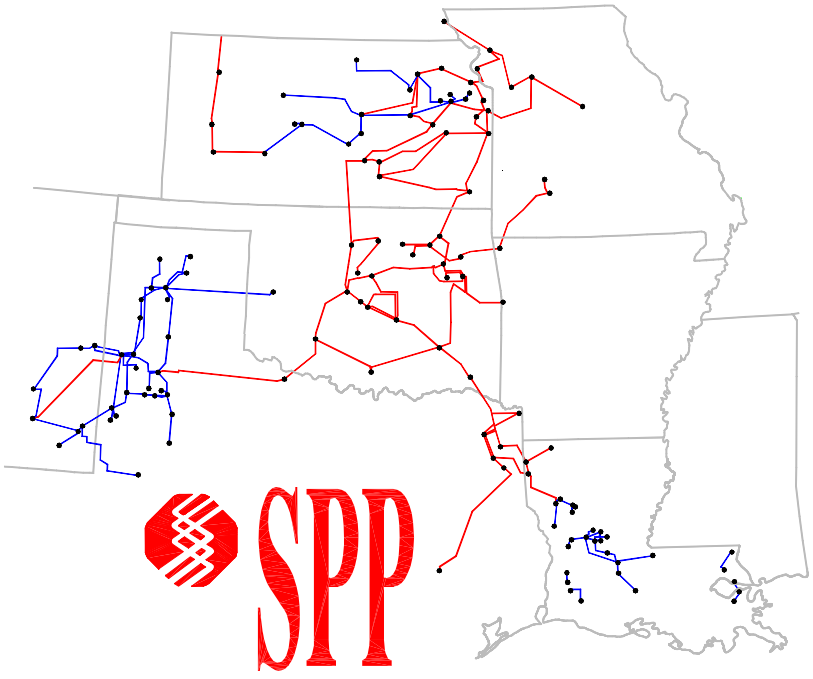
Southwest Power Pool

Intra-Regional Appraisal and Study Observation

2004 Winter Peak

Transmission Assessment

October 2004



SOUTHWEST POWER POOL
Intra-Regional Appraisal and Study Observation
2004 Winter Peak Transmission Assessment

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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 2004 winter 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-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.

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 2004 winter 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 2004 winter 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.

Sub-Regional Appraisal and Study Observations
2004 Winter Peak Transmission Assessment

I. General Observations

The MAIN TASG case was developed from the 2004 Winter Peak model of the SPP 2004 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

II. Nonsimultaneous Import Transfer Capabilities (MW) for SPP Subregions

Transfer Direction	2004/05 Winter		2003/04 Winter		2004/05 Winter Limiting Element (2004/05 Winter Outaged Element)	Owner
	FCITC	Notes	FCITC	Notes		
AMRN-SPP-N	1500*		1500*		No Limit Found (Each Valid Contingency Tested)	
IOWA-SPP-N	1200*		1200*		No Limit Found (Each Valid Contingency Tested)	
MINN-SPP-N	1500*	4,44	700		No Limit Found (Each Valid Contingency Tested)	
SMAIN-SPP-N	1500*		1500*		No Limit Found (Each Valid Contingency Tested)	
AMRN-SPP-S	1500		1500*		No Limit Found (Each Valid Contingency Tested)	
SPP-N-SPP-S	1200*		1200*		No Limit Found (Each Valid Contingency Tested)	
SPP-S-SPP-N	1500*		1500*		No Limit Found (Each Valid Contingency Tested)	

(*) 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
(44) Taconite Harbor Emergency Operating Guide

SPP-N Imports

SPP-N import FCITC from AMRN is 1500 MW. No limit was identified up to this transfer level. This is the same level reported in the 2003/04 winter study with no limitation found.

SPP-N import FCITC from IOWA is 1200 MW. No limit was identified up to this transfer level. This is the same FCITC reported for the 2003/04 winter study with no limiting element identified up to the transfer level.

SPP-N import FCITC from MINN is 1500 MW with no limit identified up to the transfer level with the availability of Arpin Area Operating Guide and Taconite Harbor Emergency Operating Guide. The import FCITC of 1500 MW is an increase from the 700 MW FCITC reported in the 2003/04 winter study limited by the Austin-Hayward 161 kV line (ALTW-DPC) for the outage of Hazleton-Adams 345 kV line (NSP), Adams 345/161 kV transformer (NSP) and Adams-Pleasant Valley 345 kV line (ALTW-NSP).

SPP-N import FCITC from SMAIN is 1500 MW with no limits found up to the test level. This is the same FCITC level reported in the 2003/04 winter study with no limitations found.

SPP-N import FCITC from SPP-S is 1500 MW with no limits found up to the test level. This is the same FCITC level reported in the 2003/04 winter study with no limitations found.

SPP-S Imports

SPP-S import FCITC from AMRN is 1500 MW with no limit identified up to the transfer level with the availability of the Maries Operating Guide. In the 2003/04 winter study, this transfer was limited at FCITC of 1500 MW by the Fort Smith 500/161 kV transformer (OKGE) for the outage of Fort Smith 500/345 kV transformer (OKGE).

SPP-S import FCITC from SPP-N is 1200 MW with no limits found up to the test level. This is the same FCITC level reported in the 2003/04 winter study with no limitations found.

Southwest Power Pool
Regional Appraisal and Study Observations
2004 Winter Peak Transmission Assessment

I. General Observations

Compared to the loads modeled in the 2003/04 winter study, the MAIN and MAPP loads are approximately 1.0% and 1.4% higher, respectively, in this study, and the SPP load is approximately 1.9% lower.

To obtain transfer capabilities representative of the MAIN, MAPP and SPP regions, the following sub-regional or geographic participation factors were used:

MAIN import and export	ALTW 7.7%; NI 35.0%; SMAIN 33.2%; WUMS 24.1%
MAPP import	IOWA 22.3%; MINN 49.9%; NEBR 27.8%
MAPP export	IOWA 25.0%; MINN 23.0%; NEBR 33.0%; DAKS 19.0%
SPP import	SPP-N 32.5%; SPP-S 67.5%
SPP export	SPP-N 29.8%; SPP-S 70.2%

The Fort Smith 500/161 kV transformer has been a limiting constraint to transfers in previous TASG studies. To address this limitation, OKGE is installing a second Fort Smith 500/161 kV transformer. Installation of the second transformer is scheduled to be completed by November 15th 2004. Another planned transmission facility of regional significant is the 210 MW Finney-Lamar HVDC interconnection between SPP and WECC that will be completed in December, 2004. No transactions are being scheduled across this new DC tie in this assessment.

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	2004/05 Winter		2003/04 Winter		2004/05 Winter Limiting Element (2004/05 Winter Outaged Element)	Owner
	FCITC	Notes	FCITC	Notes		
MAPP-MAIN	2000*	4,44	2000*	4	No Limit Found (Each Valid Contingency Tested)	-
SPP-MAIN	2400	4	1700		Volunteer-Phipps Bend 500 kV (Baker-Broadford 765 kV)	TVA (AEP)
MAIN-MAPP	1850	61	1450	61	Salem 345/161 kV Tr. (Sub 91-Quad Cities 345 kV) (Sub 91 345/161 kV Tr.) (Davenport-Sub 91 345 kV)	ALTW (MEC-ComEd) (MEC) (MEC)
SPP-MAPP	1650		2000*	8,60	St. Joe-Midway 161 kV (Fairport-Nodaway 161 kV)	MPS (AECI)
MAIN-SPP	2500*		1600		No Limit Found (Each Valid Contingency Tested)	
MAPP-SPP	2000*	4,44	2000*		No Limit Found (Each Valid Contingency Tested)	
TVA-SPP	1300		1100		Danville-Magazine 161 kV (Ft.Smith-ANO 500 KV)	EES-AEPW (OKGE-EES)

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(*)  Denotes transfer level studied or based upon the transfer level studied.
(I)  Indicates the implementation of a nonemergency guide.
(i)  Indicates the implementation of an emergency guide.

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

 (4)  Arpin Area Operating Guides
 (61) Poweshiek-Reasnor Emergency Operating Guide (2004/05 W)
 (8)  Granville Operating Guide
 (44) Taconite Harbor Special Protection System (2004/05 W)
 (60) Cornell Operating Guide
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SPP-Imports

The 2004/05 winter import FCITC from MAIN is 2500 MW with no limit found up to the transfer study level. This level is an increase from the 1600 MW FCITC reported in the 2003/04 winter study limited by the Fort Smith 500/161 kV transformer (OKGE) for the outage of Fort Smith 500/345 kV transformer (OKGE).

The 2004/05 winter import FCITC from MAPP is 2000 MW. No limit was found up to the transfer study level with the availability of Arpin Area Operating Guide and Taconite Harbor Emergency Operating Guide. No limit was reported up the transfer level in the 2003/04 winter study.

The 2004/05 winter import FCITC from TVA is 1300 MW limited by the Danville-Magazine 161 kV line (ESI-AEPW) for the outage of Fort Smith-ANO 500 kV line (OKGE-ESI). This level is an increase from the 1100 MW FCITC reported in the 2003/04 winter study with the same limiting facility.

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	2500*	<=	No Limit Found				Each Valid Contingency Tested
MAINx	IITC	2500*		No Limit Found				None
	FCITC	2500*	<=	No Limit Found				Each Valid Contingency Tested
MAPP	IITC	2000*		No Limit Found				None
	FCITC	800	(4A)	Arpin 345/138 kV Tr.	299	334E	.044	Arpin-Rocky Run 345 kV
		1750	<(44a,R)	Silver Bay Bus Tie 115 kV	58	120E	.035	Laskin 138/115 kV Tr.
		2000*	<-	No Additional Limit Found				Each Valid Contingency Tested
SERCW	IITC	2500*		No Limit Found				None
	FCITC	1400	<=	Danville-Magazine 161 kV	94	148E	.039	Ft.Smith-ANO 500 kV
		2400	(66A)	Holden-Pittsville 161 kV	66	252E	.077	Clinton-Holden 161 kV
		2500*		No Additional Limit Found				Each Valid Contingency Tested
TVA	IITC	2500*		No Limit Found				None
	FCITC	1300	<=	Danville-Magazine 161 kV	94	148E	.042	Ft.Smith-ANO 500 kV
		2500*		No Additional Limit Found				Each Valid Contingency Tested
TVAx	IITC	2500*		No Limit Found				None
	FCITC	1200	<=	Sage-Melbourne 161 kV	110	146E	.030	Ft.Smith-ANO 500 kV
		1200		Danville-Magazine 161 kV	94	148E	.044	Ft.Smith-ANO 500 kV
		1400		Quitman-Bee Branch 161 kV	124	167E	.031	Ft.Smith-ANO 500 kV

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*	<=	No Limit Found				Each Valid Contingency Tested
AMRNx	IITC	1500*		No Limit Found				None
	FCITC	1500*	<=	No 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	400	(4A)	Arpin 345/138 kV Tr.	299	334E	.084	Arpin-Rocky Run 345 kV
		550	<(44a,R)	Silver Bay Bus Tie 115 kV	58	120E	.111	Laskin 138/115 kV Tr.
		800	(44a,R)	Hoyt Lake-Laskin 138 kV	58	145E	.111	Silver Bay Bus Tie 115 kV
		1500*	<-	No Additonal Limit Found				Each Valid Contingency Tested
SMAIN	IITC	1500*		No Limit Found				None
	FCITC	1500*	<=	No Limit Found				Each Valid Contingency Tested
SMAINx	IITC	1500*		No Limit Found				None
	FCITC	1500*	<=	No Limit Found				Each Valid Contingency Tested
SPP-S	IITC	1500*		No Limit Found				None
	FCITC	1500*	<=	No Limit Found				Each Valid Contingency Tested

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	1400	(12A)	Maries 138/161 kV Tr.	55	100E	.032	Bland-Franks 345 kV
		1500*	<=	No Additional Limit Found				Each Valid Contingency Tested
AMRNx	IITC	1500*		No Limit Found				None
	FCITC	1500*	<=	No Limit Found				Each Valid Contingency Tested
SPP-N	IITC	1200*		No Limit Found				None
	FCITC	1200*	<=	No Limit Found				Each Valid Contingency 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
(8) Granville Operating Guide
(44) Taconite-Harbor Emergency Operating Guide
(60) Cornell Operating Guide
(61) Poweshiek-Reasnor Operating Guide

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.

Granville Operating Guide (WE)

The Granville operating guide consists of closing the Granville 345 kV bus section breaker 1-2 and the Granville - Arcadian 345 kV line following the outage of 345 kV bus section #1 to clear a transformer #1 failure. It also consists of closing the Granville 345 kV bus section breaker 2-3 and the Granville - Edgewater 345 kV line following the outage of 345 kV bus section #3 to clear transformer #3 failure. This procedure is performed by supervisory control.

Taconite Harbor 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. 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.

Cornell Operating Guide (ATCLLC)

During certain transmission contingencies, including the outages of the Arcadian-Granville and Wempletown-Paddock 345 kV lines, the Center-Fiebrantz 138 kV line overloads. The Cornell Operating Guide consists of opening the Cornell-Fiebrantz 138 kV line to reduce loading on the Center-Fiebrantz 138 kV line. This procedure is performed by supervisory control.

Poweshiek-Reasnor Operating Guide (ALTW-MEC)

The outage of the Montezuma-Bondurant 345 kV line can cause unacceptable overloads on the Poweshiek-Reasnor 161 kV line. This guide relieves overloads on the Poweshiek-Reasnor 161 kV line by opening the Reasnor-Des Moines 161 kV line, Knoxville-Pleasantville 69 kV line, Prairie City-S.E. Osceola 69 kV line (Murray-Osceola).

Basecase Schedules for 2004 Winter Peak

FROM		TO			MW Interchange	
Region	Co.	Region	Co.		2004/05 W	2003/04 W
MAIN	ALTE	MAPP	DPC		-5	-46
MAIN	ALTE	MAPP	NSP		61	61
MAIN	ALTW	MAPP	DPC		-13	-5
MAIN	ALTW	MAPP	GRE		-79	-65
MAIN	ALTW	MAPP	MEC		-15	-154
MAIN	ALTW	MAPP	MPW		5	0
MAIN	ALTW	MAPP	NSP		-2	-5
MAIN	ALTW	MAPP	SMP		4	13
MAIN	ALTW	MAPP	WAPA		-61	-41
MAIN	ComEd	MAPP	GRE		0	50
MAIN	ComEd	MAPP	MEC	MEC's Share of Quad Cities	434	428
MAIN	ComEd	MAPP	MEC		335	300
MAIN	IP	MAPP	NSP		102	102
MAIN	MGE	MAPP	DPC		-30	-30
MAIN	WE	MAPP	MP		-62	-62
MAIN	WE	MAPP	NSP		-42	-42
MAIN	WPS	MAPP	MHEB		-108	-108
MAIN	WPS	MAPP	MP		-76	-76
	MAIN to MAPP Net				448	320
MAIN	AMRN	SPP	SPA		-16	-16
MAIN	CWL	SPP	KACY		-20	-20
MAIN	CWL	SPP	SPA		-61	-78
MAIN	CWL	SPP	SPRM		-8	-8
	MAIN to SPP Net				-105	-122
MAPP	NPPD	SPP	MPS		100	90
MAPP	WAPA	SPP	SECI		3	3
	MAPP TO SPP Net				103	93