SCREENING STUDY

SPP-LTSR-2016-018

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REVISION HISTORY

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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 248 MW. The service type requested for this screening study is Long Term Service Request (LTSR). OASIS# 83823938 was studied as one request from 1/1/2019 to 1/1/2040.

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 transfer from OKGE to CSWS. 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 1/1/2019 to 1/1/2040.

The service was modeled from OKGE to CSWS. 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 248 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 OKGE to CSWS. 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 2015 Series Cases. Scenario 5 includes transmission service not already included in the SPP 2015 Series Cases.

STUDY METHODOLOGY

DESCRIPTION

The facility study analysis was conducted to determine the steady-state impact of the requested service on the SPP and first tier non-SPP control area systems. The steady-state analysis was performed consistent with current SPP Criteria and NERC Reliability Standards requirements. 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 monitored elements include all SPP control area branches, ties, and buses 69 kV and above, and all first tier non-SPP control area branches and ties 115 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 first tier non-SPP control area facilities, a 3% TDF cutoff was applied to AECI, AMRN (Ameren), and ENTR (Entergy) control areas. 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 four seasonal models to study the OKGE to CSWS 248 MW request for the requested service period. The following SPP Transmission Expansion Plan 2015 Build 1 Cases were used to study the impact of the requested service on the transmission system:

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

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 2015 Series Cases. Scenario 5 includes transmission service not already included in the SPP 2015 Series Cases.

TRANSMISSION REQUEST MODELING

NITS requests are modeled as Generation to Load transfers in addition to Generation to Generation transfers. NITS requests are modeled as Generation to Load transfers in addition to Generation to Generation because the requested NITS is a request to serve network load with the new designated network resource, and the impacts on Transmission System are determined accordingly. PTP Transmission Service requests are modeled as Generation to Generation transfers. 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 transfers modeled, the PSS/E Activity ACCC was run on the cases and compared to determine the facility overloads caused or impacted by the transfer. TDF cutoffs (SPP and 1st-Tier) 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

Table 1 lists the SPP thermal transfer limitations caused or impacted by the 248 MW requested transfers for applicable scenarios. Solutions are identified for the limitations in this table.

TABLE 2

Table 2 lists the SPP voltage transfer limitations caused or impacted by the 248 MW requested transfers for applicable scenarios. Solutions are identified for the violations in this table.

TABLE 3

Table 3 provides additional details for this request including all assigned facility upgrades required, allocated E&C costs, allocated revenue requirements for upgrades, upgrades not assigned to the Customer but required for service, credits to be paid for previously assigned AFS or Generation Interconnection Network Upgrades, and any required third party upgrades.

TABLE 4

Table 4 lists all upgrade requirements with associated solutions needed to mitigate the limitations caused or impacted by this request, earliest date upgrade is required (DUN), estimate date the upgrade will be completed and in-service (EOC), and estimate E&C cost.

CONCLUSION

The results of the screening study show that limiting constraints exist within the SPP regional transmission system for the requested transfer of 248 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:	X 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
• Excld 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:	X 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
0	25SP	OKGE	OKGE	FAIRMONT TAP - WOODRING 138KV CKT 1	103.0	19.17%	WAUKOMIS TAP - WOODRING 138KV CKT 1	FAIRMONT TAP - WOODRING 138KV CKT 1	Replace CT at Woodring.
5	20SP	WERE	KCPL	SWISSVALE - WEST GARDNER 345KV CKT 1	106.2	4.32%	HOYT - STRANGER CREEK 345KV CKT 1	SWISSVALE - WEST GARDNER 345KV CKT 1	Replace terminal equipment.
5	20SP	WERE	KCPL	SWISSVALE - WEST GARDNER 345KV CKT 1	105.9	4.00%	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1	SWISSVALE - WEST GARDNER 345KV CKT 1	Replace terminal equipment.
5	25SP	WERE	KCPL	SWISSVALE - WEST GARDNER 345KV CKT 1	107.3	3.38%	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1	SWISSVALE - WEST GARDNER 345KV CKT 1	Replace terminal equipment.
5	25SP	WERE	KCPL	SWISSVALE - WEST GARDNER 345KV CKT 1	107.0	3.62%	HOYT - STRANGER CREEK 345KV CKT 1	SWISSVALE - WEST GARDNER 345KV CKT 1	Replace terminal equipment.
5	20SP	WERE	WERE	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1	101.1	3.45%	AUBURN ROAD - JEFFREY ENERGY CENTER 230KV CKT 1	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1	Rebuild 24.3 miles of 345 kV transmission line from Hoyt to Jeffrey Energy Center.

Table 2- SPP Facility Voltage Transfer Limitations

Scenario	Season	Area	Monitored Bus with Violation	Transfer Case Voltage (PU)	Outaged Branch Causing Overload	Upgrade Name	Solution
			None				

Customer	**Study Number**
AEPM	SPP-LTSR-2016-018

Customer	**Reservation**	**POR**	**POD**	**Requested Amount**	**Requested Start Date**	**Requested Stop Date**	**Deferred Start Date Without Redispatch**	**Deferred Stop Date Without Redispatch**	**Potential Base Plan Funding Allowable**	**Point-to-Point Base Rate**	**Allocated E & C Cost**	**Total Revenue Requirements**
AEPM	83823938	OKGE	CSWS	248	1/1/2019	1/1/2040	6/1/2021	6/1/2042	$ 2,575,609	$ -	$ 3,493,712	$ 7,498,764
									$ 2,575,609	$ -	$ 3,493,712	$ 7,498,764

Reservation	Upgrade Name	DUN	EOC	Earliest Start Date	Redispatch Available	Base Plan Funding for Wind	Directly Assigned for Wind	Allocated E & C Cost	Total E & C Cost	Total Revenue Requirements
83823938	FAIRMONT TAP - WOODRING 138KV CKT 1	6/1/2021	6/1/2021			$ 84,639	$ -	$ 84,639	$ 84,639	$ 298,947
					Total	$ 84,639	$ -	$ 84,639	$ 84,639	$ 298,947

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

Reservation	Upgrade Name	DUN	EOC	Earliest Start Date	Redispatch Available
83823938	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1	1/1/2019	6/1/2021		

Planned Projects

Reservation	Upgrade Name	DUN	EOC	Earliest Start Date	Redispatch Available
83823938	SWISSVALE - WEST GARDNER 345KV CKT 1	1/1/2019	1/1/2019		

Credits may be required for the following Network Upgrades in accordance with Attachment Z2 of the SPP OATT.

Reservation	Upgrade Name	DUN	EOC	Earliest Start Date	Redispatch Available	Base Plan Funding for Wind	Directly Assigned for Wind	Allocated E & C Cost	Total Revenue Requirements
83823938	Kingfisher Co Tap - Mathewson 345kV CKT 1	03/01/2018	03/01/2018			$ 92,308	$ -	$ 92,308	$ 134,588
	Gracemont 138kV line terminal addition	10/15/2011	10/15/2011			$ 24,319	$ 11,978	$ 36,297	$ 63,507
	HUGO - VALLIANT 345KV CKT 1	06/08/2012	06/08/2012			$ 235,608	$ -	$ 235,608	$ 1,851,525
	NORTHWEST - WOODWARD 345KV CKT 1	03/30/2010	03/30/2010			$ 32,040	$ 15,781	$ 47,821	$ 368,001
	Otter 138kV - rebuild and add terminal for Garfield NU	06/30/2017	06/30/2017			$ 1,807,668	$ 890,344	$ 2,698,013	$ 4,026,227
	Valliant 345 kV (AEP)	04/17/2012	04/17/2012			$ 65,351	$ -	$ 65,351	$ 360,143
	WASHITA - GRACEMONT 138 KV CKT 2	10/12/2012	10/12/2012			$ 233,675	$ -	$ 233,675	$ 395,826
					Total	$ 2,490,970	$ 918,103	$ 3,409,073	$ 7,199,816

*Note: CPOs may be calculated based on estimated upgrade cost are subject to change.

Transmission Owner	Upgrade	Solution	Earliest Date Upgrade Required (DUN)	Estimated Date of Upgrade Completion (EOC)	Estimated Engineering & Construction Cost
OKGE	FAIRMONT TAP - WOODRING 138KV CKT 1	Replace CT at Woodring.	6/1/2021	6/1/2021	$84,639

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
	No Construction Pending Project				

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)
	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)
WERE	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1	Rebuild 24.3 miles of 345 kV transmission line from Hoyt to Jeffrey Energy Center.	1/1/2019	6/1/2021

Planned 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)
WERE	SWISSVALE - WEST GARDNER 345KV CKT 1 WERE	Replace terminal equipment.	1/1/2019	1/1/2019

Network Upgrades requiring credits per Attachment Z2 of the SPP OATT.

Transmission Owner	Upgrade	Solution	Earliest Date Upgrade Required (DUN)	Estimated Date of Upgrade Completion (EOC)	Total Gross CPO Allocation
CSWS	Valliant 345 kV (AEP)	Install 345 kV terminal equipment at Valliant substation.	04/17/2012	04/17/2012	$360,143
ITCM	HUGO - VALLIANT 345KV CKT 1	Install new line from Valliant 345 kV to Hugo Power Plant with 19 miles of bundled 1590 ACSR conductior. Note that ITC is building the line from Valiant to Hugo.	06/08/2012	06/08/2012	$1,851,525
OKGE	Kingfisher Co Tap - Mathewson 345kV CKT 1	Replace terminal equipment to achieve conductor limit	03/01/2018	03/01/2018	$134,588
OKGE	Gracemont 138kV line terminal addition	138kV line terminal at Gracemont substation, including breaker, line relaying, disconnect switches and associated equipment, dead end structures, revenue metering with CT's and PT's.	10/15/2011	10/15/2011	$63,507
OKGE	NORTHWEST - WOODWARD 345KV CKT 1	Build 345 kV line	03/30/2010	03/30/2010	$368,001
OKGE	Otter 138kV - rebuild and add terminal for Garfield NU	Install four (4) 138 kV, 2000 Amp breakers, line relaying, disconnect switches, and associated equipment.	06/30/2017	06/30/2017	$4,026,227
WFEC	WASHITA - GRACEMONT 138 KV CKT 2	BUILD WASHITA - GRACEMONT 138KV CKT 2 (APPROXIMATELY 7 MILES). ADD LINE TERMINAL AT WASHITA AND PROCURE RIGHT OF WAY.	10/12/2012	10/12/2012	$395,826

*Note: CPOs may be calculated based on estimated upgrade cost and are subject to change.