Large Generator Interconnection
Feasibility Study Report

Completed for
Q0060 & Q0061
Utah Phase 1 & 2 Projects

Proposed Interconnection
PacifiCorp's existing
Pavant – Gonder Line, 230 kV

May 25, 2006

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1.0 DESCRIPTION OF THE GENERATING FACILITY

Q0060 & Q0061 ("Interconnection Customer") has proposed interconnecting 400 MW of new generation, in two phases—200 MW (Phase 1) plus an additional 200 MW (Phase 2)—to PacifiCorp's ("Transmission Provider") Pavant – Gonder 230-kV transmission line in Beaver County, Utah ("Project"). The requested commercial operation date for Phase 1 of the Project is December 31, 2007. The requested commercial operation date for Phase 2 of the Project is June 30, 2008.

2.0 SCOPE OF THE STUDY

The Interconnection Feasibility Study report shall provide the following information:

- preliminary identification of any circuit breaker short circuit capability limits exceeded as a result of the interconnection;
- preliminary identification of any thermal overload or voltage limit violations resulting from the interconnection; and
- preliminary description and non-bonding estimated cost of facilities required to interconnect the Large Generating Qualifying Facility to the Transmission System and to address the identified short circuit and power flow issues.

3.0 TYPE OF INTERCONNECTION SERVICE

The Interconnection Customer has selected *Network Resource (NR)* Interconnection Service, but has also elected to have the interconnection studied as an *Energy Resource (ER)*. The customer will select NR or ER prior to the Facilities Study.

4.0 DESCRIPTION OF PROPOSED INTERCONNECTION

The Sunstone point of interconnection (POI) would consist of a new 230 kV switchyard located approximately 20 miles west of the Pavant substation on the Pavant-Gonder line. The switchyard configuration would be a three breaker ring bus. Supplemental 230 kV shunt capacitor banks will be required on the radial interconnecting line close to the Point of Interconnection (POI), on the Interconnection Customer's side of the POI. The size and number of shunt capacitor banks will be a function of the capability of the project's generation, but the generating project must be capable of delivering a +/-95% power factor at the POI. See Detailed Planning Study (Appendix 1). The 230kV line between the Sunstone Switching Station and the collector station is to terminate with a 230kV circuit breaker at the collector station.

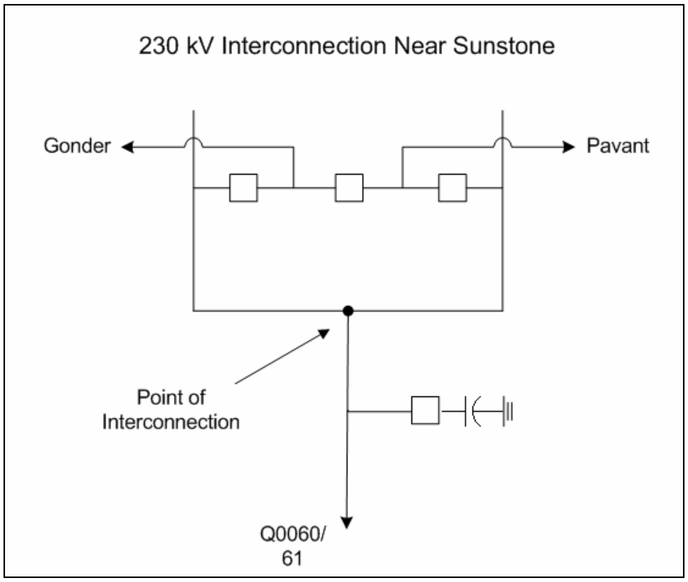


Figure 1: One-line diagram of the 230 kV interconnection facilities near Sunstone

5.0 STUDY ASSUMPTIONS

Assumptions used in conducting this Study:

- The Project will be designed to control the voltage at the POI within a specified voltage range (typically 1.0 to 1.04 pu).
- The Project will be designed with a +/- 0.95 power factor capability at the POI. Due to the length of the radial interconnection, it is expected that the supplemental reactive compensation will be installed on the radial interconnecting line, close to the Point of Interconnection.

Note: no detailed information on the Project generation was provided for study analysis. Therefore, the Project generation was modeled at the 230 kV Project bus with a +/- 0.95 power factor capability.

6.0 PHASE 1 – 200 MW

6.1 ER Interconnection Service – Interconnection Only

6.1.1 Study Results

See Appendix 1 for study results.

6.1.2 Requirements

Generating Facility Modifications

The developer is to design and construct a 50 mile (approximate) 230-kV transmission line from the interconnection point substation to the Interconnection Customer's central substation. The Interconnection Customer's generation facility must incorporate a means of automatically regulating voltage at the central substation by varying the VAR flow to and from the transmission system within a range of +/-95% power factor at the interconnection point.

The generating facility must meet the Federal Energy Regulatory Commission's Order 661 low voltage ride through requirements, and is expected to be capable of providing dynamic voltage support (similar to that provided by a synchronous machine's excitation system). Additionally, the Transmission Provider has established that: for voltages less than or equal to 1.1 pu, the wind turbine units must stay on indefinitely; for voltages less than or equal to 1.15 pu the wind turbine units can trip after a 1.0 second delay; for voltages less than or equal to 1.2 pu the wind turbines can trip after a 0.3 second delay; and for voltages greater than 1.2 pu the wind turbines can trip instantaneously.

Transmission Modifications

Transmission facility additions beyond the POI are not required for interconnection only. See Detailed Planning Study (Appendix 1).

Existing Breaker Modifications – Short-Circuit

The increase in the fault duty on the system as a result of the addition of the generation facility with the 100 - 2MVA generators and the 2 – 80/100/125MVA step up transformers with 10% impedance will not push the fault duty above the interrupting rate of any of the existing fault interrupting equipment.

Protection Requirements

High speed pilot transmission line protective relaying will need to be installed on the new 50 mile line between the Sunstone Switching Station and the wind farm collector station. Pilot transmission line protective relaying will be needed on the Sunstone Switching Station to Pavant Substation and Sunstone Switching Station to Gonder Substation. The protective relaying on the Pavant – Gonder line was recently upgraded so with the installation of similar relaying at Sunstone Switching Station should preclude the need to replace the equipment at Pavant and Gonder Substations. The equipment at Gonder Substation is owned by Sierra Pacific.

Since a communication system will be needed between the switching station and the collector station for a number of control and data acquisition proposes that same communication system can be used for the pilot line protection system for the line between the stations. The Transmission Provider will supply the protection systems for both ends of this line.

At the switching station will be installed a relay that will monitor the voltage magnitude and frequency. If the magnitude or frequency of the voltage is outside of normal range of operation a signal will be sent over the communication system to the collector station. At the collector station this signal is to trip open all of the 34.5kV feeder breakers to disconnect the wind turbine generators. By tripping the 34.5kV breakers instead of the 230kV breakers the station service to the wind farm is maintained to facilitate the restoration of the generation.

<u>Data Requirements (RTU)</u>

Data from both the switching station and the collector station will need to be fed into the Transmission Provider's SCADA to facilitate the operation of the transmission system. To accomplish this, remote terminal units (RTU)s will be installed at both stations. The RTUs will need to communicate with the Transmission Provider's SCADA master in Salt Lake City. Besides the control and data from the switching station 230kV breaker positions the following data will be needed:

From the Switching Station:

<u>Analogs:</u>

- Net Generation MW
- Net Generator MVAR
- A phase 230kV voltage
- B phase 230kV voltage
- C phase 230kV voltage

<u>Accumulator Pulses</u>:

- Interchange metering kWh

From the Collector Station

<u>Analogs:</u>

- Real power flow through each of the 34.5kV line feeder breakers
- Reactive power flow through each of the 34.5kV line feeder breakers
- Reactive power flow from each of the shunt capacitors
- A phase 230kV transmission voltage
- B phase 230kV transmission voltage
- C phase 230kV transmission voltage
- Wind speed

<u>Status:</u>

- All 34.5 and 230kV breakers and circuit switchers

- Line relay trouble alarm

The interchange real power MW will need to be telemetered to the Transmission Provider's Energy Control Center in Salt Lake City independent of the analog signal supplied to the RTU.

Communication Requirements

The scope of work is based on installing digital microwave radio from Pavant Substation to the new Sunstone POI Substation. At Pavant Substation, the new digital microwave will be interconnected to Transmission Provider's existing digital microwave system. The existing digital microwave from Milford Service Center to the Blundell Plant will be upgraded from 4-DS1 radio to an 8-DS1 digital radio. New 8-DS1 radio will be installed from the Interconnection Customer's Collector Station to the Blundell Plant where it will be interconnected to Transmission Provider's digital microwave system. This option assumes that digital conversion project from Scipio Pass to Milford Service Center has been completed. Digital multiplex will be installed at SCC, Pavant, Sunstone POI Substation, and Interconnection Customer's Collector Substation.

For the primary RAS protection scheme, RFL 9745 audio tone transmitters/receivers and digital channels will be installed at Mona, Camp Williams, Spanish Fork, Sigurd, Huntington, and Interconnection Customer's Collector substation. Leased telephone lines with protection and RFL 9745 audio tone transmitters/receivers will be installed for the RAS protection scheme secondary channels for Mona, Camp Williams, Spanish Fork, Sigurd, Huntington, and Interconnection Customer's Collector substation. Ground potential rise (GPR) measurements will be required at Emery Substation and Interconnection Customer's Collector Substation.

Substation Requirements

The switching substation will be arranged in a three breaker ring configuration. The three breakers will be rated at 230kV, 1200Amp. Each breaker will have a TPST disconnect switch installed on each side of the breaker. Each line is to be connected into the ring via a 230kV, 1200Amp, TPST disconnect switch with ground blades. The substation also requires the installation of six (6) CCVT's, (3 per line position) a 12' x 15' control house, 48 volt battery system, battery rack & 12 Amp battery charger. An eight foot high fence (7' fabric, 1' barbed wire) with at least one 24' wide double gate is to completely enclose the facility. To allow for the installation of equipment and to allow service vehicles room to access the equipment for maintenance, it is estimated that, at a minimum, a 300'x 300' parcel of land is required. Any supplemental reactive compensation required to meet the power factor requirements, to be installed at the point of interconnection, will be connected to the Interconnection Customer's incoming radial line, and be the responsibility of the Interconnection Customer, and not included in any cost estimate in this report..

Metering Requirements

The metering at the point of interconnection will be designed to accommodate both phases of the project. The metering will be accurate from a minimum of 200 KW of load or generation to a maximum rating of 800 MW. The metering design package will include two meter's at the interchange point. The primary meter will be used for standard retail sales and generation including SCADA MW, MVAR, MWh and per phase voltage quantities. The second meter is required for telemetry MW and backup register data. The meters require a dial-up phone line for retail sales and transmission accounting via the MV-90 translation system. Expect 30 weeks delivery time for instrument transformers once PO is completed. It is critical to order material well in advance of expected in-service time.

6.1.3 Cost Estimate

Interconnection at Transmission Provider's Pavant-Gonder 230 kV line

Interconnection – Other than Network Upgrades	$ 326,531
Interconnection – Network Upgrades	$5,023,815
Total Interconnection Cost	**$5,350,346**

6.1.4 Schedule

The critical path item in the construction schedule will be engineering, procurement and construction of the switching station. Transmission Provider can complete this in 18 months following the signing of a Large Generator Interconnection Agreement.

6.1.5 Maximum Allowed Output (for informational purposes only)

This section identifies the maximum allowed output, at the time the study is performed, of the interconnecting Large Generating Facility without requiring additional Network Upgrades. The maximum allowed output of the interconnecting Large Generating Facility without requiring modifications beyond those discussed above, is 200 MW.

6.2 ER Interconnection Service – 100% Deliverability (for informational purposes only)

6.2.1 Requirements

Transmission Modifications

For 200 MW of Project generation, dynamic reactive support in the Wasatch Front will be required. A static VAR compensator in the -100 / +200 MVAR range would be required to provide the dynamic support. A generator tripping remedial action scheme will be required for tripping the project generation for rare but critical transmission outages. See Detailed Planning Study (Appendix 1).

Existing Breaker Modifications – Short-Circuit

No changes in the fault duty as a result of the transmission modifications.

Protection Requirements

The studies have shown a need for a remedial action scheme (RAS) to force the curtailment of the generation at Interconnection Customer's Generation Facility for the loss of transmission capacity south of Mona Substation. This RAS will require the installation of monitoring and transfer trip equipment at the following substations: Mona, Camp Williams, Spanish Fork, Sigurd, Huntington, and Emery Substations. The status of nine 345kV lines will be brought by transfer trip equipment into Sigurd Substations. At Sigurd Substation the logic in controllers will determine if multiple paths to Mona Substation are open and if that is the case a signal will be sent to the collector station to curtail the generation. To meet regulatory operation requirements redundant systems, including dual routed communication paths, will be need to support the RAS.

A preliminary scope of the protection equipment that will be required for this RAS includes: 22 – audio tone transmitter/receivers and 2 – programmable logic controllers.

Data Requirements (RTU)

Modification to the Sigurd Substation RTU to support the new RAS.

Communication Requirements

Dual routed communication paths between:
Sigurd – Emery
Sigurd – Huntington
Sigurd – Spanish Fork
Sigurd – Camp Williams
Sigurd - Mona
Sigurd – the collection substation
Many of these communication paths already exist.

Substation Requirements

Other than the relay the installation of relaying equipment in the various substation called out above, there are no modifications to, or the replacements of, any of the substation equipment in the yards.

6.2.2 Cost Estimate

100% Deliverability Additions for Interconnection at Transmission Provider's Pavant-Gonder 230 kV line

Interconnection – Other than Network Upgrades		$ 0
Interconnection – Network Upgrades		$25,100,000
	Total Interconnection Cost	**$25,100,000**

6.2.3 Schedule

The critical path item for this portion of the study is the design, procurement and installation of the dynamic VAR support. This could be completed in approximately two years after the signing of an interconnection agreement.

6.3 Network Resource Interconnection Service

6.3.1 Study Results

The results are the same as the total results for ER Interconnection Service and 100% Deliverability). The combined results are the outcome of the NR Service study.

6.3.2 Requirements

The requirements are the same as the total requirements under Section 6.1 (for ER Interconnection Service and 100% Deliverability). All are required for NR interconnection service.

6.3.3 Cost Estimate

This section identifies the installed cost estimate (in current year dollars) for Transmission Provider's Interconnection Facilities and Network Upgrade Requirements for NR Service. The cost estimate is the sum of the cost estimates for ER Interconnection Service and for 100% Deliverability.

<u>Interconnection at Transmission Provider's Pavant-Gonder 230 kV line</u>

Interconnection – Other than Network Upgrades		$ 326,531
Interconnection – Network Upgrades		$30,123,815
	Total Interconnection Cost	**$30,450,346**

7.0 PHASE 2 – ADDITIONAL 200 MW

7.1 ER Interconnection Service – Interconnection Only

7.1.1 Requirements

Transmission Modifications

Transmission facility additions beyond the POI are not required. See Detailed Planning Study (Appendix 1).

Generating Facility Modifications

The Interconnection Customer's generation facility must incorporate a means of automatically regulating voltage at the central substation by varying the VAR flow to and from the transmission system within a range of +/-95% power factor at the interconnection point.

The generating facility must meet the Federal Energy Regulatory Commission's Order 661 low voltage ride through requirements, and is expected to be capable of providing dynamic voltage support (similar to that provided by a synchronous machine's excitation system). Additionally, the Transmission Provider has established that: for voltages less than or equal to 1.1 pu, the wind turbine units must stay on indefinitely; for voltages less than or equal to 1.15 pu the wind turbine units can trip after a 1.0 second delay; for voltages less than or equal to 1.2 pu the wind turbines can trip after a 0.3 second delay; and for voltages greater than 1.2 pu the wind turbines can trip instantaneously.

Switching Station

Any supplemental reactive compensation required to meet the power factor requirements, to be installed at the point of interconnection, will be connected to the Interconnection Customer's incoming radial line, and be the responsibility of the Interconnection Customer, and not included in any cost estimate in this report..

Existing Breaker Modifications – Short-Circuit

The increase in the fault duty on the system as a result of the addition of the generation facility with the 200 - 2MVA generators and the 4 – 80/100/125MVA step up transformers with 10% impedance will not push the fault duty above the interrupting rate of any of the existing fault interrupting equipment.

Protection Requirements

No additional protection would be requirement beyond what was added for phase 1.

Data Requirements (RTU)

From the Collector Station

Analogs:

- Real power flow through each of the 34.5kV line feeder breakers
- Reactive power flow through each of the 34.5kV line feeder breakers
- Reactive power flow from each of the shunt capacitors

Status:

- All 34.5 and 230kV breakers and circuit switchers

7.1.2 Cost Estimate

Interconnection at Transmission Provider's Pavant-Gonder 230 kV line

Interconnection – Other than Network Upgrades	$	0
Interconnection – Network Upgrades	$	0
Total Interconnection Cost	**$**	**0**

7.1.3 Schedule

The modifications required for this portion of the study could be completed with in one year of a signed interconnection agreement.

7.1.4 Maximum Allowed Output (for information only)

The Sigurd-Pavant-Gonder 230 kV line is normally scheduled and operated with an east to west flow. In the absence of the east to west flow, the 342 MVA continuous rating of the Sigurd-Pavant-Gonder 230 kV line will be exceeded when the Project generation exceeds 330 MW.

7.2 ER Interconnection Service – 100% Deliverability (for information only)

7.2.1 Requirements

Transmission Modifications

For 400 MW of Project generation, one additional circuit of the proposed Mona-Oquirrh double circuit 345 kV line will be required. With the addition of the Mona-Oquirrh circuit, additional the dynamic reactive support beyond what is required for Phase 1, is not required. A generator tripping remedial action scheme will be required for tripping the project generation for rare but critical transmission outages. See Detailed Planning Study (Appendix 1).

Existing Breaker Modifications – Short-Circuit

The increase in the fault duty on the system as a result of the addition of the Mona – Oquirrh 345kV line will require that the following circuit switchers to be replaced 128I, 130I, and 160I at Oquirrh Substation with fault interrupting devices that will interrupt at a minimum 34kA.

Protection Requirements

Pilot line protection on the new Mona – Oquirrh 345kV line.

Data Requirements (RTU)

Modification to the Oquirrh and Mona Substation RTUs to add the control and indication of the new line breakers.

Substation Requirements

Replace the existing 138kV S&C Transrupter II device (128I), the 138kV S&C Model 2030 Circuit Switcher (130I) and the 138kV S&C Circuit Switcher (160I) with new Circuit Switchers that are capable of interrupting 40kA. The new circuit switchers are supplied with their own structures so new foundations will be required.

7.2.2 Cost Estimate

For 100% deliverability of 200 MW Phase 2 - Interconnection at Transmission Provider's Pavant-Gonder 230 kV line

Interconnection – Other than Network Upgrades	$ 0
Interconnection – Network Upgrades	$83,200,000
Total Interconnection Cost	**$83,200,000**

7.2.3 Schedule

It would take approximately five years to permit and construct the Mona to Oquirrh 345 kV line.

7.3 Network Resource Interconnection Service

7.3.1 Study Results

The results are the same as the total results for ER Interconnection Service and 100% Deliverability. The combined results are the outcome of the NR Service study.

7.3.2 Requirements

The requirements are the same as the total requirements under Section 7.1 (for ER Interconnection Service and for 100% Deliverability). All are required for NR interconnection service.

7.3.3 Cost Estimate

This section identifies the installed cost estimate (in current year dollars) for Transmission Provider's Interconnection Facilities and Network Upgrade Requirements for NR Service. The cost estimate is the sum of the cost estimates for ER Interconnection Service and for 100% Deliverability.

<u>Interconnection at Transmission Provider's Pavant-Gonder 230 kV line</u>

Interconnection – Other than Network Upgrades	$ 0
Interconnection – Network Upgrades	$83,200,000
Total Interconnection Cost	**$83,200,000**

7.3.4 Schedule

It would take approximately five years to permit and construct the Mona to Oquirrh 345 kV line.

8.0 PARTICIPATION BY AFFECTED SYSTEMS

No affected systems participated in this study.

9.0 APPENDICES

<u>Appendix 1: Detailed Planning Study</u>

Appendix 1:
Detailed Planning Study

<u>Interconnection Customer</u>
<u>Detailed Planning Study</u>

1.0 Introduction

Q0060 & Q0061 ("Interconnection Customer") has submitted a request for a feasibility study to interconnect a large wind generation project in the Milford, Utah area (LL coordinates: N 38° 30.662'; W 112° 57.0'). Interconnection Customer's Project ("Project") is separated into two phases with 200 MW of generation requested for commercial operation by December 31, 2007 and a second 200 MW of generation requested for commercial operation by June 30, 2008. Interconnection Customer requested a 230 kV point of interconnection ("POI") on the existing PacifiCorp ("Transmission Provider") Sigurd-Pavant-Gonder 230 kV line near Sunstone. Three alternate proposed POIs on the Sigurd-Parowan-West Cedar 230 kV line are:

(1) near Enoch adjacent to Highway 130, west of Parowan,
(2) near the intersection of Highway 20 and I-15, and
(3) near Freedom and Marysville.

This report summarizes studies performed, POIs, transmission capacity from the interconnection points to the Sigurd substation, and summarizes transmission capacity from the Sigurd substation to the Transmission Provider's eastern control area load center.

2.0 Study Assumptions

This study assumes:
• The Project will be designed to control the voltage at the POI within a specified voltage range (typically 1.0 to 1.04 pu).
• The Project will be designed with a +/- 0.95 power factor capability at the POI. Due to the length of the radial interconnection, it is expected that the supplemental reactive compensation will be installed on the radial interconnecting line, close to the Point of Interconnection.
Note – No detailed information on the Project generation was provided for study analysis. Therefore, the Project generation was modeled at the 230 kV Project bus with a +/- 0.95 power factor capability.

3.0 Interconnecting to the Existing System

The Sigurd-Pavant-Gonder 230 kV line is a 193 mile line (Sigurd-Pavant: 43 miles, Pavant-Gonder: 150 miles) interconnecting the Transmission Provider's eastern system with the Sierra Pacific Power Company. The Sunstone POI is estimated to be 20 line miles west of Pavant.

The Sigurd-Parowan-West Cedar 230 kV line is a 117 mile radial line (Sigurd-Parowan: 92 miles, Parowan-West Cedar: 25 miles) serving a peak load of approximately 120 MW in the Cedar City area. For this report, the alternate POI near Enoch has been changed to Parowan as the Parowan-West Cedar line operation is schedule to change to 138 kV in 2008. The alternate POI near the intersection of Highway 20 and I-15 (H20-I15) is estimated to be 70 line miles from Sigurd. The alternate POI near Freedom and Marysville (Free Mary) is estimated to be 30 line miles from Sigurd. The shortest line route from Free Mary to the Project traverses through rough mountain terrain. See table below for summary of line miles.

Point of Interconnection (POI)	Line Miles to Sigurd (from POI)	Line Miles to Project (from POI)
Sunstone	Approx. 65 miles	Approx. 50 miles
Parowan	92 miles	Approx. 45 miles
H20-I15	Approx. 70 miles	Approx. 40 miles
Free Mary	Approx. 30 miles	Approx. 50 miles

4.0 Descriptions of the Project to POI to Sigurd Transmission Systems

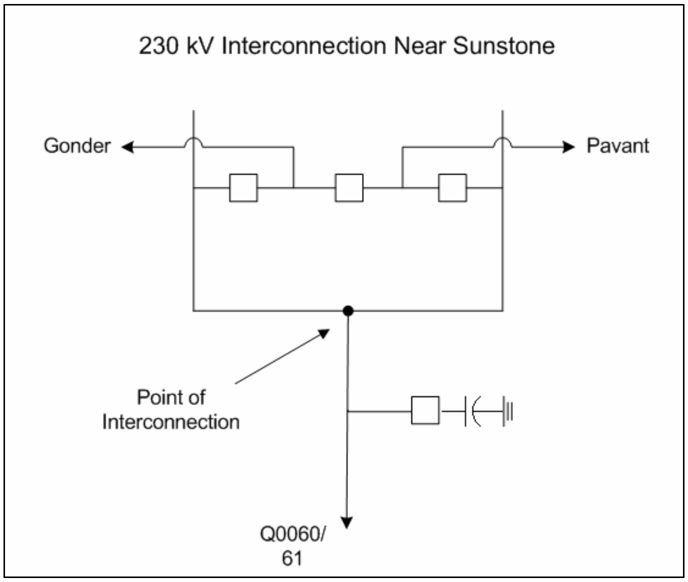
The analyses of the delivery of the Project output to the four POIs and on to Sigurd are divided into to sections, one POI on the Sigurd-Pavant-Gonder 230 kV line and three POIs on the Sigurd-Parowan 230 kV line.

4.1 Sigurd-Pavant-Gonder 230 kV Transmission System

For the analysis of the Sunstone POI, the Project was modeled with 200 MW and 400 MW of generation (+/- 0.95 pf capability) with approximately 50 miles of 230 kV transmission to Sunstone. Steady state and contingency conditions were simulated to study system performance. The Project to Sunstone line rating was assumed to exceed 400 MVA.

With 200 MW of Project generation, steady state and Sunstone-Gonder line outage study results indicated acceptable performance along the Sigurd-Pavant-Gonder line for normal operating conditions. With 400 MW of Project generation, steady state study results indicated acceptable performance with the addition of approximately 50 MVAR of shunt compensation at Sunstone and under the conditions of predominate east to west flow on the Pavant-Gonder line. This supplemental compensation is within the +/- 95% requirement at the Point of Interconnection. The Sigurd-Pavant-Gonder 230 kV line is normally scheduled and operated with an east to west flow. In the absence of the east to west flow, the 342 MVA continuous rating of the Sigurd-Pavant-Gonder 230 kV line will be exceeded when the Project generation exceeds 330 MW. Based on historical data, the potential for overload would be under several hundred hours per year and could be reduced further with the application of dynamic line ratings. To fully prevent the line overload under the worst case condition, up to 70 MW of Project generation would have to be curtailed. Alternatively the Sunstone-Pavant-Sigurd 230 kV line could be reconductored to provide firm capacity. In addition, the outage of the Sunstone-Gonder line at the higher generation level may require additional shunt compensation at Sunstone (within the required (+/- 0.95 pf capability requirement) depending upon the reactive capability of the Project. For all levels of Project generation, the loss of any section of the Sigurd-Pavant-Sunstone 230 kV line was assumed to require tripping of the Project generation as PacifiCorp would not have a transmission path to the eastern control area load center.

A simplified one-line diagram of the 230 kV interconnection facilities near Sunstone is shown in Figure 1.



4.2 Sigurd-Parowan 230 kV Transmission System

Studies were not conducted for the Parowan, H20-I15 and Free Mary POIs on the Sigurd-Parowan line, but the potential impacts, based on other studies, are described here. The Sigurd-Parowan-West Cedar 230 kV line, with a continuous rating of 342 MVA, is a radial line serving the Cedar City area load. The available capacity in this line is approximately 275 MVA due to another proposed generation project. The study results for the Sunstone POI with 200 MW of Project generation can generally be applied to all three POIs on the Sigurd-Parowan line providing the Project is designed with a +/- 0.95 power factor capability at the POI. The outage of any segment of the line between Sigurd and the POI would require tripping of the Project generation.

As the Sigurd-Parowan 230 kV line and Sigurd-Red Butte 345 kV line are in the same corridor, the only acceptable option to accommodate the 400 MW level in this same corridor, is to connect the project to the 345 kV line. Connection to a 345 kV line will require a separate generation interconnection request. Reconductoring the section of 230 kV line between Sigurd and the POI is not an option because a project to interconnect the Sigurd-Parowan-West Cedar 230 kV line with the Sigurd-Red Butte 345 kV line near Cedar City is scheduled for mid-2008. With this project and 400 MW of Project generation, the anticipated “through flow” on the Sigurd-Parowan line combined with the 400 MW of Project generation would exceed the 230 and 138 kV transmission system capacity between Parowan and Cedar City.

5.0 Descriptions of the Sigurd to Eastern Control Area Load Center

For this study, the transmission system north from Sigurd to the PACE load center in the Wasatch Front consists of two paths of interest; the section from Sigurd to Mona, and the section north from Mona to the Wasatch Front. The requirement for each section is discussed separately.

5.1 Sigurd to Mona

Sigurd is connected to Emery and Huntington by two (roughly) east/west 345 kV transmission lines. As such, the transmission network north from Sigurd to Mona must be considered in conjunction with the parallel northbound Huntington and Emery transmission lines. This network consists of the following facilities:

- Two Sigurd-Mona 345 kV lines;
- Two Emery/Huntington to Spanish Fork/Camp Williams 345 kV lines; and
- One Huntington to Mona 345 kV line.

Northbound capacity is limited by the simultaneous (N-2) outage of the two lines north from Emery/Huntington to Spanish Fork and Camp Williams which is considered credible since they are immediately adjacent to one another in a narrow corridor. Previous studies have determined that, under heavy load conditions with loading levels approximately 100 MW above existing commitments[1], this N-2 outage causes the Huntington-Mona 345 kV line to load above its Short Period Over-Load (SPOL) rating. As such, generator tripping must be added to both the first and second 200 MW phases of the proposed facility. This Remedial Action Scheme (RAS) will trip a predetermined amount of generation at the facility for certain outages[2] to prevent overloads.

5.2 Mona to the Wasatch Front

Transfers of power from the proposed project must also cross from Mona into the PACE load center in the Wasatch Front area. In addition, all transmission service requests for capacity in this same path made prior to this request must be considered which, unfortunately, considerably complicates this analysis. There are three requests germane to this path, one for 100 MW and a second that could be either 340 or 500 MW . Based on the results of prior as well as on-going studies, the first 575 MW of capacity across this path will require the addition of two Static VAR Compensators (SVC) and a new double circuit Camp Williams-90TH South 345 kV line. At some point above 575 MW, one circuit of the proposed double circuit Mona-Oquirrh 345 kV line must be added. However, the previous study didn't determine the cut-off point and that will have to be determined when additional studies are conducted. For the purposes of this feasibility study, the determination of required facility additions will be weighted toward the worst case assumptions. Further, if some or all of these earlier requests are withdrawn, the required facility additions and cost may be somewhat different.

Timing is also an issue. While the earlier 100 MW request is in a similar timeframe as the Interconnection Customer's request (2007 and 2008), the 340 or 500 request has a start date in 2012. Due to these time differences, there may be some opportunity to advance or delay projects which may affect the final cost of reinforcements and the speed at which these reinforcements can be placed into service. As such, it may be possible to advance the SVC's required for the earlier requests and delay the Mona-

[1] A proposed 100 MW wind project in the same general area as the Project will reduce this margin to 0 MW if constructed. Since it has a lower queue number, it has a higher priority and must be considered as 'in-service' for this study.
[2] Since detailed studies have not been conducted for this report, other transmission outages may require generation tripping. However, because the events for which tripping would be required are quite rare, the actual need to trip should also be quite rare.

Oquirrh line. This potentially reduces the cost of this reinforcement since the improvements at Oquirrh that will support the new line from Mona are not scheduled to be in-service until 2010.

5.2.1 Phase 1 - 200 MW

For the first 200 MW phase, two scenarios are considered.

If the higher priority requests total 440 MW (100+340), then we will assume that the Mona-Oquirrh line won't be required and that the only reinforcement will be limited to the addition of dynamic reactive support in the Wasatch Front on a one MVAR per one MW basis. In other words, a +200/-100 MVAR SVC will be required. The total new obligation would now be 640 MW (440 + 200), somewhat above the trigger level of 575 MW, but for the purposes of this feasibility study, we will assume that a new line is not required for the 200 MW first phase.

If the earlier requests total 600 MW (100 + 500), then we will assume one circuit of the proposed double circuit Mona-Oquirrh 345 kV line will be required. It is not anticipated that dynamic VAR support will be required in addition to this new line.

5.2.2 Phase 2 - 400 MW

With prior requests totaling either 440 or 600 MW, the addition of the second 200 MW phase will require the addition of one circuit of the proposed double-circuit Mona-Oquirrh 345 kV. It is not anticipated that dynamic VAR support will be required, beyond that required for Phase 1.