake Ridge Golf Club.

Greene - Melissa 345 kV Line [Phase 1]

Greene-Melissa 345 kV Line (Phase 1) is an approximately 22.1-mile rebuild of portions of the existing Greene-AD1-140 138 kV line, AD1-140-Clark 138 kV line, and Clark-East Springfield 138 kV line to build the new Greene-Melissa 345 kV Line, from the existing Greene Substation, in Greene County, Ohio, to the proposed Melissa Substation, in Clark County, Ohio. The component will traverse two counties (Greene and Clark) in Ohio. The total route is approximately 22.1 miles. Nearly the entire project will be within the existing ROW. The ROW is proposed to be 100 feet.

Melissa - Beatty 345 kV Line [Phase 1]

Melissa-Beatty 345 kV Line (Phase 1) is an approximately 34-mile rebuild of portions of the existing East Springfield-London 138 kV line, London-Deer Creek 138 kV Line, and Deer Creek-Beatty 138 kV line, from the proposed Melissa Substation, in Clark County, Ohio, to the existing Beatty Substation, in Franklin County, Ohio. The component will traverse three counties (Clark, Madison, and Franklin) in Ohio. The total route is approximately 34 miles. Nearly the entire project will be within the existing ROW. The ROW is proposed to be 150 feet.

Greene(DP&L) - Melissa - Madison(AEP) 345 kV Line [Phase 2]

Greene (DP&L)-Melissa-Madison (AEP) 345 kV Line (Phase 2) is an approximately 13.5-mile 345 kV line that will be constructed from a cut in location on the Greene (DP&L)-Madison (AEP) 345 kV line, in Greene County, Ohio to the proposed 345 kV Melissa Substation, in Clark County, Ohio. The line will traverse two counties (Greene and Clark) in Ohio. The total route is 13.5 miles, with a proposed right-of-way of 150 feet. The entire line will be greenfield.

Overall, a **Medium-High** risk is assessed for ROW/Land Acquisition due to the mix of greenfield and paralleling existing ROW for the alignment of the proposed projects.

Environmental Risk Analysis*Greene - Melissa 345 kV Line [Phase 1]*

The proposed component has the potential to impact environmental resources including FEMA floodplains, floodways, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting; woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Impacts to these resources will require coordination with the appropriate county floodplain administrator; coordination with state wildlife agencies, USACE and USFWS. Proposed route does not intersect designated Critical Habitat. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 7 conservation easements. Coordination with easement holders, NRCS and Tecumseh Land Trust, will be required. Proposed route intersects mapped karst geology. Geotechnical studies are needed to verify subsurface conditions prior to digging or trenching.

The component crosses approximately 2 railroads, 1 owned by Norfolk Southern Railway Company and 1 owned by Indiana & Ohio Railway. There are approximately 24 road and highway crossings (48 entrances) across 2 counties

(Green and Clark); approximately 9 transmission line crossings, 6 owned by DAYTON POWER & LIGHT CO (one is a parallel encroachment spanning approximately 20 miles), 3 with an unknown owner (one is a parallel encroachment spanning approximately 2 Miles); and approximately 2 pipeline crossings, 1 operated by MARATHON PIPE LINE, and 1 operated by Columbia Gas Trans Co. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Greene and Clark County in OH. State CPCN and DOT utility, driveway and right of way permits may be required.

Melissa - Beatty 345 kV Line [Phase 1]

Proposed route intersects 7 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Clark; Madison and Franklin counties, OH. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed route intersects designated Critical Habitat for the following species: Rayed Bean and Snuffbox mussel. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. The proposed route intersects designated Scenic Rivers/Scenic Trails. Coordination with the following agencies is required: Columbus and Franklin County Metro Parks. Designated Trout Waters Not Present

Proposed route intersects 1 railroads owned by Norfolk Southern Railway Company. There are approximately 29 road crossings; 9 road crossings and 3 highway crossings in Clark County, 8 road crossings and 4 highway crossings in Madison County, and 5 road crossings in Franklin County. There are approximately 8 transmission lines identified; 4 unknown owners, 2 owned by OHIO POWER CO and 2 owned by AMERICAN ELECTRIC POWER CO., INC. Proposed route intersects 2 pipelines; 1 owned by MARATHON PIPE LINE & 1 owned by Columbia Gas Trans Co. There was 1 metro park crossings owned by Columbus and Franklin County Metro Parks. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from the 3 counties in OH. State Approval of Electric Transmission Lines, and DOT utility permits are required.

Greene (DP&L) - Melissa - Madison (AEP) 345 kV Line [Phase 2]

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting; woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Impacts to these resources will require coordination with the appropriate county floodplain administer; coordination with state wildlife agencies, USACE and USFWS. Proposed route does not intersect designated Critical Habitat. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 13 conservation easements. Coordination with easement holders will be required.

Proposed route intersects mapped karst geology. Geotechnical studies are needed to verify subsurface conditions prior to digging or trenching.

The component crosses approximately 2 railroads, 1 owned by Norfolk Southern Railway Company and 1 owned by Indiana & Ohio Railway; approximately 14 roads and 2 highways (32 entrances) in Clark County; approximately 5 transmission lines, 2 owned by DAYTON POWER & LIGHT CO, and 3 owned by an unknown owner; and approximately 2 pipelines, 1 owned by MARATHON PIPE LINE, and 1 owned by Columbia Gas Trans Co. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Greene and Clark County in OH. State CPCN and DOT utility, driveway and right of way permits may be required.

Belmont - West Millersport 765 kV Line

The proposed route intersects with the following recorded Historical Sites/Structures/Districts: Muskingum River Navigation District; Rushville Historic District. Coordination with the OH SHPO is required. Proposed route intersects 29 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Fairfield; Perry; Morgan; Washington counties in OH. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed route does not intersect designated Critical Habitat. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 10 conservation easements. Coordination with the following easement holder(s) is required: NRCS-OH; Ohio Dept of Agriculture; Wayne National Forest; American Electric Power-Muskingum Mine; Arrowhead Golf Course; Lakeside Golf Course; Wolf Creek Wildlife Area; Farm and Ranch Lands Protection Program - Fairfield, OH; Clean Ohio Farmland 149, Clean Ohio Farmland 150, and Clean Ohio Farmland 151. The proposed route intersects Natural Areas/Reserves/Wildlife Refuge. Coordination with the following agencies is required: American Electric Power - Muskingum Mine; Arrowhead Golf Course; Lakeside Golf Course; Wolf Creek Wildlife Area. Designated Trout Waters Not Present

There is approximately 7 railroad crossings, 1 with CSXT, 3 with Kanawha River Railroad, and 3 with BIP. There is approximately 227 road and highway crossings (254 entrances) across 5 counties. 16 in WV, and 211 in OH. There is approximately 27 transmission line crossings, 3 with AMERICAN ELECTRIC POWER CO., INC, 9 with MONONGAHELA POWER CO, 14 with OHIO POWER CO, and 1 with no owner available. There is approximately 14 pipeline crossings, 8 with Columbia Gas Trans Co, 2 with East Ohio Gas Co, 1 with Tennessee Gas Pipeline, 1 with ENTERPRISE PRODUCTS, and 2 with Texas Eastern Trans Co. There is 2 cemeteries within the proposed route, Stevenson Cemetery and Avlon United Brethren Church Cemetery. There is approximately 5 easements owned by PVT, Farm and Ranch Lands Protection Program (FRPP), Fairfield, OH, Clean Ohio Farmland 149, Clean Ohio Farmland 150, Clean Ohio Farmland 151, Oda-Fai-2011-004. There is approximately 5 recreation areas within the proposed route, Wayne National Forest, American Electric Power - Muskingum Mine, Arrowhead Golf Course, Lakeside Golf Course, Wolf Creek Wildlife Area. It is anticipated that the proposal requires permits, consultations,

clearances and authorization from 5 counties in WV and OH. State CPCN and DOT utility, driveway and right of way permits may be required

West Millersport - Vassell 765 kV Line

"The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting. Impacts to these resources will require coordination with the USACE and appropriate Floodplain Administrators, especially in the 2 floodplain crossings. The proposed route intersects woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Proposed route does not intersect designated Critical Habitat. However, the potential for federally listed endangered/threatened species to occur within the route corridor does exist. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. The route intersects 1 conservation easement held by the Fairfield Land Preservation Association, who will need to be contacted."

The component crosses approximately 1 railroad owned by Columbus and Ohio River Railroad, approximately 95 roads and 7 highways (204 entrances); approximately 13 transmission lines, 6 owned by OHIO POWER CO, 2 owned by AMERICAN ELECTRIC POWER CO. INC, and 4 owned by an unknown owner; and approximately 7 pipelines, 2 owned by MARATHON PIPE LINE, 1 owned by ENTERPRISE PRODUCTS, 1 owned by Dominion Transmission Co, 1 owned by Rockies Express Pipeline, and 2 owned by Columbia Gas Trans Co. There is 1 recreation Trail, TJ Evans Trail. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Delaware, Fairfield and Licking County in OH. State CPCN and DOT utility, driveway and right of way permits may be required.

Transmission Line Risk Analysis

Belmont - West Millersport 765 kV Line

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Approximately one electrical crossing below 69kV poses risk to schedule due to coordinating outages.
- Multiple electrical crossings above 69 kV pose risk to schedule due to coordinating outages.
- There are approximately five underground utility crossings that may require additional coordination for construction and impact the proposed locations for new structures which will pose risk to schedule, cost, and design.

West Millersport - Vassell 765 kV Line

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Approximately ten electrical crossing below 69 kV poses a risk to schedule due to coordinating outages.
- No crossings above 69 kV noted in documentation provided, however they are likely and will pose risk to schedule due to coordinating outages.
- There are approximately 5 underground utility crossings that may require additional coordination for construction and impact the proposed locations for new structures which will pose risk to schedule, cost, and design.

Constructability Summary

The proposal contains greenfield transmission lines and substations, as well as substation expansion components and a transmission line rebuild. The main constructability risks are land acquisition, and constraints encountered by the proposed line routes. **Medium** constructability risks are assessed for this proposal.

Outage Review

Due to the primary greenfield nature of this project, only short outages to existing facilities will be required to tie in the new transmission facilities, and therefore no significant existing facility outages are anticipated. Overall outage coordination risk is deemed **Low**.

Cost Review

As part of the detailed constructability analysis, an independent consultant prepared a high-level conceptual, independent cost estimate for the components of this proposal. The independent consultant assumes a level of effort and accuracy consistent with AACE International's Recommended Practice 17R-97, Cost Estimate Classification System, Class 3 with an expected accuracy of -20% to +40% from the base total estimate. Estimates will use available industry and materials. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering, and construction. The independent cost estimate includes a 30% contingency, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates is provided below.

	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
1	Melissa Substation 345 kV switchyard - Phase 1	33.75	23.62
2	Melissa Substation 345 kV switchyard expansion - Phase 2	8.96	13.06
3	Greene - Melissa 345 kV Line [Phase 1]	95.02	106.29
4	Greene - Clark 138 kV Line [Phase 1]	Combined with Component 3	Combined with Component 3
5	Melissa - Beatty 345 kV Line [Phase 1]	134.60	126.32
6	Beatty - Deer Creek 138 kV Line [Phase 1]	Combined with Component 5	Combined with Component 5
7	Deer Creek - London 138 kV Line [Phase 1]	Combined with Component 5	Combined with Component 5
8	Greene Substation (DP&L) 345 kV [Phase 1]	Combined with Component 3	Combined with Component 3
9	Beatty Substation (AEP) 345 kV [Phase 1]	Combined with Component 5	Combined with Component 5
10	Greene (DP&L) - Melissa – Madison (AEP) 345 kV Line [Phase 2]	58.05	95.35
11	Greene (DP&L) - Melissa – Madison (AEP) 345 kV Line - - Rebuild [Phase 2]	58.39	93.93

12	Greene Substation (DP&L) 345 kV [Phase 2]	Combined with Component 10	Combined with Component 10
13	Madison Substation (AEP) 345 kV [Phase 2]	Combined with Component 10	Combined with Component 10
14	Belmont Substation 765 kV Expansion	46.81	139.74
15	West Millersport 765/345 kV Substation	74.61	199.23
16	Belmont - West Millersport 765 kV Line	489.04	579.11
17	Vassell Substation 765 kV Expansion	23.23	93.82
18	West Millersport - Vassell 765 kV Line	229.43	272.81
19	Marysville Substation 765 kV STATCOM	104.65	208.94
20	Greene - Clark 138 kV Line Rebuild	32.74	30.02
21	East Springfield - Clark 138 kV Line Rebuild	Combined with Component 20	Combined with Component 20
22	Clark - East Springfield 138 kV [Phase 1]	Combined with Component 3	Combined with Component 3
23	Rebuild the Bath - Urbana 138 kV Line	103.13	53.24
Total		1492.41	2035.48

The proposal cost estimate is within 21-30% of the independent cost estimate and is considered **Medium** risk.

Schedule Review

This proposal has a projected in-service date of June 1, 2030.

The greatest schedule risks to this project are associated with the permitting and land acquisition risks, which are mitigated to a moderate degree by use of FirstEnergy's ROW for some of the proposed transmission line projects. Overall, the overall Schedule risk is assessed as **Medium**.

Proposing Entity Experience and Capability Review

Transource, as an affiliate of AEP Transmission, has significant experience constructing and operating 765 kV transmission which represents the significant scope for Proposal 331. The proposing entity experience and capability risk is considered **Low**.

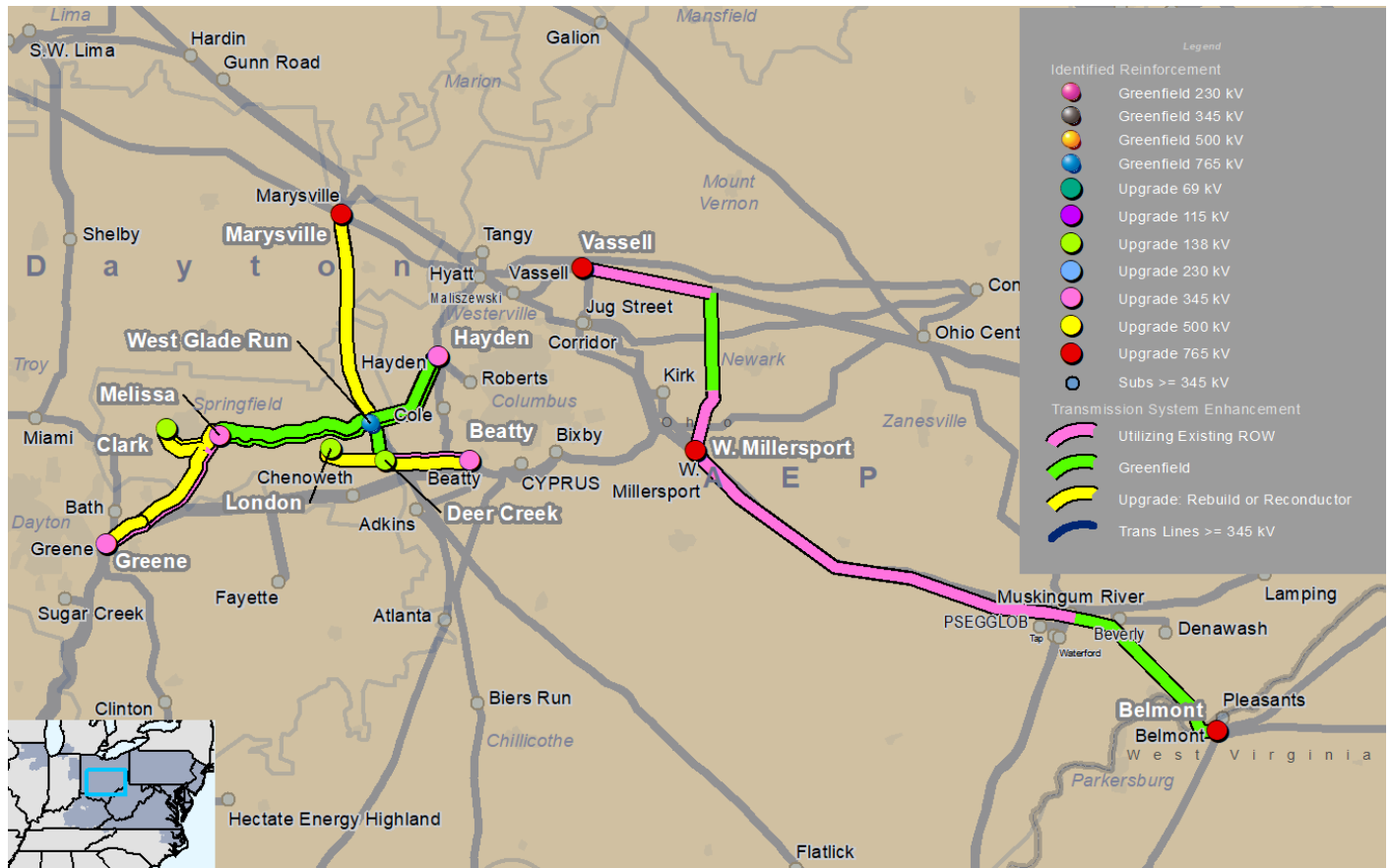
Proposal 334 – West Glade Run 765/345 kV Solution (Transource/FE-ATSI)

The project objective is to construct multiple 765/345 kV lines covering approximately 242.02 miles. The first transmission line ranges from existing Greene Substation in Greene County, Ohio to the existing Melissa Substation in Clark County, Ohio, then to the new West Glade Run Substation in Madison County, Ohio then finally to the existing Hayden Substation in Franklin County, Ohio as well as extending to the existing Beatty Substation in Franklin County, Ohio. The second line runs from the existing Vassell Substation in Delaware County, Ohio to the existing West Millersport Substation in Fairfield County, Ohio, and finally to the existing Belmont Substation in Pleasants County, West Virginia. This project will traverse one county (Pleasants) in West Virginia, and ten counties (Greene, Clark, Madison, Franklin, Delaware, Licking, Fairfield, Perry, Morgan, Washington) in Ohio.

This proposal has a total of 24 components, including nine substation upgrade components, two greenfield substation components, seven greenfield transmission line components making up 184.4 miles, and six transmission line upgrade components making up approximately 57.62 miles.

Map 22 displays the components and routes proposed for proposal 334.

Map 22. Proposal 334



NOTE: 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.

Project Overview

ATSI Proposal 334 includes the following components:

- Component 1. West Glade Run 765 kV and 345 kV Yards and Transformation
- Component 2. Melissa 345 kV Yard
- Component 3. Greene Substation Expansion (DPL)
- Component 4. Flatlick Substation: Replace Line Relaying (AEP)
- Component 5. Marysville Substation: Replace Line Relaying (AEP)
- Component 6. West Glade Run - Melissa 345 kV No. 1 and No. 2 Lines
- Component 7. Clark - East Springfield 138 kV Line (Accommodate new Greene - Melissa 345 kV Line)
- Component 8. Greene - Melissa 345 kV Line
- Component 9. Greene - Clark 138 kV Line (Accommodate new Greene - Melissa 345 kV Line)
- Component 10. West Glade Run - Beatty 345 kV Line
- Component 11. Beatty - Deer Creek 138 kV Line (Accommodate new West Glade Run - Beatty 345 kV Line)
- Component 12. West Glade Run - Hayden 345 kV No. 1 and No. 2 Lines
- Component 13. Beatty Substation Expansion (AEP)
- Component 14. Hayden Substation Expansion (AEP)
- Component 15. Marysville 765 kV STATCOM (AEP)
- Component 16. Loop Marysville - Flatlick 765 kV Line into West Glade Run Substation
- Component 17. East Springfield - Clark 138 kV EOL Line Rebuild (2032)
- Component 18. Greene - Clark 138 kV EOL Line Rebuild (2032)
- Component 19. Deer Creek - London 138 kV EOL Line Rebuild (2032)

Constructability Review

Right-of-Way/Land Acquisition Risk Analysis

West Glade Run 765 kV and 345 kV Yards and Transformation

The West Glade Run 765 kV and 345 kV yard is a proposed 23 acre greenfield substation located in Madison County, Ohio. The West Glade Run 765 and 345 kV transmission lines will connect into the yard. The proposed site is an agricultural field.

West Glade Run - Melissa 345 kV No. 1 and No. 2 Lines

The West Glade Run – Melissa 345 kV No. 1 and No.2 Lines is approximately 21.6 miles long and will be constructed from the West Glade Run Substation in Madison County, Ohio to the Melissa Substation in Clark County, Ohio. The No.1 and No. 2 transmission lines will be built adjacent in shared ROW and parallel to the existing 138 kV ROW. The line will traverse two counties (Madison and Clark) in Ohio. The proposed transmission line crosses an interstate highway and is 0.6 miles south of the Madison County Airport.

Greene - Melissa 345 kV Line

The Greene – Melissa 345 kV transmission line is approximately 22.1 miles long and will be constructed from the Greene Substation in Greene County, Ohio to the Melissa Substation in Clark County, Ohio. The line will traverse two counties (Greene and Clark) in Ohio. The proposed transmission line crosses an interstate highway crossing, several US and county road crossings, and two rail track crossings. The component is a rebuild project and will use the existing 138 kV transmission line ROW.

West Glade Run - Beatty 345 kV Line

The West Glade Run – Beatty 345 kV transmission line is approximately 17 miles long and will be constructed from the West Glade Run Substation in Madison County, Ohio to the Beatty Substation in Franklin County, Ohio. The line will traverse two counties (Madison and Franklin) in Ohio. Approximately 11 miles (65%) of 138 kV corridor will be rebuilt and approximately six miles (35%) will be greenfield. The proposed transmission line crosses four state highways, one rail track, and one Ohio Scenic River (Big Darby Creek).

West Glade Run - Hayden 345 kV No. 1 and No. 2 Lines

The West Glade Run – Hayden 345 kV No. 1 and No. 2 Lines are approximately 15 miles long and will be constructed from the West Glade Run Substation in Madison County, Ohio, to the Hayden Substation in Franklin County, Ohio. The greenfield transmission line will traverse two counties (Madison and Franklin) in Ohio. The proposed transmission line crosses an interstate highway, three US highway crossings, and crossing Big Darby Creek.

Loop Marysville - Flatlick 765 kV Line into West Glade Run Substation

The Loop Marysville – Flatlick 765 kV transmission line is approximately 0.7 miles long and will be constructed from the Marysville Substation in Union County, Ohio to the West Glade Substation in Madison County, Ohio. The line will traverse two counties (Union and Madison) in Ohio.

Belmont - West Millersport 765 kV Line

The Belmont – West Millersport 765 kV transmission line is approximately 81 miles long and will be constructed from the Belmont Substation in Pleasants County, West Virginia to the West Millersport Substation in Fairfield County, Ohio. The line will traverse five counties (Washington, Morgan, Perry, Lorain, and Fairfield) in Ohio and one county (Pleasants) in West Virginia. The proposed transmission line will parallel existing 138 kV, 345 kV, and 765 kV for most of the route with deviations to avoid developed areas or other constraints. The proposed transmission line encroaches on parklands, residences, commercial, and industrial areas; crosses the Wayne National Forest and the Wolf Creek Wildlife Area; crosses the Ohio River and seven crossings of the Muskingum River; and eight railroad crossings.

West Millersport - Vassell 765 kV Line

The West Millersport – Vassell 765 kV transmission line is approximately 38 miles long and will be constructed from the West Millersport Substation in Fairfield County, Ohio, to the Vassell Substation in Delaware County, Ohio. The line will traverse three counties (Delaware, Licking, and Fairfield) in Ohio. The proposed transmission line will parallel existing 138 kV, 345 kV, and 765 kV ROW for most of the route, with short deviations to avoid developed areas or

other constraints. The proposed transmission line encroaches on parklands, residences, two concentrated animal feeding operations, commercial, and industrial areas, as well as crossing the national Trail Raceway, and is within 0.1 mile from the end of the runway of the Buckeye Intra-national Airport.

Overall, a **Medium-High** ROW/Land Acquisition risk is assessed for proposal 334 due to the mix of greenfield and paralleling existing ROW for the alignment of the proposed projects.

Environmental Risk Analysis

West Glade Run 765 kV and 345 kV Yards and Transformation

The proposed substation footprint intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching.

The permitting risk for the proposed substation is low. It is anticipated that the proposal could require permits, consultations, clearances and authorization from the county. State CPCN and DOT utility, driveway and right of way permits may be required.

West Glade Run - Melissa 345 kV No. 1 and No. 2 Lines

The proposed component has the potential to impact environmental resources including 1 FEMA floodplain, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting. Impacts to these resources will require coordination with the USACE and appropriate Floodplain Administrators. The proposed route intersects woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Tree removal restrictions may apply due to the likelihood of the presence of listed bat species. Field verification of suitable bat habitat is recommended to determine presence. Proposed route does not intersect designated Critical Habitat. However, the potential for federally listed endangered/threatened species to occur within the route corridor does exist. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 3 conservation easements. Coordination with easement holders, including the NRCS (FRPP and ACEP programs), will be required. Proposed route intersects mapped karst geology. Geotechnical studies are needed to verify subsurface conditions prior to digging or trenching.

The component crosses approximately 17 roads and 2 highways in Clark and Madison County; approximately, 5 transmission lines, 2 owned by OHIO POWER CO, 3 owned by an unknown owner ; approximately 1 pipeline owned by MARATHON PIPE LINE. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Madison and Clark County in OH. State CPCN and DOT utility, driveway and right of way permits may be required.

Greene - Melissa 345 kV Line

The proposed component has the potential to impact environmental resources including FEMA floodplains, floodways, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting; woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Impacts to these resources will require coordination with the appropriate county floodplain administrator; coordination with state wildlife agencies, USACE and USFWS. Proposed route does not intersect designated Critical Habitat. However, there are

federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 7 conservation easements. Coordination with easement holders, NRCS and Tecumseh Land Trust, will be required. Proposed route intersects mapped karst geology. Geotechnical studies are needed to verify subsurface conditions prior to digging or trenching.

The component crosses approximately 2 railroads, 1 owned by Norfolk Southern Railway Company and 1 owned by Indiana & Ohio Railway. There are approximately 24 road and highway crossings (48 entrances) across 2 counties (Green and Clark); approximately 9 transmission line crossings, 6 owned by DAYTON POWER & LIGHT CO (one is a parallel encroachment spanning approximately 20 miles), 3 with an unknown owner (one is a parallel encroachment spanning approximately 2 Miles); and approximately 2 pipeline crossings, 1 operated by MARATHON PIPE LINE, and 1 operated by Columbia Gas Trans Co. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Greene and Clark County in OH. State CPCN and DOT utility, driveway and right of way permits may be required.

Belmont - West Millersport 765 kV Line

The proposed route intersects with the following recorded Historical Sites/Structures/Districts: Muskingum River Navigation District; Rushville Historic District. Coordination with the OH SHPO is required. Proposed route intersects 29 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Fairfield; Perry; Morgan; Washington counties in OH. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed route does not intersect designated Critical Habitat. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 10 conservation easements. Coordination with the following easement holder(s) is required: NRCS-OH; Ohio Dept of Agriculture; Wayne National Forest; American Electric Power-Muskingum Mine; Arrowhead Golf Course; Lakeside Golf Course; Wolf Creek Wildlife Area; Farm and Ranch Lands Protection Program - Fairfield, OH; Clean Ohio Farmland 149, Clean Ohio Farmland 150, and Clean Ohio Farmland 151. The proposed route intersects Natural Areas/Reserves/Wildlife Refuge. Coordination with the following agencies is required: American Electric Power - Muskingum Mine; Arrowhead Golf Course; Lakeside Golf Course; Wolf Creek Wildlife Area. Designated Trout Waters Not Present

There is approximately 7 railroad crossings, 1 with CSXT, 3 with Kanawha River Railroad, and 3 with BIP. There is approximately 227 road and highway crossings (254 entrances) across 5 counties. 16 in WV, and 211 in OH. There is approximately 27 transmission line crossings, 3 with AMERICAN ELECTRIC POWER CO., INC, 9 with MONONGAHELA POWER CO, 14 with OHIO POWER CO, and 1 with no owner available. There is approximately 14 pipeline crossings, 8 with Columbia Gas Trans Co, 2 with East Ohio Gas Co, 1 with Tennessee Gas Pipeline, 1 with ENTERPRISE PRODUCTS, and 2 with Texas Eastern Trans Co. There is 2 cemeteries within the proposed

route, Stevenson Cemetery and Avlon United Brethren Church Cemetery. There is approximately 5 easements owned by PVT, Farm and Ranch Lands Protection Program (FRPP), Fairfield, OH, Clean Ohio Farmland 149, Clean Ohio Farmland 150, Clean Ohio Farmland 151, Oda-Fai-2011-004. There is approximately 5 recreation areas within the proposed route, Wayne National Forest, American Electric Power - Muskingum Mine, Arrowhead Golf Course, Lakeside Golf Course, Wolf Creek Wildlife Area. It is anticipated that the proposal requires permits, consultations, clearances and authorization from 5 counties in WV and OH. State CPCN and DOT utility, driveway and right of way permits may be required.

West Millersport - Vassell 765 kV Line

"The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting. Impacts to these resources will require coordination with the USACE and appropriate Floodplain Administrators, especially in the 2 floodplain crossings. The proposed route intersects woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Proposed route does not intersect designated Critical Habitat. However, the potential for federally listed endangered/threatened species to occur within the route corridor does exist. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. The route intersects 1 conservation easement held by the Fairfield Land Preservation Association, who will need to be contacted.

The component crosses approximately 1 railroad owned by Columbus and Ohio River Railroad, approximately 95 roads and 7 highways (204 entrances); approximately 13 transmission lines, 6 owned by OHIO POWER CO, 2 owned by AMERICAN ELECTRIC POWER CO. INC, and 4 owned by an unknown owner; and approximately 7 pipelines, 2 owned by MARATHON PIPE LINE, 1 owned by ENTERPRISE PRODUCTS, 1 owned by Dominion Transmission Co, 1 owned by Rockies Express Pipeline, and 2 owned by Columbia Gas Trans Co. There is 1 recreation Trail, TJ Evans Trail. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Delaware, Fairfield and Licking County in OH. State CPCN and DOT utility, driveway and right of way permits may be required.

Transmission Line Risk Analysis

Belmont - West Millersport 765 kV Line

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Approximately one electrical crossing below 69kV poses risk to schedule due to coordinating outages.
- Multiple electrical crossings above 69 kV pose risk to schedule due to coordinating outages.
- There are approximately five underground utility crossings that may require additional coordination for construction and impact the proposed locations for new structures which will pose risk to schedule, cost, and design.

West Millersport - Vassell 765 kV Line

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Approximately ten electrical crossing below 69 kV poses a risk to schedule due to coordinating outages.

- No crossings above 69 kV noted in documentation provided, however they are likely and will pose risk to schedule due to coordinating outages.
- There are approximately 5 underground utility crossings that may require additional coordination for construction and impact the proposed locations for new structures which will pose risk to schedule, cost, and design.

Substation Risk Analysis

West Glade Run 765 kV and 345 kV Yards and Transformation

Construct a new West Glade Run 765 kV yard and 345 kV yard. Scope involves a four-breaker 765 kV ring bus, installing two 765/345 kV transformers, shunt reactors on 765 kV line terminations, establishing 345 kV BAAH configuration with eleven breakers, and two 150 MVAR capacitors in the new 345 kV yard at West Glade Run. Primary substation risks to this project involve procurement lead time required for the 765 kV equipment.

Constructability Summary

The proposal contains greenfield transmission lines and substations, as well as substation expansion components and a transmission line rebuild. The main constructability risks are land acquisition, and constraints encountered by the proposed line routes. **Medium** constructability risks are assessed for this proposal.

Outage Review

Due to the primary greenfield nature of this project and limited rebuild scope, mostly short outages to existing facilities will be required to tie in the new transmission facilities, and therefore no significant existing facility outages are anticipated. Overall outage coordination risk is deemed **Low**.

Cost Review

As part of the detailed constructability analysis, an independent consultant prepared a high-level conceptual, independent cost estimate for the components of this proposal. The independent consultant assumes a level of effort and accuracy consistent with AACE International's Recommended Practice 17R-97, Cost Estimate Classification System, Class 3 with an expected accuracy of -20% to +40% from the base total estimate. Estimates will use available industry and materials. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering, and construction. The independent cost estimate includes a 30% contingency, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates is provided below.

	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
1	West Glade Run 765 kV and 345 kV Yards and Transformation	217.59	298.14

2	Melissa 345 kV Yard	37.47	34.33
3	Greene Substation Expansion (DPL)	4.37	3.61
4	Flatlick Substation: Replace Line Relaying (AEP)	Combined with component 16	Combined with component 16
5	Marysville Substation: Replace Line Relaying (AEP)	Combined with component 16	Combined with component 16
6	West Glade Run - Melissa 345 kV No. 1 and No. 2 Lines	151.20	160.19
7	Clark - East Springfield 138 kV Line (Accommodate New Greene - Melissa 345 kV Line)	95.02	106.29
8	Greene - Melissa 345 kV Line	Combined with component 7	Combined with component 7
9	Greene - Clark 138 kV Line (Accommodate new Greene - Melissa 345 kV Line)	Combined with component 7	Combined with component 7
10	West Glade Run - Beatty 345 kV Line	68.30	57.45
11	Beatty - Deer Creek 138 kV Line (Accommodate new West Glade Run - Beatty 345 kV Line)	Combined with component 10	Combined with component 10
12	West Glade Run - Hayden 345 kV No. 1 and No. 2 Lines	64.50	102.11
13	Beatty Substation Expansion (AEP)	4.37	3.60
14	Hayden Substation Expansion (AEP)	7.89	6.43
15	Marysville 765 kV STATCOM (AEP)	104.65	210.37
16	Loop Marysville - Flatlick 765 kV Line into West Glade Run Substation	7.25	8.78
17	East Springfield - Clark 138 kV EOL Line Rebuild (2032)	32.74	28.93
18	Greene - Clark 138 kV EOL Line Rebuild (2032)	Combined with component 17	Combined with component 17
19	Deer Creek - London 138 kV EOL Line Rebuild (2032)	31.79	22.36
20	Belmont Substation Expansion (MP)	46.81	142.63
21	West Millersport Substation Expansion (AEP)	74.61	200.68
22	Belmont - West Millersport 765 kV Line	489.04	605.60
23	Vassell Substation Expansion (AEP)	23.23	93.82
24	West Millersport - Vassell 765 kV Line	229.43	268.34
	Total	1690.26	2353.66

The proposal cost estimate is within 21-30% of the independent cost estimate and is considered **Medium** risk.

Schedule Review

This proposal has a projected in-service date of June 1, 2030.

The greatest schedule risks to this project are associated with the permitting and land acquisition risks, which are mitigated to a moderate degree by use of FirstEnergy's ROW for some of the proposed transmission line projects. Overall, the overall Schedule risk is assessed as **Medium**.

Proposing Entity Experience and Capability Review

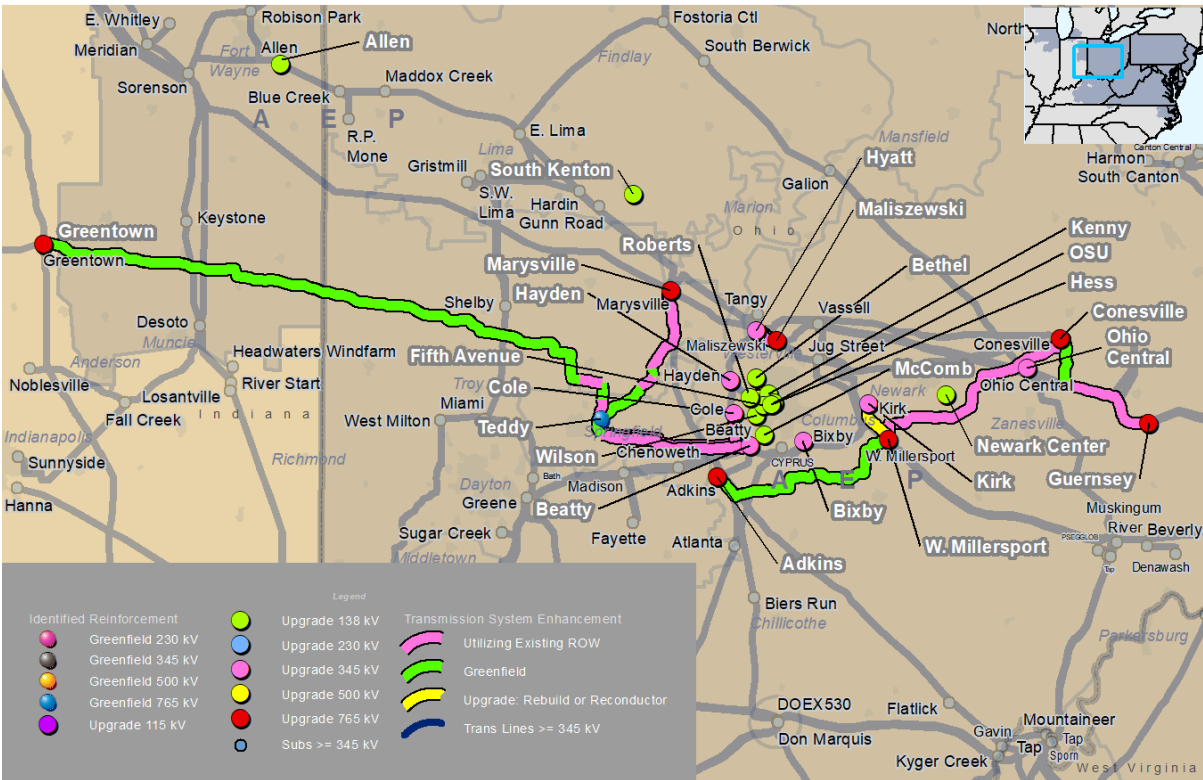
Transource, as an affiliate of AEP Transmission, has significant experience constructing and operating 765 kV transmission which represents the significant scope for Proposal 331. The proposing entity experience and capability risk is considered **Low**.

Proposal 570 – Ohio Seven Year Solution (Transource/FE-ATSI)

The objective of this project is to construct multiple transmission lines to address Ohio area violations. The total distance covered by the lines is approximately 359.54 miles. The first transmission line ranges from the existing Greentown Substation in Howard County, Indiana to the new Teddy Substation in Clark County, Ohio, the line then branches north towards the existing Marysville Substation in Union County, Ohio, and east to the existing Beatty Substation in Franklin County, Ohio, and then extends to the existing Cole Substation in Franklin County, Ohio. The second transmission line extends from the existing Adkins Substation in Pickaway County, Ohio, to the new West Millersport Substation in Fairfield County, Ohio, then continues to the existing Conesville Substation in Coshocton County, Ohio before finally extending to the existing Guernsey Substation in Guernsey County, Ohio. There is a total of five transmission lines that extend between unnamed substations (Hayden - Cole 345 kV, Hyatt - Maliszewski 345 kV [double circuit], Roberts - Kenny 138 kV, Wilson - 5th Avenue 138 kV, West Millersport-Kirk 345 kV). This project will traverse 4 counties (Howard, Grant, Blackford, Jay) in Indiana, and 13 counties (Darke, Shelby, Champaign, Clark, Madison, Franklin, Delaware, Pickaway, Fairfield, Licking, Muskingum, Coshocton, Guernsey) in Ohio. This proposal has a total of 38 components, including 16 substation upgrade components, two greenfield substation components, eight greenfield transmission line components covering approximately 336.2 miles, and 12 transmission line upgrade components covering approximately 23.34 miles.

Map 23 displays the components and routes proposed for proposal 570.

Map 23. Proposal 570



NOTE: 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.

Project Overview

Proposal 570 includes the following components:

- Component 1. Greentown Station Expansion
- Component 2. Greentown - Teddy 765 kV Line
- Component 3. Teddy 765/345 kV Station
- Component 4. Teddy - Marysville 765 kV
- Component 5. Marysville Station Upgrade
- Component 6. Teddy - Beatty DCT 345 kV
- Component 7. Cole Station Upgrade
- Component 8. Beatty Station Upgrade
- Component 9. Guernsey Station Upgrade
- Component 10. Guernsey - Conesville 765 kV
- Component 11. West Millersport Station Upgrade
- Component 12. Bixby - West Millersport 345 kV
- Component 13. Bixby Station Upgrade
- Component 14. West Millersport - Adkins 765 kV
- Component 15. West Millersport - Kirk 345 kV
- Component 16. Hyatt - Maliszewski Double Circuit 345 kV
- Component 17. Hayden - Cole 345 kV
- Component 18. Newark Center Station Upgrade
- Component 19. Ohio Central Extension
- Component 20. Allen Station Upgrade
- Component 21. Roberts - Kenny 138 kV Rebuild
- Component 22. Wilson - Fifth Avenue 138 kV line
- Component 23. McComb Station Upgrades
- Component 24. Bethel Station Upgrade
- Component 25. OSU Station Upgrade
- Component 26. Hess 138 kV Station Upgrade
- Component 27. South Kenton Station
- Component 28. Meadow Lake Station Circuit Breaker
- Component 29. Teddy - Cole 345 kV #2 Circuit
- Component 30. Conesville Station Expansion
- Component 31. Conesville - West Millersport 765 kV
- Component 32. Adkins Station Expansion
- Component 33. Ohio Central Station Upgrade
- Component 34. Kammer Dumont Structures
- Component 35. Ohio Central - Fostoria Central Structure
- Component 36. Gavin - Marysville Structures
- Component 37. East Springfield - London Structures
- Component 38. Beatty - Hayden Structures

Constructability Review

Right-of-Way/Land Acquisition Risk Analysis

Greentown - Teddy 765 kV Line

The Greentown - Teddy 765 kV transmission line is approximately 137 miles long and will be constructed from the Greentown Substation in Howard County, Indiana to the Teddy Substation in Clark County, Ohio. The greenfield transmission line will traverse four counties (Howard, Grant, Blackford, and Jay) in Indiana and five counties (Darke, Shelby, Miami, Champaign, and Clark) in Ohio. The ROW will parallel existing ROW of interstate highways, roads, transmission lines and pipelines to reduce potential impacts to natural and human environments. The transmission line crosses rural and agricultural lands, with scattered US highway crossings, and four river crossings.

Teddy 765/345 kV Station

The proposed greenfield Teddy 765 / 345 kV Substation is located in Clark County, Ohio. Approximately 80 acres is required for the substation site. The proposed substation site is rural and agricultural.

Teddy - Marysville 765 kV

The Teddy - Marysville 765 kV transmission line is approximately 35.4 miles long and will be constructed from the Teddy Substation in Clark County, Ohio to the Marysville Substation in Union County, Ohio. The line will traverse four counties (Union, Champaign, Madison, and Clark) in Ohio. The transmission line crosses a Tecumseh Land Trust easement, the Milford Center Railroad Prairie nature Preserve, two State Wild and Scenic rivers (Big Darby Creek, Little Darby Creek), and two rail track crossings..

Teddy - Beatty DCT 345 kV

The Teddy – Beatty DCT 345 kV transmission line is approximately 32 miles long and will be constructed from the Teddy Substation in Clark County, Ohio to the Beatty Substation in Franklin County, Ohio. The line will traverse three counties (Clark, Madison, Franklin) in Ohio. The transmission line crosses a Columbus/Franklin County Metro County Park, NRCS Wetland Reserve Program (WRP) easement, and several small neighborhoods.

Guernsey - Conesville 765 kV

The Guernsey - Conesville 765 kV transmission line is approximately 32 miles long and will be constructed from the Guernsey Substation in Guernsey County, Ohio to the Conesville Substation in Coshocton County, Ohio. The greenfield transmission line will traverse three counties (Coshocton, Muskingum, and Guernsey) in Ohio. The transmission line crosses the Muskingum River Navigation Historic District, an interstate and US highway, and one rail track crossing.

Bixby - West Millersport 345 kV

The Bixby – West Millersport 345 kV transmission line is approximately three miles long and will be constructed from the Structure 284 Ohio Central 345 kV in Licking County, Ohio to Structure 284 of the West Millersport 345 kV transmission line in Fairfield County, Ohio. The greenfield transmission line will traverse two counties

(Fairfield and Licking) in Ohio. The transmission line parallels existing transmission line ROW and crosses an easement held by the Fairfield Land Preservation Association.

West Millersport - Adkins 765 kV

The West Millersport - Adkins 765 kV transmission line is approximately 42 miles long and will be constructed from the West Millersport Substation in Fairfield County, Ohio to the Adkins Substation in Pickaway County, Ohio. The greenfield transmission line will traverse two counties (Pickaway and Fairfield) in Ohio. The transmission line crosses several private conservation easements, a rail track and US highway crossing, and the Scioto River.

Conesville - West Millersport 765 kV

The Conesville – West Millersport 765 kV transmission line is approximately 49.1 miles long and will be constructed from the Conesville Substation in Coshocton County, Ohio to the West Millersport Substation in Fairfield County, Ohio. The line will traverse three counties (Coshocton, Muskingum, and Licking) in Ohio. The transmission line crosses a Wetlands Reserve Easement, the Flint Ridge State Park, Dillon Wildlife/Recreation Area, Muskingum River Navigation Historic District, and three crossings of the Muskingum River. About 46 miles of the transmission line will be developed using existing 345 kV transmission rights of way between Conesville to West Millersport.

Overall, a **Medium-High** risk is assessed for ROW/Land Acquisition due to the mix of greenfield, paralleling existing ROW, and a portion of the 765 kV line routes utilizing existing ROW for the projects.

Environmental Risk Analysis

Greentown - Teddy 765 kV Line

The proposed component has the potential to impact environmental resources including FEMA floodplains, floodways, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting; woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Impacts to these resources will require coordination with the appropriate county floodplain administrator; coordination with state wildlife agencies, USACE and USFWS. Proposed route does not intersect designated Critical Habitat. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects no conservation easements. Coordination with easement holders will not be required.

This component would cross 8 railway crossings with Norfolk Southern Railway, CSXT and Indiana & Ohio Railway; approximately 188 roads and highways in Howard, Grant, Jay, Count in IN and in Clark, Champaign, Shelby and Darke County in OH; approximately 15 transmission line crossings owned by Dayton Power & Light Co, Indiana Michigan Power Co and with no owner available; approximately 12 pipeline crossings owned by BUCKEYE PARTNERS, Panhandle Eastern PL Co, MARATHON, ANR Pipeline Co, SUNOCO, ENTERPRISE

PRODUCTS and Columbia Gas Trans Co. There is 1 cemetery crossing, First Baptist Cemetery and 1 Recreation Area crossings, Clarence J. Brown Recreation Area along the proposed component route. It is anticipated that the proposal could require permits, consultations, clearances, and authorization from 8 counties in IN and OH. State CPCN and DOT utility, driveway and right of way permits may be required.

Teddy 765/345 kV Station

Desktop analysis indicates that the proposed substation intersects with farmland. Verification in the field would need to be completed. Proposed substation intersects mapped karst geology. Geotechnical studies are needed to verify subsurface conditions prior to digging or trenching..

The permitting risk for this component is low. It is anticipated that the proposal could require permits, consultations, clearances and authorization from Clark county in OH. State CPCN and DOT utility, driveway and right of way permits may be required.

Teddy - Marysville 765 kV

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting. Impacts to these resources will require coordination with the USACE and appropriate Floodplain Administrators. The proposed route intersects woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Tree removal restrictions may apply due to the likelihood of the presence of listed bat species. Field verification of suitable bat habitat is recommended to determine presence.

The permitting risk for this proposed component is medium. There is approximately 1 railroad crossing, owned by CSXT. There is approximately 39 road and highway crossings (84 entrances) across 4 counties; 7 road crossings (14 entrances) and 2 highway crossings (4 entrances) in Clark County, 6 road crossings (12 entrances) and 2 highway crossings (4 entrances) in Champaign County, 2 road crossings (4 entrances) in Madison County, 13 road crossings (26 entrances) and 7 highway crossings (14 entrances) in Union County. There are approximately 3 transmission line crossings owned by DAYTON POWER & LIGHT CO. There are 2 pipeline crossings owned by BUCKEYE PARTNERS. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from the 4 counties in OH. State Approval of Electric Transmission Lines, and DOT utility permits are required.

Teddy Beatty DCT 345 kV

The proposed route intersects with the following recorded Historical Sites/Structures/Districts: Edmund Plantation. Coordination with the state SHPO office is required. The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting. Impacts to these resources will require coordination with the USACE and appropriate Floodplain Administrators. The proposed route intersects woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Tree removal restrictions may apply due to the likelihood of the presence of listed bat species. Field verification of suitable bat habitat is recommended to determine presence. Proposed route does not intersect designated Critical Habitat. However, the potential for federally listed endangered/threatened species to occur within the route corridor does exist. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected

species. Coordination with the USACE is needed. Proposed route intersects 1 conservation easements. Coordination with easement holders will be required. Proposed route intersects mapped karst geology. Geotechnical studies are needed to verify subsurface conditions prior to digging or trenching."

The permitting risk for this proposed component is medium. The component crosses approximately 1 railroad owned by Norfolk Southern Railway Company; 7 roads and highways (14 entrances) across 3 counties (Clark, Madison, and Franklin County); 10 transmission lines, 1 owned by OHIO POWER CO, 2 owned by AMERICAN ELECTRIC POWER CO., INC, and 7 owned by an unknown company; and 2 pipelines 1 owned by Columbia Gas Trans Co, and 1 owned by MARATHON PIPE LINE. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Clark, Madison and Franklin County in OH. State CPCN and DOT utility, driveway and right of way permits may be required.

Guernsey - Conesville 765 kV

The proposed route intersects with the following recorded Historical Sites/Structures/Districts: Muskingum River Navigation Historic District. Coordination with the VA SHPO is required. Proposed route intersects 9 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Guernsey; Muskingum and Coshocton counties, OH. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval may take up to 12 months to complete. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed route intersects 2 conservation easements. Coordination with the following easement holder(s) is required: American Electric Power - Conesville; Wildfire Golf Club. Virginia Designated Trout Waters Not Present

The permitting risk for this component is high. This component intersects 3 railroads all unknown owners. There are approximately 39 road crossings. 5 road crossings in Coshocton County, 14 road crossings and 3 highway crossings in Muskingum County and 11 road crossings and 6 highway crossings in Guernsey County. There are approximately 4 transmission lines identified; 3 owned by OHIO POWER CO and 1 unknown owner. The proposed route intersects 7 pipelines; 1 owned by ENTERPRISE PRODUCTS, 1 owned by Rockies Express Pipeline, 1 owned by Dominion Transmission Co, 3 owned by Columbia Gas Trans Co, 3 owned by East Ohio Gas Co and 1 owned by Tennessee Gas Pipeline. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from the 3 counties in OH. State Approval of Electric Transmission Lines, and DOT utility permits are required.

West Millersport Station Upgrade

Desktop analysis indicates that the proposed substation intersects with farmland. Verification in the field would need to be completed.

The permitting risk for this component is low. The proposed substation interacts with two existing utility lines. There is 1 owned by OHIO POWER CO, and 1 is owned by AMERICAN ELECTRIC POWER CO., INC. It is

anticipated that the proposal could require permits, consultations, clearances and authorization from Fairfield county in OH. State CPCN and DOT utility, driveway and right of way permits may be required.

Bixby - West Millersport 345 kV

Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Proposed route intersects 1 conservation easements. Coordination with the following easement holder(s) is required: Fairfield Land Preservation Association. Virginia Designated Trout Waters include: Not Present

This component crosses over 4 transmission lines owned by AMERICAN ELECTRIC POWER CO., INC and OHIO POWER CO; 2 roads and highway crossings (4 entrances) in Fairfield County; 2 pipelines owned by Enterprise Products and Dominion Transmission Co. The component also crosses through 1 farm owned by Fairfield Land Preservation Association. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Fairfield and Licking County in OH. State CPCN and DOT utility, driveway and right of way permits may be required.

West Millersport - Adkins 765 kV

"Proposed route intersects 11 FEMA High Risk Flood Zones (100 Year Floodplain). Coordination with the Floodplain Administration from Pickaway and Fairfield counties in OH will be required. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval will take 12 months. Proposed route intersects intermittent and/or Perennical streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. Permit authorization may take 12 months to complete. Proposed route intersects streams/drainages/watercourses that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. Permit authorization may take 12 months to complete. The proposed route intersects woodlands. Tree removal restrictions may apply, consultation with USFWS is needed. The proposed route intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Field surveys, permit preparation, submittal and approval will require 12 months. Proposed route intersects 1 conservation easements. Coordination with easement holders: OH Division of Natural Resources will be required. Desktop analysis indicates that the proposed route intersects with farmland. Verification in the field would need to be completed.

There are approximately 4 railroad crossings, 1 owned by CSXT, 1 owned by Norfolk Southern Railway Company, 1 owned by Indiana & Ohio Railway, and 1 owned by Kanawha River Railroad. There is approximately 48 road and highway crossings (96 entrances) across 2 counties, 8 highway crossings (16 entrances), and 40 road crossings (80 entrances). There are 12 utility line crossings, 6 owned by Ohio Power

CO., 4 with owner unavailable, and 2 owned by American Electric Power CO. INC. There are approximately 9 pipeline crossings, 3 owned by Dominion Transmission Co, 1 owned by MARATHON PIPE LINE, 1 owned by BUCKEYE PARTNERS, 2 owned by Columbia Gas Trans Co, and 2 owned by ENTERPRISE PRODUCTS. Fairfield County requires Commercial building permit, UTILITY ROAD RIGHT-OF-WAY APPLICATION. Pickaway county requires Right of Way/Driveway/Preliminary Access/Commercial Building Permit. ODOT (Ohio Department of Transportation) requires Approval of Right-of-Way Plan Review, and utility permits.

Conesville - West Millersport 765 kV

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting. Impacts to these resources will require coordination with the USACE and appropriate Floodplain Administrators. The proposed route intersects woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Tree removal restrictions may apply due to the likelihood of the presence of listed bat species. Field verification of suitable bat habitat is recommended to determine presence. Proposed route does not intersect designated Critical Habitat. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 2 conservation easements. Coordination with easement holders will be required. Proposed route intersects the Muskingum River Navigation Historic District. Coordination with the state SHPO office is needed.

The component crosses approximately 3 railroads, 2 owned by Ohio Central Railroad (OHCR), and 1 owned by Columbus and Ohio River Railroad; 74 roads and highways (148 entrances) across 4 Counties (Fairfield, Licking, Coshocton and Muskingum County); 18 transmission lines 7 owned by AMERICAN ELECTRIC POWER CO. (approximately separate 3 parallel encroachments spanning approximately 40 miles total), INC, 10 owned by OHIO POWER CO, and 1 owned by an unknown company; 12 pipelines, 4 owned by ENTERPRISE PRODUCTS, 4 owned by Dominion Transmission Co, 3 owned by Columbia Gas Trans Co, and 1 owned by Rockies Express Pipeline. There is 1 state park, Dillon Recreation Area. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Fairfield, Licking, Coshocton, and Muskingum County in OH. State CPCN and DOT utility, driveway and right of way permits may be required.

Transmission Line Risk Analysis

Greentown - Teddy 765 kV Line

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Approximately one electrical crossing below 69kV poses risk to schedule due to coordinating outages.
- Multiple electrical crossings above 69 kV pose risk to schedule due to coordinating outages.
- Multiple underground utility crossings that may require additional coordination for construction and impact the proposed locations for new structures which will pose risk to schedule, cost, and design.

Teddy - Marysville 765 kV

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Approximately one electrical crossing below 69kV poses risk to schedule due to coordinating outages.

- Multiple electrical crossings above 69 kV pose risk to schedule due to coordinating outages.
- Multiple underground utility crossings that may require additional coordination for construction and impact the proposed locations for new structures which will pose risk to schedule, cost, and design.

Guernsey - Conesville 765 kV

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Approximately one electrical crossing below 69kV poses risk to schedule due to coordinating outages.
- Multiple electrical crossings above 69 kV pose risk to schedule due to coordinating outages.
- Multiple underground utility crossings that may require additional coordination for construction and impact the proposed locations for new structures which will pose risk to schedule, cost, and design.

West Millersport - Adkins 765 kV

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Approximately one electrical crossing below 69kV poses risk to schedule due to coordinating outages.
- Multiple electrical crossings above 69 kV pose risk to schedule due to coordinating outages.
- Multiple underground utility crossings that may require additional coordination for construction and impact the proposed locations for new structures which will pose risk to schedule, cost, and design.

Conesville - West Millersport 765 kV

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Approximately one electrical crossing below 69kV poses risk to schedule due to coordinating outages.
- Multiple electrical crossings above 69 kV pose risk to schedule due to coordinating outages.
- Multiple underground utility crossings that may require additional coordination for construction and impact the proposed locations for new structures which will pose risk to schedule, cost, and design.

Substation Risk Analysis

Teddy 765/345 kV Station

Construct a 765/345 kV greenfield substation having a 765 kV double breaker double bus design with nine (9) circuit breakers that will interconnect a new 765 kV Marysville line and a new 765 kV Greentown line having 3-100MVar single-phase reactors.

Primary substation risks to this project involve procurement lead time required for the 765 kV equipment. Access to proposed substation location is currently limited to a small two-lane road.

Constructability Summary

The proposal contains significant greenfield construction and will pose significant challenges for acquisition of the required land for the line routes and substation parcels. This is mitigated to some extent by the line routes paralleling existing ROWs for a significant portion of the project, and some utilization of the existing FirstEnergy ROW to route portions of the 765 kV transmission lines.

It is also notable that the 765 kV line from Greentown originating from AEP's existing Greentown substation which exists as a tie station between PJM and MISO regions. This new transmission facility will need

coordination between PJM and MISO, and potentially create a new tie, or impact tie flows between the two regions.

Additionally, about 61 miles of the proposed 137 mile Greentown to Teddy 765 kV line segment is located in Indiana, whereby the developer (Transource/FE) proposed assignment of this scope to I&M Transco (another AEP affiliate) due to Indiana's right of first refusal 'ROFR' regulations which require that incumbent transmission owners have responsibility for transmission projects in Indiana.

Based on the above, PJM assesses **Medium** constructability risk, and additionally a **Medium** regulatory risk for this project.

Outage Review

Due to the primary greenfield nature of this project and limited rebuild scope, mostly short outages to existing facilities will be required to tie in the new transmission facilities, and therefore no significant existing facility outages are anticipated. Overall outage coordination risk is deemed **Low**.

Cost Review

As part of the detailed constructability analysis, an independent consultant prepared a high-level conceptual, independent cost estimate for the components of this proposal. The independent consultant assumes a level of effort and accuracy consistent with AACE International's Recommended Practice 17R-97, Cost Estimate Classification System, Class 3 with an expected accuracy of -20% to +40% from the base total estimate. Estimates will use available industry and materials. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering, and construction. The independent cost estimate includes a 30% contingency, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates is provided below.

	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
1	Greentown Station Expansion	45.29	45.29
2	Greentown - Teddy 765 kV Line	633.79	863.10
3	Teddy 765/345 kV Station	228.33	265.15
4	Teddy - Marysville 765 kV	176.46	223.02
5	Marysville Station Upgrade	281.83	309.52
6	Teddy - Beatty DCT 345 kV	175.19	246.46
7	Cole Station Upgrade	1.00	2.26
8	Beatty Station Upgrade	3.86	4.71
9	Guernsey Station Upgrade	5.54	22.93
10	Guernsey - Conesville 765 kV	166.17	201.60
11	West Millersport Station Upgrade	118.11	114.52
12	Bixby - West Millersport 345 kV	12.00	17.67
13	Bixby Station Upgrade	0.08	0.14
14	West Millersport - Adkins 765 kV	201.83	263.97
15	West Millersport - Kirk 345 kV	24.30	35.85
16	Hyatt - Maliszewski Double Circuit 345 kV	34.13	30.21

17	Hayden - Cole 345 kV	37.87	36.04
18	Newark Center Station Upgrade	0.70	0.70
19	Ohio Central Extension	3.50	3.07
20	Allen Station Upgrade	0.05	0.07
21	Roberts - Kenny 138 kV Rebuild	66.36	44.05
22	Wilson - Fifth Avenue 138 kV	18.26	1.23
23	McComb Station Upgrades	7.19	8.02
24	Bethel Station Upgrade	0.50	0.88
25	OSU Station Upgrade	0.50	0.88
26	Hess 138 kV Station Upgrade	0.70	1.25
27	South Kenton Station	0.11	0.96
28	Meadow Lake Substation Circuit Breaker	4.00	5.48
29	Teddy - Cole 345 kV #2 Circuit	21.63	6.30
30	Conesville Station Expansion	140.97	150.86
31	Conesville - West Millersport 765 kV	248.98	309.33
32	Adkins Station Expansion	102.98	188.15
33	Ohio Central Station Upgrade	3.00	1.87
34	Kammer Dumont Structures 765 kV	2.00	6.07
35	Ohio Central - Fostoria Central Structure 345 kV	1.00	0.86
36	Gavin - Marysville Structures 765 kV	3.00	2.21
37	East Springfield - London Structures 138 kV	1.00	1.96
38	Beatty - Hayden Structures 345 kV	3.00	2.04
Total		2775.19	3418.68

The proposal cost estimate is within 21-30% of the independent cost estimate and is considered **Low-Medium** risk.

Schedule Review

The proposed in-service date for the project is October 2031.

The greatest schedule risks to this project are associated with the permitting and land acquisition risks, which are mitigated to a moderate degree by use of FirstEnergy's ROW for some of the proposed transmission line projects. Overall, the overall Schedule risk is assessed as **Medium**.

Proposing Entity Experience and Capability Review

Transource, as an affiliate of AEP Transmission, has significant experience constructing and operating 765 kV transmission which represents the significant scope for Proposal 331. The proposing entity experience and capability risk is considered **Low**.

Proposal 619/241 - 345 kV Solution + 765 kV Solution (Alternative) + STATCOM Solution (PSEGRT/AES Ohio/PPL)

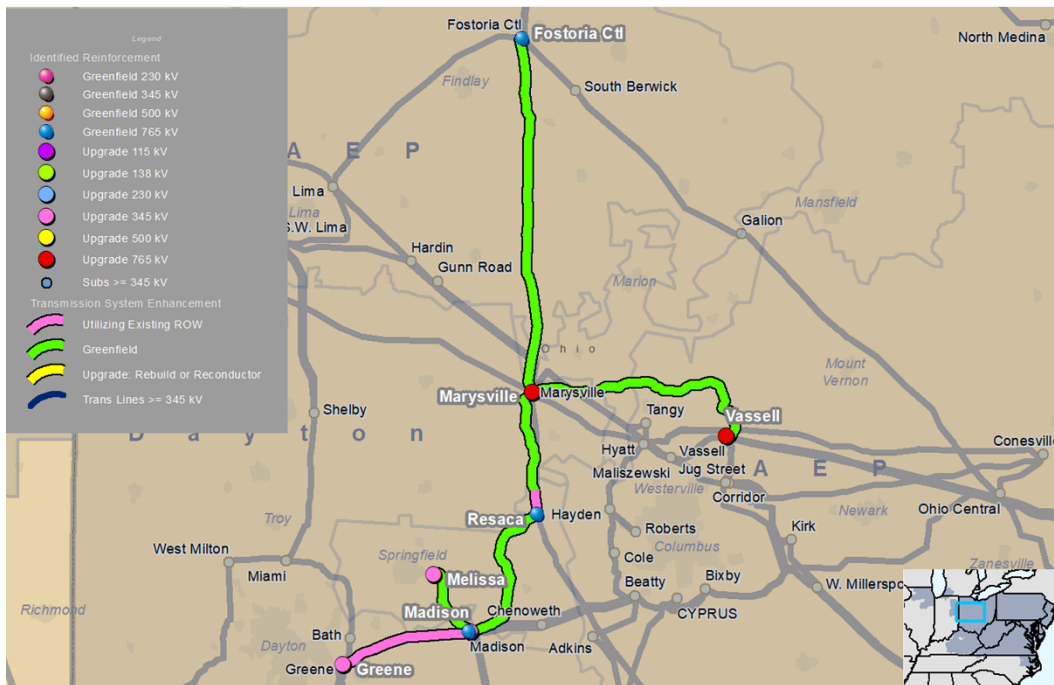
The objective of the 619 project is to construct a new 345 kV, 16 mile line from Green County, Ohio to new 765/345 kV Madison Station in Madison County, from there a new 345 kV 12.7 mile line to the existing 138 kV Melissa Station in Clark County, Ohio, then from the new 765/345 kV Madison Station in Madison County, Ohio, and construct 26.3 miles of new 765 kV line to a new 765 kV Resaca Station in Madison County, Ohio. Also to be built is a new 765 kV, 20.2-mile line from existing 765 kV Marysville Station in Union County, Ohio to new 765 kV Resaca Station in Madison County, Ohio, a new 765 kV, 56.8-mile line from existing 765 kV Marysville Station in Union County, Ohio to the new 765 kV Fostoria Station in Hancock County, Ohio, and finally, also from existing 765 kV Marysville Station, a new 42.5-mile 765kV line would be built to existing 765 kV Vassel Station in Delaware County, Ohio. This project will traverse ten counties (Greene, Clark, Madison, Union, Marion, and Hardin, Wyandot, Delaware, and Hancock) in Ohio.

This proposal has a total of sixteen components, including six substation upgrade components, three greenfield substation components, six greenfield transmission line components covering 176.5 miles, and one transmission line upgrade components spanning approximately 5.4 miles.

Additionally, the 241 project objective is to construct a +300 MVar STATCOM, in the new Resaca Substation in Madison County, Ohio. This proposal has one component: the new Greenfield Substation.

Map 24 displays the components and routes proposed for proposal 619/241.

Map 24. Proposal 619/241



NOTE: 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.

Project Overview

PSEGRT Proposals 619 and 214 includes the following components:

- Component 1: 345 kV Greenfield Transmission Line from 345 kV Transmission Line Upgrades to New 765/345 kV Madison Yard Greenfield Station
- Component 2: 345 kV Greenfield Transmission Line (Double Circuit) from 765/345 kV Madison Yard Greenfield Station to Existing 138 kV Melissa Station
- Component 3: 765 kV Greenfield Transmission Line from 765/345 kV Madison Yard Greenfield Station to 765 kV New Greenfield Station
- Component 4: 765 kV Greenfield Transmission Line from Existing 765 kV Marysville Station to New 765 kV Fostoria Yard Greenfield Station
- Component 5: 765 kV Greenfield Transmission Line from Existing 765 kV Marysville Station to Existing 765 kV Vassel Stations
- Component 6: 765 kV Greenfield Transmission Line from Marysville Station to 765 kV Greenfield Station
- Component 7: 765/345 kV Madison Yard Greenfield Station
- Component 8: 765 kV Greenfield Station
- Component 9: 765 kV Fostoria Yard Greenfield Station
- Component 10: 345 kV Greene Station Upgrade
- Component 11: 345/138 kV Melissa Station Upgrade
- Component 12: 765 kV Marysville Station Upgrade
- Component 13: 345 kV Fostoria Central Station Upgrade
- Component 14: 765 kV Vassell Station Upgrade
- Component 15: 345 kV Transmission Line Upgrades from Existing 345 kV Greene Station to New 345 kV Greenfield Transmission Line
- Component 16: 345 kV Madison Station Upgrade
- Component 17: +300MVar STATCOM Add-on

Constructability Review

Right-of-Way/Land Acquisition Risk Analysis

765kV Greenfield Transmission Line from 765/345kV Madison Yard Greenfield Station to 765kV New Greenfield Station

This component is an approximately 26.3-mile 765 kV line that will be constructed from the proposed 765/345 kV Madison Yard, in Clark County, Ohio to the proposed Resaca Substation, in Madison County, Ohio. The line will traverse two counties (Clark and Madison) in Ohio. The total route is 26.3 miles, with a proposed right-of-way of 200 feet. An unidentified length of the route parallels existing transmission right-of-way. The entire line will be greenfield.

Land acquisition will be required along the entire length of the line.

765kV Greenfield Transmission Line from Existing 765kV Marysville Station to New 765kV Fostoria Yard Greenfield Station

This component is an approximately 56.8-mile 765 kV line that will be constructed from the existing Marysville Substation, in Union County, Ohio to the proposed Fostoria Yard, in Hancock County, Ohio. The line will traverse five counties (Union, Marion, Hardin, Wyandot, and Hancock) in Ohio. The total route is 56.8 miles, with a proposed right-of-way of 200 feet. The entire line will be greenfield.

Land acquisition will be required along the entire length of the line.

765kV Greenfield Transmission Line from Existing 765kV Marysville Station to Existing 765kV Vassel Stations

This component is an approximately 42.5-mile 765 kV line that will be constructed from the existing Marysville Substation, in Union County, Ohio to the existing Vassell Station, in Delaware County, Ohio. The line will traverse two counties (Union and Delaware) in Ohio. The total route is 42.5 miles, with a proposed right-of-way of 200 feet. The entire line will be greenfield.

Land acquisition will be required along the entire length of the line.

765kV Greenfield Transmission Line from Marysville Station to 765kV Greenfield Station

This component is an approximately 20.2-mile 765 kV line that will be constructed from the existing Marysville Substation, in Union County, Ohio to the proposed Resaca Station, in Madison County, Ohio. The line will traverse two counties (Union and Madison) in Ohio. The total route is 20.2 miles, with a proposed right-of-way of 200 feet. The entire line will be greenfield.

Land acquisition will be required along the entire length of the line.

765/345kV Madison Yard Greenfield Station

This component is a greenfield substation, in Clark County, Ohio. The provided mapping proposes an approximate 11.5-acre footprint.

New land acquisition will be required; however, the proposed component site is in an undeveloped agricultural field, with no residences within the indicated component area.

765kV Greenfield Station (Resaca)

This component is a greenfield substation called Resaca, in Madison County, Ohio. The provided mapping proposes an approximate 70.7-acre footprint.

New land acquisition will be required; however, the proposed component site is in an undeveloped agricultural field, with no residences within the indicated component area.

+300MVAr STATCOM Add-on

The +300MVAr STATCOM Add-on is an upgrade to the proposed Resaca Substation, in Madison County, Ohio within proposal 241.

New land acquisition will be required for the proposed substation, and it is assumed that this component would fit within the footprint of the substation. The proposed substation site is in an undeveloped agricultural field, with no residences within the likely substation area.

765kV Fostoria Yard Greenfield Station

This component is a greenfield substation, in Hancock County, Ohio, adjacent to an existing substation.

New land acquisition will be required; however, the proposed component site is in an undeveloped agricultural field, with no residences within the likely component area.

Overall, due to the greenfield nature of the proposed developments, a **High** ROW/Land Acquisition risk is assessed for this proposal.

Environmental Risk Analysis*345kV Greenfield Transmission Line from 345kV Transmission Line Upgrades to New 765/345kV Madison Yard Greenfield Station*

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting; woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Impacts to these resources will require coordination with the appropriate county floodplain administrator; coordination with state wildlife agencies, USACE and USFWS. Proposed route does not intersect designated Critical Habitat. However, there are federally listed

endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects mapped karst geology. Geotechnical studies are needed to verify subsurface conditions prior to digging or trenching.

There is approximately 1 railroad crossing owned by Indiana & Ohio Railway. There is approximately 19 road and highway crossings (38 entrances) across Greene County, 17 road crossings (34 entrances), and 2 highway crossings (4 entrances). There is approximately 2 transmission line crossings owned by DAYTON POWER AND LIGHT CO. There is approximately 2 pipeline crossings owned by Columbia Gas Trans Co. Proposed route intersects 5 conservation easements. It is anticipated that the proposal requires permits, consultations, clearances and authorization from Clark County in OH. State CPCN and DOT utility, driveway and right of way permits may be required.

765kV Greenfield Transmission Line from 765/345kV Madison Yard Greenfield Station to 765kV New Greenfield Station

"The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting. Impacts to these resources will require coordination with the USACE and appropriate Floodplain Administrators. The proposed route intersects woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Tree removal restrictions may apply due to the likelihood of the presence of listed bat species. Field verification of suitable bat habitat is recommended to determine presence.

Proposed route does not intersect designated Critical Habitat. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects 3 conservation easements and one Scenic Trail (Camp Chase Trail). Coordination with easement holders will be required. Proposed route intersects mapped karst geology. Geotechnical studies are needed to verify subsurface conditions prior to digging or trenching."

This component has approximately 1 railroad crossing with Norfolk Southern Railway; approximately 25 roads and highways in Madison and Clark County; 3 transmission line crossing owned by Dayton Power and Light Co and with no owner available. There is approximately 1 crossing under the Farm and Ranch Land Protection Program, 1 Farm crossing and 1 Trails crossing along the proposed component route. It is anticipated that the proposal could require permits, consultations, clearances and authorization from 2 counties in OH. State CPCN and DOT utility, driveway and right of way permits may be required.

765kV Greenfield Transmission Line from Existing 765kV Marysville Station to New 765kV Fostoria Yard Greenfield Station

Proposed route intersects 7 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Union; Hardin; Wyandot; Hancock and Marion counties, Ohio. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval will take 12 months. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed route intersects woodlands.

Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Field surveys, permit preparation, submittal and approval will require 12 months. Proposed route does not intersect designated Critical Habitat. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Virginia Designated Trout Waters include: Not Present

There are 4 railroad crossings, 2 with Norfolk Southern Railway Company, 1 with CHICAGO FT. WAYNE & EASTERN, and 1 with CSXT. There are approximately 66 road and highway crossings (122 entrances) across 5 counties; 50 road crossings (100 entrances) and 16 highway crossings (32 entrances). There are approximately 4 transmission line crossings, 1 owned by OHIO POWER CO, and 3 with no owner available. There are approximately 7 pipeline crossings, 4 owned by Columbia Gas Trans Co, and there are 3 owned by MARATHON. It is anticipated that the proposal requires permits, consultations, clearances and authorization from 2 counties in OH. State CPCN and DOT utility, driveway and right of way permits may be required.

765kV Greenfield Transmission Line from Existing 765kV Marysville Station to Existing 765kV Vassel Stations

Proposed route intersects 13 FEMA High-Risk Flood Zones (100-Year Floodplain). Coordination with the Floodplain Administrator from the following jurisdictions will be required: Union; Delaware counties, Ohio. Proposed route intersects waters subject to USACE Section 404 and/or Section 10 Permitting. Field verification, permit submittal and approval will take 12 months. Proposed route intersects Perennial or Intermittent streams that are subject to USACE Section 404 and/or Section 10 permitting for any impacts to these waters. Field delineation will be required to verify boundaries of all water resources. The proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of the presence of listed endangered bat species. Field verification of bat habitat is needed to determine presence. Consultation with USFWS is needed. The proposed route intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching. The proposed route intersects with wetlands. Field verification is required to determine quality and presence of wetlands. Consultation with USACE will be required for jurisdictional determination. Field surveys, permit preparation, submittal and approval will require 12 months. Proposed route does not intersect designated Critical Habitat. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. The proposed route intersects designated Scenic Rivers/Scenic Trails. Coordination with the following agencies is required: Ohio to Erie Trail. The proposed route intersects Natural Areas/Reserves/Wildlife Refuge. Coordination with the following agencies is required: Alum Creek Recreation Area; River Run Park Virginia Designated Trout Waters include: Not Present

This component intersects 3 railroads; 2 owned by CSXT and 1 owned by Norfolk Southern Railway Company. There are approximately 45 road crossings; 21 road crossings and 13 highway crossings in Delaware County and 6 road crossings and 5 highway crossings in Union County. There are approximately 12 transmission lines identified; 2 owned by AMERICAN ELECTRIC POWER CO., INC, 6 unknown owners, 2 owned by CITY OF WESTERVILLE - (OH) and 2 owned by OHIO POWER CO. Proposed route intersects 2 pipelines; 1 owned by MARATHON PIPE LINE and 1 owned by Columbia Gas Trans Co. It is anticipated that the proposal requires permits, consultations,

clearances, and authorizations from the 2 counties in OH. State Approval of Electric Transmission Lines, and DOT utility permits are required.

765kV Greenfield Transmission Line from Marysville Station to 765kV Greenfield Station

Intersects 4 FEMA High Risk Flood Zones (100 Year Floodplain). Proposed route intersects woodlands. Tree removal restrictions will apply due to the likelihood of presence of an endangered species. The proposed route intersects Karst. Geotechnical studies are needed to verify subsurface condition before digging and/or trenching. Proposed route intersects farmland, verification in the field would be need to be completed.

There is approximately 3 railroad crossings owned by CSXT. There is approximately 19 road and highway crossings (38 entrances) across 2 counties (Madison and Union County). There are approximately 3 transmission line crossings owned by DAYTON POWER & LIGHT CO. There are 2 pipeline crossings owned by BUCKEYE PARTNERS. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from the 2 counties in OH. State Approval of Electric Transmission Lines, and DOT utility permits are required.

765/345kV Madison Yard Greenfield Station

The proposed substation footprint intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching. Desktop analysis indicates that the proposed route intersects with farmland. Verification in the field would need to be completed.

Proposed substation intersects with 1 transmission line owned by DAYTON POWER AND LIGHT CO. It is anticipated that the proposal would require permits, consultations, clearances, and authorizations from Clark County in OH. State PUCO Approval may be required, and DOT utility permits and driveway/local road permits are required.

765kV Greenfield Station (Resaca)

Desktop analysis indicates that the proposed route intersects with farmland. Verification in the field would need to be completed. The proposed substation footprint intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching.

It is anticipated that the proposal would require permits, consultations, clearances, and authorizations from Madison County in OH. State PUCO Approval may be required, and DOT utility permits and driveway/local road permits are required.

765kV Fostoria Yard Greenfield Station

Desktop analysis indicates that the proposed route intersects with farmland. Verification in the field would need to be completed. The proposed substation footprint intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching.

It is anticipated that the proposal would require permits, consultations, clearances, and authorizations from Union County in OH. State PUCO Approval may be required, and DOT utility permits and driveway/local road permits are required.

Transmission Line Risk Analysis

765kV Greenfield Transmission Line from 765/345kV Madison Yard Greenfield Station to 765kV New Greenfield Station

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Approximately one electrical crossing below 69kV poses risk to schedule due to coordinating outages.
- Multiple electrical crossings above 69 kV pose risk to schedule due to coordinating outages.
- Multiple underground utility crossings that may require additional coordination for construction and impact the proposed locations for new structures which will pose risk to schedule, cost, and design.

765kV Greenfield Transmission Line from Existing 765kV Marysville Station to New 765kV Fostoria Yard Greenfield Station

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- There are two 138 kV transmission line crossings that may pose risk to schedule due to coordinating outages.
- There are three EHV crossings, two 245 kV transmission lines, and one 765 kV that may pose risk to the design feasibility and create excessive structure heights to maintain clearances as well as schedule risks with the outage coordination.

765kV Greenfield Transmission Line from Existing 765kV Marysville Station to Existing 765kV Vassel Stations

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- There are four 69 kV transmission line crossings and two 138 kV transmission line crossings that may pose risk to schedule due to coordinating outages.
- There are three EHV crossings, one 345 kV transmission lines, and two 76 5kV that may pose risk to the design feasibility and create excessive structure heights to maintain clearances as well as schedule risks with the outage coordination.

765kV Greenfield Transmission Line from Marysville Station to 765kV Greenfield Station (Resaca)

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- There are one 169 kV transmission line crossings and two 238 kV transmission line crossings that may pose risk to schedule due to coordinating outages.

Substation Risk Analysis

765/345kV Madison Yard Greenfield Station

New Madison 765/345 kV greenfield station, with one 765 kV CB, four single phase 765/345 kV transformers, establish a 345 kV substation with nine 345 kV CBs.

Primary substation risks to this project involve procurement lead time required for the 765 kV equipment.

765kV Greenfield Station (Resaca) & +300MVar STATCOM Add-on

New Resaca 765 kV greenfield station, with eight 765 kV CBs, arranged in a four breaker ring bus configuration and four 765 kV line terminations, with thirteen single phase reactors (three for each line and one connected spare).

For the proposal 241 add-on, the additional scope is included:

- Install one (1) +300 MVAR (STATCOM) along with one (1) 765/51.8 kV transformer and two (2) 765 kV dead tank breakers.

Primary substation risks to this project involve procurement lead time required for the 765 kV equipment.

765kV Fostoria Yard Greenfield Station

New Fostoria Yard 765/345 kV greenfield station, with one 765 kV CB, four single phase 765/345 kV transformers, and one 345 kV dead tank CB.

Primary substation risks to this project involve procurement lead time required for the 765 kV equipment.

Constructability Summary

The 619 proposal contains greenfield transmission lines and substations, as well as substation expansion components and a transmission line rebuild. The main constructability risks are land acquisition, constraints associated with the greenfield line routes, and substation equipment procurement.

The 241 proposal contains an upgrade to a proposed greenfield substation. The main constructability risks for this add-on proposal are associated with procurement of the STATCOM.

These two proposals combined were assessed to have a **Medium-High** risk Constructability rating.

Outage Review

Due to the minimal number of line rebuilds and existing facility outages associated with this proposal, the overall outage coordination risk is assessed as **Low-Medium**.

Cost Review

As part of the detailed constructability analysis, an independent consultant prepared a high-level conceptual, independent cost estimate for the components of the 619 proposal. The independent consultant assumes a level of effort and accuracy consistent with AACE International's Recommended Practice 17R-97, Cost Estimate Classification System, Class 3 with an expected accuracy of -20% to +40% from the base total estimate. Estimates will use available industry and materials. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation

engineering, transmission line engineering, and construction. The independent cost estimate includes a 30% contingency, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates is provided below.

Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
619 - 1	345 kV Greenfield Transmission Line from 345 kV Transmission Line Upgrades to New 765/345 kV	64.12	72.73
619 - 2	345 kV Greenfield Transmission Line (Double Circuit) from 765/345 kV Madison Yard Greenfield Station to Existing 138 kV Melissa Station	66.97	80.77
619 - 3	765 kV Greenfield Transmission Line from 765/345 kV Madison Yard Greenfield Station to 765 kV	158.04	244.70
619 - 4	765 kV Greenfield Transmission Line from Existing 765 kV Marysville Station to New 765 kV Fostoria	310.78	488.72
619 - 5	765 kV Greenfield Transmission Line from Existing 765 kV Marysville Station to Existing 765 kV Vassel Stations	263.80	351.35
619 - 6	765 kV Greenfield Transmission Line from Marysville Station to 765 kV Greenfield Station	135.48	191.02
619 - 7	765/34 5kV Madison Yard Greenfield Station	185.17	96.88
619 - 8	765 kV Greenfield Station	248.58	318.71
619 - 9	765 kV Fostoria Yard Greenfield Station	154.35	103.26
619 - 10	345 kV Greene Station Upgrade	16.55	5.45
619 - 11	345/138 kV Melissa Station Upgrade	100.17	37.05
619 - 12	765 kV Marysville Station Upgrade	173.82	166.13
619 - 13	345 kV Fostoria Central Station Upgrade	8.72	3.52
619 - 14	765 kV Vassell Station Upgrade	45.90	39.63
619 - 15	345 kV Transmission Line Upgrades from Existing 345 kV Greene Station to New 345 kV Greenfield	9.28	7.95
619 - 16	Madison Station Upgrade	0.91	1.71
241 - 1	+300MVar STATCOM Add-on	143.36	215.93
Total		2086.01	2425.51

The proposed cost estimate is within 11-20% of the independent cost estimate. The cost estimate risk is assessed as **Low-Medium**.

Schedule Review

This proposal projects an in-service date of June 2032.

The major schedule risks identified for Proposal 619 include land acquisition, permitting, and substation equipment procurement. The scheduling risk is assessed as **Medium**, given the 2032 in-service date.

Proposing Entity Experience and Capability Review

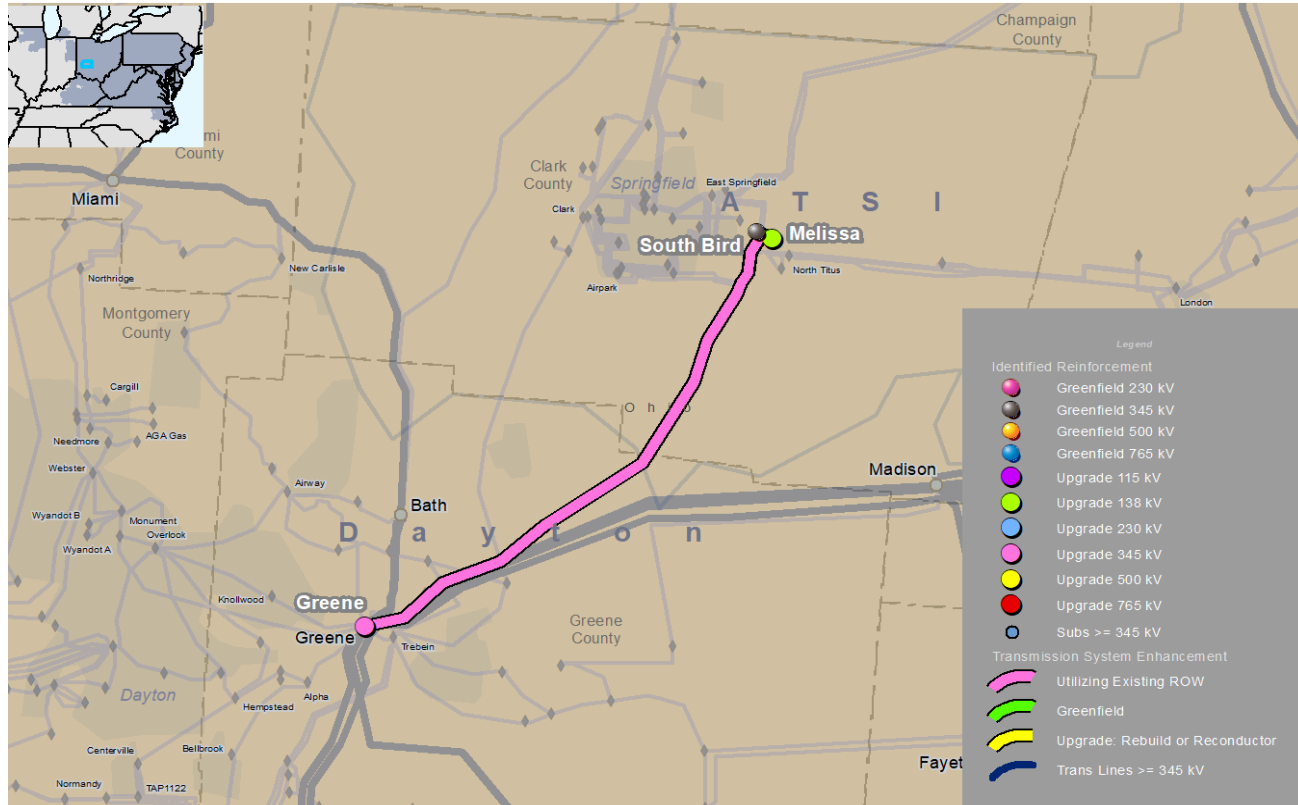
The proposing entities PSEGRT, AES Ohio, and PPL do not have experience building or operating 765 kV transmission facilities. However, the entities provided information about their EPC contractor that has significant experience constructing 765 kV projects and also demonstrated entry into partnerships with other utilities with relevant operating experience. Based on the information provided, the proposing entity experience and capability risk is assessed as **Medium**.

Proposal 543 – Greene - South Bird Transmission Project (CNTLTM)

The objective of this project is to construct a 345 kV, 22.2 mile transmission line from the existing Greene Substation in Greene County, Ohio to the new South Bird Substation in Clark County, Ohio. This project will traverse two counties (Greene, Clark) in Ohio. This proposal has a total of six components, including two substation upgrade components, one greenfield substation component, and three greenfield transmission line components making up the entire 22.2 miles of transmission line.

Map 25 displays the components and routes proposed for proposal 543.

Map 25. Proposal 543



NOTE: 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.

Project Overview

Proposal 543 includes the following components:

- Component 1. South Bird 345/138 kV Substation
- Component 2. Greene Substation Upgrade
- Component 3. Melissa Substation Upgrade
- Component 4. Greene - South Bird 345 kV Transmission Line
- Component 5. South Bird - Melissa #1 138 kV Transmission Line
- Component 6. South Bird - Melissa #2 138 kV Transmission Line Constructability Review

Constructability Review

Right-of-Way/Land Acquisition Risk Analysis

Greene - South Bird 345kV Transmission Line

The Greene – South Bird 345 kV transmission line is approximately 21.6 miles long and will be constructed from the Greene Substation in Greene County, Ohio to the South Bird Substation in Clark County, Ohio. The greenfield transmission line will traverse two counties (Greene and Clark) in Ohio. The proposed transmission line crosses an interstate highway, the Little Miami Scenic Trail, multiple crossings of two State Scenic Rivers (North Fork Little Miami River and Little Miami River).

Overall, due to the high greenfield nature of the proposed project, a **High** ROW/Land Acquisition risk is assessed for proposal 543.

Environmental Risk Analysis

South Bird 345/138kV Substation

The proposed substation footprint intersects Karst zones. Geotechnical studies are needed to verify subsurface conditions before digging and/or trenching. Desktop analysis indicates that the proposed route intersects with farmland. Verification in the field would need to be completed.

It is anticipated that the proposal would require permits, consultations, clearances, and authorizations from Clark County in OH. State PUCO Approval may be required, and DOT utility permits and driveway/local road permits are required.

Greene South Bird 345kV Transmission Line

The proposed component has the potential to impact environmental resources including FEMA floodplains, streams, wetlands subject to USACE Section 404 and/or Section 10 permitting; woodlands with the potential to serve as suitable habitat for federally-listed Threatened & Endangered Species. Impacts to these resources will require coordination with the appropriate county floodplain administrator; coordination with state wildlife agencies, USACE and USFWS. Proposed route does not intersect designated Critical Habitat. However, there are federally listed endangered/threatened species with the potential to occur within the route corridor. Consultation with USFWS and state wildlife agency is needed to determine if the proposed project will have effects on protected species. Proposed route intersects mapped karst geology. Geotechnical studies are needed to verify subsurface conditions prior to digging or trenching.

This component intersects 2 railroads; 1 owned by Indiana & Ohio Railway and 1 Norfolk Southern Railway Company. There are approximately 23 road crossings; 6 road crossings and 3 highway crossings in Clark County and 12 road crossings and 2 highway crossings in Greene County. There are approximately 11 transmission lines

identified all owned by Dayton Power and Light Co. Approximately 2 pipeline crossings are identified; 1 owned by Columbia Gas Trans Co and 1 owned by Marathon Pipeline. Lastly, the propose route intersects 5 easements owned by PVT and 1 park (fee) owned by the City of Xenia. It is anticipated that the proposal requires permits, consultations, clearances, and authorizations from the 2 counties in OH. State Approval of Electric Transmission Lines, and DOT utility permits are required. Permits generally take 3-6 months.

Transmission Line Risk Analysis

Greene - South Bird 345kV Transmission Line

From a Scope/Complexity/Technology/Feasibility perspective, the potential risks to the transmission line scope of this project are as follows:

- Multiple underground utility crossings that may require additional coordination for construction and impact the proposed locations for new structures.
- There are two 345 kV transmission line crossings, five 138 kV transmission line crossings, and two 69 kV transmission line crossings may pose schedule risk regarding outage coordination.

Constructability Summary

The proposal contains greenfield transmission lines and substations, as well as substation expansion components and a transmission line rebuild. The main constructability risks are land acquisition, permitting and siting risks due to the greenfield scope, and constraints encountered. Due to the relatively small scope of this project, a **Medium** constructability risk is assessed.

Outage Review

Due to the primary greenfield nature of this project, only short outages to existing facilities will be required to tie in the new transmission facilities, and therefore no significant existing facility outages are anticipated. Overall outage coordination risk is deemed **Low**.

Cost Review

As part of the detailed constructability analysis, an independent consultant prepared a high-level conceptual, independent cost estimate for the components of this proposal. The independent consultant assumes a level of effort and accuracy consistent with AACE International's Recommended Practice 17R-97, Cost Estimate Classification System, Class 3 with an expected accuracy of -20% to +40% from the base total estimate. Estimates will use available industry and materials. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering, and construction. The independent cost estimate includes a 30% contingency, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates is provided below.

Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
1	South Bird 345/138 kV Substation	35.47	39.98
2	Greene Substation Upgrade	5.11	7.12
3	Melissa Substation Upgrade	6.86	6.03

4	Greene - South Bird 345 kV Transmission Line	71.10	100.85
5	South Bird - Melissa #1 138 kV Transmission Line	1.44	1.79
6	South Bird - Melissa #2 138 kV Transmission Line	1.44	1.79
Total		121.45	157.56

The proposal cost estimate is within 21-30% of the independent cost estimate and is considered **Medium** risk.

Schedule Review

This proposal projects an in-service date of June 2030.

Due to the relatively small scope of the project, the scheduling risk is assessed as **Low-Medium**.

Proposing Entity Experience and Capability Review

LS Power, has experience with the proposed equipment and has the capability to construct Proposal 543 as submitted. The proposing entity experience and capability risk is considered **Low**.

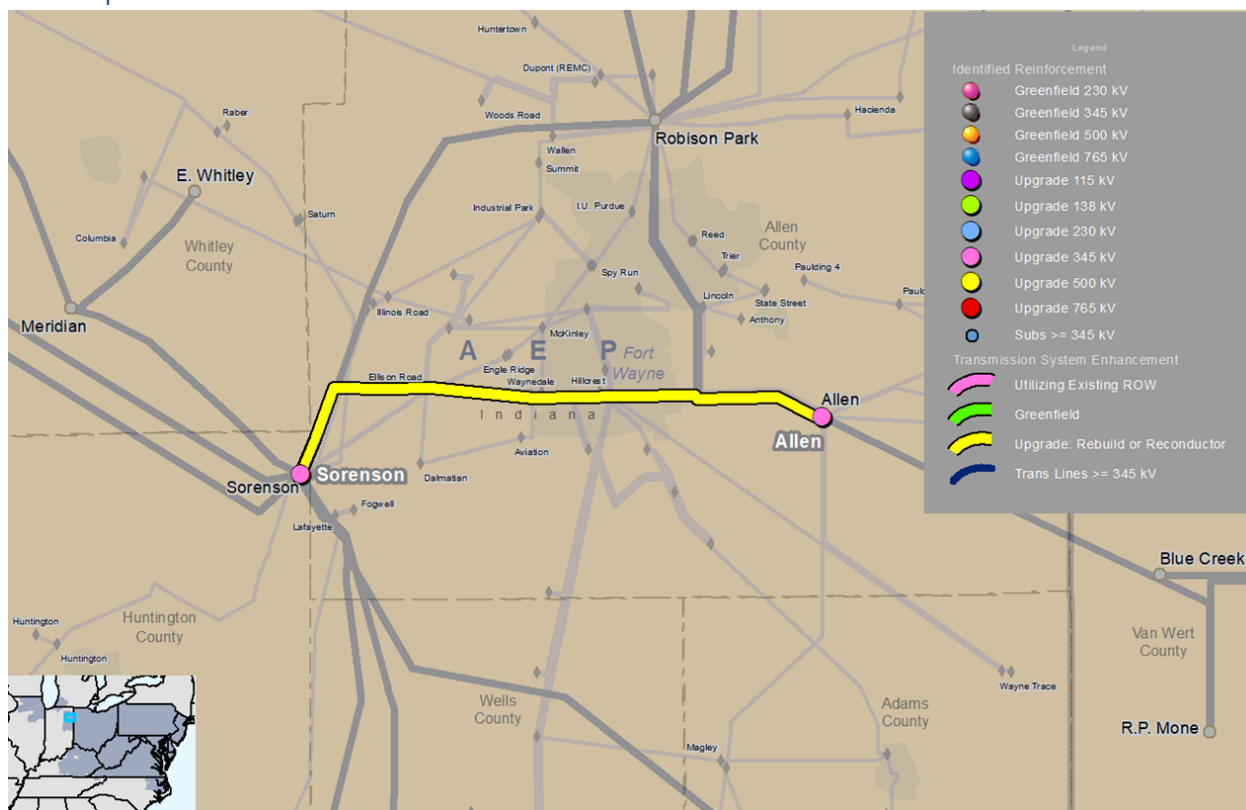
West Additional AEP Cluster Proposals

Proposal 341 – Allen-Sorenson 345kV Sag Study (AEPSC)

The project objective is to perform a sag study on the Allen-Sorenson 345 kV circuit from Sorenson Substation to Structure 214. This proposal has one component: the transmission line sag study.

Map 26 displays the components and routes proposed for proposal 341.

Map 26. Proposal 341



NOTE: 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.

Project Overview

The Allen-Sorenson 345 kV Sag Study Proposal W1-341 includes the following components:

- Component 1. Allen-Sorenson 345 kV Sag Study

Constructability Review

Right-of-Way/Land Acquisition Risk Analysis

Component 1 - Allen – Sorenson 345 kV Circuit Transmission Line Upgrade

The Allen – Sorenson 345 kV Sag Study is a technical review of the existing Allen – Sorenson 345 kV transmission line from Sorenson Substation in Huntington County, Indiana to Structure 214 in Adams County, Indiana. The purpose of the study is to identify and address line sag clearance concerns through specific hardware replacement. The sag study and hardware rebuild will occur in the existing ROW and it is not anticipated that additional permanent ROW would be required.

The ROW/Land Acquisition risk for this proposal is **Low**.

Environmental Risk Analysis

Component 1 – Allen-Sorenson 345 kV Circuit Transmission Line Upgrade

Environmental and permitting risks are low for this proposal as it is within an existing ROW with minimal anticipated earth disturbance.

Constructability Summary

The constructability risk for this project component is **Low** because the project will stay in the existing ROW and address sag clearance between structures.

Outage Review

No significant outages are anticipated with this sag study proposal. Outage coordination risk is assessed as **Low** risk.

Cost Review

As part of the detailed constructability analysis, an independent consultant prepared a high-level conceptual, independent cost estimate for the components of this proposal. The independent consultant assumes a level of effort and accuracy consistent with AACE International's Recommended Practice 17R-97, Cost Estimate Classification System, Class 3 with an expected accuracy of -20% to +40% from the base total estimate. Estimates will use available industry and materials. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering, and construction. The independent cost estimate includes a 30% contingency, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates is provided below.

Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
1	Allen-Sorenson 345 kV Circuit	37.38	40.52
	Total	37.38	40.52

The proposal cost estimate within 10% of the independent cost estimate and is considered **Low** risk.

Schedule Review

This proposal has an in-service date of April 2030. Due to the minimal scope of this proposal, **Low** schedule risks are assessed.

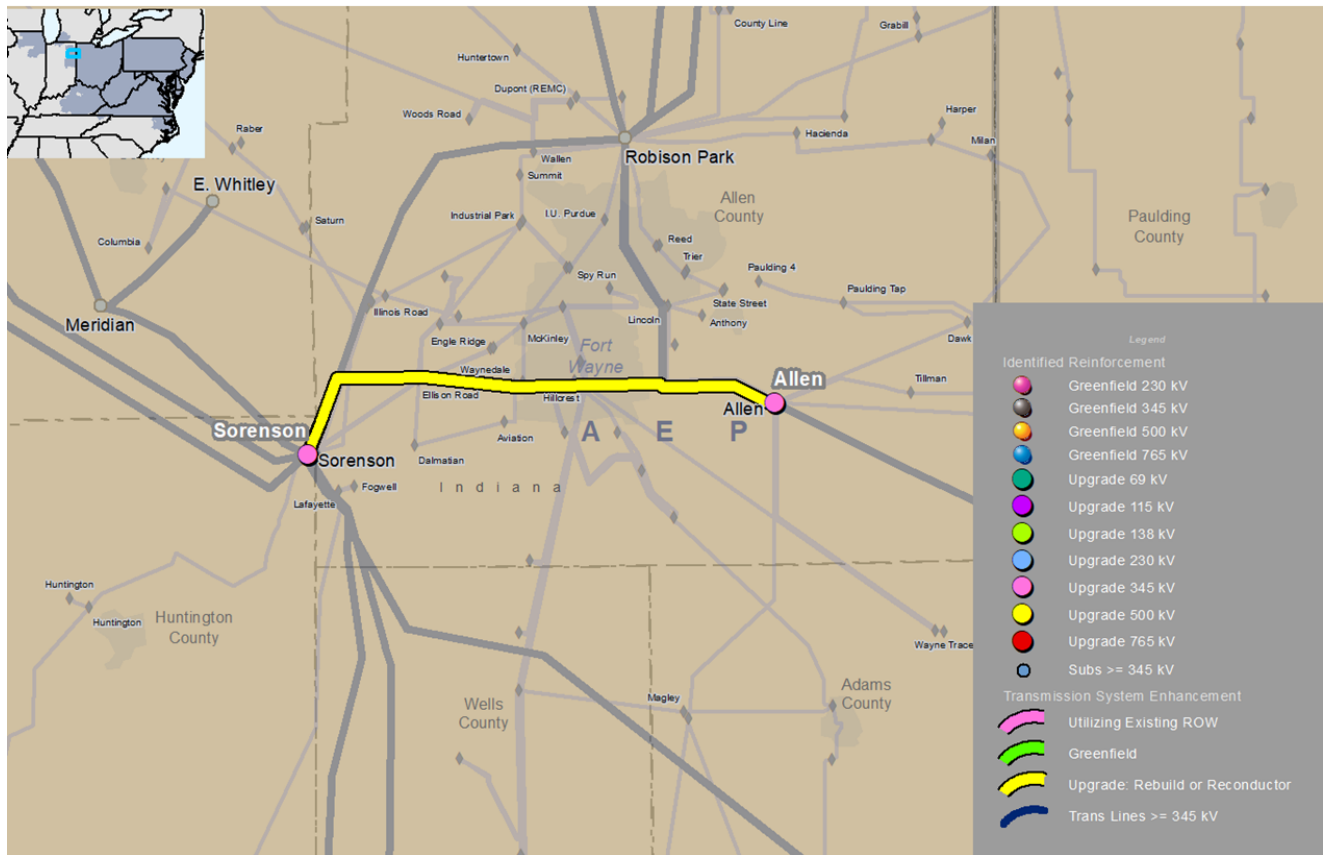
Proposing Entity Experience and Capability Review

AEP has the capability to implement Proposal 341 as proposed. The proposing entity experience and capability risk is considered **Low**.

Proposal 996 – Allen-Sorenson 345 kV Line Rebuild (AEP SCT)

AEP's Proposal No. 996 includes the rebuild of approximately 21.2 miles of the Allen-Sorenson 345 kV Transmission Line. The rebuild will be from existing structure 214 A in Adams County, Indiana, to the existing Sorenson Substation in Huntington County, Indiana. The rebuild will include double circuit capable structures, but only one side will be restrung. This proposal will traverse three counties (Huntington, Wells, and Adams) in Indiana.

Map 27 displays the components and routes proposed for proposal 996.

Map 27. Proposal 996

*NOTE: 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.*

Project Overview

Proposal 996 includes the following component:

- Component 1: Allen - Sorenson 345 kV Line Rebuild

Constructability Review

Right-of-Way/Land Acquisition Risk Analysis

Allen – Sorenson 345 kV Line Rebuild

The proposed rebuild of the Allen – Sorenson 345 kV transmission line spans approximately 21.2 miles across three counties and will be exclusively in the existing ROW. There is no anticipation of requiring additional permanent ROW for this proposal.

There are multiple access points to the ROW from public roads across the flat and rural topography of the project area. There are existing spans across roads, highways, and rail tracks, the St. Mary's River and Detmer Ditch and corresponding floodways. The project corridor is more than two miles south of Fort Wayne International Airport.

The ROW/Land Acquisition risk for this proposal is **Low**.

Environmental Risk Analysis

Component 1: Allen - Sorenson 345 kV Line Rebuild

The proposed route has the potential to impact environmental resources, including FEMA floodplains, streams and wetlands subject to USACE Section 404 and/or Section 10 permitting. The proposed route crosses St. Mary's River and Deptmer Ditch, as well as one large, forested wetland. Impacts to these resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE, and USFWS.

Transmission Line Risk Analysis

Component 1: Allen-Sorenson 345 kV Line Rebuild

- Approximately 75 existing lattice towers will require modifications and/or potential replacements.
- There are approximately more than ten electrical crossings under 69 kV that may pose schedule risk regarding outage coordination.

Constructability Summary

The proposed rebuild of the Allen – Sorenson 345 kV transmission line spans approximately 21.2 miles across three counties and will be exclusively in the existing ROW. Due to utilizing the existing ROW for the rebuild, a **Low** risk is assessed for constructability.

Outage Review

Due to the anticipated need to outage the Allen-Sorenson circuit for the rebuild, **Medium** risk is assessed for outage coordination.

Cost Review

As part of the detailed constructability analysis, an independent consultant prepared a high-level conceptual, independent cost estimate for the components of this proposal. The independent consultant assumes a level of effort and accuracy consistent with AACE International's Recommended Practice 17R-97, Cost Estimate Classification System, Class 3 with an expected accuracy of -20% to +40% from the base total estimate. Estimates will use available industry and materials. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering, and construction. The independent cost estimate includes a 30% contingency, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates is provided below.

Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
1	Allen-Sorenson 345 kV Line Rebuild	70.64	89.04
	Total	70.64	89.04

The proposal cost estimate is within 21-30% of independent cost estimate and is considered **Medium** risk.

Schedule Review

Projected in-service date is April 2030. Primary risks for this project are associated with outage coordination required to perform the rebuild. However, given the scope of the project the ISD seems reasonable. **Low** schedule risks assessed for this proposal.

Proposing Entity Experience and Capability Review

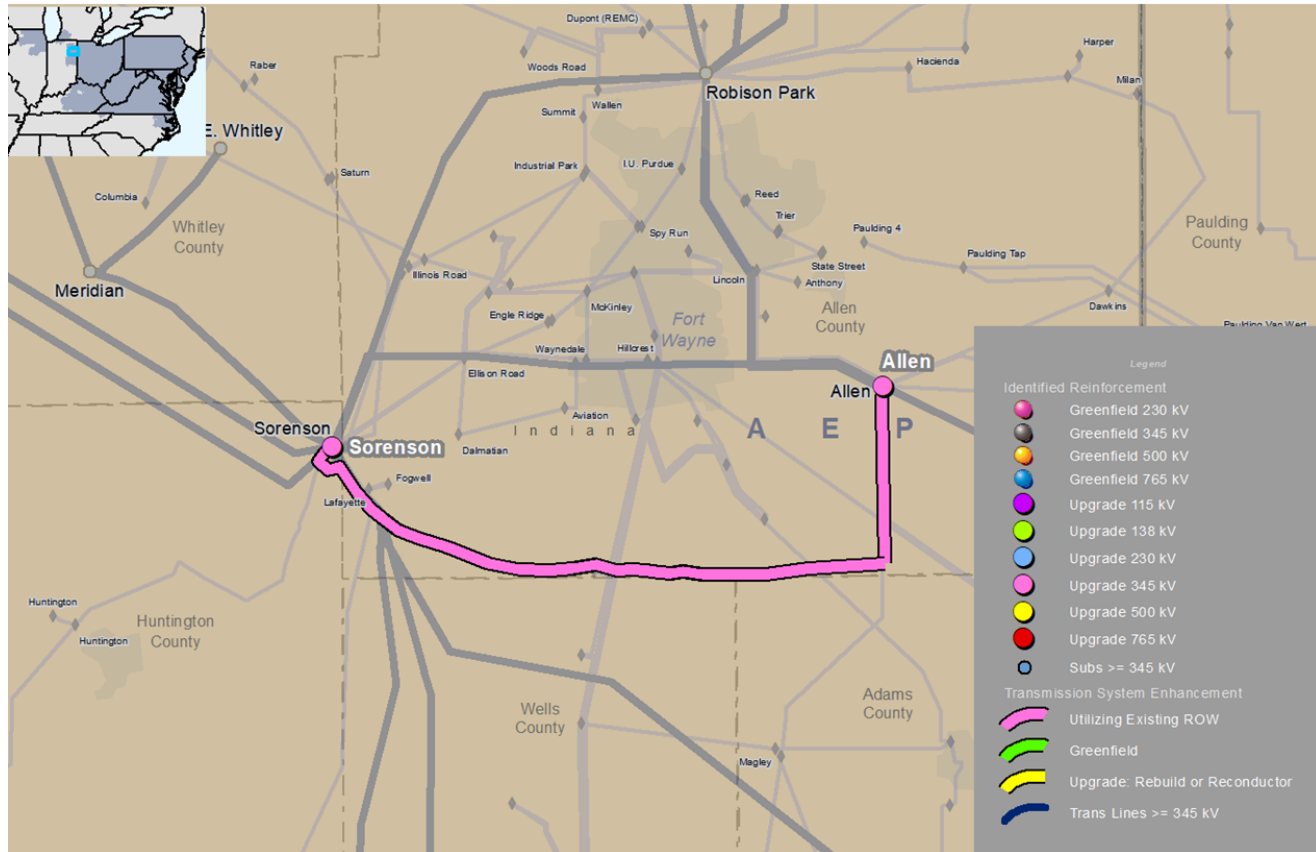
AEP has the capability to implement Proposal 996 as proposed. The proposing entity experience and capability risk is considered **Low**.

Proposal 672 – Allenson to Sorenson Transmission Project (CNTLTM)

CNTLM's Proposal No. 672 includes the construction of a 345 kV, 28.3 mile line from existing Allen 345 kV substation in Allen County, Indiana to existing Sorenson 345 kV substation in Whitley County, Indiana. This project will traverse two counties (Allen and Whitley) in Indiana. The substation upgrade components of this proposal include the expansion of Allen 345 kV Substation through the addition of two new breakers and associated equipment to add one new position, and the addition of one new breaker and associated equipment to Sorenson 345 kV Substation to create one new position.

This proposal has a total of three components, including two substation upgrade components, and one greenfield transmission line component.

Map 28 displays the components and routes proposed for proposal 672.

Map 28. Proposal 672

*NOTE: 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.*

Project Overview

The Allenson to Sorenson Transmission Project Proposal 672 includes the following components:

- Component 1: Allen 345 kV Substation Upgrade
- Component 2: Sorenson 345 kV Substation Upgrade
- Component 3: Allen - Sorenson 345 kV Transmission Line

Constructability Review

Right-of-Way/Land Acquisition Risk Analysis

Component 1 – Allen 345 kV Substation Upgrade

The existing Allen Substation is in Allen County, Indiana. The substation upgrade will include an expansion of the existing footprint to the east to accommodate new equipment. The expansion area is owned by the substation utility and acquisition from a third party is not required. It is not anticipated that the proposal would require local permits, consultations, clearances, and authorizations for the substation upgrade. The component is part of a project that will require approval from the Indiana Utility Regulatory Commission through a Certificate of Public Convenience and Necessity (CPCN), consistent with the applicable provisions of the Indiana Code.

Component 2 – Sorenson 345 kV Substation Upgrade

The existing Sorenson Substation is in Huntington County, Indiana. The substation upgrade will utilize the open position to accommodate new equipment. The substation upgrade will not require property acquisition from a third party. It is not anticipated that the proposal would require local permits, consultations, clearances, and authorizations for the substation upgrade. The component is part of a project that will require approval from the Indiana Utility Regulatory Commission through a Certificate of Public Convenience and Necessity (CPCN), consistent with the applicable provisions of the Indiana Code.

Component 3 – Allen – Sorenson 345 kV Transmission Line

The Allen - Sorenson 345 kV Transmission Line is an approximately 28.3-mile line that will be constructed from the existing Allen Substation, in Allen County, Indiana to the Sorenson Substation, in Huntington County, Indiana. The line will parallel the existing Allen – Sorenson transmission line for 100% of its length and traverse three counties (Allen, Adams, and Huntington) in Indiana. The planned ROW width is 130 feet and new ROW acquisition will be required.

The transmission line will cross ten active railroad tracks including one three-track grouping with a switch, nine transmission lines with voltages from 138 kV to 765 kV, and multiple road crossings including Interstate 69 and US 27 (4 lane, divided). The transmission line will cross three trails: the Heritage Snowmobile Trail (multiple locations along the transmission line corridor); Bluffton Road Corridor Trail (Fort Wayne, Indiana); Indianapolis Road Trail (City of Fort Wayne).

It is anticipated that the proposal could require permits, consultations, clearances, and authorizations from three counties in Indiana. The transmission line will require approval from the Indiana Utility Regulatory Commission through a Certificate of Public Convenience and Necessity (CPCN), consistent with the applicable provisions of the Indiana Code. Indiana DOT utility permits and driveway/local road permits may be required.

Overall, the ROW/Land Acquisition risk for this proposal is **Medium-High** due to the line route paralleling existing ROW for its entire alignment.

Environmental Risk Analysis

Component 1. Allen 345 kV Substation Upgrade

The proposed substation has the potential to impact environmental resources, including one potential stream. Three federally threatened and endangered bird species are also anticipated to be found in the substation footprint. Impacts to these resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE, and USFWS.

Component 2. Sorenson 345 kV Substation Upgrade

There are no environmental or permitting risks associated with this substation.

Component 3. Allen – Sorenson 345 kV Transmission Line

The proposed route has the potential to impact environmental resources, including FEMA floodplains, streams and wetlands subject to USACE Section 404 and/or Section 10 permitting. The proposed route crosses St. Mary's River, Nickelsen Creek, and Deptmer Ditch, as well as several large wetland complexes. Suitable forested habitat for federally listed bat species are anticipated to be located within the route corridor. Impacts to these resources will require coordination with the appropriate county floodplain administrator and coordination with state wildlife agencies, USACE, and USFWS. The proposed route intersects four easements. Coordination with easement holders – Heritage Snowmobile Trail, Bluffton Road Corridor Trail, Indianapolis Rail Trail, and Grassland Reserve Program will be required.

Transmission Line Risk Analysis

Component Name: 3. Allen - Sorenson 345 kV Transmission Line

- Approximately five underground utility crossings may require additional coordination for construction and impact the proposed locations for new structures.
- There are three 138 kV line crossings that may pose schedule risk regarding outage coordination.
- There are six EHV transmission line crossings, four 345 kV and two 765 kV transmission line crossings that pose risk to the design feasibility and may create excessive structure heights to maintain clearances as well as schedule risks with the outage coordination.

Constructability Summary

The Allen - Sorenson 345 kV Transmission Line is an approximately 28.3-mile line that crosses multiple private parcels and public recreation trails. The transmission line corridor is an expansion of the existing Allen – Sorenson transmission line, and the constructability risk is lower than a new, greenfield corridor. However, the proposed transmission line corridor may encounter few structural encroachments and crossings of roads, railroads, and public recreation trails.

Medium risk is assessed for constructability.

Outage Review

Due to the primary greenfield nature of this project, only short outages to existing facilities will be required to tie in the new transmission facilities, and therefore no significant existing facility outages are anticipated. Overall outage coordination risk is deemed **Low**.

Cost Review

As part of the detailed constructability analysis, an independent consultant prepared a high-level conceptual, independent cost estimate for the components of this proposal. The independent consultant assumes a level of effort and accuracy consistent with AACE International's Recommended Practice 17R-97, Cost Estimate Classification System, Class 3 with an expected accuracy of -20% to +40% from the base total estimate. Estimates will use available industry and materials. This estimate is based on a high-level assessment of probable costs for the current conceptual design and is reflective of recent supplier quotes and previous experience with substation engineering, transmission line engineering, and construction. The independent cost estimate includes a 30% contingency, as it is a concept-level estimate. A side-by-side comparison of proposing entity costs and independent cost estimates is provided below.

Component ID	Component Description	Proposal Cost Estimates (\$M)	Independent Cost Estimates (\$M)
1	Allen 345 kV Substation Upgrade	7.63	11.70
2	Sorenson 345 kV Substation Upgrade	5.11	3.81
3	Allen - Sorenson 345 kV Transmission Line	93.16	125.37
		105.90	140.88

The total proposal cost estimate is between 21-30% of the independent cost estimate and is considered **Medium** risk.

Schedule Review

This proposal has an in-service date of June 2030. The major schedule risks identified for Proposal 672 are primarily land acquisition and ROW permitting. **Medium** schedule risks are assessed for this project.

Proposing Entity Experience and Capability Review

LS Power has the capability to construct proposal 672 as submitted. The proposing entity experience and capability risk is considered **Low**.

INDEPENDENT COST ANALYSIS

Executive Summary

This report documents the independent cost analysis process for the proposals submitted in PJM's 2025 Regional Transmission Expansion Planning (RTEP) Reliability Window 1 to address transmission system constraints and forecasted load growth.

PJM received 134 proposals from various bidders, including both incumbent utilities and third-party transmission developers.¹ PJM provided Consultant with a shortlist of 29 unique proposals for review; four of which are “parent” portfolios comprised of combinations of 30 unique sub-proposals / components. The combination of these 29 unique proposals with four containing 30 unique sub-proposals / components results in a total of 59 proposals.

Given that PSEGR 241 and 619 are co-proposals as part of a single project and PPL 290 and PPL Translink (PPLTL) 552 are co-proposals as part of a single project, the total number of “projects” assigned to Consultant for evaluation can be further combined to 27.

PJM directed Consultant to evaluate the 27 projects within their assigned Clusters given the regional nature of the solution that the proposals or combination of proposals is intended to provide. For this window, proposals are segmented into six Clusters, as defined by PJM.

1. **South Regional.** To address violations by creating additional south to north paths to transfer power from planned generation in the south to load centers in the north.
2. **MAAC PPL.** To address PPL zone violations identified due to the internal PPL load growth.
3. **MAAC Regional.** To address regional west to east transfer needs, further impacted by (i) the additional PPL load growth and (ii) the anticipated delay of the New Jersey Offshore Wind projects.²
4. **MAAC Additional Regional Needs.** Additional segmentation of the MAAC Regional Cluster to transfer power from west to east.
5. **West Regional.** To address violations in central Ohio area and provide robust solutions to accommodate future growth, such as in the Columbus area.
6. **West Regional Additional AEP Needs.** To address specific violations in AEP.

Error! Reference source not found.8 below details the breadth of proposals assigned to Consultant, organized by Proposer and assigned Cluster.³

¹ Per PJM's RTEP Window 1 Progress update

² New Jersey Offshore Wind projects have faced schedule delays and cancellation due to economic and regulatory challenges.

³ In this report, Developer and Proposer may be used interchangeably.

Table 8. Proposal IDs Assigned to Consultant for Independent Review and Analysis

Cluster → Proposing Entity ↓	South Regional	MAAC PPL	MAAC Regional	MAAC Add'l Regional Needs	West Regional	West Regional Add'l AEP Needs	Unique Proposals
AEP	-	-	-	-	-	341, 996	2
ATSI	-	-	-	-	239, 334	-	2
LS Power (LSP)	260	20	-	-	543	672	4
MAIT	-	-	578	-	-	-	1
NextEra (NXTA)	-	771, 871	237, 687	896	109, 152	-	7
PEPCO (PEP)	-	-	-	371	-	-	1
PPL	-	290 853 (+10)	-	-	-	-	2 (+10)
PPL TransLink (PPLTL)	-	552	-	-	-	-	1
PSEGRT	-	-	-	-	241, 619	-	2
TrAILCo (TRAIL)	938	-	-	-	-	-	1
Transource	331, 781	-	-	-	570	-	3

(TRNSC)							
VEPCO	275 (+11)						3
	616 (+10)	-	-	-	-	-	(+20)
	705 (+9)						
Total <u>Proposals</u> for Consultant Review							59
Total <u>Proposals</u> for Consultant Evaluation							29 (+30)
Total <u>Projects</u> for Consultant Evaluation							27 (+30) (+1) (+1)

Key → Combined into 619_241 || Combined into 290_552 || Parent portfolios || Subs / components

Note. Proposal IDs specified are PJM Proposal ID numbers as found in Proposal PDF documents.

Section 0 of this report details the comprehensive data collection and review process carried out by Consultant and PJM to ensure received documentation is satisfactorily completed and internally consistent. Key documents evaluated by Consultant in its review include the PDF proposal from the Competitive Planner Tool, the Capital Expenditure Workbook (Attachment 7), Cost Containment Legal Language (Attachment 9), and the Consultant-provided Cost and Cost Containment Workbook.

Section 0 of this report discusses the range of unique cost containment mechanisms offered in this tranche of proposals. Each proposal is assigned a risk category based on cost containment mechanisms offered. Many proposals include soft capital cost caps that reduce ROE for incremental overages to different degrees, with relatively few proposals offering hard capital cost caps or no cost containment at all.

Section Error! Reference source not found. of this report discusses the varying levels of contingency budgeted in each proposal as well as the percentage of proposal CapEx that is “Work by Others” (WBO). Contingency and WBO levels are important to consider given their impact on sensitivity modeling results. Contingency ranged from 0% to 27% of total non-Contingency Proposer CapEx, and WBO ranged from 0% to 52% of total proposal CapEx.

Sections Error! Reference source not found., Error! Reference source not found., and Error! Reference source not found. of this report document Consultant’s modeling methodology, considerations, and sensitivities. Consultant used its proprietary Investment Cost of Service (ICOS) model to conduct a detailed cost analysis and estimate revenue requirements for the 27 projects. For proposals that are a combination of sub-proposals, each sub-proposal is modeled separately and summed accordingly to produce a combined result. Since Developers provided proposal materials on an individual proposal basis, and four of the 59 proposals are combinations of the 30 unique

sub-proposals / components, Consultant calibrated 55 ICOS model iterations (59 less four makes 55 unique model runs). The ICOS model calculates a bottom-up revenue requirement for each of the solutions utilizing the Developers' cost and financial assumptions, where provided, as well as several standardized model inputs and calculations. The Present Value Revenue Requirement (PVRR) represents the discounted total cost of the proposed project over its lifetime. In addition to a Base Case PVRR, Consultant modeled eight sensitivities that alter one or multiple variables for each proposal. The use of the sensitivities provides insight into the impact of potential cost increases as well as the effectiveness of the proposed cost containment mechanisms.

Section 0 documents ICOS model results, sensitivity performance, and comparative analysis within each assigned Cluster. This allows PJM to better understand the relative risk of each proposal. For each proposal, the PVRR and percent increase are measured for each of the eight sensitivities compared to the Base Case PVRR.

Key Summaries

Summary of Cost Containment Observed

Cost containment measures observed in proposals include soft capital cost caps, ROE caps, equity ratio caps, and hard capital cost caps. Within these measures, some Developers include provisions that can weaken customer protection such as ROE floors, high contingency values, excluding specific cost categories, and excluding costs above a certain stated percentage increase (often tied to an index). Few proposals were hard capped or had no cost containment at all. Many proposals included soft caps, but there is substantial variation in how the caps apply. For instance, no soft caps cover WBO, and some soft caps do not cover the cost of all Proposer components or cost categories. Some caps reduce ROE as soon as CapEx exceeds the capped amount, while others did not reduce ROE until 125% of the capped amount. The magnitude of the ROE reduction varies from 0.50 percentage points to over 4 percentage points, with some caps reducing only at one threshold, and others reducing incrementally at different cost coverage thresholds.

See **0** for a comprehensive summary of the cost containment mechanisms documented and discussed throughout this report, with further detail on each Cluster in **Section 0**.

Summary of Sensitivity Performance and Comparative Analysis

Across Clusters, proposals with no cost containment or limited cost containment (such as VEPCO's Engineering & Design (E&D) only cap) performed the worst in CapEx+ and Downside sensitivities. Proposals with soft caps, ROE caps, and equity ratio caps performed better, with the magnitude of ROE reduction, threshold for ROE reduction, and proportion of CapEx covered by the cap driving differentiated results. The best-performing proposals included hard caps on all Proposer costs, where the Proposer will not recover ROE, cost of debt, or depreciation in the event of an overage. Across cost cap types, contingency and WBO proportions also differentiated results between otherwise similar proposals.

A high-level summary of results by Cluster are as follows:

- **South Regional.** TRNSRC 331 and 781, and LSP 260 perform the best from a cost containment perspective, with TRNSRC 781 having the lowest base cost. VEPCO proposals exhibit the weakest cost containment across sensitivities, with VEP 275 performing the worst.

- **MAAC PPL.** PPL 853 performs the best due to its hard cost cap, followed by the combined PPL_PPL TransLink proposal with a partial hard cap. NextEra and LS Power proposals perform the worst with NXTA 871 having the highest cost.
- **MAAC Regional.** NXTA 237 and 687 perform the best due to a stronger cost containment structure relative to MAIT 578.
- **MAAC Additional Regional Needs.** Neither PEP 371 nor NXTA 896 offer cost containment. NXTA 896 is the lower cost proposal in the Base Case and exhibits stronger performance in the Downside despite PEP 371 performing better in CapEx+ sensitivities.
- **West Regional.** PSEGRT 619_241 has the best cost containment due to a hard cap on the majority of combined proposal costs. LSP 543 is an order of magnitude cheaper than the other proposals but performs third in cost containment. NextEra, Transource, and ATSI proposals have similar cost containment, but variation in WBO and contingency drive differentiated performance.
- **West Regional Additional AEP Needs.** LSP 672 is the most expensive but offers the strongest cost containment with soft and ROE caps versus no containment at all in the AEP proposals.

See **0** for a comprehensive summary of PVRR and sensitivity performance documented in **Section 0** of this report.

General

This report references the 29 proposals when summarizing cost containment since all 30 sub-proposals / components follow the same cost containment mechanism as the parent proposal (e.g., VEPCO 275, 616, and 705, and PPL 853).

This report references the 27 projects when reporting PVRR results and discussing sensitivity performance and comparative analysis.⁴

Data Collection and Review

Key Documents Reviewed

In the 2025 RTEP Window 1, PJM requested Consultant review of 29 proposals and 30 unique sub-proposals / components for a total of 59 sets of documents.

Upon receiving the proposal documents, Consultant reviewed the following from each Developer:

- **Proposal PDF.** This PDF document is generated from PJM's Competitive Planner tool and contains specific information about project scope, capital spend start date, in-service date, and cost containment provisions. It

⁴ In this report, "proposal" and "project" may be used interchangeably.

also includes details about each component such as component name, component description, entity responsible for construction, cost, and contingency.⁵

- **Capital Expenditure Workbook (Attachment 7).** This Excel spreadsheet contains annual capital expenditure (CapEx) data in 2025\$ for both the Proposer and WBO entities.⁶ It also includes the capital spend start date, construction start date, and commercial operation date.⁷
- **Cost Containment Legal Language (Attachment 9).** Each Developer that offers cost containment submits a supplemental document describing their cost cap(s) and any related terms and conditions. These documents are central to understanding how each Developer's cost containment should be treated in the ICOS model.
- **Cost and Cost Containment Workbook.** Proposer provides information including monthly CapEx, annual operations & maintenance and administrative & general (O&M and A&G, or O&M collectively), cost of capital, income tax rates, tax depreciation methodologies, property and other taxes, capital structure, regulatory treatment, rate base adjustments, and cost containment. This workbook is provided by the Consultant and each shortlisted Developer is required to submit one per proposal via a supplemental information request.

Deficiency Review and Information Requests

As part of the initial proposal intake process, Consultant completes a detailed review of each of the documents listed above for all proposals. The goal of this review is to identify any potential deficiencies that require resolution or other information requests required for PJM to have a complete, accurate, and consistent data set. This is also a critical process for the ICOS model as it uses information such as the in-service date and CapEx spend to calculate revenue requirement.

In total, Consultant's deficiency review yielded 132 deficiencies and associated requests for information, or RFIs (excluding follow-ups), which were communicated to PJM. Examples of the deficiencies Consultant identifies include:

- Total component cost (or specific line items like contingency or WBO totals) in the Proposal PDF did not match the Capital Expenditure Workbook.
- Proposer versus WBO component costs assigned in the Proposal PDF conflicted with the Proposer and WBO totals entered in the Capital Expenditure Workbook.

5 A proposal refers to a solution that is comprised of one or more components that are collectively described and priced by the Proposer. A component is an explicit portion of the scope of the broader solution that the proposal is offering, such as a new substation, work on an existing kV line, etc.

6 For certain components included in proposals, the entity responsible for construction may not be the proposing entity or one of its affiliates/joint venture partners. These are known as "Work by Others" or "WBO" components. All results shown in this report include Work by Others.

7 In this report, "Commercial Operation Date," or "COD," and "In-Service Date," or "ISD," may be used interchangeably.

- Commercial operation date in the Proposal PDF did not match the Capital Expenditure Workbook.
- Cost cap values in the Proposal PDF were entered as zero, but a non-zero value was provided in the Cost Containment Legal Language.
- Commercial operation date entered in the Capital Expenditure Workbook or Proposal PDF conflicted with the temporal entries found in the Cost and Cost Containment Workbook (i.e., CapEx entered after project goes into service but no Ongoing CapEx expected).

Developers provide responses to Consultant's deficiency items and information requests. These responses are then reviewed to determine whether they were sufficient.

The deficiency review process is critical to ensuring high quality cost analysis, as complete and correct proposal information is required for PJM to make informed decisions.

Key Modeling Information

Proposal capital structure and cost of capital metrics form the basis of Consultant's Base Case PVRR. Along with cost containment, these metrics are important factors to consider when evaluating proposal performance in various sensitivities, whether cost containment is offered or not. Consultant can extract cost of capital metrics for each Developer from the Cost and Cost Containment Workbooks. **Error! Reference source not found.9** summarizes the cost of capital metrics gathered across the proposals for use in Consultant's ICOS modeling efforts for Proposer CapEx spend.

Table 9. Proposer Cost of Capital Metrics (%)

Proposing Entity	COD	ROE	Equity	Debt	WACC
VEP	4.10%	11.40%	46.20%	53.80%	8.00%
LSP	5.00%	10.30%	50.00%	50.00%	7.70%
TRNSC	4.20%	10.00%	50.00%	50.00%	7.10%
NXTA	5.90%	10.20%*	50.00%*	50.00%*	8.10%
PPL	5.80%	10.50%	44.00%	56.00%	8.20%
PPLTL	5.80%	10.50%	44.00%	56.00%	8.20%
PEP	4.90%	10.50%	49.70%	50.30%	7.70%

PSEGRT	6.50%	10.40%	45.00%	55.00%	8.20%
AEP	4.00%	10.40%	45.00%	55.00%	7.50%
MAIT	5.80%	10.30%	40.00%	60.00%	8.50%
ATSI	5.80%	10.00%	50.00%	50.00%	7.90%
TRAIL	5.80%	10.00%	50.00%	50.00%	7.90%

*Average across NextEra proposals. NextEra specifies that Proposals 109, 152, 237, and 687 earn an ROE of 10.2%, Proposals 771 and 871 earn an ROE of 9.9%, and Proposal 896 earns an ROE of 10.8% at a 60% equity share.

As outlined in **Section 0** above, the Proposer provides capital costs in several documents which are compared to ensure consistency and alignment. CapEx is detailed not just by proposal component but by CapEx “cost category.” CapEx cost categories are defined as follows:

1. Engineering and Design
2. Permitting / Routing / Siting
3. Right of Way (ROW) / Land Acquisition
4. Materials and Equipment
5. Construction and Commissioning
6. Construction Management
7. Overheads and Miscellaneous Costs
8. Contingency

The Proposer also assigns construction responsibility of proposal components as either Proposer or WBO. Understanding these assignments is critical to appropriately capturing any cost containment a proposal may include, correctly applying the cost of capital, and effectively running PVRR sensitivities. **Error! Reference source not found.** summarizes the magnitude of capital costs involved with each proposal within each Cluster studied, detailing what is assigned to Proposer versus WBO.

Table 10. Summary of Proposal Capital Costs, in 2025\$

Proposal ID	Cluster	Proposing Entity	Total CapEx	Proposer Total CapEx	WBO Total CapEx
275	South Regional	VEP	\$ 4,819,506,868	\$ 4,819,506,868	-
616	South Regional	VEP	\$ 2,454,114,549	\$ 2,454,114,549	-
705	South Regional	VEP	\$ 2,864,733,311	\$ 2,864,733,311	-
260	South Regional	LSP	\$ 3,515,948,927	\$ 3,423,053,780	\$ 92,895,147
331	South Regional	TRNSC	\$ 2,895,233,711	\$ 1,917,088,339	\$ 978,145,373
781	South Regional	TRNSC	\$ 1,991,446,708	\$ 1,306,099,919	\$ 685,346,789
938	South Regional	TRAIL	\$ 3,426,930,565	\$ 3,366,536,165	\$ 60,394,400
853	MAAC PPL	PPL	\$ 797,944,851	\$ 797,944,851	-
290	MAAC PPL	PPL	\$ 88,163,848	\$ 88,163,848	-
552	MAAC PPL	PPLTL	\$ 194,253,314	\$ 61,698,009	\$ 132,555,305
20	MAAC PPL	LSP	\$ 494,286,189	\$ 450,066,651	\$ 44,219,538
771	MAAC PPL	NXTA	\$ 558,992,423	\$ 528,678,535	\$ 30,313,888
871	MAAC PPL	NXTA	\$ 1,176,240,611	\$ 1,126,958,051	\$ 49,282,560
237	MAAC Regional	NXTA	\$ 1,790,180,676	\$ 1,722,207,941	\$ 67,972,735
687	MAAC Regional	NXTA	\$ 3,342,611,168	\$ 3,270,595,885	\$ 72,015,283
578	MAAC Regional	MAIT	\$ 2,418,261,233	\$ 2,375,581,911	\$ 42,679,322

371	MAAC Add'l Regional Needs	PEP	\$ 857,220,603	\$ 857,220,603	-
896	MAAC Add'l Regional Needs	NXTA	\$ 596,567,024	\$ 578,252,258	\$ 18,314,766
239	West Regional	ATSI	\$ 1,492,405,528	\$ 1,139,973,456	\$ 352,432,072
334	West Regional	ATSI	\$ 1,690,256,560	\$ 1,417,082,187	\$ 273,174,373
570	West Regional	TRNSC	\$ 2,738,819,200	\$ 1,324,841,383	\$ 1,413,977,817
543	West Regional	LSP	\$ 121,407,651	\$ 109,441,783	\$ 11,965,868
109	West Regional	NXTA	\$ 3,418,968,926	\$ 2,096,549,549	\$ 1,322,419,377
152	West Regional	NXTA	\$ 3,012,058,502	\$ 2,092,682,897	\$ 919,375,605
619	West Regional	PSEGRT	\$ 1,942,649,642	\$ 1,587,294,745	\$ 355,354,898
241	West Regional	PSEGRT	\$ 143,361,000	\$ 143,361,000	-
672	West Add'l AEP Needs	LSP	\$ 105,924,602	\$ 93,155,748	\$ 12,768,854
341	West Add'l AEP Needs	AEP	\$ 37,375,449	\$ 37,375,449	-
996	West Add'l AEP Needs	AEP	\$ 70,644,239	\$ 70,644,239	-

Note: Excludes
Ongoing
CapEx

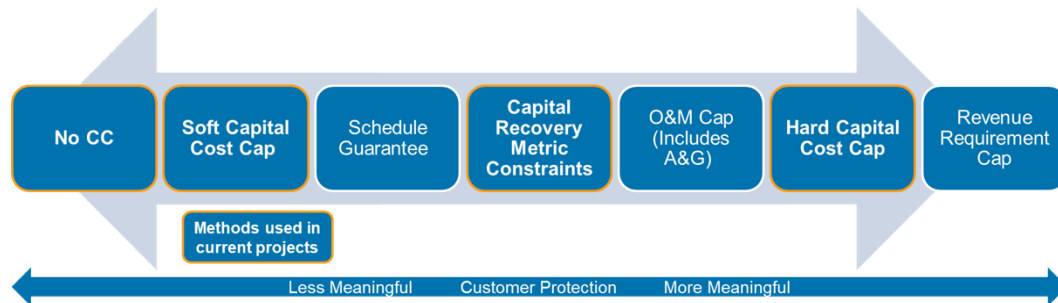
Developers
also provide
various other
inputs such as
O&M, tax rates,
and cash
working capital.
Please see
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Cost Containment

General Cost Containment Observations

This section provides a summary of cost containment methods utilized across Clusters for each proposal. Cost containment measures observed in proposals include soft capital cost caps, ROE caps, equity ratio caps, and hard capital cost caps. Within these measures, some Developers include provisions that can weaken customer protection such as ROE floors, high contingency values, excluding specific cost categories, and excluding costs above a certain stated percentage increase (often tied to an index). **Error! Reference source not found.** below shows the relative strength of common cost containment types; however, the effectiveness of a proposal's cost containment depends on the specific mix of methods used, the number of categories contained, and the type of cost overrun that occurs (if or when overrun occurs).

Figure 3. Typical Cost Containment Mechanisms



Cost containment methods can include the following characteristics (bolded items below represent cost containment present in 2025 RTEP Window 1 proposals):

- **No CC:** Developer does not include any cost containment
- **Soft Capital Cost Cap**
 - Developer reduces ROE for capital costs that exceed the soft cost cap (CapEx up to the cost estimate still earns the full ROE)
 - Developer typically continues to recover depreciation and return on debt for costs over the cap
 - May include only a subset of specific cost types, rather than entire capital cost estimate
 - May be set at or higher than estimated cost (e.g., soft cap does not take effect until 120% of cost estimate)
- **Schedule Guarantee**
 - Typically offered as a reduction to ROE if project is completed past the proposed in-service date
 - Could be in the form of a credit to revenue requirement

- Capital Recovery Metric Constraints
 - ROE cap (Developer commits not to increase their ROE above a stated rate)
 - Cost of Debt cap
 - Equity Commitment (Equity portion of capital structure, referred to as equity ratio cap)
 - May be for life or defined period
- O&M Cap
 - May be annual or total
 - May be for life or defined period
- Hard Capital Cost Cap
 - Capital costs to be recovered are limited to a capped amount – Developer absorbs all costs and returns over that cap
 - May be set at or higher than estimated cost
 - May include only a subset of specific cost types, rather than entire capital cost estimate
- Revenue Requirement Cap
 - May be for life or defined period
 - May be set higher than estimated annual revenue requirement
 - May have deferred revenue provision
 - May have other limiting provisions that weaken effectiveness

Consultant assesses project performance based on the Cost Containment Risk Assessment categories provided by PJM, as seen in **Error! Reference source not found..** PJM utilizes five distinct Risk Assessment categories in its transmission proposal risk evaluation process (Low, Low-Medium, Medium, Medium-High, High). Consultant applies this same rubric to develop a relative risk ranking for each proposal within a Cluster. In addition to criteria provided by PJM, Consultant considers whether ROE caps and equity ratio caps are included in the cost containment to determine whether a proposal is Medium or Medium-High risk. This distinction is made because Consultant considers the presence of a soft cap without a complementary ROE and equity ratio cap as a distinguishing that qualitatively adds more risk than a soft cap paired with an ROE and equity ratio cap.

Table 11. Risk Assessment Categories provided by PJM

Risk Assessment	Cost Containment Risk	Additional Consultant Considerations
Low	Revenue Requirement cap Hard cost cap (Project cost capped with no cost recovery above binding cost cap) with minimal exclusions	
Low-Medium	Mix of Hard/Soft caps on Project <i>components</i>	
Medium	Soft Caps (No direct cap on Project costs, but indirect caps via reductions to ROE and/or incentives for cost overruns)	Soft cap complemented with an ROE cap / equity ratio cap
Medium-High	Minimal cost caps and/or excessive exclusions	Soft cap present but no ROE cap / equity ratio cap
High	No cost containment	

South Regional Review and Observations

This section provides a summary of cost containment for all South Regional Cluster proposals evaluated. **Error! Reference source not found.** presents the cost cap structure, risk category, ROE cap/floor, and equity ratio cap details for all proposals. All proposals except for Dominion’s include an ROE and equity ratio cap. While the other proposals only reduce ROE at one threshold, LSP 260 reduces the ROE earned on incremental overages by 1.3 percentage points when costs exceed 100% and then by 1.5 percentage points when costs exceed 125% and again at 150% of the capped amount.

Table 12. South Regional Cost Containment Details Across Proposals

Dominion	LS Power	Transource	TrAILCo

Category	VEP	LSP	TRNSRC	TRAIL
Total Number of Proposals	3	1	2	1
Cost Containment Provided?	Yes	Yes	Yes	Yes
Risk Category	Medium-High	Medium	Medium	Medium
Hard Cost Cap	No	No	No	No
Soft Cost Cap, ROE Reduction	Will forgo RTO add from ROE on excess E&D costs	6% - 9%	9.5% for costs >120%	9.5% for costs >120%
ROE Cap	No	10.3%	Lower of 10% or approved FERC ROE	Lower of 10% or approved FERC ROE
ROE Floor	-	-	9.5%	9.5%
Equity Ratio Cap	No	50%	50%	50%

Error! Reference source not found. summarizes cost cap structure by cost category. Dominion's proposals only soft cap Engineering & Design costs, whereas all other proposals soft cap all cost categories except for Allowance for Funds Used During Construction (AFUDC).

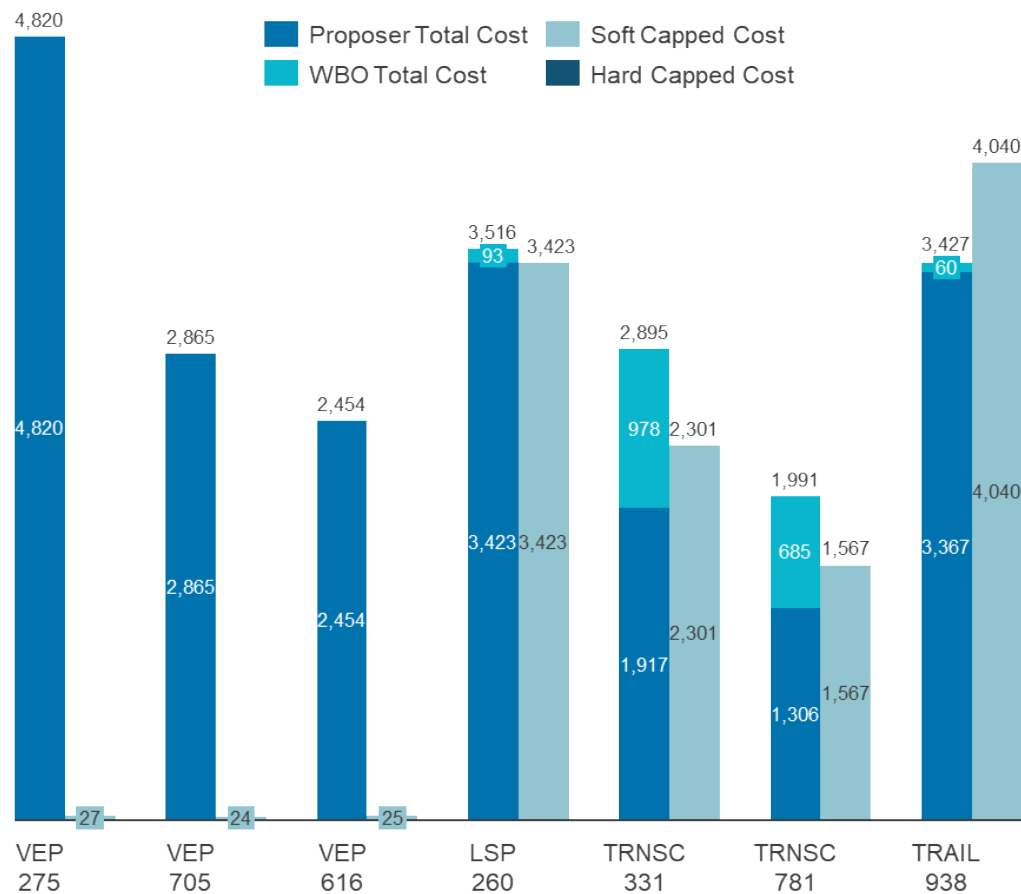
Table 13. South Regional Cost Containment Inclusions by Cost Category

	Included / Excluded in Cost Containment – By Developer			
Category	VEP	LSP	TRNSRC	TRAIL
Total Number of Proposals	3	1	2	1
Engineering & Design	Included	Included	Included	Included

Permitting/Routing/Siting		Excluded	Included	Included	Included
ROW Land Acquisition		Excluded	Included	Included	Included
Materials & Equipment		Excluded	Included	Included	Included
Construction & Commissioning		Excluded	Included	Included	Included
Construction Management		Excluded	Included	Included	Included
Overheads and Miscellaneous		Excluded	Included	Included	Included
AFUDC		Excluded	Excluded	Excluded	Excluded
Soft Cap	Hard Cap				

Error! Reference source not found. visualizes the magnitude of Proposer CapEx, WBO CapEx, and CapEx covered by soft and hard cost caps. VEP soft caps cover 1% or less of total project CapEx, while LSP's soft cap covers 100% of Proposer CapEx. TRNSC and TRAIL's soft caps begin at 120% of Proposer CapEx, allowing for some overage before ROE is reduced.

Figure 4. Cost Cap Levels Across South Regional Proposals



MAAC PPL Review and Observations

This section provides a summary of cost containment for all MAAC PPL Cluster proposals evaluated. **Error! Reference source not found.** presents the cost cap structure, risk category, ROE cap/floor, and equity ratio cap details for all proposals in the MAAC PPL Cluster. PPL’s proposals are hard capped, LSP and NXTA have soft caps as well as ROE/equity ratio caps, and PPLTL has no cost containment. LSP’s soft cap includes tiered ROE reductions. NXTA’s soft cap has a 20-year duration, which is not included by any other Proposers.

Table 14. MAAC PPL Cost Containment Details Across Proposals

	PPL	PPL TransLink	LS Power	NextEra
Category	PPL	PPLTL	LSP	NXTA
Total Number of Proposals	2	1	1	2

Cost Containment Provided?	Yes	No	Yes	Yes
Risk Category	Low	High	Medium	Medium
Hard Cost Cap	Yes	-	No	Partial
Soft Cost Cap, ROE Reduction	-	-	6% - 9%	7.8% <i>For 20 years</i>
ROE Cap	-	-	10.3%	9.9% <i>For 20 years</i>
ROE Floor	-	-	-	-
Equity Ratio Cap	-	-	50%	50% <i>For 20 years</i>

Error! Reference source not found. summarizes cost cap structure by cost category. For all proposals with cost containment, all cost categories except for AFUDC are covered. NXTA includes a hard cap only on Construction Management, with all other cost categories soft capped.

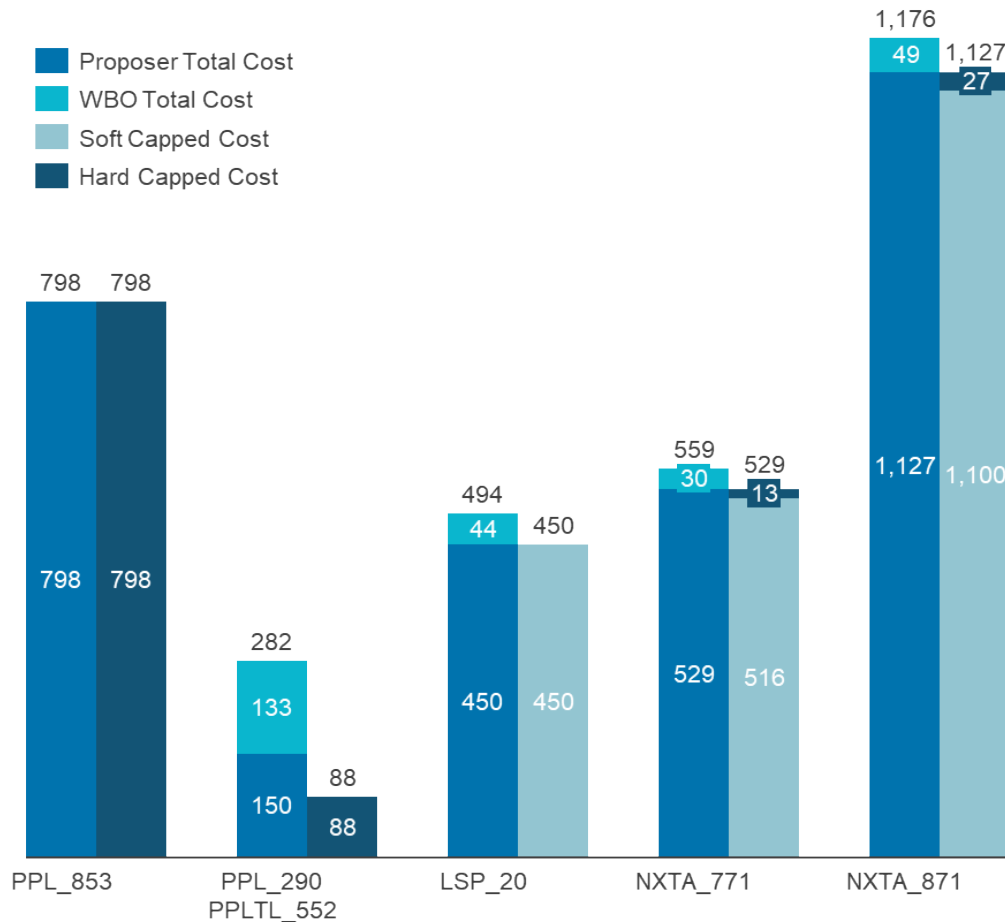
Table 15. MAAC PPL Cost Containment Inclusions by Cost Category

	Included / Excluded in Cost Containment – By Developer			
Category	PPL (Hard Cap - all)	PPLTL	LSP	NXTA
Total Number of Proposals	2	1	1	2
Engineering & Design	Included	No Cost Containment	Included	Included
Permitting/Routing/Siting	Included		Included	Included
ROW Land Acquisition	Included		Included	Included

Materials & Equipment		Included		Included	Included
Construction & Commissioning		Included		Included	Included
Construction Management		Included		Included	Included
Overheads and Miscellaneous		Included		Included	Included
AFUDC		Excluded		Excluded	Excluded
Soft Cap	Hard Cap				

Error! Reference source not found. visualizes the magnitude of Proposer CapEx, WBO CapEx, and CapEx covered by soft and hard cost caps. PPL, LSP, and NXTA cap all Proposer CapEx, while PPLTL has no cost containment.

Figure 5. Cost Cap Levels Across MAAC PPL Proposals



MAAC Regional Review and Observations

This section provides a summary of cost containment for all MAAC Regional Cluster proposals. **Error! Reference source not found.** presents the cost cap structure, risk category, ROE cap/floor, and equity ratio cap details for all proposals in the MAAC Regional Cluster. NXTA offers a soft cap where ROE is reduced for incremental overages over the cap, and a hard cap on construction management costs. NXTA also caps ROE and Equity Ratio. In contrast, MAIT offers a tiered reduction in ROE depending on the level of cost overage and does not offer a ROE or equity ratio Cap. MAIT's soft cap is unusual since, typically, ROE reductions only apply to the incremental overage, i.e., only costs over the capped amount earn the reduced ROE. MAIT included a clause that set the threshold for a 0.50 percentage point ROE reduction at 125% of Proposer CapEx but applies the ROE reduction to overages between 100% - 125% of Proposer CapEx if the 125% threshold is breached. These unusual mechanics were confirmed via the RFI process and effectively provide MAIT a stronger incentive to not exceed Proposer CapEx by more than 125%, but no incentive to not exceed it by 124%. After the 125% threshold, incremental ROE is reduced normally by an additional 0.50 percentage points at 150% and 175% of the cost-capped amount.

Table 16. MAAC Regional Cost Containment Details Across Proposals in MAAC Regional

	NextEra	MAIT
Category	NXTA	MAIT
Total Number of Proposals	2	1
Cost Containment Provided?	Yes	Yes
Risk Category	Medium	Medium-High
Hard Cost Cap	Partial	No
Soft Cost Cap, ROE Reduction	8.0% <i>For 20 years</i>	Tiered Reduction to 8%
ROE Cap	10.2% <i>For 20 years</i>	No
ROE Floor	-	Lower of FERC approved or 8.5%
Equity Ratio Cap	50% <i>For 20 years</i>	-

Error! Reference source not found. summarizes cost cap structure by cost category. All cost categories are cost contained except for AFUDC. For NXTA proposals, Construction Management is hard capped.

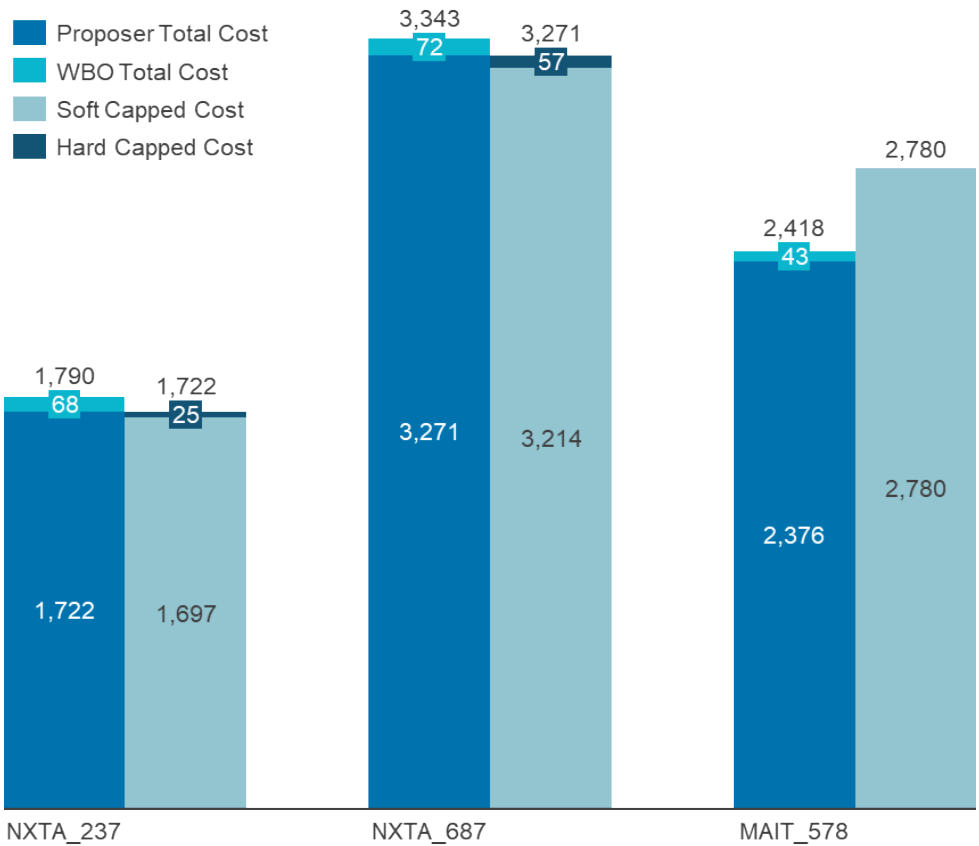
Table 17. MAAC Regional Cost Containment Inclusions by Cost Category

	Included / Excluded in Cost Containment – By Developer	
Category	NXTA	MAIT

Total Number of Proposals	2	1
Engineering & Design	Included	Included
Permitting/Routing/Siting	Included	Included
ROW Land Acquisition	Included	Included
Materials & Equipment	Included	Included
Construction & Commissioning	Included	Included
Construction Management	Included	Included
Overheads and Miscellaneous	Included	Included
AFUDC	Excluded	Excluded
Soft Cap	Hard Cap	

Error! Reference source not found. visualizes the magnitude of Proposer CapEx, WBO CapEx, and CapEx covered by soft and hard cost caps. NXTA caps all Proposer CapEx between its soft and hard capped amounts. MAIT's cost cap starts at 125% of Proposer CapEx, which allows for overages before the incremental ROE is reduced.

Figure 6. Cost Cap Levels Across Proposals in MAAC Regional



MAAC Additional Regional Needs Review and Observations

This section provides a summary of cost containment for all MAAC Additional Regional Needs Cluster proposals evaluated. **Error! Reference source not found.**8 presents the cost cap structure, risk category, ROE cap/floor, and equity ratio cap details for all proposals in the MAAC Additional Regional Needs Cluster. Neither proposal in this Cluster is cost contained.

Table 18. Cost Containment Details Across Proposals in MAAC Additional Regional Needs

	NextEra	PEPCO
Category	NXTA	PEP
Total Number of Proposals	1	1
Cost Containment Provided?	No	No

Risk Category	High	High
Hard Cost Cap	-	-
Soft Cost Cap, ROE Reduction	-	-
ROE Cap	-	-
ROE Floor	-	-
Equity Ratio Cap	-	-

Error! Reference source not found. summarizes cost cap structure by cost category. Neither proposal is cost contained.

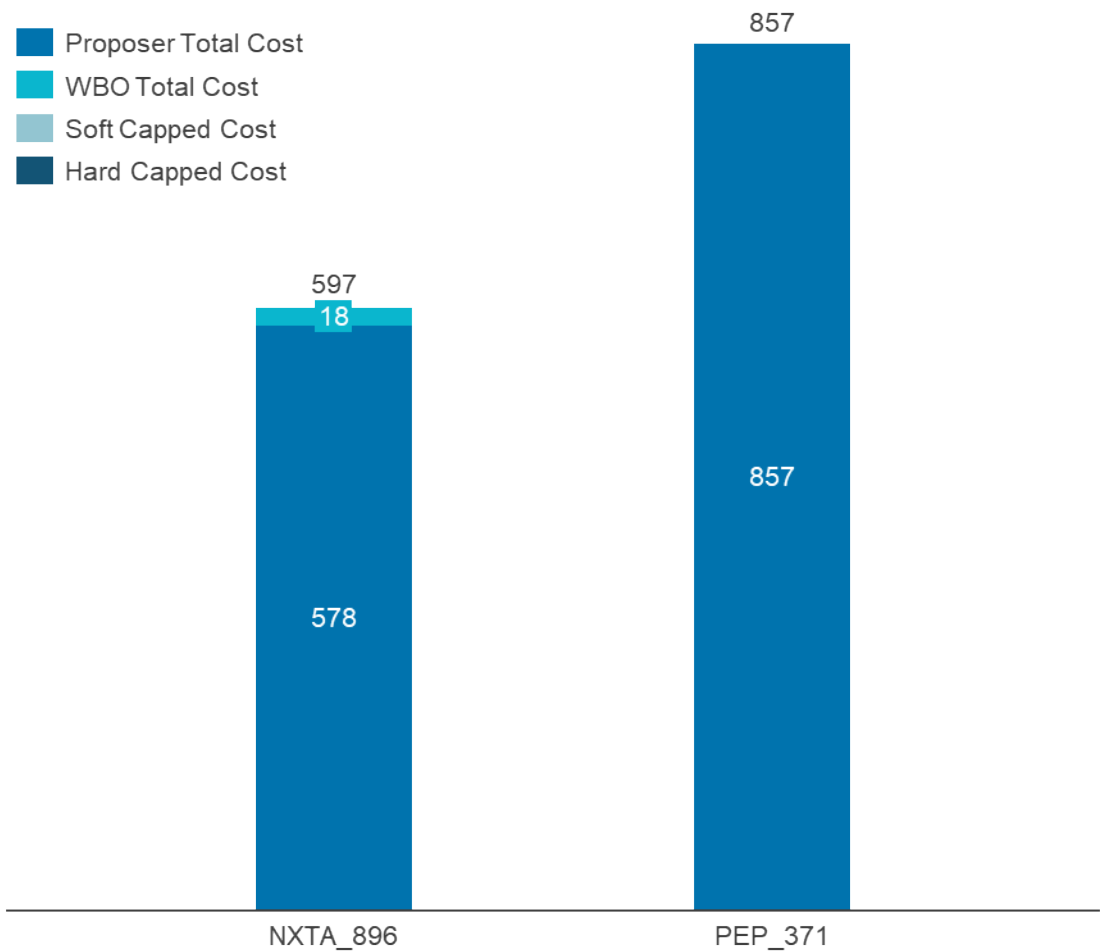
Table 19. MAAC Additional Regional Needs Cost Containment Inclusions by Cost Category

	Included / Excluded in Cost Containment – By Developer	
Category	NXTA	PEP
Total Number of Proposals	1	1
Engineering & Design	No Cost Containment	No Cost Containment
Permitting/Routing/Siting		
ROW Land Acquisition		
Materials & Equipment		
Construction & Commissioning		
Construction Management		

Overheads and Miscellaneous		
AFUDC		

Error! Reference source not found. visualizes the magnitude of Proposer CapEx and WBO CapEx. Neither proposal is cost contained.

Figure 7. Cost Cap Levels Across Proposals in MAAC Additional Regional Needs



West Regional Review and Observations

This section provides a summary of cost containment for all West Regional Cluster proposals evaluated. **Error! Reference source not found.** presents the cost cap structure, risk category, ROE cap/floor, and equity ratio cap details for all proposals in the West Regional Cluster. All proposals in the Cluster have a soft cap, an ROE cap, and an equity ratio cap except for PSEGRT, which has one hard capped proposal and one uncapped proposal. LSP, ATSI, and TRNSRC have tiered ROE reductions, whereas NXTA has a single ROE stepdown for overages. ATSI and TRNSRC's soft caps also differ at the cost category level. Engineering & Design and Material & Equipment costs earn 0% ROE over 120% of the capped amounts, while all other cost categories earn a reduced ROE on spend exceeding 100%, 150%, and 200% of the capped amounts. ATSI and TRNSC share these cost containment features because the ATSI proposals are a joint venture between FirstEnergy and Transource.

Table 20. . Cost Containment Details Across Proposals in West Regional

	LS Power	ATSI	Transource	NextEra	PSEGRT
Category	LSP	ATSI	TRNSRC	NXTA	PSEGRT
Total Number of Proposals	1	2	1	2	2
Cost Containment Provided?	Yes	Yes	Yes	Yes	Yes(1); No(1)
Risk Category	Medium	Medium	Medium	Medium	Low_High
Hard Cost Cap	No	No	No	Partial	Yes
Soft Cost Cap, ROE Reduction	6% – 9%	8.5 – 9.5%	8.5 – 9.5%	8% For 20 years	-
ROE Cap	10.3%	Lower of 10% or FERC approved ROE	Lower of 10% or FERC approved ROE	10.2% For 20 years	No
ROE Floor	-	Lower of 8.5% or approved FERC ROE	Lower of 8.5% or approved FERC ROE	-	-

Equity Ratio Cap	50%	50%	50%	50% For 20 years	No
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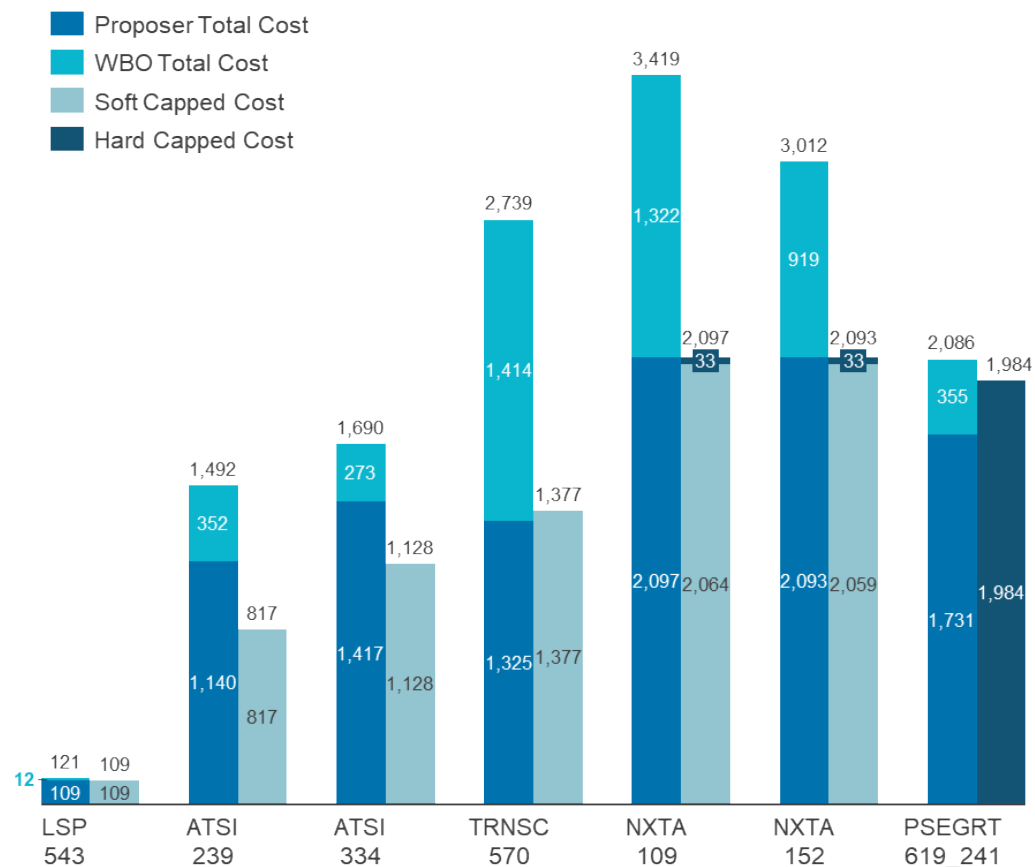
Error! Reference source not found. summarizes cost cap structure by cost category. All proposals with cost containment cap all costs except for AFUDC. NXTA hard caps Construction Management while soft capping the other cost categories. PSEGRT 619's hard cap covers all cost categories other than AFUDC.

Table 21. West Regional Cost Containment Inclusions by Cost Category

Included / Excluded in Cost Containment – By Developer						
Category	LSP	ATSI	TRNSRC	NXTA	PSEGRT	
Total Number of Proposals	1	2	1	2	1 (Hard Cap at 125%)	1
Engineering & Design	Included	Included	Included	Included	Included	N/A
Permitting/Routing/Siting	Included	Included	Included	Included	Included	
ROW Land Acquisition	Included	Included	Included	Included	Included	
Materials & Equipment	Included	Included	Included	Included	Included	
Construction & Commissioning	Included	Included	Included	Included	Included	
Construction Management	Included	Included	Included	Included	Included	
Overheads and Miscellaneous	Included	Included	Included	Included	Included	
AFUDC	Excluded	Excluded	Excluded	Excluded	Excluded	
Soft Cap	Hard Cap					

Error! Reference source not found. visualizes the magnitude of Proposer CapEx, WBO CapEx, and CapEx covered by soft and hard cost caps. LSP and NXTA cap all Proposer costs. TRNSC 570 caps all Proposer costs, but the cost cap for the Engineering and Materials cost categories starts at 120% of the Developer’s estimate. ATSI does not cap all components, and shares TRNSC’s 120% Engineering and Materials cap. PSEGRT 619’s hard cap is set at 125% of Proposer CapEx, and PSEGRT_619 makes up most of the cost of combined Proposal 619_241.

Figure 8. Cost Cap Levels Across Proposals in West Regional



West Additional AEP Needs Review and Observations

Section 0 provides a summary of cost containment for all West Additional AEP Needs Cluster proposals evaluated. **Error! Reference source not found.** presents the cost cap structure, risk category, ROE cap/floor, and equity ratio cap details for all proposals in the West Additional AEP Needs Cluster. LSP offers a tiered ROE reduction depending on the degree of cost overrun, as described in **Section 0**, as well as an ROE and equity ratio cap. AEP’s proposals are not cost contained.

Table 22. Cost Containment Details Across Proposals in West Additional AEP Needs

	AEP	LS Power
Category	AEP	LSP
Total Number of Proposals	2	1
Cost Containment Provided?	No	Yes
Risk Category	High	Medium
Hard Cost Cap	-	No
Soft Cost Cap, ROE Reduction	-	6 - 9%
ROE Cap	-	10.3%
ROE Floor	-	-
Equity Ratio Cap	-	50%

Error! Reference source not found. summarizes cost cap structure by cost category. LSP's soft cap covers all cost categories except for AFUDC, and AEP's proposals are not capped.

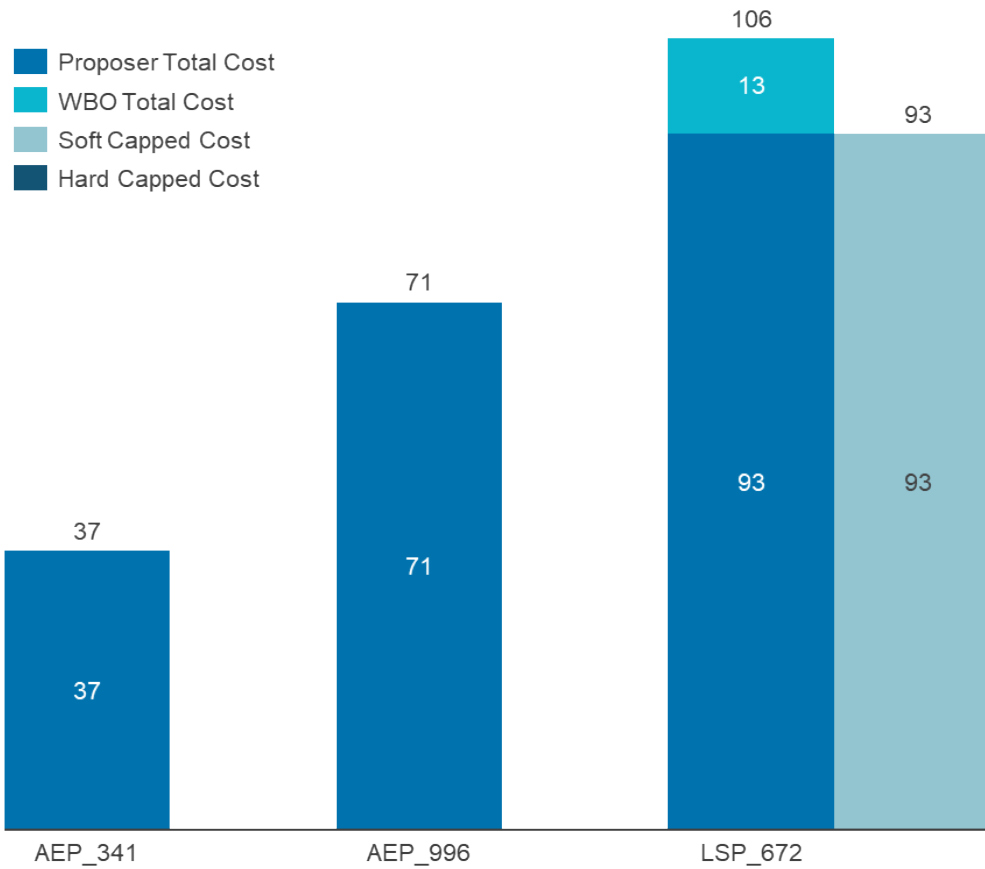
Table 23. West Additional AEP Needs Cost Containment Inclusions by Cost Category

	Included / Excluded in Cost Containment – By Developer	
Category	AEP	LSP
Total Number of Proposals	2	1
Engineering & Design	No Cost Containment	Included
Permitting/Routing/Siting		Included

ROW Land Acquisition			Included
Materials & Equipment			Included
Construction & Commissioning			Included
Construction Management			Included
Overheads and Miscellaneous			Included
AFUDC			Excluded
Soft Cap	Hard Cap		

Figure 9 visualizes the magnitude of Proposer CapEx, WBO CapEx, and CapEx covered by soft and hard cost caps. All Proposer CapEx is soft capped by LSP, while AEP has no cost containment.

Figure 9. Cost Cap Levels Across Proposals in West Additional AEP Needs Cluster



Modeling Methodology

To evaluate a proposal's lifetime cost to customers, Consultant computes the PVRR. Revenue requirement, or cost of service, reflects the total revenue that must be collected in rates for a company to recover its capital, operational, and tax expenses and earn a fair return on its capital investments.⁸ In the ICOS model, revenue requirement in each modeling period is calculated as the sum of:

- O&M/A&G
- Depreciation of capital investment
- Cost of debt (interest)
- Equity return on rate base

⁸ The rate of return on equity is reviewed and approved/adjusted by FERC for transmission projects.

- Taxes (property, income, other)

The ICOS model is developed using a standard FERC-accepted cost recovery approach. Consultant calculates the various components of revenue requirement for each month during the project's useful life, then discounts future streams of revenue requirement using a common discount rate for all proposals. For a more detailed description of the model mechanics, see **Error! Reference source not found.**

Model input is mostly provided directly by Proposers. For a fair comparison, Consultant applies common assumptions, such as the inflation rate and discount rate, that may differ from Developer input. These assumptions are explained in more detail in **Section Error! Reference source not found.**

If a Developer includes WBO in their proposal, WBO is reflected in the corresponding PVRR and sensitivity results of this report. When a proposal does include WBO, the Developer provides an estimated CapEx for those WBO cost categories. For O&M, property taxes, and working capital for WBO components, Consultant assumes that these scale in proportion to the WBO CapEx relative to the proposal's total CapEx. WBO Cost of Capital metrics is discussed in **Section 0**.

Where WBO costs are provided, Consultant models them separately, but then combines results with those of the Proposer to determine each proposal's total revenue requirement. This separation occurs to ensure proper treatment of cost containment features, which are not present for the WBO CapEx.

Modeling Considerations

Baseline Assumptions

Across all proposals, Consultant applies several standardizing assumptions to ensure a fair comparison of present value results. These assumptions can be found in **Error! Reference source not found.** below.

Table 24. Baseline Model Assumptions

Discount Rate	7.20% ⁹
Inflation Rate	2.1%
Date Used for Discounting	1/1/2025

There are instances where the Proposer does not provide values in nominal dollars, as instructed, or approximates nominal values differently than another Proposer. For consistency, Consultant independently escalates all CapEx dollar values provided by Developers in 2025\$ from their Capital Expenditure Workbook (Attachment 7) to nominal dollars using a 2.1% annual inflation rate. These values are cross checked with Proposer-provided nominal values

⁹ Discount rate is in accordance with PJM's Market Efficiency team

from the Cost and Cost Containment Workbooks to ensure relative alignment. Consultant does not adjust other inputs provided by the Proposer in this way.

Modeling Period Assumptions

If applicable, all CapEx reported after the in-service date is moved to the final year of construction unless it is explicitly entered as Ongoing CapEx. Additionally, O&M costs are not modeled until the project is placed in service.

The ICOS model calculates revenue requirement on a monthly basis. While Developers provide specific month-year clarity around construction start and in-service dates, much of the revenue requirement data, such as O&M and property taxes, is provided on an annual basis. To account for this, Consultant divided annual expenditures by the number of relevant months when partial-year spending data occurs (typically only the first and last years of the project).

CapEx and Depreciation Assumptions

CapEx

Capital costs are collected from the Capital Expenditure Workbook (Attachment 7), which provides year-by-year spend schedules broken down by cost category (Engineering and Design, Materials and Equipment, etc.).

The associated financing costs of construction are modeled using either return on Construction Work in Progress (CWIP) or AFUDC for each proposal. Both returns on CWIP and AFUDC are calculated using the Developer-specific after-tax weighted average cost of capital (WACC). AEP, Transource, and NextEra claimed a return on CWIP, and all other Developers opted to accrue AFUDC.

Capital Streams

To properly account for cost containment packages and differences in cost of capital, the model separates capital spending into streams, each modeled independently:

- CapEx Stream 1: Capped work by the Proposer
- CapEx Stream 2: Uncapped work by the Proposer
- CapEx Stream 3: Uncapped WBO

Contingency is modeled separately for Proposer work (Streams 1 and 2) and WBO (Stream 3), as applicable. For Proposer work, contingency is first applied to capped costs. Any remaining amount flows to uncapped costs. Not all Developers provide specific contingency levels for the WBO CapEx. **Section Error! Reference source not found.** provides further detail on contingency and WBO.

All revenue requirement results in this report show the sum of the revenue requirements of each of the three CapEx streams.

Book Depreciation

Straight-line depreciation is used for all proposals. Book depreciation is calculated based on the project's useful life, as provided in the Developer's Cost and Cost Containment Workbooks. No proposals included values related to non-depreciable plant (land) or net salvage, so Consultant did not model these items.

Tax Depreciation

Each project uses the 15-Year Modified Accelerated Cost Recovery System (MACRS) method for tax depreciation. Some proposals assume the Half-Year convention, others requested Mid-Quarter 2, and some proposals with fourth quarter Commercial Operation Dates were required to use the Mid-Quarter 4 convention.

Working Capital Assumption

For proposals that provide cash working capital values, those inputs are used directly. For proposals that do not, cash working capital is modeled as 1/8th of annual O&M, consistent with industry-standard practice.¹⁰

Other Inputs

Income Tax

Each Developer provides a distinct tax profile, which is used to calculate the provision for income taxes on the ROE requirements. Proposers use state-specific tax rates based on the project's location and may blend tax rates if a project traverses multiple states.

O&M and Property Tax

O&M and Property Tax values were provided by Developers. In instances where the Developer provides a formulaic relationship between capital expenditure/rate base and O&M/property tax, Consultant uses this relationship to recalibrate O&M and property tax to align with Consultant-modified nominal CapEx values (see **Section 0**).

Deferred Taxes

Deferred taxes are calculated based on tax-book life differences and used accordingly to reduce rate base each month of the ICOS model revenue requirement calculations.

¹⁰ The 45-day convention assumes that O&M is incurred evenly throughout the year but paid with a lag. An assumption of 1/8 of annual O&M is used to approximate 45 days of accrued but unpaid costs. This accrued expense paid in advance is considered used and useful capital subject to a return.

Work by Others

Cost of Capital Metrics

For all WBO CapEx, Consultant calculates and uses weighted average ROE, COD, and capital structures for each model based on Developer-provided or publicly available data for each entity involved in a proposal. The WBO O&M, property tax, and working capital EW assumed to be proportional to the Proposer values, relative to the ratio of their total CapEx. **Error! Reference source not found.** shows the entity-specific WBO cost of capital metrics.

Table 25. Work by Others – Cost of Capital Metrics by Entity

WBO Entity	Debt %	Equity %	COD	ROE	Source
AEP	44.91%	55.09%	4.02%	10.35%	AEP 341
APS / MP	52.00%	48.00%	6.37%	10.40%	<i>See FirstEnergy</i>
ATSI	50.00%	50.00%	5.80%	10.00%	ATSI 239
Dayton (AES OH, DPL)	49.03%	50.97%	4.42%	9.85%	LSPower 543
Dominion	46.20%	53.80%	4.10%	11.40%	VEP 126
Duke	44.90%	55.10%	4.95%	11.38%	PJM ATRR / FF1
FirstEnergy	52.00%	48.00%	6.37%	10.40%	PJM ATRR / FF1
JCPL	44.00%	56.00%	5.80%	10.50%	TRNSLK 552
PENELEC	52.00%	48.00%	6.37%	10.40%	<i>See FirstEnergy</i>
PEPCO	49.70%	50.30%	4.89%	10.50%	PEPCO 371
PPL	56.00%	44.00%	4.74%	10.50%	PPL 290
PSEG	44.00%	56.00%	5.80%	10.50%	TRNSLK 552

Transource	50.00%	50.00%	6.00%	10.00%	TRNSC 331	These entity-specific WBO cost of capital metrics are then weighted by their portion of the total
Valley Link	49.40%	50.60%	5.49%	10.60%	Assumed avg of FE, DOM, and Transource	

proposal to arrive at total WBO weighted cost of capital metrics, as shown in **Table 1**.

Table 1. Work by Others – Weighted Cost of Capital Metrics by Proposal

Cluster	Proposing Entity	Proposal ID	Debt %	Equity %	COD	ROE
South Regional	VEPCO	275	No WBO			
	VEPCO	705	No WBO			
	VEPCO	616	No WBO			
	LS Power	260	46.29%	53.71%	4.14%	11.37%
	Transource	331	47.68%	52.32%	4.76%	10.99%
	Transource	781	48.46%	51.54%	5.10%	10.78%
	TRAIL	938	46.20%	53.80%	4.10%	11.40%
MAAC PPL	PPL	853	No WBO			
	PPL	290	No WBO			
	PPL Translink	552	44.00%	56.00%	5.80%	10.50%
	NextEra	771	56.00%	44.00%	4.74%	10.50%
	NextEra	871	55.24%	44.76%	5.05%	10.48%
	LS Power	20	56.00%	44.00%	4.74%	10.50%

Cluster	Proposing Entity	Proposal ID	Debt %	Equity %	COD	ROE
MAAC Regional	NextEra	237	50.77%	49.23%	5.31%	10.41%
	NextEra	687	51.06%	48.94%	5.28%	10.41%
	MAITLIT	578	55.49%	44.51%	4.78%	10.50%
MAAC Additional Regional Needs	NextEra	896	51.63%	48.37%	6.13%	10.42%
	PEPCO	371	No WBO			
West Regional	ATSI	239	47.06%	52.94%	4.45%	10.21%
	ATSI	334	46.19%	53.81%	4.43%	10.35%
	Transource	570	46.06%	53.94%	4.40%	10.36%
	NextEra	109	45.17%	54.83%	4.11%	10.33%
	NextEra	152	45.28%	54.72%	4.17%	10.35%
	PSEGRT	619_241	46.55%	53.45%	4.54%	10.23%
	LS Power	543	49.03%	50.97%	4.42%	9.85%
West Additional AEP Needs	LS Power	672	44.91%	55.09%	4.02%	10.35%
	AEP	341	No WBO			
	AEP	996	No WBO			

Developer-Specific Assumptions

Transource / ATSI Assumption (CapEx+ Sensitivities)

For ATSI 239, ATSI 334, and Transource 570, Consultant calculates a weighted ROE specifically for the CapEx+ sensitivities. A weighted ROE is needed because these proposals apply different ROE treatments to different cost categories: the ROE for Engineering and Design and Materials and Equipment costs drops to 0% once spending exceeds 120% of the cap, while all other cost categories follow stepped-down ROE levels as costs rise. To compute the weighted ROE under CapEx+, Consultant first scales each cost category proportionally with the increase in total CapEx and then applies the appropriate ROE tier to the escalated amount. This approach ensures the CapEx+ sensitivities reflect the soft cap rules embedded in these proposals.

MAIT (FirstEnergy) Assumption – Soft Cap Illustration

MAIT 578 applies different ROE levels depending on how far actual project costs exceed the bid amount. All costs up to the bid amount earn the full allowed ROE. If actual costs remain below 125% of the bid amount, that full ROE continues to apply. Once total costs exceed 125%, all costs above the bid amount receive the reduced ROE—not just the portion beyond 125%. Further, ROE reductions at 150% and 175% only apply to the incremental overage. Consultant modeled this directly to reflect the soft cap structure defined for MAIT 578.

NextEra – Recovery After 20-Year Guarantee

For all NextEra proposals except NextEra 896, Consultant assumes that cost containment mechanisms including the soft cost cap, the ROE cap, and the equity cap, apply only during the 20-year guarantee period measured from the in-service date. After year 20, these caps expire and the return on equity applied in the model reverts to uncapped levels. This assumption affects the results of the five sensitivity scenarios - ROE 12%, Equity Ratio 60%, CapEx+ and Downside. This approach aligns with the Developer's submission.

West Regional Proposals – State Tax and CAT Treatment

For proposals in the West Regional Cluster, Consultant assumes a 2% state income tax rate and no application of the Commercial Activities Tax (CAT). This assumption is made due to the non-uniform treatment of state income tax rates and the inclusion/exclusion of the CAT across the Developers in this Cluster. This input override ensures consistent tax treatment for modeling purposes.

Model Sensitivities

Eight sensitivities in addition to the Base Case are applied to each proposal to evaluate cost overruns and financing risks. These sensitivities are detailed in **Error! Reference source not found.6** below.

Table 26. Sensitivities Used in ICOS Modeling

#	Sensitivity	Variable(s)	Description
S1	Base Case	None	Model the proposal using inputs from Developer and ICOS model calculations
S2	CapEx +50%	Multiple Variables (<i>changes to CapEx and reduction to ROE due to soft cap</i>)	Proposer's project cost increased by 50% for all periods
S3	CapEx +100%	Multiple Variables (<i>changes to CapEx and reduction to ROE due to soft cap</i>)	Proposer's project cost increased by 100% for all periods
S4	ROE 12%	Single Variable	Return on Equity raised to 12% for all periods (<i>unless capped</i>)
S5	Cost of Debt 9%	Single Variable	Cost of Debt raised to 9% for all periods
S6	Equity Ratio 60%	Multiple Variables (<i>changes to Debt-to-Equity ratio affects Cost of Debt and ROE for all Developers which are not already at 60%</i>)	Equity thickness set to 60% for all periods (<i>unless capped</i>)
S7	O&M +50%	Single Variable	O&M expense increased by 50% for all periods
S8	WBO +50%	Single Variable	WBO project cost increased by 50% for all periods
S9	Downside	Multiple Variables (<i>combination of most extreme changes above</i>)	Project Cost +100% (<i>Proposer</i>) WBO +50% O&M +50%

			ROE 12% (<i>unless capped</i>) COD 9% Equity 60% (<i>unless capped</i>)
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In all sensitivities, the impact of any proposed cost containment mechanisms is modeled to test the effectiveness of cost containment mechanisms. The Downside sensitivity combines multiple sensitivities to create an environment where many variables are stressed at once. Since some variables are interdependent and/or trigger cost containment mechanisms differently, the Downside can help inform how resilient a Proposer’s cost containment is under certain multiplier effects (e.g., a soft cap on cost overruns plus an ROE and Equity cap may exhibit differently in Downside versus in CapEx +50%, ROE 12%, or Equity Ratio 60% on their own).

PVRR Model Results by Cluster by Proposal

This section provides a summary of modeling results for each Cluster by proposal. Across Clusters, proposals with no cost containment or very limited cost containment (such as VEPCO’s E&D only cap) performed the worst in CapEx+ and Downside sensitivities. Proposals with soft caps, ROE caps, and equity ratio caps performed better, with

the magnitude of ROE reduction, threshold for ROE reduction, and proportion of CapEx covered by the cap driving differentiated results. The best-performing proposals included hard caps on all Proposer costs such as in PPL_853, where the Proposer would not recover ROE, cost of debt, or depreciation in the event of an overage. In the Downside sensitivity, PPL_853's total project cost only increased by 30%, as compared to VEP_705's 141% increase in the Downside sensitivity. Across cost cap types, contingency and WBO proportions also differentiated results between otherwise similar proposals.

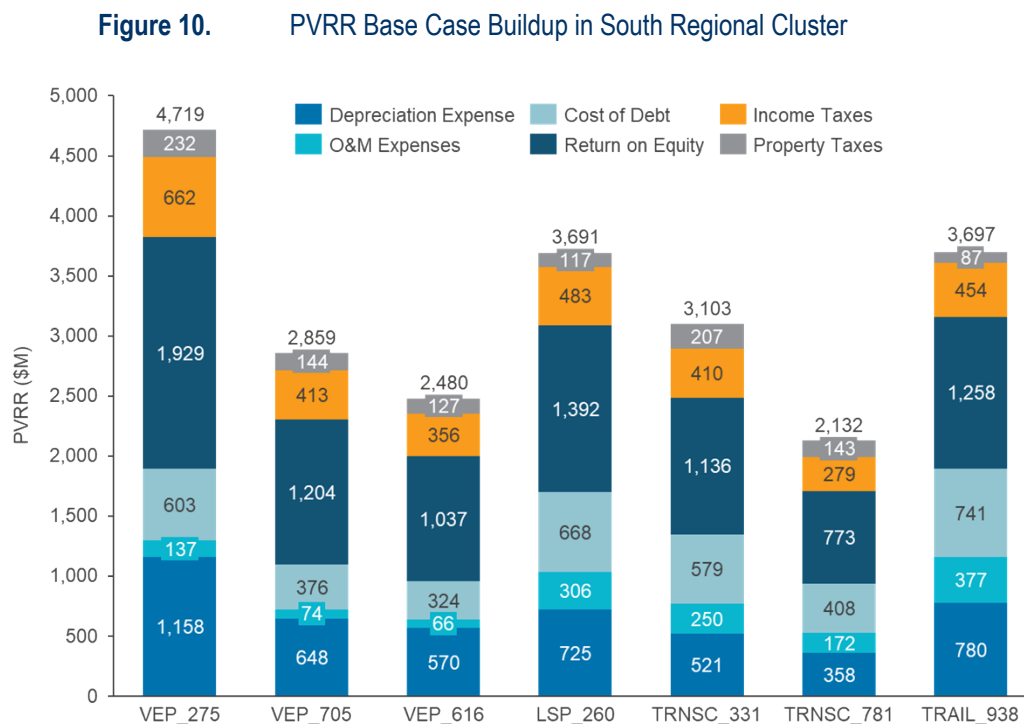
Even though the percentage increase from Base Case serves as a good indicator of the effectiveness of various cost caps, the dollar increase provides a holistic view of a proposal's affordability as part of a broader bid award package. Proposals with effective cost containment may result in a higher dollar increase in certain sensitivities due to their high base costs, whereas the opposite could be true for uncapped, lower base cost proposals. It is important to note that while proposals are ranked in each Cluster based on the quality of their cost containment, this does not imply that a proposal is superior to another, as proposals offer different solutions and system benefits.

South Regional

Summary of Base and Sensitivity PVRR Results

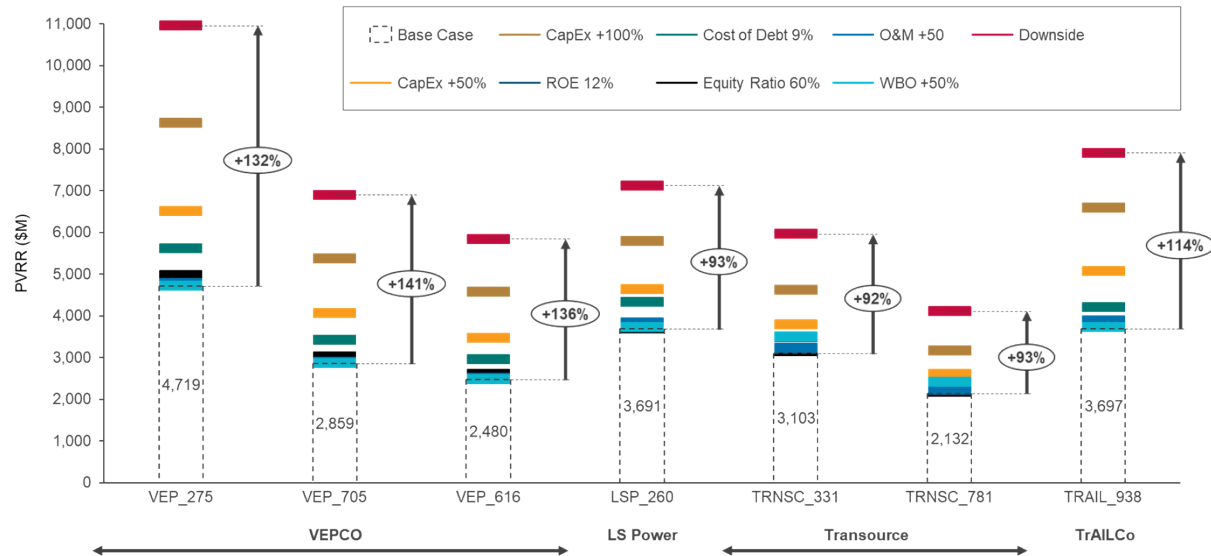
This section provides a summary of modeling results for all South Regional Cluster proposals.

Figure 10 below visualizes the cost breakdown for the Base Case for each project in the South Regional Cluster.



Error! Reference source not found. illustrates how each South cluster proposal's cost profile shifts under different scenarios. Among all Proposers, the VEPCO proposals exhibit the largest increase in PVRR in the Downside scenario, with cost growth ranging from roughly 132% - 140%, indicating the highest sensitivity to adverse conditions.

Figure 11. Percent Increase from Base Case by Sensitivity



Relative Sensitivity Performance & Comparative Analysis

Error! Reference source not found. summarizes the volatility of South Regional project costs across all modeled sensitivities, showing the percentage increase in PVRR relative to each proposal's Base Case PVRR. This provides a clear view of how sensitive each proposal is to different scenarios by comparing the proportional change in costs across sensitivities. LSP and Transource exhibit nearly identical cost containment performance in the Downside sensitivity, with LSP outperforming in the WBO +50% case due to materially lower WBO costs, while Transource performs better under the CapEx +50% and +100% scenarios. TrAILCo ranks next, showing weaker results in the CapEx+ and Downside sensitivities because of its lower contingency levels and lack of WBO. VEPCO performs the weakest in the Cluster, driven by its restrictive soft cap that applies only to E&D costs and below-average contingency levels, resulting in unstable performance across sensitivities.

Table 27. South Regional Proposal Results: All Sensitivities

Cost Containment Risk Category	Med-High	Med-High	Med-High	Med	Med	Med	Med
Relative Sensitivity Performance	Tied for 3 rd	Tied for 3 rd	Tied for 3 rd	Tied for 1 st	Tied for 1 st	Tied for 1 st	2 nd
PVRR vs. Base (%)	VEP_275	VEP_705	VEP_616	LSP_260	TRNSC_331	TRNSC_781	TRAIL_938
S1 Base Case	0%	0%	0%	0%	0%	0%	0%
S2 CapEx +50%	38%	42%	40%	26%	22%	22%	37%
S3 CapEx +100%	83%	88%	85%	57%	49%	49%	78%
S4 ROE 12%	3%	4%	3%	0%	3%	3%	1%
S5 Cost of Debt 9%	19%	20%	19%	18%	12%	12%	14%
S6 Equity Ratio 60%	5%	6%	5%	0%	2%	2%	1%
S7 O&M +50%	2%	1%	1%	4%	4%	4%	5%
S8 WBO +50%	0%	0%	0%	1%	13%	13%	1%
S9 Downside	132%	141%	136%	93%	92%	93%	114%
Proposer →	VEPCO	VEPCO	VEPCO	LS Power	Transource	Transource	TrAILCo

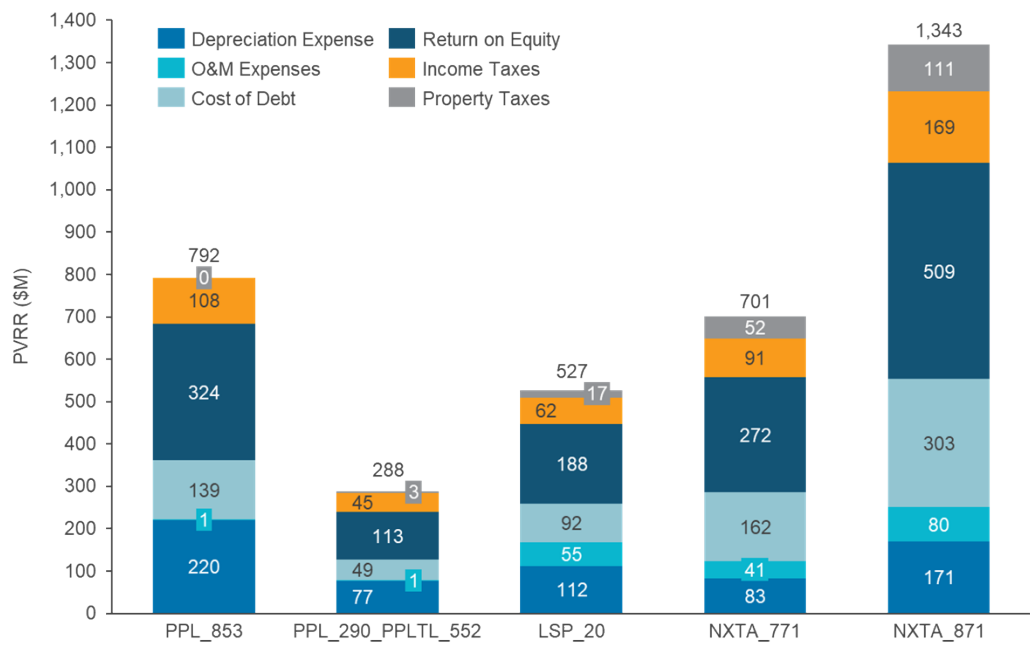
MAAC PPL

Summary of Base and Sensitivity PVRR Results

This section provides a summary of modeling results for all MAAC PPL Cluster proposals.

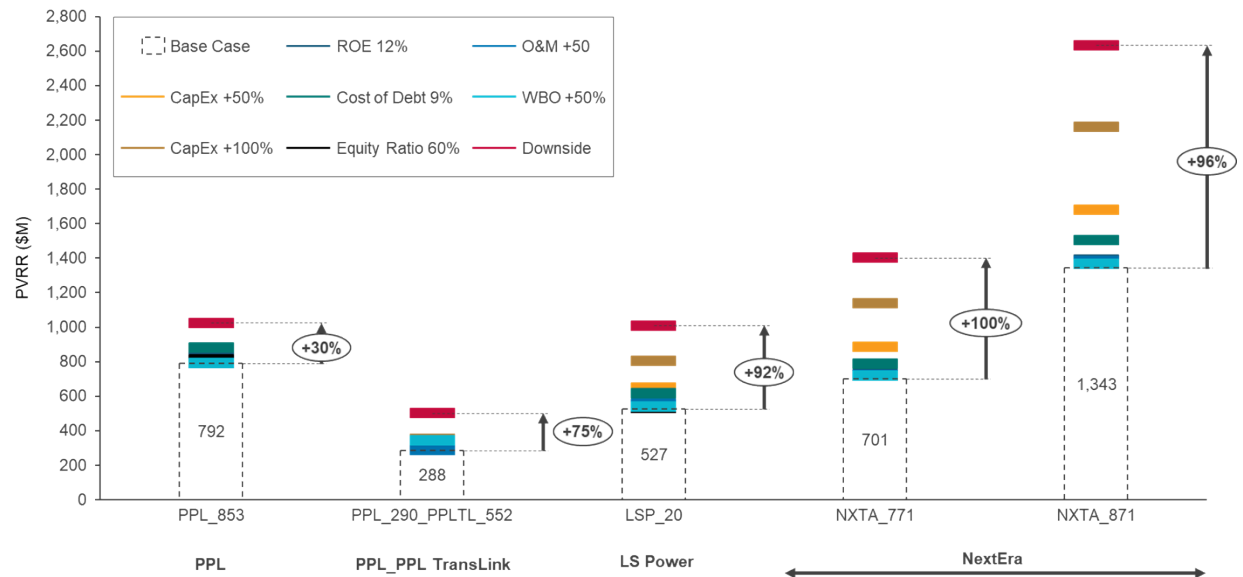
Error! Reference source not found. visualizes the cost breakdown for the Base Case for each project in the MAAC PPL Cluster. PPL proposals 853 and 290 do not have any property taxes; these projects are fully within PPL’s existing rights-of-way, as reported by the Developer. PPL’s O&M costs are also significantly lower than other proposals which is attributed to the Developer’s incremental structure of estimated O&M needs.

Figure 12. PVRR Base Case Buildup in MAAC PPL Cluster



Error! Reference source not found. illustrating how each MAAC PPL proposal’s cost profile shifts under different scenarios.

Figure 13. Percent Increase from Base Case by Sensitivity MAAC PPL Cluster



Relative Sensitivity Performance & Comparative Analysis

Error! Reference source not found. summarizes the volatility of MAAC PPL Cluster project costs across all modeled sensitivities, showing the percentage increase in PVRR relative to each proposal's Base Case PVRR. This provides a clear view of how sensitive each proposal is to different scenarios by comparing the proportional change in costs across sensitivities. PPL 853 delivers strong cost containment across all sensitivities due to its hard cap, with robust performance even under CapEx+ and Downside conditions. Within the combined PPL 290_PPLTL 552, PPL 290 benefits from a hard cap while PPLTL 552 offsets its lack of containment through lower base costs, resulting in greater overall cost stability and smaller overruns in high-cost sensitivities compared to LS Power and NextEra. The combined project's 20% PVRR increase in the WBO +50% scenario is largely driven by its unusually high WBO share (~47%), which amplifies overruns when WBO costs escalate. LS Power and NextEra show broadly similar cost containment performance and exhibit higher exposure to the Downside case, reflecting LS Power's lack of a hard cap and NextEra's hard cap that applies only to construction management costs.

Table 28. MAAC PPL Proposal Results: All Sensitivities

Cost Containment Risk Category	Low	Low_Medium	Medium	Medium	Medium
Relative Sensitivity Performance	1 st	2 nd	Tied for 3 rd	Tied for 3 rd	Tied for 3 rd
PVRR vs. Base Case (%)	PPL_853	PPL_290_PPLTL_552	LSP_20	NXTA_771	NXTA_871
S1 Base Case	0%	0%	0%	0%	0%
S2 CapEx +50%	3%	11%	24%	24%	22%
S3 CapEx +100%	5%	22%	53%	56%	54%
S4 ROE 12%	9%	9%	1%	3%	3%
S5 Cost of Debt 9%	11%	11%	17%	13%	12%
S6 Equity Ratio 60%	2%	3%	1%	2%	2%
S7 O&M +50%	0%	0%	5%	3%	3%
S8 WBO +50%	0%	20%	3%	2%	2%
S9 Downside	30%	75%	92%	92%	88%
Proposer →	PPL	PPL_PPL TransLink	LS Power	NextEra	NextEra

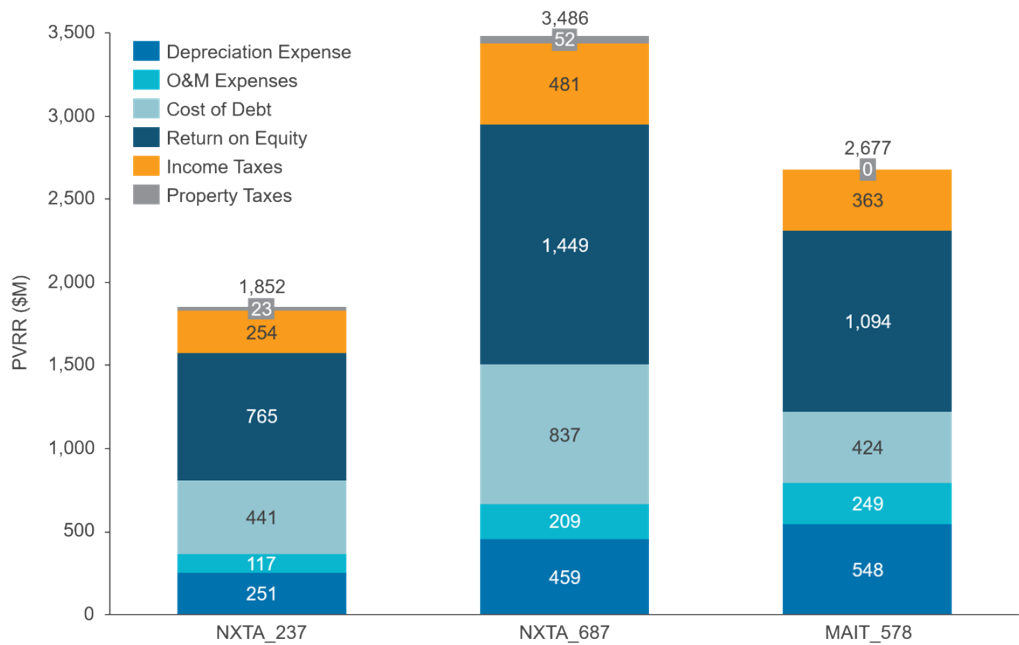
MAAC Regional

Summary of Base and Sensitivity PVRR Results

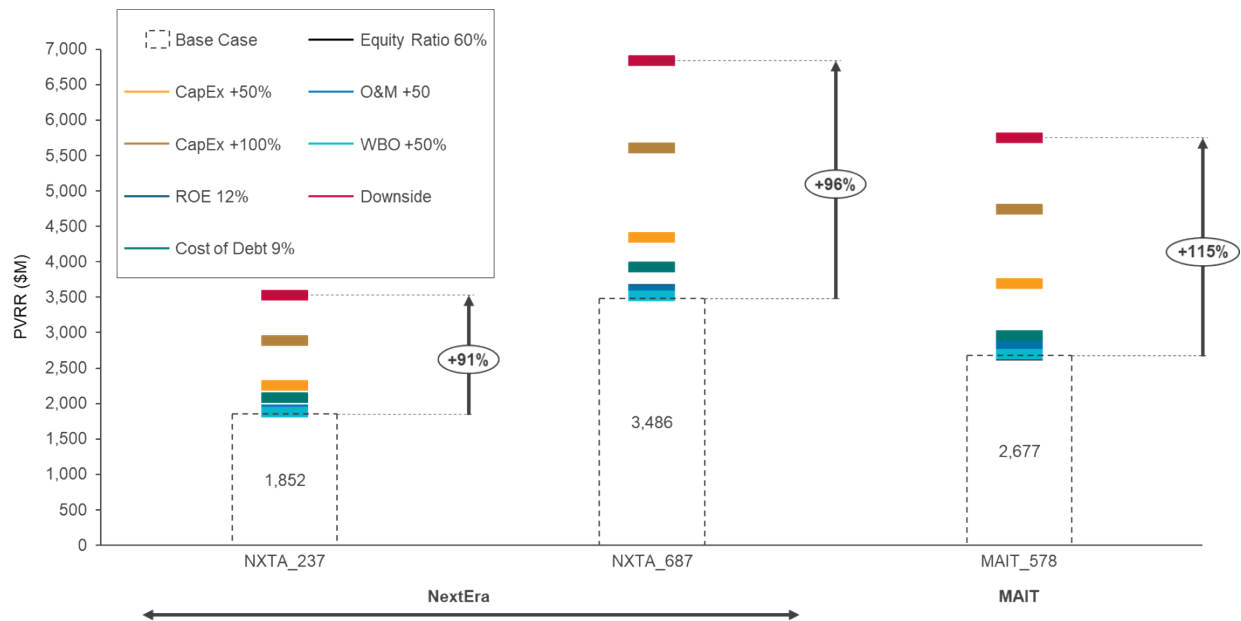
This section provides a summary of modeling results for all MAAC Regional Cluster proposals.

Error! Reference source not found.14 visualizes the cost breakdown for the Base Case for each project in the MAAC Regional Cluster.

Figure 14. PVRR Base Case Buildup in MAAC Regional Cluster



Error! Reference source not found. illustrates how each MAAC regional proposal's cost profile shifts under different scenarios. Among all Proposers, MAIT 578 exhibits the greatest increase in PVRR in the Downside scenario, with costs growing by 115%. NXTA 237 and 687 show similar cost increases in the Downside, increasing by 91% and 96%, respectively.

Figure 15. MAAC Regional: Percent Increase from Base Case by Sensitivity

Relative Sensitivity Performance & Comparative Analysis

Error! Reference source not found. summarizes the volatility of MAAC Regional project costs across all modeled sensitivities, showing the percentage increase in PVRR relative to each proposal's Base Case PVRR. This provides a clear view of how sensitive each proposal is to different scenarios by comparing the proportional change in costs across sensitivities. Across the MAAC Regional proposals, cost containment performance is primarily driven by each Developer's soft cap structure and contingency levels. NXTA 237 and 687 deliver the strongest results, supported by ROE caps and effective soft caps on capital costs. MAIT 578 shows the greatest sensitivity to CapEx and ROE increases because of its low contingency levels, a soft cap with relatively small ROE reductions, and the absence of an ROE cap complemented with a 60% equity ratio in the Base Case, which also explains the proposal's heightened response in the ROE 12% scenario.

Table 29. MAAC Regional Proposal Results: All Sensitivities

Cost Containment Risk Category	Medium	Medium	Medium-High
Relative Sensitivity Performance	Tied for 1 st	Tied for 1 st	2 nd
PVRR vs. Base (%)	NXTA_237	NXTA_687	MAIT_578
S1 Base Case	0%	0%	0%
S2 CapEx +50%	22%	25%	38%
S3 CapEx +100%	56%	61%	77%
S4 ROE 12%	3%	3%	10%
S5 Cost of Debt 9%	13%	13%	11%
S6 Equity Ratio 60%	2%	2%	0%
S7 O&M +50	3%	3%	5%
S8 WBO +50%	2%	1%	1%
S9 Downside	91%	96%	115%
Proposer →	NextEra	NextEra	MAIT

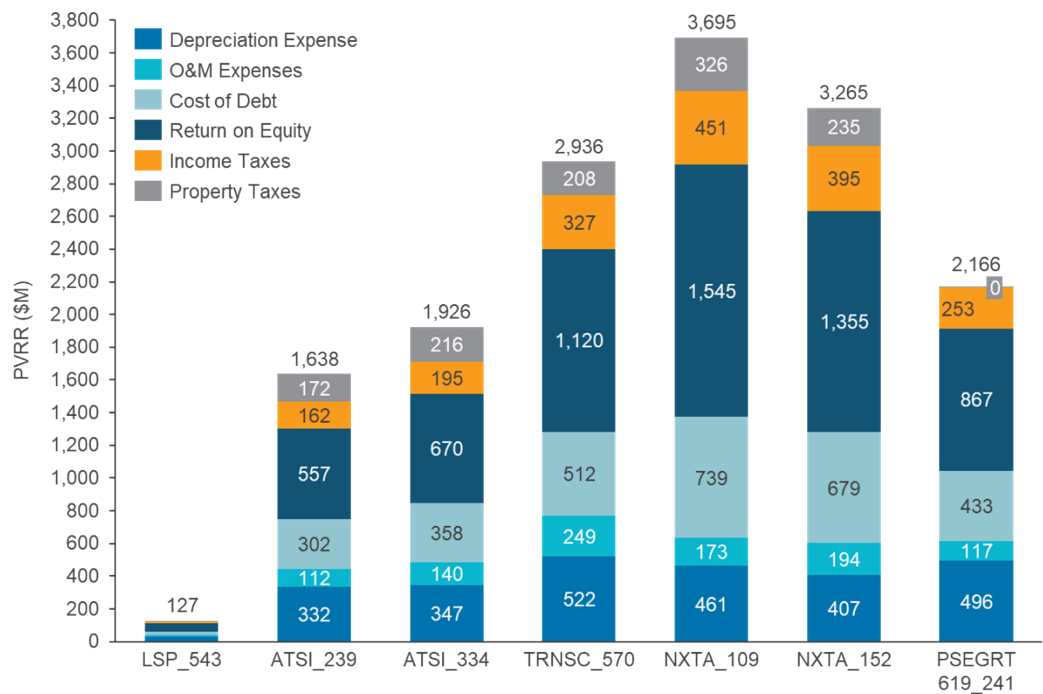
West Regional

Summary of Base and Sensitivity PVRR Results

This section provides a summary of modeling results for all West Regional Cluster proposals.

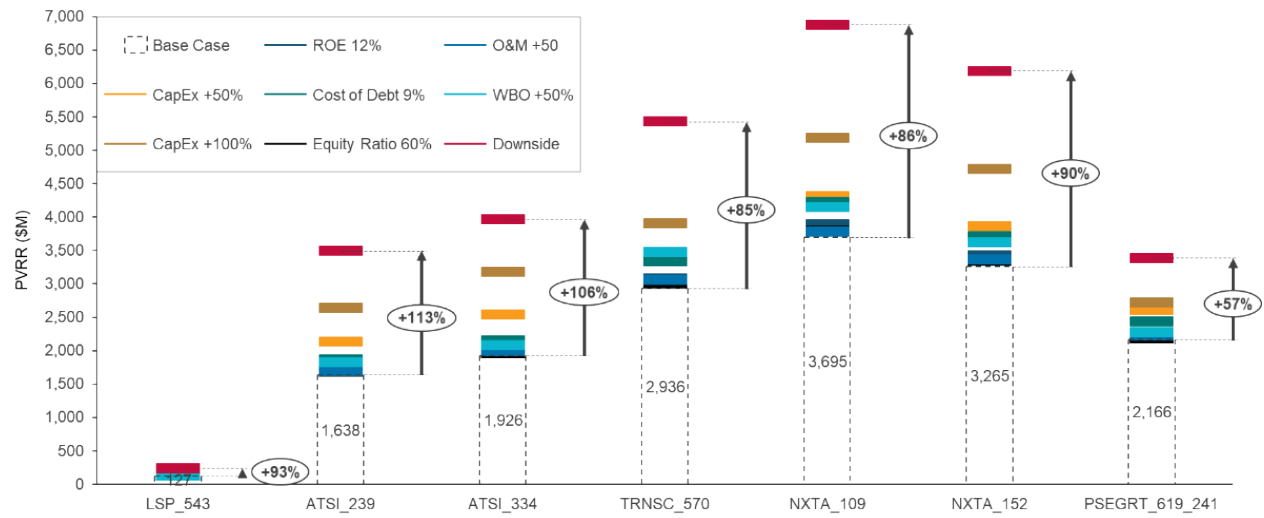
Error! Reference source not found. visualizes the cost breakdown for the Base Case for each project in the West Regional Cluster. PSEGRT provided a property tax estimate of less than \$1M in present value for PSEGRT 619_241, since the Developer only input taxes for the substations on the route.

Figure 16. PVRR Base Case Buildup in the West Regional Cluster



Error! Reference source not found. illustrates how each West Regional Cluster proposal's cost profile shifts under different scenarios. Among all Proposers, the ATSI proposals exhibit the largest increase in PVRR in the Downside scenario, with cost growth ranging from roughly 106% to 113%, indicating the highest sensitivity to adverse conditions.

Figure 17. Percent Increase from Base Case by Sensitivity in West Regional Cluster



Relative Sensitivity Performance & Comparative Analysis

Error! Reference source not found. summarizes the volatility of the West Regional project costs across all modeled sensitivities, showing the percentage increase in PVRR relative to each proposal's Base Case PVRR.

This provides a clear view of how sensitive each proposal is to different sensitivities by comparing the proportional change in costs across sensitivities. WBO and contingency are key drivers of sensitivity performance since all proposals other than PSEGRT share similar soft cap and equity ratio cap features. NextEra's Construction Management hard caps also improve their performance. 52% of Transource's CapEx is WBO, which leads to lower outcomes in the CapEx+ sensitivities, but a higher result in the WBO +50%. ATSI's proposals have notably low contingency (~5%), leading to higher CapEx sensitivity outcomes, whereas NextEra, LSPower and Transource budget 10-15% contingency. PSEGRT 619 has a hard cap and PSEGRT 241 has no cost containment. Because PSEGRT 619 makes up the majority of the combined proposal cost, its hard cap leads to strong sensitivity performance.

Table 30. West Regional Proposal Results: All Sensitivities

Cost Containment Risk Category	Medium	Medium	Medium	Medium	Medium	Medium	Low_Medium
Relative Sensitivity Performance	3 rd	5 th	4 th	Tied for 2 nd	Tied for 2 nd	Tied for 2 nd	1 st
PVRR vs. Base Case (%)	LSP_543	ATSI_239	ATSI_334	TRNSC_570	NXTA_109	NXTA_152	PSEGRT_619_241

S1	Base Case	0%	0%	0%	0%	0%	0%	0%
S2	CapEx +50%	23%	31%	32%	15%	17%	18%	21%
S3	CapEx +100%	52%	62%	65%	33%	40%	45%	26%
S4	ROE 12%	1%	5%	4%	5%	5%	5%	2%
S5	Cost of Debt 9%	18%	14%	12%	14%	14%	14%	13%
S6	Equity Ratio 60%	1%	3%	2%	2%	3%	2%	1%
S7	O&M +50%	5%	3%	4%	4%	2%	3%	3%
S8	WBO +50%	3%	12%	8%	19%	12%	11%	5%
S9	Downside	93%	113%	106%	85%	86%	90%	57%
Proposer →		LS Power	ATSI	ATSI	Transource	NextEra	NextEra	PSEGRT

APPENDIX A – CONSTRUCTABILITY MATRICES

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 Score	Proposing Entity Experience & Capability Risks
Low	Proposal is within 0-10% of Independent Estimate	Hard Cost Cap (Project cost capped with no cost recovery above binding cost cap) with minimal exclusions.	Ratings assessed based on independent assessment of proposed in-service dates, and assessment of significant schedule risks such as such as permitting and constraint mitigation, long-lead material procurement, land/ROW acquisition, construction complexity.	Ratings assessed based on independent assessment of the number and severity of constructability risks assessed for the proposed project scope, such as permitting and constraint mitigation, land/ROW acquisition, construction complexity.	Pure Brownfield Rebuild/Reconductor/New Build within existing ROW (or property already owned by entity)	Ratings assessed based on PJM's assessment of complexity, impact and duration of outages required for development, including consideration of outage coordination plans proposed.	Entity has demonstrated significant experience & capability of developing and operating proposed facilities
Low-Medium	Proposal is within 11-20% of Independent Estimate	Mix of Hard/Soft caps on Project components			Mostly brownfield with some greenfield (i.e. Uses/Overlaps existing ROW but requires expansion or some new greenfield)		Entity has demonstrated limited experience & capability of developing and operating proposed facilities
Medium	Proposal is within 21-30% of Independent Estimate	Soft Caps (No direct cap on Project costs, but indirect caps via reductions to ROE, and/or incentives for cost overruns).			Moderate Mix of Green and Brownfield (i.e. Uses/Overlaps existing ROW but requires expansion or some new greenfield)		Entity has no experience operating proposed facilities, but has demonstrated some experience with developing proposed facilities.
Medium-High	Proposal is within 31-40% of Independent Estimate	Minimal cost caps and/or excessive exclusions			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 40% 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

NOTE:

- PJM conducted its constructability evaluation of the project data submitted by proposers, and engaged expert consultants to evaluate the constructability, cost estimation and cost containment risks of the projects.
- This risk assessment is not intended as a pass/fail or quantitative test, but rather as qualitative information on potential risks PJM has considered along with the reliability performance in selection of the finalist scenarios, and ultimately the recommended solution.

South Regional Cluster Projects – Risk Assessments

South Regional Projects - 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	\$4,819.51	\$5,013.49	Low	Medium-High	Low-Medium	Low-Medium	Low	Low-Medium	Medium-High	6/1/2032	185	0	32.05	217.05	0
705	VEPCO	765kV backbone - Portfolio 2A	\$2,864.73	\$2,534.62	Low	Medium-High	Medium-High	Medium-High	High	Low-Medium	Medium	6/1/2032	0	152.3	95.01	247.31	210.8
616	VEPCO	500kV backbone - Portfolio 3	\$2,454.11	\$2,169.69	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	\$3,515.95	\$3,299.64	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	\$2,895.32	\$3,156.93	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	\$1,959.44	\$2,140.08	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	\$3,426.93	\$3,600.49	Low	Medium	High	Medium-High	High	Low	Low	6/1/2030	0	374	36	410	410

MAAC PPL Cluster Projects – Risk Assessments

MAAC - PPL Projects - Constructability Risk Assessment																	
Proposal ID	Proposing Entity	Proposal Description	Proposal Cost Estimate (\$M)	Independent Cost Estimate (\$M)	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)
853	PPL	Portfolio Proposal 3: Year 2032 + 4 GW Area 229 Essential Reliability Solution	\$797.94	\$917.20	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)	\$88.16	\$32.44	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)	\$194.25	\$185.17	Low	High	Medium	Medium	Medium-High	Low	Low	5/1/2030	0	0	20	20	20
771	NextEra/Exelon	Montour to Slykerville Reinforcement	\$539.25	\$637.66	Low-Medium	Medium	Medium	Medium	Medium-High	Low	Low	12/1/2030	0	0	26	26	26
871	NextEra/Exelon	Blockhouse Creek to Susquehanna and Montour to Stoney Creek	\$1,136.38	\$1,408.26	Low-Medium	Medium	Medium	Medium	High	Low	Low	12/1/2030	0	0	65	65	65
20	LS Power	Tri-Segment 500kV Transmission Project	\$494.29	\$692.85	Medium	Medium	Medium	Medium	Medium-High	Low	Low	6/1/2030	0	0	46.3	46.3	46.3

MAAC Regional Cluster Projects – Risk Assessments

MAAC Regional Projects - Constructability Risk Assessment																	
Proposal ID	Proposing Entity	Proposal Description	Proposal Cost Estimate (\$M)	Independent Cost Estimate (\$M)	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	Kammer to Juniata	\$1,738.59	\$1,797.32	Low	Medium	Medium	Medium	Medium-High	Low	Low-Medium	6/1/2031	0	222	1.2	223.2	223.2
687	NextEra	Kammer to Juniata to Spicewood 765 kV	\$3,238.71	\$3,537.17	Low	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.	\$2,389.93	\$2,648.18	Low	Medium-High	Medium-High	Medium-High	Medium-High	Medium	Low	6/1/2030	0	0	408	408	408

MAAC Additional Regional Cluster Projects – Risk Assessments

MAAC Additional Regional Projects - Constructability Risk Assessment																	
Proposal ID	Proposing Entity	Proposal Description	Proposal Cost Estimate (\$M)	Independent Cost Estimate (\$M)	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)
896	NextEra	Fort Martin - Woodside Double Circuit 500 kV	\$571.70	\$658.71	Low-Medium	High	Low-Medium	Low-Medium	Low-Medium	Low	Low	12/1/2031	0	0	117	117	17
371	PEPCO	Dickerson 500kV Substation & New Dickerson - Brighton 500kV Line	\$857.22	\$289.34	Low	High	Medium	Medium	Medium	Medium	Low	6/1/2032	0	0	25	25	25

West Regional Cluster Projects – Risk Assessments

West Regional Projects - Constructability Risk Assessment																	
Proposal ID	Proposing Entity	Proposal Description	Proposal Cost Estimate (\$M)	Independent Cost Estimate (\$M)	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	\$1,492.41	\$2,035.48	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	\$1,690.26	\$2,353.66	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	\$2,775.19	\$3,418.68	Low-Medium	Medium	Medium	Medium	Medium-High	Low	Low	10/1/2031	0	291.5	35	326.5	277.4
109	NextEra/Exelon	Muckshaw - Johnstown 765kV	\$3,402.57	\$4,170.25	Low-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	\$2,921.53	\$4,087.27	Medium	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)	\$2,086.01	\$2,425.51	Low-Medium	Low-Medium	Medium	Medium-High	High	Low-Medium	Medium	6/1/2032	0	145.8	28.7	174.5	174.5
543	LS Power	Greene - South Bird Transmission Project	\$121.45	\$157.56	Medium	Medium	Low-Medium	Medium	High	Low	Low	6/1/2030	0	0	21.6	21.6	21.6

West Additional AEP Cluster Projects – Risk Assessments

West Additional AEP Cluster Projects - Constructability Risk Assessment																	
Proposal ID	Proposing Entity	Proposal Description	Proposal Cost Estimate (\$M)	Independent Cost Estimate (\$M)	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)
341	AEP	Allen-Sorenson 345kV Sag Study	\$37.38	\$40.52	Low	High	Low	Low	Low	Low	Low	4/1/2030	0	0	0	0	0
996	AEP	Allen-Sorenson 345 kV Line Rebuild	\$70.64	\$89.04	Medium	High	Low	Low	Low	Medium	Low	4/1/2030	0	0	0	0	0
672	LS Power	Allenson to Sorenson Transmission Project	\$105.90	\$140.88	Medium	Medium	Medium	Medium	Medium-High	Low	Low	6/1/2030	0	0	28.3	28.3	28.3

APPENDIX B - SUMMARY OF COST CONTAINMENT ACROSS CLUSTERS

Table 2. Summary of Cost Containment Across Clusters

					← Less Meaningful More Meaningful →				
Cluster	Proposal	Developer	Cost Containment Risk Category	Other Provisions	No Cost Containment	ROE Floor	ROE Impact of Soft Cost Cap	ROE Cap Equity Cap	Hard Cost Cap
South Regional	VEP_275	Dominion	Medium-High	Engineering & Design only	-	-	No RTO adder > 100%	- -	-
	VEP_705	Dominion	Medium-High	Engineering & Design only	-	-	No RTO adder > 100%	- -	-
	VEP_616	Dominion	Medium-High	Engineering & Design only	-	-	No RTO adder > 100%	- -	-
	LSP_260	LS Power	Medium	-	-	-	9% - 6% > 100%	10.3% 50%	-
	TRNSC_331	Transource	Medium	-	-	9.5%	9.5% > 120%	9.50% 50%	-
	TRNSC_781	Transource	Medium	-	-	9.5%	9.5% > 120%	9.50% 50%	-
	TRAIL_938	TrAILCo	Medium	-	-	9.5%	9.5% > 120%	9.50% 50%	-
MAAC PPL	PPL_853	PPL	Low	-	-	-	-	-	Yes
	PPL_290	PPL	Low	-	-	-	-	-	Yes
	PPLTL_552	PPL TransLink	High	-	Yes	-	-	-	-
	LSP_20	LS Power	Medium	-	-	-	9% - 6% > 100%	10.3% 50%	-
	NXTA_771	NextEra	Medium	Soft, ROE, Equity caps last 20 yrs	-	-	7.8%	9.90% 50%	Constr. Mgmt Only
	NXTA_871	NextEra	Medium	Soft, ROE, Equity caps last 20 yrs	-	-	7.8%	9.90% 50%	Constr. Mgmt Only
MAAC Regional	NXTA_237	NextEra	Medium	Soft, ROE, Equity caps last 20 yrs	-	-	8%	10.2% 50%	Constr. Mgmt Only
	NXTA_687	NextEra	Medium	Soft, ROE, Equity caps last 20 yrs	-	-	8%	10.2% 50%	Constr. Mgmt Only
	MAIT_578	MAIT	Medium-High	-	-	8.5%	9.8% - 8.0% > 125%	- -	-
MAAC Add'l Regional Needs	NXTA_896	NextEra	High	-	Yes	-	-	-	-
	PEP_371	PEPCO	High	-	Yes	-	-	-	-
West Regional	LSP_543	LS Power	Medium	-	-	-	9% - 6% > 100%	10.3% 50%	-
	ATSI_239	ATSI	Medium	0% ROE on > 120% Non-E&M	-	8.5%	8.5% - 9.5% > 100% E&M	10.0% 50%	-
	ATSI_334	ATSI	Medium	0% ROE on > 120% Non-E&M	-	8.5%	8.5% - 9.5% > 100% E&M	10.0% 50%	-
	TRNSC_570	Transource	Medium	0% ROE on > 120% Non-E&M	-	8.5%	8.5% - 9.5% > 100% E&M	10.0% 50%	-
	NXTA_109	NextEra	Medium	Soft, ROE, Equity caps last 20 yrs	-	-	8%	10.2% 50%	Constr. Mgmt Only
	NXTA_152	NextEra	Medium	Soft, ROE, Equity caps last 20 yrs	-	-	8%	10.2% 50%	Constr. Mgmt Only
	PSEGRT_619	PSEGRT	Low	Hard cap starts at 125%	-	-	-	-	Yes
	PSEGRT_241	PSEGRT	High	-	Yes	-	-	-	-
West Add'l AEP Needs	AEP_341	AEP	High	-	Yes	-	-	-	-
	AEP_996	AEP	High	-	Yes	-	-	-	-
	LSP_672	LS Power	Medium	-	-	-	9% - 6% > 100%	10.3% 50%	-
Count →					6	7	20	16 19	3, 6 Partial

APPENDIX C - SUMMARY OF PVRR AND SENSITIVITY PERFORMANCE ACROSS CLUSTERS

Table 3. Summary of PVRR and Relative Sensitivity Performance Across Clusters

Cluster	Proposal	Base PVRR (\$M)	Proposer Contingency %	WBO as % of Total CapEx	Cost Containment Risk Category	Relative Sensitivity Performance in Cluster	PVRR vs. Base Case (%)							
							\$ 2	\$ 3	\$ 4	\$ 5	\$ 6	\$ 7	\$ 8	\$ 9
							CapEx +50%	CapEx +100%	ROE 12%	Cost of Debt 9%	Equity Ratio 60%	O&M +50	WBO +50%	Downside
South Regional	VEP_275	\$4,719	8%	-	Medium-High	Tied for 3 rd	38%	83%	3%	19%	5%	2%	0%	132%
	VEP_705	\$2,859	4%	-	Medium-High	Tied for 3 rd	42%	88%	4%	20%	6%	1%	0%	141%
	VEP_616	\$2,480	6%	-	Medium-High	Tied for 3 rd	40%	85%	3%	19%	5%	1%	0%	136%
	LSP_260	\$3,691	15%	3%	Medium	Tied for 1 st	26%	57%	0%	18%	0%	4%	1%	93%
	TRNSC_331	\$3,103	10%	34%	Medium	Tied for 1 st	22%	49%	3%	12%	2%	4%	13%	92%
	TRNSC_781	\$2,132	9%	34%	Medium	Tied for 1 st	22%	49%	3%	12%	2%	4%	13%	93%
	TRAIL_938	\$3,697	5%	2%	Medium	2 nd	37%	78%	1%	14%	1%	5%	1%	114%
MAAC PPL	PPL_853	\$792	2%	-	Low	1 st	3%	5%	9%	11%	2%	0%	0%	30%
	PPL_290 PPLTL_552	\$288	5%	47%	Low_High	2 nd	11%	22%	9%	11%	3%	0%	20%	75%
	LSP_20	\$527	15%	9%	Medium	Tied for 3 rd	24%	53%	1%	17%	1%	5%	3%	92%
	NXTA_771	\$701	13%	5%	Medium	Tied for 3 rd	27%	62%	4%	13%	2%	3%	2%	100%
	NXTA_871	\$1,343	14%	4%	Medium	Tied for 3 rd	25%	61%	4%	12%	2%	3%	2%	96%
MAAC Regional	NXTA_237	\$1,852	18%	4%	Medium	Tied for 1 st	22%	56%	3%	13%	2%	3%	2%	91%
	NXTA_687	\$3,486	16%	2%	Medium	Tied for 1 st	25%	61%	3%	13%	2%	3%	1%	96%
	MAIT_578	\$2,677	5%	2%	Medium-High	2 nd	38%	77%	10%	11%	0%	5%	1%	115%
MAAC Add'l Regional Needs	NXTA_896	\$678	19%	3%	High	1 st	28%	72%	6%	8%	0%	3%	2%	117%
	PEP_371	\$843	23%	-	High	2 nd	21%	61%	10%	21%	8%	0%	0%	122%
West Regional	LSP_543	\$127	15%	10%	Medium	3 rd	23%	52%	1%	18%	1%	5%	3%	93%
	ATSI_239	\$1,638	5%	24%	Medium	5 th	31%	62%	5%	14%	3%	3%	12%	113%
	ATSI_334	\$1,926	5%	16%	Medium	4 th	32%	65%	4%	12%	2%	4%	8%	106%
	TRNSC_570	\$2,936	10%	52%	Medium	Tied for 2 nd	15%	33%	5%	14%	2%	4%	19%	85%
	NXTA_109	\$3,695	15%	39%	Medium	Tied for 2 nd	17%	40%	5%	14%	3%	2%	12%	86%
	NXTA_152	\$3,265	15%	31%	Medium	Tied for 2 nd	18%	45%	5%	14%	2%	3%	11%	90%
	PSEGRT_619_241	\$2,166	8%	17%	Low_High	1 st	21%	26%	2%	13%	1%	3%	5%	57%
West Add'l AEP Needs	AEP_341	\$41	27%	-	High	2 nd	16%	52%	8%	16%	3%	5%	0%	98%
	AEP_996	\$81	19%	-	High	3 rd	23%	62%	9%	17%	4%	5%	0%	115%
	LSP_672	\$115	15%	12%	Medium	1 st	24%	53%	1%	18%	0%	3%	4%	93%

DOCUMENT REVISION HISTORY

12/6/2025 - V1: Original Version posted

1/5/2026 - V2: Final Version