

Screening Study SPP-LTSR-2012-002

For OASIS Request #76967749

MAINTAINED BY
SPP Engineering, SPP Transmission Service Studies
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Executive Summary

Kansas City Power and Light has requested a Screening Study to determine the impacts on SPP facilities due to the Long Term Service Requests for 170 MW. The service type requested for this screening study is Long Term Service Request (LTSR). OASIS# 76967749 was studied as one request from 5/31/2014 to 5/31/2019.

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 KCPL to MPS. 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 5/31/2014 to 5/31/2019.

The service was modeled from KCPL to MPS. 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

Kansas City Power and Light has requested a screening study to determine the impacts on SPP facilities for the Long Term Service Requests for 170 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 KCPL to MPS. 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 2011 Series Cases. Scenario 5 includes transmission service not already included in the SPP 2011 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 four seasonal models to study the KCPL to MPS 170 MW request for the requested service period. The following SPP Transmission Expansion Plan 2011 Build 2

Cases were used to study the impact of the requested service on the transmission system:

- 2013/14 Winter Peak (13WP)
- 2017 Summer Peak (17SP)
- 2017/18 Winter Peak (17WP)
- 2022 Summer Peak (22SP)

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. From the six seasonal models, two system scenarios were developed. Scenario 0 includes projected usage of transmission included in the SPP 2011 Series Cases. Scenario 5 includes transmission not already included in the SPP 2011 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 170 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 170 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 170 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:
 - 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
- Excl'd 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:
 - 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
- 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
- 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
- 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: 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	Transfer Case % Loading	TDF (%)	Outaged Branch Causing Overload	Upgrade Name	Solution
5	13WP	WERE	KCPL	87th STREET - CRAIG 345KV CKT 1	100.7	48.9%	IATAN - ST JOE 345KV CKT 1	IATAN - NASHUA 345KV CKT 1	Tap Nashua 345KV bus in Hawthorn - St. Joseph 345 KV line. Build new 345 KV line from Iatan to Nashua, Add Nashua 345/161 KV
5	13WP	WERE	WERE	87th STREET - STRANGER CREEK 345KV CKT 1	106.8	49.8%	IATAN - ST JOE 345KV CKT 1	IATAN - NASHUA 345KV CKT 1	Tap Nashua 345KV bus in Hawthorn - St. Joseph 345 KV line. Build new 345 KV line from Iatan to Nashua, Add Nashua 345/161 KV
5	17SP	GMO	GMO	ANACONDA - FREEMAN 69KV CKT 1	105.2	9.3%	PLEASANT HILL - RALPH GREEN 69KV CKT 1	HARRISONVILLE 161/69KV TRANSFORMER CKT 1 MIPL	Replace with 125 MVA unit
5	22SP	GMO	GMO	ANACONDA - FREEMAN 69KV CKT 1	113.3	9.5%	PLEASANT HILL - RALPH GREEN 69KV CKT 1	HARRISONVILLE 161/69KV TRANSFORMER CKT 1 MIPL	Replace with 125 MVA unit
5	17SP	GMO	GMO	ANACONDA - HARRISONVILLE WEST 69KV CKT 1	101.6	9.3%	PLEASANT HILL - RALPH GREEN 69KV CKT 1	HARRISONVILLE 161/69KV TRANSFORMER CKT 1 MIPL	Replace with 125 MVA unit
5	22SP	GMO	GMO	ANACONDA - HARRISONVILLE WEST 69KV CKT 1	109.3	9.5%	PLEASANT HILL - RALPH GREEN 69KV CKT 1	HARRISONVILLE 161/69KV TRANSFORMER CKT 1 MIPL	Replace with 125 MVA unit
5	22SP	GMO	GMO	BELTON - RICHARDS-GEBAUER AIR FORCE BASE 69KV CKT 1	101.3	8.0%	BELTON SOUTH 161/69KV TRANSFORMER CKT 1	HARRISONVILLE 161/69KV TRANSFORMER CKT 1 MIPL	Replace with 125 MVA unit
5	22SP	GMO	GMO	BELTON - RICHARDS-GEBAUER AIR FORCE BASE 69KV CKT 1	101.3	8.0%	BELTON SOUTH 161/69KV TRANSFORMER CKT 1	HARRISONVILLE 161/69KV TRANSFORMER CKT 1 MIPL	Replace with 125 MVA unit
5	17SP	KCPL	KCPL	BIRMINGHAM - HAWTHORN 161KV CKT 1	119.7	3.6%	ECKLES - MISSOURI CITY 161KV CKT 1	BIRMINGHAM - HAWTHORN 161KV CKT 1	Reconductor 3.0 miles of line with 1192 ACSS from Hawthorn to Birmingham JCT. & upgrade terminal equipment for 2000 amps
5	17SP	KCPL	KCPL	BIRMINGHAM - HAWTHORN 161KV CKT 1	109.4	5.0%	KCPL-OL166-2	BIRMINGHAM - HAWTHORN 161KV CKT 1	Reconductor 3.0 miles of line with 1192 ACSS from Hawthorn to Birmingham JCT. & upgrade terminal equipment for 2000 amps
5	17SP	KCPL	KCPL	BIRMINGHAM - HAWTHORN 161KV CKT 1	109.3	3.1%	ECKLES - SIBLEYPL 161.00 161KV CKT 1	BIRMINGHAM - HAWTHORN 161KV CKT 1	Reconductor 3.0 miles of line with 1192 ACSS from Hawthorn to Birmingham JCT. & upgrade terminal equipment for 2000 amps
5	17SP	KCPL	KCPL	BIRMINGHAM - HAWTHORN 161KV CKT 1	109.0	5.0%	KCPL-OL166-1	BIRMINGHAM - HAWTHORN 161KV CKT 1	Reconductor 3.0 miles of line with 1192 ACSS from Hawthorn to Birmingham JCT. & upgrade terminal equipment for 2000 amps
5	17SP	KCPL	KCPL	BIRMINGHAM - HAWTHORN 161KV CKT 1	102.3	5.0%	SPP-2006-001	BIRMINGHAM - HAWTHORN 161KV CKT 1	Reconductor 3.0 miles of line with 1192 ACSS from Hawthorn to Birmingham JCT. & upgrade terminal equipment for 2000 amps
5	22SP	KCPL	KCPL	BIRMINGHAM - HAWTHORN 161KV CKT 1	122.0	3.1%	ECKLES - MISSOURI CITY 161KV CKT 1	BIRMINGHAM - HAWTHORN 161KV CKT 1	Reconductor 3.0 miles of line with 1192 ACSS from Hawthorn to Birmingham JCT. & upgrade terminal equipment for 2000 amps
5	22SP	KCPL	KCPL	BIRMINGHAM - HAWTHORN 161KV CKT 1	114.2	3.6%	ECKLES - SIBLEYPL 161.00 161KV CKT 1	BIRMINGHAM - HAWTHORN 161KV CKT 1	Reconductor 3.0 miles of line with 1192 ACSS from Hawthorn to Birmingham JCT. & upgrade terminal equipment for 2000 amps
5	22SP	KCPL	KCPL	BIRMINGHAM - HAWTHORN 161KV CKT 1	107.1	5.9%	KCPL-OL166-2	BIRMINGHAM - HAWTHORN 161KV CKT 1	Reconductor 3.0 miles of line with 1192 ACSS from Hawthorn to Birmingham JCT. & upgrade terminal equipment for 2000 amps
5	22SP	KCPL	KCPL	BIRMINGHAM - HAWTHORN 161KV CKT 1	106.8	5.9%	KCPL-OL166-1	BIRMINGHAM - HAWTHORN 161KV CKT 1	Reconductor 3.0 miles of line with 1192 ACSS from Hawthorn to Birmingham JCT. & upgrade terminal equipment for 2000 amps
5	17SP	KCPL	GMO	BIRMINGHAM - LIBERTY SOUTH 161KV CKT 1	114.1	3.6%	ECKLES - MISSOURI CITY 161KV CKT 1	BIRMINGHAM - LIBERTY SOUTH 161KV CKT 1 KACP	Reconductor 3.41 miles of 4.03 mile line with 1192 ACSS from Hawthorn - Liberty South (KCPL) & upgrade terminal equipment for 2000 amps
5	17SP	KCPL	GMO	BIRMINGHAM - LIBERTY SOUTH 161KV CKT 1	103.7	5.0%	KCPL-OL166-2	BIRMINGHAM - LIBERTY SOUTH 161KV CKT 1 KACP	Reconductor 3.41 miles of 4.03 mile line with 1192 ACSS from Hawthorn - Liberty South (KCPL) & upgrade terminal equipment for 2000 amps
5	17SP	KCPL	GMO	BIRMINGHAM - LIBERTY SOUTH 161KV CKT 1	103.7	3.1%	ECKLES - SIBLEYPL 161.00 161KV CKT 1	BIRMINGHAM - LIBERTY SOUTH 161KV CKT 1 KACP	Reconductor 3.41 miles of 4.03 mile line with 1192 ACSS from Hawthorn - Liberty South (KCPL) & upgrade terminal equipment for 2000 amps
5	17SP	KCPL	GMO	BIRMINGHAM - LIBERTY SOUTH 161KV CKT 1	103.4	5.0%	KCPL-OL166-1	BIRMINGHAM - LIBERTY SOUTH 161KV CKT 1 KACP	Reconductor 3.41 miles of 4.03 mile line with 1192 ACSS from Hawthorn - Liberty South (KCPL) & upgrade terminal equipment for 2000 amps
5	22SP	KCPL	GMO	BIRMINGHAM - LIBERTY SOUTH 161KV CKT 1	116.0	3.1%	ECKLES - MISSOURI CITY 161KV CKT 1	BIRMINGHAM - LIBERTY SOUTH 161KV CKT 1 KACP	Reconductor 3.41 miles of 4.03 mile line with 1192 ACSS from Hawthorn - Liberty South (KCPL) & upgrade terminal equipment for 2000 amps
5	22SP	KCPL	GMO	BIRMINGHAM - LIBERTY SOUTH 161KV CKT 1	108.1	3.6%	ECKLES - SIBLEYPL 161.00 161KV CKT 1	BIRMINGHAM - LIBERTY SOUTH 161KV CKT 1 KACP	Reconductor 3.41 miles of 4.03 mile line with 1192 ACSS from Hawthorn - Liberty South (KCPL) & upgrade terminal equipment for 2000 amps
5	22SP	KCPL	GMO	BIRMINGHAM - LIBERTY SOUTH 161KV CKT 1	101.0	5.9%	KCPL-OL166-2	BIRMINGHAM - LIBERTY SOUTH 161KV CKT 1 KACP	Reconductor 3.41 miles of 4.03 mile line with 1192 ACSS from Hawthorn - Liberty South (KCPL) & upgrade terminal equipment for 2000 amps
5	22SP	KCPL	GMO	BIRMINGHAM - LIBERTY SOUTH 161KV CKT 1	100.8	5.9%	KCPL-OL166-1	BIRMINGHAM - LIBERTY SOUTH 161KV CKT 1 KACP	Reconductor 3.41 miles of 4.03 mile line with 1192 ACSS from Hawthorn - Liberty South (KCPL) & upgrade terminal equipment for 2000 amps
5	13WP	GMO	GMO	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT	106.2	19.4%	PLEASANT HILL - SIBLEY 345KV CKT 1	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT 1 #1 Accelerate	Upgrade Prairie Lee wave trap to 2000 Amps.
5	13WP	GMO	GMO	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT	106.2	19.4%	PLEASANT HILL - SIBLEY 345KV CKT 1	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT 1 #2	Reconductor 2.5 mile from Blue Springs South - Blue Springs East 161 KV to 954 ACSS. Upgrade substation equipment to 2000 Amps.
5	13WP	GMO	GMO	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT	106.2	19.4%	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 to 2000 Amps.
5	17WP	GMO	GMO	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT	109.5	15.1%	PLEASANT HILL - SIBLEY 345KV CKT 1	BLUE SPRING SOUTH - PRAIRIE LEE 161KV CKT 1 #1 Accelerate	Upgrade Prairie Lee wave trap to 2000 Amps.
5	17WP	GMO	GMO	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT	109.5	15.1%	PLEASANT HILL - SIBLEY 345KV CKT 1	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT 1 #1 Accelerate	Reconductor 2.5 mile from Blue Springs South - Blue Springs East 161 KV to 954 ACSS. Upgrade substation equipment to 2000 Amps.
5	17WP	GMO	GMO	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT	109.5	15.1%	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 to 2000 Amps.
5	17WP	GMO	GMO	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT	102.1	16.2%	CLINTON - MONTROSE 161KV CKT 1	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT 1 #1 Accelerate	Upgrade Prairie Lee wave trap to 2000 Amps.
5	17WP	GMO	GMO	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT	102.1	16.2%	CLINTON - MONTROSE 161KV CKT 1	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT 1 #2	Reconductor 2.5 mile from Blue Springs South - Blue Springs East 161 KV to 954 ACSS. Upgrade substation equipment to 2000 Amps.
5	17WP	GMO	GMO	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT	102.1	16.2%	CLINTON - MONTROSE 161KV 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 to 2000 Amps.
5	17WP	GMO	GMO	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT	102.1	16.2%	CLINTON - MONTROSE 161KV CKT 1	BLUE SPRING SOUTH - PRAIRIE LEE 161KV CKT 1 #1 Accelerate	Upgrade Prairie Lee wave trap to 2000 Amps.
5	22SP	GMO	GMO	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT	130.9	4.1%	PLEASANT HILL - SIBLEY 345KV CKT 1	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT 1 #1 Accelerate	Upgrade Prairie Lee wave trap to 2000 Amps.
5	22SP	GMO	GMO	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT	130.9	4.1%	PLEASANT HILL - SIBLEY 345KV CKT 1	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT 1 #2	Reconductor 2.5 mile from Blue Springs South - Blue Springs East 161 KV to 954 ACSS. Upgrade substation equipment to 2000 Amps.
5	22SP	GMO	GMO	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT	130.9	4.1%	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 to 2000 Amps.
5	22SP	GMO	GMO	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT	130.9	4.1%	PLEASANT HILL - SIBLEY 345KV CKT 1	BLUE SPRING SOUTH - PRAIRIE LEE 161KV CKT 1 #1 Accelerate	Upgrade Prairie Lee wave trap to 2000 Amps.
5	13WP	GMO	GMO	BLUE SPRING SOUTH - PRAIRIE LEE 161KV CKT 1	111.9	19.4%	PLEASANT HILL - SIBLEY 345KV CKT 1	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT 1 #1 Accelerate	Upgrade Prairie Lee wave trap to 2000 Amps.
5	13WP	GMO	GMO	BLUE SPRING SOUTH - PRAIRIE LEE 161KV CKT 1	111.9	19.4%	PLEASANT HILL - SIBLEY 345KV CKT 1	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT 1 #2	Reconductor 2.5 mile from Blue Springs South - Blue Springs East 161 KV to 954 ACSS. Upgrade substation equipment to 2000 Amps.
5	13WP	GMO	GMO	BLUE SPRING SOUTH - PRAIRIE LEE 161KV CKT 1	111.9	19.4%	PLEASANT HILL - SIBLEY 345KV CKT 1	BLUE SPRING SOUTH - PRAIRIE LEE 161KV CKT 1 #1 Accelerate	Upgrade Prairie Lee wave trap to 2000 Amps.
5	17WP	GMO	GMO	BLUE SPRING SOUTH - PRAIRIE LEE 161KV CKT 1	115.2	15.1%	PLEASANT HILL - SIBLEY 345KV CKT 1	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT 1 #1 Accelerate	Upgrade Prairie Lee wave trap to 2000 Amps.

5	22SP	KCPL	AECI	CLINTON - MONTROSE 161KV CKT 1	110.1	18.3%	HOYT - STRANGER CREEK 345KV CKT 1	CLINTON - MONTROSE 161KV CKT 1 AECI	Upgrade limiting terminal equipment at Clinton
5	22SP	KCPL	AECI	CLINTON - MONTROSE 161KV CKT 1	110.1	18.3%	BASE CASE	CLINTON - MONTROSE 161KV CKT 1 AECI	Upgrade limiting terminal equipment at Clinton
5	22SP	KCPL	AECI	CLINTON - MONTROSE 161KV CKT 1	109.6	18.3%	LACYGNE - WEST GARDNER 345KV CKT 1	CLINTON - MONTROSE 161KV CKT 1 AECI	Upgrade limiting terminal equipment at Clinton
5	22SP	KCPL	AECI	CLINTON - MONTROSE 161KV CKT 1	109.6	18.3%	MCCREIDIE - THOMAS HILL 345KV CKT 1	CLINTON - MONTROSE 161KV CKT 1 AECI	Upgrade limiting terminal equipment at Clinton
5	22SP	KCPL	AECI	CLINTON - MONTROSE 161KV CKT 1	106.6	18.3%	LACYGNE - STILLWELL 345KV CKT 1	CLINTON - MONTROSE 161KV CKT 1 AECI	Upgrade limiting terminal equipment at Clinton
5	13WP	WERE	WERE	EDWARDSVILLE - MUND 115KV CKT 1	146.6	5.7%	87th STREET - CRAIG 345KV CKT 1	IATAN - NASHUA 345KV CKT 1	Tap Nashua 345KV bus in Hawthorn - St. Joseph 345 KV line. Build new 345 KV line from Iatan to Nashua.Add Nashua 345/161 KV
5	13WP	WERE	WERE	EDWARDSVILLE - MUND 115KV CKT 1	128.3	4.3%	IATAN - ST. JOE 345KV CKT 1	IATAN - NASHUA 345KV CKT 1	Tap Nashua 345KV bus in Hawthorn - St. Joseph 345 KV line. Build new 345 KV line from Iatan to Nashua.Add Nashua 345/161 KV
5	13WP	WERE	WERE	EDWARDSVILLE (EDWARDS) 161/115/112.47KV TRANSFORMER CKT 1	141.8	5.7%	87th STREET - CRAIG 345KV CKT 1	IATAN - NASHUA 345KV CKT 1	Tap Nashua 345KV bus in Hawthorn - St. Joseph 345 KV line. Build new 345 KV line from Iatan to Nashua.Add Nashua 345/161 KV
5	13WP	WERE	WERE	EDWARDSVILLE (EDWARDS) 161/115/112.47KV TRANSFORMER CKT 1	123.1	4.3%	IATAN - ST. JOE 345KV CKT 1	IATAN - NASHUA 345KV CKT 1	Tap Nashua 345KV bus in Hawthorn - St. Joseph 345 KV line. Build new 345 KV line from Iatan to Nashua.Add Nashua 345/161 KV
5	17SP	GMO	GMO	GRANDVIEW TAP - RICHARDS-GEBAUER AIR FORCE BASE 69KV CKT 1	100.8	7.8%	BELTON SOUTH 161/69KV TRANSFORMER CKT 1	HARRISONVILLE 161/69KV TRANSFORMER CKT 1 MIPU	Replace with 125 MVA unit
5	17SP	GMO	GMO	GRANDVIEW TAP - RICHARDS-GEBAUER AIR FORCE BASE 69KV CKT 1	100.8	7.8%	BELTON SOUTH 161/69KV TRANSFORMER CKT 1	HARRISONVILLE 161/69KV TRANSFORMER CKT 1 MIPU	Replace with 125 MVA unit
5	22SP	GMO	GMO	GRANDVIEW TAP - RICHARDS-GEBAUER AIR FORCE BASE 69KV CKT 1	110.9	8.0%	BELTON SOUTH 161/69KV TRANSFORMER CKT 1	GRANDVIEW TAP - RICHARDS-GEBAUER AIR FORCE BASE 69KV CKT 1 #1	Rebuild and reconductor 3.9 miles of 2-795 ACSR
5	13WP	KCPL	KCPL	GREENWOOD - SHAWNEE 161KV CKT 1	100.7	4.9%	IATAN - ST. JOE 345KV CKT 1	IATAN - NASHUA 345KV CKT 1	Tap Nashua 345KV bus in Hawthorn - St. Joseph 345 KV line. Build new 345 KV line from Iatan to Nashua.Add Nashua 345/161 KV
5	22SP	GMO	GMO	HARRISONVILLE NORTH - RALPH GREEN 69KV CKT 1	103.1	26.4%	PLEASANT HILL - RALPH GREEN 69KV CKT 1	HARRISONVILLE NORTH - RALPH GREEN 69KV CKT 1	Rebuild and reconductor 8.8 miles of 795 ACSR 26/7
5	22SP	GMO	GMO	HARRISONVILLE - HARRISONVILLE SWITCHING 69KV CKT 1	101.4	26.4%	PLEASANT HILL - RALPH GREEN 69KV CKT 1	HARRISONVILLE - HARRISONVILLE SWITCHING 69KV CKT 1	Replace terminal equipment
5	17SP	GMO	GMO	HARRISONVILLE 161/69KV TRANSFORMER CKT 1	164.6	24.1%	SPP-MIPU-04	HARRISONVILLE 161/69KV TRANSFORMER CKT 1 MIPU	Replace with 125 MVA unit
5	22SP	GMO	GMO	HARRISONVILLE 161/69KV TRANSFORMER CKT 1	180.2	24.0%	SPP-MIPU-04	HARRISONVILLE 161/69KV TRANSFORMER CKT 1 MIPU	Replace with 125 MVA unit
5	13WP	WERE	WERE	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1	105.1	3.1%	AUBURN ROAD - JEFFREY ENERGY CENTER 230KV CKT 1	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1	Reconductor 24.3 miles
5	17SP	GMO	GMO	LONGVIEW - WESTERN ELECTRIC 161KV CKT 1	120.8	36.6%	HARRIS ROAD - PLEASANT HILL 161KV CKT 1	LONGVIEW - WESTERN ELECTRIC 161KV CKT 1 #1	Replace 800 amp wavetrap with 1200 amp unit
5	17SP	GMO	GMO	LONGVIEW - WESTERN ELECTRIC 161KV CKT 1	118.2	36.6%	GREENWOOD ENERGY CENTER - HARRIS ROAD 161KV CKT 1	LONGVIEW - WESTERN ELECTRIC 161KV CKT 1 #1	Replace 800 amp wavetrap with 1200 amp unit
5	17SP	KCPL	KCPL	MARTIN CITY - REDEL 161KV CKT 1	101.7	10.4%	PECULIAR - STILLWELL 345KV CKT 1	MARTIN CITY - REDEL 161KV CKT 1	Reconductor line and upgrade terminal equipment for 2000 amps
5	13WP	WERE	WERE	MUND - PENTAGON 115KV CKT 1	141.1	5.7%	87th STREET - CRAIG 345KV CKT 1	IATAN - NASHUA 345KV CKT 1	Tap Nashua 345KV bus in Hawthorn - St. Joseph 345 KV line. Build new 345 KV line from Iatan to Nashua.Add Nashua 345/161 KV
5	13WP	WERE	WERE	MUND - PENTAGON 115KV CKT 1	123.8	4.3%	IATAN - ST. JOE 345KV CKT 1	IATAN - NASHUA 345KV CKT 1	Tap Nashua 345KV bus in Hawthorn - St. Joseph 345 KV line. Build new 345 KV line from Iatan to Nashua.Add Nashua 345/161 KV
5	17WP	WERE	WERE	MUND - PENTAGON 115KV CKT 1	100.9	3.0%	87th STREET - CRAIG 345KV CKT 1	IATAN - NASHUA 345KV CKT 1	Tap Nashua 345KV bus in Hawthorn - St. Joseph 345 KV line. Build new 345 KV line from Iatan to Nashua.Add Nashua 345/161 KV
5	17WP	SWPA	GMO	NORTH WARSAW - TRUMAN 161KV CKT 1	119.8	3.6%	HUBEN - MORGAN 345KV CKT 1	NORTH WARSAW - TRUMAN 161KV CKT 1 SWPA	Replace wave trap and CTs at Truman.
5	17WP	SWPA	GMO	NORTH WARSAW - TRUMAN 161KV CKT 1	115.4	4.7%	CLINTON - WINDSOR 161KV CKT 1	NORTH WARSAW - TRUMAN 161KV CKT 1 SWPA	Replace wave trap and CTs at Truman.
5	17WP	SWPA	GMO	NORTH WARSAW - TRUMAN 161KV CKT 1	112.5	3.6%	AMI - A. O.	NORTH WARSAW - TRUMAN 161KV CKT 1 SWPA	Replace wave trap and CTs at Truman.
5	17WP	SWPA	GMO	NORTH WARSAW - TRUMAN 161KV CKT 1	111.9	3.4%	BARN-CAL-F	NORTH WARSAW - TRUMAN 161KV CKT 1 SWPA	Replace wave trap and CTs at Truman.
5	17WP	SWPA	GMO	NORTH WARSAW - TRUMAN 161KV CKT 1	110.0	3.7%	50APE GIR 161.00 161/34.5KV TRANSFORMER CKT 99	NORTH WARSAW - TRUMAN 161KV CKT 1 SWPA	Replace wave trap and CTs at Truman.
5	17WP	SWPA	GMO	NORTH WARSAW - TRUMAN 161KV CKT 1	108.2	3.7%	LACYGNE - NEGSHO 345KV CKT 1	NORTH WARSAW - TRUMAN 161KV CKT 1 SWPA	Replace wave trap and CTs at Truman.
5	17WP	SWPA	GMO	NORTH WARSAW - TRUMAN 161KV CKT 1	107.2	3.7%	MCCREIDIE - THOMAS HILL 345KV CKT 1	NORTH WARSAW - TRUMAN 161KV CKT 1 SWPA	Replace wave trap and CTs at Truman.
5	17WP	SWPA	GMO	NORTH WARSAW - TRUMAN 161KV CKT 1	105.2	3.7%	BASE CASE	NORTH WARSAW - TRUMAN 161KV CKT 1 SWPA	Replace wave trap and CTs at Truman.
5	17WP	SWPA	GMO	NORTH WARSAW - TRUMAN 161KV CKT 1	101.5	3.7%	LACYGNE - STILLWELL 345KV CKT 1	NORTH WARSAW - TRUMAN 161KV CKT 1 SWPA	Replace wave trap and CTs at Truman.
5	22SP	GMO	GMO	NORTH WARSAW - TRUMAN 161KV CKT 1	129.5	3.1%	CLINTON - WINDSOR 161KV CKT 1	NORTH WARSAW - TRUMAN 161KV CKT 1 SWPA	Replace wave trap and CTs at Truman.
5	13WP	GMO	GMO	PECULIAR - PLEASANT HILL 345KV CKT 1	105.4	26.3%	IATAN - ST. JOE 345KV CKT 1	IATAN - NASHUA 345KV CKT 1	Tap Nashua 345KV bus in Hawthorn - St. Joseph 345 KV line. Build new 345 KV line from Iatan to Nashua.Add Nashua 345/161 KV
5	22SP	GMO	GMO	PLEASANT HILL 161/69KV TRANSFORMER CKT 1	102.5	18.3%	BELTON SOUTH 161/69KV TRANSFORMER CKT 1	HARRISONVILLE 161/69KV TRANSFORMER CKT 1 MIPU	Replace with 125 MVA unit
5	17SP	KCPL	KCPL	REDEL - STILLWELL 161KV CKT 1	111.3	10.4%	PECULIAR - STILLWELL 345KV CKT 1	REDEL - STILLWELL 161KV CKT 1	Reconductor line and upgrade terminal equipment for 2000 amps
5	22SP	KCPL	KCPL	REDEL - STILLWELL 161KV CKT 1	107.7	6.8%	PECULIAR - STILLWELL 345KV CKT 1	REDEL - STILLWELL 161KV CKT 1	Reconductor line and upgrade terminal equipment for 2000 amps
5	13WP	KCPL	GMO	SOUTH HARPER - STILLWELL 161KV CKT 1	101.1	17.1%	PECULIAR - STILLWELL 345KV CKT 1	IATAN - NASHUA 345KV CKT 1	Tap Nashua 345KV bus in Hawthorn - St. Joseph 345 KV line. Build new 345 KV line from Iatan to Nashua.Add Nashua 345/161 KV

Scenario	Season	Area	Monitored Bus with Violation	Transfer Case Voltage (PU)	Outaged Branch Causing Overload	Upgrade Name	Solution
5	13WP	WERE	87th STREET 345KV	0.93258	87th STREET - STRANGER CREEK 345KV CKT 1	IATAN - NASHUA 345KV CKT 1	Tap Nashua 345kV bus in Hawthorn - St. Joseph 345 kV line. Build new 345 kV line from Iatan to Nashua, Add Nashua 345/161 kV
5	22SP	GMO	RALPH GREEN 69KV	0.855844	SPP-MIPU-04	RALPH GREEN 12MVAR CAPACITOR	12MVAR at Ralph Green
5	22SP	GMO	RALPH GREEN 69KV	0.870219	PLEASANT HILL - RALPH GREEN 69KV CKT 1	RALPH GREEN 12MVAR CAPACITOR	12MVAR at Ralph Green

Transmission Owner	Upgrade	Solution	Earliest Date Upgrade Required (DUN)	Estimated Date of Upgrade Completion (EOC)	Estimated Engineering & Construction Cost
KACP	GRANDVIEW TAP - RICHARDS-GEBAUER AIR FORCE BASE 69KV CKT 1 #1	Rebuild and reconductor 3.9 miles of 2-795 ACSR	6/1/2018	6/1/2018	\$ 2,391,200
KACP	HARRISONVILLE NORTH - RALPH GREEN 69KV CKT 1	Rebuild and reconductor 8.8 miles of 795 ACSR 26/7	6/1/2018	6/1/2018	\$ 5,355,800
KACP	HARRISONVILLE - HARRISONVILLE SWITCHING 69KV CKT 1	Replace terminal equipment	6/1/2018	6/1/2018	\$ 155,000
KACP	MARTIN CITY - REDEL 161KV CKT 1	Reconductor line and upgrade terminal equipment for 2000 amps	6/1/2014	6/1/2016	\$ 2,348,500
MIPU	RALPH GREEN 12MVAR CAPACITOR	12MVAR at Ralph Green	6/1/2018	6/1/2018	\$ 486,000
SWPA	NORTH WARSAW - TRUMAN 161KV CKT 1 SWPA #2	Rebuild 2 miles	6/1/2018	6/1/2018	\$ 1,350,000

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
AECI	CLINTON - MONTROSE 161KV CKT 1 AECI	Upgrade limiting terminal equipment at Clinton	6/1/2014	6/1/2015	\$ 180,000
KACP	BIRMINGHAM - HAWTHORN 161KV CKT 1	Reconductor 3.0 miles of line with 1192 ACSS from Hawthorn to Birmingham JCT. & upgrade terminal equipment for 2000 amps	6/1/2014	6/1/2015	\$ 2,417,187
KACP	BIRMINGHAM - LIBERTY SOUTH 161KV CKT 1 KACP	Reconductor 3.41 miles of 4.03 mile line with 1192 ACSS from Hawthorn - Liberty South (KCPL) & upgrade terminal equipment for 2000 amps	6/1/2014	6/1/2015	\$ 2,772,268
MIPU	BIRMINGHAM - LIBERTY SOUTH 161KV CKT 1 MIPU	Reconductor 0.62 miles of 4.03 mile line with 1192 ACSS from Hawthorn - LibertySouth (GMO) & upgrade terminal equipment for 2000 amps	6/1/2014	6/1/2015	\$ 692,100
MIPU	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT 1 #1 Accelerate	Upgrade Prairie Lee wave trap to 2000 Amps.	10/1/2013	6/1/2015	\$ 3,344
MIPU	BLUE SPRING SOUTH - BLUE SPRINGS EAST 161KV CKT 1 #2 Accelerate	Reconductor 2.5 mile from Blue Springs South - Blue Springs East 161 kV to 795 ACSS. Upgrade substation equipment to 2000 Amps.	6/1/2014	6/1/2016	\$ 290,272
SWPA	NORTH WARSAW - TRUMAN 161KV CKT 1 SWPA	Replace wave trap and CTs at Truman.	10/1/2014	10/1/2014	\$ 70,000
WERE	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1	Reconductor 24.3 miles	10/1/2013	6/1/2018	\$ 49,623,119
MIPU	BLUE SPRING SOUTH - PRAIRIE LEE 161KV CKT 1 #2 Accelerate	Reconductor 3.21 miles from Blue Springs South to Prairie Lee 161 kV to 954 ACSS. Upgrade substation equipment to 2000 Amps.	6/1/2014	6/1/2016	\$ 361,012
KACP	REDEL - STILWELL 161KV CKT 1	Reconductor line and upgrade terminal equipment for 2000 amps	6/1/2014	6/1/2016	\$ 2,684,000

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)
KACP	IATAN - NASHUA 345KV CKT 1	Tap Nashua 345kV bus in Hawthorn - St. Joseph 345 kV line. Build new 345 kV line from Iatan to Nashua, Add Nashua 345/161 kV	10/1/2013	6/1/2015

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)
MIPU	BLUE SPRING SOUTH - PRAIRIE LEE 161KV CKT 1 #1	Upgrade Prairie Lee wave trap to 2000 Amps.	6/1/2014	6/1/2015
MIPU	HARRISONVILLE 161/69KV TRANSFORMER CKT 1 MIPU	Replace with 125 MVA unit	6/1/2014	6/1/2016
MIPU	LONGVIEW - WESTERN ELECTRIC 161KV CKT 1 #1	Replace 800 amp wavetrapp with 1200 amp unit	6/1/2014	6/1/2014