SPP 2013 TPL Compliance Report

12/18/2013

Approved by Transmission Working Group: 12/18/2013

Southwest Power Pool

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Executive Summary

To support SPP's compliance, as the Planning Coordinator, with NERC TPL-001-0, TPL-002-0, TPL-003-0, and TPL-004-0 Reliability Standards, the objective of this document is to report findings from the 2013 Compliance Assessment process.

The goals of this assessment are:

1. To identify overloaded branches/transformers (>100% of rate A) under normal conditions. (NERC Category A)
2. To identify potential branch/transformer violations (>100% of rate B) due to the loss of a single element. (NERC Category B)
3. To identify potential branch/transformer violations (>100% of rate B) due to the loss of two elements. (NERC Category C)
4. To identify potential branch/transformer violations (>100% of rate B) due to extreme events. (NERC Category D)
5. To identify voltage performance (0.95 pu - 1.05 pu)[1] under normal conditions. (NERC Category A)
6. To identify potential voltage violations (0.9 pu – 1.05 pu)[1] due to the loss of a single element. (NERC Category B)
7. To identify potential voltage violations (0.9 pu – 1.05 pu) [1] due to the loss of two elements. (NERC Category C)
8. To identify potential voltage violations (0.9 pu – 1.05 pu) [1] due to extreme events. NERC Category D)
9. To identify potential transient stability violations under normal conditions. (NERC Category A)
10. To identify potential transient stability violations due to the loss of a single element. (NERC Category B)
11. To identify potential transient stability violations due to the loss of two elements. (NERC Category C)
12. To identify potential transient stability violations due to extreme events. (NERC Category D)

To support SPP's compliance, as the Planning Coordinator, with the NERC FAC-014-2.1 Reliability Standard, the objective of this document is to ensure that System Operating Limits (SOLs) used in the reliable planning and operation of the Bulk Electric System (BES) are determined based on an established methodology in section 12.3.2 of the SPP Criteria.[2]

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[1] Local requirements for individual Entity apply in some cases.
[2] SPP Criteria

All System Operating Limits (SOLs) that were identified in the TPL assessment were mitigated by operating procedures or transmission projects developed or approved by SPP entities and staff. Therefore, there were no Interconnection Reliability Operating Limits (IROLs) for the planning horizon.

Entities Involved

The following entities registered with the SPP Regional Entity were included in these studies.

Entity Name	Registered Function
Arkansas Electric Cooperative Corporation (AECC)	DP,GOP,GO,LSE,PSE,RP,TO
American Electric Power (AEPW)	BA,DP,GOP,GO,LSE,PSE,RP,TOP,TO,TP
East Texas Electric Cooperative (ETEC)	DP,GO,LSE,PSE,RP,TO,TP
Tex-La Electric Cooperative of Texas, Inc (TEXL)	DP,LSE,PSE,RP,TO,TP
Board of Public Utilities (BPU)	BA,DP,GOP,GO,LSE,PSE,RP,TOP,TO,TP
City Utilities of Springfield, MO (SPRM)	BA,DP,GOP,GO,LSE,RP,TOP,TO,TP
Cleco Corporation (CLECO)	BA,DP,GOP,GO,LSE,PSE,RP,TOP,TO,TP,TSP
Grand River Dam Authority (GRDA)	BA,DP,GOP,GO,LSE,PSE,RP,TOP,TO,TP
Independence Power & Light (INDN)	BA,DP,GOP,GO,LSE,PSE,RP,TOP,TO,TP
ITC Great Plains, LLC (ITCGP)	TOP,TO
Kansas City Power & Light Company (KCPL)	BA,DP,GOP,GO,LSE,PSE,RP,TOP,TO,TP
KCPL - Greater Missouri Operations (KCPL-GMO)	BA,LSE,PSE
Lafayette Utilities System (LAFA)	BA,DP,GOP,GO,LSE,PSE,TOP,TO,TP
Louisiana Energy & Power Authority (LEPA)	BA
Lincoln Electric System (LES)*	BA,DP,GOP,GO,LSE,PSE,RP,TOP,TO,TP
Midwest Energy, Inc (MIDW)	DP,LSE,PSE,TOP,TO,TP
Nebraska Public Power District (NPPD)*	BA,DP,GOP,GO,LSE,PSE,RP,TOP,TO,TP,TSP
Oklahoma Gas & Electric Company (OKGE)	BA,DP,GOP,GO,LSE,PSE,RP,TOP,TO,TP
Oklahoma Municipal Power Authority (OMPA)	DP,LSE,PSE,RP
Omaha Public Power District (OPPD)*	BA,DP,GOP,GO,LSE,PSE,RP,TOP,TO,TP
Southwestern Power Administration (SWPA)	BA,PSE,RP,TOP,TO,TP,TSP
Southwestern Public Service Company (SPS)	BA,DP,GOP,GO,LSE,PSE,RP,TOP,TO,TP
Sunflower Electric Power Corporation (SECI)	BA,DP,GOP,GO,LSE,PSE,RP,TOP,TO,TP
The Empire District Electric Company (EDE)	BA,DP,GOP,GO,LSE,PSE,RP,TOP,TO,TP
Westar Energy, Inc (WR)	BA,DP,GOP,GO,LSE,PSE,RP,TOP,TO,TP
Western Farmers Electric Cooperative (WFEC)	BA,DP,GOP,GO,LSE,PSE,RP,TOP,TO,TP

BA : Balancing Authority
DP : Distribution Provider
GOP: Generator Operator
GO: Generation Owner

LSE: Load Serving Entity
PSE: Purchasing-Selling Entity
RP: Resource Planner
TOP: Transmission Operator

TO: Transmission Owner
TSP: Transmission Service Provider
TP: Transmission Planner

*Midwest Reliability Organization (MRO) is the current Regional Entity for these entities.

Assessments

SPP staff has conducted various analyses to comply with NERC TPL standard requirements and are summarized here.

NERC TPL Standard	Key Requirement	SPP Analysis
TPL-001-0	Category A	SPP MDWG models, ITP Assessments
TPL-002-0	Category B	Steady State Mitigation Analysis, Stability Analysis, ITP Assessments
TPL-003-0	Category C	Select N-2 and N-3 Steady State Analysis, Stability Analysis
TPL-004-0	Category D	Extreme Events, Stability Analysis

Each of these analyses is discussed below.

Integrated Transmission Planning Near-Term Assessment (TPL-001 through TPL-002)

The 2014 Integrated Transmission Planning Near-Term Assessment (ITPNT) was completed in 2013 that compliments the 2013 TPL Steady State analysis. The 2014 ITPNT analysis was conducted to create a reliable transmission expansion plan for the SPP footprint through year 2019 and protect long-term firm transmission service. This steady-state assessment reviewed normal conditions (no contingency) and single contingency outage (N-1) scenarios using NERC Reliability Standards, SPP Criteria, and local planning criteria. It also coordinated appropriate mitigation plans to meet the SPP region's reliability needs. The powerflow cases used in this analysis were created from the SPP 2013 MDWG Build 1 Model Series. The generation dispatch in these cases was similar to that in the MDWG cases with exception of excluding generation without Transmission Service; the generation was also dispatched in another scenario to account for all long-term firm transmission service.

The 2014 ITPNT report is summarized in the 2014 SPP Transmission Expansion Plan (STEP) report. The planned system upgrades will be tracked to ensure reliability projects are built in time to meet system needs. The timing of the upgrades is individually listed and discussed as a whole in the 2014 STEP Report[3] (in the report's Appendix A).

[3] 2014 STEP Report

MDWG Models

Power flow and stability models are developed by the Model Development Working Group (MDWG) for an annual series of SPP cases.

In April 2013, SPP finalized 16 power flow models in coordination with SPP members through the MDWG. This set of models goes through a validation process in several iterations until all models meet requirements as stated in the SPP MDWG Procedure Manual.[4]

In September 2013, SPP finalized 9 stability models in coordination with SPP members through the MDWG. This set of models goes through a validation process such that all models meet requirements as stated in the SPP MDWG Procedure Manual.

The 2013 SPP MDWG models reflect system conditions, for selected years between years 2013 and 2024. These models are updated to reflect the most up-to-date information using the Model On Demand (MOD) program. The SPP 2013 Series MDWG Build 1 Final Powerflow and Dynamic Stability Models used for the compliance assessment have no instances of thermal overloads, voltage violations, or transient instability under N-0, or normal system conditions that were not mitigated by SPP entities and staff.

Steady State Study (TPL-001 through TPL-004)

Models and Simulation

SPP used the models in Table 1 for the TPL-001, TPL-002, TPL-003, and TPL-004 steady state analyses.

[4] SPP MDWG Procedure Manual

Model Scope	Seasonal Assessment	Model Used	Model Released	Assessment Completed
Near-Term	2014 Summer Peak	2013MDWG_FINAL-14S_May2	April 2013	December 2013
Near-Term	2014 Fall	2013MDWG_FINAL-14F_May	April 2013	December 2013
Near-Term	2014 Winter	2013MDWG_FINAL-14W_May	April 2013	December 2013
Near-Term	2015 Spring	2013MDWG_FINAL-15G_May	April 2013	December 2013
Near-Term	2015 Summer Peak	2013MDWG_FINAL-15S_May	April 2013	December 2013
Near-Term	2019 Summer Peak	2013MDWG_FINAL-19S_May	April 2013	December 2013
Longer- Term	2024 Summer Peak	2013MDWG_FINAL-24S_May	April 2013	December 2013
Longer- Term	2024 Winter	2013MDWG_FINAL-24W_May	April 2013	December 2013

Table 1: Models Used for Assessment

Physical and Operational Margins (POM) software was used to screen not only the Category B, C, and D lists developed by SPP engineering staff and by member entities but to also run automatically selected (N-k) contingency analysis based on the selection criteria below. Power System Simulation for Engineering (PSS/E) was used as a supplementary tool for analysis and verification.

The complex elements considered for system evaluation under Category B were compiled by SPP-RTO with input from stakeholders and member entities. Additional automatically selected (N-1) elements were selected according to base voltage as shown in Table 2.

Element	Base kV (low side of transformers)	Source
Complex elements	---	SPP Staff and Member Entities
Branch	100 kV and above	Software Selection
Generator	All	Software Selection
Transformer	100 kV and above	Software Selection

Table 2: N-1 Elements Selected

The complex elements considered for system evaluation under Category C and D were compiled by SPP-RTO with input from stakeholders and member entities. Additionally, the automatically selected (N-1) elements studied for TPL-002-0 were paired to form automatically selected (N-2) contingencies for the TPL assessment. Pairs of automatically selected (N-1) elements were chosen according to Table 3.

Element	Selection Rule	Source
Complex elements	---	SPP Staff and Member Entities
Branch-Branch*	Same Zone	Software Selection
Generator-Branch*	Same Area	Software Selection
Generator-Generator	All	Software Selection

*Branch represents both branch and transformer elements

Table 3: N-2 Elements Selected

Steady State: TPL-001 Assessment (Category A)

Table 4 shows a summary of potential violations analyzed under Category A, or system intact, conditions. These numbers include the potential violations which were mitigated by SPP members and SPP engineering staff. SPP verified the mitigations were effective to relieve violations.

Season	High Voltage	Low Voltage	Thermal Overloads	Total	Mitigated Findings	Remaining Violations
2014 Summer	0	0	0	0	0	0
2014 Fall	0	0	0	0	0	0
2014 Winter	0	0	0	0	0	0
2015 Spring	0	0	0	0	0	0
2015 Summer	0	1	0	1	1	0
2019 Summer	0	1	0	0	0	0
2024 Summer	0	2	3	5	5	0
2024 Winter	0	6	0	6	6	0

Table 4: TPL-001 Potential Violations by Season

Steady State: TPL-002 Assessment (N-1)

A summary of potential violations found using the Category B complex element assessment list and the automatically selected N-1 list by POM is presented in the table below. SPP members and SPP engineering staff provided mitigation for all these violations.

Season	High Voltage	Low Voltage	Thermal Overloads	Total	Mitigated Findings	Remaining Violations
2014 Summer	141	67	39	247	247	0
2014 Fall	118	25	3	146	146	0
2014 Winter	151	55	5	211	211	0
2015 Spring	122	22	6	150	150	0
2015 Summer	109	40	23	172	172	0
2019 Summer	63	103	133	299	299	0
2024 Summer	68	93	153	314	314	0
2024 Winter	53	198	18	269	269	0

Table 5: TPL-002 Steady State Potential Violations

Steady State: TPL-003 Assessment (N-2)

A summary of potential violations found using the Category C complex element assessment list and the automatically selected N-2 list by POM is presented in the table below. These numbers include the violations which were mitigated by SPP members in addition to the violations which were automatically mitigated by Optimal Mitigation Measures (OPM), which is a tool used to automatically apply mitigation techniques based on operating measures handled by SPP Operations in real-time, and verified by the SPP members.

Season	High Voltage	Low Voltage	Thermal Overloads	Total	Mitigated Findings	Remaining Violations
2014 Summer	643	2914	1978	5535	5535	0
2014 Fall	1045	1532	356	2933	2933	0
2014 Winter	1269	2343	430	4042	4042	0
2015 Spring	1004	1085	417	2506	2506	0
2015 Summer	894	3062	1782	5738	5738	0
2019 Summer	416	3127	2881	6424	6424	0
2024 Summer	394	3290	3280	6964	6964	0
2024 Winter	776	3322	661	4759	4759	0

Table 6: TPL-003 Steady State Potential Violations

Steady State: TPL-004 Assessment (Extreme Events)

A summary of potential violations found using the D complex element assessment list is presented in the table below. These numbers include the violations which were provided to SPP members in addition to the violations which were automatically mitigated by Optimal Mitigation Measures (OPM), which is a tool used to automatically apply mitigation techniques based on operating measures handled by SPP Operations in real-time, and verified by the SPP members. It should be noted that Category D events are only for assessment purposes and do not require mitigation.

Season	High Voltage	Low Voltage	Thermal Overloads	Total
2014 Summer	11	115	64	190
2014 Fall	133	52	20	205
2014 Winter	92	30	16	138
2015 Spring	28	42	28	98
2015 Summer	12	128	48	188
2019 Summer	10	74	93	177
2024 Summer	12	87	104	203
2024 Winter	45	19	23	87

Table 7: TPL-004 Steady State Potential Violations

Steady State: Summary

The MDWG models developed by SPP and member entities represent the power system for the SPP footprint. The potential violations presented in this report were mitigated by operating procedures, capital projects or modeling corrections determined by SPP entities and staff. Complex element lists were developed by SPP and entities to simulate selected Category B, C, and D events. These events were simulated by SPP along with Automatically Selected (N-k) contingency lists. All potential Category A, B and C violations found by SPP assessments were mitigated by operating procedures developed or approved by SPP entities and staff, and all potential Category D violations were evaluated and reviewed by SPP entities and staff.

A summary of potential violations organized by Model Area is presented in Table 6.

Member	Area Number	Automatically Selected	Category B	Category C	Category D	Total	Mitigated Findings	Remaining Violations
Cleco Corporation	502	1042	2	2	1	1047	1047	0
Lafayette Utilities System	503	12	0	0	0	12	12	0
Louisiana Energy & Power Authority	504	118	16	0	0	134	134	0
Southwestern Power Administration	515	252	4	1	0	257	257	0
American Electric Power	520	7951	88	181	44	8264	8264	0
Grand River Dam Authority	523	128	0	38	15	181	181	0
Oklahoma Gas & Electric Company	524	2197	5	176	17	2395	2395	0
Western Farmers Electric Cooperative	525	193	0	5	0	198	198	0
Southwestern Public Service Company	526	8284	35	19	0	8338	8338	0
Oklahoma Municipal Power Authority	527	79	0	0	0	79	79	0

Member	Area Number	Automatically Selected	Category B	Category C	Category D	Total	Mitigated Findings	Remaining Violations
Midwest Energy, Inc.	531	726	0	3	32	761	761	0
Sunflower Electric Power Corporation	534	3858	9	11	146	4024	4024	0
Westar Energy, Inc.	536	3658	5	315	418	4396	4396	0
KCPL - Greater Missouri Operations	540	577	0	9	6	592	592	0
Kansas City Power & Light Company	541	1043	0	16	39	1098	1098	0
Board of Public Utilities Kansas City	542	4	0	0	0	4	4	0
The Empire District Electric Company	544	325	0	2	0	327	327	0
Independence Power and Light	545	26	0	11	2	39	39	0
City Utilities of Springfield, MO	546	16	0	2	0	18	18	0
Nebraska Public Power District	640	8057	228	355	484	9124	9124	0

Member	Area Number	Automatically Selected	Category B	Category C	Category D	Total	Mitigated Findings	Remaining Violations
Omaha Public Power District	645	195	0	29	76	300	300	0
Lincoln Electric System	650	1	0	0	0	1	1	0

Table 7: Potential Violation Totals by Model Area

Stability Study (TPL-001 through TPL-004)

The MDWG 2013 Series 2014 Light Load and 2019 Summer Peak dynamic models were tested to be stable during normal system conditions.

The Stability Study was conducted for one seasonal light load model, the 2014 Light Load, within the near-term planning window and selected events for one seasonal peak load model, the 2019 Summer Peak, for the longer-term planning window. This assessment provides findings on potential events which could lead to instability within the SPP footprint for all member-submitted Categories (A, B, C and D) of events. A list of 38 NERC Category B, C, and D events was simulated in this assessment. These events were submitted by SPP members and include reliability type contingencies and tower outages (events) to analyze for powerflow and stability performance. Additionally SPP staff used the Fast Fault Screening tool to analyze performance of the system.

The Fast Fault Screening (FFS) tool in the POM-TS application screens potential transmission fault locations for grid stability analysis and quickly identifies the most severe locations and ranks them in the order of severity. The tool begins by identifying the most severe fault locations within the entire SPP footprint based on the most recent MDWG models (above 100kV). The tool identifies buses which are considered relative weak points in the system. Faults at each of the identified locations are then ranked according to severity using a Ranking Index (RI) for category B, C, and D contingencies. The fault severity is classified as:

- Most severe are the faults that lead to steady-state stability violation (e.g., post-fault regime does not exist);
- The next level of severity are faults leading to large loss of generation;
- The rest of the locations are ranked based on the Ranking Index.

Once the RI is known, the critical clearing time (CCT) is computed. The Critical Clearing Time is the maximum time during which a disturbance can be applied without the system losing its transient stability (e.g., difference between post-fault and pre-fault rotor angle exceeds 180 degrees).

Transient stability analysis was performed on ranked contingencies having a steady state stability violation, a loss of generation, or a critical clearing time of 9 cycles or using PTI's PSS/E Dynamics Package and the PSSPLT Plotting Package. Generator rotor speed, rotor angle, real power, and reactive power output were monitored for all SPP generators. Those generators exhibiting rotor speed and angle instability were marked for further analysis. This analysis consisted of determining and correcting the cause of instability and is further detailed in Appendix B of this report.
Some events necessitated a change in generation differing from that amount in the powerflow models. In such cases, an offset amount was included to balance generation prior to event simulation.

Attachment 1- Project List

The list of all upgrades, details, and in-service dates can be found in Appendix A of the annual SPP Transmission Expansion Plan (STEP) report:

SPP.org> Engineering>Transmission Planning.

Attachment 2 – TPL-001 Compliance Statement

R1. The Planning Authority and Transmission Planner shall each demonstrate through a valid assessment that its portion of the interconnected transmission system is planned such that, with all transmission facilities in service and with normal (pre-contingency) operating procedures in effect, the Network can be operated to supply projected customer demands and projected Firm (non-recallable reserved) Transmission Services at all Demand levels over the range of forecast system demands, under the conditions defined in Category A of Table I. To be considered valid, the Planning Authority and Transmission Planner assessments shall:

The Southwest Power Pool (SPP) MDWG models used for the TPL Compliance Assessment were validated in compliance with current SPP Criteria under Criteria 3.3.3 and were documented in ***Criteria 3.3.3 – 2013 Summer.***[5] *SPP has demonstrated with the* ***2013 TPL Compliance Assessment*** *that its portion of the interconnected transmission system has been planned as documented in the 2014 SPP Transmission Expansion Plan such that, with all transmission facilities in service and with normal (pre-contingency) operating procedures in effect, the Network can be operated to supply projected customer demands and projected Firm (non- recallable reserved) Transmission Services at all demand levels over the range of forecast system demands, under the conditions defined in Category A.*

R1.1. Be made annually.

The MDWG models used for the TPL Compliance Assessment are developed annually. The MDWG models used for this assessment are the ***MDWG 2013 Build releases****. The TPL Compliance Assessment is conducted annually. The previous iteration of the TPL Compliance Assessment was reported in comprehensive* ***SPP 2012 TPL Compliance Report***[6]*.*

R1.2. Be conducted for near-term (years one through five) and longer-term (years six through ten) planning horizons.

The MDWG powerflow models for seasons ***2014 Summer, 2014 Fall, 2014 Winter, 2015 Spring, 2015 Summer, and 2019 Summer*** *were used as the basis for the near-term (years one through five) and MDWG models for seasons* ***2024 Summer and 2024 Winter*** *were used as the basis for longer-term (years six through ten) for the TPL Compliance Assessment. The MDWG dynamic stability model for* ***2014 Light Load*** *was used as the basis for the near-term (years one through five) and MDWG model for* ***2019 Summer*** *was used as the basis for longer-term (years six through ten) for the TPL Compliance Assessment. The assessment uses MDWG models as outlined in the table below. The timing of needed transmission project upgrades for years in between those explicitly assessed was identified as part of SPP's Attachment O planning process such that the projects will be in service prior to the date needed to resolve the issue.*

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[5] SPP Criteria 3.3.3 – 2013 Summer
[6] SPP 2012 TPL Compliance Report

Powerflow Models

Model Scope	Seasonal Assessment	Model Used	Model Released	Assessment Completed
Near-Term	2014 Summer Peak	2013MDWGB1_FINAL-14S_May2	April 2013	December 2013
Near-Term	2014 Fall	2013MDWGB1_FINAL-14F_May	April 2013	December 2013
Near-Term	2014 Winter	2013MDWGB1_FINAL-14W_May	April 2013	December 2013
Near-Term	2015 Spring	2013MDWGB1_FINAL-15G_May	April 2013	December 2013
Near-Term	2015 Summer Peak	2013MDWGB1_FINAL-15S_May	April 2013	December 2013
Near-Term	2019 Summer Peak	2013MDWGB1_FINAL-19S_May	April 2013	December 2013
Model Scope	Seasonal Assessment	Model Used	Model Released	Assessment Completed
Longer-Term	2024 Summer Peak	2013MDWGB1_FINAL-24S_May	April 2013	December 2013
Longer-Term	2024 Winter	201MDWGB1_FINAL-24W_May	April 2013	December 2013

Dynamic Stability Models

Model Scope	Seasonal Assessment	Model Used	Model Released	Assessment Completed
Near-Term	2014 Light Load	2013MDWGB1_FINAL_14L_R2_DS_RED	September 2013	December 2013
Model Scope	Seasonal Assessment	Model Used	Model Released	Assessment Completed
Longer-Term	2019 Summer Peak	2013MDWGB1_FINAL_19S_R2_DS_RED	September 2013	December 2013

R1.3. Be supported by a current or past study and/or system simulation testing that addresses each of the following categories, showing system performance following Category A of Table 1 (no contingencies). The specific elements selected (from each of the following categories) shall be acceptable to the associated Regional Reliability Organization(s).

This 2013 TPL Compliance Assessment includes current system simulations that address each of the required categories and also used the 2014 Integrated Transmission Planning Near-Term and the 2012 Integrated Transmission Planning 10-Year Assessments.

R1.3.1. Cover critical system conditions and study years as deemed appropriate by the entity performing the study.

This assessment uses MDWG models including system conditions for all BA's within the SPP footprint as well as BA's connecting directly to them. These parameters are deemed to be appropriate by SPP engineering staff and members. The MDWG powerflow models for seasons ***2014 Summer, 2014 Fall, 2014 Winter, 2015 Spring, 2015 Summer, and 2019 Summer*** *were used as the basis for the near-term (years one through five) and MDWG models for seasons* ***2024 Summer and 2024 Winter*** *were used as the basis for longer-term (years six through ten) for the TPL Compliance Assessment. The MDWG dynamic stability model for* ***2014 Light Load*** *was used as the basis for the near-term (years one through five) and MDWG model for* ***2019 Summer*** *was used as the basis for longer-term (years six through ten) for the TPL Compliance Assessment. The assessment uses MDWG models as outlined in the table in R1.2.*

R1.3.2. Be conducted annually unless changes to system conditions do not warrant such analyses.

The MDWG models used for the TPL Compliance Assessment are developed annually. The MDWG models used for this assessment are the MDWG ***2013 Build 1*** *release. The continual change and improvement in system conditions warrant this* ***2013*** *assessment.*

R1.3.3. Be conducted beyond the five-year horizon only as needed to address identified marginal conditions that may have longer lead-time solutions.

It was deemed by SPP engineering staff and members that MDWG powerflow models for seasons ***2024 Summer and 2024 Winter*** *and dynamic stability model for season* ***2019 Summer*** *were necessary. These models will be sufficient to address and identify longer lead-time solutions for the transmission projects that are examined as mitigation plans to address potential violations.*

R1.3.4. Have established normal (pre-contingency) operating procedures in place.

The MDWG models and software used by SPP incorporate established normal, pre-contingency operating procedures (MVAR dispatch, transformer tap-adjustment, phase-shifter angle regulation, capacitor/reactor switching, MW dispatch, etc) as parts of the power flow solution.

R1.3.5. Have all projected firm transfers modeled.

*The assessment uses the transfers projected by **SPP-2013-MDWG-Data Submittal Forms Master 4/13/2012** submitted by SPP members **Aug 2011 - April 2012**. This data is incorporated in the MDWG models.*

R1.3.6. Be performed for selected demand levels over the range of forecast system demands.

These assessments were performed over the range of seasonal demand levels as reported in the seasonal assessment table in R1.2.

R1.3.7. Demonstrate that system performance meets Table 1 for Category A (no contingencies).

The assessments demonstrate that system performance meets Table 1 for Category A.
The MDWG models used include planned upgrades. All violations that occurred in models with no contingencies (N-0) were mitigated by SPP entities and staff, meaning the planned upgrades meet the performance requirements of Category A.

R1.3.8. Include existing and planned facilities.

The MDWG models used include all existing and planned facilities for the term modeled.

R1.3.9. Include Reactive Power resources to ensure that adequate reactive resources are available to meet system performance.

The MDWG models used include reactive power resources. The analysis performed ensures that adequate reactive power is available to meet system performance requirements.

R1.4. Address any planned upgrades needed to meet the performance requirements of Category A.

The MDWG models used include planned upgrades. All violations that occurred in models with no contingencies (N-0) were mitigated by SPP entities and staff, meaning the planned upgrades meet the performance requirements of Category A.

R2. When system simulations indicate an inability of the systems to respond as prescribed in Reliability Standard TPL-001-0_R1, the Planning Authority and Transmission Planner shall each:

R2.1. Provide a written summary of its plans to achieve the required system performance as described above throughout the planning horizon.

*A continually-updated, written summary of SPP's 10-year and beyond plans to achieve the required system performance is maintained and provided by SPP. This summary, the 2014SPP Transmission Expansion Plan, includes projects planned from summer **2014 through winter 2024.** These dates cover and exceed the planning horizon.*

R2.1.1. Including a schedule for implementation.

A continually-updated, written summary of SPP's 10-year and beyond plans to achieve the required system performance is maintained and provided by SPP. This summary, the 2014 SPP Transmission

Expansion Plan, includes projects planned from summer ***2014 through winter 2024****. This document includes the schedule on which the projects are implemented.*

R2.1.2. Including a discussion of expected required in-service dates of facilities.

A continually-updated, written summary of SPP's 10-year plans and beyond to achieve the required system performance is maintained and provided by SPP. This summary, the 2014 SPP Transmission Expansion Plan, includes projects planned from summer ***2014 through winter 2024****. This document includes the in-service dates on which the projects are implemented.*

R2.1.3. Consider lead times necessary to implement plans.

A continually-updated, written summary of SPP's 10-year plans and beyond to achieve the required system performance is maintained and provided by SPP. This summary, the 2014 SPP Transmission Expansion Plan, includes projects planned from summer ***2014 through winter 2024****. The dates on which the projects are implemented reflect lead-times necessary for members to implement plans.*

R2.2. Review, in subsequent annual assessments, (where sufficient lead time exists), the continuing need for identified system facilities. Detailed implementation plans are not needed.

A continually-updated, written summary of SPP's 10-year plans and beyond to achieve the required system performance is maintained and provided by SPP. This summary, the 2014 SPP Transmission Expansion Plan, includes projects planned from summer ***2014 through winter 2024****. The dates on which the projects are implemented reflect lead-times necessary for members to implement plans.*

R3. The Planning Authority and Transmission Planner shall each document the results of these reliability assessments and corrective plans and shall annually provide these to its respective NERC Regional Reliability Organization(s), as required by the Regional Reliability Organization.

SPP has documented the results of this reliability assessment and its corrective plans and the results were provided to its NERC RRO as required.

Attachment 3 – TPL-002 Compliance Statement

R1. The Planning Authority and Transmission Planner shall each demonstrate through a valid assessment that its portion of the interconnected transmission system is planned such that the Network can be operated to supply projected customer demands and projected Firm (non-recallable reserved) Transmission Services, at all demand levels over the range of forecast system demands, under the contingency conditions as defined in Category B of Table I. To be valid, the Planning Authority and Transmission Planner assessments shall:

*The Southwest Power Pool (SPP) MDWG models used for the TPL Compliance Assessment were validated in compliance with current SPP Criteria under Criteria 3.3.3 and were documented in **Criteria 3.3.3 – 2013 Summer**[7]. SPP has demonstrated with its **2013** TPL Compliance Assessment that its portion of the interconnected transmission system has been planned as documented in the 2014 SPP Transmission Expansion Plan such that the Network can be operated to supply projected customer demands and projected Firm (non-recallable reserved) Transmission Services, at all demand levels over the range of forecast system demands, under the contingency conditions as defined in Category B.*

R1.1. Be made annually.

*The MDWG models used for the TPL Compliance Assessment are developed annually. The MDWG models used for this assessment are the **MDWG 2013 Build releases**. The TPL Compliance Assessment is conducted annually. The previous iteration of the TPL Compliance Assessment was reported in comprehensive **SPP 2012 TPL Compliance Report**[7].*

R1.2. Be conducted for near-term (years one through five) and longer-term (years six through ten) planning horizons.

*The MDWG powerflow models for seasons **2014 Summer, 2014 Fall, 2014 Winter, 2015 Spring, 2015 Summer, and 2019 Summer** were used as the basis for the near-term (years one through five) and MDWG models for seasons **2024 Summer and 2024 Winter** were used as the basis for longer-term (years six through ten) for the TPL Compliance Assessment. The MDWG dynamic stability model for **2014 Light Load** was used as the basis for the near-term (years one through five) and MDWG model for **2019 Summer** was used as the basis for longer-term (years six through ten) for the TPL Compliance Assessment. The assessment uses MDWG models as outlined in the table below. The timing of needed transmission project upgrades for years in between those explicitly assessed was identified as part of SPP's Attachment O planning process such that the projects will be in service prior to the date needed to resolve the issue.*

[7] SPP 2012 TPL Compliance Report

Powerflow Models

Model Scope	Seasonal Assessment	Model Used	Model Released	Assessment Completed
Near-Term	2014 Summer Peak	2013MDWGB1_FINAL-14S_May2	April 2013	December 2013
Near-Term	2014 Fall	2013MDWGB1_FINAL-14F_May	April 2013	December 2013
Near-Term	2014 Winter	2013MDWGB1_FINAL-14W_May	April 2013	December 2013
Near-Term	2015 Spring	2013MDWGB1_FINAL-15G_May	April 2013	December 2013
Near-Term	2015 Summer Peak	2013MDWGB1_FINAL-15S_May	April 2013	December 2013
Near-Term	2019 Summer Peak	2013MDWGB1_FINAL-19S_May	April 2013	December 2013
Model Scope	Seasonal Assessment	Model Used	Model Released	Assessment Completed
Longer-Term	2024 Summer Peak	2013MDWGB1_FINAL-24S_May	April 2013	December 2013
Longer-Term	2024 Winter	201MDWGB1_FINAL-24W_May	April 2013	December 2013

Dynamic Stability Models

Model Scope	Seasonal Assessment	Model Used	Model Released	Assessment Completed
Near-Term	2014 Light Load	2013MDWGB1_FINAL_14L_R2_DS_RED	September 2013	December 2013
Model Scope	Seasonal Assessment	Model Used	Model Released	Assessment Completed
Longer-Term	2019 Summer Peak	2013MDWGB1_FINAL_19S_R2_DS_RED	September 2013	December 2013

R1.3. Be supported by a current or past study and/or system simulation testing that addresses each of the following categories, showing system performance following Category B of Table 1 (single contingencies). The specific elements selected (from each of the following categories) for inclusion in these studies and simulations shall be acceptable to the associated Regional Reliability Organization(s).

*The **2013** TPL Compliance Assessment is supported by several studies, including those using the most up-to-date MDWG models available— the 2013 TPL Steady State and Stability Assessments. The TPL steady state and stability assessment use **2013 Build 1 MDWG models**. For the steady state analysis, the complex elements considered for system evaluation under Category B were developed by SPP-RTO with input from stakeholders and members. Additional (N-1) elements were automatically selected based on base voltage according to the following table.*

Element	Base kV (low side of transformers)
Complex elements	---
Branch	100 kV and above
Generator	All
Transformer	100 kV and above

The Stability Study assesses contingency events to identify potential instability within the SPP footprint for all member-submitted categories (A, B, C and D) of events. A list of 6 NERC Category B events were simulated in this assessment and are listed below. These events were submitted by SPP members and include reliability type contingencies and tower outages (events) to analyze for powerflow and stability performance.

Event	Contingency
B14	3-Ø fault at S3451 on T3 transformer. Normal clearing.
B16	3-Ø fault at S1206 on the S1206-S1232 line. Normal clearing.
B19	N01A: 3PH fault at GGS on GGS-Sweetwater 345 kV Circuit #1; Normal clearing; No reclose attempts
B20	N07A: 3PH fault at GGS on GGS-Red Willow 345 kV; Normal clearing; No reclose attempts.
B21	N25A: 3PH fault at GGS on GGS-North Platte 230 kV Circuit #1; Normal clearing; No reclose attempts.
B22	3PH fault at GGS on high side of GGS 345/230 kV T-1 transformer; Normal clearing; No reclose attempts.

The Fast Fault Screening Tool identified the Category B faults below requiring further transient stability analysis. Analysis results showed that no FFS contingencies produced instability

14LL Event	Faulted Bus Number	Faulted Bus Number	RI	CCT (cy)	19SUM Event	Faulted Bus Number	Faulted Bus Name	RI	CCT (cy)
FFS-14LL-B1	500250	DOLHILL7	23.55	4.2	FFS-19SUM-B1	507789	STLGENS4	18.59	Loss of Gen 496 MW
FFS-14LL-B2	532797	WOLFCRK7	21.74	4.2	FFS-19SUM -B2	500250	DOLHILL7	17.99	4.8
FFS-14LL-B3	549954	JTEC 5	19.33	7.2	FFS-19SUM -B3	500770	RODEMR 6	14.73	8.4
FFS-14LL-B4	549969	BROOKLINE 5	15.04	7.8	FFS-19SUM -B4	507454	TURK 4	12.66	8.4

SPP members provided staff with 6 Category B events that were to be evaluated for transient stability. There were no NERC Category B contingencies that were unstable during this analysis.

Other studies supporting the assessment are the 2014 Integrated Transmission Planning Near-Term and the 2012 Integrated Transmission Planning 10-Year Assessments.

R1.3.1. Be performed and evaluated only for those Category B contingencies that would produce the more severe System results or impacts. The rationale for the contingencies selected for evaluation shall be available as supporting information. An explanation of why the remaining simulations would produce less severe system results shall be available as supporting information.

The complex elements considered for system evaluation under Category B were developed by SPP-RTO with input from stakeholders and members.

For steady state analysis, additional elements were automatically selected based on base voltage as outlined in the following table. Branch elements with base voltages less than 100 kV have less critical roles in system capability than those with higher base voltage and produce less severe system results. Transformer elements with base voltages less than 100 kV on all busses have less capacity than those with one or more higher base voltages and produce less severe system results. All generator elements were considered in evaluating system results regardless of base voltage or power capacity.

Element	Base kV (low side of transformers)
Complex elements	---
Branch	100 kV and above
Generator	All
Transformer	100 kV and above

For the stability analysis, additional elements were automatically selected based on base voltage as outlined in the following table. Branch elements with base voltages less than 100 kV have less critical roles in system capability than those with higher base voltage and produce less severe system results. Transformer elements with base voltages less than 100 kV on all busses have less capacity than those with one or more higher base voltages and produce less severe system results.

Element	Base kV (low side of transformers)
Complex elements	---
Branch	100 kV and above
Transformer	100 kV and above

R1.3.2. Cover critical system conditions and study years as deemed appropriate by the responsible entity.

This assessment uses MDWG models including system conditions for all BA's within the SPP footprint as well as BA's connecting directly to them. These parameters are deemed to be appropriate by SPP engineering staff and members. The MDWG powerflow models for seasons ***2014 Summer, 2014 Fall, 2014 Winter, 2015 Spring, 2015 Summer, and 2019 Summer*** *were used as the basis for the near-term (years one through five) and MDWG models for seasons* ***2024 Summer and 2024 Winter*** *were used as the basis for longer-term (years six through ten) for the TPL Compliance Assessment. The MDWG dynamic stability model for* ***2014 Light Load*** *was used as the basis for the near-term (years one through five) and MDWG model for* ***2019 Summer*** *was used as the basis for longer-term (years six through ten) for the TPL Compliance Assessment. The assessment uses MDWG models as outlined in the table in R1.2.*

R1.3.3. Be conducted annually unless changes to system conditions do not warrant such analyses.

The MDWG models used for the TPL Compliance Assessment are developed annually. The MDWG models used for this assessment are the MDWG ***2013 Build 1*** *release. The continual change and improvement in system conditions warrant this* ***2013*** *assessment.*

R1.3.4. Be conducted beyond the five-year horizon only as needed to address identified marginal conditions that may have longer lead-time solutions.

It was deemed by SPP engineering staff and members that MDWG powerflow models for seasons ***2024 Summer and 2024 Winter*** *and dynamic stability model for season* ***2019 Summer*** *were necessary. These models will be sufficient to address and identify longer lead-time solutions for the transmission projects that are examined as mitigation plans to address potential violations.*

R1.3.5. Have all projected firm transfers modeled.

The assessment uses the transfers projected by ***SPP-2013-MDWG-Data Submittal Forms Master 4/13/2012*** *submitted by SPP members* ***Aug 2011 - April 2012****. This data is incorporated in the MDWG models.*

R1.3.6. Be performed and evaluated for selected demand levels over the range of forecast system Demands.

These assessments were performed over the range of seasonal demand levels as reported in the seasonal assessment table in R1.2.

R1.3.7. Demonstrate that system performance meets Table 1 for Category B contingencies.

The assessments demonstrate that system performance meets Table 1 for Category B. Any violations occurring in models with events resulting in the loss of a single element (N-1) were mitigated by procedures developed by SPP engineering staff and member entities.

R1.3.8. Include existing and planned facilities.

The MDWG models used include all existing and planned facilities for the term modeled.

R1.3.9. Include Reactive Power resources to ensure that adequate reactive resources are available to meet system performance.

The MDWG models used include reactive power resources. The analysis performed ensures that adequate reactive power is available to meet system performance requirements.

R1.3.10. Include the effects of existing and planned protection systems, including any backup or redundant systems.

The Category B contingencies provided by SPP member entities include protection systems including normal clearing of 3-phase breakers for generators, branches, and transformers. The Category B contingencies provided by SPP member entities include backup and redundant systems including load throw-over.

R1.3.11. Include the effects of existing and planned control devices.

The MDWG models and software used include existing and planned control devices including transformer tap adjustments, phase-shifter angle regulation, and capacitor switching.

R1.3.12. Include the planned (including maintenance) outage of any bulk electric equipment (including protection systems or their components) at those demand levels for which planned (including maintenance) outages are performed.

The MDWG models used include planned outages of bulk electric equipment at demand levels for which those planned outages are performed.

R1.4. Address any planned upgrades needed to meet the performance requirements of Category B of Table I.

The MDWG models used include planned upgrades. All violations occurring in models with events resulting in the loss of a single element (N-1) were mitigated by transmission upgrades or operating procedures developed by SPP engineering staff and member entities; meaning the planned upgrades meet the performance requirements of Category B.

R1.5. Consider all contingencies applicable to Category B.

The complex elements considered for system evaluation under Category B were developed by SPP-RTO with input from stakeholders and members.

For the steady state analysis, additional elements were automatically selected based on base voltage as outlined in the following table. Branch elements with base voltages less than 100 kV have less critical roles in system capability than those with higher base voltage and produce less severe system results. Transformer elements with base voltages less than 100 kV on all busses have less capacity than those with one or more higher base voltages and produce less severe system results. All generator elements were considered in evaluating system results regardless of base voltage or power capacity.

Element	Base kV (low side of transformers)
Complex elements	---
Branch	100 kV and above
Generator	All
Transformer	100 kV and above

For the stability analysis, additional elements were automatically selected based on base voltage as outlined in the following table. Branch elements with base voltages less than 100 kV have less critical roles in system capability than those with higher base voltage and produce less severe system results. Transformer elements with base voltages less than 100 kV on all busses have less capacity than those with one or more higher base voltages and produce less severe system results.

Element	Base kV (low side of transformers)
Complex elements	---
Branch	100 kV and above
Transformer	100 kV and above

R2. When system simulations indicate an inability of the systems to respond as prescribed in Reliability Standard TPL-001-0_R1, the Planning Authority and Transmission Planner shall each:

R2.1. Provide a written summary of its plans to achieve the required system performance as described above throughout the planning horizon.

A continually-updated, written summary of SPP's 10-year plans and beyond to achieve the required system performance is maintained and provided by SPP. This summary, the 2014 SPP Transmission Expansion Plan, includes projects planned from summer ***2014 through winter 2024****. These dates cover and exceed the planning horizon.*

R2.1.1. Including a schedule for implementation.

A continually-updated, written summary of SPP's 10-year plans and beyond to achieve the required system performance is maintained and provided by SPP. This summary, the 2014 SPP Transmission Expansion Plan, includes projects planned from summer ***2014 through winter 2024****. This document includes the schedule on which the projects are implemented.*

R2.1.2. Including a discussion of expected required in-service dates of facilities.

A continually-updated, written summary of SPP's 10-year plans and beyond to achieve the required system performance is maintained and provided by SPP. This summary, the 2014 SPP Transmission Expansion Plan, includes projects planned from summer ***2014 through winter 2024.*** *This document includes the in-service dates on which the projects are implemented.*

R2.1.3. Consider lead times necessary to implement plans.

A continually-updated, written summary of SPP's 10-year plans and beyond to achieve the required system performance is maintained and provided by SPP. This summary, the 2014 SPP Transmission Expansion Plan, includes projects planned from summer ***2014 through winter 2024****. The dates on which the projects are implemented reflect lead-times necessary for members to implement plans.*

R2.2. Review, in subsequent annual assessments, (where sufficient lead time exists), the continuing need for identified system facilities. Detailed implementation plans are not needed.

A continually-updated, written summary of SPP's 10-year plans and beyond to achieve the required system performance is maintained and provided by SPP. This summary, the 2014 SPP Transmission Expansion Plan, includes projects planned from summer ***2014 through winter 2024****. The dates on which the projects are implemented reflect lead-times necessary for members to implement plans.*

R3. The Planning Authority and Transmission Planner shall each document the results of its Reliability Assessments and corrective plans and shall annually provide the results to its respective Regional Reliability Organization(s), as required by the Regional Reliability Organization.

SPP has documented the results of this reliability assessment and its corrective plans and the results were provided to its NERC RRO as required.

Attachment 4 – TPL-003 Compliance Statement

R1. The Planning Authority and Transmission Planner shall each demonstrate through a valid assessment that its portion of the interconnected transmission systems is planned such that the network can be operated to supply projected customer demands and projected Firm (non-recallable reserved) Transmission Services, at all demand Levels over the range of forecast system demands, under the contingency conditions as defined in Category C of Table I (attached). The controlled interruption of customer Demand, the planned removal of generators, or the Curtailment of firm (non-recallable reserved) power transfers may be necessary to meet this standard. To be valid, the Planning Authority and Transmission Planner assessments shall:

The Southwest Power Pool (SPP) MDWG models used for the TPL Compliance Assessment were validated in compliance with current SPP Criteria under Criteria 3.3.3 and were documented in ***Criteria 3.3.3 – 2013 Summer***[7]*. SPP has demonstrated with its* ***2013 TPL Compliance Assessment*** *that its portion of the interconnected transmission system has been planned as documented in the 2014 SPP Transmission Expansion Plan such that the network can be operated to supply projected customer demands and projected Firm (non-recallable reserved) Transmission Services, at all demand levels over the range of forecast system demands, under the contingency conditions as defined in Category C.*

R1.1. Be made annually.

The MDWG models used for the TPL Compliance Assessment are developed annually. The MDWG models used for this assessment are the ***MDWG 2013 Build releases****. The TPL Compliance Assessment is conducted annually. The previous iteration of the TPL Compliance Assessment was reported in comprehensive* ***SPP 2012 TPL Compliance Report***[8]*.*

R1.2. Be conducted for near-term (years one through five) and longer-term (years six through ten) planning horizons.

The MDWG powerflow models for seasons ***2014 Summer, 2014 Fall, 2014 Winter, 2015 Spring, 2015 Summer, and 2019 Summer*** *were used as the basis for the near-term (years one through five) and MDWG models for seasons* ***2024 Summer and 2024 Winter*** *were used as the basis for longer-term (years six through ten) for the TPL Compliance Assessment. The MDWG dynamic stability model for* ***2014 Light Load*** *was used as the basis for the near-term (years one through five) and MDWG model for* ***2019 Summer*** *was used as the basis for longer-term (years six through ten) for the TPL Compliance Assessment. The assessment uses MDWG models as outlined in the table below. The timing of needed transmission project upgrades for years in between those explicitly assessed was identified as part of SPP's Attachment O planning process such that the projects will be in service prior to the date needed to resolve the issue.*

[8] SPP 2012 TPL Compliance Report

Powerflow Models

Model Scope	Seasonal Assessment	Model Used	Model Released	Assessment Completed
Near-Term	2014 Summer Peak	2013MDWGB1_FINAL-14S_May2	April 2013	December 2013
Near-Term	2014 Fall	2013MDWGB1_FINAL-14F_May	April 2013	December 2013
Near-Term	2014 Winter	2013MDWGB1_FINAL-14W_May	April 2013	December 2013
Near-Term	2015 Spring	2013MDWGB1_FINAL-15G_May	April 2013	December 2013
Near-Term	2015 Summer Peak	2013MDWGB1_FINAL-15S_May	April 2013	December 2013
Near-Term	2019 Summer Peak	2013MDWGB1_FINAL-19S_May	April 2013	December 2013
Model Scope	Seasonal Assessment	Model Used	Model Released	Assessment Completed
Longer-Term	2024 Summer Peak	2013MDWGB1_FINAL-24S_May	April 2013	December 2013
Longer-Term	2024 Winter	201MDWGB1_FINAL-24W_May	April 2013	December 2013

Dynamic Stability Models

Model Scope	Seasonal Assessment	Model Used	Model Released	Assessment Completed
Near-Term	2014 Light Load	2013MDWGB1_FINAL_14L_R2_DS_RED	September 2013	December 2013
Model Scope	Seasonal Assessment	Model Used	Model Released	Assessment Completed
Longer-Term	2019 Summer Peak	2013MDWGB1_FINAL_19S_R2_DS_RED	September 2013	December 2013

R1.3. Be supported by a current or past study and/or system simulation testing that addresses each of the following categories, showing system performance following Category C of Table 1 (multiple contingencies). The specific elements selected (from each of the following categories) for inclusion in these studies and simulations shall be acceptable to the associated Regional Reliability Organization(s).

*The **2013 TPL Compliance Assessment** is supported by the most up-to-date MDWG models available. The TPL assessment uses **2013 Build 1 MDWG models**. The complex elements considered for system evaluation under Category C were developed by SPP-RTO with input from stakeholders and members.*

For the steady state analysis, additional (N-1) elements were automatically selected based on base voltage according to the following table.

Element	Base kV (low side of transformers)
Complex elements	---
Branch	100 kV and above
Generator	All
Transformer	100 kV and above

These (N-1) elements were paired to form (N-2) contingencies. Pairs of (N-1) elements were chosen according to the following table.

Element	Selection Rule
Complex elements	---
Branch-Branch*	Same Zone
Generator-Branch*	Same Area
Generator-Generator	All

*Branch represents both branch and transformer elements

The Stability Study assesses contingency events to identify potential instability within the SPP footprint for all member-submitted categories (A, B, C and D) of events. A list of 18 NERC Category C events were simulated in this assessment and are listed below in the table. These events were submitted by SPP members and include reliability type contingencies and tower outages (events) to analyze for powerflow and stability performance.

Event	Contingency
C1	Prior outage of JEC-Auburn 230kV line; 3-Ø fault at JEC 345 kV for 3.6 cycles; Trip JEC-Hoyt line; No reclosing.

Event	Contingency
C5	3-Ø fault at Wolf Creek 345 kV for 3.6 cycles; Trip Wolf Creek-Benton line; No reclosing; Reduce Wolf Creek output to 800 MW (Transmission Operating Directive 300); 3-Ø fault for 3.6 cycles at Wolf Creek 345 kV; Trip Wolf Creek-LaCygne line; No reclosing
C10	3-Ø fault at Wolf Creek 345 kV for 3.6 cycles; Trip Wolf Creek-LaCygne 345 kV line; No reclosing; Reduce Wolf Creek output to 800 MW (Transmission Operating Directive 302); 3-Ø fault at Wolf Creek 345 kV for 3.6 cycles; Trip Wolf Creek-Benton 345 kV; No reclosing.
C12	SLG fault at the S3451 end of the S3451-Raun line, followed by a stuck breaker and the opening of transformer T4 at S3451. Fault Admittance 576 - j 6089 MVA for 2014LL and 578 - j 6099 MVA for 2019SP for initial fault. Fault Admittance 450 - j 5339 MVA for 2014LL and 451 - j 5350 MVA for 2019SP after opening S3451-Raun.
C14	N915: SLG fault at GGS on GGS-Sweetwater 345 kV Circuit #2, Stuck Breaker (GGS 3322), Drop GGS-Red Willow 345 kV line; Delayed clearing; No reclose attempts.
C25	3-Ø fault at Wolf Creek for 3.6 Cycles; Trip Wolf Creek-Rose Hill line; No reclosing; Reduce Wolf Creek output to 800 MW (Transmission Operating Directive 301); 3-Ø fault at Wolf Creek 345 kV for 3.6 cycles; Trip Wolf Creek-LaCygne line; No reclosing
C28	Prior outage of Muskogee - Fort Smith 345 kV; 3-phase fault and trip Valliant - Lydia 345 kV.
C29	Prior outage of Diana - SW Shreveport 345 kV; 3-phase fault and trip Wilkes - Longwood 345 kV.
C30	Prior outage of Welsh - Lydia 345 kV; 3-phase fault and trip Welsh - NW Texarkana 345 kV. Welsh generation at Pmax.
C31	Prior outage of Dolet Hills - Carroll 230 kV; 3-phase fault and trip Dolet Hills - SW Shreveport 345 kV. Dolet Hills Plant at Pmax.
C32	Prior outage of Flint Creek Generator; 3-phase fault and trip GRDA1 - Flint Creek 345 kV.
C33	3-Ø fault and trip Welsh - Wilkes / Welsh - NW Texarkana 345 kV DCT. Welsh generation at Pmax.
C34	3-Ø fault and trip Diana - SW Shreveport / Longwood - SW Shreveport 345 kV DCT
C35	Phase-to-ground fault Welsh - NW Texarkana 345 kV with CB (#10610) failure at Welsh. 15-cycle delayed clearing removing Welsh - Wilkes 345 kV. Welsh generation at Pmax.

Event	Contingency
C36	Phase-to-ground fault Wilkes - Longwood 345 kV with CB (#1W10) failure at Wilkes. 15-cycle delayed clearing removing Wilkes - Welsh 345 kV. Wilkes generation at Pmax.
C47	SLG Fault on Knoll-Post Rock 230 kV line with breaker failure of 6002 (clears the Knoll 230/115 kV transformer and Knoll-Smoky Hill 230 kV line)
C48	SLG fault on Heizer 230/115 kV transformer with normal clearing followed by three phase fault on Heizer-Great Bend 115 kV
C49	SLG fault on Heizer 230/115 kV transformer with normal clearing followed by three phase fault on Heizer-Great Bend 115 kV

The member provided events shown above were submitted for examination and all events were found to be stable.

14LL Event	Faulted Bus Number	Faulted Bus Number	RI	CCT (cy)	19SUM Event	Faulted Bus Number	Faulted Bus Name	RI	CCT (cy)
FFS-14LL-C1	500250	DOLHILL7		Loss of Gen 638 MW	FFS-19SUM-C1	500250	DOLHILL7		Loss of Gen 580 MW
FFS-14LL-C 2	508583	ESTGEN4		Loss of Gen 155 MW	FFS-19SUM - C2	500020	ACADIA 4		Loss of Gen 580 MW
FFS-14LL-C 3	532797	WOLFCRK7	37.0	0.6	FFS-19SUM - C3	507789	STLGENS4		Loss of Gen 496 MW
FFS-14LL-C 4	542982	IATAN 7	32.27	1.2	FFS-19SUM - C4	508583	ESTGEN4		Loss of Gen 155 MW
FFS-14LL-C 5	549954	JTEC 5	28.6	6.6	FFS-19SUM - C5	500770	RODEMR 6	18.84	7.8
FFS-14LL-C 6	549969	BROOKLINE 5	15.14	7.8	FFS-19SUM - C6	507454	TURK 4	16.36	6.6

The fast fault scan results showed that the above events needed to be evaluated for transient stability.
Event FFS-2014LL-C3 caused the WOLFCREEK unit to be unstable when a fault occurs on the WOLKCREEK 345kV bus with a prior outage on the LACYGNE or BENTON 345kV line and one other line is outaged. This event has been previously identified and an existing operating guide is in place to limit the WOLFCREEK output to 800MW for the loss of a 345 kV line.

Event FFS-2014LL-C4 caused the IATAN units to be unstable when a fault occurs on the IATAN 345kV bus with a prior outage on the STRANGER CREEK or EASTOWN 345kV line and one other line is outaged. Therefore, an operating guide is needed such that the prior outage of the IATAN - STRANGER CREEK 345kV or the IATAN – EASTOWN 345kV line will necessitate the combined output of the IATAN units be curtailed to a maximum net output of 715 MW, which is the emergency rating of the IATAN 345/161kV transformer. This action will protect the units from instability in the event of the fault and trip of the remaining 345kV line. The owners are developing an operating-guide to ensure stability.

R1.3.1. Be performed and evaluated only for those Category C contingencies that would produce the more severe system results or impacts. The rationale for the contingencies selected for evaluation shall be available as supporting information. An explanation of why the remaining simulations would produce less severe system results shall be available as supporting information.

The complex elements considered for system evaluation under Category C were developed by SPP-RTO with input from stakeholders and members.

For the steady state analysis, additional elements were selected based on base voltage as outlined in the following table. Branch elements with base voltages less than 100 kV have less critical roles in system capability than those with higher base voltage and therefore produce less severe system results. Transformer elements with base voltages less than 100 kV on all busses have less capacity than those with one or more higher base voltages and therefore produce less severe system results. All generator elements were considered in evaluating system results regardless of base voltage or power capacity.

Element	Base kV (low side of transformers)
Complex elements	---
Branch	100 kV and above
Generator	All
Transformer	100 kV and above

These (N-1) elements were paired to form (N-2). Branch-branch contingencies are most likely to produce severe system results when both elements are in the same zone. Branch-generator contingencies are more likely to produce severe system results when both elements are in the same area. All possible pairs of generator contingencies were assessed. Pairs of (N-1) elements were chosen according to the following table.

Element	Selection Rule
Complex elements	---
Branch-Branch*	Same Zone
Generator-Branch*	Same Area

Generator-Generator All

*Branch represents both branch and transformer elements

R1.3.2. Cover critical system conditions and study years as deemed appropriate by the responsible entity.

*This assessment uses MDWG models including system conditions for all BA's within the SPP footprint as well as BA's connecting directly to them. These parameters are deemed to be appropriate by SPP engineering staff and members. The MDWG powerflow models for seasons **2014 Summer, 2014 Fall, 2014 Winter, 2015 Spring, 2015 Summer, and 2019 Summer** were used as the basis for the near-term (years one through five) and MDWG models for seasons **2024 Summer and 2024 Winter** were used as the basis for longer-term (years six through ten) for the TPL Compliance Assessment. The MDWG dynamic stability model for **2014 Light Load** was used as the basis for the near-term (years one through five) and MDWG model for **2019 Summer** was used as the basis for longer-term (years six through ten) for the TPL Compliance Assessment. The assessment uses MDWG models as outlined in the table in R1.2.*

R1.3.3. Be conducted annually unless changes to system conditions do not warrant such analyses.

*The MDWG models used for the TPL Compliance Assessment are developed annually. The MDWG models used for this assessment are the MDWG **2013 Build 1** release. The continual change and improvement in system conditions warrant this **2013** assessment.*

R1.3.4. Be conducted beyond the five-year horizon only as needed to address identified marginal conditions that may have longer lead-time solutions.

*It was deemed by SPP engineering staff and members that MDWG powerflow models for seasons **2024 Summer and 2024 Winter** and dynamic stability model for season **2019 Summer** were necessary. These models will be sufficient to address and identify longer lead-time solutions for the transmission projects that are examined as mitigation plans to address potential violations.*

R1.3.5. Have all projected firm transfers modeled.

*The assessment uses the transfers projected by **SPP-2013-MDWG-Data Submittal Forms Master 4/13/2012** submitted by SPP members **Aug 2011 - April 2012**. This data is incorporated in the MDWG models.*

R1.3.6. Be performed and evaluated for selected demand levels over the range of forecast system demands.

These assessments were performed over the range of seasonal demand levels as reported in the seasonal assessment table in R1.2.

R1.3.7. Demonstrate that System performance meets Table 1 for Category C contingencies.

The assessments demonstrate that system performance meets Table 1 for Category C. Any violations occurring in models with events resulting in the loss of any two or more elements (N-k) likely to *produce severe effects on the system were mitigated by procedures developed by SPP engineering staff and member entities, or were mitigated by procedures produced by software analysis of evaluation models.*

R1.3.8. Include existing and planned facilities.

The MDWG models used include all existing and planned facilities for the term modeled.

R1.3.9. Include Reactive Power resources to ensure that adequate reactive resources are available to meet System performance.

The MDWG models used include reactive power resources. The analysis performed ensures that adequate reactive power is available to meet system performance requirements.

R1.3.10. Include the effects of existing and planned protection systems, including any backup or redundant systems.

The Category C contingencies provided by SPP member entities include protection systems including normal clearing of 3-phase breakers for generators, branches, and transformers. The Category C contingencies provided by SPP member entities include backup and redundant systems including load throw-over.

R1.3.11. Include the effects of existing and planned control devices.

The MDWG models used and software include existing and planned control devices including MVAR dispatch, transformer tap adjustments, phase-shifter angle regulation, capacitor switching, MW dispatch, line switching, and load curtailment.

R1.3.12. Include the planned (including maintenance) outage of any bulk electric equipment (including protection systems or their components) at those demand levels for which planned (including maintenance) outages are performed.

The MDWG models used include planned outages of bulk electric equipment at demand levels for which those planned outages are performed.

R1.4. Address any planned upgrades needed to meet the performance requirements of Category C.

The MDWG models used include planned upgrades. All violations occurring in models with events resulting in the loss of two or more elements (N-2) were mitigated by operating procedures developed by SPP engineering staff and member entities, or were mitigated by procedures produced by software analysis of evaluation models; meaning the planned upgrades meet the performance requirements of Category C.

R1.5. Consider all contingencies applicable to Category C.

The complex elements considered for system evaluation under Category C were developed by SPP-RTO with input from stakeholders and members.

For the steady state analysis, additional elements were selected based on base voltage as outlined in the following table. Branch elements with base voltages less than 100 kV have less critical roles in system capability than those with higher base voltage and therefore produce less severe system results. Transformer elements with base voltages less than 100 kV on all busses have less capacity than those with one or more higher base voltages and therefore produce less severe system results. All generator elements were considered in evaluating system results regardless of base voltage or power capacity.

Element	Base kV (low side of transformers)
Complex elements	---
Branch	100 kV and above
Generator	All
Transformer	100 kV and above

These (N-1) elements were paired to form (N-2) contingencies. Branch-branch contingencies are most likely to produce severe system results when both elements are in the same zone. Branch-generator contingencies are more likely to produce severe system results when both elements are in the same area. All possible pairs of generator contingencies were assessed. Pairs of (N-1) elements were chosen according to the following table.

Element	Selection Rule
Complex elements	---
Branch-Branch*	Same Zone
Generator-Branch*	Same Area
Generator-Generator	All

*Branch represents both branch and transformer elements

R2. When system simulations indicate an inability of the systems to respond as prescribed in Reliability Standard TPL-001-0_R1, the Planning Authority and Transmission Planner shall each:

R2.1. Provide a written summary of its plans to achieve the required system performance as described above throughout the planning horizon.

*A continually-updated, written summary of SPP's 10-year plans and beyond to achieve the required system performance is maintained and provided by SPP. This summary, the 2014 SPP Transmission Expansion Plan, includes projects planned from summer **2014 through winter 2024**. These dates cover and exceed the planning horizon.*

R2.1.1. Including a schedule for implementation.

A continually-updated, written summary of SPP's 10-year plans and beyond to achieve the required system performance is maintained and provided by SPP. This summary, the 2014 SPP Transmission Expansion Plan, includes projects planned from summer ***2014 through winter 2024****. This document includes the dates on which the projects are implemented.*

R2.1.2. Including a discussion of expected required in-service dates of facilities.

A continually-updated, written summary of SPP's 10-year plans and beyond to achieve the required system performance is maintained and provided by SPP. This summary, the 2014 SPP Transmission Expansion Plan, includes projects planned from summer ***2014 through winter 2024****. This document includes the in-service dates on which the projects are implemented.*

R2.1.3. Consider lead times necessary to implement plans.

A continually-updated, written summary of SPP's 10-year plans and beyond to achieve the required system performance is maintained and provided by SPP. This summary, the 2014 SPP Transmission Expansion Plan, includes projects planned from summer ***2014 through winter 2024****. The dates on which the projects are implemented reflect lead-times necessary for members to implement plans.*

R2.2. Review, in subsequent annual assessments, (where sufficient lead time exists), the continuing need for identified system facilities. Detailed implementation plans are not needed.

A continually-updated, written summary of SPP's 10-year plans and beyond to achieve the required system performance is maintained and provided by SPP. This summary, the 2014 SPP Transmission Expansion Plan, includes projects planned from summer ***2014 through winter 2024****. The dates on which the projects are implemented reflect lead-times necessary for members to implement plans.*

R3. The Planning Authority and Transmission Planner shall each document the results of these Reliability Assessments and corrective plans and shall annually provide these to its respective NERC Regional Reliability Organization(s), as required by the Regional Reliability Organization.

SPP has documented the results of this reliability assessment and its corrective plans and the results were provided to its NERC RRO as required.

Attachment 5 – TPL-004 Compliance Statement

R1. The Planning Authority and Transmission Planner shall each demonstrate through a valid assessment that its portion of the interconnected transmission system is evaluated for the risks and consequences of a number of each of the extreme contingencies that are listed under Category D of Table I. To be valid, the Planning Authority's and Transmission Planner's assessment shall:

The Southwest Power Pool (SPP) MDWG models used for the TPL Compliance Assessment were validated in compliance with current SPP Criteria under Criteria 3.3.3 and were documented in ***Criteria 3.3.3 – 2013 Summer***[7]*. SPP has demonstrated with the TPL Compliance Assessment that its portion of the interconnected transmission system has been evaluated for risks and consequences for extreme contingencies covered under Category D.*

R1.1. Be made annually.

The MDWG models used for the TPL Compliance Assessment are developed annually. The MDWG models used for this assessment are the ***MDWG 2013 Build releases****. The TPL Compliance Assessment is conducted annually. The previous iteration of the TPL Compliance Assessment was reported in comprehensive* ***SPP 2012 TPL Compliance Report***[9].

R1.2. Be conducted for near-term (years one through five).

The MDWG powerflow models for seasons ***2014 Summer, 2014 Fall, 2014 Winter, 2015 Spring, 2015 Summer, and 2019 Summer*** *were used as the basis for the near-term (years one through five), and the MDWG dynamic stability model for* ***2014 Light Load*** *was used as the basis for the near-term (years one through five). Additionally SPP conducted steady state analysis for seasons* ***2024 Summer and 2024 Winter*** *and transient stability analysis for season* ***2019 Summer*** *for this TPL Compliance Assessment. The assessment uses MDWG models as outlined in the table below. The timing of needed transmission project upgrades for years in between those explicitly assessed was identified as part of SPP's Attachment O planning process such that the projects will be in service prior to the date needed to resolve the issue.*

[9] SPP 2012 TPL Compliance Report

Powerflow Models

Model Scope	Seasonal Assessment	Model Used	Model Released	Assessment Completed
Near-Term	2014 Summer Peak	2013MDWGB1_FINAL-14S_May2	April 2013	December 2013
Near-Term	2014 Fall	2013MDWGB1_FINAL-14F_May	April 2013	December 2013
Near-Term	2014 Winter	2013MDWGB1_FINAL-14W_May	April 2013	December 2013
Near-Term	2015 Spring	2013MDWGB1_FINAL-15G_May	April 2013	December 2013
Near-Term	2015 Summer Peak	2013MDWGB1_FINAL-15S_May	April 2013	December 2013
Near-Term	2019 Summer Peak	2013MDWGB1_FINAL-19S_May	April 2013	December 2013
Model Scope	Seasonal Assessment	Model Used	Model Released	Assessment Completed
Longer-Term	2024 Summer Peak	2013MDWGB1_FINAL-24S_May	April 2013	December 2013
Longer-Term	2024 Winter	201MDWGB1_FINAL-24W_May	April 2013	December 2013

Dynamic Stability Models

Model Scope	Seasonal Assessment	Model Used	Model Released	Assessment Completed
Near-Term	2014 Light Load	2013MDWGB1_FINAL_14L_R2_DS_RED	September 2013	December 2013
Model Scope	Seasonal Assessment	Model Used	Model Released	Assessment Completed
Longer-Term	2019 Summer Peak	2013MDWGB1_FINAL_19S_R2_DS_RED	September 2013	December 2013

R1.3. Be supported by a current or past study and/or system simulation testing that addresses each of the following categories, showing system performance following Category D contingencies of Table I. The specific elements selected (from within each of the following categories) for inclusion in these studies and simulations shall be acceptable to the associated Regional Reliability Organization(s).

*The **2013 TPL Compliance Assessment** is supported by the most up-to-date MDWG models available. The TPL assessment uses **2013 Build 1 MDWG models**. The complex elements considered for system evaluation under Category D were developed by SPP-RTO with input from stakeholders and members.*

The Stability Study assesses contingency events to identify potential instability within the SPP footprint for all member-submitted categories (A, B, C and D) of events. A list of 14 NERC Category D events were simulated in this assessment and are listed in the table below. These events were submitted by SPP members and include reliability type contingencies and tower outages (events) to analyze for powerflow and stability performance.

Event	Contingency
D9	3-Ø fault at the S3451 on T3 transformer, followed by a stuck breaker and the opening of the S3451-S3459 line.
D10	3-Ø fault at S3458 on the S3458 - Cooper line, followed by a stuck breaker and the opening of the west bus at S3458.
D22	Loss of Knoll 115kV Substation.
D23	Loss of Heizer 115 KV Substation.
D27	Loss of Wolf Creek 345 kV Substation.
D28	3-Ø fault Welsh - NW Texarkana 345 kV with CB (#10610) failure at Welsh. 15-cycle delayed clearing removing Welsh - Wilkes 345 kV. Welsh generation at Pmax.
D29	3-Ø fault Wilkes - Longwood 345 kV with CB (#1W10) failure at Wilkes. 15-cycle delayed clearing removing Wilkes - Welsh 345 kV. Wilkes generation at Pmax.
D30	3-Ø fault and trip NW Texarkana 345 kV Station.
D31	3-Ø fault and trip Flint Creek 161 kV Station.
D32	3-Ø fault and trip Diana 345 kV Station.
D33	3-Ø fault and trip Welsh 345 kV Station.
D53[1]	Loss of Woodward District EHV Bus

Event	Contingency
D54[1]	Loss of Mustang Bus
D55[1]	Loss of Pleasant Valley Bus

[1]: Contingency introduced for 2013 TPL Study

SPP members provided staff with 14 Category D events that were to be evaluated for transient stability. Satisfactory results were found for any Category D events showing instability by disconnecting the unstable units at the member recommended clearing time.

The Fast Fault Screening Tool identified the Category D faults below requiring further transient stability analysis. Analysis results showed that no FFS contingencies produced instability

It is noted that any category D events showing instability were made stable by disconnecting the unstable generator(s) according to allowable NERC TPL mitigation practices.

14LL Event	Faulted Bus Number	Faulted Bus Number	RI	CCT (cy)	19SUM Event	Faulted Bus Number	Faulted Bus Name	RI	CCT (cy)
FFS-14LL-D1	532797	WOLFCRK 7		Loss of Gen 1283 MW	FFS-19SUM - D 2	500770	RODEMR 6		Loss of Gen 1469 MW
FFS-14LL-D 2	500770	RODEMR 6		Loss of Gen 1030 MW	FFS-19SUM - D 3	510396	N.E.S.-4		Loss of Gen 852 MW
FFS-14LL-D 3	542982	IATAN 7		Loss of Gen 950 MW	FFS-19SUM - D 4	500250	DOLHILL7		Loss of Gen 638 MW
FFS-14LL-D 4	500250	DOLHILL7		Loss of Gen 638 MW	FFS-19SUM - D 5	500020	ACADIA 4		Loss of Gen 580 MW
FFS-14LL-D 5	645451	S3451 3		Loss of Gen 528 MW	FFS-19SUM - D 6	507789	STLGENS4		Loss of Gen 496 MW
FFS-14LL-D 6	512650	GRDA1 7		Loss of Gen 490 MW	FFS-19SUM - D 7	500820	TECHE 4		Loss of Gen 280 MW
FFS-14LL-D 7	532766	JEC N 7		Loss of Gen 390 MW	FFS-19SUM - D 8	511437	COMANC-4		Loss of Gen 168 MW
FFS-14LL-D 8	532853	LAWHILL6		Loss of Gen 341 MW	FFS-19SUM - D 9	508583	ESTGEN4		Loss of Gen 155 MW
FFS-14LL-D 9	542995	MONTRO S5		Loss of Gen 261 MW					

FFS-14LL-D 10	549954	JTEC 5		Loss of Gen 230 MW					
FFS-14LL-D 11	508583	ESTGEN4		Loss of Gen 155 MW					
FFS-14LL-D 13	549969	BROOKLINE 5	15.78	7.8					

R1.3.1. Be performed and evaluated only for those Category D contingencies that would produce the more severe system results or impacts. The rationale for the contingencies selected for evaluation shall be available as supporting information. An explanation of why the remaining simulations would produce less severe system results shall be available as supporting information.

The complex elements considered for system evaluation under Category D were developed by SPP-RTO with input from stakeholders and members. The Category D complex elements include loss of all generation at a facility, loss of substation (one voltage level plus transformers), loss of tower line with three or more circuits, or loss of all transmission circuits on a right-of-way, etc.

R1.3.2. Cover critical system conditions and study years as deemed appropriate by the responsible entity.

*This assessment uses MDWG models including system conditions for all BA's within the SPP footprint as well as BA's connecting directly to them. These parameters are deemed to be appropriate by SPP engineering staff and members. The MDWG powerflow models for seasons **2014 Summer, 2014 Fall, 2014 Winter, 2015 Spring, 2015 Summer, and 2019 Summer** were used as the basis for the near-term (years one through five), and the MDWG dynamic stability model for **2014 Light Load** was used as the basis for the near-term (years one through five). SPP additionally studied the longer-term horizon for the TPL Compliance Assessment using MDWG powerflow models for seasons **2024 Summer and 2024 Winter** and MDWG dynamic stability model for **2019 Summer**. The assessment uses MDWG models as outlined in the table in R1.2.*

R1.3.3. Be conducted annually unless changes to system conditions do not warrant such analyses.

*The MDWG models used for the TPL Compliance Assessment are developed annually. The MDWG models used for this assessment are the MDWG **2013 Build 1** release. The continual change and improvement in system conditions warrant this **2013** assessment.*

R1.3.4. Have all projected firm transfers modeled.

*The assessment uses the transfers projected by **SPP-2013-MDWG-Data Submittal Forms Master 4/13/2012** submitted by SPP members **Aug 2011 - April 2012**. This data is incorporated in the MDWG models.*

R1.3.5. Include existing and planned facilities.

The MDWG models used include all existing and planned facilities for the term modeled.

R1.3.6. Include Reactive Power resources to ensure that adequate reactive resources are available to meet system performance.

The MDWG models used include reactive power resources. The analysis performed ensures that adequate reactive power is available to meet system performance requirements.

R1.3.7. Include the effects of existing and planned protection systems, including any backup or redundant systems.

The Category D contingencies provided by SPP member entities include protection systems including normal clearing of 3-phase breakers for generators, branches, and transformers. The Category D contingencies provided by SPP member entities include backup and redundant systems including load throw-over.

R1.3.8. Include the effects of existing and planned control devices.

The MDWG models and software used include existing and planned control devices including MVAR dispatch, transformer tap adjustments, phase-shifter angle regulation, capacitor switching, MW dispatch, line switching, and load curtailment.

R1.3.9. Include the planned (including maintenance) outage of any bulk electric equipment (including protection systems or their components) at those demand levels for which planned (including maintenance) outages are performed.

The MDWG models used include reactive power resources. The analysis performed ensures that adequate reactive power is available to meet system performance requirements.

R1.4. Consider all contingencies applicable to Category D.

The complex elements considered for extreme events under Category D were developed by SPP-RTO with input from stakeholders and members and assessed by SPP-RTO. Members had the opportunity to provide mitigations for those resulting potential violations and also review those potential violations mitigated by procedures produced by software analysis of evaluation models.

R2. The Planning Authority and Transmission Planner shall each document the results of its reliability assessments and shall annually provide the results to its entities' respective NERC Regional Reliability Organization(s), as required by the Regional Reliability Organization.

SPP has documented the results of this reliability assessment and its corrective plans and the results were provided to its NERC RRO as required.