2022 ITP Needs Assessment Posting Information

As part of the Integrated Transmission Planning assessment (ITP), 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. In accordance with the reduced 2022 ITP scope, approved by the MOPC in January 2022, SPP will conduct a reliability and short circuit needs assessment only.

DPP Submittal Form Updates

The Detailed Project Proposal (DPP) Submittal form has been updated for 2022. There were no field changes for the 2022 DPP submittal form. The updates were only for study year and reference to software versions. These changes were discussed during the April 5, 2022, Transmission Working Group meeting:

SPP Submittal Form Changes:

- Added '*Reliability Only*' to form name in column E
- ITP Study Year 2021 - updated to 2022
- PSS®E version 34.6.1 IDEV - updated to *34.7 IDEV*
- PROMOD version 11.2.0 XML reference - deleted since this is a reliability only study
- Interface Rating Changes on the Section 4 tab are not applicable to the 2022 ITP

Instructions Changes:

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

SPP uses automation to complete a data verification process and identify situations in which the DPP contains errors associated with the application of files. This process is unable to ensure the correct format/syntax was used. There is a possibility that data using incorrect format/syntax passes 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.

For the 2022 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 34.7

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

SPP staff will evaluate the impacts of model changes submitted during the 2022 ITP DPP window, as appropriate. As noted in the DPP form, please check the box if your submittal includes a model correction. This includes model corrections submitted after the models were approved by either the TWG or ESWG, known Notification to Construct (NTC) projects not included in the approved model set, and modeled NTCs that have been withdrawn or will be withdrawn during the development of transmission portfolios.

- No changes will be made to the current base models to capture the impacts of model changes during initial project screening, specifically:
  - Model corrections should be submitted 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 to be considered a re-evaluation of those existing NTCs

Short Circuit Needs

The 2022 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. Additional TO responses may be received and SPP will post an update to the 2022 ITP Needs Assessment needs list to identify these changes as soon as possible within the DPP window. No new short circuit needs are expected.

NERC TPL-001 P3 Event Needs

In the 2022 ITP, SPP staff experienced a delay in developing the list of NERC TPL-001 P3 event (P3) needs. SPP staff was able to send a first batch of P3s to the applicable Transmission Owners

(TOs) for their confirmation or mitigation prior to the posting of the 2022 ITP needs. P3 thermal overloads from this first batch are located in the worksheet titled "P3 Overload - TO Verified." P3 voltage violations from this first batch are located in the worksheet titled "P3 Voltages - TO Verified."

Due to technical difficulties experienced, the second batch of P3s was not developed in time to provide the TOs adequate response time prior to the opening of the DPP window. In order to provide the applicable TOs the adequate response time, these voltage violations have been included in the worksheet titled "P3 Voltages - Not Yet Reviewed."

In addition to posting the second batch of P3s, SPP staff will reach out to each of the applicable TOs to request their confirmation the need is valid, acceptance of the Optimal Powerflow Mitigation (OPM) or mitigation. Once these TO responses have been received, SPP will post an update to the 2022 ITP Needs Assessment needs list to identify which needs remain. It is anticipated that this update will be posted about 2.5 weeks into the DPP window.

Compared to previous ITP needs assessment postings, SPP shows minimal instances of non-converged contingencies, which are situations in which the powerflow solution is not able to reach convergence within the given parameters after a contingency is taken. This can be the result of a mathematical solution divergence or the case "blowing up." The first expectation to developing quality solutions for these needs is ensuring the model can reach a valid solution. Another expectation for solutions to non-converged contingencies is for the submitter to perform limit checks and/or additional contingency analysis to ensure the solution mitigates the issue and does not result in new violations.

Violations associated with non-converged contingencies are denoted by "Voltage Collapse" in the "Voltage Cont" column in each of the voltage needs worksheets.

Local Planning Criteria violations

The ITP studies include local planning criteria to monitor facilities at a more stringent voltage criteria as well as implement local planning requirements. Attachment O, Section II.5 of the SPP Tariff requires that SPP TOs 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. The local planning criteria potential violations have been 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 *2022 ITP Needs Assessment.xlsx* workbook.[1]

Informational Needs

Various needs have been included for informational purposes only. Please refer to the "Overview" and "Legend" tabs of the *2022 ITP Needs Assessment.xlsx* workbook for identification and additional description of these needs.

Seams Consideration(s)

Seams evaluation in the ITP Assessment will be performed according to details in 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 seams project. Economic projects meeting this criteria 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.

To satisfy the requirement for a 2022 MISO-SPP Coordinated System Plan (CSP) study, as well as progress on initiatives related to the SPP Planning Roadmap, MISO and SPP are developing a Targeted Market Efficiencies Projects (TMEPs) study and will conduct the first study during the 2022 calendar year in lieu of the traditional CSP. SPP and AECI will also coordinate to complete the 2022 SPP-AECI Joint Coordinated System Plan (JCSP).

2022 ITP Staff Solution Development

SPP staff intends to create solution versions of top-performing DPPs based upon Minimum Design Standard Ratings. This removes bias introduced by various submitters utilizing different DPP ratings and impedances while being screened with the same conceptual cost estimate (*e.g.,* 3000 amps vs. 4000 amps). Staff will generally prefer minimum design characteristics unless a measureable 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.

- Existing Facilities
    - Determine most limiting element in series and develop staff solution to address most limiting elements. For example, if line conductor is most limiting then staff solution may either:
        - Achieve minimum amperage

[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.

    - If existing line is already at minimum amperage, then use next minimum amperage (1200 -> 2000 amp 138 kV, 161 kV, and 230 kV)
- New Facilities
    - Develop staff solutions to supplement DPPs as needed
    - Develop 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.

SPP Staff Standard Impedance Solution Development Information

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

Facility Ratings[2]

The minimum amperage capability of phase conductors shall meet or exceed the values shown below, 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.

Voltage (kV)	Emergency Rating (Amps)
100 - 200	**1,200**

[2] Minimum Transmission Design Standards for Competitive Upgrades, Rev.2_012617

Voltage (kV)	Emergency Rating (Amps)
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.

Data used for SPP ITP Staff Solutions

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

Typical Transformer Impedance Table				
kV	**R**	**X**	**Rate A**	**Rate B**
161/115	0.0005	0.00616	168	185
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 same impedance per kV for larger or smaller transformers.

Conceptual Cost Estimates

SPP calculates its own conceptual cost estimates as part of the DPP validation efforts. 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 differences in ratings, therefore staff is likely to prefer a project with a lower rating over a project with a larger rating unless the project with a larger rating performs significantly better overall than the lower rated project.