Seattle City Light

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Seattle City Light Facility Interconnection Requirements

For Generation, Transmission, and End-User Facilities (SCL-FAC-001)

Seattle City Light

APPROVED BY

Shengli Huang

Shengli Huang (Dec 18, 2024 15:20 PST)

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SIGNATURE **DATE**

Shengli Huang, PE
System Planning Manager, Energy Delivery Engineering

REVIEWED BY

12/18/2024

SIGNATURE **DATE**

Robert Jones, PE
Principal Electric Power Systems Engineer, System Planning

PREPARED BY

Stephanie Imamovic, System Planning

Megan Cammarano, System Planning

CONTRIBUTORS

Sung Kim, Communications Engineering

Rob Collins, Communications Technician

Paul Haase, Compliance

Eugene Haller, Compliance

Faz Kasraie, Generation Engineering

Shane Repking, Generation Engineering

Patrick Eltrich, Metering Technician

Arlen Everist, Metering Technician

Robin Cross, Power Management

Charles Freeman, Power Management

Carey Deutscher, Power Quality

Lane Newby, Protection Engineering

Claire Lloyd, Substations Engineering

Rajinder Rai, Substations Engineering

Michael Watkins, Systems Operations

Robert Jones, System Planning

Revision History

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1	12/22/2016	Initial Version	
2	12/14/2018	Robert Jones	Updated for FAC-001-3
3	12/13/2023	Robert Jones	Updated for FAC-001-4
4	12/18/2024	Robert Jones	Updated “qualified change” language

Table of Contents

1. Introduction

This document covers the technical specifications for interconnection of small and large generation facilities, transmission facilities, and end-user facilities under the jurisdiction of NERC standard FAC-001. All interconnections to the Seattle City Light (SCL) electric system must be in compliance with all applicable SCL, Western Electricity Coordinating Council (WECC), North American Electric Reliability Corporation (NERC), Institute of Electrical and Electronics Engineers (IEEE), and American National Standards Institute (ANSI) standards. The bounds of SCL's electric system that apply to this document can be defined as that which would fall under NERC's definition of "bulk electric system," as defined in the *Glossary of Terms Used in NERC Reliability Standards*. Interconnection of facilities not subject to FAC-001 are covered in other SCL requirement documents.

This document provides technical and applicable regulatory requirements. This document and any additional documents referenced in this document are subject to change. Not all interconnections may require all the items and studies. There may be additional requirements identified during the study process. Seattle City Light engineering judgment will be made on a case by case basis.

1.1. Definitions

Ancillary Services	Those services that are necessary to support the transmission of capacity and energy from resources to loads while maintaining reliable operation of the Transmission Service Provider's transmission system in accordance with good utility practice.
End-User Interconnection	Interconnections of any end-user facility. Previously referred to as "Load Interconnections."
Generation Interconnection	Interconnection of any generation facility, including both small and large generation facilities.
Qualified Change	See Appendix A for the definition of what constitutes a "qualified change" to an existing interconnection.
Project	The request to interconnect a generation, transmission or end-user facility.
Requester	Utility, developer, or other entity that requests a new or modified interconnection for a generation, transmission, or end-user facility.
System Operator	An individual at a control center (Balancing Authority, Transmission Operator, Generation Operator, Reliability Coordinator) whose responsibility it is to monitor and control that electric system in real time.
Transmission Interconnection	Interconnections of any transmission facility. Previously referred to as "Line Interconnections."

1.2. Acronyms

ACE	Area Control Error
AGC	Automatic Generator Control
ANSI	American National Standards Institute
AVR	Automatic Voltage Regulator
BAA	Balancing Authority Area
IEEE	Institute of Electrical and Electronics Engineers
LGIA	Large Generator Interconnection Agreement
LGIP	Large Generator Interconnection Procedures
NERC	North American Electric Reliability Corporation
NESC	National Electric Safety Code
NWPP	Northwest Power Pool
OATT	Open Access Transmission Tariff
OSHA	Occupational Safety and Health Association
POI	Point of Interconnection
PMU	Phasor Measurement Units
RAS	Remedial Action Schemes
SCADA	Supervisory Control and Data Acquisition
SCL	Seattle City Light
SGIA	Small Generator Interconnection Agreement
SGIP	Small Generator Interconnection Procedures
WECC	Western Electricity Coordinating Council

1.3. Purpose

The purpose of these interconnection requirements is to ensure that all facilities interconnected to the transmission system avoid adversely impacting the safety or reliability of the SCL system and to enable the interconnected customer to operate its facilities in a safe and reliable manner. Technical requirements are included in this document; however, the interconnection process, business practices, contractual matters, and transmission services are not addressed. Contact SCL for additional information regarding the excluded items.

1.4. Scope

This document (SCL-FAC-001) is intended to cover the requirements of the NERC Facilities Design, Connections, and Maintenance (FAC) standard FAC-001-3. Facility interconnection requirements are established to avoid adverse impacts on the reliability of the Bulk Electric System. These guidelines are general and may not cover all details in specific cases. Additional requirements may be necessary as a result of the findings of a system impact study for a specific project. Upon completion of studies, interconnection equipment shall be installed to meet all applicable local, state, and federal codes.

It should be noted that this document is not intended to be design specifications or an instruction manual, and the information presented may change based on industry events, regulatory requirements, evolving standards and practices or for other reasons. These technical requirements are generally consistent with principles and practices of the NERC, WECC, IEEE and ANSI. The standards of the above-listed organizations are also subject to change and when applicable, the most recent version of such standards shall apply to each interconnection request. Applicability of the above standards that affect the SCL electric system will also be consistent with SCL engineering practices and subject to final interpretation by SCL engineering staff.

Please note, facilities connected at lower voltages (non-BES) are covered by SCL's "Requirements for Electric Service Connection" for end-user interconnections or by SCL's DPP 500 P III-305 "Standards for Interconnection of Generators 20MW and less in Capacity to Seattle City Light's Electrical Distribution System" for generator interconnections.

2. Requesting a New Facility Interconnection or Qualified Change to an Existing Interconnection

Requesters can ask for a new interconnection or a qualified change to an existing interconnection of generation, transmission, or end-user facilities to the SCL electric system. An interconnection study must be performed to determine the required additions and modifications necessary to interconnect to SCL's facilities, such as substations, transmission lines, communications and control facilities to accommodate the interconnection request.

These interconnection studies will identify impacts and evaluate potential solutions. A proposed interconnection shall not degrade the reliability or operating flexibility of the existing SCL electric system.

2.1. Requesting an Interconnection

New or upgraded projects, as well as qualified changes to existing projects, are to be submitted by a Requester with the required fees. Requests and/or any questions about the process should be sent to oatt@seattle.gov. SCL evaluates and studies each project individually and determines impact to the SCL electric system. Based on studies, SCL will provide the Requester the project specific interconnection requirements. Please note that the costs for studies and interconnection requirements are borne by the Requester. Additionally, if multiple projects are received in parallel, the first project that has all submission requirements completed will be studied first.

2.1.1. Generation Interconnection Request

Requests for new interconnections and qualified changes to existing interconnections of large or small generation facilities will be consistent with the LGIP or SGIP, as appropriate. These are included as attachments to the SCL OATT. The Requester is required to provide significant project specific information to initiate the process. Upon completion of the studies, a LGIA or a SGIA, as appropriate, will be executed if the requester wants to proceed with the interconnection.

2.1.2. Transmission and End-User Interconnection Request

Requests for new interconnections and qualified changes to existing interconnections of transmission and end-user facilities will be initiated by contacting SCL. This will be consistent with SCL's OATT. Requester is required to provide project specific information to initiate the process. Upon completion, a Service Agreement will be executed if the Requester wants to proceed.

2.2. Notification of Interconnection

The Project will be added to the SCL interconnection study queue once:

- A completed application for an interconnection has been submitted to SCL
- A study agreement is signed
- Fees are paid

- Complete project technical information is provided

If the project is requesting interconnection to facilities that are owned by other entities, the Requester will make the request to each owner.

2.3. Coordination with Affected Systems

Coordinated studies will be required if other interconnected electric system owners are affected based on the SCL studies. SCL will notify the affected systems and allow those entities to review the study and proposed facility plans and identify concerns, issues, and impacted infrastructure. SCL will confirm that the facility will be within the metered boundaries of a Balancing Authority Area. All the affected parties, including the Requester and SCL will work together to develop the most efficient plan that will accommodate the proposed project and meet the reliability requirements.

2.4. Interconnection Studies

SCL will conduct interconnection studies as required to evaluate the impact of a proposed Project on the reliability and capability of the electric system. These studies can require considerable time and effort, depending on the size of the Project and its potential system impacts. Any costs to conduct or review interconnection studies are the responsibility of the Requester.

Potential studies may include, but are not limited to the following:

Interconnection Feasibility Study- A preliminary evaluation of the system impact and cost of interconnecting the Project to the SCL's system.

Interconnection System Impact Study- An engineering study that evaluates the impact of the proposed interconnection on the safety and reliability of the SCL's system and, if applicable, other affected systems. The study shall identify and detail the system impacts that would result if the Project were interconnected without alterations or system modifications, focusing on the adverse system impacts identified in the Interconnection Feasibility Study, or to study potential impacts.

This study will include:

- Powerflow
- Short circuit studies
- Dynamic stability
- Voltage studies
- Sub-Synchronous Resonance (SSR) (if deemed necessary)
- Electro-magnetic transient studies (if deemed necessary)
- Any other studies deemed necessary by SCL

Interconnection Facilities Study- a study conducted by SCL or a third-party consultant for the Requester to determine a list of facilities (including SCL's facilities and network upgrades as

identified in the Interconnection System Impact Study), the cost of those facilities, and the time required to interconnect the Project with SCL's system.

3. General Facility Interconnection Requirements

All interconnections to the SCL electric system must comply with all applicable SCL, WECC, and NERC standards, requirements, and criteria. SCL's facility interconnection requirements apply to generation, transmission, and end-user facilities unless otherwise noted. Requirements include, but are not limited to, the following:

- Voltage level and MW and Mvar capacity or demand at the point of interconnection (covered in section 3.1)
- Breaker duty and surge protection (covered in section 3.2)
- System protection and coordination (covered in section 3.3)
- Metering and telecommunications (covered in section 3.4 and 3.5)
- Grounding and safety issues (covered in section 3.6)
- Insulation and insulation coordination (covered in section 3.7)
- Voltage, reactive power, and power factor control (covered in section 3.8)
- Power quality impacts (covered in section 3.9)
- Equipment ratings (covered in section 3.10)
- Synchronizing of facilities (covered in section 3.12)
- Maintenance coordination (covered in section 3.13)
- Operational issues (abnormal frequency and voltages) (covered in section 3.14)
- Inspection requirements for new interconnections or for qualified changes to existing interconnections (covered in section 3.15)
- Communications and procedures during normal and emergency operating conditions (covered in section 3.16)

Each of the items listed above will be addressed in SCL's studies of the specific interconnection request, as applicable.

In addition, the following requirements apply to all Projects:

- SCL shall retain the right to disconnect Requester's facilities any time Requester's facilities pose a dangerous condition, and such disconnection is appropriate to protect safety of SCL's employees, customers, general public, or to maintain integrity of SCL's facilities.
- Standardized design, planning and operating practices and procedures should be used so that the new interconnection may be readily incorporated into the existing transmission network.

- For reliable operation, certain telecommunications, control, and protection equipment will need to be provided with redundancy.
- The equipment for the new interconnection shall have sufficient capabilities for both initial operation and for long range operation.
- Operations and maintenance personnel must be properly trained for both normal and emergency conditions.
- Tools and spare equipment must be readily available at the Requester's disposal to accomplish foreseeable operations and maintenance tasks

3.1. Voltage Level, MW, and Mvar Capacity or Demand at Point of Interconnection

3.1.1. Requirements for all Interconnections

The most practical voltage and interconnection points are site specific; therefore, SCL will employ engineering judgement and the results of the engineering studies to determine appropriate voltage levels, interconnection points, and system capabilities after the Requester supplies SCL with the approximate geographic location and the desired MW and Mvar capacities or demand at the Point of Interconnection. Equipment Ratings must be consistent with SCL's FAC-008 methodology.

3.2. Breaker Duty and Surge Protection

3.2.1. Requirements for all Interconnections

Circuit breakers, disconnect switches, and similar equipment connected to SCL's electric system shall be capable of carrying both normal and emergency rating load currents, and must also withstand available fault currents without damage. This equipment shall not become a limiting factor in the ability to transfer power on the SCL electric system. During prolonged steady-state operation, all such equipment shall be capable of carrying the maximum continuous current that the interconnected facility can reasonably deliver.

3.3. System Protection and Coordination

3.3.1. Requirements for all Interconnections

System protection and control schemes are coordinated to provide for safety and equipment protection and to minimize disruption of services during system disturbances. Interconnections will generally require analysis, and an addition or modification to the existing protection and control schemes to maintain security and dependability of operation. The new protection scheme must meet NERC and WECC standards and be approved by SCL engineering. The Requester will be expected to submit for SCL approval relay make and model numbers, protection schemes, relay settings, and communication requirements.

The protection scheme will also ensure there are no problems with being out of synchronization when closing breakers and, where applicable, recognize out of step conditions with the SCL electrical system for either tripping or blocking. Where it is possible for an interconnecting entity to connect to multiple points of the SCL system, that interconnecting entity will include interlocks to prevent the automatic closing of connection or separation points. All possible instances of an

interconnecting entity being able to connect to multiple points of the SCL system must be addressed in an operating agreement. The interconnecting entity will prevent the back-feed energization of Seattle City Light equipment through design or protection equipment.

3.4. Metering

3.4.1. Requirements for all Interconnections

3.4.1.1. Data Requirements for System Operation and Scheduling

All transmission arrangements for power schedules within, across, into or out of the SCL BAA require metering and telemetering. Transmission arrangements with generation, transmission, or end-user facilities may include voltage control, and automatic generation control (AGC). The Reliability Coordinator for the region, Peak Reliability, requires data to ensure the reliable operation of the entire Western Interconnection. Such metering and telemetering equipment may be owned, operated, and maintained by SCL or by other parties approved by SCL. Revenue billing, system dispatching, operation, control, transmission scheduling and power scheduling each have slightly different needs and requirements concerning metering, telemetering, data acquisition, and control. Specific requirements also vary depending upon whether the new interconnection is physically connected to the SCL electric system or electronically connected via telemetering, placing the Project within the SCL BAA. All data requirements for the project will be specified by SCL.

3.4.1.2. Telemetering Data Requirements for SCL Control Center

SCL requires telemetering data for the integration of new interconnections at adjacent BAA boundaries, as well as new generation within the SCL BAA. This typically consists of the continuous telemetering of active power quantities (in MW and Mvar) and hourly transmission of the previous hour's energy (in MWh and Mvarh) from the POI to the SCL control center. SCL will provide project specific metering and telemetering requirements. The following are general requirements for telemetering:

Telemetering is required for all interconnections at an SCL BAA boundary. For this case, telemetering of active power and energy (MW, MWh, Mvar, and Mvarh) is required. High capacity interconnections may require redundant metering and telemetering. For interconnections that are to be normally open, or closed only for emergencies, SCL determines telemetering needs on a case-by-case basis.

3.4.1.3. Calibration and Accuracy of Revenue and Interchange Metering

Revenue and interchange metering must be calibrated at least every two years. More frequent calibration intervals may be negotiated. All parties to the transmission interconnection agreement may witness the calibration. Each meter shall be calibrated against a standard or reference instrument or meter that has been calibrated and certified during the preceding twelve months. Calibration of standard meters and instruments must meet accuracy requirements of the National Institute of Standards and Technology. Parties may perform a standards comparison to test meter calibration and accuracy.

3.4.1.4. SCADA Requirements

New substations require SCL SCADA control and status indication of the power circuit breakers and associated isolating switches used to connect with SCL. SCADA indication of real and reactive power flows, current and voltage levels are also required.

For interconnection made directly to another utility's electric system, SCADA control and status indication requirements shall be jointly determined with the Requester and SCL. SCADA control of breakers and isolating switches are not normally required, although status and indication may be necessary for system security purposes. SCL will provide project specific telecommunications requirements for SCADA systems.

3.4.1.5. SCADA Metering Data

SCADA generation and/or interchange metering data shall be calibrated every two years at a minimum or more often if significant errors occur affecting the state estimator results. All parties to the transmission interconnection agreement may witness the calibration.

3.4.1.6. Interchange Scheduling Requirements

Any new facility being integrated into the SCL electric system must adhere to the scheduling requirements of the prevailing tariff under which it is taking transmission or BAA service from SCL. Customers may be required to provide SCL Transmission Scheduling with an estimate of their hourly load, hourly generation schedules, and/or net hourly interchange transactions. These estimates will be used for both pre-scheduling and planning purposes. SCL will require customers to provide these estimates as necessary in order for SCL to manage the load or resource balance within the SCL BAA and to determine usage of the SCL electric system. In the case of new transmission facilities, scheduling and accounting procedures are needed if the facility is part of an interface between the SCL BAA and another BAA. This scheduling and accounting of interchange between two BAAs normally requires telemetered data from the POI to the control centers of the BAA operators. This data is termed interchange metering and telemetering by SCL and includes MW and MWh quantities. SCL requires that all BAA transactions be pre-scheduled for each hour using the normal scheduling procedures. The end-of-hour actual interchange must be conveyed each hour to the SCL control center. This can be accomplished using telemetering or data link. When the new interconnection represents a shared or jointly owned interface to SCL, or a split resource between the BAA and any other, then a calculated allocation is usually required to divide up the total metered interchange. This nonphysical interface is accomplished by dynamic signal. A two-way dynamic signal is required when a combined request and response interface is used. An example is supplemental AGC services. A one-way dynamic signal is required when a response (or following) interface is used. Moving a BAA boundary is an example of this requirement.

3.4.1.6.1. Interchange Metering Requirements

Interchange telemetering generally consists of bi-directional meters and related telecommunications systems providing MW, Mvar, MWh, and Mvarh at or near the POI. The MW and Mvar measurements are telemetered on a continuous basis for AGC, with reporting rates/scan and communication rates of 2 seconds. MWh and Mvarh are reported each hour to the control center. Project specific interchange telemetering accuracy and calibration requirements will be provided. Effective telemetering requires real-time knowledge of the quality of measurement. There are various indications of this quality associated with the telemetered signal. Analog telemetering is commonly accompanied with squelch and telemetering carrier fail alarms. A loss of meter potential or meter potential phase unbalance should trigger a telemetering carrier failure alarm. Digital telemetering has equivalent signal failure alarms. The metering equipment must also be monitored and alarmed in the telemetering signal. Typical alarms include but are not limited to:

- Loss of meter potential
- Loss of telemetering signal

- Loss of meter potential signal

3.4.1.6.2. Revenue and Interchange Metering System

All facilities capable of exchanging at least 1 MW of active power and directly connected to the SCL electric system require SCL qualified metering for revenue and/or interchange energy data recording for SCL's billing and scheduling functions. Revenue metering includes real power (MW), real energy (MWh), reactive power (Mvar), and reactive energy (Mvarh) produced by revenue meters and recorded on a demand interval basis. Interchange metering includes bi-directional energy and reactive data as well as special telemetering requirements for scheduling purposes. The metering shall be in place to measure the net power at the POI to and from the SCL electric system. The revenue metering system (MV-90™) includes a remote metering system to record the hourly MWh data. The hourly MWh data is downloaded from the metering recorder daily over voice-grade telephone lines. Based on SCL review, recorders may need to be fully compatible with the MV-90™ protocol. Upon request, MV-90™ data is available to the Requester.

3.4.1.6.3. Requirements for Revenue and Interchange Metering

Three-element, three-phase, four-wire meters shall be used on grounded power systems. Two-element, three-phase, three-wire meters can be used on balanced, ungrounded power systems. Both revenue metering and interchange metering shall be bi-directional to record both active and reactive power flows to or from the POI. Metering packages include a MWh recording device compatible with the SCL MV-90™ or SCL scheduling system, as applicable. Project specific metering and telecommunications requirements will be provided.

3.4.2. Generator Interconnection Requirements

3.4.2.1. Metering Requirements

Generation metering usually consists of bi-directional meters and related communications systems providing active power (in MW), reactive power (in Mvar), and energy (in MWh) from the POI. Active power is telemetered on a continuous basis for AGC and hourly energy is sent each hour to the BAA accounting for SCL. A scan/reporting rate of 2 seconds is required. All generation projects of aggregate size equal or exceeding one require hourly prescheduling. SCL may also require indication of available spinning reserve and controlled reserves, both in MW. All metering equipment must be approved by SCL.

3.4.2.1.1. Parasitic Load, Station Service and Start-up Metering

SCL requires generation projects to self-supply parasitic loads when generating. When not generating, the generation plant station service load may be served over the transmission line that interconnects SCL and the generation plant. Generation plant station service and start-up loads must be properly and accurately metered. At a minimum, bi-directional revenue metering and extended range current transformers are required. In addition, separate dedicated instrument transformers and revenue meters may be required to measure station service and start-up loads. Preferably, bi-directional revenue meters and revenue accuracy current transformers should be located in such a way that accurate station service can also be metered. This will allow metering of net generation, start-up power and station service to be accomplished at a single location. If this is not possible, then metering with demand interval data recording (MV-90™ compatible) revenue meters and communications is required at the station service transformer(s).

3.4.2.2. Located within SCL BAA

For generation connected internal to the SCL BAA, telemetering is required for generation facilities of aggregate output equaling or exceeding 3 MVA. For this case, telemetering of real power and energy (MW, MWh), and reactive power (Mvar, Mvarh) is normally required. SCL will determine telemetering needs on a case by case basis for generation sites that remain below 3 MVA. Generation sites with an aggregate output exceeding 3 MVA will require redundant communication, a 2 second scan rate, and ability to be tripped off line by automatic transfer trip, remote trip signal from a control center, or the generator operator on site 24/7 for site maintenance. All other telemetering requirements for the project will be specified by SCL.

3.4.2.3. Generation in the SCL BAA not Controlled by SCL

Telemetering is required for generation located internal to the SCL BAA to account for the scheduling that is required to deliver that energy to the appropriate host BAA. The requirements are similar to interchange telemetering requirements outlined in section 3.4.1.6.1., but will be outlined in greater detail in the interconnection agreement.

3.4.2.4. Data Requirements for BAA Services

Data requirements for BAA services, such as regulation or operating reserves, apply only to generation resources inside the SCL BAA. For resources that are not part of SCL's BAA, the data requirements must meet those determined by the operator of the host BAA and SCL. For generation resources inside the SCL BAA, Ancillary Services (e.g. reserves) must be acquired. Provisions for all Ancillary Services are specified in the agreement for service separately. SCL must specifically approve all arrangements for generators intending to provide Ancillary Services to SCL. If the generator is capable of providing Ancillary Services in excess of its obligation, then SCL may choose to contract with the generator operator to provide additional Ancillary Services. Technical discussions between SCL and generator developers are necessary before the specific implementation requirements can be determined. For generation facilities with a total capacity of 3 MVA or above, redundant Distributed Network Protocol 3.0 data interconnections to the SCL control center will generally be required to transmit unit status and MW, Mvar and kV from the Project. The AGC data to be passed over the data link will be provided for the project.

For each Project a detailed data requirements list with definitions will be provided during the design phase of the interconnection of the project. Actual generator specific data requirements are developed and documented in the Interconnection Agreement. All interconnected generation projects are required to implement and maintain automatic voltage control on a voltage schedule provided by the SCL System Operator. All interconnection generation projects voltages must stay within 95% and 105% of the rated terminal voltage of the generators. The status and availability of each auxiliary reactive support device is also required. Individual generators with internal automatic var compensation (e.g. double fed wound rotor) may be required to receive a voltage set point signal. This will be determined on a case-by case basis.

3.4.2.5. Ancillary Services

If SCL is purchasing Ancillary Services from the generation facility, AGC control of the generator capability is required on a long-term basis. Prior to purchasing AGC services, a capabilities, cost, and benefit investigation as to the AGC control capabilities of the generation facility is required to determine the specific AGC requirements.

Requirements for Ancillary Services are also driven by how the generator operator or the purchaser chooses to meet the reserve obligations of the generation facility, as described below. Either the generation operator or the entity making the transmission arrangements is liable for the reserve obligations associated with the operation of the generation facility consistent with the SCL Tariff. Generation marketed as interruptible power is treated separately under special provisions and guidelines by the WECC and SCL. The responsible party may fulfill these obligations in any of the following ways:

- Make these reserves available to SCL from the generating facility
- Make these reserves available to SCL from another one of their generation resources
- Contract with another generator operator to make these reserves available to SCL on their behalf
- Contract with SCL to cover this reserve obligation

3.4.2.6. AGC Installation

Redundant SCADA communications is required for generation facilities over 3 MVA. SCL will provide project specific AGC data requirements.

3.4.3. End-User Interconnection Requirements

3.4.3.1. Located within SCL BAA

For end-user facilities with direct electrical interconnections to the SCL BAA, telemetering is required for facilities larger than 10 MVA. For interruptible loads, SCL determines telemetering needs on a case-by-case basis. Significantly large and intermittent loads (e.g. arc furnaces, irrigation pumps, electric draglines) may require an interface to the SCL AGC system. Existing practices throughout North America usually require a warning signal of pre-loading to assure that adequate generation reserves are spinning before any sudden load change occurs. Project specific metering, telemetering, and SCADA requirements will be provided.

3.4.3.2. Data Requirements for BAA Services

Non-traditional sources are sometimes used for supplying Ancillary Services. If an end-user facility provides regulating or contingency reserve services, data requirements for deployment of the reserves will be similar to those applied to generating resources, see section 3.4.2.4. Additionally, data requirements for any third-party deployment of externally supplied regulating or contingency reserve services at the SCL BAA interconnecting boundary may be similar to those applied to generating resources. Technical discussions are necessary before the specific data requirements can be determined. The following sections provide a brief overview of these requirements.

3.4.3.2.1. Supplemental AGC Services

If SCL is purchasing supplemental AGC services, AGC interface is required on a long-term basis. Prior to SCL purchasing supplemental services, an investigation into the capabilities, cost, and benefits of AGC control is required to determine the specific AGC requirements. Most supplemental services are scheduled and delivered using real-time dynamic signals, thus requiring redundant telemetering and a 2 second scan rate.

3.4.3.2.2. Ancillary Services

Ancillary Services requirements are also driven by how the interconnected customer chooses to meet these obligations. Either the Requester or the entity making the transmission arrangements is responsible for meeting obligations for necessary ancillary services associated with the interconnection through a service agreement under the tariff. Most self-provided ancillary services are scheduled and delivered using real-time dynamic signals, which require telemetering. The responsible party may fulfill these obligations in any of the following ways:

- Directly provide ancillary services by making resources available to SCL to deploy
- Contract with a third party to make resources available to SCL to deploy
- Contract with SCL to cover this ancillary services obligation

The Requester must demonstrate that the selected options are technically sound and meet all relevant reliability policies and criteria of NERC, WECC and NWPP or their successors.

Where a third party is providing ancillary services, the following data is required with a sampling rate of 2 seconds:

- Net instantaneous active power transferred (in MW)
- Instantaneous reactive power (in Mvar) and total reactive power (Mvarh) transferred
- Current P_{Max} (in MW)
- Operating reserve capability during the upcoming ten minutes
- MWh NET for most-recent hour
- MWh IN accumulated meter read for most-recent hour (frozen top-of-hour read – truncated integer)
- MWh OUT accumulated meter read for most-recent hour (frozen top-of-hour read – truncated integer)
- ACE
- Actual Scheduled Interchange

3.4.3.2.3. SCADA Requirements

Additional data may be required from end-user facilities such as steel rolling mills and wind tunnels, in order to make generation control performance more predictable. Such additional data may include, precursor signals of expected load changes and other data SCL determines to be relevant. SCADA control may also be required. Specific requirements and needs are determined for each end-user facility. This may require a separate SCADA remote terminal unit or it may require data be added into an existing SCADA unit as determined by SCL.

3.5. Telecommunications

3.5.1. Requirements for All Interconnections

Telecommunications facilities shall be installed to fulfill the control, protection, operation, dispatching, scheduling, and revenue metering requirements. They may be owned by SCL, another utility, or a third party. At a minimum, telecommunications facilities must be compatible with, and have similar reliability and performance characteristics to, that are currently used for operation of the power system to which the new generation or end-user facilities will be connected. Telecommunications facilities will employ redundant equipment and geographically diverse paths when required by WECC criteria.

The following WECC guidelines should be referenced for design:

- WECC Guidelines for the Design of Critical Communications Circuits (Telecommunications Work Group)
- WECC Communications Systems Performance Guide for Protective Relaying Applications (Telecommunications and Relay Work Groups)
- WECC Guidelines for Time Synchronization of Protection, Control and Monitoring
- WECC Guidelines for Digital Circuits Synchronization

Depending on the performance and reliability requirements of the control and metering systems to be supported, the facilities may consist of any or all of those covered in the following sections.

3.5.1.1. Microwave Radio Systems

A radio system requires transmitters, receivers, telecommunication fault alarm equipment, antennas, batteries, chargers, and multiplex equipment. It may also include buildings, towers, emergency power systems, mountaintop repeater stations and their associated land access rights, as needed to provide an unobstructed and reliable telecommunications path. In order to meet power system reliability requirements, radio path diversity, equipment redundancy or route redundancy may be required. These measures protect against telecommunications outages caused by equipment failure or atmospheric conditions. In the vicinity of wind turbines, the use of radio systems may be limited because of interference from the turbine blades.

3.5.1.2. Fiber Optic Systems

A fiber optic system requires light wave transmitters, receivers, telecommunication fault alarm equipment, multiplex equipment, batteries, chargers, emergency power systems, fiber optic cable (underground or overhead) and rights-of-way. Self-healing cable route redundancy may be required to prevent telecommunications outages caused by cable breaks.

3.5.1.3. Leased Facilities

A leased facility requires telecommunications facilities, high-voltage isolation equipment, and rights-of-way. It may also include multiplex equipment, emergency power systems, and batteries, depending on the commercial technology employed. Redundancy may be required to prevent telecommunications outage.

3.5.1.4. Wireline Facilities

A wireline facility (e.g., leased line) requires telecommunications cable (underground or overhead), high-voltage isolation equipment, and right-of-way. It may also include multiplex equipment, emergency power systems, batteries, and chargers, depending on the wireline technology employed. Cable route redundancy may be required to prevent telecommunications outage.

3.5.1.5. Voice Communications

3.5.1.5.1. Basic Requirements

If the generation or load facility is within the SCL Balancing Authority Area and any type of telemetering is required, then voice communications to the operator are also required. Voice communications may be accomplished by the Public Switched Telephone Network, a Private Switched Telephone Network, or a private Automatic Ringdown Trunk. If the facility is not staffed with operators, alternative arrangements with a scheduling or control agent may be made, subject to SCL approval.

3.5.1.5.2. Automatic Ringdown Trucks

Dedicated, direct automatic ringdown trunk (or equivalent) voice circuits between each appropriate SCL control center and the operator of the facilities may be required.

3.5.1.5.3. Independent Communications

Independent voice communications for coordination of system protection, control and telecommunication maintenance activities between SCL and the facility should be provided.

3.5.1.6. Data Communications

Telecommunications for SCADA, MV-90™, and telemetering must function at the full performance level before and after any power system fault condition. Repair personnel must restore service continuity immediately after the fault without the need for intervention. The following sections specify the requirements for telemetering of data.

3.5.1.6.1. SCADA

For communication of SCADA information, one or more dedicated circuits are typically required between a new facility and the SCL control center.

3.5.1.6.2. AGC Interchange and Control Telemetering

One or more dedicated circuits are typically required between the new generation facility and the SCL control center for telemetering of AGC Interchange and control information for operations and scheduling applications. At least two dedicated circuits are required for generators larger than 3 MVA.

3.5.1.6.3. General Telemetering

General telemetering of power and energy data (in MW, Mvar, MWh, and Mvarh) and data acquisition systems typically require one or more dedicated communication circuits. These circuits link the new facility to the SCL SCADA masters receiving the data.

3.5.1.6.4. Revenue Metering System (MV-90™)

Commercial dial-up telephone exchange line facilities or a functional equivalent are required for support of the MV-90™ compatible remote MV-90™ equipment. The exchange line facilities communicate with the MV-90™ compatible master computer at the SCL control center. The circuit used for this purpose may also be shared with voice communications and other dial-up data communications.

3.5.1.7. Telecommunications for Control and Protection

Telecommunications for control and protection must function at the full performance level before, during, and after any power system fault condition. The delivery of a false trip or control signal, or the failure to deliver a valid trip signal is unacceptable. Active telecommunication circuits for control and protection must not be tested, switched, shorted, grounded or changed in any manner by any worker, unless prior arrangements have been made through the SCL dispatcher.

3.5.1.7.1. Application on SCL Bulk Electric System

The highest telecommunications performance level as specified by the WECC is 99.999% availability. This level of performance is required on all protection circuits for facilities connected to the SCL transmission system. This performance level is also required for RAS circuits that must meet WECC compliance criteria. These circuits require totally redundant schemes. Availability is determined for the total path of the protective relaying circuit, from one end of the transmission line to the other. Options for achieving these availability requirements by utilizing two or more separate telecommunication methods, routes or systems may be considered. When alternately routed telecommunications for protective relaying schemes are required, a combination of two of these telecommunications methods may be used to meet availability requirements.

3.5.1.7.2. Speed of Operation

Throughput operating times of the telecommunications system must not add unnecessary delay to the clearing or operating times of protection or RAS. System studies and WECC trip time requirements determine maximum permissible throughput operating times of control schemes.

3.5.1.7.3. Equipment Compatibility

Protection systems and supporting telecommunications equipment installed at the interconnecting facility must be functionally compatible or identical to the corresponding equipment employed at the SCL facility. This functionality need not extend to peripherals, such as signal counters and test switches that might be present on SCL's equipment. Teleprotection equipment employed by the Requester must be approved by SCL prior to installation. At the time of the request for interconnection SCL will supply the Requester with a list of acceptable, pre-qualified equipment. Should the Requester choose to employ equipment not on this list, SCL reserves the right to test the equipment for acceptable performance in the required control application. Equipment that passes this testing can be approved by SCL for subsequent installations. Teleprotection systems, including transfer trip, must be properly designed and tested to demonstrate that they perform their intended functions. Care must be taken to ensure

equipment compatibility when applying digital telecommunications systems to protection schemes.

3.5.1.8. Telecommunications During Emergency Conditions

3.5.1.8.1. Emergency Conditions

Emergency telecommunications conditions may develop that affect telecommunications equipment with or without directly affecting power electric system facilities. Examples of telecommunications emergencies include the following:

- Interruption of power to telecommunications repeater and relay stations
- Telecommunications equipment failure, whether minor or catastrophic
- Interruption or failure of commercial, public switched telephone network facilities or services
- Damage to telecommunications facilities resulting from accident, acts of vandalism, or natural causes.

Equipment redundancy and telecommunications route redundancy can protect against certain kinds of failure and telecommunications path interruption. A repair team dedicated to the telecommunications of the interconnecting facility should be retained along with an adequate supply of spare components.

3.5.1.8.2. Backup Equipment

Where commercial, public telephone network facilities, or services support important power system telecommunications, a backup strategy should always be developed by the Requester to protect against interruption of such services. Backup methods could include redundant services, self-healing services, multiple independent routes, carriers, and combinations of independent facilities such as wireline and cellular, fiber and radio, etc. Backup telecommunications system equipment such as emergency standby power generators with ample on-site fuel storage and reserve storage battery capacity must be incorporated in critical telecommunications facilities. Backup equipment should also be considered for certain non-critical telecommunications to provide continued operation of telecommunications during interruption of transmission services.

3.5.1.8.3. Disaster Recovery

The Requester should have a disaster recovery plan in place for telecommunications restoration that should be exercised periodically. The disaster recovery plan should include the ability to provide equipment capable of bypassing or replacing entire telecommunication stations or major apparatus until permanent repairs can be made.

3.5.1.8.4. Telecommunications Security

The operation of power system telecommunications facilities should be continuously monitored at a central alarm point so that problems can be immediately reported, diagnosed, and repaired. Telecommunication sites and facilities should be secured against unauthorized access.

3.6. Grounding and Safety Issues

3.6.1. Requirements for All Interconnections

Each substation must have a ground grid that is solidly connected to all metallic structures and other non-energized metallic equipment. This grid shall limit the ground potential gradients to such voltage and current levels that will not endanger the safety of people or damage equipment in, or immediately adjacent to, the station under both normal and fault conditions. The ground grid size and type are in part based on local soil conditions and available electrical fault current magnitudes. In areas where ground grid voltage rises beyond acceptable and safe limits (for example due to high soil resistivity or limited substation space), grounding rods and grounding wells may be required to reduce the ground grid resistance to acceptable levels.

If a new ground grid is close to another substation, the two ground grids may be isolated or connected. If the ground grids are isolated, then no metallic ground connections are allowed between the two substation ground grids. Cable shields, cable sheaths, station service ground sheaths and overhead transmission shield wires can all inadvertently connect ground grids. All-dielectric type fiber optic cables are highly preferable for providing telecommunications and control between two substations while maintaining isolated ground grids. If the ground grids are to be interconnected, the interconnecting cables must have sufficient capacity to handle fault currents and control ground grid voltage rises. SCL must approve any interconnection to a SCL substation ground grid.

The ground grid will be designed to applicable ANSI and IEEE Standards relating to safety in substation grounding or the most recent guidelines found in the IEEE Guide in AC Substation Grounding (Standard IEEE 80). Design review and testing may be required to ensure these guidelines are met.

3.6.2. Generation Interconnection Requirements

New interconnections of generation may substantially increase fault current levels at nearby substations. Modifications to the ground grids of existing substations may be necessary to keep grid voltage rises within safe levels. The facilities study will determine if modifications are required and the estimated cost.

3.6.3. Transmission Interconnection Requirements

New interconnections of transmission lines may substantially increase fault current levels at nearby substations. Modifications to the ground grids of existing substations may be necessary to keep grid voltage rises within safe levels. The facilities study will determine if modifications are required and the estimated cost.

3.7. Insulation and Insulation Coordination

3.7.1. Requirements for all Interconnections

3.7.1.1. All Transmission Lines

The insulation levels of any newly added or connected transmission facility shall be coordinated with the adjoining substation insulation levels in such a way as to prevent the propagation of temporary overvoltage events (e.g. lightning, switching surges, etc.) originating on the transmission facility from violating the basic insulation level, and insulation clearances requirements within the adjoining substation(s).

3.7.1.2. Shielded Transmission Lines

Newly added transmission facilities constructed with Overhead Ground Wire (OHGW) or Optic Ground Wire (OPGW) located in the shield position shall be connected in such a way as to mitigate (send to ground) transmission line temporary over-voltage events (i.e. lightning) and isolate them from adjoining substation(s) facility equipment.

3.7.1.3. Substation Facilities

Power system equipment is designed to withstand voltage stresses associated with expected operation. Adding or connecting new facilities may change equipment duty, and may require that equipment be replaced or switchgear, telecommunications, shielding, grounding, or surge protection added to control voltage stress to acceptable levels. Voltage stresses, such as lightning or switching surges, and temporary over-voltages may affect equipment duty. Remedies will depend upon the equipment capability and the type and magnitude of the stress. Requester shall make available to SCL all drawings, specifications, test plans, application documents, and equipment settings.

3.8. Voltage, Reactive Power, and Power Factor Control

3.8.1. Requirements for All Interconnections

All interconnections must comply with SCL's Voltage Zones standard (0035.13) and designated voltage system operating limits.

Transformer tap settings, voltage ratings and the set points, sizes of shunt-connected capacitor and/or reactor equipment as well as other voltage control devices shall be coordinated with SCL to optimize reactive flows and voltage profiles. Automatic controls may be necessary to maintain these profiles on the interconnected system.

Post contingency voltage deviations at the Point of Interconnection shall be less than 8%. Any voltage control devices, such as shunt capacitors or reactors, shall limit voltage changes to 1.5%.

3.8.2. Generation Interconnection Requirements

Requester shall design the generating facility to maintain a composite power delivery at continuous rated power output at the POI at a power factor within the range of 0.95 leading to 0.95 lagging.

All synchronous generators shall be equipped with AVRs.

- AVRs shall be operated in "Voltage Control" mode
- AVRs shall support system voltage during voltage excursions
- AVRs shall be equipped with Power System Stabilizers (PSS)

All asynchronous generators shall:

- Operate in “Voltage Control” mode
- Operate to support system voltage during voltage excursions.
- Operate to limit voltage changes to 2.5% at the POI for sudden changes in generator output due to loss of fuel (wind, sun, etc.).

3.8.3. Transmission Interconnection Requirements

All line interconnections shall be operated such that reactive requirements are not a burden on either entity’s system.

3.8.4. End-User Interconnection Requirements

All load interconnections shall be operated such that:

- Lagging power factor shall remain above 0.97 at the POI
- Leading power factors will be evaluated on case by case basis

Loads that are equipped with active reactive support, such as synchronous motors equipped with voltage regulators and switched capacitors, shall support voltage at the POI during system voltage excursions

3.9. Power Quality Impacts

3.9.1. Requirements for all Interconnections

Power quality is the responsibility of any end-user and generation facilities connected to the power system, as well as the utility providing distribution and transmission. This document will focus primarily on power quality problems typically introduced by the Requester as defined in this document. The Requester is expected to address, in the design of their facilities, potential sources and mitigation of power quality degradation prior to interconnection. Design considerations should include applicable standards including, but not limited to IEEE Standards 142, 519, 1100 1159, 1547, as well as ANSI C84.1, EN 50160, and IEC 61000. SCL Voltage Zone Standard 0035.13 will be supplied for SCL specific caveats to these standards.

In general, the Requester cannot require nonlinear currents from SCL’s system, as it will degrade the voltage of the SCL electric system for other users. The Requester also has certain responsibilities to account for electric system events such as switching transients and fault-induced voltage sags. Standards exist for manufacturers and system designers to take into account short duration system events in order to design equipment or systems with sensitivities capable of riding through events that are within utility system operating standards. If it is determined that the new interconnection facility is causing a power quality problem, then the Requester will be held responsible for installation of the necessary equipment or operational measures to mitigate the problem. Typical forms of power quality degradation include, but are not limited to voltage regulation/unbalance, harmonic distortion, flicker, voltage sags/interruptions, and transients. Some of the more common forms of degradation are discussed in the following sections.

3.9.1.1. Voltage Fluctuations and Flicker

Voltage fluctuations may be noticeable as visual lighting variations (flicker) and can damage or disrupt the operation of electronic equipment. IEEE Standard 519 and IEC 61000-3 provide definitions and limits on acceptable levels of voltage fluctuation. Loads or system interconnections to the SCL electric system shall comply with the limits in these standards.

3.9.1.2. Harmonic Distortion

Nonlinear devices such as adjustable or variable speed drives (ASD/VSD), power converters, arc furnaces, and saturated transformers can generate harmonic voltages and currents on the electric system. These harmonics can cause telecommunication interference, increase thermal heating in transformers and reactors, disable or cause misoperations of solid-state equipment and create resonant overvoltages. In order to protect power system equipment from damage or misoperations, harmonics must be managed and mitigated. The new interconnection shall not introduce harmonics into the SCL electric system in excess of the limits specified in IEEE Standard 519.

In addition to loads with nonlinear devices, new generation resources or distributed resources should be evaluated not only for possible injected harmonics, but also for potential resonant conditions. For example, some generation resources, whether due to power factor correction capacitors or cable capacitances, may be capacitive during certain operating configurations. These types of configurations may result in resonant conditions within the project or in combination with the utility system. The short circuit ratio (SCR) tests as listed in IEEE 1547 and IEEE 519 can be good indicators of this potential problem. If the evaluation of the new interconnection indicates potential harmonic resonance the Requester may be required to filter, detune, or mitigate in some way the potential resonant conditions associated with interconnection of the new resource. For individual end users, the IEEE 519 Standard limits the level of harmonic currents injected at the POI (listed in IEEE literature as the Point of Common Coupling (PCC)) between the end user and the utility. Recommended limits are provided for individual harmonic components and for the total demand distortion. These limits are expressed as a percentage of the customer's demand current level, rather than as a percentage of the fundamental, in order to provide a basis for evaluation over time. There are also limits for voltage distortion for both individual frequency and total harmonic distortion.

3.9.1.3. Phase Unbalance

Unbalanced phase voltages and currents can affect coordination of protective relaying, create higher flows of current in neutral conductors, and cause thermal overloading of transformers and motors. The measurement of voltage unbalance, Negative Sequence Unbalance Factor (NSUF) is the ratio of the negative sequence voltage divided by the positive sequence voltage, expressed as a percentage. The NSUF limits listed herein applies to normal system operations. For interconnections at 230 kV and above, the voltage unbalance should not exceed 1%. For interconnections below 230 kV, the contribution at the POI from a single interconnection should not be allowed to cause a voltage unbalance greater than 1.3%. The voltage unbalance limit is 2% at Points of Common Coupling for the aggregate effect of multiple loads. System problems such as a blown transformer fuse or open conductor on an electric system can result in extended periods of phase unbalance. It is the Requester's responsibility to protect all its connected equipment from damage that could result from such an unbalanced condition.

3.10. Disturbance Monitoring Equipment (Phasor Measurement Units)

3.10.1. Requirements for all Interconnections

Phasor Measurement Units (PMUs) will be used to monitor system and/or generator performance and to verify models and modeling data. A PMU provides continuous recording of digital high-speed time-synchronized voltage and current phasors and frequency measurements, as well as MW and Mvar measurements. Interconnection studies will identify whether PMU functionality will be required. PMUs will be installed at the project substation. Typical input sampling rate is greater than 960 samples/sec and typical output sampling rate is 60 samples/sec. The PMU must be tested after configuration (but prior to installation) for compliance with IEEE C37.118 standard and WECC filtering and dynamic performance requirements. Facilities larger than 50 MVA will require installation of a PMU with a data concentrator.

3.11. Equipment Ratings

3.11.1. Requirements for all Interconnections

Circuit breakers, disconnect switches, and similar equipment connected to SCL's transmission facilities shall be capable of carrying both normal and emergency rating load currents, and must also withstand available fault currents without damage. This equipment shall not become a limiting factor, or bottleneck, in the ability to transfer power on the SCL electric system. During prolonged steady-state operation, all such equipment shall be capable of carrying the maximum continuous current that the interconnected facility can deliver.

All circuit breakers and other fault-interrupting devices shall be capable of safely interrupting fault currents for any fault that they may be required to interrupt. Application shall be in accordance with ANSI/IEEE C37 Standards. These requirements apply to the equipment at the POI as well as other locations on the SCL electric system where SCL supplies the fault-interrupting requirements.

Transformer tap settings (including those available for under load and no load tap changers), reactive control set points of shunt reactive equipment, and phase shift angles for phase shifters must be coordinated with SCL to optimize both real and reactive power flows and voltage profiles. Automatic controls may be necessary to maintain these profiles on the interconnected system. Timed changes should be coordinated with time schedules established by the NWPP.

The Requester is responsible for determining the facility ratings for the Requester's interconnection equipment. These facilities will be designed, constructed, owned, and maintained by the Requester, assigned agent, or future owner.

3.11.1.1. Transmission Line Ratings

For transmission lines interconnecting into SCL's electric system transmission line ratings and design criteria shall meet the requirements of SCL's general practices of transmission line design, including:

- MVA
- Operating voltage
- Ampacity
- Insulation critical flashover
- Insulation clearances

- Shielding
- Structure grounding
- Short circuit withstand requirements

In all cases, NESC and OSHA requirements shall be satisfied. Requester shall make available to SCL all drawings and specifications, terminations plans, and line ratings.

3.11.1.2. Substation Facility Ratings

Substation facility ratings shall meet the applicable requirements of NESC, ANSI, and IEEE Standards. SCL will design the POI station such that all electrical equipment in the substation will be sized to carry the full continuous and short circuit current ratings of the intercepted transmission path over the range of ambient temperatures from -30°C to 50°C. All interrupting devices, such as circuit breakers, shall have interrupting capability sufficient to satisfactorily interrupt the maximum short circuit currents that may occur at the location of the interconnection, including margin for circuit breaker duty and DC offset.

3.12. Synchronizing of Facilities

3.12.1. Requirements for all Interconnections

Depending on the type of interconnection, SCL utilizes either hot bus/dead line (HB/DL) reclosing or hot bus/hot line (HB/HL) automatic reclosing throughout their system. HB/HL automation reclosing is supervised by a synch check (2%) element. Refer to Figure 1 for a depiction of these system functions.

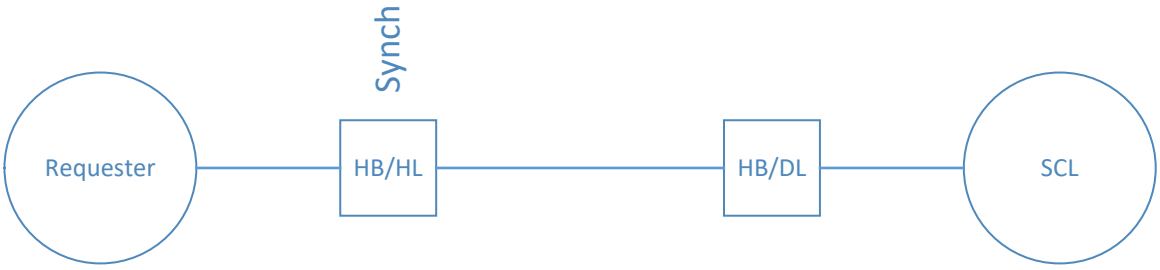

Figure 1: Requester Synchronization Diagram

3.12.1. Generation Interconnection Requirements

No generator shall be synchronized to the SCL system without the permission of the SCL System Operator.

3.12.1.1. SCL HB/HL & Requester HB/HL Automatic Reclosing

The breaker at SCL's line terminal will automatically reclose (HB/DL) to test the line in approximately 40 cycles after the fault is interrupted. If the automatic reclose is successful, the Requester's terminal breaker will automatically reclose (HB/HL), with synch check supervision, after a 5 second time delay. If SCL's initial automatic reclose is unsuccessful, the requester's terminal breaker will not automatically reclose.

3.12.2. Transmission Interconnection Requirements

3.12.2.1. SCL HB/DL & Requester HB/HL Automatic Reclosing

The breaker at SCL's line terminal will automatically reclose (HB/DL) to test the line in approximately 40 cycles after the fault is interrupted. If the automatic reclose is successful, the Requester's terminal breaker will automatically reclose (HB/HL), with synch check supervision, after a mutually agreed-to time delay. If SCL's initial automatic reclose is unsuccessful, the requester's terminal breaker will not automatically reclose.

3.12.2.2. Requester HB/DL & SCL HB/HL Automatic Reclosing

The breaker at the Requester's line terminal will automatically reclose (HB/DL) to test the line, after a mutually agreed to time delay, after the fault is interrupted. If the automatic reclose is successful, SCL's terminal breaker will automatically reclose (HB/HL), with synch check supervision, after a 40-cycle time delay. If the Requester's initial automatic reclose is unsuccessful, SCL's terminal breaker will not automatically reclose.

3.13. Maintenance Coordination

3.13.1. Requirements for all Interconnections

Both SCL and the Requester (each may be referred to as a "Party," or collectively as the "Parties") shall provide the other with reasonable notification for routine maintenance, operational tests, inspection activities and meter testing. For such activities that do not require major equipment or system outages, the Party performing the same shall provide the other Party notice at least twenty-four hours before scheduled outage. For such activities that will require major equipment or system outages, the Party performing the same activities shall provide the other Party notice consistent with the reporting requirements for the Peak Reliability (RC) Coordinated Outage System (COS).

3.13.1.1. Separation Provisions

The Requester must make provisions for clearing and disconnecting from SCL's system, including a visual open.

3.14. Operational Issues (Abnormal Frequencies and Voltages)

3.14.1. Generation Interconnection Requirements

All generators shall remain online during abnormal frequency and voltage conditions as described in the WECC Coordinated Off-Nominal Frequency Load Shedding and Restoration Requirements or its successor.

All generators shall remain online for system faults which occur outside of the generator's zone of protection.

3.14.2. Transmission Interconnection Requirements

All transmission interconnections at the BES level shall remain in service under abnormal frequency and voltage conditions unless the interconnection is part of a planned separation scheme.

3.14.3. End-User Interconnection Requirements

All loads shall be required to participate in Underfrequency Load Shedding (UFLS) at SCL's discretion. UFLS requirements will be consistent WECC Coordinated Off-Nominal Frequency Load Shedding Plan or its successor.

All loads shall be required to participate in Undervoltage Load Shedding (UVLS) at SCL's discretion. UVLS schemes may be applied over wide geographic areas or in local areas.

SCL shall have the ability to interrupt load if necessary to preserve the integrity of the Bulk Electric System (BES). This is not to be confused with "interruptible" load. This type of action is available to the SCL System Operator to address abnormal and extreme events.

3.15. Inspection Requirements

3.15.1. Requirements for All Interconnections

All transmission and generation elements (i.e. lines, line rights-of-way, circuit breakers, control and protection equipment, metering, telecommunications, generators, governor controls, and excitation systems) shall be inspected, tested, maintained and documented in conformance with all local, regional, and federal standards. The Requester has full responsibility for the inspection, testing, calibration, maintenance, and documentation of their equipment up to the location of change of ownership. SCL may request an annual certification that the Requester has documented and implemented an adequate transmission or generation maintenance and inspection plan for its interconnecting facilities. Additionally, SCL may request the maintenance records of the equipment associated with providing system protection for the interconnection generation or transmission equipment.

3.15.1.1. Pre-Energization Testing and Inspection

Pre-energization testing, inspection and operation verification, of the interconnecting facility, is the responsibility of the Requester in accordance with a documented Inspection and Test Plan. SCL may request specific tests for the POI. Requester shall make available to SCL all drawings, specifications, equipment settings, and test records of the interconnecting facilities for approval prior to energization. SCL may also choose to have an engineering representative to observe the pre-energization test procedures during the on-line and commissioning tests.

3.15.1.2. Ongoing Maintenance and Inspection Planning

Ongoing maintenance and inspection planning of Requester's facilities shall be the sole responsibility of the Requester. The Requester may be required by local, regional, or federal standards to develop a maintenance and inspection plan. It is the Requester's responsibility to identify all applicable standards and comply and document as required with those applicable standards. Additionally, the Requester may be required to develop a System Protection Maintenance Program to meet the NERC reliability requirements (refer to NERC reliability standard PRC-005).

3.15.1.3. Maintenance Coordination

See section 3.13.

3.16. Communications and Procedures During Normal and Emergency Operating Conditions

3.16.1. Requirements for all Interconnections

Complete, precise, and timely three-part communication is required for maintaining the reliability and security of a power system. Under normal operating conditions, the major link of communication with various interconnectors shall be by telephone lines. SCL and its customers shall maintain communication which shall include, but not be limited to, system paralleling or separation, scheduled or unscheduled shutdowns, equipment clearances, periodic load reports, maintenance schedules, tagging of interconnection interrupting devices, meter tests, relay tests, billing, and other routine communication. In case of emergency or abnormal operating conditions, various communication channels may be used. Emergency telephone numbers should be agreed upon by both SCL & the Requester prior to the actual interconnection date.

4. Appendix A: Definition of “Qualified Change”

A qualified change to existing interconnections is defined as follows:

- A qualified change will last more than 12 months (i.e. it is not a short-term temporary change).
- For Generation Facilities, a qualified change would:
    - Increase the output capability by 1 MVA or greater, or
    - increase the output capability to:
        - Greater than 20MVA for an individual generator, or
        - Greater than 75MVA for a generation plant, or
    - change generator, exciter, governor, or PSS characteristics such that transient response is altered.
- For Transmission Facilities a qualified change would:
    - Change system configuration/topology at the point of interconnection, or
    - change the facility impedance or thermal rating by 10% or greater, or
    - alter protection systems which would change the way the facility would switch.
- For End-User Facilities a qualified change would:
    - Change system configuration/topology at the point of interconnection, or
    - increase demand above the studied MW amount, or
    - add equipment that would significantly alter the load model, such as large motors.