SPP Southwest Power Pool

System Impact Study SPP-2001-309 For Transmission Service Requested By Western Resources Generation Services

From Western Resources to Associated Electric

For a Reserved Amount Of 40MW From 2/1/02 To 2/1/03

SPP Transmission Planning

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1. Executive Summary

Western Resources Generation Services has requested a system impact study for long-term Firm Point-to-Point transmission service from Western Resources to Associated Electric. The period of the transaction is from 2/1/02 to 2/1/03. The request is for OASIS reservation 306143 and 306144 for a total of 40MW.

The principal objective of this study is to identify system problems and potential system modifications necessary to facilitate the additional 40MW transfer while maintaining system reliability.

New overloads caused by the 40MW transfer were identified along with determining the impact of the transfer on any previously assigned and identified facilities.

The WR to AECI transfer increases the loading on previously identified facilities, resulting in an ATC of 0MW. Redispatch was looked at as an option to relieving the additional loading on these facilities caused by the WR to AECI 40MW transfer.

2. Introduction

Western Resources Generation Services has requested an impact study for transmission service from WR to AECI. The WR to AECI transfer was originally requested to run from 1/1/2002 to 1/1/2003. Due to the inability to resolve higher priority requests in the time period needed, the WR to AECI transfer was deferred to begin 2/1/2002 and end 2/1/2003.

The principal objective of this study is to identify the restraints on the SPP Regional Tariff System that may limit the transfer to less than 40MW. This study includes steady-state contingency analyses (PSS/E function ACCC) and Available Transfer Capability (ATC) analyses.

The steady-state analysis considers the impact of the 40MW transfer on transmission line loading and transmission bus voltages for outages of single and selected multiple transmission lines and transformers on the SPP system.

ATC analyses shows the amount of First Contingency Incremental Transfer Capabilities (FCITC) between the given study systems and what the limitations are, if any, for transferring up to 40MW.

3. Study Methodology

A. Description

Two analyses were conducted to determine the impact of the 40MW transfer on the system. The first analysis was conducted to identify any new overloads caused by the 40MW transfer. The second analysis was done to ensure that available capacity exists on previously identified circuits.

The first analysis was to study the steady-state analysis impact of the 40MW transfer on the SPP system. The second step was to study Available Transfer Capability (ATC) of the facilities identified in the steady-state analysis impact. The steady-state analysis was done to ensure current SPP Criteria and NERC Planning Standards requirements are fulfilled. The Southwest Power Pool (SPP) conforms to the NERC Planning Standards, which provide the strictest requirements, related to thermal overloads with a contingency. It requires that all facilities be within emergency ratings after a contingency.

The second analysis was done to determine the impact of the transfer on previously assigned and identified facilities.

B. Model Updates

SPP used five seasonal models to study the 40MW request. The SPP 2001 Series Cases 2001/2002 Winter Peak, 2002 Spring, 2002 Summer Peak, 2002 Fall, and 2002/03 Winter Peak were used to study the impact of the 40MW transfer on the SPP system during the transaction period of 2/1/02 to 2/1/03.

The chosen base case models were modified to reflect the most current modeling information. The cases were modified to reflect future firm transfers during the request period that were not already included in the January 2001 base case series models.

C. Transfer Analysis

Using the created models and the ACCC function of PSS\E, single and select double contingency outages were analyzed. Then full AC solution was used to obtain the most accurate results possible. Any facility overloaded, using MVA ratings, in the transfer case and not overloaded in the base case was flagged. The PSS/E options chosen to conduct the Impact Study analysis can be found in Appendix A.

4. Study Results

A. Study Analysis Results

Tables 1, 2, and 3 contain the analysis results of the System Impact Study. The tables identify the seasonal case in which the event occurred; the emergency rating of the overloaded circuit (Rate B), the contingent loading percentage of circuit with and without the studied transfer, the estimated ATC value using interpolation if calculated, any SPP identification or assignment of the event, and any solutions received from the transmission owners.

Table 1 shows the new facility overloads caused by the 40MW transfer. Upgrades associated with these new overloads can be directly assigned to the WR to AECI 40MW transfer.

Table 2 documents overloads on Non SPP Regional Tariff participants' transmission systems caused by the 40MW transfer.

Table 3 documents the 40MW transfer impact on previously assigned and identified facilities.

Table 4 documents possible pairs for redispatch that may be used to relieve the additional loading of the Hoyt to Circleville 115kV line for the 2002 Spring.

Table 5 documents possible pairs for redispatch that may be used to relieve the additional loading of the Hoyt to Circleville 115kV line for the 2002 Summer.

Table 6 documents possible pairs for redispatch that may be used to relieve the additional loading of the Midland 230/115kV transformer for the 2002 Summer.

Table 1 – SPP Facility Overloads caused by the WR to AECI 40MW Transfer

Study Year	From Area - To Area	Branch Over 100% Rate B	Rate B	BC % Loading	TC % Loading	Outaged Branch Causing Overload	ATC (MW)	Assignment
01WP		NONE				NONE	40	
02G		NONE				NONE	40	
02SP	WERE-WERE	**HOYT TO HOYT HTI SWITCHING JUNCTION, 115KV** 57163 HOYT 3 115 to 57165 HTI JCT3 115 CKT 1	92	99.9	100.4	**JEFFERY ENERGY CENTER TO SUMMIT, 345KV** 56766 JEC N 7 345 to 56773 SUMMIT 7 345 CKT1	40	Assigned to SPP-2001-211, Estimated In-Service Date 6/1/02, Rate B = 160MVA
02FA		NONE				NONE	40	
02WP		NONE				NONE	40	

Table 2 – Non - SPP Facility Overloads caused by the WR to AECI 40MW Transfer

Study Year	From Area - To Area	Branch Over 100% Rate B	Rate B	BC % Loading	TC % Loading	Outaged Branch Causing Overload
01WP	AECI-AECI	96099 5MONTCT 161 to 96575 2MONTGY 69.0 CKT 1	56	99.8	100.8	96059 5BIG CK 161 to 96099 5MONTCT 161 CKT1
01WP	AECI-AECI	96087 5HICKCK 161 to 96226 2HICKRY 69.0 CKT 1	56	97.7	104.9	96068 5CHILLI 161 to 96194 2CHILLI 69.0 CKT1
01WP	AECI-AECI	96076 5FAIRPT 161 to 96249 2FAIRPT 69.0 CKT 1	42	99.8	103.4	96076 5FAIRPT 161 to 96249 2FAIRPT 69.0 CKT2
01WP	AECI-AECI	96194 2CHILLI 69.0 to 96068 5CHILLI 161 CKT 1	50	96.6	109.3	96087 5HICKCK 161 to 96226 2HICKRY 69.0 CKT1
02SP	NPPD-NPPD	64181 MAXWELL7 115 to 64039 CALAWAY7 115 CKT 1	105	99.9	100.2	64102 GENTLMN3 345 to 64282 SWEET W3 345 CKT1
02SP	AECI-AECI	96120 5THMHIL 161 to 96172 2TMHILL 69.0 CKT 1	84	99.3	102.1	96044 7MCCRED 345 to 96049 7THOMHL 345 CKT1
02SP	AECI-AECI	96087 5HICKCK 161 to 96226 2HICKRY 69.0 CKT 1	56	95.0	102.1	96087 5HICKCK 161 to 96094 5LOCUST 161 CKT1
02FA	AECI-AECI	96113 5SRIVER 161 to 96349 2SRIVER 69.0 CKT 1	50	97.6	107.4	96113 5SRIVER 161 to 96349 2SRIVER 69.0 CKT2
02WP	SJLP-SJLP	69703 ST JOE 5 161 to 69701 MIDWAY 5 161 CKT 1	164	99.3	101.1	96039 7FAIRPT 345 to 96076 5FAIRPT 161 CKT3
02WP	AMRN-AMRN	31408 OVERTON 345 to 31409 OVERTON 161 CKT 1	300	100.0	100.3	31230 MONTGMRY 345 to 31231 MONTGMRY 161 CKT1
02WP	AECI-AECI	96090 5KINGDM 161 to 96517 2KINGDM 69.0 CKT 2	29	100.0	100.5	96061 5BOONE 161 to 96493 2BOONE 69.0 CKT1
02WP	AECI-AECI	96087 5HICKCK 161 to 96226 2HICKRY 69.0 CKT 1	56	99.2	107.2	96068 5CHILLI 161 to 96194 2CHILLI 69.0 CKT1
02WP	AECI-AECI	96194 2CHILLI 69.0 to 96068 5CHILLI 161 CKT 1	50	97.8	112.8	96087 5HICKCK 161 to 96226 2HICKRY 69.0 CKT1
02WP	AECI-AECI	96098 5MOCITY 161 to 96153 1MOCTN1 100 CKT 1	34	98.0	100.8	96091 5LATHRP 161 to 96302 2LATHRP 69.0 CKT1
02WP	AECI-AECI	96098 5MOCITY 161 to 96154 1MOCTN2 100 CKT 2	34	98.6	101.2	96091 5LATHRP 161 to 96302 2LATHRP 69.0 CKT1
02WP	AECI-AECI	96153 1MOCTN1 100 to 96304 2MOCITY 69.0 CKT 1	34	98.0	100.8	96091 5LATHRP 161 to 96302 2LATHRP 69.0 CKT1
02WP	AECI-AECI	96154 1MOCTN2 100 to 96304 2MOCITY 69.0 CKT 2	34	98.6	101.2	96091 5LATHRP 161 to 96302 2LATHRP 69.0 CKT1

Table 3 – Previously Assigned and Identified SPP Facilities Impacted by the WR to AECI 40MW Transfer.

Study Year	From Area - To Area	Branch Over 100% Rate B	Rate B	BC % Loading	TC % Loading	Outaged Branch Causing Overload	ATC (MW)	Assignment
01WP		NONE				NONE	40	
02G	WERE-WERE	**HOYT HTI SWITCHING JUNCTION TO CIRCLEVILLE, 115KV** 57165 HTI JCT3 115 to 57152 CIRCLVL3 115 CKT 1	92	105.6	106.2	**IATAN TO ST. JOE, 345KV** 57982 IATAN 7 345 to 69702 ST JOE 3 345 CKT1	0	Assigned to SPP-2001-227, Estimated In-Service Date 6/1/02, Rate B = 97MVA
02SP	WERE-WERE	**HOYT HTI SWITCHING JUNCTION TO CIRCLEVILLE, 115KV** 57165 HTI JCT3 115 to 57152 CIRCLVL3 115 CKT 1	92	106.3	107.0	**JEFFERY ENERGY CENTER TO EAST MANHATTAN, 230KV** 56852 JEC 6 230 to 56861 EMANHAT6 230 CKT1	0	Assigned to SPP-2001-227, Estimated In-Service Date 6/1/02, Rate B = 97MVA
02SP	WERE-WERE	**MIDLAND JUNCTION 230/115KV TR** 56855 MIDLAND6 230 to 57252 MIDLAND3 115 CKT 1	308	100.4	101.2	**LAWRENCE HILL 230/115KV TR** 56853 LAWHILL6 230 to 57250 LWRNCHL3 115 CKT1	0	Previously Identified
02FA	WERE-WERE	**HOYT TO HOYT HTI SWITCHING JUNCTION, 115KV** 57163 HOYT 3 115 to 57165 HTI JCT3 115 CKT 1	92	103.8	104.1	**CLIFTON TO CONCORDIA, 115KV** 58756 CLIFTON3 115 to 58757 CONCORD3 115 CKT1	40	Assigned to SPP-2001-211, Estimated In-Service Date 6/1/02, Rate B = 160MVA
02WP	WERE-WERE	**HOYT HTI SWITCHING JUNCTION TO CIRCLEVILLE, 115KV** 57165 HTI JCT3 115 to 57152 CIRCLVL3 115 CKT 1	92	103.8	104.0	**CONCORDIA 230/115KV TR** 58757 CONCORD3 115 to 58758 CONCORD6 230 CKT1	40	Assigned to SPP-2001-227, Estimated In-Service Date 6/1/02, Rate B = 97MVA

Table 4 – Possible Pairs Available for Redispatch to Relieve Hoyt to Circleville 115kV line - 2002 Spring

Source		Sink		% Response	Amount Needed For Redispatch (MW)
Bus #	Bus Name	Bus #	Bus Name		
56711	NEC U3	56671	TEC U7	-4.1	15.0
56731	GEC U1	56671	TEC U7	-4.1	15.0
56734	GEC U4	56671	TEC U7	-4.1	15.0
57072	WACO 4	56672	TEC U8	-4.1	15.0
56721	EEC U1	56671	TEC U7	-3.9	15.0
56725	EEC GT3	56672	TEC U8	-3.9	15.0
56711	NEC U3	56652	JEC U2	-3.5	18.0
56731	GEC U1	56653	JEC U3	-3.5	18.0
57072	WACO 4	56652	JEC U2	-3.5	18.0
56721	EEC U1	56652	JEC U2	-3.3	18.0
56711	NEC U3	56651	JEC U1	-3.1	19.0
56731	GEC U1	56651	JEC U1	-3.1	19.0
57072	WACO 4	56651	JEC U1	-3.1	19.0
56721	EEC U1	56651	JEC U1	-3.0	20.0
56711	NEC U3	56661	LEC U3	-2.7	23.0
56731	GEC U1	56661	LEC U3	-2.7	23.0
57072	WACO 4	56661	LEC U3	-2.7	23.0
56722	EEC U2	56663	LEC U5	-2.6	23.0

Table 5 – Possible Pairs Available for Redispatch to Relieve Hoyt to Circleville 115kV line - 2002 Summer

Source		Sink		% Response	Amount Needed For Redispatch (MW)
Bus #	Bus Name	Bus #	Bus Name		
56711	NEC U3	56671	TEC U7	-4.1	17
56711	NEC U3	56672	TEC U8	-4.1	17
56722	EEC U2	56671	TEC U7	-3.9	15
56722	EEC U2	56672	TEC U8	-3.9	15
56723	EEC GT1	56671	TEC U7	-3.9	15
56723	EEC GT1	56672	TEC U8	-3.9	15
56724	EEC GT2	56671	TEC U7	-3.9	15
56724	EEC GT2	56672	TEC U8	-3.9	15
56723	EEC GT1	56652	JEC U2	-3.3	18
56723	EEC GT1	56653	JEC U3	-3.3	18
56724	EEC GT2	56652	JEC U2	-3.3	18
56724	EEC GT2	56653	JEC U3	-3.3	18
56723	EEC GT1	56651	JEC U1	-3.0	20
56724	EEC GT2	56651	JEC U1	-3.0	20

Table 6 – Possible Pairs Available for Redispatch to Relieve Midland 230/115kV Transformer - 2002 Summer

Source		Sink		% Response	Amount Needed For Redispatch (MW)
Bus #	Bus Name	Bus #	Bus Name		
56661	LEC U3 14.4	56652	JEC U2 26.0	-32.1%	8.0
56661	LEC U3 14.4	56653	JEC U3 26.0	-32.1%	8.0
56661	LEC U3 14.4	56701	MCPH PLT12.5	-32.9%	8.0
56661	LEC U3 14.4	56651	JEC U1 26.0	-33.0%	8.0
56661	LEC U3 14.4	56663	LEC U5 24.0	-67.2%	4.0
56662	LEC U4 14.4	56652	JEC U2 26.0	-31.1%	8.0
56662	LEC U4 14.4	56653	JEC U3 26.0	-31.1%	8.0
56662	LEC U4 14.4	56701	MCPH PLT12.5	-31.9%	8.0
56662	LEC U4 14.4	56651	JEC U1 26.0	-32.0%	8.0
56662	LEC U4 14.4	56663	LEC U5 24.0	-66.2%	4.0
57637	IOLA 269.0	56663	LEC U5 24.0	-37.2%	7.0
56711	NEC U3 12.0	56663	LEC U5 24.0	-37.2%	7.0
57710	SUB A 269.0	56663	LEC U5 24.0	-37.1%	7.0

5. Conclusion

The WR to AECI transfer increases the loading on previously identified facilities. The acceptance of the WR to AECI request is dependant on the following:

- 2002 Spring (4/1/2002 – 6/1/2002) – The WR to AECI 40MW transfer increases the loading on the previously overloaded Hoyt to Circleville 115kV line. To provide the needed capacity on this facility, Western Resources must agree to redispatch generation as needed to relieve the additional loading caused by the transfer.

- 2002 Summer Peak (6/1/2002 – 10/1/2002) – The WR to AECI 40MW transfer increases the loading on the previously overloaded Hoyt to Circleville 115kV line. Previous studies show upgrades for this line can be completed by 6/1/2002 that will increase the rating from 92MVA to 97MVA, which is a 5.4% increase in rating. The loading of this line before the WR to AECI 40MW transfer is at 106.3 % of the original 92MW. Therefore, after implementing the upgrades to this facility, the ATC for the WR to AECI is zero for the 2002 Summer Peak. The WR to AECI transfer also impacts the previously identified Midland 230/115kV transformer. To provide the needed capacity on these facilities, Western Resources must agree to redispatch generation as needed to relieve the additional loading caused by the transfer.

- 2002 Fall (10/1/2002 – 12/1/2002) - Upgrades must be completed for the Hoyt to Hoyt Hti Switching Junction 115kV line assigned to the previously studied WR to EES 100MW transfer (SPP-2001-211). The required in-service date of this upgrade is the fall of 2002.

- 2002/2003 Winter (12/1/2002 – 4/1/2003) Upgrades must be completed for the Hoyt Hti Switching Junction to Circleville 115kV line assigned to the previously studied WR to AMRN 100MW transfer (SPP-2001-227). The scheduled in-service date of this upgrade is the summer of 2002.

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 automatically
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