Network Upgrades Status Update

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Interconnection Analysis

Transmission Expansion Advisory Committee

October 8th, 2025

Overview

- Network Upgrades status as of August 4th, 2025:
  - $218 million net increase in total Network Upgrade cost estimates since August 19th, 2024
  - $1.004 billion in New Network Upgrades
  - $239 million decrease due to cost estimates and scope changes
  - $548 million decrease due to cancelled Network Upgrades

Network Upgrades - ACE

NUN	Description	Cost ($M)	Driver
n8535	Construct a new 69 kV three-position ring bus substation off the right-of-way for line (Laurel - Roadstown) #0799. Two of the positions will be transmission line terminals for the tie-in of line #0799 to the substation. The third position will be a terminal configured for the interconnection of the AF1-208 generator.	12.949	AF1-208
n8536	Cut and loop in #0799 transmission line (Laurel - Roadstown) to the new 69 kV three-position ring bus substation. The line from the new ring bus to Laurel will remain as #0799, while the line from the new ring bus to Roadstown will be named #06XX.	1.946	AF1-208
n8537	Update relaying at Laurel substation for the #0799 Line from Laurel to the new AF1-208 substation.	0.125	AF1-208
n8538	Update relaying at Roadstown substation for the #06XX Line from the new AF1-208 substation to Roadstown.	0.125	AF1-208
n8660.0	Add a new terminal position “F” at 138/69kV Middle Substation 69kV bus #1, including new circuit breakers, disconnect switches, supporting foundations and structures, among other physical equipment.	2.56	AF2-019

Network Upgrades - ACE

NUN	Description	Cost ($M)	Driver
n8943.0	Construct a new 69 kV substation consisting of a three-position ring bus off the right-of-way for line #0724 (Salem - Woodstown). Two of the positions on the ring bus will be transmission line terminals for the tie-in of line #0724 to the substation. The third position will be a terminal configured for the interconnection of the AG1-254 generator. Install new protective relays for the AG1-254 terminal and ACE line terminals on the new three-breaker ring bus.	11.124	AG1-254
n8944.0	Update primary relaying for line #0724 at Churchtown substation.	0.023	AG1-254
n8945.0	Update primary relaying for line #0724 at Woodstown substation.	0.023	AG1-254
n8946.0	Modify Line #0724 to loop it in and out of the new ring bus. Install two (2) steel poles and two (2) overhead spans to the new substation.	1.283	AG1-254
n9100.0	Install new 69 kV terminal position at Ontario 69 KV substation	9.132	AF2-025
n6802	ACECCShermr01: To mitigate the AE1-240 tap to Sherman 69 kV line section overload a 600 Amp disc switch must be upgraded at Sherman	0.02	AF1-208
n7655	ACEWood691to2r01: To mitigate the Woodstown 69 kV bus tie overload, breaker 'T' will be replaced with a 2000 Amp breaker .	0.19	AG1-254

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n1246	Expansion to Bluff Point station to include four 138kV breakers in a ring bus configuration, relaying, SCADA, and associated equipment.	4.31	S71
n1246.1	Line work to reroute the College Corner - Jay 138 kV line into the Bluff Point station. One span of 138kV conductor out terminating on interconnection customer's first pole outside of AEP's Bluff Point station. continued in notes..	0.44	S71
n1246.2	138kV primary and back-up metering to be installed in the expanded Bluff Point yard and transformer relaying replacement at the Bluff Point station.	0.37	S71
n1571	T94 Cook-Palesades - Construct new 345kV Switching Station connecting to the Cooks - Palisades circuits, including 5-345kV CB, Relays, metering, SCADA and associated equipment	2	T94
n1572	Cook - Upgrade line relaying with AEP standard relay package of 345kV station on Cook-Palisades circuit	0.1	T94
n3711	New substation consisting of 3 circuit breakers, SCADA, revenue metering and associated equipment.	8.8	X2-052
n3711.1	Revenue metering and associated equipment.	0.35	X2-052

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n3712	Loop the Dumont-Olive circuit into and out of the X2-052 interconnection station.	0.32	X2-052
n3713	Replace relays at Olive on the Dumont line.	1.5	X2-052
n3960	Construct new 345kV (Stemple) station switchyard	13.15	Y2-050
n3961	Install 345kV revenue metering at new Y2-050 switchyard	2.29	Y2-050
n3962	Remote end work at Canton Central Station	0.06	Y2-050
n3963	Remote end relay work at Tidd Station	0.06	Y2-050
n3985	Replace 3 Marysville 765 kV wavetraps on the Sorenson-Marysville 765 kV line	0.9	AG1-302
n4076	Upgrade relaying at Fostoria Central 345kV substation. Also replace existing Fostoria Central - Bay Shore 345kV metering on 345kV Bayshore circuit to FirstEnergy.	0.18	Y1-069
n4106	Replace Two (2) Switches at the Clifty Creek 345 kV Station	0.4129	AF1-215

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n4106.1	Replace 4 Clifty switches on the Jefferson - Clifty 345 kV line	0.83	AE2-045
n4106.4	Reconductor 0.75 miles of the Jefferson - Clifty 345 kV line	2.5	AE2-045
n4106.6	Replace Jefferson Breaker (5000A)	1.2	AF1-207
n4211	Construct and cut in 0.75 miles of new 345kV transmission line	2.6638	Y2-050
n5304	Replace the George Washington wavetrap (2000A) on the Kammer - George Washington 138 kV line	0.21	AB2-093
n5352	To accommodate the interconnection on the Kammer – Vassell 765 kV circuit a new three (3) circuit breaker 765 kV switching station physically configured in a breaker and half bus arrangement but operated as a ring-bus will be constructed 40 miles east of the Kammer 765 kV substation	39.85	AB2-067
n5474	AC1-173 Fiber system modifications at Haviland and East Lima	0.01	AC1-173
n5648	Relay Settings - convert 2-terminal gen lead to 3-terminal gen lead at AC1-173 substation	0.06	AC1-173

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n5808	Install two (2) new 345 kV circuit breakers, Relocate the Bunsonville 345 kV line connection, Relocate and replace the Bunsonville 345 kV metering at the Eugene 345 kV Station	3.42	AD1-100
n5968	Install one 138 kV Circuit Breaker at the Jay 138 kV Substation and associated equipment, including upgrades to line protection and controls.	2.29	AC2-176
n6263.3	Reconductor 5.5 miles of ACSR ~ 336.4 ~ 30/7 ~ ORIOLE Harrison - Zuber 138 kV line conductor with 795 ACSR or equivalent	8.25	AF2-371
n6263.4	Replace 800 Amp wavetrap at Harrison on the Harrison - Zuber 138 kV line	0.1	AF2-371
n6497.4	Replace 3, 3000A wave traps at Rockport and 3, 3000A wave traps at Jefferson on the Rockport - Jefferson 765 kV line	0.43	AF1-322
n6497.5	Replace 12 3000A switches at Rockport	6	AF1-322
n6525.1	Replace 1200 A Switch at Fremont	0.2	AF1-206
n6776	Sag Study will be required on 37.9 miles of line between Bixby and Kirk	0.1516	AF1-283

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n7017	Perform a sag study on the 7.8 mile section of ACSR 477 26/7 HAWK on the Mottv - E Elkhart 138 kV line	0.0312	AF2-389
n7018	Perform a sag study on the 8.5 mile section of ACSR 477 26/7 HAWK on the Corey - Mottv 138 kV line	0.034	AF2-389
n7092	Perform a sag study on the Fall Creek - Madison 138 kV line	0.03	AF2-408
n7151.1	Perform a sag study on the the 5 miles of ACSR 397.5 30/7 LARK Conductor on the Techdr - M Funk 138 kV line	0.02	AF2-106
n7151.2	Perform a sag study on the the 14.5 miles of ACSR 556.5 26/7 DOVE Conductor on the Techdr - M Funk 138 kV line	0.058	AF2-106
n7152	Perform a sag study on the Edgemo - Vicker 138 kV line	0.0188	AF2-106
n7153	Rebuild 0.13 miles of 300 CU on the AF2-106 Tap - Glen Lyn 138 kV line	0.01	AF2-106
n7154	Perform a sag study on the Schiris - Techdr 138 kV line	0.02	AF2-106
n7155	Perform a sag study on the AD2-179 Tap - AF2-105 Tap 138 kV line	0.0071	AF2-106
n7155.1	Rebuild/reconductor 1.78 mi. 300 CU Overhead Conductor	2.67	AF2-106

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n7467.1	Replace three Marysville 765kV Wavetraps (3000A)	1.5	AG1-302
n7470	Expand Gunn Road 345 kV Station, including the addition of one (1) 345 kV circuit breaker, installation of associated protection and control equipment, 345 kV line risers, switches, jumpers, and supervisory control and data acquisition (SCADA) equipment.	1.332	AE2-306
n7618	Replace two Meadowlake CBs (3000A)	2	AG1-237
n7679	Replace 1272 AAC Jumper at Allen station	0.1	AG1-368
n7725	Upgrade Description: A Sag Study will be required on the 0.33 miles of ACSR 795 45/7 TERN- Conductor to mitigate the overload. Depending on the sag study results, the cost for this upgrade is expected to be between $20,000 (no remediations required, just sag study) and 0.5 million (complete line reconductor/rebuild.	0.02	AG1-369
n7754.1	Replace 5 Sub conductor 2000 AAC 91 Str at Danville2 138kV station	0	AD1-152
n7754.2	Replace 3 Sub conductor 2000 AAC 91 Str at East Danville 138kV station	0	AD1-152
n8071.1	Construct a new 69 kV ring bus station, initially populated with three (3) circuit breakers, expandable to four (4) breakers	7.290	AF2-083

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8071.2	Installation of two (2) new steel, 85' single circuit, single pole dead-end structures on concrete piers with anchor bolt cages and two (2) spans of ACSR 1033.5 (Curlew) transmission line conductor with 7#8 Alumoweld shield wire at Kenzie Creek - Stone Lake 69 kV	1.200	AF2-083
n8071.3	Install two (2) new fiber optic cable paths at Kenzie Creek - Stone Lake 69 kV	0.239	AF2-083
n8071.4	Replace all 447 all aluminum conductors and ii. Replace the bus differential panel at Stone Lake 69 kV	0.731	AF2-083
n8071.5	Rebuild 0.6 miles of the Pokagon – Colby 69 kV Circuit	2.191	AF2-083
n8199.1	Expand the station yard, fence and ground grid, Install One (1) New 138 kV Circuit Breaker, One (1) New Line Termination at the Centerburg 138 kV Station	0.955	AD2-067
n8199.2	Re-terminate the Centerburg - Trent 138 kV circuit to a different bay position at the Centerburg 138 kV station.	0.381	AD2-067
n8393	String 3.19 miles of 336.4 ACSR or equivalent conductor on the open side of the existing double circuit structures (6-wire) at 05BEATTY 138.0 kV - 05ZUBER 138.0 kV. Note, further engineering study will need to be performed to confirm this reinforcement can be performed on the existing lattice structures built in the 1950s.	6.000	AG1-351

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8431	Install CCVTs on the Alloy 138 kV line exit at Kanawha River Station. Replace P&C relays.	0.377	AE2-160
n8434.1	Reconfigure the Haviland - West Van Wert 69 kV Circuit	0.196	AE1-245
n8437	Install 138 kV Metering at Alloy 34.5 kV Station	0.619	AE2-160
n8503.1	Construct the proposed AE2-048 345 kV breaker and a half station, to be operated as a three (3) circuit breaker ring bus, initially expandable to six (6) circuit breakers	14.262	AE2-048
n8503.2	Install two (2) new fiber optic cable paths consisting of 0.5 miles of 144 count ADLT cable installed in new underground right of way (“ROW”) and associated terminating equipment and devices (transceivers, multiplexors, routers) at Muskingum River – West Millersport 345 kV	0.175	AE2-048
n8503.3	New AE2-048 Switching station Tie-in at Muskingum River – West Millersport 345 kV	1.823	AE2-048
n8503.5	Replace one (1) wavetrap and line tuner with two (2) new 1-phase wavetraps and line tuners; and Review and revise (as needed) the protective relay settings at Muskingum River 345 kV	0.173	AE2-048
n8503.6	Replace one (1) wavetrap and line tuner with two (2) new 1-phase wavetraps and line tuners; and Review and revise (as needed) the protective relay settings at West Millersport 345 kV	0.173	AE2-048

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8510	Review and revise the protective relay settings at the proposed AE2-048 345 kV Station to account for the additional generation of AE2-136	0.058	AE2-136
n8513.1	Construct the proposed 69 kV breaker and a half station, to be operated as a three (3) circuit breaker ring bus, initially expandable to six (6) circuit breakers at East Hartford - Murch 69 kV	6.409	AF1-084
n8513.2	Install two (2) new steel, 80' single circuit, single pole dead-end structures on concrete piers with anchor bolt cages and two (2) spans of aluminum conductor steel-reinforced cable (“ACSR”) 795 (Drake) transmission line conductor with 7#10 Alumoweld shield wire at East Hartford - Murch 69 kV	1.179	AF1-084
n8513.3	Review and revise the protective relay settings at the Hartford 69 kV Station	0.096	AF1-084
n8513.4	Review and revise the protective relay settings at the Almena 69 kV Station	0.096	AF1-084
n8513.5	Install two (2) new fiber optic cable paths consisting of 0.2 miles of 48 count ADLT cable installed in new underground right of way (“ROW”) and associated terminating equipment and devices (transceivers, multiplexors, routers) at Proposed AF1-084 69 kV, Hartford 69 kV, and Almena 69 kV stations new right of way	0.236	AF1-084
n8527.1	Upgrade the existing Berry Hill 138 kV Station	1.399	AF1-049
n8527.2	Review and update the line relay settings Axton 138 kV Station	0.077	AF1-049

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8527.2	Review and update the line relay settings Axton 138 kV Station	0.077	AF1-049
n8527.3	Review and update the line relay settings	0.077	AF1-049
n8528.1	Construct a new 138 kV breaker and a half station, to be operated as a three (3) circuit breaker ring bus, initially expandable to six (6) circuit breakers at Varner - Sowers 138 kV	9.179	AF1-091
n8528.2	Transmission Line Tie-in at Varner - Sowers 138 kV	1.561	AF1-091
n8528.3	Review and revise the protective relay settings at Varner138 kV	0.088	AF1-091
n8528.4	Review and revise the protective relay settings at Sowers 138 kV	0.088	AF1-091
n8528.5	Final tie in foe fiber installation in new ROW at Varner - AF1-091 station - Sowers 138 kV	0.316	AF1-091
n8530	Review and revise the protective relay settings at Cole 345 kV	0.058	AF1-275
n8531.1	Install two (2) new steel, 80' single circuit, single pole dead-end structures on concrete piers with anchor bolt cages and two (2) spans of aluminum conductor steel-reinforced cable (“ACSR”) 795 (Drake) transmission line conductor with 7#10 Alumoweld shield wire at Van Buren 69 kV	0.809	AE2-234

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8531.2	Review and revise the protective relay settings at the Van Buren 69 kV Station	0.089	AE2-234
n8531.3	Replace the protective relays at the Liberty Center 69 kV Station, updating to accommodate the dual current differential scheme	0.238	AE2-234
n8546	Review and Revise the protective relay settings at Jacksons Ferry 138 kV Station	0.058	AE2-326
n8551	Review and revise the protective relay settings at Jay 138 kV to account for the additional AG1-071 generation	0.061	AG1-017
n8557	Construct a new 345 kV breaker and a half switching station at Olive - Reynolds 345 kV, to be operated as a three (3) circuit breaker ring bus, initially expandable to six (6) circuit breakers at	16.429	AE2-045
n8558	Replace the protective relays and circuit breaker control and install a new ethernet switch at Olive 345 kV	0.854	AE2-045
n8559	Tie in the new AE2-045 345 kV switching station at Olive - Reynolds 345 kV	2.398	AE2-045
n8587.0	Construct a new 69 kV ring bus station; initially populated with two (2) circuit breakers, expandable to four (4) circuit breakers.	7.484	AF2-382

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8588.0	Connect the proposed 69 kV station to the existing Hurley - Looney Creek 69 kV	2.978	AF2-382
n8589.0	Remote End Work at Looney Creek 69 kV Station	1.853	AF2-382
n8621.0	Upgrade the existing Meadow Lane 345 kV Station	2.231	AF1-322
n8633.0	Upgrade the existing Inez 138 kV Station	1.757	AF2-018
n8644.0	Expand Maddox Creek 345 kV Station for the interconnection of AF2-014	1.533	AF2-014
n8645.0	Update Protection and Control Settings at East Lima 345 kV	0.072	AF2-014
n8646.0	Update Protection and Control Settings at RP Mone 345 kV	0.072	AF2-014
n8681.0	Desoto 138 kV - remote protection including 1 wavetrap at the Desoto 138 kV station, upgrade of current remote end protection to a dual fiber-based ICON MUX relaying scheme, 2 small form factor pluggable transceivers	0.421	AF1-268
n8682.0	Jay 138 kV - protection relays Review and revise (as needed) the protective relay settings at the Jay 138 kV Station. Reconfigure the ICON with one (1) new SFP transceiver at the Jay 138 kV station for communication towards the proposed AF1-268 138 kV Station.	0.128	AF1-268

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8683.0	Perch 138 kV - Reconfigure the CES with one (1) new SFP transceiver at the Perch 138 kV Station.	0.060	AF1-268
n8685.0	Review and update relay settings at Proposed AF1-202 345 kV Switching Station	0.071	AF1-119
n8686.0	Reconfigure existing ethernet switch at Hartford City 69 kV Station	0.059	AF1-119
n8687.0	Reconfigure existing ethernet switch at Hartford City 69 kV Station	0.059	AF1-119
n8688.0	Final tie in of Fiber installation at AF1-119 345 kV Switching Station	0.466	AF1-119
n8689.0	Review and review relay settings at Proposed AF1-119 345 kV Switching Station	0.061	AF2-162
n8690.0	AF1-119 Switching Station Tie-in to Keystone - Desoto 345 kV	1.866	AF1-119
n8703.0	Tie the proposed 138 kV Switching Station into the existing Desoto - Jay Circuit. Install two (2) new steel, 85' single circuit, single pole dead-end structures and two (2) spans of aluminum conductor steel-reinforced (ACSR) 795 Drake (26/7) transmission line conductor with 7#8 Alumoweld shield wire in the existing Desoto - Jay 138 kV right of way (ROW), cutting in the proposed 138 kV Switching Station in an in-and-out arrangement.	1.179	AF1-268

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8704.0	Final tie in for fober installation from AF1-268 - Desoto 138	0.325	AF1-268
n8705.0	Expand the existing Sharp Road 69 kV Station Control House, replace the existing underhung-mounted capacitor disconnect switch, install associated structures, jumpers, bus work, insulators, grounding, cables, telecommunications, SCADA, fiber-optic relaying connectivity & equipment, and foundations.	0.420	AF2-149
n8706.0	Replace the existing Sharp Road 69 kV Station fence with 190 feet of new fencing and a new 24-foot gate.	0.392	AF2-149
n8707.0	Relocate and replace Structure #1 in the Commerce - Sharp Road 69 kV Circuit.	0.561	AF2-149
n8722.0	Installation of one (1) new 3000A 138 kV circuit breaker, Installation of two (2) new 3000A disconnect switches, review and revise (as necessary) of the protective relay settings for the remainder of the Fall Creek 138 kV Station, replace associated conductors, telecom terminal equipment, insulators, arresters, foundations, and structures.	0.666	AF2-408
n8748.0	Review and revise (as necessary) the protective relay settings at the Keystone - Desoto 345 kV Station to account for the additional generation	0.061	AF1-223

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8760.0	Hartford City 345 kV: New 345 kV (3) breaker ring bus Switching Station with control relaying, (1) drop in control module, (9) motorized disconnect switches, (1) Three phase couling capacitor voltage transformers (CCVT), (3) Single phase couling capacitor voltage transformers (CCVT), (2) single phase station service voltage transformers, (2) A-frame line exit structures, (4) single phase line trap for line exit, r, (2) Dual Directional Comparison Blocking for each line exit, associated conductors, telecom terminal equipment, insulators, arresters, foundations and structures	18.224	AF1-202
n8761.0	Hartford City 345 kV: Transmission line tie-in: remove (2) existing structure and install (2) new dead-end structure on concrete pier and anchor bolts, (2) additional steel single pole dead-end structure on concrete piers with anchor bolts, (4) spans of double bundle T-line conductor in an in-and-out arrangement	10.484	AF1-202
n8762.0	Keystone upgrade 345: replace/upgrade protective relay to match the new 345kV Switching Station, install (1) new line trap	0.385	AF1-202
n8763.0	Desoto Upgrade 345kV: Review and revise protective relay to match the new 345kV Switching Station, install (1) new line trap	0.125	AF1-202
n8764.0	Hartford CES Upgrade: Reconfigure the CES with one (1) new SFP transceiver at the Hartford City Station	0.030	AF1-202
n8765.0	Jay CES Upgrade: reconfigure the CES with one (1) new Small Form-Factor Pluggable (SFP) transceiver at the Jay Station	0.030	AF1-202

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8766.0	Hartford City 345 kV: Install (2) 0.1 mile of All Dielectric Loose Tube (ADLT) station exit transitions and (2) new fiber-optic cable paths consisting of 3.2 miles of 48 count All Dielectric Self Supporting (ADSS)	0.767	AF1-202
n8775.0	Expand existing substation Independence 69 kV / Point Lookout 69 kV: install one (1) new 16 ft. x 12 ft. DICM (drop-in control module) non-mirrored control house expansion, review and revise (as necessary) the protective relay settings for the remainder of the Point Lookout 69 kV Station	0.395	AG1-508
n8776.0	Upgrade Fries 69kV substation: review and revise (as necessary) the protective relay settings at the Fries 69 kV Remote End Station	0.061	AG1-508
n8777.0	Upgrade Jubal Early 69kV substation: review and revise (as necessary) the protective relay settings at the Fries 69 kV Remote End Station	0.061	AG1-508
n8783.0	Ebersole - Fostoria Central 138 kV: Construct a new 138 kV ring bus station, initially populated with three (3) circuit breakers, expandable to four (4) breakers.	9.959	AF2-375
n8784.0	Ebersole - Fostoria Central 138 kV: New AF2-375 138 kV switching station Tie-in	1.120	AF2-375
n8785.0	Review and revise protective relay settings at Ebersonle 138 kV	0.453	AF2-375
n8786.0	Review and revise protective relay settings at Fostoria Central 138 kV	0.453	AF2-375

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8787.0	Ebersole - Fostoria Central 138 kV: Iinstall two (2) new fiber optic cable paths consisting of 0.2 miles of 144 count ADLT cable	0.241	AF2-375
n8788.0	Bonnyman 69kV: Installation of one (1) 16’ x 12’ drop-in control module, Relocation of the circuit breaker “D” bus side disconnect switch.	0.378	AG1-066
n8800.0	New 345 kV 3 breaker ring bus Switching Station with control relaying, 1 drop-In control codule, 9 motorized disconnect switches, 6 single phase coupling capacitor voltage transformers, 3 each on the line exits to the proposed AE2-045 and Reynolds 345 kV Stations, 1 line discharging ground switch, 2 single phase line traps for the line exit to the proposed AE2-045 345 kV Station, 2 single phase station service voltage transformers , 2 A-Frame line exit structures, 1 each for line exits to the proposed AE2-045 and Reynolds 345 kV Stations, a dual Directional Comparison Blocking line protection relaying scheme for the line to the proposed AE2-045 345 kV Station, a direct fiber based dual current differential line protection relaying scheme for the line to the Reynolds (NIPSCO) 345 kV Station, associated conductors (buswork, ground grid, jumpers), telecom terminal equipment, insulators, arresters, foundations, and structures.	14.367	AF1-207

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8801.0	AF1-207 Interconnection Substation Tie-In with removal of 1 steel lattice structure along the Olive – Reynolds 345 kV Circuit, installation of 2 new steel, single circuit, single pole dead end structures on concrete piers with anchor bolt cages along the existing Olive - Reynolds #1 (NIPSCO) 345 kV Circuit, installation of 1 new steel, single circuit, single pole, running angle structure on a concrete pier with an anchor bolt cage along the existing Olive – Reynolds (NIPSCO) 345 kV Circuit, raising of the Olive – Reynolds #2 Circuit for the Olive – Reynolds #1 Circuit to pass underneath, installation 2 single pole, single circuit, steel dead end structures on concrete piers with anchor bolt cages along the perimeter of the proposed 345 kV switching station, 4 spans of double bundle ACSR 954 (Cardinal) transmission line conductor with Guinea shield wire, cutting in the proposed 345 kV switching station in an in-and-out arrangement.	3.537	AF1-207
n8802.0	Remote Settings at Olive 345 kV, review and revise (as needed) the protective relay settings at the Olive 345 kV Station.	0.071	AF1-207
n8803.0	Upgrade at Meadow Lake 345 kV reconfigure the Carrier Ethernet Switch with 1 new Small Form-factor transceiver at the Meadow Lake 345 kV station.	0.059	AF1-207
n8804.0	Upgrade at Greentown 345 kV reconfigure the CES with 1 new SFP transceiver at the Greentown 345 kV station.	0.059	AF1-207

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8805.0	Fiber Installation in New ROW - Install 2 new fiber-optic All Dielectric Loose Tube station exit transitions and 2 new fiber-optic cable paths consisting of 2.6 miles of 144 count ADLT cable installed in new underground ROW to existing splices on the Reynolds – Meadow Lake fiber cable. This installation is required to accommodate fiber-based relaying between the proposed AF1-207 and Reynolds 345 kV Stations, supervisory control and data acquisition connectivity, and carrier ethernet switch connectivity.	0.757	AF1-207
n8806.0	Final Tie in for Fiber installation in New ROW at Monticello 345 kV	0.320	AF1-207
n8817.0	Substation Expansion at Kanawha River 138 kV	0.541	AE2-160
n8818.0	Install new revenue metering on a new structure inside Alloy 34.5 kV Station	0.887	AE2-160
n8829.0	Jay 138 kV: Review and revise the protective relay settings to account for the additional generation of AG1-047.	0.061	AG1-047

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8833.0	Dodson Township: New 345 kV (3) breaker ring bus Switching Station with control relaying, (1) drop in control module (DICM), (6) disconnect switch, (1) additional breaker string disconnect switch, (3) motor operated disconnect switch, (2) Single phase Station Service Voltage Transformers (SSVT), (6) Single phase couling capacitor voltage transformers (CCVT), (2) H-frame line exit structures, (1) single phase line trap for line exit, (1) Dual Directional Comparison Blocking (DCB) for each line exit, (1) station battery & charger, (1) Integrated Communications Optical Network Multiplexor (ICON MUX), associated conductors, telecom terminal equipment, insulators, arresters, foundations and structures	8.322	AF2-440
n8834.0	Dodson Township: Transmission line tie-in: remove (1) existing structure and install (2) new dead-end structure on concrete pier and anchor bolts, (2) new H-frame structure on concrete piers with Anchor bolts, (2) new single-pole dead-end structure on concrete piers with anchor bolts (4) spans T-line conductor in an in-and-out arrangement, (2) shield wire	1.749	AF2-440
n8835.0	Hillsboro upgrade 138: replace/upgrade protective relay with ICON MUX diff relay, Reconfigure existing ICON, remove existing line trap & tuner line to Hutchings 138kV, replace existing 1-phase CCVT with 3-phase CCVT	0.443	AF2-440
n8836.0	Hutchings 138kV: Review and revise protective relay settings	0.604	AF2-440

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8837.0	AC2-061 138kV: reconfigure the ICON at the AC2-061 138 kV station for fiber-optic communication connectivity with the proposed AF2-440 138 kV interconnection station	0.023	AF2-440
n8838.0	Dodson Township: Install 0.3 mile of All Dielectric Loose Tube (ADLT) for two (2) new extensions from the proposed IMTCo 138 kV station to the new 85-foot transmission line extension dead ends and transition the extensions into two (2) new OPGW splices.	0.300	AF2-440
n8839.0	New 138kV substation: Review and revise protective relay settings to account for the additional generations	0.061	AG1-107
n8846.0	IMTCo will review and revise (as necessary) the protective relay settings at the proposed AF1-207 345 kV Station to account for the additional generation.	0.061	AF2-078
n8854.0	IMTCo will review and revise (as necessary) the protective relay settings at the Allen 345 kV Station to account for the additional generation.	0.061	AG1-365
n8855.0	IMTCo will review and revise (as necessary) the protective relay settings at the Allen 345 kV Station to account for the additional generation.	0.061	AG1-366

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8885.0	Installation of one (1) new 3000A 138 kV circuit breaker with associated control relaying, creating a new line exit position on the western face of the 138 kV box bay. Installation of two (2) new 138 kV breaker disconnect switches. Installation of three (3) single phase capacitor coupled voltage transformers (CCVT) for the new line exit to the Allen 138 kV Station. Associated conductors, insulators, arrestors, foundations, and structures Review and revision (as necessary) of the protective relay settings for the remainder of the Magley 138 kV Station.	0.901	AG1-232
n8886.0	The Magley – Allen 138 kV Circuit will be reterminated into the western face of the 138 kV box bay at the Magley 138 kV Station. The circuit will then be rerouted to the north, creating sufficient clearance for the installation of the new line exit to the AG1-232 generation facilities. Required facilities will include but are not limited to: Installation of two (2) single pole, single circuit, steel running angle structures on concrete piers with anchor bolt cages. Installation of one (1) single pole, single circuit, steel dead end structure on a concrete pier with an anchor bolt cage. Installation of three (3) spans of aluminum conductor steel reinforced (ACSR) 795 (Drake) transmission line conductor with 7#8 Alumoweld shield wire. Removal of one (1) existing steel pole structure in the Magley – Allen 138 kV Circuit Right of Way.	0.898	AG1-232

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8892.0	Three (3) 63 kA circuit breakers with associated control relaying. One (1) 16' x 48' Drop-In Control Module (DICM). Nine (9) motorized disconnect switches. Six (6) single phase coupling capacitor voltage transformers (CCVT), three (3) each on the line exits to the proposed AF1-215 and AF2-133 345 kV Stations. Two (2) single phase station service voltage transformers (SSVT). Two (2) A-Frame line exit structures, one (1) each on the line exits to the proposed AF1-215 and AF2-133 345 kV Stations. Two (2) single phase line traps on the line exit to the proposed AF1-215 345 kV Station. A fiber-based Integrated Communications Optical Network Multiplexor (ICON MUX) dual current differential line protection relay scheme for the line to the proposed AF2-133 345 kV Station. A Dual Directional Comparison Blocking (DCB) with Direct Transfer Trip (DTT) line protection relay scheme for the line to the proposed AF1-215 345 kV Station. Associated conductors (buswork, ground grid, jumpers), telecom terminal equipment, insulators, arresters, foundations, and structures.	13.920	AG1-349

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8893.0	Install two (2) All Dielectric Loose Tube (ADLT) fiber-optic cable station exit transitions Two (2) new fiber-optic cable paths consisting of 14.4 miles of 144 count ADLT cable installed in new underground ROW. This installation is required to accommodate fiber-based relaying between the New 345 kV Switching Station and proposed AF2-133 345 kV Stations, supervisory control and data acquisition (SCADA) connectivity, and carrier ethernet switch (CES) connectivity.	4.195	AG1-349
n8894.0	Winamac: Removal of three (3) existing steel lattice structures (structures 205, 206, and 207). Installation of two (2) new steel, single circuit, single pole dead end structures on concrete piers with anchor bolt cages. Installation of two (2) steel, single circuit, single pole, running angle structures on concrete piers with anchor bolt cages. Installation of three (3) steel, single circuit, single pole, tangent structures on concrete piers with anchor bolt cages. Installation of four (4) spans of double bundle ACSR 954 (Cardinal) transmission line conductor with 7#8 Alumoweld shield wire.	6.204	AG1-349

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8895.0	Replacement of the protective relays to accommodate a fiber-based ICON MUX dual current differential line protection scheme at the proposed AF2-133 345 kV Station.	0.335	AG1-349
n8896.0	Review and revision of the protective relay settings at the proposed AF1-215 345 kV Station.	0.071	AG1-349
n8897.0	Reconfigure the Carrier Ethernet Switch (CES) with a new Small Form-factor Pluggable (SFP) transceiver at the proposed AF2-205 345 kV Station.	0.055	AG1-349
n8898.0	Winamac 345 kV: Final Tie in for Fiber installation in New ROW	0.320	AG1-349
n8899.0	Beaver 345 kV: New 345 kV (3) breaker ring bus Switching Station with control relaying, (1) drop in control module (DICM), (9) motor operated disconnect switch, (2) Single phase Station Service Voltage Transformers (SSVT), (6) Single phase couling capacitor voltage transformers (CCVT), (2) A-frame line exit structures, (4) single phase line trap for line exit, (2) Dual Directional Comparison Blocking (DCB), associated conductors, telecom terminal equipment, insulators, arresters, foundations and structures	13.970	AF2-205

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8900.0	Transmission 345kV Tie-in: Installation of two (2) new 150’ steel, single circuit, single pole dead end structures on concrete piers with anchor bolt cages in the existing Olive - Reynolds #2 345 kV Circuit Right of Way. Installation of one (1) 170’ steel, single circuit, single pole, running angle structure on a concrete pier with an anchor bolt cage to support the Olive – Reynolds #1 345 kV Circuit, maintaining clearances with the Olive – Reynolds #2 345 kV Circuit. Installation of two (2) spans of double bundle ACSR 954 (Cardinal) transmission line conductor with Guinea 159 ACSR 12/7 shield wire, cutting in the New 345 kV Switching Station in an in-and-out arrangement	1.866	AF2-205
n8901.0	AF2-215 345kV: Review and revise protective relay settings	0.071	AF2-205
n8902.0	AF2-133 345kV: Review and revise protective relay settings	0.394	AF2-205
n8903.0	Stand-Alone Fiber installation in New Right-Of-Way if AF2-133 project executed: Replacement of the DCB line protection relay scheme for the line to the New AF1-215 345 kV Switching Station with a dual fiber-based Integrated Communications Optical Network Multiplexor (ICON MUX) current differential relaying scheme for the line to the proposed AF2-133 345 kV Station. Removal of two (2) line traps on the line exit to the New AF1-215 345 kV Switching Station at the New AF2-205 345 kV Switching Station.	2.738	AF2-205

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8904.0	Fiber Tie-in: install two (2) new All Dielectric Loose Tube (ADLT) fiber-optic cable station exit transitions and 9.4 miles of 96 count ADLT cable installed in new underground ROW. This installation is required to accommodate fiber-based relaying between the proposed New AF2-133 and AF2-205 345 kV Switching Stations, supervisory control and data acquisition (SCADA) connectivity, and carrier ethernet switch (CES) connectivity.	0.320	AF2-205
n8905.0	Three (3) 63 kA circuit breakers with associated control relaying. One (1) 16' x 48' Drop-In Control Module (DICM). Nine (9) motorized disconnect switches. Six (6) single phase coupling capacitor voltage transformers (CCVT), three (3) each on the lines to the Eugene and Dequine 345 kV Stations. Two (2) single phase station service voltage transformers (SSVT). Two (2) A-Frame line exit structures, one (1) each on the line exits to the Eugene and Dequine 345 kV Stations. Associated conductors (buswork, ground grid, jumpers), telecom terminal equipment, insulators, arresters, foundations, and structures. A fiber-based Integrated Communications Optical Network Multiplexor (ICON MUX) dual current differential line protection relay scheme for the line to the Dequine Station. A fiber-based Integrated Communications Optical Network Multiplexor (ICON MUX) dual current differential line protection relay scheme for the line to the Eugene Station. The civil work required to develop a site that accommodates the installation of the above station includes grading of a 580' x 370' pad with an assumed fall across the pad of 18' and a minimum of 200' x 24' of access road.	16.464	AG1-237

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8906.0	Removal of one (1) double circuit lattice tower along the existing Dequine – Eugene 345 kV Circuit. Installation of two (2) 120’ new steel, single circuit, single pole dead end structures on concrete piers with anchor bolt cages along the existing Dequine - Eugene 345 kV Circuit. Installation of one (1) 120’ steel, single circuit, single pole, running angle structure on a concrete pier with an anchor bolt cage to support the Dequine – Sullivan 345 kV Circuit, maintaining clearances to the Dequine – Eugene 345 kV Circuit. Installation of two (2) spans of double bundle ACSR 954 (Cardinal) transmission line conductor with ACSR GUINEA shield wire, cutting in the proposed 345 kV station in an in-and-out arrangement.	1.866	AG1-237
n8907.0	IMTCo will review and revise (as needed) the protective relay settings at the Dequine 345 kV Station. IMTCo will reconfigure the existing carrier ethernet switch (CES) and dual ICON MUX, installing three (3) new transceivers at the Dequine Station. IMTCo will upgrade the existing relays at the Dequine 345 kV Station by installing a new dual fiber-based ICON MUX current differential protection scheme.	0.496	AG1-237

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8908.0	IMTCo will review and revise (as needed) the protective relay settings at the Eugene 345 kV Station. IMTCo will upgrade the existing relays at the Eugene 345 kV Station by installing a new dual fiber-based ICON MUX current differential protection scheme. IMTCo will reconfigure the existing carrier ethernet switch (CES) and dual ICON MUX, installing three (3) new transceivers at the Eugene Station.	0.493	AG1-237
n8909.0	IMTCo will install two (2) new fiber-optic cable station exit transitions to new splices on the existing Eugene – Dequine 345 kV OPGW. This installation is required to accommodate ICON MUX relaying between the proposed AG1-237, Eugene, and Dequine 345 kV Stations, supervisory control and data acquisition (SCADA) connectivity, and carrier ethernet switch (CES) connectivity.	0.301	AG1-237
n8918.0	New 765 Switching Station on Maryville - Flatlick 765 kV, initially populated with four (4) circuit breakers, expandable to five (5) circuit breakers	78.390	AG1-125
n8919.0	Install two (2) new fiber optic cable paths consisting of 0.2 miles of 144 count ADLT cable at the new AG1-125 switching station	0.690	AG1-125
n8920.0	Maryville – Flatlick 765 kV: New 765 kV switching station tie – in	8.410	AG1-125
n8921.0	Review and revise protective relays settings at Maryville 765 kV Substation	1.660	AG1-125
n8922.0	Review and revise protective relays settings at Flatlick 765 kV Substation	1.090	AG1-125

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8923.0	Review and revise (as necessary) the protective relays settings at the new AG1-125 765 kV Switching Station to account for the additional generation	0.061	AG1-126
n8947.0	New AE2-234 Switching Station: Install two (2) new fiber optic cable paths consisting of 0.5 miles of 48 count ADLT cable installed in new underground ROW and associated terminating equipment and devices (transceivers, multiplexors, routers)	0.403	AE2-234
n8956.0	New AF2-359 345 kV switching station Tie-in	2.124	AF2-359
n8957.0	Review and revise protective relay settings at Olive 345 kV	0.071	AF2-359
n8977.0	(Oversight)Stand-Alone Network: Franklin 345 kV, new 345 kV (3) breaker ring bus Switching Station with control relaying, (1) drop in control module (DICM), (9) motor operated disconnect switch, (1) phase to ground switch, (2) Single phase Station Service Voltage Transformers (SSVT), (6) Single phase couling capacitor voltage transformers (CCVT), (2) A-frame line exit structures, (4) single phase line trap for line exits, (2) Dual Directional Comparison Blocking (DCB),(2) A-frame line exit structure, associated conductors, telecom terminal equipment, insulators, arresters, foundations and structures	0.415	AF2-132

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8978.0	Franklin 345 kV: Transmission 345kV Tie-in: Two (2) new 130’ custom steel, single circuit, three-pole dead end structures on concrete piers with anchor bolt cages, One (1) new 140’ custom steel, single circuit, single-pole dead end structure on a concrete pier with an anchor bolt cage, Two (2) spans of aluminum conductor steel reinforced (ACSR) 2156 (Bluebird) transmission line conductor with ACSR 159 (Guinea) shield wire.	2.738	AF2-132
n8979.0	Olive 345kV: Review and revise protective relay settings	0.071	AF2-132
n8980.0	AE2-045 345kV: Review and revise protective relay settings	0.071	AF2-132
n8986.0	Expansion of the Clifford 138 kV Station ground grid (including yard and fence)	1.583	AF2-107
n8987.0	IMPCo will review and revise (as necessary) the protective relay settings at the Sullivan 345 kV Station to account for the additional generation.	0.061	AE2-276
n8988.0	Tie the proposed AF2-106 138 kV Switching Station into the existing Glen Lyn – Claytor #1 138 kV Circuit	6.720	AF2-106
n8989.0	Replace the protective relays, remove one (1) wave trap and install a new ICON at Claytor 138 kV Station.	0.983	AF2-106
n8990.0	Review and revise the protective relay settings at the Glen Lyn 138 kV Station.	0.071	AF2-106

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n8991.0	Install one (1) new All Dielectric Loose Tube (ADLT) fiber-optic cable station exit transition and 0.2 miles of new ADLT fiber-optic cable to a new splice on existing fiber-cable at the Morgan's Cut 138 kV Station	0.218	AF2-106
n8992.0	Tie in the proposed 138 kV station into existing Sporn South-Leon circuit (APCo)	7.340	AF2-291
n8993.0	Replace existing protective relays with new fiber-based ICON MUX current differential relays at Sporn South 138 kV station (APCo)	0.377	AF2-291
n8994.0	Reconfigure existing ICON with one (1) new small form-factor pluggable (SFP) transceiver at Sporn 345 kV station (APCo)	0.030	AF2-291
n8995.0	Reconfigure existing ICON with one (1) new (SFP) transceiver at Mountaineer 765 kV station (APCo)	0.030	AF2-291
n8996.0	Review and revise (as needed) protective relay settings at Leon 138 kV station (APCo)	0.027	AF2-291
n8997.0	Fiber installation in existing ROW for AF2-291 interconnection	0.306	AF2-291
n8998.0	Final tie in for fiber installation in new ROW for AF2-291 interconnection	0.068	AF2-291
n9000.0	AF2-291: (1) New three (3), expandable to four (4), breaker 138 kV ring bus substation	7.100	AF2-291

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n9001.0	Stand-Alone Network: New 345 kV (3) breaker ring bus Switching Station with control relaying, (1) drop in control module (DICM), (9) motor operated disconnect switch, (2) Single phase Station Service Voltage Transformers (SSVT), (6) Single phase couling capacitor voltage transformers (CCVT), (2) A-frame line exit structures, (2) single phase line trap for line exit, (2) Dual Directional Comparison Blocking (DCB), associated conductors, telecom terminal equipment, insulators, arresters, foundations and structures	0.415	AF2-133
n9002.0	Transmission 345kV Tie-in: Installation of two (2) 120’ steel, double circuit, single pole dead end structures on concrete piers with anchor bolt cages in the existing Reynolds - Olive #2 345 kV Circuit Right of Way. Installation of two (2) 120’ steel, single circuit, single pole, dead end structures along the perimeter of the proposed New 345 kV Switching Station. Installation of four (4) spans of double bundle ACSR 954 (Cardinal) transmission line conductor with 7#8 Alumoweld shield wire, cutting in the proposed 345 kV station in an in-and-out arrangement. Removal of one (1) existing steel lattice structure (structure #226).	2.491	AF2-133
n9003.0	AF2-215 345kV: Review and revise protective relay settings	0.071	AF2-133
n9004.0	AF2-133 345kV: Review and revise protective relay settings	0.071	AF2-133

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n9005.0	Fiber Tie-in: Install two (2) new All Dielectric Loose Tube (ADLT) fiber-optic cable station exit transitions, splicing into the new fiber-cables to be installed by the proposed AF2-205 Switching Station project.	0.274	AF2-133
n9022.0	Review & revise the protective relay settings at the new AF2-132 switching station to account for additional generations.	0.061	AG1-302
n9023.0	Kenzie Creek - Stone Lake 69 kV: New 69 kV ring bus station; initially populated with three (3) circuit breakers, expandable to four (4) circuit breakers	6.344	AF2-389
n9024.0	Kenzie Creek - Stone Lake 69 kV: Proposed AF2-389 69 kV Switching Station Tie-in	1.287	AF2-389
n9025.0	Reconfigure the existing ICON and carrier ethernet switch (CES), installing two (2) new small form-factor pluggable (SFP) transceivers at the AF2-083 69 kV Station. Review and revise the protective relay settings there.	0.197	AF2-389
n9026.0	Reconfigure the existing ICON, installing one (1) new SFP transceiver at the Stone Lake 69 kV Station. Review and revise the protective relay settings there.	0.134	AF2-389
n9027.0	Reconfigure the existing CES at Corey 69 kV Station, installing one (1) new SFP transceiver there.	0.063	AF2-389
n9028.0	Install two (2) new fiber-optic cable station exit transitions and 0.2 miles of 144 count ADLT cable to new splices on the existing all dielectric self-supporting (ADSS) cable.	0.062	AF2-389

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n9029.0	Final Tie in for Fiber installation in New ROW at Proposed AF2-389, proposed AF2-083, and Stone Lake 69 kV Switching Stations	0.340	AF2-389
n9039.0	Transmission tie the proposed 138 kV Switching Station into the proposed Lockbourne - Good Hope line	1.441	AF2-371
n9040.0	Review and revise (as needed) the protective relay settings at the Lockbourne 138 kV Switching Station.	0.088	AF2-371
n9041.0	Review and revise (as needed) the protective relay settings at the Lemaster 138 kV Switching Station.	0.088	AF2-371
n9042.0	Install two (2) new All Dielectric Loose Tube (ADLT) fiber-optic cable in new underground ROW and associated terminating equipment and devices (transceivers, multiplexors, routers).	0.395	AF2-371
n9043.0	Review and revise (as needed) the protective relay settings at the new proposed 138 kV Switching Station.	0.061	AG1-351
n9047.0	Review and revise the protective relay settings at the College Corner 138 kV Station	0.061	AF1-071
n9051.0	Expansion of existing Dequine 345 kV substation	1.450	AG1-555
n9054.0	Upgrade the existing Tillman 138 kV Switching Station	2.618	AG1-368
n9055.0	Allen – Timber Switch 138 kV Circuit re-route.	1.002	AG1-368

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n9056.0	Timber Switch 138 kV: Reconfigure the existing ICON and review and revise the protective relay settings.	0.084	AG1-368
n9057.0	Allen 138 kV: Reconfigure the existing ICON and review and revise the protective relay settings plus replace aluminum conductor jumper.	0.084	AG1-368
n9058.0	Tillman 138 kV: Expand to the south and east by roughly 120’ x 60’ including civil pad work, fencing, and ground grid.	0.613	AG1-368
n9065.0	Reconfigure the existing CES, installing one (1) new transceiver at Hartford 345 kV	0.059	AF1-118
n9066.0	Reconfigure the existing CES, installing one (1) new transceiver at Bluffton 345 kV	0.059	AF1-118
n9067.0	Final fiber tie-in at the new AF1-118 345 kV Switching Station.	0.320	AF1-118
n9068.0	New AF1-118 345 kV Switching Station tie-in to Sorenson -Desoto 345 kV.	1.866	AF1-118
n9069.0	Review and revise the protective relay settings and Install one (1) single phase line trap on the line exit at Desoto 345 kV	0.146	AF1-118
n9070.0	Review and revise the protective relay settings and Install one (1) single phase line trap on the line exit at Sorenson 345 kV	0.146	AF1-118
n9079.0	Expand Mississinewa Sub property and remove existing equipment	0.904	AG1-414

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n9080.0	Upgrade the existing Mississinewa 138 kV Station for interconnection of PJM queue project AG1-414	3.882	AG1-414
n9081.0	Modify the existing Deer Creek – Wes Del 138 kV Circuit, raising the circuit to accommodate the crossing of the generation lead circuit underneath	1.850	AG1-414
n9082.0	Upgrade the protective relaying at the Deer Creek substation	0.396	AG1-414
n9083.0	Upgrade the protective relaying at the proposed AE1-207 138 kV Switching Station	0.358	AG1-414
n9084.0	KPCo will review and revise the protective relay settings at the Inez 138 kV Station.	0.061	AF1-162
n9098.0	Construct a new 138 kV ring bus Switching Station initially populated with three (3) circuit breakers, expandable to four (4) circuit breakers on the Claytor - Glen Lyn #1 Circuit.	9.291	AF2-106
n9278.0	Centerburg 138 kV - review and revise relay settings for AG1-024	0.060	AG1-024
n9279.0	Centerburg 138 kV - review and revise relay settings for AG1-034	0.060	AG1-034
n9285.0	Remove the existing 138/69 kV TR1 transformer. Remove the existing dual 2000KCM Strain Bus Assembly on the 138 kV side.	0.289	AG1-232

Network Upgrades - AEP

NUN	Description	Cost ($M)	Driver
n9286.0	Magley 138 kV: Replace existing 138/69 kV TR1 transformer with a 130 MVA transformer. This replacement is required due to a criteria violation not considered under the PJM studies. AEP performs a separate study that monitors non-PJM monitored (sub-transmission) utility equipment. Move the primary station service with the new transformer. Replace the TR1 transformer low side jumpers to reach the box bay structure.	2.501	AG1-232
n9300.0	Review and revise (as necessary) the protective relay settings at the Logtown 138 kV Station, and replace current transformer on the line exit to AG1-369 Generating Facility at the Logtown 138 kV Station	0.022	AG1-369
n9301.0	Review and revise (as necessary) the protective relay settings at the Logtown 138 kV Station to account for the additional generation	0.061	AF2-377

Network Upgrades - AMPT

NUN	Description	Cost ($M)	Driver
n9012.0	Revise relay settings at Woodings Substation	0.1	AF2-005

Network Upgrades - APS

NUN	Description	Cost ($M)	Driver
n1325	Doubs - Install redundant channel transfer trip carrier equipment on the Bismark (Mt. Storm) 500kV terminal	0.061	T157
n1397	Rhodes Lane - Construct a one span 2-2032 ACSR 500kV loop line from the existing Yukon-Browns Run (Hatfield) line at approx. 2.8 miles from substation to new switching station	5.6	T174
n1398	Yukon - Upgrade the relaying for the Rhodes Lane terminal and install fiber optic cable from the 500kV line dead-end structure to the control building	0.2	T174
n1866	Meadow Brook - Install dual primary relays	0.04	V2-030
n2143	Install anti-islanding (transfer trip) facilities at Taneytown 2 substation.	0.26	W1-116
n2146	Expand Frostburg#1 substation. Extend 138kV bus, install 1-138kV breaker, 3-138kV disconnect switches, 138kV metering, arresters, line traps and CVTls.	1.553	U2-073
n3316	Replace two 500kV shield wire between Yukon sub and Rhodes Lane switching station with OPGW	0.4	T174
n3317	Hatfield: Revise/upgrade relay equipment	0.6	T174
n3508	Replace the Ridgeley 'A' 34.5kV breaker	0.1	U2-073

Network Upgrades - APS

NUN	Description	Cost ($M)	Driver
n4335	Upgrade relay and carrier equipment at 115kV Potter substation	0	Z1-069
n4843	Metering and relay settings adjustments at Oak Grove 138kV Substation	0	AA2-131
n8543	Ronco Substation: Revise Relay Settings	0.0600	AF2-029
n8544	Hatfield Substation: Revise Relay Settings	0.0582	AF2-029
n8545	Fort Martin Substation: Revise Relay Settings	0.0582	AF2-029
n8614.0	Guilford Substation: Revise relay settings.	0.0582	AG1-515
n8641.0	Double Toll Gate Substation - Install carrier equipment	0.534	AG1-307
n8642.0	Kabletown Substation - replace line relaying panel	0.574	AG1-307
n8643.0	Old Chapel - Update nameplate/relay settings	0.0123	AG1-307
n8665.0	Install security and communications infrastructure at AG1-415 interconnection substation	1.28	AG1-415
n8666.0	Install approximately 5.6 miles of new 48-count of OPGW/ADSS fiber solution between the planned AG1-307 interconnecting substation and the planned AG1-415 interconnecting substation.	2.281	AG1-415

Network Upgrades - APS

NUN	Description	Cost ($M)	Driver
n8667.0	Cut and loop Double Toll Gate - Millville 138 kV line into new 3-breaker ring bus for AG1-415 (approx.. 9.6 miles from Double Toll Gate and 0.2 miles from Old Chapel)	1.33	AG1-415
n8668.0	Double Toll Gate Substation - Update relay settings	0.040	AG1-415
n8669.0	Millville Substation - Update relay settings	0.0427	AG1-415
n8670.0	AG1-307 Substation - Update relay settings	0.0418	AG1-415
n8747.0	Keisters Substation – review and update relay settings	0.051	AG1-054
n8749.0	Revise relay settings at Harwick Substation	0.062	AG1-514
n8750.0	Revise relay settings at Yukon Substation	0.061	AG1-514
n8751.0	Revise relay settings at Brackenridge Substation	0.060	AG1-514
n8752.0	Revise relay settings at Huntingdon Substation	0.059	AG1-514
n8753.0	Revise relay settings at Pittsburgh Mills Substation	0.059	AG1-514

Network Upgrades - APS

NUN	Description	Cost ($M)	Driver
n8754.0	Revise relay settings at White Valley Substation	0.059	AG1-514
n8755.0	Revise relay settings at All Dam 6 Substation	0.059	AG1-514
n8756.0	Revise relay settings at Shaffers Corner Substation	0.061	AG1-514
n8757.0	Revise relay settings at Springdale Substation	0.062	AG1-514
n8840.0	Construct new 3 breaker ring along Back Oak-Hatfield 500 kV line	0.901	AG1-363
n8841.0	Install/Test 3,115 ft underground 96,888 aerial 48F/SM ADSS from Jade Meadow AG1-363 substation control house to Black Oak #1 substation control house	3.420	AG1-363
n8842.0	Design, install, test/commission MPLS equipment for SCADA at Hatfield Substation (KATCo)	0.236	AG1-363
n8843.0	Cut existing Hatfield-Black Oak 500 kV approximately 5.3 miles from Black Oak Sub and 56 miles from Hatfield sub to create loop into new substation	7.000	AG1-363
n8844.0	Install one(1) line relaying panel at Black Oak Substation	0.663	AG1-363
n8845.0	Install one(1) line relaying panel at Hatfield Substation (KATCo)	0.682	AG1-363

Network Upgrades - APS

NUN	Description	Cost ($M)	Driver
n8857.0	Construct new three breaker ring bus on the Millville – Old Chapel (Double Toll Gate) 138 kV line for AG1-307 Interconnection Substation	9.520	AG1-307
n8858.0	Design, installation, and testing/commissioning for MPLS equipment for SCADA transport at AG1-307 Substation	0.231	AG1-307
n8859.0	Cut and loop in the Millville – Old Chapel (Double Toll Gate) 138 kV line to the interconnection substation for AG1307, approximately 0.1 mile	0.837	AG1-307
n8860.0	Double Toll Gate Substation - Update relay settings	0.055	AG1-307
n8861.0	Millville Substation - Update relay settings	0.053	AG1-307
n8862.0	AG1-182/AG1-186 Substation - Update relay settings	0.055	AG1-307
n9086.0	Install approx.. 3.15 miles of new 48-count OPGW/ADSS fiber solution between the planned AE2-226 Kabletown interconnecting substation and the planned AG1-307 interconnecting substation.	0.688	AG1-307

Network Upgrades - ATSI

NUN	Description	Cost ($M)	Driver
n3925	Bayshore-Fostoria Central/Bayshore-Monroe 345kV, Loops to Interconnecting Substation	3.020	Y1-069
n3926	Bayshore Substation - update relaying on the 345kV Fostoria Central and Monroe lines.	0.580	Y1-069
n3927	Fiber - build approximately one (1) mile of ADSS fiber to existing backbone connection to Bayshore substation. See details for more...	0.420	Y1-069
n4338.3	Replace with an 80kA circuit breaker at Bruce Mansfield breaker GEN NO 3-(B8	1.530	AA1-123
n4339.1	Replace with an 80kA circuit breaker at Bruce Mansfield breaker GEN2-HAN(B23	1.360	AA1-123
n4339.2	Replace with an 80kA circuit breaker at Bruce Mansfield breaker GEN3-S. (B12	1.530	AA1-123
n4694	Build new 345kV, 3-breaker ring bus for the AA1-123 project.	0.830	AA1-123
n4695	Tie in new substation for AA1-123 to the Highland-Sammis 345kV line	4.490	AA1-123
n4696	Protection system modifications at Highland substation.	0.100	AA1-123
n4697	Protection system modifications at Sammis substation.	0.600	AA1-123

Network Upgrades - ATSI

NUN	Description	Cost ($M)	Driver
n5056	Install dual fiber optic cables from the new AA1-123 Interconnection SS to the Sammis SS approximately 11 miles.	3.340	AA1-123
n6005	Install attachment facility line and associated hardware to accept the Interconnection Customer generator lead line terminating at the AC2-103 Interconnection substation.	0.010	AC2-103
n6006	Construct three (3) breaker 345kV ring bus substation for future four (4) breaker expansion at AC2-103.	9.470	AC2-103
n6007	Construct a line tap to the proposed AC2-103 switching station. Construct one span from the proposed AC2-103 switching station to the customer POI at Beaver-Davis Besse (S-26) 345kV Line Tap to Customer POI.	1.384	AC2-103
n6008	Standard dual SEL421 panel with UPLC for pilot scheme and DTT for the AC2-103 line at Beaver SS.	0.286	AC2-103
n6009	Standard dual SEL421 panel with UPLC for pilot scheme and DTT for the AC2-103 line at Davis Bessie SS.	0.286	AC2-103
n6010	Estimated MPLS router at AC2-103 substation to provide SCADA transport for new RTU. Next MPLS hops for SCADA backhaul are assumed to be at Avery substation and Hayes substation.	0.186	AC2-103
n6735	Sag study is required on 19.5 mile double circuit line between Fostoria Central and Lemoyn . The cost is expected to be 78,000.New ratings after sag Mitigation S/N: 1409 MVA , S/E: 1887MVA. Rebuild/Reconductor cost: $29.2 million.	0.078	AF1-206

Network Upgrades - ATSI

NUN	Description	Cost ($M)	Driver
n7339	AE2-217: Construct a new 3-breaker Ring Bus on the 138 kV East Springfield-London line. This includes Project Management.	5.587	AE2-217
n7340	SCADA/Fiber Communication: Design, install, and test/commission MPLS Equipment for SCADA transport at AE2-217 substation.	0.182	AE2-217
n7341	Estimated SCADA work at East Springfield & London substation to support relay installations, updated relay settings, and wave trap installations. Estimated in-sub fiber run to customer-built fiber to support communications to AE2-217 substation.	0.084	AE2-217
n7342	Install fiber from AE2-217 to North Titus for communication transport at AE2-217 to North Titus	0.880	AE2-217
n7343	East Springfield – London No. 1 138 kV Line Loop: Loop the East Springfield – London No. 1 138kV line into the new AE2-217 substation between existing structures #5762 and #5763, approximately 8.44 miles from the London substation.	1.355	AE2-217
n7344	London – North Titus 138kV Line Loop: Transfer conductor and install dead-end hardware assemblies on the new 3-pole structure	0.088	AE2-217
n7345	East Springfield: Line Terminal Upgrade	0.797	AE2-217
n7346	London: Line Terminal Upgrade	1.007	AE2-217

Network Upgrades - ATSI

NUN	Description	Cost ($M)	Driver
n8206	Snyder: Extend the Snyder 69 kV bus. Install one 69 kV circuit breaker.	2.313	AE2-181
n8516	Allen Junction Substation - Review relay settings.	0.071	AF1-206
n8517	Stryker Substation - Review relay settings.	0.071	AF1-206
n8518	Reconfigure East Fayette substation from 4 breaker ring bus to double breaker, double bus configuration.	7.852	AF1-206
n8519	Re-terminate the Arche Energy – East Fayette 138kV Line into the East Fayette substation.	0.514	AF1-206
n8520	Relocate and re-terminate the East Fayette-Stryker 138kV line into the expanded double breaker double bus East Fayette substation to accommodate the line exit for AF1-206.	1.491	AF1-206
n8729.0	TO construction scope of work at AG1-054 substation (includes security systems)	1.328	AG1-054
n8730.0	Design, install, and test/commission Multi-Protocol Label Switching (MPLS) equipment for Supervisory Control and Data Acquisition (SCADA) transport at AG1-054 interconnection substation	0.310	AG1-054
n8731.0	Install 3.44 miles of ADSS to nearest splice point of OPGW on existing Campbell – Cedar Street line.	1.328	AG1-054

Network Upgrades - ATSI

NUN	Description	Cost ($M)	Driver
n8732.0	Loop the Campbell to Cedar Street 69 kV line into new interconnection substation approximately 10.2 miles from Campbell substation (between Potter and Harlan substations)	0.770	AG1-054
n8733.0	Frew Mill Substation – update drawings and nameplates for line name change	0.029	AG1-054
n8734.0	Potter Substation – update drawings and nameplates for line name change	0.029	AG1-054
n8735.0	Willowbrook Substation – update drawings and nameplates for line name change	0.029	AG1-054
n8736.0	Harlan Substation - update drawings and nameplates for line name change	0.029	AG1-054
n8737.0	Leesburg Substation - update drawings and nameplates for line name change	0.029	AG1-054
n8738.0	Veterans Substation - update drawings and nameplates for line name change	0.029	AG1-054
n8739.0	Frisco Substation – review and update relay settings	0.048	AG1-054
n8740.0	McDowell Substation – review and update relay settings	0.048	AG1-054
n8741.0	New Castle Substation – review and update relay settings	0.048	AG1-054

Network Upgrades - ATSI

NUN	Description	Cost ($M)	Driver
n8742.0	Masury Substation – review and update relay settings	0.051	AG1-054
n8743.0	Columbiana Substation – review and update relay settings	0.051	AG1-054
n8744.0	Lowellville Substation – review and update relay settings	0.051	AG1-054
n8745.0	Cedar Street Substation – Update drawings and nameplates for line name change. Review and update relay settings. Convert primary and back up relays to POTT over fiber with step distance	0.067	AG1-054
n8746.0	Campbell Substation – Update drawings and nameplates for line name change. Review and update relay settings. Convert primary and back up relays to POTT over fiber with step distance.	0.073	AG1-054
n9006.0	Revise relay settings at Beaver Substation	0.053	AF2-005
n9007.0	Revise relay settings at NASA Substation	0.053	AF2-005
n9008.0	Revise relay settings at Wellington Substation	0.053	AF2-005
n9009.0	Revise relay settings at Ford Substation	0.055	AF2-005
n9010.0	Revise relay settings at Henrietta Substation	0.055	AF2-005

Network Upgrades - ATSI

NUN	Description	Cost ($M)	Driver
n9011.0	Revise relay settings at Johnson Substation	0.055	AF2-005
n9316.0	Change relay settings at the Maysville Substation	0.055	AE1-183
n9317.0	Change relay settings at the McDowell Substation	0.053	AE1-183
n9318.0	Change relay setting at the Cedar Street Substation	0.053	AE1-183
n9319.0	Change relay settings at the Campbell Substation	0.053	AE1-183
n9320.0	Change relay settings at the Sharon Substation	0.053	AE1-183
n9321.0	Change relay settings at the Dillworth Substation	0.052	AE1-183

Network Upgrades - BGE

NUN	Description	Cost ($M)	Driver
n4906	Upgrade the wire drops to the high side circuit switcher. Change the tap settings on the Pumphrey breakers B31 & B32 current transformers to correspond to 3000 amps and adjust relays to accommodate. Reset 6 additional relays and change out an auxiliary	0.150	AA2-054
n8620.0	Expand the Waugh Chapel 230 kV substation by adding a new breaker in position B29.	8.339	AG1-104

Network Upgrades - ComEd

NUN	Description	Cost ($M)	Driver
n3998	Blue Mound –Kincaid: 345kV transmission line tie-in	3.400	W4-005
n4000	Blue Mound: Remote-end relay upgrade	1.500	W4-005
n5144	Re-conductor a portion of the Kendall – Lockport ‘B’ 345 kV line along with sag mitigation on a separate portion.	38.670	AB1-122
n5295	TSS 92 McLean: Engineering and Construction Oversight	1.450	Z2-087
n5296	TSS 92 McLean: Transmission Line Cut In and Turning Structures	2.910	Z2-087
n5297	Relay, Protection, and Communication Upgrades at TSS 80 Pontiac Midpoint	0.210	Z2-087
n5298	Brokaw: Relay, Protection, and Communication Upgrades	0.040	Z2-087
n5756	Mitigate sag limitation on the AB1-122 Tap – Dresden; R 345 kV line.	6.930	AB1-122
n5915	Reconductor the Elwood - Goodings Grove 'B' 345 kV line, upgrade the station conductor at both line terminals, and upgrade the line circuit breaker at Goodings Grove.	30.830	AC1-204
n5916	Reconductor the Elwood - Goodings Grove 'R' 345 kV line, upgrade the station conductor at both line terminals, and upgrade the line circuit breaker at Goodings Grove.	31.520	AC1-204

Network Upgrades - ComEd

NUN	Description	Cost ($M)	Driver
n5918	Upgrade station conductor on the Kendall - Lockport 'B' 345 kV line.	35.590	AC1-204
n6604	The upgrade is to replace the station conductor at Station 20. A preliminary estimate for this upgrade is $0.6M with a estimate construction timeline of 24 months subject to outage scheduling coordination with Station 20 Braidwood Nuclear Station. Upon completion of the upgrade the ratings will be 1872/2162/2500/2973 MVA (SN/SLTE/SSTE/SLD)	0.000	AE2-152
n6840	ComEd 345kV L11212 SSTE rating is 1846 MVA. The upgrade will be to install a new 345kV bus tie circuit breaker at Station 12 Dresden. The new 345kV breaker will be installed as BT CB 12-13. Initial review of this proposal is that the existing contingency will be reduced and potentially reducing the post contingency flow. PJM to confirm this proposal in study. The ratings for L11212 will not change rather the contingency as stated above will be revised.	3.075	AD2-100
n6860	The upgrade will require a ComEd Relay group review of the 765kV Bus Tie 3-4 Circuit Breaker Current Transformer settings. A possible upgrade of the relay scheme may be required. A preliminary estimate for this upgrade is $1M with an estimated construction timeline of 18 months. Upon completion of this upgrade the ratings will be 4142/4460/5331/6368 MVA (SN/SLTE/SSTE/SLD).	1.000	AF1-090
n8052.1	TSS 86 Davis Creek: Substation to be expanded with one (1) new gas 138kV circuit breaker, Two (2) new 138kV MODs, new 138kV CCVTs, and associated equipment	2.982	AC2-154

Network Upgrades - ComEd

NUN	Description	Cost ($M)	Driver
n8052.2	TSS 86 Davis Creek: Install new primary, backup, and control relay and protection equipment for the new terminal.	0.530	AC2-154
n8162	ComEd 345kV L0304 SSTE rating is 1512 MVA. The upgrade will be to mitigate the sag on the Powerton - Tazewell 345 kV line and replace a 345kV disconnect switch. A preliminary estimate for this work is $9.7M with a estimated construction timeline of 30 months. Upon completion of this upgrade the new ratings will be 1679/2058/2107/2280/2622 MVA (SN/SLTE/SSTE/SLD/ALDR).	3.700	AE2-255
n8509.1	Install bus-tie circuit breaker and all related relays and appurtenance at STA 21 Kincaid to interconnect AF2-032	3.500	AF2-032
n8509.2	Kincaid: Install dead-end and metering to interconnect AF2-032	2.800	AF2-032
n8591.0	TSS 964 Substation: Revise relay settings	0.150	AF1-090
n8592.0	Transmission Line Tie-In: L96407 345 kV line tie into new TSS 931 Cottonwood Creek substation	14.100	AF1-090
n8593.0	TSS 931 Cottonwood Creek Substation: Transmission Line Tie-In Fiber: OPGW	0.610	AF1-090
n8781.0	Expand the TSS 189 Crego road substation to accommodate the AF2-366 project	6.340	AF2-366

Network Upgrades - ComEd

NUN	Description	Cost ($M)	Driver
n8782.0	Relocate L8302 and L11106 138kV lines to new deadends at TSS 189 Crego Rd Substation	1.458	AF2-366
n8958.0	Review and revise protective relay settings at University Park 345 kV	0.450	AF2-359
n9038.0	Distribution for Aux Power at TSS 931 Cottonwood creek substation	5.450	AF1-090

Network Upgrades - Dayton

NUN	Description	Cost ($M)	Driver
n8887.0	Extend the existing Vandalia 69 kV south bus by one bay to accommodate a new disconnect switch and breaker. Procure and install new breakers, disconnect switches, structures, and foundations	1.487	AG1-207
n8924.0	Givens-Mechanicsburg: Interconnection substation tie-in: Cut and loop the Urbana-Darby 138 kV line into the new substation and Re-route Givens Tap 138 kV line	5.972	AE2-305
n8925.0	Givens-Mechanicsburg: New two-bay breaker and a half switching station	13.451	AE2-305
n8926.0	Remote end relaying at Urbana substation	0.680	AE2-305
n8927.0	Remote end relaying at Darby substation	0.710	AE2-305
n8928.0	Remote end relaying at Mutual substation	0.073	AE2-305
n8929.0	Interconnection substation tie-in: Cut and loop the Hutchings-Crown 69 kV line into the new substation and Re-route New LebanonTap 69 kV line	6.102	AF2-298
n8930.0	Crown-New Lebanon: New four-position ring bus switching station; expandable to six	10.693	AF2-298
n8931.0	Remote end relaying at Crown substation	0.075	AF2-298
n8932.0	Remote end relaying at Hutchings substation	0.075	AF2-298

Network Upgrades - Dayton

NUN	Description	Cost ($M)	Driver
n8933.0	Remote end relaying at Lebanon substation	0.075	AF2-298
n8959.0	Upgrade Clay 345 kV substation to interconnect the AF1-282 Generating Facility. Remove existing rigid bus and install one (1) 345 kV breaker and one (1) 345 kV disconnect switch on existing stand in the fourth (future) position of the ring bus. Install rigid bus from the 345 kV ring to the new take-off structure location. Install three (3) line PT's at the new take-off structure location and add one (1) new relay panel for line protection and metering of the AF1-282 generator tie line in the existing control enclosure. Also install rigid bus and two (2) additional 345 kV disconnect switches on the north end of the ring to accommodate future expansion of the ring	2.937	AF1-282
n8960.0	Review and update relay protection settings at Lynchburg substation	0.075	AF1-282
n8961.0	Review and update relay protection settings at Stuart substation	0.075	AF1-282
n9270.0	Expand the Clay 345 kV substation to a five-breaker ring bus. Remove one (1) 345 kV breaker, install two (2) 345 kV breakers, four (4) 345 kV disconnect switches, one (1) take-off structure for the AF1-283 line terminal position, three (3) line PT's, three (3) arresters, one (1) shield mast, new rigid bus and steel supports. One (1) station service transformer will be relocated.	8.560	AF1-283
n9271.0	Review and update relay protection settings at Lynchburg substation	0.075	AF1-283

Network Upgrades - Dayton

NUN	Description	Cost ($M)	Driver
n9272.0	Review and update relay protection settings at Stuart substation	0.075	AF1-283
n9642.0	New four-position ring bus switching station expandable to six, Olive substation 69 kV.	10.693	AF2-298

Network Upgrades - DEOK

NUN	Description	Cost ($M)	Driver
n4251.10	Replace Todhunter 138kV breaker 939 from 63kA to 80kA	0.600	Z1-079
n4251.4	Replace Todhunter 138kV breaker 921 from 63kA to 80kA	0.600	Z1-079
n4251.6	Replace Todhunter 138kV breaker 927 from 63kA to 80kA	0.600	Z1-079
n4251.7	Replace Todhunter 138kV breaker 929 from 63kA to 80kA	0.600	Z1-079
n4251.8	Replace Todhunter 138kV breaker 933 from 63kA to 80kA	0.600	Z1-079
n4251.9	Replace Todhunter 138kV breaker 935 from 63kA to 80kA	0.600	Z1-079
n4254	Reconductor the Todhunter - Nickel 138 kV line	4.380	Z1-079

Network Upgrades - DL

NUN	Description	Cost ($M)	Driver
n2085	Woodville - Install 42.31 MVAR capacitors in substation from the MVAR deficiency at Bever Valley	2.330	U3-029/U3-030

Network Upgrades - Dominion

NUN	Description	Cost ($M)	Driver
n1865	Front Royal - Construct loop in line 508 to a new 3-breaker ring bus substation	7.310	V2-030
n3285.1	Replace existing Ox wave trap with 4000 A.	0.917	Z2-017
n3285.2	Replace existing Bristers wave trap with 4000 A.	0.053	Z2-017
n3287	Install Breaker and a half interconnection substation for Brunswick Generator X2-076 and loop in and out line 570.	13.315	X2-076
n3289	Install three breaker ring bus substation on line 556	8.626	X2-076
n3290	Add new 500 kV transmission line between line 570 and 556.	64.729	X2-076
n3292	Carson: Rearrange substation to separate line 556 and 570 from the same breaker bay.	4.832	X2-076
n3356.17	North Anna: Replace existing wave trap with 4000 A	0.120	X4-041
n3454.1	Loudoun: Upgrade breakers L152, L252 with 63 kA breaker	0.630	X4-039
n3454.2	Loudoun: Upgrade breakers L152, L252 with 63 kA breaker	0.630	X4-039

Network Upgrades - Dominion

NUN	Description	Cost ($M)	Driver
n3457.3	Pleasant View: Upgrade breakers H1T274 (274T2098), SC322 & H1T201 (201T2098) with 63 kA breaker	0.960	X4-039
n3670	Replace six poles, add two poles and upgrade approximately one mile of OH conductor to 477 aluminum.	0.240	Y1-086
n3752	Upgrade Brambleton Transfer Trip	0.710	X4-039
n5142	Install new relay panel at Old Church substation	0.066	AB1-027
n5143	Old Church - Build circuit #474 extension for 4 miles	0.975	AB1-027
n5409	Build New AB2-158 Switching Substation (interconnection substation)	13.080	AB2-158
n5410	Install Transmission structure in line with South Anna - Louisa 230 kV transmission line to allow the proposed interconnection switching station to be interconnected with the transmission system	3.000	AB2-158
n6129	Remote protection and communication changes to allow for interconnection of the AC1-080 generating Customer Facility with the transmission system	0.851	AC1-075
n6334	Modify protection and communication work to support interconnection of new AC1-120 generator	0.250	AC1-120
n6335	Build new structures to cut and loop the line #2 into AC1-120 115 kV substation	1.300	AC1-120

Network Upgrades - Dominion

NUN	Description	Cost ($M)	Driver
n6336	Build a three breaker 115 kV substation at the AC1-120 facility	5.300	AC1-120
n6715	Build new structures to cut and loop the transmission line into AC1-191 115 kV substation	2.290	AC1-191
n6716	Modify protection and communication work to support interconnection of new AC1-191 generator	0.169	AC1-191
n6795	Build a three breaker 230 kV substation at the AC1-189 facility	6.470	AC1-189
n6796	Build new structures to cut and loop the transmission line into AC1-189 230 kV substation	1.670	AC1-189
n6797	Modify protection and communication work to support interconnection of new AC1-189 generator	0.070	AC1-189
n7049	Install a second 230 kV circuit of 3.94 miles from Ladysmith to Ladysmith CT (Line 2089) with a 2000/2000/2300 MVA conductor. Add Breakers at both stations.	6.320	AF2-013
n7506	Reconductor 4.1 miles of 115 kV Line 1021 from Grey Spot to Harmony with 768.2 ACSS 250 C	2.700	AG1-038
n7513	Rebuild 1.07 miles of 230 kV Line 299 from Marsh Run to Remington CT with 2-636 ACSR 150 C	2.900	AG1-152
n7526	Reconductor 0.877 miles of 115 kV Line 65 from Whitestone to Rappahannock with 768.2 ACSS 250 C	1.140	AG1-038

Network Upgrades - Dominion

NUN	Description	Cost ($M)	Driver
n7614	Reconductor 1.4 miles of 115 kV Line 89 from Hayes to AF1-201 Tap with 768.2 ACSS 250 C. Replace Line Switch at Hayes terminal.	2.040	AG1-038
n7635	Rebuild 0.79 miles of 230 kV Line 2088 from Louisa CT to Gordonsville with 2-795 ACSR 150 C	1.190	AE2-305
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. AD1-152 provides for the initial construction of a new 230 kV three breaker ring substation between transmission structures 2068/446 and 2068/447. The objective of this project is to build a 230 kV, 3-breaker ring bus to support the new 80 MW solar farm built by Piney Creek Solar, LLC. The site is located along Dominion Energy's existing 230 kV, 2068 line from Clover substation to Sedge Hill substation. The cut line will consume two of the positions in the ring bus. The third position will be for the 230 kV feed from Piney Creek Solar, LLC collector station for the new 80 MW solar farm. The new 230 V three breaker ring substation will share a common footprint and fence line with Piney Creek Solar, LLC collector station. The demarcation point between the two stations will be the 230 kV breaker disconnect switch 4-hole pad in the Piney Creek Solar, LLC collector station by the common fence. The grounding systems for each station will be tied together. The developer will provide the	7.597	AD1-152

Network Upgrades - Dominion

NUN	Description	Cost ($M)	Driver
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
n8152	Add Additional 500/230 kV Transformer at Midlothian Substation	40.000	AF1-069
n8444.1	Re-arrange line #2076 to loop into and out of the new three breaker AF1-114 230 kV switching station	2.701	AF1-114
n8444.2	Remote protection and communication work.	0.294	AF1-114
n8444.3	Build a three breaker AF1-114 230 kV switching station	8.388	AF1-114
n8723.1	Build a three breaker AE2-094 500 kV switching station	23.010	AE2-094
n8723.2	Re-arrange line #585 to loop into and out of the new three breaker AE2-094 500 kV switching station	2.210	AE2-094
n8723.3	Remote protection and communication work at Carson and Rogers Road Substations	0.190	AE2-094
n8934.1	Three-breaker AF2-304 (AG1-000B) 230 kV switching station located along VEPCO's existing 230 kV line #240 from Wards Creek Substation to Surry Substation	12.570	AF2-304

Network Upgrades - Dominion

NUN	Description	Cost ($M)	Driver
n8934.2	Re-arrange line #240 to loop into and out of the new AF2-304 230 kV switching station	3.966	AF2-304
n8934.3	Remote protection and communication work at Wards Creek, Surry, and Hopewell 230 kV Substations	0.372	AF2-304
n8935.1	Build a new AE1-173 500 kV three-breaker ring switching station located along VEPCO's existing 500 kV, 544 line from Carson Substation to Suffolk Substation	22.897	AE1-173
n8935.2	Re-arrange line #544 to loop into and out of the new three-breaker AE1-173 500 kV switching station	5.659	AE1-173
n8935.3	Remote protection and communication work at Carson and Suffolk 500 kV Substations	0.191	AE1-173
n8936.1	Construct a new AF2-303 230 kV Generation Interconnect Line into the Edgecombe Nug Station. This will involve a total demo and rebuild of the existing Edgecombe Nug Station	10.470	AF2-303
n8936.2	Re-energize Line 229 and Line 2167 to interconnect Edgecombe 230 kV substation	4.069	AF2-303
n8936.3	Remote protection and communication work at Hathaway and Tarboro 230 kV substations	0.389	AF2-303
n9290.0	Add new line position and two 230 kV breakers at Remington CT substation for AG1-152	13.264	AG1-152
n9293.0	Construct 12.5 kV circuit to Tar River Substation	4.500	AG1-007

Network Upgrades - Dominion

NUN	Description	Cost ($M)	Driver
n9294.0	Expand Tar River Substation	1.500	AG1-007
n9296.0	Re-arrange line #2145 to loop into and out of the new three breaker AF2-013 230 kV switching station	3.025	AF2-013
n9297.0	Build a 230 kV three breaker ring AF2-013 switching station	12.198	AF2-013
n9298.0	Remote protection and communication work at Arnold's Corner 230 kV Substation, Dahlgren 230 kV Substation, and Birchwood Nug 230 kV Substation for AF2-013	0.517	AF2-013
n9298.1	Arnold's Corner 230 kV Substation: Project AF2-013 provides for drawing work, relay resets, and field support necessary to change the line 2145 destination at Arnold's Corner Substation	0.000	AF2-013
n9298.2	Dahlgren 230 kV Substation: Project AF2-013 provides for drawing work, islanding panel addition, relay resets, and field support necessary to change line 2145 destination to AF2-013 Generator Interconnect.	0.000	AF2-013
n9298.3	Birchwood Nug 230 kV Substation: Project AF2-013 provides for drawing work, islanding panel addition, relay resets, and field support necessary to change line 2145 destination from Birchwood Nug to AF2-013 Generator Interconnect	0.000	AF2-013

Network Upgrades - DPL

NUN	Description	Cost ($M)	Driver
n7246	Expand Cedar Creek 138 kV substation from a three (3) position ring bus to a four (4) position ring bus	2.990	AC1-091

Network Upgrades - DL

NUN	Description	Cost ($M)	Driver
n8758.0	Revise relay settings at Cheswick Substation	0.053	AG1-514
n8759.0	Revise relay settings at Plum Substation	0.053	AG1-514

Network Upgrades - EKPC

NUN	Description	Cost ($M)	Driver
n5630	Adjust remote, relaying, and metering settings at Avon 138kV Sub	0.065	AC1-074
n8396	Replace the existing Green County 161/69 kV, 93 MVA transformer with a 150 MVA transformer.	2.280	AG1-351

Network Upgrades – Essential Power

NUN	Description	Cost ($M)	Driver
n3645	Engineering and design related activities associated with relocating one (1) H-frame structure and re-positioning another H-frame structure and the future generator disconnect in the Rock Springs 500kV substation.	0.870	Y1-065
n3646	Rock Springs 500 kV: Engineering and design related activities associated with upgrading bus differential protection relays.	0.050	Y1-065

Network Upgrades - JCPL

NUN	Description	Cost ($M)	Driver
n0645.1	Whippany - Roseland - upgrade 230kV of JCPL side (rebuild circuit)	11.910	O66
n0657	Atlantic - Larrabee - upgrade 230kV reconductor circuit	6.320	O66
n8532.1	Install (2) 34.5 kV load-break air switches with SCADA control on the Gilbert – Rocktown Road 34.5 kV line approximately 1.2 miles from Frenchtown and 3.5 miles from Frenchtown Solar 3. Provide 120V AC Power Supply to accommodate SCADA controlled line switches.	1.378	AG1-495
n8532.2	Build new structures on the A729 West Flemington 34.5kV line to facilitate construction of new tap on the Gilbert – Rocktown Road 34.5kV line	0.825	AG1-495
n8532.3	West Flemington 34.5 kV Line (A729): Review relay settings	0.048	AG1-495
n8532.4	Rocktown Road Substation: Review relay settings	0.048	AG1-495
n8547	Gilbert Substation: Remove circuit switcher BK12. Install (1) 230kV H-frame, (3) CVTs, (3) surge arresters, and (1) MOAB disconnect switch, and relaying. Install pre-wired relay panel and update relay settings.	2.047	AG1-487
n8548	Morris Park Substation: Update the relay settings for the 230kV Gilbert - Morris Park line terminal.	0.058	AG1-487
n8549	Morristown Substation: Update the relay settings for the 230kV Gilbert - Morristown line terminal.	0.058	AG1-487

Network Upgrades - JCPL

NUN	Description	Cost ($M)	Driver
n8550	Glen Gardner Substation: Update the relay settings for the 230kV Gilbert-Glen Gardner line terminal	0.058	AG1-487
n8565	Oyster Creek – Whitings 34.5kV: Install (2) line switches, one on each side of tap on the Q121 Oyster Creek – Whitings 34.5kV Line, approximately 1.5 miles from Bamber Lake to the generator facility near structure 90200.	1.085	AG1-188
n8566	Oyster Creek Substation: Revise relay settings	0.068	AG1-188
n8567	Whitings Substation: Revise relay settings	0.067	AG1-188
n8568	Kittatinny Substation: Install new 230kV breakers, disconnect switches and line terminal for AG1-511 direct connection.	4.697	AG1-511
n8569	Yards Creek Substation: Relay Setting Changes	0.065	AG1-511
n8570	Newton Substation: Relay Setting Changes	0.066	AG1-511
n8583	Oyster Creek – Whitings 34.5kV: Install (2) line switches, one on each side of tap on the Q121 Oyster Creek – Whitings 34.5kV Line, approximately 4.5 miles from Oyster Creek and 4 miles from Bamber Lake to the generator facility near structure 90253.	1.024	AG1-189
n8584	Oyster Creek Substation: Revise relay settings	0.068	AG1-189
n8585	Whitings Substation: Revise relay settings	0.067	AG1-189

Network Upgrades - JCPL

NUN	Description	Cost ($M)	Driver
n8948.0	Reconfigure Raritan River substation and add a new 230kV circuit breaker to support AF2-413 generator interconnection.	4.474	AF2-413
n8949.0	Upgrade relay settings for EH Werner Substation	0.061	AF2-413
n8950.0	Upgrade relay settings for Parlin Substation	0.061	AF2-413
n8951.0	Upgrade relay settings for Red Oak Substation	0.061	AF2-413
n8952.0	Upgrade relay settings for South River Substation	0.061	AF2-413

Network Upgrades - MAIT

NUN	Description	Cost ($M)	Driver
n8502.1	Rockwood: Review and revise relay settings as needed	0.064	AF1-143
n8502.2	Bigby: Review and revise relay settings as needed	0.064	AF1-143
n8533.1	Construct (2) line switches on the Claysburg-Hollidaysburg 46kV line approximately 0.1 miles from Claysburg Substation.	0.856	AG1-281
n8533.2	Revise relay settings at Holidaysburg 46kV substation	0.055	AG1-281
n8533.3	Revise relay settings at Claysburg 46kV substation	0.054	AG1-281
n8962.0	Review and revise relay settings as required	0.065	AG1-486

Network Upgrades - ME

NUN	Description	Cost ($M)	Driver
n0636.2	Portland - replace Terminal Equipment - upgrade 230kV 1 CT, 1 CB and 1 line trap	1.040	O66
n4857	Construct a new three (3) breaker ring bus interconnection substation near the South Reading - North Boyertown 230kV Line; Location South Reading - North Boyertown 230kV Line	1.000	AA2-115
n4858	Upgrade line carrier and transfer trip relaying/equipment affected by the AA2-115 interconnection; Location South Reading 230kV Substation	2.300	AA2-115
n4859	Upgrade line carrier and transfer trip relaying/equipment affected by the AA2-115 interconnection; Location: Hosensack 230kV Substation	0.470	AA2-115
n4860	Upgrade carrier relaying affected by the AA2-115 interconnection; Location: North Boyertown 230kV Substation.	0.080	AA2-115
n4861	Loop the South Reading-North Boyertown 230kV Line into the new AA2-115 interconnection substation (Approximately 200' in length); Location South Reading- North Boyertown 230kV Line.	1.670	AA2-115
n7002	Construct a new three-breaker ring bus on the 115kV line (977) between Middletown Junction Substation and Zions View Substation. Perform related project management, and Supervisory Control and Data Acquisition (SCADA) and fiber communication work.	9.705	AE1-129
n7003	Cut the existing Middletown Junction – Smith Street (977) 115kV line between existing structure 65 and structure 66 to create a loop to the proposed ring	2.679	AE1-129

Network Upgrades - ME

NUN	Description	Cost ($M)	Driver
n7004	Replace existing line relaying with (1) standard line relaying panel with (1) SEL421 and (1) SEL411L.Install (1) standard breaker control panel with (1) SEL451 BFT and (1) SATEC Meter at Middletown Junction Substation	0.687	AE1-129
n7005	Replace (1) 115 kV OCB due to single CT condition with 145 kV 3000A 40kAIC breaker. Replace existing line relaying with (1) standard line relaying panel with (1) SEL421 and (1) SEL411L. Install (1) standard breaker control panel with (1) SEL451 BFT and (1) SATEC Meter at Smith Street Substation	1.528	AE1-129
n8571	Portland Substation: Relay Setting Changes	0.061	AG1-511
n8870.0	Review and update relay settings for Ontelaunee Substation	0.051	AF2-030

Network Upgrades - MISO

NUN	Description	Cost ($M)	Driver
n9135.0	Upgrade the Powerton-Tazewell 345 kV circuit 1 terminal equipment and breaker and a half leg at Tazewell from 3000A to 4000A. Rebuild 0.6 miles of the Powerton-Tazewell 345 kV transmission line to increase the ampacity to 4000A	2.760	AE1-113

Network Upgrades - ODEC

NUN	Description	Cost ($M)	Driver
n4367	Construct a three-switch tap structure substation by cutting the Bayview-Kellam 69 kV circuit.	1.300	Z2-012

Network Upgrades - PENELEC

NUN	Description	Cost ($M)	Driver
n3655	Install 115kV three position ring bus interconnect substation.	4.100	Y1-033
n3656	Connect Penn Mar - Deep Creek line into new 115 kV Y1-033 substation.	0.240	Y1-033
n3657	Replace relaying on 115kV Y1-033 (former Rockwood) line to accommodate new fiber connection.	0.160	Y1-033
n3658	Install new wave trap, CVT, tuner, DCB relaying, TT relaying, and line relaying on 115kV Y1-033 (former Penn Mar) line.	0.360	Y1-033
n3659	Install 1300 nm Single Mode Fiber-Optic Cables with dedicated fibers between Y1-033 Ring Bus and Penn Mar 115 kV SS, approximately 4.7 miles.	0.510	Y1-033
n4332	Upgrade carrier equipment and install DTT on the 115kV Niles Valley line. Utilize existing equipment on Everts Drive (future Mainesburg) line to receive breaker status from Mainesburg breaker.	0.160	Z1-069
n4333	Install anti-islanding scheme at Mainesburg to transmit breaker open status of the Mansfield 115kV line breaker.	0.090	Z1-069
n4334	Install anti-islanding scheme at Pierce Brook to transmit breaker open status of the Potter 115kV line breaker.	0.090	Z1-069
n4492	Transmission Line Loop Niles Valley-Potter 115kV	0.380	Z1-069
n4493	Z1-069 Interconnection Substation - oversight for OTB 115kV three breaker ring bus interconnection substation.	0.000	Z1-069

Network Upgrades - PENELEC

NUN	Description	Cost ($M)	Driver
n4494	Niles Valley protection changes	0.440	Z1-069
n4682	Construct new 500kV 3 breaker ring bus substation to connect the AA1-076 project.	0.000	AA1-076
n4986	Region Line Tap on Wyalusing 34.5 kV line AA2-133 Point of Interconnection including costs associated with 34.5 kV Metering Package.	0.030	AA2-133
n4987	New Albany SS. 34.5kV Relaying Upgrade for AA2-133 Generation Interconnection.	0.050	AA2-133
n4988	Wyalusing SS. 34.5kV Relaying Upgrade for AA2-133 Generation Interconnection.	0.050	AA2-133
n4989	East Towanda SS. Relaying Upgrade for AA2-133 Generation Interconnection.	0.050	AA2-133
n4990	34.5 kV Pole Recloser Work Wyalusing-New Albany 34.5 kV.	0.050	AA2-133
n5174	New 230kV series reactor and required associated substation equipment at Erie East substation	3.946	Y2-089
n6249	Replace the wave trap on the Hillside 230 kV terminal at the East Towanda Substation	0.315	NYISO-Q387
n6630	Reconductoring line with 1033 ACSS conductor	89.827	AE2-139

Network Upgrades - PENELEC

NUN	Description	Cost ($M)	Driver
n8471	East Sayre-North Waverly 115kV line upgrade - FE (NYISO project driven)	1.417	NYISO-Q387/NYISO-Q421/NYISO-Q505
n8561	Morgan Street Substation: Replace 34.5kV Mount Hope line relays and controls; and install (1) 34.5kV PT	0.636	AG1-040
n8581	Install two SCADA operated switches on the Miller REC - Warrior Ridge 46 kV Line	0.612	AG1-301
n8582	Replace line relaying panel at Warrior Ridge substation	0.465	AG1-301
n8586	Roxbury Substation: Install new 23 kV PT on the Arco line. Revise relay settings for new customer tap. Replace existing 23kV KRB ARCO relays with SEL-0351S line panel	2.816	AF2-229
n9085.0	East Towanda Substation: Install (1) 230 kV wave trap, line tuner, and coax. Install (1) carrier panel containing (2) RFL GARD 8000 units, (1) PCM-5350, and (1) skewed hybrid. Review and revise relay settings as required.	0.532	NYISO-Q596
n9303.0	Upgrade line relaying equipment at Mainesburg terminal.	0.956	NYISO-Q1080
n9304.0	Upgrade line relaying equipment at Homer City terminal.	0.950	NYISO-Q1080

Network Upgrades - PEPCO

NUN	Description	Cost ($M)	Driver
n3487	Install a new 5 breaker at North Keys Area Road sub.	2.700	X4-035
n3488	Connect Pepco 5071 line into new 500 kV North Keys Area Road sub	3.000	X4-035
n3772	Replace existing static wire with OPGW on line 5071 which runs from Burches Hill to Chalk Point	1.600	X4-035
n7504	Reconductor/bundle circuit 23103 from Dickerson to Station H. This would raise the thermal rating to approximately 1200 MVA. To achieve this rating the 2 breakers and 4 disconnect switches connected to this circuit would also have to be upgraded along with any other associated terminal equipment	5.304	AG1-483
n9099.0	Install new 230 kV breaker, switches, foundations and structures in the existing Dickerson 230 kV breaker-and-a-half bay.	4.940	AG1-483

Network Upgrades - PPL

NUN	Description	Cost ($M)	Driver
n3562	Rebuild the Lackawanna-Peckville 230kV line (3.0 miles), the first 0.6 miles of the Blooming Grove-Peckville 230kV line and a new 0.7 mile 230kV line using double bundled 1590 ACSR .. see notes	14.050	X4-048
n3563	Install one new 3000A, 230kV circuit breaker, and upgrade equipment in Bay 4 of the Lackawanna 230kV substation to a rating of 3000A.	3.870	X4-048
n3575	Install new 500kV gas-insulated line between the Sunbury 500kV substation and the new X2-025 interconnection facility.	7.080	X2-025
n3576	Install fourth bay to the double breaker Sunbury 500kV substation to connect the line from the X2-025 interconnection facility.	1.980	X2-025
n4401	Tie in new 500kV substation built to connect Z2-046.	3.150	Z2-046
n4402	Installation of fiber optic line to support new substation for Z2-046	1.200	Z2-046
n6490	Construct 69 kV Attachment line from the Point of Interconnection to the Milton 230/69 kV substation	0.811	AE2-042
n6491	Modify the Milton 230/69 kV Substation relays to accommodate the AE2-042 interconnection request.	0.138	AE2-042
n6492	Remove the existing disconnect switches and install new disconnect switches and surge arrestors with support structures at the Milton 230/69 kV Substation	0.400	AE2-042
n8495.1	Construct transmission tap from the Point of Change in Ownership to the Sunbury-Lock Haven 69kV line.	0.900	AF1-333

Network Upgrades - PPL

NUN	Description	Cost ($M)	Driver
n8495.2	Modify Sunbury-Lock Haven 69kV line to tine in the new interconnection facilities	0.280	AF1-333
n8495.3	Modify relays at Lock Haven 69kV Substation	0.240	AF1-333
n8495.4	Modify relays at Sunbury 69kV Substation	0.240	AF1-333
n8615.0	Modify Blooming Grove-West Damascus 69 kV line to tie in the new Transmission Owner Interconnection Facility.	0.614	AF2-417
n8616.0	Modify relays at Paupack 69 kV Substation	0.137	AF2-417
n8617.0	Modify relays at Blooming Grove 69 kV Substation	0.137	AF2-417
n8618.0	Modify Harwood - East Hazelton 69 kV line to tie in the new Transmission Owner Interconnection Facility	0.614	AF2-421
n8619.0	Modify relays at Harwood 69 kV Substation	0.137	AF2-421
n8634.0	Modify Scott Tap - Bowmans Mill Tap 69 kV line to tie in the new Transmission Owner Interconnection Facility.	0.097	AF2-086
n8635.0	Modify relays at Columbia 69 kV Substation	0.137	AF2-086

Network Upgrades - PPL

NUN	Description	Cost ($M)	Driver
n8636.0	Modify relays at Glen Brook 69 kV Substation	0.137	AF2-086
n8691.0	Modify Sunbury – Columbia 69 kV line to tie in the new Transmission Owner Interconnection Facility.	0.796	AF2-433
n8692.0	Modify relays at Columbia 69 kV Substation	0.137	AF2-433
n8693.0	Relay modifications at Sunbury 69 kV substation	0.137	AF2-433
n8791.0	Modify Blooming East Palmerton - Acahela 69 kV line to tie in the new Transmission Owner Interconnection Facility.	0.903	AG1-156
n8792.0	Modify relays at Acahela 69 kV Substation	0.137	AG1-156
n8793.0	Modify relays at East Palmerton 69 kV Substation	0.137	AG1-156
n8915.0	Modify Sunbury-Dauphin 69 kV line to tie in the new Transmission Owner Interconnection Facility.	0.903	AG1-259
n8916.0	Modify relays at Sunbury 69 kV Substation	0.137	AG1-259
n8917.0	Modify relays at Dauphin 69 kV Substation	0.137	AG1-259

Network Upgrades - PSEG

NUN	Description	Cost ($M)	Driver
n0629	Sewaren - Woodbridge "O" - Reconductor Circuit - Upgrade 230kV line	11.100	O66
n0666.1	Hudson - 230kV substation upgrade	31.200	O66
n0666.10	Hudson - Replace 230kV breaker 4HB, upgrade with 80 kA	0.000	O66
n0666.11	Hudson - Replace 230kV breaker 1HA, upgrade with 80 kA (cost differential from 63 to 80kA)	0.000	O66
n0666.12	Hudson - Replace 230kV breaker 1HC, upgrade with 80 kA	0.000	O66
n0666.13	Hudson - Replace 230kV breaker 1HA, upgrade with 80 kA (cost differential from 63 to 80kA)	0.000	O66
n0666.2	Hudson - Replace 230kV breaker 2HC, upgrade with 80 kA	0.000	O66
n0666.3	Hudson - Replace 230kV breaker 2HA, upgrade with 80 kA (cost differential from 63 to 80kA)	0.000	O66
n0666.4	Hudson - Replace 230kV breaker 3HA, upgrade with 80 kA	0.000	O66
n0666.5	Hudson - Replace 230kV breaker 1HB, upgrade with 80 kA	0.000	O66

Network Upgrades - PSEG

NUN	Description	Cost ($M)	Driver
n0666.6	Hudson - Replace 230kV breaker 4HA, upgrade with 80 kA (cost differential from 63 to 80kA)	0.000	O66
n0666.7	Hudson - Replace 230kV breaker 4HC, upgrade with 80 kA	0.000	O66
n0666.8	Hudson - Replace 230kV breaker 3HB, upgrade with 80 kA (cost differential from 63 to 80kA)	0.000	O66
n0666.9	Hudson - Replace 230kV breaker 3HC, upgrade with 80 kA	0.000	O66
n0985	Replace Athenia 230 kV breaker 21H	1.500	O66
n0986	Replace Athenia 230 kV breaker 11H	1.500	O66
n0987	Replace Athenia 230 kV breaker 51H	1.500	O66
n0988	Replace Athenia 138 kV breaker 2BH	1.500	O66
n1035	Athenia - Bergen - build new 230 kV Parallel Circuit	129.190	O66
n1236	Essex34 - Replace 230kV Breaker 4LM with 80 kA Symmetrical Breaker	1.500	T107

Network Upgrades - PSEG

NUN	Description	Cost ($M)	Driver
n3301	Essex 230kV Three Breaker Bay Expansion less one breaker	7.000	T107
n4793	Install a new 63 kA breaker into existing bus position at the Sewaren 230 kV substation along with the associated disconnect switches, equipment and structures.	6.480	Z2-089
n5177	Reconductor 3 spans (2 structures) of the Roseland-Williams 230kV Line with 1590 ACSS conductor.	0.570	AB2-020
n5564	Reconductor Roseland-Cedar Grove 230 kV Line with 1590 ACSS	16.120	AD2-018
n5565	Reconductor the Williams-Cedar Grove 230 kV Line with 1590 ACSS	0.000	AD2-019
n7135	Upgrade Greenbrook terminal equipment to achieve a SER of 1167MVA	0.530	AF2-413
n8529	New relays to accommodate the AF1-245 generator lead line	0.076	AF1-245
n8985.0	Update relay settings at Lake Nelson for the two (2) circuits entering the station from JCPL's Raritan River station	0.307	AF2-413

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