

Southwest Power Pool

Intra-Regional Appraisal and Study Observation

2006 Summer Peak

Transmission Assessment

May 2006





SOUTHWEST POWER POOL
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2006 Summer Peak Transmission Assessment

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Overview

In accordance with the MAIN-MRO-SPP (MMS) Agreement to review the reliability of the interconnected system along the interface of the three regions, a study was made to determine the ability of this system to transfer power between MAIN, MRO and SPP, and their respective subregions for the modeled 2006 summer peak conditions. The primary goal of this report is to review and assess the overall adequacy of the Southwest Power Pool region's interconnected bulk electric transmission system based on the results of the MMS study.

The specific tasks involved were:

1. Determine the adequacy of the bulk transmission system for numerous contingency conditions.
2. Review the application of operating guides required in this study to assure they perform as intended.
3. Determine areas where special operating procedures might be required to reduce heavy transmission loading during contingency conditions.

Regional transfers were studied with information supplied by neighboring regions. Individual NERC Regions are allowed to simulated transfers using their own criteria defined for transmission assessments. The MAIN-MRO-SPP (MMS) study is performed for summer and winter peaks by a separate study group at the request of NERC. Transfer capability of the inter- and intra-transmission system was also studied as an indicator of the overall adequacy of the transmission system. The simulated transfers do not represent how commercial business is done and should not be used as an indicator of commercially available transmission capacity for the given season. These transfer numbers are not simultaneous and cannot be added together (see NERC document on Transfer Capability).

The NERC Planning Standards define system reliability in terms of adequacy and security. This report addresses system adequacy. This study does not assess system security, which involves the system's response to sudden disturbances and requires the use of study techniques such as short circuit and stability analysis.

This study does not determine if adequate generating capacity exists to create the transfers documented here, especially if the system is experiencing a wide-spread temporary power deficiency as has happened during adverse weather conditions. **The nature of the study was to focus on the bulk transmission network.**

SPP is divided into two sub-regions consisting of the North and South. The North Sub-Region contains the operating companies in the states of Kansas and Missouri. The South Sub-Region contains the remaining companies in SPP which includes all of Oklahoma and parts of Arkansas, Louisiana, Mississippi, New Mexico, and Texas.

Each transfer direction was studied to determine any limiting facilities under any single contingency event (Linear FCITC - First Contingency Incremental Transfer Capability) up to the transfer test level. The three most limiting elements are noted. Operating Guides used are shown as applicable to increase transfer capability.

This study is based on a single "snapshot" which includes many variables and thus, many assumptions. Many of these variables (load, generation dispatch, unit outages, generating

additions, etc.) will change throughout the 2006 Summer Peak season, so they will differ from those simulated in the models. These transfer capability numbers, therefore, should be taken as a **guide** to transmission adequacy during 2006 summer peak period.

Additional study was performed to evaluate transfer capabilities with respect to voltage limits. This analysis is intended to serve as a screening study for areas of the system that may require further analysis.

A change in the method used in simulating the transfer levels could also vary the values of the transfer capability number. For more specific details on the transmission assessment methodology and procedures, contact the Southwest Power Pool office.

**Southwest Power Pool
Sub-Regional Appraisal and Study Observations
2006 Summer Peak Transmission Assessment**

I. General Observations

The MAIN TASG case was developed from the 2006 Summer Peak model of the SPP 2006 series of load flow cases along with models from MAIN, MRO and SERC. The sub-regions of MAIN, MRO and SPP along with member companies are listed below.

SPP-North

The SPP-North sub-region consists of the utilities located principally within the states of Kansas and Missouri. The member systems in the area are:

- The Board of Public Utilities, Kansas City
- City Power & Light, Independence
- City Utilities, Springfield
- The Empire District Electric Company
- Kansas City Power & Light Company
- Midwest Energy Inc.
- Sunflower Electric Power Corp.
- Aquila, Inc.
 - Missouri Public Service Company
 - West Plains Energy
 - St. Joseph Light & Power
- Westar Energy
 - Westar Energy, Inc.
 - Kansas Gas and Electric Company

SPP-South

The SPP-South sub-region consists of the utilities located principally within the states of Oklahoma, Arkansas, Louisiana, Mississippi, New Mexico, and Texas. The member systems in the area are:

- American Electric Power
 - AEP Public Service Company of Oklahoma
 - AEP Southwestern Electric Power Company
- CLECO Power
- City of Lafayette, Louisiana
- Louisiana Energy & Power Authority
- Grand River Dam Authority
- Oklahoma Gas & Electric Company
- Oklahoma Municipal Power Authority
- Southwestern Power Administration
- Southwestern Public Service Company
- Western Farmers Electric Cooperative

MAIN-South

The member systems in the area are :

- Ameren
- Central Illinois Light Company
- Columbia Water & Light
- City Water Light and Power, Springfield, Illinois
- Duke Energy Audrain County – IPP Control Area
- Electric Energy, Incorporated
- Illinois Municipal Electric Agency
- Illinois Power Company
- Southern Illinois Power Cooperative
- Soyland Power Cooperative

Iowa (MRO)

The member systems in the area are :

- Mid-American Energy Company
- Muscatine Power and Water Company

Minnesota (MRO)

The member systems in the area are :

- Dairyland Power Cooperative
- Great River Energy
- Cooperative Power
- United Power Association
- Manitoba Hydro-Electric Board
- Minnesota Power
- Excel Energy Company
- Southern Minnesota Power

II. Nonsimultaneous Import Transfer Capabilities (MW) for SPP Sub-Regions

Transfer Direction	2006 Summer		2005 Summer		2005 Summer (2005 Summer Outaged Element)	Owner
	FCITC	Notes	FCITC	Notes		
AMRN-SPP-N	500		1400		Montgomery-Guthrie 161 kV line (McCredie-Overton-Montgomery 345kV)	AMRN
IOWA-SPP-N	1500	10	1200*		No Limit Found (Each Valid Contingency Tested)	-
MINN-SPP-N	1500		1200	4, 23, 44, 72	No Limit Found (Each Valid Contingency Tested)	-
Old SMAIN-SPP-N	150		1400		Montgomery-Guthrie 161 kV line (McCredie-Overton-Montgomery 345kV)	AMRN
AMRN-SPP-S	1500		1000		No Limit Found (Each Valid Contingency Tested)	-
SPP-S-SPP-N	1200*		1200		No Limit Found (Each Valid Contingency Tested)	-
SPP-N-SPP-S	1200*	68, 71	1200*	71	No Limit Found (Each Valid Contingency Tested)	-

⁽¹⁾ FCTTC is defined as the scheduled transfers plus the lower of either the FCITC or test level.
^(*) Denotes transfer level studied or based upon the transfer level studied.

A description of the following guides can be found in Exhibit D-2:

- | | |
|--|--|
| (4) Arpin Area Operating Guides | (16) Thomas Hill Operating Guide |
| (23) Boswell Special Protection System | (44) Taconite Harbor Special Protection System |
| (68) Wells Operating Guide | (72) Woodbin-East Temp Operating Guide |
| (71) TEC-Tecumseh Hill Operating Guide | |

SPP-North Imports

SPP-N import FCTTC from AMRN is 500 MW limited by the Montgomery-Guthrie 161 kV line (AMRN) for the outage of the McCredie-Overton-Montgomery three terminal 345 kV line (AMRN). This level is a decrease from the 1400 MW reported in the 2005 summer study that was limited by the Moberly-Salisbury 161 kV line (AMRN-KCPL) for the outage of Salisbury-Thomas Hill 161 kV line (KCPL-AECI). This decrease in FCTTC can be attributed to the introduction of market dispatch into the model.

SPP-N import FCTTC from IOWA is 1600 MW. No limiting element was identified up to this transfer level with the availability of the Lake Road-Nashua Operating Guide. No limit was identified up to the 1200 MW test level in the 2005 summer study.

SPP-N import FCTTC from MINN is 1500 MW with no limitations found. This level is an increase from the 1200 MW reported in the 2005 summer study limited by the Prestot-Eau Claire 161 kV line (XEL) for the outage of Tremval-Alma 161 kV line (XEL-DPC). This increase can be attributed to the market dispatch in the 2006 summer model.

SPP-N import FCTTC from SMAIN is 500 MW limited by the Montgomery-Guthrie 161 kV line (AMRN) for the outage of the McCredie-Overton-Montgomery three terminal 345 kV line (AMRN). This level is a decrease from the 1400 MW FCITC reported in the 2005 summer study limited by the Overton 345/161 kV transformer (AMRN) for the outage of Overton-Sibley 345 kV line (AMRN-MIPU). This decrease can be attributed to the introduction of market dispatch in the model.

SPP-N import FCITC from SPP-S is 1200 MW. No limiting element was identified up to this transfer level. This is the same FCITC reported for the 2005 summer study.

SPP-South Imports

SPP-S import FCTTC from AMRN is 1500 MW with no limitation found. This level is an increase from the 1000 MW reported in the 2005 summer study limited by the Danville-Magazine 161 kV line (EES-AEPW) for the outage of Fort Smith-ANO 500 kV line (OKGE-EES).

SPP-S import FCITC from SPP-N is 1200 MW with no limit identified up to the transfer level with the availability of TEC-Tecumseh Hill Operating Guide and the Wells Operating Guide. This is the same FCITC reported in 2004 summer with no limiting element identified.

**Southwest Power Pool
Inter-Regional Appraisal and Study Observations
2006 Summer Peak Transmission Assessment**

I. General Observations

Compared to the loads modeled in the 2005 summer study, the Old MAIN, MRO, and SPP loads are approximately 3.8%, 2.6%, and 2.4% higher, respectively, in this study.

The MAIN import FCITC from SPP in the 2006 summer study is the same as reported in the 2005 MAIN Summer Transmission Assessment Study, and is judged to be adequate.

The MAIN import FCITC from MRO is 500 MW higher in the 2006 summer than in the 2005 MAIN Summer Transmission Assessment Study, and is judged to be adequate. This increase can be attributed to market based interchange being included in the model.

The SPP import FCITC from MAIN and MRO are over 2000 MW

Regional imports into SPP from TVA were limited by 161 kV lines in the vicinity of ANO and Russellville for the outages of Ft. Smith-ANO 500 kV line.

II. Regional First Contingency Incremental Transfer Capability (FCITIC)

The FCITC are incremental above the modeled base case transactions. These values should be considered along with the base case transfers listed in Section V of this report. The following tables show the FCITC for the SPP Inter-Regional Transfers.

Transfer Direction	2006 Summer			2005 Summer			2006 Summer Limiting Element (Outaged Element)	Owner
	FCITC C (MW)	FCTTC 1 (MW)	Notes	FCITC (MW)	FCTTC 1 (MW)	Notes		
MRO-Old MAIN	2800*	700*		1500	1100	23, 44,4	No Limit Found (Each Valid Contingency Tested)	-
SPP-Old MAIN	2500*	2700*	81	2500*	2600*		No Limit Found (Each Valid Contingency Test)	-
Old MAIN-MRO	0	1650	67	1100	1500	67	Badger-Bell Plaine 115 kV (N. Appleton-Rocky Run 345 kV)	ATCLLC (ATCLLC)
SPP-MRO	0	1000	67	1300	1050		Fox River-N. Appleton 345 kV (N. Appleton-Kewaunee 345 kV)	ATCLLC (ATCLLC)
Old MAIN-SPP	2100	2000		2500*	2400*	68	ANO-North Russellville 161 kV (Ft. Smith-ANO 500 kV)	(EES) (OKGE-EES)
MRO-SPP	2000*	2250*	10	2000*	2250*	4,10,23,44,68	No Limit Found (Each Valid Contingency Tested)	-
TVA-SPP	0	0		750	750	68	Sage-Melbourn 161 kV line (Ft. Smith-ANO 500 kV)	(EES) (OKGE-

(¹) FCTTC is defined as the scheduled transfers plus the lower of either the FCITC or test level.

(*) Denotes transfer level studied or based upon the transfer level studied.

A description of the following guides can be found in Exhibit D-2:

- | | |
|--|--|
| (4) Arpin Area Operating Guides | (10) Lake Road - Nashua Guide |
| (23) Boswell Special Protection System | (44) Taconite Harbor Special Protection System |
| (67) Salem Transformer Emergency Operating Guide | (68) Wells Operating Guide |
| (70) Weston Area Special Operating Procedure | (81) Wayne Bus Tie Operating Guide |

SPP-Imports

The SPP import FCTTC from MAIN is 2000 MW limited by the ANO-N.Russellville 161 kV Line (EES) for the outage of the Ft.Smith-ANO 500 kV line (OKGE-EES). This level is a decrease from the 2400 MW reported in the 2005 summer study with no limitation found.

The SPP import FCTTC from MRO is 2250 MW with no limit found. This level is unchanged from the 2250 MW FCITC reported in the 2005 summer study.

The SPP import FCTTC from TVA is 0 MW limited by the Sage-Melbourn 161 kV line (EES) for the outage of the Fort Smith-ANO 500 kV line (OKGE-EES). This level is a decrease from the 750 MW reported in the 2005 summer study limited by the Danville-Magazine 161 kV line (EES-AEPW) for the outage of Fort Smith-ANO 500 kV line (EES-OKGE).

The SPP import FCITC from SERC-WEST is 200 MW limited by the Danville-Magazine 161 kV line (EES-AEPW) for the outage of the Fort Smith-ANO 500 kV line (OKGE-EES). This level is a decrease from the 850 MW reported in the 2005 summer study limited by the Danville-Magazine 161 kV line (EES-AEPW) for the outage of Fort Smith-ANO 500 kV line (EES-OKGE). This Change can be attributed to increased generation at ANO.

SPP IMPORTS

*****SPP Imports*****

OLD MAIN	IITC	2500*	No Limit Found				None
	FCITC	1800	(70A) N. Appleton-Rocky Run 345 kV	748	836E	.049	Weston Unit #3
		2050 <=	Thomas Hill 345/161 kV Tr.	480	556E	.037	McCredie Tap-Overton 345
		2100	ANO-Russellville North 161 kV	330	396E	.032	Ft. Smith-ANO 500 kV
		2400	Central-Central Watson Tap 138 kV	184	256E	.030	Roxford-Sioux 345 kV Sioux 345/138 kV Tr.
		2500*	No Additional Limit Found				Each Valid Contingency Tested

*****SPP Imports*****

MRO	IITC	2000*	No Limit Found				None
	FCITC	1600	(10A,R) Lake Road-Alabama 161 kV	75	152E	.048	Stranger-Iatan 345 kV
		2000* <=	No Additional Limit Found				None

*****SPP Imports*****

SERCw	IITC	2500*	No Limit Found				None
	FCITC	200 <=	Danville-Magazine 161 kV	140	148E	.039	Ft. Smith-ANO 500 kV
		850	ANO-Russellville North 161 kV	358	396E	.044	Ft. Smith-ANO 500 kV
		1500	Russellville South-Dardane 161 kV	228	332E	.068	Ft. Smith-ANO 500 kV
		1900	(66) Holden-Pittsville 161 kV	150	227E	.041	Clinton-Holden 161 kV

*****SPP Imports*****

Transfer direction with subscript 'x' includes uncommitted resources in the exporting subsystem
Summary of results

TVA	IITC	2500*	No Limit Found				None
	FCITC	0 <=	Sage-Melborne 161 kV	147	147E	.030	Ft. Smith-ANO 500 kV
		200	Danville-Magazine 161 kV	140	148E	.046	Ft. Smith-ANO 500 kV
		700	ANO-Russellville North 161 kV	358	396E	.053	Ft. Smith-ANO 500 kV
		1300	Russellville South-Dardane 161 kV	228	332E	.081	Ft. Smith-ANO 500 kV
		1700	Muskogee-Clarksville 345 kV	911	986E	.044	Riverside Station-Muskogee 345 kV
		1800	Dardane-Clarksville 161 kV	114	189E	.042	Ft. Smith-ANO 500 kV

SPP NORTH (SPP-N) IMPORTS

*****SPP-N Imports*****

AMRN	IITC	1500*	No Limit Found				None
	FCITC	500 <=	Montgomery-Guthrie 161 kV	201	218E	.033	McCredie Tap-Montgomery 345 kV McCredie Tap-Overton 345 kV McCredie Tap-McCredie 345 kV
		1000	Thomas Hill 345/161 kV Tr.	480	556E	.073	McCredie Tap-Overton 345 kV
		1200	Osage-Eldon 161 kV	97	166E	.059	McCredie Tap-Montgomery 345 kV McCredie Tap-Overton 345 kV McCredie Tap-McCredie 345 kV
		1300	Moberly-Salsbury 161 kV	148	212E	.048	Salsbury-Thomas Hill 161 kV
		1500*	No Additional Limit Found				Each Valid Contingency Tested

*****SPP-N Imports*****

IOWA	IITC	1500*	No Limit Found				None
	FCITC	250 (16A,R)	Thomas Hill-Salsbury 161 kV	326	334E	.033	Thomas Hill-Moberly Tap 161 kV Moberly Tap-Hinton 161 kV Bolstad-Hinton 161 kV
		1500 (10A)	Lake Road-Alabama 161 kV	75	152E	.053	Stranger-Iatan 345 kV

Transfer direction with subscript 'x' includes uncommitted resources in the exporting subsystem
Summary of results

		1500* <=	No Additional Limit Found					Each Valid Contingency Tested
*****SPP-N Imports*****								
MINN	IITC	1500*	No Limit Found					None
	FCITC	1500* <=	No Limit Found					None
*****SPP-N Imports*****								
OLD SMAIN	IITC	1500*	No Limit Found					None
	FCITC	500 <=	Montgomery-Guthrie 161 kV	201	218E	.034		McCredie Tap-Montgomery 345 kV McCredie Tap-Overton 345 kV McCredie Tap-McCredie 345 kV
		1100	Thomas Hill 345/161 kV Tr.	480	556E	.070		Overton 345/161 kV Tr. McCredie Tap-Overton 345 Overton-Sibley 345 kV
		1200	(16A) Thomas Hill-Salsbury 161 kV	295	334E	.032		Moberly-Moberly Tap 161 kV
		1300	Osage-Eldon 161 kV	97	166E	.054		McCredie Tap-Montgomery 345 kV McCredie Tap-Overton 345 kV McCredie Tap-McCredie 345 kV
		1500*	No Additional Limit Found					None
*****SPP-N Imports*****								
SPP-S	IITC	1500*	No Limit Found					None
	FCITC	1500* <=	No Limit Found					All Valid Contingencies Tested

SPP SOUTH (SPP-S) IMPORTS

*****SPP-S Imports*****

AMRN	IITC	1500*	No Limit Found				None
	FCITC	1500* <=	No Limit Found				Each Valid Contingency Tested

*****SPP-S Imports*****

SPP-N	IITC	1200*	No Limit Found				None
	FCITC	600	(71A) Tec-Hook Jct 115 kV	131	159E	.045	Tec-Techill 115 kV
		1200 <=	Neosho SPA-Neosho South Jct 161 kV	70	110E	.034	Neosho SPA-Washburn 161 kV
		1200*	No Additional Limit Found				Each Valid Contingency Tested

Southwest Power Pool Voltage Study Appraisal 2005 Summer Peak Transmission Assessment

Introduction

This study was completed subsequent to completion of the 2006 MAIN Summer Transmission Assessment Study with the purpose of evaluating transfer capabilities with respect to voltage limits. MAIN has routinely performed transfer capability studies based on circuit thermal ratings. While this provides a good indication of thermal limitations of the system, it does not ensure that there are not more stringent voltage limitations. Historically, the MAIN region and surrounding regions have been primarily limited by thermal constraints. There have been specific interfaces limited by voltage or voltage stability. These specific interfaces have been analyzed by special studies focusing on only those areas. This study is intended to serve as a screening study for areas of the system that may require further analysis.

The base case used for this study was the same base case as used for the 2006 MAIN Summer Transmission Assessment Study in conducting the thermal transfer analyses, except that minor adjustments were made to facilitate the use of A/C solution techniques of PTI's MUST program. The objective of this voltage study was to determine if there were potential voltage limits that are more constraining than the thermal limits identified in the previous thermal study. **The scenarios developed for this study include transfers that exceed the thermal limits of the transmission system as calculated in the 2006 SUMMER TRANSMISSION ASSESSMENT STUDY.**

This study addresses sensitivity of the monitored voltages for NERC Category B events with imports into each region or subregion with critical generating units out of service.

Category B Screening

Base Case

A review of the 2006 summer TASG voltage analysis results considering single contingencies on the SPP transmission system showed that some transmission voltages were below the SPP criteria of 0.90 per unit. Several of the low voltages can be mitigated by turning on capacitors.

Voltages at several SPP buses in the Northwest Kansas area drop below 0.90 per unit under N-1 conditions. These low voltages are the result of contingencies around the Knoll area. WEPL, SUNC, & MIDW all have projects in this area of Kansas to alleviate these problems. WEPL is planning for the installation of an 8 Mvar STATCOM at Plainville by summer 2006 as well as line upgrades in the area planned to be completed by 2008. SUNC is planning on installation of 12 Mvar capacitors, and a breaker is being installed to switch the 60 MVAR line reactor on the Setab – Mingo 345 kV line for voltage control to further mitigate these problems prior to the 2006 summer.

Transfer Case

As per additional TASG study method, SPP provided four directions to MAIN for performing the voltage limited import capability into SPP. Below is a summary of those results.

AMRN-SPP-S

The reported thermal FCITC from AMRN for summer 2006 is 1500 MW. The generating unit outaged in this scenario consists of the Dolet Hills unit that is generating at 609 MW and 170 Mvar. The transfer level tested for this scenario was 1700 MW. The results of the analysis did not show any voltage levels below target values. The result shows that voltage constraints would not limit the reported thermal FCITC value.

MAIN-SPP

No thermal limitation was identified for SPP imports from MAIN for summer 2006. A transfer limit of 2050 MW of was simulated in the thermal analysis. The generating unit outaged in this scenario consists of the Wolf Creek Nuclear Plant, and the Northeastern Station Unit #1 that summed to approximately 1313 MW and 343 Mvar. The transfer level tested for this voltage screening scenario was 2255 MW.

In this scenario, voltage at several SPP area buses in the Northwest Kansas area drop below the SPP criteria of 0.90 per unit. These low voltages are the result of contingencies around the Knoll area. These problems exist in the base scenario, as described above, while transfers simulated slightly exacerbate the problem. Also, Midwest Energy is planning upgrades around Hays, KS which should be completed by 2007 summer.

TVA-SPP

The reported thermal FCITC from TVA for summer 2005 is 0 MW. The generating unit outaged in this scenario consists of the Sooner unit that is generating at 530 MW and 66 Mvar. The transfer level tested for this scenario was 530 MW. The results of the analysis did not show any additional voltage levels below target values. The result shows that voltage constraints would not limit the reported thermal FCITC value.

MRO-SPP

No thermal limitation was identified for SPP imports from MAPP for summer 2005. 2000 MW of transfers was simulated in the thermal analysis. The generating unit outaged in this scenario consists of the Tolk Unit #1, and Seminole Unit #1 that summed to approximately 766 MW and 64 Mvar. The transfer level tested for this scenario was 2200 MW. The results show voltages dropping below 0.90 per unit in the Northwest Kansas around Knoll. These problems exist in the no incremental transfer scenario, as described above, while transfers simulated slightly exacerbate the problem.

Other Transfer Cases

Review of the other transfer cases run as requested by other companies in the TASG study showed that there were no other voltage problems of concern on SPP system.

FOOTNOTES

- (R) This element repeats as a limit for other outages.
- (A) Availability of operating guide for both emergency and nonemergency transactions will increase capability to the reported FCITC level.
 - (a) Availability of operating guide for emergency transactions will increase capability to the reported FCITC Level.
- (<) Reported FCITC limit for nonemergency transactions.
- (<-) Reported FCITC limit for emergency transactions.
- (<=) Reported FCITC limit for emergency and nonemergency transactions.
- (I) Indicates implementation of a nonemergency operating guide.
- (i) Indicates implementation of an emergency operating guide.
- (*) Denotes transfer level studied.

Operating Guides

- (4) Arpin Area Operating Guides
- (23) Boswell Special Protection System
- (10) Lake Road – Nashua Guide
- (67) Salem Transformer Emergency Operating Guide
- (44) Taconite Harbor Special Protection System
- (71) TEC-Tecumseh Hill Operating Guide
- (16) Thomas Hill Operating Guide
- (68) Wells Operating Guide
- (72) Woodbin-East Temporary Operating Guide

Arpin Area Operating Guides (4)

Transmission Owner: ATCLLC
Transmission Operator: MISO/ATCLLC
Control Area: ALTE/WPS
Reliability Coordinator: MISO

Automatic
Post-Contingency Implementation

Guide Description:

Council Creek 69 kV Bus Tie Status

This tie would be expected to be open during high transfer periods. This tie is very sensitive to flows across the interface and studies have shown that it will overload at high transfer levels with all facilities in service. The relays at Council Creek are set to trip 69 kV breaker #335-S in 10 seconds if the flow from Oakdale exceeds 32 MVA or the flow from Monroe County exceeds 50 MVA.

Post - Contingency Mitigation Upon the loss of Arpin-Rocky Run 345kV:

The Port Edwards 138kV System

The Arpin 345-138 kV transformer and the Arpin-Port Edwards 138 kV system are both susceptible to overloading for the outage of the Arpin-Rocky Run 345 kV line. To prevent this, the relays at Port Edwards will trip breaker #421 on the Wautoma 138 kV line and breaker #436 on the Saratoga 138 kV line when the flow from Lakehead Vesper reaches 231 MVA.

The Hillsboro-Hilltop 69 kV Line

This line is sensitive to loss of the Arpin-Rocky Run 345 kV line and will overload. The relays at Hilltop are set to trip 69 kV breaker #569 at Hilltop if the flow is greater than or equal to 72 MVA.

The Lublin-Lakehead 69 kV Line

This line is also sensitive to the loss of the Arpin-Rocky Run 345 kV line. The DPC system operators will open this line by supervisory control in response to sag limitations at 27 MVA and above, depending on ambient temperature. The relays at Lublin are set to operate breaker #12NB56 automatically at 47 MVA.

The T-Corners Area 115 kV System

Open Wien-Stratford 115kV. The Arpin 138-115 kV transformer and the Arpin-

Hume-Wildwood-McMillan-Stratford-Wien 115 kV system is susceptible to overloading for the outage of the Arpin-Rocky Run 345 kV line with the Port Edwards 138 kV lines open at high transfer levels. The relay setting at Wien will trip the B-54 breaker on the Wien-Stratford 115 kV line at 90 MVA in 10 seconds. This protects the Marshfield 115 kV system from overload and will also limit the Arpin 138-115 kV transformer to approximately 160 MVA with normal Marshfield system peak loads.

ATCLLC will test the line from Arpin to determine if the fault is temporary or permanent.

Temporary Fault: The line is available to the network. A minimum 5-minute time delay from the original trip is required to discharge capacitor banks before attempting to loop the Arpin-Rocky Run 345 kV line. These capacitor banks are required to maintain adequate system voltage at high transfer levels and are required to be available when closing the loop. These include:

- Eau Claire 161 kV – (4) 88.0 MVAR switched
- Arpin 138 kV - (1) 50.0 MVAR switched
- T-Corners 115 kV – (1) 20.0 MVAR and (4) 30.0 MVAR
- Wien 115 kV – (3) 21.6 MVAR (manually switched)

Prior to re-closing at Arpin, the ATCLLC system operator contacts the WPS system operator, who notifies the Weston generating station of the situation and requests that the station prepare for re-closure of the Arpin-Rocky Run facility. The ATCLLC system operator verifies with the WPS system operator that the Weston generating units are prepared for networking the 345 kV system. The ATCLLC system operator verifies with XEL that the Eau Claire capacitors are available. The ATCLLC system operator verifies that the Arpin capacitors are available. The ATCLLC system operator verifies that the T Corners-Wien 115 kV line is closed. The ATCLLC system operator closes the 345 kV line breaker at Arpin.

Permanent Fault: If the Arpin-Rocky Run 345 kV line cannot be successfully re-closed and it is determined that the outage is not of a temporary nature, additional measures need to be taken by the system operators to prepare for the next contingency. The next worst contingency with Arpin-Rocky Run 345 kV out of service is expected to be Rocky Run-North Appleton 345 kV. The next contingency would have very serious consequences and would require the curtailment of schedules across the Minnesota-Eastern Wisconsin interface. To prepare for the next contingency and reduce its' severity, the following steps should be followed.

Post-Contingency Operation for a Permanent Fault

The ATCLLC system operator contacts the WPS system operator, who notifies the Weston generating plant of the permanent fault situation. ATCLLC will take necessary action to return the system to a secure state. ATCLLC will review real-time security analysis to determine necessary actions. This may include, but is not limited to:

- a. Initiating TLR (as needed) for the Rocky Run-North Appleton contingency (ATCLLC).
- b. Initiating TLR (as needed) for the Prairie Island-Byron contingency (XEL).

Pre – Contingency loading of Eau Claire-Arpin

At a loading level of 765 MW, ATC and MISO will coordinate the issuance of TLR Level 1. At a loading level of 790 MW, ATC and MISO will coordinate issuance of the appropriate TLR level to avoid increasing the flow above the 790 MW limit. ² Before TLR Level 2 or higher is called, MISO should identify all Firm Redispatch (FRD) on the Eau Claire-Arpin flowgate. All available FRD should be utilized. The MISO Security Coordinator will maintain the real-time flow as measured at Eau Claire, on the Eau Claire-Arpin 345 kV line to a maximum value of 790 MW. The MISO Security Coordinator may limit the pre-contingent flow to less than 790 MW if real-time studies, including, but not limited to, the daily voltage stability study indicate a need for reduction to a lesser value.

Post - Contingency Mitigation

Upon the loss of King-Eau Claire-Arpin 345kV or the Eau Claire-Arpin 345kV line:

The Hillsboro-Hilltop 69 kV Line

This line is very sensitive to loss of the Eau Claire-Arpin 345 kV line and will overload. The relays at Hilltop are set to trip 69 kV breaker # 569 at Hilltop if the flow is greater than or equal to 72 MVA.

The Lublin-Lakehead 69 kV Line

This line is also sensitive to the loss of the Eau Claire-Arpin 345 kV line. The DPC system operators will open this line by supervisory control in response to sag limitations at 27 MVA and above, depending on ambient temperature. The relays at Lublin are set to operate breaker #12NB56 automatically at 47 MVA.

The T-Corners Area 115 kV System

The Hydro Lane-T Corners-Wien 115 kV line and the Wien-McMillan-Wildwood-Hume-Arpin 115 kV systems are susceptible to overloading for the outage of any portion of the King-Eau Claire-Arpin 345kV line. The relays at Wien are set to open the B-54 breaker on the Wien-Stratford 115 kV line when the flow exceeds 90 MVA for 10 seconds. This operation will prevent the Marshfield 115 kV system from overloading. If this line does not trip automatically, the ATCLLC system operator should open the B-54 breaker at Wien via supervisory control if system conditions are such that opening the line will improve conditions on the 115 kV system.

XEL and ATCLLC will test the line from Eau Claire to determine if the fault is temporary or permanent.

Temporary Fault: The line is available to the network. A minimum 5-minute time delay from the original trip is required to discharge capacitor banks before attempting to loop the Eau Claire-Arpin 345 kV line. These capacitor banks are required to maintain adequate system voltage at high transfer levels and are required to be available when closing the loop. These include:

Eau Claire 161kV – (4) 88 MVAR switched
Arpin 138kV - (1) 50 MVAR switched
T-Corners 115 kV – (4) 30 MVAR switched

Prior to re-closing at Arpin, the ATCLLC system operator notifies the Weston generating station of the situation and requests that the station prepare for re-closure of the Eau Claire-Arpin facility. The ATCLLC system operator verifies that the Weston generating units are prepared for networking the 345 kV system. The ATCLLC system operator verifies that the T Corners-Wien 115 kV line is closed. The ATCLLC system operator verifies with XEL that the Eau Claire capacitors are available and that the King-Eau Claire 345 kV line is closed. The ATCLLC system operator verifies with XEL that the Eau Claire end of the line is closed. The ATCLLC system operator verifies that the Arpin capacitors are available. The ATCLLC system operator closes the 345 kV line breaker at Arpin.

Permanent Fault: If the Eau Claire-Arpin 345 kV line cannot be successfully reclosed and it is determined that the outage is not of a temporary nature, additional measures need to be taken by the system operators to prepare for the next contingency. The next worst contingency with Eau Claire-Arpin 345 kV line out of service is expected to be Prairie Island-Byron 345 kV line. The next contingency would have very serious consequences and would require the curtailment of schedules across this interface and south of Twin Cities. To prepare for the next contingency and reduce its' severity, the steps in section 5.3 should be followed.

Post-Contingency Operation for a Permanent Fault

The ATCLLC system operator notifies the Weston generating plant of the permanent fault situation. The ATCLLC system operators assess system conditions to determine if complete separation of the Minnesota-Eastern Wisconsin tie is necessary. Upon verification that complete interface separation is necessary to protect the NSP/DPC 69 kV system, open breaker #W-23 at Wien on the Wien-T Corners line. Under certain high transfer system condition during a permanent Eau Claire-Arpin outage, if the power flow on the T-corners to Wien (W-23) line is over 88 MW, one T-Corners 115/69 kV transformer may be overloaded for loss of the Hydro Lane to T-Corners 115 kV line. Leaving this line in service during a permanent Eau Claire-Arpin outage could result in system violations in western and central Wisconsin for the next contingency. Close breaker #B-54 on the Wien-Stratford 115 kV line. ATCLLC and XEL will take necessary action to return the system to a secure state. ATCLLC, XEL, and MISO will review real-time security analysis to determine necessary actions. This may include, but is not limited to:

- a. Initiating TLR (as needed) for the Prairie Island-Byron contingency (XEL).
- b. Initiating TLR (as needed) for the Wempletown-Paddock contingency (ATCLLC).

The Arpin Area Operating guides are automatic and do not require operator intervention.

The Arpin Area Operating guides are automatic and do not make use of short-term ratings for limiting facilities.

Arpin Area Operating Guides are updated annually by ATC, DPC and XEL based on MISO request and are assessed on an as needed basis. They are studied by simulating contingencies for both the pre-implementation and post-implementation of the operating guide in internal as well as regional studies.

Boswell Emergency Operating Guide (23)

Transmission Owner: Minnesota Power

Transmission Operator: MP

Control Area: MP

Reliability Coordinator: MISO

Automatic
Post-Contingency Implementation

Guide Description:

MRO systems **do not implement operating procedures for the purpose of increasing non-emergency transfers.** However, if a situation exists where a utility requires emergency import, the MRO system(s) responsible for the operating procedure will implement the procedure only as long as the implementation of the guide isn't detrimental to the network or system reliability. The Boswell special protection system is designed to automatically reduce generation at the Clay Boswell plant in response to contingent overloads of the following lines:

- Boswell Blackberry 230 kV circuits 1 & 2
- Boswell – Shannon 230 kV line
- Blackberry – Riverton 230 kV line
- Arrowhead – Bear Creek 230 kV line

If an overload occurs on any of the transmission lines (listed above), generation at Boswell Units #3 and #4 will be reduced such that all remaining lines are within their long term continuous rating. This action is automatic and not dependant on operator action.

The approximate time required to implement this guide is 10 Minutes.

Based on engineering judgment, MP believes that the post-contingency loading of the transmission lines mentioned above would be acceptable provided the pre-contingency line flow does not exceed the normal ratings of the lines. These acceptable post-contingency loadings may exceed emergency ratings during the 10 minutes it would take to implement the special protection system.

The Boswell Special Protection System is assessed on an as needed basis and is studied by simulating contingencies for both the pre-implementation and post-implementation of the operating guide in internal as well as regional studies.

Lake Road-Nashua Operating Guide (10)

Transmission Owner: KCPL
Transmission Operator: KCPL
Control Area: KCPL
Reliability Coordinator: SPP

Automatic
Post-Contingency Implementation

Guide Description:

The Lake Road-Nashua operating guide is implemented automatically on a post-contingency basis. The guide calls for corrective action to relieve overloads on the Lake Road to Nashua 161 kV line with either the St Joe-Hawthorn 345 kV line outage or the Iatan-Stranger Creek 345 kV line outage. The Lake Road-Nashua 161 kV line is opened automatically. The Lake Road-Nashua operating guide is unconditionally available.

Automatic overcurrent relays will trip the breakers associated with this line at normal clearing time of 10.8 cycles.

The continuous normal summer rating and 8 hour emergency summer rating of the Lake Road-Nashua 161 kV line is 153 MVA and 172 MVA, respectively. No special short-term rating is used.

The effectiveness of this guide was initially assessed by transfer study analysis and continues to be studied seasonally by contingency analysis.

Salem Emergency Operating Guide (67)

Transmission Owner: ALTW

Transmission Operator: ATCLLC

Control Area: ALTW

Reliability Coordinator: MISO

Post-Contingency Implementation
Operator Intervention

Guide Description:

The purpose of this guide is to protect the Salem 345/161 kV transformer from a thermal overload for the loss of the Quad Cities-Sub 91 345 kV line. Potential overloading of this transformer may result from to high south to north flows in Wisconsin and high east to west flows in Iowa. For an overload condition, the system operator will open the 161 kV bus tie at Salem Substation via supervisory control. This operating guide will not be used to increase non-emergency transactions.

The approximate time required to implement this guide is 30 minutes.

Short-term rating of limiting facilities and duration for which the rating can be used is 110% for 30 minutes.

This guide was last evaluated by MISO and ALTW on 10/15/04.

Taconite Harbor Special Protection System (44)

Transmission Owner: Minnesota Power

Transmission Operator: MP

Control Area: MP

Reliability Coordinator: MISO

Automatic
Post-Contingency Implementation

Guide Description:

MRO systems **do not implement operating procedures for the purpose of increasing non-emergency transfers.** However, if a situation exists where a utility requires emergency import, the MRO system(s) responsible for the operating procedure will implement the procedure only as long as the implementation of the guide isn't detrimental to the network or system reliability. The Taconite Harbor special protection system is designed to automatically reduce generation at the Taconite Harbor plant in response to contingent overloads of the portion of the system known as the North Shore Loop. The North shore loop system consists of all transmission lines directly connected to the following stations: Laskin, Hoyt Lakes, Taconite Harbor, and Silver Bay. Should any of these lines (described above) become overloaded, the Taconite Harbor generation will automatically be run back such that all remaining lines are within their long term continuous rating. This action is automatic and not dependant on operator action.

The approximate time required to implement this guide is 10 Minutes.

Based on engineering judgment, MP believes that the post-contingency loading of the transmission lines known as the North Shore Loop would be acceptable provided the pre-contingency line flow does not exceed the normal ratings of the lines. These acceptable post-contingency loadings may exceed emergency ratings during the 10 minutes it would take to implement the special protection system.

The Taconite Harbor Special Protection System is assessed on an as needed basis and is studied by simulating contingencies for both the pre-implementation and post-implementation of the operating guide in internal as well as regional studies.

TEC-Tecumseh Hill Operating Guide (71)

Transmission Owner: Westar

Transmission Operator: Westar

Control Area: WR

Reliability Coordinator: SPP

Post-Contingency Implementation
Operator Intervention

Guide Description:

Outage of the Tecumseh Energy Center-Tecumseh Hill 161 kV transmission line can cause overloads on the TEC-County Line and/or County Line-Tecumseh Hill 115 kV lines. When this occurs, decrease the total generation of TEC until the loading on the TEC to County Line and County Line to Tecumseh Hill 115 kV lines are within acceptable limits.

The approximate time required to implement this guide is 15 minutes. TEC units 7 and 8 can each reduce generation at a rate of 1.5 MW per minute.

The TEC-Hook Junction 115 kV line has a short-term emergency rating of 192 MVA.

An annual operating directives review is performed to assure that the system withstands any resulting overloads and voltages and places no undue burden on neighboring systems prior to, and subsequent to, implementation of the guide.

Thomas Hill Operating Guide (16)

Transmission Owner: Associated Elec Coop (AECI)

Transmission Operator: AECI

Control Area: AECI

Reliability Coordinator: TVA

Post-Contingency Implementation
Operator Intervention

Guide Description:

The Thomas Hill operating guide calls for manually reducing generation at Thomas Hill, on a post-contingency basis, during a first contingency until all in-service Thomas Hill outlet elements are loaded at or below their respective emergency ratings. The Thomas Hill operating guide can be used for remote facilities when one of the Thomas Hill outlet facilities would pose a more severe limit causing the guide to already be in effect. The Thomas Hill operating guide is unconditionally available.

The approximate time required to implement this guide is ten to fifteen minutes.

The pre-contingency loading of the Thomas Hill outlet facilities provide a fifteen minute operating window before the facilities reach the conductor temperature associated with the modeled 372 MVA emergency rating.

AECI assesses its operating guides during internal seasonal operating studies performed on an annual basis.

Wells Guide (68)

Transmission Owner: Cleco Power

Transmission Operator: Cleco Power

Control Area: Cleco

Reliability Coordinator: Entergy

Automatic

Guide Description:

Wells 36 ohm series reactor will be placed in service for cases in which Cleco's Wells 500/230 kV autotransformer and/or Lafayette Utility System (LUS) Bonin 230/138 kV autotransformer exceeds emergency rating.

The approximate time required to implement this guide is approximately 4 seconds.

Short-term rating of limiting facilities and duration for which the rating can be used: **Ratings during switching not provided.**

A joint transmission study was performed by SPP, Cleco, Entergy, and LUS to evaluate the impact of the installation of Wells as well as the 36 ohm reactor.

Woodbin-East Temporary Operating Guide (72)

Transmission Owner: Aquila

Transmission Operator: MIPU

Control Area: MPS

Reliability Coordinator: MISO

Post-Contingency Implementation
Operator Intervention

Guide Description:

Outage of the St.Joe-Cook 161 kV transmission line can cause overloads on the Woodbin-East 161 kV Line. When this occurs, the East-Industrial Park 161 kV line is opened to relieve the overload of Woodbin-East 161 kV line.

For post-contingency operating steps, the approximate time required to implement this guide:
No answer provided.

Short-term rating of limiting facilities and duration for which the rating can be used: **No answer provided.**

It is essential that the system withstands any resulting overloads and voltages and places no undue burden on neighboring systems prior to, and subsequent to, implementation of the guide. When and how was this assessed? **No answer provided.**

Basecase Schedules for 2006 Summer Peak

FROM		TO		MW Interchange	
Region	Co.	Region	Co.	2006 S	2005 S
Old MAIN	ALTE	MRO	DPC	-5	-5
Old MAIN	ALTE	MRO	XEL	61	61
Old MAIN	ALTW	MRO	DPC	N/A	-6
Old MAIN	ALTW	MRO	GRE	N/A	-98
Old MAIN	ALTW	MRO	MEC	N/A	-119
Old MAIN	ALTW	MRO	XEL	N/A	-20
Old MAIN	ALTW	MRO	SMP	N/A	-5
Old MAIN	ALTW	MRO	WAPA	N/A	-84
Old MAIN	AMRN	MRO	MEC	7	0
Old MAIN	AMRN	MRO	ALTW	-41	N/A
Old MAIN	NI	MRO	GRE	50	0
Old MAIN	NI	MRO	MEC	728	778
Old MAIN	NI	MRO	XEL	108	100
Old MAIN	NI	MRO	MEC	100	100
Old MAIN	MGE	MRO	DPC	-30	-30
Old MAIN	WE	MRO	MP	-62	-62
Old MAIN	WE	MRO	XEL	-42	-42
Old MAIN	WPS	MRO	MHEB	-108	-108
Old MAIN	ALTE	MRO	ALTW	-8	N/A
Old MAIN	WPS	MRO	MP	0	-76
Old MAIN to MRO Net				758	384
Old MAIN	CWLD	SPP	KACY	-20	-20
Old MAIN	CWLD	SPP	SPA	-79	-79
Old MAIN to SPP Net				-99	-99
MRO	MEC	SPP	KCPL	71	50
MRO	NPPD	SPP	MIPU	175	175
MRO	WAPA	SPP	SUNC	4	4
MRO TO SPP Net				250	229
Old MAIN	Market Interchange			1330	0
MRO	Market Interchange			-1653	0