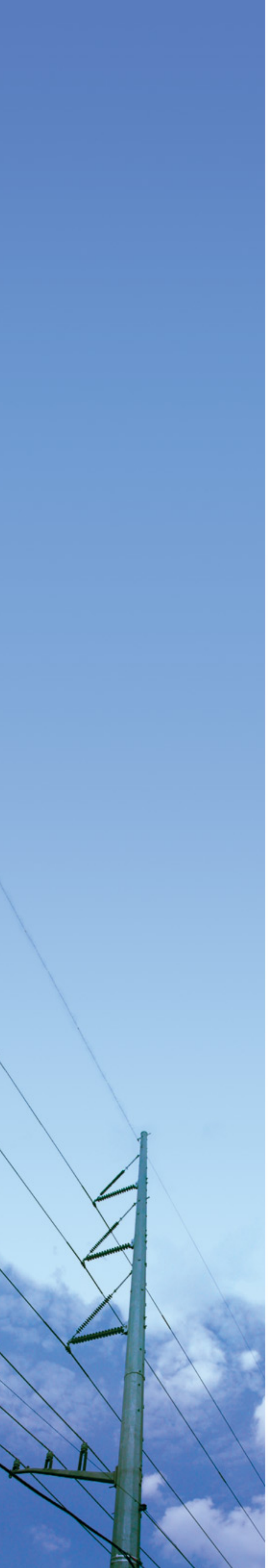

Screening Study
SPP-LTSR-2010-007&012

For OASIS Request #74845906 & 74845899

MAINTAINED BY
SPP Engineering, SPP Transmission Service Studies
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SPP Southwest Power Pool

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Executive Summary

Arkansas Electric Cooperative Corporation has requested a screening study to determine the impacts on SPP facilities due to the Long Term Service Requests for 500 MW. The service type requested for this screening study is Long Term Service Request (LTSR). OASIS# 74845906 and OASIS# 74845899 were studied as one request from 6/1/2015 to 6/1/2035.

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 EES to AEPW and OKGE. 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 6/1/2015 to 6/1/2035.

The service was modeled from EES to AEPW and OKGE. 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

Arkansas Electric Cooperative Corporation has requested a screening study to determine the impacts on SPP facilities for the Long Term Service Requests for 500 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 EES to AEPW and OKGE. 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 2010 Series Cases. Scenario 5 includes transmission service not already included in the SPP 2010 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 Updates

SPP used three seasonal models to study the EES to AEPW and OKGE 500 MW request for the requested service period. The following SPP Transmission Expansion

Plan 2010 Build 2 Cases were used to study the impact of the requested service on the transmission system:

2016 Summer Peak (16SP)
2016/17 Winter Peak (16WP)
2021 Summer Peak (21SP)

The Spring Peak models apply to April and May, the Summer Peak models apply to June through September, the Fall Peak models apply to October and November, and the Winter Peak models apply to December through March.

The chosen base case models were modified to reflect the current modeling information. From the three seasonal models, two system scenarios were developed. Scenario 0 includes projected usage of transmission included in the SPP 2010 Series Cases. Scenario 5 includes transmission not already included in the SPP 2010 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 500 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 500 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 500 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 CASES:

• 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 CASES for system intact:

• Solutions:	AC contingency checking (ACCC)
• MW mismatch tolerance:	0.5
• Contingency case rating:	Rate A
• Percent of rating:	100
• Output code:	Summary
• Min flow change in overload report:	3 MW
• Excld cases w/ no overloads form 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
• VAR limits:	Apply automatically
• Solution options:	
	X Phase shift adjustment _ Flat start _ Lock DC taps _ Lock switched shunts

ACCC CASES for branch and transformer contingencies:

• Solutions:	AC contingency checking (ACCC)
• MW mismatch tolerance:	0.5
• Contingency case rating:	Rate B
• Percent of rating:	100
• Output code:	Summary

- Min flow change in overload report: 3mw
- Excld cases w/ no overloads form 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
- VAR limits: Apply automatically
- Solution options:

X Phase shift adjustment
_ Flat start
_ Lock DC taps
_ Lock switched shunts

ACCC CASES for generator contingencies (largest machine at a bus):

- Solutions: AC contingency checking (ACCC)
- MW mismatch tolerance: 0.5
- Contingency case rating: Rate B
- Percent of rating: 100
- Output code: Summary
- Min flow change in overload report: 3mw
- Excld cases w/ no overloads form 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: Disabled
- Var limits: Apply automatically
- 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	Rating (MVA)	Transfer Case % Loading	TDF	Outaged Branch Causing Overload	Upgrade Name	Solution
5	21SP	AEPW	AEPW	BONANZA - HACKETT AECC 161KV CKT 1	177	101.882004	5.0%	AES - TARBY 161KV CKT 1	Multi - Bonanza - North Huntington 69kV	Rebuild and reconductor 4.0 miles of 4/0 ACSR 69 kV to 1590 ACSR 161 kV from converting North Huntington to Midland REC to 161 kV. Add 161 kV terminal at North Huntington.,Rebuild and reconductor Midland REC-Midland from 69 kV 4/0 ACSR to 161 kV 1590 ACSR.,Add 161/69 kV autotransformer at Midland.,Build Bonanza-Midland 1590 ACSR 161 kV line. Old Midland-Excelsior section to be converted from 69 kV to 161 kV. Add 4-161 kV breakers at Bonanza.
5	21SP	AEPW	AEPW	BONANZA - HACKETT AECC 161KV CKT 1	152	101.310898	4.6%	BASE CASE	Multi - Bonanza - North Huntington 69kV	Rebuild and reconductor 4.0 miles of 4/0 ACSR 69 kV to 1590 ACSR 161 kV from converting North Huntington to Midland REC to 161 kV. Add 161 kV terminal at North Huntington.,Rebuild and reconductor Midland REC-Midland from 69 kV 4/0 ACSR to 161 kV 1590 ACSR.,Add 161/69 kV autotransformer at Midland.,Build Bonanza-Midland 1590 ACSR 161 kV line. Old Midland-Excelsior section to be converted from 69 kV to 161 kV. Add 4-161 kV breakers at Bonanza.
5	21SP	AEPW	AEPW	CHAMBER SPRINGS - FARMINGTON AECC 161KV CKT 1	353	117.330299	8.0%	ELM SPRINGS REC - TONTITOWN 161KV CKT 1	CHAMBER SPRINGS - FARMINGTON AECC 161KV CKT 1 Accelerate	Rebuild and reconductor 11.1 mile Chamber Springs-Farmington REC 161 kV line with 2156 ACSR. Replace wave traps at Chamber Springs and bus at Farmington REC.
5	21SP	AEPW	AEPW	CHAMBER SPRINGS - FARMINGTON AECC 161KV CKT 1	294	114.8181	6.7%	BASE CASE	CHAMBER SPRINGS - FARMINGTON AECC 161KV CKT 1 Accelerate	Rebuild and reconductor 11.1 mile Chamber Springs-Farmington REC 161 kV line with 2156 ACSR. Replace wave traps at Chamber Springs and bus at Farmington REC.
5	21SP	AEPW	AEPW	CHAMBER SPRINGS - FARMINGTON AECC 161KV CKT 1	353	114.680298	7.8%	CARLY ROAD - DYESS 161KV CKT 1	CHAMBER SPRINGS - FARMINGTON AECC 161KV CKT 1 Accelerate	Rebuild and reconductor 11.1 mile Chamber Springs-Farmington REC 161 kV line with 2156 ACSR. Replace wave traps at Chamber Springs and bus at Farmington REC.
5	21SP	AEPW	AEPW	CHAMBER SPRINGS - FARMINGTON AECC 161KV CKT 1	353	114.419098	7.3%	DYESS - SOUTH SPRINGDALE 161KV CKT 1	CHAMBER SPRINGS - FARMINGTON AECC 161KV CKT 1 Accelerate	Rebuild and reconductor 11.1 mile Chamber Springs-Farmington REC 161 kV line with 2156 ACSR. Replace wave traps at Chamber Springs and bus at Farmington REC.
0	16SP	EES	SWPA	DARDANELLE - RUSSELLVILLE SOUTH 161KV CKT 1	335	108.25	20.2%	ARKANSAS NUCLEAR ONE - FT SMITH 500KV CKT 1	DARDANELLE - RUSSELLVILLE SOUTH 161KV CKT 1	Replace wave trap, disconnect switches, current transformers, and breaker at Dardanelle
0	16WP	EES	SWPA	DARDANELLE - RUSSELLVILLE SOUTH 161KV CKT 1	335	100.717697	19.0%	ARKANSAS NUCLEAR ONE - FT SMITH 500KV CKT 1	DARDANELLE - RUSSELLVILLE SOUTH 161KV CKT 1	Replace wave trap, disconnect switches, current transformers, and breaker at Dardanelle
5	21SP	AEPW	AEPW	ELM SPRINGS REC - TONTITOWN 161KV CKT 1	592	102.5485	11.3%	DYESS - TONTITOWN 161KV CKT 1	ELM SPRINGS REC - TONTITOWN 161KV CKT 1	Replace Tontitown wavetrap & jumpers
5	16WP	OKGE	OKGE	NORTHWEST (NORTWST2) 345/138/13.8KV TRANSFORMER CKT 1	493	100.434303	3.0%	NORTHWEST (NORTWST3) 345/138/13.8KV TRANSFORMER CKT 1	NORTHWEST 345/138/13.8KV TRANSFORMER CKT 3 Accelerate	Install third 345/138 kV Bus Tie in Northwest Sub

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				

Transmission Owner	Upgrade	Solution	Earliest Date Upgrade Required (DUN)	Estimated Date of Upgrade Completion (EOC)	* Estimated Engineering & Construction Cost	RTO Determined Need Date
AEPW	CHAMBER SPRINGS - FARMINGTON AECC 161KV CKT 1 Accelerate	Rebuild and reconductor 11.1 mile Chamber Springs-Farmington REC 16 kV line with 2156 ACSR. Replace wave traps at Chamber Springs and bus at Farmington REC.	6/1/2017	6/1/2017	$ 12,500,000	6/1/2020

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
OKGE	NORTHWEST 345/138/13.8KV TRANSFORMER CKT 3 Accelerate	Install third 345/138 kV Bus Tie in Northwest Sub	10/1/2013	6/1/2014	$ 15,000,000

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)
AEPW	ELM SPRINGS REC - TONTITOWN 161KV CKT 1	Replace Tontitown wavetrap & jumper	6/1/2017	6/1/2017
AEPW	Multi - Bonanza - North Huntington 69kV	Rebuild and reconductor 4.0 miles of 4/0 ACSR 69 kV to 1590 ACSR 161 kV from converting North Huntington to Midland REC to 161 kV. Add 161 k terminal at North Huntington.,Rebuild and reconductor Midland REC-Midlan from 69 kV 4/0 ACSR to 161 kV 1590 ACSR.,Add 161/69 kV autotransformer at Midland.,Build Bonanza-Midland 1590 ACSR 161 kV line Old Midland-Excelsior section to be converted from 69 kV to 161 kV. Add 4-161 kV breakers at Bonanza.	6/1/2019	6/1/2019
SWPA	DARDANELLE - RUSSELLVILLE SOUTH 161KV CKT 1	Replace wave trap, disconnect switches, current transformers, and breake at Dardanelle	6/1/2013	6/1/2011

* The previously identified Network Upgrade may be accelerated. The accelerated cost would be based on the change in date from the respective "RTO Determined Need Date" to the Estimated Date of Upgrade Completion (EOC) in accordance with Financial Analysis of the Aggregate Transmission Service Study (See Financial Analysis section). An expected cost may be estimated by assuming 5-10% of the Estimated Engineering & Construction Cost per year.