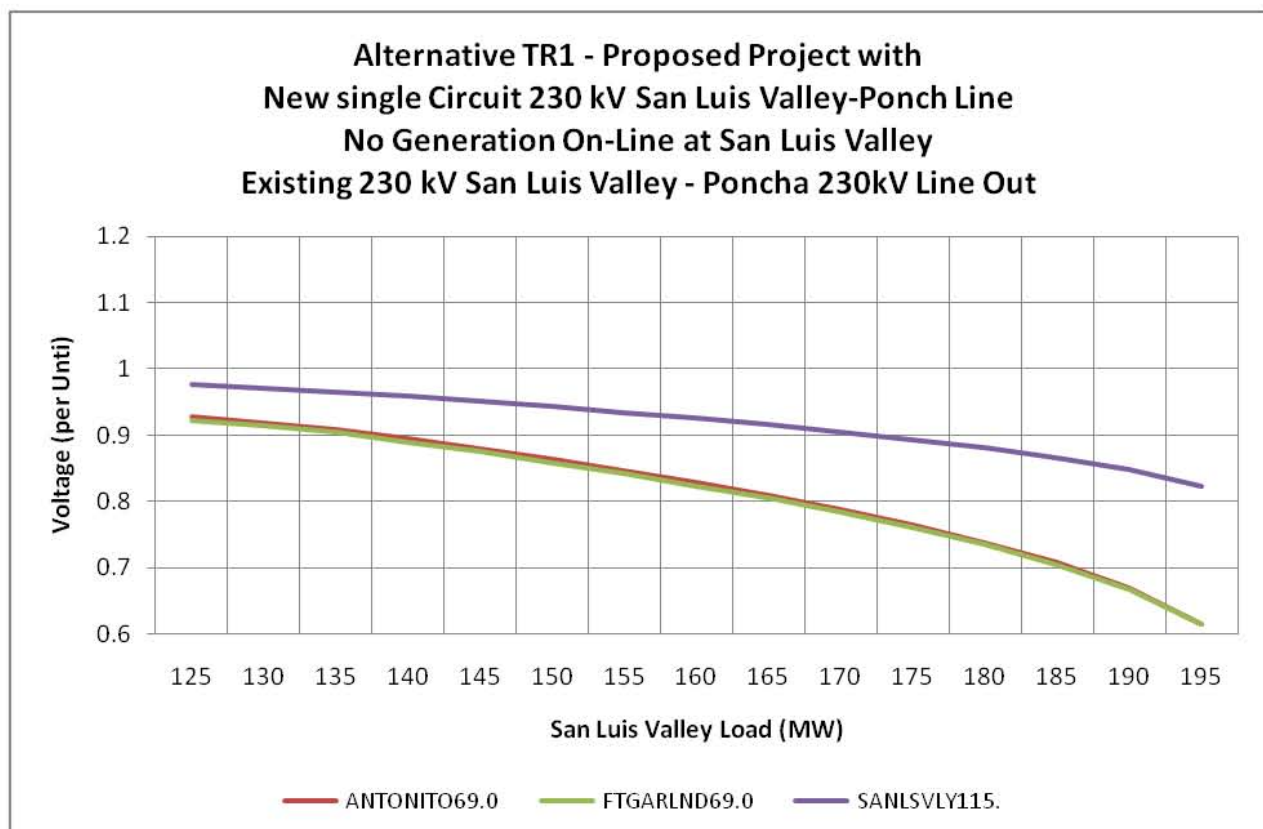
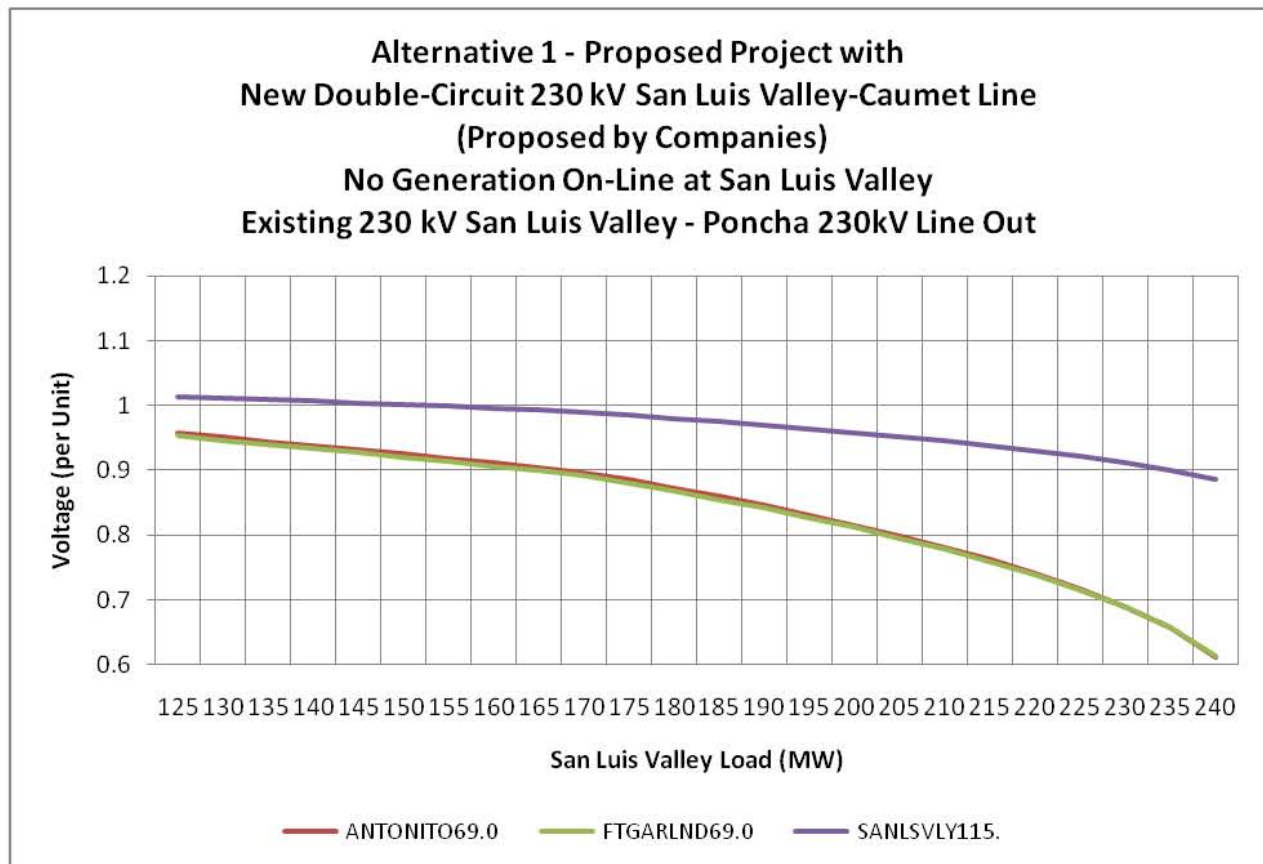
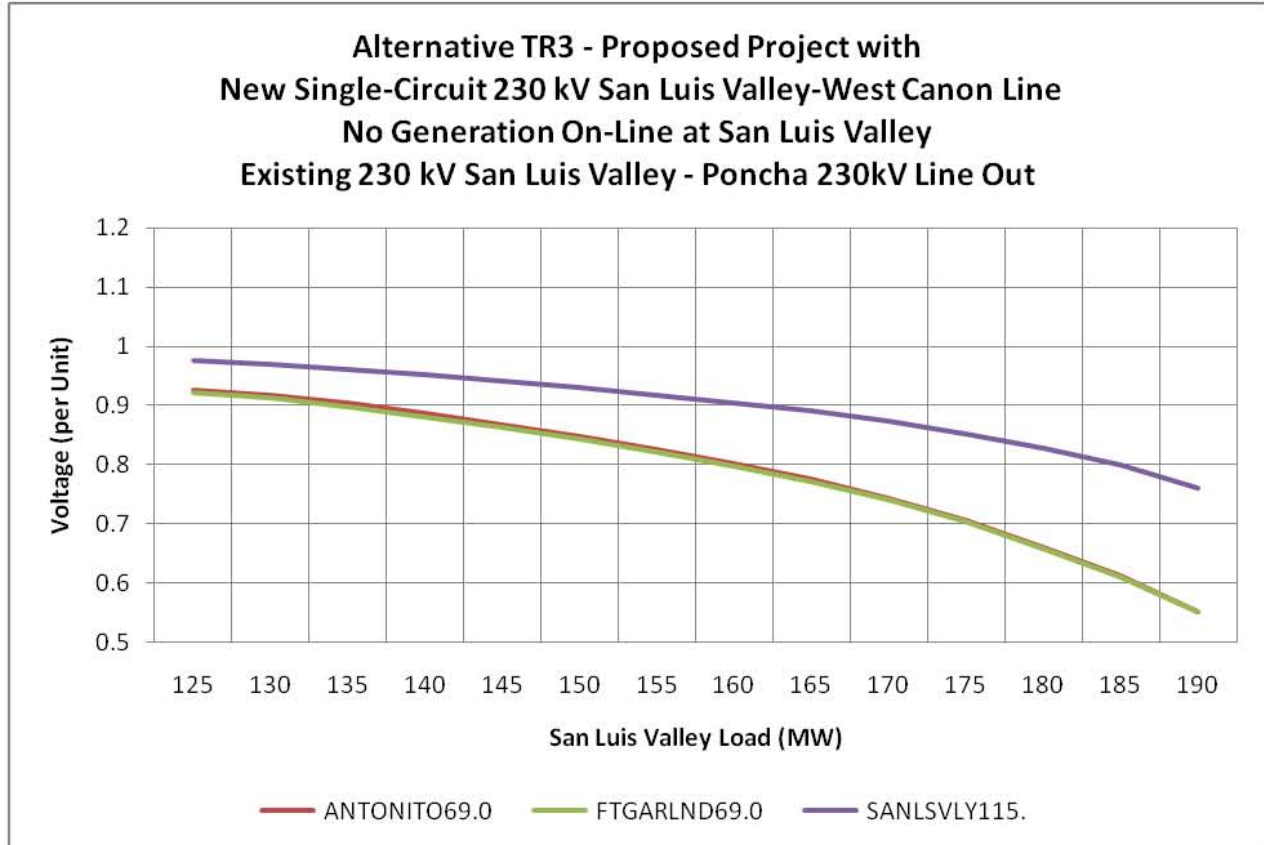
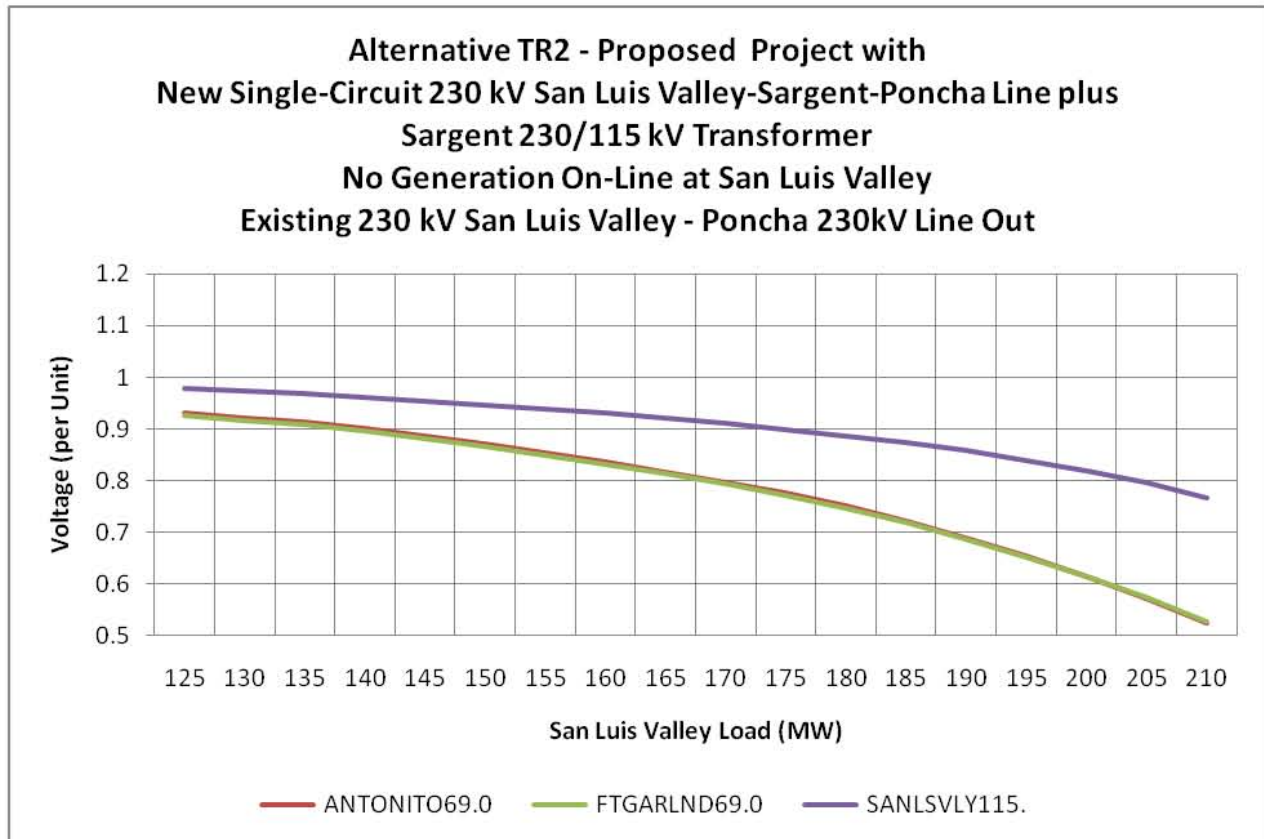


Appendix A

PV Curves





Appendix B

**Cost Estimates
for the
Trinchera Ranch
Alternatives**

Appendix B

Cost Estimates for the Trinchera Ranch Alternatives

Assumptions

1. The estimated cost of a new single-circuit 230 kV transmission line would roughly be the same on a per mile basis as that of Tri-State's previously proposed single-circuit 230 kV San Luis Valley to Walsenburg transmission line.
2. A conservative estimate for the cost for a new 100 MVA, 230/115 kV transformer would be \$2.5 million (Approximately 250% of the estimated cost reported at TSGT000822 in Tri-State's 2004 PV Study Report)
3. The cost for a new San Luis Valley-Poncha 230 kV generation Renedial Actions Scheme (RAS) would be no more than \$5 million. This is a conservative estimate. It is BAI's experience that such a RAS would typically have an installed cost of less than \$1 million in the early 1990s.
4. The net change in circuit breaker and other substation costs associated with replacing the San Luis Valley-Calumet portion of the Proposed Project with any of the Trinchera Ranch alternatives was assumed to be relatively small (+/- \$5 million) and neglected in these cost estimates.
5. All estimates exclude Allowance for Funds Used During Construction (AFUDC).

Per Mile Estimated Cost of a new Single-Circuit 230 kV Transmission Line

Line	Description	Amount	Units	Notes
1	Latest Tri-State Estimated Cost for Single-Circuit 230 kV SLV-Walsenburg Transmission Line with AFUDC	\$48,076,000		Tri-State Response to TR 10-2 at TSGT 004587
2	AFUDC (rounded)	\$2,462,000		Tri-State Response to TR 10-2 at TSGT 000891
3	Latest S-C 230 kV SLV-Walsenburg Estimate without AFUDC	\$45,614,000		Line 1 - Line 2
4	Mileage Associated with Latest Cost Estimate for S-C 230 kV SLV-Walsenburg Transmission Line		80 miles	Tri-State Response to TR 10-2 at TSGT 000886
5	Estimated per mile cost of Single-Circuit 230 kV Transmission Line (as of 8/28/07)	\$570,175	per mile	Line 3 / Line 4
6	Tri-State Estimated Cost for Double-Circuit 230 kV SLV-Calumet Transmission Line (as of 11/12/08)	\$89,850,000		Tri-State Discovery Resposnes at TSGT 00977
7	Mileage Associated with Cost Estimate for D-C 230 kV SLV-Calumet Transmission Line		102 miles	Tri-State Discovery Resposnes at TSGT 00972
8	Typical cost ratio of Double-Circuit 230 kV line to a Single-Circuit 230 kV line		1.5	BAI Experience
9	Estimated per mile cost of Single-Circuit 230 kV Transmission Line (as of 11/12/08)	\$587,255	per mile	Line 6 / Line 7 / Line 8
10	BAI Estimated per mile cost of Single-Circuit 230 kV Transmission Line	\$587,255	per mile	Higher of Line 5 and Line 9

Estimated Cost for Alternative TR1

11	Estimated Length of new Single-Circuit 230 kV San Luis Valley - Poncha Transmission Line	61.9 miles	Public Service Reponse to WRA 2-3 at Page 4 of Attachment WRA2-3.A1
12	Estimated Cost of a new Single-Circuit 230 kV San Luis Valley - Poncha Transmission Line	\$36,351,078	Line 11 * Line 10
13	Contingency Cost for a new West Canon 230/115 kV Transformer	\$2,500,000	BAI Assumption (see above)
14	Total Estimated Cost of San Luis Valley Upgrades for Alternative TR1 without AFUDC	\$38,851,078	Line 12 + Line 13

Estimated Cost for Alternative TR2

15	Estimated Length of new Single-Circuit 230 kV San Luis Valley - Sargent Transmission Line	6 miles	Public Service Reponse to WRA 2-3 at Page 3 of Attachment WRA2-3.A1
16	Estimated Length of new Single-Circuit 230 kV Sargent - Poncha Transmission Line	66.3 miles	Public Service Reponse to WRA 2-3 at Page 3 of Attachment WRA2-3.A1
17	Estimated Cost of a new Single-Circuit 230 kV San Luis Valley - Sargent - Poncha Transmission Line	\$42,458,529	(Line 15 + Line 16) * Line 10
18	Estimated Cost for a new Sargent 230/115 kV Transformer	\$2,500,000	BAI Assumption (see above)
19	Contingency Cost for a new West Canon 230/115 kV Transformer	\$2,500,000	BAI Assumption (see above)
20	Total Estimated Cost of San Luis Valley Upgrades for Alternative TR2 without AFUDC	\$47,458,529	Line 18 + Line 19 + Line 20

Estimated Cost for Alternative TR3

21	Estimated Length of new Single-Circuit 230 kV San Luis Valley - West Canon Transmission Line	108 miles	BAI Estimate
22	Estimated Cost of a new Single-Circuit 230 kV San Luis Valley - Poncha Transmission Line	\$63,423,529	Line 21 * Line 10
23	Contingency Cost for a new West Canon 230/115 kV Transformer	\$2,500,000	BAI Assumption (see above)
24	Total Estimated Cost of San Luis Valley Upgrades for Alternative TR3 without AFUDC	\$65,923,529	Line 22 + Line 23

Estimated Cost for Alternative TR4AR

25	Estimated Cost for the 280 MVA, Poncha 230/115 kV Transformer Project (includes one-mile of transmission)	\$8,400,000	Attachment TR5-4.A3 to Public Service Response to TR 5-4
26	Estimated Cost of a San Luis Valley - Poncha 230 kV Generation Remedial Action Scheme (RAS)	\$5,000,000	BAI Assumption (see above)
27	Total Estimated Cost of San Luis Valley Upgrades for Alternative TR4AR without AFUDC	\$13,400,000	Line 25 + Line 26

Appendix C

Alternative TR1

Alternative TR1 -SLV Injections				2nd SLV-Poncha Single Circuit 230kV Calumet-Comanche double circuit 345 kV						
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	0	0	0	0	0	0	0
			Injection Level in SLV	400	500	525	550	600	700	750
			Owner	Percent Overload (%)						
70330 PORTLAND 115	73413 MIDWAYBR 230	80	Black Hills						113.7	131.8
70456 W.STATON 115 1	73551 W CANON 230 1									
70550 W CANON 115	73413 MIDWAYBR 230	100	Black Hills	109.0	133.4	139.3	145.2	156.8	178.4	188.2
73551 W CANON 230 T1	73551 W CANON 230 1									
70550 W CANON 115	73413 MIDWAYBR 230	120	Black Hills			101.3	106.4	116.6	*	*
70086 CANONCTY 115 1	73551 W CANON 230 1									
70390 SKALA 115 1	73413 MIDWAYBR 230	105	Black Hills			102.7	108.6	120.7	*	*
70330 PORTLAND 115 1	73551 W CANON 230 1									
70028 ANGEL TS 69	70374 SANLSVLY 115	65	PSCo						105.8	113.3
70118 COCENTER 69 1	70379 SARGENT 115 1									
70028 ANGEL TS 69	70374 SANLSVLY 115	65	PSCo						110.8	118.4
70376 SANLSVLY 69 1	70379 SARGENT 115 1									
70118 COCENTER 69	70374 SANLSVLY 115	65	PSCo						103.0	110.5
70380 SARGENT 69 1	70379 SARGENT 115 1									
70121 COMANCHE 115	70121 COMANCHE 115	176	PSCo	123.8	121.7	121.2	120.7	119.7	118.1	117.4
70122 COMANCHE 230 T1	70122 COMANCHE 115 T2									
70121 COMANCHE 115	70121 COMANCHE 115	185	PSCo	118.2	116.1	115.6	115.2	114.3	112.7	112.1
70122 COMANCHE 230 T2	70122 COMANCHE 115 T2									
70327 PONCHA 115	79054 PONCHABR 230	128	PSCo						118.6	132.0
70379 SARGENT 115 1	73551 W CANON 230 1									
70374 SANLSVLY 115	79054 PONCHABR 230	159	PSCo						103.8	113.1
70379 SARGENT 115 1	73551 W CANON 230 1									
70026 ALMSA TM 69	70374 SANLSVLY 115	25	PSCo			100.7	102.1	105.3	111.5	114.9
70025 ALMSA TM 115 T1	70379 SARGENT 115 1									
70374 SANLSVLY 115	70374 SANLSVLY 115	42	PSCo/Tri-State					103.2	113.0	117.9
70376 SANLSVLY 69 T3	70379 SARGENT 115 1									
70374 SANLSVLY 115	70374 SANLSVLY 115	42	PSCo/Tri-State					103.2	113.0	117.9
70376 SANLSVLY 69 T4	70379 SARGENT 115 1									
70374 SANLSVLY 115	70374 SANLSVLY 115	150	PSCo/Tri-State	103.7	112.6	114.8	117.1	121.7	131.0	135.8
70375 SANLSVLY 230 T2	70375 SANLSVLY 115 T1									
70374 SANLSVLY 115	70374 SANLSVLY 115	150	PSCo/Tri-State	103.7	112.5	114.8	117.1	121.6	131.0	135.8
70375 SANLSVLY 230 T1	70375 SANLSVLY 115 T2									
73412 MIDWAYBR 115	73413 MIDWAYBR 230	100	PSCo/WAPA	104.4	107.5	108.3	109.0	110.4	113.3	114.6
73413 MIDWAYBR 230 1	73419 RD_NIXON 230 1									
79020 CURECANT 115	79054 PONCHABR 230	133	WAPA					100.3	107.5	115.2
79192 SOCANAL 115 1	73551 W CANON 230 1									
79048 MONTROSE 115	79054 PONCHABR 230	133	WAPA						106.0	113.6
79192 SOCANAL 115 1	73551 W CANON 230 1									
79007 BLUEMESA 115	79021 CURECANT 230	120	WAPA							101.3
79020 CURECANT 115 1	79198 PARLIN 230 1									

* indicates monitored element not monitored for this contingency, for this specific case in the powerflow runs.

Alternative TR1 -Calumet Injections				2nd SLV-Poncha single circuit 230kV Calumet-Comanche double circuite 345 kV		
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	1000	1200	1400
			Injection Level in SLV	0	0	0
			Owner	Percent Overload (%)		
70030 APT PARK 115 70549 APT MEM 115 1	70003 NYBERG 230 70286 MIDWAYPS 230 1	105	Black Hills	103.1	108.2	113.6
70002 BURNT MI 115 70456 W.STATON 115 1	70339 PUEBPLNT 115 70352 READER 115 1	100	Black Hills	140.8	147.8	155.3
70449 DESRTOV 115 70456 W.STATON 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	121.0	135.3	150.3
70193 FTN VALL 115 70449 DESRTOV 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	102.5	116.7	131.7
70193 FTN VALL 115 73412 MIDWAYBR 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	101.6	115.9	130.8
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	150.4	157.7	165.5
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	System Normal	105	Black Hills	106.7	111.9	117.3
70236 HYDEPARK 115 70456 W.STATON 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	133.4	140.8	148.3
70236 HYDEPARK 115 70456 W.STATON 115 1	System Normal	105	Black Hills			100.1
70285 MIDWAYPS 115 70301 NTHRIDGE 115 1	70030 APT PARK 115 70549 APT MEM 115 1	100	Black Hills			100.3
70330 PORTLAND 115 70456 W.STATON 115 1	73413 MIDWATBR 230 73551 W CANON 230 1	80	Black Hills	166.7	176.4	186.2
70330 PORTLAND 115 70456 W.STATON 115 1	System Normal	80	Black Hills	112.6	119.1	125.8
70550 W CANON 115 73551 W CANON 230 T1	70330 PORTLAND 115 70456 W. STATON 115 1	100	Black Hills	101.4	103.2	104.9
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	161.4	167.2	173.1
70121 COMANCHE 115 70122 COMANCHE 230 T1	System Normal	176	PSCo	104.4	108.1	111.9
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T1	185	PSCo	154.1	159.6	165.2
70121 COMANCHE 115 70122 COMANCHE 230 T2	System Normal	185	PSCo		103.5	107.1
70139 DANIELPK 230 70601 DANIELPK 345 T1	70139 DANIELPK 230 70601 DANIELPK 345 T2	560	PSCo			101.3
70139 DANIELPK 230 70601 DANIELPK 345 T2	70139 DANIELPK 230 70601 DANIELPK 345 T1	560	PSCo			101.3
70139 DANIELPK 230 70601 DANIELPK 345 T3	70139 DANIELPK 230 70601 DANIELPK 345 T1	560	PSCo			101.3
70212 GREENWD 230 70323 PRAIRIE2 230 1	70139 DANIELPK 230 70331 PRAIRIE 230 1	478	PSCo			103.9
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWARBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	104.4	107.6	110.9
70458 WALSENBG 115 70459 WALSENBG 230 T1	70458 WALSENBG 115 70459 WALSENBG 230 T2	100	Tri-State	115.2	121.7	128.3
70458 WALSENBG 115 70459 WALSENBG 230 T2	70458 WALSENBG 115 70459 WALSENBG 230 T1	100	Tri-State	115.4	122.0	128.5

Alternative TR1 - 525 MW at SLV				2nd SLV-Poncha single circuit 230kV Calumet-Comanche double circuit 345 kV		
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	0	100	775
			Injection Level in SLV	525	525	525
			Owner	Percent Overload (%)		
70002 BURNT MI 115 70456 W.STATON 115 1	70339 PUEBPLNT 115 70352 READER 115 1	100	Black Hills			112.3
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills			120.3
70236 HYDEPARK 115 70456 W.STATON 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills			103.2
70330 PORTLAND 115 70456 W.STATON 115 1	70550 W CANON 115 73551 W CANON 230 T1	80	Black Hills			104.6
70550 W CANON 115 73551 W CANON 230 T1	73413 MIDWARBR 230 73551 W CANON 230 1	100	Black Hills	139.3	136.8	122.6
70550 W CANON 115 70086 CANONCTY 115 1	73413 MIDWARBR 230 73551 W CANON 230 1	120	Black Hills	101.3	*	*
70086 CANONCTY 115 70390 SKALA 115 1	73413 MIDWARBR 230 73551 W CANON 230 1	105	Black Hills	102.7	*	*
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	121.2	123.6	141.4
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T1	185	PSCo	115.6	117.9	134.9
70026 ALMSA TM 69 70025 ALMSA TM 115 T1	70374 SANLSVLY 115 70379 SARGENT 115 1	25	PSCo	100.7	100.9	102.0
70374 SANLSVLY 115 70375 SANLSVLY 230 T1	70374 SANLSVLY 115 70375 SANLSVLY 115 T2	150	PSCo/Tri-State	114.8	115.1	116.8
70374 SANLSVLY 115 70375 SANLSVLY 230 T2	70374 SANLSVLY 115 70375 SANLSVLY 115 T1	150	PSCo/Tri-State	114.8	115.1	116.9
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWARBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	108.3	109.8	119.8
70458 WALSENBG 115 70459 WALSENBG 230 T1	70458 WALSENBG 115 70459 WALSENBG 230 T1	100	Tri-State			101.5
70458 WALSENBG 115 70459 WALSENBG 230 T2	70458 WALSENBG 115 70459 WALSENBG 230 T1	100	Tri-State			101.7
79020 CURECANT 115 79192 SOCANAL 115 1	79021 CURECANT 230 79045 LOSTCANY 230 1	133	WAPA			101.8
79048 MONTROSE 115 79192 SOCANAL 115 1	79021 CURECANT 230 79045 LOSTCANY 230 1	133	WAPA			100.4
*indicates monitored element not monitored for this contingency, for this specific case in the powerflow runs.						

Alternative TR1 - 500 MW at CAL				2nd SLV-Poncha single circuit 230kV Calumet-Comanche double circuit 345 kV		
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	500	500	500
			Injection Level in SLV	400	500	525
			Owner	Percent Overload (%)		
70002 BURNT MI 115 70456 W.STATON 115 1	70339 PUEBPLNT 115 70352 READER 115 1	100	Black Hills	108.2	104.6	103.7
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	116.0	112.3	111.4
70330 PORTLAND 115 70456 W.STATON 115 1	70550 W CANON 115 73551 W CANON 230 T1	80	Black Hills	104.0		
70550 W CANON 115 73551 W CANON 230 T1	73413 MIDWARBR 230 73551 W CANON 230 1	100	Black Hills		122.2	128.2
70330 PORTLAND 115 70456 W.STATON 115 1	70550 W CANON 115 70089 CANONCTY 115 1	80	Black Hills	102.1	100.6	100.3
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	136.7	134.5	133.9
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T1	185	PSCo	130.5	128.3	127.8
70026 ALMSA TM 69 70025 ALMSA TM 115 T1	70374 SANLSVLY 115 70379 SARGENT 115 1	25	PSCo		100.1	101.5
70374 SANLSVLY 115 70375 SANLSVLY 230 T1	70374 SANLSVLY 115 70375 SANLSVLY 115 T2	150	PSCo/Tri-State	104.9	113.8	116.1
70374 SANLSVLY 115 70375 SANLSVLY 230 T2	70374 SANLSVLY 115 70375 SANLSVLY 115 T1	150	PSCo/Tri-State	105.0	113.9	116.1
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWARBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	111.5	114.8	115.6

Alternative TR1 - 1000MW at Calumet				2nd SLV-Poncha single circuit 230kV Calumet-Comanche double circuite 345 kV			
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	1000	1000	1000	1000
			Injection Level in SLV	0	200	300	400
			Owner	Percent Overload (%)			
70002 BURNT MI 115 70456 W.STATON 115 1	70339 PUEBPLNT 115 70352 READER 115 1	100	Black Hills	140.8	132.2	128.1	124.2
70030 APT PARK 115 70549 APT MEM 115 1	70003 NYBERG 230 70286 MIDWAYPS 230 1	105	Black Hills	103.1	101.2	100.4	0.0
70193 FTN VALL 115 70449 DESRTOV 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	102.5			
70193 FTN VALL 115 73412 MIDWAYBR 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	101.6			
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	150.4	141.3	137.0	132.9
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	System Normal	105	Black Hills	106.7	100.4		
70236 HYDEPARK 115 70456 W.STATON 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	133.4	124.3	120.0	115.8
70330 PORTLAND 115 70456 W.STATON 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	80	Black Hills	166.7	127.0	121.3	116.0
70330 PORTLAND 115 70456 W.STATON 115 1	System Normal	80	Black Hills	112.6			
70449 DESRTOV 115 70456 W.STATON 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	121.0	111.4	106.7	102.1
70550 W CANON 115 73551 W CANON 230 T1	70330 PORTLAND 115 70456 W. STATON 115 1	100	Black Hills	101.4	100.7	100.4	0.0
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	161.4	155.7	153.0	150.3
70121 COMANCHE 115 70122 COMANCHE 230 T1	System Normal	176	PSCo	104.4	100.7		
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T1	185	PSCo	154.1	148.6	146.0	143.7
70374 SANLSVLY 115 70375 SANLSVLY 230 T1	70374 SANLSVLY 115 70375 SANLSVLY 115 T2	150	PSCo/Tri-State				106.3
70374 SANLSVLY 115 70375 SANLSVLY 230 T2	70374 SANLSVLY 115 70375 SANLSVLY 115 T1	150	PSCo/Tri-State				106.3
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWAYBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	104.4	112.0	115.6	119.1
70458 WALSENBG 115 70459 WALSENBG 230 T1	70458 WALSENBG 115 70459 WALSENBG 230 T2	100	Tri-State	115.2	112.8	111.7	110.6
70458 WALSENBG 115 70459 WALSENBG 230 T2	70458 WALSENBG 115 70459 WALSENBG 230 T1	100	Tri-State	115.4	113.0	111.9	110.8

Appendix D

Alternative TR2

Alternative TR2 - SLV Injections				SLV-Sargent-Poncha single circuit 230kV Line Calumet-Comanche double circuit 345 kV							
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	0	0	0	0	0	0	0	0
			Injection Level in SLV	500	525	550	575	600	650	675	750
			Owner	Percent Overload (%)							
70550 W CANON 115	73413 MIDWAYBR 230	120	Black Hills		101.1	106.1	111.1	116.3	*	*	*
70086 CANONCTY 115 1	73551 W CANON 230 1										
70390 SKALA 115	73413 MIDWAYBR 230	105	Black Hills			100.9	107.0	113.1	*	*	*
70330 PORTLAND 115 1	73551 W CANON 230 1										
70086 CANONCTY 115	73413 MIDWAYBR 230	105	Black Hills		102.3	108.2	114.2	120.3	*	*	*
70390 SKALA 115 1	73551 W CANON 230 1										
70330 PORTLAND 115	73413 MIDWAYBR 230	80	Black Hills							104.6	131.3
70456 W.STATON 115 1	73551 W CANON 230 1										
70550 W CANON 115	73413 MIDWAYBR 230	100	Black Hills	131.1	136.9	142.7	148.4	154.1	165.1	170.4	185.1
73551 W CANON 230 T1	73551 W CANON 230 1										
70327 PONCHA 115	79054 PONCHABR 230	128	PSCo					102.0	113.2	119.1	138.9
70379 SARGENT 115 1	73551 W CANON 230 1										
70121 COMANCHE 115	70121 COMANCHE 115	185	PSCo	116.1	115.6	115.2	120.2	119.8	113.5	113.1	112.1
70122 COMANCHE 230 T2	70122 COMANCHE 115 T2										
70121 COMANCHE 115	70121 COMANCHE 115	176	PSCo	121.7	121.2	120.7	114.7	114.3	118.9	118.5	117.4
70122 COMANCHE 230 T1	70122 COMANCHE 115 T2										
73412 MIDWAYBR 115	73413 MIDWAYBR 230	100	PSCo/WAPA	107.4	108.1	108.9	109.6	110.3	111.7	112.4	114.5
73413 MIDWAYBR 230 1	73419 RD_NIXON 230 1										
79007 BLUEMESA 115	79021 CURECANT 230	120	WAPA								101.1
79020 CURECANT 115 1	79198 FARLIN 230 1										
79048 MONTROSE 115	79054 PONCHABR 230	133	WAPA							103.7	112.6
79192 SOCANAL 115 1	73551 W CANON 230 1										
79020 CURECANT 115	79054 PONCHABR 230	133	WAPA					100.2	103.4	105.1	114.1
79192 SOCANAL 115 1	73551 W CANON 230 1										

* Indicates monitored element not monitored for this contingency, for this specific case in the powerflow runs.

Alternative TR2 - Calumet Injections				SLV-Sargent-Poncha single circuit 230kV Line Calumet-Comanche double circuit 345 kV		
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	975	1000	1025
			Injection Level in SLV	0	0	0
			Owner	Percent Overload (%)		
70030 APT PARK 115 70549 APT MEM 115 1	70003 NYBERG 230 70286 MIDWAYPS 230 1	105	Black Hills	102.5	103.1	103.7
70002 BURNT MI 115 70456 W.STATON 115 1	70330 PUEBPLNT 115 70352 READER 115 1	100	Black Hills	139.9	140.7	141.6
70449 DESRTOV 115 70456 W.STATON 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	119.4	121.2	122.9
70193 FTN VALL 115 70449 DESRTOV 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	100.9	102.6	104.3
70193 FTN VALL 115 73412 MIDWAYBR 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills		101.7	103.5
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	149.4	150.3	151.2
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	System Normal	105	Black Hills	106.1	106.7	107.3
70236 HYDEPARK 115 70456 W.STATON 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	132.5	133.3	134.2
70330 PORTLAND 115 70456 W.STATON 115 1	System Normal	80	Black Hills	165.6	166.9	113.2
70330 PORTLAND 115 70456 W.STATON 115 1	70374 SANLSVLY 115 70379 SARGENT 115 1	80	Black Hills	111.6	112.4	113.2
70550 W CANON 115 73551 W CANON 230 T1	70330 PORTLAND 115 70456 W. STATON 115 1	100	Black Hills	100.2	100.4	100.6
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	160.7	161.4	162.1
70121 COMANCHE 115 70122 COMANCHE 230 T1	System Normal	176	PSCo	103.9	104.3	104.8
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T1	185	PSCo	153.3	154.0	154.7
70121 COMANCHE 115 70122 COMANCHE 230 T2	System Normal	185	PSCo			100.3
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWARBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	104.0	104.4	104.7
70458 WALSENBG 115 70459 WALSENBG 230 T1	70458 WALSENBG 115 70459 WALSENBG 230 T2	100	Tri-State	114.4	115.2	116.0
70458 WALSENBG 115 70459 WALSENBG 230 T2	70458 WALSENBG 115 70459 WALSENBG 230 T1	100	Tri-State	114.6	115.4	116.2

Alternative TR2 - 575 MW at SLV				SLV-Sargent-Poncha single circuit 230kV Line Calumet-Comanche double circuit 345 kV					
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	0	100	150	200	225	300
			Injection Level in SLV	575	575	575	575	575	575
			Owner	Percent Overload (%)					
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills				100.6	101.4	103.6
70550 W CANON 115 73551 W CANON 230 T1	73413 MIDWAYBR 230 73551 W CANON 230 1	100	Black Hills	148.4	146.0	144.9	143.8	143.3	141.7
70550 W CANON 115 70086 CANONCTY 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	120	Black Hills	111.1					
70390 SKALA 115 70330 PORTLAND 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	105	Black Hills	107.0					
70086 CANONCTY 115 70390 SKALA 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	105	Black Hills	114.2					
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	120.2	122.6	123.9	125.2	125.8	127.8
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T1	185	PSCo	114.3	117.0	118.2	119.5	120.1	121.9
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWAYBR 230 73419 RD. NIXON 230 1	100	PSCo/WAPA	109.6	111.2	111.9	112.6	113.0	114.1
79020 CURECANT 115 79192 SOCANAL 115 1	79021 CURECANY 230 79045 LOSTCANY 230 1	133	WAPA			100.0	100.5	100.7	101.3

Alternative TR2 - 500 MW at Calumet				SLV-Sargent-Poncha single circuit 230kV Line Calumet-Comanche double circuit 345 kV		
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	500	500	500
			Injection Level in SLV	500	525	550
			Owner	Percent Overload (%)		
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	112.2	111.3	110.5
70550 W CANON 115 73551 W CANON 230 T1	73413 MIDWAYBR 230 73551 W CANON 230 1	100	Black Hills	119.9	125.9	131.7
70330 PORTLAND 115 70456 W. STATON 115 1	70550 W CANON 115 70089 CANONCTY 115 1	80	Black Hills	100.6	100.3	100.0
70002 BURNT MI 115 70456 W. STATON 115 1	70330 PUEBPLNT 115 70352 READER 115 1	100	Black Hills	104.5	103.7	102.8
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	134.5	133.9	133.4
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T1	185	PSCo	128.3	127.8	127.3
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWAYBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	114.7	115.5	116.2
79020 CURECANT 115 79192 SOCANAL 115 1	79021 CURECANY 230 79045 LOSTCANY 230 1	133	WAPA			101.3

Alternative TR2 - 1000 MW at Calumet				SLV-Sargent-Poncha single circuit 230kV Line Calumet-Comanche double circuit 345 kV				
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	1000	1000	1000	1000	1000
			Injection Level in SLV	0	100	250	275	300
			Owner	Percent Overload (%)				
70030 APT PARK 115 70549 APT MEM 115 1	70003 NYBERG 230 70286 MIDWAYPS 230 1	105	Black Hills	103.1	102.1	100.8	100.6	100.4
70002 BURNT MI 115 70456 W.STATON 115 1	70330 PUEBPLNT 115 70352 READER 115 1	100	Black Hills	140.7	136.4	130.1	129.1	128.1
70449 DESRTCOV 115 70456 W.STATON 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	121.2	116.3	109.2	108.1	106.9
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	150.3	145.7	139.0	138.0	136.9
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	System Normal	105	Black Hills	106.7	103.5			
70236 HYDEPARK 115 70456 W.STATON 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	133.3	128.7	122.1	121.0	120.0
70330 PORTLAND 115 70456 W.STATON 115 1	System Normal	80	Black Hills	166.9	133.4	122.8	121.4	120.0
70330 PORTLAND 115 70456 W.STATON 115 1	70374 SANLSVLY 115 70379 SARGENT 115 1	80	Black Hills	112.4	101.1			
70193 FTN VALL 115 70449 DESRTCOV 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	102.6				
70193 FTN VALL 115 73412 MIDWAYBR 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	101.7				
70550 W CANON 115 73551 W CANON 230 T1	70330 PORTLAND 115 70456 W. STATON 115 1	100	Black Hills	100.4				
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	161.4	158.5	154.3	153.7	153.0
70121 COMANCHE 115 70122 COMANCHE 230 T1	System Normal	176	PSCo	104.3	102.5			
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T1	185	PSCo	154.0	151.2	147.3	146.6	146.0
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWARBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	104.4	108.2	113.7	114.6	115.5
70458 WALSENBG 115 70459 WALSENBG 230 T1	70458 WALSENBG 115 70459 WALSENBG 230 T2	100	Tri-State	115.2	114.0	112.2	111.9	111.7
70458 WALSENBG 115 70459 WALSENBG 230 T2	70458 WALSENBG 115 70459 WALSENBG 230 T1	100	Tri-State	115.4	114.2	112.4	112.1	111.9

Appendix E

**Alternative
TR3**

Alternative TR3 - SLV Injections				SLV-W CANON single circuit 230kV Line Calumet-Comanche double circuit 345 kV							
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	0	0	0	0	0	0	0	0
			Injection Level in SLV	475	500	525	550	575	600	650	750
			Owner	Percent Overload (%)							
70330 PORTLAND 115	73413 MIDWAYBR 230	80	Black Hills							108.5	146.5
70456 W.STATON 115 1	73551 W CANON 230 1										
70550 W CANON 115	73413 MIDWAYBR 230	100	Black Hills	143.8	150.8	157.8	164.7	171.5	178.3	191.5	216.5
73551 W CANON 230 T1	73551 W CANON 230 1										
70550 W CANON 115	73413 MIDWAYBR 230	120	Black Hills				114.0	119.5	125.1	136.5	160.4
70086 CANONCTY 115 1	73551 W CANON 230 1										
70390 SKALA 115	73413 MIDWAYBR 230	105	Black Hills				110.2	116.7	123.3	136.8	164.8
70330 PORTLAND 115 1	73551 W CANON 230 1										
70086 CANONCTY 115	73413 MIDWAYBR 230	105	Black Hills				117.6	124.1	130.7	144.1	171.9
70390 SKALA 115 1	73551 W CANON 230 1										
70028 ANSEL TS 69	70374 SANLSVLY 115	65	PSCo								101.9
70118 COCENTER 69 1	70379 SARGENT 115 1										
70028 ANSEL TS 69	70374 SANLSVLY 115	65	PSCo								106.9
70376 SANLSVLY 69 1	70379 SARGENT 115 1										
70121 COMANCHE 115	70121 COMANCHE 115	176	PSCo	120.9	120.3	119.7	119.1	118.5	118.0	117.0	115.2
70122 COMANCHE 230 T1	70122 COMANCHE 115 T2										
70121 COMANCHE 115	70121 COMANCHE 115	185	PSCo	115.4	114.8	114.2	113.7	113.2	112.7	111.7	109.9
70122 COMANCHE 230 T2	70122 COMANCHE 115 T2										
70327 PONCHA 115	70375 SANLSVLY 230	128	PSCo								107.0
70379 SARGENT 115 1	79054 PONCHABR 230 1										
70026 ALMSA TM 69	70374 SANLSVLY 115	25	PSCo					100.1	101.3	104.2	109.6
70025 ALMSA TM 115 T1	70379 SARGENT 115 1										
70435 TWINKTAP 115	73413 MIDWAYBR 230	80	PSCo								103.8
70273 MALTA 115 1	73551 W CANON 230 1										
70374 SANLSVLY 115	70374 SANLSVLY 115	150	PSCo/Tri-State	106.2	108.1	110.1	112.1	114.1	116.1	120.2	128.5
70375 SANLSVLY 230 T1	70375 SANLSVLY 115 T2										
70374 SANLSVLY 115	70374 SANLSVLY 115	150	PSCo/Tri-State	106.2	108.1	110.1	112.1	114.1	116.1	120.2	128.6
70375 SANLSVLY 230 T2	70375 SANLSVLY 115 T1										
70374 SANLSVLY 115	70374 SANLSVLY 115	42	PSCo/Tri-State							101.6	110.3
70376 SANLSVLY 69 T3	70379 SARGENT 115 1										
70374 SANLSVLY 115	70374 SANLSVLY 115	42	PSCo/Tri-State							101.6	110.3
70376 SANLSVLY 69 T4	70379 SARGENT 115 1										
73412 MIDWAYBR 115	73413 MIDWAYBR 230	100	PSCo/WAPA	108.8	109.7	110.5	111.4	112.3	113.1	114.8	118.1
73413 MIDWAYBR 230 1	73419 RD_NIXON 230 1										
79020 CURECANT 115	79021 CURECANY 230	133	WAPA								102.7
79192 SOCANAL 115 1	79045 LOSTCANY 230 1										
79048 MONTROSE 115	79021 CURECANY 230	133	WAPA								101.3
79192 SOCANAL 115 1	79045 LOSTCANY 230 1										

Alternative TR3 - Calumet Injections				SLV-W CANON single circuit 230kV Line Calumet-Comanche double circuit 345 kV		
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	975	1000	1025
			Injection Level in SLV	0	0	0
			Owner	Percent Overload (%)		
70030 APT PARK 115 70549 APT MEM 115 1	70003 NYBERG 230 70286 MIDWAYPS 230 1	105	Black Hills	102.5	103.2	103.8
70002 BURNT MI 115 70456 W.STATON 115 1	70330 PUEBPLNT 115 70352 READER 115 1	100	Black Hills	140.2	141.0	141.9
70449 DESRTC OV 115 70456 W.STATON 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	120.4	122.1	123.8
70193 FTN VALL 115 70449 DESRTC OV 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	101.9	103.6	105.3
70193 FTN VALL 115 73412 MIDWAYBR 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	101.0	102.7	104.5
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	149.7	150.6	151.5
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	System Normal	105	Black Hills	106.2	106.9	107.5
70236 HYDEPARK 115 70456 W.STATON 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	132.8	133.7	134.6
70330 PORTLAND 115 70456 W.STATON 115 1	73413 MIDWATER 230 73551 W CANON 230 1	80	Black Hills	169.2	170.4	171.6
70330 PORTLAND 115 70456 W.STATON 115 1	System Normal	80	Black Hills	112.6	113.4	114.2
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	160.8	161.5	162.3
70121 COMANCHE 115 70122 COMANCHE 230 T1	System Normal	176	PSCo	104.0	104.5	104.9
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T1	185	PSCo	153.5	154.2	154.8
70121 COMANCHE 115 70122 COMANCHE 230 T2	System Normal	185	PSCo		100.0	100.4
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWATER 230 73419 RD NIXON 230 1	100	PSCo/WAPA	103.5	103.9	104.3
70458 WALSENBG 115 70459 WALSENBG 230 T1	70458 WALSENBG 115 70459 WALSENBG 230 T2	100	Tri-State	114.6	115.4	116.2
70458 WALSENBG 115 70459 WALSENBG 230 T2	70458 WALSENBG 115 70459 WALSENBG 230 T1	100	Tri-State	114.8	115.6	116.4

Alternative TR3 - 525 MW at SLV				SLV-W CANON single circuit 230kV Line Calumet-Comanche double circuit 345 kV					
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	0	100	200	300	375	400
			Injection Level in SLV	525	525	525	525	525	525
			Owner	Percent Overload (%)					
70550 W CANON 115 73551 W CANON 230 T1	73413 MIDWAYBR 230 73551 W CANON 230 1	100	Black Hills	157.8	155.3	152.9	150.6	148.8	148.2
70550 W CANON 115 70086 CANONCTY 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	120	Black Hills	108.5	105.4	102.4		0.0	0.0
70390 SKALA 115 70330 PORTLAND 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	105	Black Hills	103.6				0.0	0.0
70086 CANONCTY 115 70390 SKALA 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	105	Black Hills	111.2	107.5	103.9	100.3	0.0	0.0
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills				102.7	105.0	105.8
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	119.7	122.2	124.8	127.5	129.4	130.1
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T2	185	PSCo	114.2	116.7	119.1	121.6	123.5	124.2
70374 SANLSVLY 115 70375 SANLSVLY 230 T1	70374 SANLSVLY 115 70375 SANLSVLY 115 T2	150	PSCo/Tri-State	110.1	110.5	110.8	111.2	111.5	111.6
70374 SANLSVLY 115 70375 SANLSVLY 230 T2	70374 SANLSVLY 115 70375 SANLSVLY 115 T1	150	PSCo/Tri-State	110.1	110.5	110.9	111.2	111.5	111.6
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWAYBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	110.5	112.0	113.4	114.8	115.9	116.2

Alternative TR3 - 500 MW at Calumet				SLV-W CANON single circuit 230kV Line Calumet-Comanche double circuit 345 kV		
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	500	500	500
			Injection Level in SLV	400	450	500
			Owner	Percent Overload (%)		
70002 BURNT MI 115 70456 W.STATON 115 1	70330 PUEBPLNT 115 70352 READER 115 1	100	Black Hills	107.2	105.1	103.1
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	114.9	112.8	110.7
70330 PORTLAND 115 70456 W.STATON 115 1	70550 W CANON 115 73551 W CANON 230 T1	80	Black Hills	106.3	104.4	102.5
70550 W CANON 115 73551 W CANON 230 T1	73413 MIDWAYBR 230 73551 W CANON 230 1	100	Black Hills	110.4	124.7	138.8
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	135.9	134.6	133.3
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T1	185	PSCo	129.7	128.4	127.2
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWAYBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	113.2	115.1	116.9
70374 SANLSVLY 115 70375 SANLSVLY 230 T1	70374 SANLSVLY 115 70375 SANLSVLY 115 T2	150	PSCo/Tri-State	102.1	106.0	110.0
70374 SANLSVLY 115 70375 SANLSVLY 230 T2	70374 SANLSVLY 115 70375 SANLSVLY 115 T1	150	PSCo/Tri-State	102.1	106.1	110.0

Alternative TR3 - 1000 MW at Calumet				SLV-W CANON single circuit 230kV Line Calumet-Comanche double circuit 345 kV				
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	1000	1000	1000	1000	1000
			Injection Level in SLV	0	100	250	275	300
			Owner	Percent Overload (%)				
70030 APT PARK 115 70549 APT MEM 115 1	70003 NYBERG 230 70286 MIDWAYPS 230 1	105	Black Hills	103.2	102.1	100.6	100.3	100.1
70002 BURNT MI 115 70456 W.STATON 115 1	70330 PUEBPLNT 115 70352 READER 115 1	100	Black Hills	141.0	136.4	129.6	128.5	127.4
70449 DESRTOV 115 70456 W.STATON 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	122.1	116.4	108.1	106.7	105.4
70193 FTN VALL 115 70449 DESRTOV 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	103.6				
70193 FTN VALL 115 73412 MIDWAYBR 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	102.7				
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	150.6	145.6	138.5	137.3	136.2
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	System Normal	105	Black Hills	106.9	103.4			
70236 HYDEPARK 115 70456 W.STATON 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	133.7	128.8	121.6	120.4	119.3
70330 PORTLAND 115 70456 W.STATON 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	80	Black Hills	170.4	134.0	124.9	123.7	122.5
70330 PORTLAND 115 70456 W.STATON 115 1	System Normal	80	Black Hills	113.4	101.5			
70550 W CANON 115 73551 W CANON 230 T1	70330 PORTLAND 115 70456 W. STATON 115 1	100	Black Hills		*	*	103.5	*
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	161.5	158.4	153.8	153.1	152.4
70121 COMANCHE 115 70122 COMANCHE 230 T1	System Normal	176	PSCo	104.5	102.4			
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T1	185	PSCo	154.2	151.1	146.8	146.1	145.4
70121 COMANCHE 115 70122 COMANCHE 230 T2	System Normal	185	PSCo	100.0				
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWAYBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	103.9	108.2	114.6	115.6	116.6
70458 WALSENBG 115 70459 WALSENBG 230 T1	70458 WALSENBG 115 70459 WALSENBG 230 T2	100	Tri-State	115.4	114.0	112.0	111.7	111.4
70458 WALSENBG 115 70459 WALSENBG 230 T2	70458 WALSENBG 115 70459 WALSENBG 230 T1	100	Tri-State	115.6	114.2	112.2	111.9	111.6

* Indicates monitored element not monitored for this contingency, for this specific case in the powerflow runs.

Appendix F

**Alternative
TR1A**

Alternative TR1A-SLV Injections				2nd SLV-Poncha single circuit 230kV Line with Poncha 230/115 kV Transformer Calumet-Comanche double circuit 345 kV				
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	0	0	0	0	0
			Injection Level in SLV	525	550	575	600	625
			Owner	Percent Overload (%)				
70550 W CANON 115 73551 W CANON 230 T1	73413 MIDWAYBR 230 73551 W CANON 230 1	100	Black Hills	105.7	109.8	113.9	117.9	121.9
70390 SKALA 115 70330 PORTLAND 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	105	Black Hills			103.7	109.5	115.4
70086 CANONCTY 115 70390 SKALA 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	105	Black Hills		105.3	111.0	116.8	122.7
70550 W CANON 115 70086 CANONCTY 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	120	Black Hills		103.6	108.4	113.3	118.3
70435 TWNLAOTP 115 70273 MALTA 115 1	79054 PONCHABR 230 73551 W CANON 230 1	80	PSCo		100.4	108.5	116.7	125.0
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	120.8	120.3	119.8	119.4	118.9
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T2	185	PSCo	115.3	114.8	114.4	113.9	113.5
70374 SANLSVLY 115 70375 SANLSVLY 230 T1	70374 SANLSVLY 115 70375 SANLSVLY 115 T2	150	PSCo/Tri-State		100.8	102.3	103.7	105.2
70374 SANLSVLY 115 70375 SANLSVLY 230 T2	70374 SANLSVLY 115 70375 SANLSVLY 115 T1	150	PSCo/Tri-State		100.8	102.3	103.8	105.2
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWAYBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	106.9	107.6	108.3	108.9	109.6
79020 CURECANT 115 79192 SOCANAL 115 1	79021 CURECANY 230 79045 LOSTCANY 230 1	133	WAPA					101.5
79048 MONTROSE 115 79192 SOCANAL 115 1	79021 CURECANY 230 79045 LOSTCANY 230 1	133	WAPA					100.2

Alternative TR1A - Calumet Injections				2nd SLV-Poncha single circuit 230kV Line with Poncha 230/115 kV Transformer Calumet-Comanche double circuit 345 kV		
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	975	1000	1025
			Injection Level in SLV	0	0	0
			Owner	Percent Overload (%)		
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	149.4	150.3	151.2
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	System Normal	105	Black Hills	106.1	106.7	107.4
70193 FTN VALL 115 70449 DESRTOV 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	100.3	102.1	103.8
70002 BURNT MI 115 70456 W. STATON 115 1	70339 PUEBPLNT 115 70352 READER 115 1	100	Black Hills	139.9	140.8	141.6
70236 HYDEPARK 115 70456 W. STATON 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	132.5	133.4	134.3
70330 PORTLAND 115 70456 W. STATON 115 1	73413 MIDWATER 230 73551 W CANON 230 1	80	Black Hills	164.7	165.9	167.1
70330 PORTLAND 115 70456 W. STATON 115 1	System Normal	80	Black Hills	111.7	112.5	113.3
70449 DESRTOV 115 70456 W. STATON 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	118.9	120.6	122.4
70030 APT PARK 115 70549 APT MEM 115 1	70003 NYBERG 230 70286 MIDWAYPS 230 1	105	Black Hills	102.5	103.1	103.7
70193 FTN VALL 115 73412 MIDWAYBR 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills		101.2	102.9
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	160.7	161.4	162.1
70121 COMANCHE 115 70122 COMANCHE 230 T1	System Normal	176	PSCo	103.9	104.4	104.8
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T1	185	PSCo	153.4	154.1	154.7
70121 COMANCHE 115 70122 COMANCHE 230 T2	System Normal	185	PSCo			100.4
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWAYBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	104.0	104.3	104.7
70458 WALSENBG 115 70459 WALSENBG 230 T1	70458 WALSENBG 115 70459 WALSENBG 230 T2	100	Tri-State	114.4	115.2	116.0
70458 WALSENBG 115 70459 WALSENBG 230 T2	70458 WALSENBG 115 70459 WALSENBG 230 T1	100	Tri-State	114.6	115.4	116.3

Alternative TR1A SLV at 575MW				2nd SLV-Poncha single circuit 230kV Line with Poncha 230/115 kV Transformer Calumet-Comanche double circuit 345 kV						
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	0	100	200	300	500	550	600
			Injection Level in SLV	575	575	575	575	575	575	575
			Owner	Percent Overload (%)						
70550 TWNLAKTP 115 70273 MALTA 115 1	79054 PONCHABR 230 73551 W CANON 230 1	80	Black Hills	108.5	109.6	110.7	111.8	106.1	106.7	107.3
70435 SKALA 115 70330 PORTLAND 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	105	Black Hills	103.7						
70390 CANONCTY 115 70390 SKALA 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	105	Black Hills	111.0	107.2	103.7	100.2			
70086 W CANON 115 73551 W CANON 230 T1	73413 MIDWAYBR 230 73551 W CANON 230 1	100	Black Hills	113.9	111.4	109.1	106.9			
73412 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills					109.7	111.3	112.9
79020 BURNT MI 115 70456 W. STATON 115 1	70339 PUEBPLNT 115 70352 READER 115 1	100	Black Hills					102.1	103.6	105.1
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	119.8	122.2	124.8	127.4	133.2	134.5	135.8
70374 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T2	185	PSCo	114.4	116.6	119.1	121.6	127.1	128.3	129.6
70550 SANLSVLY 115 70375 SANLSVLY 230 T1	70374 SANLSVLY 115 70375 SANLSVLY 115 T2	150	PSCo/Tri-State	102.3	102.4	102.4	102.5	101.2	101.2	101.2
70121 SANLSVLY 115 70375 SANLSVLY 230 T2	70374 SANLSVLY 115 70375 SANLSVLY 115 T1	150	PSCo/Tri-State	102.3	102.4	102.4	102.5	101.2	101.2	101.2
70374 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWAYBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	108.3	109.8	111.2	112.6	114.8	115.6	116.3
70236 W CANON 115 70086 CANONCTY 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	120	WAPA	108.4	105.4	102.4				
70002 CURECANT 115 79192 SOCANAL 115 1	79021 CURECANY 230 79045 LOSTCANY 230 1	133	WAPA			100.2	101.0	101.0	101.4	101.7
79048 MONTROSE 115 79192 SOCANAL 115 1	79021 CURECANY 230 79045 LOSTCANY 230 1	133	WAPA						100.0	100.4

Alternative TR1A - 1000 MW at Calumet				2nd SLV-Poncha single circuit 230kV Line with Poncha 230/115 kV Transformer Calumet-Comanche double circuit 345 kV					
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	1000	1000	1000	1000	1000	1000
			Injection Level in SLV	0	100	200	300	325	350
			Owner	Percent Overload (%)					
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	150.3	145.5	140.8	136.4	135.3	134.2
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	System Normal	105	Black Hills	106.7	103.3	100.1			
70193 FTN VALL 115 70449 DESRTCOV 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	102.1					
70002 BURNT MI 115 70456 W.STATON 115 1	70339 PUEBPLNT 115 70352 READER 115 1	100	Black Hills	140.8	136.2	131.8	127.5	126.5	125.5
70236 HYDEPARK 115 70456 W.STATON 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	133.4	128.6	123.9	119.4	118.3	117.2
70330 PORTLAND 115 70456 W.STATON 115 1	73413 MIDWATBR 230 73551 W CANON 230 1	80	Black Hills	165.9	133.5	114.9	108.1	107.4	106.9
70330 PORTLAND 115 70456 W.STATON 115 1	System Normal	80	Black Hills	112.5	100.3				
70449 DESRTCOV 115 70456 W.STATON 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	120.6	116.5	112.4	108.4		106.4
70030 APT PARK 115 70549 APT MEM 115 1	70003 NYBERG 230 70286 MIDWAYPS 230 1	105	Black Hills	103.1	102.2	101.4	100.6	100.4	100.2
70193 FTN VALL 115 73412 MIDWAYBR 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	101.2					
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	161.4	158.4	155.5	152.8	152.2	151.5
70121 COMANCHE 115 70122 COMANCHE 230 T1	System Normal	176	PSCo	104.4	102.4	100.6		145.2	
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T1	185	PSCo	154.1	151.2	148.4	145.8		144.6
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWABR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	104.3	107.8	111.2	114.5	115.3	116.1

Appendix G

Alternative TR2A

Alternative TR2A - SLV Injections				SLV-Sargent-Poncha single circuit 230kV Line with Poncha 230/115 kV Transformer Calumet-Comanche double circuit 345 kV				
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	0	0	0	0	0
			Injection Level in SLV	500	525	550	575	600
			Owner	Percent Overload (%)				
70550 W CANON 115 73551 W CANON 230 T1	73413 MIDWAYBR 230 73551 W CANON 230 1	100	Black Hills	101.0	105.2	109.3	113.3	117.3
70550 W CANON 115 70086 CANONCTY 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	120	Black Hills			103.4	108.3	113.2
70390 SKALA 115 70330 PORTLAND 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	105	Black Hills				103.5	109.4
70086 CANONCTY 115 70390 SKALA 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	105	Black Hills			105.2	110.9	116.7
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	121.4	120.8	120.3	119.9	119.4
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T2	185	PSCo	115.8	115.3	114.9	114.4	113.9
70435 TWNLAKE 115 70273 MALTA 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	80	PSCo			100.7	108.8	117.0
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWAYBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	106.2	106.9	107.5	108.2	108.9

Alternative TR2A - Calumet Injections				SLV-Sargent-Poncha single circuit 230kV Line with Poncha 230/115 kV Transformer Calumet-Comanche double circuit 345 kV		
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	975	1000	1025
			Injection Level in SLV	0	0	0
			Owner	Percent Overload (%)		
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	149.4	150.3	151.2
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	System Normal	105	Black Hills	106.1	106.7	107.3
70193 FTN VALL 115 70449 DESRTOV 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	100.4	102.1	103.9
70002 BURNT MI 115 70456 W.STATON 115 1	70330 PUEBPLNT 115 70352 READER 115 1	100	Black Hills	139.9	140.7	141.6
70236 HYDEPARK 115 70456 W.STATON 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	132.5	133.4	134.2
70330 PORTLAND 115 70456 W.STATON 115 1	System Normal	80	Black Hills	164.7	165.9	167.1
70330 PORTLAND 115 70456 W.STATON 115 1	70374 SANLSVLY 115 70379 SARGENT 115 1	80	Black Hills	111.7	112.5	113.2
70449 DESRTOV 115 70456 W.STATON 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	118.9	120.7	122.4
70030 APT PARK 115 70549 APT MEM 115 1	70003 NYBERG 230 70286 MIDWAYPS 230 1	105	Black Hills	102.5	103.1	103.7
70193 FTN VALL 115 73412 MIDWAYBR 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills		101.2	103.0
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	160.7	161.4	162.1
70121 COMANCHE 115 70122 COMANCHE 230 T1	System Normal	176	PSCo	103.9	104.3	104.8
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T1	185	PSCo	153.3	154.0	154.7
70121 COMANCHE 115 70122 COMANCHE 230 T2	System Normal	185	PSCo			100.3
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWAYBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	104.0	104.3	104.7
70458 WALSENBG 115 70459 WALSENBG 230 T1	70458 WALSENBG 115 70459 WALSENBG 230 T2	100	Tri-State	114.4	115.2	116.0
70458 WALSENBG 115 70459 WALSENBG 230 T2	70458 WALSENBG 115 70459 WALSENBG 230 T1	100	Tri-State	114.6	115.4	116.2

Alternative TR2A - 575 MW at SLV				SLV-Sargent-Poncha single circuit 230kV Line with Poncha 230/115 kV Transformer Calumet-Comanche double circuit 345 kV		
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	0	100	300
			Injection Level in SLV	575	575	575
			Owner	Percent Overload (%)		
70550 W CANON 115 73551 W CANON 230 T1	System Normal	100	Black Hills	110.9	108.6	106.3
70550 W CANON 115 70086 CANONCTY 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	120	Black Hills	105.2	102.2	
70086 CANONCTY 115 70390 SKALA 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	105	Black Hills	107.1	103.5	100.0
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills			102.6
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	122.2	124.8	127.4
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T2	185	PSCo	116.7	119.1	121.6
70435 TWNLAKTP 115 70273 MALTA 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	80	PSCo	109.9	111.0	112.1
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWAYBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	109.8	111.2	112.6
79020 CURECANT 115 79192 SOCANAL 115 1	79021 CURECANY 230 79045 LOSTCANY 230 1	133	WAPA		100.0	100.9

Alternative TR2A - 500 MW at Calumet				SLV-Sargent-Poncha single circuit 230kV Line with Poncha 230/115 kV Transformer Calumet-Comanche double circuit 345 kV		
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	500	500	500
			Injection Level in SLV	500	550	600
			Owner	Percent Overload (%)		
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	111.5	109.7	107.9
70002 BURNT MI 115 70456 W. STATON 115 1	70330 PUEBPLNT 115 70352 READER 115 1	100	Black Hills	103.9	102.1	100.4
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	134.3	133.2	132.1
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T2	185	PSCo	128.1	127.1	126.1
70435 TWNLAKTP 115 70273 MALTA 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	80	PSCo		106.3	122.6
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWAYBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	113.3	114.8	116.2
79020 CURECANT 115 79192 SOCANAL 115 1	79021 CURECANY 230 79045 LOSTCANY 230 1	133	WAPA		100.9	104.1
79048 MONTROSE 115 79192 SOCANAL 115 1	79021 CURECANY 230 79045 LOSTCANY 230 1	133	WAPA			102.8

Alternative TR2A - 1000 MW at Calumet				SLV-Sargent-Poncha single circuit 230kV Line with Poncha 230/115 kV Transformer Calumet-Comanche double circuit 345 kV			
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	1000	1000	1000	1000
			Injection Level in SLV	0	300	325	350
			Owner	Percent Overload (%)			
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	150.3	136.4	135.3	134.2
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	System Normal	105	Black Hills	106.7			
70193 FTN VALL 115 70449 DESRTOV 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	102.1			
70002 BURNT MI 115 70456 W. STATON 115 1	70330 PUEBPLNT 115 70352 READER 115 1	100	Black Hills	140.7	127.5	126.5	125.4
70236 HYDEPARK 115 70456 W. STATON 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	133.4	119.4	118.3	117.2
70330 PORTLAND 115 70456 W. STATON 115 1	System Normal	80	Black Hills	165.9	108.1	107.4	106.9
70330 PORTLAND 115 70456 W. STATON 115 1	70374 SANLSVLY 115 70379 SARGENT 115 1	80	Black Hills	112.5			
70449 DESRTOV 115 70456 W. STATON 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	120.7	108.4	107.4	106.4
70030 APT PARK 115 70549 APT MEM 115 1	70003 NYBERG 230 70286 MIDWAYPS 230 1	105	Black Hills	103.1	100.6	100.4	100.2
70193 FTN VALL 115 73412 MIDWAYBR 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	101.2			
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	161.4	152.8	152.2	151.5
70121 COMANCHE 115 70122 COMANCHE 230 T1	System Normal	176	PSCo	104.3			
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T1	185	PSCo	154.0	145.8	145.2	144.6
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWAYBR 230 73419 RD. NIXON 230 1	100	PSCo/WAPA	104.3	114.5	115.3	116.1
70458 WALSENBG 115 70459 WALSENBG 230 T1	70458 WALSENBG 115 70459 WALSENBG 230 T2	100	Tri-State	115.2	111.6	111.3	111.0
70458 WALSENBG 115 70459 WALSENBG 230 T2	70458 WALSENBG 115 70459 WALSENBG 230 T1	100	Tri-State	115.4	111.8	111.5	111.2

Appendix H

**Alternative
TR3A**

Alternative TR3A - SLV Injections				SLV-W CANON single circuit 230kV Line with Poncha 230/115 kv Transformer Calumet-Comanche double circuit 345 kv				
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	0	0	0	0	0
			Injection Level in SLV	475	500	550	600	625
			Owner	Percent Overload (%)				
70550 W CANON 115 73551 W CANON 230 T1	73413 MIDWAYBR 230 73551 W CANON 230 1	100	Black Hills	117.3	122.7	133.4	143.9	149.1
70550 W CANON 115 70086 CANONCTY 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	120	Black Hills		100.8	111.4	122.1	127.6
70390 SKALA 115 70330 PORTLAND 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	105	Black Hills			107.1	119.8	126.3
70086 CANONCTY 115 70390 SKALA 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	105	Black Hills		102.1	114.6	127.3	133.7
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	120.7	120.1	118.9	117.8	117.3
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T2	185	PSCo	115.2	114.6	113.5	112.4	111.9
70435 TWNLAKTP 115 70273 MALTA 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	80	PSCo				100.3	108.2
70374 SANLSVLY 115 70375 SANLSVLY 230 T1	70374 SANLSVLY 115 70375 SANLSVLY 115 T2	150	PSCo/Tri-State			101.4	104.5	106.0
70374 SANLSVLY 115 70375 SANLSVLY 230 T2	70374 SANLSVLY 115 70375 SANLSVLY 115 T1	150	PSCo/Tri-State			101.5	104.5	106.0
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWAYBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	107.8	108.7	110.3	111.9	112.7

Alternative TR3A - Calumet Injections				SLV-W CANON single circuit 230kV Line with Poncha 230/115 kV Transformer Calumet-Comanche double circuit 345 kV		
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	975	1000	1025
			Injection Level in SLV	0	0	0
			Owner	Percent Overload (%)		
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	149.6	150.5	151.4
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	System Normal	105	Black Hills	106.2	106.8	107.4
70193 FTN VALL 115 70449 DESRTOV 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	101.7	103.5	105.2
70002 BURNT MI 115 70456 W. STATON 115 1	70330 PUEBPLNT 115 70352 READER 115 1	100	Black Hills	140.1	140.9	141.8
70236 HYDEPARK 115 70456 W. STATON 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	132.7	133.6	134.5
70330 PORTLAND 115 70456 W. STATON 115 1	System Normal	80	Black Hills	168.5	169.7	171.0
70330 PORTLAND 115 70456 W. STATON 115 1	70374 SANLSVLY 115 70379 SARGENT 115 1	80	Black Hills	112.1	112.9	113.7
70449 DESRTOV 115 70456 W. STATON 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	120.2	122.0	123.7
70030 APT PARK 115 70549 APT MEM 115 1	70003 NYBERG 230 70286 MIDWAYPS 230 1	105	Black Hills	102.6	103.2	103.8
70193 FTN VALL 115 73412 MIDWAYBR 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	100.9	102.6	104.4
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	160.8	161.5	162.2
70121 COMANCHE 115 70122 COMANCHE 230 T1	System Normal	176	PSCo	104.0	104.4	104.9
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T1	185	PSCo	153.4	154.1	154.8
70121 COMANCHE 115 70122 COMANCHE 230 T2	System Normal	185	PSCo			100.4
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWAYBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	103.3	103.6	104.0
70458 WALSENBG 115 70459 WALSENBG 230 T1	70458 WALSENBG 115 70459 WALSENBG 230 T2	100	Tri-State	114.6	115.4	116.2
70458 WALSENBG 115 70459 WALSENBG 230 T2	70458 WALSENBG 115 70459 WALSENBG 230 T1	100	Tri-State	114.8	115.6	116.4

Alternative TR3A - 550 MW at SLV				SLV-W CANON single circuit 230kV Line with Poncha 230/115 kV Transformer Calumet-Comanche double circuit 345 kV			
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	0	300	350	400
			Injection Level in SLV	550	550	550	550
			Owner	Percent Overload (%)			
70550 W CANON 115 73551 W CANON 230 T1	73413 MIDWAYBR 230 73551 W CANON 230 1	100	Black Hills	133.4	125.9	124.7	123.5
70550 W CANON 115 70086 CANONCTY 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	120	Black Hills	111.4	102.3	100.9	
70390 SKALA 115 70330 PORTLAND 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	105	Black Hills	107.1			
70086 CANONCTY 115 70390 SKALA 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	105	Black Hills	114.6	103.7	101.9	100.2
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills		101.8	103.3	104.9
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	118.9	126.6	127.9	129.2
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T2	185	PSCo	113.5	120.8	122.1	123.3
70374 SANLSVLY 115 70375 SANLSVLY 230 T1	70374 SANLSVLY 115 70375 SANLSVLY 115 T2	150	PSCo/Tri-State	101.4	102.0	102.1	102.2
70374 SANLSVLY 115 70375 SANLSVLY 230 T2	70374 SANLSVLY 115 70375 SANLSVLY 115 T1	150	PSCo/Tri-State	101.5	102.0	102.1	102.2
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWAYBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	110.3	114.6	115.3	116.0

Alternative TR3A - 500 MW at Calumet				SLV-W CANON single circuit 230kV Line with Poncha 230/115 kV Transformer Calumet-Comanche double circuit 345 kV		
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	500	500	500
			Injection Level in SLV	475	500	525
			Owner	Percent Overload (%)		
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	111.1	110.1	109.0
70002 BURNT MI 115 70456 W.STATON 115 1	70330 PUEBPLNT 115 70352 READER 115 1	100	Black Hills	103.5	102.5	101.5
70550 W CANON 115 73551 W CANON 230 T1	73413 MIDWAYBR 230 73551 W CANON 230 1	100	Black Hills	104.9	110.3	115.7
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	133.7	133.1	132.5
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T1	185	PSCo	127.6	127.0	126.4
70374 SANLSVLY 115 70375 SANLSVLY 230 T1	70374 SANLSVLY 115 70375 SANLSVLY 115 T2	150	PSCo/Tri-State			100.9
70374 SANLSVLY 115 70375 SANLSVLY 230 T2	70374 SANLSVLY 115 70375 SANLSVLY 115 T1	150	PSCo/Tri-State			100.9
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWARBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	114.9	115.7	116.6

Alternative TR3A- 1000 MW at Calumet				SLV-W CANON single circuit 230kV Line with Poncha 230/115 kV Transformer Calumet-Comanche double circuit 345 kV			
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	1000	1000	1000	1000
			Injection Level in SLV	0	275	300	325
Loaded Element	Contingency	Rating (MVA)	Owner	Percent Overload (%)			
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	150.5	136.8	135.7	134.5
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	System Normal	105	Black Hills	106.8			
70193 FTN VALL 115 70449 DESRTOV 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	103.5			
70002 BURNT MI 115 70456 W. STATON 115 1	70330 PUEBPLNT 115 70352 READER 115 1	100	Black Hills	140.9	128.0	126.9	125.8
70236 HYDEPARK 115 70456 W. STATON 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	133.6	120.0	118.8	117.6
70330 PORTLAND 115 70456 W. STATON 115 1	System Normal	80	Black Hills	169.7	109.8	107.9	106.6
70330 PORTLAND 115 70456 W. STATON 115 1	70374 SANLSVLY 115 70379 SARGENT 115 1	80	Black Hills	112.9			
70449 DESRTOV 115 70456 W. STATON 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	122.0	108.0	106.7	105.5
70030 APT PARK 115 70549 APT MEM 115 1	70003 NYBERG 230 70286 MIDWAYPS 230 1	105	Black Hills	103.2	100.5	100.2	100.0
70193 FTN VALL 115 73412 MIDWAYBR 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	102.6			
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	161.5	153.0	152.2	151.5
70121 COMANCHE 115 70122 COMANCHE 230 T1	System Normal	176	PSCo	104.4			
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T1	185	PSCo	154.1	146.0	145.3	144.6
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWAYBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	103.6	114.7	115.7	116.6
70458 WALSENBG 115 70459 WALSENBG 230 T1	70458 WALSENBG 115 70459 WALSENBG 230 T2	100	Tri-State	115.4	111.6	111.3	111.0
70458 WALSENBG 115 70459 WALSENBG 230 T2	70458 WALSENBG 115 70459 WALSENBG 230 T1	100	Tri-State	115.6	111.9	111.5	111.2

Appendix I

**Alternative
TR4**

Alternative TR4 - SLV Injections				Only Minor 115kV upgrades in SLV Area Calumet-Comanche double circuit 345 kv					
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	0	0	0	0	0	0
			Injection Level in SLV	225	240	250	255	260	275
			Owner	Percent Overload (%)					
70236 HYDEPARK 115	70002 BURNT MI 115	105	Black Hills	106.7	106.1	105.7	105.5	105.3	104.7
70339 PUEBPLNT 115 1	70456 W. STATON 115 1								
70330 PORTLAND 115	70550 W CANON 115								
70456 W.STATON 115 1	70086 CANONCITY 115 1	80	Black Hills	101.5	101.2	101.0	100.9	100.8	100.5
70327 PONCHA 115	70375 SANLSVLVY 230	128	PSCo					101.4	113.5
70379 SARGENT 115 1	79054 PONCHBR 230 1								
70121 COMANCHE 115	70121 COMANCHE 115								
70122 COMANCHE 230 T1	70122 COMANCHE 115 T2	176	PSCo	128.2	127.8	127.5	127.4	127.3	126.9
70121 COMANCHE 115	70121 COMANCHE 115	185	PSCo	122.3	121.9	121.7	121.6	121.5	121.1
70122 COMANCHE 230 T2	70122 COMANCHE 115 T1								
70374 SANLSVLVY 115	70375 SANLSVLVY 230								
70379 SARGENT 115 1	79054 PONCHBR 230 1	159	PSCo						100.0
73412 MIDWAYBR 115	73413 MIDWAYBR 230	100	PSCo/WAPA						100.1
73413 MIDWAYBR 230 1	73419 RD_NIXON 230 1								

Alternative TR4 - Calumet Injections				Only Minor 115kV upgrades in SLV Area Calumet-Comanche double circuit 345 kV		
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	975	1000	1025
			Injection Level in SLV	0	0	0
			Owner	Percent Overload (%)		
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	149.8	150.7	151.6
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	System Normal	105	Black Hills	106.4	107.0	107.6
70193 FTN VALL 115 70449 DESRTC OV 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	100.3	102.0	103.8
70002 BURNT MI 115 70456 W. STATON 115 1	70330 PUEBPLNT 115 70352 READER 115 1	100	Black Hills	140.3	141.1	142.0
70236 HYDEPARK 115 70456 W. STATON 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	132.8	133.7	134.6
70330 PORTLAND 115 70456 W. STATON 115 1	73413 MIDWATBR 230 73551 W CANON 230 1	80	Black Hills	165.6	166.8	168.0
70330 PORTLAND 115 70456 W. STATON 115 1	System Normal	80	Black Hills	112.5	113.3	114.1
70449 DESRTC OV 115 70456 W. STATON 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills		120.7	122.4
70030 APT PARK 115 70549 APT MEM 115 1	70003 NYBERG 230 70286 MIDWAYPS 230 1	105	Black Hills	102.5	103.1	103.8
70193 FTN VALL 115 73412 MIDWAYBR 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills		101.2	102.9
70550 W CANON 115 73551 W CANON 230 T1	70330 PORTLAND 115 70456 W. STATON 115 1	100	Black Hills	103.2	103.5	103.7
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	161.0	161.7	162.4
70121 COMANCHE 115 70122 COMANCHE 230 T1	System Normal	176	PSCo	104.0	104.5	105.0
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T1	185	PSCo	153.6	154.3	155.0
70121 COMANCHE 115 70122 COMANCHE 230 T2	System Normal	185	PSCo		100.0	100.5
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWATBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	104.1	104.5	104.8
70458 WALSENBG 115 70459 WALSENBG 230 T1	70458 WALSENBG 115 70459 WALSENBG 230 T2	100	Tri-State	114.5	115.3	116.1
70458 WALSENBG 115 70459 WALSENBG 230 T2	70458 WALSENBG 115 70459 WALSENBG 230 T1	100	Tri-State	114.7	115.5	116.3

Alternative TR4 - Simultaneous Injections				Only Minor 115kV upgrades in SLV Area Calumet-Comanche double circuit 345 kV				
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	1000	1000	1000	975	950
			Injection Level in SLV	200	225	250	250	250
			Owner	Percent Overload (%)				
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	141.3	140.2	139.2	138.3	137.4
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	System Normal	105	Black Hills	100.4				
70002 BURNT MI 115 70456 W.STATON 115 1	70330 PUEBPLNT 115 70352 READER 115 1	100	Black Hills	132.2	131.2	130.2	129.3	128.5
70236 HYDEPARK 115 70456 W.STATON 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	124.4	123.3	122.2	121.3	120.4
70330 PORTLAND 115 70456 W.STATON 115 1	73413 MIDWATER 230 73551 W CANON 230 1	80	Black Hills	126.4	124.7	123.0	122.3	121.7
70449 DESRTOCV 115 70456 W.STATON 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	111.5	110.4	109.3	107.5	105.8
70030 APT PARK 115 70549 APT MEM 115 1	70003 NYBERG 230 70286 MIDWAYPS 230 1	105	Black Hills	101.3	101.1	100.9	100.2	
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	155.8	155.1	154.4	153.7	153.0
70121 COMANCHE 115 70122 COMANCHE 230 T1	System Normal	176	PSCo	100.7	100.2			
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T1	185	PSCo	148.6	148.0	147.4	146.7	146.0
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWAYBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	111.9	112.7	113.6	113.2	112.8
70458 WALSENBG 115 70459 WALSENBG 230 T1	70458 WALSENBG 115 70459 WALSENBG 230 T2	100	Tri-State	112.8	112.5	112.2	111.4	110.6
70458 WALSENBG 115 70459 WALSENBG 230 T2	70458 WALSENBG 115 70459 WALSENBG 230 T1	100	Tri-State	113.0	112.7	112.5	111.6	110.2

Appendix J

Alternative TR4AR

Alternative TR4AR - SLV Injections				Minor 115kV upgrade in SLV Area with Poncha 230/115 kV Transformer and SLV to Poncha 230 kV Generation RAS Calumet-Comanche double circuit 345 kV		
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	0	0	0
			Injection Level in SLV	500	525	550
			Owner	Percent Overload (%)		
70550 W CANON 115 70086 CANONCTY 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	120	Black Hills			103.1
70086 CANONCTY 115 70390 SKALA 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	105	Black Hills			104.7
70550 W CANON 115 73551 W CANON 230 T1	73413 MIDWAYBR 230 73551 W CANON 230 1	100	Black Hills		101.6	105.3
70435 TWNLAOTP 115 70273 MALTA 115 1	73413 MIDWAYBR 230 73551 W CANON 230 1	80	PSCo			102.9
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	121.9	121.4	121.0
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T2	185	PSCo	116.3	115.9	115.5
70026 ALMSA TM 69 70025 ALMSA TM 115 T1	70374 SANLSVLY 115 70379 SARGENT 115 1	25	PSCo		100.2	101.7
70374 SANLSVLY 115 70375 SANLSVLY 230 T1	70374 SANLSVLY 115 70375 SANLSVLY 115 T2	150	PSCo/Tri-State	112.4	114.9	117.4
70374 SANLSVLY 115 70375 SANLSVLY 230 T2	70374 SANLSVLY 115 70375 SANLSVLY 115 T1	150	PSCo/Tri-State	112.4	114.9	117.4
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWAYBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	105.8	106.4	107.1

Alternative TR4AR - Calumet Injections				Minor 115kV upgrades in SLV Area with Poncha 230/115 kV Transformer abd SLV to Poncha 230kV Generation RAS Calumet-Comanche double circuit 345 kV		
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	975	1000	1025
			Injection Level in SLV	0	0	0
			Owner	Percent Overload (%)		
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	149.7	150.6	151.5
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	System Normal	105	Black Hills	106.3	106.9	107.6
70193 FTN VALL 115 70449 DESRTOV 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	100.1	101.8	103.6
70002 BURNT MI 115 70456 W.STATON 115 1	70330 PUEBPLNT 115 70352 READER 115 1	100	Black Hills	140.2	141.0	141.9
70236 HYDEPARK 115 70456 W.STATON 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	132.7	133.6	134.5
70330 PORTLAND 115 70456 W.STATON 115 1	73413 MIDWATER 230 73551 W CANON 230 1	80	Black Hills	164.9	166.1	167.3
70330 PORTLAND 115 70456 W.STATON 115 1	System Normal	80	Black Hills	112.2	112.9	113.7
70449 DESRTOV 115 70456 W.STATON 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	118.7	120.5	122.2
70030 APT PARK 115 70549 APT MEM 115 1	70003 NYBERG 230 70286 MIDWAYPS 230 1	105	Black Hills	102.5	103.2	103.8
70193 FTN VALL 115 73412 MIDWAYBR 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills		101.0	102.7
70550 W CANON 115 73551 W CANON 230 T1	70330 PORTLAND 115 70456 W. STATON 115 1	100	Black Hills		100.0	100.2
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	160.9	161.7	162.4
70121 COMANCHE 115 70122 COMANCHE 230 T1	System Normal	176	PSCo	104.0	104.5	104.9
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T1	185	PSCo	153.6	154.3	155.0
70121 COMANCHE 115 70122 COMANCHE 230 T2	System Normal	185	PSCo		100.0	100.5
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWARBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	103.9	104.3	104.7
70458 WALSENBG 115 70459 WALSENBG 230 T1	70458 WALSENBG 115 70459 WALSENBG 230 T2	100	Tri-State	114.4	115.3	116.1
70458 WALSENBG 115 70459 WALSENBG 230 T2	70458 WALSENBG 115 70459 WALSENBG 230 T1	100	Tri-State	114.7	115.5	116.3

Alternative TR4AR - 525 MW at SLV				Minor 115kV upgrades in SLV Area with Poncha 230/115 kV Transformer and SLV to Poncha 230kV Generation RAS Calumet-Comanche double circuit 345 kV					
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	0	100	200	300	500	575
			Injection Level in SLV	525	525	525	525	525	
			Owner	Percent Overload (%)					
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills			102.2	105.2	111.3	113.7
70002 BURNT MI 115 70456 W.STATON 115 1	70330 PUEBPLNT 115 70352 READER 115 1	100	Black Hills					103.6	105.9
70330 PORTLAND 115 70456 W.STATON 115 1	70550 W CANON 115 70086 CANONCITY 115 1	80	Black Hills					100.7	101.3
70550 W CANON 115 73551 W CANON 230 T1	73413 MIDWAYBR 230 73551 W CANON 230 1	100	Black Hills	101.6					
70435 TWNLAKTP 115 70273 MALTA 115 1	79054 PONCHABR 230 73551 W CANON 230 1	80	Black Hills					100.1	101.0
70026 ALMSA TM 69 70025 ALMSA TM 115 T1	70374 SANLSVLY 115 70379 SARGENT 115 1	25	PSCo		100.3	100.3	100.3	100.4	100.4
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	121.4	123.8	126.4	129.0	134.2	136.2
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T2	185	PSCo	115.9	118.2	120.6	123.1	128.1	130.0
70374 SANLSVLY 115 70375 SANLSVLY 230 T1	70374 SANLSVLY 115 70375 SANLSVLY 115 T2	150	PSCo/Tri-State	114.9	115.0	115.0	115.1	115.2	115.3
70374 SANLSVLY 115 70375 SANLSVLY 230 T2	70374 SANLSVLY 115 70375 SANLSVLY 115 T1	150	PSCo/Tri-State	114.9	115.0	115.1	115.1	115.3	115.3
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWAYBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	106.4	108.0	109.4	110.8	113.7	114.8

Alternative TR4AR - 500 MW at SLV				Minor 115kV upgrades in SLV Area with Poncha 230/115 kV Transformer and SLV to Poncha 230 kV Generation RAS Calumet-Comanche double circuit 345 kV				
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	500	550	650	700	725
			Injection Level in SLV	500	500	500	500	500
			Owner	Percent Overload (%)				
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	112.2	113.8	117.0	118.6	119.4
70002 BURNT MI 115 70456 W.STATON 115 1	70330 PUEBPLNT 115 70352 READER 115 1	100	Black Hills	104.4	105.9	109.0	110.6	111.3
70330 PORTLAND 115 70456 W.STATON 115 1	70550 W CANON 115 70086 CANONCITY 115 1	80	Black Hills	100.9	101.3	102.0	102.4	102.6
70236 HYDEPARK 115 70456 W.STATON 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills				101.4	102.3
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	134.7	136.1	138.7	140.1	140.8
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T2	185	PSCo	128.6	129.8	132.4	133.7	134.3
70374 SANLSVLY 115 70375 SANLSVLY 230 T1	70374 SANLSVLY 115 70375 SANLSVLY 115 T2	150	PSCo/Tri-State	112.8	112.8	112.9	112.9	112.9
70374 SANLSVLY 115 70375 SANLSVLY 230 T2	70374 SANLSVLY 115 70375 SANLSVLY 115 T1	150	PSCo/Tri-State	112.8	112.8	112.9	112.9	113.0
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWAYBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	113.0	113.7	115.2	115.9	116.3
70458 WALSENBG 115 70459 WALSENBG 230 T1	70458 WALSENBG 115 70459 WALSENBG 230 T2	100	Tri-State					100.0
70458 WALSENBG 115 70459 WALSENBG 230 T2	70458 WALSENBG 115 70459 WALSENBG 230 T1	100	Tri-State					100.2

Alternative TR4AR - 1000MW at Calumet				Minor 115kV upgrades in SLV Area with Poncha 230/115 kV Transformer and SLV to Poncha 230 kV Generation RAS Calumet-Comanche double circuit 345 kV			
Loaded Element	Contingency	Rating (MVA)	Injection Level in Calumet	1000	1000	1000	1000
			Injection Level in SLV	0	275	300	325
			Owner	Percent Overload (%)			
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	150.6	137.6	136.5	135.5
70236 HYDEPARK 115 70339 PUEBPLNT 115 1	System Normal	105	Black Hills	106.9			
70193 FTN VALL 115 70449 DESRTOCOV 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	101.8			
70002 BURNT MI 115 70456 W.STATON 115 1	70330 PUEBPLNT 115 70352 READER 115 1	100	Black Hills	141.0	128.7	127.6	126.6
70236 HYDEPARK 115 70456 W.STATON 115 1	70002 BURNT MI 115 70456 W. STATON 115 1	105	Black Hills	133.6	120.6	119.5	118.5
70330 PORTLAND 115 70456 W.STATON 115 1	73413 MIDWATBR 230 73551 W CANON 230 1	80	Black Hills	166.1	109.0	108.4	107.9
70330 PORTLAND 115 70456 W.STATON 115 1	System Normal	80	Black Hills	112.9			
70449 DESRTOCOV 115 70456 W.STATON 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	120.5	109.4	108.4	107.4
70030 APT PARK 115 70549 APT MEM 115 1	70003 NYBERG 230 70286 MIDWAYPS 230 1	105	Black Hills	103.2	100.8	100.6	100.5
70193 FTN VALL 115 73412 MIDWAYBR 115 1	70286 MIDWAYPS 230 73413 MIDWAYBR 230 1	105	Black Hills	101.0			
70550 W CANON 115 73551 W CANON 230 T1	70330 PORTLAND 115 70456 W. STATON 115 1	100	Black Hills	100.0			
70121 COMANCHE 115 70122 COMANCHE 230 T1	70121 COMANCHE 115 70122 COMANCHE 115 T2	176	PSCo	161.7	153.6	153.0	152.3
70121 COMANCHE 115 70122 COMANCHE 230 T1	System Normal	176	PSCo	104.5			
70121 COMANCHE 115 70122 COMANCHE 230 T2	70121 COMANCHE 115 70122 COMANCHE 115 T1	185	PSCo	154.3	146.6	146.0	145.4
70121 COMANCHE 115 70122 COMANCHE 230 T2	System Normal	185	PSCo	100.0			
70327 PONCHA 115 70379 SARGENT 115 1	70375 SANLSVLY 230 79054 PONCHBR 230 1	128	PSCo		113.2	133.8	156.2
70374 SANLSVLY 115 70379 SARGENT 115 1	70375 SANLSVLY 230 79054 PONCHBR 230 1	159	PSCo			114.3	130.0
70374 SANLSVLY 115 70375 SANLSVLY 230 T1	70375 SANLSVLY 230 79054 PONCHBR 230 1	150	PSCo/Tri-State			100.8	110.2
70374 SANLSVLY 115 70375 SANLSVLY 230 T2	70375 SANLSVLY 230 79054 PONCHBR 230 1	150	PSCo/Tri-State			100.8	110.2
73412 MIDWAYBR 115 73413 MIDWAYBR 230 1	73413 MIDWARBR 230 73419 RD_NIXON 230 1	100	PSCo/WAPA	104.3	113.6	114.4	115.2
70458 WALSENBG 115 70459 WALSENBG 230 T1	70458 WALSENBG 115 70459 WALSENBG 230 T2	100	Tri-State	115.3	111.9	111.6	111.3
70458 WALSENBG 115 70459 WALSENBG 230 T2	70458 WALSENBG 115 70459 WALSENBG 230 T1	100	Tri-State	115.5	112.1	111.8	111.6

Appendix K

Internal Public Service Correspondence Related to Current SLV Generation Addition Limit

**(Attachment TR2-5.A19 to Public
Service's Response to TR2-5 in
CPCN Dockets)**

From: Silver, David W
To: Stellern; Gerald M
Date: Mon 3/9/2009 12:21 pm
Subject: San Luis Valley Maximum Generation

Gerry,

At your request, I examined the maximum generation that can be installed at the San Luis Valley Substation without network upgrades. The studies were based on a 2012 Heavy Summer budget load flow case with Zone 710 (San Luis Valley) load scaled back to 60% of peak. The primary contingency that was examined was the loss of the Poncha Branch-San Luis Valley 230 kV circuit leaving the San Luis Valley area served entirely from the Poncha-Sargent-San Luis Valley 115 kV circuit. I did not impose the San Luis Valley RAS scheme to trip Tri-State load in the area following loss of the 230 kV line. The generation was modeled on both the 230 kV and 115 kV buses with a 60/40 ratio, respectively.

The results indicate a very weak system in the area. I was unable to raise the generation to the thermal limit of the 115 kV line before the case failed to converge (blow up). That is very likely a voltage collapse point. Therefore, after imposing a 10% margin (reduction), the maximum generation that can be installed at the San Luis Valley Substation is 130 MW. Note that at that level, the San Luis Valley-Sargent 115 kV circuit is loaded to 89% of its 102 MVA rating. The Sargent-Poncha 115 kV circuit is loaded to 88% of its 102 MVA rating.

Let me know if you have any questions.

Regards,
David W. Silver, P.E.

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