2020 ITP Needs Assessment Posting Information

DPP Submittal Form Updates

The DPP Submittal form has been updated for 2020, and those updates are itemized below and were also discussed during the March 12 DPP Educational Session:

- PROMOD files should use version 11.1.14
- PSS/E should be version 33.11
- Sequence data is required for all submittals
- Table added in Section 1f1 tab requesting Station Name, Bus Number, Latitude, Longitude
- Hyperlinks to tabs were added to the sections below:
  - 1.f.1 GPS coordinates
  - 2. ITP Need(s) Addressed
  - 3. Proposed Project Schedule
  - 8. Transmission Economic or Reliability Analysis
- Validate DPP Form button for self-validating before submitting in RMS

2020 ITP Needs Assessment

MISO Regional Directional Transfer Target Area

The MISO Regional Directional Transfer (RDT) has been identified as the approved Target Area for the 2020 ITP. SPP staff has included an additional document identified in the 2020 ITP Needs Assessment Transmittal detailing inclusion criteria for a facility being identified as part of the MISO RDT. Solution evaluation is also discussed within the document. Additional stakeholder presentations given during Transmission Working Group and Economic Studies Working Group meetings on the topic have also been included in the transmittal for reference.

Addition of the SPSNMTIES Interface

As discussed during the DPP Educational Session on March 12, SPP staff discovered high levels of economic energy transfers into the southern portion of SPS's system while building the 2020 ITP Market Powerflow Models (MPM). This economic import of energy resulted in the de-commitment of critical conventional generation, leading to major deficiency of reactive support in the area. In many of the individual cases, voltage collapse was observed under system intact conditions.

Staff worked with SPS to develop a method to correct this voltage support deficiency, and determined the addition of the SPSNMTIES interface to the 2020 ITP event files would likely limit the economic transfer of energy into the area, causing the conventional generation in the area to remain online providing necessary voltage support. The SPSNMTIES interface is made up for 4 transmission lines allowingenergy to flow in the north-to-south direction serving one of SPP's load pocket areas. Additional information on the SPSNMTIES interface and how DPP submitters can develop and test solutions to address the expected future congestion can be found in the SPSNMTIES Interface Guidelines and Study Scope. The location of the document can be found in the 2020 ITP Needs Assessment transmittal.

SPPSPSTIES Interface Modeling

During quality control assessments of the updated MPMs, SPP also discovered the SPPSPSTIES interface was defined incorrectly in the event file, which led to implications in the Market Economic Models and Market Powerflow Models. The issue stemmed from an inadvertent switching of the direction of the Tuco-Border 345 kV line. This error is corrected in the updated event file and is included as part of this posting, however, the PROMOD runs used to generate the economic dispatch for each of the five economic scenarios do not have this issue corrected. Out of the 10 MPMs built for the 2020 ITP, only the F2 Year 5 and 10 summer peak MPM were found with an economic transfer of energy surpassing the limit of the interface. Because of the limited effect of this error, SPP staff has determined that this issue is best addressed during solution development.

Process for Reclassification and Invalidation of Market Powerflow Model Needs

As SPP continued its evolution of the Market Powerflow Model build, SPP staff has carefully assessed criteria violations identified by contingency analysis of these powerflow models. Staff has previously communicated that these models do not automatically reflect a reliability violation, and additional consideration of these violations may be necessary.

Section 4.2 of the ITP Manual states that thermal violations in the Market Powerflow Models may be reclassified as an economic need if the violation did not meet the initial constraint assessment criteria to be defined as a constraint or is related to a defined constraint in the economic model in order to properly evaluate system needs. This additional consideration may result in SPP reclassifying the market powerflow violations

as an economic issue by including it as a constraint in the approved event file to determine if any congestion results. Review of MPM violations meeting this criteria is underway and further review will continue, as necessary during the Solution Evaluation milestone. Stakeholders will be notified via email or the SPP website if additional need reclassifications are identified.

Additionally, Section 4.2.5 of the ITP Manual provides guidance that thermal violations in the Market Powerflow Models may be invalidated as a reliability need if it is found to be equivalent or related to an economic constraint. The invalidation will ensure that a cost-beneficial solution is available based upon economic analysis. Violations meeting this criteria will continue, as necessary, during the Solution Evaluation milestone.

Refer to the 'Legend' tab in the "2020 ITP Needs Assessment.xlsx" workbook to determine which needs may have met these criteria.

Informational Needs

Various needs have been included for informational purposes only. Please refer to the 'Overview' and 'Legend' tabs of the "2020 ITP Needs Assessment.xlsx" workbook for identification and additional description of these needs.

Short Circuit Needs

The 2020 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.

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

SPP staff will evaluate the impacts of model changes submitted during the 2020 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, specifically:
  - 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.

Event File Changes During Economic Portfolio Development

During the Economic Portfolio Development milestone, it may be necessary to add additional constraints to the event file to identify upstream and/or downstream congestion. Staff will make these determinations, however suggestions for these additional constraints may be included as part of a DPP submittal.

Correlation of Need Types for Solution Development

Reliability, Economic, and Operational Needs have been correlated in order to identify overlap and additional opportunities for synergy of projects. During the Project Screening milestone, all solutions will be evaluated to determine their ability to provide relief or mitigate each economic and reliability need, as applicable[1]. As discussed during the March 12 DPP Educational Session, SPP staff does not plan to evaluate highly complex DPP submittals consisting of varying combinations of projects. Instead, SPP staff will ensure the individual components of these highly complex portfolios are evaluated. Paired solutions that work well together by addressing related needs or upstream/downstream congestion are encouraged to be submitted by stakeholders for consideration.

The evaluation all solutions will provide information which can be leveraged in the Grouping and Optimization milestones to aid in determining whether a reliability or economic solution addressing similar needs should be selected. During this effort, the Avoided Reliability Benefit Metric (discussed in the Benefits Metric Manual) will be calculated and may considered as a supplement to the adjusted production cost savings benefit metric of an economic project that can successfully and appropriately avoid or

[1] Solutions providing only reactive support cannot be evaluated in economic analysis because the economic tool does not consider reactive flows

defer a base reliability project. This effort will attempt to introduce the Avoided Reliability Benefit Metric[2] to the decision making process of project and portfolio recommendations and, while SPP staff is still investigating and vetting this approach with the appropriate stakeholder groups, it should be considered when developing solutions to the 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 adjusted production cost 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. Please consider this information in your solution development.

The 2020 ITP needs assessment has identified multiple constraints along SPP's seams for inclusion in the SPP-MISO CSP. Some of these constraints are equivalent or related to constraints on SPP's neighboring transmissions systems. In an effort to accurately evaluate these constraints, SPP is coordinating with adjacent entities to develop potential seams solutions that may provide benefit to both SPP and the adjacent entity. These SPP constraints are included in the needs assessment and will be evaluated through the 2020 ITP, and the SPP-MISO Coordinated System Plan (CSP). Some of these seams issues are also directly related to the approved Target Area mentioned above.

The SPP-MISO CSP will evaluate needs identified in this SPP 2020 ITP and MISO's 2020 MTEP. The SPP-MISO CSP issues list will be comprised of SPP and MISO regional needs with potential to benefit from an SPP-MISO Interregional Project. These issues were presented at the SPP-MISO IPSAC meeting on March 10, 2020.

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

[2] Currently, the adjusted production cost is the only metric used in the decision making process with regards to project recommendations or consolidation.

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 MDWG Manual by kV level

Phase Conductors[3]

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
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 7.2.; however, the RFP will specify the design wind speed and direction.

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

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
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.

General Staff Solution Development and Evaluation

Staff solution versions of top-performing DPPs were created and utilized for economic portfolio development in the 2019 ITP. Staff solutions were 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. 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
        - 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 Detailed Project Proposals (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.

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. A spreadsheet containing these estimates is reference in the Needs Assessment transmittal.