



Screening Study

SPP-LTSR-2014-003

9/18/2014

SPP Engineering, SPP Transmission Service Studies



Table of Contents

Table of Contents1

Executive Summary2

Introduction.....3

Study Methodology4

 Description4

 Model Development.....5

 Transmission Request Modeling.....5

 Transfer Analysis5

Study Results6

 Study Analysis Results6

Conclusion7

Appendix A8

 BASE CASE SETTINGS:8

 ACCC CASE SETTINGS:.....8

Executive Summary

American Electric Power has requested a Screening Study to determine the impacts on SPP facilities due to the Long Term Service Requests for 1000 MW. The service type requested for this screening study is Long Term Service Request (LTSR). OASIS# 79867001, 79867013, 79867038, 79867044, and 79867055 was studied as one request from 6/1/2016 to 6/1/2026.

The principal objective of this study is to identify system problems and potential system modifications necessary to facilitate the LTSR request while maintaining system reliability. The LTSR request was studied using two system scenarios. The service was modeled by the transfers from multiple AEPW to AEPW, EES to AEPW, and MPS to AEPW. The two scenarios were studied to capture system limitations caused or impacted by the requested service. An analysis was conducted on the planning horizon from 6/1/2016 to 6/1/2026.

The service was modeled from multiple AEPW to AEPW, EES to AEPW, and MPS to AEPW. Facilities on the SPP system were identified for the requested service due to the SPP Study Methodology criteria. Tables 1 and 2 summarize the results of the screening study analysis for the transfers for the scenarios listed in the table. Table 1 lists SPP thermal transfer limitations identified. Table 2 lists SPP voltage transfer limitations identified. Table 3 lists the network upgrades required to mitigate the limitations impacted by this request.

Introduction

American Electric Power has requested a screening study to determine the impacts on SPP facilities for the Long Term Service Requests for 1000 MW.

The purpose of the LTSR Option Screening Study is to provide the Eligible Customer with an approximation of the transmission remediation costs of each potential LTSR and a reasonable cost differential between alternatives for the purpose of an Eligible Customer's ranking of its potential LTSRs. The results of the Screening Study are not binding and the Eligible Customer retains the rights to enter the Aggregate Transmission Service Study. The Screening Study results will not assess the third party impacts and upgrades required. Service will not be granted based on the Screening Study for potential LTSRs on the Transmission System. To obtain a Service Agreement, Eligible Customers must apply for service and follow the application process set forth in Parts II and III of the Tariff.

This study includes steady-state contingency analysis (PSS/E function ACCC). The steady-state analysis considers the impact of the request on transmission line and transformer loadings for outages of single transmission lines, transformers, and generating units, and selected multiple transmission lines and transformers on the SPP and first-tier third party systems.

The LTSR request was studied using two system scenarios. The service was modeled by a transfer from multiple AEPW to AEPW, EES to AEPW, and MPS to AEPW. The two scenarios were studied to capture the system limitations caused or impacted by the requested service. Scenario 0 includes projected usage of transmission service included in the SPP 2014 Series Cases. Scenario 5 includes transmission service not already included in the SPP 2014 Series Cases.

Study Methodology

Description

The facility study analysis was conducted to determine the steady-state impact of the requested service on the SPP system. The steady-state analysis was performed to ensure current SPP Criteria and NERC Reliability Standards requirements are fulfilled. SPP conforms to NERC Reliability Standards, which provide strict requirements related to voltage violations and thermal overloads during normal conditions and during a contingency. NERC Standards require all facilities to be within normal operating ratings for normal system conditions and within emergency ratings after a contingency.

Normal operating ratings and emergency operating ratings monitored are Rate A and B in the SPP Model Development Working Group (MDWG) models, respectively. The upper bound and lower bound of the normal voltage range monitored is 105% and 95%. The upper bound and lower bound of the emergency voltage range monitored is 105% and 90%. Transmission Owner voltage monitoring criteria is used if more restrictive. The SPS Tuco 230 kV bus voltage is monitored at 92.5% due to pre-determined system stability limitations. The WERE Wolf Creek 345 kV bus voltage is monitored at 103.5% and 98.5% due to transmission operating procedure.

The contingency set includes all SPP control area branches and ties 69 kV and above; first tier non-SPP control area branches and ties 115 kV and above; any defined contingencies for these control areas; and generation unit outages for the control areas with SPP reserve share program redispatch. The monitor elements include all SPP control area branches, ties, and buses 69 kV. and above,. Voltage monitoring was performed for SPP control area buses 69 kV and above.

A 3 % transfer distribution factor (TDF) cutoff was applied to all SPP control area facilities. For voltage monitoring, a 0.02 per unit change in voltage must occur due to the transfer or modeling upgrades to be considered a valid limit to the transfer.

Model Development

SPP used six seasonal models to study the multiple AEPW to AEPW, EES to AEPW, and MPS to AEPW 1000 MW request for the requested service period. The following SPP Transmission Expansion Plan 2014 Build 1 Cases were used to study the impact of the requested service on the transmission system:

- 2016 Summer Peak (16SP)
- 2016/17 Winter Peak (16WP)
- 2020 Summer Peak (20SP)
- 2020/21 Winter Peak (20WP)
- 2025 Summer Peak (25SP)
- 2025/26 Summer Peak (25SP)

The Summer Peak models apply to June through September, and the Winter Peak models apply to December through March.

The chosen base case models were modified to reflect the current modeling information. One group of requests was developed from the aggregate to model the requested service. From the seasonal models, two system scenarios were developed. Scenario 0 includes projected usage of transmission included in the SPP 2014 Series Cases. Scenario 5 includes transmission service not already included in the SPP 2014 Series Cases.

Transmission Request Modeling

Network Integration Transmission Service requests are modeled as Generation to Load transfers in addition to Generation to Generation because the requested Network Integration Transmission Service is a request to serve network load with the new designated network resource, and the impacts on the Transmission System are determined accordingly. Generation to Generation transfers are accomplished by developing a post-transfer case for comparison by dispatching the request source and redispatching the request sink.

Transfer Analysis

Using the selected cases both with and without the requested transfer modeled, the PSS/E Activity ACCC was run on the cases and compared to determine the facility overloads caused or impacted by the transfer. Transfer distribution factor cutoffs and voltage threshold (0.02 change) were applied to determine the impacted facilities. The PSS/E options chosen to conduct the analysis can be found in Appendix A.

Study Results

Study Analysis Results

Tables 1 and 2 contain the initial steady-state analysis results of the LTSR. The tables are attached to the end of this report, if applicable. The tables identify the scenario and season in which the event occurred, the transfer amount studied, the facility control area location, applicable ratings of the thermal transfer limitations and voltage transfer limitations, and the loading percentage and voltage per unit (pu).

Table 1 lists the SPP thermal transfer limitations caused or impacted by the 1000 MW requested transfers for applicable scenarios. Solutions are identified for the limitations in this table.

Table 2 lists the SPP voltage transfer limitations caused or impacted by the 1000 MW requested transfers for applicable scenarios. Solutions are identified for the violations in this table.

Table 3 lists the network upgrades required to mitigate the limitations caused or impacted by this request. Engineering and construction costs are provided for assigned upgrades in this table.

Conclusion

The results of the screening study show that limiting constraints exist within the SPP regional transmission system for the requested transfer of 1000 MW. The next steps are to WITHDRAW the request on OASIS and, if desired, enter a new OASIS request into the aggregate study queue.

The results contained in this study are for informational purposes only. Service will not be granted based on the Screening Study results. To obtain a Service Agreement, Eligible Customers must apply for service and follow the application processes set forth in Parts II and III of the Tariff and enter the Aggregate Study process. The results of the Aggregate Study may vary from the results of this screening study.

As a final step in this process, it is requested that the customer WITHDRAW the LTSR screening study request on OASIS.

Appendix A

PSS/E CHOICES IN RUNNING LOAD FLOW PROGRAM AND ACCC

BASE CASE SETTINGS:

- Solutions: Fixed slope decoupled Newton-Raphson solution (FDNS)
- Tap adjustment: Stepping
- Area Interchange Control: Tie lines and loads
- Var limits: Apply immediately
- Solution Options:
 - Phase shift adjustment
 - Flat start
 - Lock DC taps
 - Lock switched shunts

ACCC CASE SETTINGS:

- Solutions: AC contingency checking (ACCC)
- MW mismatch tolerance: 0.5
- System intact rating: Rate A
- Contingency case rating: Rate B
- Percent of rating: 100
- Output code: Summary
- Min flow change in overload report: 3mw
- Excl'd cases w/ no overloads from report: YES
- Exclude interfaces from report: NO
- Perform voltage limit check: YES
- Elements in available capacity table: 60000
- Cutoff threshold for available capacity table: 99999.0
- Min. contng. Case Vltg chng for report: 0.02
- Sorted output: None
- Newton Solution:
- Tap adjustment: Stepping
- Area interchange control: Tie lines and loads (Disabled for generator outages)
- Var limits: Apply immediately
- Solution options:
 - Phase shift adjustment
 - Flat start
 - Lock DC taps
 - Lock switched shunts

Scenario	Season	From Area	To Area	Monitored Branch Over 100% Rate B	Transfer Case % Loading	TDF (%)	Outaged Branch Causing Overload	Upgrade Name	Solution
5	16WP	KCPL	KCPL	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT 1	103.7	22.12%	PLEASANT HILL - SIBLEY 345KV CKT 1	BLUE SPRING SOUTH - PRAIRIE LEE 161KV CKT 1 #2	Reconductor 3.21 miles from Blue Springs South to Prairie Lee 161 kV to 954 ACSS. Upgrade substation equipment 2000 Amps.
5	16SP	KCPL	KCPL	LONGVIEW - WESTERN ELECTRIC 161KV CKT 1	103.4	10.19%	HARRIS ROAD - PLEASANT HILL 161KV CKT 1	LONGVIEW - WESTERN ELECTRIC 161KV CKT 1 #2 Accelerate	Rebuild 3.6 miles
5	16SP	KCPL	KCPL	LONGVIEW - WESTERN ELECTRIC 161KV CKT 1	102.1	10.19%	GREENWOOD ENERGY CENTER - HARRIS ROAD 161KV CKT 1	LONGVIEW - WESTERN ELECTRIC 161KV CKT 1 #2 Accelerate	Rebuild 3.6 miles
5	16SP	KCPL	KCPL	LONGVIEW - WESTERN ELECTRIC 161KV CKT 1	101.3	10.19%	GREENWOOD ENERGY CENTER - LEES SUMMIT EAST 161KV CKT 1	LONGVIEW - WESTERN ELECTRIC 161KV CKT 1 #2 Accelerate	Rebuild 3.6 miles
5	16SP	OKGE	OKGE	PARK LANE - SEMINOLE 138KV CKT 1	108.0	3.03%	SEMINOLE - VANOSTP4 138.00 138KV CKT 1	PARK LANE - SEMINOLE 138KV CKT 1	Upgrade CT on 138 kV line from Park Lane to Seminole to increase the line rating to 382.4 MVA.
5	20SP	OKGE	OKGE	PARK LANE - SEMINOLE 138KV CKT 1	111.9	3.02%	SEMINOLE - VANOSTP4 138.00 138KV CKT 1	PARK LANE - SEMINOLE 138KV CKT 1	Upgrade CT on 138 kV line from Park Lane to Seminole to increase the line rating to 382.4 MVA.
5	20SP	OKGE	OKGE	PARK LANE - SEMINOLE 138KV CKT 1	101.8	3.81%	PITTSBURG - SEMINOLE 345KV CKT 1	PARK LANE - SEMINOLE 138KV CKT 1	Upgrade CT on 138 kV line from Park Lane to Seminole to increase the line rating to 382.4 MVA.
5	25WP	WFEC	SWPA	TUPELO - TUPELO TAP 138KV CKT 1	100.3	4.51%	PITTSBURG - VALLIANT 345KV CKT 1	TUPELO - TUPELO TAP 138KV CKT 1	Replace Terminal Equipment

Scenario	Season	Area	Monitored Bus with Violation	Transfer Case Voltage (PU)	Outaged Branch Causing Overload	Upgrade Name	Solution
5	25WP	AEPW	ALBA 69KV	0.841791	EXXON-MOBIL HAWKINS - PERDUE 138KV CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	ALTO (ETEC) 138KV	0.84894	CROCKETT (CROCKETT) 345/138/13.8KV TRANSFORMER CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	BEREA (ETEC) 138KV	0.838146	CROCKETT (CROCKETT) 345/138/13.8KV TRANSFORMER CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	CROCKETT 138KV	0.839034	CROCKETT (CROCKETT) 345/138/13.8KV TRANSFORMER CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	EXXON-MOBIL HAWKINS 138KV	0.817758	EXXON-MOBIL HAWKINS - PERDUE 138KV CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	FOREST HILLS REC 69KV	0.866687	EXXON-MOBIL HAWKINS - PERDUE 138KV CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	GRAND SALINE 69KV	0.841772	EXXON-MOBIL HAWKINS - PERDUE 138KV CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	GRAND SALINE REC 69KV	0.840919	EXXON-MOBIL HAWKINS - PERDUE 138KV CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	GRAPELAND (ETEC) 138KV	0.842114	CROCKETT (CROCKETT) 345/138/13.8KV TRANSFORMER CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	HOARD REC 69KV	0.894035	EXXON-MOBIL HAWKINS - PERDUE 138KV CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	K37 138KV	0.863301	EXXON-MOBIL HAWKINS - PERDUE 138KV CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	LAKE HAWKINS 138KV	0.823132	EXXON-MOBIL HAWKINS - PERDUE 138KV CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	LATEXO (ETEC) 138KV	0.839553	CROCKETT (CROCKETT) 345/138/13.8KV TRANSFORMER CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	MAGNOLIA TAP 69KV	0.886042	EXXON-MOBIL HAWKINS - PERDUE 138KV CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	MINEOLA 69KV	0.890201	EXXON-MOBIL HAWKINS - PERDUE 138KV CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	MUSTANG PRAIRIE 138KV	0.837967	CROCKETT (CROCKETT) 345/138/13.8KV TRANSFORMER CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	NORTH MINEOLA 138KV	0.83427	EXXON-MOBIL HAWKINS - PERDUE 138KV CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	NORTH MINEOLA 69KV	0.885904	EXXON-MOBIL HAWKINS - PERDUE 138KV CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	PILGRIMS REST REC 69KV	0.841908	EXXON-MOBIL HAWKINS - PERDUE 138KV CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	PITTSBURG 138KV	0.89409	EXXON-MOBIL HAWKINS - PERDUE 138KV CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	QUITMAN 69KV	0.86055	EXXON-MOBIL HAWKINS - PERDUE 138KV CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	QUITMAN MAGNOLIA PUMP 69KV	0.886316	EXXON-MOBIL HAWKINS - PERDUE 138KV CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	REDSPRW4 138.00 138KV	0.818565	EXXON-MOBIL HAWKINS - PERDUE 138KV CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	SLOCUM 138KV	0.845362	CROCKETT (CROCKETT) 345/138/13.8KV TRANSFORMER CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	WESTWOOD 69KV	0.855059	EXXON-MOBIL HAWKINS - PERDUE 138KV CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	WINNSBORO 138KV	0.854912	EXXON-MOBIL HAWKINS - PERDUE 138KV CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).
5	25WP	AEPW	WINNSBORO 69KV	0.893615	EXXON-MOBIL HAWKINS - PERDUE 138KV CKT 1	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).

Transmission Owner	Upgrade	Solution	Earliest Date Upgrade Required (DUN)	Estimated Date of Upgrade Completion (EOC)	Estimated Engineering & Construction Cost
MIPU	BLUE SPRING SOUTH - PRAIRIE LEE 161KV CKT 1 #2	Reconductor 3.21 miles from Blue Springs South to Prairie Lee 161 kV to 954 ACSS.	6/1/2016	6/1/2016	\$2,983,952
WFEC	TUPELO - TUPELO TAP 138KV CKT 1	Upgrade substation equipment to 2000 Amps. Replace Terminal Equipment	10/1/2021	10/1/2021	\$358,434

Construction Pending Projects - The requested service is contingent upon completion of the following upgrades. Cost is not assignable to the transmission customer.

Transmission Owner	Upgrade	Solution	Earliest Date Upgrade Required (DUN)	Estimated Date of Upgrade Completion (EOC)	Estimated Engineering & Construction Cost
MIPU	LONGVIEW - WESTERN ELECTRIC 161KV CKT 1 #2 Accelerate	Rebuild 3.6 miles	6/1/2016	6/1/2016	

Expansion Plan Projects - The requested service is contingent upon completion of the following upgrades. Cost is not assignable to the transmission customer.

Transmission Owner	Upgrade	Solution	Earliest Date Upgrade Required (DUN)	Estimated Date of Upgrade Completion (EOC)	Estimated Engineering & Construction Cost
	No Expansion Plan Project				

Reliability Projects - The requested service is contingent upon completion of the following upgrades. Cost is not assignable to the transmission customer.

Transmission Owner	Upgrade	Solution	Earliest Date Upgrade Required (DUN)	Estimated Date of Upgrade Completion (EOC)	Estimated Engineering & Construction Cost
OKGE	PARK LANE - SEMINOLE 138KV CKT 1	Upgrade CT on 138 kV line from Park Lane to Seminole to increase the line rating to 382.4 MVA.	6/1/2016	6/1/2016	
AEPW	Lake Hawkins - Welsh 345 kV Ckt 1	Build 55 mile new 345 kV line from Welsh to Lake Hawkins (or Perdue).	10/1/2021	10/1/2021	