Network Upgrades Presentation

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Overview

- All study reports located at: https://pjm.com/planning.aspx

- Period between October 9, 2022 and September 6, 2023

- 151 System Impact Study reports issued
- $138.13 million net increase in total Network Upgrade costs
- $179.58 million in New Network Upgrades
- $41.45 million decrease for cancelled Network Upgrades

New and Revised System Impact Study Reports

Generation Interconnection Projects - ACE

Queue	Fuel	MW Energy	MW Capacity
AE1-240	Solar	49.7	29
AE2-020	Offshore Wind	604.8	106.44
AE2-021	Offshore Wind	604.8	106.44
AE2-022	Offshore Wind	300	52.8
AF2-021	Storage	20	8
AF2-024	Storage	24	9.6

Generation Interconnection Projects - AEP

Queue	Fuel	MW Energy	MW Capacity
AD1-102	Wind	180.01	23.4
AD2-162	Solar	110	73.81
AD2-178	Solar	120	72
AD2-179	Solar	100	60
AE1-093	Storage	42	42
AE1-170	Solar	150	63
AE1-207	Solar	160	67.2
AE1-208	Solar	130	55
AE1-209	Wind	100	13
AE1-210	Wind	100	13
AE1-227	Solar	49.5	30.69

Queue	Fuel	MW Energy	MW Capacity
AE1-245	Wind	150	19.5
AE1-250	Solar	150	90
AE2-047	Solar	50	32.4
AE2-072	Solar	150	90
AE2-089	Solar	155	93
AE2-160	Hydro	51	30
AE2-166	Solar	90	54
AE2-169	Solar	33	33
AE2-172	Storage	40	40
AE2-195	Solar	19.7	9
AE2-214	Solar	200	120

Generation Interconnection Projects - AEP

Queue	Fuel	MW Energy	MW Capacity
AE2-219	Solar	100	42
AE2-236	Solar	55	38.5
AE2-298	Solar	49.9	29.9
AE2-302	Solar	49.9	29.94
AE2-322	Solar	60	40.3
AE2-323	Solar	100	67.1
AF1-029	Solar	25	15
AF1-092	Solar; Storage	150	115
AF1-130	Solar	190	133.9
AF1-158	Solar; Storage	150	90
AF1-164	Solar	300	195

Queue	Fuel	MW Energy	MW Capacity
AF1-202	Wind	200	34
AF1-204	Wind	255	63.75
AF1-207	Solar	180	34
AF1-215	Solar	300	180
AF1-223	Solar	150	90
AF1-227	Solar	325	195
AF1-228	Solar	155	93
AF1-229	Solar	120	72
AF2-078	Solar; Storage	200	120
AF2-122	Solar	107.7	64.62
AF2-134	Solar	100	60

Generation Interconnection Projects - AMPT

Queue	Fuel	MW Energy	MW Capacity
AF1-205	Solar	40	24

Generation Interconnection Projects - APS

Queue	Fuel	MW Energy	MW Capacity
AE2-137	Natural Gas	84	87
AE2-262	Solar	83.6	50
AE2-263	Solar	78.38	47
AE2-316	Solar	90	41.2
AF1-153	Solar	20	12
AF1-167	Solar	13.515	8.109
AF1-225	Solar	20	8.4
AF1-254	Solar	20	12
AF2-356	Solar	175	105
AG1-293	Solar	7.5	4.9

Generation Interconnection Projects - ATSI

Queue	Fuel	MW Energy	MW Capacity
AE2-194	Solar	145	84
AF1-064	Solar	50	33.4
AF1-120	Solar	40	26.6
AF1-122	Solar	64	26.88
AF1-279	Solar; Storage	150	90
AF2-123	Solar	49	20.58
AF2-129	Solar	20	12
AF2-150	Solar	88	36.96
AF2-322	Solar	199.67	119.802
AG1-252	Solar	3.875	2.3

Generation Interconnection Projects - BGE

Queue	Fuel	MW Energy	MW Capacity
AE1-001	Nuclear	28.1	7.1

Generation Interconnection Projects - ComEd

Queue	Fuel	MW Energy	MW Capacity
AD1-013	Solar	40	15.4
AD1-031	Solar	70	26.6
AD1-039	Natural Gas	102.7	93
AD1-098	Solar	100	57.8
AD1-100	Wind	850	150
AD2-038	Wind	150	26.4
AD2-047	Wind	200	34
AD2-066	Solar	116	69.6
AD2-100	Solar	210	126
AD2-131	Solar	50	8.3
AD2-134	Wind	105.9	21.2

Queue	Fuel	MW Energy	MW Capacity
AD2-194	Natural Gas	60	120
AD2-214	Solar	68	40.8
AE1-113	Wind	300	66
AE1-163	Wind	350	49
AE2-255	Wind	100	25
AE2-281	Wind	50	7
AG1-478	Solar; Storage	19.9	15.9

Generation Interconnection Projects - Dayton

Queue	Fuel	MW Energy	MW Capacity
AF1-078	Solar	45	18.9

Generation Interconnection Projects - DEOK

Queue	Fuel	MW Energy	MW Capacity
AE2-267	Solar	49	28.6

Generation Interconnection Projects - Dominion

Queue	Fuel	MW Energy	MW Capacity
AD1-056	Solar	60	38.9
AD1-057	Solar	33	21.7
AD1-074	Solar	300	198.8
AD1-075	Solar	75	49.7
AD1-076	Solar	109	72.2
AD2-008	Solar	52.1	16.4
AD2-033	Solar	130	78
AD2-046	Solar	80	54.8
AD2-063	Solar	149.5	89.7
AE1-068	Solar	500	322.1
AE1-069	Solar	400	254.5

Queue	Fuel	MW Energy	MW Capacity
AE1-149	Solar	100	60
AE2-034	Solar	60	42
AF1-017	Solar	20	7.6
AF2-119	Solar	80	48

Generation Interconnection Projects - DPL

Queue	Fuel	MW Energy	MW Capacity
AE1-107	Solar	53.1	31
AF2-061	Storage	40	40
AF2-313	Solar	19.9	12.7
AF2-325	Solar; Storage	10	4.2

Generation Interconnection Projects - EKPC

Queue	Fuel	MW Energy	MW Capacity
AE2-308	Solar; Storage	150	110

Generation Interconnection Projects - JCPL

Queue	Fuel	MW Energy	MW Capacity
AE2-024	Offshore Wind	882	155.23
AE2-025	Offshore Wind	445.2	78.36
AF1-019	Storage	20	0
AF1-325	Storage	20	0
AF2-254	Solar	10	4.2
AG1-191	Solar	15.4	6.5

Generation Interconnection Projects - ME

Queue	Fuel	MW Energy	MW Capacity
AF2-102	Solar	3	1.8
AF2-175	Solar	3	1.8

Generation Interconnection Projects - ODEC

Queue	Fuel	MW Energy	MW Capacity
AF2-055	Storage; Solar	45	27

Generation Interconnection Projects - PENELEC

Queue	Fuel	MW Energy	MW Capacity
AE2-113	Solar	120	61.9
AE2-264	Solar	80	48
AE2-299	Storage	160	32
AF1-086	Wind	109.9	20.54
AF1-094	Solar	20	12
AF1-098	Solar	80	48
AF1-104	Solar; Storage	20	20
AF1-134	Solar	20	12
AF1-143	Solar	100	60
AF1-272	Solar	110	66
AF1-286	Solar	13.6	5

Queue	Fuel	MW Energy	MW Capacity
AF2-001	Solar	20	12
AF2-002	Solar	10	6
AF2-039	Solar	13.5	8.1
AF2-088	Solar	6.5	3.9
AF2-092	Solar	12	7.2
AF2-121	Solar	20	12
AF2-165	Solar	20	12
AF2-166	Solar	20	12
AF2-221	Solar	15	6.3
AG1-041	Solar	12	7.2
AG1-193	Solar	20	12

Generation Interconnection Projects - PENELEC

Queue	Fuel	MW Energy	MW Capacity
AG1-301	Solar	20	12

Generation Interconnection Projects - PPL

Queue	Fuel	MW Energy	MW Capacity
AD2-077	Storage	150	100
AF1-216	Solar	143.11	85.87
AF2-145	Solar	51	30.6
AG1-259	Solar	15.9	6.7
AG1-260	Solar	15.9	6.7
AG1-262	Storage	85	40

Generation Interconnection Projects - PSEG

Queue	Fuel	MW Energy	MW Capacity
AF2-416	Storage	10	10

Network Upgrades

Network Upgrades – AEP

NUN	Description	Cost ($M)	Driver
n4106	Replace Two (2) Switches at the Clifty Creek 345 kV Station	$0.413	AF1-215
n4106.3	Jefferson - Clifty 345 kV line sag study remediation is one location of grading to remediate clearance location of concern in span 1 to 2. Latest Facility Study: Extend One (1) Tower on the Jefferson - Clifty Creek (IKEC) 345 kV Circuit	$0.410	AF1-215
n5769.5	Replace 4 Dumont switches on the Stillwell-Dumont 345 kV line.	$2.400	AG1-005
n5769.6	Adjust Dumont relay trip limit settings on the Stillwell-Dumont 345 kV line.	$0.600	AG1-005
n5834	Mitigate the sag on the St John - Green Acre 345 kV line	$3.800	AD1-100
n6279.2	Perform a sag study on the Desoto - Jay 138 kV line.	$0.050	AF1-173
n6383	A Sag Study will be required on the 20 miles section of ACSR ~ 477 ~ 26/7 ~ HAWK conductor section 2 line to mitigate the overload. New Ratings after the sag study S/N : 185MVA S/E: 257MVA. Depending on the sag study results, cost for this upgrade is expected to be between $80,000 (no remediation required just sag study) and $30 million (complete line reconductor/rebuild required).	$0.080	J1969 (MISO)
n6457.1	The sag study was completed under AE1-130 project and determined that no violations occur on this line when operating at Maximum Operating Temperature. No work required on the circuit at this time.	$0.000	AG1-124
n6476	Perform a sag study on the 11.7 mile single circuit line between Fostoria Central and South Berwick.	$0.070	AG1-319

Network Upgrades – AEP

NUN	Description	Cost ($M)	Driver
n6526.2	Sag Study will be required on ACSR ~ 954 ~ 45/7, 18.3 miles line between South Berwick and Galion .The cost is expected to be 73,200. New Ratings after sag study: S/N: 1409 MVA S/E: 1887 MVA. Rebuild/Reconductor cost: $ 36.6 million	$0.732	AG1-411
n6538.1	Replace five substation conductor 2156 ACSR 84/19 Std at E Lima	$0.500	AG1-199
n6538.2	Sag study is required on 4 mile single circuit line between Fremont Center and Fremont with 1033 ACSR. The cost is expected to be around $20,000.The Rating after the sag study S/N: 1409MVA ,S/E: 1887MVA. Rebuild/Reconductor cost : $ 8 million	$0.020	AG1-199
n6538.3	Replace substation conductor 2870 MCM ACSR at E Lima	$0.100	AG1-319
n6634.10	Telecom upgrades at Highland 138kV	$0.015	AC2-061
n6634.6	Install 138kV Revenue Meter, generator lead transmission line span from the new Spickard 138kV station to the Point of Interconnection, and extend dual fiber-optic from the Point of Interconnection to the new Spickard 138kV Station control house.	$0.572	AC2-061
n6634.7	Install new Spickard 138kV three-breaker ring bus station along the Hillsboro-Clinton County 138kV line, installation of associated protection and control equipment, line risers, switches, jumpers, and supervisory control and data acquisition (SCADA) equipment.	$4.922	AC2-061
n6634.8	Modify Hillsboro-Clinton County 138kV T-Line and Fiber Cut In for AC2-061 interconnection	$0.958	AC2-061
n6634.9	Upgrade line protection and fiber connectivity at Hillsboro 138kV station for AC2-061 interconnection	$0.275	AC2-061

Network Upgrades – AEP

NUN	Description	Cost ($M)	Driver
n7280	Exit Span and 1st Structure to Gen Lead Line at Adam 138kV	$0.592	AB2-085
n7281	Extend fiber-optic cables from the point of transition into the Adams 138kV control house	$0.124	AB2-085
n7289	Expand the Lockwood Road 138 kV substation: Install two (2) additional 138 kV circuit breakers. Installation of associated protection and control equipment, 138 kV line risers and SCADA	$1.604	AF1-063
n7297	Install One (1) New 138 kV Circuit Breaker, Associated Equipment, Update Protective Relay Settings at the Kirk 138 kV Station	$1.000	AF2-122
n7298	Install Three (3) Dead End Structures, Three (3) Spans of Conductor, OPGW and Alumoweld Shield Wires from the Kirk 138 kV Station to the Point of Interconnection	$1.650	AF2-122
n7299	Install Revenue Metering at Kirk 138 substation	$0.310	AF2-122
n7300	Install Two (2) Fiber-Optic Cable Paths from the Kirk 138 kV Station to the Fiber-Optic Cable Points of Interconnection	$0.270	AF2-122
n7384	Install 345 kV metering at the Marysville 345 kV station. Construct line from the Marysville 345 kV Station to the Point of Interconnection. Install dual fiber telecommunications from the Marysville 345 kV station to the Customer Facility collector station	$1.459	AD2-093
n7385	Modify and expand the existing Marysville 345 kV station including one 345 kV circuit breaker installation	$1.267	AD2-093

Network Upgrades – AEP

NUN	Description	Cost ($M)	Driver
n7433	Construct a new three (3) circuit breaker 345 kV station, Chenoweth, physically configured and operated as a ring bus	$10.466	AE2-148
n7434	Install 345 kV Revenue Meter, Generator lead first span exiting the POI station, including the first structure outside the fence at the new AE2-148 switching station	$1.600	AE2-148
n7435	Install a cut in at Beatty Road - Greene 345 kV	$1.426	AE2-148
n7436	Upgrade line protection and controls at the Beatty Road 345 kV Station	$0.604	AE2-148
n7449	Install new 345 kV three-breaker ring bus station along the Olive – Reynolds 345 kV line	$0.346	AF1-215
n7450	Install Three (3) Structures, Two (2) Spans of Conductor, Connect Ora Ora 345 kV Station to Existing Transmission Circuit	$1.189	AF1-215
n7451	Replace Protective Relays at Olive 345 kV Station	$0.605	AF1-215
n7469	Install 345 kV metering at the Gunn Road 345 kV station. Construct line from the Gunn Road 345 kV Station to the Point of Interconnection. Install dual fiber telecommunications from the Gunn Road 345 kV station to the Customer Facility collector station	$1.438	AE2-306
n7492	Install 138kV metering at the Inez 138kV station. Construct generator lead transmission line from the Inez 138kV Station to the Point of Interconnection. Install dual fiber telecommunications from the Inez 138kV station to the Customer Facility collector station	$0.878	AF1-130

Network Upgrades – AEP

NUN	Description	Cost ($M)	Driver
n7493	Expand Inez 138kV Station, including the addition of a new string and two (2) 138kV circuit breakers, installation of associated protection and control equipment, 138kV line risers, switches, jumpers, and supervisory control and data acquisition (SCADA) equipment	$1.530	AF1-130
n7751	Replace 1600A Switches at Sorenson 345kV	$0.100	AG1-224
n7754.1	Replace 5 Substation conductor 2000 AAC 91 Str at Danville2 138kV station	$0.000	AD1-152
n7754.2	Replace 3 Substation conductor 2000 AAC 91 Str at East Danville 138kV station	$0.000	AD1-152
n7991	Install 69kV Revenue Meter, generator lead transmission line span from the new 69kV station to the Point of Interconnection, including the first structure outside the new 69kV station, and extend fiber-optic from the Point of Interconnection to the new 69kV Station control house	$0.692	AC1-167
n7992	Expand the Platter Creek 69kV Station, including the addition of one 69kV circuit breaker, installation of associated protection and control equipment, 69kV line risers, and supervisory control and data acquisition (SCADA) equipment	$0.683	AC1-167
n8004	Install new 138kV three-breaker ring bus station along the Grandview-Clifftop 138kV line, installation of associated protection and control equipment, 138kV line risers, and supervisory control and data acquisition (SCADA) equipment	$3.884	AE1-212
n8005	Modify Grandview-Clifftop 138kV T-Line Cut In	$1.222	AE1-212
n8006	Upgrade line protection and controls at the Grandview 138kV station	$0.302	AE1-212

Network Upgrades – AEP

NUN	Description	Cost ($M)	Driver
n8029.1	Attachment facility line and Revenue Metering Installation at the new AF1-202 345 kV switching station	$1.082	AF1-202
n8029.2	Construct a new 3 breaker 345 kV Switching station for AF1-202 interconnection	$17.440	AF1-202
n8029.3	Construct a new loop-in tap line at the Kerston - Desoto 345 kV line for AF1-202 interconnection	$1.210	AF1-202
n8029.4	Modify relay settings at Desoto 345 kV substation	$0.045	AF1-202
n8031.1	New 138kV switching station (Wapahani switching station) to interconnect AD1-128 customer facility	$5.368	AD1-128
n8031.2	Loop-in tap line to new AD1-128 switching station from College Corner-Desoto 138kV line	$0.927	AD1-128
n8035.1	Install 69kV Revenue Meter, generator lead transmission line spans from the Buckskin 69kV station to the Point of Interconnection, including the first two structures outside the Buckskin 69kV station, and extend dual fiber-optic from the Point of Interconnection to the Buckskin 69kV Station control house.	$1.025	AC2-060
n8035.2	Expand the Buckskin 69kV Station, including the addition of one (1) 69kV circuit breaker, installation of associated protection and control equipment, 69kV line risers, and supervisory control and data acquisition (SCADA) equipment	$0.713	AC2-060
n8035.3	Buckskin-Highland 69kV T-Line Re-termination. External Station associated work, including two structures, including one double circuit structure	$0.818	AC2-060

Network Upgrades – AEP

NUN	Description	Cost ($M)	Driver
n8059.1	Construct one (1) 69 kV generator lead transmission line from the Steubenville 69 kV Station to the Point of Interconnection, install 69 kV revenue meter, extend dual fiber-optic cable from the Point of Interconnection to the Steubenville 69 kV Station control house. Expand the Steubenville 69 kV Station, including the addition of one 69kV circuit breaker, installation of associated protection and control equipment, line risers, switches, jumpers, and SCADA	$1.569	AD2-014
n8059.2	Install one (1) additional 69 kV circuit breaker on the 69 kV side of the Steubenville 138/69/12 kV autotransformer	$0.373	AD2-014
n8083.1	Construct a new Switching Station for AF2-205 interconnection	$5.413	AF2-205
n8083.2	Transmission line cut-in of Swingle 345 kV switching station & update remote end protection settings	$0.714	AF2-205
n8083.3	Install fiber-optic connections (2) at Swingle - Tatertown 345 kV transmission line	$0.559	AF2-205
n8319	Relocate the East Bend 345kV line from the T bay to the R bay at the Tanners Creek 345kV substation. This addresses the breaker failure contingency AEP_P4_#14920_05TANNER 345_T_SRT-A for the Tanners tie breaker failure	$3.100	AE2-297
n8438.1	Construct Three (3) Breaker 138 kV Station in a Breaker and a Half Configuration for AE2-323 interconnection	$6.364	AE2-323
n8438.2	Install Two (2) Dead End Structures, Two (2) Spans of Conductor, Two (2) Spans of OPGW Shield wire, Connect New 138 kV Station to Existing Twin Branch - Guardian Transmission Circuit and upgrade remote end relays	$0.693	AE2-323
n8445	Update Protective Relay Settings at the Proposed AF1-215 345 kV Station	$0.050	AF2-134

Network Upgrades – AMPT

NUN	Description	Cost ($M)	Driver
n8359.1	Upgrade existing Sullivan 138 kV (previously named Napoleon Muni Northside) substation to a five-breaker ring bus substation	$2.939	AF1-205

Network Upgrades – APS

NUN	Description	Cost ($M)	Driver
n6078	Substation - Design, install, and test/commission Multiprotocol Label Switching (MPLS) Equipment for SCADA transport. Install fiber from AD2-158 to backbone for communication transport. SCADA work at Millville and Double Toll Gate substations to support wave trap & relay installations. Estimated (1) in-sub fiber run from AD2-158 substation control house to Interconnection Customer built fiber run to support communications and control to generator site	$0.666	AD2-158
n6079	Project Management, Environmental, Forestry, Real Estate, and Right of Way at AD2-158 interconnection substation	$1.341	AD2-158
n6080	Double Toll Gate-Millville 138 kV Line - Cut the Double Toll Gate 138 kV line and install line loop to the new AD2-158 Wheatland 138 kV Interconnection Substation	$0.749	AD2-158
n6081	Double Toll Gate 138kV Substation - Upgrade carrier and line relaying and wave trap	$0.550	AD2-158
n6082	Millville 138kV Substation - Upgrade carrier relaying and wave trap	$0.360	AD2-158
n7279	Old Chapel 138kV Substation - Modify substation nameplates, and high voltage circuit diagram	$0.060	AD2-158
n7965	Millville-Old Chapel 138 kV Line: Loop the Millville-Old Chapel 138 kV line into new AE2-226 interconnection substation	$1.023	AE2-226
n7966	Double Toll Gate 138kV: Adjust relay settings and update drawings and nameplates	$0.053	AE2-226
n7967	Old Chapel 138kV: Modify SCADA RTU and update drawings and nameplates	$0.047	AE2-226

Network Upgrades – APS

NUN	Description	Cost ($M)	Driver
n7968	Wheatland 138kV (AD2-158 Interconnect): Upgrade relaying as needed to accommodate the new AE2-226 generation queue project interconnection of 99 MW MFO	$0.358	AE2-226
n7969	AE2-226 Interconnect: Construct new Kabletown 138 kV substation as a 3-breaker ring bus looping in and out the Old Chapel – Millville 138 kV line	$6.884	AE2-226
n7970	Kabletown 138kV Substation Fiber Installation: Install fiber from Kabletown Substation to AD2-158 Interconnection for communication transport	$0.163	AE2-226
n7971	SCADA/Fiber Communication: Design, install, and test/commission MPLS Equipment at Kabletown 138kV for SCADA transport	$0.252	AE2-226
n8097.1	AE2-001: Tap the existing Nittany – Zion 46 kV line and install 2 main line switches and 1 tap switch to interconnect queue project AE2-001. Tap and CTs/PTs mounted in the customer's station	$0.164	AE2-001
n8097.2	Nittan 46 kV: Replace Stone Junction 46 kV line relaying at Nittany for AE2-001 interconnection	$0.263	AE2-001
n8097.3	Pleasant Gap 46 kV: Replace Stone Junction 46 kV line relaying at Pleasant Gap for AE2-001 interconnection	$0.263	AE2-001
n8097.4	Milesburg 46 kV: Replace Stone Junction 46 kV line relaying at Milesburg for AE2-001 interconnection	$0.263	AE2-001
n8159.1	AF1-290 Mechanicstown Interconnection Sub: Design, install, and test/commission MPLS Equipment for SCADA transport	$0.246	AF1-290

Network Upgrades – APS

NUN	Description	Cost ($M)	Driver
n8159.2	Fiber from AF1-290 Mechanicstown to Feagans Mill - Millville: Install fiber from Mechanicstown to backbone for communication transport	$0.268	AF1-290
n8159.3	Feagans Mill-Millville 138 kV Line Loop: Loop the Feagans Mill - Millville 138kV into the new Mechanicstown Substation	$1.913	AF1-290
n8159.4	Stonewall Substation: Line Terminal Upgrade	$0.656	AF1-290
n8159.5	Feagans Mill Substation: Modify drawings and nameplates for line name change	$0.033	AF1-290
n8159.6	Millville Substation: Line Terminal Upgrade	$0.621	AF1-290
n8211.1	Albright – Cross School 138kV Line: Loop in and out the Albright-Cross School AFA 138kV line to new 3-breaker ring bus at Swanton 138kV substation	$1.355	AF2-356
n8211.2	Cross School 138kV Substation: Replace (1) 138kV, 2000A, wave trap, line tuner, and coax on Albright line exit with (1) 138kV, 2000A wideband wave trap, line tuner, and coax. Replace line relaying panel for the Swanton line terminal	$1.376	AF2-356
n8211.3	Albright 138kV Substation: Replace (1) 138kV, 2000A, wave trap, line tuner, and coax on Cross School line exit with (1) 138kV, 2000A wideband wave trap, line tuner, and coax. Replace line relaying panel for the Swanton line terminal	$1.813	AF2-356
n8211.4	Dan’s Rock Substation 138 kV: Design, install, and test/commission new licensed microwave link at Dan's Rock MW	$0.193	AF2-356

Network Upgrades – APS

NUN	Description	Cost ($M)	Driver
n8211.5	Design, install, and test/commission MPLS Equipment for SCADA transport at Swanton 138 KV substation	$0.659	AF2-356
n8211.6	AF2-356 Interconnection Substation (OTB): Install physical security camera system	$1.796	AF2-356
n8374.1	Warfordsburg Substation: Replace existing McConnellsburg line relaying with (1) standard line relaying panel with (2) SEL-421 and (1) SEL-501 BFT	$0.191	AF1-136
n8374.2	Warfordsburg – Purcell Jct 34.5 kV Line: Install two main line switches on the existing Warfordsburg – Purcell Jct 34.5 kV line	$0.116	AF1-136
n8374.3	Mercersburg – AD1-061 34.5 kV Tap: Reconductor approximately 1.6 mi from Mercersburg – AD1-061 (Elk Hill 1) Tap 34.5 kV Line from Mercersburg Substation to Pole PA406-WP47 with 795 ACSR conductor	$1.316	AF1-136
n8374.4	Mercersburg Substation 34.5 kV: Replace limiting conductors and revise relay settings	$0.232	AF1-136
n8374.5	McConnellsburg Substation 34.5 kV: Revise relay settings	$0.134	AF1-136
n8450.1	Bruceton Mills Interconnection Sub 138 kV: Construct 3-breaker ring-bus substation for new generation interconnection	$8.378	AE1-106
n8450.2	AE1-106 Sub: Design, install, and test/commission multi-protocol label switching (MPLS) equipment for SCADA transport	$0.744	AE1-106

Network Upgrades – APS

NUN	Description	Cost ($M)	Driver
n8450.3	Design, install, and test/commission microwave equipment for Supervisory Control and Data Acquisition (SCADA) transport between AE1-106 Customer Facility and Bruceton Mills 138 kV Substation	$0.227	AE1-106
n8450.4	Brandonville Junction (Albright-Hazelton-Lake Lynn) 138kV: Loop the existing Brandonville Junction (Albright-Hazelton-Lake Lynn) 138kV line into the new Bruceton Mills Substation	$1.674	AE1-106
n8450.5	Lake Lynn Substation 138 kV: Replace Panel No. 4 existing line relaying with new breaker control panel with (1) SEL451 and (1) SATEC meter	$0.332	AE1-106
n8450.6	Hazelton Substation 138 kV: Provide remote end equipment required for AE1-106	$0.925	AE1-106
n8450.7	Albright Substation 138 kV: Provide remote end equipment required for AE1-106	$1.717	AE1-106
n8455.3	Bowling Green No.2 69 kV: Install Carrier equipment for anti-islanding	$0.471	AF1-064
n8457.1	AE2-262/AE2-263 Interconnection Sub: Construct a new 230 kV three breaker ring bus looping in the Moshannon-Milesburg 230 kV line to provide interconnection facilities for AE2-262/AE2-263	$11.426	AE2-262
n8457.2	AE2-262/AE2-263 Interconnection Sub: Design, install and test/commission MPLS Equipment for SCADA transport at new Interconnection Sub	$0.239	AE2-262
n8457.3	AE2-262/AE2-263 Interconnection Sub: Install fiber from AE2-262/AE2-263 New Interconnection Substation to fiber backbone for communication transport	$0.149	AE2-262

Network Upgrades – APS

NUN	Description	Cost ($M)	Driver
n8457.4	Moshannon-Milesburg 230 kV Line: The Moshannon-Milesburg 230 kV line will be cut and looped into the new 230 kV interconnect substation. This cut will take place at a location that is approximately 16.3 miles from the Moshannon substation	$1.721	AE2-262
n8457.5	Moshannon 230 kV: Anti-islanding and carrier equipment will be installed in existing relay panels. Existing Milesburg line relaying will be replaced	$0.691	AE2-262
n8457.6	Milesburg 230 kV: One existing 230 kV CVT, wave trap, line tuner, and circuit breaker will be replaced. Anti-islanding will be installed. Existing Moshannon line relaying panel will be replaced	$1.821	AE2-262
n8457.7	Dale Summit 230 kV: A new carrier relaying panel with anti-islanding will be installed for the Milesburg and Shingletown exits	$0.568	AE2-262
n8457.8	Shingletown 230 kV: A new carrier relaying panel with anti-islanding will be installed for the Dale Summit exit	$0.614	AE2-262

Network Upgrades – ATSI

NUN	Description	Cost ($M)	Driver
n5783	Reconductor the AC1-078 Tap - London 138 kV line	$3.908	AF1-270
n5867	Cut the East-Springfield-Tangy 138 kV Line and terminate the line inside the proposed AD2-163 ring bus in an in-out configuration at East Springfield - Tangy 138 kV Line	$0.368	AD2-163
n5868	Adjust remote, relaying, and metering settings, and Replace 138 kV wave trap, line tuner, and coax at Tangy 138kV Substation	$0.118	AD2-163
n5869	Adjust remote, relaying, and metering settings, and Replace 138 kV wave trap, line tuner, and coax. Also replace line and carrier relaying at East Springfield 138 kV Substation	$0.265	AD2-163
n7349	Engineering and construction oversight for a new 3-breaker ring bus on the Greene-Clark 138 kV line for the AD1-140 interconnection. Includes review of drawings, nameplates, and relay settings for FirstEnergy standards. Includes Project Management, Environmental and Right of Way	$0.716	AD1-140
n7350	AD1-140 Supervisory Control and Data Acquisition (SCADA): Design, install and test/commission Multiprotocol Label Switching (MPLS) equipment for SCADA transport	$0.199	AD1-140
n7351	Fiber Communication: ADSS fiber run from AD1-140 Interconnection Switchyard control house to Greene-East Springfield line fiber and to developer built fiber run to support communications and control to the generator site	$0.081	AD1-140
n7352	AD1-140 Clark-Green 138 kV Line Loop: Loop the Clark-Greene 138kV circuit into the new AD1-140 Interconnection Switchyard. The proposed location of the new ring bus is near structure #5604. Includes project management, environmental, forestry, real estate and right-of-way	$0.413	AD1-140

Network Upgrades – ATSI

NUN	Description	Cost ($M)	Driver
n7353	Clark 138 k Substation: Install two (2) 138 kV wave traps and tuners. Update Relay Settings	$0.130	AD1-140
n8098.1	East Fayette 138 kV: To connect the AE2-282 solar project with the Toledo Edison transmission system, a new line position will be established within the East Fayette 138 kV Substation by adding a new 138 kV circuit breaker and related equipment. A circuit breaker, 3 CCVTs, 1 138 kV Tubular Steel H- frame Dead End, and a relaying panel will be installed to accommodate the new line terminal	$1.029	AE2-282
n8098.2	East Fayette 138 kV: Estimated SCADA work at East Fayette substation to support breaker installation, relay installation, and updated relay setting. Estimated in-sub fiber run from East Fayette control house to developer ran fiber build for communications to AE2-282 Generator	$0.057	AE2-282
n8206	Snyder: Extend the Snyder 69 kV bus. Install one 69 kV circuit breaker	$0.873	AE2-181
n8217.1	Groton Substation 138 kV: Expand existing Groton ring bus to a four-breaker ring bus	$1.635	AE2-176
n8217.2	Hayes Substation 138 kV: Modify Relay setting	$0.125	AE2-176
n8217.3	West Fremont Substation 138 kV: Revise relay settings	$0.125	AE2-176
n8221.1	Construct a new 69 kV 3 breaker ring bus on the Cardington-Tangy 69 kV line	$5.777	AF1-122
n8221.2	Design, install, and test/commission MPLS Equipment for SCADA transport on the Cardington - Tangy 69 kV line	$0.262	AF1-122

Network Upgrades – ATSI

NUN	Description	Cost ($M)	Driver
n8221.3	Loop the Cardington-Tangy 69kV line to create the interconnection for the new AF1-122 3-breaker ring bus, approximately 1.1 miles from the Cardington substation. Install fiber from the new AF1-122 3-breaker ring bus to the Cardington substation	$1.144	AF1-122
n8221.4	Relay Settings Changes, Drawing Updates, and Nameplates at Tangy 69 kV substation	$0.063	AF1-122
n8221.5	Upgrade line relaying at Cardington 69 kV substation	$0.560	AF1-122
n8337.1	Construct a new line exit out of the Galion Substation by adding a new 138 kV breaker	$2.135	AF2-150
n8337.2	Modify Relay Settings Roberts 138 kV	$0.097	AF2-150
n8337.3	Modify Relay Settings at Cardington 138 KV	$0.097	AF2-150
n8337.4	Modify Relay Settings at Leaside 138 kV	$0.097	AF2-150
n8337.5	Modify Relay Settings at Ontario 138 kV	$0.097	AF2-150
n8359.2	Reterminate the Midway-Sullivan 138kV line into the expanded substation to support new generation interconnection	$0.706	AF1-205

Network Upgrades – ATSI

NUN	Description	Cost ($M)	Driver
n8359.3	Revise relay settings at Striker 138 kV substation	$0.083	AF1-205
n8359.4	Perform end to end testing and revising relay settings at Midway 138 kV substation	$0.083	AF1-205
n8359.5	Integrate upgrades to the Sullivan 138 kV Substation to the FirstEnergy transmission system	$0.083	AF1-205
n8451.1	Construct a new 138 kV three breaker ring bus looping in the South Akron- Toronto 138 kV line to provide interconnection facilities for AE2-194	$6.377	AE2-194
n8451.10	Relay settings for the Gilchrist- Lakemore 138kV Line will be adjusted	$0.093	AE2-194
n8451.12	Relay settings for the Lakemore- South Akron 138kV Line will be adjusted	$0.185	AE2-194
n8451.13	Relay settings for the Boardman-Toronto 138kV Line will be adjusted	$0.093	AE2-194
n8451.14	Relay settings for the Lowellville- Dobbins 138kV Line will be adjusted	$0.093	AE2-194
n8451.15	Relay settings for the Urban-Firestone 138kV Line will be adjusted	$0.185	AE2-194

Network Upgrades – ATSI

NUN	Description	Cost ($M)	Driver
n8451.16	Relay settings for the Tusc-Urban 138kV Line will be adjusted	$0.093	AE2-194
n8451.2	The South Akron to Toronto 138 kV line will be cut and looped into the new 138 kV interconnection substation. This cut will take place at a location that is approximately 21 miles from the Toronto Substation. It is assumed that the interconnection substation will be located within one span (approximately 0.1 mile) from the existing line	$3.061	AE2-194
n8451.5	138kV Line relay setting for AE2-194 Interconnection (South Akron) will be changed	$0.501	AE2-194
n8451.6	One (1) 138 kV 2000A dual-frequency wave traps, line tuners and coax will be installed	$0.173	AE2-194
n8451.7	Relay settings for the Dobbins-Toronoto 138kV Line will be adjusted	$0.185	AE2-194
n8451.8	Relay settings for the Dale- South Akron 138kV Line will be adjusted	$0.093	AE2-194
n8451.9	Relay settings for the Sammis-Toronoto 138kV Line will be adjusted	$0.093	AE2-194
n8455.1	Sandridge Substation: Establish new 69 kV line position for AF1-064	$1.556	AF1-064
n8455.2	Midway Substation 69 kV: Install Carrier equipment for anti-islanding	$0.505	AF1-064

Network Upgrades – ComEd

NUN	Description	Cost ($M)	Driver
n5833	Mitigate the sag on the 17ST John - St John 345 kV line	$3.800	AD1-100
n6285	Modify breaker failure scheme to incorporate “A-Contact” logic to 138 kV blue bus to reduce total clearing times at TSS111 Electric Junction to 9 cycles for fault on 345/138 kV transformer 81	$0.140	AC1-109
n6929	Construct new substation for AF2-349 interconnection	$15.000	AF2-349
n6930	Cut circuit and loop into new AF2-349 substation	$3.700	AF2-349
n6931	Install communications equipment at new AF2-349 substation	$2.900	AF2-349
n6932	Update relays at Cherry Valley TSS 156 for AF2-349 interconnection	$0.187	AF2-349
n6933	Update relays at Silver Lake TSS 138 for AF2-349 interconnection	$0.187	AF2-349

Network Upgrades – Dayton

NUN	Description	Cost ($M)	Driver
n7475	Install a new 138kV circuit breaker, physical structures, protection and control equipment, communications equipment, and associated facilities at the Eldean 138kV substation	$0.849	AE2-218

Network Upgrades – DEOK

NUN	Description	Cost ($M)	Driver
n6239	Install metering and overhead conductors from the POI to the interconnection switching substation AC2-088/AD1-136	$0.420	AD1-136
n6634.11	Warren 138 kV station: Replace the wave trap on the feeder to Clinton County 138 kV station and make necessary relay settings changes	$0.120	AC2-061
n6634.12	Clinton County 138 kV station: Replace the wave trap on the high side of TB1	$0.100	AC2-061

Network Upgrades – Dominion

NUN	Description	Cost ($M)	Driver
n6134	Build a new three breaker 230kV ring bus cutting the Clover - Sedge Hill 230kV line	$6.120	AD1-087
n6135	Install new structures to cut and loop the line into AD1-087 switching station	$1.280	AD1-087
n6136	Protection and communication work to support interconnection of new AD1-087 generator	$0.159	AD1-087
n6220	Install a second, back-to-back breaker between existing line positions #254 and #2141 at the Lakeview substation	$1.960	AC1-086
n6235	Build a three breaker ring bus at the new AC1-043 substation	$5.468	AC1-043
n6237	Modify protection and communication work to support interconnection of new AC1-105 generator	$0.180	AC1-043
n6331	Modify protection and communication work to support interconnection of new AC1-222 generator	$0.180	AC1-222
n6332	Build new structures to cut and loop the line #1016 into AC1-222 115 kV substation	$0.680	AC1-222
n6333	Build a three breaker 115 kV substation at the AC1-222 facility	$5.100	AC1-222

Network Upgrades – Dominion

NUN	Description	Cost ($M)	Driver
n6355	Modify protection and communication work to support interconnection of new AC1-221 generator	$0.070	AC1-221
n6356	Build new structures to cut and loop the line #1016 into AC1-221 230 kV substation	$0.610	AC1-221
n6357	Build a three breaker 230 kV substation at the AC1-221 facility	$5.800	AC1-221
n6648	Build a three breaker 115 kV substation at the AC1-143 facility	$5.300	AC1-143
n6649	Build new structures to cut and loop the transmission line into AC1-143 115 kV substation	$1.800	AC1-143
n6650	Modify protection and communication work to support interconnection of new AC1-143 generator	$0.150	AC1-143
n6764	Build a three breaker 115 kV substation at the AE1-084 facility	$5.600	AE1-084
n6765	Build new structures to cut and loop the transmission line into AE1-084 115 kV substation	$0.800	AE1-084
n6766	Modify protection and communication work to support interconnection of new AE1-084 generator	$0.270	AE1-084

Network Upgrades – Dominion

NUN	Description	Cost ($M)	Driver
n6770	Build a three breaker 230 kV substation at the AC2-165 facility	$6.300	AC2-165
n6771	Build new structures to cut and loop the transmission line into the Powhatan 230kV substation	$1.000	AC2-165
n6772	Modify protection and communication work to support interconnection of new Powhatan generator	$0.190	AC2-165
n7422	Construct line #2XXX between Morrisville substation and AE1-044 Transition station	$1.706	AE1-044
n7853.1	Re-arrange line #1012 to loop into and out of the new three breaker AD2-063 115 kV switching station. A new three breaker ring bus substation will be installed between structures 2068/446 and 2068/447	$1.199	AD1-152
n7853.2	Build a three breaker AD1-152 230 kV switching station	$7.597	AD1-152
n7853.3	Remote protection and communications work at Clover 230 kV Substation	$0.056	AD1-152
n7853.4	Remote drawing work at Sedge Hill 230 kV Substation	$0.016	AD1-152
n8113	The Contingency driving this upgrade/overload is DVP_P7-1: LN 25-2034-A which is the tower failure of the Dominion 115 kV Line#25 Trowbridge-Everett and 230 kV Line#2034 who share a common tower. Dominion new proposal is to resolve the overload by splitting line #25 off of line#2034, which eliminate the tower contingency	$4.740	AD1-076

Network Upgrades – Dominion

NUN	Description	Cost ($M)	Driver
n8157	Update 138 kV line relaying at the Bremo 138 kV Station	$0.175	AE1-108

Network Upgrades – DPL

NUN	Description	Cost ($M)	Driver
n5879	Rebuild the 6705 Sharptown - AD2-088 TAP 69kV line	$5.934	AC1-190
n5880	Rebuild the 6705 AD2-088 TAP - Laurel 69kV line	$5.092	AC1-190
n6632	New 138 kV substation with a three-position ring bus for AB2-036 interconnection	$5.445	AB2-036
n7753	Upgrade circuit breaker and associated Current Transformers and Switches from 2000A to 3000A at Mt. Pleasant Substation	$0.400	AG1-464
n8443.5	Communication network upgrades for Island detection at Oakhall 69 kV substation	$0.500	AF2-055

Network Upgrades – EKPC

NUN	Description	Cost ($M)	Driver
n6197.1	Uprate CT associated with Barren Co – Horsecave Jct 69 kV line	$0.000	AG1-071
n6197.2	Upgrade jumpers at Barren Co associated with Barren Co – Horsecave Jct 69 kV line.	$0.010	AG1-472
n6198.2	Uprate high side and two low side CTs associated with Barren Co 161/69kV Auto to a minimum of 230 MVA summer LTE	$0.000	AE1-246
n6232	Upgrade the existing 500 MCM Cu bus jumpers to 750 MCM Cu. New rating after the upgrade will be 148 MVA	$0.250	AF1-038
n6274	Install an Attachment facility line from the AC1-074 interconnection substation to the first structure located outside of the switchyard. Also, install revenue metering.	$0.350	AC1-074
n6275	Install a new loop-in tap line will be constructed from EKPC's existing Jacksonville to Renaker 138 kV transmission line to the new switching station	$0.520	AC1-074
n6463.2	Upgrade bus and jumpers associated with Boone 138 kV bus using 2-500 MCM 37 CU conductor or equivalent on the Boone Co - Longbranch 138 kV line.	$0.170	AE2-138
n6463.5	Boone Co - Longbranch 138 kV line: Replace the 750 MCM copper substation bus and jumpers at the Longbranch substation with bundled 500 MCM copper or equivalent equipment	$0.190	AF1-256
n6494	Increase the maximum operating temperature of the 266 MCM ACSR conductor in the Edmonton/JB Galloway Jct-Knob Lick 69kV line section to 176 degrees F (5.7 miles)	$0.310	AE2-071

Network Upgrades – EKPC

NUN	Description	Cost ($M)	Driver
n6494.1	Increase MOT (maximum operating temperature) of 266 MCM ACSR conductor to 212 degrees on the EDM-JBGAL J - Knob Lick 69 kV line	$0.290	AF1-203
n7847	EKPC to install necessary equipment (a 69 kV isolation switch structure and associated switch, plus interconnection metering, fiber-optic connection and telecommunications equipment, circuit breaker and associated switches, and relay panel) at the new Eighty Eight 69kV Switching station to accept the IC generator lead line/bus	$1.030	AE2-071
n7848	Construct a new 69kV switching station built to 161kV standards (Eighty Eight Switching) to facilitate connection of the Glover Creek Solar generation project	$3.735	AE2-071
n7849	Construct facilities (~175 feet) to loop the existing Patton Road Junction-Summer Shade 69kV line section into the new Eighty Eight Switching substation	$0.555	AE2-071
n7850	Modify relay settings at Fox Hollow substation for existing line to Eighty Eight Switching station	$0.045	AE2-071
n7851	Modify relay settings at Summer Shade substation for existing line to Eighty Eight Switching substation	$0.045	AE2-071
n7852	install OPGW in the Summer Shade-Eighty Eight 69kV line section (1.7 miles)	$0.500	AE2-071
n8075.1	Construct a new switching station (North Taylor County switching station) to interconnect AF1-083 customer facility	$3.953	AF1-083
n8075.2	Loop-in tap line to new AF1-083 switching station from Green County - Marion County 161kV line	$0.343	AF1-083

Network Upgrades – EKPC

NUN	Description	Cost ($M)	Driver
n8075.3	Modify relay settings at Green County 161 kV substation	$0.010	AF1-083
n8075.4	Modify relay settings at Marion County 161kV substation	$0.010	AF1-083
n8075.5	Install OPGW at Green County - North Taylor Switching Station	$0.898	AF1-083

Network Upgrades – JCPL

NUN	Description	Cost ($M)	Driver
n6892	Review of relay settings/ protection settings at Washington 34.5 kV substation.	$0.020	AF2-354
n8151.1	The Hackettstown to Pohatcong 34.5 kV line will be tapped to accommodate the AF1-328 interconnect project. This tap will take place at a location that is approximately 1.25 miles from the Pohatcong substation and 1.50 miles from the Hackettstown Substation.	$0.442	AF1-328
n8151.2	Relay settings will be revised for tap at Pohatcong 34.5 kV	$0.039	AF1-328
n8151.3	Adjust relay settings at AF1-328 substation	$0.072	AF1-328
n8160.1	Tap the Y701 Cozy Lake (Franklin) 34.5kV Line to interconnect to the new AF1-325 customer substation.	$1.502	AF1-325
n8160.2	Revise relay settings at Franklin 34.5 kV	$0.053	AF1-325
n8166.1	115kV line to provide for the AF1-320 interconnection at the new Merrill Creek 115kV substation.	$6.364	AF1-320
n8166.2	Modify drawings, relay settings, and nameplates for line name change at Flanders 115 kV	$0.132	AF1-320
n8166.3	Modify drawings, relay settings, and nameplates for line name change at Drakestown 115 kV	$0.132	AF1-320

Network Upgrades – JCPL

NUN	Description	Cost ($M)	Driver
n8166.4	Replace (1) 115kV wave trap, line tuner, and coax for Gilbert line exit at Morris Park 115 kV	$0.816	AF1-320
n8166.5	Relay setting changes at Pequest River 115 kV	$0.214	AF1-320
n8166.6	Review drawings, nameplates, and relay settings Gilbert 115 kV	$0.147	AF1-320
n8166.7	Merrill Creek Substation: Install new 3 breaker ring bus at Merrill Creek Substation 115 kV	$13.740	AF1-320
n8166.8	SCADA/Fiber Communication: Install fiber from Merrill Creek to backbone for communication transport. Fiber backbone location is subject to change at Merrill Creek to Fiber Backbone. Design, install, and test/commission MPLS Equipment for SCADA transport at Merrill Creek 115 KV	$1.390	AF1-320
n8166.9	SCADA/Fiber Communication: Design, install, and test/commission MPLS Equipment for SCADA transport at Merrill Creek 115 kV	$0.387	AF1-320
n8198.1	Install (3) 34.5 kV load-break air switches with SCADA control on the Cookstown – New Lisbon (W75) 34.5 kV line approximately 0.3 miles from the Fort Dix W75 Tap and 3.1 miles from the Hanover Solar Tap (at structures 116 & 117).	$0.364	AF2-254
n8198.2	Review Cookstown line relay settings as required for AF2-254 tap at New Lisbon 34.5 KV	$0.041	AF2-254
n8198.3	Review New Lisbon line relay settings as required for AF2-254 tap at Cookstown 34.5 kV	$0.041	AF2-254

Network Upgrades – JCPL

NUN	Description	Cost ($M)	Driver
n8210.1	Branchville to Holiday Lakes 34.5 kV line: The Branchville to Holiday Lakes 34.5 kV line will be tapped to accommodate the Customer Facility. This tap will take place at a location that is approximately 1.50 miles from the Holiday Lakes Substation and 10 miles from the Branchville Substation	$1.419	AF1-019
n8210.2	Branchville Substation 34.5 KV: Revise relay settings	$0.047	AF1-019

Network Upgrades – MAIT

NUN	Description	Cost ($M)	Driver
n8314.1	SCADA/Fiber Communication: Design, install, and test/commission MPLS Equipment for SCADA transport at the new AF1-086 interconnection substation	$0.213	AF1-086
n8314.2	Install fiber from AF1-086 interconnection substation to ADSS Backbone for communication transport	$1.255	AF1-086
n8314.3	Garman-Shawville 115 kV Line Loop: Loop existing Garman Shawville 115 kV Line into the new CPV Rogue's Wind interconnection substation.	$1.214	AF1-086
n8314.4	Madera 115 kV: Modify drawings and nameplates for line name change.	$0.033	AF1-086
n8314.5	Westover 115 KV: Modify drawings and nameplates for line name change.	$0.033	AF1-086
n8314.6	Glory 115 kV: Line Terminal upgrade	$0.393	AF1-086
n8314.7	Shawville 115 kV: Line Terminal upgrade	$0.567	AF1-086
n8314.8	Garman 115 kV: Line Terminal upgrade	$0.814	AF1-086

Network Upgrades – ME

NUN	Description	Cost ($M)	Driver
n5886	Install one span of Attachment Facility line from the Point of Interconnection (POI) to the tap point at or near MAIT structure #838-175 of the Lyons – Moselem 69 kV Line.	$0.210	AD2-115
n5887	Install two switches at the tap point at or near MAIT structure #838-175 of the Lyons – Moselem 69kV Line.	$0.419	AD2-115
n5888	Estimated installation of 700 MHz radio system (70% penetration of FE territory) at AD2-115 to support the SCADA switch installations. Assumed SCADA work is included in this cost.	$0.047	AD2-115
n8018	AE2-256 Substation 230 kV: Design, install, and test/commission MPLS Equipment for SCADA transport.	$0.295	AE2-256
n8019	North Lebanon Substation 230 kV: Replace CVT & Line/carrier Relaying	$0.667	AE2-256
n8020	Copperstone – North Lebanon 230 kV: Loop the 1094-1(Copperstone- North Lebanon) 230 kV line into a new substation, approximately 7.5 miles from the North Lebanon substation.	$2.333	AE2-256
n8021	North Hershey – North Temple 230 kV: Install one steel pole strain structure on the existing North Hershey-North Temple 230 kV line to avoid clearance violations to new loop structures on the 1094-1 (Copperstone-North Lebanon) 230 kV line	$1.041	AE2-256
n8072.1	Design, install, and test/commission MPLS Equipment for SCADA transport at the new AE2-345 substation	$0.260	AE2-345
n8072.2	SCADA/Fiber Communication: Install fiber from AE2-345 Interconnection to Hunterstown for relaying communication and MPLS transport.	$1.070	AE2-345

Network Upgrades – ME

NUN	Description	Cost ($M)	Driver
n8072.3	Gardners-Hunterstown 115 kV Line Loop: Loop existing L991 Gardners-Hunterstown 115 kV Line into the new 3-breaker Ring Bus approximately 4.2 miles from the Hunterstown substation.	$0.770	AE2-345
n8072.4	Gardeners 115 kV: Modify drawings, relay settings, and nameplates for line name change.	$0.104	AE2-345
n8072.5	Hunterstown 115 kV: Modify drawings, relay settings, and nameplates for line name change.	$0.104	AE2-345
n8072.6	AE2-345 OPTION TO BUILD: FirstEnergy Work at new station built by developer (Security & Network)	$1.572	AE2-345
n8118	AE2-256 Substation: Construct a new 3-breaker ring bus on the 230 kV (1094) line between Copperstone and North Lebanon. Includes Project Management, Environmental, Forestry, Real Estate and Right of Way.	$6.140	AE2-256
n8119	AE2-256 Substation: Estimated in-sub fiber run to customer built fiber run outside AE2-256 substation. Estimated SCADA work at North Lebanon substation to support relay installation and updated relay settings.	$0.052	AE2-256

Network Upgrades – ODEC

NUN	Description	Cost ($M)	Driver
n8443.1	Build a new 69kV IC substation with a 3-breaker ring bus. Two of the positions on the ring bus will be transmission line terminals for the tie-in of the Kellam - Cheriton 69 kV line (Line 6750) to the substation. The other position will be a terminal configured for AF2-055 with a disconnect switch	$5.000	AF2-055
n8443.2	Rebuild about 20 miles of Cheriton/Bayview – Kellam 69 kV. Install reverse power relay at Cheriton station to trip the generator tie if power flow is greater that 0.15 MW toward AF2-055	$20.000	AF2-055
n8443.3	Install dynamic VAR compensation at Kellam - Chriton 69 kV substation	$5.000	AF2-055
n8443.4	Communication network upgrades for Island detection at Oakhall 69 kV substation	$0.500	AF2-055

Network Upgrades – OVEC

NUN	Description	Cost ($M)	Driver
n6759.1	Perform a sag study on the Deaborn - Pierce 345 kV line	$0.125	AE2-297

Network Upgrades – PENELEC

NUN	Description	Cost ($M)	Driver
n8187.1	Farmers Valley – Ridgway 115 kV Line Loop: Construct a loop from the Farmers Valley – Ridgway 115 kV line to the new substation, approximately 14.4 miles from Farmers Valley substation.	$1.694	AE2-113
n8187.2	Ridgway Substation 115 kV: Line terminal upgrade	$0.192	AE2-113
n8187.3	Farmers Substation 115 kV: Line terminal upgrade	$0.301	AE2-113
n8187.4	Pierce Brook Substation 115 kV: Line terminal upgrade	$0.056	AE2-113
n8188.1	Brookville-Squab Hollow 138 kV Line: Loop the Brookville-Squab Hollow 138kV line into the new AE2-316 interconnection sub.	$1.576	AE2-316
n8188.2	Brookville 138 kV: Install new relays and modify relay settings.	$0.240	AE2-316
n8188.3	Armstrong 138 kV: Install anti-islanding transmitter.	$0.191	AE2-316

Network Upgrades – PENELEC

NUN	Description	Cost ($M)	Driver
n8188.4	Squab Hollow 138 kV: Install anti-islanding transmitter.	$0.209	AE2-316
n8188.5	Install fiber from AE2-316 to Backbone for communication transport at AE2-316 Direct Connect – Squab Solar	$1.112	AE2-316
n8188.6	SCADA/Fiber Communication: Design, install, and test/commission MPLS Equipment for SCADA transport at AE2-316 interconnection substation	$0.293	AE2-316
n8193.1	Install fiber from AE2-344 interconnection substation to Edinboro South for communication transport.	$0.396	AE2-344
n8193.10	Morgan Street Substation 115 kV: Line Terminal Upgrade	$0.586	AE2-344
n8193.2	Design, install, and test/commission MPLS Equipment for SCADA transport at AE2-344 interconnection substation	$0.193	AE2-344
n8193.3	Edinboro South-Morgan Street-Springboro 115kV Line Loop: Loop from the MF1/MFS (Edinboro South-Morgan Street-Springboro) 115kV line to the new AE2-344 interconnection substation.	$0.965	AE2-344
n8193.4	Edinboro South 115 kV: Line Terminal Upgrade	$0.547	AE2-344
n8193.5	Wayne Substation 115 kV: Line Terminal Upgrade	$0.033	AE2-344

Network Upgrades – PENELEC

NUN	Description	Cost ($M)	Driver
n8193.6	Geneva Substation 115 kV: Line Terminal Upgrade	$0.526	AE2-344
n8193.7	Erie West Substation 115 kV: Line Terminal Upgrade	$0.207	AE2-344
n8193.8	Erie South Substation 115 kV: Line Terminal Upgrade	$0.207	AE2-344
n8193.9	Springboro Substation 115 kV: Line Terminal Upgrade	$0.518	AE2-344
n8207.1	New SCADA switch at AF2-130 POI: Add new SCADA switch at the proposed tap point near pole #0C-37451 on the 34.5kV Tionesta Jct./Crown distribution ckt#00519-51	$0.105	AF2-130
n8207.2	AF2-130 Generation Substation: Integrate customer protection and controls to the FE transmission system.	$0.084	AF2-130
n8207.3	Crown Substation: Installing 34.5KV PT as well as SEL-351S.	$0.631	AF2-130
n8207.4	Tionesta Substation 34.5 kV: Revise relay settings	$0.114	AF2-130
n8312.1	Corry East – Four Mile 115kV Line Loop: Loop the Corry East – Four Mile Junction 115kV line into the new substation, approximately 7.7 miles from Four Mile Junction substation	$0.956	AF1-098

Network Upgrades – PENELEC

NUN	Description	Cost ($M)	Driver
n8312.2	Warren Substation 115 kV: Provide interconnection facilities for PJM AF1-098.	$0.585	AF1-098
n8312.3	Corry East Substation 115 kV: Provide interconnection facilities for PJM AF1-098. Replace carrier equipment and relaying at Corry East.	$0.893	AF1-098
n8312.4	Four Mile Substation 115 kV: Provide interconnection facilities for PJM AF1-098. Replace carrier equipment and relaying at Four Mile Junction.	$0.772	AF1-098
n8312.5	Construct a new interconnection substation with 3-115kV breakers in a ring bus configuration at Four Mile 115 kV substation	$7.903	AF1-098
n8312.6	Install fiber from AF1-098 to Four Mile Junction for communication transport at AF1-098	$4.697	AF1-098
n8312.7	Design, install, and test/commission MPLS Equipment for SCADA transport at AF1-098	$0.293	AF1-098
n8313.1	Install Tap Pole at Emlenton 34.5 kV	$0.024	AF2-166
n8313.2	Haynie 34.5 kV: Revise Relay Settings	$0.273	AF2-166
n8313.3	Emlenton 34.5 kV: Revise Relay Settings	$0.273	AF2-166

Network Upgrades – PENELEC

NUN	Description	Cost ($M)	Driver
n8327	Replace existing 23kV Bedford relaying with (1) SEL-351S and install (1) SATEC meter	$0.774	AF2-092
n8370.1	Tap Cambridge Springs-Corry Central 34.5kV line and convert approximately ¾ of a mile of 12kv to 35kv	$0.420	AF1-094
n8370.2	Update relay settings on 34.5kV Cambridge Springs line	$0.046	AF1-094
n8370.3	Installation of (1) 700 MHz radio system to support SCADA Switch at AF1-094 tap location	$0.058	AF1-094
n8449.1	Install (1) 230kV breaker and a new 230kV line terminal position to create a five-breaker ring bus at Erie East substation	$2.905	AE2-299
n8449.2	Install anti-islanding (transfer trip) equipment at Four Mile Junction Substation	$0.632	AE2-299
n8449.3	Fiber connection and associated conduit to customer substation at Erie East substation	$0.175	AE2-299
n8458	Install (1) 23kV line potential transformer and associated structure on Bedford North line Replace 23kV Bedford North line relays with (1) line relaying panel with (1) SEL351S and (1) SATEC Meter	$0.688	AG1-041

Network Upgrades – PPL

NUN	Description	Cost ($M)	Driver
n5806	Relay Modification Work to Accommodate AD1-037	$0.030	AD1-037
n6688	Attachment Facilities: Construct 69 kV Tap line, MOLBAB Switch, Poles, structure and foundations for AE1-226 interconnection	$0.836	AE1-226
n6689	Modifications to the Face Rock - Kinzer 69 kV line to tie in the AE1-226 Attachment Facilities	$0.093	AE1-226
n6690	Relay Modification Scope of Work at Face Rock substation	$0.205	AE1-226
n8022	Copperstone Substation (PPL 230 kV): Replace CVT & Line/carrier Relaying.	$0.518	AE2-256

Network Upgrades – PSEG

NUN	Description	Cost ($M)	Driver
n7267	Extend the Burlington 26 kV P-120 circuit to the Point of Interconnection (POI) and install revenue grade metering	$0.342	AG1-130

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Network Upgrades Update

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Revision History

- V1 – 9/28/2023 – Original slides posted

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