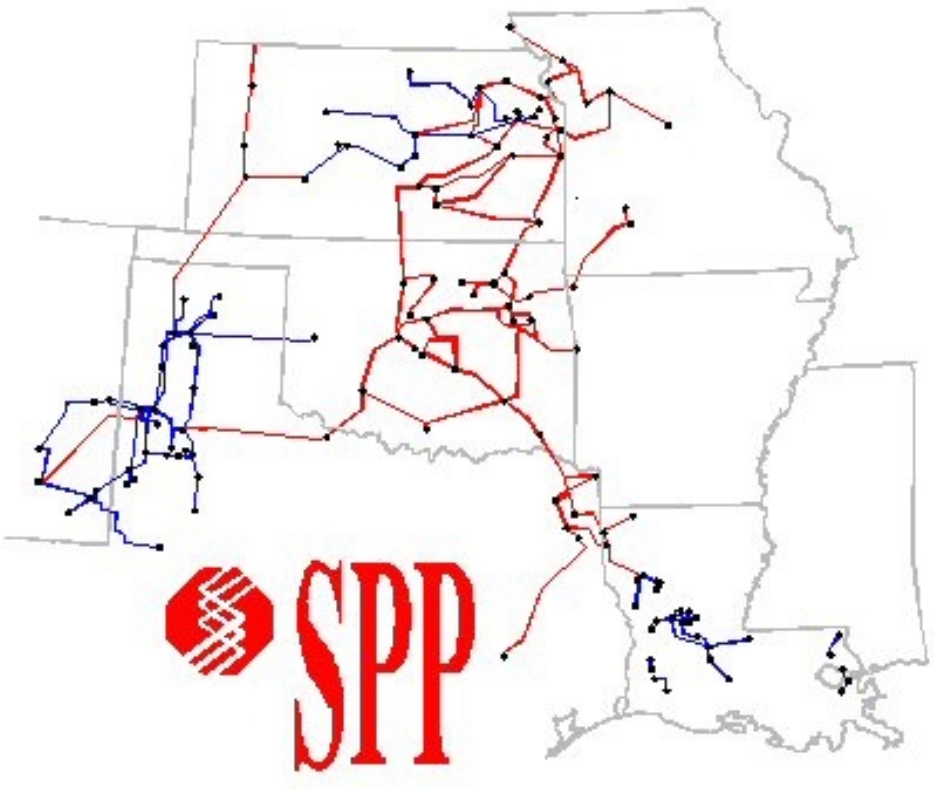
Southwest Power Pool

Intra-Regional Appraisal and Study Observation

2009 Summer Peak

Long Range Transmission Assessment

April 2004



SOUTHWEST POWER POOL
Intra-Regional Appraisal and Study Observation
2009 Summer Peak Long Range Transmission Assessment

TABLE OF CONTENTS

Overview

In accordance with the MAIN-MAPP-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, MAPP and SPP, and their respective subregions for the modeled 2009 summer peak conditions. This study was performed as part of an effort to build a library of studies that can be used to meet the NERC planning standards. The intent of the report is to provide results to transmission owners who will then perform additional analysis as required.

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-MAPP-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 four most limiting elements are noted. Operating Guides used are shown as applicable to increase transfer capability. In addition to the regular thermal analysis, voltage stability analysis was also performed. The purpose of the voltage stability analysis will

be to determine if any transfer directions are limited by voltage stability at a lower level of transfer than identified in the thermal analysis.

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 2009 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 2009 summer peak period.

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
Inter-Regional & Sub-Regional Appraisal and Study Observations
2009 Summer Peak Long Range Transmission Assessment

General Observations

The MAIN FSSG case was developed from the 2009 Summer Peak model of the SPP 2003 basecase series of load flow cases along with models from MAIN, MAPP and SERC. The sub-regions of MAIN, MAPP 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

Central Louisiana Electric Company
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
Duke Energy McClain

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 (MAPP)

The member systems in the area are :

Mid-American Energy Company
Muscatine Power and Water Company

Minnesota (MAPP)

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

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

Transfer Direction	2009 Summer		2003 Summer		2009 Summer Limiting Element (2009 Summer Outaged Element)	Owner
	FCITC	Notes	FCITC	Notes		
AMRN-SPP-N	1500*		1500*		Franks 345/161 kV Trf (Franks-Huben 345 kV) (Huben-Morgan 345 kV)	AMRN (AMRN) (AMRN)
IOWA-SPP-N	1200*		1200*		No Limit Found (Each valid contingency tested)	
MINN-SPP-N	0		900	4,44	Weston-Kelly 115 kV (N.Appleton-Rocky Run 345 kV)	WPS (WEC-WPS)
SMAIN-SPP-N	1500*		1500		Muskogee-Clarksville 345 kV (Riverside Station-Muskogee 345 kV)	OKGE-AEPW (OKGE-AEPW)
AMRN-SPP-S	1300		1100		Danville-Magazine 161 kV (Fort Smith-A.N.O 500 kV)	AEPW-ENTR (OKGE-ENTR)
SPP-S–SPP-N	1400		1100		Newkirk-Creswell 138 kV (Wichita-Woodring 345 kV)	OKGE-WR (WR-OKGE)
SPP-N–SPP-S	600	5	1200*		Tipton Ford-Neosho 161 kV (Tipton Ford-Monnett 161 kV)	EMDE-SWPA (EMDE)

Notes :
(*) Denotes transfer level studied.
(4) Arpin Area Operating Guide
(5) Auburn Operating Guide
(44) Taconite Harbor Emergency Operating Guide (2003S)

SPP-North Imports

SPP-N import FCITC from AMRN is 1500 MW limited by the Franks 345/161 kV transformer (AMRN) for the outage of Franks-Huben 345 kV (AMRN) and Huben-Morgan 345 kV (AMRN) . No limit was reported in the 2003 summer study up to the transfer level. With IPP participation in the AMRN export transfer points, SPP-N import FCITC from AMRN decreased by another 100 MW.

SPP-N import FCITC from IOWA is 1200 MW. No limiting element was identified up to this transfer level. This is the same FCITC reported for the 2003 summer study with no limiting element identified up to the transfer level.

SPP-N import FCITC from MINN is 0 MW limited by the Weston-Kelly 161 kV (WPS) for the outage of N.Appleton-Rocky Run 345 kV (WEC-WPS). The import FCITC of 0 MW is a decrease from the 900 MW FCITC reported in the 2003 summer study by the Lime Creek-Emery 161 kV line (ALTW) for the outage of Hazleton-Adams 345 kV line (ALTW-NSP) with the availability of the Arpin Area Operating Guides and the Taconite Harbor Emergency Operating Guide. The import FCITC of 0 MW is due to modeling error in the WUMS area. Actual FCITC would be higher.

SPP-N import FCITC from SMAIN is 1500 MW limited by the Muskogee-Clarksville 345 kV (OKGE-AEPW) for the outage of Riverside Station-Muskogee 345 kV (OKGE-AEPW). The import FCITC of 1500 MW is the same level reported in the 2003 summer study limited by the same element and outage.

SPP-N import FCITC from SPP-S is 1400 MW limited by the Newkirk-Creswell 161 kV (OKGE-WR) for the outage of Wichita-Woodring 345 kV (WR-OKGE). The import FCITC of 1400 MW is an increase from the 1100 MW FCITC reported in 2003 summer study limited by Muskogee-Clarksville 345 kV (OKGE-AEPW) for the outage of Riverside Station-Muskogee 345 kV (OKGE-AEPW)

SPP-South Imports

SPP-S import FCITC from AMRN is 1300 MW limited by the Danville-Magazine 161 kV (AEPW-ENTR) for the outage of Fort Smith-A.N.O 500 kV (OKGE-ENTR). This level is an increase from the 1100 MW FCITC reported in the 2003 summer study limited by the Fort Smith 500/161 kV transformer (OKGE) for the outage of the Fort Smith 345/161 kV transformer.

SPP-S import FCITC from SPP-N is 600 MW limited by the Tipton Ford-Neosho 161 kV (EMDE-SPA) for the outage of Tipton Ford-Monnett 161 kV (EMDE) with the availability of the Auburn Operating Guide. No limiting elements were identified in the 2003 summer study.

Nonsimultaneous Import Transfer Capabilities (MW) for SPP Region

Transfer Direction	2009 Summer		2003 Summer		2009 Summer Limiting Element (2009 Summer Outaged Element)	Owner
	FCITC	Notes	FCITC	Notes		
MAIN-SPP	600		1100		A.N.O-Russellville North 161 kV (Fort Smith-A.N.O 500 kV)	ENTR (OKGE-ENTR)
MAPP-SPP	2000	4,10,23,44	1950	4,44	No Limit Found (Each Valid Contingency Tested)	
TVA-SPP	400		750		A.N.O-Russellville North 161 kV (Fort Smith-A.N.O 500 kV)	ENTR (OKGE-ENTR)

Notes :
(*) Denotes transfer level studied.
(4) Arpin Area Operating Guide
(10) Lake Road-Nashua Operating Guide
(23) Boswell Emergency Operating Guide
(44) Taconite Harbor Emergency Operating Guide (2003S)

SPP-Imports

The SPP import FCITC from MAIN is 600 MW limited by the A.N.O-Russellville North 161 kV (ENTR) for the outage of Fort Smith-A.N.O 500 KV (OKGE-ENTR). This level is a decrease from the 1100 MW FCITC reported in the 2003 summer study limited by Fort Smith 500/161 kV transformer (OKGE) for the outage of Fort Smith 345/161 kV transformer (OKGE).

The SPP import FCITC from MAPP is 2000 MW with no limiting element found up to the test level with the availability of the Arpin Area Operating Guide, Lake Road-Nashua Operating Guide, Boswell Emergency Operating Guide and the Taconite Harbor Emergency Operating Guide. This level is an increase from the 1950 MW FCITC reported in the 2003 summer limited by Fort Smith 500/161 kV transformer (OKGE) for the outage of Fort Smith 345/161 kV transformer (OKGE).

The SPP import FCITC from TVA is 400 MW limited by the A.N.O-Russellville North 161 kV (ENTR) for the outage of Fort Smith-A.N.O 500 KV (OKGE-ENTR). This level is a decrease from the 750 MW FCITC reported in the 2003 summer limited by Fort Smith 500/161 kV transformer (OKGE) for the outage of Fort Smith 345/161 kV transformer (OKGE).

SPP IMPORTS

FROM	TRANSFER CAPABILITY CONDITION	MW	(NOTE)	LIMITING ELEMENT	FLOW	RATING	PTDF/ OTDF	FACILITY OUTAGE(S)
MAIN	IITC	2500*		No Limit Found				None
	FCITC	600	<=	A.N.O-Russellville North 161 kV	381	395E	.031	Ft.Smith-A.N.O 500 kV
		1850		Franks 345/161 kV Trf	318	390E	.039	Franks-Huben 345 kV Huben-Morgan 345 kV
		2500*		No Limit Found				Each Valid Contingency Tested
MAINx	IITC	2500*		No Limit Found				None
	FCITC	600	<=	A.N.O-Russellville North 161 kV	376	395E	.031	Ft.Smith-A.N.O 500 kV
		1850		Franks 345/161 kV Trf	319	390E	.039	Franks-Huben 345 kV Huben-Morgan 345 kV
		2500*		No Limit Found				Each Valid Contingency Tested
MAPP	IITC	2000*		No Limit Found				None
	FCITC	0	< (23a)	Blackberry-Boswell 230 kV ckt 2	454	438E	.039	Blackberry-Boswell 230 kV ckt 1
		700	(4A)	Arpin 345/138 kV Trf	310	334E	.033	Arpin-Rocky Run 345 kV
		1300	(44a,R)	Silverbay Bus Tie 115 kV	31	107E	.060	Taconite Harbor-Hoyt Lake 138 kV
		1700	(10A)	Lake Road-Nashua 161 kV	93	172E	.047	Stranger-Iatan 345 kV
		2000	<=	No Additional Limit Found				Each Valid Contingency Tested
SERCW	IITC	2500*		No Limit Found				None
	FCITC	450	<=	A.N.O-Russellville North 161 kV	376	395E	.043	Ft.Smith-A.N.O 500 kV
		1100		Danville-Magazine 161 kV	106	148E	.040	Ft.Smith-A.N.O 500 kV
		1500		Toledo-Van Ply Tap 138 kV	100	145E	.030	Colfax-Rodemacher 230 kV
		1800		Muskogee-Clarksville 345 kV	821	895E	.042	Riverside Station-Muskogee 345 kV

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

TVA	IITC	2500*		No Limit Found					None
	FCITC	400	<=	A.N.O-Russellville North 161 kV	376	395E	.050		Ft.Smith-A.N.O 500 kV
		1000		Danville-Magazine 161 kV	106	148E	.043		Ft.Smith-A.N.O 500 kV
		1900		Muskogee-Clarksville 345 kV	821	895E	.040		Riverside Station-Muskogee 345 kV
TVAx	IITC	2500*		No Limit Found					None
	FCITC	350	<=	A.N.O-Russellville North 161 kV	376	395E	.052		Ft.Smith-A.N.O 500 kV
		1000		Danville-Magazine 161 kV	106	148E	.043		Ft.Smith-A.N.O 500 kV
		1700		Muskogee-Clarksville 345 kV	821	895E	.043		Riverside Station-Muskogee 345 kV

Transfer direction with subscript ‘x’ includes uncommitted resources in the exporting subsystem

SPP NORTH (SPP-N) IMPORTS

FROM	TRANSFER CAPABILITY CONDITION	MW	(NOTE)	LIMITING ELEMENT	FLOW	RATING	PTDF/ OTDF	FACILITY OUTAGE(S)
AMRN	IITC	1500*		No Limit Found				None
	FCITC	1500	<=	Franks 345/161 kV Trf	318	390E	.049	Franks-Huben 345 kV Huben-Morgan 345 kV
		1500*		No Additional Limit Found				Each Valid Contingency Tested
AMRNx	IITC	1500*		No Limit Found				None
	FCITC	1400	<=	Franks 345/161 kV Trf	318	390E	.050	Franks-Huben 345 kV Huben-Morgan 345 kV
		1500		Muskogee-Clarksville 345 kV	821	895E	.050	Riverside Station-Muskogee 345 kV
		1500*		No Additional Limit Found				Each Valid Contingency Tested
IOWA	IITC	1200*		No Limit Found				None
	FCITC	1200*	<=	No Limit Found				Each Valid Contingency Tested
MINN	IITC	1500*		No Limit Found				None
	FCITC	0	(13A)	Weston-Kelly 115 kV	252	239E	.031	N.Appleton 345/138 kV Trf N.Appleton-Point Beach 345 kV N.Appleton-Rocky Run 345 kV
		0	<=	Weston-Kelly 115 kV	250	239E	.032	N.Appleton-Rocky Run 345 kV
		0	(13AA)	Whiting-Hoover 115 kV	252	239E	.046	N.Appleton 345/138 kV Trf N.Appleton-Point Beach 345 kV N.Appleton-Rocky Run 345 kV
		0		Whiting Ave-Hoover 115 kV	248	239E	.046	N.Appleton-Rocky Run 345 kV
		0	(23a)	Blackberry-Boswell 230 kV ckt 2	454	438E	.088	Blackberry-Boswell 230 kV ckt 1
		200		Point Beach-Forest Junction 345 kV	570	578E	.043	Point Beach-Granville 345 kV
		300		Port Edwards-Sal 138 kV	128	143E	.051	N.Appleton 345/138 kV Trf N.Appleton-Point Beach 345 kV N.Appleton-Rocky Run 345 kV

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

		400	(4A)	Arpin 345/138 kV Trf	310	334E	.060	Arpin-Rocky Run 345 kV
		600	(44a,R)	Silverbay Bus Tie 115 kV	31	107E	.127	Taconite Harbor-Hoyt Lake 138 kV
SMAIN	IITC	1500*		No Limit Found				None
	FCITC	1500	<=	Muskogee-Clarksville 345 kV	821	895E	.050	Riverside Station-Muskogee 345 kV
		1500*		No Additional Limit Found				Each Valid Contingency Tested
SMAINx	IITC	1500*		No Limit Found				None
	FCITC	1400	<=	Muskogee-Clarksville 345 kV	821	895E	.052	Riverside Station-Muskogee 345 kV
		1500*		No Additional Limit Found				Each Valid Contingency Tested
SPP-S	IITC	1500*		No Limit Found				None
	FCITC	1400	<=	Newkirk-Creswell 138 kV	62	168E	.074	Wichita-Woodring 345 kV
		1500*		No Additional Limit Found				Each Valid Contingency Tested

Transfer direction with subscript ‘x’ includes uncommitted resources in the exporting subsystem

S: SPP SOUTH (SPP-S) IMPORTS

FROM	TRANSFER CAPABILITY CONDITION	MW	(NOTE)	LIMITING ELEMENT	FLOW	RATING	PTDF/ OTDF	FACILITY OUTAGE(S)
AMRN	IITC	1500*		No Limit Found				None
	FCITC	1300	<=	Danville-Magazine 161 kV	106	148E	.032	Ft.Smith-A.N.O 500 kV
		1500*		No Limit Found				Each Valid Contingency Tested
AMRNx	IITC	1500*		No Limit Found				None
	FCITC	1300	<=	Danville-Magazine 161 kV	106	148E	.032	Ft.Smith-A.N.O 500 kV
		1500*		No Limit Found				Each Valid Contingency Tested
SPP-N	IITC	600		Tipton Ford-Neosho 161 kV	109	130E	.032	None
		1100		Hays-Vine 115 kV	27	80E	.099	None
		1200		Knoll-Vine 115 kV	38	80E	.099	None
	FCITC	0	(5A)	Jeffrey Energy Ctr-Auburn 230 kV	608	564E	.039	Hoyt-Jeffrey Energy Ctr 345 kV
		600	<= (R)	Tipton Ford-Neosho 161 kV	134	157E	.037	Tipton Ford-Monett 161 kV
		950	(R)	Judson Large-Greensburg 115 kV	16	79E	.067	Judson Large-Spearville 115 kV

Transfer direction with subscript ‘x’ includes uncommitted resources in the exporting subsystem

Voltage Stability Study
2009 Summer Peak Long Range Transmission Assessment

Study Methodology

1. For each sub-region or region analyzed, at least two import directions will be studied for voltage stability limitations. SPP evaluated SPP-N imports from IOWA and AMRN and SPP imports from MAPP.

2. For each direction selected, generation outages will be identified for the importing area that sum to approximately 50% of the FCITC thermal import limit. For larger FCITC thermal import limits, if more than three generator outages are required to achieve approximately 50% of the thermal transfer limit, the additional generator outages may be limited based on the judgment of the importing area FSSG representative or designee from that area. No complete multi-unit generating station outages should be taken unless the station is on a single radial transmission line. An outage of Holcomb unit and at least one unit at Hawthorn were evaluated.

3. An AC powerflow model will be developed with the generator outages as described above. The transfer level being studied will be the higher of 10% above the FCITC thermal transfer limit or the thermal transfer limit plus 200 MW, or equal to the amount of generation being outaged if a single generator outage is greater than the previous levels. In the importing area, the additional scaling beyond the generators outaged will be accomplished by scaling down all other on-line generation in the importing area. Exporting of power will be modeled by scaling load down in the exporting area(s). The voltages in the transmission system basecase model will be checked and voltages below 95% will be identified. No voltages below 0.95 were identified in SPP.

4. The AC model created in Step 3 will be studied for all single contingencies in the importing area and all areas adjacent to the importing area. An AC analysis of all single contingencies in these areas will be performed, including generator and transmission element contingencies. For generator outages the replacement power will be modeled from all other generators in the interconnection, approximating the initial inertia response of the system. For each AC contingency study, the voltage levels in the case will be checked. For system elements rated at or above 161kV, voltages below 0.95 per unit will be identified. For system elements rated below 161kV, voltages below 0.90 per unit will be identified. If significant low voltages exist that would be a concern for load stability, further analysis may be required. If there are no significant low voltages, the study for this direction and contingency is complete with the conclusion that an adequate voltage stability margin exists. Adequate voltage stability margin exist in SPP for these scenarios.

5. For any AC powerflow simulation that fails solve in Step 4, an iterative powerflow solution will be performed for the direction and contingency. The purpose of this iterative powerflow solution will be to determine at what transfer level the powerflow fails to solve, indicating a possible voltage collapse. Once the voltage stability limit is identified, a margin will be subtracted from the limit (similar to the margin added in step 3 above) and this new limit will represent the modified transfer limit based on a voltage stability limitation.

Study Results Summary

The transfer scenarios and generator outages selected by SPP for the voltage study includes the following :

Transfer Direction	Generator Outages
IOWA -> SPP-N	Take out Holcomb (365 MW, 56447)and Hawthorn 6 (132MW, 57961) and Hawthorn 9 (137MW, 57967)
AMRN -> SPP-N	Take out Holcomb (365 MW, 56447)and Hawthorn 6 (132MW, 57961)
MAPP -> SPP	Take out Holcomb (365 MW, 56447)and Hawthorn 6 (132MW, 57961)

In reviewing the study results, SPP did not identify any voltage problems that were a result of the transfers tested.

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 Guide
(5) Auburn Operating Guide
(10) Lake Road-Nashua Operating Guide
(23) Boswell Emergency Operating Guide
(44) Taconite Harbor Emergency Operating Guide (2003S)

DESCRIPTION OF OPERATING GUIDES/PROCEDURES

Arpin Area Operating Guide (ATCllc) (rev March 2001)

The completion of the Baldwin-Marathon City project (Pine Lake-Cassel 115 kV rebuild) by June 1, 2001 will require modification of the existing Arpin Operating Guide. Modification of the guide is required to fully realize the benefits of the upgraded NSP-ATCLLC interconnection at the T-Corners 115 kV substation. It is anticipated that maintaining the T-Corners interconnection during an outage of the 345 kV line will improve the post-contingency phase angle separation across the 345 kV system. The Arpin Operating guide, which removes limitations on lower voltage facilities during an outage of King-Eau Clarie-Arpin 345 kV or Arpin-Rocky Run 345 kV line, is currently under inter-regional review by those transmission entities affected by the guide.

Although not in its final form, the Arpin operating guide included within this study includes two portions to remove limits on lower voltage 115 kV facilities which parallel the King-Eau Claire-Arpin-Rocky Run 345 kV line.

Part I: For an outage of the King-Eau Claire-Arpin or the Eau Claire-Arpin 345 kV line, this study maintained the interconnection at T Corners (the T Corners-Wien 115 kV line) and simulated the automatic opening of the Arpin-Hume 115 kV line to remove overloads on the 115 kV system between Wien and Arpin.

Part II: For an outage of the Arpin-Rocky Run 345 kV line, this study maintained the T Corners interconnection, simulated the automatic opening of the Port Edwards-Sand Lake and Port Edwards- Saratoga 138 kV lines to remove overloads on the 138 kV system between Arpin and Port Edwards, and simulated the opening of the Arpin-Hume 115 kV line to remove overloads on the 115 kV system between Arpin and Wien.

Arpin Area Operating Guide (ALTE & WPS)
(Guide as used in past studies)

The Arpin area operating guide consists of opening substation breakers to prevent transmission lines from overloading during specific transmission line outages or overload conditions. The Arpin area operating guide is described as three separate parts. All parts of the Arpin area operating guide are required for this seasonal transmission assessment study.

Part I: The first part of the Arpin area operating guide consists of opening a 115 kV breaker at the T Corners substation to prevent the Wissota - T Corners - Wien 115 kV line from overloading. The Wissota - T Corners - Wien 115 kV line is most susceptible to overloading for the outage of any portion of the King - Eau Claire - Arpin 345 kV line. The T Corners 115 kV breaker will operate automatically for an overload of the T Corners - Wien 115 kV when the flow is from T Corners to Wien.

Part II: The second part of the Arpin area operating guide consists of opening 138 kV breakers at the Port Edwards substation on the Port Edwards - Wautoma and Port Edwards - Saratoga 138 kV lines to prevent the Arpin - Sigel 138 kV line from overloading. This portion of the guide also requires the operation of a 46 kV breaker at the West Wisconsin Rapids substation to open the West Wisconsin Rapids - Water Quality 46 kV line. The Arpin - Sigel 138 kV line is most

susceptible to overloading for the Arpin - Rocky Run 345 kV line outage. These breakers will open automatically for an overload of the Arpin - Sigel 138 kV line.

Part III: The third part of the Arpin area operating guide consists of opening a 115 kV breaker at the Sherman Street substation on the Sherman Street - Cassel 115 kV line to prevent an overload of the Wien - Cassel 115 kV line. The Wien - Cassel 115 kV line is most susceptible to overloads for the outage of the Arpin - Rocky Run 345 kV line. The 115 kV breaker at Sherman Street will open automatically for an overload of the Wien - Cassel 115 kV line.

Auburn Operating Guide (WR)

The outage of the Jeffrey-Hoyt 345 kV line can cause unacceptable overloads in the Auburn substation area. When this outage occurs, and overloads are noted in the Auburn substation area, generation at Jeffrey will be reduced until all overloads in the Auburn area are within acceptable limits.

Lake Road-Nashua Operating Guide (KCPL)

The Lake Road-Nashua operating guide calls for KCPL operators to take 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 outage. The Lake Road-Nashua 161 kV line is opened via supervisory control. The Lake Road-Nashua operating guide is unconditionally available.

Boswell Emergency Operating Guide (MP)

MAPP systems do not implement operating procedures for the purpose of increasing nonemergency transfers. However, if a situation exists where a utility requires emergency import, the MAPP 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.

If one of the three Boswell 230 kV transmission outlets trip, or becomes out of service, Boswell generation at Units #3 and #4 will be reduced to be within the guidelines for operation on two outlets. The Boswell Operating Guide consists of reducing generation at Boswell until the Boswell 230 kV transmission outlets are loaded at or below their respective emergency rating.

All Boswell generation limits are based on either Summer or Winter emergency thermal MVA ratings. The actual Boswell generation limit depends upon Manitoba Hydro to U.S. transfer level, International Falls phase shifter flow, Boswell 115 kV generation and line conductor temperature. Since the Manitoba - Minnesota 500 kV transmission upgrade, Boswell generation is not limited transiently. Boswell generation can exceed these limits up to a level at which a thermal line limit is reached.

Taconite Harbor Emergency Operating Guide (MP) prior to 2004 summer

MAPP systems do not implement operating procedures for the purpose of increasing nonemergency transfers. However, if a situation exists where a utility requires emergency import, the MAPP 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. Minnesota Power has an automatic tripping scheme that would open the Taconite Harbor 138/115 kV transformer, for overloads on any of the series elements between Laskin and Colby 115 kV substations. This is done based on about 90% of the emergency rating of the above circuits. Load shedding is also available at the Hoyt Lake Plant as well as generation adjustment.