

PAWNEE GENERATOR ADDITION IMPACT AND FEASIBILITY STUDY

**Xcel Energy Transmission Planning
May 2003**

Executive Summary

Xcel Energy Transmission Planning has studied the existing transmission system at the request of <omitted text> and has determined the transmission requirements and estimated costs to install either a 500 MW or 750 MW coal fired generator at Xcel Energy's Pawnee Generating Plant.

The estimated transmission cost for the 500 MW addition will be \$48.7 million and the estimated transmission cost for the 750 MW addition will be \$180.4 million. The time frame to get the transmission requirements constructed for the 500 MW and 750 MW generation additions will be a minimum of 24 months and 50 months, respectively.

Should <omitted text> decide to proceed with either of these options, detailed TOT 3 studies must be conducted with all owners of TOT 3 participating to determine the full impact of the generator addition on these transmission facilities. This study monitored these facilities, but did not determine if any additional reinforcements will be required. There is a possibility that additional transmission will be required to maintain existing TOT 3 capabilities.

Background

<omitted text> has requested Xcel Transmission Planning evaluate the impacts on the Colorado transmission system associated with the installation of a second coal fired generator at Pawnee to be sized with either a 500 MW or 750 MW generator.

Study Scope and Analysis

This second coal fired Pawnee unit, sized at 500 MW, will be about the same size as the existing Pawnee Unit; therefore, the new unit used the same parameters for the 500 MW case. For the 750 MW case, Four Corners #4 was used for the generator parameters. The parameters used are shown below in Table 1.

TABLE 1: GENERATOR PARAMETERS USED

BUS#	NAME	BSKV	ID	QMAX	QMIN	PMAX	PMIN	MBASE
14914	FCNGN4CC	22.0	4	395.0	-280.0	750.0	0.0	909.0
70310	PAWNEE	22.0	1	300.0	-130.0	530.0	300.0	613.7

The system model studied was a 2008 heavy summer load flow case used in the Southeast Colorado Power Plant Study as well as a 2008 heavy summer base case with a more updated system model for PSCo and the other area utilities. The study modeled a fairly high import level and all existing generation on at Pawnee, including Manchief. The study then ran sensitivities with other area generation dispatches to stress flows.

Study Methology:

For planning studies, PSCo adheres to the WECC Reliability Criteria. For system intact conditions, PSCo planning criteria is to maintain system bus voltages between 0.95 and 1.05 per unit. Operationally, PSCo tries to maintain a system voltage profile ranging from 1.02 at generators to 1.0 or higher at load buses in the Denver/Boulder area. Following a single contingency, voltages must be within 0.90 and 1.10 per unit. Facility loadings must remain within 100% of their nominal steady state ratings for system intact conditions. Under certain contingency conditions, PSCo will allow a 110% short-term (emergency) rating for transmission lines and 115% for large transformers if the transformer follows a daily load curve.

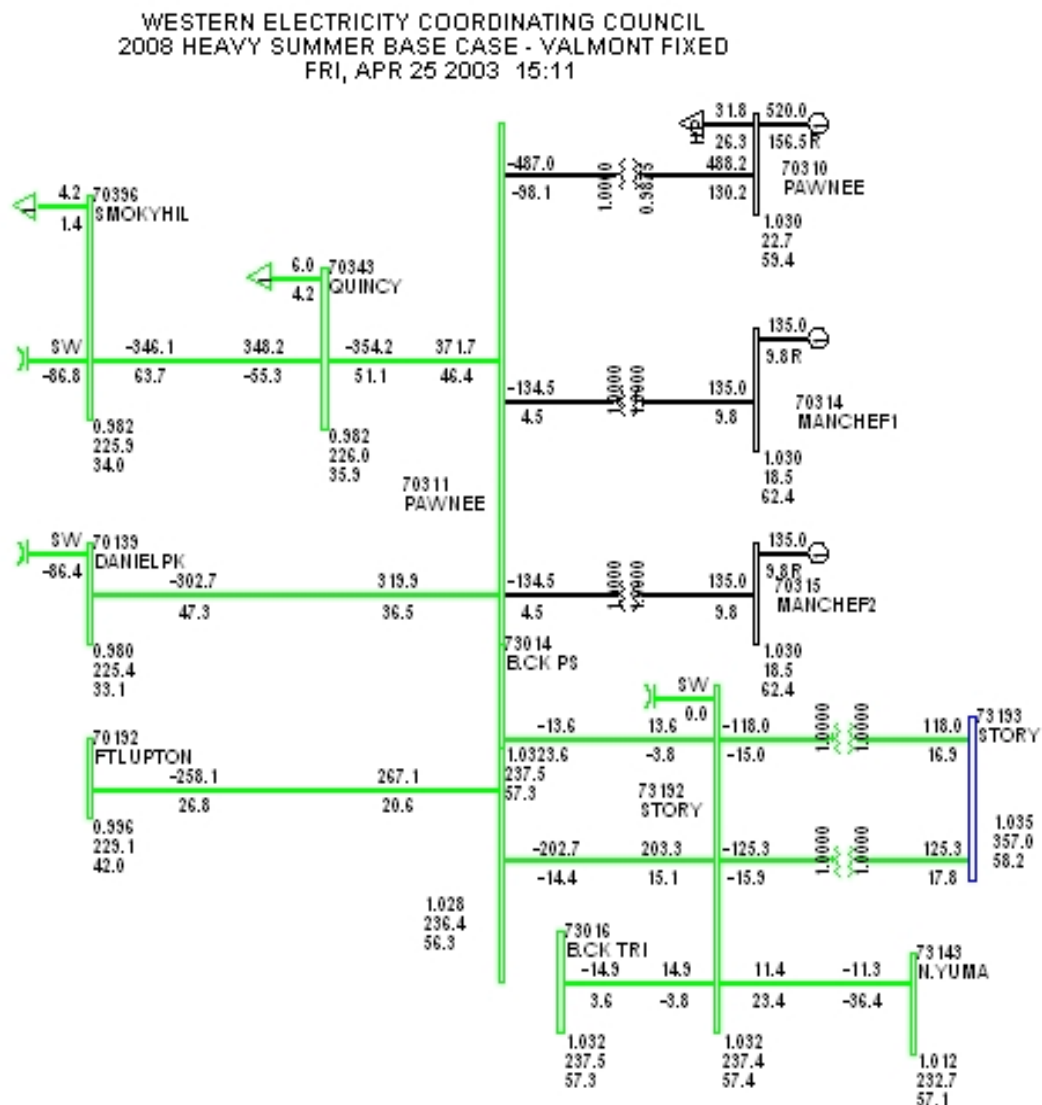
Contingency analysis examined the existing system's weaknesses and determined the minimal required system reinforcements. The process examined the 500 MW level of the new unit and then the 750 MW level. The 500 MW study level resulted in the addition of significant network reinforcements, Xcel Energy Transmission Planning attempted to determine the level of generation that could be added with minimal or no new facility additions. This level was approximately 65 MW and based on limitations as the results of a contingency on the 115 kV transmission lines around Ft. Morgan. To determine this limit, new generation was scheduled to the throughout Colorado. Table B-2 located in Appendix B, page 22 details this analysis.

As a starting reference point, all the analysis was performed with the base case before the additional Pawnee Generation was modeled. This provided a benchmark as to what reinforcements may be required before the added generation. Table B-1, page 18 in Appendix B shows these violations.

The study tools used were PTI's MUST software and PSS/E Version 28. The objective was to perform a quick analysis of the additional Pawnee generation levels and to determine the need for any system reinforcements.

Figure 1 shows a power flow one line of the existing Pawnee area transmission system.

FIGURE 1: PAWNEE AREA TRANSMISSION SYSTEM ONE-LINE



Xcel Energy Transmission Planning proposed to perform this study in two phases. Phase I focused on power flow analysis, excluding full TOT analysis. Phase II will cover

stability, if required, as well as a comprehensive TOT 3 study. These studies will be performed later if <omitted text> decides to pursue the development of the second generator at Pawnee. **Pawnee generation levels have direct impacts on TOT3 and it's limit, therefore a study with all TOT3 owners must be conducted.**

Results:

The existing transmission system is sufficient to deliver the existing Pawnee and Manchief generation in addition to the power flowing in from Story, high TOT 3 levels, system intact and under contingency conditions. Any excess capacity that existed on the transmission system when Pawnee Unit 1 was put in-service no longer exists due to the addition of Manchief and Brush generation and increased TOT 3 capability.

A. 500 MW Addition

An increase of generation at Pawnee will require new transmission as well as transmission upgrades for contingency conditions. For the system model studied, the new 500 MW Pawnee generator was modeled tied to the 230 kV bus similar to the existing unit 1. Under single contingency scenarios the Pawnee to Ft. Lupton 230 kV transmission line experiences significant overloads making this the limiting PSCo transmission facility. These results can be seen in Table B-3, page 26. **There are also reliability criteria violations under contingency conditions east of Pawnee on Western Area Power Administration's (WAPA) system that will need to be addressed through Phase II/TOT3 joint utility studies.**

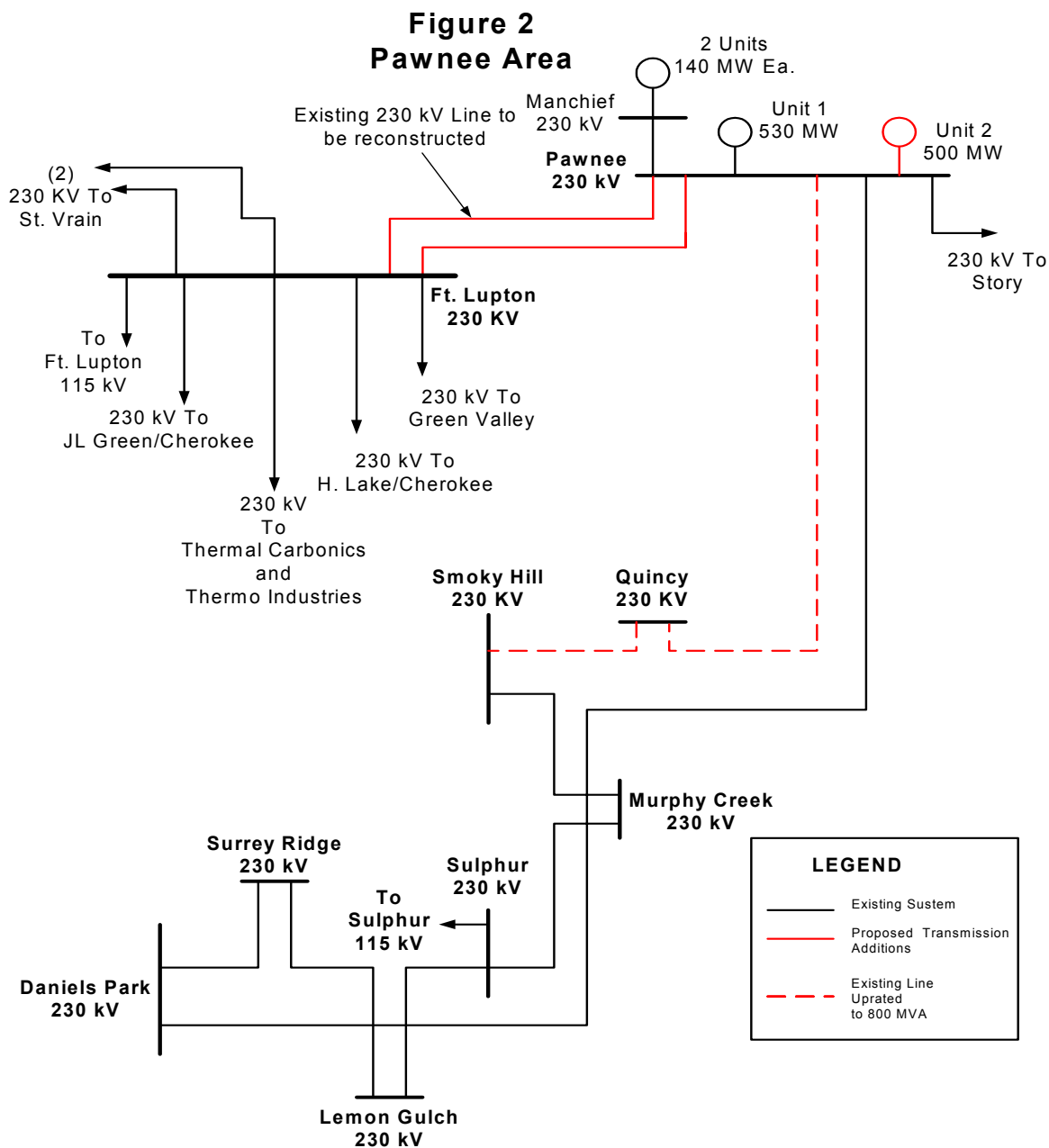
To accommodate 500MW of additional generation at Pawnee, the Pawnee to Ft. Lupton 230 kV line should be rebuilt in the existing corridor and right-of-way to double circuit capability. This will increase the current capability from 416 MVA to 834 MVA/circuit. This will require modifications and upgrades at the Ft. Lupton and Pawnee substations. Small amounts of additional right-of-way may need to be acquired along the route since the existing right-of-way varies in width.

Because of the significant amount of existing generation in the Pawnee area, major outages to allow construction will likely be problematic. In order to accommodate transmission outages, the Pawnee to Smoky Hill 230 kV line should be uprated from 637 MVA to 800 MVA. This will require minimal construction, minimal cost, and very limited outages. This will also require some upgrades at Pawnee and Smoky Hill substations to handle the increase in ampacity.

Once this line is uprated, the Pawnee to Ft. Lupton 230 kV line can be removed for major reconstruction with little or no impacts to generation or import

capabilities. However, operating procedures will need to be developed for the loss of the Pawnee to Daniels Park or the Pawnee-Smoky Hill 230 kV lines during construction. These procedures will range from switching to generation re-dispatch.

Figure 2 shows a one-line of the proposed 500 MW system.



The total estimated cost for the previously described reinforcements is \$48.7 million in 2003 dollars. Please recognize that these are indicative estimates, similar to IRP estimates and are in the +/- 25% range. Please see Appendix A for a detailed description as well as major assumptions used in developing these costs.

As stated earlier, there are also reliability criteria violations under contingency conditions east of Pawnee on WAPA's system that will need to be addressed through Phase II/TOT3 joint utility studies. Table B-4 on page 29 details these criteria violations.

The estimated time frame for construction of these generator-required reinforcements is a minimum of 24 months.

To verify that this is the optimum solution, various generation dispatch scenarios for this 500 MW Pawnee addition were evaluated.

The other transmission alternatives considered included reconductoring the Pawnee to Smoky Hill and the Pawnee to Daniels Park 230 kV lines with larger conductors to increase capacity. Converting the Pawnee to Smoky Hill 230 kV circuit to 345 kV operation was also examined. The results of either of these options showed contingency violations with the most common being overloads on the Pawnee to Ft. Lupton 230 kV line. The Pawnee to Ft. Lupton 230kV line would need to be reconductored or rebuilt in addition to either of the above alternatives. And, as with the recommended alternative, uprates on the Pawnee to Smoky Hill 230kV line would also need to take place prior to major construction. Pursuing either of these alternatives would increase the costs significantly.

B. 750 MW Addition

Numerous system alternatives at 230 kV were evaluated in the development of the recommended plan required to accommodate the 750 MW of additional generation at Pawnee. Attempts at placing the generator on the existing 230 kV system produced multiple contingency criteria violations that could not be easily remedied with only 230 kV reinforcements thus resulting in a 345 kV solution.

The recommended system was determined to be the most efficient and least costly solution for the 750 MW generator addition.

For the 750 MW scenario the following transmission upgrades will be required:

1. Upgrade the existing 93 mile Pawnee to Smoky Hill 230 kV line from 637 to 800 MVA. (This was a requirement for the 500 MW case)
2. Remove the existing 64 mile single circuit 230 kV line from Pawnee to Ft. Lupton and construct a double circuit 230 kV transmission line in its place. (This was a requirement for the 500 MW case)
3. Construct a new Corner Point 345 kV and 230 kV switching station located approximately 40 miles east of Smoky Hill Substation and sectionalize the existing Pawnee to Daniels Park and Pawnee to Smoky Hill lines at this new switching station.
4. Reconductor and reinsulate the 54 miles of the existing 230 kV transmission lines from Pawnee that terminate at Smoky Hill and Daniels Park substations to 345 kV specifications from Pawnee substation to the new Corner Point Switching Station. From Corner Point switching station to just outside Smoky Hill substation, reconstruct 40 miles of the two existing 230 kV single circuit structures to a double circuit single structure monopole configuration. The 230 kV termination equipment at Smoky Hill and Daniels Park substations will remain the same and continue serving the same loads as today.
5. Construct from Corner Point switching station to Daniels Park substation 60 miles of double circuit 345 kV transmission on a single monopole structure.
6. Construct new 345 kV switchyards at Pawnee and Daniels Park.

7. Install 345/230 kV, 560MVA, autotransformers at locations shown in Table 2.

**TABLE 2: LOCATION OF AUTOTRANSFORMERS FOR 750 MW
GENERATOR ADDITION**

LOCATION	NUMBER OF AUTOTRANSFORMERS
PAWNEE	2
CORNER POINT	2
DANIELS PARK	3

These reinforcements may require minimal amounts of additional permanent right-of-way in addition to some temporary easements that may be required during construction.

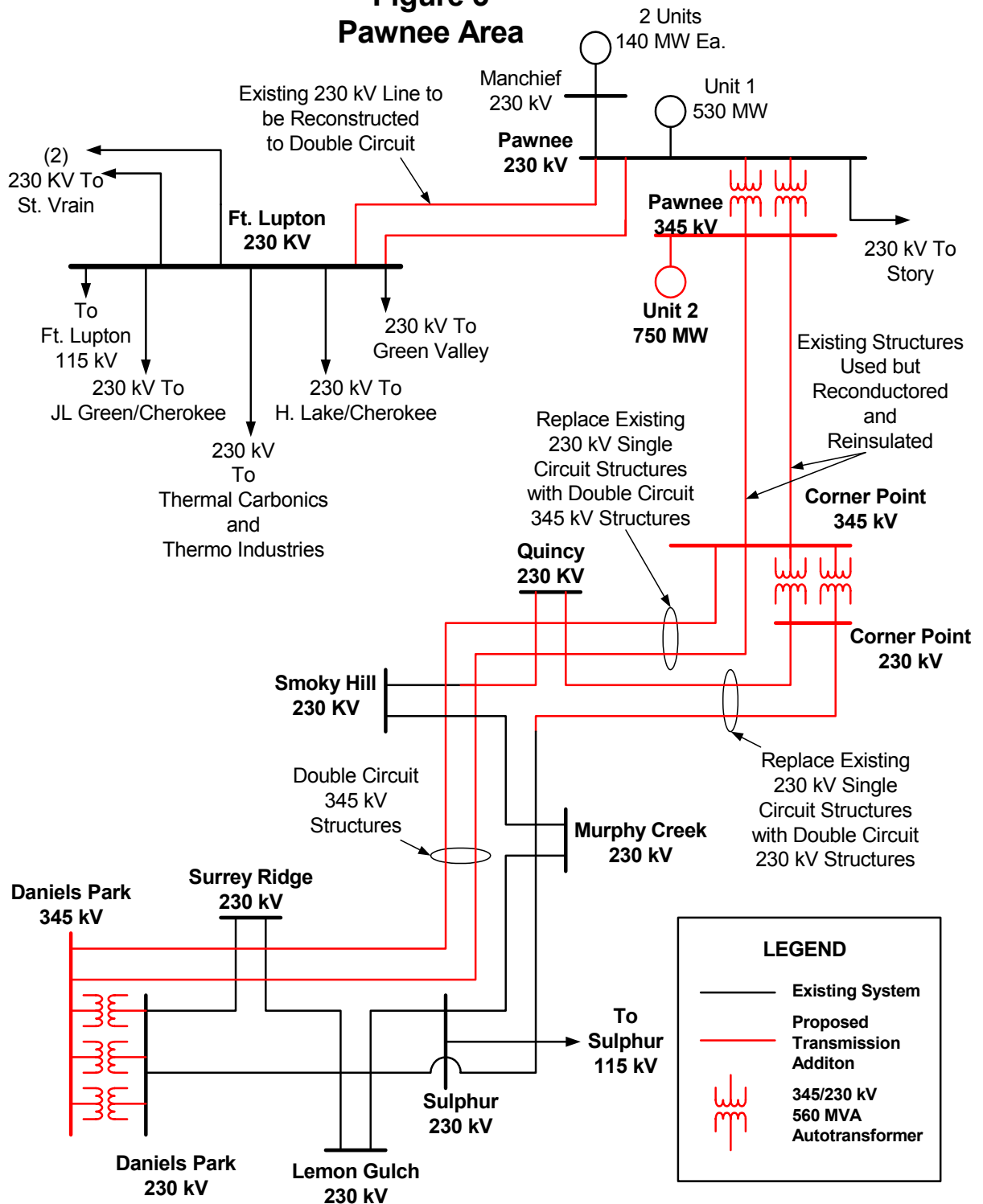
Figure 3 shows a one-line diagram of the proposed 750 MW system.

It is estimated that a minimum of 50 months be required for construction of these transmission facilities.

The total estimated costs for these additional reinforcements is \$180.4 million in 2003 dollars. Again these are indicative estimates, similar to IRP estimates and are in the +/- 25% range. Please see Appendix A for a detailed description as well as major assumptions used in developing these costs

There are also reliability criteria violations under contingency conditions east of Pawnee on Western Area Power Administrations system that will need to be addressed through Phase II/TOT3 joint utility studies. Table B-5 on page 31 shows criteria violations with the new generator connected to the 230 kV Pawnee bus and Table B-6 on page 34 shows the violations as a result of the added 345 kV reinforcements.

Figure 3
Pawnee Area



APPENDIX A

TRANSMISSION REINFORCEMENT COST DETAILS

PAWNEE 500 MW GENERATION ADDITION TRANSMISSION REINFORCEMENT COSTS

ITEM	Siting & Land Rights Estimate	Trans Eng Estimate	Pawnee Sub Estimate	Smoky Hill Estimate	Ft. Lupton Estimate	Total
Uprate Pawnee to Smoky Hill 230kV Single Circuit (S/C) trans line to 800MVA	\$100	\$500	\$520	\$625		\$1,745
Remove exist Pawnee to Ft Lupton 230kV SC trans line and const new Double Circuit (D/C) line in same ROW	\$1,000	\$38,500	\$1,800		\$1,230	\$42,530
10% Contingency						\$4,428
TOTAL						\$48,703

Overall timeline to complete all required transmission and substation work: more than 24 Months

Major Assumptions (Pawnee to Smoky Hill Uprate):

- Existing Pawnee-Smoky Hill will be uprated to 800 MVA based on 4-ft/sec wind calculations.
- Existing conductor will be used, and only minor wood pole replacements are required.
- Several new mid-span steel pole double circuit structures needed on the section from Smoky Hill east for approx. 3/4 mile.
- At Smoky Hill, one existing bay will be upgraded to 3000 A.
- At Smoky Hill, existing East and West main busses will be upgraded to 3000 A.
- At Pawnee, one exist bay will be upgraded to 3000 A.
- No additional land needed at Subs, minor trans line ROW acquisition, and only minor permitting efforts.

Major Assumptions (Pawnee to Ft. Lupton New Line):

- Any NEPA requirements imposed on transmission as a result of the generation addition will most likely have adverse effects on schedule and deliverables
- After the Pawnee-Smoky Hill line is uprated to 800 MVA, the existing S/C Pawnee-Ft. Lupton line can be taken out of service.
- New 230 kV D/C line from Pawnee to Ft. Lupton will be constructed within existing 150' ROW after S/C line is removed.

4. New D/C line will be built with bundled 954 ACSR (54/7 Cardinal) per phase for a 2000 Amp capacity rating.
5. Only minimal ROW acquisition and permitting is needed.
6. At Pawnee, one new 2-breaker bay will be added for generation interconnection, with load control and revenue metering.
7. At Pawnee, one new 2-breaker bay will be added for one Ft. Lupton circuit term, existing term used for other circuit.
8. At Ft. Lupton, the Cherokee and Green Valley lines will be swung and re-terminated at different positions.
9. At Ft. Lupton, the exist 5525 bay will be upgraded to 3000 A, and the 5463 breaker will be replaced with new 2000 A breaker.
10. At Ft. Lupton, one new breaker added for new Cherokee termination.
11. At Ft. Lupton, no additional land is required, no new bays are being added, and all exist terminations will be used.

PAWNEE 750 MW GENERATION ADDITION TRANSMISSION REINFORCEMENT COSTS

500 MW Generation Addition Transmission Estimates (000)

(This transmission is required for the 750MW addition as well)

ITEM	Siting & Land Rights Estimate	Trans Eng Estimate	Pawnee Sub Estimate	Smoky Hill Estimate	Ft. Lupton Estimate	Total
Uprate Pawnee to Smoky Hill 230kV Single Circuit (S/C) trans line to 800MVA	\$100	\$500	\$520	\$625		\$1,745
Remove exist Pawnee to Ft Lupton 230kV SC trans line and const new D/C line in same ROW	\$1,000	\$38,500	\$1,800		\$1,230	\$42,530
10% Contingency						\$4,428
TOTAL						\$48,703

750 MW Generation Addition Transmission Estimates (000)

ITEM	Siting & Land Rights Estimate	Trans Eng Estimate	Pawnee Sub Estimate	Corner Point Estimate	Daniels Park Estimate	Total
Construct new 345/230 kV Corner Point Switching Station				\$12,100		\$12,100
Reconductor and insulate the two existing S/C 230 kV trans lines to 345 kV from Pawnee to Corner Pt -54 miles		\$13,220	\$11,500			\$24,720
Remove exist Pawnee/Corner Pt to Smoky Hill 230 kV S/C trans line and const new D/C 230 kV line in same ROW (one circuit to Smoky Hill and one to Daniels Park) - 41 miles		\$26,880				\$26,880
Remove exist Pawnee/Corner Pt to Daniels Park 230 kV S/C trans line to a point near Smoky Hill and const new D/C 345 kV line in same ROW - 40 miles		\$28,500				\$28,500
Construct new 345 kV D/C trans line in existing ROW from Smoky Hill area to Daniels Park - 24 miles		\$17,100			\$14,300	\$31,400
TOTAL	\$1,850	\$85,700	\$11,500	\$12,100	\$14,300	\$125,450
5% Contingency						\$6,273
TOTAL						\$131,723

Grand Total for the 750MW Generation Addition Transmission Estimates (000) = \$180,425

Overall timeline to complete all required transmission and substation work > 50 Months

Major Assumptions 500MW Generation Addition:

1. Existing Pawnee-Smoky Hill will be uprated to 800 MVA based on 4-ft/sec wind calculations.
2. Existing conductor will be used, and only minor wood pole replacement.
3. Several new mid-span steel pole D/C structures needed on the section from Smoky Hill east for approx. 3/4 mile.
4. At Smoky Hill, one exist bay will be upgraded to 3000 A.
5. At Smoky Hill, exist East and West main busses will be upgraded to 3000 A.
6. At Pawnee, one exist bay will be upgraded to 3000 A.
7. No additional land needed at Subs, minor trans line ROW acquisition, and only minor permitting efforts.
8. After the Pawnee- Smoky Hill line is uprated to 800 MVA, the existing. S/C Pawnee-Ft. Lupton line can be taken out of service.
9. New 230kV D/C line from Pawnee to Ft. Lupton will be constructed within exist. 150' ROW after S/C line is removed.
10. New D/C line will be built with bundled 954 ACSR (54/7 Cardinal) per phase for a 2000 Amp capacity rating.
11. Only minimal ROW acquisition and permitting is needed.
12. At Pawnee, one new 2-breaker bay will be added for generation interconnection, with load control and revenue metering.
13. At Pawnee, one new 2-breaker bay will be added for one Ft. Lupton circuit term, existing term used for other circuit.
14. At Ft. Lupton, the Cherokee and Green Valley lines will be swung and re-terminated at different positions.
15. At Ft. Lupton, the exist 5525 bay will be upgraded to 3000A, and the 5463 breaker will be replaced with new 2000 A breaker.
16. At Ft. Lupton, one new breaker added for new Cherokee termination.
17. At Ft. Lupton, no additional land is required, no new bays are being added, and all exist terminations will be used.

Major Assumptions 750MW Generation Addition:

1. Any NEPA requirements imposed on transmission as a result of the generation addition will most likely have adverse effects on schedule and deliverables.
2. No screening has been estimated at any of the substations. If this is required the cost will be significant at each location.
3. These estimates due not include any cost for legal fees.
4. Detailed field investigations have not been conducted and could increase these estimates.
5. Only minimal transmission line ROW acquisition is assumed, since exist ROW will be utilized.
6. Permitting the new DC 345kV trans line from Smoky Hill to Daniels Park will be extremely difficult and could require legal action.

7. Two new 230kV bays will be added at Pawnee for the 345/230 interconnection to avoid major trans line crossings.
8. At Daniels Park both Greenwood circuits will be swung to a different termination to free up a termination for one 345/230 auto.
9. All necessary transmission line outages can be obtained. If not, const duration times will be longer.
10. All estimates are in 2003 dollars. There was no escalation used.

APPENDIX B

CONTINGENCY ANALYSIS TABLES

TABLE B-1: BASE CASE CONTINGENCY VIOLATIONS – BRANCH FLOWS 100% OR MORE OF RATING

**	From bus	** **	To bus	** CKT TYP	Cont MVA	Base Flow	Rating	Loading%	Contingency
	70336 PUEB-TAP	115 70412 STEM BCH	115 1 LN		122.7	22.5	77	159.3	70122 COMANCHE 230 70459 WALSENBG 230 1
	70336 PUEB-TAP	115 70456 W.STATON	115 1 LN		130.6	27.5	77	169.7	70122 COMANCHE 230 70459 WALSENBG 230 1
	70412 STEM BCH	115 70458 WALSENBG	115 1 LN		94.2	16	77	122.4	70122 COMANCHE 230 70459 WALSENBG 230 1
	73023 BIJOUTAP	115 73379 FMWEST	115 1 LN		88.1	65	80	110.2	70139 DANIELPK 230 70311 PAWNEE 230 1
	73031 BRUSHTAP	115 73305 EFMORGTP	115 1 LN		123.7	100	121.7	101.7	70139 DANIELPK 230 70311 PAWNEE 230 1
	73531 LINCOLNT	230 73413 MIDWAYBR	230 1 LN		243.5	202.4	239	101.9	70139 DANIELPK 230 70311 PAWNEE 230 1
	73023 BIJOUTAP	115 73379 FMWEST	115 1 LN		95.7	65	80	119.6	70311 PAWNEE 230 70343 QUINCY 230 1
	73030 BRIGHTNW	115 73493 SANDCRK	115 1 LN		87.6	59.5	85.1	102.9	70311 PAWNEE 230 70343 QUINCY 230 1
	73031 BRUSHTAP	115 73305 EFMORGTP	115 1 LN		131.6	100	121.7	108.1	70311 PAWNEE 230 70343 QUINCY 230 1
	73531 LINCOLNT	230 73413 MIDWAYBR	230 1 LN		249.7	202.4	239	104.5	70311 PAWNEE 230 70343 QUINCY 230 1
	73023 BIJOUTAP	115 73379 FMWEST	115 1 LN		95.2	65	80	119	70343 QUINCY 230 70396 SMOKYHIL 230 1
	73030 BRIGHTNW	115 73493 SANDCRK	115 1 LN		87.1	59.5	85.1	102.3	70343 QUINCY 230 70396 SMOKYHIL 230 1
	73031 BRUSHTAP	115 73305 EFMORGTP	115 1 LN		131	100	121.7	107.7	70343 QUINCY 230 70396 SMOKYHIL 230 1
	73531 LINCOLNT	230 73413 MIDWAYBR	230 1 LN		248.9	202.4	239	104.2	70343 QUINCY 230 70396 SMOKYHIL 230 1
	70474 WINDSOR	230 73011 AULT	230 1 LN		506.3	361.4	494.8	102.3	70410 ST.VRAIN 230 70471 WELD PS 230 1
	70474 WINDSOR	230 73011 AULT	230 1 LN		505.8	361.4	494.8	102.2	70471 WELD PS 230 73212 WELD LM 230 1
	73020 BEAVERCK	115 73464 ADENA	115 1 LN		111.2	77.1	109	102	73012 AULT 345 73108 LAR.RIVR 345 1
	73023 BIJOUTAP	115 73379 FMWEST	115 1 LN		101.9	65	80	127.4	73012 AULT 345 73108 LAR.RIVR 345 1
	73030 BRIGHTNW	115 73493 SANDCRK	115 1 LN		88.8	59.5	85.1	104.3	73012 AULT 345 73108 LAR.RIVR 345 1
	73031 BRUSHTAP	115 73305 EFMORGTP	115 1 LN		138	100	121.7	113.4	73012 AULT 345 73108 LAR.RIVR 345 1
	73088 HOYT	115 73464 ADENA	115 1 LN		109.2	75.1	109	100.2	73012 AULT 345 73108 LAR.RIVR 345 1
	73379 FMWEST	115 73305 EFMORGTP	115 1 LN		124.2	86.5	121	102.7	73012 AULT 345 73108 LAR.RIVR 345 1
	73015 B.CK TRI	115 73020 BEAVERCK	115 1 LN		212.7	36.7	200	106.4	73013 B.CK PS 115 73020 BEAVERCK 115 1
	73020 BEAVERCK	115 73464 ADENA	115 1 LN		124	77.1	109	113.8	73020 BEAVERCK 115 73031 BRUSHTAP 115 1
	73088 HOYT	115 73464 ADENA	115 1 LN		122.1	75.1	109	112	73020 BEAVERCK 115 73031 BRUSHTAP 115 1
	73103 L.MEADOW	115 73213 WIGGINS	115 1 LN		68.4	6.3	59.6	114.7	73020 BEAVERCK 115 73031 BRUSHTAP 115 1
	73023 BIJOUTAP	115 73379 FMWEST	115 1 LN		98.9	65	80	123.7	73020 BEAVERCK 115 73464 ADENA 115 1

**	From bus	** **	To bus	** CKT TYP	Cont MVA	Base Flow	Rating	Loading%	Contingency
	73031 BRUSHTAP	115 73305 EFMORGTP	115 1 LN		133.5	100	121.7	109.7	73020 BEAVERCK 115 73464 ADENA 115 1
	73020 BEAVERCK	115 73464 ADENA	115 1 LN		119.9	77.1	109	110	73031 BRUSHTAP 115 73305 EFMORGTP 115 1
	73088 HOYT	115 73464 ADENA	115 1 LN		117.9	75.1	109	108.2	73031 BRUSHTAP 115 73305 EFMORGTP 115 1
	73103 L.MEADOW	115 73213 WIGGINS	115 1 LN		62.5	6.3	59.6	104.9	73031 BRUSHTAP 115 73305 EFMORGTP 115 1
	73023 BIJOUTAP	115 73379 FMWEST	115 1 LN		98	65	80	122.5	73088 HOYT 115 73464 ADENA 115 1
	73031 BRUSHTAP	115 73305 EFMORGTP	115 1 LN		132.6	100	121.7	109	73088 HOYT 115 73464 ADENA 115 1
	73020 BEAVERCK	115 73464 ADENA	115 1 LN		114.1	77.1	109	104.6	73305 EFMORGTP 115 73379 FMWEST 115 1
	73088 HOYT	115 73464 ADENA	115 1 LN		112.1	75.1	109	102.8	73305 EFMORGTP 115 73379 FMWEST 115 1

Case Description

WESTERN ELECTRICITY COORDINATING COUNCIL

2008 HEAVY SUMMER BASE CASE - Valmont Adjusted

Subsys.File: S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\2003 Energy Supply Requests\Pawnee\Case files\PAWNEE-1.sub

Monit.File: S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\2003 Energy Supply Requests\Pawnee\Case files\PAWNEE.mon

Contin.File: S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\2003 Energy Supply Requests\Pawnee\Case files\pAWNEE.con

Exclud.File none

Load Flow File Name: 2008hs1-rev2.sav

Import Path Flows

PATH	Flow (MW)
TOT 3 (1588 MW Rating)	1198
TOT 5 (1675 MW Rating)	494
TOT 7 (890 MW Rating)	567
SOSV (1600 MW Rating)	1232

TABLE B-2: First Contingency Incremental Transfer Capability Study

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*** MUST 5.0 ***  THU, APR 10 2003   7:43 ***
WESTERN ELECTRICITY COORDINATING COUNCIL
2008 HEAVY SUMMER BASE CASE - VALMONT FIXED
Subsys.File S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\2003 Energy Supply Requests\Pawnee\Case files\PAWNEE-1.sub
Monit.File  S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\2003 Energy Supply Requests\Pawnee\Case files\PAWNEE.mon
Contin.File S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\2003 Energy Supply Requests\Pawnee\Case files\pAWNEE.con
Exclud.File S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\2003 Energy Supply Requests\Pawnee\Case files\2008base-rev2.exc

Study transfer level -      500.0 MW. Total violations: 23
First violation      -      64.8 MW.

Study transfer. From PAWNEE          To TRISTATE_XCEL_. Transfer level -      500.0 MW

**** No Base Case Violations have been found

Study transfer. From PAWNEE          To TRISTATE_XCEL_. Transfer level -      500.0 MW

Violations report ordered by transfer capability. Total      23 violations

Flowgate-1      11:TOT 1A              Init.Flow=      354.14 TDF=-0.0130
Flowgate-2      21:TOT 2A              Init.Flow=      162.09 TDF=-0.0148
Flowgate-3      211:TOT 2A*            Init.Flow=      344.30 TDF=-0.0142
Flowgate-4       3:TOT 3                Init.Flow=     1146.42 TDF=-0.0556
Flowgate-5       5:TOT 5                Init.Flow=      542.91 TDF=-0.0131
Flowgate-6       7:TOT 7                Init.Flow=      563.57 TDF= 0.0351
```

N	FCITC	Export	Import	Fgate1	Fgate2	Fgate3	Fgate4	Fgate5	Fgate6	L: Limiting constraint	PreShift	MW	TDF	PTDF	=Base Case Flow=		
										C: Contingency description	Ncon	Flow	Rating	LODF	Init	Final	
1	64.8	63.2	-1668.9	353.3	161.1	343.4	1142.8	542.1	565.8	L:73023 BIJOUTAP 115 73379 FMWEST 115 1	-77.2	-80.0	-0.04325	-0.03023	-49.1	-51.1	
										C:73020 BEAVERCK 115 73464 ADENA 115 1	562						
										Open 73020 BEAVERCK 115 73464 ADENA 115 1				-0.44107	0.02952	63.7	65.6
2	101.2	99.6	-1705.3	352.8	160.6	342.9	1140.8	541.6	567.1	L:70192 FTLUPTON 230 70311 PAWNEE 230 1	-385.9	-413.5	-0.27248	-0.21176	-266.9	-288.4	
										C:70311 PAWNEE 230 70343 QUINCY 230 1	376						
										Open 70311 PAWNEE 230 70343 QUINCY 230 1				-0.32019	0.18966	371.6	390.8
3	105.3	103.7	-1709.5	352.8	160.5	342.8	1140.6	541.5	567.3	L:73020 BEAVERCK 115 73464 ADENA 115 1	104.5	109.0	0.04258	0.02952	63.7	66.8	
										C:73020 BEAVERCK 115 73031 BRUSHTAP 115 1	559						
										Open 73020 BEAVERCK 115 73031 BRUSHTAP 115 1				0.43210	0.03023	94.5	97.6
4	107.6	106.0	-1711.7	352.7	160.5	342.8	1140.4	541.5	567.3	L:73023 BIJOUTAP 115 73379 FMWEST 115 1	-75.3	-80.0	-0.04325	-0.03023	-49.1	-52.4	
										C:73088 HOYT 115 73464 ADENA 115 1	689						
										Open 73088 HOYT 115 73464 ADENA 115 1				0.44107	-0.02952	-59.5	-62.7
5	130.3	128.6	-1734.4	352.4	160.2	342.4	1139.2	541.2	568.1	*L:73023 BIJOUTAP 115 73379 FMWEST 115 1	-75.5	-80.0	-0.03465	-0.03023	-49.1	-53.0	
										C:73012 AULT 345 73108 LAR.RIVR 345 1	545						
										Open 73012 AULT 345 73108 LAR.RIVR 345 1				0.04456	-0.09907	-592.1	-605.0
6	131.2	129.6	-1735.4	352.4	160.2	342.4	1139.1	541.2	568.2	L:70192 FTLUPTON 230 70311 PAWNEE 230 1	-377.7	-413.5	-0.27248	-0.21176	-266.9	-294.7	
										C:70343 QUINCY 230 70396 SMOKYHIL 230 1	397						
										Open 70343 QUINCY 230 70396 SMOKYHIL 230 1				-0.32019	0.18966	346.0	370.9
7	201.5	199.9	-1805.7	351.5	159.1	341.4	1135.2	540.3	570.7	*L:70192 FTLUPTON 230 70311 PAWNEE 230 1	-361.3	-413.5	-0.25892	-0.21176	-266.9	-309.6	
										C:70139 DANIELPK 230 70311 PAWNEE 230 1	194						
										Open 70139 DANIELPK 230 70311 PAWNEE 230 1				0.29501	-0.15988	-319.9	-352.1
8	203.9	202.3	-1808.0	351.5	159.1	341.4	1135.1	540.2	570.7	L:73088 HOYT 115 73464 ADENA 115 1	-100.3	-109.0	-0.04258	-0.02952	-59.5	-65.5	
										C:73020 BEAVERCK 115 73031 BRUSHTAP 115 1	559						
										Open 73020 BEAVERCK 115 73031 BRUSHTAP 115 1				-0.43210	0.03023	94.5	100.6
9	206.8	205.2	-1811.0	351.5	159.0	341.4	1134.9	540.2	570.8	L:73020 BEAVERCK 115 73464 ADENA 115 1	100.2	109.0	0.04258	0.02952	63.7	69.8	
										C:73031 BRUSHTAP 115 73305 EFMORGTP 115 1	587						
										Open 73031 BRUSHTAP 115 73305 EFMORGTP 115 1				0.43210	0.03023	84.5	90.7
10	211.3	209.7	-1815.5	351.4	159.0	341.3	1134.7	540.2	571.0	L:73031 BRUSHTAP 115 73305 EFMORGTP 115 1	112.6	121.7	0.04325	0.03023	84.5	90.9	
										C:73020 BEAVERCK 115 73464 ADENA 115 1	562						
										Open 73020 BEAVERCK 115 73464 ADENA 115 1				0.44107	0.02952	63.7	69.9
12	254.1	252.5	-1858.3	350.8	158.3	340.7	1132.3	539.6	572.5	L:73031 BRUSHTAP 115 73305 EFMORGTP 115 1	110.7	121.7	0.04325	0.03023	84.5	92.1	
										C:73088 HOYT 115 73464 ADENA 115 1	689						



Generation/Load adjustments in the [PAWNEE] sub-system. Type PartFactDef.

Total change	500.0 MW. (! Load Changes are shown with negative sign)
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Load buses involved in the adjustments.

Generation/Load adjustments in the [TRISTATE_XCEL_] sub-system. Type PartFactDef.
Total change -500.0 MW. (! Load Changes are shown with negative sign)

Bus#	BusName	KV	NAr	Zne	ParFact	Pload	Pmin	Pmax	Pgen	Reserv-	Reserv+	NewGen	Change	Viol
70010	QF MNFRT	13.8	70	706	60.00	0.0	22.0	32.0	32.0	10.0	-0.0	28.7	-3.3	
70034	ARAP3	13.8	70	700	106.00	3.3	30.0	48.0	42.0	12.0	6.0	36.2	-5.8	
70035	ARAP4	13.8	70	700	106.00	8.7	70.0	118.0	110.0	40.0	8.0	104.2	-5.8	
70069	CABCRKA	13.8	70	705	167.00	0.0	-4.0	162.0	60.0	64.0	102.0	50.8	-9.2	
70070	CABCRKB	13.8	70	705	167.00	0.0	-4.0	162.0	60.0	64.0	102.0	50.8	-9.2	
70080	CAMEO1	13.8	70	708	29.40	1.6	15.0	25.0	25.0	10.0	0.0	23.4	-1.6	
70081	CAMEO2	13.8	70	708	58.80	3.0	36.0	52.0	50.0	14.0	2.0	46.8	-3.2	
70083	CANON 55	13.8	70	712	17.60	0.0	0.0	17.5	17.5	17.5	0.0	16.5	-1.0	
70084	CANON 59	13.8	70	712	23.50	0.0	0.0	23.5	24.0	24.0	-0.5	22.7	-1.3	
70103	CHEROK1	15.5	70	700	147.00	7.2	50.0	117.0	110.0	60.0	7.0	101.9	-8.1	
70104	CHEROK2	15.5	70	700	147.00	6.9	50.0	114.0	110.0	60.0	4.0	101.9	-8.1	
70105	CHEROK3	20.0	70	700	182.00	10.8	50.0	165.0	165.0	115.0	0.0	155.0	-10.0	
70106	CHEROK4	22.0	70	700	448.00	32.4	150.0	383.0	375.0	225.0	8.0	350.4	-24.6	
70119	COMAN 1	24.0	70	704	450.00	28.2	200.0	360.0	295.0	95.0	65.0	270.3	-24.7	
70120	COMAN 2	24.0	70	704	440.00	27.0	200.0	365.0	355.0	155.0	10.0	330.9	-24.1	
70133	CTY LAM	14.4	70	712	28.00	0.0	10.0	25.0	23.0	13.0	2.0	21.5	-1.5	
70180	FRUITA	13.8	70	708	28.00	0.0	5.0	17.0	15.0	10.0	2.0	13.5	-1.5	
70188	FTLUP1-21	13.8	70	706	112.00	0.0	20.0	100.0	100.0	80.0	0.0	93.9	-6.1	
70310	PAWNEE	22.0	70	706	614.00	31.8	300.0	530.0	520.0	220.0	10.0	486.3	-33.7	
70334	PUB DSLS4	1.16	70	712	10.00	0.0	0.0	10.0	10.0	10.0	0.0	9.5	-0.5	
70337	PUEBLO	14.0	70	712	35.00	38.4	5.0	29.0	27.5	22.5	1.5	25.6	-1.9	
70344	R.F.DSLS4	1.16	70	712	10.00	0.0	0.0	10.0	10.0	10.0	0.0	9.5	-0.5	
70350	RAWHIDE	24.0	70	706	335.00	19.0	45.0	290.0	290.0	245.0	0.0	271.6	-18.4	
70385	SHOSHA&B4	0.00	70	708	412.00	0.0	10.0	15.0	15.0	5.0	0.0	-7.6	-22.6	L
70406	ST.VR 2	18.0	70	700	206.00	0.0	45.0	130.0	128.0	83.0	2.0	116.7	-11.3	
70407	ST.VR 3	18.0	70	700	206.00	0.0	45.0	130.0	128.0	83.0	2.0	116.7	-11.3	

70408	ST.VR 4	18.0	70	700	206.00	0.0	45.0	130.0	128.0	83.0	2.0	116.7	-11.3
70409	ST.VRAIN22.0	70	700	403.00	0.0	35.0	314.0	310.0	275.0	4.0	287.9	-22.1	
70446	VALMONT 20.0	70	703	205.00	9.7	100.0	188.0	180.0	80.0	8.0	168.8	-11.2	
70448	VALMONT613.8	70	703	66.00	0.0	10.0	53.0	50.0	40.0	3.0	46.4	-3.6	
70485	ALMSACT113.8	70	710	29.60	0.0	5.0	17.0	10.0	5.0	7.0	8.4	-1.6	
70486	ALMSACT213.8	70	710	29.60	0.0	5.0	19.0	12.0	7.0	7.0	10.4	-1.6	
70487	QF TC1 13.8	70	706	120.00	0.0	44.0	66.0	66.0	22.0	-0.0	59.4	-6.6	
70490	QF TC2 13.8	70	706	112.20	0.0	46.0	83.0	83.0	37.0	0.0	76.8	-6.2	
70493	QF TI1 13.8	70	706	52.20	0.0	24.0	50.0	50.0	26.0	0.0	47.1	-2.9	
70495	QF TI2 13.8	70	706	120.00	0.0	44.0	66.0	66.0	22.0	-0.0	59.4	-6.6	
70498	QF BCP 113.8	70	706	95.99	0.0	34.0	66.0	66.0	32.0	0.0	60.7	-5.3	
70499	QF BCP 213.8	70	706	94.00	0.0	14.0	49.0	47.0	33.0	2.0	41.8	-5.2	
70500	QF CPP 113.8	70	706	56.00	0.0	20.0	48.0	48.0	28.0	0.0	44.9	-3.1	
70501	QF CPP 213.8	70	706	37.50	0.0	10.0	27.0	27.0	17.0	0.0	24.9	-2.1	
70502	QF UNC 13.8	70	706	83.00	0.0	14.0	75.0	75.0	61.0	0.0	70.4	-4.6	
70553	ARAP5-6 13.8	70	700	98.00	0.0	34.0	74.0	74.0	40.0	0.0	68.6	-5.4	
70314	MANCHEF118.0	70	706	206.00	0.0	45.0	140.0	135.0	90.0	5.0	123.7	-11.3	
70315	MANCHEF218.0	70	706	206.00	0.0	45.0	140.0	135.0	90.0	5.0	123.7	-11.3	
70557	VALMONT713.8	70	703	100.00	0.0	17.0	37.0	37.0	20.0	0.0	31.5	-5.5	
70558	VALMONT813.8	70	703	100.00	0.0	17.0	37.0	37.0	20.0	0.0	31.5	-5.5	
70578	FTNVL3-413.8	70	704	49.00	0.0	17.0	40.0	39.5	22.5	0.5	36.8	-2.7	
70579	FTNVL5-613.8	70	704	98.00	0.0	34.0	80.0	79.0	45.0	1.0	73.6	-5.4	
70556	QF BCP 313.8	70	706	81.25	0.0	17.0	70.0	45.0	28.0	25.0	40.5	-4.5	
70580	VAUXM1-218.0	70	703	200.00	0.0	34.0	110.0	110.0	76.0	-0.0	99.0	-11.0	
70351	RAWHIDEA13.8	70	706	70.00	0.0	5.0	63.0	60.0	55.0	3.0	56.2	-3.8	
73299	BIGTHOMP4.20	73	754	100.00	0.0	0.0	4.5	2.0	2.0	2.5	-3.5	-5.5	L
73306	ESTES1 6.90	73	754	100.00	0.5	0.0	15.0	5.0	5.0	10.0	-0.5	-5.5	L
73307	ESTES2 6.90	73	754	100.00	0.0	0.0	15.0	5.0	5.0	10.0	-0.5	-5.5	L
73308	ESTES3 6.90	73	754	100.00	0.0	0.0	15.0	5.0	5.0	10.0	-0.5	-5.5	L
73319	MARYLKPP6.90	73	754	100.00	0.0	0.0	8.1	3.6	3.6	4.5	-1.9	-5.5	L
73324	POLEHILL13.8	73	754	100.00	0.0	0.0	38.2	30.0	30.0	8.2	24.5	-5.5	
73448	FLATIRN113.8	73	754	47.80	0.0	0.0	43.0	30.0	30.0	13.0	27.4	-2.6	
73449	FLATIRN213.8	73	754	58.00	0.0	0.0	51.5	34.0	34.0	17.5	30.8	-3.2	
70554	ARAP7 13.8	70	700	100.00	0.0	17.0	45.0	45.0	28.0	0.0	39.5	-5.5	

70568	RAWHIDEB13.8	70 706	70.00	0.0	5.0	63.0	60.0	55.0	3.0	56.2	-3.8
70569	RAWHIDEC13.8	70 706	70.00	0.0	5.0	63.0	60.0	55.0	3.0	56.2	-3.8
70562	SPRUCE1 13.8	70 700	100.00	0.0	50.0	140.0	135.0	85.0	5.0	129.5	-5.5
70563	SPRUCE2 13.8	70 700	100.00	0.0	50.0	140.0	135.0	85.0	5.0	129.5	-5.5
70565	BARRLAK113.8	70 700	100.00	0.0	17.0	64.0	62.0	45.0	2.0	56.5	-5.5
70566	BARRLAK213.8	70 700	100.00	0.0	17.0	64.0	62.0	45.0	2.0	56.5	-5.5
70548	APT DSLS4.16	70 712	10.00	0.0	0.0	10.0	10.0	10.0	0.0	9.5	-0.5
70588	RMEC1 18.0	70 706	100.00	0.0	45.0	239.0	235.0	190.0	4.0	229.5	-5.5
70589	RMEC2 18.0	70 706	100.00	0.0	45.0	239.0	235.0	190.0	4.0	229.5	-5.5
70560	LAMAR DC 230	70 712	100.00	0.0	-200.0	210.0	210.0	410.0	0.0	204.5	-5.5
Total			9119.44	228.5	2116.0	6939.3	6430.1	4314.1	509.2		

Maximum transfers without violating limits with specified participation factors

Import= 110.7 MW. Export= 0.0 MW

TABLE B-3: PAWNEE 500 MW GENERATOR ADDITIONS CONTINGENCY VIOLATIONS BEFORE RECOMMENDED REINFORCEMENTS– BRANCH FLOWS 100% OR MORE OF RATING (BASE CASE VIOLATIONS SCREENED OUT)

**	From bus	**	**	To bus	**	CKT	TYP	Cont MVA	Base Flow	Rating	Loading%	Contingency
70273	MALTA	115	70274	MALTA	230	1	TR	101.8	64.2	100	101.8	70064 BRECKRDG 230 70274 MALTA 230 1
70192	FTLUPTON	230	70311	PAWNEE	230	1	LN	518.4	390	413.5	125.4	70139 DANIELPK 230 70311 PAWNEE 230 1
73023	BIJOUTAP	115	73379	FMWEST	115	1	LN	85.5	68.3	80	106.8	70139 DANIELPK 230 70311 PAWNEE 230 1
73531	LINCOLNT	230	73413	MIDWAYBR	230	1	LN	252.1	217.2	239	105.5	70139 DANIELPK 230 70311 PAWNEE 230 1
73023	BIJOUTAP	115	73379	FMWEST	115	1	LN	90.4	68.3	80	112.9	70192 FTLUPTON 230 70311 PAWNEE 230 1
73031	BRUSHTAP	115	73305	EFMORGTP	115	1	LN	126.1	103.4	121.7	103.6	70192 FTLUPTON 230 70311 PAWNEE 230 1
73531	LINCOLNT	230	73413	MIDWAYBR	230	1	LN	243.3	217.2	239	101.8	70192 FTLUPTON 230 70311 PAWNEE 230 1
70047	BARRLAKE	230	70610	REUNION	230	1	LN	456.5	376	434.6	105	70192 FTLUPTON 230 70529 JLGREEN 230 1
70107	CHEROKEE	230	70610	REUNION	230	1	LN	440	360.5	434.6	101.2	70192 FTLUPTON 230 70529 JLGREEN 230 1
70047	BARRLAKE	230	70610	REUNION	230	1	LN	436.8	376	434.6	100.5	70192 FTLUPTON 230 70605 HENRYLAK 230 1
70047	BARRLAKE	230	70610	REUNION	230	1	LN	440.6	376	434.6	101.4	70200 GLENN PS 230 70461 WASHINGT 230 1
70192	FTLUPTON	230	70311	PAWNEE	230	1	LN	554.8	390	413.5	134.2	70311 PAWNEE 230 70343 QUINCY 230 1
73023	BIJOUTAP	115	73379	FMWEST	115	1	LN	90.4	68.3	80	113	70311 PAWNEE 230 70343 QUINCY 230 1
73031	BRUSHTAP	115	73305	EFMORGTP	115	1	LN	126.2	103.4	121.7	103.7	70311 PAWNEE 230 70343 QUINCY 230 1
73531	LINCOLNT	230	73413	MIDWAYBR	230	1	LN	254.9	217.2	239	106.6	70311 PAWNEE 230 70343 QUINCY 230 1
70192	FTLUPTON	230	70311	PAWNEE	230	1	LN	552.3	390	413.5	133.6	70343 QUINCY 230 70396 SMOKYHIL 230 1
73023	BIJOUTAP	115	73379	FMWEST	115	1	LN	90.1	68.3	80	112.6	70343 QUINCY 230 70396 SMOKYHIL 230 1
73031	BRUSHTAP	115	73305	EFMORGTP	115	1	LN	125.8	103.4	121.7	103.4	70343 QUINCY 230 70396 SMOKYHIL 230 1
73531	LINCOLNT	230	73413	MIDWAYBR	230	1	LN	254.3	217.2	239	106.4	70343 QUINCY 230 70396 SMOKYHIL 230 1
70474	WINDSOR	230	73011	AULT	230	1	LN	507.5	363.5	494.8	102.6	70410 ST.VRAIN 230 70471 WELD PS 230 1
70047	BARRLAKE	230	70610	REUNION	230	1	LN	454.9	376	434.6	104.7	70461 WASHINGT 230 70529 JLGREEN 230 1
70107	CHEROKEE	230	70610	REUNION	230	1	LN	438.4	360.5	434.6	100.9	70461 WASHINGT 230 70529 JLGREEN 230 1
70474	WINDSOR	230	73011	AULT	230	1	LN	506.8	363.5	494.8	102.4	70471 WELD PS 230 73212 WELD LM 230 1
70192	FTLUPTON	230	70311	PAWNEE	230	1	LN	502	390	413.5	121.4	73012 AULT 345 73108 LAR.RIVR 345 1

**	From bus	**	To bus	**	CKT	TYP	Cont	MVA	Base Flow	Rating	Loading%	Contingency
73023	BIJOUTAP	115	73379	FMWEST	115	1	LN	99	68.3	80	123.7	73012 AULT 345 73108 LAR.RIVR 345 1
73030	BRIGHTNW	115	73493	SANDCRK	115	1	LN	86.2	62.5	85.1	101.2	73012 AULT 345 73108 LAR.RIVR 345 1
73031	BRUSHTAP	115	73305	EFMORGTP	115	1	LN	135	103.4	121.7	110.9	73012 AULT 345 73108 LAR.RIVR 345 1
73379	FMWEST	115	73305	EFMORGTP	115	1	LN	121.3	89.9	121	100.2	73012 AULT 345 73108 LAR.RIVR 345 1
73531	LINCOLNT	230	73413	MIDWAYBR	230	1	LN	244.2	217.2	239	102.2	73012 AULT 345 73108 LAR.RIVR 345 1
73015	B.CK TRI	115	73016	B.CK TRI	230	1	TR	226.8	43.7	224	101.2	73013 B.CK PS 115 73020 BEAVERCK 115 1
73015	B.CK TRI	115	73020	BEAVERCK	115	1	LN	225.4	43.2	200	112.7	73013 B.CK PS 115 73020 BEAVERCK 115 1
73020	BEAVERCK	115	73464	ADENA	115	1	LN	127.6	80.3	109	117.1	73020 BEAVERCK 115 73031 BRUSHTAP 115 1
73088	HOYT	115	73464	ADENA	115	1	LN	125.6	78.3	109	115.2	73020 BEAVERCK 115 73031 BRUSHTAP 115 1
73103	L.MEADOW	115	73213	WIGGINS	115	1	LN	69.8	6.3	59.6	117.1	73020 BEAVERCK 115 73031 BRUSHTAP 115 1
73023	BIJOUTAP	115	73379	FMWEST	115	1	LN	102.9	68.3	80	128.6	73020 BEAVERCK 115 73464 ADENA 115 1
73031	BRUSHTAP	115	73305	EFMORGTP	115	1	LN	137.6	103.4	121.7	113	73020 BEAVERCK 115 73464 ADENA 115 1
73379	FMWEST	115	73305	EFMORGTP	115	1	LN	124.3	89.9	121	102.7	73020 BEAVERCK 115 73464 ADENA 115 1
73020	BEAVERCK	115	73464	ADENA	115	1	LN	123.6	80.3	109	113.4	73031 BRUSHTAP 115 73305 EFMORGTP 115 1
73088	HOYT	115	73464	ADENA	115	1	LN	121.6	78.3	109	111.5	73031 BRUSHTAP 115 73305 EFMORGTP 115 1
73103	L.MEADOW	115	73213	WIGGINS	115	1	LN	64	6.3	59.6	107.3	73031 BRUSHTAP 115 73305 EFMORGTP 115 1
73531	LINCOLNT	230	73413	MIDWAYBR	230	1	LN	241.3	217.2	239	101	73035 BURLNGTN 115 73485 BURL KC 115 1
73023	BIJOUTAP	115	73379	FMWEST	115	1	LN	102	68.3	80	127.5	73088 HOYT 115 73464 ADENA 115 1
73031	BRUSHTAP	115	73305	EFMORGTP	115	1	LN	136.7	103.4	121.7	112.3	73088 HOYT 115 73464 ADENA 115 1
73379	FMWEST	115	73305	EFMORGTP	115	1	LN	123.4	89.9	121	102	73088 HOYT 115 73464 ADENA 115 1
73020	BEAVERCK	115	73464	ADENA	115	1	LN	117.8	80.3	109	108.1	73305 EFMORGTP 115 73379 FMWEST 115 1
73088	HOYT	115	73464	ADENA	115	1	LN	115.8	78.3	109	106.3	73305 EFMORGTP 115 73379 FMWEST 115 1
70192	FTLUPTON	230	70311	PAWNEE	230	1	LN	430.7	390	413.5	104.2	73531 LINCOLNT 230 73413 MIDWAYBR 230 1
73023	BIJOUTAP	115	73379	FMWEST	115	1	LN	81.7	68.3	80	102.2	73531 LINCOLNT 230 73413 MIDWAYBR 230 1

Base Case Description

2008 HEAVY SUMMER BASE CASE - VALMONT FIXED

PAWNEE G2 ADDED WITH METRO DISPATCH

Subsys.File S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\2003 Energy Supply Requests\Pawnee\Case files\PAWNEE-1.sub

Monit.File S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\2003 Energy Supply Requests\Pawnee\Case files\PAWNEE.mon

Contin.File S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\2003 Energy Supply Requests\Pawnee\Case files\pAWNEE.con
Exclud.File S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\2003 Energy Supply Requests\Pawnee\Case files\2008base-rev2.exc
Load Flow File Name: 2008hs1-p500-metro.sav

PATH FLOWS with 2nd PAWNEE GENERATOR ADDED

PATH	BASE Flow (MW)	NEW Flow (MW)
TOT 3 (1588 MW Rating)	1198	1186
TOT 5 (1675 MW Rating)	494	518.4
TOT 7 (890 MW Rating)	567	671
SOSV (1600 MW Rating)	1232	1334

**TABLE B-4: PAWNEE 500 MW GENERATOR ADDITION CONTINGENCY VIOLATIONS
AFTER RECOMMENDED REINFORCEMENTS– BRANCH FLOWS 100% OR MORE OF
RATING**

** From	** **	To bus	** CKT TYP	Cont MVA	Base Flow	Rating	Loading%	Contingency
70192 FTLUPTON 230	70529 JLGREEN 230 1 LN			495.1	431	495	100	70048 GREENVAL 230 70192 FTLUPTON 230 1
70301 NTHRIDGE 115	70285 MIDWAYPS 115 1 LN			110.7	41	99.6	111.1	70060 BOONE 115 70061 BOONE 230 1
70273 MALTA 115	70274 MALTA 230 1 TR			101	72.7	100	101	70064 BRECKRDG 230 70274 MALTA 230 1
70073 CALIFOR1 115	70299 NORTH542 115 1 LN			153.8	111.7	150	102.5	70107 CHEROKEE 230 70324 LACOMBE 230 1
70087 CAPHILL1 115	70300 NORTH547 115 1 LN			156	107.5	150	104	70107 CHEROKEE 230 70324 LACOMBE 230 1
70215 HARRISPS 115	70259 LEETSDAL 115 1 LN			169	99.2	150	112.7	70107 CHEROKEE 230 70324 LACOMBE 230 1
70192 FTLUPTON 230	70529 JLGREEN 230 1 LN			501.7	431	495	101.3	70107 CHEROKEE 230 70362 RIVERDAL 230 1
73531 LINCOLNT 230	73413 MIDWAYBR 230 1 LN			246.2	224.4	239	103	70139 DANIELPK 230 70311 PAWNEE 230 1
70087 CAPHILL1 115	70300 NORTH547 115 1 LN			150.4	107.5	150	100.2	70149 DENVTM 230 70324 LACOMBE 230 1
70215 HARRISPS 115	70259 LEETSDAL 115 1 LN			161.8	99.2	150	107.9	70149 DENVTM 230 70324 LACOMBE 230 1
70047 BARRLAKE 230	70610 REUNION 230 1 LN			449.2	362.9	434.6	103.4	70192 FTLUPTON 230 70529 JLGREEN 230 1
70192 FTLUPTON 230	70605 HENRYLAK 230 1 LN			439.7	342.4	435	101.1	70192 FTLUPTON 230 70529 JLGREEN 230 1
70192 FTLUPTON 230	70529 JLGREEN 230 1 LN			522.1	431	495	105.5	70192 FTLUPTON 230 70605 HENRYLAK 230 1
70461 WASHINGT 230	70529 JLGREEN 230 1 LN			514.9	423.7	495	104	70192 FTLUPTON 230 70605 HENRYLAK 230 1
73531 LINCOLNT 230	73413 MIDWAYBR 230 1 LN			245	224.4	239	102.5	70311 PAWNEE 230 70343 QUINCY 230 1
73531 LINCOLNT 230	73413 MIDWAYBR 230 1 LN			254.1	224.4	239	106.3	70311 PAWNEE 230 73192 STORY 230 1
73531 LINCOLNT 230	73413 MIDWAYBR 230 1 LN			244.6	224.4	239	102.4	70343 QUINCY 230 70396 SMOKYHIL 230 1
70192 FTLUPTON 230	70529 JLGREEN 230 1 LN			516	431	495	104.2	70605 HENRYLAK 230 70362 RIVERDAL 230 1
70461 WASHINGT 230	70529 JLGREEN 230 1 LN			508.7	423.7	495	102.8	70605 HENRYLAK 230 70362 RIVERDAL 230 1
70047 BARRLAKE 230	70610 REUNION 230 1 LN			447.6	362.9	434.6	103	70461 WASHINGT 230 70529 JLGREEN 230 1
70192 FTLUPTON 230	70605 HENRYLAK 230 1 LN			438	342.4	435	100.7	70461 WASHINGT 230 70529 JLGREEN 230 1
73531 LINCOLNT 230	73413 MIDWAYBR 230 1 LN			241.5	224.4	239	101	73012 AULT 345 73108 LAR.RIVR 345 1
73531 LINCOLNT 230	73413 MIDWAYBR 230 1 LN			243.9	224.4	239	102	73034 BURL PSC 115 73209 WANIBETP 115 1
73531 LINCOLNT 230	73413 MIDWAYBR 230 1 LN			244.2	224.4	239	102.2	73034 BURL PSC 115 73485 BURL KC 115 1

** From	** **	To bus	** CKT TYP	Cont MVA	Base Flow	Rating	Loading%	Contingency
73531 LINCOLNT	230 73413	MIDWAYBR	230 1 LN	248.4	224.4	239	103.9	73035 BURLNGTN 115 73485 BURL KC 115 1
73531 LINCOLNT	230 73413	MIDWAYBR	230 1 LN	239.7	224.4	239	100.3	73207 WAANIBE 115 73209 WANIBETP 115 1

Case Description:

2008 HEAVY SUMMER - PAWNEE G2 ADDED WITH METRO DISPATCH

2ND FT. LUPTON-PAWNEE LINE ADDED (DBL CKT)

Subsys.File S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\2003 Energy Supply Requests\Pawnee\Case files\PAWNEE-1.sub

Monit.File S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\2003 Energy Supply Requests\Pawnee\Case files\PAWNEE.mon

Contin.File S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\2003 Energy Supply Requests\Pawnee\Case files\pAWNEE.con

Exclud.File S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\2003 Energy Supply Requests\Pawnee\Case files\2008base-rev2.exc

Load Flow File Name: 2008hs1-p500-metro-2nd PAW-FTLUPT-230.sav

IMPORT PATH FLOWS with A NEW DOUBLE CIRCUIT 230 KV LINE FROM PAWNEE TO FT. LUPTON

PATH	Flow before reinforcements (MW)	NEW Flow With 2 nd Paw-Ft. Lupt. 230 kV added (MW)
TOT 3 (1588 MW Rating)	1186	1191
TOT 5 (1675 MW Rating)	518.4	503
TOT 7 (890 MW Rating)	671	540
SOSV (1600 MW Rating)	1334	1206

TABLE B-5: PAWNEE 750 MW GENERATOR ADDITIONS CONTINGENCY VIOLATIONS WITH ONLY 500 MW REINFORCEMENTS– BRANCH FLOWS 100% OR MORE OF RATING

**	From bus	**	**	To bus	**	CKT	TYP	Cont MVA	Base Flow	Rating	Loading%	Contingency
70192	FTLUPTON	230	70529	JLGREEN	230	1	LN	507.5	463.9	495	102.5	70047 BARRLAKE 230 70048 GREENVAL 230 1
70461	WASHINGT	230	70529	JLGREEN	230	1	LN	500.4	456.7	495	101.1	70047 BARRLAKE 230 70048 GREENVAL 230 1
70192	FTLUPTON	230	70529	JLGREEN	230	1	LN	521.5	463.9	495	105.4	70047 BARRLAKE 230 70610 REUNION 230 1
70461	WASHINGT	230	70529	JLGREEN	230	1	LN	514.3	456.7	495	103.9	70047 BARRLAKE 230 70610 REUNION 230 1
70192	FTLUPTON	230	70529	JLGREEN	230	1	LN	537.4	463.9	495	108.6	70048 GREENVAL 230 70192 FTLUPTON 230 1
70461	WASHINGT	230	70529	JLGREEN	230	1	LN	530.3	456.7	495	107.1	70048 GREENVAL 230 70192 FTLUPTON 230 1
70273	MALTA	115	70274	MALTA	230	1	TR	101.3	65.6	100	101.3	70064 BRECKRDG 230 70274 MALTA 230 1
70047	BARRLAKE	230	70610	REUNION	230	1	LN	438.5	378.4	434.6	100.9	70107 CHEROKEE 230 70200 GLENN PS 230 1
70192	FTLUPTON	230	70605	HENRYLAK	230	1	LN	438	369	435	100.7	70107 CHEROKEE 230 70200 GLENN PS 230 1
70192	FTLUPTON	230	70529	JLGREEN	230	1	LN	541.9	463.9	495	109.5	70107 CHEROKEE 230 70362 RIVERDAL 230 1
70461	WASHINGT	230	70529	JLGREEN	230	1	LN	534.7	456.7	495	108	70107 CHEROKEE 230 70362 RIVERDAL 230 1
70192	FTLUPTON	230	70529	JLGREEN	230	1	LN	518.9	463.9	495	104.8	70107 CHEROKEE 230 70610 REUNION 230 1
70461	WASHINGT	230	70529	JLGREEN	230	1	LN	511.6	456.7	495	103.4	70107 CHEROKEE 230 70610 REUNION 230 1
70192	FTLUPTON	230	70529	JLGREEN	230	1	LN	509.8	463.9	495	103	70139 DANIELPK 230 70311 PAWNEE 230 1
70461	WASHINGT	230	70529	JLGREEN	230	1	LN	502.6	456.7	495	101.5	70139 DANIELPK 230 70311 PAWNEE 230 1
70192	FTLUPTON	230	70529	JLGREEN	230	1	LN	502	463.9	495	101.4	70191 FTLUPTON 115 70192 FTLUPTON 230 1
70047	BARRLAKE	230	70610	REUNION	230	1	LN	471.5	378.4	434.6	108.5	70192 FTLUPTON 230 70529 JLGREEN 230 1
70107	CHEROKEE	230	70610	REUNION	230	1	LN	454.7	362.9	434.6	104.6	70192 FTLUPTON 230 70529 JLGREEN 230 1
70192	FTLUPTON	230	70605	HENRYLAK	230	1	LN	474.1	369	435	109	70192 FTLUPTON 230 70529 JLGREEN 230 1
70605	HENRYLAK	230	70362	RIVERDAL	230	1	LN	450.8	345.9	435	103.6	70192 FTLUPTON 230 70529 JLGREEN 230 1
70047	BARRLAKE	230	70610	REUNION	230	1	LN	449.1	378.4	434.6	103.3	70192 FTLUPTON 230 70605 HENRYLAK 230 1
70192	FTLUPTON	230	70529	JLGREEN	230	1	LN	562.6	463.9	495	113.7	70192 FTLUPTON 230 70605 HENRYLAK 230 1
70461	WASHINGT	230	70529	JLGREEN	230	1	LN	555.4	456.7	495	112.2	70192 FTLUPTON 230 70605 HENRYLAK 230 1
70047	BARRLAKE	230	70610	REUNION	230	1	LN	455.7	378.4	434.6	104.9	70200 GLENN PS 230 70461 WASHINGT 230 1

**	From bus	**	**	To bus	**	CKT	TYP	Cont MVA	Base Flow	Rating	Loading%	Contingency
70107	CHEROKEE	230	70610	REUNION	230	1	LN	438.9	362.9	434.6	101	70200 GLENN PS 230 70461 WASHINGT 230 1
70192	FTLUPTON	230	70605	HENRYLAK	230	1	LN	456.9	369	435	105	70200 GLENN PS 230 70461 WASHINGT 230 1
70192	FTLUPTON	230	70529	JLGREEN	230	1	LN	502.2	463.9	495	101.5	70261 LEGGETT 230 70297 NIWOT 230 1
70461	WASHINGT	230	70529	JLGREEN	230	1	LN	495	456.7	495	100	70261 LEGGETT 230 70297 NIWOT 230 1
70192	FTLUPTON	230	70529	JLGREEN	230	1	LN	515.7	463.9	495	104.2	70297 NIWOT 230 70544 ISABELLE 230 1
70461	WASHINGT	230	70529	JLGREEN	230	1	LN	508.5	456.7	495	102.7	70297 NIWOT 230 70544 ISABELLE 230 1
70192	FTLUPTON	230	70529	JLGREEN	230	1	LN	515.1	463.9	495	104.1	70311 PAWNEE 230 70343 QUINCY 230 1
70461	WASHINGT	230	70529	JLGREEN	230	1	LN	507.9	456.7	495	102.6	70311 PAWNEE 230 70343 QUINCY 230 1
70192	FTLUPTON	230	70529	JLGREEN	230	1	LN	514.2	463.9	495	103.9	70343 QUINCY 230 70396 SMOKYHIL 230 1
70461	WASHINGT	230	70529	JLGREEN	230	1	LN	507	456.7	495	102.4	70343 QUINCY 230 70396 SMOKYHIL 230 1
70047	BARRLAKE	230	70610	REUNION	230	1	LN	444.6	378.4	434.6	102.3	70605 HENRYLAK 230 70362 RIVERDAL 230 1
70192	FTLUPTON	230	70529	JLGREEN	230	1	LN	556.3	463.9	495	112.4	70605 HENRYLAK 230 70362 RIVERDAL 230 1
70461	WASHINGT	230	70529	JLGREEN	230	1	LN	549.1	456.7	495	110.9	70605 HENRYLAK 230 70362 RIVERDAL 230 1
70192	FTLUPTON	230	70529	JLGREEN	230	1	LN	514.1	463.9	495	103.9	70410 ST.VRAIN 230 70447 VALMONT 230 1
70461	WASHINGT	230	70529	JLGREEN	230	1	LN	506.8	456.7	495	102.4	70410 ST.VRAIN 230 70447 VALMONT 230 1
70192	FTLUPTON	230	70529	JLGREEN	230	1	LN	517.5	463.9	495	104.5	70410 ST.VRAIN 230 70544 ISABELLE 230 1
70461	WASHINGT	230	70529	JLGREEN	230	1	LN	510.2	456.7	495	103.1	70410 ST.VRAIN 230 70544 ISABELLE 230 1
70047	BARRLAKE	230	70610	REUNION	230	1	LN	469.9	378.4	434.6	108.1	70461 WASHINGT 230 70529 JLGREEN 230 1
70107	CHEROKEE	230	70610	REUNION	230	1	LN	453.1	362.9	434.6	104.3	70461 WASHINGT 230 70529 JLGREEN 230 1
70192	FTLUPTON	230	70605	HENRYLAK	230	1	LN	472.4	369	435	108.6	70461 WASHINGT 230 70529 JLGREEN 230 1
70605	HENRYLAK	230	70362	RIVERDAL	230	1	LN	449.1	345.9	435	103.3	70461 WASHINGT 230 70529 JLGREEN 230 1
73103	L.MEADOW	115	73213	WIGGINS	115	1	LN	61.8	6	59.6	103.7	73020 BEAVERCK 115 73031 BRUSHTAP 115 1
73023	BIJOUTAP	115	73379	FMWEST	115	1	LN	83.3	54.9	80	104.1	73020 BEAVERCK 115 73464 ADENA 115 1
73023	BIJOUTAP	115	73379	FMWEST	115	1	LN	82.4	54.9	80	103	73088 HOYT 115 73464 ADENA 115 1

Case Description:

2008 HS - PAWNEE 750 MW G2 ADDED WITH METRO DISPATCH

2ND FT. LUPTON-PAWNEE LINE ADDED (DBL CKT), P-SMKY @ 800

Subsys.File S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\2003 Energy Supply Requests\Pawnee\Case files\PAWNEE-1.sub

Monit.File S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\2003 Energy Supply Requests\Pawnee\Case files\PAWNEE.mon

Contin.File S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\2003 Energy Supply Requests\Pawnee\Case files\PAWNEE.con

Exclud.File S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\2003 Energy Supply Requests\Pawnee\Case files\2008base-rev2.exc
Load Flow File Name: 2008hs1-p750-metro-2nd PAW-FTLUPT-230.sav

**IMPORT PATH FLOWS with A NEW DOUBLE CIRCUIT 230 KV LINE FROM PAWNEE TO FT. LUPTON
And 2ND PAWNEE UNIT AT 750 MW**

PATH	500 MW GEN Flow With 2nd Paw-Ft. Lupt. 230 kV added (MW)	750 MW GEN Flow With 2nd Paw-Ft. Lupt. 230 kV added (MW)
TOT 3 (1588 MW Rating)	1191	1183
TOT 5 (1675 MW Rating)	503	509
TOT 7 (890 MW Rating)	540	566
SOSV (1600 MW Rating)	1206	1231

TABLE B-6: PAWNEE 750 MW GENERATOR ADDITION CONTINGENCY VIOLATIONS WITH 345 KV REINFORCEMENTS– BRANCH FLOWS 100% OR MORE OF RATING

**	From bus	** **	To bus	**	CKT	TYP	Cont MVA	Base Flow	Rating	Loading%	Contingency
70273	MALTA	115	70274 MALTA	230	1	TR	100.3	66.2	100	100.3	70064 BRECKRDG 230 70274 MALTA 230 1
73150	PEETZ	115	73191 STERLING	115	1	LN	89.3	57.3	85.1	104.9	73143 N.YUMA 230 73180 SIDNEY 230 1

Case Description:

2008HS - PAWNEE 500 MW G2 W/ METRO DISPATCH, 2-230 KV FTLUP

345 KV GEN AND CKTS TO CORNER POINT, 2 CKTS TO DANIELS PARK

Subsys.File S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\2003 Energy Supply Requests\Pawnee\Case files\PAWNEE-1.sub

Monit.File S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\2003 Energy Supply Requests\Pawnee\Case files\PAWNEE.mon

Contin.File S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\2003 Energy Supply Requests\Pawnee\Case files\pawnee.con

Exclud.File S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\2003 Energy Supply Requests\Pawnee\Case files\2008base-rev3.exc

Load Flow File Name: 2008hs1-p750-metro-345.sav

**IMPORT PATH FLOWS with A NEW DOUBLE CIRCUIT 230 KV LINE FROM PAWNEE TO FT. LUPTON,
2ND PAWNEE UNIT AT 750 MW, AND 345 KV RECOMMENDED OPTIONS**

PATH	750 MW GEN Flow With 2 nd Paw-Ft. Lupt. 230 kV added (MW)	750 MW GEN Flow With 2 nd Paw-Ft. Lupt. 230 kV, and 345 kV Options (MW)
TOT 3 (1588 MW Rating)	1183	1202
TOT 5 (1675 MW Rating)	509	486
TOT 7 (890 MW Rating)	566	507
SOSV (1600 MW Rating)	1231	1173