



PJM Baseline Reliability Assessment

2023 – 2038 Period: TPL-001-5.1

PJM
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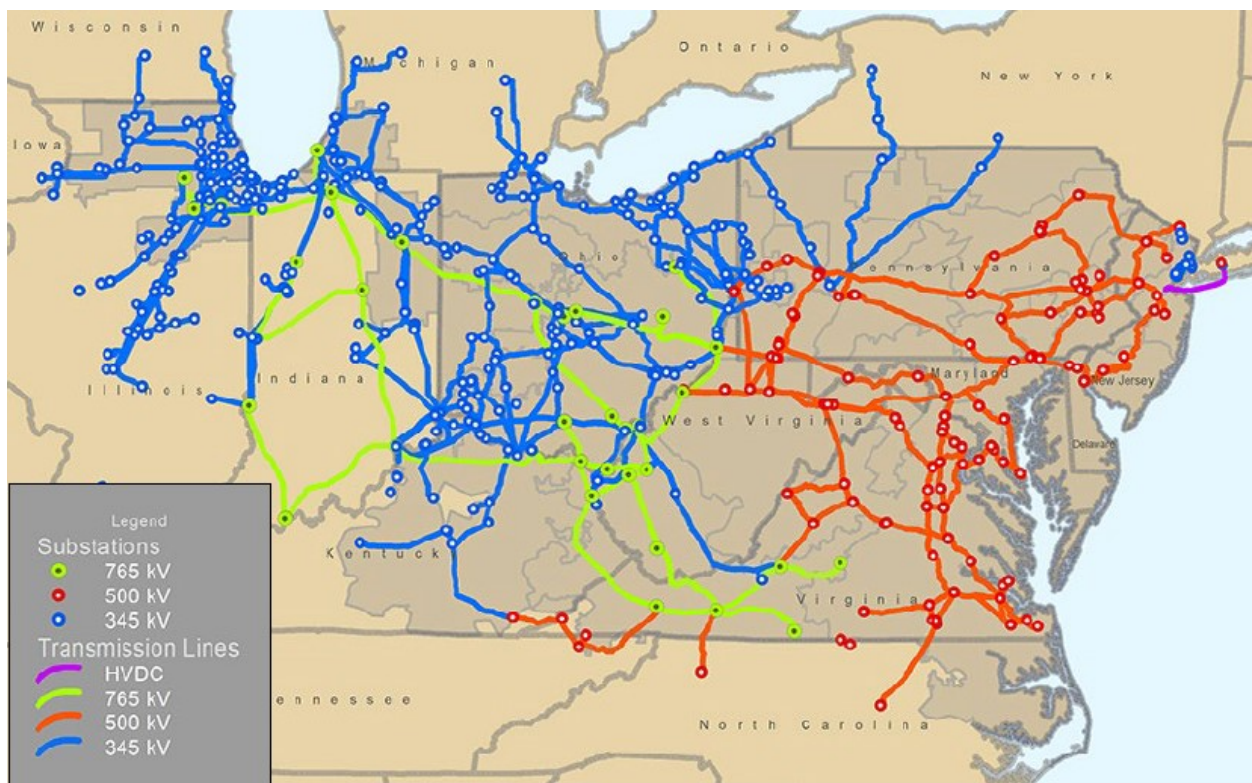
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Introduction

The PJM system covers more than 368,000 square miles in 13 states and the District of Columbia. Serving approximately 65 million people with over 1,000 member companies, the PJM system includes major U.S. load centers from the western border of Illinois to the Atlantic coast including the metropolitan areas of Baltimore, Chicago, Cleveland, Columbus, Dayton, Newark, Norfolk, Philadelphia, Pittsburgh, Richmond, and Washington D.C. PJM dispatches more than 183,000 megawatts of generation capacity over more than 88,000 miles of transmission lines – a system that serves nearly 21 percent of the U.S. economy. The PJM system is electrically continuous and consists of multiple electrical service territories. PJM’s Bulk Electric System (BES) includes a robust network of 765kV, 500kV, 345kV, 230kV, 161kV, 138kV, and 115kV facilities. The map below depicts the PJM service territory footprint overlaid with PJM high voltage lines operated at 345 kV and above.



Map 1. Existing PJM 345 kV, 500 kV, and 765 kV Network

As a Federal Energy Regulatory Commission (FERC) approved Regional Transmission Organization (RTO), one of PJM's core functions encompasses regional transmission planning. PJM is also a North American Electric Reliability Corporation (NERC) registered Reliability Coordinator, Planning Coordinator, and Transmission Planner. PJM's annual planning process is known as the PJM Regional Transmission Expansion Plan (RTEP). The RTEP process is established in the PJM Operating Agreement – Schedule 6 – Regional Transmission Expansion Planning Protocol. The RTEP processes and procedures are described in detail in the PJM Regional Transmission Planning Process Manuals. PJM Manual 14B – PJM Region Transmission Planning process contains the process used to complete the annual baseline reliability assessment.

PJM's Regional Transmission Expansion Plan (RTEP) identifies transmission upgrades and enhancements that are required to preserve the reliability of the transmission system. The PJM system is planned such that it can be operated to applicable System Operating Limits (SOL) while supplying projected customer demands and projected firm transmission service over a range of forecast system demands under contingency conditions that have a reasonable probability of occurrence. PJM reliability planning encompasses a comprehensive series of detailed analyses that ensure reliability and compliance under the most stringent of the applicable NERC, Regional Entity (RFC or SERC as applicable), PJM, and local criteria. To accomplish this each year, a baseline assessment is completed for applicable facilities over the near term (1-5 years) and longer term (years 6-15). All Bulk Electric System (BES) facilities are included in the RTEP baseline assessment process as required by NERC Standards.

PJM is registered with the North American Electric Reliability Corporation (NERC) as the Reliability Coordinator (RC), Interchange Authority (IA), Transmission Operator (TOP), Balancing Authority (BA), Planning Coordinator (PC), Transmission Planner (TP), Transmission Service Provider (TSP), and Resource Planner (RP). There are multiple transmission zones within PJM. Table 1 lists individual transmission zones in the PJM footprint. A few smaller PJM transmission owners are modeled within another larger PJM transmission area and are not explicitly listed on this table. A few examples of this are Neptune Regional Transmission System LLC, AMPT, Linden VFT LLC, and Essential Power/Rock Springs.

AP	Allegheny Power System, Inc.
AE	Atlantic Electric
AEP	American Electric Power Co., Inc.
ATSI	American Transmission Systems, Inc.
BG&E	Baltimore Gas & Electric Co.
CE	Commonwealth Energy System
DAY	Dayton Power and Light Co
DEO&K	Duke Energy Ohio and Kentucky
DLCO	Duquesne Light Co
DP&L	Delmarva Power and Light Co
EKPC	Eastern Kentucky Power Cooperative
JCP&L	Jersey Central Power and Light
METED	Metropolitan Edison Co
OVEC	Ohio Valley Electric Corporation
PECO	PECO Energy Co.
PENELEC	Pennsylvania Electric Co
PEPCO	Potomac Electric Power Co.
PPL	PPL Electric Utilities
PSE&G	Public Service Electric and Gas Company
RECO	Rockland Electric Company
UGI	UGI Utilities Inc.
DVP	Dominion

 Table 1. **PJM area Transmission Zones**

PJM is interconnected with neighboring systems and has over 100 BES transmission ties to these adjacent systems. Table 2 lists PJM's neighboring systems and associated entities. PJM coordinates planning analyses with adjacent Planning Coordinators and Transmission Planners to ensure that contingencies on adjacent systems are studied as part of PJM's RTEP process.

ALTE	Alliant Gas and Electric – East
ALTW	Alliant Gas and Electric – West
AMIL	Ameren Illinois
CPLE	Carolina Power and Light Company - East
CPLW	Carolina Power and Light Company - West
DEI	Duke Energy Indiana
DUKE	Duke Energy Carolinas
IPL	Indianapolis Power and Light Company
ITCT	International Transmission Company
LGEE	LGE Energy
MEC	MidAmerican Energy
METC	Michigan Electric Transmission Co.
NIPS	Northern Indiana Public Service Company
NYISO	New York ISO
TVA	Tennessee Valley Authority
WEC	Wisconsin Electric Power Company

Table 2. **PJM Neighboring Systems**

The PJM RTEP process requires that cost responsibility for facility enhancements be established. In order to establish a starting point for development of Regional Transmission Expansion Plans and determine cost responsibility for expansion facilities, a 'baseline' assessment of system adequacy and security is necessary. The purpose of this assessment is threefold:

1. To identify areas where the system as planned under previous assessments does not meet the applicable reliability criteria and standards as a result of load increases on the system or changes to methodologies associated with the analyses.
2. To develop and recommend facility expansion plans which will bring areas where the system does not meet performance requirements specified in an applicable standard into compliance. These plans include cost estimates and required in-service dates.
3. To establish what will be included as baseline costs in the allocation of the costs of expansion for those generation and merchant transmission projects proposing to connect to the PJM system.

The system as planned is evaluated for its compliance with all applicable reliability standards to accommodate the forecast demand, committed resources, and commitments for firm transmission services for a specified time frame. Areas that are found to not meet applicable reliability criteria are identified and enhancement plans are developed to achieve compliance within an identified timeframe. The lead time necessary to implement the system enhancement is considered as part of the overall plan. In addition, the status and progress of each upgrade is tracked closely to ensure that the required in-service dates are met.

The 'baseline' assessment and the resulting expansion plans serve as the base system for the conduct of Interconnection Feasibility Studies and System Impact Studies associated with new generation, merchant transmission and long term firm transmission service. The interconnection process is described by Manual 14A: Generation and Transmission Interconnection Process. This report details the results of the 'baseline' assessment from 2023 through 2038 for the PJM footprint.

Executive Summary

PJM is responsible for the development of a Regional Transmission Expansion Plan (RTEP) for the PJM system that will meet the needs of the region in a reliable, economic and environmentally acceptable manner. As further described in following portions of this assessment, the PJM RTEP combines a broad set of analysis into a single plan. The annual RTEP process consists of a baseline reliability review, analysis to identify the transmission needs associated with both generation interconnection and merchant transmission, review of conditions experienced in real time operations, inter-regional reliability analysis, and many other special studies. The RTEP incorporates the unique needs identified by in-depth thermal, stability, short circuit, and voltage reliability analysis. PJM ensures a robust and comprehensive annual RTEP by incorporating all of these diverse needs into a single plan.

The annual RTEP planning assessment includes a comprehensive review of PJM Bulk Electric System (BES) facilities as required by NERC standard TPL-001-5.1. PJM maintains a series of power flow, short circuit and stability cases that represent a range of critical system conditions for a range of forecast demand levels and study years. The annual RTEP baseline analysis performs the following tests at a minimum to ensure NERC TPL compliance:

- 1) Thermal Analysis
 - a) Normal system (all facilities in service), single, and multiple contingency analysis as required by NERC TPL-001-5.1, including non-convergent events
 - b) Generation Deliverability analysis, as described in PJM Manual 14B Section 2 RTEP Process
 - c) Common Mode outage procedure analysis, as described in PJM Manual 14B Section 2 RTEP Process
 - d) Load Deliverability analysis, as described in PJM Manual 14B Section 2 RTEP Process
 - e) N-1-1 Analysis
 - f) Light Load Reliability Analysis
 - g) Winter Reliability Analysis
 - h) 15 Year Analysis
 - i) Transfer Limit Analysis
- 2) Short Circuit fault duty Analysis
- 3) Voltage Analysis
 - a) Voltage limit testing, including voltage magnitude and voltage drop monitoring for many of the test methods listed above for the thermal analysis, including non-convergent events
 - b) Voltage collapse, including non-convergent events
 - c) PV analysis, including Transfer Limits
- 4) Stability Analysis
 - a) Transient Stability (short and long term)
 - b) Small Signal Stability (oscillations)
 - c) Voltage Stability
 - d) Nuclear Plant Interface Requirements (NPIR)

PJM also studies, requests for new generation, merchant transmission, and long term firm transmission service. The process for studying these requests is described in PJM Manual 14A. In Calendar year 2023, PJM completed 114 system impact studies to accommodate new generation, merchant transmission, and long term firm transmission service. The 2023 RTEP includes any upgrades associated with the queue projects that are required to maintain the reliability of the PJM system.

- 1) New Services Queue Analysis
 - a) Generation interconnection
 - b) Merchant transmission
 - c) Yearly long term firm transmission service

Information related to the generation, merchant transmission, and yearly long term firm transmission service request queues can be found on the PJM website at the following link.

<https://www.pjm.com/planning/service-requests/services-request-status>

Information that is posted on the PJM website includes the status of the New Services Queues, as well as the technical study reports. The technical reports include the feasibility, impact, and facility study reports. PJM agreements such as interconnection service agreements (ISA) and interconnection construction service agreements (CSA) are also posted on the website.

PJM coordinates inter-regional activities with neighboring systems pursuant to PJM's Tariff and interregional agreements. PJM annually participates in a wide range of inter-regional groups and committees. Several significant efforts in 2023 are listed below.

- 1) Inter-regional planning groups
 - a) Independent System Operator / Regional Transmission Organization (ISO/RTO) Council (IRC)
 - b) Eastern Interconnection Planning Collaborative (EIPC): Planning Coordinators of the Eastern Interconnection
 - i) Workshops on Transmission Planning for DER and Resilience
 - ii) Finalizing post-Workshop comments to Docket N. AD23-3-000 entitled "Establishing Interregional Transfer Capability Transmission Planning and Cost Allocation Requirements"
 - c) Joint Operating Agreement with New York ISO (NYISO) and Joint Operating Agreement with Mid-Continent ISO (MISO)
 - i) Joint ISO/RTO Planning Committee (JIPC) activities pursuant to the PJM/NYISO/ISO-NE Northeast Planning Coordination Protocol
 - (1) Interregional Planning Stakeholder Advisory Committee (IPSAC) – Reliability Interconnection Queue and Market Efficiency Analysis
 - ii) Joint RTO Planning Committee (JRPC) activities pursuant to the MISO/PJM Joint Operating Agreement
 - (1) Interregional Planning Stakeholder Advisory Committee (IPSAC) – Reliability and Market Efficiency Analysis
 - d) Southeastern Regional Transmission Planning: (SERTP)

- i) Joint Operating Agreement with Duke Energy Progress (DEP)
- e) Joint Reliability Coordination Agreement between PJM and TVA and LGE/KU
- f) North Carolina Transmission Planning Collaborative (NCTPC) planning and data sharing agreement
- 2) North American Electric Reliability Corporation (NERC) and Eastern Interconnection Reliability Assessment Group (ERAG) related activities
 - i) SERC Reliability Corporation and associated committees and working groups
 - ii) RFC Reliability Corporation and associated committees and working groups

PJM Planning also coordinates with PJM Operations to review operational performance issues. In addition, sensitivity studies may be requested by stakeholders. Examples of these studies include:

Additional Studies

- Investigation of Safe Harbor operation real-time damping issue under normal and specific dispatch conditions.
- Investigation of Racine Hydro operation damping and stable issue.
- Verification of John H Kerr MOD26/MOD27 new model stability issue.
- Verification of Mitchell MOD26/MOD27 new model stability damping issue.
- Evaluation of Chesterfield #7 and #8 MOD26/MOD27 new model stable issue.
- Verification of Susquehanna oscillation issue with updated dynamic models using a Planning case.
- Critical clearing time calculation for a critical contingency at Montour station.
- Safe Harbor oscillation issue investigation.
- Hope Creek stability review for updated dynamic models.
- Verification of Tasley CT, Bayview Diesels potential instability issue.

The RTEP assesses the needs of the system, at peak load for year one, two, three, four and year five in the near term and over the longer term (up to 15 years) to identify baseline transmission enhancements that require more time to implement. Additionally, PJM evaluates an off peak load seasonal assessment for year five. PJM also is responsible for recommending the assignment of any transmission expansion costs to the appropriate parties. In order to carry out these responsibilities, it is necessary to establish a starting point or 'baseline' from which the need and responsibility for enhancements can be determined.

As the NERC registered Planning Coordinator, PJM is the responsible entity that coordinates and integrates transmission facility and service plans, resource plans, and protection systems for both the near term and longer term. The planned network upgrades required by the RTEP serve as a central repository for the BES related reliability plans of the individual PJM transmission owners. By integrating the individual plans into a single plan, the RTEP is able to provide a robust reliability plan for the PJM Bulk Electric System.

In order to establish the long term plan, PJM has defined the fifteen (15) year period from 2023 through 2038 as the 2023 "baseline" planning period. This assessment is inclusive of the previous years' baseline assessments, models, and required upgrades. As such, the existing system plus any planned modifications to the transmission system

including reactive resources that are scheduled to be in service prior to the 2028 summer peak period were chosen as the base system for the near-term assessment. This ensures the system as planned remains compliant with reliability standards. Appendix A represents a snapshot of all upgrades identified in RTEP evaluations prior to 2023. These identified upgrades, when added to the previously existing system, function as the base system for future models. In addition, assessments for delivery years prior to 2028 were updated with current assumptions to validate the on-going need for identified upgrades and to ensure continued compliance with reliability criteria.

For the 2023 RTEP cycle, PJM has studied 26 generator deactivation notifications resulting in over 5,400 MW of existing generation deactivating in 2023 or some point in the near term planning horizon. In order to establish a model which accurately included all expected generation retirements, PJM performed many sets of analysis to study the effects of these generation retirements on the system. Baseline transmission upgrades were identified as a result of these deactivations. The upgrades resulting from the deactivations were examined in the basecase before approving new RTEP upgrades for any of the standard RTEP analysis for the 2023 RTEP cycle. The scope of the deactivation notification analysis was significant and included a review of system impacts in years 2023 through 2028. The scope and results of the generation deactivation analysis is discussed in subsequent sections of this report.

All new generation and merchant transmission projects that executed an Interconnection Service Agreement were also included in this baseline system along with any associated transmission enhancements as identified in the System Impact Studies associated with those requests. Queued generation, merchant transmission, and firm transmission service is studied and subsequently included in the basecase for the New Services Queue studies. The process for these studies is detailed in PJM manual 14A and 14H. PJM manual 14B attachments A-I describe the analysis that is performed to ensure the reliability of new generation, merchant transmission, and firm transmission service. Any supplemental transmission enhancements independent of those associated with new generation or merchant transmission projects were also included. All firm transmission service currently committed for the period was represented.

PJM has conducted a comprehensive assessment of the ability of the PJM system to meet all applicable reliability planning criteria. The applicable reliability planning criteria are listed below:

- NERC Planning Standards
<http://www.nerc.com/pa/Stand/Pages/default.aspx>
- RFC Reliability Standards
<https://www.rfirst.org/compliance/standards/>
- SERC Reliability Corporation
<http://www.serc1.org/Application/HomePageView.aspx>
- PJM Reliability Planning Criteria as contained in PJM Regional Transmission Planning Process Manuals
<http://www.pjm.com/library/manuals.aspx>

- Transmission Owner Reliability Planning Criteria as filed in their respective FERC Form 715 filing
<http://www.pjm.com/planning/planning-criteria/to-planning-criteria.aspx>

In completing this assessment, PJM has documented all conditions where the system did not meet applicable reliability criteria and identified the system reinforcements required to bring the system into compliance along with estimated cost and lead-time to implement them.

Those areas that were found to not meet applicable reliability standards establish the need for reinforcement in those areas independent of any future interconnection projects not included in the baseline analysis. The resulting system with the identified reinforcements to bring the system into compliance, is expected to be used in evaluating the impact of the projects in queues AG2 and AH1 that qualify and elect to proceed with the system impact studies. The extent to which reinforcements identified in the baseline assessment are advanced, deferred, modified or eliminated will be used in determining cost responsibility for the final plans in the RTEP.

It should be recognized that the reinforcements identified in this baseline analysis may be modified, advanced, deferred or eliminated as a result of future system assumptions. Future assumptions include generation projects, merchant transmission projects, generation retirements, or transmission service being added to or removed from the system. The development of the RTEP for PJM is an ongoing process, which includes the conduct of system impact studies and development of plans to accommodate the new interconnection projects. Upon completion of the system impact studies some projects may elect not to proceed. When it is determined which projects will commit to proceed, PJM develops a new baseline RTEP to meet the needs of the region, including the accommodation of all new projects committed to connect, during the next 5 year period.

Key Findings

Inclusive of the baseline upgrades identified in the Results Section of this assessment, PJM assesses its system as being compliant with the thermal, voltage, reactive, short circuit, and stability requirements of all applicable standards including NERC Standard TPL-001-5.1 for both the near term and longer term. The results section of this assessment includes all planned upgrades needed to meet the performance requirements of Table 1 in each respective TPL standard throughout the planning horizon.

The reinforcements identified as part of the 2023 RTEP that are required to achieve compliance having an estimated cost of at least \$5 million are described below. The required in-service date of these upgrades is also included. A complete list of projects along with detailed descriptions of the conditions that are driving the need for them, are described in the Results section and Appendix A of this report. PJM staff from the Infrastructure Coordination group coordinates with the transmission owners and generation or merchant transmission developers to monitor project schedules for implementation of these reinforcements and coordinate any required outage activities to ensure these reinforcements are completed by their required in-service dates. The cost estimates below are based on those provided by the responsible entities and discussed at the monthly Transmission Expansion Advisory Committee (TEAC) and three Subregional RTEP Committee (SRRTEP) meetings during the calendar year.

PJM MID ATLANTIC

APS

- Construct New 230 kV Hunterstown-Carroll line (APS-PE Section). - 6/1/2027 - \$6.71M
- Expand Carroll 230 kV substation to ring bus. - 6/1/2027 - \$7.62M
- Rebuild the Germantown-Carroll 138 kV line to 230 kV double circuit construction (APS-PE Section). - 6/1/2027 - \$47.31M
- Reconfigure Doubs 500 kV station and upgrade terminal equipment to terminate new line. - 6/1/2027 - \$57.50M

BGE

- Batavia Road to Riverside 230 kV reconductor New rating: 1941 MVA SN / 2181 MVA SE - 6/1/2025 - \$21.00M
- Build Batavia Road substation.
- Add 4x 230 kV breaker bays. - 6/1/2025 - \$36.00M
- Build Granite substation + Statcom.
- New STATCOM rating: 350 MVAR
- Add 4x 230 kV breaker bays. - 6/1/2025 - \$91.00M
- Build new North Delta-High Ridge 500 kV line. (~59 miles). - 6/1/2027 - \$407.11M
- Build Solley Road substation + Statcom.
- New STATCOM rating: 350 MVAR
- Add 4x 230 kV breakers bays. - 6/1/2025 - \$109.00M
- Conastone-Brighton 500 kV (5011 circuit) - Replace terminal equipment limitations at Conastone 500 kV. - 6/1/2027 - \$7.16M
- Graceton 500 kV expansion
- Add 3x 500 kV breaker bays, 2x 500/230 kV auto transformer, 1x 500 kV caps.
- New transformer rating: 1559 MVA SN / 1940 MVA SE

- New capacitor rating: 250 MVAR - 6/1/2025 - \$82.00M
- Graceton to Batavia Road 230 kV double circuit pole line
- New rating: 1331 MVA SN/ 1594 MVA SE - 6/1/2025 - \$195.00M
- High Ridge - Install two 500/230 kV transformers. - 6/1/2027 - \$22.11M
- High Ridge 500 kV substation (cut into Brighton-Waugh Chapel 500 kV line) - Waugh Chapel side. - 6/1/2027 - \$33.67M
- High Ridge 500 kV substation (cut into Brighton-Waugh Chapel 500 kV line) - Brighton side. - 6/1/2027 - \$33.67M
- High Ridge termination for the North Delta-High Ridge 500 kV line. - 6/1/2027 - \$33.67M
- Install new Conastone capacitor.
- New capacitor rating: 350 MVAR - 6/1/2025 - \$15.00M
- New Otter Creek to Doubs 500 kV line (MD Border-PSEG Demarcation Point). Rebuild and expand existing ~1.6 miles of Otter Creek-Conastone 230 kV line to become a double-circuit 500 and 230 kV lines. - 6/1/2027 - \$11.11M
- Peach Bottom to Graceton (BGE) – transmission work
- New rating: 4503 MVA SN/ 5022 MVA SE - 6/1/2025 - \$17.00M
- Rebuild 5012 (existing Peach Bottom-Conastone) (new Graceton-Conastone) 500 kV line on single circuit structures within existing ROW and cut into North Delta 500 kV and Gracetone 500 kV stations. - 6/1/2027 - \$70.00M
- Rebuild 5012 (existing Peach Bottom-Conastone) (new North Delta-Graceton BGE) 500 kV line on single circuit structures within existing ROW and cut into North Delta 500 kV and Gracetone 500 kV stations. - 6/1/2027 - \$10.44M

DPL

- Reconductor Silver Run - Cedar Creek 230kV line. Reconductor 8.8 miles of 230 kV Circuit with 1594-T11/ACCR “Lapwing” conductor and replace all insulators with high temp hardware - 6/1/2028 - \$7.68M
- JCPL
- Remove the existing E83 line 115 kV (not in-service) to accommodate the new 500 kV/230 kV lines (~ 7.7 miles). - 12/31/2027 - \$8.47M
- Remove the existing H2008 Larrabee-Smithburg No. 2 230 kV to accommodate the new 500 kV/230 kV lines. - 12/31/2027 - \$8.47M

ME

- Break the existing TMI-Peach Bottom 500 kV line and reterminate into adjacent Otter Creek 500 kV Switchyard. - 6/1/2027 - \$7.03M
- Construct New 230 kV Hunterstown-Carroll line (MAIT section). - 6/1/2027 - \$17.37M
- Rebuild the Germantown-Carroll 138 kV line for 230 kV double circuit construction (MAIT). - 6/1/2027 - \$12.16M
- Rebuild the Germantown-Lincoln 115 kV line for 230 kV double circuit construction. - 6/1/2027 - \$30.10M
- Rebuild the Hunterstown-Lincoln 115 kV line for 230 kV double circuit construction. - 6/1/2027 - \$11.48M
- Reconductor Lincoln-Orrtanna 115 kV line. - 6/1/2027 - \$10.98M

PECO

- Build new North Delta-High Ridge 500 kV line. - 6/1/2027 - \$13.36M
- Cut-in 5012 Peach Bottom - Conastone 500kV line into North Delta 500/230kV substation by rebuilding 5012 between new terminal at Peach Bottom South and North Delta on single circuit structures and terminating at North Delta - 6/1/2025 - \$7.86M
- Peach Bottom North upgrades – substation work

- Add 3x 500 kV breakers to form a breaker-and-a-half bay. - 6/1/2025 - \$33.00M
- Peach Bottom to Graceton (PECO) – New 500 kV transmission line
- New rating: 4503 MVA SN/ 5022 MVA SE - 6/1/2025 - \$48.00M
- Rebuild 5012 (existing Peach Bottom-Conastone) (new North Delta-Graceton PECO) 500 kV line on single circuit structures within existing ROW and cut into North Delta 500 kV and Gracetone 500 kV stations. - 6/1/2027 - \$29.86M
- Build new Peach Bottom South-North Delta 500 kV line – cut in to Peach Bottom tie No. 1 and extending line to North Delta (~1.25 miles new ROW). - 6/1/2027 - \$5.50M
- North Delta 500 kV termination for the Rock Springs 500 kV line (5034/5014 line) (PECO work). - 6/1/2027 - \$10.20M

PENELEC

- Rebuild the North Meshoppen - Mehoopany #1 115 kV Line with 795 ACSR 26/7 STR conductor. Upgrade terminal equipment to exceed transmission line ratings. - 6/1/2028 - \$17.40M
- Rebuild the North Meshoppen - Mehoopany #2 115 kV Line using 795 ACSR 26/7 STR conductor and upgrade terminal equipment to exceed the transmission line rating - 6/1/2028 - \$17.70M

PEPCO

- Brighton Statcom and capacitor
- New STATCOM rating: 350 MVAR
- New capacitor rating: 350 MVAR - 6/1/2025 - \$63.00M
- Burchess Hill Cap
- New capacitor rating: 250 MVAR - 6/1/2025 - \$15.00M

PPL

- Build New Otter Creek 500 kV (Collinsville) - (switching station -Two bay three breaker configuration). - 6/1/2027 - \$32.76M
- New Otter Creek (Collinsville) to Doubs 500 kV line (Otter Creek 500 kV - MD Border). Rebuild and expand existing ~12 miles of Otter Creek-Conastone 230 kV line to become a double-circuit 500 and 230 kV lines. - 6/1/2027 - \$83.30M

PSEG

- Construct 38 miles of 500 kV overhead AC line between the Conastone vicinity and the Doubs substations (BGE zone portion). - 6/1/2027 - \$213.20M
- Construct 31.5 miles of 500 kV overhead AC line between the Conastone vicinity and the Doubs substations (APS zone portion). - 6/1/2027 - \$176.80M

PJM SOUTH

APS

- Doubs substation work - Re-terminate the rebuilt Doubs-Goose Creek 500 kV line in its existing bay, Terminate the new Doubs-Aspen 500 kV line in the open bay at Doubs, Replace three 500 kV breakers, Replace 500 kV terminal equipment including disconnect switches, CTs and substation conductor & Replace relaying. (APS Portion) - 6/1/2027 - \$31.70M
- New Doubs to Aspen 500 kV line - Aspen substation is not yet constructed but is a component in Dominion's proposal 2022-W3-692. (APS Portion) - 6/1/2027 - \$68.80M

- Rebuild 500 kV line No. 514 from Doubs-Goose Creek 500 kV line. The Doubs-Goose Creek 500 kV line will be rebuilt (APS Portion) - 6/1/2027 - \$103.27M
- Rebuild the Dickerson-Aqueduct 230 kV line. This will be underbuilt on the new Doubs-Aspen 500 kV line. (APS Portion) - 6/1/2027 - \$6.80M
- Rebuild the Doubs-Aqueduct 230 kV line. This will be underbuilt on the new Doubs-Aspen 500 kV line. (APS Portion) - 6/1/2027 - \$11.35M
- Rebuild the Doubs-Dickerson 230 kV line. This will be underbuilt on the new Doubs-Goose Creek 500 kV line. (APS Portion) - 6/1/2027 - \$13.04M

Dominion

- Aspen substation work to terminate new NextEra 500 kV line. Include Aspen 500 kV substation portion build. - 6/1/2027 - \$30.49M
- Build a new 230 kV line from Aspen-Sycolin Creek on 500/230 kV double circuit structures to achieve a summer rating of 1573 MVA. Install 230 kV equipment at Golden and Sycolin Creek. - 6/1/2027 - \$60.42M
- Build a new 230 kV line from Lockridge-Golden on 500/230 kV double circuit structures to achieve a summer rating of 1573 MVA. Install 230 kV equipment at Golden and Lockridge. - 6/1/2027 - \$56.93M
- Build a new 230 kV line from Mars-Lockridge on 500/230 kV double circuit structures to achieve a summer rating of 1573 MVA. Install 230 kV equipment at Mars and Lockridge. - 6/1/2027 - \$57.95M
- Build a new 230 kV line from Sycolin Creek-Golden on 500/230 kV double circuit structures to achieve a summer rating of 1573 MVA. Install 230 kV equipment at Golden and Sycolin Creek. - 6/1/2027 - \$69.84M
- Build a new 500 kV line from Aspen-Doubs using double circuit 500/230 kV structures. The 230 kV line is from Pleasant View-structure 203/15. Install terminal equipment at Aspen for a 5000A line to Doubs (First Energy). This includes GIS breakers, GIS-to-AIS transition equipment, and metering CCVTs and CTs for the tie line. - 6/1/2027 - \$41.68M
- Build a new 500 kV line from Aspen-Golden on 500/230 kV double circuit structures with substation upgrades at Aspen and Golden. New conductor to have a minimum summer normal rating of 4357MVA. - 6/1/2027 - \$176.02M
- Build a new 500 kV line from Aspen-Goose Creek to achieve a summer rating of 4357 MVA. Install new 500 kV terminal equipment at Aspen. - 6/1/2027 - \$38.53M
- Build a new 500 kV line from Mars-Golden on 500/230 kV double circuit structures with substation upgrades at Golden and Mars. New conductor to have a minimum summer normal rating of 4357 MVA. - 6/1/2027 - \$228.04M
- Build a new 500 kV line from Morrisville to Vint Hill. New conductor to have a summer rating of 4357 MVA. Line length is approximately 19.71 miles. - 6/1/2027 - \$101.89M
- Build a new 500 kV line from Vint Hill to Wishing Star. The line will be supported on single circuit monopoles. New conductor to have a summer rating of 4357 MVA. Line length is approximately 16.59

miles. - 6/1/2027 - \$87.81M

- Cut 230 kV line No. 2081 Sterling Park-Paragon Park Circuit 2 into Golden substation and install 230 kV equipment at Golden. Upgrade relay settings at Golden substation for upgrading 230 kV line No. 2081 to 4000A continuous current rating. - 6/1/2027 - \$57.62M
- Cut 230 kV line No. 2150 Sterling Park-Paragon Park Circuit 1 into Golden substation and install 230 kV equipment at Golden. Upgrade relay settings at Golden substation for upgrading 230 kV line No. 2150 to 4000A continuous current rating. - 6/1/2027 - \$57.62M
- Cut 500 kV line No. 558 Brambleton-Goose Creek into Aspen substation. Upgrade 500 kV terminal equipment at Aspen and Goose Creek to 5000A continuous rating current. At Goose Creek, replace circuit breakers 59582 and 55882, and associated disconnect switches, breaker leads, bus, and line risers to accommodate 5000A rating. - 6/1/2027 - \$50.12M
- Cut existing 230 kV line #2183 and extend from Poland Road substation to Evergreen Mills substation. Approximately 0.59 miles of new line will be built from the cut-in to the Evergreen Mills substation. Cut and extend the existing 230 kV line #2183 creating a new line #2210 from Brambleton substation to be terminated at Evergreen Mills substation. Approximately 0.59 miles of new line will be built from the cut-in to the Evergreen Mills substation. - 6/1/2027 - \$7.71M
- Install (1) 500-230 kV transformer bank at Aspen substation. - 6/1/2027 - \$42.00M
- Install a 2nd 500-230 kV 1440MVA transformer at Mars substation. - 6/1/2027 - \$42.19M
- Install one (1) 230 kV, 150MVAR Shunt Capacitor Bank & associated equipment at Mars substation. - 6/1/2027 - \$5.26M
- Install one (1) 230 kV, 150MVAR Shunt Capacitor Bank & associated equipment at Wishing Star substation. - 6/1/2027 - \$6.09M
- Install one (1) 300 MVAR Static synchronous Compensator (STATCOM) & associated equipment at Beaumeade substation. - 6/1/2027 - \$43.57M
- Install one (1) 500 kV, 300 MVAR Static synchronous Compensator (STATCOM) & associated equipment at Mars substation. - 6/1/2027 - \$41.27M
- Install terminal equipment at Vint Hill substation to support a 5000A line to Morrisville. Update relay settings for 230 kV lines No. 2101, No. 2163, and 500 kV line No. 535. - 6/1/2027 - \$23.64M
- Install terminal equipment at Wishing Star substation to support a 5000A line to Vint Hill. Update relay settings for 500 kV lines No. 546 and No. 590. - 6/1/2027 - \$12.30M
- Install two 500-230 kV transformer banks at Golden substation. - 6/1/2027 - \$70.00M
- Rebuild 230 kV line No. 2054 Charlottesville-Proffit DP using double-circuit capable 500/230 kV poles. (The 500 kV circuit will not be wired as part of this project). - 6/1/2027 - \$70.14M
- Rebuild 230 kV line No. 2135 Cash's Corner-Gordonsville using double-circuit capable 500/230 kV poles. New conductor has a summer rating of 1573 MVA. (The 500 kV circuit will not be wired as part of this project). - 6/1/2027 - \$21.51M
- Rebuild 230 kV line No. 2135 Hollymeade Junction-Cash's Corner using double-circuit capable 500/230 kV

- poles. New conductor has a summer rating of 1573 MVA. (The 500 kV circuit will not be wired as part of this project). - 6/1/2027 - \$32.45M
- Rebuild 230 kV line No. 233 Charlottesville-Hydraulic Rd-Barracks Road-Crozet-Dooms. - 6/1/2027 - \$54.54M
 - Rebuild 230 kV line No. 291 segment Crozet-Dooms. - 6/1/2027 - \$11.23M
 - Rebuild 230 kV line No. 291 segment from Barracks Road-Crozet. - 6/1/2027 - \$20.81M
 - Rebuild 230 kV line No. 291 segment from Charlottesville-Barracks Road. - 6/1/2027 - \$22.50M
 - Rebuild 500 kV line No. 514 from Goose Creek-Doubs using 500/230 kV double circuit structures. The new double circuit towers will accommodate 230 kV line No. 2098 between Pleasant View substation and structure 2098/9. Upgrade equipment at Goose Creek to 5000A continuous current rating in support of line No. 514 wreck and rebuild. Replace circuit breakers 514T595 & 51482 and associated disconnect switches, breaker leads, bus, and line risers to accommodate 5000A rating. - 6/1/2027 - \$16.11M
 - Rebuild 500 kV line No. 545 Bristers-Morrisville as a single circuit monopole line to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 4357 MVA. - 6/1/2027 - \$65.86M
 - Rebuild 500 kV line No. 569 Loudoun-Morrisville to accommodate the new 500 kV line in the existing right-of-way. New conductor to have a summer rating of 4357 MVA. - 6/1/2027 - \$175.62M
 - Rebuild approximately 0.48 miles of line No. 2176 Heathcote-Gainesville to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. - 6/1/2027 - \$8.78M
 - Rebuild approximately 1.11 miles of line No. 2222 Rollins Ford-Gainesville to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. - 6/1/2027 - \$13.17M
 - Rebuild approximately 1.65 miles of line No. 183 Bristers-Ox to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. - 6/1/2027 - \$8.78M
 - Rebuild approximately 10.09 miles of 230 kV line No. 2114 Vint Hill-Elk Run to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. - 6/1/2027 - \$13.21M
 - Rebuild approximately 10.29 miles line segment of line No. 535 (Meadow Brook to Loudoun) to accommodate the new 500 kV line in the existing ROW. - 6/1/2027 - \$65.86M
 - Rebuild approximately 2.88 miles of 230 kV line No. 2140 Catharpin-Loudoun to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. - 6/1/2027 - \$6.92M
 - Rebuild approximately 3.69 miles of 230 kV line No. 2094 Racefield-Loudoun to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. - 6/1/2027 - \$13.20M
 - Rebuild approximately 4.14 miles of 230 kV line No. 2163 Vint Hill-Liberty to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. - 6/1/2027 - \$17.56M
 - Rebuild approximately 4.2 miles of 230 kV line No. 2045 Loudoun-North Star to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. - 6/1/2027 -

\$14.52M

- Rebuild approximately 4.43 miles of 230 kV line No. 2140 Heathcote-Catharpin to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. - 6/1/2027 - \$10.64M
- Rebuild approximately 4.59 miles of 500 kV line No. 590 Mosby-Wishing Star to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 4357 MVA. Upgrade and install equipment at Mosby substation to upgrade terminal equipment to be rated for 5000A for 500 kV lines No. 590. - 6/1/2027 - \$49.79M
- Rebuild approximately 4.83 miles of 500 kV line No. 546 Mosby-Wishing Star to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 4357 MVA. Upgrade and install equipment at Mosby substation to upgrade terminal equipment to be rated for 5000A for 500 kV lines No. 546. - 6/1/2027 - \$49.79M
- Rebuild approximately 6.17 miles of 230 kV line No. 2030 Gainesville-Mint Springs to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. - 6/1/2027 - \$13.98M
- Rebuild approximately 9.16 miles of 230 kV line No. 2101 Bristers-Nokesville to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA. - 6/1/2027 - \$12.99M
- Reconductor 0.67 miles of 230 kV circuits 2194 and 9231 from Davis Drive to Sterling Park substation. Terminal equipment at remote end substations will be installed or upgraded to 4000A continuous current rating to support new conductor ratings. - 6/1/2027 - \$5.53M
- Reconductor 1.47 miles of 230 kV circuits 2081 and 2150 from Sterling Park to Golden substation. Upgrade terminal equipment at Sterling Park to 4000A continuous current. - 6/1/2027 - \$7.97M
- Reconductor approximately 5.30 miles of 230 kV line No. 256 from Ladysmith CT to structure 256/107 to achieve a summer rating of 1573 MVA. Terminal equipment at remote end substations will be upgraded to 4000A. - 6/1/2028 - \$16.14M
- Replace Brambleton 230 kV breakers 20102, 20602, 204502, 209402, 201T2045, 206T2094 with breakers rated 80 kA. - 6/1/2027 - \$9.38M
- Replace Loudoun 230 kV breakers 204552, 217352 with breakers rated 80 kA. - 6/1/2027 - \$5.57M
- Replace Loudoun 230kV breakers 204552, 217352 with a breakers rated 80kA - - \$5.57M
- Replace Ox 230 kV breakers 22042, 24342, 24842, 220T2063, 243T2097, 248T2013, H342 with breakers rated 80 kA. - 6/1/2027 - \$9.02M
- Replace Ox 230kV breakers 22042, 24342, 24842, 220T2063, 243T2097, 248T2013, H342 with a breakers rated 80kA - - \$9.02M
- Replace single unit Locks 230/115 kV 168MVA transformer TX No. 7 with new single unit transformer with a rating of 224 MVA. Lead lines at the 115 kV level will be upgraded to 2000A. - 6/1/2027 - \$7.14M
- Upgrade and install equipment at Bristers substation to support the new conductor 5000A rating for 500 kV

line No. 545. - 6/1/2027 - \$5.72M

- Upgrade and install equipment at Loudoun substation to support the new conductor 5000A rating for 500 kV line No. 569 Loudoun-Morrisville. - 6/1/2027 - \$10.70M
- Upgrade and install equipment at Morrisville substation to support the new 500 kV conductor termination. All terminal equipment to be rated for 5000 A for 500 kV line No. 545 & No. 569. Upgrade 500 kV bus 2 to 5000 A. - 6/1/2027 - \$17.54M
- Wreck and rebuild 230 kV line No. 203 between Pleasant View and structure 203/15 using double circuit 500/230 kV structures. The 500 kV line is from Aspen-Doubs. - 6/1/2027 - \$6.87M
- Wreck and rebuild approximately 7.14 miles of 230 kV line No. 256 from St. Johns to structure 256/108 to achieve a summer rating of 1573 MVA. line switch 25666 at St. Johns to be upgraded to 4000A. - 6/1/2028 - \$21.75M
- Wreck and rebuild line No. 2090 Ladysmith CT- Summit D.P. segment as a double circuit 230 kV line to achieve a summer rating of 1573 MVA. Only one circuit will be wired at this stage. Upgrade circuit breaker leads, switches and line leads at Ladysmith CT to 4000A - 6/1/2027 - \$36.50M

PEPCO

- Rebuild 7.26 miles of existing 230 kV circuit from Dickerson Station H to Ed's Ferry area to accommodate the new 500 kV circuit between Doubs and Aspen. (The 230 kV portion of the project) - 6/1/2027 - \$18.60M
- Rebuild 7.26 miles of existing 230 kV circuit from Dickerson Station H to Ed's Ferry area to accommodate the new 500 kV circuit between Doubs and Aspen. (the 500 kV portion of the work) - 6/1/2027 - \$37.20M
- Reconfigure Dickerson H 230 kV substation and upgrade terminal equipment. - 6/1/2027 - \$10.58M

PJM WEST

AEP

- Establish a new 500 kV breaker position for the low-side of the existing 765/500 kV transformer at Cloverdale Station. The new position will be between two new 500 kV circuit breakers located in a new breaker string, electrically converting the 500 kV yard to "double-bus double-breaker" configuration. - 6/1/2027 - \$11.59M
- Rebuild approximately 1.7 miles of line on the Chemical - Washington Street 46 kV circuit - 6/1/2028 - \$7.60M

APS

- 502 Junction substation two 500 kV circuit breaker expansion. - 6/1/2027 - \$30.60M
- Construct the Woodside-Stonewall 138 kV No. 1 line. - 6/1/2027 - \$6.28M
- Construct the Woodside-Stonewall 138 kV No. 2 line. - 6/1/2027 - \$6.31M

- Rebuild ~15 miles of the Stonewall-Millville 138 kV line with 500 kV overbuild (502 Jct to Woodside 500 kV line section). - 6/1/2027 - \$136.93M
- Rebuild ~16 miles of the Gore-Stonewall 138 kV line with 500 kV overbuild (502 Jct to Woodside 500 kV line section). - 6/1/2027 - \$151.72M
- Rebuild ~6 miles of the Millville-Doubs 138 kV line with 500 kV overbuild (502 Jct to Woodside 500 kV line section). - 6/1/2027 - \$52.35M
- Replace Doubs 500 kV breaker DL-55 522LIN with a breaker rated 60 kA. - 6/1/2027 - \$10.01M
- Replace Doubs 500kV breaker DL-55 522LIN with a breaker rated 80kA - - \$10.01M
- Stonewall 138 kV substation two 138kV breaker expansion. - 6/1/2027 - \$8.30M

ATSI

- A 69 kV, 60 MVAR Shunt Reactor will be installed at the Salt Springs Substation. The reactor terminal will be connected to the existing 69 kV bus and an independent-pole operation, 1200 A circuit breaker will be installed for reactor switching. - 6/1/2028 - \$5.45M

ComEd

- Rebuild 12.7 miles of 345 kV double circuit extending from Crete to E. Frankfort with twin bundled 1277 ACAR conductor. - 12/1/2026 - \$42.28M
- Rebuild ComEd's section of 345 kV double circuit in IL from St. John to Crete (5 miles) with twin bundled 1277 ACAR conductor. - 12/1/2026 - \$16.64M

Dominion

- Line work for terminating Doubs to Bismark line into Woodside 500 kV substation. (DOM Portion) - 6/1/2027 - \$5.10M

NEET

- New 500 kV line from existing 502 Junction substation to Woodside 500 KV substation (bypass Black Oak) (NEET Portion). - 6/1/2027 - \$315.64M
- New 500 kV transmission line from Woodside substation to Aspen substation (in DOM zone). (NEET Portion) - 6/1/2027 - \$71.72M
- Two 150 MVAR Cap banks and one +500/-300 MVAR STATCOM at Woodside 500 kV substation. - 6/1/2027 - \$44.22M
- Two 500/138 kV transformers at Woodside 500 kV substation. - 6/1/2027 - \$33.68M
- Woodside 500 kV substation (Except terminations, Transformer, Cap Banks and Statcom). - 6/1/2027 - \$43.96M

Objective and Scope

The objectives of this assessment were as follows:

- a) To identify system reinforcements as required to ensure compliance with NERC standards TPL-001-5.1.
- b) To identify areas where the system as planned for the near term period 2023 through 2028 would not meet applicable reliability standards.
- c) To develop and recommend preliminary facility expansion plans, including cost estimates and required in service dates, to ensure all areas meet applicable reliability criteria.
- d) To identify areas where the system as planned for the longer term period 2029 through 2038 that would not meet applicable reliability criteria, and where appropriate, develop expansion plans. These plans include required in service dates of the facilities needed to bring those areas into compliance. This longer term planning is in consideration of larger scope projects that may require long lead time to implement.
- e) To establish what will be included as baseline expansion costs for the allocation of the costs of expansion for those projects included in New Services Queues.

The scope of this assessment included analysis for the period 2023 through 2038 to ensure the system would meet all applicable reliability planning criteria. These assessments include baseline thermal, baseline voltage, thermal and voltage Load Deliverability, generation deliverability, and baseline stability analysis. The baseline thermal and voltage analysis encompasses an exhaustive analysis of all BES facilities for compliance with NERC P0 – P7 (TPL-001-5.1) events. In addition, consistent with NERC standard TPL-001-5.1, a number of extreme events as defined in Table 1 of TPL-001-5.1 were evaluated for risk and consequences to the system. Results of this study are not documented in this report due to their sensitive nature, and can be found in the 2023 Extreme Event Report.

The PJM Load Deliverability testing methods are described in Manual 14B, section 2. The tests ensure that an area of the transmission system that is experiencing higher than normal load levels (90/10) with higher than normal internal generation unavailability has the transmission capability to import energy to meet the transmission system reliability criteria. The generation deliverability testing ensures sufficient transmission capability so that generation can be ramped to full output so that excess energy can be exported to an area that is experiencing a capacity deficiency. PJM also performed a stability analysis consistent with NERC and local transmission owner criteria to ensure the system is stable for critical system conditions including fault conditions that include multi-phase faults and faults with delayed clearing and light load conditions.

Analytical testing is performed annually on a range of study years and system conditions to satisfy NERC standards. Every year analysis is performed on the 5 year out case, while the other nearer term cases (years 0 through 4) are retooled to be studied for specific projects as changes to system conditions warrant. Additional analysis is also performed for the longer term to identify marginal conditions that may require long lead time solutions. Currently, as part of the RTEP a year 7 or year 8 case is studied in detail as part of the annual RTEP. During the 2023 RTEP, a year 7 (2030 study year) was studied.

PJM Generator Deliverability testing, which simulates higher than normal generation availability in an area, is performed at 50/50 load levels. PJM Load Deliverability testing, which is performed on 27 Locational Deliverability Areas (LDA's) within PJM's footprint, simulates an internal generation deficiency within the LDA (which simulates

higher than expected forced outage conditions) being tested with the area at 90/10 load levels. Single and multiple contingency analyses were also performed on a shoulder peak case as described in subsequent sections of this document.

The combination of these tests includes simulation of various system conditions over a range of forecast system demands and generation availability scenarios that simulate planned and forced outage conditions. This analysis is performed for both the near term and longer term.

The continued need for the system reinforcements previously identified in prior RTEP Baseline Assessment Reports and the queue A through AG1 System Impact Studies associated with projects that have executed an Interconnection Service Agreement were evaluated. Any previously identified reinforcements that are no longer required were documented and removed from the list of RTEP Reinforcements. PJM adjusts required in-service dates based on updated forecasts that can affect the modeling of the system conditions. In the event that changing system conditions delay the need for a baseline upgrade beyond the 5 year planning horizon, PJM will re-evaluate the need for that upgrade. When evaluating the continued need for previous reinforcements, analysis is performed to test for system performance associated with all applicable reliability criteria including that specified under all event categories listed in Table 1 of TPL-001-5.1.

Analysis methodology

PJM completed a robust series of analysis over a broad spectrum of system conditions encompassing a range of study years and forecast demand levels. The following sections detail the assumptions of the modeling and analysis. The analysis sub-sections are grouped by the analysis type. The modeling assumptions of the 2028 cases and analysis are discussed in detail. The modeling assumptions for the retool cases are not discussed in detail but followed the same procedure as the 2028 case, which can be found in PJM Manual 14B, Attachment H. The modeling assumptions of all of the cases follow the procedure in PJM Manual 14B, Attachment B. All study year cases model all normal (NERC TPL P0) operating procedures in place. PJM Manual 3 – Transmission Operations contains all PJM operating procedures that are applicable to PJM planning studies.

Analysis Type	NERC Contingency Category from Table 1 of TPL Standard	Applicable Limits Monitored	Monitored Elements	Contingencies Considered
Normal System (no contingency)	P0	All System Operating Limits, including the most limiting thermal, voltage limit (magnitude and deviation), voltage collapse	All BES & select lower voltage facilities, all ties to neighboring systems regardless of voltage	Normal system, All BES & select lower voltage facilities. N-1-1 considers all possible combinations of single contingencies
Single Contingency	P1, P2			
Multiple Contingency	P3, P4, P5, P6, P7			
Load Deliverability	P1			
Light Load Reliability Analysis	P0, P1, P2, P4, P5, P7			
Winter Reliability Analysis	P0, P1, P2, P3, P4, P5, P6, P7			
N-1-1 Analysis	P3, P6			
Generation Deliverability	P1	thermal, voltage collapse		
Common Mode Outage Procedure	P2, P4, P7			

Table 3. Analysis Type Summary

Modeling Assumptions & Critical System Conditions

PJM selected a range of forecast demand levels for the year 2028.

- 2028 90/10 Summer Peak
- 2028 50/50 Summer Peak
- 2028 Light Load Reliability Analysis (50% of 50/50 Summer Peak)
- 2028 Winter Reliability Analysis

In addition to the analysis of the 2028 system, as part of this assessment, PJM also performed analysis of multiple critical system conditions in the near term and longer term planning horizons. The assessments of the critical system conditions within these study years will be discussed in subsequent sections of this document.

In 2023, PJM continued its effort in pursuing modifications to the RTEP process generator deliverability methodology, as initiated in 2021 with PJM stakeholders in the Planning Committee, to improve variable resource modeling and

consistency with operations. PJM is pursuing Figure 1.8: Generator Deliverability Concept such modifications in order to more accurately reflect the emerging resource mix under summer, light load and winter operating conditions. PJM's existing generator deliverability test does not dispatch generation in the same way as PJM's real-time operations, and therefore does not accurately reflect the behavior of PJM's rapidly evolving resource mix. Instead of dispatching generation in merit order (by least cost), the existing test relies on historic capacity factors to derate all generation. PJM's updated testing methodology, implemented starting in 2023, will include a new dispatch approach that better aligns with how operations dispatches units based on economic conditions. With this new approach, Locational Deliverability Area imports will be limited to their Capacity Emergency Transfer Objective in the base case. Additionally, only firm interchange will be modeled in the base case, with separate, simplified procedures for performing historical interchange sensitivity analysis.

In 2023, PJM has updated Manual 14B languages for the light-load period for planning studies. The published line and transformer daytime thermal ratings at ambient temperatures of 50F (10C) winter, 95F (35C) summer and 59F (15C) light load will be used as the default rating sets for all facilities. PJM will apply alternate Transmission Owner ambient temperature rating sets wherever variations exist.

The load forecast from the 2023 PJM Load Forecast Report was used and can be found on the PJM website at the following address:

<https://www.pjm.com/-/media/library/reports-notice/load-forecast/2023-load-report.ashx>

The 2028 summer peak analysis used the 2028 summer model from the 2022 series MMWG (Multiregional Model Working Group) case. The model was updated according to the procedures in PJM Manual 14B, Attachment H. The case build is a collaborative process that involves PJM, PJM transmission owners, and neighboring entities. The case was reviewed with all PJM transmission owners to ensure that all existing and planned facilities were modeled. All future transmission upgrades with a required in-service date up to and including June 1, 2028 were modeled as in service. The list of future upgrades along with a schedule for implementation is contained in Appendix A.

All existing generation was modeled in the base case. Future generation that had an executed Interconnection Service Agreement (ISA) was modeled along with any upgrades required to maintain the reliability of the PJM system including the future generation. Future merchant transmission facilities that had an executed Interconnection Service Agreement (ISA) or Wholesale Market Participation Agreement (WMPA) were modeled along with any upgrades required to maintain the reliability of the PJM system including the future merchant transmission. Information regarding all of these projects can be found on the PJM website at the address below.

<https://www.pjm.com/planning/service-requests/services-request-status>

Adequate Reactive Power resources were included in the base model to ensure system voltage performance. Some of the reactive power resources modeled are existing and in-service equipment while some are planned with a future implementation date. A list of the planned reactive upgrades along with a schedule for implementation is contained in

Appendix A. Table 4 below is a summary of the reactive power resources included in the 2028 case (note these are in addition to the reactive power associated with the generation noted above).

2028			
Area Name	Static	Dynamic	Total
AE	944	450	1394
AEP	14057	650	14707
AP	6806	2260	9066
BGE	6744	350	7094
CE	10501	1500	12001
DAY	1084	0	1084
DEO&K	846	0	846
DLCO	-110	0	-110
DP&L	1365	375	1740
DVP	15129	2350	17479
EKPC	1332	0	1332
FE	7232	1514	8746
JCPL	4031	40	4071
METED	1233	500	1733
PECO	5417	600	6017
PENELEC	2731	1174	3905
PEPCO	1905	350	2255
PJM*	0	0	0
PPL	3172	0	3172
PSEG	7279	0	7279
RECO	0	0	0
UGI	66	0	66
Grand Total	91764	12113	103876

Table 4. Reactive Power Resources in base case Static MVAR: Capacitor Banks, Switched Shunts; Dynamic MVAR: SVCs, Synchronous Condensers, and Dynamic Switched Shunts.

The interchange targets in Table 5 below represents the net sum of all existing and planned yearly long-term firm transmission service commitments between PJM and neighboring systems for the 2028 summer period. A 2028, 2022 Series, MMWG case was used as a starting point for the modeling, all PJM firm transactions were included in the RTEP base case modeling. The base dispatch is set as defined in PJM Manual 14B, Attachment B.

2028 RTEP Interchange		
Source	Sink	Total (MW)
PJM	NYISO	817
PJM	LGEE	-484
PJM	DEI	410
PJM	WEC	94
PJM	LAGN	500
PJM	CPLE	105
PJM	DUK	-100
PJM	TVA	250
PJM	AMIL	-375
PJM	MEC	454
PJM	SMT	-285
Total		1386

Table 5. **Net Yearly Long Term Firm Interchange**

In all cases, where the physical design of connections or breaker arrangements resulted in the outage of more than the faulted facility when the fault was cleared, the additional facilities were also outaged in the load flow. That is, the breaker arrangements and system topology are used to develop and maintain the contingency files. For example, if a transformer is tapped off a line without a breaker, both the line and transformer were outaged as a single contingency event.

In addition, approved operating procedures were utilized as applicable. These operating procedures include the use of control devices such as Phase Angle Regulators (PARs) to manage flows on the system. Also, the expected operation of Remedial Action Schemes (RAS) were modeled and additionally tested where applicable. A complete listing of applicable remedial action schemes and operating procedures can be found in the Transmission Operation Manual (M-03) at the following link:

<https://www.pjm.com/library/manuals.aspx>

Contingencies Considered

The thermal and voltage analysis used a set of contingencies as required by NERC TPL standards. PJM's rationale was to define and select a comprehensive set that includes every possible BES contingency. Every possible single and multiple contingency loss of PJM BES elements as described in Table 1 of NERC TPL-001-5.1 was defined in contingency files and included in the assessment. No single or multiple BES contingencies were excluded from this assessment. The contingency set also included an inclusive set of single contingencies of non-BES elements that are modeled in the base case. A set of multiple facility contingencies involving non-BES facilities was included in the contingency set. A complete set of multiple facility contingencies involving non-BES facilities was not included in the contingency set given that issues on non-BES facilities are not expected to propagate to the BES system.

Contingency analysis takes into account the removal of all elements that the protection system and other automatic controls are expected to disconnect without operator intervention. This includes tripping of generators and transmission elements when protection equipment may exceed its performance capabilities.

In addition to the contingencies studied within PJM's footprint, analysis includes contingencies located in areas outside of PJM's footprint. PJM worked with its neighboring ISO's and RTO's to identify off-system contingencies that could affect PJM's system. All contingencies identified by these entities have been included in PJM's RTEP analysis.

- Over 14,000 Single contingencies were defined, including contingencies involving the loss of facilities in neighboring systems.
- Over 31,000 Multiple Facility Contingencies were defined, including contingencies involving the loss of facilities in neighboring systems.
- The N-1-1 analysis considers every possible combination of single contingencies, a total of over 190,000,000 combinations.

Planned Outages in the Transmission Planning Horizon

Although there are situations in which outages are planned and scheduled more than 12 months in advance, more often outages are submitted no more than one year in advance of the planned outage. Most maintenance plans are developed, and therefore the associated outages are planned with less lead time. In cases where outages are scheduled less than one year out, the lead time makes it impractical for inclusion in planning studies under the TPL timeframe. Outages planned with a lead time of less than one year are evaluated by PJM Operations.

PJM performed analysis as per TPL-001-5.1 of known outages in the planning horizon by utilizing a documented technical rationale for their selection. For the steady state portion (Requirement 2.1.4), analysis consisted of studying outages of 5 days or greater and on facilities 230 kV and above as reported through PJM's outage coordination software (eDART). For the stability portion (Requirement 2.4.4), analysis consisted of studying outages within eDART that also had the 'stability' or 'TSA Stability Study' flag set which identifies stability-related facilities. Results of the analysis are documented in the "2023 RTEP Maintenance Outage Analysis_TPL-001-5_Final_December.docx" report. The report was sent to PJM Operations for review and situational awareness.

Spare Equipment

In instances where an entity's spare equipment strategy could result in the unavailability of major Transmission equipment that has a lead time of one year or more (such as a transformer), PJM studies the impact of this possible unavailability on system performance. Annually, PJM solicits input from its Transmission Owners to identify long lead time equipment for subsequent study. Steady state analysis (Requirement 2.1.5) is conducted for the P0, P1 and P2 categories and stability analysis (Requirement 2.4.5) is conducted for the P1 and P2 categories defined in Table 1 of TPL-001-5.1 with the conditions that the system is expected to experience during the possible unavailability of the long lead time equipment. Results of the analysis are documented in the "2023 RTEP Spare Equipment Strategy Analysis_TPL_001-5_Final.docx" report.

Monitored Facilities

All cases used for this assessment model all PJM Bulk Electric System facilities. The specific facilities monitored for each analysis is described in detail in subsequent sections of this document. PJM also monitored every tie line to neighboring systems regardless of voltage. Over 20,000 individually modeled BES facilities are monitored in the analysis that supports this assessment. In addition to all BES elements, PJM monitors lower voltage, non-BES, facilities that are monitored by PJM operations. As part of the 2023 RTEP, PJM expanded its monitored facility list to include BES facilities in the MISO, NYISO and other external TO's footprint. PJM also completed several joint studies of neighboring systems as described in the scope contained in the Executive Summary above.

Analysis of Near-Term

As part of the near-term assessment, PJM evaluated a range of critical system conditions. The range of system conditions included thermal and voltage analysis of a 2028 90/10 summer peak scenario, thermal and voltage analysis of a 2028 50/50 summer peak scenario, and thermal and voltage analysis of a light load scenario. The thermal analysis included applicable thermal limit checking. The voltage limit analysis included checking applicable voltage magnitude and voltage drop limits. PV analysis is an important part of the RTEP analysis and is performed for selected scenarios. The methodology for selecting the PV scenarios is discussed in a subsequent section of this document.

Analysis is performed for planning events listed in Table 1 of TPL-001-5.1 to ensure that all performance requirements are met, or upgrades to the system are implemented to address required performance issues.

The forecast demand level, analysis type, and mapping to TPL standards are summarized in tables in this section. In addition, a summary of the analysis type, contingencies considered, monitored elements, and monitored limits are summarized in the Analysis Methodology Section. Stability tests are detailed in a subsequent section of this document.

Normal System (All Facilities in Service) Analysis

The 2028 90/10 summer peak, 50/50 summer peak, light load and shoulder peak cases were evaluated for system performance under normal conditions. These models use data consistent with information provided in MOD-032 and MOD-033 standards. The normal system analysis as defined in P0 on Table 1 of NERC TPL-001-5.1 does not include a contingency event. Rather, all facilities are assumed to be in-service. Every BES facility and select lower voltage facilities in PJM were monitored for thermal limits, voltage limits, and voltage stability. Reinforcements were

developed for areas where the system exceeded applicable thermal limits, voltage limits, or became unstable. The reinforcements, along with a schedule for implementation, are contained in the results section of this document.

Single Contingency Analysis

The 2028 50/50 summer peak, 90/10 summer peak and light load cases were evaluated for system performance following the loss of a single element. The single elements included all of the P1 and P2 events defined on Table 1 of NERC TPL-001-5.1. Every BES facility and select lower voltage facilities were monitored for thermal limits, voltage limits, and voltage collapse. Additionally, select off-system contingencies which may affect PJM's system were included in the single contingency analysis. Reinforcements were developed for areas where the system exceeded applicable thermal limits, voltage limits, or became unstable. The reinforcements, along with a schedule for implementation, are contained in the results section of this document.

Common Mode Contingency Analysis

The 2028 50/50 summer peak and light load cases were evaluated for system performance following the loss of two or more (multiple) elements. The multiple elements included all common mode events defined in Table 1 of NERC TPL-001-5.1. Every BES facility and select lower voltage facilities were monitored for thermal limits, voltage limits, and voltage stability. Additionally, select off-system contingencies which may affect PJM's system were included in the Common Mode contingency analysis. Reinforcements were developed for areas where the system exceeded applicable thermal limits, voltage limits, or became unstable. The reinforcements, along with a schedule for implementation, are contained in the results section of this document.

N-1-1 Analysis

The purpose of the N-1-1 analysis is to determine if all monitored facilities can be operated within normal thermal and voltage limits after an actual N-1 contingency and within the applicable emergency thermal and voltage limits after an additional simulated contingency. The 2028 50/50 summer peak was evaluated for system performance following a single contingency, followed by manual system adjustments, followed by another single contingency. The N-1-1 analysis monitored all BES facilities. The set of single contingencies that was used to compile the contingency pairs included all single contingencies in PJM regardless of voltage, all PJM tie lines regardless of voltage, and selected contingencies in neighboring systems. The contingency pairs that were considered included every possible combination of single contingencies, a total of over 196,000,000 combinations. The N-1-1 analysis also analyzed the contingency pairs in both possible orders to assess every combination and order of event. Reinforcements were developed for areas where the system failed to meet the applicable normal rating after the first contingency or the applicable emergency rating after the second contingency.

The N-1-1 analysis also assessed applicable voltage magnitude and voltage drop limits. For voltage magnitude and voltage drop testing, PJM screened for potential voltage violations. Voltage violations include exceeding the normal low voltage limit after the first contingency, emergency low limit after the second contingency, or exceeding the emergency voltage drop limit after the second contingency. Reinforcements were developed for areas where voltage violations were identified.

Deliverability Analysis

The 2028 base case was also used to analyze the capability of PJM's transmission system, including all PJM BES elements. To maintain reliability in a competitive capacity market, a resource must be deliverable to the overall network. PJM has developed the Load Deliverability and Generator Deliverability test methods for evaluating the adequacy of network capability for each of these deliverability requirements. Common mode outage analysis uses a procedure similar to Generator Deliverability to assess the impact of P2, P4 and P7 contingencies, as defined in PJM Manual 14B, Addendum 2.

A broad range of critical system conditions are established and analyzed through the deliverability test methods. The Generator Deliverability test establishes a critical stressed generation dispatch for every flowgate (monitored element and contingency pair) that could potentially be overloaded by the test. For every monitored facility, a critical stressed dispatch is created for all normal (all facilities in service) and single contingency conditions that could potentially overload the facility. This method results in the analysis of a large number of critical system conditions.

The Load Deliverability test procedure evaluates multiple critical system conditions through the evaluation of 27 individual stressed Locational Deliverability Areas, one thermal and one voltage case, for each of the defined Locational Deliverability Areas (LDA's) resulting in a minimum of 54 cases. The Locational Deliverability Areas are defined in Manual 14B – Attachment C. The Load Deliverability cases model stressed 90/10 summer peak loads in the LDA under study in each of the cases. A Capacity Emergency Transfer Objective (CETO) is identified. The CETO is the amount of energy an LDA will need to be able to import so that the area is not expected to have a loss of load event more frequently than one event in 25 years. A Capacity Emergency Transfer Limit (CETL) is calculated for each LDA (i.e. 54 cases) to determine the energy that can be imported into the area under test. In each case, the CETL ("the limit") is compared to the target Capacity Emergency Transfer Objective (CETO). Through this method, a large number of critical system conditions are also developed as part of the Load Deliverability Analysis. The system is planned to ensure that each of the LDAs meet the CETO at a minimum. System reinforcements were developed for any condition where the calculated import capability into any LDA would not meet the CETO.

Generator Deliverability Analysis

The PJM Generation Deliverability procedure was used to determine if the PJM transmission system, including all PJM BES elements, was adequate to deliver all PJM capacity resources to the network. Generator Deliverability analysis is performed to ensure that capacity resources within a given electrical area will, in aggregate, be able to be exported to other areas of PJM that are experiencing a capacity emergency. PJM utilizes the Generator Deliverability procedure to study the normal system and single contingencies under a stressed generation dispatch. Every BES facility and select lower voltage facilities were monitored for thermal limits and voltage stability. The stressed generation dispatch is unique to each monitored element and contingency pair under study. The Generator Deliverability procedure is defined in PJM Manual 14B Attachment C.

PJM performed the Generator Deliverability test on the 2028 50/50 summer peak model. The Generator Deliverability test examined system performance under normal and single contingency conditions. The contingency set included a complete set of single contingencies as defined by P1 in Table 1 of TPL-001-5.1.

The 2028 generator deliverability analysis tested a large number of critical system conditions. Every facility was monitored for applicable thermal limits for both the normal system and following the loss of every possible contingency. This process considers every one of the 14,000+ possible single contingencies for each monitored facility. As described in PJM Manual 14B, Attachment C a stressed dispatch was also developed and applied to each potentially overloaded flowgate to determine if an overload could be simulated. Through the method of applying a stressed dispatch to every possible single flowgate, the Generator Deliverability test identifies a large number of critical system conditions.

Reinforcements were developed for areas where the system failed to meet thermal limits or demonstrated a voltage collapse. The reinforcements, along with a schedule for implementation, are contained in the results section of this document.

Common Mode Outage Analysis

Common mode outage analysis procedures are similar to the generation deliverability analysis procedure; however this analysis focuses specifically on the loss of multiple elements. The common mode outage analysis studies all events listed as P2, P4 and P7 under a stressed generation dispatch. Over 27,000 multiple contingency events were analyzed. Every BES facility and select lower voltage facilities were monitored for thermal limits and voltage stability. The stressed generation dispatch is unique to each monitored element and contingency pair under study. The common mode outage procedure is defined in Addendum 2 of PJM Manual 14B.

Reinforcements were developed for areas where the system failed to meet thermal limits, voltage limits, or became unstable. The reinforcements, along with a schedule for implementation, are contained in the results section of this document.

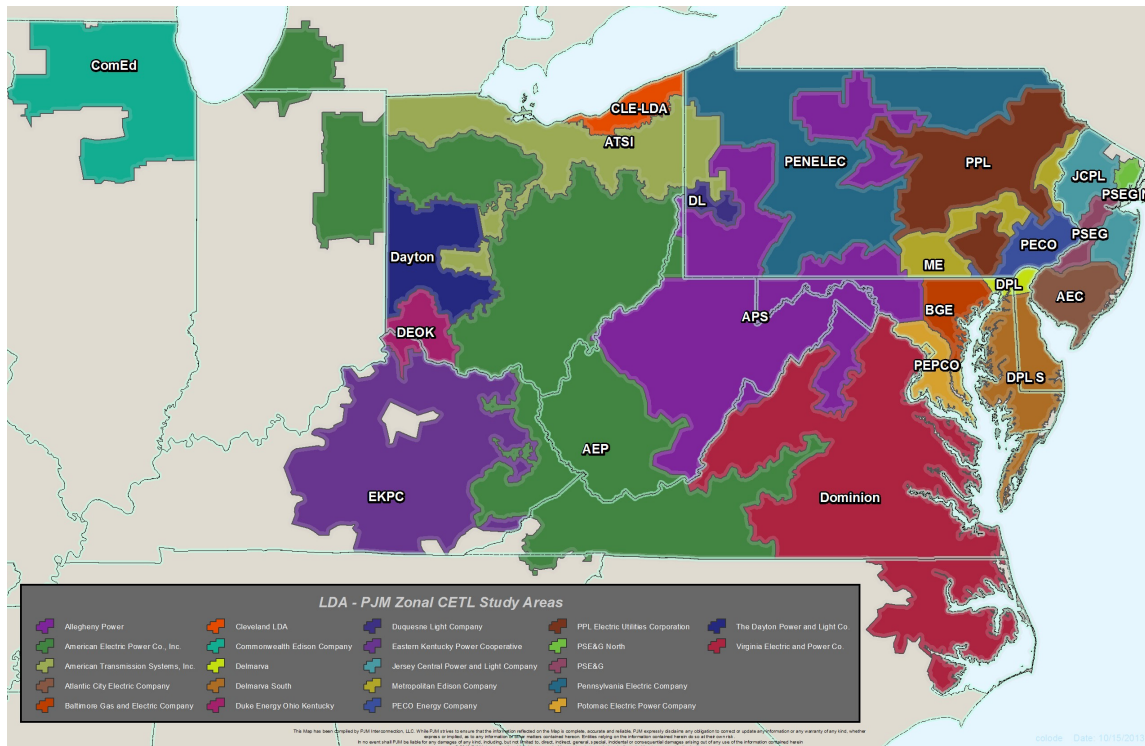
Load Deliverability Analysis

The Load Deliverability test procedures were used to determine if the Capacity Emergency Transfer Limit (CETL) for each of the various electrical areas of PJM is greater than each respective area's Capacity Emergency Transfer Objective (CETO).

There are currently 27 Locational Deliverability areas defined in PJM. The electrical areas within each of the 27 Locational Deliverability areas are described in table 6 and Map 2.

LDA	Description
EMAAC	Global area - PJM 500, JCPL, PECO, PSEG, AE, DPL, RECO
SWMAAC	Global area - BGE and PEPSCO
MAAC	Global area - PJM 500, Penelec, Meted, JCPL, PPL, PECO, PSEG, BGE, Pepco, AE, DPL, UGI, RECO
PPL	PPL & UGI
PJM WEST	APS, AEP, Dayton, DUQ, ComEd, ATSI, DEO&K, EKPC, Cleveland, OVEC
WMAAC	PJM 500, Penelec, Meted, PPL, UGI
PENELEC	Pennsylvania Electric
METED	Metropolitan Edison
JCPL	Jersey Central Power and Light
PECO	PECO
PSEG	Public Service Electric and Gas
BGE	Baltimore Gas and Electric
PEPCO	Potomac Electric Power Company
AE	Atlantic City Electric
DPL	Delmarva Power and Light
DPLSOUTH	Southern Portion of DPL
PSNORTH	Northern Portion of PSEG
VAP	Dominion Virginia Power
APS	Allegheny Power
AEP	American Electric Power
DAYTON	Dayton Power and Light
DLCO	Duquesne Light Company
ComEd	Commonwealth Edison
ATSI	American Transmission Systems, Incorporated
DEO&K	Duke Energy Ohio and Kentucky
EKPC	Eastern Kentucky Power Cooperative
Cleveland	Cleveland Area

Table 6. PJM Locational Deliverability Areas (LDA)



Map 2. PJM Load Deliverability Areas

The 2028 Load Deliverability test used the 2028 summer peak base case as a starting point. From that starting point, 27 individual thermal Load Deliverability cases were built following the Load Deliverability thermal procedure as defined in PJM Manual 14B Attachment C. In addition, 27 individual voltage Load Deliverability cases were built following the Load Deliverability voltage procedure defined in PJM Manual 14B, Attachment C. This process developed one thermal and one voltage study case for each of the 27 Locational Deliverability Areas (LDA) resulting in 54 cases. These studies cover critical system conditions with load levels in the cases set to a 90/10 summer peak for the respective LDA under study and a 50/50 summer load level for all other areas. Modeling of specific system conditions such as load, reactive resources, and phase angle regulator settings were modeled as specified in PJM Manual 14B, Attachment G for the Load Deliverability tests. Manual 14B, Attachment C also specifies a procedure to dispatch generation in both the area assumed to be under a capacity emergency and the areas assumed not to be under a capacity emergency.

Capacity emergency transfer objectives (CETO's) for each of the 27 LDA's were used to set the target net interchange for the LDA under study in each of the thermal and voltage cases.

A thermal Load Deliverability study was then performed on each of the 27 thermal Load Deliverability cases. The thermal Load Deliverability study of each LDA monitored the respective LDA under study and tested system performance of the normal system and all single contingencies. Reinforcements were developed for areas where the system failed to meet thermal limits. The reinforcements, along with a schedule for implementation, are contained in the results section of this document.

A voltage Load Deliverability study was then performed on each of the 27 voltage Load Deliverability cases. The voltage Load Deliverability study of each LDA monitored the respective LDA under study and tested system performance of the normal system and all single contingencies. Critical system conditions were analyzed and reinforcements were developed for areas where the system failed to meet voltage magnitude limits, voltage drop limits, or demonstrated a voltage collapse. The reinforcements, along with a schedule for implementation, are contained in the results section of this document.

Light Load Reliability Analysis

PJM also performed a year 2028 light load reliability analysis. The 50% of 50/50 summer peak demand level was chosen as being representative of a stressed light load condition. The system generating capability modeling assumption for this analysis is that the generation modeled reflects generation by fuel class that historically operates during the light load demand level. In addition to the generation dispatch, the Light Load Reliability Analysis procedure also requires that PJM set interchanges within PJM and neighboring regions to their historical values.

The starting point power flow is the same power flow case set up for the baseline analysis, with adjustment to the model for the light load demand level, interchange, and accompanying generation dispatch. The flowgates ultimately used in the light load reliability analysis were determined by running all contingencies maintained by PJM planning and monitoring all PJM market monitored facilities and all BES facilities. The contingencies used for light load reliability analysis included single and multiple contingencies, with the exception of the N-1-1 criteria. Normal system conditions (P0) were also studied. All BES facilities and all non-BES facilities in the PJM real-time congestion management control facility list were monitored.

Winter Reliability Analysis

PJM also performed a year 2028 winter reliability analysis. This analysis included Generator Deliverability Studies, as well as Load Deliverability studies using a 2028 RTEP case with winter loadings and winter transmission line ratings.

Voltage Stability

PV analysis was used to study a set of contingencies from the 2028 Load Deliverability voltage studies that were very severe or non-convergent. A set of single contingencies was selected for further study in the PV analysis. The methodology used to select the contingencies was to choose 500 kV or above contingencies that did not converge in a Load Deliverability voltage test. Also, contingencies that created a severe voltage drop or severe low magnitude violation on the BES were selected.

A PV analysis was then run on each of the selected contingencies. The analysis monitored all PJM facilities while simulating a transfer from all PJM generation outside the CETO area to all generation inside the CETO area where the contingency was identified. Typical to a PV analysis, the transfer was backed off until each contingency solved, and was then incrementally increased until a voltage collapse was simulated.

Retool Analysis of the Near-Term 2023-2028

Retool analysis is analysis that is performed during the current assessment to verify analysis that was performed in previous assessment. The retool analysis of the near-term was performed to verify the RTEP for the near-term due to forecasted changes in system conditions. Due to the recent overall net decrease in the projected load forecast for the

PJM system, the retool work performed by PJM was a significant part of the 2023 RTEP. The retool analysis of the near-term included Generator Deliverability, Load Deliverability, common mode outage, and N-1-1 analysis. The methodologies for each of these analyses was performed as described in the detailed 2028 method descriptions in previous sections of this document. Through this approach, an extensive set of critical system conditions were analyzed. The conditions studies are summarized below.

Cases and contingency files for each year under study were updated in coordination with the Transmission Owners to reflect the most recent planned and existing facilities. The updated 2023 PJM load forecast was used to determine the load in the individual cases. The modeling updates included a review of the modeling of existing and planned facilities.

The retool analysis performed as part of the 2023 RTEP included the following groups of analysis. This analysis was in addition to the work performed as part of the near term and long term assessments required by the TPL standards. As a result of the significant generation deactivation notifications received throughout 2023, PJM performed a significant reliability review of years 2023 through 2028. As part of the 2023 RTEP, PJM performed system wide assessment of normal system, single contingency, multiple contingency, N-1-1, generator deliverability and load deliverability testing for year 2023 through 2028 summer peak models as needed for the widespread generation deactivations. PJM completed studies and developed system reinforcements related to generation deactivation requests for each year in the near-term in addition to the specific retool efforts outlined below. System enhancements, including an implementation schedule, were developed for every system performance issue that was identified as a result of the generation deactivation notifications. The system enhancements required as a result of the generation deactivations are described in more detail in the results section of this report. In addition to deactivation related retool studies PJM continually validates that previously identified system enhancements are still necessary.

PENELEC

- s1729 retool study

PPL

- s0945.2 retool study

PSEG

- s2491 retool study

15 Year Planning and Analysis of the Longer-Term System

The purpose of the long term review is to simulate system trends to identify problems which may require longer lead time solutions. This enables PJM to take appropriate action when system issues may require initiation of a reinforcement project in anticipation of potential violations in the longer term. System issues uncovered that are amenable to shorter lead time remedies will be addressed as they enter into the near-term horizon. The detailed description of the 15 year planning process is described in PJM Manual 14B.

The 2023 RTEP also included a review of the fifteen year planning horizon through 2038. The analyses conducted as part of the review included normal system, single, and multiple (tower) contingency analysis of the 2028 50/50 Summer Peak case as summarized in Table 7. Following the 15 year procedure, the calculated loading on every flowgate was then scaled by a factor consistent with the forecasted load growth to determine a facility loading in years 2029 through 2038 (years 6 through 15). Both the Generator Deliverability and Load Deliverability procedures were used to establish the critical system conditions under which the system was evaluated.

Analysis Type	Monitored Flowgates	Contingencies Considered	Years Considered
Load Deliverability	Any BES element loaded at 75% or greater in the 2028 analysis	normal system, single, double circuit tower line	2029 through 2038
Generation Deliverability		normal system, single	

Table 7. **15 Year Planning Analysis**

Load forecasts for the years 2029 through 2038 from the 2023 PJM Load Forecast Report were used to generate load growth scaling factors for each of the highest loaded flowgates in each year. The DC scaling factors were then used to calculate a loading for each flowgate for each year 2029 through 2038.

Analysis of the Longer-Term System

PJM evaluated a 2030 (year 7) 50/50 Summer Peak case. One purpose of this evaluation was to identify any thermal or voltage reliability criteria violations in year 2030 that would require a longer term lead time to resolve. The evaluation of the 2030 Summer Peak case did not identify any reliability criteria violations that would require a longer lead time solution. In addition, this targeted analysis of 2030 summer conditions was benchmarked for consistency to the 2030 results from the 15 year analysis procedure.

Verification of Planned Reinforcements

Analysis was performed to verify that all planned reinforcements that were identified as part of the 2023 RTEP and all previously identified reinforcements acceptably resolved all criteria violations throughout the planning horizon.

Analysis was also performed to verify that no new potential criteria violations were created as a result of implementing the required system reinforcements.

New Services Queue Analysis

Analysis for customer requests in the New Services Queue was performed for several different types of New Service Requests: Generator interconnection, long term firm transmission service, ARR requests, and Merchant transmission requests. The reliability of the requests is determined through two separate technical studies, the feasibility study and system impact study.

The feasibility study is the first study that is performed and is an initial look at the effect of the New Service Request on the transmission system. This study includes generator deliverability analysis that is performed on a summer peak load case to analyze the normal system and all single and multiple contingencies (Excluding N-1-1). Additionally Short Circuit analysis is performed.

If a developer elects to move forward and executes a System Impact Study Agreement PJM performs a more detailed study of the impact of the proposed request. The system impact study includes thermal analysis (AC Generator Deliverability) of the normal system and all single and multiple contingencies (Excluding N-1-1) as well as short circuit and stability assessments. Additionally, and as required based on the type of request made, load deliverability analysis may also be performed.

As part of the system impact study process, steady state voltage studies are performed for all interconnection projects. The steady state voltage studies included a check of the applicable voltage magnitude limits under normal and contingency conditions. The voltage of every BES facility was monitored. The contingencies included in the steady state voltage analysis included all multiple contingencies except N-1-1 contingencies.

<https://www.pjm.com/planning/service-requests/services-request-status.aspx>

Short Circuit Assessment

PJM conducts short circuit analysis annually to determine whether circuit breakers have interrupting capability for Faults that they will be expected to interrupt using the system short circuit model with any planned generation and transmission facilities in service which could impact the study area. Short circuit analysis is performed consistent with the current version of the following industry standards:

- 1) ANSI/IEEE 551 –IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems
 - a) This standard is used to provide short circuit current information for breakers and power system equipment used to sense and interrupt fault currents.
- 2) ANSI/IEEE C37.04 –IEEE Standard Rating Structure for AC High-Voltage Circuit Breakers
 - a) This standard is used to establish the rating structure for circuit breakers and equipment associated with breakers.
- 3) ANSI/IEEE C37.010 –IEEE Application Guide for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis
 - a) This standard is used to calculate the fault current on breakers that are rated on a Symmetrical Current Basis taking into consideration reclosing duration, X/R ratio differences, temperature conditions, etc.
- 4) ANSI/IEEE C37.5 –IEEE Guide for Calculation of Fault Currents for Applications of AC High-Voltage Circuit Breakers Rated on a Total Current Basis
 - a) This standard is used to calculate the fault current on breakers that are rated on a Total Current Basis.

Each of these standards is used jointly with transmission owners' methodologies as a basis to calculate fault currents on all BES breakers. By using these standards, single phase to ground and three phase fault currents are calculated and compared to the breaker interrupting capability, provided by the transmission owners, for each BES breaker

within the PJM footprint. All breakers whose calculated fault currents exceed breaker interrupting capabilities are considered over duty and reported to transmission owners for confirmation. All breakers are used in specific short circuit cases which help to identify the cause and year breakers are likely to become over duty.

Short circuit cases are built consistent with a 2 year planning representation and a 5 year planning representation. The 2 year planning case consists of the current system in addition to all facilities planned to be in-service within the next year. The 5 year planning case uses the 2 year planning case as its base model and it is updated to include all system upgrades, generation projects, and merchant transmission projects planned to be in-service within 5 years. The 5 year planning case is similar to the 5 year PJM RTEP load flow basecase.

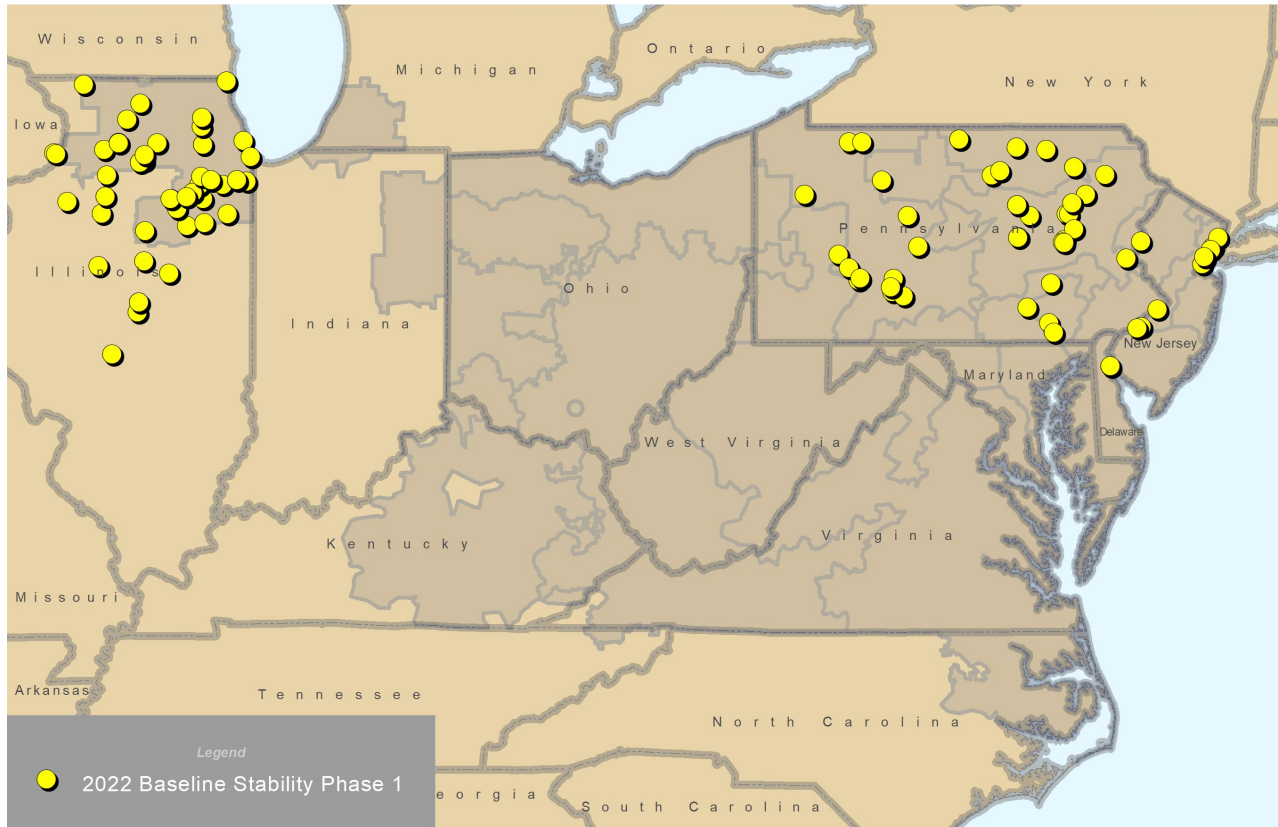
Once an over duty breaker is confirmed breaker replacement and reinforcements along with cost estimates are determined. Breaker replacements and reinforcements, along with a schedule for implementation, were presented at monthly TEAC stakeholder meetings and are contained in the results section of this document.

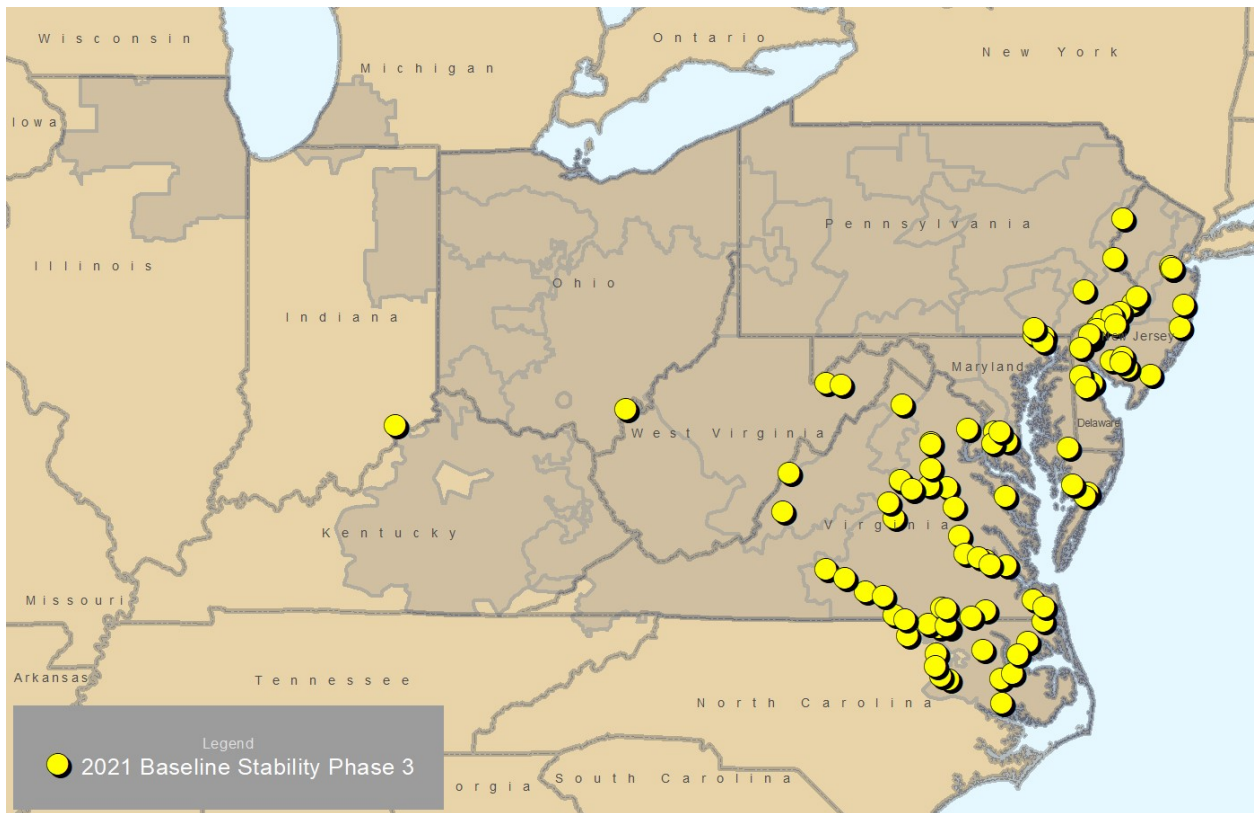
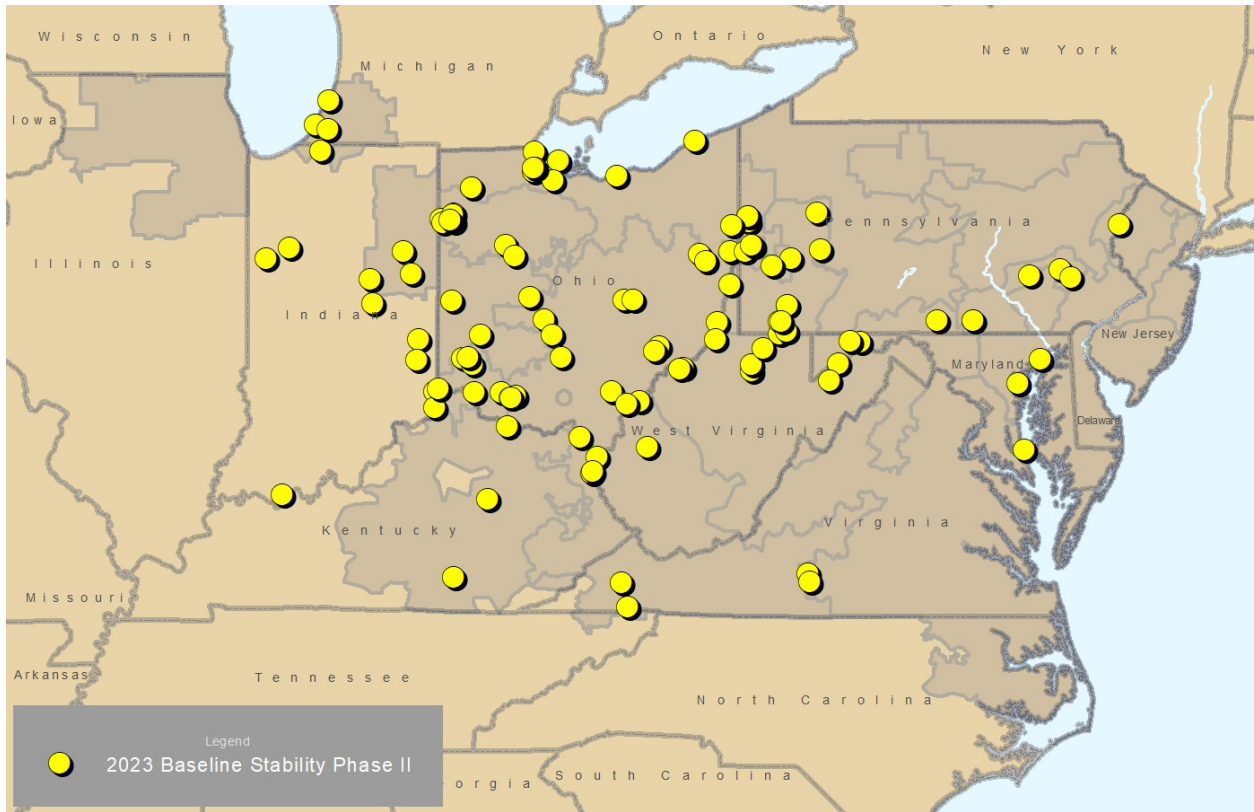
Stability Assessment

PJM performs multiple tiers of analysis to ensure the system will remain stable and have satisfactory dynamic performance for disturbances that are consistent with Table 1 of the NERC TPL-001-5.1 standards. Collectively, the studies performed assess system dynamic performance over a wide range of load levels. Whenever system dynamic performance does not meet criteria, appropriate reinforcements are incorporated in the system plans and design. These measures include the installation of PSS (Power System Stabilizer), Excitation system refinements, dynamic or static reactive supports for wind generation plants, relaying and breaker configuration modifications.

Stability Studies	2023 RTEP
Annual baseline stability analysis of 1/3 of existing stations	100
New Services Queue stability analysis	189
Total	289

Table 8. Number of Generation Stations Studied for Stability as Part of the 2023 RTEP





Map 3. Three-Year Baseline Stability Cycle

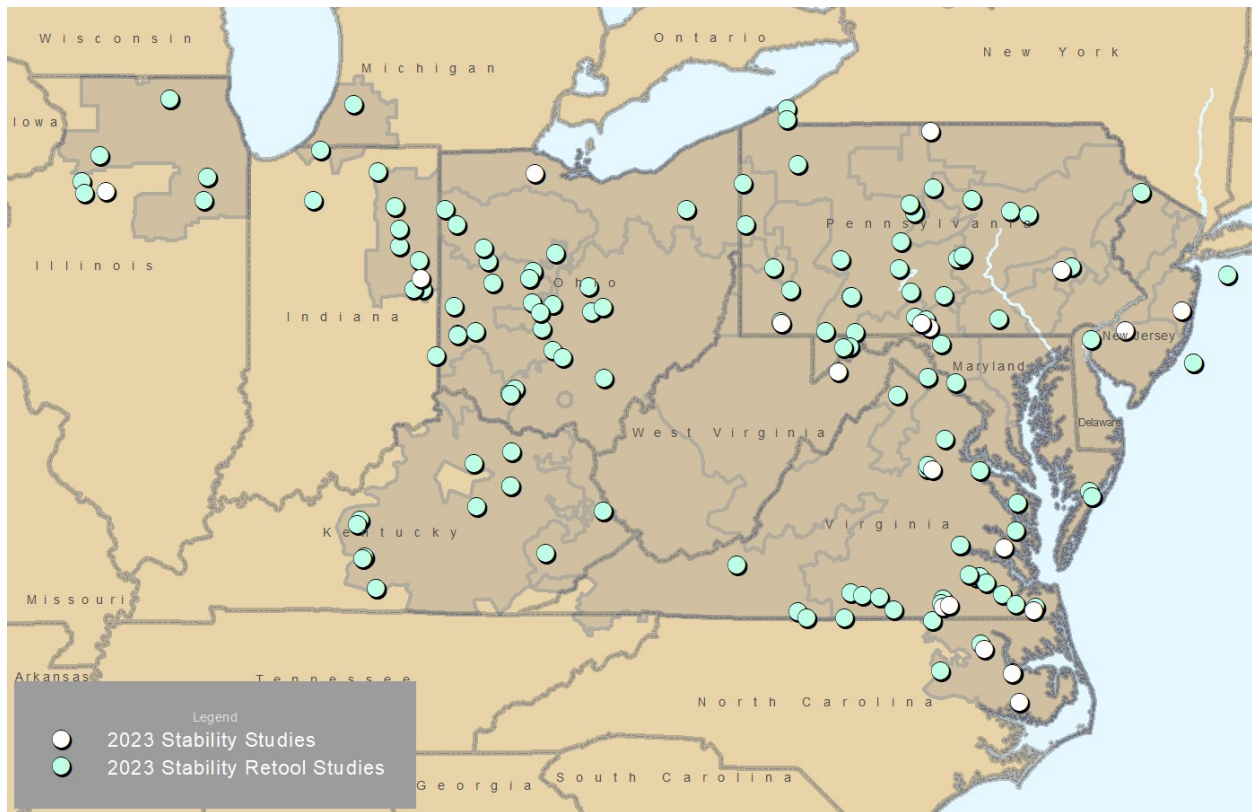
Good engineering practices as related to ensuring adequate system dynamic performance for the Bulk Electric System starts with proper base case models. PJM uses full ERAG MMWG models as a starting point for the dynamic stability analysis. All known transmission system as well as generation model changes available from approved system plans are incorporated. Step response simulations are conducted to detect and correct any modeling errors. Case initialization results are carefully analyzed to make sure that all the initial conditions are satisfactory. A 20 second no fault simulation is performed to ensure proper parameters are used in the models.

As part of the 2023 RTEP, several tiers of system stability analysis were performed. The first tier of this analysis includes PJM's annual comprehensive transient stability assessment of generating stations in the system. The annual analysis is performed for one third of the PJM footprint each year.

The annual baseline analysis includes an evaluation of the system under light load conditions as well as peak load conditions. PJM's rationale for choosing a light load case is that the light load system conditions are found to be the most challenging and severe from a transient stability perspective. The analysis also includes an evaluation of the system under summer peak loading (50/50) conditions.

PJM incorporates dynamic load models in peak load stability study to consider the behaviors of dynamic loads including induction motor loads. Various contingencies near load centers and generation stations are studied to ensure PJM system meets dynamic voltage recovery criteria as well as transient stability and damping criteria. In addition PJM evaluates the impact of dynamic load models on the system performance under a stressed power transfer condition across PJM eastern interface.

All PJM stability studies start by testing the system for a major transmission line switching operation. This examines the system under system normal conditions, as specified in TPL-001-5.1. The system response is verified by monitoring generating unit angle curves over a 20 second time frame. This test also provides the information to verify that all dynamic parameters are correctly initiating and responding properly. The stability test procedure includes a simulation of all applicable disturbances on all outlets of generating plants for multiple contingency (P3-P7) conditions. Additionally, all existing Remedial Action Schemes and their controlling actions are evaluated to ensure their effectiveness. A visual depiction of the coverage of the three latest baseline stability study cycles is shown in Map 3 above.



Map 4. Locations of proposed generation studied for stability in 2023

A second tier of PJM’s stability assessment includes stability analysis for all proposed generator interconnections that exceed 20 MWs. New generator interconnections represent a significant modification to the system that could affect stability. In 2023, as part of the generation interconnection process, PJM completed transient stability analysis for 189 proposed generator interconnections within the PJM footprint. The locations of these proposed generators are shown in Map 4. In this analysis P0, P1, P2, P3, P4, P5, P6 and P7 conditions were analyzed for disturbances on all generating plant outlets as well as on transmission lines at a minimum, one bus away and more than one bus away from the point of interconnection if warranted by the system topology. In general, the analysis associated with proposed generation additions identifies any potential transient stability concerns among the generators electrically close to the portion of the system being modified. The proposed generation interconnections span all transmission system voltage levels and are widespread throughout PJM’s footprint. Hence, the resulting stability analysis covers broad sections of PJM’s Bulk Electric System. Solutions to the identified problems are developed and implemented prior to the proposed generation being placed in service.

As depicted in Map 4, the locations of the proposed generation additions are dispersed throughout the PJM footprint. In addition to monitoring the stability of the proposed generation, existing generation within several layers of the interconnection bus are also monitored. The transient stability analysis that is run for proposed generation interconnections not only ensures that the proposed unit will remain stable but also ensures that the transient stability of existing generation at nearby buses will not be compromised. It is important to note that the relative queue position is respected for this analysis, so that potential transient stability concerns are identified for the proposed unit and

nearby existing generation. This ensures that violations will be allocated to the correct project based on queue order. The results of this analysis and any required upgrades or other mitigation measures needed, are identified in the System Impact Study for each New Service Request and are posted on the PJM web at the following address:

<https://www.pjm.com/planning/service-requests/services-request-status>

A third tier of PJM's stability analysis includes ad-hoc studies that were performed in 2023 and occur annually to support PJM operations.

The transient stability analysis performed by PJM is done with forward looking cases representing the system as planned in future years. Given the continued load growth within the PJM footprint and the on-going transmission system reinforcements that are identified as part of the regional transmission expansion plan, the transient stability of the system is expected to continue to improve.

As a result of PJM integrating each of these tiers of stability assessment, PJM has ensured its compliance to all applicable standards including the assessments required by Table 1 of the NERC TPL-001-5.1 standard.

Based on PJM's knowledge and evaluation of current and forecasted system conditions, stability related upgrades would not require a lead time during the longer-term (year 6 and beyond) time frame, therefore stability analysis is not performed beyond 5 years out.

N-1-1 Stability Assessment

An N-1-1 stability study for 77 plants was performed as part of the 2023 RTEP. Critical contingency pairs which may lead to potential stability issues were applied to the study. RAS or specific operation guidelines were also implemented if necessary. Comprehensive time-domain simulations for N-1-1 contingencies were conducted to ensure those plants comply with PJM stability criteria. PJM will continue to conduct N-1-1 stability study for selected plants on a rotating basis.

NPIR Plant Specific Stability & Voltage Assessment

PJM has a total of 17 plants that fit the criteria for NPIR stability study. Five of the 17 nuclear plants were studied as part of the 2023 RTEP. PJM will continue to study these 17 plants annually as part of future RTEPs. RAS or specific operation guidelines were implemented if necessary. Also, several nuclear plant NPIR studies were performed to verify and validate 2023 new dynamic models per TOs request.

In addition to the NPIR stability study, PJM also performed NPIR voltage studies. As part of the 2023 RTEP, all 17 PJM nuclear plants were studied to ensure these plants comply with voltage monitoring criteria. Voltage magnitude and voltage drop were monitored under selected contingencies. Study results have been sent to NGOs.

Results of 2023 RTEP

The results of the baseline assessment for the 2023 – 2038 periods are presented below. This report, containing all corrective reinforcements, is provided to applicable regional entities annually in compliance with TPL-001-5.1. All of the upgrades below were presented to the TEAC stakeholder committee at one of the monthly TEAC or SRTEP stakeholder meetings in 2023.

PJM found the following areas of the PJM system to not meet reliability criteria during the assessment of the 2023 – 2038 study periods. These baseline upgrades were all identified as part of the 2023 RTEP. The list of required upgrades contains a summary of the system deficiencies and the associated action needed to achieve required system performance. This includes deficiencies identified in multiple sensitivity studies. The expected required in-service date of each upgrade is also included. PJM continuously evaluates the lead times of these plans with respect to the expected required in-service dates. System enhancements and corrective action plans are reviewed in subsequent annual studies for continued validity and implementation status of identified system facilities and operating procedures. Additionally, results include all recommended upgrades where short circuit analysis shows that existing breakers exceed their equipment rating.

In areas of the PJM system that did not meet reliability criteria under the revised P5 planning event, PJM will be working with its Transmission Owners on the identification of Corrective Action Plans (CAPs) to remediate the violations. Corrective reinforcements can include among other things the elimination of non-redundancy and/or inclusion of monitoring and reporting at a Control Center where applicable. The TPL-001-5 Implementation Plan provides an additional 24-month period for the development of CAPs (7/1/2025) following the effective date of the standard (7/1/2023). Upgrades identified and established in previous RTEP cycles are detailed in Appendix A.

The most up to date information concerning in-service dates and schedule for implementation can be found at the following link: <https://www.pjm.com/planning/project-construction.aspx>. With the exception of the baseline upgrades noted below, all other areas of the system were found to meet applicable reliability criteria.

1) Baseline Upgrade b3717.3

- Overview of Reliability Problem
 - Criteria Violation: Overload Collier - Erwin #1 and #2 138KV Lines, Forbes - Oakland 138KV Line, Carson - Oakland 138KV Line
 - Criteria Test: N-1-1 Thermal
- Overview of Reliability Solution
 - Description of Upgrade: Relay work at Springdale 138 kV
 - Upgrade In-Service Date: 12/31/2024
 - Estimated Upgrade Cost: \$1.00M
 - Construction Responsibility: APS

2) Baseline Upgrade b3717.4

- Overview of Reliability Problem

- Criteria Violation: Overload Collier - Erwin #1 and #2 138KV Lines, Forbes - Oakland 138KV Line, Carson - Oakland 138KV Line
 - Criteria Test: N-1-1 Thermal
 - Overview of Reliability Solution
 - Description of Upgrade: Transmission line work – a new transmission structure and necessary tower work to handle the change in tension at Cheswick 138 kV
 - Upgrade In-Service Date: 1/1/2025
 - Estimated Upgrade Cost: \$2.00M
 - Construction Responsibility: APS
- 3) Baseline Upgrade b3737.53
- Overview of Reliability Problem
 - Criteria Violation: N/A
 - Criteria Test: N/A
 - Overview of Reliability Solution
 - Description of Upgrade: Remove the existing E83 line 115 kV (not in-service) to accommodate the new 500 kV/230 kV lines (~ 7.7 miles).
 - Upgrade In-Service Date: 12/31/2027
 - Estimated Upgrade Cost: \$8.47M
 - Construction Responsibility: JCPL
- 4) Baseline Upgrade b3737.54
- Overview of Reliability Problem
 - Criteria Violation: N/A
 - Criteria Test: N/A
 - Overview of Reliability Solution
 - Description of Upgrade: Remove the existing H2008 Larrabee-Smithburg No. 2 230 kV to accommodate the new 500 kV/230 kV lines.
 - Upgrade In-Service Date: 12/31/2027
 - Estimated Upgrade Cost: \$8.47M
 - Construction Responsibility: JCPL
- 5) Baseline Upgrade b3737.55
- Overview of Reliability Problem
 - Criteria Violation: Lake Nelson I-Middlesex I 230 kV overload
 - Criteria Test: Winter generator deliverability
 - Overview of Reliability Solution
 - Description of Upgrade: Middlesex substation 230 kV – Replace the 2000A circuit switcher at Middlesex switch point for the Lake Nelson I1023 230 kV exit.
 - Upgrade In-Service Date: 6/1/2029
 - Estimated Upgrade Cost: \$0.53M

- Construction Responsibility: JCPL

6) Baseline Upgrade b3737.59

- Overview of Reliability Problem
 - Criteria Violation: The Windsor-Clarksville 230 kV line is overloaded
 - Criteria Test: Summer Generator Deliverability
- Overview of Reliability Solution
 - Description of Upgrade: Windsor to Clarksville subproject: Upgrade terminal equipment at Windsor 230 kV.
 - Upgrade In-Service Date: 6/1/2029
 - Estimated Upgrade Cost: \$1.58M
 - Construction Responsibility: JCPL

7) Baseline Upgrade b3737.60

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Perform a Pre-build Infrastructure evaluation study in alignment with the NJBPU Solicitation Guidance Document requirements.
 - Upgrade In-Service Date: 6/2/2023
 - Estimated Upgrade Cost: \$0.29M
 - Construction Responsibility: MAOD

8) Baseline Upgrade b3775.1

- Overview of Reliability Problem
 - Criteria Violation: Overload of Stillwell-Dumont 345 kV in 2027 RTEP summer; Overload of Crete-St. John, Crete-E. Frankfort, University Park N-Olive 345 kV lines in 2027 RTEP winter
 - Criteria Test: Summer & Winter Generator Deliverability
- Overview of Reliability Solution
 - Description of Upgrade: Outside of the Green Acres substation, swap the NIPSCO Green Acre Tap towers from the St. John-Green Acres-Olive 345 kV line to the University Park N-Olive 345 kV line to create a University Park N-Green Acres-Olive and St. John-Olive 345 kV lines.
 - Upgrade In-Service Date: 12/1/2026
 - Estimated Upgrade Cost: \$1.98M
 - Construction Responsibility: NEET

9) Baseline Upgrade b3775.10

- Overview of Reliability Problem
 - Criteria Violation: Overload of Stillwell-Dumont 345 kV in 2027 RTEP summer; Overload of Crete-St. John, Crete-E. Frankfort, University Park N-Olive 345 kV lines in 2027

RTEP winter

- Criteria Test: Summer & Winter Generator Deliverability
- Overview of Reliability Solution
 - Description of Upgrade: Perform a sag study on the Olive – University Park 345kV line to increase the operating temperature to 225 F. Remediation work includes two tower replacements on the line.
 - Upgrade In-Service Date: 12/1/2026
 - Estimated Upgrade Cost: \$1.50M
 - Construction Responsibility: AEP

10) Baseline Upgrade b3775.11

- Overview of Reliability Problem
 - Criteria Violation: Overload of Stillwell-Dumont 345 kV in 2027 RTEP summer; Overload of Crete-St. John, Crete-E. Frankfort, University Park N-Olive 345 kV lines in 2027 RTEP winter
 - Criteria Test: Summer & Winter Generator Deliverability
- Overview of Reliability Solution
 - Description of Upgrade: Upgrade the limiting element at Stillwell substation to increase the rating of the Stillwell-Dumont 345 kV line to match conductor rating.
 - Upgrade In-Service Date: 12/1/2026
 - Estimated Upgrade Cost: \$0.14M
 - Construction Responsibility: AEP

11) Baseline Upgrade b3775.2

- Overview of Reliability Problem
 - Criteria Violation: Overload of Stillwell-Dumont 345 kV in 2027 RTEP summer; Overload of Crete-St. John, Crete-E. Frankfort, University Park N-Olive 345 kV lines in 2027 RTEP winter
 - Criteria Test: Summer & Winter Generator Deliverability
- Overview of Reliability Solution
 - Description of Upgrade: Reconductor NEET's section of Crete(IN/IL border)-St. John 345 kV line (6.95 miles).
 - Upgrade In-Service Date: 12/1/2026
 - Estimated Upgrade Cost: \$1.99M
 - Construction Responsibility: NEET

12) Baseline Upgrade b3775.3

- Overview of Reliability Problem
 - Criteria Violation: Overload of Stillwell-Dumont 345 kV in 2027 RTEP summer; Overload of Crete-St. John, Crete-E. Frankfort, University Park N-Olive 345 kV lines in 2027 RTEP winter
 - Criteria Test: Summer & Winter Generator Deliverability
- Overview of Reliability Solution

- Description of Upgrade: Rebuild ComEd's section of 345 kV double circuit in IL from St. John to Crete (5 miles) with twin bundled 1277 ACAR conductor.
- Upgrade In-Service Date: 12/1/2026
- Estimated Upgrade Cost: \$16.64M
- Construction Responsibility: ComEd

13) Baseline Upgrade b3775.4

- Overview of Reliability Problem
 - Criteria Violation: Overload of Stillwell-Dumont 345 kV in 2027 RTEP summer; Overload of Crete-St. John, Crete-E. Frankfort, University Park N-Olive 345 kV lines in 2027 RTEP winter
 - Criteria Test: Summer & Winter Generator Deliverability
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild 12.7 miles of 345 kV double circuit extending from Crete to E. Frankfort with twin bundled 1277 ACAR conductor.
 - Upgrade In-Service Date: 12/1/2026
 - Estimated Upgrade Cost: \$42.28M
 - Construction Responsibility: ComEd

14) Baseline Upgrade b3775.5

- Overview of Reliability Problem
 - Criteria Violation: Overload of Stillwell-Dumont 345 kV in 2027 RTEP summer; Overload of Crete-St. John, Crete-E. Frankfort, University Park N-Olive 345 kV lines in 2027 RTEP winter
 - Criteria Test: Summer & Winter Generator Deliverability
- Overview of Reliability Solution
 - Description of Upgrade: Replace E. Frankfort 345 kV circuit breaker "9-14" with 3150A SF6 circuit breaker.
 - Upgrade In-Service Date: 12/1/2026
 - Estimated Upgrade Cost: \$3.27M
 - Construction Responsibility: ComEd

15) Baseline Upgrade b3775.6

- Overview of Reliability Problem
 - Criteria Violation: Overload of Stillwell-Dumont 345 kV in 2027 RTEP summer; Overload of Crete-St. John, Crete-E. Frankfort, University Park N-Olive 345 kV lines in 2027 RTEP winter
 - Criteria Test: Summer & Winter Generator Deliverability
- Overview of Reliability Solution
 - Description of Upgrade: Perform sag study mitigation work on the Dumont-Stillwell 345 kV line (remove a center-pivot irrigation system from under the line, allowing for the normal and emergency ratings of the line to increase, replace two structures and modify a third structure).
 - Upgrade In-Service Date: 12/1/2026

- Estimated Upgrade Cost: \$2.22M
- Construction Responsibility: AEP

16) Baseline Upgrade b3775.7

- Overview of Reliability Problem
 - Criteria Violation: Overload of Stillwell-Dumont 345 kV in 2027 RTEP summer; Overload of Crete-St. John, Crete-E. Frankfort, University Park N-Olive 345 kV lines in 2027 RTEP winter
 - Criteria Test: Summer & Winter Generator Deliverability
- Overview of Reliability Solution
 - Description of Upgrade: Upgrade the limiting element at Dumont substation to increase the rating of the Stillwell-Dumont 345 kV line to match conductor rating.
 - Upgrade In-Service Date: 12/1/2026
 - Estimated Upgrade Cost: \$2.00M
 - Construction Responsibility: AEP

17) Baseline Upgrade b3775.8

- Overview of Reliability Problem
 - Criteria Violation: Overload of Stillwell-Dumont 345 kV in 2027 RTEP summer; Overload of Crete-St. John, Crete-E. Frankfort, University Park N-Olive 345 kV lines in 2027 RTEP winter
 - Criteria Test: Summer & Winter Generator Deliverability
- Overview of Reliability Solution
 - Description of Upgrade: Upgrade the existing terminal equipment (substation conductor) at St. John on the existing Crete to St. John 345 kV line with bundled 2x1590 ACSR Lapwing
 - Upgrade In-Service Date: 12/1/2026
 - Estimated Upgrade Cost: \$2.00M
 - Construction Responsibility: NEET

18) Baseline Upgrade b3775.9

- Overview of Reliability Problem
 - Criteria Violation: Overload of Stillwell-Dumont 345 kV in 2027 RTEP summer; Overload of Crete-St. John, Crete-E. Frankfort, University Park N-Olive 345 kV lines in 2027 RTEP winter
 - Criteria Test: Summer & Winter Generator Deliverability
- Overview of Reliability Solution
 - Description of Upgrade: Upgrade the existing terminal equipment (substation conductor) at Green Acres on the existing St. John to Green Acres 345 kV line with bundled 2x1590 ACSR Lapwing
 - Upgrade In-Service Date: 12/1/2026
 - Estimated Upgrade Cost: \$2.00M
 - Construction Responsibility: NEET

19) Baseline Upgrade b3777

- Overview of Reliability Problem
 - Criteria Violation: Not Specified
 - Criteria Test: Not Specified
- Overview of Reliability Solution
 - Description of Upgrade: Disconnect and remove three 345 kV breakers, foundations and associated equipment from Sammis substation. Remove nine 345 kV CVTs. Remove two 345 kV disconnect switches. Install new 345 kV bus work and foundations. Install new fencing. Remove and adjust relaying at Sammis substation.
 - Upgrade In-Service Date: 6/1/2023
 - Estimated Upgrade Cost: \$2.10M
 - Construction Responsibility: ATSI

20) Baseline Upgrade b3779

- Overview of Reliability Problem
 - Criteria Violation: >300MW load loss under N-1-1
 - Criteria Test: N-1-1 Load Drop
- Overview of Reliability Solution
 - Description of Upgrade: Cut existing 230 kV line #2183 and extend from Poland Road substation to Evergreen Mills substation. Approximately 0.59 miles of new line will be built from the cut-in to the Evergreen Mills substation. Cut and extend the existing 230 kV line #2183 creating a new line #2210 from Brambleton substation to be terminated at Evergreen Mills substation. Approximately 0.59 miles of new line will be built from the cut-in to the Evergreen Mills substation.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$7.71M
 - Construction Responsibility: Dominion

21) Baseline Upgrade b3780.1

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Peach Bottom North upgrades – substation work Add 3x 500 kV breakers to form a breaker-and-a-half bay.
 - Upgrade In-Service Date: 6/1/2025
 - Estimated Upgrade Cost: \$33.00M
 - Construction Responsibility: PECO

22) Baseline Upgrade b3780.10

- Overview of Reliability Problem
 - Criteria Violation:

- Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Install new Conastone capacitor.
New capacitor rating: 350 MVAR
 - Upgrade In-Service Date: 6/1/2025
 - Estimated Upgrade Cost: \$15.00M
 - Construction Responsibility: BGE

23) Baseline Upgrade b3780.11

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Brighton Statcom and capacitor
New STATCOM rating: 350 MVAR
New capacitor rating: 350 MVAR
 - Upgrade In-Service Date: 6/1/2025
 - Estimated Upgrade Cost: \$63.00M
 - Construction Responsibility: PEPCO

24) Baseline Upgrade b3780.12

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Burchess Hill Cap
New capacitor rating: 250 MVAR
 - Upgrade In-Service Date: 6/1/2025
 - Estimated Upgrade Cost: \$15.00M
 - Construction Responsibility: PEPCO

25) Baseline Upgrade b3780.13

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Batavia Road to Riverside 230 kV reconductor New rating: 1941 MVA SN / 2181 MVA SE
 - Upgrade In-Service Date: 6/1/2025
 - Estimated Upgrade Cost: \$21.00M
 - Construction Responsibility: BGE

26) Baseline Upgrade b3780.14

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Reconfigure Cooper transmission feeds by establishing new Cooper - North Delta 230kV line and rerouting existing transmissions lines by Cooper
 - Upgrade In-Service Date: 6/1/2025
 - Estimated Upgrade Cost: \$3.60M
 - Construction Responsibility: PECO

27) Baseline Upgrade b3780.15

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Cut-in 5012 Peach Bottom - Conastone 500kV line into North Delta 500/230kV substation by rebuilding 5012 between new terminal at Peach Bottom South and North Delta on single circuit structures and terminating at North Delta
 - Upgrade In-Service Date: 6/1/2025
 - Estimated Upgrade Cost: \$7.86M
 - Construction Responsibility: PECO

28) Baseline Upgrade b3780.16

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: North Delta 230 kV termination for new Cooper - North Delta 230 kV line (Transource Scope)
 - Upgrade In-Service Date: 6/1/2025
 - Estimated Upgrade Cost: \$0.47M
 - Construction Responsibility: Transource

29) Baseline Upgrade b3780.17

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Cut-in 5012 Peach Bottom - Conastone 500kV line into North Delta 500/230kV substation by rebuilding 5012 between new terminal at Peach Bottom

South and North Delta on single circuit structures and terminating at North Delta (Transource Scope)

- Upgrade In-Service Date: 6/1/2025
- Estimated Upgrade Cost: \$1.10M
- Construction Responsibility: Transource

30) Baseline Upgrade b3780.2

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Peach Bottom to Graceton (PECO) – New 500 kV transmission line
New rating: 4503 MVA SN/ 5022 MVA SE
 - Upgrade In-Service Date: 6/1/2025
 - Estimated Upgrade Cost: \$48.00M
 - Construction Responsibility: PECO

31) Baseline Upgrade b3780.4

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Peach Bottom to Graceton (BGE) – transmission work
New rating: 4503 MVA SN/ 5022 MVA SE
 - Upgrade In-Service Date: 6/1/2025
 - Estimated Upgrade Cost: \$17.00M
 - Construction Responsibility: BGE

32) Baseline Upgrade b3780.5

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Build Solley Road substation + Statcom.
New STATCOM rating: 350 MVAR
Add 4x 230 kV breakers bays.
 - Upgrade In-Service Date: 6/1/2025
 - Estimated Upgrade Cost: \$109.00M
 - Construction Responsibility: BGE

33) Baseline Upgrade b3780.6

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Build Granite substation + Statcom.
New STATCOM rating: 350 MVAR
Add 4x 230 kV breaker bays.
 - Upgrade In-Service Date: 6/1/2025
 - Estimated Upgrade Cost: \$91.00M
 - Construction Responsibility: BGE

34) Baseline Upgrade b3780.7

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Build Batavia Road substation.
Add 4x 230 kV breaker bays.
 - Upgrade In-Service Date: 6/1/2025
 - Estimated Upgrade Cost: \$36.00M
 - Construction Responsibility: BGE

35) Baseline Upgrade b3780.8

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Graceton 500 kV expansion
Add 3x 500 kV breaker bays, 2x 500/230 kV auto transformer, 1x 500 kV caps.
New transformer rating: 1559 MVA SN / 1940 MVA SE
New capacitor rating: 250 MVAR
 - Upgrade In-Service Date: 6/1/2025
 - Estimated Upgrade Cost: \$82.00M
 - Construction Responsibility: BGE

36) Baseline Upgrade b3780.9

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Graceton to Batavia Road 230 kV double circuit pole line
New rating: 1331 MVA SN/ 1594 MVA SE

- Upgrade In-Service Date: 6/1/2025
- Estimated Upgrade Cost: \$195.00M
- Construction Responsibility: BGE

37) Baseline Upgrade b3781

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Replace line drops to Doubs transformer 3. New transformer rating: 721MVA SN /862 MVA SE
 - Upgrade In-Service Date: 12/31/2025
 - Estimated Upgrade Cost: \$0.80M
 - Construction Responsibility: APS

38) Baseline Upgrade b3782

- Overview of Reliability Problem
 - Criteria Violation: N-1-1 Thermal
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Adjust relay settings at Riverton substation on the Riverton-Bethel Tap 138 kV line.
 - Upgrade In-Service Date: 6/1/2025
 - Estimated Upgrade Cost: \$0.08M
 - Construction Responsibility: APS

39) Baseline Upgrade b3783

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Cut and remove the 345 kV and 230 kV generator lead lines at Homer City. Install new station service supply, separate AC station service, separate protection and controls schemes, and review and adjust relay protection settings
 - Upgrade In-Service Date: 6/1/2025
 - Estimated Upgrade Cost: \$2.25M
 - Construction Responsibility: PENELEC

40) Baseline Upgrade b3785.1

- Overview of Reliability Problem
 - Criteria Violation: Overload on the Mountaineer-Belmont 765 kV line

- Criteria Test: Summer Gen Deliv
 - Overview of Reliability Solution
 - Description of Upgrade: Replace existing 3000 A wavetrapp at Mountaineer 765 kV, on the Belmont - Mountaineer 765 kV line, with a new 5000 A wavetrapp.
 - Upgrade In-Service Date: 6/1/2028
 - Estimated Upgrade Cost: \$0.46M
 - Construction Responsibility:
- 41) Baseline Upgrade b3786.1
- Overview of Reliability Problem
 - Criteria Violation: Overload on the Abert-Reusens 69 kV line
 - Criteria Test: FERC 715 Thermal
 - Overview of Reliability Solution
 - Description of Upgrade: Rebuild ~4.5 miles of 69 kV line between Abert and Reusens Substations. Update Line Settings at Reusens and Skimmer.
 - Upgrade In-Service Date: 6/1/2028
 - Estimated Upgrade Cost: \$14.40M
 - Construction Responsibility:
- 42) Baseline Upgrade b3787.1
- Overview of Reliability Problem
 - Criteria Violation: Overload of the Coalton-Princess 69 kV
 - Criteria Test: FERC 715 Thermal
 - Overview of Reliability Solution
 - Description of Upgrade: Install a CCVT on 3 phase stand and remove the single phase existing CCVT on the 69kV Coalton to Bellefonte line exit. The existing CCVT is mounted to lattice on a single phase CCVT stand, which will be replaced with the 3 phase CCVT stand. The line riser between line disconnect and line take off is being replaced. This remote end work changes the MLSE of the line section between Coalton - Princess 69kV line section.
 - Upgrade In-Service Date: 12/1/2028
 - Estimated Upgrade Cost: \$0.00M
 - Construction Responsibility: AEP
- 43) Baseline Upgrade b3788.1
- Overview of Reliability Problem
 - Criteria Violation: Overload of the Kyger Creek-Sporn 345 kV line
 - Criteria Test: Summer Gen Deliv
 - Overview of Reliability Solution
 - Description of Upgrade: Replace AEP owned station takeoff riser and breaker BB risers at OVEC owned Kyger Creek station.
 - Upgrade In-Service Date: 6/1/2028

- Estimated Upgrade Cost: \$0.41M
- Construction Responsibility: AEP

44) Baseline Upgrade b3788.2

- Overview of Reliability Problem
 - Criteria Violation: Overload of the Kyger Creek-Sporn 345 kV line
 - Criteria Test: Summer Gen Deliv
- Overview of Reliability Solution
 - Description of Upgrade: Replace OVEC owned breaker AA risers, bus work, and breaker AA disconnect switches at OVEC owned Kyger Creek station.
 - Upgrade In-Service Date: 6/1/2028
 - Estimated Upgrade Cost: \$0.75M
 - Construction Responsibility: OVEC

45) Baseline Upgrade b3789

- Overview of Reliability Problem
 - Criteria Violation: FERC 715
 - Criteria Test: N-1
- Overview of Reliability Solution
 - Description of Upgrade: A 69 kV, 60 MVAR Shunt Reactor will be installed at the Salt Springs Substation. The reactor terminal will be connected to the existing 69 kV bus and an independent-pole operation, 1200 A circuit breaker will be installed for reactor switching.
 - Upgrade In-Service Date: 6/1/2028
 - Estimated Upgrade Cost: \$5.45M
 - Construction Responsibility: ATSI

46) Baseline Upgrade b3790

- Overview of Reliability Problem
 - Criteria Violation: Over Duty Breaker
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Olive 345kV Breaker "D" Replacement
Replace the overdutied Olive 345kV circuit breaker "D" with a 5000A 63 kA circuit breaker.
Re-use existing cables and a splice box to support the CB install.
 - Upgrade In-Service Date:
 - Estimated Upgrade Cost: \$1.08M
 - Construction Responsibility: AEP

47) Baseline Upgrade b3791

- Overview of Reliability Problem

- Criteria Violation: Overload on the North Meshoppen - Mehoopany #1 115 kV Line
- Criteria Test: Generation Deliverability
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild the North Meshoppen - Mehoopany #1 115 kV Line with 795 ACSR 26/7 STR conductor. Upgrade terminal equipment to exceed transmission line ratings.
 - Upgrade In-Service Date: 6/1/2028
 - Estimated Upgrade Cost: \$17.40M
 - Construction Responsibility: PENELEC

48) Baseline Upgrade b3792

- Overview of Reliability Problem
 - Criteria Violation: Overload on the North Meshoppen - Mehoopany #2 115 kV Line
 - Criteria Test: Generation Deliverability
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild the North Meshoppen - Mehoopany #2 115 kV Line using 795 ACSR 26/7 STR conductor and upgrade terminal equipment to exceed the transmission line rating
 - Upgrade In-Service Date: 6/1/2028
 - Estimated Upgrade Cost: \$17.70M
 - Construction Responsibility: PENELEC

49) Baseline Upgrade b3793.1

- Overview of Reliability Problem
 - Criteria Violation: Overload on Silver Run – Cedar Creek 230 kV circuit
 - Criteria Test: Generation Deliverability
- Overview of Reliability Solution
 - Description of Upgrade: Reconductor Silver Run - Cedar Creek 230kV line. Reconductor 8.8 miles of 230 kV Circuit with 1594-T11/ACCR “Lapwing” conductor and replace all insulators with high temp hardware
 - Upgrade In-Service Date: 6/1/2028
 - Estimated Upgrade Cost: \$7.68M
 - Construction Responsibility: DPL

50) Baseline Upgrade b3793.2

- Overview of Reliability Problem
 - Criteria Violation: Overload on Silver Run – Cedar Creek 230 kV circuit
 - Criteria Test: Generation Deliverability
- Overview of Reliability Solution
 - Description of Upgrade: Cedar Creek – Replace three (3) standalone CTs, disconnect switch, stranded bus, and rigid bus to achieve higher rating
 - Upgrade In-Service Date: 6/1/2028

- Estimated Upgrade Cost: \$0.45M
- Construction Responsibility: DPL

51) Baseline Upgrade b3793.3

- Overview of Reliability Problem
 - Criteria Violation: Overload on Silver Run – Cedar Creek 230 kV circuit
 - Criteria Test: Generation Deliverability
- Overview of Reliability Solution
 - Description of Upgrade: Silver Run - Replace three(3) 1-1590 ACSR Jumpers and one(1) air disconnect switch
 - Upgrade In-Service Date: 6/1/2028
 - Estimated Upgrade Cost: \$0.58M
 - Construction Responsibility: DPL

52) Baseline Upgrade b3794.1

- Overview of Reliability Problem
 - Criteria Violation: Overload on Ridley – Macdade 230 kV circuit
 - Criteria Test: Generation Deliverability
- Overview of Reliability Solution
 - Description of Upgrade: Replace existing Waldwick 230kV 50MVAR fixed shunt reactor with a 230kV 150MVAR variable shunt reactor
 - Upgrade In-Service Date: 6/1/2028
 - Estimated Upgrade Cost: \$0.00M
 - Construction Responsibility: PSEG

53) Baseline Upgrade b3794.2

- Overview of Reliability Problem
 - Criteria Violation: High voltage in the Waldwick vicinity
 - Criteria Test: baseline voltage
- Overview of Reliability Solution
 - Description of Upgrade: Replace existing Waldwick 345kV 100MVAR fixed shunt reactor with a 345kV 150MVAR variable shunt reactor
 - Upgrade In-Service Date: 6/1/2028
 - Estimated Upgrade Cost: \$0.00M
 - Construction Responsibility: PSEG

54) Baseline Upgrade b3797

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution

- Description of Upgrade: Replace Beaumeade 230kV breaker 227T2152 with a breaker rated 80kA
- Upgrade In-Service Date:
- Estimated Upgrade Cost: \$2.31M
- Construction Responsibility: Dominion

55) Baseline Upgrade b3798

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Replace BECO 230kV breakers 215012 and H12T2150 with breakers rated 63kA
 - Upgrade In-Service Date:
 - Estimated Upgrade Cost: \$4.21M
 - Construction Responsibility: Dominion

56) Baseline Upgrade b3799

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Replace Belmont 230kV breaker 227T2180 with a breaker rated 80kA
 - Upgrade In-Service Date:
 - Estimated Upgrade Cost: \$2.24M
 - Construction Responsibility: Dominion

57) Baseline Upgrade b3800.1

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Build New Otter Creek 500 kV (Collinsville) - (switching station - Two bay three breaker configuration).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$32.76M
 - Construction Responsibility: PPL

58) Baseline Upgrade b3800.10

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3

- Criteria Test: 2022 Window 3
 - Overview of Reliability Solution
 - Description of Upgrade: Rebuild the Germantown-Lincoln 115 kV line for 230 kV double circuit construction.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$30.10M
 - Construction Responsibility: ME
- 59) Baseline Upgrade b3800.100
- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
 - Overview of Reliability Solution
 - Description of Upgrade: Establish a new 500 kV breaker position for the low-side of the existing 765/500 kV transformer at Cloverdale Station. The new position will be between two new 500 kV circuit breakers located in a new breaker string, electrically converting the 500 kV yard to "double-bus double-breaker" configuration.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$11.59M
 - Construction Responsibility: AEP
- 60) Baseline Upgrade b3800.101
- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
 - Overview of Reliability Solution
 - Description of Upgrade: 502 Junction substation two 500 kV circuit breaker expansion.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$30.60M
 - Construction Responsibility: APS
- 61) Baseline Upgrade b3800.102
- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
 - Overview of Reliability Solution
 - Description of Upgrade: New 500 kV line from existing 502 Junction substation to Woodside 500 KV substation (bypass Black Oak) (NEET Portion).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$315.64M
 - Construction Responsibility: NEET

62) Baseline Upgrade b3800.103

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild ~16 miles of the Gore-Stonewall 138 kV line with 500 kV overbuild (502 Jct to Woodside 500 kV line section).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$151.72M
 - Construction Responsibility: APS

63) Baseline Upgrade b3800.104

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild ~15 miles of the Stonewall-Millville 138 kV line with 500 kV overbuild (502 Jct to Woodside 500 kV line section).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$136.93M
 - Construction Responsibility: APS

64) Baseline Upgrade b3800.105

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild ~6 miles of the Millville-Doubs 138 kV line with 500 kV overbuild (502 Jct to Woodside 500 kV line section).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$52.35M
 - Construction Responsibility: APS

65) Baseline Upgrade b3800.106

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
- Overview of Reliability Solution
 - Description of Upgrade: Woodside 500 kV substation (Except terminations, Transformer, Cap Banks and Statcom).
 - Upgrade In-Service Date: 6/1/2027

- Estimated Upgrade Cost: \$43.96M
- Construction Responsibility: NEET

66) Baseline Upgrade b3800.107

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
- Overview of Reliability Solution
 - Description of Upgrade: Line Termination cost at Woodside 500 kV for 502 Jct to Woodside 500 kV line.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.51M
 - Construction Responsibility: NEET

67) Baseline Upgrade b3800.108

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
- Overview of Reliability Solution
 - Description of Upgrade: Line Termination cost at Woodside 500 kV for Woodside to Aspen 500 kV line.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.51M
 - Construction Responsibility: NEET

68) Baseline Upgrade b3800.109

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
- Overview of Reliability Solution
 - Description of Upgrade: Termination work for two 500/138 kV transformer at Woodside 500 kV substation
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$1.35M
 - Construction Responsibility: NEET

69) Baseline Upgrade b3800.11

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution

- Description of Upgrade: Rebuild the Hunterstown-Lincoln 115 kV line for 230 kV double circuit construction.
- Upgrade In-Service Date: 6/1/2027
- Estimated Upgrade Cost: \$11.48M
- Construction Responsibility: ME

70) Baseline Upgrade b3800.110

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
- Overview of Reliability Solution
 - Description of Upgrade: Two 500/138 kV transformers at Woodside 500 kV substation.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$33.68M
 - Construction Responsibility: NEET

71) Baseline Upgrade b3800.111

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
- Overview of Reliability Solution
 - Description of Upgrade: Construct the Woodside-Stonewall 138 kV No. 1 line.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$6.28M
 - Construction Responsibility: APS

72) Baseline Upgrade b3800.112

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
- Overview of Reliability Solution
 - Description of Upgrade: Construct the Woodside-Stonewall 138 kV No. 2 line.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$6.31M
 - Construction Responsibility: APS

73) Baseline Upgrade b3800.113

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1

- Overview of Reliability Solution
 - Description of Upgrade: Two 150 MVAR Cap banks and one +500/-300 MVAR STATCOM at Woodside 500 kV substation.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$44.22M
 - Construction Responsibility: NEET

74) Baseline Upgrade b3800.114

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
- Overview of Reliability Solution
 - Description of Upgrade: Stonewall 138 kV substation two 138kV breaker expansion.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$8.30M
 - Construction Responsibility: APS

75) Baseline Upgrade b3800.115

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
- Overview of Reliability Solution
 - Description of Upgrade: Line work for terminating Doubs to Bismark line for Doubs side for Woodside 500 kV substation. (NEET Portion)
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.51M
 - Construction Responsibility: NEET

76) Baseline Upgrade b3800.116

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
- Overview of Reliability Solution
 - Description of Upgrade: Line work for terminating Doubs to Bismark line for Doubs side for Woodside 500 kV substation. (FE Portion)
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.06M
 - Construction Responsibility: APS

77) Baseline Upgrade b3800.117

- Overview of Reliability Problem

- Criteria Violation: Baseline Load Growth Deliverability & Reliability
- Criteria Test: Generation Deliverability, N-1 and N-1-1
- Overview of Reliability Solution
 - Description of Upgrade: Line work for terminating Doubs to Bismark line for Bismark side for Woodside 500 kV substation. (NEET Portion)
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.51M
 - Construction Responsibility: NEET

78) Baseline Upgrade b3800.118

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
- Overview of Reliability Solution
 - Description of Upgrade: Line work for terminating Doubs to Bismark line into Woodside 500 kV substation. (DOM Portion)
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$5.10M
 - Construction Responsibility: Dominion

79) Baseline Upgrade b3800.119

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
- Overview of Reliability Solution
 - Description of Upgrade: New 500 kV transmission line from Woodside substation to Aspen substation (in DOM zone). (NEET Portion)
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$71.72M
 - Construction Responsibility: NEET

80) Baseline Upgrade b3800.12

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild the Germantown-Carroll 138 kV line for 230 kV double circuit construction (MAIT).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$12.16M
 - Construction Responsibility: ME

81) Baseline Upgrade b3800.120

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
- Overview of Reliability Solution
 - Description of Upgrade: Aspen substation work to terminate new NextEra 500 kV line. Include Aspen 500 kV substation portion build.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$30.49M
 - Construction Responsibility: Dominion

82) Baseline Upgrade b3800.121

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
- Overview of Reliability Solution
 - Description of Upgrade: Kammer to 502 Junction 500 kV line: Conduct LIDAR Sag Study to assess SE rating and needed upgrades.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.10M
 - Construction Responsibility: AEP

83) Baseline Upgrade b3800.122

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild 500 kV line No. 514 from Doubs-Goose Creek 500 kV line. The Doubs-Goose Creek 500 kV line will be rebuilt (APS Portion)
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$103.27M
 - Construction Responsibility: APS

84) Baseline Upgrade b3800.123

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
- Overview of Reliability Solution
 - Description of Upgrade: Doubs substation work - Re-terminate the rebuilt Doubs-Goose Creek 500 kV line in its existing bay, Terminate the new Doubs-Aspen 500 kV line in the open bay at Doubs, Replace three 500 kV breakers, Replace 500 kV terminal

equipment including disconnect switches, CTs and substation conductor & Replace relaying. (APS Portion)

- Upgrade In-Service Date: 6/1/2027
- Estimated Upgrade Cost: \$31.70M
- Construction Responsibility: APS

85) Baseline Upgrade b3800.124

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
- Overview of Reliability Solution
 - Description of Upgrade: New Doubs to Aspen 500 kV line - Aspen substation is not yet constructed but is a component in Dominion's proposal 2022-W3-692. (APS Portion)
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$68.80M
 - Construction Responsibility: APS

86) Baseline Upgrade b3800.125

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild the Doubs-Dickerson 230 kV line. This will be underbuilt on the new Doubs-Goose Creek 500 kV line. (APS Portion)
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$13.04M
 - Construction Responsibility: APS

87) Baseline Upgrade b3800.126

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability
 - Criteria Test: Generation Deliverability, N-1 and N-1-1
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild the Doubs-Aqueduct 230 kV line. This will be underbuilt on the new Doubs-Aspen 500 kV line. (APS Portion)
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$11.35M
 - Construction Responsibility: APS

88) Baseline Upgrade b3800.127

- Overview of Reliability Problem
 - Criteria Violation: Baseline Load Growth Deliverability & Reliability

- Criteria Test: Generation Deliverability, N-1 and N-1-1
 - Overview of Reliability Solution
 - Description of Upgrade: Rebuild the Dickerson-Aqueduct 230 kV line. This will be underbuilt on the new Doubs-Aspen 500 kV line. (APS Portion)
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$6.80M
 - Construction Responsibility: APS
- 89) Baseline Upgrade b3800.13
- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
 - Overview of Reliability Solution
 - Description of Upgrade: Rebuild the Germantown-Carroll 138 kV line to 230 kV double circuit construction (APS-PE Section).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$47.31M
 - Construction Responsibility: APS
- 90) Baseline Upgrade b3800.14
- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
 - Overview of Reliability Solution
 - Description of Upgrade: Construct New 230 kV Hunterstown-Carroll line (MAIT section).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$17.37M
 - Construction Responsibility: ME
- 91) Baseline Upgrade b3800.15
- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
 - Overview of Reliability Solution
 - Description of Upgrade: Construct New 230 kV Hunterstown-Carroll line (APS-PE Section).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$6.71M
 - Construction Responsibility: APS
- 92) Baseline Upgrade b3800.16

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Expand Carroll 230 kV substation to ring bus.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$7.62M
 - Construction Responsibility: APS

93) Baseline Upgrade b3800.17

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Network upgrade at Carroll substation.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.43M
 - Construction Responsibility: APS

94) Baseline Upgrade b3800.18

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Add a new 230 kV Breaker at the Hunterstown 230 kV substation for the new Hunterstown-Carroll 230 kV termination.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$2.31M
 - Construction Responsibility: ME

95) Baseline Upgrade b3800.19

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Reconductor Lincoln-Orrtanna 115 kV line.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$10.98M
 - Construction Responsibility: ME

96) Baseline Upgrade b3800.2

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Break the existing TMI-Peach Bottom 500 kV line and reterminate into adjacent Otter Creek 500 kV Switchyard.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$7.03M
 - Construction Responsibility: ME

97) Baseline Upgrade b3800.20

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Fayetteville-Grand Point 138 kV – Replace line trap at Grand Point 138 kV.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.40M
 - Construction Responsibility: APS

98) Baseline Upgrade b3800.200

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Build a new 500 kV line from Aspen-Golden on 500/230 kV double circuit structures with substation upgrades at Aspen and Golden. New conductor to have a minimum summer normal rating of 4357MVA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$176.02M
 - Construction Responsibility: Dominion

99) Baseline Upgrade b3800.201

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Install two 500-230 kV transformer banks at Golden substation.

- Upgrade In-Service Date: 6/1/2027
- Estimated Upgrade Cost: \$70.00M
- Construction Responsibility: Dominion

100) Baseline Upgrade b3800.202

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Install (1) 500-230 kV transformer bank at Aspen substation.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$42.00M
 - Construction Responsibility: Dominion

101) Baseline Upgrade b3800.203

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Install a 2nd 500-230 kV 1440MVA transformer at Mars substation.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$42.19M
 - Construction Responsibility: Dominion

102) Baseline Upgrade b3800.204

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Reconductor 0.5 mile section of 230 kV line No. 2150 Golden-Paragon Park Circuit 1 to achieve a summer rating of 1573 MVA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$1.44M
 - Construction Responsibility: Dominion

103) Baseline Upgrade b3800.205

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution

- Description of Upgrade: Reconductor 0.5 mile section of 230 kV line No. 2081 Golden-Paragon Park Circuit 2 to achieve a summer rating of 1573 MVA.
- Upgrade In-Service Date: 6/1/2027
- Estimated Upgrade Cost: \$1.44M
- Construction Responsibility: Dominion

104) Baseline Upgrade b3800.206

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Upgrade Paragon Park substation line conductors to 4000A continuous current rating for 230 kV lines No. 2081 & line No. 2150.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.09M
 - Construction Responsibility: Dominion

105) Baseline Upgrade b3800.207

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Reconductor 230 kV line No. 2207 Paragon Park-Beco to achieve a summer rating of 1573 MVA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$3.36M
 - Construction Responsibility: Dominion

106) Baseline Upgrade b3800.208

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Upgrade Paragon Park substation conductor and line leads to 4000A continuous current rating for 230 kV line No. 2207.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.10M
 - Construction Responsibility: Dominion

107) Baseline Upgrade b3800.209

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3

- Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Upgrade BECO substation equipment to 4000A continuous current rating for 230 kV line No. 2207.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$1.86M
 - Construction Responsibility: Dominion

108) Baseline Upgrade b3800.21

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Reid-Ringgold 138 kV – Replace line trap, substation conductor, breaker, relaying and CTs at Ringgold.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$3.80M
 - Construction Responsibility: APS

109) Baseline Upgrade b3800.210

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Build a new 230 kV line from Mars-Lockridge on 500/230 kV double circuit structures to achieve a summer rating of 1573 MVA. Install 230 kV equipment at Mars and Lockridge.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$57.95M
 - Construction Responsibility: Dominion

110) Baseline Upgrade b3800.211

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Build a new 230 kV line from Lockridge-Golden on 500/230 kV double circuit structures to achieve a summer rating of 1573 MVA. Install 230 kV equipment at Golden and Lockridge.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$56.93M

- Construction Responsibility: Dominion

111) Baseline Upgrade b3800.212

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Build a new 500 kV line from Mars-Golden on 500/230 kV double circuit structures with substation upgrades at Golden and Mars. New conductor to have a minimum summer normal rating of 4357 MVA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$228.04M
 - Construction Responsibility: Dominion

112) Baseline Upgrade b3800.213

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Cut 500 kV line No. 558 Brambleton-Goose Creek into Aspen substation. Upgrade 500 kV terminal equipment at Aspen and Goose Creek to 5000A continuous rating current. At Goose Creek, replace circuit breakers 59582 and 55882, and associated disconnect switches, breaker leads, bus, and line risers to accommodate 5000A rating.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$50.12M
 - Construction Responsibility: Dominion

113) Baseline Upgrade b3800.214

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Build a new 500 kV line from Aspen-Goose Creek to achieve a summer rating of 4357 MVA. Install new 500 kV terminal equipment at Aspen.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$38.53M
 - Construction Responsibility: Dominion

114) Baseline Upgrade b3800.215

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3

- Criteria Test: 2022 Window 3
 - Overview of Reliability Solution
 - Description of Upgrade: Cut 230 kV line No. 2150 Sterling Park-Paragon Park Circuit 1 into Golden substation and install 230 kV equipment at Golden. Upgrade relay settings at Golden substation for upgrading 230 kV line No. 2150 to 4000A continuous current rating.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$57.62M
 - Construction Responsibility: Dominion
- 115) Baseline Upgrade b3800.216
- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
 - Overview of Reliability Solution
 - Description of Upgrade: Cut 230 kV line No. 2081 Sterling Park-Paragon Park Circuit 2 into Golden substation and install 230 kV equipment at Golden. Upgrade relay settings at Golden substation for upgrading 230 kV line No. 2081 to 4000A continuous current rating.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$57.62M
 - Construction Responsibility: Dominion
- 116) Baseline Upgrade b3800.217
- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
 - Overview of Reliability Solution
 - Description of Upgrade: Build a new 230 kV line from Aspen-Sycolin Creek on 500/230 kV double circuit structures to achieve a summer rating of 1573 MVA. Install 230 kV equipment at Golden and Sycolin Creek.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$60.42M
 - Construction Responsibility: Dominion
- 117) Baseline Upgrade b3800.218
- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
 - Overview of Reliability Solution
 - Description of Upgrade: Build a new 230 kV line from Sycolin Creek-Golden on 500/230 kV double circuit structures to achieve a summer rating of 1573 MVA. Install 230 kV equipment at Golden and Sycolin Creek.

- Upgrade In-Service Date: 6/1/2027
- Estimated Upgrade Cost: \$69.84M
- Construction Responsibility: Dominion

118) Baseline Upgrade b3800.219

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Replace 7 overdutied 230 kV breakers at Beaumeade substation with 80 kA breakers.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$3.03M
 - Construction Responsibility: Dominion

119) Baseline Upgrade b3800.22

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Install DTT relaying at Straban substation.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.67M
 - Construction Responsibility: ME

120) Baseline Upgrade b3800.220

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Replace 4 overdutied 230 kV breakers at BECO substation with 80 kA breakers.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$1.81M
 - Construction Responsibility: Dominion

121) Baseline Upgrade b3800.221

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution

- Description of Upgrade: Replace 4 overdutied 230 kV breakers at Belmont substation with 80 kA breakers.
- Upgrade In-Service Date: 6/1/2027
- Estimated Upgrade Cost: \$1.90M
- Construction Responsibility: Dominion

122) Baseline Upgrade b3800.222

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Replace 1 overdutied 230 kV breaker at Discovery substation with 80 kA breaker.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.49M
 - Construction Responsibility: Dominion

123) Baseline Upgrade b3800.223

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Replace 1 overdutied 230 kV breaker at Pleasant View substation with 80 kA breaker.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.51M
 - Construction Responsibility: Dominion

124) Baseline Upgrade b3800.224

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Replace 2 overdutied 230 kV breakers at Shellhorn substation with 80 kA breakers.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.93M
 - Construction Responsibility: Dominion

125) Baseline Upgrade b3800.225

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3

- Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Change 500 kV line No. 558 destination at Brambleton to Aspen substation and upgrade line protection relays.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.23M
 - Construction Responsibility: Dominion

126) Baseline Upgrade b3800.226

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Change 230 kV lines No. 2081 and 2150 at Paragon Park substation destination to Golden substation and upgrade line protection relays
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.30M
 - Construction Responsibility: Dominion

127) Baseline Upgrade b3800.227

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Change 230 kV lines No. 2081 and 2150 at Sterling Park substation destination to Golden substation and upgrade line protection relays.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.30M
 - Construction Responsibility: Dominion

128) Baseline Upgrade b3800.228

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Reconductor 1.47 miles of 230 kV circuits 2081 and 2150 from Sterling Park to Golden substation. Upgrade terminal equipment at Sterling Park to 4000A continuous current.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$7.97M
 - Construction Responsibility: Dominion

129) Baseline Upgrade b3800.229

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Reconductor 0.67 miles of 230 kV circuits 2194 and 9231 from Davis Drive to Sterling Park substation. Terminal equipment at remote end substations will be installed or upgraded to 4000A continuous current rating to support new conductor ratings.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$5.53M
 - Construction Responsibility: Dominion

130) Baseline Upgrade b3800.23

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Revise Relay Settings at Lincoln substation.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.31M
 - Construction Responsibility: ME

131) Baseline Upgrade b3800.230

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Reset relays at Breezy Knoll for the revised current rating of 230 kV line No. 2098 Pleasant View-Hamilton.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.02M
 - Construction Responsibility: Dominion

132) Baseline Upgrade b3800.231

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Reset relays at Dry Mill for the revised current rating of 230 kV line No. 2098 Pleasant View-Hamilton.

- Upgrade In-Service Date: 6/1/2027
- Estimated Upgrade Cost: \$0.02M
- Construction Responsibility: Dominion

133) Baseline Upgrade b3800.232

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Reset relays at Hamilton for the revised current rating of 230 kV line No. 2098 Pleasant View-Hamilton.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.01M
 - Construction Responsibility: Dominion

134) Baseline Upgrade b3800.233

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Upgrade equipment to 4000A continuous current rating at Pleasant View substation in support of 230 .kV line No. 2098 wreck and rebuild. Replace circuit breakers 274T2098 & 2098T2180 and associated disconnect switches, breaker leads, bus, and line risers to accommodate 4000A rating.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$1.81M
 - Construction Responsibility: Dominion

135) Baseline Upgrade b3800.234

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Wreck and rebuild approximately one mile of 230 kV line No. 2098 between Pleasant View and structure 2098/9, where line No. 2098 turn towards Hamilton substation.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$3.44M
 - Construction Responsibility: Dominion

136) Baseline Upgrade b3800.235

- Overview of Reliability Problem

- Criteria Violation: 2022 Window 3
- Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Replace 5 overdutied 230 kV breakers at Loudoun substation with 80 kA breakers.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$2.32M
 - Construction Responsibility: Dominion

137) Baseline Upgrade b3800.236

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Replace 2 overdutied 230 kV breakers at Ox substation with 63kA breakers.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$2.51M
 - Construction Responsibility: Dominion

138) Baseline Upgrade b3800.237

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Replace 2 overdutied 230 kV breakers at Pleasant View substation with 63kA breakers.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$1.29M
 - Construction Responsibility: Dominion

139) Baseline Upgrade b3800.238

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Upgrade equipment to 4000A continuous current rating at Pleasant View substation in support of 230 kV line No. 203 rebuild. Replace circuit breakers 203T274 & L3T203 and associated disconnect switches, breaker leads, bus, and line risers to accommodate 4000A rating.
 - Upgrade In-Service Date: 6/1/2027

- Estimated Upgrade Cost: \$1.81M
- Construction Responsibility: Dominion

140) Baseline Upgrade b3800.239

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Wreck and rebuild 230 kV line No. 203 between Pleasant View and structure 203/15 using double circuit 500/230 kV structures. The 500 kV line is from Aspen-Doubs.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$6.87M
 - Construction Responsibility: Dominion

141) Baseline Upgrade b3800.24

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Revise Relay Settings at Germantown substation.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.47M
 - Construction Responsibility: ME

142) Baseline Upgrade b3800.240

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Build a new 500 kV line from Aspen-Doubs using double circuit 500/230 kV structures. The 230 kV line is from Pleasant View-structure 203/15. Install terminal equipment at Aspen for a 5000A line to Doubs (First Energy). This includes GIS breakers, GIS-to-AIS transition equipment, and metering CCVTs and CTs for the tie line.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$41.68M
 - Construction Responsibility: Dominion

143) Baseline Upgrade b3800.241

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3

- Overview of Reliability Solution
 - Description of Upgrade: Rebuild 500 kV line No. 514 from Goose Creek-Doubs using 500/230 kV double circuit structures. The new double circuit towers will accommodate 230 kV line No. 2098 between Pleasant View substation and structure 2098/9. Upgrade equipment at Goose Creek to 5000A continuous current rating in support of line No. 514 wreck and rebuild. Replace circuit breakers 514T595 & 51482 and associated disconnect switches, breaker leads, bus, and line risers to accommodate 5000A rating.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$16.11M
 - Construction Responsibility: Dominion

144) Baseline Upgrade b3800.242

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Upgrading switches 20366M and 20369M and line leads to 4000A continuous current rating of 230 kV line No. 203 at Edwards Ferry substation
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.51M
 - Construction Responsibility: Dominion

145) Baseline Upgrade b3800.243

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild 7.26 miles of existing 230 kV circuit from Dickerson Station H to Ed's Ferry area to accommodate the new 500 kV circuit between Doubs and Aspen. (the 500 kV portion of the work)
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$37.20M
 - Construction Responsibility: PEPCO

146) Baseline Upgrade b3800.244

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild 7.26 miles of existing 230 kV circuit from Dickerson Station H to Ed's Ferry area to accommodate the new 500 kV circuit between Doubs and Aspen. (The 230 kV portion of the project)
 - Upgrade In-Service Date: 6/1/2027

- Estimated Upgrade Cost: \$18.60M
- Construction Responsibility: PEPCO

147) Baseline Upgrade b3800.245

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Reconfigure Dickerson H 230 kV substation and upgrade terminal equipment.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$10.58M
 - Construction Responsibility: PEPCO

148) Baseline Upgrade b3800.25

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Taneytown substation terminal upgrade.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.53M
 - Construction Responsibility: APS

149) Baseline Upgrade b3800.26

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Build High Ridge 500 kV substation - Three bay breaker and half configuration.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.00M
 - Construction Responsibility: BGE

150) Baseline Upgrade b3800.27

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: High Ridge 500 kV substation (cut into Brighton-Waugh Chapel

500 kV line) - Waugh Chapel side.

- Upgrade In-Service Date: 6/1/2027
- Estimated Upgrade Cost: \$33.67M
- Construction Responsibility: BGE

151) Baseline Upgrade b3800.28

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: High Ridge 500 kV substation (cut into Brighton-Waugh Chapel 500 kV line) -Brighton side.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$33.67M
 - Construction Responsibility: BGE

152) Baseline Upgrade b3800.29

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: High Ridge termination for the North Delta-High Ridge 500 kV line.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$33.67M
 - Construction Responsibility: BGE

153) Baseline Upgrade b3800.3

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: New Otter Creek (Collinsville) to Doubs 500 kV line (Otter Creek 500 kV - MD Border). Rebuild and expand existing ~12 miles of Otter Creek-Conastone 230 kV line to become a double-circuit 500 and 230 kV lines.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$83.30M
 - Construction Responsibility: PPL

154) Baseline Upgrade b3800.30

- Overview of Reliability Problem

- Criteria Violation: 2022 Window 3
- Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: High Ridge - Install two 500/230 kV transformers.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$22.11M
 - Construction Responsibility: BGE

155) Baseline Upgrade b3800.300

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild 230 kV line No. 2135 Hollymeade Junction-Cash's Corner using double-circuit capable 500/230 kV poles. New conductor has a summer rating of 1573 MVA. (The 500 kV circuit will not be wired as part of this project).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$32.45M
 - Construction Responsibility: Dominion

156) Baseline Upgrade b3800.301

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild 230 kV line No. 2135 Cash's Corner-Gordonsville using double-circuit capable 500/230 kV poles. New conductor has a summer rating of 1573 MVA. (The 500 kV circuit will not be wired as part of this project).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$21.51M
 - Construction Responsibility: Dominion

157) Baseline Upgrade b3800.302

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Upgrade Cash's Corner switches 213576 and 213579 and line leads to 4000A continuous current rating of 230 kV line No. 2135.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.51M

- Construction Responsibility: Dominion

158) Baseline Upgrade b3800.303

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Upgrade Gordonsville substation line leads to 4000A continuous current rating of 230 kV line No. 2135.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.08M
 - Construction Responsibility: Dominion

159) Baseline Upgrade b3800.304

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Upgrade Hollymeade substation switch 213549 and line leads to 4000A continuous current rating of 230 kV line No. 2135.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.30M
 - Construction Responsibility: Dominion

160) Baseline Upgrade b3800.305

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Install one (1) 300 MVAR Static synchronous Compensator (STATCOM) & associated equipment at Beaumeade substation.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$43.57M
 - Construction Responsibility: Dominion

161) Baseline Upgrade b3800.306

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Install one (1) 500 kV, 150 MVA Shunt Capacitor Bank & associated equipment at Morrisville substation. This addition will require a control house

expansion to accommodate for two new panels.

- Upgrade In-Service Date: 6/1/2027
- Estimated Upgrade Cost: \$3.63M
- Construction Responsibility: Dominion

162) Baseline Upgrade b3800.307

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Install one (1) 500 kV, 300 MVAR Static synchronous Compensator (STATCOM) & associated equipment at Mars substation.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$41.27M
 - Construction Responsibility: Dominion

163) Baseline Upgrade b3800.308

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Install one (1) 230 kV, 150MVAR Shunt Capacitor Bank & associated equipment at Mars substation.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$5.26M
 - Construction Responsibility: Dominion

164) Baseline Upgrade b3800.309

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Install one (1) 230 kV, 150MVAR Shunt Capacitor Bank & associated equipment at Wishing Star substation.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$6.09M
 - Construction Responsibility: Dominion

165) Baseline Upgrade b3800.31

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3

- Criteria Test: 2022 Window 3
 - Overview of Reliability Solution
 - Description of Upgrade: Build new North Delta-High Ridge 500 kV line.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$13.36M
 - Construction Responsibility: PECO
- 166) Baseline Upgrade b3800.310
- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
 - Overview of Reliability Solution
 - Description of Upgrade: Install one 500 kV, 293.8MVAR Shunt Capacitor Bank & associated equipment at Wishing Star substation.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$3.97M
 - Construction Responsibility: Dominion
- 167) Baseline Upgrade b3800.311
- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
 - Overview of Reliability Solution
 - Description of Upgrade: Rebuild 500 kV line No. 545 Bristers-Morrisville as a single circuit monopole line to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 4357 MVA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$65.86M
 - Construction Responsibility: Dominion
- 168) Baseline Upgrade b3800.312
- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
 - Overview of Reliability Solution
 - Description of Upgrade: Rebuild 500 kV line No. 569 Loudoun-Morrisville to accommodate the new 500 kV line in the existing right-of-way. New conductor to have a summer rating of 4357 MVA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$175.62M
 - Construction Responsibility: Dominion

169) Baseline Upgrade b3800.313

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild approximately 10.29 miles line segment of line No. 535 (Meadow Brook to Loudoun) to accommodate the new 500 kV line in the existing ROW.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$65.86M
 - Construction Responsibility: Dominion

170) Baseline Upgrade b3800.314

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild approximately 4.83 miles of 500 kV line No. 546 Mosby-Wishing Star to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 4357 MVA. Upgrade and install equipment at Mosby substation to upgrade terminal equipment to be rated for 5000A for 500 kV lines No. 546.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$49.79M
 - Construction Responsibility: Dominion

171) Baseline Upgrade b3800.315

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild approximately 4.59 miles of 500 kV line No. 590 Mosby-Wishing Star to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 4357 MVA. Upgrade and install equipment at Mosby substation to upgrade terminal equipment to be rated for 5000A for 500 kV lines No. 590.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$49.79M
 - Construction Responsibility: Dominion

172) Baseline Upgrade b3800.316

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3

- Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild approximately 6.17 miles of 230 kV line No. 2030 Gainesville-Mint Springs to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$13.98M
 - Construction Responsibility: Dominion

173) Baseline Upgrade b3800.317

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild approximately 1.58 miles of 230 kV line No. 2030 Mint Springs-Loudoun to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$3.59M
 - Construction Responsibility: Dominion

174) Baseline Upgrade b3800.318

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild approximately 4.2 miles of 230 kV line No. 2045 Loudoun-North Star to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$14.52M
 - Construction Responsibility: Dominion

175) Baseline Upgrade b3800.319

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild approximately 0.88 miles of 230 kV line No. 2045 North Star-Brambleton to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA.
 - Upgrade In-Service Date: 6/1/2027

- Estimated Upgrade Cost: \$3.04M
- Construction Responsibility: Dominion

176) Baseline Upgrade b3800.32

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Build new North Delta-High Ridge 500 kV line. (~59 miles).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$407.11M
 - Construction Responsibility: BGE

177) Baseline Upgrade b3800.320

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild approximately 1.22 miles of 230 kV line No. 2227 Brambleton-Racefield to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$4.36M
 - Construction Responsibility: Dominion

178) Baseline Upgrade b3800.321

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild approximately 3.69 miles of 230 kV line No. 2094 Racefield-Loudoun to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$13.20M
 - Construction Responsibility: Dominion

179) Baseline Upgrade b3800.322

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3

- Overview of Reliability Solution
 - Description of Upgrade: Rebuild approximately 9.16 miles of 230 kV line No. 2101 Bristers-Nokesville to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$12.99M
 - Construction Responsibility: Dominion

180) Baseline Upgrade b3800.323

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild approximately 2.89 miles of 230 kV line No. 2101 Nokesville-Vint Hill TP to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$4.10M
 - Construction Responsibility: Dominion

181) Baseline Upgrade b3800.324

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild approximately 0.33 miles of 230 kV line No. 2101 Vint Hill TP-Vint Hill to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.47M
 - Construction Responsibility: Dominion

182) Baseline Upgrade b3800.325

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild approximately 3.32 miles of 230 kV line No. 2114 Rollins Ford-Vint Hill to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$4.35M

- Construction Responsibility: Dominion

183) Baseline Upgrade b3800.326

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild approximately 10.09 miles of 230 kV line No. 2114 Vint Hill-Elk Run to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$13.21M
 - Construction Responsibility: Dominion

184) Baseline Upgrade b3800.327

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild approximately 4.43 miles of 230 kV line No. 2140 Heathcote-Catharpin to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$10.64M
 - Construction Responsibility: Dominion

185) Baseline Upgrade b3800.328

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild approximately 2.88 miles of 230 kV line No. 2140 Catharpin-Loudoun to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$6.92M
 - Construction Responsibility: Dominion

186) Baseline Upgrade b3800.329

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3

- Overview of Reliability Solution
 - Description of Upgrade: Rebuild approximately 0.25 miles of 230 kV line No. 2151 Railroad DP-Gainesville to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$4.39M
 - Construction Responsibility: Dominion

187) Baseline Upgrade b3800.33

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Replace terminal equipment limitations at Brighton 500 kV - on the existing Brighton-Waugh Chapel 500 kV (5053) or new Brighton-High Ridge 500 kV.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$4.13M
 - Construction Responsibility: PEPCO

188) Baseline Upgrade b3800.330

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild approximately 4.14 miles of 230 kV line No. 2163 Vint Hill-Liberty to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$17.56M
 - Construction Responsibility: Dominion

189) Baseline Upgrade b3800.331

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild approximately 0.48 miles of line No. 2176 Heathcote-Gainesville to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$8.78M
 - Construction Responsibility: Dominion

190) Baseline Upgrade b3800.332

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild approximately 1.11 miles of line No. 2222 Rollins Ford-Gainesville to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$13.17M
 - Construction Responsibility: Dominion

191) Baseline Upgrade b3800.333

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild approximately 1.65 miles of line No. 183 Bristers-Ox to accommodate the new 500 kV line in the existing ROW. New conductor to have a summer rating of 1573 MVA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$8.78M
 - Construction Responsibility: Dominion

192) Baseline Upgrade b3800.334

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Replace 4 overdutied 230 kV breakers at Loudoun substation with 80 kA breakers.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$1.72M
 - Construction Responsibility: Dominion

193) Baseline Upgrade b3800.335

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Replace 1 overdutied 500 kV breaker at Ox substation with a

63kA breaker.

- Upgrade In-Service Date: 6/1/2027
- Estimated Upgrade Cost: \$1.29M
- Construction Responsibility: Dominion

194) Baseline Upgrade b3800.336

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Upgrade and install equipment at Bristers substation to support the new conductor 5000A rating for 500 kV line No. 545.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$5.72M
 - Construction Responsibility: Dominion

195) Baseline Upgrade b3800.337

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Upgrade and install equipment at Brambleton substation to support the new conductor termination. All terminal equipment for 230 kV lines No. 2045 & No. 2094 to be rated for 4000A continuous current rating.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$4.65M
 - Construction Responsibility: Dominion

196) Baseline Upgrade b3800.338

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Revise relay settings at Dawkins Branch.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.02M
 - Construction Responsibility: Dominion

197) Baseline Upgrade b3800.339

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3

- Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Upgrade and install equipment at Gainesville substation to support the new conductor termination. All terminal equipment for 230 kV line No. 2030 to be rated for 4000A continuous current rating.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$3.71M
 - Construction Responsibility: Dominion

198) Baseline Upgrade b3800.34

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild 5012 (existing Peach Bottom-Conastone) (new Gracetone-Conastone) 500 kV line on single circuit structures within existing ROW and cut into North Delta 500 kV and Gracetone 500 kV stations.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$70.00M
 - Construction Responsibility: BGE

199) Baseline Upgrade b3800.340

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Revise relay settings at Heathcote.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.02M
 - Construction Responsibility: Dominion

200) Baseline Upgrade b3800.341

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Upgrade and install equipment at Loudoun substation for 230 kV line No. 2094 Loudoun-Racefield to be rated for 4000A continuous current rating.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$2.50M
 - Construction Responsibility: Dominion

201) Baseline Upgrade b3800.342

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Upgrade and install equipment at Loudoun substation for 230 kV line No. 2045 Loudoun-North Star to be rated for 4000A continuous current rating.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$2.50M
 - Construction Responsibility: Dominion

202) Baseline Upgrade b3800.343

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Upgrade and install equipment at Loudoun substation for 230 kV line No. 2030 Loudoun-Mint Springs to be rated for 4000A continuous current rating.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$1.00M
 - Construction Responsibility: Dominion

203) Baseline Upgrade b3800.344

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Upgrade and install equipment at Loudoun substation to support the new conductor 5000A rating for 500 kV line No. 569 Loudoun-Morrisville.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$10.70M
 - Construction Responsibility: Dominion

204) Baseline Upgrade b3800.345

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Revise relay settings at Mint Springs.
 - Upgrade In-Service Date: 6/1/2027

- Estimated Upgrade Cost: \$0.03M
- Construction Responsibility: Dominion

205) Baseline Upgrade b3800.346

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Upgrade and install equipment at Morrisville substation to support the new 500 kV conductor termination. All terminal equipment to be rated for 5000 A for 500 kV line No. 545 & No. 569. Upgrade 500 kV bus 2 to 5000 A.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$17.54M
 - Construction Responsibility: Dominion

206) Baseline Upgrade b3800.347

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Revise relay settings at North Star.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.03M
 - Construction Responsibility: Dominion

207) Baseline Upgrade b3800.348

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Revise relay settings at Racefield.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.03M
 - Construction Responsibility: Dominion

208) Baseline Upgrade b3800.349

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution

- Description of Upgrade: Revise relay settings at Railroad.
- Upgrade In-Service Date: 6/1/2027
- Estimated Upgrade Cost: \$0.02M
- Construction Responsibility: Dominion

209) Baseline Upgrade b3800.35

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild 5012 (existing Peach Bottom-Conastone) (new North Delta-Gracetone PECO) 500 kV line on single circuit structures within existing ROW and cut into North Delta 500 kV and Gracetone 500 kV stations.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$29.86M
 - Construction Responsibility: PECO

210) Baseline Upgrade b3800.350

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Install terminal equipment at Vint Hill substation to support a 5000A line to Morrisville. Update relay settings for 230 kV lines No. 2101, No. 2163, and 500 kV line No. 535.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$23.64M
 - Construction Responsibility: Dominion

211) Baseline Upgrade b3800.351

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Update relay settings at Vint Hill for 230 kV line No. 2101 Vint Hill-Bristers.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.03M
 - Construction Responsibility: Dominion

212) Baseline Upgrade b3800.352

- Overview of Reliability Problem

- Criteria Violation: 2022 Window 3
- Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Update relay settings at Vint Hill for 230 kV line No. 2163 Vint Hill-Liberty.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.03M
 - Construction Responsibility: Dominion

213) Baseline Upgrade b3800.353

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Update relay settings at Vint Hill for 500 kV line No. 535 Vint Hill-Loudoun.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.03M
 - Construction Responsibility: Dominion

214) Baseline Upgrade b3800.354

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Install terminal equipment at Wishing Star substation to support a 5000A line to Vint Hill. Update relay settings for 500 kV lines No. 546 and No. 590.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$12.30M
 - Construction Responsibility: Dominion

215) Baseline Upgrade b3800.355

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Revise relay settings at Youngs Branch.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.02M
 - Construction Responsibility: Dominion

216) Baseline Upgrade b3800.356

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Build a new 500 kV line from Vint Hill to Wishing Star. The line will be supported on single circuit monopoles. New conductor to have a summer rating of 4357 MVA. Line length is approximately 16.59 miles.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$87.81M
 - Construction Responsibility: Dominion

217) Baseline Upgrade b3800.357

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Build a new 500 kV line from Morrisville to Vint Hill. New conductor to have a summer rating of 4357 MVA. Line length is approximately 19.71 miles.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$101.89M
 - Construction Responsibility: Dominion

218) Baseline Upgrade b3800.358

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Replace single unit Locks 230/115 kV 168MVA transformer TX No. 7 with new single unit transformer with a rating of 224 MVA. Lead lines at the 115 kV level will be upgraded to 2000A.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$7.14M
 - Construction Responsibility: Dominion

219) Baseline Upgrade b3800.359

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution

- Description of Upgrade: Wreck and rebuild line No. 2090 Ladysmith CT- Summit D.P. segment as a double circuit 230 kV line to achieve a summer rating of 1573 MVA. Only one circuit will be wired at this stage. Upgrade circuit breaker leads, switches and line leads at Ladysmith CT to 4000A
- Upgrade In-Service Date: 6/1/2027
- Estimated Upgrade Cost: \$36.50M
- Construction Responsibility: Dominion

220) Baseline Upgrade b3800.36

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild 5012 (existing Peach Bottom-Conastone) (new North Delta-Gracetone BGE) 500 kV line on single circuit structures within existing ROW and cut into North Delta 500 kV and Gracetone 500 kV stations.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$10.44M
 - Construction Responsibility: BGE

221) Baseline Upgrade b3800.360

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild 230 kV line No. 2054 Charlottesville-Proffit DP using double-circuit capable 500/230 kV poles. (The 500 kV circuit will not be wired as part of this project).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$70.14M
 - Construction Responsibility: Dominion

222) Baseline Upgrade b3800.361

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild 230 kV line No. 233 Charlottesville-Hydraulic Rd-Barracks Road-Crozet-Dooms.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$54.54M
 - Construction Responsibility: Dominion

223) Baseline Upgrade b3800.362

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild 230 kV line No. 291 segment from Charlottesville-Barracks Road.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$22.50M
 - Construction Responsibility: Dominion

224) Baseline Upgrade b3800.363

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild 230 kV line No. 291 segment from Barracks Road-Crozet.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$20.81M
 - Construction Responsibility: Dominion

225) Baseline Upgrade b3800.364

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild 230 kV line No. 291 segment Crozet-Dooms.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$11.23M
 - Construction Responsibility: Dominion

226) Baseline Upgrade b3800.365

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Hollymeade substation Relay Revision for 230 kV line No. 2054 Charlottesville-Hollymeade.
 - Upgrade In-Service Date: 6/1/2027

- Estimated Upgrade Cost: \$0.01M
- Construction Responsibility: Dominion

227) Baseline Upgrade b3800.366

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Upgrade the terminal equipment at Charlottesville to 4000A for 230 kV line No. 2054 (Charlottesville-Hollymeade).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.97M
 - Construction Responsibility: Dominion

228) Baseline Upgrade b3800.367

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Proffit DP substation Relay Revision for 230 kV line No. 2054 Charlottesville-Hollymeade
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.02M
 - Construction Responsibility: Dominion

229) Baseline Upgrade b3800.368

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Barracks Rd substation Relay Reset to accommodate the rebuilt line 230 kV lines No. 233 and No. 291.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.03M
 - Construction Responsibility: Dominion

230) Baseline Upgrade b3800.369

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution

- Description of Upgrade: Crozet substation Relay Reset to accommodate the rebuilt line 230 kV lines No. 233 and No. 291.
- Upgrade In-Service Date: 6/1/2027
- Estimated Upgrade Cost: \$0.03M
- Construction Responsibility: Dominion

231) Baseline Upgrade b3800.37

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Replace terminal equipment limitations at Conastone 500 kV - on the (existing Peach Bottom-Conastone) or (new Graceton-Conastone) 500 kV line.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$4.93M
 - Construction Responsibility: BGE

232) Baseline Upgrade b3800.370

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Charlottesville substation Terminal Equipment Upgrade for 230 kV lines No. 233 & No. 291 Rebuild.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$1.50M
 - Construction Responsibility: Dominion

233) Baseline Upgrade b3800.371

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Upgrade Hydraulic Rd substation Equipment for 230 kV line No. 233 & No. 291 Rebuild.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.65M
 - Construction Responsibility: Dominion

234) Baseline Upgrade b3800.372

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3

- Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Dooms substation Terminal Equipment Upgrade for 230 kV line No. 233 & No. 291 Rebuild.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$1.06M
 - Construction Responsibility: Dominion

235) Baseline Upgrade b3800.373

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Wreck and rebuild approximately 7.14 miles of 230 kV line No. 256 from St. Johns to structure 256/108 to achieve a summer rating of 1573 MVA. line switch 25666 at St. Johns to be upgraded to 4000A.
 - Upgrade In-Service Date: 6/1/2028
 - Estimated Upgrade Cost: \$21.75M
 - Construction Responsibility: Dominion

236) Baseline Upgrade b3800.374

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Reconductor approximately 5.30 miles of 230 kV line No. 256 from Ladysmith CT to structure 256/107 to achieve a summer rating of 1573 MVA. Terminal equipment at remote end substations will be upgraded to 4000A.
 - Upgrade In-Service Date: 6/1/2028
 - Estimated Upgrade Cost: \$16.14M
 - Construction Responsibility: Dominion

237) Baseline Upgrade b3800.38

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Chalk Point-Cheltenham 500 kV (5073) - Replace relay at Chalk Point 500 kV.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.34M

- Construction Responsibility: PEPCO

238) Baseline Upgrade b3800.39

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Red Lion-Hope Creek 500 kV - Replace terminal equipment at Red Lion.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$4.00M
 - Construction Responsibility: DPL

239) Baseline Upgrade b3800.4

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: New Otter Creek to Doubs 500 kV line (MD Border-PSEG Demarcation Point). Rebuild and expand existing ~1.6 miles of Otter Creek-Conastone 230 kV line to become a double-circuit 500 and 230 kV lines.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$11.11M
 - Construction Responsibility: BGE

240) Baseline Upgrade b3800.40

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Conastone-Brighton 500 kV (5011 circuit) - Replace terminal equipment limitations at Brighton 500 kV.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$4.13M
 - Construction Responsibility: PEPCO

241) Baseline Upgrade b3800.401

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution

- Description of Upgrade: Replace Ashburn 230 kV breaker SC432 with a breaker rated 63 kA.
- Upgrade In-Service Date: 6/1/2027
- Estimated Upgrade Cost: \$0.79M
- Construction Responsibility: Dominion

242) Baseline Upgrade b3800.402

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Replace Beaumeade 230 kV breaker 227T2152 with a breaker rated 80 kA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$2.31M
 - Construction Responsibility: Dominion

243) Baseline Upgrade b3800.403

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Replace BECO 230 kV breakers 215012 and H12T2150 with breakers rated 63kA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$4.21M
 - Construction Responsibility: Dominion

244) Baseline Upgrade b3800.404

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Replace Belmont 230 kV breaker 227T2180 with a breaker rated 80 kA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$2.24M
 - Construction Responsibility: Dominion

245) Baseline Upgrade b3800.405

- Overview of Reliability Problem
 - Criteria Violation:

- Criteria Test:
 - Overview of Reliability Solution
 - Description of Upgrade: Replace Brambleton 230 kV breakers 20102, 20602, 204502, 209402, 201T2045, 206T2094 with breakers rated 80 kA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$9.38M
 - Construction Responsibility: Dominion
- 246) Baseline Upgrade b3800.406
- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
 - Overview of Reliability Solution
 - Description of Upgrade: Replace Gainesville 230 kV breaker 216192 with a breaker rated 80 kA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$3.11M
 - Construction Responsibility: Dominion
- 247) Baseline Upgrade b3800.407
- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
 - Overview of Reliability Solution
 - Description of Upgrade: Replace Loudoun 230 kV breakers 204552, 217352 with breakers rated 80 kA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$5.57M
 - Construction Responsibility: Dominion
- 248) Baseline Upgrade b3800.408
- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
 - Overview of Reliability Solution
 - Description of Upgrade: Replace Ox 230 kV breakers 22042, 24342, 24842, 220T2063, 243T2097, 248T2013, H342 with breakers rated 80 kA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$9.02M
 - Construction Responsibility: Dominion
- 249) Baseline Upgrade b3800.409

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Replace Paragon Park 230 kV breakers 208132, 215032, 2081T2206, 2150T2207 with breakers rated 80 kA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$4.96M
 - Construction Responsibility: Dominion

250) Baseline Upgrade b3800.41

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Conastone-Brighton 500 kV (5011 circuit) - Replace terminal equipment limitations at Conastone 500 kV.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$7.16M
 - Construction Responsibility: BGE

251) Baseline Upgrade b3800.410

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Replace Reston 230 kV breaker 264T2015 with a breaker rated 63 kA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.79M
 - Construction Responsibility: Dominion

252) Baseline Upgrade b3800.411

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Replace Stonewater 230 kV breakers 20662-1, 20662-2, 217862-1, 217862-2 with breakers rated 80 kA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$4.95M

- Construction Responsibility: Dominion

253) Baseline Upgrade b3800.412

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Replace Waxpool 230 kV breakers 214922-5, 214922-6, 216622-5, 216622-6 with breakers rated 63 kA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$2.93M
 - Construction Responsibility: Dominion

254) Baseline Upgrade b3800.413

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Replace Double Toll Gate 138 kV breaker MDT 138 OCB with a breaker rated 40 kA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$3.00M
 - Construction Responsibility: APS

255) Baseline Upgrade b3800.414

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Replace Doubs 500 kV breaker DL-55 522LIN with a breaker rated 60 kA.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$10.01M
 - Construction Responsibility: APS

256) Baseline Upgrade b3800.42

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Peach Bottom North bus upgrade - Replace 11 – Instances of strain bus conductor used for breaker drops or CT drops, 7 – 500 kV disconnect

switches, 7 – Free Standing CTs, 1 – 500 kV breaker, 2 – Breaker relays or meters.

- Upgrade In-Service Date: 6/1/2027
- Estimated Upgrade Cost: \$2.70M
- Construction Responsibility: PECO

257) Baseline Upgrade b3800.43

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Construct 31.5 miles of 500 kV overhead AC line between the Conastone vicinity and the Doubs substations (APS zone portion).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$176.80M
 - Construction Responsibility: PSEG

258) Baseline Upgrade b3800.44

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: North Delta termination for the North Delta-High Ridge 500 line (PECO work).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$3.40M
 - Construction Responsibility: PECO

259) Baseline Upgrade b3800.45

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: North Delta 500 kV termination for the Rock Springs 500 kV line (5034/5014 line) (PECO work).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$10.20M
 - Construction Responsibility: PECO

260) Baseline Upgrade b3800.46

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3

- Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: North Delta 500 kV termination for the new Peach Bottom-North Delta 500 kV line (PECO work).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$2.60M
 - Construction Responsibility: PECO

261) Baseline Upgrade b3800.47

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Build new Peach Bottom South-North Delta 500 kV line – cut in to Peach Bottom tie No. 1 and extending line to North Delta (~1.25 miles new ROW).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$5.50M
 - Construction Responsibility: PECO

262) Baseline Upgrade b3800.48

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: North Delta termination for the North Delta-High Ridge 500 line (Transource work).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.96M
 - Construction Responsibility: Transource

263) Baseline Upgrade b3800.49

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: North Delta 500 kV termination for the Calpine generator (Calpine/Transource work).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$4.05M
 - Construction Responsibility: Transource

264) Baseline Upgrade b3800.5

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Peach Bottom-TMI 500 kV - Replace terminal equipment at Peach Bottom.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.00M
 - Construction Responsibility: PECO

265) Baseline Upgrade b3800.50

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: North Delta 500 kV termination for the Rock Springs 500 kV line (5034/5014 line) (Transource work).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.49M
 - Construction Responsibility: Transource

266) Baseline Upgrade b3800.51

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: North Delta 500 kV termination for the new Peach Bottom-North Delta 500 kV line (Transource work).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.29M
 - Construction Responsibility: Transource

267) Baseline Upgrade b3800.6

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Peach Bottom-TMI 500 kV - Replace terminal equipment at TMI.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.00M

- Construction Responsibility: ME

268) Baseline Upgrade b3800.7

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Construct 38 miles of 500 kV overhead AC line between the Conastone vicinity and the Doubs substations (BGE zone portion).
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$213.20M
 - Construction Responsibility: PSEG

269) Baseline Upgrade b3800.8

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Reconfigure Doubs 500 kV station and upgrade terminal equipment to terminate new line.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$57.50M
 - Construction Responsibility: APS

270) Baseline Upgrade b3800.9

- Overview of Reliability Problem
 - Criteria Violation: 2022 Window 3
 - Criteria Test: 2022 Window 3
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild the existing Hunterstown-Carroll 115/138 kV Corridor as Double Circuit using 230 kV construction standards. New circuit will be operated at 230 kV. Existing circuit to remain at 115/138 kV.
 - Upgrade In-Service Date: 6/1/2027
 - Estimated Upgrade Cost: \$0.00M
 - Construction Responsibility: APS

271) Baseline Upgrade b3801

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution

- Description of Upgrade: Replace Gainesville 230kV breaker 216192 with a breaker rated 80kA
- Upgrade In-Service Date:
- Estimated Upgrade Cost: \$3.11M
- Construction Responsibility: Dominion

272) Baseline Upgrade b3802

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Replace Loudoun 230kV breakers 204552, 217352 with a breakers rated 80kA
 - Upgrade In-Service Date:
 - Estimated Upgrade Cost: \$5.57M
 - Construction Responsibility: Dominion

273) Baseline Upgrade b3803

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Replace Ox 230kV breakers 22042, 24342, 24842, 220T2063, 243T2097, 248T2013, H342 with a breakers rated 80kA
 - Upgrade In-Service Date:
 - Estimated Upgrade Cost: \$9.02M
 - Construction Responsibility: Dominion

274) Baseline Upgrade b3804

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Replace Paragon Park 230kV breakers 208132, 215032, 2081T2206, 2150T2207 with a breakers rated 80kA
 - Upgrade In-Service Date:
 - Estimated Upgrade Cost: \$4.96M
 - Construction Responsibility: Dominion

275) Baseline Upgrade b3805

- Overview of Reliability Problem
 - Criteria Violation:

- Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Replace Reston 230kV breaker 264T2015 with a breaker rated 63kA
 - Upgrade In-Service Date:
 - Estimated Upgrade Cost: \$0.79M
 - Construction Responsibility: Dominion

276) Baseline Upgrade b3806

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Replace Stonewater 230kV breakers 20662-1, 20662-2, 217862-1, 217862-2 with a breakers rated 80kA
 - Upgrade In-Service Date:
 - Estimated Upgrade Cost: \$4.95M
 - Construction Responsibility: Dominion

277) Baseline Upgrade b3807

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Replace Waxpool 230kV breakers 214922-5, 214922-6, 216622-5, 216622-6 with a breakers rated 63kA
 - Upgrade In-Service Date:
 - Estimated Upgrade Cost: \$2.93M
 - Construction Responsibility: Dominion

278) Baseline Upgrade b3808

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Replace Double Toll Gate 138kV breaker MDT 138 OCB with a breaker rated 80kA
 - Upgrade In-Service Date:
 - Estimated Upgrade Cost: \$3.00M
 - Construction Responsibility: APS

279) Baseline Upgrade b3809

- Overview of Reliability Problem
 - Criteria Violation:
 - Criteria Test:
- Overview of Reliability Solution
 - Description of Upgrade: Replace Doubs 500kV breaker DL-55 522LIN with a breaker rated 80kA
 - Upgrade In-Service Date:
 - Estimated Upgrade Cost: \$10.01M
 - Construction Responsibility: APS

280) Baseline Upgrade b3836.1

- Overview of Reliability Problem
 - Criteria Violation: Overload of the Chemical-Washington Street 46 kV line
 - Criteria Test: FERC 715 Thermal
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild approximately 1.7 miles of line on the Chemical - Washington Street 46 kV circuit
 - Upgrade In-Service Date: 6/1/2028
 - Estimated Upgrade Cost: \$7.60M
 - Construction Responsibility: AEP

281) Baseline Upgrade b3840.1

- Overview of Reliability Problem
 - Criteria Violation: Overload of the 24th Street-26th Street and 24th Street-BASF 34.5 kV lines
 - Criteria Test: FERC 715 Thermal
- Overview of Reliability Solution
 - Description of Upgrade: Replace Structures 382-66 and 382-63 on Darrah - East Huntington 34.5 kV line to bypass 24th Street station. Retire structures 1 through 5 on Twenty Fourth Street 34.5 kV Extension. Retire 24th Street Station. Remove conductors from BASF Tap to BASF.
 - Upgrade In-Service Date: 6/1/2028
 - Estimated Upgrade Cost: \$1.80M
 - Construction Responsibility: AEP

282) Baseline Upgrade b3843.1

- Overview of Reliability Problem
 - Criteria Violation: The underground portion of the Ohio University-West Clark 69 kV line is overloaded.
 - Criteria Test: FERC 715 Thermal
- Overview of Reliability Solution
 - Description of Upgrade: Rebuild the underground portion of the Ohio University-West

Clark 69 kV line, approximately 0.65 miles.

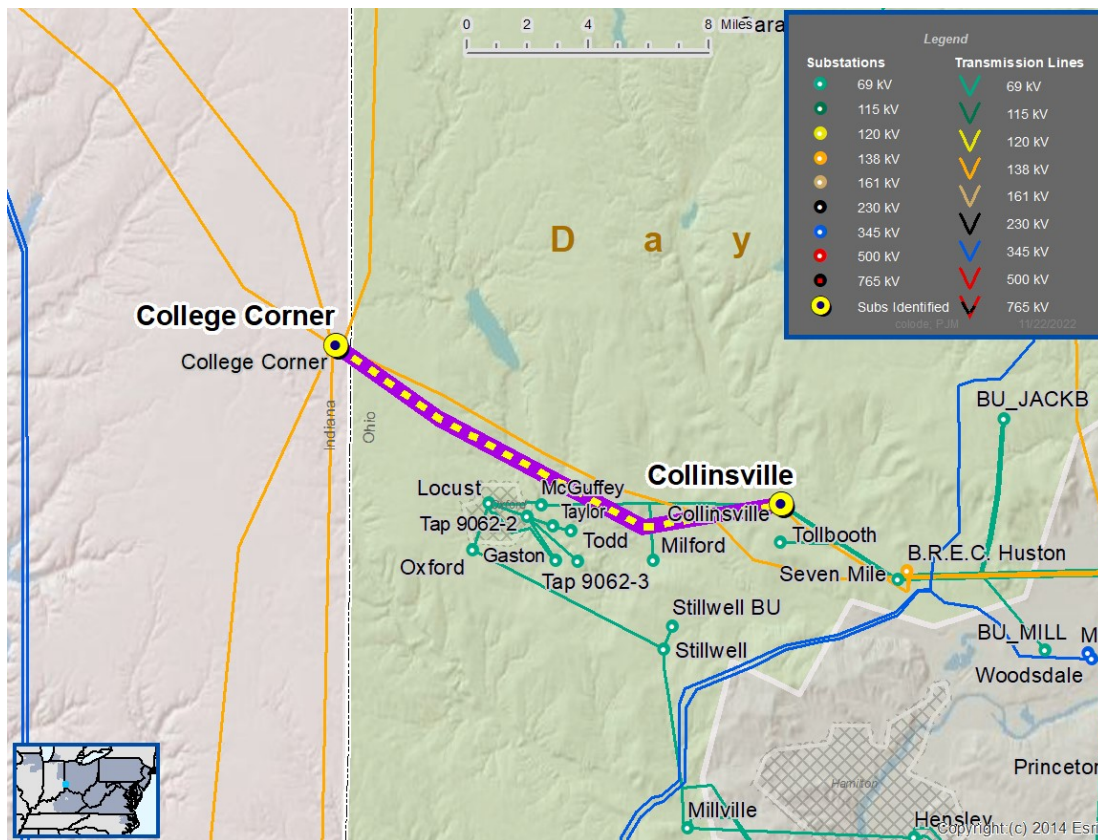
- Upgrade In-Service Date: 6/1/2028
- Estimated Upgrade Cost: \$4.60M
- Construction Responsibility: AEP

Baseline Project b3766.1-6: College Corner-Collinsville 138 kV Construction

APS Transmission Zone

In 2027 RTEP summer/winter cases, the College Corner-Collinsville 138 kV line is overload for an N-2 contingency in generator deliverability tests.

Map 1. b3766.1-6 – College Corner-Collinsville 138 kV Construction



The recommended solution is to construct a 138 kV 1.86-mile single circuit transmission line from New Westville-AEP Hayes station. Construct a new 11-mile single circuit 138 kV line from New Westville to the Lewisburg tap off 6656. Convert a portion of 6656 West Manchester-Garage Rd 69 kV line between West Manchester-Lewisburg to 138 kV operation (circuit is built to 138 kV). This will utilize part of the line already built to 138 kV and will take place of the 3302 that currently feeds New Westville. The 3302 138 kV line will be retired as part of this project. The West Manchester substation will be expanded to a double bus double breaker design where AES Ohio will install one 138 kV circuit breaker, a 138/69 kV transformer, and eight new 69 kV circuit breakers. Hayes-New Westville 138 kV line: Build ~0.19 miles of 138 kV line to the Indiana/ Ohio State line to connect to AES's line portion of the Hayes-New Westville 138 kV line with the conductor size 795 ACSR26/7 Drake. Hayes-Hodgin 138 kV line: Build ~0.05 miles of 138 kV line with the conductor size 795 ACSR26/7 Drake. Hayes 138 kV: Build a new 4-138 kV circuit breaker ring

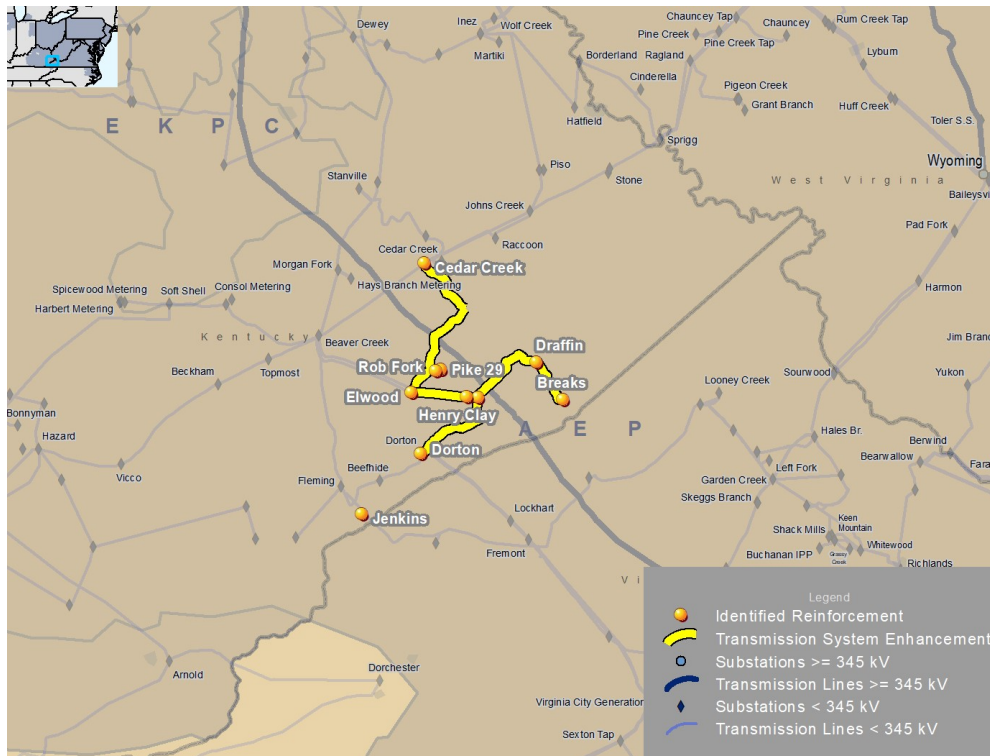
bus. The estimated cost for this project is \$38.64 million. This project has a required in-service date of June 2027 and a projected in-service date of December 2025. The designated entities to complete this work will be AEP and Dayton.

Baseline Project b3736.1-18: Breaks-Dorton 69 kV Rebuild

AEP Transmission Zone

In 2027 winter RTEP case, Dorton, Pike 29, Rob Fork, Burdine, Henry Clay, Draffin 46 kV buses (along the Cedar Creek-Elwood and Breaks-Dorton-Elwood 46 kV circuits) experience voltage magnitude and drop violations under multiple N-1-1 contingency scenarios.

Map 2. b3736.1-18 – Breaks-Dorton 69 kV Rebuild



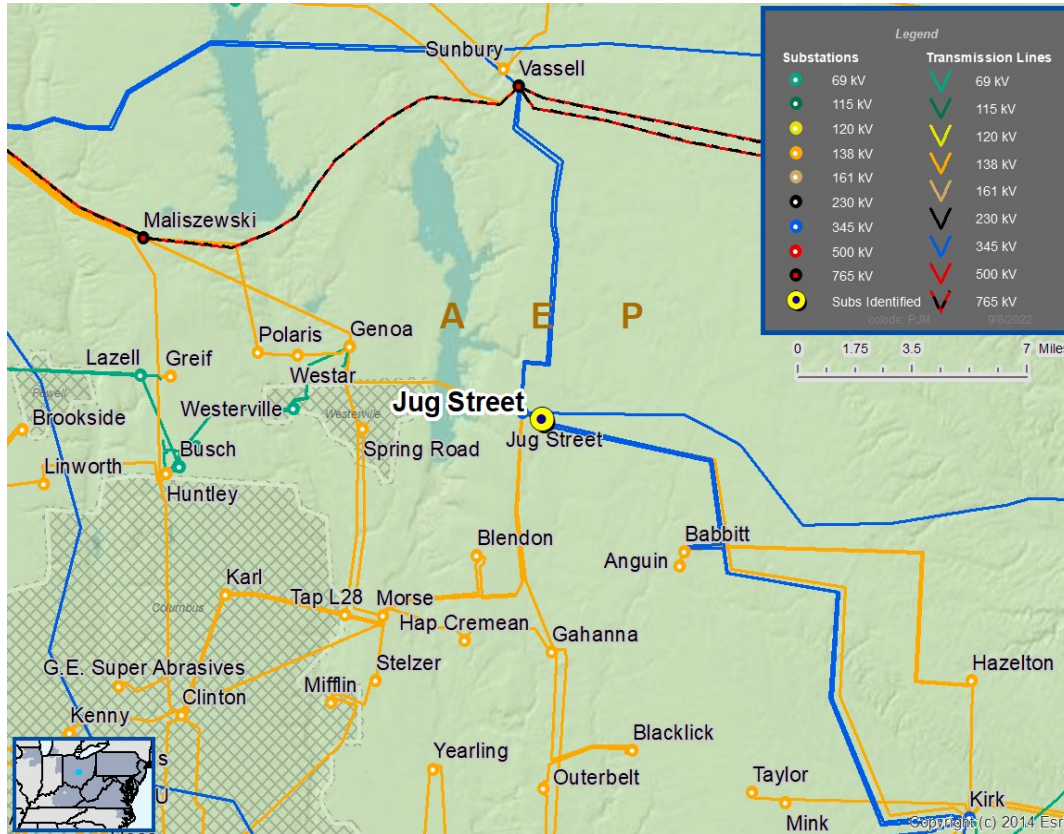
The recommended solution is to establish 69 kV bus and new 69 kV line CB at Dorton substation. At Breaks substation, reuse 72 kV breaker A as the new 69 kV line breaker. Rebuild ~16.7-mile Dorton-Breaks 46 kV line to 69 kV. Retire ~17.2-mi Cedar Creek-Elwood 46 kV circuit. Retire ~ 6.2-mi Henry Clay-Elwood 46 kV line section. Retire Henry Clay 46 kV substation and replace with Poor Bottom 69 kV station. Install a new 0.7-mile double circuit extension to Poor Bottom 69 kV. Retire Draffin substation and replace with a new substation. Install a new 0.25-mile double circuit extension to New Draffin substation. Perform remote end work at Jenkins substation. Provide transition fiber to Dorton, Breaks, Poor Bottom, Jenkins and New Draffin substations. Retirement of Henry Clay S.S. Cedar Creek substation work. Retire Breaks substation 46 kV equipment. Retire Pike 29 SS and Rob Fork SS. Serve Pike 29 and Rob Fork customers from nearby 34 kV distribution sources. Install Poor Bottom Substation. Retirement of Henry Clay 46 kV substation. Installation of substation New Draffin 69 kV substation. Retirement of Draffin 46 kV substation. The estimated cost for this project is \$101.9 million. This project has a required in-service date of

December 2027 and a projected in-service date of July 2027. The local transmission owner, AEP, will be designated to complete this work.

Baseline Project b3763: Jug Street 138 kV Breaker Replacement
AEP Transmission Zone

In 2027 RTEP, Jug Street 138 kV breakers M, N, BC, BF, BD, BE, D, H, J, L, BG, BH, BJ, and BK are overdutied.

Map 3. b3763 – Jug Street 138 kV Breaker Replacement

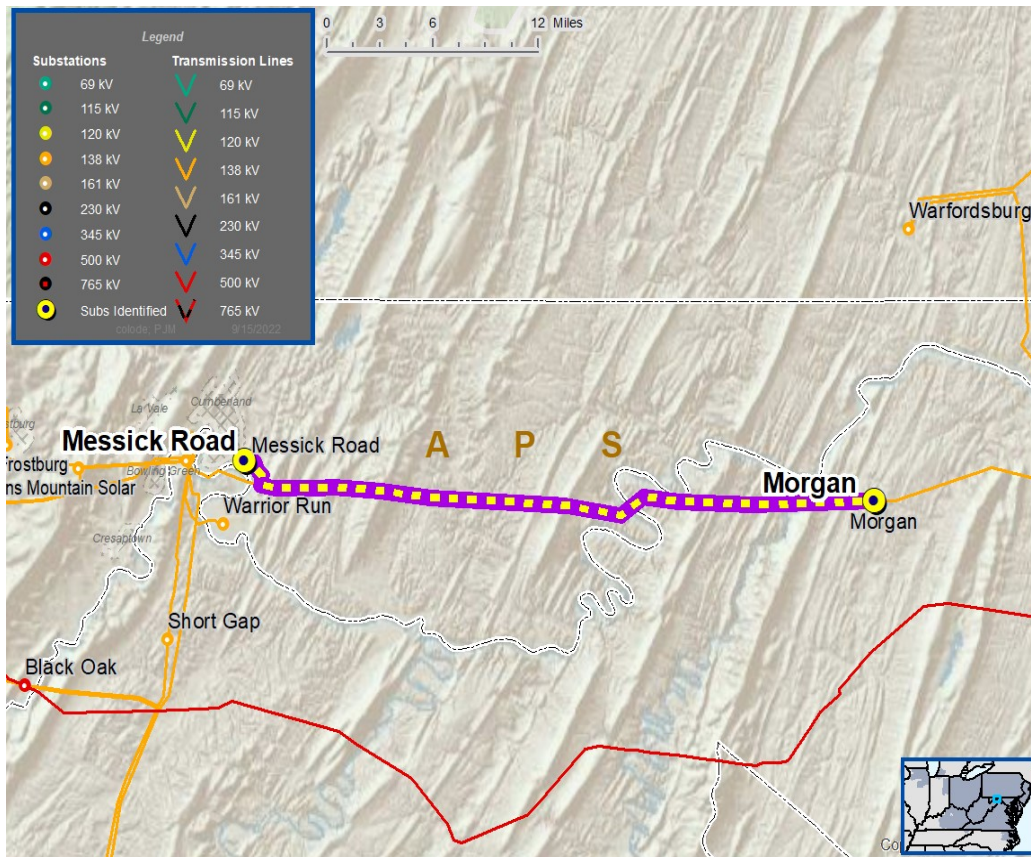


The recommended solution is to replace the Jug Street 138 kV breakers M, N, BC, BF, BD, BE, D, H, J, L, BG, BH, BJ, and BK with 80KA breakers. The estimated cost for this project is \$14 million, with a required and projected in-service date of June 2027. The local transmission owner, AEP, will be designated to complete this work.

Baseline Project b3772: Messick Road-Morgan 138 kV APS Transmission Zone

In 2027 RTEP summer and winter cases, Messick road to Morgan 138 kV line is overloaded due to two breaker contingencies.

Map 4. b3772 – Messick Road-Morgan 138 kV

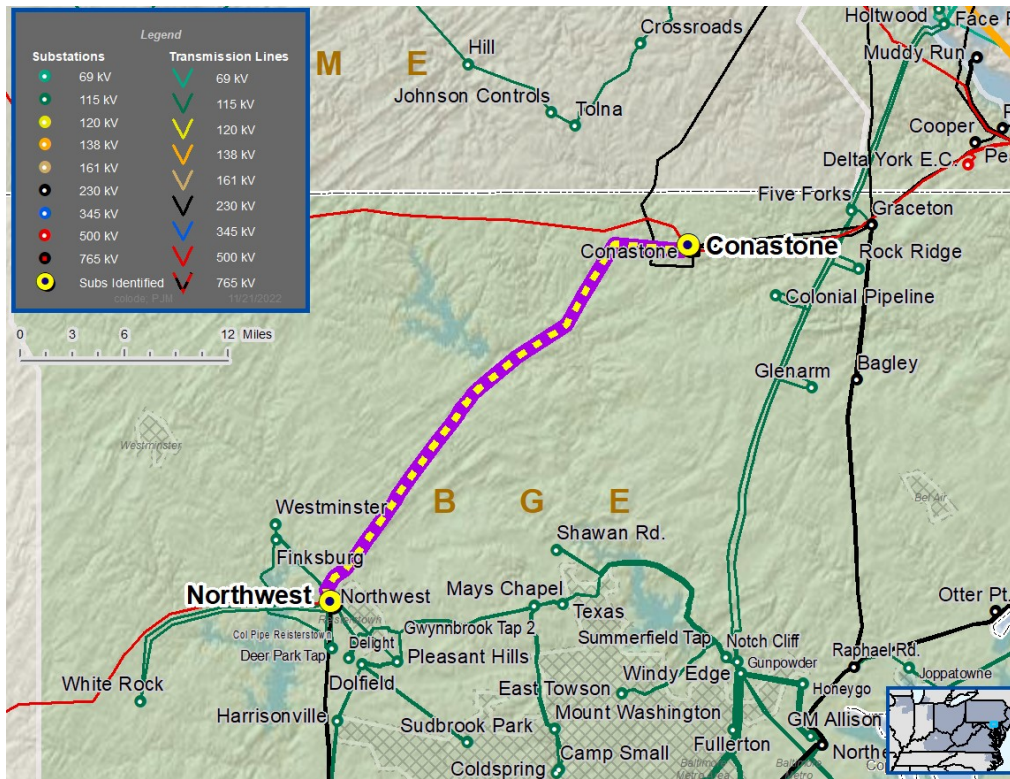


The recommended solution is to reconductor 27.3 miles of the Messick Road-Morgan 138 kV line from 556 ACSR to 954 ACSR. At Messick Road substation: Replace 138 kV wave trap, circuit breaker, CTs, disconnect switch, and substation conductor and upgrade relaying. At Morgan substation: Upgrade relaying. The estimated cost for this project is \$49.2 million. This project has a required and projected in-service date of June 2027. The local transmission owner, APS, will be designated to complete this work.

Baseline Project b3771: Conastone-North West 230 kV Reconductor BGE Transmission Zone

In 2027 RTEP summer and winter cases, Messick road to Morgan 138 kV line is overloaded due to two breaker contingencies.

Map 5. b3771 – Conastone-North West 230 kV Reconductor

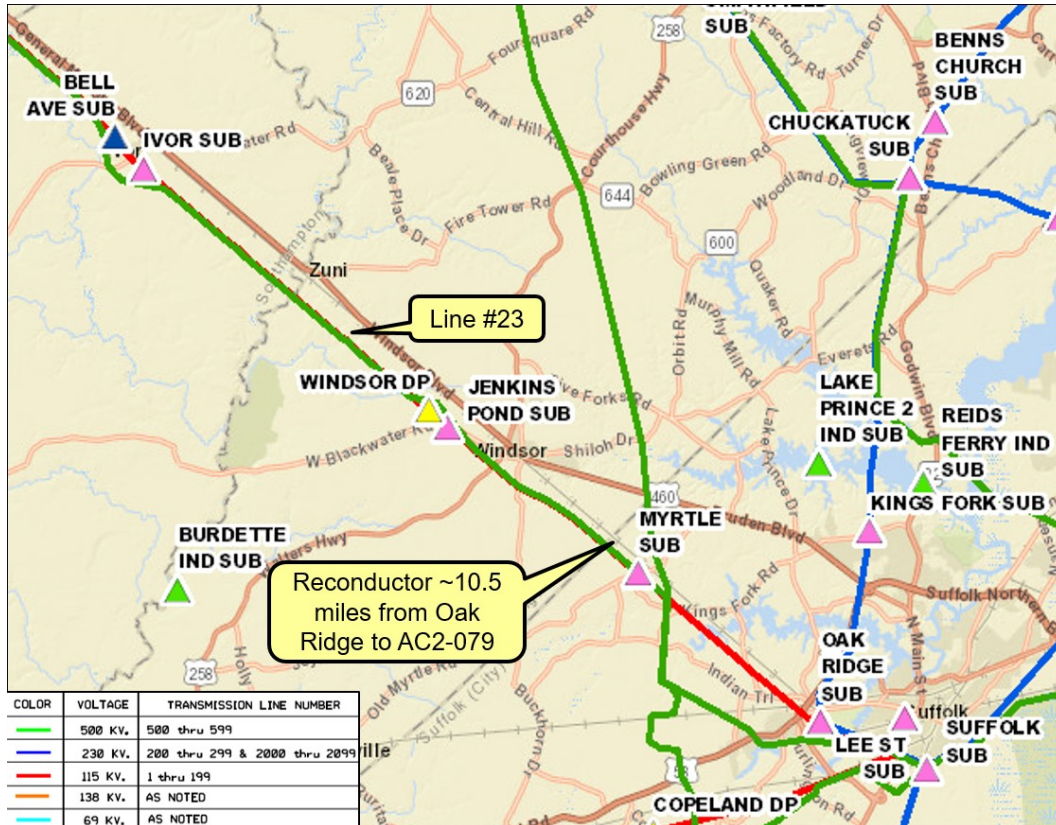


The recommended solution is to reconductor two 230 kV circuits from Conastone to Northwest No. 2. The existing conductor is 1272 ACSR and 1590 ACSR. The new conductor will be 1927-T13 42/29 ACCR/TW. The estimated cost for this project is \$49.2 million. This project has a required in-service date of June 2027 and projected in-service date of June 2026. The local transmission owner, BGE, will be designated to complete this work.

Baseline Project b3759: Line No. 23 Bell Ave-Suffolk 115 kV Reconductor Dominion Transmission Zone

In the 2027 RTEP case, failed breaker contingencies that isolate Poe 115 kV Bus No. 1 overload the Oak Ridge to AC2-079 segment of 115 kV Line No. 23 Bell Ave-Suffolk.

Map 6. b3759 – Line No. 23 Bell Ave-Suffolk 115 kV Reconductor

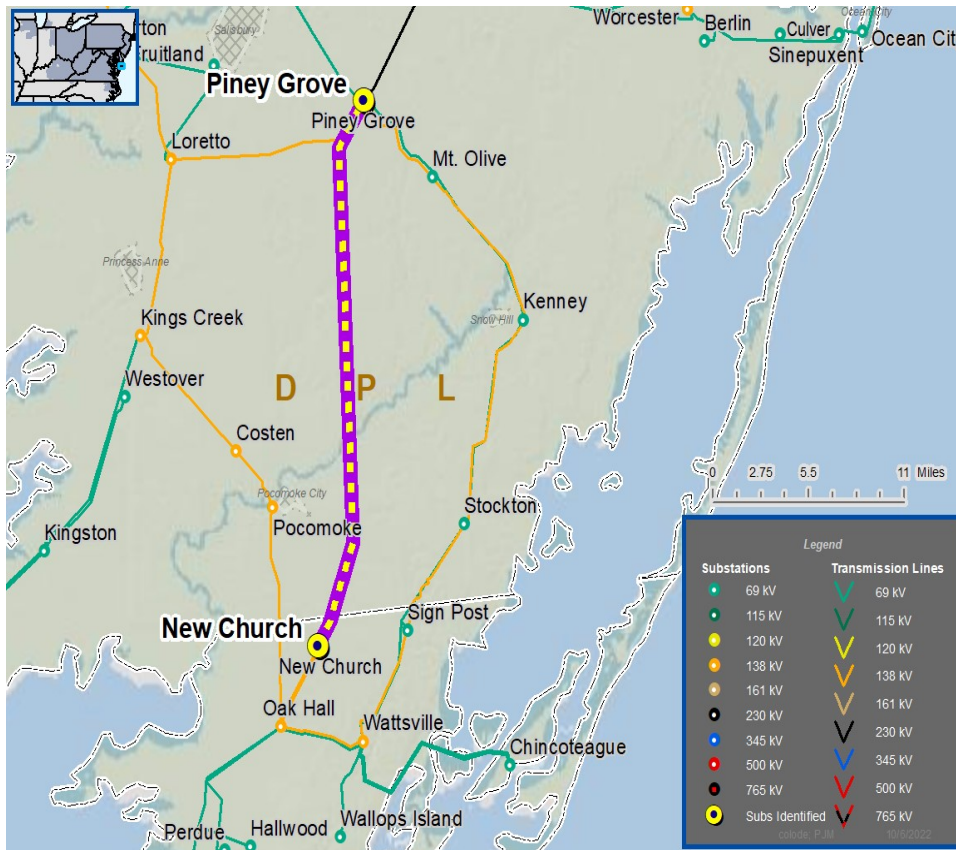


The recommended solution is to reconductor approximately 10.5 miles of 115 kV line No. 23 segment from Oak Ridge to AC2-079 from its existing 336 ACSR Tap to a minimum emergency ratings of 393 MVA Summer/412 MVA Winter. The estimated cost for this project is \$23.5 million. This project has a required and projected in-service date of June 2027. The local transmission owner, Dominion, will be designated to complete this work.

Baseline Project b3749: New Church-Piney 138 kV Rebuild DPL Transmission Zone

In the 2027 RTEP case, the New Church-Piney 138 kV circuit is overloaded for line fault stuck breaker contingency.

Map 7. b3749 – New Church-Piney 138 kV Rebuild

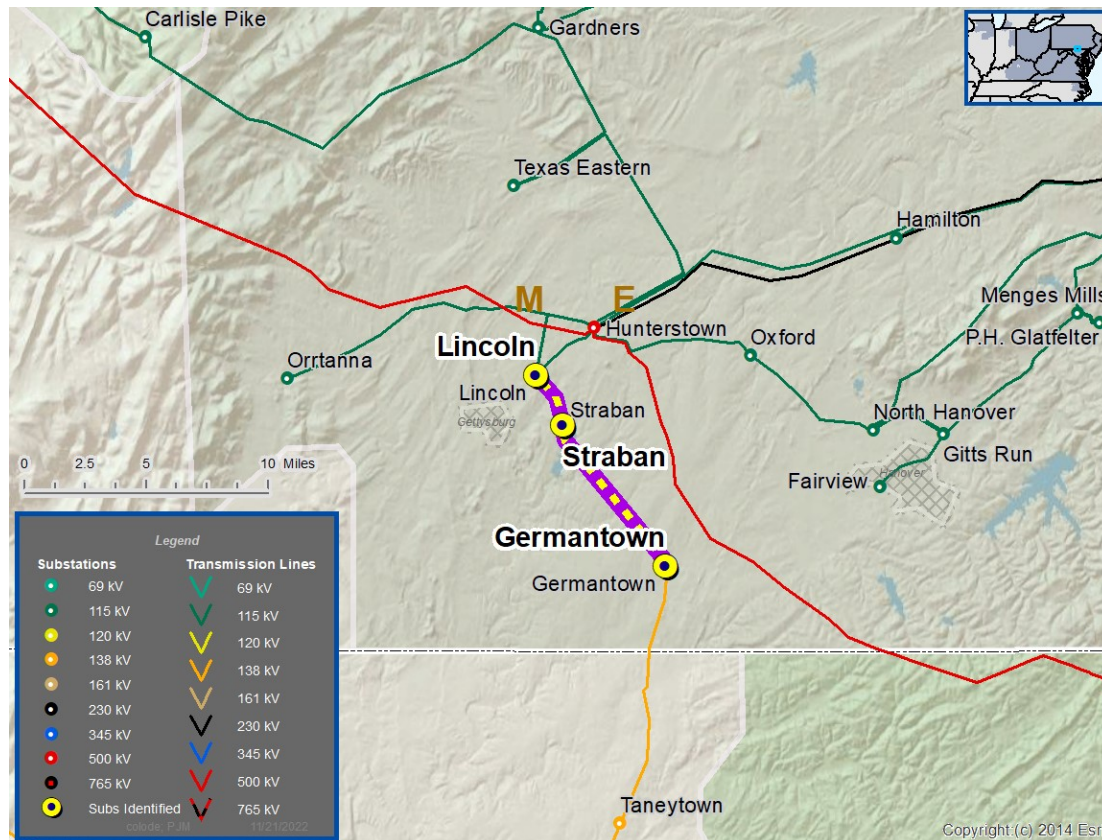


The recommended solution is to rebuild the New Church-Piney Grove 138 kV line. The existing conductor is 477 ACSR and the proposed conductor is 1590 ACSR. The estimated cost for this project is \$63 million. This project has a required in-service and projected in-service date of June 2027. The local transmission owner, DPL, will be designated to complete this work.

Baseline Project b3768: Lincoln-Germantown 115 kV Rebuild MetEd Transmission Zone

In 2027 RTEP summer case, the Lincoln-Straban-Germantown 115 kV circuit is overloaded for multiple N-1 contingencies.

Map 8. **b3768 – Lincoln-Germantown 115 kV Rebuild**

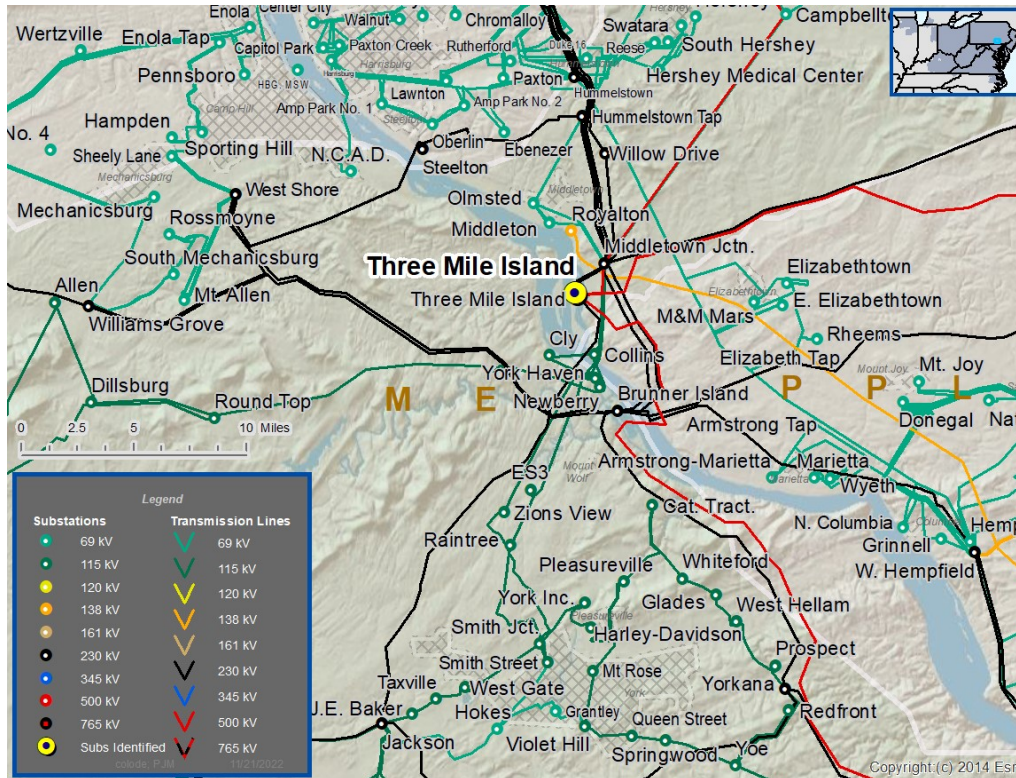


The recommended solution is to rebuild/reconductor 7.6 miles of the Germantown-Lincoln 115 kV line. Additionally, upgrade to limiting terminal equipment is required at Lincoln, Germantown and Straban. The existing conductor is 556 ACSR and the proposed upgrade is 954 ACSR. The estimated cost for this project is \$17.4 million. This project has a required in-service and projected in-service date of June 2027. The local transmission owner, MetEd, will be designated to complete this work.

Baseline Project b3769: TMI 500/230 kV Transformer Install MetEd Transmission Zone

In 2027 RTEP summer case, the TMI 500/230 kV transformer is overloaded for multiple N-1 contingencies.

Map 9. b3769 – TMI 500/230 kV Transformer Install

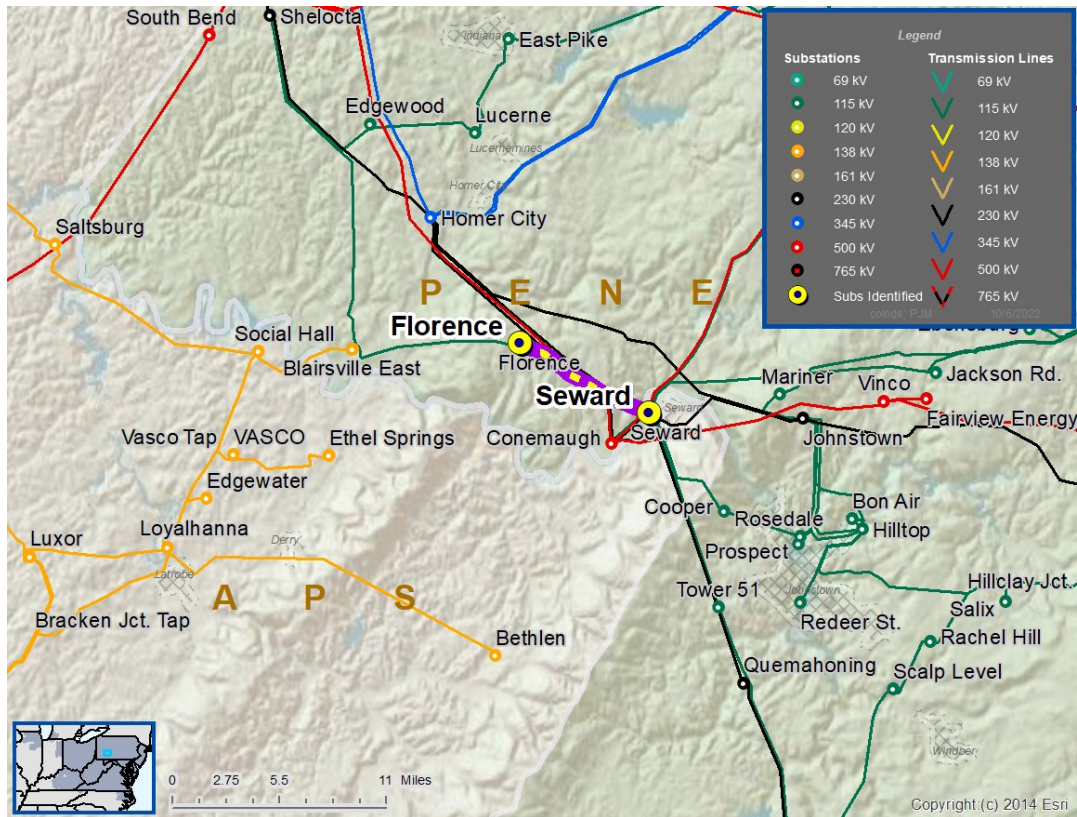


The recommended solution is to install a second TMI 500/230 kV transformer with additional 500 and 230 bus expansions. The estimated cost for this project is \$30.2 million. This project has a required and projected in-service date of June 2027. The local transmission owner, MetEd, will be designated to complete this work.

Baseline Project b3751: Roxbury-AE1-071 115 kV Rebuild PENELEC Transmission Zone

In the 2027 RTEP case, the Roxbury-AE1-071 115 kV line is overloaded for multiple N-1 contingencies.

Map 10. b3751 – Roxbury-AE1-071 115 kV Rebuild

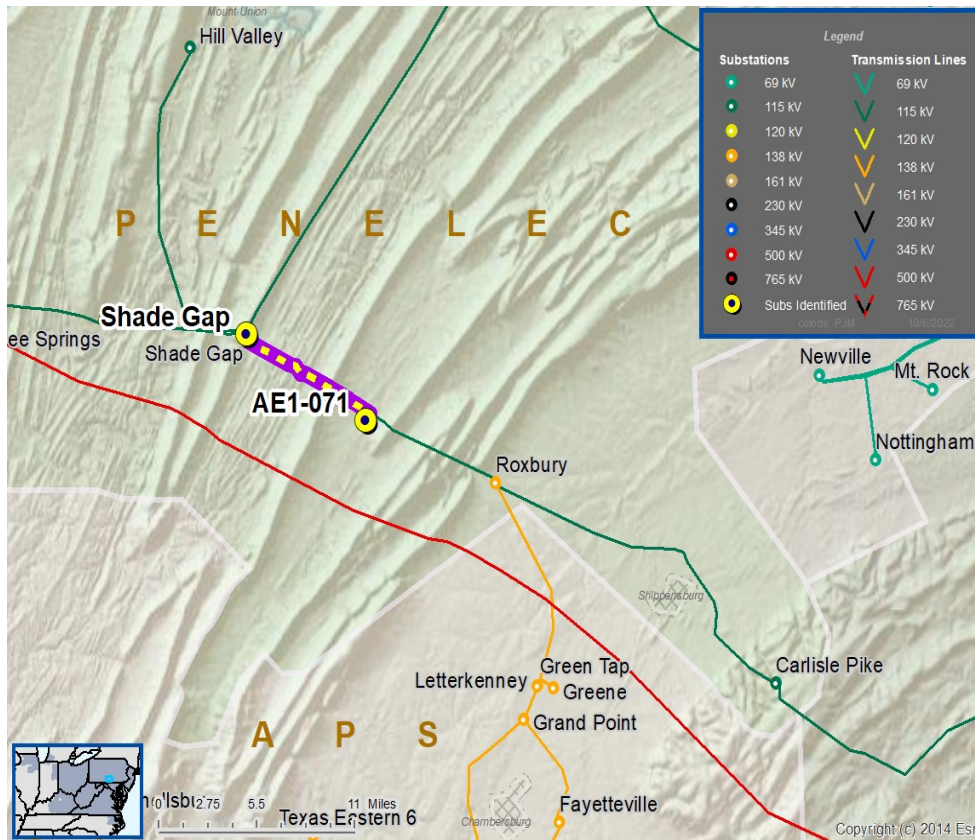


The recommended solution is to rebuild 6.4 miles of the Roxbury-Shade Gap 115 kV line from Roxbury to the AE1-071 115 kV ring bus with single circuit 115 kV construction. The existing conductor is 336 ACSR and the proposed upgrade is 1033 ACSR. The estimated cost for this project is \$15 million. This project has a required and projected in-service date of June 2027. The local transmission owner, PENELEC, will be designated to complete this work.

Baseline Project b3752: Shade Gap-AE-071 115 kV Rebuild PENELEC Transmission Zone

In the 2027 RTEP case, the AE1-071-Shade Gap 115 kV line is overloaded multiple N-1 contingencies.

Map 11. b3752 – Shade Gap-AE-071 115 kV Rebuild

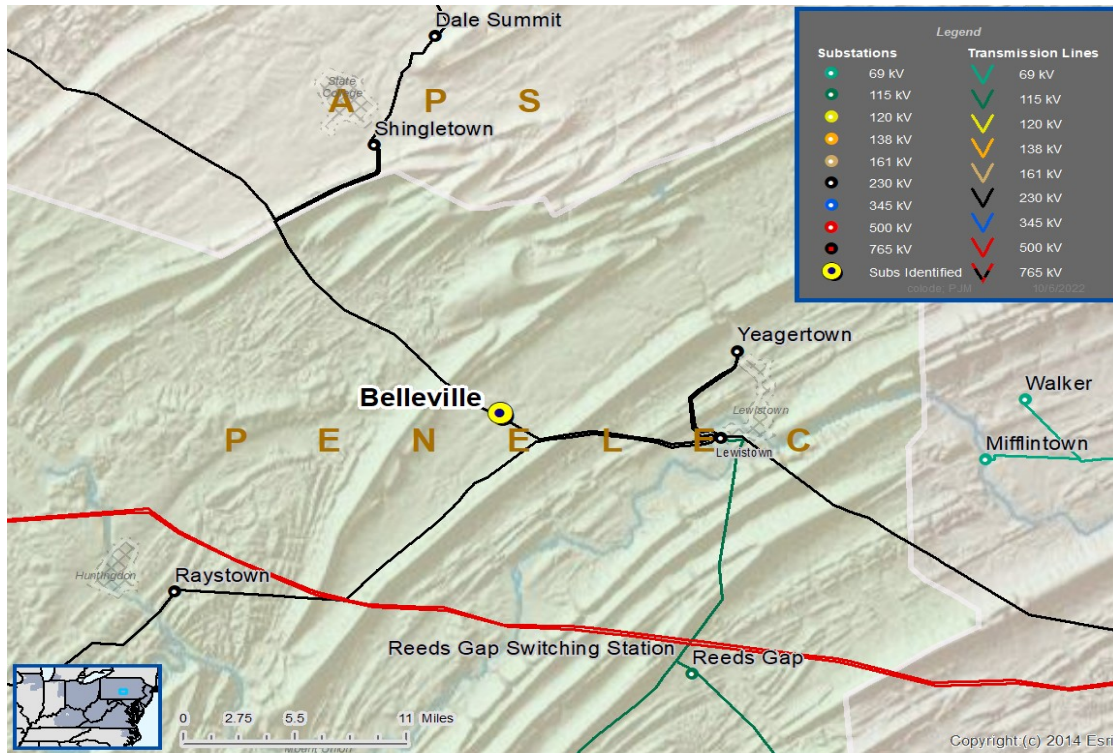


The recommended solution is to rebuild 7.2 miles of the Shade Gap-AE1-071 115 kV line section of the Roxbury-Shade Gap 115 kV line. The existing conductor is 336 ACSR and the proposed upgrade is 1033 ACSR. The estimated cost for this project is \$17.4 million. This project has a required and projected in-service date of June 2027. The local transmission owner, PENELEC, will be designated to complete this work.

Baseline Project b3754: Belleville Breaker Ring Bus Construction PENELEC Transmission Zone

In the 2027 RTEP case, there is a low voltage violation in the Belleville 46 kV vicinity for multiple N-1 contingencies.

Map 12. b3754 – Belleville Breaker Ring Bus Construction

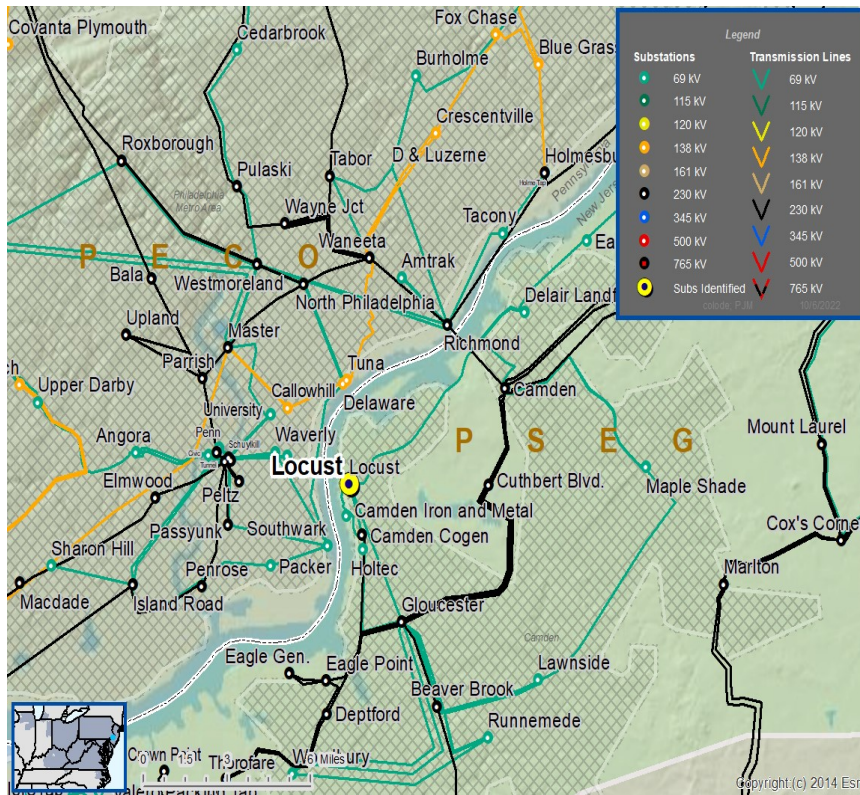


The recommended solution is to construct a new three-breaker ring bus at MacLane Tap to tie into the Warrior Ridge-Belleville 46 kV D line and the 1LK line. The estimated cost for this project is \$10.1 million. This project has a required and projected in-service date of June 2027. The local transmission owner, PENELEC, will be designated to complete this work.

Baseline Project b3755: Locust Street Conversion PSEG Transmission Zone

In the 2027 RTEP case, low voltage and voltage drop violations at Locust 69 kV station for a bus contingency.

Map 13. b3755 – Locust Street Conversion

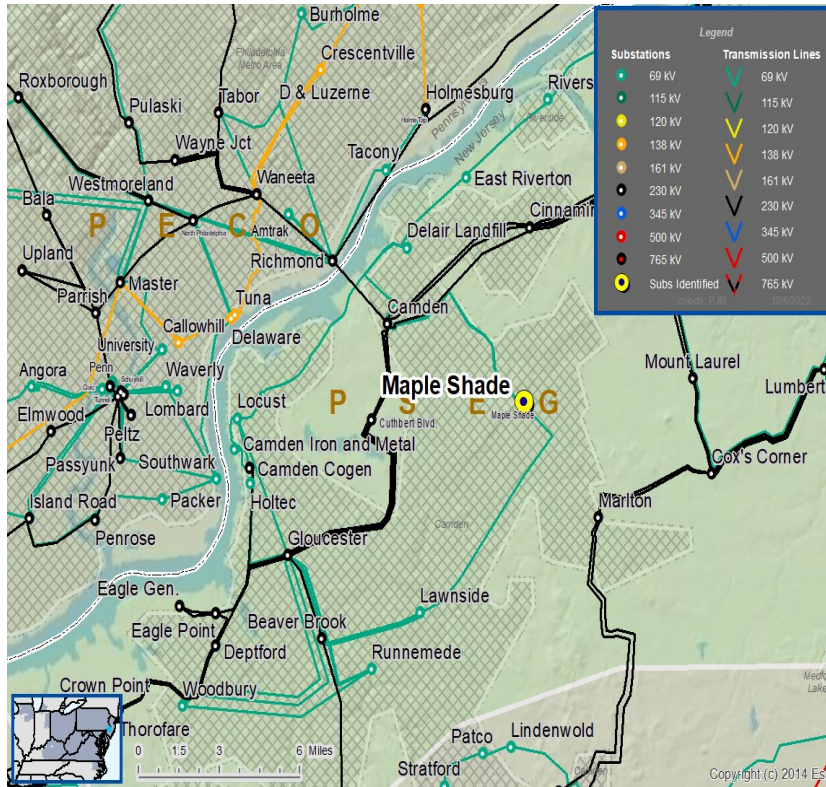


The recommended solution is to convert Locust Street 69 kV from a straight bus to a ring bus. The estimated cost for this project is \$30 million. This project has a required and projected in-service date of June 2027. The local transmission owner, PSEG, will be designated to complete this work.

Baseline Project b3756: Maple Shade 69 kV Conversion PSEG Transmission Zone

In the 2027 RTEP case, voltage drop violation at Maple Shade 69 kV station for multiple line fault stuck breaker contingencies.

Map 14. b3756 – Maple Shade 69 kV Conversion

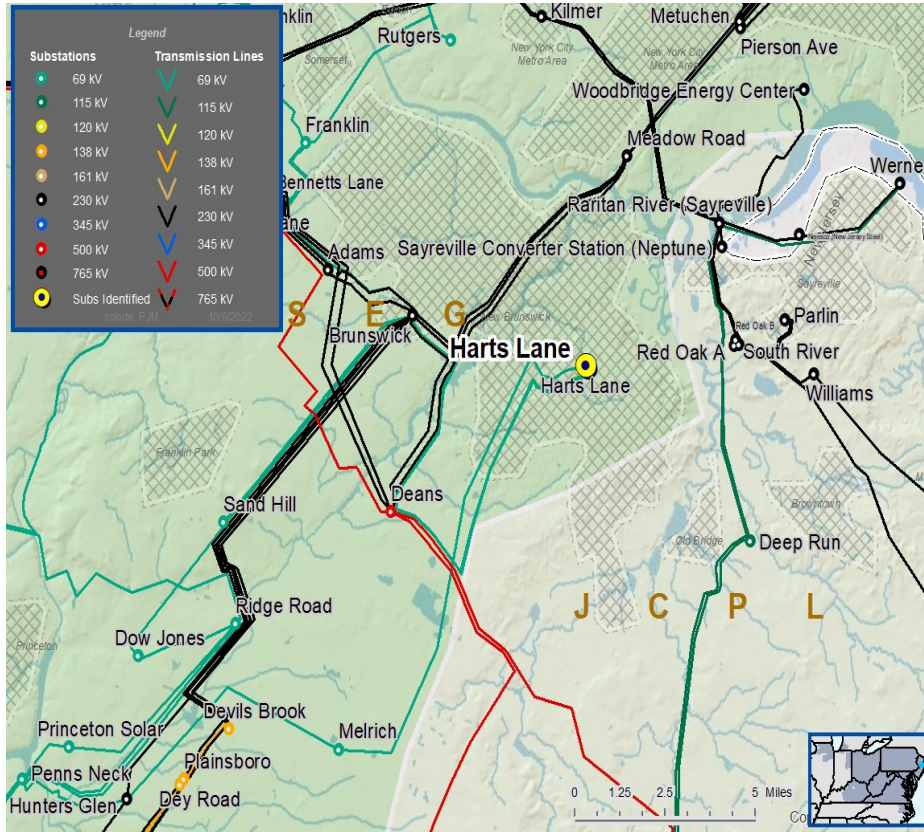


The recommended solution is to convert Maple Shade 69 kV from a straight bus to a ring bus. The estimated cost for this project is \$33.9 million. This project has a required and projected in-service date of June 2027. The local transmission owner, PSEG, will be designated to complete this work.

Baseline Project b3758: Harts Lane 69 kV Construction PSEG Transmission Zone

In the 2027 RTEP case, voltage drop violations at Harts Lane station for several multiple N-1-1 contingencies.

Map 15. b3758 – Harts Lane 69 kV Construction



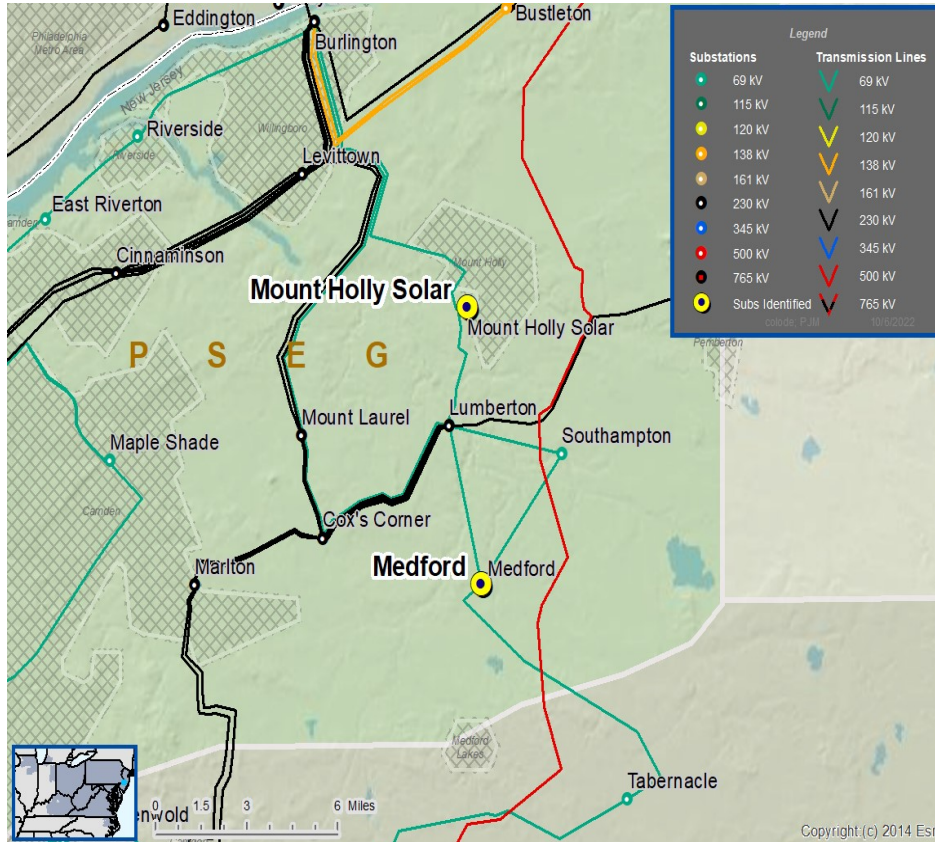
The recommended solution is to construct a new 69 kV line from 14th Street to Harts Lane. The estimated cost for this project is \$34.4 million. This project has a required and projected in-service date of June 2027. The local transmission owner, PSEG, will be designated to complete this work.

Baseline Project b3757: Mount Holly-Medford 230/69kv Transformer Construction

PSEG Transmission Zone

In 2027 RTEP summer case, there were multiple voltage drop violations at Medford and South Hampton 69 kV stations for several N-1-1 contingencies.

Map 16. b3757 – Mount Holly-Medford



The recommended solution is outside of the Mount Holly and Medford substations. Convert existing Medford 69 kV straight bus to seven-breaker ring bus, and construct a new 230/69 kV transformer at Cox's Corner and a new 69 kV line from Cox's Corner to Medford. The estimated cost for this project is \$101.5 million.

Baseline Project b3780 & b3781 – Brandon Shores Generation Deactivation Reinforcements

APS/BGE/PECO/PEPCO Transmission Zones

Brandon Shores 1 and 2 are coal units in the BGE zone with a total of approximately 1,282 MW capacity, and have requested to deactivate on June 1, 2025. The deactivation of these units will cause widespread voltage violations in neighboring areas (PEPCO, ME, PPL, PECO, APS and Dominion). The deactivation also results in thermal violations for the following facilities:

- BGE Transmission Zone

- Five Rock-Rock Ridge 1 115 kV
- Five Rock-Rock Ridge 2 115 kV
- Rock Ridge-Colonial Pipeline 1 115 kV
- Rock Ridge-Colonial Pipeline 2 115 kV
- Colonial Pipeline-Glenarm 1 115 kV
- Colonial Pipeline-Glenarm 2 115 kV
- Chestnut Hill 7-Frederick Road 7 115 kV
- Chestnut Hill 8-Frederick Road 8 115 kV

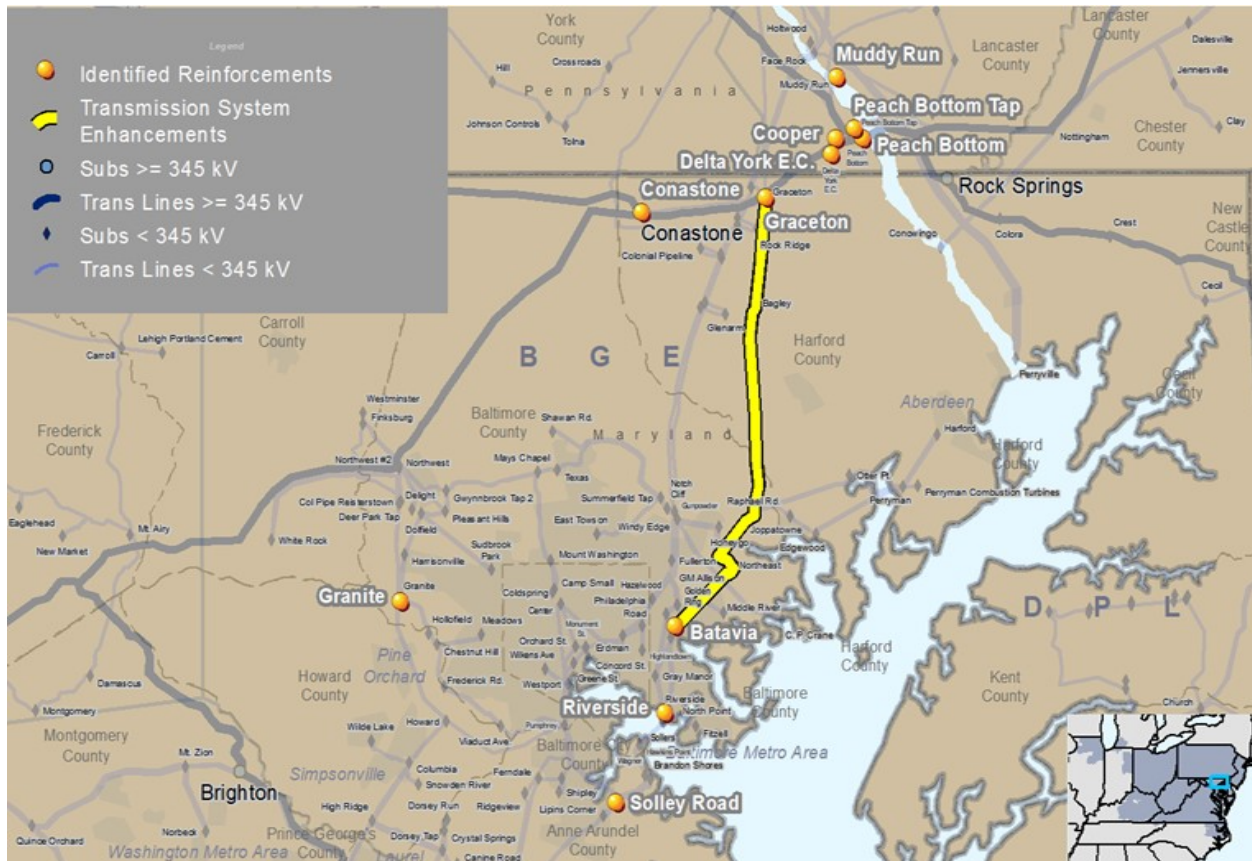
- APS Transmission Zone
 - Doubs Transformer 3 500/230 kV
 - Bethel-Riverton 138 kV

- PEPCO Transmission Zone
 - Dickerson-Dickerson H 230 kV

Map 17. **b3780.1-4, .8, .10-12: Brandon Shores Generation Deactivation 500 kV Reinforcements**



Map 18. b3780.5-7, .9, .13 & b3781: Brandon Shores Generation Deactivation 230 kV Reinforcements



500 kV Reinforcements

The recommended solution includes upgrades at Peach Bottom North substation to add three 500 kV breakers to form a breaker-and-a-half bay; construction of a new Peach Bottom-Graceton 500 kV line; construction of new West Cooper 500 kV and expansion of Graceton 500 kV substations; and installations of a 350 MVAR capacitor at Conastone 500 kV, a 350 MVAR statcom and a 350 MVAR capacitor at Brighton 500 kV, and a 250 MVAR capacitor at Burchess Hill 500 kV. The estimated cost for the 500 kV reinforcements is \$333 million. This project is an immediate-need project and has a projected in-service date of December 2028. The local transmission owners, **BGE**, **PECO** and **PEPCO**, will be designated to complete this work.

230 kV Reinforcements

The recommended solution includes the construction of new Solley Road and Granite 230 kV substations, each with 350 MVAR statcoms, construction of a new Batavia Road 230 kV substation, and construction of a Graceton-Batavia Road 230 kV double circuit line. The existing double circuit line from Northeast-Riverside 230 kV will tie into the new Batavia Road 230 kV substation, and the Batavia Road-Riverside 230 kV will be reconducted. The project will also replace 230 kV line drops to Doubs transformer No. 3. The estimated cost for the 230 kV reinforcements is \$452.8 million. This project is an immediate-need project, and the majority of the components have a projected in-service

date of December 2028. The local transmission owners, APS and BGE, will be designated accordingly to complete this work.

Baseline project b3800 – 2022 RTEP Window 3 Recommended Solution: \$5,142.98 million

A detailed description of the above project is detailed in the [2022 RTEP Window 3 Reliability Analysis Report](#) and the [2022 RTEP Window 3 Constructability & Financial Analysis Report](#).

Appendix A - Previously Identified RTEP Baseline Upgrades

Appendix A contains all currently required baseline upgrades that were identified in previous RTEP assessments. This appendix also contains expected required in-service dates for facilities. PJM continuously evaluates the lead times of these plans with respect to the expected required in-service dates. The continuing need for these required system facilities was evaluated as part of the 2023 RTEP assessment and will be evaluated in future RTEP assessments. This list of upgrades represents a snapshot of all required planned facilities in the RTEP as of 12/31/2023.

- 1) Baseline Upgrade b1270
 - Reconductor Bath - Trebein 138kV - 6/1/2015 - \$1.30M
- 2) Baseline Upgrade b1273
 - Add 2nd Bath 345/138kV Xfr - 6/1/2015 - \$7.00M
- 3) Baseline Upgrade b1274
 - Add 2nd Trebein 138/69kV Xfr - 6/1/2015 - \$5.30M
- 4) Baseline Upgrade b1275
 - Add 2nd W. Milton 138/69kV Xfr - 6/1/2015 - \$8.80M
- 5) Baseline Upgrade b1276
 - Add 2nd W. Milton 345/138 Xfr - 6/1/2015 - \$5.50M
- 6) Baseline Upgrade b1570
 - Add a 345/69 kV transformer at Dayton's Peoria 345 kV bus - 6/1/2014 - \$16.00M
- 7) Baseline Upgrade b1570.1
 - Add/reconductor Peoria - Darby 69 kV line - 6/1/2014 - \$0.00M
- 8) Baseline Upgrade b1570.2
 - Add / reconductor Peoria - Union REA 69 kV line - 6/1/2014 - \$0.00M
- 9) Baseline Upgrade b1570.3
 - Reconductor Union REA - Honda MT 69 kV line - 6/1/2014 - \$0.00M
- 10) Baseline Upgrade b1572
 - Construct a new 138 kV line from West Milton to Eldean - 6/1/2014 - \$16.00M
- 11) Baseline Upgrade b1696
 - Install a breaker and a half scheme with a minimum of eight 230 kV breakers for five existing lines at Idylwood 230 kV - 5/1/2016 - \$159.00M
- 12) Baseline Upgrade b1696.2
 - Replace the Idylwood 230 kV '209712' breaker with 50 kA breaker - 6/1/2017 - \$0.35M

- 13) Baseline Upgrade b2003
 - Construct a Whippany to Montville 230 kV line (6.4 miles) - 6/1/2015 - \$80.60M
- 14) Baseline Upgrade b2220
 - Install two 115 kV breakers at Chestnut Hill and remove sag limitations on the Pumphrey - Frederick Rd 115 kV circuits 110527 and 110528 to obtain a 125 deg. Celsius rating (161/210 MVA) - 6/1/2017 - \$14.00M
- 15) Baseline Upgrade b2361
 - Construct a 230kV UG line approx. 4.5 miles from Idylwood to Tysons. Tysons Substation will be rebuilt, within its existing footprint, with a 6-breaker ring bus using GIS equipment. - 6/1/2017 - \$228.00M
- 16) Baseline Upgrade b2436.90
 - Relocate Farragut - Hudson "B" and "C" 345 kV circuits to Marion 345 kV and any associated substation upgrades - 6/1/2015 - \$40.21M
- 17) Baseline Upgrade b2443.6
 - Install a second 500/230 kV transformer at Possum Point substation and replace bus work and associated equipment as needed. - 6/1/2026 - \$23.08M
- 18) Baseline Upgrade b2555
 - Updated scope: Reconductor 0.3 miles of Tiltonsville-Windsor 138 kV into Tiltonsville station with 795 ACSS; string the vacant side of the 3.8 mile middle section using 556 ACSR and operate in a six wire configuration; rebuild the 0.9 mile section crossing from Ohio into the Windsor station in West Virginia, using 795 ACSS. - 6/1/2019 - \$2.00M
- 19) Baseline Upgrade b2597
 - Rebuild approximately 1 mi. section of Dragoon-Virgil Street 34.5 kV line between Dragoon and Dodge Tap switch and replace Dodge switch MOAB to increase thermal capability of Dragoon-Dodge Tap branch - 6/1/2019 - \$2.15M
- 20) Baseline Upgrade b2598
 - Rebuild approximately 1 mile section of the Kline-Virgil Street 34.5 kV line between Kline and Virgil Street tap. Replace MOAB switches at Beiger, risers at Kline, switches and bus at Virgil Street. - 6/1/2019 - \$1.69M
- 21) Baseline Upgrade b2604.1
 - Remove approximately 11.32 miles of the 69 kV line between Millbrook Park and Franklin Furnace. - 6/1/2019 - \$1.13M
- 22) Baseline Upgrade b2604.10
 - Build a new station (Althea) with a 138/69 kV, 90 MVA transformer. The 138 kV side will have a single 2000 A 40 kA circuit breaker and the 69 kV side will be a 2000 A 40 kA three breaker ring bus. - 6/1/2019 - \$11.07M
- 23) Baseline Upgrade b2604.11
 - Remote end work at Hanging Rock, East Wheelersburg and North Haverhill 138 kV. - 6/1/2019 - \$0.06M
- 24) Baseline Upgrade b2604.2
 - At Millbrook Park station, add a new 138/69 kV transformer #2 (90 MVA) with

- 3000 A 40 kA breakers on the high and low side. Replace the 600 A MOAB Switch and add a 3000 A circuit switcher on the high side of transformer #1. - 6/1/2019 - \$3.05M
- 25) Baseline Upgrade b2604.3
- Replace Sciotoville 69 kV station with a new 138/12 kV in-out station (Cottrell) with 2000A line MOABs facing Millbrook Park and East Wheelersburg 138 kV. - 6/1/2019 - \$1.40M
- 26) Baseline Upgrade b2604.4
- Tie Cottrell switch into the Millbrook Park-East Wheelersburg 138 kV circuit by constructing 0.50 miles of line using 795 ACSR 26/7 Drake (SE 359 MVA). - 6/1/2019 - \$1.96M
- 27) Baseline Upgrade b2604.5
- Install a new 2000 A 3-way POP Switch outside of Texas Eastern 138 kV substation (Sadiq Switch). - 6/1/2019 - \$1.08M
- 28) Baseline Upgrade b2604.6
- Replace the Wheelersburg 69 kV station with a new 138/12 kV in-out station (Sweetgum) with a 3000 A 40 kA breaker facing Sadiq Switch and a 2000 A 138 kV MOAB facing Althea. - 6/1/2019 - \$2.16M
- 29) Baseline Upgrade b2604.7
- Build approximately 1.4 miles of new 138 kV line using 795 ACSR 26/7 Drake (SE 359 MVA) between the new Sadiq Switch and the new Sweetgum 138 kV stations. - 6/1/2019 - \$3.41M
- 30) Baseline Upgrade b2604.8
- Remove the existing 69 kV Hayport Road Switch. - 6/1/2019 - \$0.10M
- 31) Baseline Upgrade b2604.9
- Rebuild approximately 2.3 miles along existing ROW from Sweetgum to the Hayport Rd switch 69 kV location as 138 kV single circuit and rebuild approximately 2.0 miles from the Hayport Road switch to Althea 69 kV with double circuit 138 kV construction, one side operated at 69 kV to continue service to K.O. Wheelersburg, using 795 ACSR 26/7 Drake (SE 359 MVA). - 6/1/2019 - \$10.76M
- 32) Baseline Upgrade b2743.1
- Tap the Conemaugh - Hunterstown 500 kV line & create new Rice 500 kV & 230 kV stations. Install two 500/230 kV transformers, operated together. - 6/1/2020 - \$43.10M
- 33) Baseline Upgrade b2743.2
- Tie in new Rice substation to Conemaugh-Hunterstown 500 kV - 6/1/2020 - \$14.60M
- 34) Baseline Upgrade b2743.3
- Upgrade terminal equipment at Conemaugh 500 kV: on the Conemaugh - Hunterstown 500 kV circuit - 6/1/2020 - \$0.35M
- 35) Baseline Upgrade b2743.4

- Upgrade terminal equipment at Hunterstown 500 kV: on the Conemaugh - Hunterstown 500 kV circuit - 6/1/2020 - \$0.20M
- 36) Baseline Upgrade b2743.5
- Build new 230 kV double circuit line between Rice and Ringgold 230 kV, operated as a single circuit. - 6/1/2020 - \$93.40M
- 37) Baseline Upgrade b2743.6
- Reconfigure the Ringgold 230 kV substation to double bus double breaker scheme - 6/1/2020 - \$7.87M
- 38) Baseline Upgrade b2743.6.1
- Replace the two Ringgold 230/138 kV transformers - 6/1/2020 - \$6.26M
- 39) Baseline Upgrade b2743.7
- Rebuild/Reconductor the Ringgold - Catoctin 138 kV circuit and upgrade terminal equipment on both ends - 6/1/2020 - \$47.22M
- 40) Baseline Upgrade b2743.8
- Replace Ringgold Substation 138 kV breakers '138 BUS TIE' and 'RCM0' with 40 kA breakers - 6/1/2020 - \$0.71M
- 41) Baseline Upgrade b2752.1
- Tap the Peach Bottom – TMI 500 kV line & create new Furnace Run 500 kV & 230 kV stations. Install two 500/230 kV transformers, operated together. - 6/1/2020 - \$39.80M
- 42) Baseline Upgrade b2752.2
- Tie in new Furnace Run substation to Peach Bottom-TMI 500 kV - 6/1/2020 - \$10.50M
- 43) Baseline Upgrade b2752.3
- Upgrade terminal equipment and required relay communication at Peach Bottom 500 kV: on the Peach Bottom - TMI 500 kV circuit - 6/1/2020 - \$1.70M
- 44) Baseline Upgrade b2752.4
- Upgrade terminal equipment and required relay communication at TMI 500 kV: on the Peach Bottom - TMI 500 kV circuit - 6/1/2020 - \$2.00M
- 45) Baseline Upgrade b2752.5
- Build new 230 kV double circuit line between Furnace Run and Conastone 230 kV, operated as a single circuit. - 6/1/2020 - \$51.12M
- 46) Baseline Upgrade b2752.6
- Conastone 230 kV substation tie-in work (install a new circuit breaker at Conastone 230 kV and upgrade any required terminal equipment to terminate the new circuit) - 6/1/2020 - \$6.14M
- 47) Baseline Upgrade b2752.7
- Reconductor/Rebuild the two Conastone - Northwest 230 kV lines and upgrade terminal equipment on both ends - 6/1/2020 - \$52.14M
- 48) Baseline Upgrade b2752.8
- Replace the Conastone 230kV '2322 B5' breaker with a 63kA breaker - 6/1/2020

- \$1.51M
- 49) Baseline Upgrade b2752.9
 - Replace the Conastone 230kV '2322 B6' breaker with a 63kA breaker - 6/1/2020 - \$1.51M
- 50) Baseline Upgrade b2753.7
 - Retire line sections (Dilles Bottom - Bellaire and Moundsville - Dilles Bottom 69 kV lines) south of First Energy 138 kV line corridor, near "Point A". Tie George Washington - Moundsville 69 kV circuit to George Washington - West Bellaire 69 kV circuit. - 5/31/2020 - \$5.52M
- 51) Baseline Upgrade b2759
 - Rebuild Line #550 Mt. Storm – Valley 500kV - 6/1/2016 - \$476.00M
- 52) Baseline Upgrade b2760
 - Perform a Sag Study of the Saltville - Tazewell 138 kV line to increase the thermal rating of the line - 6/1/2021 - \$0.10M
- 53) Baseline Upgrade b2793
 - Energize the spare Fremont Center 138/69 kV 130 MVA transformer #3. Reduces overloaded facilities to 46% loading. - 6/1/2021 - \$1.30M
- 54) Baseline Upgrade b2914
 - Rebuild Tharp Tap-KU Elizabethtown 69kV line section to 795 MCM (2.11 miles). - 12/1/2024 - \$1.22M
- 55) Baseline Upgrade b2932
 - Replace terminal equipment at Tanners Creek on Tanners Creek Dearborn 345 kV line. - 6/1/2021 - \$1.50M
- 56) Baseline Upgrade b2933
 - Third Source for Springfield Rd. and Stanley Terrace Stations - 6/1/2018 - \$0.00M
- 57) Baseline Upgrade b2933.31
 - Construct a 69 kV network between Front Street, Springfield and Stanley Terrace (Front Street - Springfield) - 6/1/2018 - \$39.66M
- 58) Baseline Upgrade b2938
 - Perform a sag mitigations on the Broadford – Wolf Hills 138kV circuit to allow the line to operate to a higher maximum temperature. - 6/1/2022 - \$2.60M
- 59) Baseline Upgrade b2940
 - Upgrade the distance relay on the Wayne Co – Wayne Co KY 161kV line to increase the line winter rating would be 167/167 - 12/1/2022 - \$0.00M
- 60) Baseline Upgrade b2946
 - Convert existing Preston 69 kV Substation to DPL's current design standard of a 3-breaker ring bus. - 6/1/2022 - \$6.67M
- 61) Baseline Upgrade b2970
 - Ringgold - Catocin Solution - 6/1/2020 - \$0.00M

- 62) Baseline Upgrade b2970.1
- Install two new 230 kV positions at Ringgold for 230/138 kV transformers. - 6/1/2020 - \$3.20M
- 63) Baseline Upgrade b2970.2
- Install new 230 kV position for the Catoctin 230 kV line at Ringgold. - 6/1/2020 - \$1.60M
- 64) Baseline Upgrade b2970.3
- Install one new 230 kV breaker at Catoctin substation. - 6/1/2020 - \$7.60M
- 65) Baseline Upgrade b2970.4
- Install new 230 / 138 kV transformer at Catoctin substation. Convert Ringgold-Catoctin 138 kV Line to 230 kV operation. - 6/1/2020 - \$0.90M
- 66) Baseline Upgrade b2970.5
- Convert Garfield 138/12.5 kV substation to 230/12.5 kV - 6/1/2020 - \$2.20M
- 67) Baseline Upgrade b2981
- Rebuild 115 kV Line No.29 segment between Fredericksburg and Aquia Harbor to current 230 kV standards (operating at 115 kV) utilizing steel H-frame structures with 2-636 ACSR to provide a normal continuous summer rating of 524 MVA at 115 kV (1047 MVA at 230 kV) - 12/31/2022 - \$19.24M
- 68) Baseline Upgrade b3007.1
- Reconductor the Blairsville East to Social Hall 138 kV line and upgrade terminal equipment - AP portion. 4.8 miles total. The new conductor will be 636 ACSS replacing the existing 636 ACSR conductor. At Social Hall, meters, relays, bus conductor, a wavetrap, circuit breaker and disconnects will be replaced. - 6/1/2021 - \$4.42M
- 69) Baseline Upgrade b3007.2
- Reconductor the Blairsville East to Social Hall 138 kV line and upgrade terminal equipment - PENELEC portion. 4.8 miles total. The new conductor will be 636 ACSS replacing the existing 636 ACSR conductor. At Blairsville East, the wave trap and breaker disconnects will be replaced. - 6/1/2021 - \$7.00M
- 70) Baseline Upgrade b3017.1
- Rebuild Glade to Warren 230 kV line with hi-temp conductor and substation terminal upgrades. 11.53 miles. New conductor will be 1033 ACSS. Existing conductor is 1033 ACSR. - 6/1/2021 - \$42.40M
- 71) Baseline Upgrade b3017.2
- Glade substation terminal upgrades. Replace bus conductor, wave traps, and relaying. - 6/1/2021 - \$0.05M
- 72) Baseline Upgrade b3017.3
- Warren substation terminal upgrades. Replace bus conductor, wave traps, and relaying. - 6/1/2021 - \$0.05M
- 73) Baseline Upgrade b3019.1
- Update the nameplate for Morrisville 500 kV breaker "H1T594" to be 50 kA - 6/1/2018 - \$0.00M

- 74) Baseline Upgrade b3019.2
- Update the nameplate for Morrisville 500 kV breaker "H1T545" to be 50 kA - 6/1/2018 - \$0.00M
- 75) Baseline Upgrade b3020
- Rebuild 500kV Line #574 Ladysmith to Elmont - 26.2 miles long - 6/1/2018 - \$91.32M
- 76) Baseline Upgrade b3021
- Rebuild 500kV Line #581 Ladysmith to Chancellor - 15.2 miles long - 6/1/2018 - \$44.38M
- 77) Baseline Upgrade b3031
- Transfer load off of the Leroy Center-Mayfield Q2 138 kV line by reconfiguring the Pawnee Substation primary source, via the existing switches, from the Leroy Center-Mayfield Q2 138 kV line to the Leroy Center-Mayfield Q1 138 kV line. - 6/1/2021 - \$0.10M
- 78) Baseline Upgrade b3033
- Ottawa-Lakeview 138 kV Reconductor and Substation Upgrades - 12/1/2023 - \$20.00M
- 79) Baseline Upgrade b3037
- Upgrades at the Natrium substation - 6/1/2023 - \$1.10M
- 80) Baseline Upgrade b3041
- Peach Bottom - Furnace Run 500kV Terminal Equipment - 6/1/2021 - \$3.50M
- 81) Baseline Upgrade b3042
- Replace substation conductor at Raritan River 230 kV substation on the Kilmer line terminal - 6/1/2023 - \$0.05M
- 82) Baseline Upgrade b3053
- Upgrade terminal equipment on Gibson - Petersburg 345kV - 10/29/2018 - \$4.30M
- 83) Baseline Upgrade b3054
- Install a battery storage device at Grasonville Substation * Rebuild Wye Mills - Stevensville 69 kV Line * Construct a new 69 kV line from Wye Mills to Grasonville. - 12/1/2023 - \$0.00M
- 84) Baseline Upgrade b3055
- Install spare 230/69 kV transformer at Davis Substation - 6/1/2023 - \$0.54M
- 85) Baseline Upgrade b3058
- Partial Rebuild of 230 kV lines between Clifton and Johnson DP (#265, #200 and #2051) with double circuit steel structures using double circuit conductor at current 230 kV northern Virginia standards with a minimum rating of 1200 MVA. - 6/1/2018 - \$11.50M
- 86) Baseline Upgrade b3085
- Reconductor Kammer - George Washington 138 kV line (~0.08 miles). Replace the wave trap at Kammer 138 kV. - 6/1/2022 - \$0.50M

87) Baseline Upgrade b3086.4

- North Findlay Station: Install a 138 kV 3000 A 63 kA line breaker and low side 34.5 kV 2000 A 40 kA breaker, high side 138 kV circuit switcher on T1 - 6/1/2022 - \$1.70M

88) Baseline Upgrade b3087.1

- Construct a new greenfield station to the west (~1.5 mi.) of the existing Fords Branch Station potentially in/near the new Kentucky Enterprise Industrial Park. . This new station will consist of 4 -138 kV breaker ring bus and two 30 MVA 138/34.5 kV transformers. The existing Fords Branch Station will be retired. - 12/1/2018 - \$3.40M

89) Baseline Upgrade b3087.2

- Construct approximately 5 miles of new double circuit 138 kV line in order to loop the new Fords Branch station into the existing Beaver Creek – Cedar Creek 138 kV circuit. - 12/1/2018 - \$19.90M

90) Baseline Upgrade b3087.3

- Remote end work will be required at Cedar Creek Station. - 12/1/2018 - \$0.50M

91) Baseline Upgrade b3087.4

- Install 28.8MVar switching shunt at the new Fords Branch substation - 12/1/2023 - \$0.50M

92) Baseline Upgrade b3089

- Rebuild 230kV Line #224 between Lanexa and Northern Neck utilizing double circuit structures to current 230kV standards. Only one circuit is to be installed on the structures with this project with a minimum summer emergency rating of 1047 MVA. - 6/1/2018 - \$128.00M

93) Baseline Upgrade b3090

- Convert the OH portion (approx. 1500 Feet) of 230 kV Lines #248 & #2023 to UG and convert Glebe substation to GIS. - 1/1/2021 - \$202.00M

94) Baseline Upgrade b3094

- Move 69 kV 12.0 MVAR capacitor bank from Greenbriar to Bullitt Co 69kV substation - 6/1/2018 - \$0.40M

95) Baseline Upgrade b3095

- Rebuild Lakin – Racine Tap 69 kV line section (9.2 miles) to 69 kV standards, utilizing 795 26/7 ACSR conductor - 12/1/2022 - \$23.90M

96) Baseline Upgrade b3096

- Rebuild 230 kV line No.2063 (Clifton – Ox) and part of 230 kV line No.2164 (Clifton – Keene Mill) with double circuit steel structures using double circuit conductor at current 230 kV northern Virginia standards with a minimum rating of 1200 MVA. - 6/1/2019 - \$19.00M

97) Baseline Upgrade b3098

- Rebuild 9.8 miles of 115kV Line #141 between Balcony Falls and Skimmer and 3.8 miles of 115kV Line #28 between Balcony Falls and Cushaw to current standards with a minimum rating of 261 MVA. - 6/1/2019 - \$30.90M

98) Baseline Upgrade b3098.1

- Rebuild Balcony Falls Substation - 6/1/2019 - \$9.00M

99) Baseline Upgrade b3099

- Install a 138 kV 3000A 40 kA circuit switcher on the high side of the existing 138/34.5 kV transformer #5 and a 138 kV 3000A 40 kA circuit switcher transformer #7 at Holston station - 6/1/2022 - \$0.70M

100) Baseline Upgrade b3100

- Relocate 138 kV circuit breaker W between 138 kV bus #1 extension and bus #2 at Chemical station. Install a new 138 kV circuit breaker between bus #1 and bus #1 extension. - 12/1/2022 - \$0.70M

101) Baseline Upgrade b3101

- Rebuild the 1/0 Cu. conductor sections (~1.5 miles) of the Fort Robinson - Moccasin Gap 69 kV line section (~5 miles) utilizing 556 ACSR conductor and upgrade existing relay trip limit (WN/WE: 63 MVA, line limited by remaining conductor sections). - 12/1/2023 - \$3.00M

102) Baseline Upgrade b3114

- Rebuild the 18.6 mile section of 115kV Line #81 which includes 1.7 miles of double circuit Line #81 with 230kV Line #2056 and 1.3 miles of double circuit Line #81 with 230kV Line #239. This segment of Line #81 will be rebuilt to current standards with a minimum rating of 261 MVA. This segment of Line #239 will be rebuilt to current standards with a minimum rating of 1046 MVA. Line #2056 rating will not change. - 6/1/2019 - \$27.10M

103) Baseline Upgrade b3115

- Provide new station service to control building from 230 kV bus (served from plant facilities presently). - 9/30/2019 - \$1.50M

104) Baseline Upgrade b3119.1

- Rebuild the Jay – Pennville 138 kV line as double circuit 138/69 kV. Build a new 9.8 mile single circuit 69 kV line from near Pennville station to North Portland station - 6/1/2022 - \$38.10M

105) Baseline Upgrade b3119.2

- Install three (3) 69 kV breakers to create the “U” string and add a low side breaker on the Jay transformer 2 - 6/1/2022 - \$3.40M

106) Baseline Upgrade b3119.3

- Install two (2) 69 kV breakers at North Portland station to complete the ring and allow for the new line. - 6/1/2022 - \$1.90M

107) Baseline Upgrade b3121

- Rebuild Clubhouse-Lakeview 230 kV Line #254 with single-circuit wood pole equivalent structures at the current 230 kV standard with a minimum rating of 1047 MVA. - 6/1/2019 - \$25.50M

108) Baseline Upgrade b3122

- Rebuild Hathaway-Rocky Mount (Duke Energy Progress) 230 kV Line #2181 and Line #2058 with double circuit steel structures using double circuit conductor at current 230 kV standards with a minimum rating of 1047 MVA. - 6/1/2019 -

- \$13.00M
- 109) Baseline Upgrade b3123
- At Sammis 345 kV station: Install a new control building in the switchyard, construct a new station access road, install new switchyard power supply to separate from existing generating station power service, separate all communications circuits, and separate all protection and controls schemes - 6/1/2022 - \$8.00M
- 110) Baseline Upgrade b3124
- Separate metering, station power, and communication at Bruce Mansfield 345 kV station - 12/31/2020 - \$0.93M
- 111) Baseline Upgrade b3125
- At Davis Bessie 345 kV station: Install new switchyard power supply to separate from existing generating station power service, separate all communications circuits, and separate all protection and controls schemes - 5/31/2020 - \$1.80M
- 112) Baseline Upgrade b3126
- At Perry 345 kV station: Install new switchyard power supply to separate from existing generating station power service, separate all communications circuits, and construct a new station access road - 6/1/2021 - \$0.60M
- 113) Baseline Upgrade b3130
- Construct seven new 34.5 kV circuits on existing pole lines (total of 53.5 miles), Rebuild/Reconductor two 34.5 kV circuits (total of 5.5 miles) and install a 2nd 115/34.5 kV transformer (Werner) - 6/1/2016 - \$223.00M
- 114) Baseline Upgrade b3130.1
- Construct a new 34.5 kV circuit from Oceanview to Allenhurst 34.5 kV (3.9 Miles) - (replaces B1690) - 6/1/2016 - \$0.00M
- 115) Baseline Upgrade b3130.10
- Install 2nd 115-34.5 kV Transformer at Werner Substation - (replaces B1690) - 6/1/2016 - \$13.90M
- 116) Baseline Upgrade b3130.11
- Replace four Atlantic 34.5 kV breakers (BK1A, BK1B, BK3A and BK3B) with 63kA rated breakers and associated equipment - 9/30/2023 - \$3.50M
- 117) Baseline Upgrade b3130.12
- Replace six Werner 34.5 kV breakers (E31A_Prelim, E31B_Prelim, V48 future, W101, M39 and U99) with 40 kA rated breakers and associated equipment. - 6/1/2024 - \$4.20M
- 118) Baseline Upgrade b3130.2
- Construct a new 34.5 kV circuit from Atlantic to Red Bank 34.5 kV (10.3 Miles) - (replaces B1690) - 6/1/2016 - \$0.00M
- 119) Baseline Upgrade b3130.3
- Construct a new 34.5 kV circuit from Freneau to Taylor Lane 34.5 kV (10.7 Miles) - (replaces B1690) - 6/1/2016 - \$0.00M
- 120) Baseline Upgrade b3130.4

- Construct a new 34.5 kV circuit from Keyport to Belford 34.5 kV (5.6 Miles) - (replaces B1690) - 6/1/2016 - \$0.00M
- 121) Baseline Upgrade b3130.5
 - Construct a new 34.5 kV circuit from Red Bank to Belford 34.5 kV (5.7 Miles) - (replaces B1690) - 6/1/2016 - \$0.00M
- 122) Baseline Upgrade b3130.6
 - Construct a new 34.5 kV circuit from Werner to Clark Street (7.3 Miles) - (replaces B1690) - 6/1/2016 - \$0.00M
- 123) Baseline Upgrade b3130.7
 - Construct a new 34.5 kV circuit from Atlantic to Freneau (13.3 Miles) - (replaces B1690) - 6/1/2016 - \$0.00M
- 124) Baseline Upgrade b3130.8
 - Rebuild/Reconductor the Atlantic to Camp Woods Switch Point (3.5 Miles) 34.5 kV circuit - (replaces B1690) - 6/1/2016 - \$0.00M
- 125) Baseline Upgrade b3130.9
 - Rebuild/Reconductor the Allenhurst to Elberon (2.0 Miles) 34.5 kV circuit - (replaces B1690) - 6/1/2016 - \$0.00M
- 126) Baseline Upgrade b3131
 - At East Lima and Haviland. The Haviland – East Lima 138kV line is overloaded for multiple contingencies in winter generator deliverability test and basecase analysis test. 138 kV stations, replace line relays and wavetrap on the East Lima-Haviland 138 kV facility. In addition, replace 500 MCM Cu Risers and Bus conductors at Haviland 138 kV - 12/1/2024 - \$1.35M
- 127) Baseline Upgrade b3131.1
 - Rebuild approximately 12.3 miles of remaining Lark conductor on the double circuit line between Haviland and East Lima with 1033 54/7 ACSR conductor. - 12/1/2024 - \$25.90M
- 128) Baseline Upgrade b3133
 - Move the existing Botkins 69 kV capacitor from the Sidney-Botkins side of the existing breaker at Botkins to the Botkins-Jackson Center side. This will keep the capacitor in-service for the loss of Sidney-Botkins. This reduces the voltage drop to less than 3% and also resolves the overload on the Blue Jacket Tap-Huntsville 69 kV line. - 6/1/2024 - \$0.20M
- 129) Baseline Upgrade b3134
 - Build a new single circuit 69 kV overhead from existing Kellam substation to newly constructed Cheriton substation (21 miles). - 6/1/2019 - \$22.00M
- 130) Baseline Upgrade b3134.1
 - Reconfigure the Kellam ring station to create a line terminal for the new 69 kV circuit to Cheriton S/S. Cheriton S/S is a new station (ID s2027) that was placed in service in Jan 2023. - 6/1/2019 - \$0.00M
- 131) Baseline Upgrade b3134.2
 - Build a new single circuit 69 kV overhead line from Kellam S/S to new Cheriton

- S/S (21 miles) - 6/1/2019 - \$0.00M
- 132) Baseline Upgrade b3136
- Replace bus conductor at Smith 115 kV substation - 6/1/2024 - \$0.24M
- 133) Baseline Upgrade b3137
- Rebuild 20 miles of the East Towanda - North Meshoppen 115 kV line - 6/1/2024 - \$58.60M
- 134) Baseline Upgrade b3143.1
- Reconductor the Silverside – Darley 69 kV circuit - 6/1/2024 - \$9.10M
- 135) Baseline Upgrade b3143.2
- Reconductor the Darley – Naamans 69 kV circuit - 6/1/2024 - \$11.70M
- 136) Baseline Upgrade b3143.3
- Replace three (3) existing 1200 A disconnect switches with 2000 A disconnect switches and install three (3) new 2000 A disconnect switches at Silverside 69 kV station - 6/1/2024 - \$0.48M
- 137) Baseline Upgrade b3143.4
- Replace two (2) 1200 A disconnect switches with 2000 A disconnect switches, replace existing 954 ACSR and 500 SDCU stranded bus with (2) 954 ACSR stranded bus. Reconfigure four (4) CTs from 1200 A to 2000 A and install two (2) new 2000 A disconnect switches, new (2) 954 ACSR stranded bus at Naamans 69 kV station - 6/1/2024 - \$0.60M
- 138) Baseline Upgrade b3143.5
- Replace four (4) 1200 A disconnect switches with 2000 A disconnect switches. Replace existing 954 ACSR and 1272 MCM AL stranded bus with (2) 954 ACSR stranded bus. Reconfigure eight (8) CTs from 1200 A to 2000 A and install Four (4) new 2000 A (310 MVA SE / 351 MVA WE) disconnect switches, new (2) 954 ACSR (331 MVA SE / 369 MVA WE) stranded bus at Darley 69 kV station - 6/1/2024 - \$0.95M
- 139) Baseline Upgrade b3144
- Upgrade bus conductor and relay panels Jackson Road – Nanty Glo 46 kV SJN line - 6/1/2024 - \$1.50M
- 140) Baseline Upgrade b3144.1
- Upgrade line relaying and substation conductor on the 46 kV Nanty Glo line exit at Jackson Road substation - 6/1/2024 - \$0.00M
- 141) Baseline Upgrade b3144.2
- Upgrade line relaying and substation conductor on the 46 kV Jackson Road line exit at Nanty Glo substation - 6/1/2024 - \$0.00M
- 142) Baseline Upgrade b3150
- Rebuild Ferguson 69/12 kV station in the clear as the 138/12 kV Bear station and connect it to a ~1 mile double circuit 138 kV extension from the Aviation – Ellison Rd 138 kV line to remove the load from the 69 kV line. - 6/1/2024 - \$6.40M

- 143) Baseline Upgrade b3151.1
- Rebuild the ~30 mile Gateway – Wallen 34.5 kV circuit as the ~27 mile Gateway – Wallen 69 kV circuit. - 6/1/2024 - \$43.30M
- 144) Baseline Upgrade b3151.13
- Rebuild the 0.5 mile Whitley – Columbia City No.1 line as 69 kV. - 6/1/2024 - \$1.00M
- 145) Baseline Upgrade b3151.14
- Rebuild the 0.5 mile Whitley – Columbia City No.2 line as 69 kV. - 6/1/2024 - \$0.70M
- 146) Baseline Upgrade b3151.15
- Rebuild the 0.6 mile double circuit section of the Rob Park – South Hicksville / Rob Park – Diebold Road as 69 kV - 6/1/2024 - \$1.00M
- 147) Baseline Upgrade b3151.2
- Retire the ~3 miles Columbia – Whitley 34.5 kV line. - 6/1/2024 - \$0.50M
- 148) Baseline Upgrade b3151.3
- At Gateway station, remove all 34.5 kV equipment and install one (1) 69 kV circuit breaker for the new Whitley line entrance. - 6/1/2024 - \$1.00M
- 149) Baseline Upgrade b3151.4
- Rebuild Whitley as a 69 kV station with two (2) line and one (1) bus tie circuit breakers. - 6/1/2024 - \$4.20M
- 150) Baseline Upgrade b3151.5
- Replace the Union 34.5 kV switch with a 69 kV switch structure. - 6/1/2024 - \$0.60M
- 151) Baseline Upgrade b3151.6
- Replace the Eel River 34.5 kV switch with a 69 kV switch structure. - 6/1/2024 - \$0.60M
- 152) Baseline Upgrade b3151.7
- Install a 69 kV Bobay switch at Woodland Station. - 6/1/2024 - \$0.60M
- 153) Baseline Upgrade b3151.8
- Replace Carroll and Churubusco 34.5 kV stations with the 69 kV Snapper station. Snapper will have two (2) line circuit breakers, one (1) bus tie circuit breaker and a 14.4 MVAR cap bank - 6/1/2024 - \$8.70M
- 154) Baseline Upgrade b3151.9
- Remove 34.5 kV circuit breaker "AD" at Wallen station. - 6/1/2024 - \$0.30M
- 155) Baseline Upgrade b3152
- Reconductor the 8.4 mile section of the Leroy Center - Mayfield Q1 line between Leroy Center and Pawnee Tap to achieve a rating of at least 160 MVA / 192 MVA (SN/SE). - 6/1/2022 - \$14.10M
- 156) Baseline Upgrade b3154
- Install one (1) 13.2 MVAR 46 kV capacitor at the Logan substation - 6/1/2024 -

\$1.70M

157) Baseline Upgrade b3155

- Rebuild approximately 12 miles of Wye Mills - Stevensville line to achieve needed ampacity - 12/1/2023 - \$33.70M

158) Baseline Upgrade b3160.1

- Construct a ~2.4 mile double circuit 138 kV extension using 1033 ACSR to connect Lake Head to the 138 kV network. - 6/1/2024 - \$6.00M

159) Baseline Upgrade b3160.2

- Retire the ~2.5 mile 34.5 kV Niles – Simplicity Tap line. - 6/1/2024 - \$1.20M

160) Baseline Upgrade b3160.3

- Retire the ~4.6 mile Lakehead 69 kV Tap - 6/1/2024 - \$1.40M

161) Baseline Upgrade b3160.4

- Build new 138/69 kV drop down station to feed Lakehead with a 138 kV breaker, 138 kV switcher, 138/69 kV transformer and a 138 kV MOAB - 6/1/2024 - \$4.00M

162) Baseline Upgrade b3160.5

- Rebuild the ~1.2 mile Buchanan South 69 kV Radial Tap using 795 ACSR - 6/1/2024 - \$3.00M

163) Baseline Upgrade b3160.6

- Rebuild the ~8.4 mile 69 kV Pletcher – Buchanan Hydro line as the ~9 mile Pletcher – Buchanan South 69 kV line using 795 ACSR. - 6/1/2024 - \$20.00M

164) Baseline Upgrade b3160.7

- Install a PoP switch at Buchanan South station with 2 line Moabs. - 6/1/2024 - \$0.60M

165) Baseline Upgrade b3161.1

- Install two, 2000 Amp, 115kV line switches. Extend Reymet fence and bus to allow installation of risers to Line #53 (Chesterfield-Kevlar 115 kV). - 6/1/2024 - \$3.00M

166) Baseline Upgrade b3162

- Acquire land and build a new 230 kV switching station (Stevensburg) with a 224 MVA, 230/115 kV transformer. Gordonsville-Remington 230 kV (Line #2199) will be cut and connected to the new station. Remington-Mt. Run 115 kV (Line #70) and Mt. Run-Oak Green 115 kV (Line #2) will also be cut and connected to the new station. - 6/1/2024 - \$22.00M

167) Baseline Upgrade b3208

- Retire approximately 38 miles of the 44 mile Clifford-Scottsville 46 kV circuit. Build new 138 kV “in and out” to two new Distribution stations to serve the load formerly served by Phoenix, Shipman, Schuyler (AEP), and Rockfish stations. Construct new 138 kV lines from Joshua Falls-Riverville (~10 mi.) and Riverville-Gladstone (~5 mi.). Install required station upgrades at Joshua Falls, Riverville and Gladstone stations to accommodate the new 138 kV circuits. Rebuild Reusen – Monroe 69 kV (~4 mi.) - 12/1/2022 - \$85.00M

168) Baseline Upgrade b3209

- Rebuild the 10.5 mile Berne – South Decatur 69 kV line using 556 ACSR in order to alleviate the overload and address a deteriorating asset. - 6/1/2022 - \$16.60M

169) Baseline Upgrade b3211

- Rebuild the 1.3 mile section of 500 kV Line No.569 (Loudoun - Morrisville) with single-circuit 500 kV structures at the current 500 kV standard. This will increase the rating of the line to 3424 MVA. - 6/1/2019 - \$4.50M

170) Baseline Upgrade b3213

- Install 2nd Chickahominy 500/230 kV transformer Relocate the Chickahominy – Elmont 500kV line #557 to terminate in a new bay at Chickahominy substation and relocate the Chesterfield – Lanexa 115kV line #92 to allow for the expansion of the Chickahominy substation • Add three new 500 kV breakers with 50kA interrupting rating and associated equipment - 6/1/2023 - \$22.00M

171) Baseline Upgrade b3218

- At Oak Mound 138 kV substation, replace the 138 kV bus tie and Waldo Run #2 breakers with 40 kA, 3000 amp units. Install CTs as 2000/5 MR. - - \$0.00M

172) Baseline Upgrade b3221

- Replace terminal equipment (bus conductor) on the 230 kV side of the Steel City 500/230 kV transformer #1 - 6/1/2025 - \$0.09M

173) Baseline Upgrade b3222

- Install one (1) 7.2 MVAR fixed cap bank on the Lock Haven-Reno 69 kV line and one (1) 7.2 MVAR fixed cap bank on the Lock Haven-Flemington 69 kV line near the Flemington 69/12kV substation. - 6/1/2025 - \$1.90M

174) Baseline Upgrade b3223.1

- Install a 2nd 230kV circuit with a minimum summer emergency rating of 1047 MVA between Lanexa and Northern Neck Substations. The 2nd circuit will utilize the vacant arms on the double-circuit structures that are being installed on the Line #224 (Lanexa-Northern Neck) End-of-Life rebuild project (b3089). - 6/1/2023 - \$14.00M

175) Baseline Upgrade b3223.2

- Expand the Northern Neck terminal from a 230kV, 4-breaker ring bus to a 6-breaker ring bus. - 6/1/2023 - \$5.00M

176) Baseline Upgrade b3223.3

- Expand the Lanexa terminal from a 6-breaker ring bus to a breaker-and-a-half arrangement. - 6/1/2023 - \$4.00M

177) Baseline Upgrade b3224

- Replace a disconnect switch and reconductor a short span of Mt. Pleasant - Middletown Tap line - 6/1/2025 - \$0.43M

178) Baseline Upgrade b3226

- Add 10 MVAR 69 kV capacitor bank at Swinton substation - 6/1/2025 - \$2.90M

179) Baseline Upgrade b3227

- Rebuild the Corson-Court 69 kV line to achieve ratings equivalent to 795 ACSR conductor or better - 6/1/2025 - \$13.20M
- 180) Baseline Upgrade b3228
- Replace two relays at Center Substation to increase ratings on the 110552 circuit - 6/1/2025 - \$0.03M
- 181) Baseline Upgrade b3230
- At Enon Substation install a second 138 kV, 28.8 MVAR nameplate, capacitor and the associated 138 kV capacitor switcher. - 6/1/2025 - \$1.84M
- 182) Baseline Upgrade b3231
- Replace the existing No. 2 cap bank breaker at Huntingdon substation with a new breaker with higher interrupting capability. - 6/1/2025 - \$0.80M
- 183) Baseline Upgrade b3232
- Replace the existing Williamsburg, ALH (Hollidaysburg) and bus section breaker at the Altoona substation with a new breaker with higher interrupting capability. - 6/1/2025 - \$1.70M
- 184) Baseline Upgrade b3233
- Install one 34 MVAR 115 kV shunt reactor and breaker. Install one 115 kV circuit breaker to expand the substation to a 4 breaker ring bus. - 6/1/2025 - \$4.90M
- 185) Baseline Upgrade b3234
- Extend both the east and west 138 kV buses at Pine substation, and install one 138 kV breaker, associated disconnect switches, and one 100 MVAR reactor. - 6/1/2025 - \$3.80M
- 186) Baseline Upgrade b3235
- Extend 138 kV bus work to the west of Tangy substation for the addition of the 100 MVAR reactor bay and one 138 kV 40 kA circuit breaker. - 6/1/2025 - \$3.70M
- 187) Baseline Upgrade b3236
- Extend the 138 kV Bus by adding two new breakers and associated equipment and install a 75 MVAR Reactor - 6/1/2025 - \$4.50M
- 188) Baseline Upgrade b3237
- Install two 46 kV 6.12 MVAR capacitors effective at Mt Union. - 6/1/2025 - \$4.00M
- 189) Baseline Upgrade b3238
- Replace (7) overdutied 34.5 kV breakers with 50 kA rated equipment at the Whippany substation. - 6/1/2025 - \$5.10M
- 190) Baseline Upgrade b3239
- Replace (14) overdutied 34.5 kV breakers with 63 kA rated equipment. - 6/1/2025 - \$8.50M
- 191) Baseline Upgrade b3240
- Upgrade Cherry Run and Morgan terminals to make the Transmission Line the limiting component.

- Morgan: Wave Trap
- Cherry Run: Substation conductor, relays, CT - 6/1/2024 - \$1.10M
- 192) Baseline Upgrade b3241
- Install 138 kV, 36 MVAR capacitor and a 5 uF reactor protected by a 138 kV capacitor switcher. Install a breaker on the 138 kV Junction terminal. Install a 138 kV 3.5 uF reactor on the existing Hardy 138 kV capacitor. - 6/1/2025 - \$2.85M
- 193) Baseline Upgrade b3242
- Reconfigure Stonewall 138 kV substation from its current configuration to a six-breaker breaker-and-a-half layout and add two 36 MVAR capacitors with capacitor switchers. - 6/1/2025 - \$13.30M
- 194) Baseline Upgrade b3243
- Replace risers at Bass 34.5kV station - 6/1/2025 - \$0.10M
- 195) Baseline Upgrade b3244
- Rebuild approximately 9 miles of the Rob Park - Harlan 69 kV line - 6/1/2025 - \$20.90M
- 196) Baseline Upgrade b3245
- Construct a new breaker-and-a-half substation near Tiffany substation. All transmission assets and lines will be relocated to the new substation. The two distribution transformers will be fed via two dedication 115 kV feeds to the existing Tiffany substation. - 6/1/2025 - \$23.20M
- 197) Baseline Upgrade b3246.1
- Convert 115 kV Line #172 Liberty-Lomar and 115 kV Line #197 Cannon Branch-Lomar to 230 kV to provide a new 230 kV source between Cannon Branch and Liberty. The majority of 115 kV Line #172 Liberty-Lomar and Line #197 Cannon Branch-Lomar is adequate for 230 kV operation. Lines to have a summer rating of 1047 MVA/1047 MVA (SN/SE) - 6/1/2023 - \$8.00M
- 198) Baseline Upgrade b3246.2
- Perform substation work for the 115 kV to 230 kV Line conversion at Liberty, Wellington, Godwin, Pioneer, Sandlot and Cannon Branch. - 6/1/2023 - \$20.00M
- 199) Baseline Upgrade b3246.3
- Extend 230kV Line #2011 Cannon Branch – Clifton to Winters Branch by removing the existing Line #2011 termination at Cannon Branch and extending the line to Brickyard creating 230kV Line #2011 Brickyard-Clifton. Extend a new 230kV line between Brickyard and Winters Branch with a summer rating of 1572MVA/1572MVA (SN/SE) - 6/1/2023 - \$10.29M
- 200) Baseline Upgrade b3246.4
- Perform substation work at Cannon Branch, Brickyard and Winters Branch for the 230kV Line #2011 extension. - 6/1/2023 - \$1.41M
- 201) Baseline Upgrade b3248
- Install a low side 69 kV circuit breaker at Albion 138/69 kV transformer 1 - 6/1/2025 - \$0.40M

202) Baseline Upgrade b3249

- Rebuild the Chatfield-Melmore 138kV line (~ 10 miles) to 1033 ACSR conductor. - 6/1/2025 - \$27.20M

203) Baseline Upgrade b3253

- Install a 3000A 40 kA 138 kV breaker on high side of 138/69 kV transformer #5 at Millbrook Park station. The transformer and associated bus protection will be upgraded accordingly. - 6/1/2025 - \$0.63M

204) Baseline Upgrade b3255

- Upgrade 795 AAC risers at Sand Hill 138 kV station towards Cricket Switch with 1272 AAC - 6/1/2025 - \$0.04M

205) Baseline Upgrade b3257

- Replace two spans of 336.4 26/7 ACSR on Twin Branch-AM General #2 34.5 kV circuit - 6/1/2025 - \$0.14M

206) Baseline Upgrade b3258

- Install a 3000A 63 kA 138 kV breaker on high side of 138/69 kV transformer #2 at Wagenhals station. The transformer and associated bus protection will be upgraded accordingly. - 6/1/2025 - \$1.10M

207) Baseline Upgrade b3259

- At West Millersburg station, replace the 138 kV MOAB on the West Millersburg - Wooster 138 kV line with a 3000A 40 kA breaker. - 6/1/2025 - \$0.68M

208) Baseline Upgrade b3262

- Install a second 115kV 33.67MVar cap bank at Harrisonburg substation along with a 115kV breaker. - 12/1/2025 - \$1.25M

209) Baseline Upgrade b3264

- Install 115kV breaker at Stuarts Draft station and sectionalize 115kV Line#117 into two 115kV lines. - 6/1/2025 - \$5.00M

210) Baseline Upgrade b3265

- Implement slow circulation on existing underground 138 kV high pressure fluid filled (HPFF) cable between Arsenal and Riazzi substations. - 6/1/2025 - \$2.90M

211) Baseline Upgrade b3267

- Rebuild the 4/0 ACSR Norwood-Shopville 69 kV line section using 556 ACSR/TW. - 12/1/2021 - \$5.21M

212) Baseline Upgrade b3268

- Build a switching station at the junction of 115kV line #39 and 115kV line #91 with a 115kV capacitor bank. The switching station will be built with 230kV structures but will operate at 115kV. - 12/1/2025 - \$23.65M

213) Baseline Upgrade b3269

- At West New Philadelphia station, add a high side 138 kV breaker on the 138/69 kV transformer #2 along with a 138 kV breaker on the line towards Newcomerstown. - 6/1/2025 - \$2.02M

214) Baseline Upgrade b3270

- Install 1.7 miles of 795 ACSR 138kV conductor along the other side of Dragoon Tap 138 kV line, which is currently double circuit tower with one position open. Additionally, install a 2nd 138/34.5 kV transformer at Dragoon, install a high side circuit switcher on the current transformer at Dragoon Station, and install 2-138 kV line breakers on the Dragoon-Jackson 138 kV and Dragoon-Twin Branch 138 kV lines. - 6/1/2025 - \$4.89M
- 215) Baseline Upgrade b3270.1
- Replace Dragoon 34.5 kV Breakers "B", "C" and "D" with 40 kA breakers. - 6/1/2025 - \$2.00M
- 216) Baseline Upgrade b3271
- Install a 138 kV circuit breaker at Fremont station on line towards Fremont Center and install a 9.6 MVAR 69 kV capacitor bank at Bloom Road station. - 6/1/2025 - \$1.76M
- 217) Baseline Upgrade b3272
- Install two 138 kV circuit switchers on the high side of 138/34.5 kV transformers #1 & #2 at Rockhill station. - 6/1/2025 - \$1.47M
- 218) Baseline Upgrade b3273.1
- Rebuild and convert the existing 17.6 miles East Leipsic-New Liberty 34.5 kV circuit to 138 kV using 795 ACSR - 6/1/2025 - \$31.35M
- 219) Baseline Upgrade b3273.2
- Convert the existing 34.5 kV equipment to 138 kV and expanded the existing McComb station to the north and east to allow for new equipment to be installed. Install two new 138 kV box bays to allow for line positions and two new 138/12 kV transformers. - 6/1/2025 - \$0.87M
- 220) Baseline Upgrade b3273.3
- Expand the existing East Leipsic 138 kV station to the north to allow for another 138 kV line exit to be installed. The new line exit will involve installing a new 138 kV circuit breaker, disconnect switches and new dead end structure along with extending existing 138 kV bus work. - 6/1/2025 - \$1.30M
- 221) Baseline Upgrade b3273.4
- Add one 138 kV circuit breaker and disconnect switches in order to add an additional line position at New Liberty 138 kV station. Install line relaying potential devices and retire the 34.5 kV breaker F. - 6/1/2025 - \$0.90M
- 222) Baseline Upgrade b3274
- Rebuild approximately 8.9 miles of 69 kV line between Newcomerstown and Salt Fork Switch with 556 ACSR conductor. - 6/1/2025 - \$15.89M
- 223) Baseline Upgrade b3275.1
- Rebuild Kammer Station-Cresaps Switch 69 kV, approximately 0.5 miles. - 6/1/2025 - \$0.93M
- 224) Baseline Upgrade b3275.2
- Rebuild Cresaps Switch-McElroy Station 69 kV, approximately 0.67 miles. - 6/1/2025 - \$1.25M
- 225) Baseline Upgrade b3275.3

- Replace a single span of 4/0 ACSR from Moundville-Natrium str 93L to Carbon Tap switch 69kV located between Colombia Carbon and Conner Run stations. Remainder of line is 336 ACSR. - 6/1/2025 - \$0.01M
- 226) Baseline Upgrade b3275.4
- Rebuild from Colombia Carbon to Columbia Carbon Tap str 93N 69 kV, approximately 0.72 miles. The remainder of the line between Colombia Carbon Tap structure 93N and Natrium station is 336 ACSR and will remain. - 6/1/2025 - \$1.08M
- 227) Baseline Upgrade b3275.5
- Replace the Cresaps 69 kV 3-Way Phase-Over-Phase Switch and structure with a new 1200 A 3-Way Switch and Steel Pole. - 6/1/2025 - \$0.71M
- 228) Baseline Upgrade b3275.6
- Replace 477 MCM Alum bus and risers at McElroy 69 kV station. - 6/1/2025 - \$0.33M
- 229) Baseline Upgrade b3275.7
- Replace Natrium 138 kV bus existing between CB-BT1 and along the 138 kV Main Bus # 1 dropping to CBH1 from the 500MCM conductors to a 1272 KCM AAC conductor. Replace the dead end clamp and strain insulators. - 6/1/2025 - \$0.29M
- 230) Baseline Upgrade b3276.1
- Rebuild the 2/0 Copper section of the Lancaster-South Lancaster 69 kV line, approximately 2.9 miles of the 3.2 mile total length with 556 ACSR conductor. The remaining section has 336 ACSR conductor. - 6/1/2025 - \$5.37M
- 231) Baseline Upgrade b3276.2
- Rebuild the 1/0 Copper section of the line between Lancaster Junction and Ralston station 69 kV, approximately 2.3 miles of the 3.1 mile total length. - 6/1/2025 - \$4.58M
- 232) Baseline Upgrade b3276.3
- Rebuild the 2/0 Copper portion of the line between East Lancaster Tap and Lancaster 69 kV, approximately 0.81 miles. - 6/1/2025 - \$1.20M
- 233) Baseline Upgrade b3277
- Replace the existing East Akron 138 kV breaker B-22 with 3000A continuous, 40 KA momentary current interrupting rating circuit breaker. - 6/1/2021 - \$0.55M
- 234) Baseline Upgrade b3278.1
- Saltville Station: Replace H.S. MOAB Switches on the high side of the 138/69/34.5 kV T1 with a H.S. Circuit Switcher. - 12/1/2025 - \$0.72M
- 235) Baseline Upgrade b3278.2
- Meadowview Station: Replace existing 138/69/34.5 kV transformer T2 with a new 130 MVA 138/69/13 kV transformer. - 12/1/2025 - \$3.14M
- 236) Baseline Upgrade b3278.3
- Saltville Station: Install two 138 kV breakers and bus diff protection - 12/1/2025 - \$0.36M

237) Baseline Upgrade b3279

- Install a new 138 kV, 21.6 MVAR cap bank and circuit switcher at Apple Grove Station. - 6/1/2025 - \$1.00M

238) Baseline Upgrade b3280

- Rebuild the existing Cabin Creek - Kelly Creek 46 kV line (to structure 366-44), approximately 4.4 miles. This section is double circuit with the existing Cabin Creek - London 46 kV line so a double circuit rebuild would be required. - 6/1/2025 - \$17.90M

239) Baseline Upgrade b3281

- Install 138 kV circuit switcher on the 138/69 kV transformer #1 and 138/34.5 kV transformer #2 at Dewey. Install 138 kV 2000 A 40 kA breaker on Stanville line at Dewey 138 kV substation. - 12/1/2025 - \$1.40M

240) Baseline Upgrade b3282.1

- Install a second 138 kV circuit utilizing 795 ACSR conductor on the open position of the existing double circuit towers from East Huntington-North Proctorville. Remove the existing 34.5 kV line from East Huntington-North Chesapeake and rebuild this section to 138 kV served from a new PoP switch off the new East Huntington-North Proctorville 138 kV #2 line. - 6/1/2025 - \$7.10M

241) Baseline Upgrade b3282.2

- Install a 138 kV 40 kA circuit breaker at North Proctorville. - 6/1/2025 - \$1.40M

242) Baseline Upgrade b3282.3

- Install a 138 kV 40 kA circuit breaker at East Huntington. - 6/1/2025 - \$1.10M

243) Baseline Upgrade b3282.4

- Convert the existing 34/12 kV North Chesapeake to a 138/12 kV station. - 6/1/2025 - \$0.80M

244) Baseline Upgrade b3283

- Replace the existing Inez 138/69 kV 50 MVA autotransformer with a 138/69 kV 90 MVA autotransformer. - 12/1/2025 - \$2.96M

245) Baseline Upgrade b3284

- Rebuild ~5.44 miles of 69 kV line from Lock Lane to Point Pleasant. - 6/1/2025 - \$13.50M

246) Baseline Upgrade b3285

- Replace the Meigs 69 kV 4/0 Cu station riser towards Gavin and rebuild the section of the Meigs – Hemlock 69 kV circuit from Meigs to approximately structure #40 (~4 miles) replacing the line conductor 4/0 ACSR with the line conductor size 556.5 ACSR. - 6/1/2025 - \$12.14M

247) Baseline Upgrade b3287

- Upgrade 69 kV risers at Moundsville station towards George Washington. - 6/1/2025 - \$0.05M

248) Baseline Upgrade b3288.1

- Construct ~ 2.75 mi Orinoco - Stone 69 kV transmission line in the clear between Orinoco station and Stone station. - 12/1/2025 - \$9.23M

249) Baseline Upgrade b3288.2

- Construct ~ 3.25 mi Orinoco – New Camp 69 kV transmission line in the clear between Orinoco station and New Camp station. - 12/1/2025 - \$9.95M

250) Baseline Upgrade b3288.3

- At Stone substation, circuit breaker A to remain in place and be utilized as T1 low side breaker, circuit breaker B to remain in place and be utilized as new Hatfield (via Orinoco and New Camp) 69 kV line breaker. Add new 69 kV circuit breaker E for Coleman Line exit. - 12/1/2025 - \$0.66M

251) Baseline Upgrade b3288.4

- Reconfigure the New Camp 69 kV tap which includes access road improvements/installation, temporary wire and permanent wire work along with dead end structures installation. - 12/1/2025 - \$0.45M

252) Baseline Upgrade b3288.5

- At New Camp substation, rebuild the 69 kV bus, add 69 kV MOAB W and replace the 69 kV ground switch Z1 with a 69 kV circuit switcher on the New Camp transformer. - 12/1/2025 - \$1.18M

253) Baseline Upgrade b3289.1

- Roanoke Station: Install high-side circuit switcher on 138/69/12 kV T5 - 6/1/2025 - \$1.10M

254) Baseline Upgrade b3289.2

- Huntington Court Station: Install high-side circuit switcher on 138/69/34.5 kV T1 - 6/1/2025 - \$1.42M

255) Baseline Upgrade b3290.1

- Build 9.4 miles of single circuit 69 kV line from Roselms to near East Ottoville 69 kV Switch. - 6/1/2025 - \$13.70M

256) Baseline Upgrade b3290.2

- Rebuild 7.5 miles of double circuit 69kV line between East Ottoville Switch and Kalida Station (combining with the new Roselms to Kalida 69 kV circuit). - 6/1/2025 - \$23.60M

257) Baseline Upgrade b3290.3

- At Roselms Switch, install a new three way 69kV, 1200 A phase-over-phase switch, with sectionalizing capability. - 6/1/2025 - \$0.60M

258) Baseline Upgrade b3290.4

- At Kalida 69 kV station, terminate the new line from Roselms Switch. Move the CS XT2 from high side of T2 to the high side of T1. Remove existing T2 transformer. - 6/1/2025 - \$1.00M

259) Baseline Upgrade b3291

- Replace the Russ St. 34.5 kV Switch - 6/1/2025 - \$1.50M

260) Baseline Upgrade b3292

- Replace existing 69 kV capacitor bank at Stuart Station with a 17.2 MVar capacitor bank - 12/1/2025 - \$0.00M

261) Baseline Upgrade b3293

- Replace 2/0 Cu entrance span conductor on the South Upper Sandusky 69 kV line and 4/0 Cu Risers/Bus conductors on the Forest line at Upper Sandusky 69 kV station. - 6/1/2025 - \$0.54M

262) Baseline Upgrade b3294

- Replace existing 69 kV disconnect switches for circuit breaker "C" at Walnut Avenue station - 6/1/2025 - \$0.00M

263) Baseline Upgrade b3295

- Grundy 34.5 kV: Install a 34.5 kV 9.6 MVAR cap bank - 6/1/2025 - \$0.80M

264) Baseline Upgrade b3296

- Rebuild the overloaded portion of the Concord-Whitaker 34.5 kV line (1.13 miles). Rebuild is double circuit and will utilize 795 ACSR conductor. - 6/1/2025 - \$2.80M

265) Baseline Upgrade b3297.1

- Rebuild 4.23 miles of 69 kV line between Sawmill and Lazelle station, using 795 ACSR 26/7 conductor. - 6/1/2025 - \$12.00M

266) Baseline Upgrade b3297.2

- Rebuild 1.94 miles of 69 kV line between Westerville and Genoa stations, using 795 ACSR 26/7 conductor. - 6/1/2025 - \$5.90M

267) Baseline Upgrade b3297.3

- Replace risers and switchers at Lazelle, Westerville, and Genoa 69 kV stations. Upgrade associated relaying accordingly. - 6/1/2025 - \$1.90M

268) Baseline Upgrade b3298

- Rebuild 0.8 miles of double circuit 69 kV line between South Toronto and West Toronto. Replace 219 kcmil ACSR with 556 ACSR. - 6/1/2025 - \$2.83M

269) Baseline Upgrade b3298.1

- Replace the 69 kV breaker D at South Toronto station with 40 kA breaker. - 6/1/2025 - \$0.70M

270) Baseline Upgrade b3299

- Rebuild 0.2 mile of the West End Fostoria - Lumberjack Switch 69 kV line with 556 ACSR (Dove) conductors. Replace jumpers on West End Fostoria line at Lumberjack Switch. - 6/1/2025 - \$0.47M

271) Baseline Upgrade b3300

- Reconductor 230kV Line #2172 from Brambleton to Evergreen Mills along with upgrading the line leads at Brambleton to achieve a summer emergency rating of 1574 MVA. - 6/1/2025 - \$2.32M

272) Baseline Upgrade b3301

- Reconductor 230kV Line #2210 from Brambleton to Evergreen Mills along with upgrading the line leads at Brambleton to achieve a summer emergency rating of 1574 MVA. - 6/1/2025 - \$2.26M

273) Baseline Upgrade b3302

- Reconductor 230kV Line #2213 from Cabin Run to Yardley Ridge along with upgrading the line leads at Yardley to achieve a summer emergency rating of 1574 MVA. - 6/1/2025 - \$1.75M
- 274) Baseline Upgrade b3303.1
- Extend a new single circuit 230KV line (#9250) from Farmwell Substation to Nimbus Substation. - 6/1/2025 - \$5.65M
- 275) Baseline Upgrade b3304
- Midlothian Area 300 MW Load Drop Relief Area Improvements - 6/1/2025 - \$6.22M
- 276) Baseline Upgrade b3304.1
- Cut 230kV Line #2066 at Trabue junction - 6/1/2025 - \$0.00M
- 277) Baseline Upgrade b3304.2
- Reconductor idle 230kV Line #242 (radial from Midlothian to Trabue junction) to allow a minimum summer rating of 1047 MVA and connect to the section of 230kV Line #2066 between Trabue junction and Winterpock; re-number 230kV Line #242 structures to #2066; - 6/1/2025 - \$0.00M
- 278) Baseline Upgrade b3304.3
- Use the section of idle 115kV Line #153, between Midlothian and Trabue junction to connect to the section of (former) 230kV Line #2066 between Trabue junction and Trabue to create new Midlothian-Trabue lines with new line numbers #2218 and #2219 - 6/1/2025 - \$0.00M
- 279) Baseline Upgrade b3304.4
- Create new line terminations at Midlothian for the new Midlothian-Trabue lines. - 6/1/2025 - \$2.27M
- 280) Baseline Upgrade b3306
- Install a second 125 MVAR 345 kV shunt reactor and associated equipment at Pierce Brook Substation. Install a 345 kV breaker on the high side of the #1 345/230 kV transformer - 6/1/2025 - \$8.08M
- 281) Baseline Upgrade b3307
- Rebuild Fleming station in the clear; Replace 138/69kV Fleming Transformer #1 with 138/69 kV 130 MVA transformer with high side 138 kV CB; Install a 5 breaker 69 kV ring bus on the low side of the transformer, replace 69 kV circuit switcher AA, replace 69/12kV transformer #3 with 69/12 kV 30 MVA transformer, replace 12 kV CB A and D. Retire existing Fleming substation. - 12/1/2025 - \$21.10M
- 282) Baseline Upgrade b3308
- Reconductor and rebuild 1 span of T-line on the Fort Steuben-Sunset Blvd 69 kV branch with 556 ACSR. - 6/1/2025 - \$0.73M
- 283) Baseline Upgrade b3309
- Rebuild 1.75 miles of the Greenlawn - East Tiffin line section of the Carrothers - Greenlawn 69 kV circuit containing 133 ACSR conductor with 556 ACSR conductor. Upgrade relaying as required. - 6/1/2025 - \$3.45M
- 284) Baseline Upgrade b3310.1

- Rebuild 10.5 miles of the Howard-Willard 69 kV line utilizing 556 ACSR conductor. - 6/1/2025 - \$19.00M
- 285) Baseline Upgrade b3310.2
- Upgrade relaying at Howard 69 kV station. - 6/1/2025 - \$0.23M
- 286) Baseline Upgrade b3310.3
- Upgrade relaying at Willard 69 kV station. - 6/1/2025 - \$0.23M
- 287) Baseline Upgrade b3312
- Rebuild approximately 4.0 miles of existing 69 kV line between West Mount Vernon and Mount Vernon stations. Replace the existing 138/69 kV transformer at West Mount Vernon with a larger 90 MVA unit along with existing 69 kV breaker 'C'. - 6/1/2025 - \$12.93M
- 288) Baseline Upgrade b3313
- Add 40 kA circuit breakers on the low and high side of East Lima 138/69 kV Transformer - 6/1/2025 - \$1.20M
- 289) Baseline Upgrade b3314.1
- Install a new 138/69 kV 130 MVA transformer and associated protection at Elliot station. - 6/1/2025 - \$3.00M
- 290) Baseline Upgrade b3314.2
- Perform work at Strouds Run station to retire 138/69/13 kV 33.6 MVA transformer #1 and install a dedicated 138/13 kV distribution transformer. - 6/1/2025 - \$0.00M
- 291) Baseline Upgrade b3315
- Upgrade Relaying on Mark Center-South Hicksville 69 kV line and replace Mark Center cap bank with a 7.7 MVAR unit. - 6/1/2025 - \$1.25M
- 292) Baseline Upgrade b3316
- Greene Substation - replace 138 kV 40 kA breaker GJ-138C with a 63 kA breaker - 6/1/2025 - \$0.28M
- 293) Baseline Upgrade b3319
- Add forced cooling to increase the normal rating of the Brunot Island-Carson (302) 345 kV High Pressure Fluid Filled (HPFF) underground cable circuit - 6/1/2022 - \$22.00M
- 294) Baseline Upgrade b3321
- Rebuild Cranes Corner-Stafford 230 kV line - 6/1/2022 - \$20.20M
- 295) Baseline Upgrade b3325
- Reconductor the Charleroi-Union 138 kV line and upgrade terminal equipment at Charleroi - 6/1/2022 - \$11.00M
- 296) Baseline Upgrade b3326
- Rebuild the 13707 Vienna-Nelson 138 kV line - 6/1/2022 - \$57.00M
- 297) Baseline Upgrade b3327
- Upgrade the disconnect switch (6784-L1) at Kent - 6/1/2022 - \$0.25M

- 298) Baseline Upgrade b3328
- Upgrade the disconnect switch (13710-L1) and CT at Vienna - 6/1/2022 - \$0.08M
- 299) Baseline Upgrade b3329
- Rerate the 13773 Farmview-Milford 138 kV line - 6/1/2022 - \$0.36M
- 300) Baseline Upgrade b3332
- Rerate the 23076 Steel-Milford 230 kV line - 6/1/2022 - \$6.00M
- 301) Baseline Upgrade b3333.1
- Rebuild Skeggs Branch substation in the clear as Coronado substation. Establish New 138 kV and 69 kV Buses. Install 138/69 kV 130 MVA transformer, 138 kV circuit switcher and 69 kV breaker. Retire Existing Skeggs Branch substation. - 6/1/2023 - \$6.32M
- 302) Baseline Upgrade b3333.10
- At Whetstone Branch substation, Replace 69KV 600A 2 Way POP Switch with 69KV 1200A 2 Way POP Switch. Remove 69KV to Skeggs Branch (Switch "22" POP). - 6/1/2023 - \$0.57M
- 303) Baseline Upgrade b3333.11
- At Garden Creek substation, remove 69 kV Richlands (via Coal Creek) line (Circuit Breaker F and disconnect switches) and update relay settings. - 6/1/2023 - \$0.14M
- 304) Baseline Upgrade b3333.12
- Remote end work at Clinch River substation - 6/1/2023 - \$0.08M
- 305) Baseline Upgrade b3333.13
- Remote end work at Clinchfield substation. - 6/1/2023 - \$0.08M
- 306) Baseline Upgrade b3333.2
- New ~1.2 mi 138kV extension to new Skeggs Branch substation location. - 6/1/2023 - \$4.62M
- 307) Baseline Upgrade b3333.3
- Install 46.1 MVAR Cap bank at Whitewood substation along with a 138 kV breaker. - 6/1/2023 - \$1.05M
- 308) Baseline Upgrade b3333.4
- Rebuild ~9 mi 69kV line from new Skeggs branch station to Coal Creek 69kV line. 6-wire the short double circuit section between Whetstone Branch and Str. 340-28 to convert the line to single circuit. Retire Garden Creek to Whetstone Branch 69kV line section. - 6/1/2023 - \$26.25M
- 309) Baseline Upgrade b3333.5
- Retire Knox Creek SS. - 6/1/2023 - \$0.06M
- 310) Baseline Upgrade b3333.6
- Retire Horn Mountain SS. This will be served directly from 69kV bus at New Skeggs branch Substation. - 6/1/2023 - \$0.05M

- 311) Baseline Upgrade b3333.7
- At Clell SS, replace two 600A POP Switches and Poles with single 2 Way 1200A POP Switch and Pole. - 6/1/2023 - \$0.34M
- 312) Baseline Upgrade b3333.8
- At Permac, replace 600A Switch and structure with 2 Way 1200A POP Pole Switch and pole. - 6/1/2023 - \$0.31M
- 313) Baseline Upgrade b3333.9
- At Marvin SS, replace 600 A Switch and structure with 2 Way 1200 A POP Pole Switch and pole. - 6/1/2023 - \$0.31M
- 314) Baseline Upgrade b3334
- Rebuild the section of Miami Fort-Hebron Tab 138 kV - 6/1/2022 - \$44.30M
- 315) Baseline Upgrade b3335
- Reconductor a 0.76 mile portion of the Croydon-Burlington 230 kV line - 6/1/2022 - \$0.79M
- 316) Baseline Upgrade b3337
- Replace the one (1) Hyatt 138 kV breaker “AB1(101N)” with 3000 A, 63 kA interrupting breaker. - 6/1/2026 - \$0.48M
- 317) Baseline Upgrade b3338
- Replace the two (2) Kenny 138 kV breakers, “102” (SC-3) and “106” (SC-4), each with a 3000 A, 63 kA interrupting breaker. - 6/1/2026 - \$0.76M
- 318) Baseline Upgrade b3339
- Replace the one (1) Canal 138 kV breaker “3” with 3000 A, 63 kA breaker. - 6/1/2026 - \$0.48M
- 319) Baseline Upgrade b3341.1
- Marysville Substation: Install two 69 kV 16.6 MVAR cap banks; Install five 69 kV circuit breakers; Upgrade station relaying; Replace 600 A wave trap on the Marysville-Kings Creek 69 kV (6660) circuit - 6/1/2026 - \$2.43M
- 320) Baseline Upgrade b3341.2
- Darby Substation: Upgrade remote end relaying at Darby 69 kV substation - 6/1/2026 - \$0.25M
- 321) Baseline Upgrade b3341.3
- Kings Creek: Upgrade remote end relaying at Kings Creek 69 kV substation - 6/1/2026 - \$0.25M
- 322) Baseline Upgrade b3342
- Replace the 2156 ACSR & 2874 ACSR bus and risers with 2-bundled 2156 ACSR at Muskingum River 345 kV station to address loading issues on Muskingum-Waterford 345 kV line. - 6/1/2026 - \$0.53M
- 323) Baseline Upgrade b3343
- Rebuild approximately 0.3 miles of overloaded 69 kV line between Albion-Philips Switch and Philips Switch-Brimfield Switch with 556 ACSR conductor. - 6/1/2026 - \$0.61M

324) Baseline Upgrade b3344.1

- Install two (2) 138 kV circuit breakers in the M and N strings in the breaker-and-a-half configuration in West Kingsport station 138 kV yard to allow the Clinch River-Moreland Dr. 138 kV to cut in the West Kingsport station - 11/1/2026 - \$1.85M

325) Baseline Upgrade b3344.2

- Upgrade remote end relaying at Riverport 138 kV station due to the line cut in at West Kingsport station - 11/1/2026 - \$0.25M

326) Baseline Upgrade b3345.1

- Rebuild ~4.2 miles of overloaded sections of the 69 kV line between Salt Fork Switch and Leatherwood Switch with 556 ACSR. - 6/1/2026 - \$9.06M

327) Baseline Upgrade b3345.2

- Update relay settings at Broom Road station. - 6/1/2026 - \$0.04M

328) Baseline Upgrade b3346.1

- Rebuild approximately 3.5 miles of overloaded 69 kV line between North Delphos-East Delphos-Elida Road switch. This includes approximately 1.1 miles of double circuit line that makes up a portion of the North Delphos-South Delphos 69 kV line and the North Delphos-East Delphos 69 kV line. Approximately 2.4 miles of single circuit line will also be rebuilt between the double circuit portion to East Delphos station and from East Delphos to Elida Road Switch. - 6/1/2026 - \$8.43M

329) Baseline Upgrade b3346.2

- Replace the line entrance spans at South Delphos to eliminate the overloaded 4/0 Copper and 4/0 ACSR conductor. - 6/1/2026 - \$0.44M

330) Baseline Upgrade b3347.1

- Rebuild approximately 20 miles of line between Bancroft and Milton stations with 556 ACSR conductor - 11/1/2026 - \$56.55M

331) Baseline Upgrade b3347.2

- Replace the jumpers around Hurrigan switch with 556 ACSR - 11/1/2026 - \$0.01M

332) Baseline Upgrade b3347.3

- Replace the jumpers around Teays switch with 556 ACSR - 11/1/2026 - \$0.01M

333) Baseline Upgrade b3347.4

- Winfield Station Relay Settings: Update relay settings to coordinate with remote ends on line rebuild - 11/1/2026 - \$0.05M

334) Baseline Upgrade b3347.5

- Bancroft Station Relay Settings: Update relay settings to coordinate with remote ends on line rebuild - 11/1/2026 - \$0.03M

335) Baseline Upgrade b3347.6

- Milton Station Relay Settings: Update relay settings to coordinate with remote ends on line rebuild. - 11/1/2026 - \$0.03M

336) Baseline Upgrade b3347.7

- Putnam Village Station Relay Settings: Update relay settings to coordinate with remote ends on line rebuild - 11/1/2026 - \$0.05M

337) Baseline Upgrade b3348.1

- Construct a 138 kV single bus station (Tin Branch) consisting of a 138 kV box bay with a distribution transformer and 12 kV distribution bay. Two 138 kV lines will feed this station (from Logan and Sprigg stations), and distribution will have one 12 kV feed. Install two 138 kV circuit breakers on the line exits. Install 138 kV circuit switcher for the new transformer. - 11/1/2026 - \$5.58M

338) Baseline Upgrade b3348.2

- Construct a new 138/46/12 kV Argyle station to replace Dehue station. Install a 138 kV ring bus using a breaker-and-a-half configuration, with an autotransformer with a 46 kV feed and a distribution transformer with a 12 kV distribution bay. Two 138 kV lines will feed this station (from Logan and Wyoming stations). There will also be a 46 kV feed from this station to Becco station. Distribution will have two 12 kV feeds. Retire Dehue station in its entirety. - 11/1/2026 - \$10.00M

339) Baseline Upgrade b3348.3

- Bring the Logan-Sprigg #2 138 kV circuit in and out of Tin Branch station by constructing approximately 1.75 miles of new overhead double circuit 138 kV line. Double circuit T3 series lattice towers will be used along with 795,000 cm ACSR 26/7 conductor. One shield wire will be conventional 7 #8 ALUMOWELD, and one shield wire will be OPGW. - 11/1/2026 - \$8.58M

340) Baseline Upgrade b3348.4

- Logan-Wyoming No. 1 circuit in and out of the proposed Argyle station. Double circuit T3 series lattice towers will be used along with 795,000 cm ACSR 26/7 conductor. One shield wire will be conventional 7 #8 ALUMOWELD, and one shield wire will be OPGW. - 11/1/2026 - \$7.70M

341) Baseline Upgrade b3348.5

- Rebuild approximately 10 miles of 46 kV line between Becco and the new Argyle substation. Retire approximately 16 miles of 46 kV line between the new Argyle substation and Chauncey station. - 11/1/2026 - \$33.71M

342) Baseline Upgrade b3348.6

- Adjust relay settings due to new line terminations and retirements at Logan, Wyoming, Sprigg, Becco and Chauncey stations. - 11/1/2026 - \$0.23M

343) Baseline Upgrade b3349

- Replace Bellefonte 69 kV risers on the section between Bellefonte TR #3 and 69 kV Bus #2. - 6/1/2026 - \$0.54M

344) Baseline Upgrade b3350.1

- Replace overdutied 69 kV breakers C, G, I, Z, AB and JJ in place. The new 69 kV breakers to be rated at 3000 A 40 kA breakers. - 6/1/2023 - \$2.00M

345) Baseline Upgrade b3350.2

- Upgrade remote end relaying at Point Pleasant, Coalton and South Point 69 kV

- substations. - 6/1/2023 - \$0.00M
- 346) Baseline Upgrade b3351
- Replace the 69 kV in-line switches at Monterey 69 kV substation. - 6/1/2026 - \$0.00M
- 347) Baseline Upgrade b3352
- Replace MOAB W, MOAB Y, line and bus side jumpers of both W and Y at 47th Street 69 kV station. Upgrade the 69 kV strain bus between MOABs W and Y to 795 KCM AAC. Change the connectors on the tap to MOAB X1 to accommodate the larger 795 KCM AAC. - 6/1/2026 - \$0.00M
- 348) Baseline Upgrade b3353.1
- Allen substation: Rebuild Allen station to the northwest of its current footprint utilizing a standard air-insulated substation with equipment raised by 7' concrete platforms and control house raised by a 10' platform to mitigate flooding concerns. Install five 69 kV 3000A 40 kA circuit breakers in a ring bus (operated at 46 kV) configuration with a 13.2 MVAR capacitor bank. Existing Allen station will be retired (does not include the distribution cost). Distribution scope of work: Install 69/46 kV-12 kV 20 MVA transformer along with 2-12 kV breakers on 7' concrete platforms (conversion of S2405.1). - 12/1/2026 - \$10.55M
- 349) Baseline Upgrade b3353.2
- Allen-East Prestonsburg: A 0.20 mile segment of this 46 kV line will be relocated to the new station (SN/SE/WN/WE: 53/61/67/73MVA). (Conversion of S2405.2) - 12/1/2026 - \$0.33M
- 350) Baseline Upgrade b3353.3
- McKinney-Allen: The new line extension will walk around the south and east sides of the existing Allen station to the new Allen station being built in the clear. A short segment of new single circuit 69 kV line and a short segment of new double circuit 69 kV line (both operated at 46 kV) will be added to the line to tie into the new Allen station bays. (Conversion of S2405.3) - 12/1/2026 - \$1.95M
- 351) Baseline Upgrade b3353.4
- Stanville-Allen: A segment of this line will have to be relocated to the new station (SN/SE/WN/WE: 50/50/63/63MVA). (Conversion of S2405.4) - 12/1/2026 - \$0.17M
- 352) Baseline Upgrade b3353.5
- Allen-Prestonsburg: 0.25 mile segment of this existing single circuit will be relocated. The relocated line segment will require construction of one custom self-supporting double circuit dead-end structure and single circuit suspension structure. A short segment of new double circuit 69 kV line (energized at 46 kV) will be added to tie into the new Allen station bays, which will carry Allen-Prestonsburg 46 kV and Allen-East Prestonsburg 46 kV lines. A temporary 0.15 mile section double circuit line will be constructed to keep Allen-Prestonsburg and Allen-East Prestonsburg 46 kV lines energized during construction. (Conversion of S2405.5) - 12/1/2026 - \$2.66M
- 353) Baseline Upgrade b3353.6
- Remote end work will be required at Prestonsburg, Stanville and McKinney

- stations. (Conversion of S2405.6) - 12/1/2026 - \$0.34M
- 354) Baseline Upgrade b3354
- Replace circuit breakers '42' and '43' at Bexley station with 3000 A, 40 kA 69 kV breakers (operated at 40 kV), slab, control cables and jumpers. - 6/1/2023 - \$1.00M
- 355) Baseline Upgrade b3358
- Install a 69 kV 11.5 MVAR capacitor at Biers Run station. - 6/1/2026 - \$0.85M
- 356) Baseline Upgrade b3359
- Rebuild approximately 2.3 miles of the existing North Van Wert Sw-Van Wert 69 kV line utilizing 556 ACSR conductor. - 6/1/2026 - \$6.20M
- 357) Baseline Upgrade b3360
- Replace Thelma Transformer #1 with a 138/69/46 kV 130/130/90 MVA transformer and replace 46 kV risers and relaying toward Kenwood substation. Existing TR#1 to be used as spare. - 12/1/2026 - \$3.54M
- 358) Baseline Upgrade b3361
- Rebuild Prestonsburg-Thelma 46 kV circuit, approximately 14 miles. Retire Jenny Wiley SS. - 12/1/2026 - \$33.01M
- 359) Baseline Upgrade b3362
- Rebuild approximately 3.1 miles of the overloaded conductor on the existing Oertels Corner-North Portsmouth 69 kV line utilizing 556 ACSR. - 6/1/2026 - \$8.00M
- 360) Baseline Upgrade b3370
- Upgrade terminal equipment on the Loretto - Fruitland 69 kV circuit: Replace the 477 ACSR stranded bus on the 6711 line terminal inside Loretto substation and the 500 SDCU stranded bus on the 6711 line terminal inside Fruitland substation with 954 ACSR conductor - 6/1/2026 - \$0.80M
- 361) Baseline Upgrade b3371
- Rebuild approx. 3.6 miles of 875 (N. Boyertown - W. Boyertown). Upgrade terminal equipment (circuit breaker, disconnect switches, substation conductor) and relays at N. Boyertown and W. Boyertown substation - 6/1/2026 - \$8.79M
- 362) Baseline Upgrade b3372
- East Towanda – North Meshoppen 115 kV Line: Rebuild 2.5 miles of 636 ACSR with 1113 ACSS conductor using single circuit construction. Upgrade all terminal equipment to the rating of 1113 ACSS - 6/1/2026 - \$6.66M
- 363) Baseline Upgrade b3373
- Replace the relay panels at Bethlehem 33 46 kV substation on the Cambria Prison line - 6/1/2026 - \$0.30M
- 364) Baseline Upgrade b3374
- Replace Five Atlantic 34.5 kV breakers (J36, BK1A, BK1B, BK3A and BK3B) with 63kA rated breakers and associated equipment - 6/1/2026 - \$3.50M
- 365) Baseline Upgrade b3375

- Replace Six Werner 34.5 kV breakers (E31A_Prelim, E31B_Prelim, V48 future, W101, M39 and U99) with 40 kA rated breakers and associated equipment.. - 6/1/2026 - \$4.20M
- 366) Baseline Upgrade b3376
- Replace One Freneau 34.5 kV breaker (BK6) with 63 kA rated breakers and associated equipment - 6/1/2026 - \$0.70M
- 367) Baseline Upgrade b3664
- Juniata: Replace the limiting 230 kV T2 transformer leads, bay conductor and bus conductor with double bundle 1590 ACSR. Replace the limiting 1200 A MODs on the Bus tie breaker with 3000 A MODs - 6/1/2026 - \$0.68M
- 368) Baseline Upgrade b3665
- Replace several pieces of 1033.5 AAC substation conductor at East Towanda 230 kV Substation (on East Towanda-Canyon 230 kV Line terminal) - 6/1/2026 - \$0.41M
- 369) Baseline Upgrade b3666
- Marshall 230 kV Substation: Install dual reactors and expand existing ring bus - 6/1/2026 - \$5.83M
- 370) Baseline Upgrade b3667
- Pierce Brook Substation: Install second 230/115 kV transformer - 6/1/2026 - \$5.07M
- 371) Baseline Upgrade b3668
- Upgrade Windy Edge 115 kV substation conductor to increase ratings of the Windy Edge-Chesco Park 110501 circuit. - 6/1/2026 - \$0.50M
- 372) Baseline Upgrade b3669.1
- Replace terminal equipment (stranded bus, disconnect switch and circuit breaker) at Church substation (Townsend-Church 138 kV). - 12/1/2026 - \$1.00M
- 373) Baseline Upgrade b3669.2
- Replace terminal equipment (circuit breaker) at Townsend substation (Townsend-Church 138 kV). - 12/1/2026 - \$0.45M
- 374) Baseline Upgrade b3670
- Upgrade terminal equipment on the Loretto-Fruitland 69 kV circuit: Replace the 477 ACSR stranded bus on the 6711 line terminal inside Loretto substation and the 500 SDCU stranded bus on the 6711 line terminal inside Fruitland substation with 954 ACSR conductor. - 6/1/2026 - \$0.80M
- 375) Baseline Upgrade b3672
- East Towanda-North Meshoppen 115 kV line: Rebuild 2.5 miles of 636 ACSR with 1113 ACSS conductor using single circuit construction. Upgrade all terminal equipment to the rating of 1113 ACSS. - 6/1/2026 - \$6.66M
- 376) Baseline Upgrade b3673
- Replace the relay panels at Bethlehem 33 46 kV substation on the Cambria Prison line. - 6/1/2026 - \$0.30M
- 377) Baseline Upgrade b3677

- Rebuild a 13 mile section of 138 kV line 0108 between LaSalle and Mazon with 1113 ACSR or higher rated conductor. The 13 mile portion of line 7713 from Oglesby (future Corbin) to Mazon that shares double circuit towers with line 0108 will also be reconducted due to the rebuild. - 11/1/2026 - \$51.98M

378) Baseline Upgrade b3678

- Expand Galion 138 kV substation; Install 100 MVAR reactor, associated breaker and relaying. - 11/1/2026 - \$5.74M

379) Baseline Upgrade b3679

- Replace West Fremont 138/69 kV TR2 with a transformer having additional high-side taps. - 11/1/2026 - \$6.44M

380) Baseline Upgrade b3681

- Upgrade the Shingletown #82 230-46 kV transformer circuit by installing a 230 kV breaker and disconnect switches, removing existing 230 kV switches, replacing 46 kV disconnect switches, replacing limiting substation conductor, and installing/replacing relays. - 6/1/2026 - \$1.66M

381) Baseline Upgrade b3682

- Install a second 345/138 kV transformer at Hayes, 448 MVA nameplate rating. Add one 345 kV circuit breaker (3000A) to provide transformer high-side connection between breaker B-18 and the new breaker. Connect the new transformer low side to the 138 kV bus. Add one 138 kV circuit breaker (3000A) at Hayes 138 kV substation between B-42 and the new breaker. Relocate the existing 138 kV No. 1 capacitor bank between B-42 and the new breaker. Protection per FE standard. - 6/1/2026 - \$7.59M

382) Baseline Upgrade b3683

- Reconductor the existing 556.5 ACSR line segments (3.49 miles) on the Messick Road-Ridgeley WC4 138 kV line with 954 45/7 ACSR to achieve 308/376 MVA SN/SE and 349/445 MVA WN/WE ratings. Replace the remote end equipment for the Messick Road-Ridgeley WC4 138 kV line. The total length of the line is 5.02 miles. - 6/1/2026 - \$11.20M

383) Baseline Upgrade b3684

- Rebuild 12.4 miles of 115 line #126 segment from Earleys to Kelford with a summer emergency rating of 262 MVA. Replace structures as needed to support the new conductor. Upgrade breaker switch 13668 at Earleys from 1200 A to 2000 A. - 6/1/2026 - \$18.75M

384) Baseline Upgrade b3685

- Install a 33 MVAR cap bank at Cloud 115 kV bus along with a 115 kV breaker. Add 115 kV circuit breaker for 115 kV line #38. - 6/1/2026 - \$1.50M

385) Baseline Upgrade b3686

- Purchase land close to the bifurcation point of 115 kV line #4 (where the line is split into two sections) and build a new 115 kV switching station called Duncan Store. The new switching station will require space for an ultimate transmission interconnection consisting of a 115 kV six-breaker ring bus (with three breakers installed initially). - 12/1/2026 - \$16.00M

386) Baseline Upgrade b3687

- Rebuild approximately 15.1-mile-long line segment between 115 kV line #183 Bristers and Minnieville D.P. with 2-768 ACSS and 4000 A supporting equipment from Bristers to Ox to allow for future 230 kV capability of 115 kV line #183. The continuous summer normal rating will be 523 MVA from Ox-Minnieville. The continuous summer normal rating will be 786 MVA from Minnieville-Bristers. - 6/1/2026 - \$30.00M

387) Baseline Upgrade b3688

- Replace the 4/0 SDCU stranded bus with 954 ACSR and a 600 A disconnect switch with a 1200 A disconnect switch on the 6716 line terminal inside Todd substation (on the Preston-Todd 69 kV circuit). - 6/1/2026 - \$0.75M

388) Baseline Upgrade b3689.1

- Reconductor approximately 24.42 miles of 230 kV line #2114 Remington CT-Elk Run-Gainesville to achieve a summer rating of 1574 MVA by fully reconductoring the line and upgrading the wave trap and substation conductor at Remington CT and Gainesville. - 6/1/2026 - \$52.00M

389) Baseline Upgrade b3689.2

- Replace 230 kV breakers SC102, H302, H402 and 218302 at Brambleton substation with 4000A 80 kA breakers and associated equipment including breaker leads as necessary to address breaker duty issues identified in short circuit analysis. - 6/1/2026 - \$1.69M

390) Baseline Upgrade b3690

- Reconductor approximately 1.07 miles of 230 kV line #2008 segment from Cub Run-Walney to achieve a summer rating of 1574 MVA. Replace line switch 200826 with a 4000A switch. - 6/1/2026 - \$2.03M

391) Baseline Upgrade b3692

- Rebuild approximately 27.7 miles of 500 kV transmission line from Elmont to Chickahominy with current 500 kV standards construction practices to achieve a summer rating of 4330 MVA. - 6/1/2026 - \$58.16M

392) Baseline Upgrade b3693

- Expand substation and install approximately 294 MVAR cap bank at 500 kV Lexington substation along with a 500 kV breaker. Adjust the tap positions associated with the two 230/69 kV transformers at Harrisonburg to neutral position and lock them. - 11/1/2026 - \$5.86M

393) Baseline Upgrade b3694.1

- Convert line #29 Aquia Harbor to Possum Point to 230 kV (Extended line #2104) and swap line #2104 and converted line #29 at Aquia Harbor backbone termination. Upgrade terminal equipment at Possum Point to terminate converted line 29 (now extended line #2104). (Line #29 from Fredericksburg to Aquia Harbor is being rebuilt under baseline b2981 to 230kV standards.) - 6/1/2026 - \$9.39M

394) Baseline Upgrade b3694.10

- Reconductor approximately 2.9 miles of 230 kV line #211 Chesterfield-Hopewell to achieve a minimum summer emergency rating of 1046 MVA. - 6/1/2026 - \$4.91M

- 395) Baseline Upgrade b3694.11
- Reconductor approximately 2.9 miles of 230 kV line #228 Chesterfield-Hopewell to achieve a minimum summer emergency rating of 1046 MVA. - 6/1/2026 - \$4.91M
- 396) Baseline Upgrade b3694.12
- Upgrade equipment at Chesterfield substation to not limit ratings on lines 211 and 228. - 6/1/2026 - \$0.76M
- 397) Baseline Upgrade b3694.13
- Upgrade equipment at Hopewell substation to not limit ratings on lines 211 and 228. - 6/1/2026 - \$1.71M
- 398) Baseline Upgrade b3694.2
- Upgrade Aquia Harbor terminal equipment to not limit 230 kV line #9281 conductor rating. - 6/1/2026 - \$0.63M
- 399) Baseline Upgrade b3694.3
- Upgrade Fredericksburg terminal equipment by rearranging 230 kV bus configuration to terminate converted line 29 (now becoming 9281). The project will add a new breaker at the 230 kV bay and reconfigure line termination of 230 kV lines #2157, #2090 and #2083. - 6/1/2026 - \$2.73M
- 400) Baseline Upgrade b3694.4
- Reconductor/rebuild approximately 7.6 miles of 230 kV line #2104 Cranes Corner-Stafford to achieve a summer rating of 1047 MVA(1). Reconductor/rebuild approximately 0.34 miles of 230 kV line #2104 Stafford-Aquia Harbor to achieve a summer rating of 1047 MVA. Upgrade terminal equipment at Cranes Corner to not limit the new conductor rating. - 6/1/2026 - \$19.60M
- 401) Baseline Upgrade b3694.5
- Upgrade wave trap and line leads at 230 kV line #2090 Ladysmith CT terminal to achieve 4000A rating. - 6/1/2026 - \$0.15M
- 402) Baseline Upgrade b3694.6
- Upgrade Fuller Road substation to feed Quantico substation via 115 kV radial line. Install four-breaker ring and break 230 kV line #252 into two new lines: 1) #252 between Aquia Harbor to Fuller Road and 2) #9282 between Fuller Road and Possum Point. Install a 230/115 kV transformer which will serve Quantico substation. - 6/1/2026 - \$24.16M
- 403) Baseline Upgrade b3694.7
- Energize in-service spare 500/230 kV Carson Tx#1. - 6/1/2026 - \$0.00M
- 404) Baseline Upgrade b3694.8
- Partial wreck and rebuild 10.34 miles of 230 kV line #249 Carson-Locks to achieve a minimum summer emergency rating of 1047 MVA. Upgrade terminal equipment at Carson and Locks to not limit the new conductor rating. - 6/1/2026 - \$25.60M
- 405) Baseline Upgrade b3694.9

- Wreck and rebuild 5.4 miles of 115 kV line #100 Locks-Harrowgate to achieve a minimum summer emergency rating of 393 MVA. Upgrade terminal equipment at Locks and Harrowgate to not limit the new conductor rating and perform line #100 Chesterfield terminal relay work. - 6/1/2026 - \$9.10M
- 406) Baseline Upgrade b3697
- Replace station conductor and metering inside Whitpain and Plymouth substations to increase the ratings of the 220-13/220-14 Whitpain-Plymouth 230 kV line facilities. - 6/1/2025 - \$0.62M
- 407) Baseline Upgrade b3698
- Reconductor the 14.2 miles of the existing Juniata-Cumberland 230 kV line with 1272 ACSS/TW HS285 "Pheasant" conductor. - 12/31/2023 - \$8.99M
- 408) Baseline Upgrade b3702
- Install one 13.5 Ohm series reactor to control the power flow on the 230 kV line #2054 from Charlottesville substation to Proffit Rd 230 kV line. - 6/1/2023 - \$11.38M
- 409) Baseline Upgrade b3704
- Replace the Lawrence switching station 230/69 kV transformer No. 220-4 and its associated circuit switchers with a new larger capacity transformer with load tap changer (LTC) and new dead tank circuit breaker. Install a new 230 kV gas insulated breaker, associated disconnects, overhead bus and other necessary equipment to complete the bay within the Lawrence 230 kV switchyard - 6/1/2026 - \$13.36M
- 410) Baseline Upgrade b3705
- Replace existing 230/138 kV Athenia No. 220-1 transformer. - 6/1/2026 - \$13.04M
- 411) Baseline Upgrade b3708
- Replace the Shawville 230/115/17.2 kV transformer with a new Shawville 230/115 kV transformer and associated facilities. Replace the plant's No. 2B 115/17.2 kV transformer with a larger 230/17.2 kV transformer. - 6/1/2026 - \$8.78M
- 412) Baseline Upgrade b3709
- Rebuild the Summer Shade-West Columbia 69 kV 0.19 miles of 266 conductor double circuit to 556 conductor. - 12/1/2025 - \$0.19M
- 413) Baseline Upgrade b3711
- Install 345 kV bus tie 5-20 circuit breaker in the ring at Dresden station in series with existing bus tie 5-6. - 12/1/2026 - \$4.60M
- 414) Baseline Upgrade b3712
- Install a 28 MVAR cap bank at Liberty Junction 69 kV. - 12/1/2022 - \$0.54M
- 415) Baseline Upgrade b3713
- Avon Plant Separation:• Disconnect and remove five 138 kV bus tie lines and associated equipment from the Avon Lake Substation to the plant (800-B Bank, 8-AV-T Generator, 5-AV-T, 6-AV-T, and 7-AV-T).• Disconnect and remove one 345 kV bus tie line and associated equipment from the Avon substation to the

- plant (Unit 9). • Adjust relay settings at Avon Lake, Avon and Avondale substations. • Removal/rerouting of fiber to the plant and install new fiber between the 345 kV and 138 kV yards for the Q4-AV-BUS relaying. • Remove SCADA RTU, communications and associated equipment from plant. - 4/28/2023 - \$2.50M
- 416) Baseline Upgrade b3714
- Beaver Substation terminal upgrades: • Replace (4) 345 kV disconnect switches (D74, D92, D93, & D116) with 3000 A disconnect switches at Beaver. • Replace dual 954 45/7 ACSR SCCIR conductors between 5" pipe and WT with new, which meets or exceeds ratings of SN: 1542 MVA, SSTE: 1878 MVA at Beaver. • Replace 3000 SAC TL drop and 3000 SAC SCCIR between 954 ACSR and 5" bus with new, which meets or exceeds ratings of SN: 1542 MVA, SSTE: 1878 MVA at Beaver. • Upgrade BDD relays at breaker B-88 and B-115 at Beaver. • Relay settings changes at Hayes. - 6/1/2023 - \$2.10M
- 417) Baseline Upgrade b3715.1
- At the existing PPL Williams Grove substation, install a new 300 MVA 230/115 kV transformer. - 6/1/2026 - \$6.30M
- 418) Baseline Upgrade b3715.2
- Construct a new ~3.4 mile 115 kV single circuit transmission line from Williams Grove to Allen substation. - 6/1/2026 - \$5.11M
- 419) Baseline Upgrade b3715.3
- Install a new Allen four breaker ring bus within the existing MetEd Allen substation. Terminate the Round Top-Allen and the Allen-PPGI (PPG Industries) 115 kV lines into the new switchyard. - 6/1/2026 - \$11.73M
- 420) Baseline Upgrade b3716
- Construct a third 69kV supply line from Totowa substation to the customer's substation - 1/1/2025 - \$4.00M
- 421) Baseline Upgrade b3717.1
- Install a series reactor on Cheswick-Springdale 138 kV line - 12/31/2024 - \$9.00M
- 422) Baseline Upgrade b3717.2
- Transmission Line Rearrangement:
 - Replacement of four structures and reconductor DLCO portion of Plum-Springdale 138 kV line.
 - Associated communication and relay setting changes at Plum and Cheswick. - 12/31/2024 - \$15.00M
- 423) Baseline Upgrade b3718.1
- Install one 500/230kV 1440MVA transformer at a new substation called Wishing Star. Cut and extend 500 kV Line #546 (Brambleton-Mosby) and 500 kV Line #590 (Brambleton-Mosby) to the proposed Wishing Star substation. Lines to terminate in a 500 kV breaker and a half configuration. - 6/1/2025 - \$342.30M
- 424) Baseline Upgrade b3718.10
- Reconductor ~1.61 miles of 230 kV line #9349 (Sojourner-Mars) to achieve a summer rating of 1574 MVA. - 6/1/2025 - \$1.40M

- 425) Baseline Upgrade b3718.11
- Upgrade 4-500 kV breakers (total) to 63kA on either end of 500 kV Line #502 (Loudoun-Mosby) - 6/1/2025 - \$0.00M
- 426) Baseline Upgrade b3718.12
- Upgrade 4-500 kV breakers (total) to 63 kA on either end of 500 kV Line #584 (Loudoun-Mosby) - 6/1/2025 - \$0.00M
- 427) Baseline Upgrade b3718.13
- Cut and loop 230 kV Line #2079 (Sterling Park-Dranesville) into Davis Drive substation and install two GIS 230 kV breakers. - 6/1/2025 - \$0.00M
- 428) Baseline Upgrade b3718.14
- Construct a new 230 kV transmission line for ~3.5 miles along with substation upgrades at Wishing Star and Mars. New right-of-way will be needed and will share same structures with the 500 kV line. New conductor to have a minimum summer normal rating of 1573 MVA. - 6/1/2025 - \$80.00M
- 429) Baseline Upgrade b3718.2
- Install one 500/230 kV 1440 MVA transformer at a new substation called Mars near Dulles International Airport. - 6/1/2025 - \$290.00M
- 430) Baseline Upgrade b3718.3
- Construct a new 500 kV transmission line for ~ 3.5 miles along with substation upgrades at Wishing Star and Mars. New right-of-way will be needed and will share same structures with the line. New conductor to have a minimum summer normal rating of 4357 MVA. - 6/1/2025 - \$130.00M
- 431) Baseline Upgrade b3718.4
- Reconductor ~0.62 miles of 230 kV line #2214 (Buttermilk-Roundtable) to achieve a summer rating of 1574 MVA. - 6/1/2025 - \$4.80M
- 432) Baseline Upgrade b3718.5
- Reconductor ~1.52 miles of 230 kV line #2031 (Enterprise-Greenway-Roundtable) to achieve a summer rating of 1574 MVA. - 6/1/2025 - \$0.00M
- 433) Baseline Upgrade b3718.6
- Reconductor ~0.64 miles of 230 kV line #2186 (Enterprise-Shellhorn) to achieve a summer rating of 1574 MVA. - 6/1/2025 - \$0.00M
- 434) Baseline Upgrade b3718.7
- Reconductor ~2.17 miles of 230 kV line #2188 (Lockridge-Greenway-Shellhorn) to achieve a summer rating of 1574 MVA. - 6/1/2025 - \$0.00M
- 435) Baseline Upgrade b3718.8
- Reconductor ~0.84 miles of 230 kV line #2223 (Lockridge-Roundtable) to achieve a summer rating of 1574 MVA. - 6/1/2025 - \$0.00M
- 436) Baseline Upgrade b3718.9
- Reconductor ~3.98 miles of 230 kV line #2218 (Sojourner-Runway-Shellhorn) to achieve a summer rating of 1574 MVA. - 6/1/2025 - \$6.60M
- 437) Baseline Upgrade b3719

- Replace the two existing 1200A Bergen 138 kV Circuit Switchers with two (2) 138 kV Disconnect Switches to achieve a minimum summer normal device rating of 298 MVA and a minimum summer emergency rating of 454 MVA. - 12/31/2022 - \$2.10M

438) Baseline Upgrade b3720

- Rebuild the Abbe-Johnson #2 69 kV line (approx. 4.9 miles) with 556 kcmil ACSR conductor. Replace three disconnect switches (A17, D15 & D16) and line drops and revise relay settings at Abbe. Replace one disconnect switch (A159) and line drops and revise relay settings at Johnson. Replace two MOAB disconnect switches (A4 & A5), one disconnect switch (D9), and line drops at Redman. - 6/1/2027 - \$12.40M

439) Baseline Upgrade b3721

- Rebuild and reconductor the Avery-Hayes 138 kV line (approx. 6.5 miles) with 795 kcmil 26/7 ACSR. - 6/1/2027 - \$19.49M

440) Baseline Upgrade b3722

- Rebuild the existing Darrah-Barnett 69 kV line, approximately 2.8 miles and replace a riser at Darrah station. - 12/1/2027 - \$6.98M

441) Baseline Upgrade b3723

- Rebuild the George Washington – Kammer 138 kV circuit, except for 0.1-mile of previously-upgraded T-line outside each terminal station (6.7 miles of total upgrade scope). Remove the existing 6-wired steel lattice towers and supplement the right-of-way as needed. - 6/1/2027 - \$18.30M

442) Baseline Upgrade b3724

- Install 138 kV circuit switcher on the high-side of Transformer #2 at Roanoke station (previously proposed as a portion of s2469.7, posted in 2021 AEP local plan). - 6/1/2027 - \$0.10M

443) Baseline Upgrade b3725

- Replace the 1600A bus disconnect switch at Goodings Grove on L11622 Elwood-Goodings Grove 345 kV. - 12/1/2027 - \$0.50M

444) Baseline Upgrade b3726

- Install two new 500 kV breakers on the existing open SVC string to create a new bay position. Relocate & Reterminate facilities as necessary to move the 500 kV SVC into the new bay position and Install a 500 kV breaker on the 500/138 kV #3 transformer. Upgrade relaying at Black Oak substation. - 6/1/2025 - \$17.37M

445) Baseline Upgrade b3727

- Rebuild EKPC's Fawkes-Duncannon Lane Tap 556.5 ACSR 69 kV line section (7.2 miles) using 795 ACSR. - 12/1/2026 - \$8.50M

446) Baseline Upgrade b3728.1

- Upgrade two Breaker bushings on the 500 kV Line 5012 (Conastone-Peach Bottom) at Conastone substation. - 12/1/2027 - \$2.00M

447) Baseline Upgrade b3728.2

- Replace 4 meters and bus work inside Peach Bottom substation on the 500 kV Line 5012 (Conastone-Peach Bottom). - 12/1/2027 - \$3.80M

- 448) Baseline Upgrade b3729
- To increase the Maximum Operating Temperature of DPL Circuit 22088 (Colorado Conowingo 230 kV), install cable shunts on each phase, on each side of four (4) dead-end structures and replace existing insulator bells. - 6/1/2027 - \$0.26M
- 449) Baseline Upgrade b3730
- Rereminate the Lackawanna T3 and T4 500/230 kV transformers on the 230 kV side to remove them from the 230 kV buses and bring them into dedicated bay positions that are not adjacent to one another. - 6/1/2027 - \$10.70M
- 450) Baseline Upgrade b3731
- Replace 40kV breaker J at McComb station with a new 3000A 40kA breaker - 6/1/2027 - \$0.50M
- 451) Baseline Upgrade b3732
- Install a 6 MVAR, 34.5kV cap bank at Morgan Run station - 6/1/2027 - \$0.37M
- 452) Baseline Upgrade b3733
- Rebuild the 1.8 mile 69kV T-line between Summerhill and Willow Grove Switch. Replace 4/0 ACSR conductor with 556 ACSR. - 6/1/2027 - \$5.10M
- 453) Baseline Upgrade b3734
- Install a 7.7 MVAR, 69kV cap bank at both Otway station and Rosemount station - 6/1/2027 - \$1.73M
- 454) Baseline Upgrade b3735
- Terminate the existing Broadford – Wolf Hills #1 138 kV line into Abingdon 138 kV Station. This line currently bypasses the existing Abingdon 138 kV Station; Install two new 138 kV circuit breakers on each new line exit towards Broadford and towards Wolf Hills #1; Install one new 138 kV circuit breaker on line exit towards South Abingdon for standard bus sectionalizing - 6/1/2027 - \$8.48M
- 455) Baseline Upgrade b3736.1
- Establish 69kV bus and new 69 kV line CB at Dorton substation. - 12/1/2027 - \$1.13M
- 456) Baseline Upgrade b3736.10
- Henry Clay S.S Retirement: - 12/1/2027 - \$0.30M
- 457) Baseline Upgrade b3736.11
- Cedar Creek substation work - 12/1/2027 - \$0.44M
- 458) Baseline Upgrade b3736.12
- Breaks substation retire 46kV equipment: - 12/1/2027 - \$0.25M
- 459) Baseline Upgrade b3736.13
- Retire Pike 29 SS and Rob Fork SS - 12/1/2027 - \$0.42M
- 460) Baseline Upgrade b3736.14
- Serve Pike 29 and Rob Fork customers from nearby 34kV Distribution sources. - 12/1/2027 - \$0.00M

- 461) Baseline Upgrade b3736.15
 - Poor Bottom substation install - 12/1/2027 - \$0.00M
- 462) Baseline Upgrade b3736.16
 - Henry Clay 46kV substation retirement - 12/1/2027 - \$0.00M
- 463) Baseline Upgrade b3736.17
 - New Draffin 69kV substation install - 12/1/2027 - \$0.00M
- 464) Baseline Upgrade b3736.18
 - Draffin 46kV substation retirement - 12/1/2027 - \$0.00M
- 465) Baseline Upgrade b3736.2
 - At Breaks substation, reuse 72kV breaker A as the new 69kV line breaker. - 12/1/2027 - \$0.71M
- 466) Baseline Upgrade b3736.3
 - Rebuild ~16.7 mi Dorton – Breaks 46kV line to 69kV - 12/1/2027 - \$58.52M
- 467) Baseline Upgrade b3736.4
 - Retire ~17.2 mi Cedar Creek – Elwood 46kV circuit. - 12/1/2027 - \$11.15M
- 468) Baseline Upgrade b3736.5
 - Retire ~ 6.2 mi Henry Clay – Elwood 46kV line section. - 12/1/2027 - \$4.30M
- 469) Baseline Upgrade b3736.6
 - Retire Henry Clay 46 kV substation and replace with Poor Bottom 69 kV station. Install a new 0.7 mi double circuit extension to Poor Bottom 69kV. - 12/1/2027 - \$3.42M
- 470) Baseline Upgrade b3736.7
 - Retire Draffin substation and replace with a new substation. Install a new 0.25 mi double circuit extension to New Draffin substation. - 12/1/2027 - \$2.01M
- 471) Baseline Upgrade b3736.8
 - Remote End work at Jenkins substation - 12/1/2027 - \$0.03M
- 472) Baseline Upgrade b3736.9
 - Provide Transition fiber to Dorton, Breaks, Poor Bottom, Jenkins and New Draffin substations - 12/1/2027 - \$0.41M
- 473) Baseline Upgrade b3737.1
 - Larrabee substation – Reconfigure substation. - 6/1/2029 - \$4.24M
- 474) Baseline Upgrade b3737.10
 - Atlantic 230 kV substation – Convert to double-breaker double-bus. - 6/1/2030 - \$31.47M
- 475) Baseline Upgrade b3737.11
 - Freneau substation – Update relay settings on the Atlantic 230 kV line. - 6/1/2030 - \$0.03M
- 476) Baseline Upgrade b3737.12

- Smithburg substation – Update relay settings on the Atlantic 230 kV line. - 6/1/2030 - \$0.03M
- 477) Baseline Upgrade b3737.13
 - Oceanview substation – Update relay settings on the Atlantic 230 kV lines. - 6/1/2030 - \$0.04M
- 478) Baseline Upgrade b3737.14
 - Red Bank substation – Update relay settings on the Atlantic 230 kV lines. - 6/1/2030 - \$0.04M
- 479) Baseline Upgrade b3737.15
 - South River substation – Update relay settings on the Atlantic 230 kV line. - 6/1/2030 - \$0.03M
- 480) Baseline Upgrade b3737.16
 - Larrabee substation – Update relay settings on the Atlantic 230 kV line. - 6/1/2030 - \$0.03M
- 481) Baseline Upgrade b3737.17
 - Atlantic substation – Construct a new 230 kV line terminal position to accept the generator lead line from the offshore wind Larrabee Collector station. - 6/1/2030 - \$4.95M
- 482) Baseline Upgrade b3737.18
 - G1021 (Atlantic-Smithburg) 230 kV upgrade. - 6/1/2030 - \$9.68M
- 483) Baseline Upgrade b3737.19
 - R1032 (Atlantic-Larrabee) 230 kV upgrade. - 6/1/2030 - \$14.50M
- 484) Baseline Upgrade b3737.2
 - Larrabee substation – 230 kV equipment for direct connection. - 6/1/2029 - \$4.77M
- 485) Baseline Upgrade b3737.20
 - New Larrabee Collector station-Atlantic 230 kV line. - 6/1/2030 - \$17.07M
- 486) Baseline Upgrade b3737.21
 - Larrabee-Oceanview 230 kV line upgrade. - 6/1/2030 - \$6.00M
- 487) Baseline Upgrade b3737.22
 - Construct the Larrabee Collector station AC switchyard, composed of a 230 kV 3 x breaker and a half substation with a nominal current rating of 4000 A and four single phase 500/230 kV 450 MVA autotransformers to step up the voltage for connection to the Smithburg substation. Procure land adjacent to the AC switchyard, and prepare the site for construction of future AC to DC converters for future interconnection of DC circuits from offshore wind generation. Land should be suitable to accommodate installation of four individual converters to accommodate circuits with equivalent rating of 1400 MVA at 400 kV. - 12/31/2027 - \$193.30M
- 488) Baseline Upgrade b3737.23
 - Rebuild the underground portion of Richmond-Waneeta 230 kV. - 6/1/2029 -

- \$16.00M
- 489) Baseline Upgrade b3737.24
- Upgrade Cardiff-Lewis 138 kV by replacing 1590 kcmil strand bus inside Lewis substation. - 4/30/2028 - \$0.10M
- 490) Baseline Upgrade b3737.25
- Upgrade Lewis No. 2-Lewis No. 1 138 kV by replacing its bus tie with 2000 A circuit breaker. - 4/30/2028 - \$0.50M
- 491) Baseline Upgrade b3737.26
- Upgrade Cardiff-New Freedom 230 kV by modifying existing relay setting to increase relay limit. - 6/1/2029 - \$0.30M
- 492) Baseline Upgrade b3737.27
- Rebuild approximately 0.8 miles of the D1018 (Clarksville-Lawrence 230 kV) line between Lawrence substation (PSEG) and structure No. 63. - 6/1/2029 - \$14.58M
- 493) Baseline Upgrade b3737.28
- Reconductor Kilmer I-Lake Nelson I 230 kV. - 6/1/2029 - \$4.42M
- 494) Baseline Upgrade b3737.29
- Convert the six-wired East Windsor-Smithburg E2005 230 kV line (9.0 mi.) to two circuits. One a 500 kV line and the other a 230 kV line. - 12/31/2028 - \$206.48M
- 495) Baseline Upgrade b3737.3
- Lakewood Generator substation – Update relay settings on the Larrabee 230 kV line. - 6/1/2029 - \$0.03M
- 496) Baseline Upgrade b3737.30
- Add third Smithburg 500/230 kV transformer. - 12/31/2027 - \$13.40M
- 497) Baseline Upgrade b3737.31
- Additional reconductoring required for Lake Nelson I-Middlesex 230 kV. - 6/1/2029 - \$3.30M
- 498) Baseline Upgrade b3737.32
- Rebuild Larrabee-Smithburg No. 1 230 kV. - 12/31/2027 - \$44.77M
- 499) Baseline Upgrade b3737.33
- Reconductor Red Oak A-Raritan River 230 kV. - 6/1/2029 - \$12.53M
- 500) Baseline Upgrade b3737.34
- Reconductor Red Oak B-Raritan River 230 kV. - 6/1/2029 - \$3.90M
- 501) Baseline Upgrade b3737.35
- Reconductor small section of Raritan River-Kilmer I 230 kV. - 6/1/2029 - \$27.30M
- 502) Baseline Upgrade b3737.36
- Replace substation conductor at Kilmer and reconductor Raritan River-Kilmer W

- 230 kV. - 6/1/2029 - \$25.88M
- 503) Baseline Upgrade b3737.37
- Add a third set of submarine cables, rerate the overhead segment, and upgrade terminal equipment to achieve a higher rating for the Silver Run-Hope Creek 230 kV line. - 6/1/2029 - \$61.20M
- 504) Baseline Upgrade b3737.38
- Linden subproject: Install a new 345/230 kV transformer at the Linden 345 kV Switching station, and relocate the Linden-Tosco 230 kV (B-2254) line from the Linden 230 kV to the existing 345/230 kV transformer at Linden 345 kV. - 12/31/2027 - \$37.20M
- 505) Baseline Upgrade b3737.39
- Bergen subproject: Upgrade the Bergen 138 kV ring bus by installing a 80 kA breaker along with the foundation, piles, and relays to the existing ring bus, install breaker isolation switches on existing foundations and modify and extend bus work. - 12/31/2027 - \$5.53M
- 506) Baseline Upgrade b3737.4
- B54 Larrabee-South Lockwood 34.5 kV line transfer. - 6/1/2029 - \$0.31M
- 507) Baseline Upgrade b3737.40
- Windsor to Clarksville subproject: Reconductor one span of the C1017 (Clarksville-Windsor) 230kV line from structure #126 to Windsor Substation with double bundled 1590 ACSR conductor, approximately (0.1) mile. - 6/1/2029 - \$1.72M
- 508) Baseline Upgrade b3737.41
- Windsor to Clarksville subproject: Upgrade terminal equipment at Clarksville 230 kV. - 6/1/2029 - \$1.49M
- 509) Baseline Upgrade b3737.42
- Upgrade inside plant equipment at Lake Nelson I 230 kV. - 6/1/2029 - \$4.80M
- 510) Baseline Upgrade b3737.43
- Upgrade Kilmer W-Lake Nelson W 230 kV line drop and strain bus connections at Lake Nelson 230 kV. - 6/1/2029 - \$0.57M
- 511) Baseline Upgrade b3737.44
- Upgrade Lake Nelson-Middlesex-Greenbrook W 230 kV line drop and strain bus connections at Lake Nelson 230 kV. - 6/1/2029 - \$0.58M
- 512) Baseline Upgrade b3737.45
- Reconductor 0.33 miles of PPL's portion of the Gilbert-Springfield 230 kV line. - 6/1/2030 - \$0.38M
- 513) Baseline Upgrade b3737.47
- Build New North Delta 500 kV substation (four bay breaker and half configuration) - the substation will include 12 - 500kV breakers and one 500/230 kV transformer, will allow the termination of six - 500 kV lines - 6/1/2027 - \$104.10M
- 514) Baseline Upgrade b3737.5

- Larrabee Collector station-Larrabee 230 kV new line. - 6/1/2029 - \$7.52M
- 515) Baseline Upgrade b3737.50
- Bring the Peach Bottom-Delta Power Plant 500 kV line “in and out” of North Delta by constructing a new Peach Bottom-North Delta 500 kV (0.3 miles) cut-in and cut-out lines. - 6/1/2029 - \$1.56M
- 516) Baseline Upgrade b3737.52
- Replace one 63 kA circuit breaker "B4" at Conastone 230 kV with 80 kA. - 6/1/2029 - \$1.30M
- 517) Baseline Upgrade b3737.6
- Larrabee Collector station-Smithburg No. 1 500 kV line (new asset). New 500 kV line will be built double circuit to accommodate a 500 kV line and a 230 kV line. - 12/31/2027 - \$150.35M
- 518) Baseline Upgrade b3737.7
- Rebuild G1021 Atlantic-Smithburg 230 kV line between the Larrabee and Smithburg substations as a double circuit 500 kV/230 kV line. - 12/31/2027 - \$62.85M
- 519) Baseline Upgrade b3737.8
- Smithburg substation 500 kV expansion to 4-breaker ring. - 12/31/2027 - \$68.25M
- 520) Baseline Upgrade b3737.9
- Larrabee substation upgrades. - 6/1/2030 - \$0.86M
- 521) Baseline Upgrade b3738
- Charleroi - Dry Run 138 kV Line: Replace Limiting Terminal Equipment - 6/1/2027 - \$0.38M
- 522) Baseline Upgrade b3739
- Dry Run - Mitchell 138 kV Line: Replace Limiting Terminal Equipment - 6/1/2027 - \$0.40M
- 523) Baseline Upgrade b3740
- Glen Falls - Bridgeport 138 kV Line: Replace Limiting Terminal Equipment - 6/1/2027 - \$1.88M
- 524) Baseline Upgrade b3741
- Yukon - Charleroi No.1 138 kV Line: Replace Limiting Terminal Equipment - 6/1/2027 - \$0.70M
- 525) Baseline Upgrade b3742
- Yukon - Charleroi No.2 138 kV Line: Replace Limiting Terminal Equipment - 6/1/2027 - \$0.45M
- 526) Baseline Upgrade b3743
- At Bedington Substation: Replace substation conductor, wavetrapp, CT's and upgrade relaying
At Cherry Run Substation: Replace substation conductor, wavetrapp, CT's, disconnect switches, circuit breaker and upgrade relaying

- At Marlowe: Replace substation conductor, wavetrap, CT's and upgrade relaying. - 6/1/2027 - \$4.66M
- 527) Baseline Upgrade b3744
- Replace one span of 1272 ACSR from Krendale substation to structure 35 (~630 ft)
Replace one span of 1272 ACSR from Shanor Manor to structure 21 (~148 ft)
Replace 1272 ACSR risers at Krendale & Shanor Manor Substations
Replace 1272 ACSR Substation Conductor at Krendale Substation
Replace relaying at Krendale Substation
Revise Relay Settings at Butler & Shanor Manor Substations.
- 6/1/2027 - \$1.75M
- 528) Baseline Upgrade b3745
- Carbon Center Substation - Install Redundant Relaying - 6/1/2027 - \$0.57M
- 529) Baseline Upgrade b3746
- Meadow Brook Substation - Install Redundant Relaying - 6/1/2027 - \$0.21M
- 530) Baseline Upgrade b3747
- Bedington Substation - Install Redundant Relaying - 6/1/2027 - \$0.28M
- 531) Baseline Upgrade b3748
- Replace four Clifty Creek 345 kV 3000A switches with 5000 A 345 kV switches. - 6/1/2027 - \$0.85M
- 532) Baseline Upgrade b3749
- Rebuild the New Church - Piney Grove 138 kV line - 6/1/2027 - \$63.00M
- 533) Baseline Upgrade b3750
- Upgrade Seward Terminal Equipment of the Seward-Blairsville 115 kV Line to increase the line rating such that the Transmission Line conductor is the limiting component. - 6/1/2027 - \$0.43M
- 534) Baseline Upgrade b3751
- Rebuild 6.4 miles of the Roxbury - Shade Gap 115 kV line from Roxbury to the AE1-071 115 kV ring bus with single circuit 115 kV construction - 6/1/2027 - \$15.03M
- 535) Baseline Upgrade b3752
- Rebuild 7.2 miles of the Shade Gap - AE1-071 115 kV line section of the Roxbury - Shade Gap 115 kV line - 6/1/2027 - \$17.43M
- 536) Baseline Upgrade b3753
- Replace the Tyrone North 115 /46 kV transformer with a new standard 75 MVA top rated bank and upgrade the entire terminal to minimum 100 MVA capability for both SN and SE rating - 6/1/2027 - \$2.82M
- 537) Baseline Upgrade b3754
- At Maclane tap: Construct a new three breaker ring bus to tie into the Warrior Ridge - Belleville 46 kV D line and the 1LK line - 6/1/2027 - \$10.09M
- 538) Baseline Upgrade b3755

- Convert Locust Street 69kV from a Straight Bus to a Ring Bus. - 6/1/2027 - \$45.50M
- 539) Baseline Upgrade b3756
- Convert Maple Shade 69kV from a Straight Bus to a Ring Bus - 6/1/2027 - \$38.18M
- 540) Baseline Upgrade b3757
- Convert existing Medford 69kV Straight bus to Seven breaker ring bus, , construct a new 230/69kV transformer at Cox's Corner and a new line from Cox's Corner to Medford. - 6/1/2027 - \$101.50M
- 541) Baseline Upgrade b3758
- Construct a new 69kV line from 14th Street to Harts Lane - 6/1/2027 - \$41.30M
- 542) Baseline Upgrade b3759
- Reconductor approximately 10.5 miles of 115kV Line #23 segment from Oak Ridge to AC2-079 Tap to minimum emergency ratings of 393 MVA Summer / 412 MVA Winter - 6/1/2027 - \$23.50M
- 543) Baseline Upgrade b3760
- At Powerton Sub, replace most limiting facility 800A wave trap with 2000A wave trap on the Powerton-Towerline 138kV line terminal - 6/1/2025 - \$0.20M
- 544) Baseline Upgrade b3761
- Install 138 kV Breaker on the Ridgway 138/46 kV #2 Transformer - 6/1/2027 - \$1.10M
- 545) Baseline Upgrade b3762
- Rebuild EKPC's Fawkes-Duncannon Lane Tap 556.5 ACSR 69 kV line section (7.2 miles) using 795 ACSR. - 12/1/2026 - \$19.10M
- 546) Baseline Upgrade b3763
- Replace the Jug Street 138kV breakers M, N, BC, BF, BD, BE, D, H, J, L, BG, BH, BJ, BK with 80KA breakers - 6/1/2024 - \$14.00M
- 547) Baseline Upgrade b3764
- Replace the Hyatt 138kV breakers AB1 and AD1 with 63kA breakers - 6/1/2024 - \$2.00M
- 548) Baseline Upgrade b3765
- Purchase one 80 MVAR 345 kV spare reactor, to be located at the Mainesburg station. - 12/1/2022 - \$6.44M
- 549) Baseline Upgrade b3766.1
- Hayes – New Westville 138 kV line: Build ~0.19 miles of 138 kV line to the Indiana/ Ohio State line to connect to AES's line portion of the Hayes – New Westville 138 kV line with the conductor size 795 ACSR26/7 Drake. The following cost includes the line construction and ROW. - 6/1/2027 - \$0.38M
- 550) Baseline Upgrade b3766.2
- Hayes – Hodgkin 138 kV line: Build ~0.05 miles of 138 kV line with the conductor size 795 ACSR26/7 Drake. The following cost includes the line construction,

- ROW, and fiber. - 6/1/2027 - \$1.22M
- 551) Baseline Upgrade b3766.3
- Hayes 138 kV: Build a new 4-138 kV circuit breaker ring bus. The following cost includes the new station construction, property purchase, metering, station fiber and the College Corner –Randolph 138 kV line connection. - 6/1/2027 - \$7.44M
- 552) Baseline Upgrade b3766.4
- New Westville – AEP Hodgin 138kV Line: Construct a 138kV 1.86-mile single circuit transmission line. This transmission line will help loop the radial load served at New Westville as part of the overall effort to improve reliability in this area. Also, it provides a source to feed New Westville load while the 138kV tie built back into the AES Ohio system - 6/1/2027 - \$3.70M
- 553) Baseline Upgrade b3766.5
- New Westville – West Manchester 138kV Line: Construct a new approximate 11-mile single circuit 138kV line from New Westville to the Lewisburg tap off 6656. Convert a portion of 6656 West Manchester – Garage Rd 69kV line between West Manchester - Lewisburg to 138kV operation (circuit is built to 138kV). This will utilize part of the line already built to 138kV and will take place of the 3302 that currently feeds New Westville. The 3302 line will be retired as part of this project. - 6/1/2027 - \$16.00M
- 554) Baseline Upgrade b3766.6
- West Manchester Substation: The West Manchester Substation will be expanded to a double bus double breaker design where AES Ohio will install one 138kV circuit breaker, a 138/69kV transformer, and eight new 69kV circuit breakers. These improvements will improve help improve a non-standard bus arrangement where there is only one bus tie today and will improve the switching arrangement for the West Sonora Delivery Point. - 6/1/2027 - \$9.90M
- 555) Baseline Upgrade b3769
- Install second TMI 500/230kV Transformer with additional 500 and 230 bus expansions - 6/1/2027 - \$30.19M
- 556) Baseline Upgrade b3770
- Rebuild 1.4 miles of existing single circuit 230 kV tower line between BGE's Graceton substation to the Brunner Island PPL tie-line at the MD/PA state line to double circuit steel pole line with one (1) circuit installed to uprate 2303 circuit - 6/1/2027 - \$8.40M
- 557) Baseline Upgrade b3771
- Reconductor two (2) 230 kV circuits from Conastone to Northwest #2 - 6/1/2027 - \$37.76M
- 558) Baseline Upgrade b3772
- Reconductor 27.3 miles of the Messick Road - Morgan 138 kV Line from 556 ACSR to 954 ACSR. At Messick Road Substation: Replace 138 kV wave trap, circuit breaker, CT's, disconnect switch, and substation conductor and upgrade relaying. At Morgan Substation: Upgrade Relaying - 6/1/2027 - \$49.23M

559) Baseline Upgrade b3773

- McConnellsburg 138 kV Substation: Install 33 MVAR switched capacitor, 138 kV Breaker, and associated relaying - 6/1/2027 - \$3.05M

560) Baseline Upgrade b3774

- Upgrade terminal equipment at Brunner Island (on the Brunner Island - Yorkana 230 kV circuit) - 6/1/2027 - \$2.50M

Revision History:

Version: 1

Date: 3/1/2024

Approver: Sami Abdulsalam, Sr. Manager, Transmission Planning