SPP Southwest Power Pool

System Impact Study SPP-2003-276-1 For Transmission Service Requested By City Power & Light of Independence, MO

From OPPD To INDN

For a Reserved Amount Of 50 MW From 6/1/2009 To 6/1/2049

SPP Engineering, Tariff Studies

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1. Executive Summary

City Power & Light of Independence, MO has requested a system impact study for long-term Firm Point-to-Point transmission service from OPPD to INDN. The period of the service is from 6/1/2009 to 6/1/2049. The request is for OASIS reservation 624705 for a total amount of 50 MW.

The principal objective of this study is to identify current system limitations using AC analyses and to determine the system upgrades necessary to provide the requested service. The OPPD to INDN 50 MW transfer was studied using three System Scenarios. The service was modeled from a source in OPPD to marginally dispatched INDN units. The three scenarios were studied to capture worst case system limitations dependent on the bias of the transmission system.

Tables 1.1, 1.2, and 1.3 list the SPP facility overloads caused or impacted by the transfer modeled, using Scenarios 1, 2, and 3, respectively. Tables 2.1, 2.2, and 2.3 list the SPP voltage violations caused or impacted by the transfer modeled, using Scenarios 1, 2, and 3, respectively. Tables 3.1, 3.2, and 3.3 list the Non-SPP facility overloads caused or impacted by the transfer modeled, using Scenarios 1, 2, and 3, respectively. Tables 4.1, 4.2, and 4.3 list the Non-SPP voltage violations caused or impacted by the transfer modeled, using Scenarios 1, 2, and 3, respectively.

The OPPD to INDN 50 MW transfer does not create any new violations or impacts on facilities requiring upgrades. Therefore, the service will be accepted.

2. Introduction

City Power & Light of Independence, MO has requested a system impact study for long-term Firm Point-to-Point transmission service from OPPD to INDN for 50 MW. The principal objective of this study is to identify the restraints on the SPP Regional Tariff System that may limit the requested service and determine the least cost solutions required to alleviate the limiting facilities.

This study includes steady-state contingency analyses (PSS/E function ACCC) and Available Transfer Capability (ATC) analyses. The steady-state analyses consider the impact of the request on transmission line and transformer loadings, and bus voltages for outages of single transmission lines and transformers, and selected multiple transmission lines and transformers on the SPP system and first tier Non - SPP systems.

The OPPD to INDN 50 MW transfer was studied using three System Scenarios. The service was modeled from a source in OPPD to marginally dispatched INDN units. The three scenarios were studied to capture worst case system limitations dependent on the bias of the transmission system.

3. Study Methodology

A. Description

The system impact 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 done to ensure current SPP Criteria and NERC Planning Standards requirements are fulfilled. The Southwest Power Pool conforms to the NERC Planning Standards, which provide the strictest requirements, related to voltage violations and thermal overloads during normal conditions and during a contingency. It requires that all facilities 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 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 110% and 90%. The SPS Tuco 230 kV bus voltage is monitored at 92.5% due to pre-determined system stability limitations.

The contingency set includes all SPP control area branches and ties 69kV 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 SPP control areas, AECI, and ENTR with SPP reserve share program redispatch. The monitor 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 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 first tier Non – SPP control area facilities, a 3 % TDF cutoff was applied to AECI, AMRN, and ENTR and a 2 % TDF cutoff was applied to MEC, NPPD, and OPPD. For voltage monitoring, a 0.02 per unit change in voltage must occur due to the transfer to be considered a valid limit to the transfer.

B. Model Updates

SPP used eight seasonal models to study the OPPD to INDN 50 MW transfer for the requested service period. The SPP MDWG 2004 Series Cases Update 5 2005 April Minimum (05AP), 2005 Spring Peak (05G), 2005 Summer Shoulder (05SH), 2005 Fall Peak (05FA), 2007 Summer Peak (07SP), 2007/08 Winter Peak (07WP), 2010 Summer Peak (10SP), and 2010/11 Winter Peak (10WP) were used to study the impact of the 50 MW transfer on the system during the requested service period of 6/1/2009 to 6/1/2049.

The chosen base case models were modified to reflect the most current modeling information. From the eight seasonal models, three system scenarios were developed. Scenario 1 includes SWPP OASIS transmission requests not already included in the SPP 2004 Series Cases flowing in a West to East direction with ERCOT exporting and the Southwestern Public Service (SPS) Control Area exporting to outside control areas and exporting to the planned Lamar HVDC Tie. Scenario 2 includes transmission requests not already included in the SPP 2004 Series Cases flowing in an East to West direction with ERCOT importing and SPS importing from an outside control area and importing from the planned Lamar HVDC Tie. The third scenario includes SWPP OASIS transmission requests not already included in the SPP 2004 Series Cases flowing in a West to East direction with ERCOT importing and SPS importing from an outside control area and importing from the planned Lamar HVDC Tie. The system scenarios were developed to minimize counter flows to the transfer studied.

C. 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. The PSS/E options chosen to conduct the analysis can be found in Appendix A.

4. Study Results

A. Study Analysis Results

The attached Tables contain the steady-state analysis results of the System Impact Study. The Tables are in the attached workbook *SPP-2003-276-1 Tables*. The tables identify the seasonal case in which the event occurred, the facility control area location, applicable ratings of the overloaded facility, the loading percentage or voltage with and without the 50 MW transfer, the percent transfer distribution factor (TDF) if applicable, and the estimated ATC value using interpolation if calculated. Comments are provided in the tables to document any SPP or Non - SPP identification or assignment of the event, existing mitigations plans or criteria to disregard the event as a limiting constraint, upgrades and costs to mitigate a limiting constraint, or any specific study procedures associated with modeling an event.

Tables 1.1, 1.2, and 1.3 list the SPP Facility Overloads caused or impacted by the transfer modeled, using Scenarios 1, 2, and 3, respectively. Tables 2.1, 2.2, and 2.3 list the SPP facility voltage violations caused or impacted by the transfer modeled, using Scenarios 1, 2, and 3, respectively. Tables 3.1, 3.2, and 3.3 list the Non-SPP Facility Overloads caused or impacted by the transfer modeled, using Scenarios 1, 2, and 3, respectively. Tables 4.1, 4.2, and 4.3 list the Non-SPP facility voltage violations caused or impacted by the transfer modeled, using Scenarios 1, 2, and 3, respectively. Solutions with engineering and construction costs are provided in the tables.

Tables 1.1a, 1.2a, and 1.3a document the modeling representation of the events identified in Tables 1.1, 1.2, and 1.3 to include bus numbers and bus names.

5. Conclusion

The OPPD to INDN 50 MW transfer does not create any new violations or impacts on facilities requiring upgrades. Therefore, the service will be accepted.

Appendix A

PSS/E CHOICES IN RUNNING LOAD FLOW PROGRAM AND ACCC

BASE CASES:
Solutions - Fixed slope decoupled Newton-Raphson solution (FDNS)
1. Tap adjustment – Stepping
2. Area interchange control – Tie lines only
3. Var limits – Apply immediately
4. Solution options - X Phase shift adjustment
   _ Flat start
   _ Lock DC taps
   _ Lock switched shunts

ACCC CASES:
Solutions – AC contingency checking (ACCC)
1. MW mismatch tolerance – 0.5
2. Contingency case rating – Rate B
3. Percent of rating – 100
4. Output code – Summary
5. Min flow change in overload report – 1mw
6. Excld cases w/ no overloads form report – YES
7. Exclude interfaces from report – NO
8. Perform voltage limit check – YES
9. Elements in available capacity table – 60000
10. Cutoff threshold for available capacity table – 99999.0
11. Min. contng. case Vltg chng for report – 0.02
12. Sorted output – None

Newton Solution:
1. Tap adjustment – Stepping
2. Area interchange control – Tie lines only
3. Var limits - Apply automatically
4. Solution options - X Phase shift adjustment
   _ Flat start
   _ Lock DC taps
   _ Lock switched shunts

Study Case	From Area	To Area	Monitored Branch Overload	Rate <MVA>	BC % Loading	TC % Loading	%TDF	Outaged Branch Causing Overload	ATC (MW)	Solution	Estimated Cost
05AP			NONE IDENTIFIED						50		
05G			NONE IDENTIFIED						50		
05SH			NONE IDENTIFIED						50		
05FA			NONE IDENTIFIED						50		
07SP			NONE IDENTIFIED						50		
07WP			NONE IDENTIFIED						50		
10SP			NONE IDENTIFIED						50		
10WP			NONE IDENTIFIED						50		
										Total Estimated Engineering and Construction Cos	$0

Study Case	AREA	Monitored Bus with Violation	BC Voltage (PU)	TC Voltage (PU)	Outaged Branch Causing Voltage Violation	ATC (MW)	Solution	Estimated Cost
05AP		NONE IDENTIFIED				50		
05G		NONE IDENTIFIED				50		
05SH		NONE IDENTIFIED				50		
05FA		NONE IDENTIFIED				50		
07SP		NONE IDENTIFIED				50		
07WP		NONE IDENTIFIED				50		
10SP		NONE IDENTIFIED				50		
10WP		NONE IDENTIFIED				50		
							Total Estimated Engineering and Construction Cost	$0

Study Case	From Area	To Area	Monitored Branch Overload	Rate <MVA>	BC % Loading	TC % Loading	%TDF	Outaged Branch Causing Overload	Comments
05AP			NONE IDENTIFIED						
05G			NONE IDENTIFIED						
05SH			NONE IDENTIFIED						
05FA			NONE IDENTIFIED						
07SP	INDN	INDN	59800 SUB I 2 69 to 59809 SHRNKRD2 69 CKT 1	69	88.5	103.9	21.3	59806 BLUVLY 2 69 to 59827 SUB P 2 69 CKT 1	Facility owned by City Power & Light of Independence, MO
07SP			NONE IDENTIFIED						
07WP			NONE IDENTIFIED						
10SP	INDN	INDN	59800 SUB I 2 69 to 59809 SHRNKRD2 69 CKT 1	69	70.7	110.3	54.6	59806 BLUVLY 2 69 to 59827 SUB P 2 69 CKT 1	Facility owned by City Power & Light of Independence, MO
10SP			NONE IDENTIFIED						
10WP			NONE IDENTIFIED						

Study Case	AREA	Monitored Bus with Violation	BC Voltage (PU)	TC Voltage (PU)	Outaged Branch Causing Voltage Violation	Comments
05AP		NONE IDENTIFIED				
05G	INDN	59820 SUB N 5 161	0.9853	0.8998	OPEN LINE FROM BUS 57997 [LEEDS 5161.00] TO BUS 59820 [SUB N 5161.00] CKT 1	Not a Load Serving Bus, Facility owned by City Power & Light of Independence, MO
05SH		NONE IDENTIFIED				
05FA		NONE IDENTIFIED				
07SP		NONE IDENTIFIED				
07WP		NONE IDENTIFIED				
10SP		NONE IDENTIFIED				
10WP		NONE IDENTIFIED				

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05SH			NONE IDENTIFIED						50		
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07SP			NONE IDENTIFIED						50		
07WP			NONE IDENTIFIED						50		
10SP			NONE IDENTIFIED						50		
10WP			NONE IDENTIFIED						50		
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05SH		NONE IDENTIFIED				50		
05FA		NONE IDENTIFIED				50		
07SP		NONE IDENTIFIED				50		
07WP		NONE IDENTIFIED				50		
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07SP	INDN	INDN	59800 SUB I 2 69 to 59809 SHRNKRD2 69 CKT 1	69	91.3	106.4	20.9	59806 BLUVLY 2 69 to 59827 SUB P 2 69 CKT 1	Facility owned by City Power & Light of Independence, MO
07SP			NONE IDENTIFIED						
07WP			NONE IDENTIFIED						
10SP	INDN	INDN	59800 SUB I 2 69 to 59809 SHRNKRD2 69 CKT 1	69	73.0	112.2	54.1	59806 BLUVLY 2 69 to 59827 SUB P 2 69 CKT 1	Facility owned by City Power & Light of Independence, MO
10SP			NONE IDENTIFIED						
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05SH		NONE IDENTIFIED				
05FA	INDN	59820 SUB N 5 161	0.9844	0.8982	OPEN LINE FROM BUS 57997 [LEEDS 5161.00] TO BUS 59820 [SUB N 5161.00] CKT 1	Not a Load Serving Bus, Facility owned by City Power & Light of Independence, MO
07SP		NONE IDENTIFIED				
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