Interconnection Feasibility Study Report
Request # GI-2012-3

60 MW Wind Generation Facility Expansion at Spring Canyon

PSCo Transmission Planning
June 12, 2013

Executive Summary

On May 22, 2012, Public Service Company of Colorado (PSCo) Transmission received a generation request to determine the feasibility of interconnecting a 60 MW wind generation expansion to the existing 60 MW Spring Canyon Energy wind generation facility located at the jointly owned Spring Canyon Substation in Logan County Colorado. Generation from the expansion will be supplied to the PSCo Balancing Authority (BA). The Customer requested a primary Point of Interconnection (POI) on the 230 kV bus at the existing Spring Canyon Substation. No alternative POI was requested. The Customer proposed a commercial operation date of December 1, 2013. Based on projected equipment lead-times and other transmission project in service dates, the commercial operation date requested by the Customer is not feasible.

This request was studied as an Energy Resource (ER)[1] only. The study included steady-state power flow and short-circuit analysis only, and did not include a transient dynamic stability analysis. The request was studied as a stand-alone project only, with no evaluations made of other potential new generation requests that may exist in the Large Generator Interconnection Request (LGIR) queue, other than the generation projects that are already approved and planned to be in service by the winter of 2013. The main purpose of this Feasibility Study was to evaluate the potential impact on the PSCo transmission infrastructure as well as that of neighboring utilities, when injecting the new 60 MW of generation into the Spring Canyon 230 kV bus, and delivering the additional generation to the PSCo BA. Affects on other entities' nearby transmission systems will need to be analyzed by the affected parties.

A 2013 Heavy Summer (HS) Western Electricity Coordinating Council (WECC) case was used to conduct the study. This benchmark case scenario was used to analyze the impacts when adding GI-2012-3 to the existing transmission system. The generation dispatch for this benchmark case was adjusted to simulate high north-to-south flow

[1] **Energy Resource Interconnection Service (ER Interconnection Service)** shall mean an Interconnection Service that allows the Interconnection Customer to connect its Generating Facility to the Transmission Provider's Transmission System to be eligible to deliver the Generating Facility's electric output using the existing firm or non-firm capacity of the Transmission Provider's Transmission System on an as available basis. Energy Resource Interconnection Service in and of itself does not convey transmission service.

levels across the TOT3 transfer path. Wind generation at the existing Spring Canyon was modeled at 21% in the benchmark case and increased to 100% with the addition of GI-2012-3. Single contingencies were applied.

With the addition of GI-2012-3, the parallel 34.5/230 kV generator step-up (GSU) transformers at Spring Canyon were overloaded by 162% of their thermal rating when one transformer was taken out of service[2]. The Customer has indicated this overload is not possible due to absence of a bus tie breaker on the 34.5 kV bus. Additionally, the Sidney 230/115 kV transformer was overloaded by 115.5% when the North Yuma – Spring Canyon 230 kV line was taken out of service. Currently there is an agreement which indicates the existing Spring Canyon facility must curtail its wind generation to 0 MW at Spring Canyon in the event either end of the North Yuma – Spring Canyon 230 kV line unintentionally opens; however, the Customer will need to contact TSGT to discuss mitigation of this transformer overload when interconnecting GI-2012-3. Finally, the Alvin – Wauneta 115 kV line is overloaded by 110% when the North Yuma – Wray 230 kV line is taken out of service. WAPA has indicated they are aware of this overload and have future plans for mitigation. Low voltage violations (below 0.90 per unit) were observed at Burlington 115 kV, 230 kV and the two 13.8 kV generator busses when the Lands Creek to Burlington 230 kV line was taken out of service due to the addition of GI-2012-3.

Energy Resource (ER)

ER = 0 MW

Interconnection to the PSCo network is feasible however, firm capacity is not available due to existing firm transmission commitments, and is not possible without the construction of network reinforcements. Non-firm transmission capability may be available depending on marketing activities, dispatch patterns, generation levels, demand levels, import path levels (TOT 3, etc.) and the operational status of transmission facilities.

The cost for the transmission interconnection (in 2013 dollars):
Recommended system upgrades include adjustments to existing metering (retapping current transformers and reprogramming the meter) to account for the additional generation. The total estimated cost of the recommended system upgrades to interconnect the project is approximately **$ 21,511** and includes:

- $ 0 for PSCo-Owned, Customer-Funded Interconnection Facilities
- $ 21,511 for PSCo-Owned, PSCo-Funded Network Upgrades for Interconnection
- $ 0 for PSCo Network Upgrades for Delivery

[2] The rating of the Spring Canyon GSU transformers in the case was 74.7 MVA which is greater than the 66.6 MVA rating supplied in the customer one-line diagram. The larger rating in the case was assumed.

A partial one-line of the Spring Canyon Substation detailing the Interconnection and Delivery is shown in Figure 1.

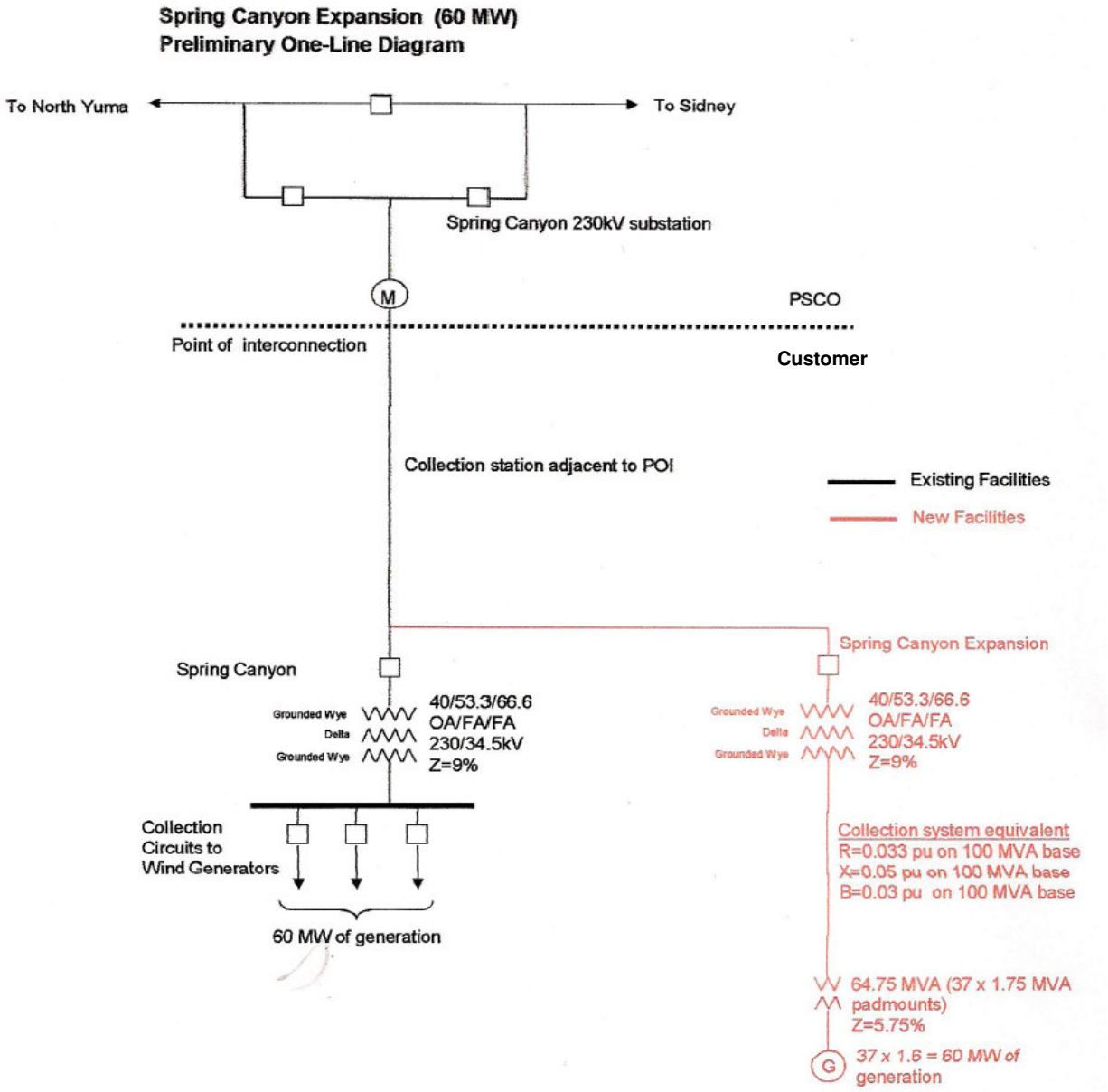

Figure 1: Proposed Spring Canyon One-Line Diagram (Upgrades Marked in Red)

Introduction

Public Service Company of Colorado (PSCo) Transmission Planning received a generation request on May 22, 2012, to determine the feasibility of interconnecting a 60 MW wind generation expansion to the existing 60 MW Spring Canyon Energy wind generation facility. The Customer's project facility would consist of 37 GE 1.6 MW wind turbines and would be located immediately adjacent to the existing Spring Canyon Energy Facility, near Peetz Colorado in Logan County. Generation from the expansion will be supplied to the PSCo Balancing Authority (BA) and delivered to PSCo native load customers.

The Customer requested a primary Point of Interconnection (POI) on the 230 kV bus at the existing Spring Canyon Substation. No alternative POI was requested.

The Customer proposed a commercial operation date of December 1, 2013. Based on projected equipment lead-times and other transmission project in service dates, the commercial operation date requested by the Customer is not feasible.

The Customer has requested that this project be evaluated as an Energy Resource (ER) only, with the generation delivered to PSCo native load customers.

Study Scope and Analysis

PSCo conducted a Feasibility Study Analysis for the interconnection of a 60 MW wind generation expansion to the existing 60 MW Spring Canyon Energy wind generation facility. The analysis consisted of power flow and short circuit analyses. The power flow analysis provided a preliminary identification of any thermal or voltage limit violations resulting for the interconnection. The short circuit analysis identified any circuit breaker short circuit capability limits exceeded as a result of the Interconnection.

PSCo adheres to NERC / WECC Reliability Criteria, as well as internal Company criteria for planning studies. During system intact conditions, transmission system bus voltages are to be maintained between 0.95 and 1.05 per-unit of system nominal / normal conditions, and steady state power flows within 1.0 per-unit of all elements thermal (continuous current or MVA) ratings. Operationally, PSCo tries to maintain a transmission system voltage profile ranging from 1.03 per-unit or higher at generation buses, to 1.0 per-unit or higher at transmission load buses. Following a single contingency element outage, transmission system steady state bus voltages must remain within 0.90 per-unit to 1.05 per-unit, and power flows within 1.0 per-unit of the elements continuous thermal ratings.

For this project, potential affected parties include Western Area Power Administration (WAPA) and Tri-State Generation & Transmission (TSGT). PSCo has coordinated and cooperated on its study assessment through e-mail and phone correspondence and has also forwarded a copy of this feasibility study report to the affected parties.

Power Flow Study Models

A 2013 Heavy Summer (HS) Western Electricity Coordinating Council (WECC) case was modified to reflect topological, loading and generation changes as discussed with the affected parties and the Customer. This benchmark case scenario was used to analyze the impacts when adding GI-2012-3 to the existing transmission system. Automated contingency power flow studies were completed on all case models, switching out single elements (lines and transformers) one at a time in the study area. Results from the contingency analyses were compared to identify thermal or voltage limit violations resulting from the addition of GI-2012-3.

Generation dispatch in area 70 (PSCo) for the benchmark case was adjusted to simulate high north-to-south flow levels across the TOT3 transfer path. The TOT3 interface flow was set to 1338.3 MW and the TOT7 interface flow was set to 418.2 MW. Manchief units 1 and 2, Ft. St. Vrain units 5 and 6, and UNC units 1, 2 and 3 were each set off-line, while the Rawhide units A, B and D were turned on.

PSCo control area (Area 70) wind generation facilities near Pawnee, Missile Site, and the Peetz Logan and Cedar Creek facilities were dispatched at approximately 21% of their respective ratings. Wind generation at the existing Spring Canyon facility was modeled at 100% for the benchmark case and the addition of GI-2012-3 was also modeled at 100%.

A complete list of the generation facilities for each of the models in area 70 (PSCo) and area 73 (WAPA) is presented in Table A1 in the Appendix.

The proposed generation expansion facility, as modeled, consists of one lumped generation unit representing the 37 individual GE 1.6 MW wind turbines. The generator has a terminal voltage of 34.5 kV and is connected to the 230 kV system through one 34.5/230 kV transformer. The 34.5/230 kV transformer is in parallel with another existing transformer for the current generation facility. For modeling purposes, the generator was set to control the bus voltage on the facility's 34.5 kV bus to 1.030 per-unit.

A single-line diagram showing the transmission system model with high TOT3 flows is presented as Figure B1 in the Appendix. Figure B2 in the Appendix indicates the flows with the addition of the GI-2012-3 project.

Stand Alone Power Flow Results

ER = 0 MW

Interconnection to the PSCo network is feasible however, firm capacity is not available due to existing firm transmission commitments, and is not possible without the

construction of network reinforcements. Non-firm transmission capability may be available depending on marketing activities, dispatch patterns, generation levels, demand levels, import path levels (TOT 3, etc.) and the operational status of transmission facilities.

With the addition of GI-2012-3, the parallel 34.5/230 kV generator step-up (GSU) transformers at Spring Canyon were overloaded by 162% of their thermal rating when one transformer was taken out of service. The customer has indicated that there will not be a bus tie breaker between the 34.5 kV busses at Spring Canyon; therefore, when one of the transformers is out, the generation for that portion of the facility will also be out thereby eliminating the possibility of overloading the remaining transformer.

PSCo's Weld – Greeley 115 kV line is also overloaded by 111.3%; however this is not related to the addition of GI-2012-3. This overload is a result of the generation changes made to the WECC 2013 HS case with the retirement of the UNC generation facilities. PSCo is currently upgrading its facilities at Weld in order to increase the rating of the line from 181 MVA to 219 MVA, thereby eliminating the overload.

Additionally, the Sidney 230/115 kV transformer was overloaded by 115.5% when the North Yuma – Spring Canyon 230 kV line was taken out of service. Currently there is an agreement which indicates the existing Spring Canyon facility must curtail its wind generation to 0 MW at Spring Canyon in the event either end of the North Yuma – Spring Canyon 230 kV line unintentionally opens. TSGT has indicated it will not permit curtailment of generation to be a mitigation solution to an N-1 overload of a TSGT transmission element. Therefore, when adding GI-2012-3 for a total of 120 MW of wind generation (60 MW existing plus 60 MW expansion), the above mentioned operating procedure would not be allowed to mitigate the overload above the Sidney transformer's 203 MVA (continuous and emergency) rating. The Customer will need to submit a formal request to TSGT to discuss mitigation of this transformer overload when interconnecting GI-2012-3.

Finally, with the addition of GI-2012-3, the Alvin – Wauneta 115 kV line is overloaded by 110% when the North Yuma – Wray 230 kV line is taken out of service. WAPA has indicated that the limiting elements on the Alvin line termination at Wauneta are presently rated at 200 A (40 MVA), and are based on SCADA transducers or panel meters which are fed from the WAPA breakers 262 & 362 bushing CTs. WAPA has also indicated they have plans to mitigate this overload. The Customer will need to contact WAPA to discuss mitigation of this elemental overload when interconnecting GI-2012-3.

Low voltage violations (below 0.90 per unit) were observed at Burlington 115 kV, 230 kV and the two 13.8 kV generator busses when the Lands Creek to Burlington 230 kV line was taken out of service due to the addition of GI-2012-3. Results from the contingency analysis can be seen below in Table 1.

			WECC 2013HS Case		Benchmark Stressed Case		Stressed with GI-2012-3	
Contingency	***Monitered Element***	Line Rating (MVA)	Flow (MVA)	Percent Loading (%)	Flow (MVA)	Percent Loading (%)	Flow (MVA)	Percent Loading (%)
BUS 70005 [BRUSH_SS 115.00] TO BUS 70397 [B.CRK_PS 115.00] CKT 2	70005 BRUSH_SS 115.00 70397 B.CRK_PS 115.00 1	181	192	105.3	192	105.3	193	105.6
BUS 70005 [BRUSH_SS 115.00] TO BUS 70397 [B.CRK_PS 115.00] CKT 1	70005 BRUSH_SS 115.00 70397 B.CRK_PS 115.00 2	181	193	105.5	193	105.5	193	105.8
BUS 70470 [WELD_PS 115.00] TO BUS 70475 [ARROWHLK 115.00] CKT 1	70209 GREELEY 115.00 70470 WELD_PS 115.00 1	181			203	111.2	203	111.3
BUS 70310 [PAWNEE 22.000] TO BUS 70311 [PAWNEE 230.00] CKT U2	70310 PAWNEE 22.000 70311 PAWNEE 230.00 U1	364	487	133.8	486	133.6	487	133.8
BUS 70310 [PAWNEE 22.000] TO BUS 70311 [PAWNEE 230.00] CKT U1	70310 PAWNEE 22.000 70311 PAWNEE 230.00 U2	364	487	133.8	486	133.6	487	133.8
BUS 70721 [SPRNGCAN 34.500] TO BUS 73579 [SPRNGCAN 230.00] CKT 2	70721 SPRNGCAN 34.500 73579 SPRNGCAN 230.00 1	74.7					121	162.2
BUS 73143 [N.YUMA 230.00] TO BUS 73224 [WRAY 230.00] CKT 1	73005 ALVIN 115.00 73210 WAUNETA 115.00 1	40	43	107.5	42	104.5	44	110
BUS 73143 [N.YUMA 230.00] TO BUS 73579 [SPRNGCAN 230.00] CKT 1	73179 SIDNEY 115.00 73180 SIDNEY 230.00 1	203			210	103.4	234	115.5
BUS 73189 [STEGALL 115.00] TO BUS 73190 [STEGALL 230.00] CKT 2	73189 STEGALL 115.00 73190 STEGALL 230.00 1	100	107	107.3	107	106.8	107	106.7
BUS 70721 [SPRNGCAN 34.500] TO BUS 73579 [SPRNGCAN 230.00] CKT 1	70721 SPRNGCAN 34.500 73579 SPRNGCAN 230.00 2	74.7					121	162.2
Contingency	***Monitered Element***			Voltage (pu)		Voltage (pu)		Voltage (pu)
BUS 72710 [LANDS.CRK1 230.00] TO BUS 73036 [BURLNGTN 230.00] CKT 1	73035 BURLNGTN 115.00							0.89768
BUS 72710 [LANDS.CRK1 230.00] TO BUS 73036 [BURLNGTN 230.00] CKT 1	73036 BURLNGTN 230.00							0.89768
BUS 72710 [LANDS.CRK1 230.00] TO BUS 73036 [BURLNGTN 230.00] CKT 1	73302 BRLNGTN1 13.800							0.89768
BUS 72710 [LANDS.CRK1 230.00] TO BUS 73036 [BURLNGTN 230.00] CKT 1	73303 BRLNGTN2 13.800							0.89768

Table 1: Contingency Analysis for GI-2012-3

Short Circuit Study Results

A short circuit breaker duty analysis was conducted to determine if the available fault current (single-line-to ground or three-phase) exceeds the interrupt ratings of any circuit breakers at the Spring Canyon Substation. The fault study compared the available fault current at the Spring Canyon Substation before and after the addition of the proposed new generation injected at the POI. Table 2 below summarizes the results of the short circuit analysis.

System Condition	Three-phase (amps)	Thevenin System Equivalent Impedance (R,X) (ohms)	Single-line-to-ground (amps)	Thevenin System Equivalent Impedance (R,X) (ohms)
System Intact	I_1=4,139.84 I_2=I_0=0 I_A=I_B=I_C=4,139.84	Z1(pos)= 4.28023, 31.7894 Z2(neg)= 4.63927, 34.7776 Z0(zero)= 6.51284, 34.7392	I_1=I_2=1,295.84 3I_0=3887.51 I_A=3887.51 I_B=I_C=0	Z1(pos)= 4.28023, 31.7894 Z2(neg)= 4.63927, 34.7776 Z0(zero)= 6.51284, 34.7392

Table 2: Short-Circuit Study Results With the Proposed 60 MW of Generation

Fault currents at the Spring Canyon 230 kV bus after the addition of GI-2012-3 are 3,888 amps for single-line to ground faults, and 4,140 amps for a three-phase fault.

Results of the short circuit analysis show that the fault current levels at the Spring Canyon 230 kV bus are within the interrupting ratings of the breakers; therefore, the addition of the generation interconnection project and associated infrastructure will not cause fault currents to exceed the circuit breaker ratings.

Costs Estimates and Assumptions

The estimated total cost for the required upgrades for is **$ 21,511** and includes the labor materials and overhead associated with adjusting the existing metering to accommodate the Project. Adjustments include retapping the current transformers and reprogramming the meter. The estimated costs shown are (+/-30%) estimates in 2013 dollars (no escalation applied) and are based upon typical construction costs for previously performed similar construction. These estimated costs include all applicable labor and overheads associated with the siting, engineering, design, procurement and construction of these new PSCo facilities. This estimate does not include the cost for any other Customer owned equipment and associated design and engineering.

The following table lists the improvements required to accommodate the interconnection and the delivery of the Project. The cost responsibilities associated with these facilities shall be handled as per current FERC guidelines. System improvements are subject to change upon more detailed analysis.

Estimate Summary					
WBS Costs	**Labor**	**Equipment**	**Material**	**Other**	**Total**
CBS1 - Permitting/Project Managem	$0	$0	$0	$0	$0
CBS2 - Engineering/Design	$8,256	$0	$0	$0	$8,256
CBS3 - Civil Construction	$0	$0	$0	$0	$0
CBS4 - Electrical Construction	$4,901	$1,240	$2,937	$209	$9,287
CBS5 - Construction Remove	$0	$0	$0	$0	$0
CBS6 - Commissioning	$0	$0	$0	$0	$0
CBS7 - CIAC and Other	$0	$0	$0	$0	$0
Direct Cost Subtotal	$13,157	$1,240	$2,937	$209	$17,543
Indirect Costs					
Powerplant Overheads (E&S + A&G)	$553	$10	$123	$51	$737
Material overheads	$460	$8	$103	$42	$614
AFUDC	$316	$6	$70	$29	$421
Contingency	$1,316	$24	$294	$121	$1,754
Escalation	$332	$6	$74	$30	$442
Indirect Cost Subtotal	$2,976	$54	$664	$273	$3,969
Project Total					**$21,511**

Table 3: Cost Estimates for GI-2012-3

Assumptions for Alternatives

- Scoping level cost estimates for Interconnection Facilities and Network/Infrastructure Upgrades for Delivery (+/- 30% accuracy) were developed by Xcel Energy/PSCo Engineering staff.
- Estimates are based on 2013 dollars (appropriate contingency and escalation applied).
- AFUDC has been excluded.
- Engineering will be performed in house.
- Lead times for materials were considered for the schedule.
- The Generation Facility is not in PSCo's retail service territory.
- PSCo (or it's Contractor) crews will perform all construction, wiring, testing and commissioning for PSCo owned and maintained facilities.
- Construction labor is estimated for straight time only – no overtime included.
- The estimated time to design, procure and construct the interconnection facilities is approximately 6 months after authorization to proceed has been obtained.
- Authorization to proceed is considered to be the execution of the LGIA.
- This project is completely independent of other queued projects and their respective ISD's.
- Line and substation bus outages will need to be authorized during the construction period to meet requested backfeed dates.

Project Schedule

The estimated time to design, procure and construct the interconnection facilities is approximately 6 months after authorization to proceed has been obtained. Authorization to proceed is considered to be the execution of the LGIA.

Appendix

A. Generation Dispatch

Table A1: Generation Dispatch

		Case	*Benchmark*	*GI-2012-3*
Bus Number	**Bus Name**	**Pgen (MW)**	**Pgen (MW)**	**Pgen (MW)**
70034	ARAP3 13.800	40	40	40
70035	ARAP4 13.800	98	98	98
70069	CABCRKA 13.800	80	80	80
70070	CABCRKB 13.800	80	80	80
70083	CANON_55 13.800	14	14	14
70084	CANON_59 13.800	20	20	20
70104	CHEROK2 15.500	0	0	0
70105	CHEROK3 20.000	143.2704	97.2294	97.7615
70106	CHEROK4 22.000	360	383	383
70119	COMAN_1 24.000	355	355	355
70120	COMAN_2 24.000	360	360	360
70310	PAWNEE 22.000	505	505	505
70314	MANCHEF1 16.000	130	0	0
70315	MANCHEF2 16.000	130	0	0
70344	R.F.DSLS 4.1600	8	8	8
70350	RAWHIDE 24.000	300	300	300
70351	RAWHIDEA 13.800	0	60	60
70385	SHOSHA&B 4.0000	7	7	7
70385	SHOSHA&B 4.0000	8	8	8
70406	ST.VR_2 18.000	130	130	130
70407	ST.VR_3 18.000	130	130	130
70408	ST.VR_4 18.000	130	130	130
70409	ST.VRAIN 22.000	300	300	300
70446	VALMONT 20.000	160	160	160
70448	VALMONT6 13.800	50	50	50
70487	QF_TC-T4 13.800	33.7	33.7	33.7
70487	QF_TC-T4 13.800	33.7	33.7	33.7
70490	QF_TC-T3 13.800	33.7	33.7	33.7
70490	QF_TC-T3 13.800	51.7	51.7	51.7
70498	QF_BCP2T 13.800	19.4	19.4	19.4
70498	QF_BCP2T 13.800	19.3	19.3	19.3
70499	QF_B4-4T 13.800	20	20	20
70499	QF_B4-4T 13.800	20	20	20
70500	QF_CPP1T 13.800	20	20	20
70500	QF_CPP1T 13.800	20	20	20
70501	QF_CPP3T 13.800	27	27	27
70502	QF_UNC 13.800	25	0	0

70502	QF_UNC 13.800	25	0	0
70502	QF_UNC 13.800	15	0	0
70503	PONNEQUI 26.100	6.3	6.3	6.3
70556	QF_B4D4T 12.500	50	50	50
70560	LAMAR_DC 230.00	0	200	101
70561	RAWHIDEF 18.000	125	135	135
70562	SPRUCE1 18.000	130	130	130
70563	SPRUCE2 18.000	130	130	130
70565	BRTNNUG1 13.800	35	35	35
70567	RAWHIDED 13.800	0	60	60
70568	RAWHIDEB 13.800	0	60	60
70569	RAWHIDEC 13.800	54	60	60
70580	PLNENDG1 13.800	4.8	4.8	4.8
70580	PLNENDG1 13.800	4.8	4.8	4.8
70580	PLNENDG1 13.800	4.8	4.8	4.8
70580	PLNENDG1 13.800	4.8	4.8	4.8
70580	PLNENDG1 13.800	4.8	4.8	4.8
70580	PLNENDG1 13.800	4.8	4.8	4.8
70580	PLNENDG1 13.800	4.8	4.8	4.8
70580	PLNENDG1 13.800	4.8	4.8	4.8
70580	PLNENDG1 13.800	4.8	4.8	4.8
70580	PLNENDG1 13.800	4.8	4.8	4.8
70585	PLNENDG3 13.800	7.2	7.2	7.2
70585	PLNENDG3 13.800	7.2	7.2	7.2
70585	PLNENDG3 13.800	7.2	7.2	7.2
70585	PLNENDG3 13.800	7.2	7.2	7.2
70585	PLNENDG3 13.800	7.2	7.2	7.2
70585	PLNENDG3 13.800	7.2	7.2	7.2
70585	PLNENDG3 13.800	7.2	7.2	7.2
70586	PLNENDG4 13.800	7.2	7.2	7.2
70586	PLNENDG4 13.800	7.2	7.2	7.2
70586	PLNENDG4 13.800	7.2	7.2	7.2
70586	PLNENDG4 13.800	7.2	7.2	7.2
70586	PLNENDG4 13.800	7.2	7.2	7.2
70586	PLNENDG4 13.800	7.2	7.2	7.2
70586	PLNENDG4 13.800	7.2	7.2	7.2
70587	PLNENDG2 13.800	4.8	4.8	4.8
70587	PLNENDG2 13.800	4.8	4.8	4.8
70587	PLNENDG2 13.800	4.8	4.8	4.8
70587	PLNENDG2 13.800	4.8	4.8	4.8
70587	PLNENDG2 13.800	4.8	4.8	4.8
70587	PLNENDG2 13.800	4.8	4.8	4.8
70587	PLNENDG2 13.800	4.8	4.8	4.8
70587	PLNENDG2 13.800	4.8	4.8	4.8
70587	PLNENDG2 13.800	4.8	4.8	4.8
70587	PLNENDG2 13.800	4.8	4.8	4.8
70588	RMEC1 15.000	95	94	142

70589	RMEC2 15.000	90	141	141
70591	RMEC3 23.000	255	322	322
70593	SPNDLE1 18.000	110	129	129
70594	SPNDLE2 18.000	110	129	129
70622	MIS_SITE 34.500	52.5	52.5	52.5
70625	MISSILEW2 34.500	42	42	42
70626	MISSILEW3 34.500	42	42	42
70701	CO_GRN_E 34.500	17	17	17
70702	CO_GRN_W 34.500	17	17	17
70703	TWNBUTTE 34.500	15.8	15.8	15.8
70710	PTZLOGN1 34.500	42.2	42.2	42.2
70712	PTZLOGN2 34.500	25.2	25.2	25.2
70713	PTZLOGN3 34.500	16.7	16.7	16.7
70714	PTZLOGN4 34.500	36.8	36.8	36.8
70721	SPRNGCAN 34.500	12.6	60	60
70721	SPRNGCAN 34.500	0	0	60
70723	RDGCREST 34.500	6.3	6.3	6.3
70777	COMAN_3 27.000	805	805	795
70822	CEDARCK1 34.500	31.5	31.5	31.5
70823	CEDARCK2 34.500	31.5	31.5	31.5
70824	CEDAR3 34.500	52.5	52.5	52.5
70931	GR_SANDH_PV 34.500	9.98	9.98	9.98
70932	SOLAR_GE 34.500	19.5	19.5	19.5
70933	COGENTIX_PV 34.500	19.5	19.5	19.5
70950	ST.VR_5 18.000	150	0	0
70951	ST.VR_6 18.000	100	0	0
71001	BAC_MSA 13.800	100	100	100
71002	BAC_MSA 13.800	100	100	100
71003	BAC_MSA 13.800	40	40	40
71003	BAC_MSA 13.800	40	40	40
71003	BAC_MSA 13.800	20	20	20
71004	BAC_MSA 13.800	40	40	40
71004	BAC_MSA 13.800	40	40	40
71004	BAC_MSA 13.800	20	20	20
71009	BUSCHRWTG1 0.7000	28.8	28.8	28.8
73054	ELBERT-1 11.500	99	99	99
73129	MBPP-1 24.000	605.0183	610.0098	613.7371
73130	MBPP-2 24.000	605	605	605
73181	SIDNEYDC 230.00	196	196	196
73226	YELLO1-2 13.800	62	62	62
73226	YELLO1-2 13.800	62	62	62
73227	YELLO3-4 13.800	62	62	62
73227	YELLO3-4 13.800	62	62	62
73288	NSS1 13.800	18.6	18.6	18.6

73289	RCCT1 13.800	17	17	17
73291	RCCT2 13.800	17	17	17
73292	RCCT3 13.800	17	17	17
73293	RCCT4 13.800	1.4	1.4	1.4
73299	BIGTHOMP 4.2000	4	4	4
73306	ESTES1 6.9000	17	17	17
73307	ESTES2 6.9000	17	17	17
73308	ESTES3 6.9000	17	17	17
73316	GREENMT1 6.9000	13	13	13
73317	GREENMT2 6.9000	13	13	13
73319	MARYLKPP 6.9000	8	8	8
73324	POLEHILL 13.800	36	36	36
73328	WILLMFRK 2.4000	2	2	2
73332	ALCOVA1 6.9000	21	21	21
73333	BOYSEN1 4.2000	7	7	7
73333	BOYSEN1 4.2000	7	7	7
73334	BBILL1-2 6.9000	5	5	5
73334	BBILL1-2 6.9000	5	5	5
73339	HEART MT 2.4000	5	5	5
73341	NSS2 13.800	93.7	93.7	93.7
73347	SHOSHONE 6.9000	2	2	2
73349	FREMONT1 11.500	29	29	29
73350	FREMONT2 11.500	29	29	29
73351	GLENDO1 6.9000	15	15	15
73352	GLENDO2 6.9000	15	15	15
73353	GUERNSY1 2.4000	2.5	2.5	2.5
73356	KORTES1 6.9000	12	12	12
73357	KORTES2 6.9000	12	12	12
73358	KORTES3 6.9000	12	12	12
73363	SEMINOE1-2 6.9000	12.5	12.5	12.5
73363	SEMINOE1-2 6.9000	12.5	12.5	12.5
73418	RD_NIXON 20.000	224.8	224.8	224.8
73424	TESLA1 13.800	28	28	28
73427	DRAKE 5 13.800	49	49	49
73428	DRAKE 6 13.800	82.3	82.3	82.3
73429	DRAKE 7 13.800	139.1	139.1	139.1
73438	ALCOVA2 6.9000	20	20	20
73439	BBILL3-4 6.9000	5	5	5
73441	SEMINOE3 6.9000	13	13	13
73444	GUERNSY2 2.4000	2.5	2.5	2.5
73448	FLATIRN1 13.800	42	42	42
73449	FLATIRN2 13.800	43	43	43
73449	FLATIRN2 13.800	8	8	8
73461	ELBERT-2 11.500	99	99	99
73462	SPIRTMTN 6.9000	4	4	4
73507	FTRNG1CC 18.000	100	100	100
73508	FTRNG2CC 18.000	100	100	100

73509	FTRNG3CC 21.000	162	162	162
73532	LINCOLN1 13.800	50	50	50
73533	LINCOLN2 13.800	50	50	50
73631	COHIWND_G1 0.6900	67	67	67
74014	NSS_CT1 13.800	40	40	40
74015	NSS_CT2 13.800	40	40	40
74016	WYGEN 13.800	93.7	93.7	93.7
74017	WYGEN2 13.800	95	95	95
74018	WYGEN3 13.800	110	110	110
74029	LNG_CT1 13.800	40	40	40
74042	CLR_1 0.6000	29.4	29.4	29.4
74043	SS_GEN1 0.6000	42	42	42
74399	BHPLPLAN 13.800	100	100	100
76351	RCDC W 230.00	-130	-130	-130
76404	DRYFORK 19.000	420	420	420
79015	CRAIG 1 22.000	451	451	451
79016	CRAIG 2 22.000	451	451	451
79017	CRAIG 3 22.000	433.8	433.8	433.8
79019	MORRO1-2 12.500	81	81	81
79019	MORRO1-2 12.500	81	81	81
79040	HAYDEN1 18.000	175	175	175
79041	HAYDEN2 22.000	250	250	250
79123	FONTNLLE 4.1600	9.5	9.5	9.5
79154	FLGORG1 11.500	50	50	50
79155	FLGORG2 11.500	50	50	50
79156	FLGORG3 11.500	50	50	50
79157	BMESA1-2 11.000	42	42	42
79157	BMESA1-2 11.000	42	42	42
79158	NUCLA 1 13.800	12.6	12.6	12.6
79159	NUCLA 2 13.800	12.6	12.6	12.6
79160	NUCLA 3 13.800	12.6	12.6	12.6
79161	NUCLA 4 13.800	72	72	72
79162	CRYSTAL 12.500	27	27	27
79164	TOWAOC 6.9000	11	11	11
79166	MOLINA-L 4.2000	4.5	4.5	4.5
79172	MOLINA-U 4.2000	8.5	8.5	8.5
79176	MCPHEE 2.4000	1	1	1

B. One Line Diagrams

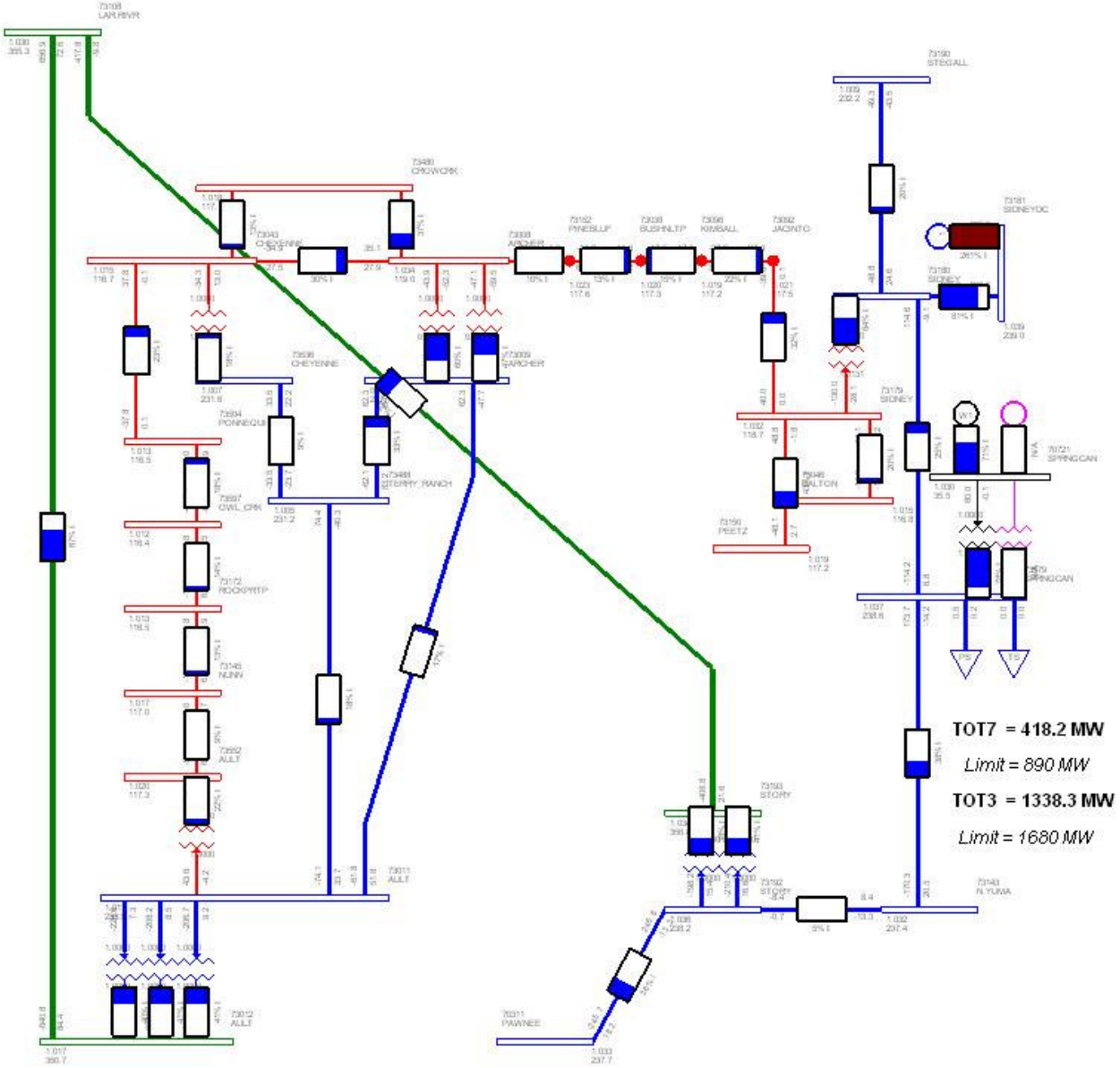

Figure B1: One Line Diagram with high TOT3 flows

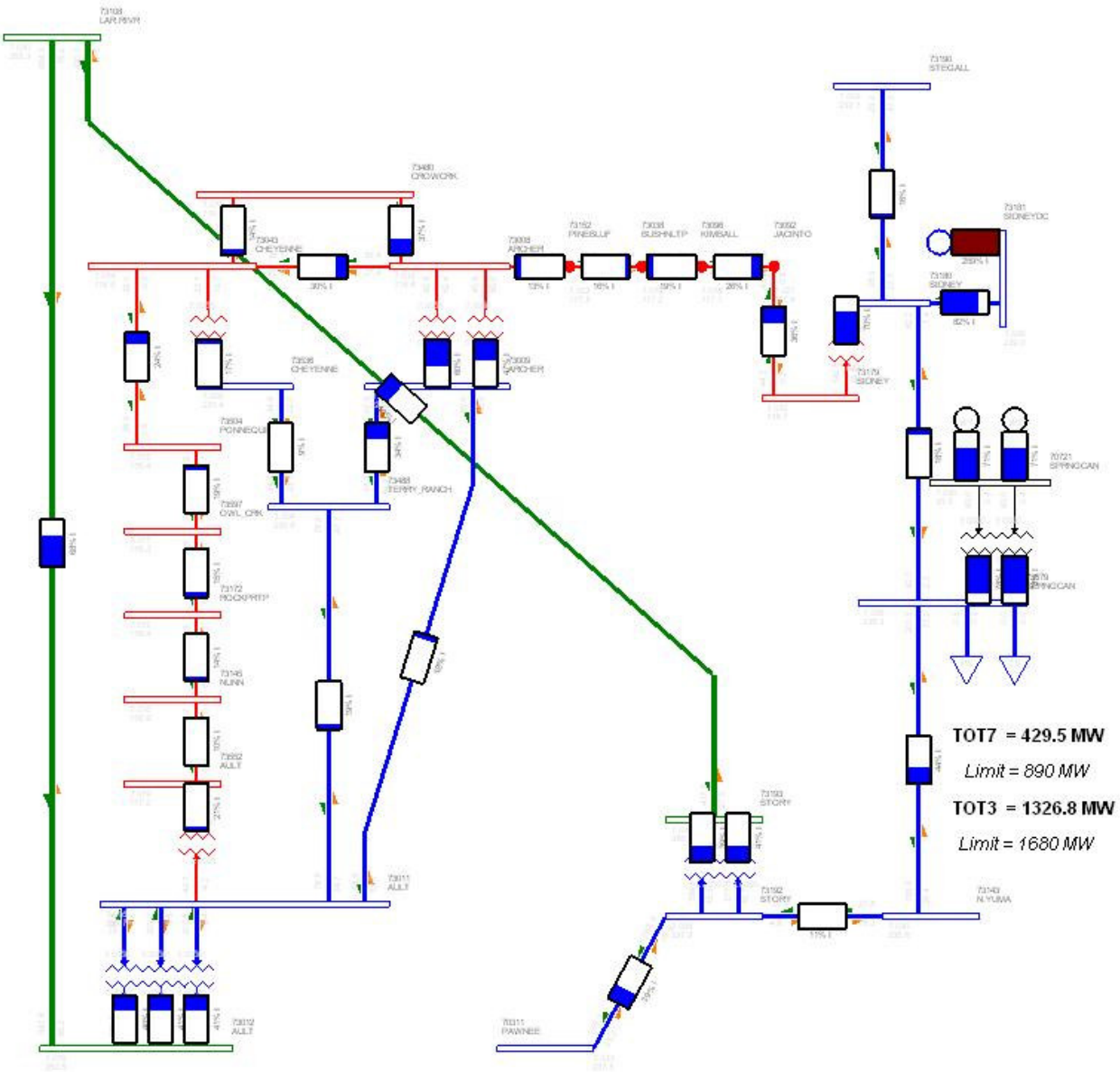

Figure B2: One Line Diagram with Addition of GI-2012-3