PPL Electric Utilities

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PPL 2023 RTEP Planning Assumptions

PJM Sub-Regional RTEP Committee

December 2022

Agenda

A. PPL TO Criteria Assumptions

B. Attachment M-3 Project Assumptions & Methodology

C. Attachment M-3 EOL Planning Criteria

D. Retirement of Existing Facilities

A. PPL TO Criteria Assumptions

Base Case

- PPL uses the latest PJM's RTEP power flow cases and models for assessments
- 5-year assessment – 2028 PJM RTEP Case
- Contingencies are updated as per NERC TPL-001-5 Standard
- Loads will be modeled per the latest PJM Load Forecast Report

A. PPL TO Criteria Assumptions

Baseline Analyses

- PJM performs baseline analyses to identify system needs as per the following criteria:
  - NERC Reliability Standards
  - PJM Transmission Planning Criteria as specified in Manual 14B
  - PPL EU Transmission Planning Criteria filed with PJM and FERC under FERC Form 715. The Form 715 can be accessed at: http://www.pjm.com/library/request-access/ferc-form-715.aspx
- PPL performs analyses by applying TO criteria (Form 715) on BES and non-BES system
- PPL and PJM planning departments work closely to validate power flow cases and study results
- Any baseline violations are addressed through PJM RTEP process

B. Attachment M-3 Project Assumptions & Methodology

	Driver	Examples
1	Equipment Material Condition, Performance and Risk	Degraded equipment performance, operational performance, material condition/health, maintainability/serviceability, obsolescence, equipment failure, predictive failure analysis, employee and public safety and environmental impact.
2	Operational Flexibility and Efficiency	Optimizing system configuration, asset criticality, asset availability, equipment duty cycles and restoration capability, minimize outages.
3	Infrastructure Resilience	Improve system ability to anticipate, absorb, adapt to, and/or rapidly recover from a potentially disruptive event, including severe weather, geo-magnetic disturbances, physical and cyber security challenges, critical infrastructure reduction.
4	Customer Service	Service to new and existing customers. Interconnect new customer load. Address distribution load growth, customer outage exposure, equipment loading.
5	Other	Meet objectives not included in other definitions

B. Attachment M-3 Project Assumptions and Methodology

1) <u>Equipment Material Condition, Performance and Risk:</u>
Identify and make the needed investments to ensure the safe and reliable operation of the transmission system. These decisions can be based on equipment performance, obsolescence and expected service life concerns, condition of equipment, reliability impact, increased maintenance costs, and engineering recommendations.

Examples of Project Drivers:

- Degraded Equipment Performance
- Operational Performance
- Material Condition/Health
- Obsolescence
- Equipment Failure
- Asset Modernization and Standardization
- Employee and Public Safety
- Environmental Impact

B. Attachment M-3 Project Assumptions & Methodology

2) <u>Operational Flexibility and Efficiency</u>

Planning teams coordinate with Operations to identify needed improvements on the transmission system that will provide for improved operating flexibility. These projects can reduce the impact and limit exposure to our customers for planned or forced events and can facilitate improved restoration times. These projects can opportunistically bring the system up to current standards and design principals.

Examples of Project Drivers:

- Optimizing system configuration
- Equipment duty cycles
- Restoration capability
- Minimize outages

B. Attachment M-3 Project Assumptions & Methodology

3) <u>Infrastructure Resilience</u>

Improving the resilience of the system is an important consideration in the design of the transmission system and these projects are designed to reduce the impact to our customers for disruptive natural or man-made events. These projects can also improve the operability of the system and will reduce customer exposure.

Examples of Project Drivers:

- Reduction in customer outage exposure by reducing circuit length
- Severe Weather Events
- Network existing radial facilities
- Limit the number of taps on a transmission line

B. Attachment M-3 Project Assumptions & Methodology

4) Customer Service

Projects that accommodate new, increasing, or future load so that the system can reliably address customer needs. Also includes improvements to facilities that serve our customers.

Examples of Project Drivers:

- Service to New and Existing Customers
- Interconnect New Customer Load
- Address Distribution Load Growth

B. Attachment M-3 Project Assumptions & Methodology

5) Other

Meet objectives not included in other definitions.

Examples of Project Drivers:

- New Technology (pilots)
- Telemetry/Data Availability
- Industry Recommendations
- Others

C. Attachment M-3 EOL Planning Criteria

- **EOL Need**

  A need to replace a transmission line between breakers operating at or above 100 kV or a transformer, the high side of which operates at or above 100 kV and the low side of which is not connected to distribution facilities, which the Transmission Owner has determined to be near the end of its useful life, the replacement of which would be an Attachment M-3 Project.

- **Need Identification**

  An EOL Need is likely to arise from one or more drivers related to equipment material condition, performance and risk (*See M-3 Driver #1*), such as equipment performance, obsolescence and expected service life concerns, condition of equipment, reliability impact, increased maintenance costs, and engineering recommendations.

C. Attachment M-3 EOL Planning Criteria

- Transmission Lines (≥100kV)

EOL Needs for Transmission Lines are generally driven by multiple compounding factors and are not determined based on age alone. In order to determine an EOL Need, an assessment of these factors must be done through a combination of desktop analysis and field assessments. Assessments can include evaluation of the asset's history, design, performance, maintenance records, physical condition, etc. The following are some examples of factors that may aid in determining an EOL Need:

- Wood Structures
  - Decay/Rot
  - Checking/Splitting
  - Woodpecker damage
  - Ineffective treatment
- Poor Lightning Performance
- Degraded/Ineffective Grounding
- Degraded Anchor Rods/Guys

- Steel Structures
  - Corrosion/Section Loss/Structural integrity
  - Corten Lattice
  - Degraded coatings/foundations
- Conductor
  - Damage/Corrosion
  - Failing splices/connectors/fittings

C. Attachment M-3 EOL Planning Criteria

- Transformers (≥100kV high side)

EOL Needs for Transformers are generally driven by multiple compounding factors and are not determined based on age alone. In order to determine an EOL Need, an assessment of these factors must be done through a combination of desktop analysis and field assessments. Assessments can include evaluation of the asset's history, design, performance, maintenance records, physical condition, etc. The following are some examples of factors that may aid in determining an EOL Need:

- Manufacturer/Vintage
- Transformer Design
- Oil Dielectric
- Moisture Content
- Bushing Power Factor
- Exposure to Faults
- Radiator/Cooling Equipment Design
- Maintenance History
- Technological Advancements
- Dissolved Gas Analysis

D. Retirement of Existing Facilities

The purpose of transmission planning is to ensure that the capacity of the existing transmission system is maintained or expanded as needed to ensure the reliability, efficiency, safety, resilience and security of the transmission system for the benefit of customers. There are no national, regional or local standards or criteria driving the retirement of existing facilities. Although in specific situations, facilities may be removed or not replaced as dictated by system and/or customer needs, and the design and construction of new or replacement transmission projects, decisions to not replace individual facilities may have the cumulative effect of negatively impacting the reliability, efficiency, safety, resilience and security of the transmission system. That cumulative negative impact could also drive the need for additional facilities to be constructed to compensate for those removed, including greenfield installations. Accordingly, existing facilities are maintained in service or retired based on Good Utility Practice.

Questions?