



SCREENING STUDY

SPP-LTSR-2016-014

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By SPP Engineering, Transmission Services

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION	COMMENTS
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2/27/17	SPP	Revenue Credits for Creditable Upgrades	

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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 200 MW. The service type requested for this screening study is Long Term Service Request (LTSR). OASIS# 83823870 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 transfers 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 200 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 AECL, 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 200 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 200 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 200 MW requested transfers for applicable scenarios. Solutions are identified for the violations in this table.

TABLE 3

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.

TABLE 4

Table 4 lists the credits to be paid for previously assigned AFS or Generation Interconnection Network Upgrades by this request. Engineering and construction costs and allocated revenue requirements for creditable upgrades are provided 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 200 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	20WP	OKGE	OKGE	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	100.5339966	63.19%	CLEO CORNER (CLEOCOR1) 138/69/13.8KV TRANSFORMER CH	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	Replace terminal equipment to at least 1200 amps.
5	20SP	WERE	WERE	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1	100.9880981	3.96%	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.
5	25WP	OKGE	OKGE	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	101.1051025	63.27%	CLEO CORNER (CLEOCOR1) 138/69/13.8KV TRANSFORMER CH	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	Replace terminal equipment to at least 1200 amps.
5	25SP	WERE	WERE	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1	101.219902	3.11%	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.
5	25SP	OKGE	OKGE	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	102.6279984	63.22%	CLEO CORNER (CLEOCOR1) 138/69/13.8KV TRANSFORMER CH	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	Replace terminal equipment to at least 1200 amps.
5	20SP	OKGE	OKGE	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	103.3340988	62.98%	CLEO CORNER (CLEOCOR1) 138/69/13.8KV TRANSFORMER CH	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	Replace terminal equipment to at least 1200 amps.
5	20SP	WERE	KCPL	SWISSVALE - WEST GARDNER 345KV CKT 1	105.808197	4.86%	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1	SWISSVALE - WEST GARDNER 345KV CKT 1 WERE	Replace terminal equipment.
5	20SP	WERE	KCPL	SWISSVALE - WEST GARDNER 345KV CKT 1	106.0898972	5.23%	HOYT - STRANGER CREEK 345KV CKT 1	SWISSVALE - WEST GARDNER 345KV CKT 1 WERE	Replace terminal equipment.
5	25SP	WERE	KCPL	SWISSVALE - WEST GARDNER 345KV CKT 1	106.9555969	4.58%	HOYT - STRANGER CREEK 345KV CKT 1	SWISSVALE - WEST GARDNER 345KV CKT 1 WERE	Replace terminal equipment.
5	25SP	WERE	KCPL	SWISSVALE - WEST GARDNER 345KV CKT 1	107.3478012	4.29%	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1	SWISSVALE - WEST GARDNER 345KV CKT 1 WERE	Replace terminal equipment.
5	25SP	OKGE	OKGE	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	109.3089981	53.26%	DBL-TGA-MATT	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	Replace terminal equipment to at least 1200 amps.
5	20WP	OKGE	OKGE	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	109.8995972	53.32%	DBL-TGA-MATT	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	Replace terminal equipment to at least 1200 amps.
5	25WP	OKGE	OKGE	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	109.9133987	53.31%	DBL-TGA-MATT	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	Replace terminal equipment to at least 1200 amps.
5	20SP	OKGE	OKGE	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	110.7397003	53.10%	DBL-TGA-MATT	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	Replace terminal equipment to at least 1200 amps.
5	20WP	OKGE	WFEC	CLEO CORNER - CLEO JCT 69KV CKT 1	118.1281967	24.39%	IMO TAP - MEN TAP 138KV CKT 1	CLEO CORNER - CLEO JCT 69KV CKT 1	Rebuild 1.56 miles of 69 kV transmission line from Cleo Corner to Cleo Jct.
5	25WP	OKGE	WFEC	CLEO CORNER - CLEO JCT 69KV CKT 1	118.3450012	24.42%	IMO TAP - MEN TAP 138KV CKT 1	CLEO CORNER - CLEO JCT 69KV CKT 1	Rebuild 1.56 miles of 69 kV transmission line from Cleo Corner to Cleo Jct.
5	20WP	OKGE	WFEC	CLEO CORNER - CLEO JCT 69KV CKT 1	119.2440033	24.39%	CLEOPLT4 138.00 - MEN TAP 138KV CKT 1	CLEO CORNER - CLEO JCT 69KV CKT 1	Rebuild 1.56 miles of 69 kV transmission line from Cleo Corner to Cleo Jct.
5	25WP	OKGE	WFEC	CLEO CORNER - CLEO JCT 69KV CKT 1	119.4531021	24.42%	CLEOPLT4 138.00 - MEN TAP 138KV CKT 1	CLEO CORNER - CLEO JCT 69KV CKT 1	Rebuild 1.56 miles of 69 kV transmission line from Cleo Corner to Cleo Jct.
5	25SP	OKGE	WFEC	CLEO CORNER - CLEO JCT 69KV CKT 1	120.177597	24.41%	IMO TAP - MEN TAP 138KV CKT 1	CLEO CORNER - CLEO JCT 69KV CKT 1	Rebuild 1.56 miles of 69 kV transmission line from Cleo Corner to Cleo Jct.
5	20WP	OKGE	WFEC	CLEO CORNER - CLEO JCT 69KV CKT 1	121.2270966	24.39%	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	CLEO CORNER - CLEO JCT 69KV CKT 1	Rebuild 1.56 miles of 69 kV transmission line from Cleo Corner to Cleo Jct.
5	25WP	OKGE	WFEC	CLEO CORNER - CLEO JCT 69KV CKT 1	121.4369965	24.42%	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	CLEO CORNER - CLEO JCT 69KV CKT 1	Rebuild 1.56 miles of 69 kV transmission line from Cleo Corner to Cleo Jct.
5	20SP	OKGE	WFEC	CLEO CORNER - CLEO JCT 69KV CKT 1	121.6025009	24.36%	IMO TAP - MEN TAP 138KV CKT 1	CLEO CORNER - CLEO JCT 69KV CKT 1	Rebuild 1.56 miles of 69 kV transmission line from Cleo Corner to Cleo Jct.
5	25SP	OKGE	WFEC	CLEO CORNER - CLEO JCT 69KV CKT 1	121.8659973	24.41%	CLEOPLT4 138.00 - MEN TAP 138KV CKT 1	CLEO CORNER - CLEO JCT 69KV CKT 1	Rebuild 1.56 miles of 69 kV transmission line from Cleo Corner to Cleo Jct.
5	20SP	OKGE	WFEC	CLEO CORNER - CLEO JCT 69KV CKT 1	123.2656021	24.36%	CLEOPLT4 138.00 - MEN TAP 138KV CKT 1	CLEO CORNER - CLEO JCT 69KV CKT 1	Rebuild 1.56 miles of 69 kV transmission line from Cleo Corner to Cleo Jct.
5	25SP	OKGE	WFEC	CLEO CORNER - CLEO JCT 69KV CKT 1	123.8638992	24.41%	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	CLEO CORNER - CLEO JCT 69KV CKT 1	Rebuild 1.56 miles of 69 kV transmission line from Cleo Corner to Cleo Jct.
5	20SP	OKGE	WFEC	CLEO CORNER - CLEO JCT 69KV CKT 1	125.259903	24.36%	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	CLEO CORNER - CLEO JCT 69KV CKT 1	Rebuild 1.56 miles of 69 kV transmission line from Cleo Corner to Cleo Jct.

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-2016-014

Customer	Reservation	POR	POD	Requested Amount	Requested Start Date	Requested Stop Date	Deferred Start Date Without Redispach	Deferred Stop Date Without Redispach	Potential Base Plan Funding Allowable	Point-to-Point Base Rate	Allocated E & C Cost	Total Revenue Requirements
AEPM	83823870	OKGE	CSWS	200	1/1/2019	1/1/2040	6/1/2021	6/1/2042	\$ 3,735,410	\$ -	\$ 4,773,530	\$ 12,622,365
									\$ 3,735,410	\$ -	\$ 4,773,530	\$ 12,622,365

Reservation	Upgrade Name	DUN	EOC	Earliest Start Date	Redispach Available	Base Plan Funding for Wind	Directly Assigned for Wind	Allocated E & C Cost	Total E & C Cost	Total Revenue Requirements
83823870	CLEO CORNER - CLEO JCT @18KV CKT 1			1/1/2019	1/1/2019	\$ 1,144,232	\$ -	\$ 1,144,232	\$ 1,144,232	\$ 2,738,718
						\$ -	\$ -	\$ -	\$ -	\$ -
						\$ 1,144,232	\$ -	\$ 1,144,232	\$ 1,144,232	\$ 2,738,718

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	Redispach Available
83823870	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1			1/1/2019	6/1/2021

Construction Periods - 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	Redispach Available
83823870	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1			1/1/2019	1/1/2019

Planned Projects

Reservation	Upgrade Name	DUN	EOC	Earliest Start Date	Redispach Available
83823870	SPRISDALE - WEST GARDNER 345KV CKT 1 WLR			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	Redispach Available	Base Plan Funding for Wind	Directly Assigned for Wind	Allocated E & C Cost	Total Revenue Requirements
83823870	Cleo Corner - Cleo Plant Tap 138KV Ckt 1	12/01/2017	12/01/2017			\$ 60,213.76	\$ -	\$ 60,214	\$ 88,560
	Cleo Corner 138KV GEN-2015-048 Addition (NU)	12/01/2017	12/01/2017			\$ 1,887,442.93	\$ 821,278	\$ 2,488,721	\$ 3,690,396
	GEN-2015-043 Tap - Matheuxon 345KV CKT 1	03/01/2018	03/01/2018			\$ 45,762.29	\$ -	\$ 45,762	\$ 66,122
	Stacmont 138V line terminal addition	10/15/2011	10/15/2011			\$ 13,180.10	\$ 6,452	\$ 19,632	\$ 34,418
	HAZCO - VALLEVE 345KV CKT 1	06/30/2012	06/30/2012			\$ 166,387.49	\$ -	\$ 166,388	\$ 1,443,011
	NORTHWEST - WOODWARD 345KV CKT 1	05/26/2010	05/26/2010			\$ 326,585.58	\$ -	\$ 487,441	\$ 3,751,063
	Vallant 345 KV (AEP)	04/17/2012	04/17/2012			\$ 54,472.39	\$ -	\$ 54,472	\$ 300,192
	WASHITA - GRACEMONT 138KV CKT 2	10/12/2012	10/12/2012			\$ 126,643.33	\$ -	\$ 126,643	\$ 214,553
	Woodward EHV 138KV Phase Shifting Transformer circuit #1	06/01/2017	06/01/2017			\$ 100,489.92	\$ 49,455	\$ 149,985	\$ 224,472
						\$ 2,591,178	\$ 1,038,120	\$ 3,629,298	\$ 9,883,647

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

Table 4 - Upgrade Requirements and Solutions Needed

Transmission Owner	Upgrade	Solution	Earliest Date Upgrade Required (DUN)	Estimated Date of Upgrade Completion (EOC)	Estimated Engineering & Construction Cost
WFEC	CLEO CORNER - CLEO JCT 69KV CKT 1	Rebuild 1.56 miles of 69 kV transmission line from Cleo Corner to Cleo Jct.	1/1/2019	1/1/2019	\$1,144,232

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	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	Replace terminal equipment to at least 1200 amps.	1/1/2019	1/1/2019	\$500,000

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 Projects				

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	\$300,192
ITCM	HUGO - VALLIANT 345KV CKT 1	Install new line from Valliant 345 kV to Hugo Power Plant with 19 miles of bundled 1590 ACSR conductor. Note that ITC is building the line from Valiant to Hugo.	06/08/2012	06/08/2012	\$1,543,311
OKGE	Cleo Corner - Cleo Plant Tap 138kV Ckt 1	Replace terminal equipment to at least 1200 amps: Change CT tap setting and testing.	12/01/2017	12/01/2017	\$88,560
OKGE	Cleo Corner 138kV Major Co Addition (NU)	Install four (4) 2000A circuit breakers, control panel replacement, line relaying, disconnect switches, and associated material and equipment. Reroute transmission line to the south to open up the north terminal.	12/01/2017	12/01/2017	\$3,660,366
OKGE	Kingfisher Co Tap - Mathewson 345KV CKT 1	Replace terminal equipment to achieve conductor limit	03/01/2018	03/01/2018	\$66,722
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	\$34,418
OKGE	NORTHWEST - WOODWARD 345KV CKT 1	Build 345 kV line	03/30/2010	03/30/2010	\$3,751,083
OKGE	Woodward EHV 138kV Phase Shifting Transformer circuit #1	Install one (1) 138 kV phase shifting transformer along with upgrading relay, protective, and metering equipment, and all associated and miscellaneous materials.	06/01/2017	06/01/2017	\$224,472
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	\$214,523

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