Provisional Interconnection Study Report for GI-2020-5

24MW Incremental Output in Fort Saint Vrain#4

(in DISIS-2020-001)

6/15/2020

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1.0 Executive Summary

Th Provisional Interconnection Service Request (PI-2020-1) is for Generation Interconnection Request GI-2020-5 in the DISIS-2020-001 Cluster, which is an Affiliate request.

The GI-2020-5 is a request for 18MW(Summer)/24MW(Winter) incremental capacity in the output of the existing Fort Saint Vrain#4 Combustion Turbine Generator located in Weld County, Colorado. The Point of Interconnection (POI) of the incremental capacity is the existing Fort Saint Vrain Substation where Fort Saint Vrain#4 is currently interconnected.

The total estimated cost of the Public Service Company of Colorado (PSCo) transmission system improvements required for GI-2020-5 in the DISIS-2020-001 to qualify for Provisional Interconnection Service is $50,000

The Provisional Interconnection Service of GI-2020-5 is 24MW

There are no Contingent Facilities identified.

Security: As stated in the study agreement, assuming GI-2020-5 in DISIS-2020-001, selects Energy Resource Interconnection Service (ERIS), the security associated with the Network Upgrades that might be identified at the conclusion of the GI-2020-5 Large Generation Interconnection Procedure (LGIP) in the DISIS-2020-001 cluster is estimated to be approximately $5 Million.

The Interconnection Customer assumes all risk and liabilities with respect to changes between the Provisional Large Generator Interconnection Agreement (PLGIA) and the Large Generator Interconnection Agreement (LGIA), including changes in output limits and Interconnection Facilities, Network Upgrades, Distribution Upgrades, and/or System Protection Facilities cost responsibility.

Note: Provisional Interconnection Service in and of itself, does not convey transmission service.

2.0 Introduction

PI-2020-1 is the Provisional Interconnection Service[1] Request for GI-2020-5 (GI) request in the DISIS-2020-001 Cluster, which is an Affiliate request.

The GI-2020-5 is a request for 18MW (Summer)/24MW(Winter) incremental capacity in the output of the existing Fort Saint Vrain#4 Combustion Turbine generator located in Weld County, Colorado. The incremental output is driven by turbine prime mover changes being performed as part of maintenance and modernizing the equipment and no changes to the electrical generator set are anticipated. The net generating capacity of Fort Saint Vrain#4 after the Provisional Interconnection will be 167MW(Summer)/173MW(Winter).

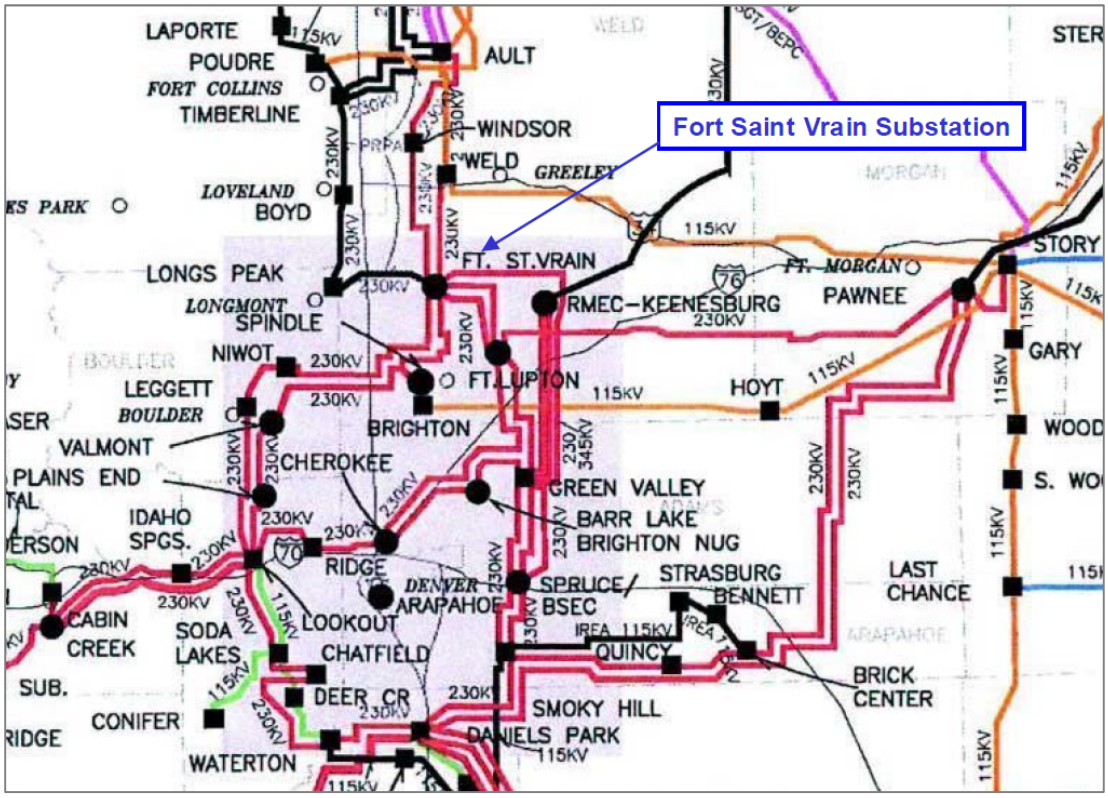
The POI of the incremental capacity is the existing Fort Saint Vrain Substation where Fort Saint Vrain#4 is currently interconnected.

The proposed Commercial Operation Date (COD) of the incremental capacity is November 1, 2020. Since the POI is existing and operational, a backfeed date is not applicable to GI-2020-5.

The geographical location of the transmission system near the POI is shown in Figure 1.

[1] **Provisional Interconnection Service** shall mean an Interconnection Service provided by Transmission Provider associated with interconnecting the Interconnection Customer's Generating Facility to Transmission Provider's Transmission System and enabling that Transmission System to receive electric energy and capacity from the Generating Facility at the Point of Interconnection, pursuant to the terms of the Provisional Large Generator Interconnection Agreement and, if applicable, the Tariff

Figure 1 – Point of Interconnection of GI-2020-5 in DISIS-2020-001 Cluster



3.0 Study Scope

The main purpose of this study is to determine the system impact of interconnecting GI-2020-5 for Provisional Service. As stated in the PI-2020-1 study agreement, the Provisional Service assumes GI-2020-5 selects (ERIS)[2].

Since GI-2020-5 has a maximum winter incremental output of 24MW, the Provisional Service evaluation is performed for the 24MW.

The scope of this report includes steady state (thermal and voltage) analysis, transient stability analysis, short circuit analysis, and Appropriation Level cost estimates (+/-20% accuracy) for

[2] **Energy Resource 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

Interconnection Facilities and Station Network Upgrades. The study also identifies the estimated Security[3] and Contingent Facilities associated with the Provisional Service.

The steady state analysis identifies thermal and voltage violations in the PSCo system and the neighboring systems using the study criteria in Section 3.1.1 and study methodology in Section 3.2.1. The transient stability analysis verifies that all generating units within the PSCo transmission system and the neighboring systems remain stable (in synchronism), have positive damping (angle and voltage) and satisfy acceptable dynamic performance criteria. The study criteria and study methodology for transient stability analysis are given in Section 3.1.2 and Section 3.2.2 respectively. The short circuit analysis determines the maximum available fault current at the POI and identifies if any circuit breaker(s) within the PSCo station(s) exceed their breaker duty ratings. The study criteria and study methodology for short circuit analysis are given in Section 3.1.3 and Section 3.2.3 respectively.

3.1 Study Criteria

PSCo adheres to applicable NERC Reliability Standards and WECC Reliability Criteria, as well as its internal transmission planning criteria for studies. The following Criteria is used for the reliability analysis of the PSCo system and Neighboring Utility systems.

3.1.1 Steady-State Criteria

The steady state analysis criteria are as follows:

P0 - System Intact conditions:

Thermal Loading: <=100% of the normal facility rating

Voltage range: 0.95 to 1.05 per unit

P1 & P2-1 – Single Contingencies:

Thermal Loading: <=100% Normal facility rating

Voltage range: 0.90 to 1.10 per unit

Voltage deviation: <=8% of pre-contingency voltage

P2 (except P2-1), P4, P5 & P7 – Multiple Contingencies:

Thermal Loading: <=100% Emergency facility rating

Voltage range: 0.90 to 1.10 per unit

[3] **Security** estimates the risk associated with the Network Upgrades and Interconnection Facilities that could be identified in the corresponding LGIA

Voltage deviation: <=8% of pre-contingency voltage

3.1.2 Transient Stability Criteria

Transient Voltage Stability Performance Criteria:

a. Following fault clearing, the voltage shall recover to 80% of the pre-contingency voltage within 20 seconds of the initiating event for all P1 through P7 events for each applicable Bulk Electric System (BES) bus serving load.
b. Following fault clearing and voltage recovery above 80%, voltage at each applicable BES bus serving load shall neither dip below 70% of pre-contingency voltage for more than 30 cycles nor remain below 80% of pre-contingency voltage for more than two seconds, for all P1 through P7 events.
c. For Contingencies without a fault (P2.1 category event), voltage dips at each applicable BES bus serving load shall neither dip below 70% of pre-contingency voltage for more than 30 cycles nor remain below 80% of pre-contingency voltage for more than two seconds.

Transient Angular Stability Performance Criteria:

a. P1 – No generating unit shall pull out of synchronism. A generator being disconnected from the system by fault clearing action or by a special Protection System is not considered an angular instability.
b. P2-P7 – One or more generators may pull out of synchronism, provided the resulting apparent impedance swings shall not result in the tripping of any other generation facilities.
c. P1-P7 – The relative rotor angle (power) oscillations are characterized by positive damping (i.e. amplitude reduction of successive peaks) > 5% within 30 seconds.

3.1.3 Breaker Duty Analysis

Fault Current after PI addition should not exceed 100% of the Breaker Duty rating. PSCo can only perform breaker duty analysis on the PSCo system. Before the PI goes in-service the Affected Systems may choose to perform a breaker duty analysis to identify breaker duty violations on their system.

3.2 Study Methodology

The steady state assessment is performed using PSSE V33 and the ACCC tool. The transient stability assessment is performed using GE PSLF DYTOOLs. The short circuit analysis is performed using CAPE.

3.2.1 Steady State Assessment Methodology

The thermal and voltage violations are identified by running the same set of contingencies on the Benchmark Case and the Study Case and comparing the results.

For PSCo facilities, thermal violations attributable to the PI include any facilities without a pre-existing thermal violation that (i) resulted in a thermal loading >100% post the PI addition and (ii) contributed to an incremental loading increase of 2% or more to the benchmark case loading.

For non-PSCo facilities, thermal violations attributed to the PI request include all new facility overloads with a thermal loading of >100% and existing thermal overloads that increased by 1% or more from the benchmark case overload post the PI addition.

The voltage violations assigned to the PI request include new voltage violations which resulted in a further variation of 0.1 per unit.

Since the request is for Provisional Service, if thermal or voltage violations are seen, the maximum permissible Provisional Interconnection before violations is identified. For voltage violations caused by reactive power deficiency at the POI, voltage upgrades are identified.

3.2.2 Transient Stability Study Methodology

The Provisional Interconnection request should meet the Transient stability criteria as stated in 3.1.2. If the addition of the GI causes any violations, the maximum permissible Provisional Interconnection Service before violations is identified.

3.3 Contingency Analysis

The transmission system on which steady state contingency analysis is run includes the WECC designates areas 70 and 73.

The transient stability analysis is performed for the following worst case contingencies:

- Three-phase fault at Fort Saint Vrain#3, lose Fort Saint Vrain#3 and half of Fort Saint Vrain#1
- Bus fault at Fort Saint Vrain 230kV, lose Fort Lupton – Fort Saint Vrain#1 & 2
- Three-phase fault at RMEC 230kV, lose RMEC#1, #2 and #3 units

3.4 Study Area

The study area or monitored area is the electrical system consisting of PSCo's transmission system and the neighboring transmission systems that may be impacted by or that could impact the Provisional Interconnection.

The study area includes WECC designated zones 700, 703, and 706. The neighboring utilities included in the analysis include Tri-State Generation and Transmission Inc system in the study area.

4.0 Base Case Modeling Assumptions

Consistent with the COD of the Provisional Interconnection, the 2020HW WECC base case released on February 28, 2020 is selected for the studies.

4.1 Base Case Modeling

There are no future transmission planned projects in PSCo's 10 year transmission plan expected to be in-service between November 2020 and when these studies are being performed, so no additional projects are modeled.

These projects planned transmission projects can be found at:

https://www.oasis.oati.com/woa/docs/PSCO/PSCOdocs/FERC_890_Q1_2020_Transmission_Plan_Presentation.pdf

The Base Case model includes the existing PSCo generation resources. The following higher-queued Provisional requests are modeled:

- Provisional Interconnection Service for GI-2018-25 and GI-2019-3
- Provisional Interconnection Service for GI-2019-6

5.0 Provisional Interconnection Service Analysis

5.1 Voltage and Reactive Power Capability Evaluation

Xcel Energy's OATT requires all synchronous Generator Interconnection Customers to provide dynamic reactive power within the power factor range of 0.95 leading to 0.95 lagging at the POI.

See the Interconnection guidelines for Generators greater than 20MW for additional details - https://www.transmission.xcelenergy.com/staticfiles/microsites/Transmission/Files/PDF/Interconnection/Interconnections-POL-TransmissionInterconnectionGuidelineGreat20MW.pdf

The Fort Saint Vrain#4 is currently capable of voltage control at the POI, since the reactive capability curve of the generator is not expected to change due to the prime mover modifications, the Provisional Interconnection is modeled by increasing the Qmax and Qmin values pro-rata for the 24MW increase in Fort Saint Vrain#4 capacity. The analysis indicates that the Provisional Interconnection Service is capable of meeting +/-0.95 power factor at the POI.

Table 1 – Reactive capability evaluation of PI-2020-1

Gen MW/Mvar	Gen Terminal Voltage (p.u.)	POI Voltage (p.u.)	POI MW	POI MVar	POI power Factor
177MW / 105.2Mvar	1.039	1.022	172.6	84.8	0.898 (lag)
177MW / -55.9Mvar	0.961	1.016	172.6	-75.8	0.916 (lead)

5.2 Benchmark Case Modeling

The Benchmark Case was created from Base Case described in Section 4.1 by changing the study pocket generation dispatch to reflect a heavy north to south flow. This was accomplished by adopting the stressed generation dispatch given in Table 2.

Table 2 – Generation Dispatch Used to Stress the Benchmark Case
(MW is Gross Capacity)

Bus Name	ID	Status	PGen (MW)	PMax (MW)	Owner
CEDAR2_W1 0.66	W1	1	100	125	PSCO
CEDAR2_W2 0.69	W2	1	80.6	100.8	PSCO
CEDAR2_W3 0.66	W3	1	20	25	PSCO
CEDARCK_1A 34.50	W1	1	176	220	PSCO
CEDARCK_1B 34.50	W2	1	64	80	PSCO
CHEROK4 22.00	G4	0	0	383	PSCO
FTLUP1-2 13.80	G1	1	45	50	PSCO

FTLUP1-2	13.80	G2	1	45	50	PSCO
JMSHAFR1	13.80	G1	1	32.2	35.8	TSGT
JMSHAFR1	13.80	G2	1	31.5	35	TSGT
JMSHAFR2	13.80	ST	1	45.6	50.7	TSGT
JMSHAFR3	13.80	G3	1	32.5	36.1	TSGT
JMSHAFR3	13.80	ST	1	45	50	TSGT
JMSHAFR4	13.80	G4	1	31.3	34.8	TSGT
JMSHAFR4	13.80	G5	1	29.7	33	TSGT
KNUTSON1	13.80	G1	1	65.3	72.5	TSGT
KNUTSON2	13.80	G2	1	65.3	72.5	TSGT
PAWNEE	22.00	C1	1	535	535	PSCO
MANCHEF1	16.00	G1	0	0	140	PSCO
MANCHEF1	16.00	IA	0	0	11	PSCO
MANCHEF2	16.00	G2	0	0	140	PSCO
MANCHEF2	16.00	IA	0	0	10	PSCO
PLNENDG1_1	13.80	G0	1	4.9	5.4	PSCO
PLNENDG1_1	13.80	G1	1	4.9	5.4	PSCO
PLNENDG1_1	13.80	G2	1	4.9	5.4	PSCO
PLNENDG1_1	13.80	G3	1	4.9	5.4	PSCO
PLNENDG1_1	13.80	G4	1	4.9	5.4	PSCO
PLNENDG1_1	13.80	G5	1	4.9	5.4	PSCO
PLNENDG1_1	13.80	G6	1	4.9	5.4	PSCO
PLNENDG1_1	13.80	G7	1	4.9	5.4	PSCO
PLNENDG1_1	13.80	G8	1	4.9	5.4	PSCO
PLNENDG1_1	13.80	G9	1	4.9	5.4	PSCO
PLNENDG1_2	13.80	G0	1	4.9	5.4	PSCO
PLNENDG1_2	13.80	G1	1	4.9	5.4	PSCO
PLNENDG1_2	13.80	G2	1	4.9	5.4	PSCO
PLNENDG1_2	13.80	G3	1	4.9	5.4	PSCO
PLNENDG1_2	13.80	G4	1	4.9	5.4	PSCO
PLNENDG1_2	13.80	G5	1	4.9	5.4	PSCO
PLNENDG1_2	13.80	G6	1	4.9	5.4	PSCO
PLNENDG1_2	13.80	G7	1	4.9	5.4	PSCO
PLNENDG1_2	13.80	G8	1	4.9	5.4	PSCO

PLNENDG1_2	13.80	G9	1	4.9	5.4	PSCO
PLNENDG2_1	13.80	G1	1	7.3	8.1	PSCO
PLNENDG2_1	13.80	G2	1	7.3	8.1	PSCO
PLNENDG2_1	13.80	G3	1	7.3	8.1	PSCO
PLNENDG2_1	13.80	G4	1	7.3	8.1	PSCO
PLNENDG2_1	13.80	G5	1	7.3	8.1	PSCO
PLNENDG2_1	13.80	G6	1	7.3	8.1	PSCO
PLNENDG2_1	13.80	G7	1	7.3	8.1	PSCO
PLNENDG2_2	13.80	G1	1	7.3	8.1	PSCO
PLNENDG2_2	13.80	G2	1	7.3	8.1	PSCO
PLNENDG2_2	13.80	G3	1	7.3	8.1	PSCO
PLNENDG2_2	13.80	G4	1	7.3	8.1	PSCO
PLNENDG2_2	13.80	G5	1	7.3	8.1	PSCO
PLNENDG2_2	13.80	G6	1	7.3	8.1	PSCO
PLNENDG2_2	13.80	G7	1	7.3	8.1	PSCO
PLNENDG2_2	13.80	G1	1	7.3	8.1	PSCO
RMEC1	15.00	G1	1	128	142.2	PSCO
RMEC1	15.00	IA	1	11.5	12.8	PSCO
RMEC2	15.00	G2	1	135.5	150.5	PSCO
RMEC2	15.00	IA	1	4.1	4.5	PSCO
RMEC3	23.00	ST	1	281.7	313	PSCO
RMEC3	23.00	IA	1	9.9	11	PSCO
SPNDLE1	18.00	G1	1	128.8	143.1	PSCO
SPNDLE1	18.00	IA	1	12.5	13.9	PSCO
SPNDLE2	18.00	G2	1	126.5	140.6	PSCO
SPNDLE2	18.00	IA	1	14.8	16.4	PSCO
ST.VRAIN	22.00	ST	1	279	310	PSCO
ST.VR_2	18.00	G2	1	120.5	133.9	PSCO
ST.VR_2	18.00	IA	1	10.89	12.1	PSCO
ST.VR_3	18.00	G3	1	111.9	124.3	PSCO
ST.VR_3	18.00	IA	1	21.3	23.7	PSCO
ST.VR_4	18.00	G4	1	145.4	145.4	PSCO
ST.VR_4	18.00	IA	1	7.6	7.6	PSCO
ST.VR_5	18.00	G5	1	141.7	157.4	PSCO

ST.VR_5	18.00	IA	1	23	25.6	PSCO
ST.VR_6	18.00	G6	1	141.7	157.4	PSCO
ST.VR_6	18.00	IA	1	23	25.6	PSCO
VALMONT6	13.80	G6	0	0	53	PSCO
VALMNT7	13.80	G7	0	0	41.7	PSCO
VALMNT7	13.80	IA	0	0	2.6	PSCO
VALMNT8	13.80	G8	0	0	41.7	PSCO
VALMNT8	13.80	IA	0	0	2.6	PSCO
MTNBRZ_W1	34.50	W1	1	135.2	169	PSCO

5.3 Study Case Modeling

A Study case was created from the Benchmark Case by increasing Fort Saint Vrain#4 by 24 MW. The additional 24 MW output from PI-2020-1 was sunk to Comanche 3.

5.4 Steady State Analysis

The single contingency analysis (P1 and P2-1) and multiple contingency analysis (P4 and P7) did not result in any new thermal or voltage violations after the additional of the 24MW Provisional Interconnection at Fort Saint Vrain#4.

5.5 Transient Stability Results

The following results were obtained for the disturbances analysed:

- ✓ No machines lost synchronism with the system
- ✓ No transient voltage drop violations were observed
- ✓ Machine rotor angles displayed positive damping

The results of the contingency analysis are shown in Table 3. The transient stability plots are shown in Appendix A to this report.

Table 3 – Transient Stability Analysis Results

#	Fault Location	Fault Type	Facility Tripped	Clearing Time (cycles)	Post-Fault Voltage Recovery	Angular Stability
1	Fort Saint Vrain#3 gen	3ph	Fort Saint Vrain#3 and half of Fort Saint Vrain#1	5.0	Maximum transient voltage dips within criteria	Stable with positive damping

2	Fort Saint Vrain 230kV bus	3ph	Fort Lupton – Fort Saint Vrain#1 & 2	5.0	Maximum transient voltage dips within criteria	Stable with positive damping
3	RMEC 230kV	3ph	All RMEC generators	5.0	Maximum transient voltage dips within criteria	Stable with positive damping

5.6 Short Circuit and Breaker Duty Analysis Results

Since there are no changes to the Fort Saint Vrain#4 electrical characteristics, there is no short circuit current contribution due to the incremental output.

6.0 Cost Estimates

The POI is existing and the Provisional Interconnection study did not identify any new Interconnection Facilities or Station Network Upgrades required to accommodate the 24MW incremental output at Fort Saint Vrain#4.

The total cost of the required Upgrades for GI-2020-5 to interconnect for Provisional Service at the Fort Saint Vrain Substation is **$50,000.**

- **The cost of Transmission Provider's Interconnection Facilities is $50,000**
- **The cost of Station Network Upgrades is $0**

The list of improvements required to accommodate the Provisional Interconnection of GI-2020-5 (in DISIS-2020-001), the Customer's 24MW incremental output at Fort Saint Vrain#4 are given in Tables 4a and 4b. The work needed to interconnect the Provisional Interconnection only includes testing of fibre, communication and relaying installed to accommodate the incremental 24MW output. Since the POI is existing, a CPCN will not be required to accommodate the interconnection.

Table 4a – PI-2020-1 Transmission Provider's Interconnection Facilities

Element	Description	Cost Est. (Millions)
Existing Fort Saint Vrain Substation POI	Interconnect PI-2020-1 Generating Facility. The new equipment includes: • testing of communications, relays	$0.05

	Transmission line tap into substation:	0
	Siting and Land Rights support for siting studies, land and ROW acquisition and construction	0
	Total Cost Estimate for Transmission Providers Interconnection Facilities	**$0.05**
Time Frame	**Site, design, procure and construct**	**12 Months**

Table 4b – PI-2020-1 Station Network Upgrades

Element	**Description**	**Cost Est. (Millions)**
N/A	N/A	0
	Siting and Land Rights support for substation construction	0
	Total Cost Estimate for Network Upgrades for Interconnection	**0**
Time Frame	**Site, design, procure and construct**	**N/A**

The PSCo Engineering has developed Appropriation Level cost estimates for Interconnection Facilities and Network/Infrastructure Upgrades required for the interconnection of the Provisional Interconnection. The cost estimates are in 2020 dollars with escalation and contingencies applied. Allowances for Funds Used During Construction (AFUDC) is not included. These estimated costs include all applicable labor and overheads associated with the siting, engineering, design, and construction of these new PSCo facilities. This estimate does not include the cost for any Customer owned equipment and associated design and engineering.

- A level of accuracy of ±20% is specified for Appropriation Level cost estimates.
- Labor is estimated for straight time only – no overtime included.
- Lead times for materials were considered for the schedule.
- The POI is existing and metered, so no costs for retail load metering are included in these estimates.
- PSCo (or it's Contractor) crews will perform all construction, wiring, testing and commissioning for PSCo owned and maintained facilities.

- Breaker duty study determined that no breaker replacements are needed in neighboring substations.
- Line outages may be necessary during the construction period. Outage availability could potentially be problematic and extend the construction period.
- Existing Power Quality Metering (PQM) is adequate.
- Existing Load Frequency/Automated Generation Control (LF/AGC) RTU is adequate.

7.0 Summary of Provisional Interconnection Service Analysis

The total estimated cost of the PSCo transmission system improvements required for GI-2020-5 in DISIS-2020-001 to qualify for Provisional Interconnection Service is: $50,000

The Provisional Interconnection Service of GI-2020-5 is 24MW

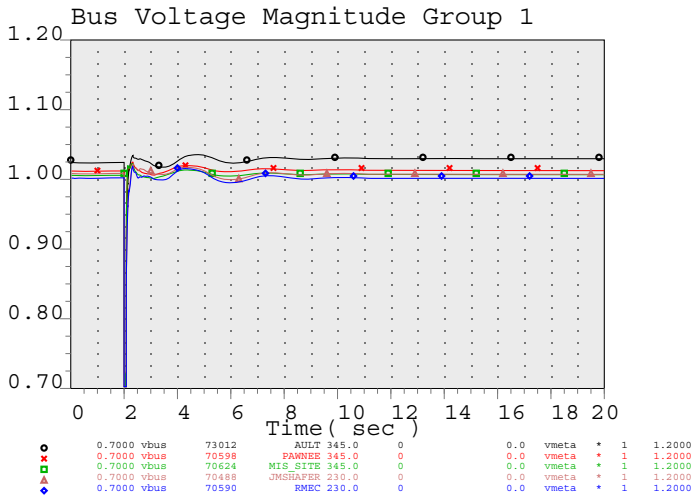
There are no Contingent Facilities identified.

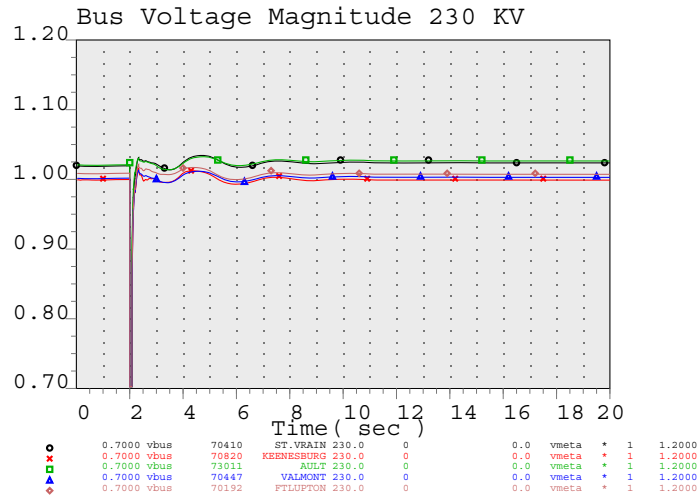
Security: As stated in the study agreement, assuming GI-2020-5 in DISIS 2020-001 selects ERIS, the security associated with the Network Upgrades that might be identified at the conclusion of the GI-2018-25 LGIP is estimated to be approximately $5 Million.

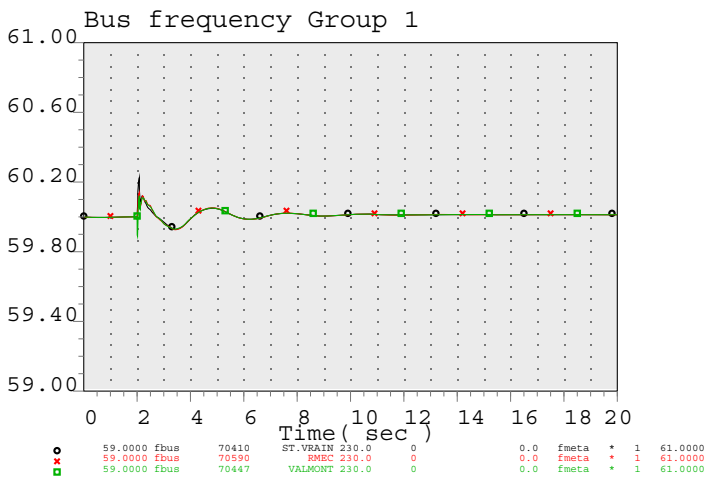
The Interconnection Customer assumes all risk and liabilities with respect to changes between the Provisional Large Generator Interconnection Agreement and the Large Generator Interconnection Agreement, including changes in output limits and Interconnection Facilities, Network Upgrades, Distribution Upgrades, and/or System Protection Facilities cost responsibility.

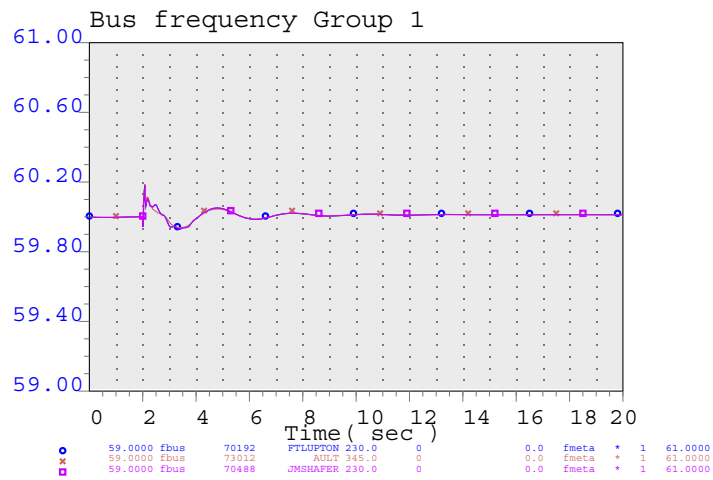
Note: Provisional Interconnection Service in and of itself, does not convey transmission service.

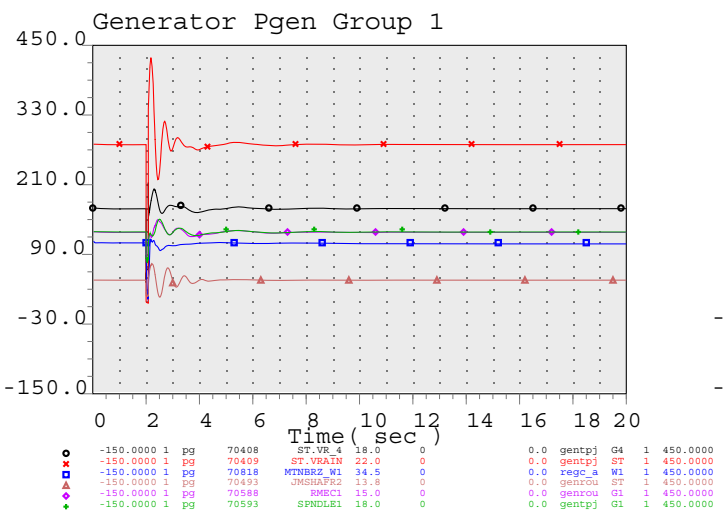
Appendix A - Transient Stability Plots

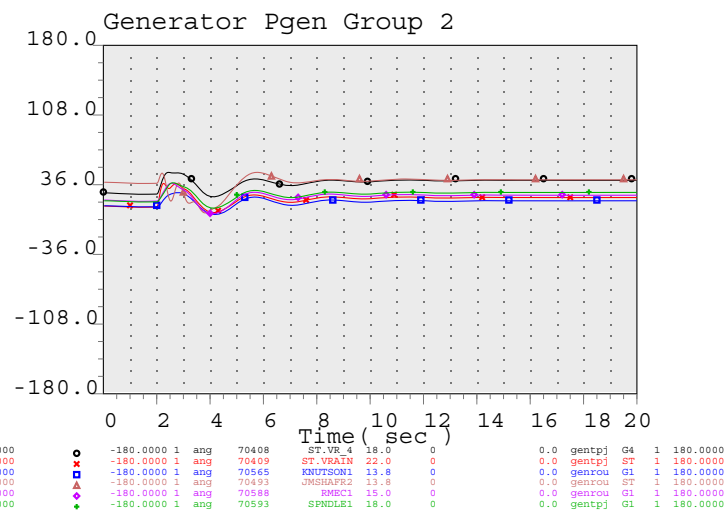




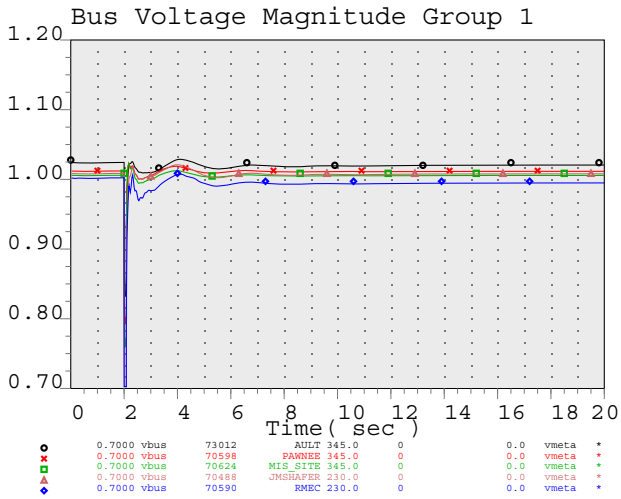


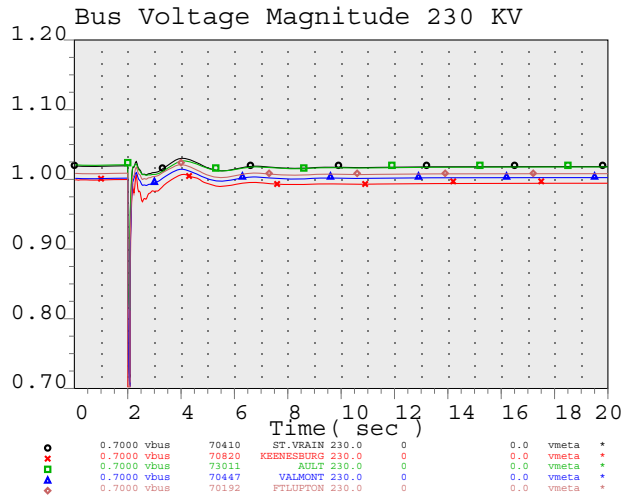


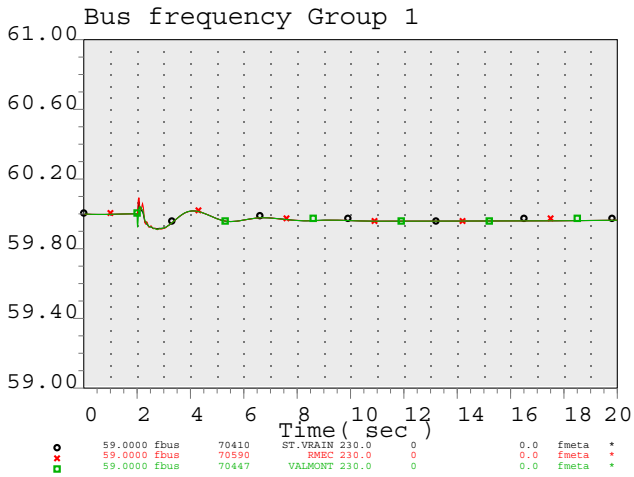


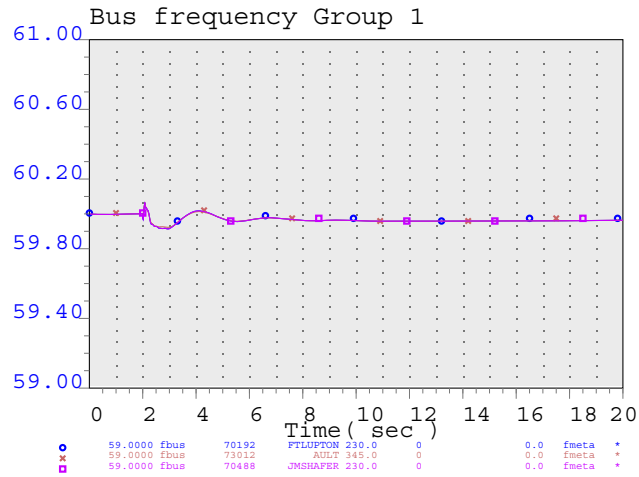


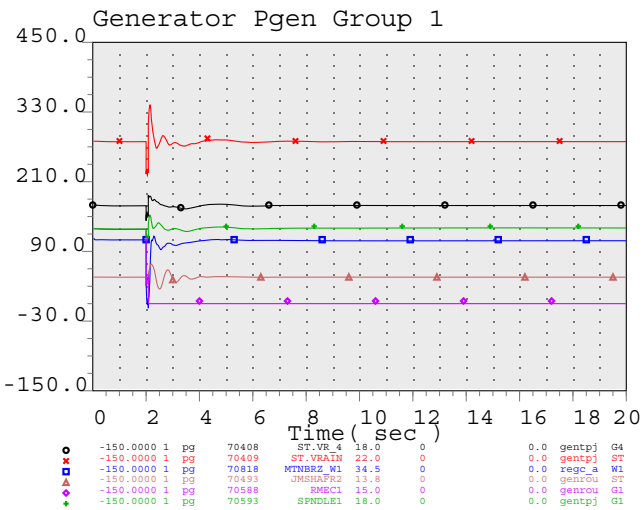
Fault: 5-cycle fault at St. Vrain 230kV
Outage: Ftlupton - St. Vrain 230kV lines #1 and #2

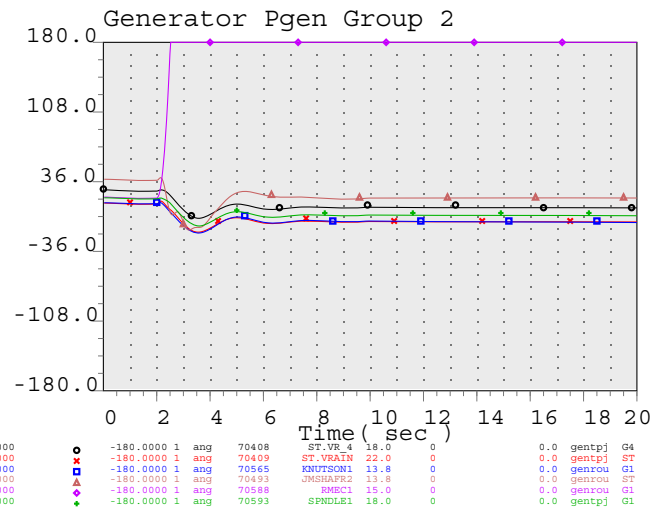




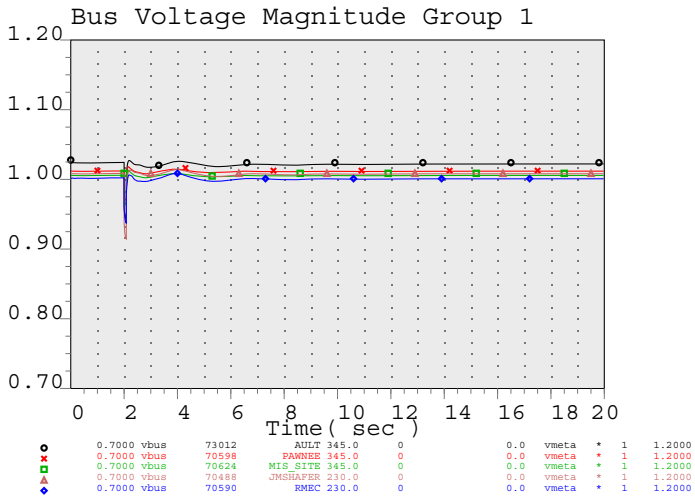


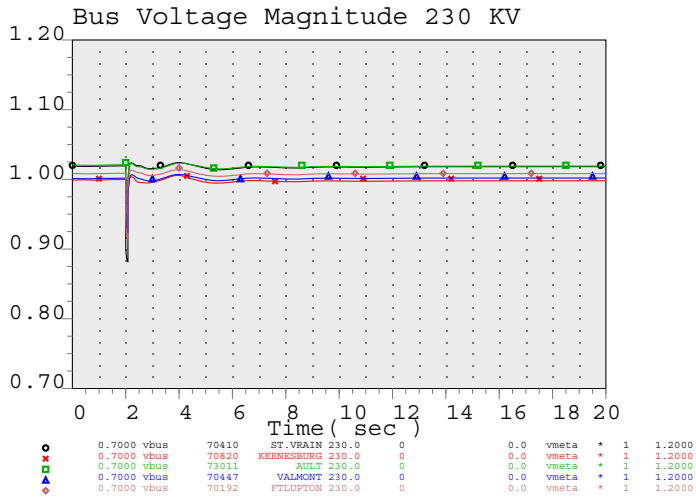


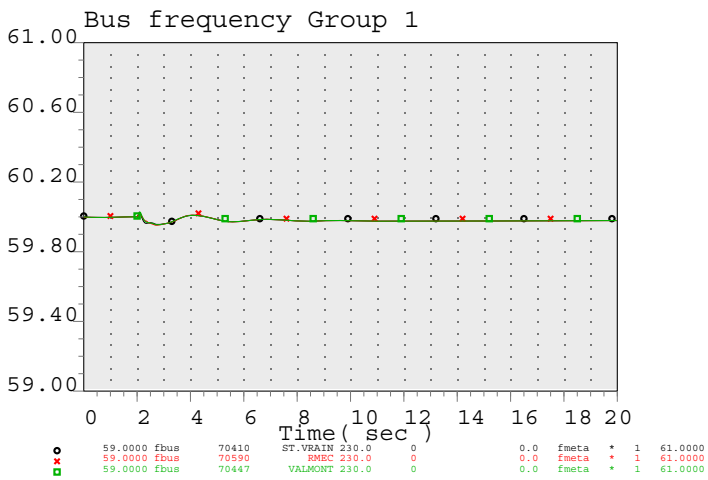


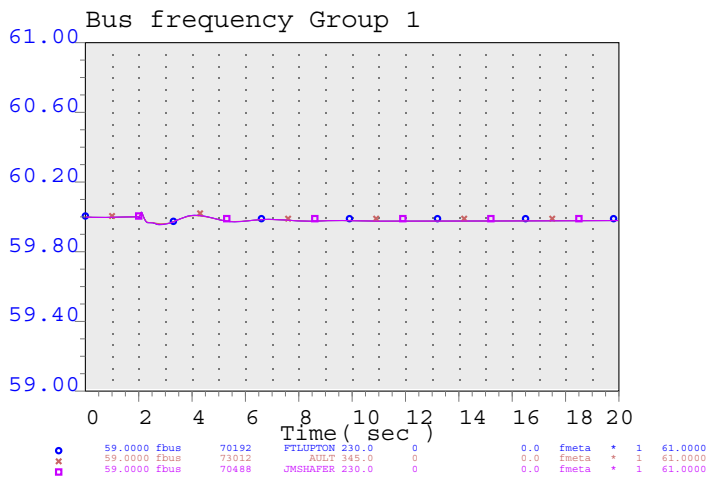


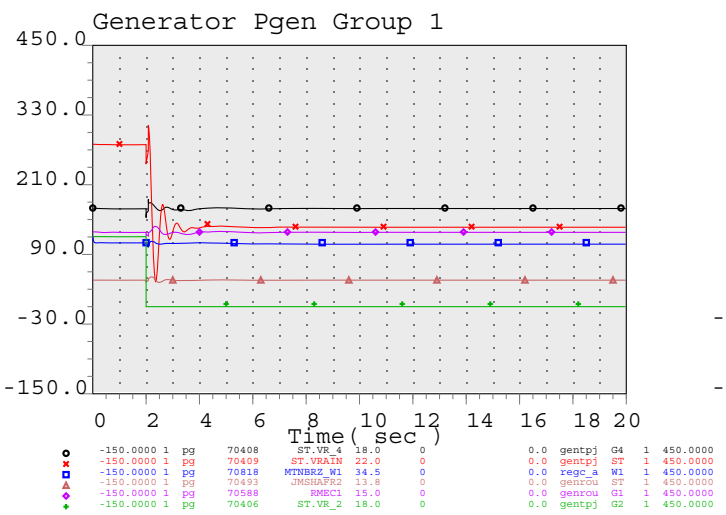
Fault: 5-cycle fault at RMEC
Outage: RMEC #1, #2 and #3 units

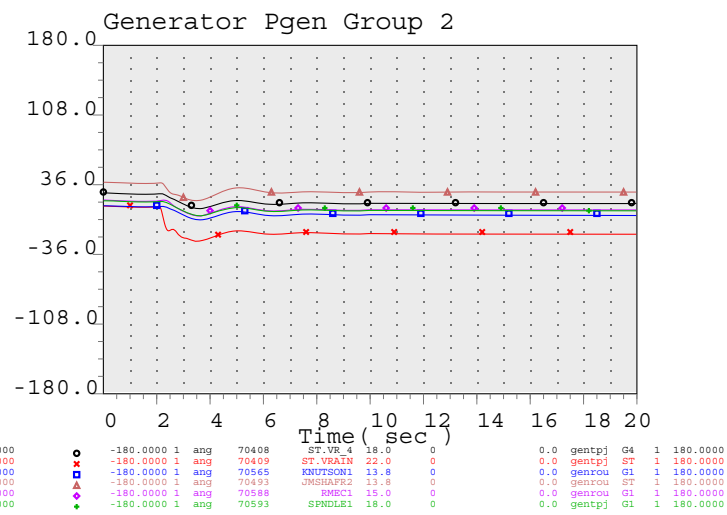




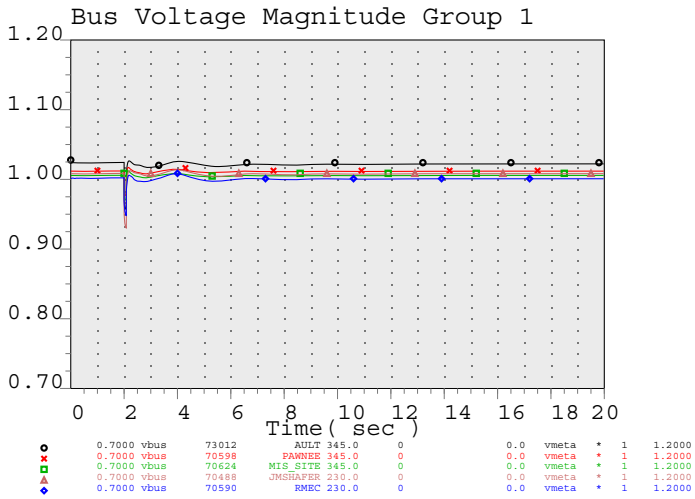


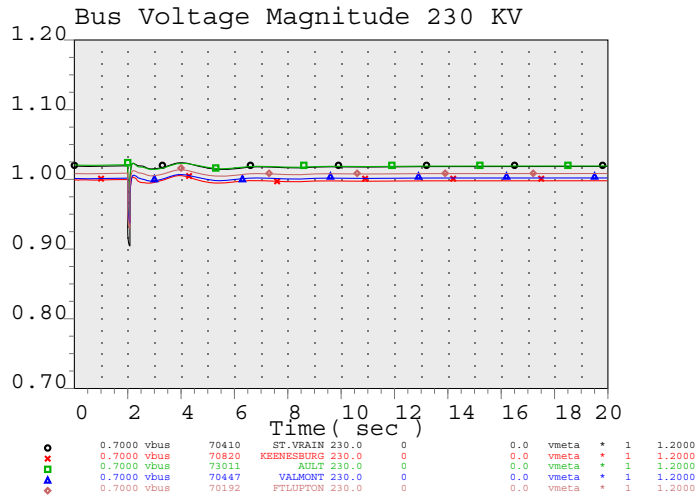


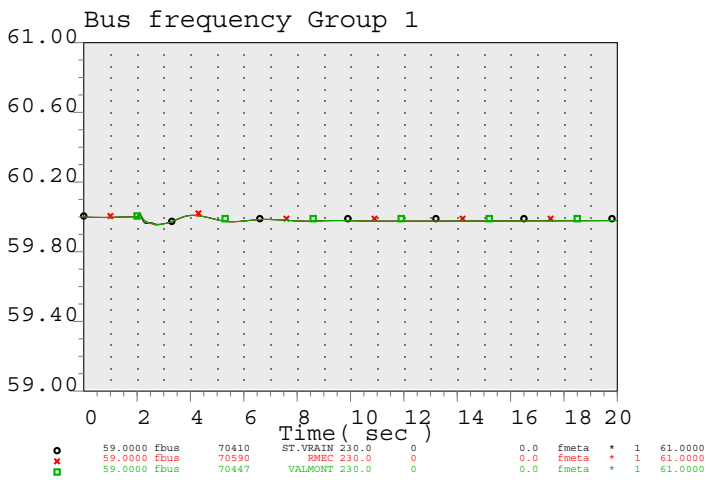


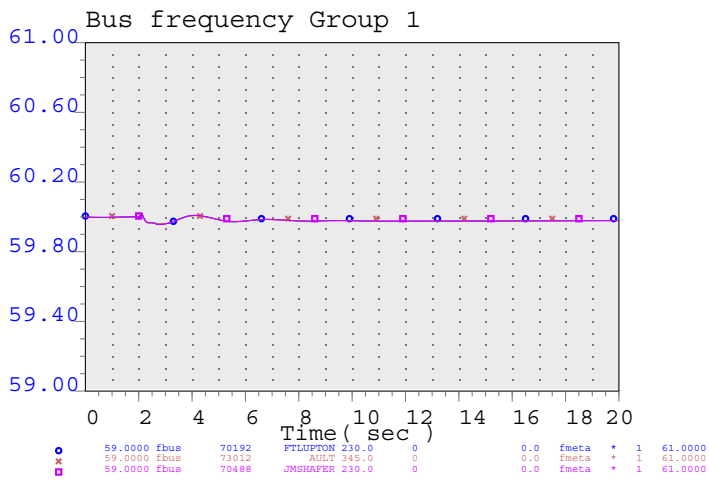


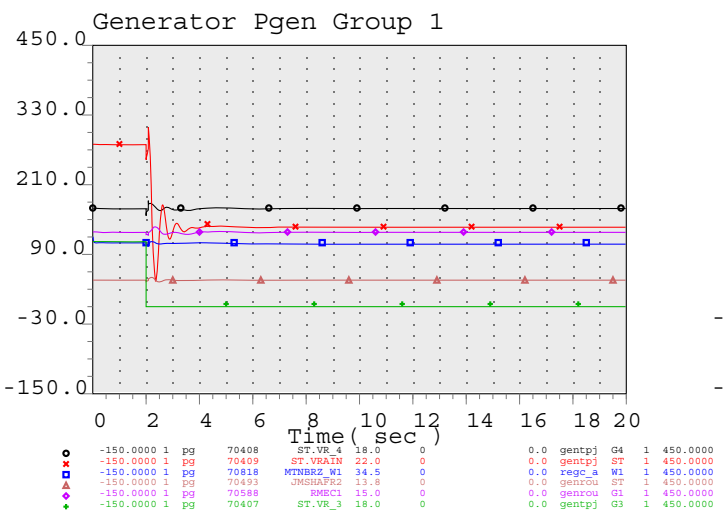
Fault: 5-cycle fault at St. Vrain #2
Outage: St. Vrain #2 and 50% reduction of St. Vrain 'ST'

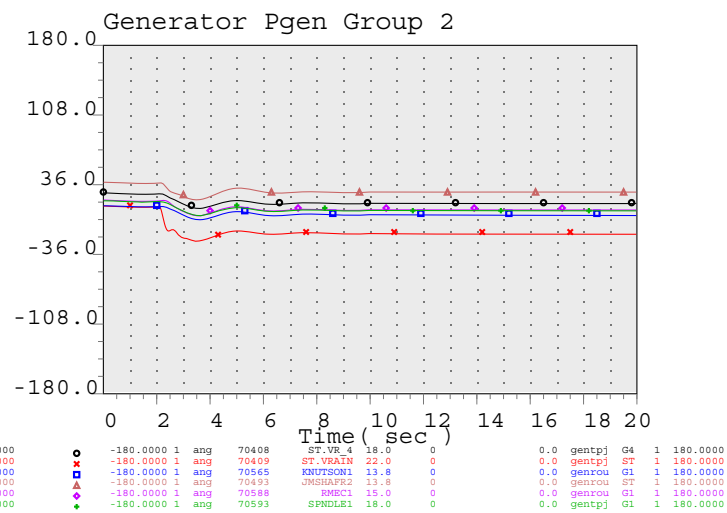












Fault: 5-cycle fault at St. Vrain #3
Outage: St. Vrain #3 and 50% reduction of St. Vrain 'ST'