

EKPC Local Planning Assumptions Updates for 2020 Planning Cycle

July 2020

Reason for Updates

- No changes to EKPC criteria being utilized for EKPC's FERC Form 715 analysis
- Providing additional detail regarding assumptions and methodology utilized in order to enhance transparency and replicability of results

Additional Details Regarding Models/Planning Horizon

- Assumptions presented in December 2019 for the 2020 planning cycle stated that “EKPC generally uses a 10-year baseline planning horizon, but will expand the planning horizon to 15 or 20 years, as appropriate and necessary for specific areas of its system.”
- Specifically, for the 2020 planning cycle, EKPC utilizes the following power flow models for assessment of EKPC’s Form 715 criteria violations:
 - 2021, 2024, 2029 summer peak (50% load probability)
 - 2021/22, 2024/25, 2029/30 winter peak (50% load probability)
 - 2021, 2024, 2029 summer extreme (10% load probability)
 - 2021/22, 2024/25, 2029/30 winter extreme (10% load probability)
- EKPC will either interpolate or extrapolate power flow results from these models to determine specific timing of needs

Generation Dispatch Additional Information

- Assumptions presented in December 2019 for the 2020 planning cycle stated “Base case generation assumptions – EKPC generators are dispatched as needed to meet EKPC load based on economic merit order.”
- The Laurel Dam hydroelectric facility is connected to the EKPC transmission system, and is therefore modeled as EKPC generation.
 - For baseline planning studies, EKPC assumes that this generation is offline.
 - Rationale for this assumption is the uncertain nature of availability to operate due to the primary goal of the U.S. Army Corps of Engineers being control of lake level and flood control. There is no guarantee that the facility will be generating during peak-load conditions, and a reasonable likelihood that generation will not be available.

Load Forecast Additional Information

- EKPC's individual substation forecasts are based on the overall EKPC-developed system forecast projections approved by EKPC's Board of Directors in 2018.
- Individual substation forecasts are modified as necessary based on known or likely added customer demand.
- Modeled power factor at each substation is based on the substation power factor at EKPC's 2018 summer peak (for summer models) and 2018/19 winter peak (for winter models).

Appendix – EKPC Local Planning Assumptions for 2020 Originally Presented in December 2019



EKPC Local Planning Assumptions

December 2019

EKPC Project Identification Process

- EKPC develops three different categories of projects:
 - **Baseline projects** are projects that address planning criteria violations which originate from internal analysis and/or PJM RTEP analysis.
 - **Network upgrade projects** are developed in conjunction with PJM to provide facilities for connection of new generation facilities and/or upgrades in output of existing generation facilities.
 - **Supplemental projects** are not covered by baseline analysis and address the following drivers:
 - Equipment Material Condition, Performance and Risk
 - Operational Flexibility and Efficiency
 - Customer Service
 - Infrastructure Resilience
 - Other

EKPC Baseline Planning Criteria

- EKPC plans its system to meet:
 - NERC TPL Reliability Standards
 - SERC regional criteria
 - PJM planning criteria
 - EKPC transmission planning criteria
- EKPC planning criteria for both BES and non-BES facilities is similar to Table 1 of the existing NERC TPL Standards in most respects
 - Primary difference -- EKPC considers the loss of a line, transformer, or generator in conjunction with the loss of a generator to be a single-contingency (P1) event subject to the performance requirements for P1 events.
 - EKPC planning criteria are posted at <http://www.pjm.com/planning/planning-criteria/to-planning-criteria.aspx>

EKPC Baseline Planning Methodology & Assumptions

- EKPC will share its baseline assessment results with PJM
- EKPC generally uses a 10-year baseline planning horizon, but will expand the planning horizon to 15 or 20 years, as appropriate and necessary for specific areas of its system.

EKPC Baseline Planning Methodology & Assumptions (cont.)

- EKPC jointly develops internal base cases with LGE/KU for EKPC baseline project planning studies
 - EKPC and LGE/KU have 54 free-flowing interconnections
 - EKPC has 57 distribution delivery points connected to the LGE/KU system (600+ MW at peak)
 - LGE/KU has 17 distribution delivery points connected to the EKPC system (100+ MW at peak)
 - System topology is based on the most recent MMWG modeling efforts extended to include both the EKPC and LGE/KU respective area topology updates since the creation of the MMWG models.
 - All EKPC known future baseline and supplemental projects are modeled as in service in the appropriate year.
- EKPC considers external contingencies from neighboring systems (AEP, DEOK, LGE/KU, and TVA) in addition to all internal EKPC contingencies in its baseline project planning

EKPC Baseline Planning Methodology & Assumptions (cont.)

- EKPC uses the following load forecast assumptions/methodology:
 - EKPC uses substation load forecasts developed internally
 - Developed using a top-down approach
 - Start with overall EKPC system forecast developed by EKPC Load Forecasting department
 - The overall EKPC system forecast is segmented by the EKPC Load Forecasting department among the 16 EKPC distribution cooperatives based on a variety of factors, including historical load, anticipated growth in service area residential, commercial, and industrial builds, etc.
 - EKPC Transmission Planning then allocates each distribution cooperative forecast among the delivery points for that distribution cooperative using similar factors.
- EKPC baseline planning models use two sets of forecast probabilities
 - 50/50 probability for summer and winter (equal probability of actual load being above or below the forecast)
 - 90/10 probability for summer and winter (10% probability of actual load reaching the forecast)

EKPC Baseline Planning Methodology & Assumptions (cont.)

- EKPC uses the following assumptions:
 - Base case generation assumptions – EKPC generators are dispatched as needed to meet EKPC load based on economic merit order.
 - EKPC uses the generation dispatch scenarios below during annual planning analysis. These generation dispatch scenarios, when coupled with a contingency, are assumed to create the worst case power flow condition.

Generation Outage	Replacement Generation Imported From
Big Sandy	South
Brown 3	North
Brown 3	South
Cooper 1&2	North
Cooper 1&2	South
Ghent 1	South
JK Smith 9 & 10	North
JK Smith 9 & 10	South
Mill Creek 4	South
Spurlock 2	South
Trimble 2	South

Supplemental Projects

- Supplemental Projects – EKPC supplemental projects are identified based on the following drivers:
 - Equipment Material Condition, Performance and Risk
 - Operational Flexibility and Efficiency
 - Customer Service
 - Infrastructure Resilience
 - Other

Supplemental Projects – Equipment Material Condition, Performance and Risk

- Equipment Material Condition, Performance and Risk projects are identified to address degraded equipment performance, material condition, obsolescence, equipment failure, safety and environmental impact.
- Project drivers include:
 - Safety
 - Transmission infrastructure replacements based on condition, obsolescence, or equipment that has reached its end of life
 - Environmental drivers
 - Other
- Inputs considered include:
 - Outage history, maintenance history, condition assessment reports, number of customers/amount of load/type of load at risk, etc.

Supplemental Projects – Operational Flexibility and Efficiency

- Operational Flexibility and Efficiency projects are identified to optimize system configuration, equipment duty cycles, and restoration capabilities and to minimize outages.
 - Project drivers include:
 - Enhancing system functionality, flexibility, or operability
 - Recurring real time equipment overloads
 - PCLLRW frequency
 - Number of outages and annual outage duration
 - Load exposure
 - Inputs considered include:
 - Number of customers/amount of load/type of load at risk, number of PCLLRWs, restrictions in ability to take maintenance outages, operational loading/voltage concerns, etc.

Supplemental Projects – Customer Service

- Customer service projects are identified to address customer outage exposure, equipment loading, load growth or to interconnect new customer load.
 - Project drivers include:
 - Member System Needs
 - Identified based on Member System requirements for service to end-use customers
 - SAIDI, CAIDI, number of outages and annual outage durations
 - New customer connections
 - Inputs considered include:
 - Customer input, ability to serve from existing system, outage history, etc.

Supplemental Projects – Infrastructure Resilience

- Infrastructure Resilience projects improve the system's ability to anticipate, absorb, adapt to, and/or rapidly recover from a potentially disruptive event, including severe weather, geo-magnetic disturbances or physical and cyber security challenges.
- Project drivers include:
 - Network existing radial facilities
 - Building new 69kV for future higher voltage conversion and eliminate 69kV in dense load pockets
 - Adding redundant facilities
 - Infrastructure hardening (additional physical/cyber security, replacement of equipment, etc.)
 - Other
- Inputs considered include:
 - Load exposure, long-term plan compatibility, outage history, type/amount of load at risk, environmental considerations, etc.

Supplemental Projects – Other

- These projects would address concerns not discussed in the other definitions.
- Project drivers include:
 - Industry recommendations
 - Technological pilot projects
 - Other

EKPC Project Approval Process

- EKPC has a Capital Management Committee (CMC)
 - Members include all levels of leadership at the Manager level and above in the Power Delivery business unit.
 - Process starts with a problem to be addressed.
 - SME Team develops solution projects (alternatives) to address the identified problem.
 - All solution projects and the recommended solution are presented to the CMC.
 - CMC reviews solutions and approves projects.
 - All projects are approved by the CMC, COO, CEO and the EKPC Board.

EKPC/PJM Coordination and RTEP

- EKPC will share its assessment results with PJM
- EKPC will work with PJM to develop appropriate upgrades/mitigation plans for identified planning criteria violations
- EKPC will coordinate with PJM to present identified needs, potential solutions, and recommended projects at the PJM sub-regional RTEP meetings and TEAC meetings as necessary to consider stakeholder needs and potential solutions.

