



Transmission Expansion Preliminary Evaluation

MAINTAINED BY
SPP

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Background

Southwest Power Pool (SPP) evaluates short-term Available Transfer Capability on the transmission system through flowgates. Flowgates are a selected transmission element or group of elements acting as a proxy for the transmission network representing potential thermal, voltage, stability, and contractual system constraints to power transfer. The SPP primarily has flowgates limited by thermal capability of transmission circuit elements. These circuit elements are rated in accordance with the SPP Criteria 12, Electrical Facility Ratings. SPP has over 80 flowgates that it monitors on a continuous basis for reliability. Terminal equipment limits 26 of those flowgates. Of these terminally limited flowgates, 17 flowgates experienced at least a Transmission Loading Relief (TLR) of 3 or greater in the last two years. Firm curtailments of TLR level 5 occurred in 6 terminal equipment limited flowgates. The SPP Staff is preparing this analysis to assist in determining upgrades that are financially beneficial.

Analysis

The SPP Staff has reviewed flowgates that are terminally limited and have been recognized as having considerable impact on the reliability and transfer capability of the transmission system. The terminally limited flowgates have not only caused TLR but also limited the availability of transmission service within SPP. The focus on the terminal equipment limited facilities will be done first because of the lower cost and shorter construction times. Review of conductor limited flowgates can also be done using the same analysis.

Flowgate Selection

Staff used four different criteria in selecting these facilities. The four different criteria are:

1. Previous and projected TLR impacts
2. Transmission service that is rejected because of limited ATC
3. Flowgate capacity improvement due to upgrade
4. Cost of upgrade of terminal equipment

When looking at TLR impacts several factors must be considered. What is the magnitude of the curtailments that occurred? Was there an unusual situation that caused the TLR's and that condition is not expected to occur again? What if any projection of future TLR events can be predicted?

The Staff administers the Open Access Regional Tariff. During the evaluation of transmission service certain flowgates will show up with a higher frequency of causing the denial of service. If these limits were removed additional transmission service would have been granted on the system. A review was done to determine which flowgates are and have been limits to service during various seasons.

Another key review is determining how much capacity will be gained on a flowgate by upgrading the terminal equipment. On some flowgates little or no benefit is realized. An upgrade to the most limiting terminal equipment element merely increases the rating a few MVA to the much more expensive conductor. On others a significant benefit is gained. On certain flowgates the rating of the facility can almost be doubled by upgrading equipment such as a wavetrap or CT.

Another consideration is the cost of the upgrade compared to the expected benefit. If several pieces of terminal equipment need to be upgraded the cost may be greater than the projected benefit. Staff looked at the specific facilities to determine exactly what would need to be upgraded and used estimated costs of equipment in the initial review.

The table below displays the summary of results in the first analysis. Certain upgrade costs were not known and only estimated. These costs will have to be reviewed and are provided as an estimated only. This is a preliminary analysis to show a type of assessment that can be done to determine the benefits of upgrading facilities. This assessment can be done on an on-going basis or on a requested basis for certain paths and or flowgates.

Paths	Increased Revenue (based on firm monthly service)	Estimated Upgrade Cost
CLEC-AECI	\$321,200	\$102,000
CSWS-AECI	\$281,050	\$152,000
CSWS-AMRN	\$297,110	\$152,000
CSWS-MPS	\$301,840	\$152,000
CSWS-OPPD	\$316,800	\$152,000
CSWS-SPS	\$523,020	\$602,000
CSWS-WFEC	\$170,300	\$402,000
KCPL-WFEC	\$188,500	\$702,000
SPA-MPS	\$687,200	\$152,000
WR-WFEC	\$188,500	\$250,000

Results

To understand the need for upgrades, one must realize the magnitude of lost revenue when comparing the current state of the system to the desired state. Below, in the Table 1, is a view of the MWHrs being refused for two particular months within the last year. The dashes represent no refused service or unavailable information for the period.

Paths	March 2004 MWHrs Refused		April 2003 MWHrs Refused	
	Firm	Non-Firm	Firm	Non-Firm
CLEC-AECI	4800	0	-	-
CSWS-AECI	22320	109	8400	115
CSWS-AMRN	18048	104760	16800	823
CSWS-MPS	753408	-	324	115
CSWS-OPPD	237360	-	7536	-
CSWS-SPS	6000	816	38040	50
CSWS-WFEC	127776	20160	108000	-
KCPL-WFEC	4800	1830	-	50
SPA-MPS	12048	-	-	-
WR-WFEC	8400	3039	36000	200

Table 1: MWh's of refused service requests

Another source of lost revenue is TLR Events. The magnitude of such events on Terminally Limited Flowgates (TLFs) can be viewed in Table 2 shown below.

Flowgates	2002					2003					2004				
	# of TLRs		MWHrs Curtailed		Redispatch (MWHrs)	# of TLRs		MWHrs Curtailed		Redispatch (MWHrs)	# of TLRs		MWHrs Curtailed		Redispatch (MWHrs)
	TLR 3	TLR 5	Non-Firm	Firm		TLR 3	TLR 5	Non-Firm	Firm		TLR 3	TLR 5	Non-Firm	Firm	
BVSNBVNEWDEL	2	0	0	0	0	18	3	16989	2609	0	5	0	4297	100	0
ELKXFRTUCOKU	5	0	2081	0	0	1	0	319	0	0	-	-	352	0	0
MUSCLAMUSRSS	-	-	-	-	-	-	-	-	-	-	1	0	207	0	0
SCODEADELNEO	8	0	5670	0	0	8	1	5565	1686	3321	1	0	-	-	-
SWSANASWSFTC	-	-	-	-	-	1	0	0	0	0	-	-	-	-	-
WDRCIMSPRNRW	-	-	-	-	-	32	7	82272	10308	4097	-	-	-	-	-

Table 2: TLR occurrences on certain flowgates

Table 3 displays the desired state of the Transmission System by showing the increased amount of ATC possible for each path that is currently being refused. The limiting element shows what flowgate will limit the ATC for each path after the existing terminal equipment limitations are removed. The initial analysis is for a limited period and would be expanded for a detailed review.

Paths	Increased ATC	Duration of Increase	Limiting Element
CLEC-AECI	440 MW	May 6 – June 1, 2004; April and May 2005	NWTPATLYDVAL
CSWS-AECI	385 MW	May 6 – June 1, 2004; April and May 2005	NWTPATLYDVAL
CSWS-AMRN	407 MW	May 6 – June 1, 2004; April and May 2005	BVSNBVNESDEL
CSWS-MPS	343 MW	May 6 – June 1, 2004; April and May 2005	NWTPATLYDVAL
CSWS-OPPD	360 MW	May 6 – June 1, 2004; April and May 2005	NWTPATLYDVAL
CSWS-SPS	379 MW	May 6 – June 1, 2004; April and May 2005	SILDIVNWSCIM
CSWS-WFEC	131 MW	June – August 2005	SWSANASWSFTC
KCPL-WFEC	145 MW	May 6 – June 1, 2004; April – August 1, 2005	SWSANASWSFTC
SPA-MPS	781 MW	May 6 – June 1, 2004; April – August 1, 2005	STJXFRSTJXFR
WR-WFEC	145 MW	June – August 2005	SWSANASWSFTC

Table 3: ATC increases for currently refused paths

(Note: The increased ATC value does not account for simultaneous transfers.)

Table 4 displays the cost of each flowgate upgrade, the increased AFC, and the owner of each flowgate. Several of the costs were not available and an estimate is provided only.

Flowgate	Trans. Owner	Ex. MVA	New MVA	Limit	Est. Cost
BRIKEYRIVRED Bristow – Keystone 138 KV	OGE	191	267	Wavetrap & CT	\$50,000
BVSNBVNEWDEL Bartlesville SE – N. Bartlesville 138 KV	AEP	210	225	Wavetrap	\$50,000
CORCORSWSANA Cornville – Cornville Tap 138KV	AEP, WFEC	105	168	Wavetrap	\$50,000
ELKXFRTUCOKU Elk City 230/115 KV	AEP	263	392	CT	\$50,000
MUSCLAMUSRSS Muskogee – Clarksville 345 KV	OGE	896	1195	CT	\$50,000
PITSEMPITSUN Pittsburg – Seminole 345KV	OGE	717	1195	Wavetrap, CT, & Disconnect	\$52,000
SCODEADELNEO S. Coffeyville – Dearing 138 KV	WS	210	232	Wavetrap	\$50,000
SILDIVNWSCIM Silver Lake – Division 138 KV	OKGE	287	308	Wavetrap, Breaker, Disconnect, & CT	\$250,000
SWSANASWSFTC Southwestern Station – Anadarko 138 KV	AEP, WFEC	203	235	Wavetrap, CT, and Substation Conductor	\$50,000
VALHUGVALLYD Valiant – Hugo 138 KV	AEP	210	227	Wavetrap	\$50,000
WDRCIMSPRNRW Woodring – Cimarron 345 kV	OGE	956	1195	Breaker, switch	\$250,000

Table 4: Flowgate estimated costs to upgrade terminal limits

Further, Table 5 depicts what flowgates require upgrades in order to increase the ATC on a particular path. These values, when added to the TLR information, validate the need to upgrade each TLF described in this document. These are based on the minimum response factor for each path for the flowgate to be considered a limit to the requested path. These numbers are seasonal and one season is provided for the initial analysis.

Paths	Upgrade Costs	BRIKEYRVED	BVSNBVNEWDEL	CORCORSWSANA	MUSCLAMUSRSS	PITSEMPITSUN	SCODEADELNEO	SILDIVNWSCIM	SWSANASWSFTC	WDRCIMSPRNRW
CLEC-AECI	\$102,000				X	X				
CSWS-AECI	\$152,000		X			X	X			
CSWS-AMRN	\$152,000		X			X				
CSWS-MPS	\$152,000		X			X	X			
CSWS-OPPD	\$152,000		X			X	X			
CSWS-SPS	\$602,000	X				X		X		X
CSWS-WFEC	\$402,000	X		X		X		X		
KCPL-WFEC	\$702,000	X		X		X		X	X	X
SPA-MPS	\$152,000				X	X	X			
WR-WFEC	\$702,000	X		X		X		X	X	X
Totals		4	4	3	2	11	4	4	2	5

Table 5: Path flowgate limitations

Summary

Based on the information described in this proposal, upgrading certain terminally limited flowgates would be shown to have a financial benefit to both the Transmission Owner and the Transmission Customer. As the upgrades are an investment, the advantages of increased ATC and the reduction of TLR events will provide a return on the investment.