

2024 ITP Needs Assessment Posting Information

As part of the Integrated Transmission Planning (ITP) assessment, SPP conducts economic, reliability, public policy, short circuit, and operational needs assessments, as detailed in section 4 of the [ITP Manual](#), which results in a comprehensive list of needs being posted for SPP stakeholders.

For the 2024 ITP Assessment, the following versions were used and are the recommended version for any data supplied to SPP in support of a submitter's DPP:

- PSS®E: Version 35.3

This document is organized into three sections:

- General Information
- 2024 ITP Staff Solution Development
- 2024 ITP Needs Assessment Information

General Information

The General Information section covers information that is not specific to the 2024 ITP or any particular area of the SPP system.

DPP Data Versioning and Submission Form Updates

SPP uses automation to complete a data verification process and identify situations in which DPPs contain errors associated with the application of files. This process is unable to ensure the correct format and syntax were used. It is possible for projects that have used incorrect formatting or syntax to pass through the verification process without producing an error. This may result in the IDEV file not being applied in the way the submitter intended. The risk of improper application resides with the submitter. SPP recommends that PSS®E IDEV files be submitted using commands or syntax in the recommended versions to avoid the risk of improper application of desired solutions.

The Detailed Project Proposal (DPP) Submittal form has been updated for 2024. There were no field changes for the 2024 DPP submittal form. The updates were only for study year and references to software versions.

DPP Submittal Form Changes:

- ITP Study Year 2023 - updated to 2024
- PSS®E version 34.7 IDEV - updated to 35.3 IDEV
- PROMOD version 11.5 XML reference
- Interface Rating Changes on the section 4 tab are not applicable to the 2024 ITP

Instructions Changes:

- Updated the SPP Request Management System (RMS) instructions to use the new RMS template

SPP Evaluation of Model Changes Not Included in the Approved Model Set

SPP staff will evaluate the impacts of model changes submitted during the 2024 ITP DPP window, as appropriate. As noted in the DPP form, DPP submitters should check the box if your submittal includes a model correction. This includes model corrections submitted after the models were approved by either the Transmission Working Group or Economic Studies Working Group, known Notification to Construct (NTC) projects not included in the approved model set, and modeled NTCs that have been withdrawn or that will be withdrawn during the development of transmission portfolios.

The current base models will not be updated to capture the impacts of model changes during initial project screening. Please note that:

- DPP submitters should submit model corrections independent from solution submittals
 - Provide cross-references between model corrections and solution submittals, as needed
- Defined needs will be based on the current approved models
- All solutions will be screened against the approved reliability models without consideration of model changes
- The impacts of all model changes will be captured and considered in development of the transmission portfolio
- No new needs will be identified due to the impact of any model changes; any new violations will be assessed in future studies
- Model corrections will be evaluated to determine the impact on posted transmission needs and either utilized to invalidate system needs or as solutions in development of the transmission portfolio(s)
- Current NTCs not already modeled will be evaluated and utilized as potential solutions to transmission needs; this is not considered a re-evaluation of those existing NTCs

Short Circuit Needs

The 2024 ITP will evaluate the system and develop solutions to address short circuit needs. Short circuit needs are reliability needs identified when maximum available fault current exceeds the respective equipment fault-interrupting duty capability.

Local Planning Criteria Violations

The ITP assessment includes analysis of voltage-based Local Planning Criteria (LPC). Attachment O, section II.5 of the SPP Tariff requires that SPP Transmission Owners (TO) provide their local planning criteria to the Transmission Provider at least once a year, by April 1, in order for Zonal Reliability Upgrades to be assessed and included in the SPP Transmission Expansion Plan. Violations resulting from the application of LPC that enforces voltage criteria that is stricter than

SPP's planning criteria are included in the Needs Assessment posting, and are demarcated as Local Planning Criteria Violations via the "Local Planning Criteria Violations" column in the applicable worksheets of the

2024 ITP Needs Assessment.xlsx workbook¹. Violations of any other LPC are determined by the local entity, and projects to address the violations are submitted to SPP using the ZPC Non-DPP form for analysis in an ITP Supplemental study.

Informational Needs

Various needs have been included for informational purposes only. Please refer to the "Overview" and "Legend" tabs of the *2024 ITP Needs Assessment.xlsx* workbook for identification and additional description of these needs.

SPP will post a separate workbook including invalid needs from the 2023 ITP market powerflow models (MPMs) at a later date. Please refer to the *2023 ITP MPM Needs Invalidation Workbook* section below for more information.

Seams Consideration(s)

Seams evaluation in the ITP assessment will be performed according to details in the [ITP Manual](#), sections 5.3.1 and 5.3.2. Economic projects interconnecting SPP with a non-SPP TO or with an APC benefit to a neighboring entity of at least 20% of total benefit will be evaluated as a project with the potential opportunity for cost sharing. Economic projects meeting this criterion will be evaluated with at least 20% of the cost applicable to the neighboring entity. As solution development moves forward, SPP staff will coordinate with the applicable neighboring entity to determine a more accurate level of cost sharing for any potential reliability and economic seams projects.

SPP will leverage efforts during the 2024 ITP to complete two joint transmission planning studies with neighbors: one with MISO and one with AECI. MISO and SPP are required to commence a Coordinated System Plan (CSP) study in 2024. SPP and MISO will utilize information from studies currently underway and previously completed; including but not limited to the SPP 20-year assessment, 2023 SPP ITP, MISO Long Range Transmission Plan (LRTP) Tranche 1 and Tranche 2; to assist in determining which transmission system needs that will be evaluated in completing the 2024 CSP.

SPP and AECI will also coordinate the completion of an SPP-AECI Joint Coordinated System Plan (JCSP) study in 2024, leveraging efforts in the 2024 SPP ITP. In addition to evaluating transmission system reliability on and near the SPP-AECI seam, this joint transmission planning study will also include evaluation of transmission system conditions during an extreme weather scenario, focusing on the geographic area around Southwest Missouri.

¹ Zonal Reliability Upgrades resolving Local Planning Criteria violations do not fall under the definition of a Competitive Upgrade as defined in Attachment Y, section I.

2024 ITP Staff Solution Development

Staff Solution Development

SPP staff intends to create standardized solution versions of top performing DPPs based upon Minimum Design Standard Ratings. During the screening process, a project's cost effectiveness can be misrepresented when similar projects have different ratings and impedances but are assigned the same conceptual cost. Creating standardized solutions mitigates this misrepresentation. Staff will generally prefer minimum design characteristics unless a measurable increase in benefit is expected for a solution with a rating higher than minimum design standards. In these cases, staff may request a study level cost estimate for both sets of design characteristics for a better evaluation to ensure the best project is selected.

When developing solutions, SPP staff takes a different approach, depending on if a solution targets existing or new facilities.

For existing facilities

- SPP staff determines the most limiting element in series and develops staff solution to address most limiting elements. For example, if line conductor is most limiting, staff solution may either:
 - Achieve minimum amperage
 - If existing line is already at minimum amperage, then use next minimum amperage (1200 -> 2000-amp 138 kV, 161 kV, and 230 kV)

For new facilities

- SPP staff develops staff solutions to supplement DPPs as needed
- SPP staff develops staff solution versions of top performing DPPs using minimum emergency rating amperages and typical impedances as needed to evaluate solutions on consistent basis. For example, a staff solution using minimum amperages and typical impedances with same new line terminations as DPP

Standard impedance information is being provided in order to improve stakeholder transparency and consistency in the data utilized by SPP staff. This data is utilized for solution development work performed during SPP's ITP Solution Development and Evaluation and Portfolio Development processes outlined in the ITP Manual.

Data used for SPP staff solutions:

- Emergency Rating Amperage from Minimum Transmission Design Standards for Competitive Upgrades by kV level
- Impedances from previous version of SPP MDAG Manual by kV level

Voltage (kV)	Emergency Rating (Amps)
100 - 200	1,200
230	1,200
345	3,000
500	3,000
765	4,000

The conversion from conductor ampacity to conductor temperature shall be based on [SPP Planning Criteria](#), section 7.2.; however, any subsequent request for proposal (RFP) would specify the design wind speed and direction.

SPP Staff Solution Data

Typical Branch Impedance Table						
kV	R/mi	X/mi	B/mi	Amps	MVA	X/R
69	0.0054	0.0143	0.0003	600	71	2.6
115	0.00064	0.005	0.00084	1200	239	7.8
138	0.00045	0.0038	0.0012	1200	286	8.4
161	0.0002	0.0019	0.0022	2000	557	9.5
230	0.0001	0.001	0.004	2000	796	10
345	0.00004	0.00048	0.0091	3000	1792	12
500	0.00002	0.00026	0.017	3000	2598	13
765	0.000004	0.000084	0.051015	4000	5300	21

SPP will use the same impedance per kV for higher amperage line.

Typical Transformer Impedance Table				
kV	R	X	Rate A	Rate B
765/345	0.00006	0.00799	2877	3174
345/230	0.00082	0.0307	675	675
345/161	0.00022	0.03009	400	440
345/138	0.00052	0.00485	493	493
345/115	0.00078	0.00685	435	435
230/138	0.00109	0.07741	168	193
230/115	0.00028	0.05181	280	308
161/138	0.00032	0.01983	150	165
161/115	0.0005	0.00616	168	185
138/115	0.00052	0.00124	200	250
138/115	0.00052	0.00124	200	250
500/115	0.0002	0.03	600	600
500/230	0.0002	0.03	600	600
500/345	0.0002	0.03	600	600
138/69	0.00052	0.00124	200	250
115/69	0.004458	0.143531	84	96

SPP will use the same impedance per kV for all transformers.

Facility Ratings²

The minimum amperage capability of phase conductors shall meet or exceed the values shown above unless otherwise specified by SPP. If otherwise specified by SPP, the SPP value shall govern. The amperage values shown in the table shall be considered to be associated with emergency operating conditions.

The emergency rating is the amperage the circuit can carry for the time sufficient for adjustment of transfer schedules, generation dispatch, or line switching in an orderly manner with acceptable loss of life to the circuit involved. Conductors shall be selected such that they will lose no more than 10 percent of their original strength due to anticipated periodic operation above the normal rating.

Conceptual Cost Estimates

SPP validates each DPP to develop an understanding of the project intent and ensure the correct data is included. SPP calculates its own conceptual cost estimates during DPP validation. This provides each solution with a +100/-50% cost estimate utilized for the solution screening process. These cost estimates are based upon historical projects directed by SPP and completed by its members. The data is not available at a level of granularity that allows for conceptual cost estimates to differentiate electrically similar solutions with a significant difference in ratings,

² [Minimum Transmission Design Standards for Competitive Upgrades, Rev.2 012617](#)

therefore staff is likely to prefer a project with a lower rating over a project with a higher rating, unless the project with a higher rating performs significantly better overall than the lower rated project.

2024 ITP Needs Assessment Information

The following information is specific to the 2024 ITP Needs Assessment and provides stakeholders with relevant information to support the most efficient use of their time and resources for the submission of DPPs.

2024 ITP Winter Weather Models and Target Area

The 2024 ITP Assessment includes the first-ever evaluation of extreme winter conditions in an SPP Planning study. The 2024 ITP winter weather evaluation includes two model sets. Additionally, a target area consisting of the SPP system in the area of southeast Kansas, southwest and south-central Missouri, and northwest Arkansas is also defined in the 2024 ITP scope.

The first winter weather model set is the regional generic case based upon impacts observed in Winter Storm Uri, which occurred in February 2021. There are three models (Years 2, 5, and 10) mimicking conditions from this storm, matching the years and topology from the BR models. This model set includes significant reductions in available generation, which mimics fuel supply issues observed during the storm. The models are dispatched using the TARA software with the intention of limiting mitigating thermal loading violations.

The second model set is the Winter Storm Elliott model series. This model set includes two models intended to mimic system conditions consistent with the period of SPP-member load shed during the December 2022 event. The first model replicates exact system conditions built from an EMS output case. The second model includes similar storm conditions but adds key topology expected to be in-service by 2028 including the Neosho-Riverton 161 kV line and the Wolfcreek – Blackberry 345 kV line. An SVC has been added at the Stateline bus to mitigate voltage collapse conditions.

SPP staff intends to evaluate these models to identify transmission projects that can support the system during extreme winter weather. **It is important to note the main goal of the target area is to improve the voltage profile. Staff does not intend to fix all needs identified from the winter weather models.**

Economic Model Congestion and Overlap with Base Reliability (BR) Needs

Congestion scores for the economic needs are based upon the approved set of event files resulting from the constraint assessment milestone. The 2024 ITP market economic models (MEM) contain extraordinary levels of congestion and emergency energy in three distinct areas of its system:

- Southern portion of the SPS system near the Texas/New Mexico border
- The load in the area near Williston, North Dakota
- Omaha, Nebraska

Similar to the MEMs, the base reliability (BR) models identify needs local to these areas. High congestion and emergency energy caused increased PROMOD simulation times. SPP staff plans to use two event files during project screening as a way to mitigate the length of time it takes to screen solutions.

Staff will screen solutions targeting the previously identified areas using the E024 event file. Staff will evaluate all other solutions with a modified version of the event file (E025) that relaxes the rating of specific events to allow for decreased simulation times and more realistic APC benefit calculation.

Area Specific Information

SPS Area

In the 2024 ITP, the southern portion of the SPS system is experiencing thermal loading and voltage issues in the BR model set along with economic congestion and emergency energy in the MEM models. Many of these issues, such as the SPS New Mexico Interface (SPSNMTIES), are similar to what was observed in the 2021 ITP. SPP is also observing reliability needs, including voltage collapse, in the New Mexico area even after the addition of a large combined cycle resource in the Year 10 summer model. This generator was added to support load growth in the area.

The Integrated Transmission Plan Assessment cannot direct generation additions for its members, however Attachment O Section III.7.c of the SPP Open Access Transmission Tariff directs staff to consider alternative proposals such as 'generation options'.

SPP staff is evaluating the impact of this resource in both the MEM and BR models. Staff's initial findings show inclusion of a resource in this area has the potential to reduce economic congestion by 60-100% on specific constraints, including the SPSNMTIES interface. Because of this, SPP staff plans to focus on the underlying N-1 thermal overloads, voltage violations, and economics congestion observed in the area. The evaluation of the impacts of this generation resource will continue throughout the 2024 ITP. SPP staff has included PSSE idevs and PROMOD XML files in the needs assessment posting to allow stakeholders to properly evaluate the impacts of this resource on posted needs before submitting solutions. The included files allow stakeholders to add or remove the combined cycle resource and redispatch the system in same manner SPP staff plans to evaluate the area. Included are some topology modifications that proxy transmission upgrades that may be identified in the SPP Generator Interconnection study process.

As identified earlier in this document, Section 4 of the DPP Submittal form is not applicable to the 2024 ITP.

Williston, ND Area

Similar to New Mexico, load in the Williston, ND area continues to show increased growth beyond what is observed through most of the SPP footprint. This load growth results in loading violations within the PROMOD simulations where the software is unable to mitigate thermal loading utilizing redispatch. This is indicative of a true reliability need. SPP staff plans to evaluate solutions in this area as reliability solutions first with the intent of optimizing high-ranking projects with the potential to provide the best overall adjusted production cost reduction.

This may result in SPP removing the recommended solution from the subtraction run process as an economic project to ensure adjusted production cost benefits and B/C ratios for economic projects are not influenced by heavy congestion and emergency energy reductions.

Omaha, NE Area

The 2024 ITP BR and MEMs include a significant load addition in the Omaha, NE area. This load addition causes reliability issues in the BR models. Additionally, certain constraints in the MEMs are binding up to 8,760 hours of the year. SPP's delivery point addition (DPA) process identified upgrades for this load addition that would likely mitigate much of the congestion observed in the area, however the financial commitment window for NTC issuance was not met. This is also indicative of a reliability need in the Omaha area. Staff will evaluate the recommended DPA solution as well as others to determine the best regional solution.

SPP staff plans to evaluate solutions for the Omaha area in the same manner as the Williston, ND area.

Economic Event File Updates

After the constraint assessment event file was approved and throughout the economic needs assessment, SPP staff implemented changes in an effort to capture rating corrections submitted through RMS as well as general event file clean up. Changes from the approved event file include the following:

- Three line rating corrections submitted through RMS
- Removal of duplicate monitored elements
- Added constraints to show up in all five scenarios if topology existed. This did not result in new needs
- Removed events that were being ignored by PROMOD (monitored element = contingent element)
- Added two operational constraints that were not captured in the event file to observe congestion (no congestion was observed)
- The Red Willow to Mingo 345 kV monitored line limits have been corrected to reflect flow in the opposite direction of that approved in the constraint assessment

These changes encompass the full event file that will be used during project screening (E024).

Alternate Event File for Project Screening

As previously noted in this document, heavy congestion and emergency energy have increased PROMOD simulation times beyond what has been previously observed in the ITP. To mitigate the effect of long simulation times, staff plans to screen DPPs and staff solutions against two event files.

The first event file will be the standard event file discussed in the above section (E024). Staff will use this event file to evaluate solutions for the three areas described above. This will allow a proper evaluation of adjusted production cost benefits and congestion shifts for the most heavily congested areas.

The second event file (E025) will modify the E024 event file by relaxing key constraints that are causing emergency energy and heavy congestion or removing events that are not binding. Staff will utilize this event file to evaluate the remaining portion of the system as a way to limit simulation times and calculate more realistic adjusted production cost benefits and B/C ratios. The following facilities ratings have been increased in the alternate event file:

- S1209-S1358 161 kV line increased to 557 MVA
- S1250-S1358 161 kV line increased to 557 MVA
- Finstad-Van Hook 115 kV to 239 MVA
- Robinson Lake-Finstad 115 kV to 239 MVA
- Eastfork-Folvag 115 kV to 239 MVA
- Eastfork-Springbrook 115kV to 415 MVA
- Osborn-Van Hook 115 kV to 239 MVA
- North Williston Tap-North Williston 115 kV to 239 MVA
- North Williston-North Williston East 115 kV to 239 MVA
- Tioga North-Neset 115 kV to 239 MVA
- Ness Gas-Neset to 239 MVA
- Gaines-Oxy West Seminole Tap 115 kV tap 115 kV to 239 MVA
- Roadrunner 345/115 kV transformer increased to 601 MVA
- Lynch Tap-Pearle 115 kV to 239 MVA
- Lea Road-Oil Center 115kV to 239 MVA
- Cooper Ranch-Byrd Tap to 239 MVA

Joint Targeted Interconnection Queue Information

Projects identified by the SPP-MISO Joint Targeted Interconnection Queue (JTIQ) effort have not been included in the topology of any 2024 ITP models. During the completion of the 2024 ITP, SPP will consider whether any of the transmission projects included in the JTIQ portfolio have the potential to address needs identified in the 2024 ITP. SPP may deem a 2024 ITP system need mitigated by one or more projects included in the JTIQ portfolio but will not issue any NTCs through the completion of the 2024 ITP process for any transmission projects being considered for inclusion in the JTIQ portfolio. This consideration of whether transmission projects included in the JTIQ portfolio address system needs being evaluated during the 2024 ITP process may also

prevent other solutions from being issued an NTC to the extent those other solutions address needs that are the same or similar to those being addressed by the JTIQ portfolio. SPP and MISO, with the support of stakeholders, will continue to work toward completing development and implementation of the JTIQ process. The goal is to achieve approval of the process, rates, terms, and conditions framework from FERC and subsequent approval of the JTIQ portfolio and issuance of NTCs by the respective SPP and MISO Boards before the end of 2024.

Auxiliary File Update

Staff posted updated auxiliary files correcting issues identified by stakeholders during the need invalidation window. Staff encourages stakeholders to review these updates prior to submitting DPPs.

Persistent Operational Need Update

On January 16, 2024, the Market and Operations Policy Committee (MOPC) approved Revision Request 577 (RR 577). This revision request added new criterion to support the identification of persistent operational needs. The MOPC approval explicitly identified the updated language would be used in the 2024 ITP Needs Assessment. Needs identified using these criteria can be found in the Operational Voltage Exceedances and Operational Thermal Exceedances tabs.

2023 MPM Needs Assessment Update

During the 2023 ITP, SPP staff and stakeholders decided to implement a pilot effort to shift the MPM build to later in the normal ITP study schedule. By shifting the MPM build, staff and stakeholders increased the amount of time spent on solution development by being able to post the needs assessment earlier. This schedule shift meant the results from the 2023 ITP MPM Needs Assessment would not be posted in the 2023 ITP Needs Assessment, but rather the following 2024 ITP Needs Assessment.

The 2024 ITP Needs Assessment completes the implementation of that pilot program. SPP will post an additional workbook detailing the violations observed in the 2023 MPMs following the 2024 ITP Needs Assessment posting. All violations posted in this additional workbook have been invalidated by SPP staff. Solutions submitted to mitigate needs in the 2024 ITP will not be evaluated against these violations.