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## 1. Background

In accordance with SMUD’s Rule and Regulation 21 (“Rule 21”), the following interconnection guidelines under this Rate Policy and Procedures Manual 11-01 (“Interconnection Guidelines”) shall apply to distributed generation connecting to SMUD’s Distribution System. These Interconnection Guidelines are consistent with the technical aspects of the California Energy Commission (CEC) and California Public Utility Commission’s (CPUC) approved investor-owned utilities' Rule 21 Interconnection Rules while supporting prevailing SMUD Rates, Rules and Regulations.

## 2. Applicability

These Interconnection Guidelines describe the interconnection, operating, and metering requirements for Generating Facilities to be connected to SMUD’s Distribution System. Subject to the requirements of these and other applicable guidelines including:

(American National Standards Institute, Institute of Electrical Electronic Engineers (ANSI/IEEE) 1547-2018 Standard for Interconnecting Distributed Resources with Electrical Power Systems), SMUD will allow the interconnection of Generating Facilities with its Distribution System.

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### 3. Definitions

**Advanced Distribution Management System (ADMS)**

A system of computer-aided tools used by operators of electric utility grids to monitor, control, and optimize the performance of the Distribution System and all distributed energy resources connected to the Distribution System.

**Applicant**

The entity submitting an Application for Interconnection process. The applicant may be the Facility Owner, Developer and/or Customer.

**Application**

A SMUD-approved standard form submitted to SMUD for Interconnection of a Generating Facility.

**Board**

The publicly elected Board of Directors of the Sacramento Municipal Utility District.

**Business Day**

Monday through Friday, excluding Federal Holidays.

**Calendar Day**

Any day, including Saturday, Sunday, or a Federal and State Holiday.

**Certification;  
Certified;  
Certificate**

The documented results of a successful Certification Test.

**Certification Test**

A test that verifies conformance of certain equipment with SMUD-approved performance standards in order to be classified as Certified Equipment. Certification Tests are performed by National Recognized Testing Laboratory(s) (NRTLs).

**Certified Equipment**


Equipment that has passed all required Certification Tests.

**Commercial Operation**

The period of operation of the Generating Facility following the Commercial Operation Date until the time the Generating Facility has shut down or the Power Purchase Agreement has terminated, whichever occurs first.


**Commercial Operation Date**

The date specified in the Commercial Operation Date Confirmation Letter on which the Facility shall conform to the requirements for Commercial Operation.

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<b>Commercial Operation Date Confirmation Letter</b>	The letter that the Parties execute and exchange in accordance with the Power Purchase Agreement.
<b>Commissioning Test</b>	A test performed during the commissioning of all or part of a Generating Facility to achieve one or more of the following: 1) verify specific aspects of its performance; 2) calibrate its instrumentation; 3) establish instrument or protective function set-points.
<b>Continuous Operation</b>	The Inverter operates indefinitely without tripping. Any functions that protect the Inverter from damage may operate as needed.
<b>Curtailment</b>	The instructed reduction or cessation of generation. Generators will be required to respond to SMUD instructions to reduce generation from the Generating Facility below the forecast amount for the period of time set forth in such instructions.
<b>Customer</b>	The person/entity receiving retail electric service from SMUD.
<b>Dedicated Transformer; Dedicated Distribution Transformer</b>	A transformer that provides Electric Service to a single Customer. The Customer may or may not have a Generating Facility.
<b>Dispatchability</b>	The ability of a Generator to be shut down, or have decreased generation, at the request of a utility's system operator. "Dispatch" shall mean to cause the output from a Generator to be curtailed (in whole or in part) or to terminate the curtailment (in whole or in part) of such generating unit.
<b>Distributed Generation (DG)</b>	Any type of electric generating and/or storage facility being operated in parallel with SMUD's Distribution System.
<b>Distribution Service</b>	All services required by, or provided to, a Customer through SMUD's Distribution System pursuant to SMUD's current Rates, Rules, and Regulations. SMUD system voltage information can be found within Rule and Regulation 1.

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<b>Distribution System</b>	All electrical wires, equipment, and other facilities owned or provided by SMUD, including Interconnection Facilities, by which SMUD provides Distribution Service to a Customer. SMUD system voltage information can be found within Rule and Regulation 2.
<b>Distribution Wheeling Service</b>	A service that wheels (transfers) the power from the associated Generating Facility ) across SMUD’s Distribution System from the Point of Interconnection to SMUD’s bulk power system.
<b>Electric Utility Service Equipment Requirements Committee (EUSERC)</b>	Designation that Metering Equipment meets the requirements of the member utilities developed to promote safe and uniform electric service equipment requirements.
<b>Energy Management System (EMS)</b>	A system of computer-aided tools used by operators of electric utility grids to monitor, control, and optimize the performance of the generation and/or transmission system.
<b>Facility Owner</b>	The owner of the Generating Facility, who has an Interconnection Agreement with SMUD.
<b>Generating Facility</b>	All Generators, electrical wires, equipment, and other facilities, owned or provided by the Facility Owner, for the purpose of producing electric power, including storage.
<b>Generator</b>	A device capable of converting mechanical, chemical, or solar energy into electrical energy, including all its protective and control functions and structural appurtenances. A Generating Facility is comprised of one or more generators.
<b>Grid Networks</b>	A Networked Secondary system that consists of multiple transformers and protectors, located at multiple vault locations, whose secondaries are tied together to serve multiple customers.
<b>Gross AC Nameplate Rating</b>	Also known as Gross Rating; Capacity; or Inverter AC Capacity if inverter based-distributed generation is the total gross generating capacity of a Generator or Generating Facility as designated by the manufacturer of the Generator(s).

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<b>Host Load</b>	The electrical power, less the Generator auxiliary load, consumed by the Customer, to which the Generating Facility is connected.
<b>Initial Review</b>	<p>The review by SMUD, following receipt of an application, to determine one of the following:</p> <ul style="list-style-type: none"> <li>a) Whether the Generating Facility qualifies for the Standard Process Interconnection; or</li> <li>b) Whether the Generating Facility can be made to qualify for Interconnection with a Supplemental Review that determines any potential additional requirements; or</li> <li>c) Whether the Generating Facility requires an Interconnection Study.</li> </ul>
<b>In-rush Current</b>	The maximum instantaneous input current drawn by an electrical device when first turned on as determined by the In-rush Current test.
<b>Inverter</b>	<p>A power electronic device that converts Direct Current (DC) power to Alternating Current (AC) by means of electronic switching. When used in this document SMUD is generally referring to UL 1741 Supplement SB (UL 1741 SB) compliant Smart Inverters.</p> <p>A Smart Inverter is a generating source that performs functions, that when activated, can autonomously contribute to grid support during excursions from normal operating voltage and frequency system conditions by providing dynamic reactive/real power support, voltage and frequency ride-through, ramp rate controls, communication systems with ability to accept external commands and other functions.</p>
<b>Interconnection; Interconnected</b>	The physical connection of a Generating Facility in accordance with the requirements under these Interconnection Guidelines so that operation with the Distribution System can occur (has occurred).

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**Interconnection Agreement**

An agreement between SMUD and the Facility Owner to interconnect and operate the Facility Owner's Generating Facility in parallel with SMUD's Distribution System.

A separate Interconnection Agreement is required for Generating Facilities  $\geq 500$  kW, any generation source directly connected to the SMUD Distribution System, and any non-renewable Generating Facility connected on the customer load side of the service point.

Interconnection Agreement Requirement		
Criteria	Included as part of the Application	Separate Interconnection Agreement
Renewable Energy/fuel source < 500kW	X	
Renewable Energy/fuel source $\geq 500$ kW		X
All generation sources of any size connected directly to the grid (SMUD side of electric service point if the customer exists).		X
Non-Renewable Energy/fuel sources of any size connected on the customer side of the electric service point		X

**Interconnection Facilities**

The electrical wires, switches and related equipment that are required, in addition to the facilities required to provide Distribution Service to a Customer, including any required Telemetering, to allow the interconnection of a Generating Facility to the Distribution System. Interconnection Facilities may be integrated into a Generating Facility or provided separately. Interconnection Facilities may be connected to either side of the Point of Common Coupling, as appropriate to their purpose and design.

**Interconnection Facilities Costs**


SMUD's cost to operate and maintain the Interconnection Facilities, including anticipated replacement costs. See Interconnection Facilities Costs Payment.

**Interconnection Facilities Costs Payment**

The Interconnection Facilities Costs charged to the Facility Owner/Seller through one of two options: recurring monthly, or a one-time payment based on actual SMUD Rule 21 Design and Construction Cost. These maintenance costs (one-time or ongoing) are paid in addition to the Rule 21 Design and Construction Cost.

**Interconnection Request**


An applicant's request to interconnect a new Generating Facility, or to increase the capacity of, or change the operating characteristics of an existing Generating Facility that is interconnected with SMUD's Distribution System.

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<b>Interconnection Study</b>	A study to establish the requirements for Interconnection of a Generating Facility to SMUD's Distribution System.
<b>Island; Islanding</b>	A condition on the Distribution System in which one or more Generating Facilities deliver power to Customer(s) that is electrically isolated from the Distribution System.
<b>Line Section</b>	That portion of the Distribution System connected to a customer bounded by sectionalizing devices or the end of the distribution line.
<b>Mandatory Operation</b>	The Inverter operates at maximum available current without tripping during Distribution Provider's Transmission or Distribution System excursions outside the region of continuous operation. Any functions that protect the Inverter from damage may operate as needed.
<b>Metering</b>	The measurement of electrical power flow in kilowatts (kW) and/or energy in kilowatt-hours (kWh), and, if necessary, reactive power in kilovolt ampere reactive, (kVAR) at a point, and its display to SMUD.
<b>Metering Equipment</b>	All equipment, hardware, and software including meter cabinets, conduit, etc. that is necessary for Metering.
<b>MicroGrid</b>	An interconnected system of loads and energy resources, including, but not limited to distributed energy resources, energy storage, demand response tools, or other management, forecasting, and analytical tools, appropriately sized to meet customer needs, within a clearly defined electrical boundary that can act as a single, controllable entity, and can connect to, disconnect from, or run in parallel with, larger portions of the electrical grid or can be managed and isolated to withstand larger disturbances and maintain electrical supply to connected infrastructure.
<b>Momentary Cessation</b>	The Inverter momentarily reduces current output to the Distribution System to below 10% of the maximum continuous output current rating. The Inverter is allowed to increase current output to the Distribution Provider's Distribution System without any intentional reconnection delay once voltage exits the Momentary Cessation region and enters a Permissive Operation region or Continuous Operation region.
<b>Momentary Parallel Operation</b>	The interconnection of a Generating Facility to the Distribution System for one second (60 cycles) or less.

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<b>Nationally Recognized Testing Laboratory (NRTL)</b>	A laboratory accredited to perform the certification testing requirements under these Interconnection Guidelines.
<b>Net Energy Metering (NEM)</b>	Closed to new customers effective 3/1/2022. Metering for the receipt and delivery of electricity between the Facility Owner (or Customer) and SMUD, pursuant to SMUD’s Net Energy Metering Rate Schedule. <b>See Solar and Storage Rate (SSR) definition.</b>
<b>Net Generation</b>	Gross generation minus the energy consumed by the generating station.
<b>Network Service</b>	More than one electrical feeder providing Distribution Service at a Point of Common Coupling.
<b>Networked Secondary</b>	An AC distribution system where the secondaries of the distribution transformers are connected to a common bus for supplying electricity directly to consumers. There are two types of secondary networks: Grid Networks (also referred to as area networks or street networks) and Spot Networks. Synonyms: Secondary Network. Refer to IEEE 1547.6-2011 for additional details.
<b>Non-Export; Non-Exporting</b>	Designed to prevent the transfer of electrical energy from the Applicant’s Generating Facility to SMUD.
<b>Non-Qualified Generation Facility</b>	Any generation facility type that is not listed in the CEC’s most current Renewables Portfolio Standard Eligibility Guidebook, which provides the technical definition of a Renewable Electrical Generation Facility.
<b>Parallel Operation</b>	The simultaneous operation of a Generator with power delivered or received by SMUD while Interconnected. Under these Interconnection Guidelines (SMUD’s Rate Policy and Procedures Manual, No. 11-01, “Interconnection Guidelines,”) Parallel Operation includes only those generators that are so interconnected with the Distribution System for more than one second (60 cycles).

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<b>Periodic Test</b>	<p>A test performed on part or all of a Generating Facility at pre-determined time or operational intervals to achieve one or more of the following:</p> <ul style="list-style-type: none"> <li>• Verify specific aspects of its performance;</li> <li>• Calibrate instrumentation; and</li> <li>• Verify and re-establish instrument or Protective Function set-points.</li> </ul>
<b>Point of Common Coupling (PCC)</b>	The transfer point for electricity between the electrical conductors of SMUD and the electrical conductors of the Generating Facility.
<b>Point of Interconnection</b>	The electrical transfer point between a Generator or a Generating Facility and the electrical system. This may or may not be coincident with the Point of Common Coupling.
<b>Power Control System (PCS)</b>	A listed Power Control System (PCS) is a type of an energy management system that is capable of monitoring multiple power sources and controlling the current on busbars and conductors to prevent overloading. Such systems capable of controlling the input and output power at facility may be integrated to support utility operations and price signals.
<b>Power Production Meter</b>	The meter located at the Generator panel, or otherwise located to record generation output excluding other unrelated Customer loads. Loads ancillary to the generation (e.g. solar tracker motors, engine cooling fans, pumps, etc.) are to be connected, to the extent practicable, so that these are metered with the generation by the Power Production Meter. Metering must be connected such that no Western Renewable Energy Generation Information System (WREGIS) certificates for renewable generation will be issued for station service associated with a generating unit registered with WREGIS, regardless of the source of such station service.
<b>Power Purchase Agreement (PPA)</b>	A contract executed between an independent power producer (Seller/Facility Owner) and SMUD, wherein the seller exports and delivers to SMUD energy generated from the Generating Facility, which SMUD pays for under the terms of the contract.
<b>Pre-Commercial Energy</b>	Energy delivered to SMUD from the Generating Facility prior to the Commercial Operation Date which is sometimes referred to as test energy.

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<b>Protective Function(s)</b>	The equipment, hardware and/or software in a Generating Facility (whether discrete or integrated with other functions) whose purpose is to protect against Unsafe Operating Conditions.
<b>Prudent Electrical Practices</b>	Those practices, methods, and equipment, as modified from time to time, that are commonly used in prudent electrical engineering and operations to design and operate electrical equipment lawfully, safely, dependably, efficiently, and economically.
<b>Renewable Electrical Generation Facility (REGF)</b>	A Renewable Electrical Generation Facility, which utilizes a renewable fuel source, is a facility that is eligible for certification as a renewable energy resource as defined by the California Energy Resources Conservation and Development Commission (CEC).
<b>Remote Terminal Unit (RTU)</b>	The device that transmits telemetry data between the Generating Facility and SMUD's system.
<b>Rule and Regulation 21</b>	SMUD's Rule and Regulation establishing requirements for Generating Facility interconnection to the Distribution System.
<b>Scheduled Commercial Operation Date</b>	The date when the Generating Facility is, by the Applicant's estimate, expected to begin commercial operation.
<b>Short Circuit Contribution Ratio (SCCR)</b>	The ratio of the Generating Facility's short circuit contribution to SMUD's short circuit contribution for a three-phase fault at the high voltage side of the distribution transformer connecting the Generating Facility to SMUD's Distribution System.
<b>Single Line Diagram; Single Line Drawing</b>	A schematic drawing, showing the major electrical switchgear, protection devices, wires, generators, transformers, and other devices, providing sufficient detail to communicate to a qualified engineer the essential design and safety of the system being considered.
<b>Site Aggregate</b>	Generating Facility(ies) on one parcel or one contiguous property defined under SMUD Campus Billing Policy.
<b>Site Layout</b>	The drawing showing the physical location of the Generating Facility components in relation to the SMUD Distribution System.

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<b>SMUD</b>	Sacramento Municipal Utility District, a municipal utility district organized and existing under the laws of the State of California, which provides electrical service in its defined service territory of Sacramento County and small portions of Placer and Yolo counties.
<b>Solar and Storage Rate (SSR)</b>	The rate which applies under Rate Schedule SSR to residential, commercial/industrial, and agricultural customers who establish service at a premises that has an electrical generation facility that is fueled by a renewable fuel source on or after March 1, 2022.
<b>Stabilization; Stability</b>	The return to normalcy of SMUD's Distribution System, following a disturbance. Stabilization is usually measured as a time period during which voltage and frequency are within acceptable ranges.
<b>Standard Process Interconnection</b>	Interconnection conforming to the minimum requirements under SMUD's 11-01 Interconnection Guidelines, as determined by Appendix A - Initial Review Screening Process for Applications to Interconnect a Generating Facility.
<b>Starting Voltage Drop</b>	The percentage voltage drop at a specified point resulting from In-rush Current. The Starting Voltage Drop can also be expressed in percentage on a particular base voltage, (e.g., 6 volts on a 120-volt base, yielding a 5% drop).
<b>Station Service Load</b>	The electrical loads associated with operation and maintenance of the Generating Facility that may be supplied by the Generator or SMUD.
<b>Storage</b>	Capturing and storing energy generated at one point in time to be used later.
<b>Substation Arrangement Drawing</b>	The drawing showing the arrangement of components in the Facility Owner's substation.
<b>Supervisory Control and Data Acquisition (SCADA)</b>	A system of hardware, software, and other equipment, including Remote Terminal Units and Telemetry, used to remotely monitor and control SMUD's Distribution System.

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**Supplemental Review**

A process wherein SMUD further reviews an application that fails one or more Initial Review screens, which may result in either approval of Interconnection with additional requirements or cost and schedule for an Interconnection Study.


**System Emergency**

Any abnormal system condition that requires automatic or immediate manual action to prevent or limit the failure of transmission or distribution facilities or generation supply or that could adversely affect the reliability or integrity of the Bulk Electric System, SMUD Electric System, or an Electric System owned or controlled by a non-SMUD entity. As used in this definition of System Emergency, with respect to any action that may or must be taken, or judgment or determination of a Party, such action or judgment shall be exercised, or such determination shall be made, (i) in good faith, (ii) where applicable, in accordance with Prudent Utility Practice, and (iii) in a non-arbitrary and non-capricious manner. System Emergency includes:

- (a) That in SMUD's or Facility Owner's reasonable judgment will likely endanger life or property;
- (b) That in the reasonable judgement of SMUD, is imminently likely to cause a material adverse effect on the security of, or damage to, SMUD's Electric System, SMUD's Interconnection Facilities or the Electric Systems of other entities to which the SMUD Electric System is directly connected;
- (c) An imminent condition or situation, which jeopardizes SMUD's Electric System reliability or integrity, or the reliability or integrity of other Electric Systems to which the SMUD is connected, or
- (d) That in the reasonable judgment of Facility Owner, is imminently likely to cause a material adverse effect on the security of, or damage to, the Facility or Seller's interconnection facilities. System restoration or black start shall be considered a System Emergency; provided, however, that the Generating Facility shall not be obligated to possess black start capability.


**System Integrity**

The condition under which a Distribution System is deemed safe and can reliably perform its intended functions in accordance with the safety and reliability rules of SMUD.

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<b>Telemetering</b>	The transmittal of Metering data in real-time to SMUD.
<b>Telemetry</b>	Equipment and other provisions to enable continuous streaming of generation data to SMUD.
<b>Transfer Trip</b>	A Protective Function that trips a Generating Facility remotely by means of an automated communications link controlled by SMUD.
<b>Trip</b>	The act of a Generating Facility to cease to energize or disconnect from SMUD's Distribution System automatically due to a SMUD Distribution System disturbance. Following a Trip, the Generator must delay re-energization or reconnection for a preset period of time once the voltage and frequency of SMUD's Distribution System are within normal ranges.
<b>Unintended Island</b>	The creation of an Island, usually following a loss of a portion of the Distribution System, without the approval of SMUD.
<b>Unsafe Operating Conditions</b>	Conditions that, if left uncorrected, could result in harm to personnel, damage to equipment, loss of System Integrity or operation outside pre-established parameters required by the Interconnection Agreement.
<b>Utility Service Meter</b>	The meter located in a Customer's main electrical panel that is capable of separately recording power flow into and power flow out of a Customer's facility or premise and provides data for utility billing purposes.
<b>Visible Disconnect</b>	An electrical switching device that can separate the Generating Facility from the Distribution System and is designed to allow visible verification that separation has been accomplished. This requirement can be met by opening the enclosure to observe the contact separation.
<b>Western Renewable Energy Generation Information System (WREGIS)</b>	Western Renewable Energy Generation Information System is the independent, renewable energy tracking system sponsored by the Western Electricity Coordinating Council (WECC) and utilized by the California Energy Commission for implementing California's Renewables Portfolio Standard (RPS). WREGIS tracks the generation and transfer of renewable energy credits (RECs) for the generation.

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## Interconnection Agreement

### 1. General Rules, Rights and Obligation

#### 1.1. Authorization Required to Operate

A Facility Owner must comply with these Interconnection Guidelines, execute an Interconnection Agreement with SMUD, and receive SMUD's express written Permission to Operate its Generating Facility in parallel with SMUD's Distribution System. SMUD shall apply these Interconnection Guidelines in a non-discriminatory manner and shall not unreasonably withhold its permission for a Facility Owner's Generating Facility to operate in parallel with SMUD's Distribution System. The Facility Owner's authorization to operate remains in effect until the earliest date that one of the following occurs:

- the Parties agree in writing to terminate the Interconnection Agreement; or
- Ten (10) Calendar Days after SMUD provides written notice to Facility Owner of SMUD's intent to terminate the Interconnection Agreement (Notice of Termination) in accordance with Section 1.10; or
- Ten (10) Calendar Days after Facility Owner provides written notice to SMUD of Facility Owner's intent to terminate the Interconnection Agreement, which may occur at Facility Owner's sole discretion; or
- at 12:01 a.m. on the day following the date that the Customer's electrical service account is closed or terminated; or
- unless otherwise agreed in writing by the Parties.


#### 1.2. Separate Arrangement Required for Other Services

A Facility Owner requiring other electric services from SMUD including, but not limited to, Distribution Service during periods of curtailment or interruption of its Generating Facility, must sign separate agreements with SMUD for such services.

#### 1.3. Service Limited to Interconnection

Interconnection with SMUD's Distribution System under these Interconnection Guidelines does not provide a Facility Owner any rights to utilize SMUD's Distribution System for the transmission, distribution, or wheeling of electric power, nor does it limit those rights.

Distribution Wheeling Service is on a first-come, first-served basis and is available for the interconnection of the qualified Generating Facility wherever that may occur within SMUD's service territory, unless detrimental to SMUD. Entities taking Distribution Wheeling Service under the rate schedule will also be required to take transmission

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service from SMUD under the SMUD Open Access Transmission Tariff (OATT). SMUD's Distribution Wheeling Service Rate schedule can be found here: [https://www.smud.org/-/media/Documents/Rate-Information/Rates/01\\_DWS.ashx](https://www.smud.org/-/media/Documents/Rate-Information/Rates/01_DWS.ashx)


#### 1.4. Compliance with Rates, Rules, Regulations and Laws

A Facility Owner shall ascertain and comply with applicable SMUD Rates, Rules, and Regulations, applicable Federal Energy Regulatory Commission-approved rules, tariffs, and regulations, and any local, state or federal law, statute or regulation which applies to the design, siting, construction, installation, operation, or any other aspect of the Applicant's Generating Facility and Interconnection Facilities.

All installed equipment must meet the version of SMUD's electric service requirements, Interconnection Guidelines, and standards including but not limited to, ANSI, UL, IEE, and NEC, effective on the date of SMUD's Permission to Operate. The Equipment shall not have violations or variances. The Facility Owner will comply with SMUD's Residential Overhead-Engineering Specifications T002 (T002), Residential Underground-Engineering Specifications T003 (T003), Commercial Industrial-Engineering Specifications T004 (T004), Sub transmission and Primary Services – Engineering Specification T010 (T010), Residential Distributed Generation-Engineering Specifications T014 (T014), Commercial Distributed Generation-Engineering Specifications T015 (T015), and or Distribution Generation (DG) Interconnection Requirements on the Downtown Secondary Network System GP-001 (GP-001).

#### 1.5. Design Reviews and Inspections

SMUD shall have the right to review the design of a Facility Owner's Generating Facility and Interconnection Facilities and to inspect a Facility Owner's Generating and/or Interconnection Facilities prior to the commencement of Parallel Operation with SMUD's Distribution System. The Facility Owner is responsible for all local building permits and final inspections with the local agency before SMUD performs its final inspection in accordance with T002, T003, T004, T010, T014, T015, or GP-001. SMUD may require a Facility Owner to make modifications as necessary to comply with the requirements of these Interconnection Guidelines. SMUD may require proof that the Facility Owner's protection system is performing to the level required in these Interconnection Guidelines and the Interconnection Agreement. SMUD's review and authorization for Parallel Operation shall not be construed as confirming or endorsing the Facility Owner's design or as warranting the Generating and/or Interconnection Facilities' safety, durability or reliability. SMUD shall not, by reason of such review or lack of review, be responsible for the strength, adequacy, or capacity of such equipment.

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### 1.6. Right to Cancel

Applications that have not progressed within 12 months of SMUD issuing an approval to build email will be subject to cancellation or require updating should SMUD's interconnection guidelines or Electric Service Requirements change.

### 1.7. Right to Access

A Facility Owner's Generating Facility and Interconnection Facilities shall be reasonably accessible to SMUD personnel as necessary for SMUD to perform its duties and exercise its rights.

### 1.8. Confidentiality of Information

SMUD shall treat Interconnection information provided to SMUD by an Applicant, Facility Owner, and/or Customer in a confidential manner, unless disclosure is otherwise required by applicable law. Notwithstanding the foregoing, SMUD shall be entitled to disclose Generator information to other regulatory bodies with authority over the construction, operation, or development of the Generating Facility, or as necessary to comply with reporting requirements imposed by applicable regulatory authorities.

### 1.9. Prudent Operation and Maintenance Required

The Facility Owner shall operate and maintain its Generating Facility and Interconnection Facilities in accordance with Prudent Electrical Practices and shall maintain compliance with these Interconnection Guidelines.

### 1.10. Curtailment, Disconnection, or Termination

SMUD may limit the operation, or disconnect or require the disconnection, of a Facility Owner's Generating Facility from SMUD's Distribution System at any time with or without notice in the event of a System Emergency, or to correct Unsafe Operating Conditions.

SMUD may also limit the operation, disconnect, or require the disconnection, of the Generating Facility from SMUD's Distribution System upon notice: 1) to allow for routine maintenance, repairs, or modifications to SMUD's Distribution System; 2) of SMUD's determination that the Generating Facility is not in compliance with these Interconnection Guidelines; or 3) of termination of the Interconnection Agreement. SMUD shall not be obligated to compensate Facility Owner for any loss of use of generation of electricity during any and all periods of such disconnection.

SMUD may terminate the Interconnection Agreement if the Facility Owner violates any provision of SMUD Rule 11 or SMUD Rule 21, any provision of these Interconnection Guidelines, or their Interconnection Agreement. In the event of violation SMUD will notify Facility Owner in writing that its Generating Facility is out of compliance with the terms of the Interconnection Agreement, and if appropriate, request Facility Owner to

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take remedial action to cure such violation. If Facility Owner fails to take all corrective actions specified in SMUD’s notice or has not otherwise submitted a cure plan acceptable to SMUD within the thirty (30) day period, SMUD may issue a Notice of Termination.

### 1.11. Transferability of Interconnection Request

With approval from SMUD an Applicant or Facility Owner may transfer its Interconnection rights to another entity or person in the Interconnection Agreement or Application only if such entity acquires the proposed Generating Facility identified in the Interconnection Application. The Point of Interconnection shall not change. The applicant must notify InterconnectionPM@smud.org at the time of transfer.

### 1.12. Compliance with Established Timelines

SMUD shall use reasonable efforts in meeting all the timelines. In the event SMUD is not able to meet a particular timeline set forth in these Interconnection Guidelines, SMUD shall notify Applicant as soon as practicable and provide an estimated completion date. Applicant may request a modified timeline which shall be mutually agreed upon between SMUD and Applicant.

## 2. Application Process


Applicant shall complete Application available on SMUD’s website.

All Applicants shall be required to complete and file an Application and supply any relevant additional information requested by SMUD. The filing must include the completed Application and fee (if applicable) for processing the Application and performing the Initial Review to be completed by SMUD pursuant to Section 2. The Application fee will vary depending on how the Generating Facility will be interconnected as indicated in Table 1 – Interconnection Application Fees (effective March 1, 2022)<sup>1</sup>.

*Table 1 – Interconnection Application Fees (effective March 1, 2022)<sup>1</sup>*

System Size	Interconnection Fee Amount	Non-Refundable <sup>2</sup>	Supplemental Review	Interconnection Study
Residential < 10 kW	\$475	\$180	\$0	\$0
Residential ≥ 10 kW and < 20 kW <sup>4</sup>	\$900	\$300	\$0	\$0
Commercial < 100 kW	\$2,500	\$2,000	\$0	\$0
Commercial ≥100 kW and < 500 kW	\$3,300	\$2,400	\$0	\$0
Commercial ≥ 500 kW <sup>3</sup>	\$5,000	N/A	\$0	\$0

1. These fees apply to all distributed energy resources, including battery storage and other resources listed in the SSR rate schedule.

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2. The non-refundable amount is SMUD's cost for the application, initial and technical review.
3. This fee is based on the gross nameplate AC rating and is non-refundable. SMUD's current process is to provide an upfront estimate for the remaining billable work to interconnect with telemetry. A detailed cost-based invoice at the end of the interconnection process.
4. Residential systems  $\geq 20$  kW will be charged the commercial fees.

*Table 2- Interconnection Application Timelines<sup>1</sup>*


Study Path	Eligibility	Study requirements & definitions	Timelines <sup>1</sup>
Standard Process (Small)	Residential < 20kW, single phase Commercial < 500kW	Initial Review ( <b>IR</b> )	<b>IR</b> —10-15 Business Days
Standard Process (Large)	Residential $\geq 20$ kW, on a shared secondary Commercial $\geq 500$ kW Fuel cells	<b>IR</b> Supplemental Review ( <b>SR</b> )	Residential <b>IR &amp; SR</b> —10-20 Business Days, Commercial <b>IR &amp; SR</b> —20- 30 Business Days
Non-Standard Process	Rotating Machinery Non-Qualified Generating Facility Some Energy Storage	<b>IR, SR</b> Interconnection Study ( <b>IS</b> , determined by complexity of the project)	<b>IR &amp; SR</b> —10-20 Business Days <b>IS</b> —60 Business Days

Typically, within ten (10) Business Days of receiving an Application, SMUD shall normally acknowledge its receipt and state whether the Application has been completed adequately. If deficiencies are noted, the Applicant shall, in a timely manner, correct the deficiencies needed to establish a satisfactory Application. SMUD reserves the right to reject any Application that does not address identified deficiencies within a reasonable time period. Once the application has been reviewed and approved, construction is expected to begin within six months. If there is no progress on the project, SMUD reserves the right to cancel the application.

## 2.1 Initial Review

Upon receipt of a completed Application, applicable fees as outlined in Section 2.5, Table 3 - Summary of Applicable Costs for Facility Owners, and any additional information necessary to evaluate the Interconnection of a Generating Facility, SMUD shall perform an Initial Review using the process defined in Appendix A - Initial Review Screening Process for Applications to Interconnect a Generating Facility. The Initial Review determines if the Generating Facility qualifies for the Standard Process

<sup>1</sup> Interconnection Application timelines are estimated, subject to change. Study timelines are reset upon project resubmittal and requires a full application review based on the study path.

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Interconnection process, if it requires a Supplemental Review, or will require an Interconnection Study to determine the Interconnection requirements.

## 2.2 Initial Review Timeframe

SMUD shall complete its Initial Review, absent any extraordinary circumstances, typically within ten (10) Business Days, upon determination that the Application is complete and receipt of fee payment, if the Generating Facility qualifies for the Standard Process Interconnection. If the Initial Review determines that the proposed facility can be interconnected by means of a Standard Process Interconnection, SMUD will provide the Applicant with a written description of the requirements for Interconnection.

## 2.3 Standard Process

Standard Process evaluation allows for rapid review of the Interconnection of those Generating Facilities that do not require an Interconnection Study. Standard Process review consists of the Initial Review and, if required, a Supplemental Review. The need for Supplemental Review will be determined based on the results of the Initial Review Screens 1 through 12. Applicants that successfully pass the Initial Review will be allowed to interconnect without Supplemental Review.


If Supplemental Review is required, SMUD will notify the Applicant. Supplemental Review shall consist of the application of Screens 13 through 15. Applicants that pass Screens 13 through 15 will be allowed to interconnect without additional review.

If the Supplemental Review determines that the proposed Generating Facility cannot interconnect to SMUD’s Distribution System by means of the Standard Process evaluation, SMUD will notify Applicant that an Interconnection Study will be required. The Standard Process, Supplemental Review, and Interconnection Study may impose interconnection requirements, additional components, or additional testing. Regardless of the evaluation or study process, all Generating Facilities shall be designed to meet the applicable requirements of Section 3.

See Appendix A - Initial Review Screening Process for Applications to Interconnect a Generating Facility, for information regarding each Screen.

## 2.4 Supplemental Review

If the Generating Facility does not qualify for the Standard Process Interconnection as proposed, SMUD will notify the Applicant and perform a Supplemental Review as described in the Appendix A. The Supplemental Review will provide requirements for Interconnection beyond those for a Standard Process Interconnection.

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## 2.5 Fees

The Facility Owner is responsible for all fees and/or costs, including Commissioning Tests, required to complete the interconnection process. The Facility Owner is responsible for all costs associated with Parallel Operation to support the safe and reliable operation of the Distribution System. See Table 3 - Summary of Applicable Costs for Facility Owners.


The Interconnection and Parallel Operation of a Facility Owner plant may trigger the need for Interconnection Facilities, equipment upgrades, delivery network upgrades, and/or reliability network upgrades. Interconnection Facilities installed on Facility Owner's side of the PCC shall be owned, operated, and maintained by SMUD. Interconnection Facilities installed on SMUD's side of PCC and Distribution System modifications shall be owned, operated, and maintained by SMUD.

*Table 3 - Summary of Applicable Costs for Facility Owners*

Generating Facility Type (Site AC Aggregate)	< 500kW	≥ 500 kW	Non-exporting standalone storage	Non-exporting Fuel Cell
Initial Review	Yes	Yes	Yes	Yes
Supplemental Review	No	Yes	No	Yes
Interconnection Study	No	Yes	No	Yes
Interconnection Facility Costs (Customer side)	Yes	Yes	Yes	Yes
Interconnection Facility Operations and Maintenance Costs	If required	Yes	Yes	Yes
Telemetry Costs	N/A	Yes	Yes	Yes
Distribution Upgrades Cost (Line side)	Yes	Yes	N/A	Yes
Distribution Operations and Maintenance Cost	If required	Yes	Yes	Yes

## 2.6 Additional Costs for Commercial Interconnection

Commercial Interconnection Only-Commercial customers (6kW or greater) that add Distributed Generation (whether behind the utility service meter or interconnected directly to SMUD's Distribution System) that cause voltage or frequency issues may be required to pay for any additional circuit upgrades as part of their interconnection costs. These costs will be assessed at the time of all interconnection costs.

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## 2.7 Interconnection Study

When the Supplemental Review reveals that the proposed facility requires an Interconnection Study due to the need for significant SMUD Interconnection Facilities or Distribution System improvements to accommodate the interconnection of an Applicant's Generating Facility.

Upon completion of an Interconnection Study, SMUD shall provide the Applicant with the specific requirements, estimated costs, and schedule for interconnecting the Generating Facility to accommodate execution of agreements pursuant to Fees, Section 2.3.

## 2.8 Applicable Agreements


SMUD shall provide the Facility Owner with an executable version of the applicable agreements, which may include an Interconnection Agreement or other agreements, as appropriate for the Facility Owner's Generating Facility and desired mode of operation. Where the Supplemental Review or Interconnection Study performed by SMUD has determined that modifications or additions are required to be made to its Distribution System, or that additional metering, monitoring, or protection devices will be necessary to accommodate an Applicant's Generating Facility, SMUD shall notify the Applicant of the estimated costs for the required work. Facility Owner shall execute agreements for SMUD to complete the required work. Such Agreements shall require the Facility Owner to reimburse SMUD for all actual costs incurred by SMUD in performing the work unless applicable law prevents SMUD from recovering such costs from Facility Owner.

## 2.9 Upon Execution of Agreements

After executing the applicable agreements and receiving the estimated Interconnection Facilities Cost Payment (noted in Section 2.10), SMUD will commence construction/installation of the modifications or metering and monitoring requirements identified in the agreements. The parties will use good faith efforts to meet the schedules and cost estimates.

## 2.10 Interconnection Facilities Cost Payment

The Facility Owner will be required to pay SMUD's estimated costs (including loadings) prior to SMUD procuring or installing equipment or facilities (Interconnection Facilities) which allow the interconnection and operation of the Facility Owner's Generator in parallel with SMUD's system. All extensions of electric distribution lines needed to make connection to Generators, as well as all required system upgrades, will be constructed at Applicant's expense. Payment is due prior to the start of construction activity by SMUD. The Facility Owner must submit a separate application for any special facilities needed to accommodate the interconnection.

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### 2.11 Ownership, Operations, Maintenance, Repair, and Replacement of Interconnection Facilities

While the Facility Owner bears the cost of the Interconnection Facilities, ultimate ownership will reside with SMUD. SMUD shall be responsible for operation, maintenance, repair, and replacement of the Interconnection Facilities in accordance with then-current SMUD practices.

### 2.12 Testing of Generating Facilities

The Facility Owner is responsible for all testing of a Generating Facility and associated Interconnection Facilities, according to Testing and Certification Criteria to ensure compliance with the safety and reliability provisions of these Interconnection Guidelines prior to operation.

### 2.13 Operating Within SMUD’s Distribution System

The Facility Owner’s Generating Facility shall be authorized by SMUD for Parallel Operation, Momentary Parallel Operation, or Islanding operation as applicable, with SMUD’s Distribution System following demonstration of compliance with the terms of all applicable agreements and express written permission. Compliance may include, but not be limited to, provision of any required documentation and satisfactorily completing any required inspections or tests as described herein or in the agreements formed between the Facility Owner and SMUD.

### 2.14 Interconnection Facilities Cost


Facility Owner shall be responsible for payment of costs related to ongoing operations and maintenance of the Interconnection Facilities, based on the installation costs, pursuant to SMUD’s Rule and Regulation 21. The Facility Owner can elect to pay this cost either as a one-time payment or a monthly payment. The “Cost of Service Charge” represents the continuing service costs of the Interconnection Facilities as determined in accordance with SMUD’s Rules and Regulations as adopted by SMUD’s Board of Directors and amended from time to time.

### 2.15 Interconnection Facilities Cost Payment Options

The following formulas are for facilities for which the loadings are included in the actual SMUD design and construction cost.

A monthly Interconnection Facilities Costs Payment calculated as follows: \$5.40 divided by \$1,000 multiplied by the actual SMUD design and construction cost. This monthly charge is perpetual for as long as the Interconnection Facilities serve the Facility Owner and Generating Facility.

Or:

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A one-time Interconnection Facilities Costs Payment calculated as follows: \$978.00 divided by \$1,000 multiplied by the actual SMUD design and construction cost.

And:

In addition to the costs above, a recurring charge will be paid to SMUD for reimbursement to maintain the SCADA and metering communication, an annual 2% escalation may be applied.

### 2.16 Adjustment of Service Charges

SMUD will review the Interconnection Facilities Charge calculations periodically as SMUD's costs change. The annual service cost used to determine the monthly Cost of Service Charge shall automatically increase or decrease without formal amendment to the Exhibit if SMUD's Board of Director's should subsequently amend SMUD's Rates, Rules and Regulations to provide for higher or lower percentage rates for monthly costs of service for such facilities, effective the date set forth in the amended Rates, Rules and Regulations. If any portion of the Interconnection Facilities for which Facility Owner pays either a one-time or a monthly Interconnection Facilities Charge is, at some future date, utilized by others, the Interconnection Facilities Charge may be reassessed based on the Facility Owner's proportionate share of the maximum load on the portion of Interconnection Facilities utilized by such third party.


## 3. Generating Facility Design and Operating Requirements

These requirements are intended to be consistent with ANSI/IEEE 1547-2018 Standard for Interconnecting Distributed Resources with Electric Power Systems. The language that has been adopted directly or by reference is followed by a citation that lists the clause from which the language derived. For example, IEEE 1547-2018, 4.1.1 is a reference to Clause 4.1.1. In the event of conflict between these Interconnection Guidelines and UL 1741 – Supplement SB and/or IEEE 1547-2018 and/or IEEE 1547.1-2020, these Interconnection Guidelines shall take precedence. Exceptions are taken to IEEE 1547 Clauses 4.1.4.2 Distribution Secondary Spot Networks where SMUD's GP-001 shall apply, and to Clauses 4.1.8.1 or 5.1.3.1, which address Protection from Electromagnetic Interference. These Interconnection Guidelines also do not adopt the Generating Facility power limitation of 10 MVA incorporated in IEEE 1547.

### 3.1. General Interconnection and Protection Requirements

#### 3.1.1. Protective Functions Required

The Protective Functions for Generating Facilities operating in parallel with SMUD's Distribution System shall include:

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- Over and under voltage trip functions and over and under frequency trip functions;
- A means for disconnecting the Generating Facility from SMUD's Distribution System when a protective function initiates a trip;
- An automatic means to prevent the Generating Facility from energizing a de-energized Distribution System circuit and to prevent the Generating Facility from reconnecting with the Distribution System unless the Distribution System service voltage and frequency is of specified settings and is stable for at least 60 seconds;
- A means to prevent the Generating Facility from contributing to the formation of an Unintended Island;
- Momentary Paralleling Generating Facilities. With SMUD's approval, the transfer switch or system used to transfer the Facility Owner's loads from SMUD's Distribution System to Facility Owner's Generating Facility may be used in lieu of the Protective Functions required for Parallel Operation. Momentary Paralleling to SMUD's Distribution System shall be one second (60 cycles) or less.

### 3.1.2. Inverter Protective Functions Required

Inverters operating in parallel with SMUD's Distribution System shall be equipped with the following Protective Functions to sense abnormal conditions on SMUD's Distribution System and cause the Inverter to be automatically disconnected from SMUD's Distribution System or to prevent the Inverter from being connected to SMUD's Distribution System inappropriately:

- Over and under voltage trip functions and over and under frequency trip functions;
- A voltage and frequency sensing and time-delay function to prevent the Inverter from energizing a de-energized Distribution System circuit and to prevent the Inverter from reconnecting with SMUD's Distribution System unless SMUD's Distribution System service voltage and frequency is within the ANSI C84.1-1995 Table 1 Range B voltage Range of 106 volts to 127 volts (on a 120 volt basis), inclusive, and a frequency range of 59.3 Hz to 60.5 Hz, inclusive, and are stable for at least 15 seconds; and
- A function to prevent the Inverter from contributing to the formation of an Unintended Island and cease to energize SMUD's Distribution System within two seconds of the formation of an Unintended Island.

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The Inverter shall cease to energize SMUD’s Distribution System for faults on SMUD’s Distribution System circuit to which it is connected (IEEE 1547-6.2.1). The Inverter shall cease to energize SMUD’s Distribution circuit prior to re-closure by SMUD’s Distribution System equipment (IEEE 1547-6.3).

**3.1.3. Purpose of Protective Functions**

The Protective Functions and requirements of these Interconnection Guidelines are designed to protect SMUD’s Distribution System and not the Generating Facility. A Facility Owner shall be solely responsible for providing adequate protection for its Generating Facility and Interconnection Facilities. The Facility Owner’s protective equipment shall not impact the operation of other protective devices utilized on the Distribution System in a manner that would affect SMUD's capability of providing reliable service to its customers.

**3.1.4. Suitable Equipment Required**


Circuit breakers or other interrupting devices located at the Point of Common Coupling must be Certified or "Listed" (as defined in Article 100, the Definitions Section of the National Electrical Code) as suitable for their intended application. This includes being capable of interrupting the maximum available fault current expected at their location. Facility Owner’s Generating Facility and the Interconnection Facilities shall be designed so that the failure of any one device shall not potentially compromise the safety and reliability of SMUD’s Distribution System.

The Inverter paralleling-device shall be capable of withstanding 220% of the Interconnection Facility rated voltage (IEEE 1547-4.11.3). The Interconnection Facility shall have the capability to withstand voltage and current surges in accordance with the environments defined in IEEE Std C62.41.2 or IEEE Std C37.90.1 as applicable and as described in L.3.e (IEEE 1547-4.11.2).

**3.1.5. Visible Disconnect Required**

When required by SMUD’s operating practices, Facility Owner shall furnish and install a ganged, manually-operated isolating switch (or a comparable device mutually agreed upon by SMUD and Facility Owner) near the Point of Interconnection to isolate the Generating Facility from SMUD’s Distribution System. The device does not have to be rated for load break nor provide over-current protection.

The device must:

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- i. allow visible verification that separation has been accomplished. (This requirement may be met by opening the enclosure to observe contact separation.)
- ii. include markings or signage that clearly indicates open and closed positions.
- iii. be capable of being reached:
  - a. for Emergency purposes quickly and conveniently 24 hours a day by SMUD personnel for construction, operation, maintenance, inspection, testing or to isolate the Generating Facility from SMUD's Distribution System without obstacles or requiring those seeking access to obtain keys, special permission, or security clearances.
  - b. for non-Emergency purposes during normal business hours. SMUD, where possible, will provide notice to Facility Owner for gaining access to Facility Owner's premises.
- iv. be capable of being locked in the open position.
- v. be clearly marked on the submitted single line diagram and its type and location approved by SMUD prior to installation. If the device is not adjacent to the PCC, permanent signage must be installed at a SMUD approved location providing a clear description of the location of the device.


Generating Facilities with Non-Islanding Inverters totaling one (1) kilovolt-ampere (kVA) or less are exempt from this requirement.

### 3.1.6. Single-Phase Generators

For single-phase Generators connected to a shared single-phase secondary system, the maximum Gross AC Nameplate Rating of the Generating Facility shall be 20 kVA. Generators applied on a center-tapped neutral 240-volt service must be installed such that no more than 6 kVA of imbalance in capacity exists between the two sides of the 240-volt service. For Dedicated Distribution Transformer services, the maximum Gross AC Nameplate Rating of a single-phase Generating Facility shall be the transformer nameplate rating. SMUD's Rates, Rules and Regulations currently may charge for power factors below .95 lagging.

### 3.1.7. Drawings Required

SMUD, prior to Parallel Operation or Momentary Parallel Operation of the Generating Facility, shall approve the Facility Owner's protection and control diagrams for the Generating Facility. A Generating Facility equipped with a protection and control scheme previously approved by SMUD for system-wide application or only Certified Equipment may satisfy this requirement by reference.

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### 3.1.8. Generating Facility Conditions Not Identified

In the event these Interconnection Guidelines do not address the interconnection requirements for a particular Generating Facility, SMUD and the Facility Owner may agree upon other requirements.

### 3.1.9. Operational Requirements for Generating Facilities that can be Intentionally Islanded

Generating Facilities operated where they isolate and island intentionally from the Distribution System to serve Host Load must adhere to all of the requirements in these Interconnection Guidelines. Additional operational requirements are presented in Appendix C.

### 3.1.10. Generating Facilities that use a Power Control System (PCS):


Generating Facilities that use a power control system (PCS) must use a PCS that is listed and evaluated to limit the amount of export and/or to control the output of one or more power production sources, storage systems, and other equipment. The PCS shall limit current and loading on the busbars and conductors supplied by the PCS. Additional details are presented in Appendix D.

## 3.2. Prevention of Interference

The Facility Owner shall not operate equipment that superimposes a voltage or current upon SMUD's Distribution System that interferes with SMUD's service to SMUD's customers or communication facilities. If such interference occurs, the Facility Owner must diligently pursue and take corrective action at its own expense after being given notice and reasonable time to do so by SMUD. If the Facility Owner does not take corrective action in a timely manner, or continues to operate the equipment causing interference without restriction or limit, SMUD may, without liability, disconnect the Generating Facility from the Distribution System, in accordance with Curtailment, Disconnection, or Termination Section 1.10 of these Interconnection Guidelines.

### 3.2.1. Voltage Regulation

If approved by SMUD, the Inverter may actively regulate the voltage at the PCC while in Parallel Operation with SMUD's Distribution System. The Inverter shall not cause the service voltage at other customers to go outside the requirements of ANSI C84.1, Range A (IEEE 1547-5.1).


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### 3.2.2. Voltage Trip and Ride-Through Settings

The voltage ranges in Table 4 - Inverter Voltage Trip and Ride-Through Settings, define protective trip limits for the Protective Functions and are not intended to define or imply a voltage regulation function. A Generating Facility shall cease to energize SMUD’s Distribution System within the prescribed trip time whenever the voltage at the PCC deviates from the allowable voltage operating range. The Protection Functions shall detect and respond to voltage on all phases to which the Generating Facility is connected.

- vi. Inverters. Inverters shall be capable of operating within the voltage range normally experienced on SMUD’s Distribution System from plus to minus 5% of the nominal voltage (e.g. 114 volts to 126 volts, on a 120-volt base), at the service panel or PCC. The trip settings at the generator terminals may be selected in a manner that minimizes nuisance tripping in accordance with Table 4 - Inverter Voltage Trip and Ride-Through Settings to compensate for voltage drop between the generator terminals and the PCC. Voltage may be detected at either the PCC or the Point of Interconnection. However, the voltage range at the PCC, with the generator on-line, shall stay within +/-5% of nominal.
- vii.
  - ii. Voltage Disturbances. Whenever SMUD’s Distribution System voltage at the PCC varies from and remains outside the near nominal (NN) magnitude range for the predetermined parameters set forth in Table 4, the Smart Inverter’s Protective Functions shall cause the Smart Inverter(s) to trip and become isolated from Distribution Provider’s Distribution System:
    - a) The Smart Inverter shall stay connected to the SMUD’s Distribution System while the grid remains within the “Ride-Through Until” voltage-time range and must stay connected in the corresponding “Operating Mode.”
    - b) In the HV1 region, the Inverter is permitted to reduce power output as a function of voltage under mutual agreement between the Facility Owner and SMUD.
    - c) If SMUD’s Distribution System voltage recovers to normal system voltage before reaching the “Ride-Through Until” time limit, the Inverter shall restore continuous operation within 2 seconds.

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d) If SMUD’s Distribution System voltage returns from LV3 region to the LV2 or LV1 region before reaching the “Ride-Through Until” time limit, the Smart Inverter shall restore available current within 2 seconds.

e) At its sole discretion, SMUD may permit different voltage-time settings than those specified in Table 4 - Inverter Voltage Trip and Ride-Through Settings.

*Table 4 - Inverter Voltage Trip and Ride-Through Settings*

Region	Voltage at PCC (% Nominal Voltage)	Ride-Through Until	Operating Mode	Clearing time
High Voltage 2 (HV2)	$V \geq 120\%$	NA	Cease to Energize	0.16 sec
High Voltage 1 (HV1)	$110\% < V < 120\%$	12 sec	Momentary Cessation	13 sec
Near Nominal (NN)	$88\% \leq V \leq 110\%$	Indefinite	Continuous Operations	Not Applicable
Low Voltage 1 (LV1)	$70\% \leq V < 88\%$	20 sec	Mandatory Operations	21 sec
Low Voltage 2 (LV2)	$50\% \leq V < 70\%$	10 sec	Mandatory Operations	21 sec
Low Voltage 3 (LV3)	$V < 50\%$	1 sec	Momentary Cessation	2 sec


### 3.2.3. Flicker

The Generating Facility shall parallel with SMUD’s Distribution System without causing a voltage fluctuation at the PCC greater than plus/minus 5% of the prevailing voltage level of SMUD’s Distribution System at the PCC, and meet SMUD’s flicker requirements, Certification and Testing Criteria, provides technology-specific tests for evaluating the paralleling Function. (IEEE 1547-4.10.4)

The Generating Facility shall not create objectionable flicker for other customers on SMUD’s Distribution System. To minimize the adverse voltage effects experienced by other SMUD customers (IEEE 1547-7.2.1), any voltage flicker at the PCC caused by the Generating Facility should not exceed the limits defined by the “Maximum Borderline of Irritation Curve” identified in IEEE 519 (IEEE Recommended Practices and Requirements for Harmonic Control in Electric Power Systems, IEEE STD 519). Induction Generators may be connected and brought up to synchronous speed (as an induction motor) provided these flicker limits are not exceeded.

### 3.2.4. Integration with SMUD’s Distribution System Grounding

The grounding scheme of the Generating Facility shall not cause over-voltages that exceed the rating of the equipment connected to SMUD’s Distribution

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System and shall not disrupt the coordination of the ground fault protection on SMUD's Distribution System (IEEE 1547-4.12 and subclause 7.4) (See Appendix A, Screen 8, line configuration).


### 3.2.5. Frequency Trip and Ride-Through Settings

SMUD controls system frequency, and the Generating Facility shall operate in synchronism with the Distribution System. Whenever SMUD's Distribution System frequency at the PCC remains outside of the frequency limits stated in Table 5 - Inverter Frequency Trip and Ride-Through Settings, the Generating Facility's Protective Functions shall cease to energize SMUD's Distribution System in a maximum of 0.16 seconds. The purpose of the Ride-Through Until time is to allow the Generating Facility to ride through short-term disturbances to avoid nuisance tripping. Frequency Ride-Through Requirements for Inverters

Inverter based systems shall remain connected to SMUD's Distribution System while the grid is within the frequency-time range indicated in Table 5 - Inverter Frequency Trip and Ride-Through Settings.

Inverter Frequency Trip and Ride-Through Settings and shall disconnect from the electric grid during a high or low frequency event that is outside that frequency-time range. The frequency values are shown in Table 5 - Inverter Frequency Trip and Ride-Through Settings The inverter shall disconnect by the clearing times. In the high frequency range between 60.2 Hz and 61.5 Hz, or some other mutually agreed range, the Inverter is permitted to reduce real power output until it ceases to export power by 61.5 Hz, or other frequency value mutually agreed between the generating facility operator and SMUD.

Smart Inverter shall not trip for frequency excursion having magnitude Rate of Change of Frequency (ROCOF) that is less than or equal to 3.0Hz per second as specified in IEEE 1547- 2018, section 6.5.2.5 category III. For ROCOF greater than 3Hz per second, it is preferred for Smart Inverter to ride-through as long as frequency remains in the continuous operating region, low frequency ride-through region (and corresponding duration times), or high frequency region (and corresponding duration times).

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**Table 5 - Inverter Frequency Trip and Ride-Through Settings**

Region	Frequency at PCC (Hz)*	Ride-Through Until	Operating Mode	Clearing Time
High Frequency 2 (HF2)	$f \geq 62.0$	No Ride Through	Not Applicable	0.16 sec
High Frequency 1 (HF1)	$61.2 < f < 61.8^*$	299 sec	Mandatory Operation	300 sec
Near Nominal	$58.8 < f \leq 61.2$	Indefinite	Continuous Operation	Not Applicable
Low Frequency 1 (LF1)	$57.0 \leq f \leq 58.8$	299 sec	Mandatory Operation	300 sec
Low Frequency 2 (LF2)	$f < 56.5^*$	No Ride Through	Not Applicable	0.16 sec

\* For  $61.8 \leq f < 62$  and  $56.5 \leq f < 57$ , Inverter “may ride-through or may trip


### 3.2.6. Harmonics

Harmonic current distortion, inter-harmonic current distortion, and total rated-current distortion (TRD) at the PCC shall be in compliance with IEEE 519 and shall not exceed the limits stated in Table 6 - Maximum Harmonic Current Distortion in Percent of Current. The harmonic current injections shall be exclusive of any harmonic currents due to harmonic voltage distortion present in SMUD’s Distribution System without the Inverter connected (IEEE 1547-7.3.). The harmonic distortion of an Inverter shall be evaluated using the same criteria as for the Host Loads.

Exceptions: The harmonic distortion of a Generating Facility located at a Customer’s site shall be evaluated using the same criteria as for the loads at that site.

“Total Rated-current Distortion (TRD)” was introduced and used instead of TDD and the even order current distortion limits above the second order relaxed (in Table 6).

When the Inverter is serving balanced linear loads, harmonic current injection into SMUD’s Distribution System at the PCC shall not exceed the limits stated in Table 6 - Maximum Harmonic Current Distortion in Percent of Current.

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*Table 6 - Maximum Harmonic Current Distortion in Percent of Current (I) [1,2,3]*

Individual harmonic order, h						Total rated current distortion
(odd harmonics) [3]	$h < 11$	$11 \leq h < 17$	$17 \leq h < 23$	$23 \leq h < 35$	$35 \leq h < 50$	
Max Distortion (%)	4.0	2.0	1.5	0.6	0.3	5.0
[1] – IEEE 1547-7.3						
[2] – I = the greater of the maximum Host Load current average demand over 15 or 30 minutes without the Generating Facility (GF), or the GF rated current capacity (transformed to the PCC when a transformer exists between the GF and the PCC).						
[3] – Even harmonics are limited to 1%, 2%, & 3% for h=2, 4, & 6 respectively. Associated range for $8 \leq h < 50$ is the same as specified above.						

### 3.2.7. Direct Current Injection

Generating Facilities shall not inject Direct Current greater than 0.5% of rated output current into SMUD’s Distribution System.

### 3.2.8. Power Factor

Each Generator in a Generating Facility shall be capable of operating at some point within a power factor range of 0.85 leading and 0.85 lagging. Operation outside this range is acceptable provided the reactive power of the Generating Facility is used to meet the reactive power needs of on-site loads or that reactive power is otherwise provided under applicable Rates, Rules and Regulations by SMUD. The Facility Owner shall notify SMUD if it is using the Generating Facility for power factor correction.


### 3.2.9. Inverter Power Factor Requirements

Facility Owner shall provide adequate reactive power compensation on site to maintain the Inverter power factor near unity at rated output or a SMUD specified power factor in accordance with the following requirements:

- Default Power Factor setting: 1.0 +/- 0.01 (0.99 Lagging to 0.99 Leading).
- Aggregate generating facility is greater than 15 kW: 1.0 +/- 0.15 (0.85 Lagging to 0.85 Leading) down to 20% rated power based on available reactive power.
- Aggregate generating facility is less than or equal to 15 kW: 1.0 +/- 0.10 (0.90 Lagging to 0.90 Leading) down to 20% rated power based on available reactive power.

### 3.2.10. Smart Inverter Reactive Power Requirements

Smart Inverter reactive power capabilities shall comply with IEEE 1547- 2018, Section 5.2 Category B requirement.

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### 3.2.11. Dynamic Volt-VAR Operations.

The Inverter shall be capable of operating dynamically within a power factor range of +/- 0.85 PF for larger (>15 kW) systems, down to 20% of rated power, and +/- 0.9 PF for smaller systems (≤15 kW), down to 20% of rated power, based on available reactive power.

The Inverter shall be capable of providing dynamic reactive power compensation (dynamic Volt-VAR operation) within the following constraints:


- The Inverter shall not cause the line voltage at the PCC to go outside the requirements of the latest version of ANSI C84.1, Range A.
- The Inverter shall be able to absorb reactive power in response to an increase in line voltage and inject reactive power in response to a decrease in line voltage (refer to 3.2.13).
- The reactive power provided shall be based on available reactive power, but the maximum reactive power provided to the system shall be as directed by SMUD.

This dynamic Volt-VAR capability shall be able to be activated or deactivated in accordance with SMUD interconnection requirements. SMUD may permit or require the Inverter systems to operate in larger power factor ranges, including in 4- quadrant operations for storage systems with the implementation of additional anti-islanding protection as determined by SMUD.

### 3.2.12. Ramp Rate Requirements

The Inverter is required to have the following ramp controls. These functions can be established by multiple ramp rate control functions or by one general ramp rate control function. Ramp rates are contingent upon sufficient energy available from the Inverter.

- Normal Ramp-up rate: For transitions between energy output levels over the normal course of operation. The default value is 100% of maximum current output per second with a range of adjustment between 1% to 100%, with specific settings as mutually agreed by SMUD and the Facility Owner.
- Connect/Reconnect Ramp-up rate: Upon starting to inject power into the grid, following a period of inactivity or a disconnection, the inverter shall be able to control its rate of increase of power from 1 to 100% maximum current per second, with specific settings as mutually agreed upon by SMUD and the Facility Owner.

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### 3.2.13. Default Activation States

Unless otherwise provided by SMUD, the inverter default features will be as follows:

- Anti-islanding – activated
- Low/High Voltage Ride-Through – activated
- Low/High Frequency Ride-Through – activated
- Ramp rates – activated
- Reconnect by “soft-start” methods – activated

### 3.2.14. Additional Activation States or Advanced Inverter Function settings


Additional activation states or Advanced Inverter Function (AIF) settings can be manually customized to meet SMUD interconnection requirements. Additional inverter features that may be required by SMUD are as follows:

- Fixed Power factor – activated
- Dynamic Volt-VAR – deactivated
- Dynamic Volt-Watt – deactivated
- Frequency/Watt – deactivated

For the Generating Facility inverter system’s programmed Volt-VAR and Volt-Watt setpoints, many residential customers work through a PV solar providing company to set or change these settings. In these cases, the installer or company typically manages inverter settings at installation or commissioning and may provide ongoing service after installation.

SMUD typically communicates with the installer during the application process and includes the customer in communications. Other customers might choose to install and/or manage their own inverter settings. Inverter settings are typically accessed through a settings input screen directly on the device. Many inverters now also have mobile or web applications that allow installers or owners to change settings remotely.

AIF settings will be included in the approval to build email. Inverters must be configured to comply with the project’s AIF settings requirements and verification must be provided to confirm compliance. There are three settings outcomes: No AIF settings or Unity PF, Standard AIF settings, or Custom AIF settings. If no AIF settings are required, the inverter(s) are to use default Fixed Power factor settings and no verification is needed (the email will not list any AIF information). If specific AIF settings are required, such as Standard AIF or Custom AIF settings, verification must be provided to show that the system has been updated

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with the appropriate Volt-VAR & Volt-Watt setpoints to comply with SMUD’s required AIF settings.


Acceptable picture(s) proof includes the inverter settings screenshots showing Volt-VAR setpoints, As-Left settings sheet/screenshot, or a web/mobile application printout/screenshot, etc. Manufacturer specification sheets are not acceptable verification as they do not verify inverter setpoints As-Left on a specific project. Some manufacturers may provide a way to produce a Grid Compliance or Utility Compliance report. SMUD may accept screenshots showing system, utility or grid profile or country code selection with accompanying manufacturer documentation listing the associated Volt-VAR and Volt-Watt setpoints.

Some microinverter configurations may show the overall system Volt-VAR and Volt-Watt setpoints which may be accessed from a gateway, envoy, or master controller type device or from a web or mobile application. Please contact the inverter manufacturer directly for instructions on how to obtain this information for your specific system.

Inverter feature activation states may be modified by mutual agreement between SMUD and Generating Facility Owner. SMUD, in the study process for new Generating Facilities, may determine and provide the optimum Smart Inverter Settings for the reactive power settings, including changes to the reactive power default settings (Example: Deactivate Volt-VAR and activate Fixed Power Factor at given power factor).

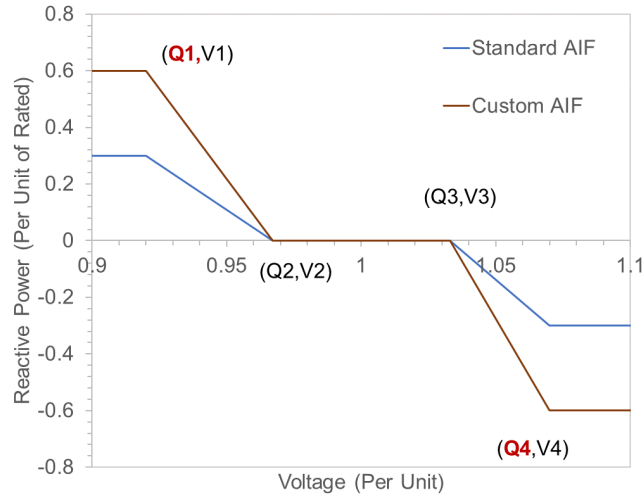
Dynamic Volt-VAR settings in Figure AA, Table AB and Table AC depict the Standard and Custom AIF settings, which could be applied for all inverter sizes. Custom AIF settings may be required for larger Generating Facilities (such as 50 kW or greater), or for specific areas with the Distribution Systems as determined by the Distribution Provider. Figure BB and Table BA depict the Volt-Watt settings.

*Default Open Loop Response Time (OLRT) for Volt-VAR operation should be five (5) seconds.*

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*Figure AA: Standard and Custom AIF Volt-VAR settings*



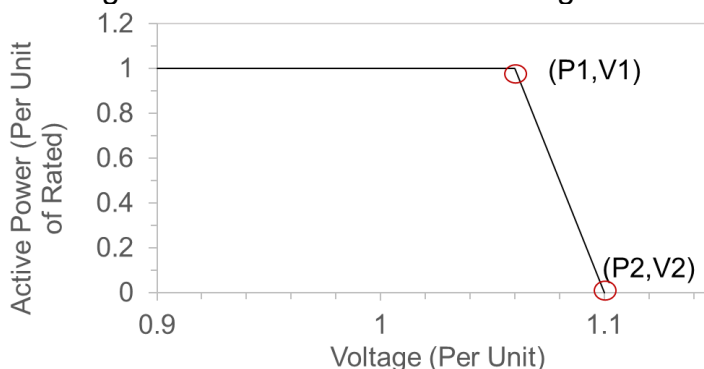
**Table AB: Standard AIF Volt-VAR settings values  
(formatting to be revised to match the rest of the document)**

Reactive Power (Q), Voltage (V) Pairs	Reactive Power (% of inverter capacity), Per unit voltage
(Q1,V1)	(0.3, 0.92)
(Q2,V2)	(0, 0.967)
(Q3,V3)	(0, 1.033)
(Q4,V4)	(-0.3, 1.07)

**Table AC: Custom AIF Volt-VAR settings values (values for Q change in increments of 0.5 from default)  
(formatting to be revised to match the rest of the document)**

Reactive Power (Q), Voltage (V) Pairs	Reactive Power (% of inverter capacity), Per unit voltage
(Q1,V1)	(0.6, 0.92)
(Q2,V2)	(0, 0.967)
(Q3,V3)	(0, 1.033)
(Q4,V4)	(-0.6, 1.07)

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**Figure BB: Volt-Watt default settings curve**

**Table BA: Volt-Watt default settings values**

Active Power (P), Voltage (V) Pairs	Active Power (% of inverter capacity), Per unit voltage
(P1,V1)	(100%, 1.06)
(P2,V2)	(0, 1.1)


These activation states may be modified by mutual agreement between SMUD and Facility Owner.

### 3.2.15. Automatic Transfer (Load Shedding or Transfer)

The voltage and frequency ride-through requirements of 3.2 shall not apply if either:

a) Condition 1:

- i) Prior to any voltage disturbance, the real power flowing across the Point of Common Coupling is less than 10% of the Gross AC Nameplate Rating of the Generating Facility, and
- ii) The Generating Facility and any Generating Facility load disconnects from the SMUD Distribution System, and
- iii) The disconnection results in a net change in real power flow to or from SMUD's Distribution System of less than 10% of the Gross AC Nameplate Rating of the Generating Facility, or

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b) Condition 2:

- i) Prior to any voltage disturbance, the Generating Facility real power demand is between 90% and 120% of the Gross AC Nameplate Rating of the Generating Facility, and
- ii) This load is shed within 0.1 seconds of Inverter disconnection.

### 3.3 Control, Protection and Safety Equipment Requirements


#### 3.3.1 Technology Specific Requirements

**Three-Phase Synchronous Generators:** For three-phase Generators, the circuit breakers shall be three-phase devices with electronic or electromechanical control. The Facility Owner shall be responsible for properly synchronizing its Generating Facility with the Distribution System by means of either a manual or automatic synchronizing function. The synchronizing function used shall not allow the Generating facility to parallel with SMUD’s Distribution System unless at the time of connection, the frequency difference is less than 0.2 Hz, the voltage difference is less than 10%, and the phase angle difference is less than 10 degrees.

Automatic synchronizing is required for all synchronous generators, which have a Short Circuit Contribution Ratio (SCCR) exceeding 0.05. A Generating Facility whose SCCR exceeds 0.05 shall be equipped with Protective Functions suitable for detecting loss of synchronism and rapidly disconnecting the Generating Facility from the Distribution System. Unless otherwise agreed to between the Facility Owner and SMUD, synchronous generators shall automatically regulate power factor, not voltage, while in Parallel Operation with the Distribution System. Power system stabilization functions are specifically not required for Generating Facilities under 10 MW Gross AC Nameplate Rating.

**Induction Generators:** Induction Generators do not require a synchronizing function. Starting or rapid load fluctuations on induction Generators can adversely impact the Distribution System’s voltage. Corrective step-switched capacitors or other techniques may be necessary and may cause undesirable ferro resonance. When these counter measures (e.g. additional capacitors) are installed on the Facility Owner’s side of the Point of Common Coupling, SMUD must review these measures. Additional equipment may be required as determined in a Supplemental Review or an Interconnection Study.

**Inverter Systems:** Grid-interactive inverters do not require separate synchronizing equipment. Non-grid-interactive or “stand-alone” inverters shall not be used for parallel operation with the Distribution System.

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### 3.3.2 Limitations on Inverters Not Classified as Smart Inverters

Effective September 2017, SMUD requires only Smart Inverters.

The replacement of an existing inverter to an inverter that is of equal or greater ability than the original is allowed per Section 3. Section 3 may be used in all or in part, for replacement inverter-based technologies by mutual agreement of SMUD and the Facility Owner.

### 3.3.3 Supplemental Generating Facility Requirements

Unintended Islanding for Generating Facilities that fail the Export Screen (Appendix A): Generating Facilities must mitigate their potential contribution to an Unintended Island. This can be accomplished by one of the following options: (1) incorporating certified Non-Islanding control functions into the Protective Functions, or (2) verifying that local loads sufficiently exceed the Gross AC Nameplate Rating of the Generating Facility, or (3) incorporating a Transfer Trip or an equivalent Protective Function.

Fault Detection: A Generating Facility with an SCCR exceeding 0.1 or one with Protective Functions that do not meet any one of the options for mitigating Unintended Islands shall be equipped with Protective Functions designed to detect Distribution System faults, both line-to-line and line-to-ground, and promptly cease to energize the Distribution System in the event of a fault within two seconds. For a Generating Facility that cannot detect these faults within two seconds, SMUD may require a Transfer Trip or equivalent Protective Function. Reclose-blocking of SMUD's affected recloser(s) may also be required by SMUD for Generating Facilities that exceed 15% of the peak load on the Line Section.


## 3.4 Supplemental Inverter Requirements

### 3.4.1 Fault Detection

A Generating Facility with a SCCR exceeding 0.1 or one that does not cease to energize SMUD's Distribution System within 2 seconds of the formation of an Unintended Island shall be equipped with Protective Functions designed to detect Distribution System faults, both line-to-line and line-to-ground and cease to energize SMUD's Distribution System within two seconds of the initiation of a fault.

### 3.4.2 Transfer Trip

For a Generating Facility that cannot detect both line-to-line and line-to-ground Distribution System faults or the formation of an Unintended Island and cease to energize SMUD's Distribution System within two seconds of the initiation of the

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fault, SMUD shall require a Transfer Trip system or an equivalent Protective Function.

### 3.4.3 Reclose Blocking

Where the aggregate Generating Facility capacity exceeds 15% of the peak load on any automatic reclosing device, SMUD may require additional Protective Functions, including, but not limited to, reclose-blocking on some of the automatic reclosing devices.

## 4. Maintenance and Permits


Facility Owner, at Facility Owner's sole expense, shall obtain and possess all permits and authorizations for the Generating Facility in accordance with all applicable laws and regulations for the construction, installation, design, operation, and maintenance of the Generating Facility.

The Facility Owner shall: (a) maintain the Facility and Interconnection Facilities in a safe and prudent manner and in conformance with all applicable laws and regulations including, but not limited to, requirements of Section 3 above and (b) to the extent that future requirements may dictate, obtain any government authorizations or permits required for the operation of the Generator or Generating Facility. The Facility Owner shall reimburse SMUD for any and all losses, damages, claims, penalties, or liability SMUD incurs as a result of the Facility Owner's failure to obtain or maintain any government authorizations and permits required for construction and operation of the Generating Facility.

## 5. Access to Premises

In the event that Facility Owner owns the real property where the Interconnection Facilities will be located, or (in the event that Facility Owner is leasing or otherwise obtaining rights to locate the Generation Facilities on real property of a third party), Facility Owner shall grant to SMUD (or obtain for SMUD) (i) the right to install the Interconnection Facilities and related equipment or materials on said real property along the most practical route which is of sufficient width to provide legal and safe clearance from all structures now or hereafter erected on said real property; and (ii) The right of ingress and egress from said real property as reasonably necessary for SMUD to operate, maintain, and remove the Interconnection Facilities.

Where formal rights of way and/or easements are required on or over said real property or the property of some third party for the installation of the Interconnection Facilities, Facility Owner agrees that SMUD's obligation to install the Interconnection Facilities is expressly conditioned on the granting, without cost to SMUD, of any and all necessary rights of way and/or easements to SMUD.

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SMUD may enter the Customer’s premises without prior notice (a) to inspect at all reasonable hours the Generating Facility’s protective devices and read or test any meter for the Generator or Generating Facility; (b) to disconnect, at any time, without notice, the Generator or Generating Facility if, in SMUD’s sole opinion, a hazardous condition exists and that immediate action is necessary to protect persons, or SMUD’s facilities or property of others from damage or interference caused by (1) the Generator or Generating Facility or (2) the Customer and/or Facility Owner’s failure to comply with requirements of these provisions; and (c) if applicable, monthly to read the digital meter for billing purposes. Self-reads and reads from adjacent properties are not permitted.

## 6. Conditions of Facility Operations


The Facility Owner generally shall deliver electricity from the Generating Facility to SMUD at SMUD’s Utility Service Meter.

The Facility Owner, and not SMUD, shall be solely responsible for all legal and financial obligations arising from the construction, installation, design, operation and maintenance of the Generator or Generating Facility in accordance with all applicable laws and regulations.

The Facility Owner, at the Facility Owner’s sole expense, shall obtain and possess all permits and authorizations in accordance with all applicable laws and regulations for the construction, installation, design, operation and maintenance of the Generator or Generating Facility. The generator equipment shall be designed, installed, constructed, operated, and maintained in compliance with NEC, IEEE 1547, General Order 95 & 128, and these guidelines, including without limitation, the photovoltaic interconnection design standards. Compliance is mandatory unless prior written SMUD approval is provided for those specific items not in compliance and documented in the Interconnection Agreement.

The Facility Owner shall not connect the Generator or Generating Facility, or any portion of it, to the SMUD Distribution System, until the Generator or Generating Facility has passed SMUD inspection. SMUD may not recognize any generation until inspections and tests are passed and accepted by SMUD. Such approval shall not be unreasonably withheld. SMUD shall have the right to have representatives present at the initial testing of the Generator or Generating Facility.

The Facility Owner may reconnect its Generator or Generating Facility to the SMUD Distribution System following normal operational outages and interruptions without notifying SMUD unless SMUD has disconnected services, or SMUD notifies customer that a reasonable possibility exists that reconnection would pose a safety hazard.

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If SMUD has disconnected Service to the Generator or Generating Facility, or SMUD has notified the Facility Owner that a reasonable possibility exists that reconnection would pose a safety hazard, the Facility Owner may call SMUD at 1-888-742-SMUD (7683) to request authorization to reconnect the Generator or Generating Facility.

## **7. Interconnection Facility and Distribution System Modifications and Costs**

### **7.1. Scope and Ownership of Interconnection Facilities**

#### **7.1.1. Scope**

Parallel Operation of Generating Facilities may require Interconnection Facilities or improvements to be made to SMUD's Distribution System. The type, extent and costs of Interconnection Facilities and Distribution System improvements shall be consistent with these Interconnection Guidelines and determined through the Initial Review or Interconnection Study described in Appendix A. Facility Owner understands, accepts and agrees that connection and operation of the Generating Facility shall be subject to the terms and conditions set forth in these guidelines, as they may be amended from time to time.


#### **7.1.2. Ownership**

Interconnection Facilities installed on Facility Owner's side of the Point of Common Coupling may be owned, operated, and maintained by the Facility Owner or SMUD. Interconnection Facilities installed on SMUD's side of the Point of Common Coupling and Distribution System improvements shall be owned, operated, and maintained only by SMUD.

### **7.2. Responsibility for Costs of Interconnecting a Generating Facility**

#### **7.2.1. Study and Review Costs**

The Facility Owner shall be responsible for the reasonably incurred costs of the reviews and studies conducted pursuant to Section 2 of these Interconnection Guidelines.

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### 7.2.2. Facility Costs

The Facility Owner shall be responsible for all costs associated with Interconnection Facilities owned by the Facility Owner. The Facility Owner shall also be responsible for any costs reasonably incurred by SMUD in providing, operating, or maintaining the Interconnection Facilities and Distribution System improvements required solely for the interconnection of the Facility Owner's Generating Facility with SMUD's Distribution System, as further specified in Section 2.

### 7.2.3. Separation of Costs

Should SMUD combine the installation of Interconnection Facilities, or Distribution System improvements required for the interconnection of a Generating Facility with modifications or additions to SMUD's Distribution System to serve other Customers or third parties, SMUD shall not include the costs of such separate or incremental facilities in the amounts billed to the Facility Owner.

## 7.3. Installation and Payment for Distribution System Improvements

### 7.3.1. Agreement Required


The Facility Owner, pursuant to the provisions contained in the Interconnection Agreement or other agreements, shall pay the costs of Interconnection Facilities and Distribution System improvements as listed in Table 3 - Summary of Applicable Costs for Facility Owners. Where the type and extent of the Interconnection Facilities or Distribution System improvements warrant additional detail, Facility Owner and SMUD may form a separate agreement to more fully describe and allocate the parties' responsibilities for installing, owning, operating, maintaining the Interconnection Facilities and Distribution System improvements.

### 7.3.2. Attachments and Modifications to Distribution System

Except as provided for in Section 7.3.2 of these Interconnection Guidelines, Interconnection Facilities connected to SMUD's side of the Point of Common Coupling and Distribution System improvements shall be provided, installed, owned and maintained by SMUD at Facility Owner's expense.

### 7.3.3. Third-Party Installations

Subject to the approval of SMUD, the Facility Owner may, at its option, employ a qualified contractor to provide and install Interconnection Facilities or Distribution System improvements on SMUD's side of the Point of Common Coupling to be owned and operated by SMUD. Such Interconnection Facilities and Distribution System improvements shall be installed in accordance with SMUD's design and specifications. Upon final inspection and acceptance by SMUD, the Facility

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Owner shall transfer ownership of such Interconnection Facilities or Distribution System improvements to SMUD and such facilities shall thereafter be owned and maintained by SMUD at Facility Owner’s expense. The Facility Owner shall pay SMUD’s reasonable cost of design, administration, and monitoring of the installation for such facilities to ensure compliance with SMUD’s requirements. Facility Owner shall also be responsible for all costs, including any income tax liability, associated with the transfer of Facility Owner installed Interconnection Facilities and Distribution System improvements to SMUD.

**7.3.4. Reservation of Unused Facilities**

When a Facility Owner wishes to reserve SMUD-owned Interconnection Facilities or Distribution System improvements installed and operated for the Facility Owner at the Facility Owner’s expense but idled by a change in the operation of the Facility Owner’s Generating Facility or otherwise, Facility Owner may elect to abandon or reserve such facilities consistent with the terms of its agreement with SMUD. If Facility Owner elects to reserve idle Interconnection Facilities or Distribution System improvements, SMUD shall be entitled to continue to charge Facility Owner for the costs related to the ongoing operation and maintenance of such Facilities.


**7.3.5. Refund of Salvage Value**

When a Facility Owner elects to abandon the Interconnection Facilities or Distribution System improvements for which it has either advanced the installed costs or constructed and transferred to SMUD, the Facility Owner shall pay for all costs of removal and receive from SMUD a credit for the net salvage value of the Interconnection Facilities or Distribution System improvements. Within one hundred eighty (180) days, SMUD shall have the right to remove any portion of the Interconnection Facilities located on the property where the Interconnection Facilities are installed.

**8. Metering, Monitoring and Telemetry**

**8.1. General Requirements**

All Generating Facilities shall be metered in accordance with this section and shall meet all applicable standards of SMUD contained in SMUD’s applicable Rates, Rules, and Regulations and published in SMUD’s T002, T003, T004, T010, T014 and T015 addressing Metering specifications.

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### 8.2. Power Production Metering

In order to determine applicable standby charges and non-bypassable charges, and to provide for Distribution System planning and operations, consistent with Section 1.4 of this manual, SMUD requires the installation, including technical specifications and location, of a Power Production Meter to monitor Facility Owner's Generating Facility operations. SMUD shall require the provision of generator output data to the extent reasonably necessary to provide information for SMUD to administer its policies or to operate and plan its system.

### 8.3. Costs of Metering

Except for Renewable Electrical Generating Facilities with a site aggregate of less than 500kW (Gross AC Nameplate Rating), the Facility Owner shall bear all costs of the Metering required by these Interconnection Guidelines, including the incremental costs of operating and maintaining the Metering Equipment, unless otherwise provided by law or applicable SMUD policy.

### 8.4. Telemetry


Telemetry equipment is required for a Generator or Generating Facility with an individual or site aggregate of 500 kW or greater (Gross AC Nameplate Rating). Notwithstanding the foregoing, SMUD may require Facility Owner to install Telemetry as necessary or appropriate to ensure reliable operations, as determined in SMUD's sole discretion.

### 8.5. Cost of Telemetry

See Table 3 - Summary of Applicable Costs for Facility Owners

### 8.6. Location

Facility Owner shall provide, at no expense to SMUD, a suitable location for all such Metering Equipment and Telemetry equipment. Customer switchgear installed to accommodate SMUD meters shall be EUSERC-compliant. Facility Owner shall receive SMUD approval of the switchgear design for commercial projects over 200 Amps.

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## 9. Testing and Certification Criteria

### 9.1. Introduction

This section describes the test procedures and requirements for equipment used for the Interconnection of a Generating Facility to SMUD’s Distribution System. The procedures listed rely heavily on those described in applicable Underwriters Laboratory (UL), Institute of Electrical and Electronic Engineers (IEEE), and International Electrotechnical Commission (IEC) documents—most notably UL 1741 SB and IEEE 1547, and may be readily adaptable to synchronous Generators, induction Generators, as well as site controllers and protection relays.

The tests described here, together with the technical requirements in Section 3 of these Interconnection Guidelines, are intended to provide assurance that the Generating Facility’s equipment will not adversely affect SMUD’s Distribution System and that a Generating Facility will cease providing power to SMUD’s Distribution System under abnormal conditions.


### 9.2. Certification Criteria

Equipment tested and approved (e.g. listed) by a NRTL as having met the requirements of UL 1741 SB and IEEE 1547 is considered to be Certified Equipment for purposes of Interconnection with SMUD’s Distribution System when listed by the California Energy Commission on its Go Solar California website under “Grid Support Inverters” ([Solar Equipment Lists Program | California Energy Commission](#)).

### 9.3. Commissioning Testing

When equipment is not Certified as listed above or certified equipment is being used in an application inconsistent with its Certification or where the interconnection is for a large generating facility (such as 500 kW and greater), commissioning testing, where required, will be performed on-site to verify protective settings and functionality. Upon initial Parallel Operation of a Generating Facility, or any time interface hardware or software is changed that may affect the functions listed below; a Commissioning Test must be performed. An individual qualified in testing protective equipment (professional engineer, factory-certified technician, or licensed electrician with experience in testing protective equipment) must perform commissioning testing in accordance with the manufacturer’s recommended test procedure to prove the settings and requirements of these Interconnection Guidelines.

SMUD has the right to witness commissioning tests as described below, or to require written certification by the installer describing which tests were performed and their results.

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Functions to be tested during commissioning may consist of the following:

- Over- and under-voltage
- Over- and under-frequency
- Anti-Islanding (if applicable)
- Non-Export (if applicable)
- Inability to energize dead line
- Time delay restart after utility source is stable
- Utility system fault detection (if used)
- Synchronizing controls (if applicable)
- Other interconnection protective functions that may be required as part of the Interconnection Agreement

Other checks and tests that may need to be performed include:

- Verifying final protective settings
- Trip test
- In-service test

#### 9.4. Verification of Settings

If the testing is part of the commissioning process, then, at the completion of such testing, the Facility Owner shall confirm all devices are set to SMUD-approved settings. This step shall be documented in the Commissioning Test Certification.


##### 9.4.1. Trip Test

Interconnection protective devices (e.g. reverse power relay) that have not previously been tested as part of the interconnection system with their associated interrupting devices (e.g. contactor or circuit breaker) shall be trip tested during commissioning. The trip test shall be adequate to prove that the associated interrupting devices open when the protective devices operate.

Interlocking circuits between protective devices or between interrupting devices shall be similarly tested unless they are part of a system that has been tested and approved during manufacture.

##### 9.4.2. In-Service Test

Interconnection protective devices that have not previously been tested as part of the interconnection system with their associated instrument transformers or that are wired in the field shall be given an in-service test during commissioning. This test will verify proper wiring, polarity, CT/PT ratios, and proper operation of the measuring circuits. The in-service test shall be made with the power system

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energized and carrying a known level of current. A measurement shall be made of the magnitude and phase angle of each AC voltage and current connected to the protective device and the results compared to expected values.

For protective devices with built-in metering functions that indicate current and voltage magnitudes and phase angles, or magnitudes of current, voltage, and real and reactive power, the metered values may be used for in-service testing. Otherwise, portable ammeters, voltmeters, and phase-angle meters shall be used.

### 9.5. Periodic Testing

The Facility Owner shall perform periodic Testing of Interconnection-related Protective Functions as specified by the manufacturer, or at least every four years. All periodic tests prescribed by the manufacturer shall be performed. The Facility Owner shall maintain periodic test reports or a log for inspection by SMUD. Periodic Testing conforming to SMUD test intervals for the particular Line Section may be specified by SMUD under special circumstances, such as high fire hazard areas.

A system that depends upon a battery for trip power shall be checked and logged once per month for proper voltage. Once every four years, the battery must be either replaced or a discharge test performed.

## 10. Dispute Resolution Process


The following procedures will apply for disputes arising from these Interconnection Guidelines:

### 10.1. Jurisdiction

SMUD shall have jurisdiction to interpret, add, delete or modify any provision of these Interconnection Guidelines or of any agreements entered into between SMUD and the Facility Owner to implement these Interconnection Guidelines and to resolve disputes regarding SMUD's performance of its obligations under its Rates, Rules, and Regulations, the applicable agreements, and requirements related to the interconnection of the Generator or Generating Facilities pursuant to these Interconnection Guidelines.

### 10.2. Procedures

Any dispute arising between SMUD and the Facility Owner (individually "Party" and collectively "the Parties") regarding SMUD's performance of its obligations under its Rates, Rules, and Regulations, the applicable agreements, and requirements related to the interconnection of Facility Owner's Generating or Interconnection Facilities pursuant

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to these Interconnection Guidelines shall be resolved according to the following procedures.

The dispute shall be reduced to writing by the aggrieved Party in a letter (“the dispute letter”) to the other Party containing the relevant known facts pertaining to the dispute, the specific dispute and the relief sought, and express notice by the aggrieved Party that it is invoking the procedures under Section 10. The dispute letter shall be served on the other Party within thirty (30) Calendar Days of the date the aggrieved Party either knew or should reasonably have known of the acts, active or passive, giving rise to the dispute. Within thirty (30) Calendar Days of the date the dispute letter is served, the Party’s authorized representative and the responsible SMUD Manager shall meet and confer to try to resolve the dispute.

**10.3. Protest Process**


If the Parties do not resolve their dispute within forty-five (45) Calendar Days after the date the dispute letter was served, the Facility Owner’s authorized representative may file a protest with the Director, Customer Success. Protests must be received by the Director, Customer Success within five (5) Calendar Days of the end of the above dispute resolution period. Failure to file a protest as set forth in Section 10.4 will result in the protest being deemed untimely and the protest will not be considered.

**10.4 Filing a Protest**

**10.4.1 Delivery of Protest**

A protest must be received within the timeline set forth in Section 10.3. All protests must be submitted to the Director, Customer Success by email, overnight courier, certified mail, or personal delivery:

Sacramento Municipal Utility District  
 Director, Customer Success  
 Re: Protest Under Interconnection Guidelines  
 6301 S Street, MS A151  
 Sacramento, CA 95817  
 Email: InterconnectionPM@smud.org

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### 10.4.2 Specify Dispute

The protest must specify the dispute under SMUD’s Interconnection Guidelines which is the object of the protest and the grounds of the protest. The protest must include the relevant known facts pertaining to the dispute, the specific dispute, the relief sought and any reasons the parties were unable to resolve the dispute during the dispute resolution period. The protest must also include a detailed written statement of the protest grounds and provide the documents or other information the protesting party believes is relevant to the protest.

### 10.4.3 SMUD Acknowledgement

Upon receipt of a protest the Director, Customer Success will: i) notify SMUD’s Office of the General Counsel, ii) send the protesting party an acknowledgement letter within two (2) Business Days of the date the protest as received (the acknowledgment may be by electronic mail, overnight courier, certified mail, or personal delivery), and iii) analyze the protest and the documentation provided by the protesting party and any other documentation provided or information the Director, Customer Success deems relevant to the disposition of the protest, including but not limited to, documents or information requested from or provided by third parties. The Director, Customer Success may also meet informally with a protesting party to better understand the claim or attempt to resolve the protest.

### 10.4.4 Communication of Decision

Following the review of a protest, the Director, Customer Success is empowered to: i) deny the protest on either procedural or substantive grounds, or ii) grant the protest.


The Director, Customer Success decision will be in writing, state the basis of the decision and be provided to the protesting party and other interested parties by electronic mail, overnight courier, certified mail, or personal delivery.

## 10.5 Appeals

The Director, Customer Success decision to grant or deny a protest may be appealed to SMUD’s CEO and General Manager.

### 10.5.1 Delivery of Appeal

An appealing party must file its appeal within three (3) Business Days after receipt of the Director, Customer Success’ decision. The appeal must be submitted in writing, referencing the protest decision being appealed, to the CEO and General Manager, with a mandatory copy to the Office of General Counsel by electronic mail, overnight courier, certified mail, or personal delivery, to the following addresses:

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Sacramento Municipal Utility District  
 CEO and GM  
 Re: Appeal of the Director, Customer Success Decision  
 6201 S Street, MS B308  
 Sacramento, CA 95817  
 Email: CorpFiles@smud.org

Sacramento Municipal Utility District  
 Office of the General Counsel  
 Re: Appeal of the Director, Customer Success Decision  
 6201 S Street, MS B406  
 Sacramento, CA 95817  
 Email: Legal@smud.org

The appeal must set forth the grounds of the appeal and is limited to those issues raised in the original protest.

**10.5.2 Decision of Appeal**


On receipt of the appeal from the appealing party, if any, the CEO and General Manager or delegate will analyze the Director, Customer Success’ decision, the documentation reviewed by the Director, Customer Success in rendering the decision, the appeal and documentation provided by the appealing party and any other documentation or information the General Manager and CEO or delegate deems relevant to the disposition of the appeal, including but not limited to documents or information requested from or provided by third parties.

**10.5.3 Communication of Appeal Decision**

Following the review of the appeal, the General Manager and CEO, or delegate, is empowered to: i) deny the appeal on either procedural or substantive grounds, or ii) grant the appeal. The CEO and General Manager’s decision will be in writing, will state the basis of the decision and will be provided to the appealing party and other interested parties by electronic mail, overnight courier, certified mail, or personal delivery.

**10.6 Performance During Dispute Process**

Pending resolution of any dispute under this section, the Parties shall proceed diligently with the performance of their respective obligations under these Interconnection Guidelines and the applicable agreements, unless the applicable agreements have been terminated.

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## 11. Indemnity and Liability by Customer

The Facility Owner shall indemnify and hold SMUD, its directors, officers, agents and employees harmless against all loss, damages, expense and liability to third parties for injury to, or death of persons, or injury to property caused by the Facility Owner's engineering, design, construction, installation, ownership, maintenance or operations of, or the making of replacements, additions or betterments to, or by failure of, the Generator or Generating Facility in connection with these provisions by reason or omission or negligence, whether active or passive. The Facility Owner shall, on SMUD's request, defend any suit asserting a claim covered by the indemnity. The Facility Owner shall pay all costs that may be incurred by SMUD in enforcing this indemnity.

Each Party's liability to the other Party for any loss, cost, claim, injury, liability, or expense, including reasonable attorney's fees, relating to or arising from any act or omission in its performance of its obligations in these guidelines shall be limited to the amount of direct damage actually incurred. In no event shall either Party be liable to the other Party for any indirect, special, consequential, or punitive damages of any kind whatsoever.

Nothing in these provisions shall be construed to create any duty to, any standard or care with reference to, or any liability to, any person not a Party to these provisions. Neither SMUD, its officers, agents or employees shall be liable for any claims, demands, costs, losses, causes or action, or any other liability of any nature or kind, arising out of the engineering, design, construction, ownership, maintenance or operation of, or making of replacements, additions or betterment to, the Generator of Generating Facility except to the extent actually caused by the sole and gross negligence of SMUD.


Neither SMUD, its officers, agents, or employees shall be liable for damages of any kind to the Generator or Generating Facility caused by any electrical disturbance of the SMUD system or on the system of another, whether or not the electrical disturbance results from the negligence of SMUD or not.

## Non-Qualified Generation Facility Metering Interconnections

### 1. General Rules, Rights and Obligation

#### 1.1 Authorization Required to Operate

A Facility Owner must comply with these Interconnection Guidelines, execute an Interconnection Agreement with SMUD, and receive SMUD's express written Permission to Operate its Generating Facility in parallel with SMUD's Distribution System. SMUD shall apply these Interconnection Guidelines in a non-discriminatory

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manner and shall not unreasonably withhold its permission for a Facility Owner's Generating Facility to operate in parallel with SMUD's Distribution System. The Facility Owner's authorization to operate remains in effect until the earliest date that one of the following occurs:

- the Parties agree in writing to terminate the Interconnection Agreement; or
- ten (10) Calendar Days after SMUD provides written notice to Facility Owner of SMUD's intent to terminate the Interconnection Agreement (Notice of Termination) in accordance with Section 1.9; or
- ten (10) Calendar Days after Facility Owner provides written notice to SMUD of Facility Owner's intent to terminate the Interconnection Agreement, which may occur at Facility Owner's sole discretion; or
- at 12:01 a.m. on the day following the date that the Customer's electrical service account is closed or terminated.
- unless otherwise agreed in writing by the Parties.

### 1.2 Separate Arrangement Required for Other Services

A Facility Owner requiring other electric services from SMUD including, but not limited to, Distribution Service during periods of curtailment or interruption of its Generating Facility, must sign separate agreements with SMUD for such services.


### 1.3 Service Limited to Interconnection

Interconnection with SMUD's Distribution System under these Interconnection Guidelines does not provide a Facility Owner any rights to utilize SMUD's Distribution System for the transmission, distribution, or wheeling of electric power, nor does it limit those rights.

### 1.4 Compliance with Rates, Rules, Regulations and Laws

A Facility Owner shall ascertain and comply with applicable SMUD Rates, Rules, and Regulations, applicable Federal Energy Regulatory Commission-approved rules, tariffs and regulations, and any local, state or federal law, statute or regulation which applies to the design, siting, construction, installation, operation, or any other aspect of the Applicant's Generating Facility and Interconnection Facilities.

The Facility owner will comply with SMUD's Residential Overhead-Engineering Specifications T002 (T002), Residential Underground-Engineering Specifications T003 (T003), Commercial Industrial-Engineering Specifications T004 (T004), Transmission 69kV Service – Engineering Specification T010 (T010), Residential Distributed Generation-Engineering Specifications T014 (T014), and or Commercial Distributed Generation-Engineering Specifications T015 (T015).

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### 1.5 Design Reviews and Inspections

SMUD shall have the right to review the design of a Facility Owner's Generating Facility and Interconnection Facilities and to inspect a Facility Owner's Generating and/or Interconnection Facilities prior to the commencement of Parallel Operation with SMUD's Distribution System. The Facility Owner is responsible for all local building permits and final inspections with the local agency before SMUD performs its final inspection in accordance with T002, T003, T004, T010, T014, T015, or GP-001. SMUD may require a Facility Owner to make modifications as necessary to comply with the requirements of these Interconnection Guidelines. SMUD may require proof that the Facility Owner's protection system is performing to the level required in these Interconnection Guidelines and the Interconnection Agreement. SMUD's review and authorization for Parallel Operation shall not be construed as confirming or endorsing the Facility Owner's design or as warranting the Generating and/or Interconnection Facilities' safety, durability, or reliability. SMUD shall not, by reason of such review or lack of review, be responsible for the strength, adequacy, or capacity of such equipment.

### 1.6 Right to Access

A Facility Owner's Generating Facility and Interconnection Facilities shall be reasonably accessible to SMUD personnel as necessary for SMUD to perform its duties and exercise its rights.

### 1.7 Confidentiality of Information


SMUD shall treat Interconnection information provided to SMUD by an Applicant, Facility Owner, and/or Customer in a confidential manner, unless disclosure is otherwise required by applicable law. Notwithstanding the foregoing, SMUD shall be entitled to disclose Generator information to other regulatory bodies with authority over the construction, operation, or development of the Generating Facility, or as necessary to comply with reporting requirements imposed by applicable regulatory authorities.

### 1.8 Prudent Operation and Maintenance Required

The Facility Owner shall operate and maintain its Generating Facility and Interconnection Facilities in accordance with PPA requirements (if applicable) and Prudent Electrical Practices and shall maintain compliance with these Interconnection Guidelines.

### 1.9 Curtailment, Disconnection, or Termination

SMUD may limit the operation, or disconnect or require the disconnection, of a Facility Owner's Generating Facility from SMUD's Distribution System at any time with or without notice in the event of a System Emergency, or to correct Unsafe Operating Conditions.

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SMUD may also limit the operation, or disconnect or require the disconnection, of the Generating Facility from SMUD’s Distribution System upon notice: 1) to allow for routine maintenance, repairs, or modifications to SMUD’s Distribution System; 2) upon SMUD’s determination that the Generating Facility is not in compliance with these Interconnection Guidelines; or, 3) upon termination of the Interconnection Agreement. SMUD shall not be obligated to compensate Facility Owner for any loss of use of generation of electricity during any and all periods of such disconnection.

SMUD may terminate the Interconnection Agreement if the Facility Owner violates any provision of SMUD Rule 11 or SMUD Rule 21, or any provision of these rules or their Interconnection Agreement. In the event of violation SMUD will notify Facility Owner in writing that its Generating Facility is out of compliance with the terms of the Interconnection Agreement, and if appropriate, request Facility Owner to take remedial action to cure such violation. If Facility Owner fails to take all corrective actions specified in SMUD’s notice or has not otherwise submitted a cure plan acceptable to SMUD within the thirty (30) day period, SMUD may issue a Notice of Termination.

**1.10 Curtailment and Dispatchability**

Generating Facilities with a Site Aggregate of 500 kW (Gross AC Nameplate Rating) or greater must install necessary telemetry and other mechanisms and controls, as specified by SMUD. Curtailment and dispatchability requirements are specified in the associated definitive agreements.

**1.11 Transferability of Interconnection Request**


With approval from SMUD an Applicant or Facility Owner may transfer its Interconnection rights to another entity or person in the Interconnection Agreement or Application only if such entity acquires the proposed Generating Facility identified in the Interconnection Application. The Point of Interconnection shall not change. The applicant must notify InterconnectionPM@smud.org at the time of transfer and include a copy of the executed PPA Acknowledgement Agreement with SMUD, documenting transfer of PPA obligations.

**1.12 Compliance with Established Timelines**

SMUD shall use reasonable efforts in meeting all timelines. In the event SMUD is not able to meet a particular timeline set forth in these Interconnection Guidelines, SMUD shall notify Applicant as soon as practicable and provide an estimated completion date. Applicant may request a modified timeline which shall be mutually agreed upon between SMUD and Applicant.

**2. Application Process**

Applicant shall complete Application available on SMUD’s website.

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All Applicants shall be required to complete and file an Application and supply any relevant additional information requested by SMUD. The filing must include the completed Application and fee (if applicable) for processing the Application and performing the Initial Review to be completed by SMUD pursuant to Section 2. The Application fee will vary depending on how the Generating Facility will be interconnected as indicated in Table 7 – Interconnection Application Fees.

*Table 7 – Interconnection Application Fees*

Generating Facility Type	Initial Review	Supplemental Review	Interconnection Study
Non-Qualified Generating Facility	\$800	\$2,500 (no size limit)	\$10,000
Study Path	Eligibility	Studies	Timelines
Standard Process	Commercial ≥ 500 kW Fuel cells	Initial Review (IR) Supplemental Review (SR)	IR & SR—20 Business Days
Non-Standard Process	Rotating Machinery Non-Qualified Generation Facility Energy Storage	IR SR Interconnection Study (IS) (determined by complexity of the project)	IR & SR—10 Business Days IS—60 Business Days

Typically, within ten (10) Business Days of receiving an Application, SMUD shall normally acknowledge its receipt and state whether the Application has been completed adequately. If deficiencies are noted, the Applicant shall, in a timely manner, correct the deficiencies needed to establish a satisfactory Application. SMUD reserves the right to reject any Application that does not address identified deficiencies within a reasonable time period.


## 2.1 Initial Review

Upon receipt of a completed Application, applicable fees as outlined in Section 2.3 – Fees, and any additional information necessary to evaluate the Interconnection of a Generating Facility, SMUD shall perform an Initial Review using the process defined in Appendix B - Initial and Supplemental Review Screening Process for Applications to Interconnect a Generating Facility with Export to the Grid.

If the Initial Review determines that the proposed facility can be interconnected by means of the Initial Review, SMUD will provide the Applicant with a written description of the requirements for Interconnection.

See Appendix B for information regarding each screen.

See Table 7 – Interconnection Application Fees for review timeframes.

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## 2.2 Supplemental Review

If the Generating Facility does not pass the Initial Review as proposed, SMUD will notify the Applicant and perform a Supplemental Review as described in Appendix B. The Supplemental Review will provide either (a) requirements for Interconnection beyond those for an Initial Review, and/or (b) a cost estimate and schedule for an Interconnection Study. Payment for the Supplemental Review shall be submitted with the application.

Regardless of the evaluation or study process, all Generating Facilities shall be designed to meet the applicable requirements of Section 3 – Generating Facility Design and Operating Requirements.


## 2.3 Fees

The Facility Owner is responsible for all fees and/or costs, including Commissioning Testing, required to complete the interconnection process. The Facility Owner is responsible for all costs associated with Parallel Operation to support the safe and reliable operation of the Distribution System. See Table 8 – Summary of Facility Owner Interconnection Costs.

The Interconnection and Parallel Operation of a Facility Owner plant may trigger the need for Interconnection Facilities, added facilities, upgrades, delivery network upgrades, and/or reliability network upgrades. Interconnection Facilities installed on Facility Owner's side of the PCC shall be owned, operated, and maintained by SMUD. Interconnection Facilities installed on SMUD's side of PCC and Distribution System modifications shall be owned, operated, and maintained by SMUD.

*Table 8 – Summary of Facility Owner Interconnection Costs*

Generating Facility Type	Export with PPA	Storage PPA	CHP (non-renewable)
Initial Review	Yes	Yes	Yes
Supplemental Review	Yes	Yes	Yes
Interconnection Study	Yes	Yes	Yes
Interconnection Facility Costs (Customer side)	Yes	Yes	Yes
Interconnection Facility Operations and Maintenance Costs	Yes	Yes	Yes
Telemetry Costs	Yes	Yes	Yes
Distribution Upgrades Cost (Line Side)	Yes	Yes	Yes
Distribution Operations and Maintenance Cost	Yes	Yes	Yes

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## 2.4 Interconnection Study

When the Supplemental Review reveals that the proposed facility requires an Interconnection Study due to the need for significant SMUD Interconnection Facilities or Distribution System improvements to accommodate the interconnection of an Applicant's Generating Facility. SMUD and Applicant shall enter into an agreement that provides for SMUD to perform additional studies, facility design, and engineering and to provide detailed cost estimates, to the Applicant at the Applicant's expense.

Upon completion of an Interconnection Study, SMUD shall provide the Applicant with the specific requirements, estimated costs, and schedule for interconnecting the Generating Facility to accommodate execution of agreements pursuant to Section 2.5.

## 2.5 Interconnection Agreement


SMUD shall provide the Facility Owner with an executable version of the Interconnection Agreement, as appropriate for the Facility Owner's Generating Facility and desired mode of operation. Where the Supplemental Review or Interconnection Study performed by SMUD has determined that modifications or additions are required to be made to its Distribution System, or that additional metering, monitoring, or protection devices will be necessary to accommodate an Applicant's Generating Facility, SMUD shall notify the Applicant of the estimated costs for the required work. Facility Owner shall execute the Interconnection Agreement for SMUD to complete the required work. Such Interconnection Agreement shall require the Facility Owner to reimburse SMUD for all actual costs incurred by SMUD in performing the work.

## 2.6 Upon Execution of Agreements

After executing the Interconnection Agreement and receiving the estimated Interconnection Facilities Cost Payment (see Section 2.7), SMUD will commence the process to construct/install the modifications or metering and monitoring requirements identified. The parties will use good faith efforts to meet the schedules and cost estimates.

## 2.7 Interconnection Facilities Cost Payment

The Facility Owner will be required to pay SMUD's estimated costs (including loadings) prior to SMUD procuring or installing equipment or facilities (Interconnection Facilities) which allow the interconnection and operation of the Facility Owner's Generator in parallel with SMUD's system. All extensions of electric distribution lines needed to make connection to Generators, as well as all required system upgrades, will be constructed at the Applicant's expense. Payment is due prior to the start of construction activity by SMUD. The Facility Owner must submit a separate application for any special facilities needed to accommodate the interconnection.

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### 2.8 Ownership, O&M, Repair, and Replacement of Interconnection Facilities

While the Facility Owner bears the responsibility of the Interconnection Facilities Cost, ultimate ownership will reside with SMUD. SMUD shall be responsible for operation, maintenance, repair, and replacement of the Interconnection Facilities in accordance with then-current SMUD practices.

### 2.9 Testing of Generating Facilities

The Facility Owner is responsible for all testing of Generating Facilities and associated Interconnection Facilities (see Section 9) and the Interconnection Agreement to ensure compliance with the safety and reliability provisions of these Interconnection Guidelines prior to operation.

### 2.10 Operating Within SMUD’s Distribution System

The Facility Owner’s Generating Facility shall be authorized by SMUD for Parallel Operation, Momentary Parallel Operation, or Islanding operation as applicable, with SMUD’s Distribution System following demonstration of compliance with the terms of all applicable agreements and express written permission. Compliance may include, but not be limited to, provision of any required documentation and satisfactorily completing any required inspections or tests as described herein or in the agreements formed between the Facility Owner and SMUD.

### 2.11 Interconnection Facility Costs


Facility Owner shall be responsible for payment of costs related to ongoing operations and maintenance of the Interconnection Facilities, based on the installed costs, pursuant to SMUD’s Rule and Regulation 21 and/or the Interconnection Agreement. The Facility Owner can elect to pay this cost either as a one-time payment or a monthly Interconnection Facilities Charge. The “Cost of Service Charge” represents the continuing service costs of the Interconnection Facilities as determined in accordance with SMUD’s Rules and Regulations as adopted by SMUD’s Board of Directors and amended from time to time.

### 2.12 Interconnection Facilities Cost Payment Options

The following formulas are for facilities for which the loadings are included in the actual SMUD design and construction cost.

A monthly Interconnection Facilities Costs Payment calculated as follows: \$5.40 divided by \$1,000 multiplied by the actual SMUD design and construction cost. This monthly charge is perpetual for as long as the Interconnection Facilities serve the Facility Owner and Generating Facility.

Or:

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A one-time Interconnection Facilities Cost Payment calculated as follows: \$978.00 divided by \$1,000 multiplied by the actual SMUD design and construction cost.

And:

In addition to the options above, a recurring charge will be paid to SMUD to maintain the SCADA and metering communication, and an annual 2% escalation may be applied.

### 2.13 Adjustment of Service Charges

SMUD will review the Interconnection Facilities Charge calculations periodically as SMUD's costs change. The annual service cost used to determine the monthly Cost of Service Charge shall automatically increase or decrease without formal amendment to the Exhibit if SMUD's Board of Director's should subsequently amend SMUD's Rates, Rules and Regulations to provide for higher or lower percentage rates for monthly costs of service for such facilities, effective the date set forth in the amended Rates, Rules and Regulations. If any portion of the Interconnection Facilities for which Facility Owner pays either a one-time or a monthly Interconnection Facilities Charge is, at some future date, utilized by others, the Interconnection Facilities Charge may be reassessed based on the Facility Owner's proportionate share of the nameplate capacity on the portion of Interconnection Facilities utilized by such third party.

## 3. Generating Facility Design and Operating Requirements


These requirements are intended to be consistent with IEEE 1547-2018 Standard for Interconnecting Distributed Resources with Electric Power Systems. The language that has been adopted directly or by reference is followed by a citation that lists the clause from which the language derived. For example, IEEE 1547-2018, 4.1.1 is a reference to Clause 4.1.1. In the event of conflict between these Interconnection Guidelines and UL 1741 – Supplement SB and/or IEEE 1547-2018 or IEEE 1547.1-2020, these Interconnection Guidelines shall take precedence. Exceptions are taken to IEEE 1547 Clauses 4.1.4.2 Distribution Secondary Spot Networks where SMUD's GP-001 shall apply, and to Clauses 4.1.8.1 or 5.1.3.1, which address Protection from Electromagnetic Interference. These Interconnection Guidelines also do not adopt the Generating Facility power limitation of 10 MW incorporated in IEEE 1547.

### 3.1 General Interconnection and Protection Requirements

#### 3.1.1 Protective Functions Required

The Protective Functions for Generating Facilities operating in parallel with SMUD's Distribution System shall include:

- Over and under voltage trip functions and over and under frequency trip functions;

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- A means for disconnecting the Generating Facility from SMUD’s Distribution System when a protective function initiates a trip;
- An automatic means to prevent the Generating Facility from energizing a de-energized Distribution System circuit and to prevent the Generating Facility from reconnecting with the Distribution System unless the Distribution System service voltage and frequency are within specified settings and stable for at least 60 seconds;
- A means to prevent the Generating Facility from contributing to the formation of an Unintended Island;
- Momentary Paralleling Generating Facilities. With SMUD’s approval, the transfer switch or system used to transfer the Facility Owner’s loads from SMUD’s Distribution System to Facility Owner’s Generating Facility may be used in lieu of the Protective Functions required for Parallel Operation. Momentary Paralleling to SMUD’s Distribution System shall be one second (60 cycles) or less.

### 3.1.2 Inverter Protective Functions Required

Inverters operating in parallel with SMUD’s Distribution System shall be equipped with the following Protective Functions to sense abnormal conditions on SMUD’s Distribution System and cause the Inverter to be automatically disconnected from SMUD’s Distribution System or to prevent the Inverter from being connected to SMUD’s Distribution System inappropriately:

- Over and under voltage trip functions and over and under frequency trip functions;
- A voltage and frequency sensing and time-delay function to prevent the Inverter from energizing a de-energized Distribution System circuit and to prevent the Inverter from reconnecting with SMUD’s Distribution System unless SMUD’s Distribution System service voltage and frequency is within the ANSI C84.1 Table 1 Range B voltage Range of 106 volts to 127 volts (on a 120 volt basis), inclusive, and a frequency range of 59.3 Hz to 60.5 Hz, inclusive, and are stable for at least 15 seconds; and
- A function to prevent the Inverter from contributing to the formation of an Unintended Island and cease to energize SMUD’s Distribution System within two seconds of the formation of an Unintended Island.

The Inverter shall cease to energize SMUD’s Distribution System for faults on SMUD’s Distribution System circuit to which it is connected (IEEE 1547-6.2.1). The Inverter shall cease to energize SMUD’s Distribution circuit prior to re-closure by SMUD’s Distribution System equipment (IEEE 1547-6.3).

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### 3.1.3 Purpose of Protective Functions

The Protective Functions and requirements of these Interconnection Guidelines are designed to protect SMUD’s Distribution System and not the Generating Facility. A Facility Owner shall be solely responsible for providing adequate protection for its Generating Facility and Interconnection Facilities. The Facility Owner’s protective equipment shall not impact the operation of other protective devices utilized on the Distribution System in a manner that would affect SMUD’s capability of providing reliable service to its customers.

### 3.1.4 Suitable Equipment Required

Circuit breakers or other interrupting devices located at the Point of Common Coupling must be Certified or “Listed” (as defined in Article 100, the Definitions Section of the National Electrical Code) as suitable for their intended application. This includes being capable of interrupting the maximum available fault current expected at their location Facility Owner’s Generating Facility and Interconnection Facilities shall be designed and coordinated so that the failure of any one device shall not potentially compromise the safety and reliability of SMUD’s Distribution System.


The Inverter paralleling-device shall be capable of withstanding 220% of the Interconnection Facility rated voltage (IEEE 1547-4.11.3). The Interconnection Facility shall have the capability to withstand voltage and current surges in accordance with the environments defined in IEEE Std C62.41.2 or IEEE Std C37.90.1 as applicable and as described in L.3.e (IEEE 1547-4.11.2).

### 3.1.5 Visible Disconnect Required

When required by SMUD’s operating practices, Facility Owner shall furnish and install a ganged, manually-operated isolating switch (or a comparable device mutually agreed upon by SMUD and Facility Owner) near the Point of Interconnection to isolate the Generating Facility from SMUD’s Distribution System. The device does not have to be rated for load break nor provide over-current protection.

The device must:

- i. allow visible verification that separation has been accomplished. (This requirement may be met by opening the enclosure to observe contact separation.)
- ii. include markings or signage that clearly indicates open and closed positions.
- iii. be capable of being reached:

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- a. for Emergency purposes quickly and conveniently 24 hours a day by SMUD personnel for construction, operation, maintenance, inspection, testing or to isolate the Generating Facility from SMUD's Distribution System without obstacles or requiring those seeking access to obtain keys, special permission, or security clearances.
- b. for Non-Emergency purposes during normal business hours. SMUD, where possible, will provide notice to Customer for gaining access to Customer's premises.
- iv. be capable of being locked in the open position.
- v. be clearly marked on the submitted Single
- vi. line Diagram and its type and location approved by SMUD prior to installation. If the device is not adjacent to the PCC, permanent signage must be installed at a SMUD approved location providing a clear description of the location of the device. Generating Facilities with Non-Islanding inverters totaling one (1) kilovolt-ampere (kVA) or less are exempt from this requirement.

### 3.1.6 Single-Phase Generators


For single-phase Generators connected to a shared single-phase secondary system, the maximum Gross Nameplate Rating of the Generating Facilities shall be 20 kVA. Generators applied on a center-tapped neutral 240-volt service must be installed such that no more than 6 kVA of imbalance in capacity exists between the two sides of the 240-volt service. For Dedicated Distribution Transformer services, the maximum nameplate rating of a single-phase Generating Facility shall be the transformer nameplate rating. SMUD's Rates, Rules and Regulations currently may charge for power factors below .95 lagging.

### 3.1.7 Drawings Required

SMUD, prior to Parallel Operation or Momentary Parallel Operation of the Generating Facility, shall approve the Facility Owner's protection and control diagrams for the Generating Facility. Generating Facilities equipped with a protection and control scheme previously approved by SMUD for system-wide application or only Certified Equipment may satisfy this requirement by reference.

### 3.1.8 Generating Facility Conditions Not Identified

In the event these Interconnection Guidelines do not address the interconnection requirements for a Generating Facility, SMUD and the Facility Owner shall mutually agree upon other requirements.

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### 3.1.9. Operational Requirements for Intentionally Islanded Generating Facilities

Generating Facilities operated where they isolate and island intentionally from the Distribution System to serve Host Load must adhere to all of the requirements in these Interconnection Guidelines. Additional operational requirements are presented in Appendix C.

### 3.1.10. Generating Facilities that use a Power Control System (PCS):

Generating facilities that use a PCS must use a PCS that is listed and evaluated to limit the amount of export and/or to control the output of one or more power production sources, storage systems, and other equipment. The PCS shall limit current and loading on the busbars and conductors supplied by the PCS. Additional details are presented in Appendix D – Generating facilities that use a Power Control System (PCS).

## 3.2 Prevention of Interference


The Facility Owner shall not operate equipment that superimposes a voltage or current upon SMUD’s Distribution System that interferes with SMUD’s service to SMUD’s customers or communication facilities. If such interference occurs, the Facility Owner must diligently pursue and take corrective action at its own expense after being given notice and reasonable time to do so by SMUD. If the Facility Owner does not take corrective action in a timely manner or continues to operate the equipment causing interference without restriction or limit, SMUD may, without liability, disconnect the Generating Facility from the Distribution System, in accordance with Section 1.9 of these Interconnection Guidelines.

### 3.2.1 Voltage Regulation

If approved by SMUD, the Inverter may actively regulate the voltage at the PCC while in parallel with SMUD’s Distribution System. The Inverter shall not cause the service voltage at other customers’ PCC’s to go outside the requirements of ANSI C84.1, Range A (IEEE 1547-5.1).

### 3.2.2 Voltage Trip and Ride-Through Settings

The voltage ranges Table 9 - Inverter Voltage Trip and Ride-Through Settings define protective trip limits for the Protective Function and are not intended to define or imply a voltage regulation function. Generating Facilities shall cease to energize SMUD’s Distribution System within the prescribed trip time whenever the voltage at the PCC deviates from the allowable voltage operating range. The Protection Function shall detect and respond to voltage fluctuations on all phases to which the Generating Facility is connected.


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- vii. Inverters. Inverters shall be capable of operating within the voltage range normally experienced on SMUD’s Distribution System from plus to minus 5% of the nominal voltage (e.g. 114 volts to 126 volts, on a 120-volt base), at the service panel or PCC. The trip settings at the generator terminals may be selected in a manner that minimizes nuisance tripping in accordance with Table 9 - Inverter Voltage Trip and Ride-Through Settings to compensate for voltage drop between the generator terminals and the PCC. Voltage may be detected at either the PCC or the Point of Interconnection. However, the voltage range at the PCC, with the generator on-line, shall stay within +/-5% of nominal.
  
- ii. Voltage Disturbances. Whenever SMUD’s Distribution System voltage at the PCC varies from and remains outside near nominal voltage for the predetermined parameters set forth in Table 9 - Inverter Voltage Trip and Ride-Through Settings the Inverter’s Protective Functions shall cause the Inverter(s) to become isolated from SMUD’s Distribution System:
  - a. The Inverter shall stay connected to SMUD’s Distribution System while the grid remains within the “Ride-Through Until” voltage-time range and must stay connected in the corresponding Operating Mode.
  - b. For voltage excursions beyond the near nominal (NN) magnitude range and within the range of the HV1 or LV3 regions, the Inverter shall momentarily cease to energize within 0.16 seconds.
  - c. In the HV1 region, the Inverter is permitted to reduce power output as a function of voltage under mutual agreement between the Facility Owner and SMUD.
  - d. If SMUD’s Distribution System voltage does not exit the ride-through region and recovers to normal system voltage, the Inverter shall restore continuous operation within 2 seconds.
  - e. If SMUD’s Distribution System voltage does not exit the ride-through region and returns from the LV3 region to the LV2 or LV1 region, the Inverter shall restore available current within 2 seconds.

Different voltage-time settings could be permitted by SMUD.

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**Table 9 - Inverter Voltage Trip and Ride-Through Settings**

Region	Voltage at PCC (% Nominal Voltage)	Ride-Through Until	Operating Mode	Clearing time
High Voltage 2 (HV2)	$V \geq 120\%$	NA	Cease to Energize	0.16 sec
High Voltage 1 (HV1)	$110\% < V < 120\%$	12 sec	Momentary Cessation	13 sec
Near Nominal (NN)	$88\% \leq V \leq 110\%$	Indefinite	Continuous Operations	Not Applicable
Low Voltage 1 (LV1)	$70\% \leq V < 88\%$	20 sec	Mandatory Operations	21 sec
Low Voltage 2 (LV2)	$50\% \leq V < 70\%$	10 sec	Mandatory Operations	21 sec
Low Voltage 3 (LV3)	$V < 50\%$	1 sec	Momentary Cessation	2 sec

### 3.2.3 Flicker

The Generating Facility shall parallel with SMUD’s Distribution System without causing a voltage fluctuation at the PCC greater than plus/minus 5% of the prevailing voltage level of SMUD’s Distribution System at the PCC, and meet SMUD’s flicker requirements, Certification and Testing Criteria, and provide technology-specific tests for evaluating the paralleling Function. (IEEE 1547-4.1.3)


The Generating Facility shall not create objectionable flicker for other customers on SMUD’s Distribution System. To minimize the adverse voltage effects experienced by other SMUD customers (IEEE 1547-7.2.1), any voltage flicker at the PCC caused by the Generating Facility should not exceed the limits defined by the “Maximum Borderline of Irritation Curve” identified in IEEE 519 (IEEE Recommended Practices and Requirements for Harmonic Control in Electric Power Systems, IEEE STD 519). This requirement is necessary to minimize the adverse voltage effects experienced by other customers on SMUD’s Distribution System. Induction Generators may be connected and brought up to synchronous speed (as an induction motor) provided these flicker limits are not exceeded.

### 3.2.4 Integration with SMUD’s Distribution System Grounding

The grounding scheme of the Generating Facility shall not cause over-voltages that exceed the rating of the equipment connected to SMUD’s Distribution System and shall not disrupt the coordination of the ground fault protection on SMUD’s Distribution System (IEEE 1547-4.12 and subclause 7.4) (See Appendix B, Screen 6, line configuration).

### 3.2.5 Frequency

SMUD controls system frequency, and the Generating Facility shall operate in synchronism with the Distribution System. Whenever SMUD’s Distribution System frequency at the PCC varies from and remains outside normal (nominally 60 Hz) by predetermined amounts the Generating Facility’s Protective Functions shall cease to energize SMUD’s Distribution System in a maximum of ten cycles

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should Distribution System remain outside of the frequency limits or stated maximum trip time (see *Table 10 - Inverter Frequency Trip and Ride-Through Settings*) The purpose of the time delay is to allow the Generating Facility to ride through short-term disturbances to avoid nuisance tripping.

### 3.2.6 Frequency Ride-Through Requirements for Inverters

Smart Inverter based systems shall remain connected to SMUD’s Distribution System while the grid is within the frequency-time range indicated in Table 10 - Inverter Frequency Trip and Ride-Through Settings and shall disconnect from the electric grid during a high or low frequency event that is outside that frequency-time range. The frequency values are shown in Table 10 - Inverter Frequency Trip and Ride-Through Settings Smart Inverter shall not trip for frequency excursion having magnitude Rate of Change of Frequency (ROCOF) that is less than or equal to 3.0Hz per second as specified in IEEE 1547- 2018, section 6.5.2.5 category III. For ROCOF greater than 3Hz per second, it is preferred for Smart Inverter to ride-through as long as frequency remains in the continuous operating region, low frequency ride-through region (and corresponding duration times), or high frequency region (and corresponding duration times).


Table 10 - Inverter Frequency Trip and Ride-Through Settings

Region	Frequency at PCC (Hz)*	Ride-Through Until	Ride-Through Operational Mode	Clearing Time
High Frequency 2 (HF2)	$f \geq 62.0$	No Ride Through	Not Applicable	0.16 sec
High Frequency 1 (HF1)	$61.2 < f < 61.8^*$	299 sec	Mandatory Operation	300 sec
Near Nominal	$58.8 < f \leq 61.2$	Indefinite	Continuous Operation	Not Applicable
Low Frequency 1 (LF1)	$57.0 \leq f \leq 58.8$	299 sec	Mandatory Operation	300 sec
Low Frequency 2 (LF2)	$f < 56.5^*$	No Ride Through	Not Applicable	0.16 sec

\* For  $61.8 \leq f < 62$  and  $56.5 \leq f < 57$ , Inverter “may ride-through or may trip”.

### 3.2.7 Harmonics

Harmonic current distortion, inter-harmonic current distortion, and total rated-current distortion (TRD) at the PCC shall be in compliance with IEEE 519 and shall not exceed the limits stated in Table 11 - Maximum Harmonic Current Distortion in Percent of Current. The harmonic current injections shall be exclusive of any harmonic currents due to harmonic voltage distortion present in SMUD’s Distribution System without the Inverter connected (IEEE 1547-7.3.). The harmonic distortion of an Inverter shall be evaluated using the same criteria as for the Host Loads.

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Exceptions: The harmonic distortion of a Generating Facility located at a Customer's site shall be evaluated using the same criteria as for the loads at that site. "Total Rated-current Distortion (TRD)" was introduced and used instead of TDD, the even order current distortion limits above the second order relaxed (in Table 11).

When the Inverter is serving balanced linear loads, harmonic current injection into SMUD's Distribution System at the PCC shall not exceed the limits stated in Table 11.

*Table 11 - Maximum Harmonic Current Distortion in Percent of Current (I) [1,2,3]*

Individual harmonic order, h						Total rated current distortion
(odd harmonics) [3]	h < 11	11 ≤ h < 17	17 ≤ h < 23	23 ≤ h < 35	35 ≤ h < 50	
Max Distortion (%)	4.0	2.0	1.5	0.6	0.3	5.0
[1] - IEEE 1547-7.3						
[2] - I = the greater of the maximum Host Load current average demand over 15 or 30 minutes without the Generating Facility (GF), or the GF rated current capacity (transformed to the PCC when a transformer exists between the GF and the PCC).						
[3] - Even harmonics are limited to 1%, 2%, & 3% for h=2, 4, & 6 respectively. Associated range for 8 ≤ h < 50 is the same as specified above.						

### 3.2.8 Direct Current Injection

Generating Facilities should not inject Direct Current greater than 0.5% of rated output current into SMUD's Distribution System.


### 3.2.9 Power Factor

Each Generator in a Generating Facility shall be capable of operating at any point within a power factor range of 0.85 leading and 0.85 lagging. Operation outside this range is acceptable provided the reactive power of the Generating Facility is used to meet the reactive power needs of on-site loads or that reactive power is otherwise provided under applicable Rates, Rules and Regulations by SMUD. The Facility Owner shall notify SMUD if it is using the Generating Facility for power factor correction.

### 3.2.10 Inverter Power Factor Requirements

Facility Owner shall provide adequate reactive power compensation on site to maintain the Inverter power factor near unity at rated output or a SMUD specified power factor in accordance with the following requirements:

- Default Power Factor setting: 1.0 +/- 0.01 (0.99 Lagging to 0.99 Leading).

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- Aggregate generating facility is greater than 15 kW: 1.0 +/- 0.15 (0.85 Lagging to 0.85 Leading) down to 20% rated power based on available reactive power.
- Aggregate generating facility is less than or equal to 15 kW: 1.0 +/- 0.10 (0.90 Lagging to 0.90 Leading) down to 20% rated power based on available reactive power.

### 3.2.11 Smart Inverter Reactive Power Requirements

Smart Inverter reactive power capabilities shall comply with IEEE 1547- 2018, Section 5.2 Category B requirement.

### 3.2.12 Dynamic Volt-VAR Operations

The Inverter shall be capable of operating dynamically within a power factor range of +/- 0.85 PF for larger (>15 kW) systems, down to 20% of rated power, and +/- 0.9 PF for smaller systems (≤15 kW), down to 20% of rated power, based on available reactive power.


The Inverter shall be capable of providing dynamic reactive power compensation (dynamic Volt-VAR operation) within the following constraints:

- The Inverter shall not cause the line voltage at the PCC to go outside the requirements of the latest version of ANSI C84.1, Range A.
- The Inverter shall be able to absorb reactive power in response to an increase in line voltage and inject reactive power in response to a decrease in line voltage (refer to section 3.2.13).
- The reactive power provided shall be based on available reactive power, but the maximum reactive power provided to the system shall be as directed by the SMUD.

This dynamic Volt-VAR capability shall be able to be activated or deactivated in accordance with SMUD requirements. SMUD may permit or require the Inverter systems to operate in larger power factor ranges, including in 4- quadrant operations for storage systems with the implementation of additional anti-islanding protection as determined by SMUD.

### 3.2.13 Ramp Rate Requirements

The Inverter is required to have the following ramp controls for at least the following two conditions. These functions can be established by multiple control functions or by one general ramp rate control function. Ramp rates are contingent upon sufficient energy available from the Inverter.

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- Normal ramp-up rate: For transitions between energy output levels over the normal course of operation. The default value is 100% of maximum current output per second with a range of adjustment between 1% to 100%, with specific settings as mutually agreed by SMUD and the Facility Owner.
- Connect/Reconnect Ramp-up rate: Upon starting to inject power into the grid, following a period of inactivity or a disconnection, the inverter shall be able to control its rate of increase of power from 1 to 100% maximum current per second, with specific settings as mutually agreed upon by SMUD and the Facility Owner.

### 3.2.14 Default Activation States

Unless otherwise provided by SMUD, the default features will be as follows:

- Anti-Islanding – activated
- Low/High Voltage Ride-Through – activated
- Low/High Frequency Ride-Through – activated
- Ramp rates – activated
- Reconnect by “soft-start” methods – activated


### 3.2.15 Additional Activation States or Advanced Inverter Function settings

Additional activation states or Advanced Inverter Function (AIF) settings can be manually customized to meet SMUD interconnection requirements. Additional inverter features that may be required by SMUD are as follows:

- Fixed Power factor – activated
- Dynamic Volt-VAR – deactivated
- Dynamic Volt-Watt – deactivated
- Frequency/Watt – deactivated

For the Generating Facility Inverter system’s programmed Volt-VAR and Volt-Watt setpoints, many residential customers work through a PV solar providing company to set or change these settings. In these cases, the installer or company typically manages inverter settings at installation or commissioning and may provide ongoing service after installation.

SMUD typically communicates with the installer during the application process and includes the customer in communications. Other customers might choose to install and/or manage their own inverter settings. Inverter settings are typically accessed through a settings input screen directly on the device. Many Inverters

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now also have mobile or web applications that allow installers or owners to change settings remotely.


AIF settings will be included in the approval to build email. Inverters must be configured to comply with the project’s AIF settings requirements and verification must be provided to confirm compliance. There are three settings outcomes: No AIF settings or Unity PF, Standard AIF settings, or Custom AIF settings. If no AIF settings are required, the inverter(s) are to use default Fixed Power factor settings and no verification is needed (the email will not list any AIF information). If specific AIF settings are required, such as Standard AIF or Custom AIF settings, verification must be provided to show that the system has been updated with the appropriate Volt-VAR & Volt-Watt setpoints to comply with SMUD’s required AIF settings.

Acceptable picture(s) proof includes the inverter settings screenshots showing Volt-VAR setpoints, As-Left settings sheet/screenshot, or a web/mobile application printout/screenshot, etc. Manufacturer specification sheets are not acceptable verification as they do not verify inverter setpoints As-Left on a specific project. Some manufacturers may provide a way to produce a Grid Compliance or Utility Compliance report. SMUD may accept screenshots showing system, utility or grid profile or country code selection with accompanying manufacturer documentation listing the associated Volt-VAR and Volt-Watt setpoints.

Microinverters can show the overall system Volt-VAR and Volt-Watt setpoints which may be accessed from a gateway, envoy, or master controller type device or from a web or mobile application. Please contact the inverter manufacturer directly for instructions on how to obtain this information for your specific system.

Inverter feature activation states may be modified by mutual agreement between SMUD and Generating Facility Owner. SMUD, in the study process for new Generating Facilities, may determine and provide the optimum Smart Inverter Settings for the reactive power settings, including changes to the reactive power default settings (Example: Deactivate Volt-VAR and activate Fixed Power Factor at given power factor).

Dynamic Volt-VAR settings in Figure AA, Table AB and Table AC depict the Standard and Custom AIF settings, which could be applied for all Inverter sizes. Custom AIF settings may be required for larger Generating Facilities (such as 50 kW or greater), or for specific areas with the Distribution Systems as determined by the Distribution Provider. Figure BB and Table BA depict the Volt-Watt settings.

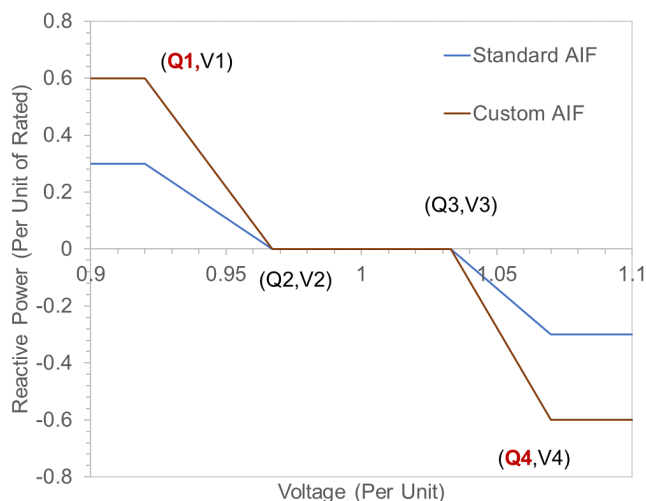
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Default Open Loop Response Time (OLRT) for Volt-VAR operation should be five (5) seconds.


*Figure AA: Standard and Custom AIF Volt-VAR settings*



*Table AB: Standard AIF Volt-VAR settings values (formatting to be revised to match the rest of the document)*

Reactive Power (Q), Voltage (V) Pairs	Reactive Power (% of inverter capacity), Per unit voltage
(Q1,V1)	(0.3, 0.92)
(Q2,V2)	(0, 0.967)
(Q3,V3)	(0, 1.033)
(Q4,V4)	(-0.3, 1.07)

*Table AC: Custom AIF Volt-VAR settings values (formatting to be revised to match the rest of the document)*

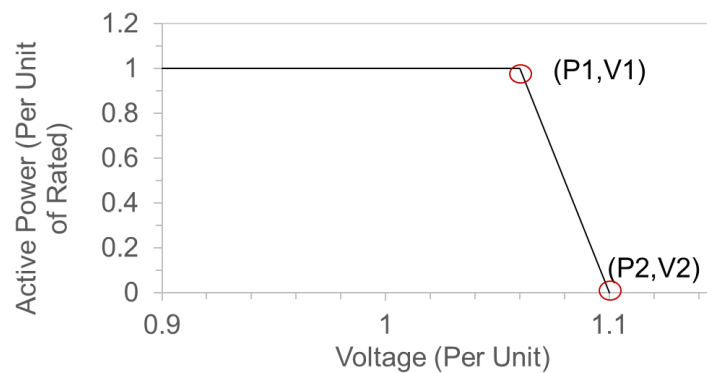
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Reactive Power (Q), Voltage (V) Pairs	Reactive Power (% of inverter capacity), Per unit voltage
(Q1,V1)	(0.6, 0.92)
(Q2,V2)	(0, 0.967)
(Q3,V3)	(0, 1.033)
(Q4,V4)	(-0.6, 1.07)


*Figure BB: Volt-Watt default settings curve*



*Table BA: Volt-Watt default settings values*

Active Power (P), Voltage (V) Pairs	Active Power (% of inverter capacity), Per unit voltage
(P1,V1)	(100%, 1.06)
(P2,V2)	(0, 1.1)

These activation states may be modified by mutual agreement between SMUD and Facility Owner.

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### 3.2.16 Automatic Transfer (Load Shedding or Transfer)


The voltage and frequency ride-through requirements found in section 3.2 shall not apply if either: a) The real power across the Point of Common Coupling is continuously maintained at a value less than 10% of the aggregate rating of the Inverters connected to the Generating Facility prior to any voltage disturbance, and the Generating Facility disconnects from SMUD's Distribution system, along with Generating Facility load, such that the net change in real power flow from or to SMUD is less than 10% of the aggregate Inverter capacity; or b) Generating Facility load real power demand equal to 90% to 120% of the pre-disturbance aggregate Inverter real power output is shed within 0.1 seconds of Inverter disconnection.

## 3.3 Control, Protection and Safety Equipment Requirements

### 3.3.1 Technology Specific Requirements

**Three-Phase Synchronous Generators:** For three-phase Generators, the circuit breakers shall be three-phase devices with electronic or electromechanical control. The Facility Owner shall be responsible for properly synchronizing its Generating Facility with the Distribution System by means of either a manual or automatic synchronizing function. Automatic synchronizing is required for all synchronous generators, which have a Short Circuit Contribution Ratio (SCCR) exceeding 0.05. A Generating Facility whose SCCR exceeds 0.05 shall be equipped with Protective Functions suitable for detecting loss of synchronism and rapidly disconnecting the Generating Facility from the Distribution System. Unless otherwise agreed to between the Facility Owner and SMUD, synchronous generators shall automatically regulate power factor, not voltage, while operating in parallel with the Distribution System. Power system Stabilization functions are specifically not required for Generating Facilities under 10 MW Gross Nameplate Rating. Synchronization means that at the time of connection, the frequency difference shall be less than 0.2 Hz, the voltage difference shall be less than 10%, and the phase angle difference shall be less than 10 degrees.

**Induction Generators:** Induction Generators do not require a synchronizing function. Starting or rapid load fluctuations on induction Generators can adversely impact the Distribution System's voltage. Corrective step-switched capacitors or other techniques may be necessary and may cause undesirable ferro resonance. When these counter measures (e.g. additional capacitors) are installed on the Facility Owner's side of the Point of Common Coupling, SMUD must review these measures. Additional equipment may be required as determined in a Supplemental Review or an Interconnection Study.

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Inverter Systems: Grid-interactive inverters do not require separate synchronizing equipment. Non-grid-interactive or “stand-alone” inverters shall not be used for parallel operation with the Distribution System.

### 3.3.2 Limitations on Inverters Not Classified as Smart Inverters

Effective September 2017, SMUD requires only Smart Inverters.

The replacement of an existing Inverter to an Inverter that is of equal or greater ability than the original is allowed per Section 3. Section 3 may be used in all or in part, for replacement inverter-based technologies by mutual agreement of SMUD and the Facility Owner.

### 3.3.3 Supplemental Generating Facility Requirements


Unintended Islanding for Generating Facilities that fail the Export Screen (Appendix B). Generating Facilities must mitigate their potential contribution to an Unintended Island. This can be accomplished by one of the following options: (1) incorporating certified Non-Islanding control functions into the Protective Functions, or (2) verifying that local loads sufficiently exceed the Nameplate Rating of the Generating Facility, or (3) incorporating a transfer trip or an equivalent Protective Function.

Fault Detection. A Generating Facility with an SCCR exceeding 0.1 or one with Protective Functions that do not meet any one of the options for mitigating Unintended Islands shall be equipped with Protective Functions designed to detect Distribution System faults, both line-to-line and line-to-ground, and promptly cease to energize the Distribution System in the event of a fault. For a Generating Facility that cannot detect these faults within two seconds, SMUD may require a transfer trip system or equivalent Protective Function. Reclose-blocking of SMUD's affected recloser(s) may also be required by SMUD for Generating Facilities that exceed 15% of the peak load on the Line Section.

## 3.4 Supplemental Generating Facility Requirements

### 3.4.1 Fault Detection

A Generating Facility with a SCCR exceeding 0.1 or one that does not cease to energize SMUD's Distribution System within 2 seconds of the formation of an Unintended Island shall be equipped with Protective Functions designed to detect Distribution System faults, both line-to-line and line-to-ground and cease to energize SMUD's Distribution System within two seconds of the initiation of a fault.

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### 3.4.2 Transfer Trip

For a Generating Facility that cannot detect Distribution System faults (both line-to-line and line-to-ground) or the formation of an Unintended Island and cease to energize SMUD’s Distribution System within two seconds, SMUD may require a Transfer Trip system or an equivalent Protective Function.

### 3.4.3 Reclose Blocking

Where the aggregate Generating Facility, capacity exceeds 15% of the peak load on any automatic reclosing device, SMUD may require additional Protective Functions, including, but not limited to reclose-blocking on some of the automatic reclosing devices.


## 4. Maintenance and Permits

Facility Owner, at Facility Owner’s sole expense, shall obtain and possess all permits and authorizations for the Generating Facility in accordance with all applicable laws and regulations for the construction, installation, design, operation, and maintenance of the Generating Facility.

The Facility Owner shall: (a) maintain the Facility and Interconnection Facilities in a safe and prudent manner and in conformance with all applicable laws and regulations including, but not limited to, requirements of Section 3 above and (b) to the extent that future requirements may dictate, obtain any government authorizations or permits required for the operation of the Generator or Generating Facility. The Facility Owner shall reimburse SMUD for any and all losses, damages, claims, penalties or liability SMUD incurs as a result of the Facility Owner’s failure to obtain or maintain any government authorizations and permits required for construction and operation of the Generating Facility.

## 5. Access to Premises

In the event that Facility Owner owns the real property where the Interconnection Facilities will be located, or in the event that Facility Owner is leasing or otherwise obtaining rights to locate the Generation Facilities on real property of a third party Facility Owner shall grant to SMUD (or obtain for SMUD) (i) the right to install the Interconnection Facilities and related equipment or materials on said real property along the most practical route which is of sufficient width to provide legal and safe clearance from all structures now or hereafter erected on said real property; and (ii) the right of ingress and egress from said real property as reasonably necessary for SMUD to operate, maintain, and remove the Interconnection Facilities.

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Where formal rights of way and /or easements are required on or over said real property or the property of some third party for the installation of the Interconnection Facilities, Facility Owner agrees that SMUD’s obligation to install the Interconnection Facilities is expressly conditioned on the granting, without cost to SMUD, of any and all necessary rights of way and/or easements to SMUD.

SMUD may enter the Customer’s premises without prior notice (a) to inspect at all reasonable hours the Generating Facility’s protective devices and read or test any meter for the Generator or Generating Facility; (b) to disconnect, at any time, without notice, the Generator or Generating Facility if, in SMUD’s sole opinion, a hazardous condition exists and that immediate action is necessary to protect persons, or SMUD’s facilities or property of others from damage or interference caused by (1) the Generator or Generating Facility or (2) the Customer and/or Facility Owner’s failure to comply with requirements of these provisions; and (c) if applicable, monthly to read the digital meter for billing purposes. Self-reads and reads from adjacent properties are not permitted.


## 6. Conditions of Facility Operations

The Facility Owner generally shall deliver electricity from the Generating Facility to SMUD at SMUD’s Utility Service Meter.

The Facility Owner, and not SMUD, shall be solely responsible for all legal and financial obligations arising from the construction, installation, design, operation and maintenance of the Generator or Generating Facility in accordance with all applicable laws and regulations.

The Facility Owner, at the Facility Owner’s sole expense, shall obtain and possess all permits and authorizations in accordance with all applicable laws and regulations for the construction, installation, design, operation and maintenance of the Generator or Generating Facility. The generator equipment shall be designed, installed, constructed, operated, and maintained in compliance with NEC, IEEE 1547, General Order 95 & 128, and these guidelines, including without limitation, the photovoltaic interconnection design standards. Compliance is mandatory unless prior written SMUD approval is provided for those specific items not in compliance and documented in the Interconnection Agreement.

The Facility Owner shall not connect the Generator or Generating Facility, or any portion of it, to the SMUD Distribution System, until the Generator or Generating Facility has passed SMUD inspection, completed performance tests, and met all requirements, if any, in the Interconnection Agreement. SMUD may not recognize any generation until inspections and tests are passed and accepted by SMUD. Such approval shall not be unreasonably withheld. SMUD shall have the right to have representatives present at the initial testing of the Generator or Generating Facility.

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The Facility Owner may reconnect its Generator or Generating Facility to the SMUD Distribution System following normal operational outages and interruptions without notifying SMUD unless SMUD has disconnected services, or SMUD notifies customer that a reasonable possibility exists that reconnection would pose a safety hazard. Facility Owners should always follow notice requirements in the Interconnection Agreement and Power Purchase Agreement.

If SMUD has disconnected Service to the Generator or Generating Facility, or SMUD has notified the Facility Owner that a reasonable possibility exists that reconnection would pose a safety hazard, the Facility Owner may call SMUD at 1-888-742-SMUD (7683) to request authorization to reconnect the Generator or Generating Facility.

## **7. Interconnection Facility and Distribution System Modifications and Costs**

### **7.1 Scope and Ownership of Interconnection Facilities**

#### **7.1.1 Scope**

Parallel Operation of Generating Facilities may require Interconnection Facilities or improvements to be made to SMUD's Distribution System. The type, extent and costs of Interconnection Facilities and Distribution System improvements shall be consistent with these Interconnection Guidelines and determined through the Initial Review or Interconnection Study described in the Appendix B. Facility Owner understands, accepts and agrees that connection and operation of the Generating Facility shall be subject to the terms and conditions set forth in these guidelines, as they may be amended from time to time.


#### **7.1.2 Ownership**

Interconnection Facilities installed on Facility Owner's side of the PCC may be owned, operated, and maintained by the Facility Owner or SMUD. Interconnection Facilities installed on SMUD's side of the PCC and Distribution System improvements shall be owned, operated, and maintained only by SMUD.

### **7.2 Responsibility for Costs of Interconnecting a Generating Facility**

#### **7.2.1 Study and Review Costs**

The Facility Owner shall be responsible for the reasonably incurred costs of the reviews and studies conducted pursuant to Section 2 of these Interconnection Guidelines.

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### 7.2.2 Facility Costs

The Facility Owner shall be responsible for all costs associated with Interconnection Facilities owned by the Facility Owner. The Facility Owner shall also be responsible for any costs reasonably incurred by SMUD in providing, operating, or maintaining the Interconnection Facilities and Distribution System improvements required solely for the interconnection of the Facility Owner's Generating Facility with SMUD's Distribution System, as further specified in Section 2.


### 7.2.3 Separation of Costs

Should SMUD combine the installation of Interconnection Facilities, or Distribution System improvements required for the interconnection of a Generating Facility with modifications or additions to SMUD's Distribution System to serve other Customers or third parties, SMUD shall not include the costs of such separate or incremental facilities in the amounts billed to the Facility Owner.

## 7.3 Installation and Payment for Distribution System Improvements

### 7.3.1 Agreement Required

The Facility Owner, pursuant to the provisions contained in the Interconnection Agreement, shall pay the costs of Interconnection Facilities and Distribution System improvements as listed in Table 8 – Summary of Facility Owner Interconnection Costs. Where the type and extent of the Interconnection Facilities or Distribution System improvements warrant additional detail, Facility Owner and SMUD may form a separate agreement to more fully describe and allocate the parties' responsibilities for installing, owning, operating, maintaining the Interconnection Facilities and Distribution System improvements.

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### 7.3.2 Attachments and Modifications to Distribution System

Except as provided for in Section 7.3.3 of these Interconnection Guidelines, Interconnection Facilities connected to SMUD's side of the Point of Common Coupling and Distribution System improvements shall be provided, installed, owned and maintained by SMUD at Facility Owner's expense.

### 7.3.3 Third-Party Installations


Subject to the approval of SMUD, the Facility Owner may, at its option, employ a qualified contractor to provide and install Interconnection Facilities or Distribution System improvements on SMUD's side of the PCC to be owned and operated by SMUD. Such Interconnection Facilities and Distribution System improvements shall be installed in accordance with SMUD's design and specifications. Upon final inspection and acceptance by SMUD, the Facility Owner shall transfer ownership of such Interconnection Facilities or Distribution System improvements to SMUD and such facilities shall thereafter be owned and maintained by SMUD at Facility Owner's expense. The Facility Owner shall pay SMUD's reasonable cost of design, administration, and monitoring of the installation for such facilities to ensure compliance with SMUD's requirements. Facility Owner shall also be responsible for all costs, including any income tax liability, associated with the transfer of Facility Owner installed Interconnection Facilities and Distribution System improvements to SMUD.

### 7.3.4 Reservation of Unused Facilities

When a Facility Owner wishes to reserve SMUD-owned Interconnection Facilities or Distribution System improvements installed and operated for the Facility Owner at the Facility Owner's expense but idled by a change in the operation of the Facility Owner's Generating Facility or otherwise, Facility Owner may elect to abandon or reserve such facilities consistent with the terms of its agreement with SMUD. If Facility Owner elects to reserve idle Interconnection Facilities or Distribution System improvements, SMUD shall be entitled to continue to charge Facility Owner for the costs related to the ongoing operation and maintenance of such Facilities.

### 7.3.5 Refund of Salvage Value

When a Facility Owner elects to abandon the Interconnection Facilities or Distribution System improvements for which it has either advanced the installed costs or constructed and transferred to SMUD, the Facility Owner shall pay for all costs of removal and receive from SMUD a credit for the net salvage value of the Interconnection Facilities or Distribution System improvements. Within one hundred eighty (180) Calendar Days, SMUD shall have the right to remove any

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portion of the Interconnection Facilities located on the property where the Interconnection Facilities are installed.

## 8. Metering, Monitoring and Telemetry

### 8.1 General Requirements

All Generating Facilities shall be metered in accordance with this section and shall meet all applicable standards of SMUD contained in SMUD's applicable Rates, Rules, and Regulations and published in SMUD's T002, T003, T004, T010, T014 and T015 addressing Metering specifications.

### 8.2 Power Production Metering

In order to determine applicable standby charges and non-bypassable charges, and to provide for Distribution System planning and operations, consistent with Section 1.4 of this manual, SMUD shall have the right to require the installation, including technical specifications and location, of a Power Production Meter to monitor Facility Owner's Generating Facility operations. SMUD shall require the provision of generator output data to the extent reasonably necessary to provide information for SMUD to administer its policies or to operate and plan its system.

### 8.3 Costs of Metering

The Facility Owner shall bear all costs of the Metering required by these Interconnection Guidelines, including the incremental costs of operating and maintaining the Metering Equipment, unless otherwise provided by law or applicable SMUD policy.

### 8.4 Telemetry


Telemetry equipment is required for a Generator or Generating Facility with an individual or site aggregate of 500 kW or greater (Gross AC Nameplate Rating). Notwithstanding the foregoing, SMUD may require Facility Owner to install Telemetry as necessary or appropriate to ensure reliable operations, as determined in SMUD's sole discretion.

### 8.5 Cost of Telemetry

See Table 8 – Summary of Facility Owner Interconnection Costs.

### 8.6 Location

Facility Owner shall provide, at no expense to SMUD, a suitable location for all such Metering Equipment and Telemetry equipment. Customer switchgear installed to

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accommodate SMUD meters shall be EUSERC-compliant. Facility Owner shall receive SMUD approval of the switchgear design for commercial projects over 200 Amps.

## 9. Testing and Certification Criteria

### 9.1 Introduction

This Section describes the test procedures and requirements for equipment used for the Interconnection of a Generating Facility to SMUD’s Distribution System. The procedures listed rely heavily on those described in applicable Underwriters Laboratory (UL), Institute of Electrical and Electronic Engineers (IEEE), and International Electrotechnical Commission (IEC) documents—most notably UL 1741 SB and IEEE 1547, and may be readily adaptable to synchronous Generators, induction Generators, as well as site controllers and protection relays.


The tests described here, together with the technical requirements in Section 3 of these Interconnection Guidelines and the Interconnection Agreement, are intended to provide assurance that the Generating Facility’s equipment will not adversely affect SMUD’s Distribution System and that a Generating Facility will cease providing power to SMUD’s Distribution System under abnormal conditions.

### 9.2 Certification Criteria

Equipment tested and approved (e.g. listed) by a NRTL as having met the requirements of UL 1741 SB and IEEE 1547 is considered to be Certified Equipment for purposes of Interconnection with SMUD’s Distribution System when listed by the California Energy Commission on its Go Solar California website under “Grid Support Inverters” (<https://www.energy.ca.gov/programs-and-topics/programs/solar-equipment-lists>)

### 9.3 Commissioning Testing

When equipment is not Certified as listed above or certified equipment is being used in an application inconsistent with its Certification or where the interconnection is for a large generating facility (such as 500 kW and greater), commissioning testing, where required, will be performed on-site to verify protective settings and functionality. Upon initial Parallel Operation of a Generating Facility, or any time interface hardware or software is changed that may affect the functions listed below; a Commissioning Test must be performed. An individual qualified in testing protective equipment (professional engineer, factory-certified technician, or licensed electrician with experience in testing protective equipment) must perform commissioning testing in accordance with the manufacturer’s recommended test procedure to prove the settings and requirements of these Interconnection Guidelines.

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SMUD has the right to witness commissioning tests as described below, or to require written certification by the installer describing which tests were performed and their results.

Functions to be tested during commissioning may consist of the following:

- Over- and under-voltage
- Over- and under-frequency
- Anti-Islanding (if applicable)
- Non-Export (if applicable)
- Inability to energize dead line
- Time delay restart after utility source is stable
- Utility system fault detection (if used)
- Synchronizing controls (if applicable)
- Other interconnection protective functions that may be required as part of the Interconnection Agreement

Other checks and tests that may need to be performed include:

- Verifying final protective settings
- Trip test
- In-service test


## 9.4 Verification of Settings

If the testing is part of the commissioning process, then, at the completion of such testing, the Facility Owner shall confirm all devices are set to SMUD-approved settings. This step shall be documented in the Commissioning Test Certification.

### 9.4.1 Trip test

Interconnection protective devices (e.g. reverse power relay) that have not previously been tested as part of the interconnection system with their associated interrupting devices (e.g. contactor or circuit breaker) shall be trip tested during commissioning. The trip test shall be adequate to prove that the associated interrupting devices open when the protective devices operate.

Interlocking circuits between protective devices or between interrupting devices shall be similarly tested unless they are part of a system that has been tested and approved during manufacture.

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### 9.4.2 In-service test

Interconnection protective devices that have not previously been tested as part of the interconnection system with their associated instrument transformers or that are wired in the field shall be given an in-service test during commissioning. This test will verify proper wiring, polarity, CT/PT ratios, and proper operation of the measuring circuits. The in-service test shall be made with the power system energized and carrying a known level of current. A measurement shall be made of the magnitude and phase angle of each AC voltage and current connected to the protective device and the results compared to expected values.

For protective devices with built-in metering functions that indicate current and voltage magnitudes and phase angles, or magnitudes of current, voltage, and real and reactive power, the metered values may be used for in-service testing. Otherwise, portable ammeters, voltmeters, and phase-angle meters shall be used.

### 9.5 Periodic Testing

The Facility Owner shall perform periodic Testing of Interconnection-related Protective Functions as specified by the manufacturer, or at least every four years. All periodic tests prescribed by the manufacturer shall be performed. The Facility Owner shall maintain periodic test reports or a log for inspection by SMUD. Periodic Testing conforming to SMUD test intervals for the particular Line Section may be specified by SMUD under special circumstances, such as high fire hazard areas.


A system that depends upon a battery for trip power shall be checked and logged once per month for proper voltage. Once every four years, the battery must be either replaced or a discharge test performed.

## 10. Dispute Resolution Process

The following procedures will apply for disputes arising from these Interconnection Guidelines:

### 10.1 Jurisdiction

SMUD shall have jurisdiction to interpret, add, delete or modify any provision of these Interconnection Guidelines or of any agreements entered into between SMUD and the Facility Owner to implement these Interconnection Guidelines and to resolve disputes regarding SMUD's performance of its obligations under its Rates, Rules, and Regulations, the applicable agreements, and requirements related to the interconnection of the Generator or Generating Facilities pursuant to these Interconnection Guidelines.

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## 10.2 Procedures

Any dispute arising between SMUD and the Facility Owner (individually “Party” and collectively “the Parties”) regarding SMUD’s performance of its obligations under its Rates, Rules, and Regulations, the applicable agreements, and requirements related to the interconnection of Facility Owner’s Generating or Interconnection Facilities pursuant to these Interconnection Guidelines shall be resolved according to the following procedures.

The dispute shall be reduced to writing by the aggrieved Party in a letter (“the dispute letter”) to the other Party containing the relevant known facts pertaining to the dispute, the specific dispute and the relief sought, and express notice by the aggrieved Party that it is invoking the procedures under Section 10. The dispute letter shall be served on the other Party within thirty (30) Calendar Days of the date the aggrieved Party either knew or should reasonably have known of the acts, active or passive, giving rise to the dispute. Within thirty (30) Calendar Days of the date the dispute letter is served, the Party’s authorized representative and the responsible SMUD Manager shall meet and confer to try to resolve the dispute.

## 10.3 Protest Process

If the Parties do not resolve their dispute within forty-five (45) Calendar Days after the date the dispute letter was served, the Facility Owner’s authorized representative may file a protest with the Director, Customer Success. Protests must be received by the Director, Customer Success within five (5) Calendar Days of the end of the above dispute resolution period. Failure to file a protest as set forth in Section 10.4 will result in the protest being deemed untimely and the protest will not be considered.

## 10.4 Filing a Protest

### 10.4.1 Delivery of Protest

A protest must be received within the timeline set forth in Section 10.3. All protests must be submitted to the Director, Customer Success by email, overnight courier, certified mail, or personal delivery:

Sacramento Municipal Utility District  
 Director, Customer Success  
 Re: Protest Under Interconnection Guidelines  
 6301 S Street, MS A151  
 Sacramento, CA 95817  
 Email: InterconnectionPM@smud.org

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### 10.4.2 Specify Dispute

The protest must specify the dispute under SMUD’s Interconnection Guidelines which is the object of the protest and the grounds of the protest. The protest must include the relevant known facts pertaining to the dispute, the specific dispute, the relief sought and any reasons the parties were unable to resolve the dispute during the dispute resolution period. The protest must also include a detailed written statement of the protest grounds and provide the documents or other information the protesting party believes is relevant to the protest.

### 10.4.3 SMUD Acknowledgement

Upon receipt of a protest the Director, Customer Success will: i) notify SMUD’s Office of the General Counsel, ii) send the protesting party an acknowledgement letter within two (2) Business Days of the date the protest as received (the acknowledgment may be by electronic mail, overnight courier, certified mail, or personal delivery), and iii) analyze the protest and the documentation provided by the protesting party and any other documentation provided or information the Director, Customer Success deems relevant to the disposition of the protest, including but not limited to, documents or information requested from or provided by third parties. The Director, Customer Success may also meet informally with a protesting party to better understand the claim or attempt to resolve the protest.

### 10.4.4 Communication of Decision


Following the review of a protest, the Director, Customer Success is empowered to: i) deny the protest on either procedural or substantive grounds, or ii) grant the protest. The Director, Customer Success’ decision will be in writing, state the basis of the decision and be provided to the protesting party and other interested parties by electronic mail, overnight courier, certified mail, or personal delivery.

## 10.5 Appeals

The Director, Customer Success’ decision to grant or deny a protest may be appealed to SMUD’s CEO and General Manager.

### 10.5.1 Delivery of Appeal

An appealing party must file its appeal within three (3) Business Days after receipt of the Director, Customer Success’ decision. The appeal must be submitted in writing, referencing the protest decision being appealed, to the CEO and General Manager, with a mandatory copy to the Office of General Counsel by electronic mail, overnight courier, certified mail, or personal delivery, to the following addresses:

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Sacramento Municipal Utility District  
 CEO and GM  
 Re: Appeal of the Director, Customer Success Decision  
 6201 S Street, MS B308  
 Sacramento, CA 95817  
 Email: CorpFiles@smud.org

Sacramento Municipal Utility District  
 Office of the General Counsel  
 Re: Appeal of the Director, Customer Success Decision  
 6201 S Street, MS B406 Sacramento, CA 95817  
 Email: legal@smud.org

The appeal must set forth the grounds of the appeal and is limited to those issues raised in the original protest.

**10.5.2 Decision of Appeal**


On receipt of the appeal from the appealing party, if any, the CEO and General Manager or delegate will analyze the Director, Customer Success’ decision, the documentation reviewed by the Director, Customer Success in rendering the decision, the appeal and documentation provided by the appealing party and any other documentation or information the General Manager and CEO or delegate deems relevant to the disposition of the appeal, including but not limited to documents or information requested from or provided by third parties.

**10.5.3 Communication of Appeal Decision**

Following the review of the appeal, the General Manager and CEO, or delegate, is empowered to: i) deny the appeal on either procedural or substantive grounds, or ii) grant the appeal. The CEO and General Manager’s decision will be in writing, will state the basis of the decision and will be provided to the appealing party and other interested parties by electronic mail, overnight courier, certified mail, or personal delivery.

**10.6 Performance During Dispute Process**

Pending resolution of any dispute under this section, the Parties shall proceed diligently with the performance of their respective obligations under these Interconnection Guidelines and the applicable agreements, unless the applicable agreements have been terminated.

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## 11. Indemnity and Liability by Customer

The Facility Owner shall indemnify and hold SMUD, its directors, officers, agents and employees harmless against all loss, damages, expense and liability to third parties for injury to, or death of persons, or injury to property caused by the Facility Owner's engineering, design, construction, installation, ownership, maintenance or operations of, or the making of replacements, additions or betterments to, or by failure of, the Generator or Generating Facility in connection with these provisions by reason or omission or negligence, whether active or passive. The Facility Owner shall, on SMUD's request, defend any suit asserting a claim covered by the indemnity. The Facility Owner shall pay all costs that may be incurred by SMUD in enforcing this indemnity.

Each Party's liability to the other Party for any loss, cost, claim, injury, liability, or expense, including reasonable attorney's fees, relating to or arising from any act or omission in its performance of its obligations in these guidelines shall be limited to the amount of direct damage actually incurred. In no event shall either Party be liable to the other Party for any indirect, special, consequential, or punitive damages of any kind whatsoever.


Nothing in these provisions shall be construed to create any duty to, any standard or care with reference to, or any liability to, any person not a Party to these provisions. Neither SMUD, its officers, agents or employees shall be liable for any claims, demands, costs, losses, causes or action, or any other liability of any nature or kind, arising out of the engineering, design, construction, ownership, maintenance or operation of, or making of replacements, additions or betterment to, the Generator of Generating Facility except to the extent actually caused by the sole and gross negligence of SMUD.

Neither SMUD, its officers, agents, or employees shall be liable for damages of any kind to the Generator or Generating Facility caused by any electrical disturbance of the SMUD system or on the system of another, whether the electrical disturbance results from the negligence of SMUD or not.

## Appendix A - Initial Review Screening Process for Applications to Interconnect a Generating Facility

### Introduction

This Initial Review Process was developed to create a path for selection and rapid approval for the Interconnection of those Generating Facilities that do not require an Interconnection Study. The Initial Review Process includes a screening to determine if a Supplemental Review is required.

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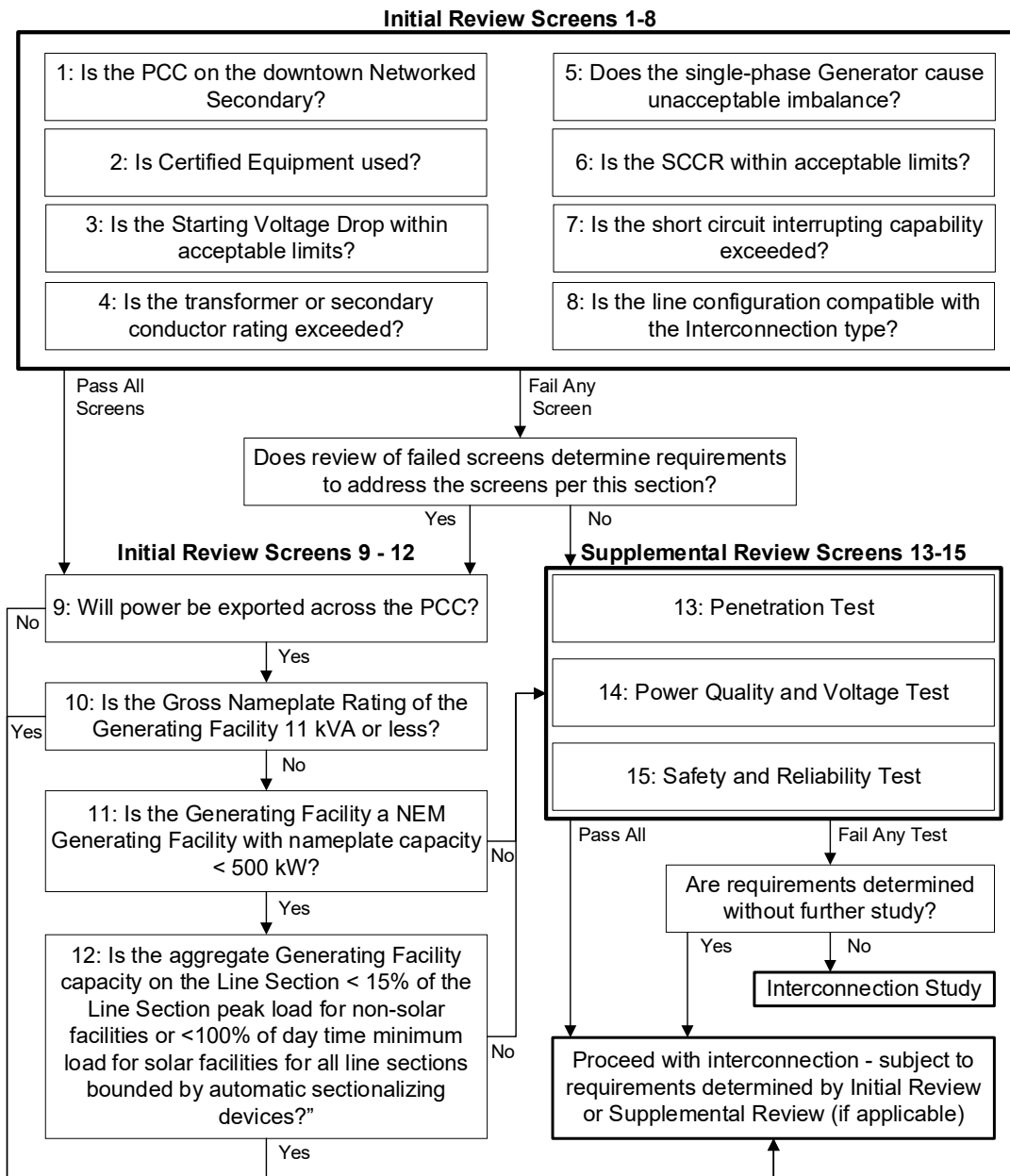
**Purpose**

The Initial Review determines:

- If a Generating Facility qualifies for the Standard Process Interconnection.
- If a Generating Facility can be made to qualify for Interconnection with a Supplemental Review determining any potential additional requirements.
- Supplemental Review determines if a more detailed Interconnection Study is required and the cost estimate and schedule for performing the Interconnection Study.

NOTE: Failure to pass any screen of the Initial Review means only that further review, and/or studies, are required before the Generating Facility can be approved for interconnection with SMUD's Distribution System. It does not mean that the Generating Facility cannot be interconnected.

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**Engineering Review Details**
*Figure 1 - Technical Review Process Appendix A*


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### Initial Review Screening Process Details

The Initial Review consists of Screens 1 through 12. If any of the Screens 1 through 8 is not passed, a quick review of the failed screen(s) may determine the requirements to address the failure(s). Otherwise, Supplemental Review is required.

Some examples of solutions that may be available to mitigate the impact of a failed Screen 1 through 8 are:

- Replace an overloaded distribution transformer with a larger transformer.
- Replace overloaded secondary conductors with larger conductor.
- Determine if phase balancing on the transformer is possible with minimal review.
- If possible, without further study check if the Generating Facility will overstress equipment.

#### Screen 1: Is the PCC on the downtown Networked Secondary?

- If Yes (fail), must go to Supplemental Review since special considerations are required for interconnection to the downtown Networked Secondary.
- If No (pass), continue to Screen 2.


Significance: Special considerations must be given to Generating Facilities proposed to be installed on SMUD's downtown Networked Secondary because of the design and operational aspects of the downtown Networked Secondary System. All requests proposing to interconnect to SMUD's downtown Networked Secondary shall follow the requirements set forth in SMUD's Grid Planning and Operations Distributed Generation Downtown Network System Requirements (GP-001).

#### Screen 2: Is Certified Equipment used?

Does the Interconnection Request propose to use Certified Equipment as set out in Section 31, Testing and Certification Criteria or does the equipment have SMUD approval?

- If Yes (pass), continue to Screen 3.
- If No (fail) continue to Screen 3.

Significance: If the Generating and/or Interconnection Facility has been Certified or previously approved by SMUD, SMUD does not need to repeat its full review and/or test of the Generating and/or Interconnection Facility's Protective Functions. Site Commissioning Testing may still be required to ensure that the Protective Functions are working properly.

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Certification indicates that the criteria in Section 9 as appropriate, have been tested and verified.

**Screen 3: Is the Starting Voltage Drop within acceptable limits?**

- If Yes (pass), continue to Screen 4.
- If No (fail), continue to Screen 4.

Note: This screen only applies to Generating Facilities that start by motoring the Generator(s). SMUD has two options in determining whether Starting Voltage Drop is acceptable. The option to be used is at SMUD’s discretion.

Option 1: SMUD may determine that the Generating Facility’s starting In-rush Current is equal to or less than the continuous ampere rating of the Customer’s service equipment.

Option 2: SMUD may determine the impedances of the service distribution transformer (if present) and the secondary conductors to Customer’s service equipment and perform a voltage drop calculation. Alternatively, SMUD may use tables or nomographs to determine the voltage drop. Voltage drops caused by starting a Generator must be less than 2.5% for primary Interconnections and 5% for secondary Interconnections.


Significance:

1. This screen addresses potential voltage fluctuation problems that may be caused by Generators that start by motoring.
2. When starting, Generating Facilities should have minimal impact on the service voltage to other SMUD Customers.
3. Passing this screen does not relieve Facility Owner from ensuring that its Generating Facility complies with the flicker requirements of this manual.

**Screen 4: Is the transformer or secondary conductor rating exceeded?**

Do the maximum aggregated Nameplate Ratings for all the Generating Facilities connected to a secondary of the distribution transformer exceed the transformer name plate rating or secondary conductor rating, modified per established SMUD practice, absent any Generating Facilities?

- If Yes (fail), continue to Screen 5.
- If No (pass), continue to Screen 5.

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Significance: This screen addresses potential secondary transformer or secondary conductor overloads. When SMUD’s analysis determines a transformer or conductor change is required, SMUD will furnish Facility Owner with an explanation of why the change is needed.

**Screen 5: Does the single-phase Generator cause unacceptable imbalance?**

If the proposed Generating Facility is single-phase and is to be interconnected on a center tap neutral of a 240-volt service, does it cause unacceptable imbalance between the two phases of the 240-volt service?

- If Yes (fail), continue to Screen 6.
- If No (pass), continue to Screen 6.

Significance: Generating Facilities connected to a single-phase transformer with 120/240V secondary voltage must be installed such that the aggregated gross output is as balanced as practicable between the two phases of the 240-volt service. When SMUD’s analysis determines a transformer change is required; SMUD will furnish the customer with an explanation of why the change is needed.

**Screen 6: Is the Short Circuit Current Contribution Ratio within acceptable limits?**

- If Yes (pass), continue to Screen 7.
- If No (fail), continue to Screen 7.


Note: This screen does not apply to Generating Facilities with a Gross Nameplate Rating of 11 kVA or less.

When measured at the primary side (high side) of the Dedicated Distribution Transformer serving a Generating Facility, the sum of the Short Circuit Contribution Ratios of all Generating Facilities connected to SMUD’s Distribution System circuit that serves the Generating Facility must be less than or equal to 0.1.

Significance: If the Generating Facility passes this screen, it can be expected that it will have no significant impact on SMUD’s Distribution System’s short circuit duty, fault detection sensitivity, relay coordination or fuse-saving schemes.

**Screen 7: Is the short circuit interrupting capability exceeded?**

Does the proposed Generating Facility, in aggregate with other Generating Facilities on the distribution circuit, cause any distribution protective devices and equipment (including, but not limited to, substation breakers, fuse cutouts, and line reclosers), or Interconnection Request equipment on the system to exceed 87.5 % of the short circuit interrupting capability; or is the Interconnection proposed for a circuit that already exceeds 87.5 % of the short circuit interrupting capability?

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- If Yes (fail) continue to Screen 8.
- If No (pass), continue to Screen 8.

Note: This screen does not apply to Generating Facilities with a Gross Nameplate Rating of 11 kVA or less.

Significance: If the Generating Facility passes this screen, it can be expected that it will not cause any of SMUD's equipment to be overstressed.

**Screen 8: Is the line configuration compatible with the Interconnection type?**

- If Yes (pass), continue to Screen 9.
- If No (fail), continue to Screen 9.

Note: This screen does not apply to Generating Facilities with a Gross Nameplate Rating of 11 kVA or less

Line configuration screen: Identify primary distribution line configuration that will serve the Generating Facility. Based on the type of Interconnection to be used for the Generating Facility, determine from Table 4 - Inverter Voltage Trip and Ride-Through Settings if the proposed Generating Facility passes the screen.


*Table 12 - Type of Interconnection Appendix A*

Primary Distribution Line Type	Type of Interconnection to Primary Distribution Line	Result/Criteria
Three-phase, three wire	Any	Pass screen
Three-phase, four wire	Single-phase, line-to-neutral	Pass screen
Three-phase, four wire (For any line that has such a section OR mixed 3 wire & 4 wire)	All others	To pass, aggregate Generating Facility Capacity must be less than or equal to 10% of Line Section Peak Load.

Significance: If the primary distribution line serving the Generating Facility is of a "three-wire" configuration, or if the Generating Facility's distribution transformer is single-phase and connected in a line-to-neutral configuration, then there is no concern about over-voltages to SMUD's, or other Customer's equipment caused by loss of system neutral grounding during the operating time of the Non-Islanding Protective Function.

**Screen 9: Will power be exported across the PCC?**

- If Yes, Continue to Screen 10.
- If No, then to ensure that the Generating Facility does not export across the PCC, the Generating Facility must incorporate one of the following five options. Following that selection, Initial Review is complete.

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Option 1: (“Reverse Power Protection”): To ensure power is never exported across the PCC, a reverse power Protective Function may be provided. The default setting for this Protective Function shall be 0.1% (export) of the service transformer’s rating, with a maximum 2.0 second time delay.

Option 2: (“Minimum Power Protection”): To ensure at least a minimum amount of power is imported across the PCC at all times (and, therefore, that power is not exported), an under-power Protective Function may be provided. The default setting for this Protective Function shall be 5% (import) of Generating Facility’s total Gross Nameplate Rating, with a maximum 2.0 second time delay.


Option 3: (incidental export with Certified Non-Islanding Protection): To ensure the incidental export of power is limited to acceptable levels, this option requires that all of the following conditions be met: a) the total Gross Capacity of the Generating Facility must be no more than 25% of the nominal ampere rating of Facility Owner’s service equipment; b) the total Gross Capacity of the Generating Facility must be no more than 50% of Facility Owner’s service transformer capacity rating (this capacity requirement does not apply to Customers taking primary service without an intervening transformer); and c) the Generating Facility must be Certified as Non-Islanding. See 3 (Significance) below.

The ampere rating of the Customer’s service equipment to be used in this evaluation will be that rating for which the customer’s utility service was originally sized or for which an upgrade has been approved. It is not the intent of this provision to allow increased export simply by increasing the size of the customer’s service panel, without separate approval for the resize.

Option 4: (Relative Generating Facility Rating): This option, when used, requires the Gross Nameplate Rating of the Generating Facility to be so small in comparison to its host facility’s minimum load, that the use of additional Protective Functions is not required to ensure that power will not be exported to SMUD’s Distribution System. This option requires the Generating Facility capacity to be no greater than 50% of Facility Owner’s verifiable minimum Host Load over the past 12 months.

**Significance:**

1. If it can be assured that the Generating Facility will not export power, SMUD’s Distribution System does not need to be studied for load-carrying capability or Generating Facility power flow effects on SMUD’s voltage regulators.
2. This screen permits the use of reverse-power or minimum-power relaying as a Non-Islanding Protective Function (Option 1, 2, and 3).

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3. This screen allows, under certain defined conditions, for Generating Facilities that incorporate Certified Non-Islanding protection to qualify for interconnection through the Standard Process without implementing reverse power or minimum power Protective Functions (Option 3).

**Screen 10: Is the Gross Nameplate Rating of the Generating Facility 11 kVA or less?**

- If Yes (pass), skip Screens 11 and 12; Initial Review is complete.
- If No (fail), continue to Screen 11.

Significance: The Generating Facility will have a minimal impact on fault current levels and any potential line over-voltages from loss of SMUD’s Distribution System neutral grounding.

**Screen 11: Is the Generating Facility a Renewable Electrical Generating Facility with Nameplate Capacity less than 500kW?**

- If Yes (pass), continue to screen 12.
- If No (fail), Supplemental Review may be required at SMUD’s sole discretion.

Significance: The purpose of this screen is solely to facilitate interconnection of Renewable Electrical Generating Facilities below this size threshold. The use of Gross Nameplate Capacity expedites the Initial Review analysis. In Supplemental Review, the net export will be analyzed.


**Screen 12: Is the aggregate Generating Facility capacity on the Line Section < 15% of the Line Section peak load for non-solar facilities or <100% of day time minimum load for solar facilities for all Line Sections bounded by automatic sectionalizing devices?**

- If Yes (pass), Initial Review is complete.
- If No (fail), Supplemental Review is required.

Significance:

Low penetration of Generating Facility capacity will have a minimal impact on the operation and load restoration efforts of SMUD’s Distribution System.

The operating requirements for a high penetration of Generating Facility capacity may be different since the impact on SMUD’s Distribution System will no longer be minimal, therefore requiring additional study or controls.

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The purpose of this screen is solely to identify if the Generating Facility needs additional study and is not intended as justification for limiting the penetration of generation on a Line Section.

### Supplemental Review Screens

The Supplemental Review consists of Screens 13 through 15. If any of the screens are not passed, a quick review of the failed screen(s) will determine the requirements to address the failure(s) or that an Interconnection Study is required. In certain instances, SMUD may be able to identify the necessary solution and determine that an Interconnection Study is unnecessary. Some examples of solutions that may be available to mitigate the impact of a failed screen are:

- Replacing a fixed capacitor bank with a switched capacitor bank.
- Adjustment of line regulation settings.
- Simple reconfiguration of the distribution circuit.

### Screen 13: Penetration Test


Where 12 months of Line Section minimum load data is available, can be calculated, can be estimated from existing data, or determined from a power flow model, is the aggregate Generating Facility capacity on the Line Section less than 100% of the minimum load for all line sections bounded by automatic sectionalizing devices upstream of the Generating Facility?

- If yes (pass), continue to Screen 14.
- If no (fail), a quick review of the failure may determine the requirements to address the failure; otherwise an Interconnection Study is required.

Note 1: If none of the above options are available, this screen defaults to Screen 12.

Note 2: The type of Generating Facility technology will be taken into account when calculating, estimating, or determining circuit or Line Section minimum load relevant for the application of this screen. For solar Generating Facilities with no battery storage, daytime minimum load will be used (i.e., 10 am to 4 pm for fixed panel solar Generating Facilities and 8 am to 6 pm for solar Generating Facilities utilizing tracking systems), while absolute minimum load will be used for all other Generating Facility technologies.

Note 3: When this screen is being applied to a Renewable Electrical Generation Facility, the net export in kW, if known, which may flow across the Point of Common Coupling into SMUD's Distribution System will be considered as part of the aggregate generation.

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Note 4: SMUD will not consider as part of the aggregate Generating Facility capacity for purposes of this screen Generating Facility capacity known to be already reflected in the minimum load data.

Significance: Penetration of Generating Facility capacity that does not result in power flow from the circuit back toward the substation will have a minimal impact on equipment loading, operation, and protection of the Distribution System.

### Screen 14: Power Quality and Voltage Tests

In aggregate with existing Generating Facility capacity on the Line Section, distribution circuit, and/or substation.

- i. Can it be determined within the Supplemental Review that the voltage regulation on the Line Section can be maintained in compliance with SMUD standards (ANSI C84, Range A) and/or Conservation Voltage Regulation voltage requirements under all system conditions?
  - ii. Can it be determined within the Supplemental Review that the voltage fluctuation is within acceptable limits as defined by IEEE 1453 or utility practice similar to IEEE 1453?
  - iii. Can it be determined within the Supplemental Review that the harmonic levels meet IEEE 519 limits at the PCC?
- If yes to all of the above (pass), continue to Screen 15.
  - If no to any of the above (fail), a quick review of the failure may determine the requirements to address the failure; otherwise an Interconnection Study is required.


Significance: Adverse voltages and undesirable interference may be experienced by other Customers on SMUD's Distribution System caused by operation of the Generating Facility(ies).

### Screen 15: Safety and Reliability Tests

Does the location of the proposed Generating Facility or the aggregate generation capacity on the Line Section create impacts to safety or reliability that cannot be adequately addressed without an Interconnection Study?

- If yes (fail), review of the failure may determine the requirements to address the failure; otherwise an Interconnection Study is required.
- If no (pass), Supplemental Review is complete.

Significance: In the safety and reliability test, there are several factors that may affect the nature and performance of an Interconnection. These include, but are not limited to:


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- i. Generating Facility energy source
- ii. Modes of synchronization
- iii. Unique system topology
- iv. Possible impacts to critical load customers
- v. Possible safety impacts

The specific combination of these factors will determine if any system study requirements are needed. The following are some examples of the items that may be considered under this screen:

- i. Does the Line Section have significant minimum loading levels dominated by a small number of customers (i.e. several large commercial customers)?
- ii. Is there an even or uneven distribution of loading along the feeder?
- iii. Is the proposed Generating Facility located in close proximity to the substation (i.e. <2.5 electrical line miles), and is the distribution line from the substation to the customer composed of large conductor/cable (i.e. 600A class cable)?
- iv. Does the Generating Facility incorporate a time delay function to prevent reconnection of the generator to the system until system voltage and frequency are within normal limits for a prescribed time?
- v. Is operational flexibility reduced by the proposed Generating Facility, such that transfer of the Line Section(s) of the Generating Facility to a neighboring distribution circuit/substation may trigger overloads or voltage issues?
- vi. Does the Generating Facility utilize certified anti-islanding functions and equipment?

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## **Appendix B - Initial and Supplemental Review Screening Process for Applications to Interconnect a Generating Facility with Export to the Grid**

### **Introduction**

SMUD performs a combined Initial and Supplemental Review Process prior to approving the Interconnection of Generating Facilities with proposed export to the grid.

### **Purpose**

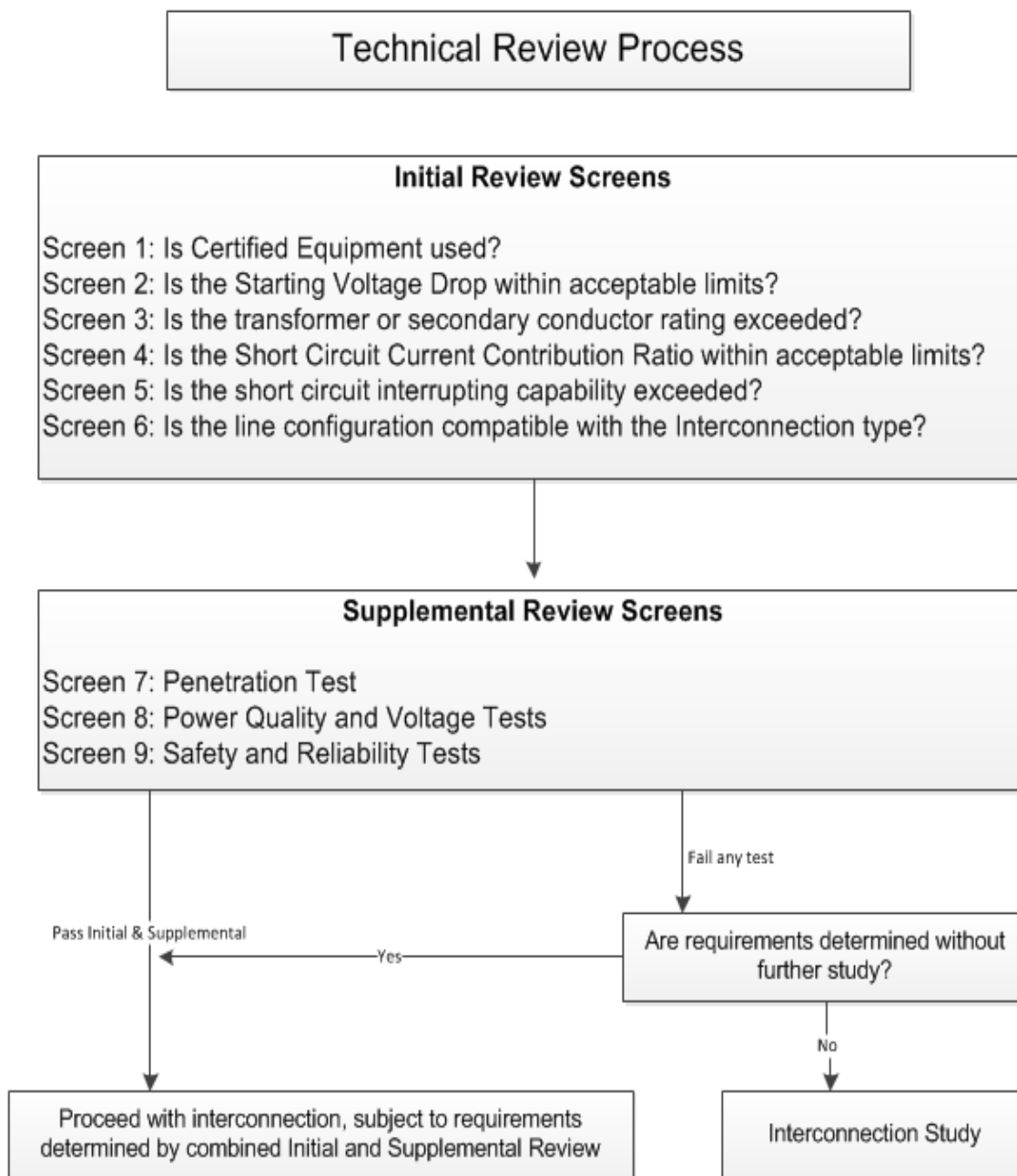
The review consists of Initial and Supplemental Review Screens. The screening process will establish the requirements in order for the Generating Facility to be approved for interconnection with SMUD's Distribution System. The process will also determine if a more detailed Interconnection Study is required, and the cost estimate and schedule for performing the Interconnection Study.


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Figure 2 - Technical Review Process Appendix B



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**Screen 1: Is Certified Equipment used?**

Does the Interconnection Request propose to use Certified Equipment or does the equipment have SMUD approval?

Significance: If the Generating and/or Interconnection Facility has been Certified or previously approved by SMUD, SMUD does not need to repeat its full review and/or test of the Generating and/or Interconnection Facility's Protective Functions. Site Commissioning Testing may still be required to ensure that the Protective Functions are working properly.

**Screen 2: Is the Starting Voltage Drop within acceptable limits?**

Note: This screen only applies to voltage fluctuation of Generating Facilities that start by motoring the Generator(s). SMUD has two options in determining whether Starting Voltage Drop is acceptable. The option to be used is at SMUD's discretion.

Option 1: SMUD may determine that the Generating Facility's starting In-rush

Current is equal to or less than the continuous ampere rating of the Customer's service equipment.

Option 2: SMUD may determine the impedances of the service distribution transformer (if present) and the secondary conductors to Customer's service equipment and perform a voltage drop calculation. Alternatively, SMUD may use tables or nomographs to determine the voltage drop. Voltage drops caused by starting a Generator must be less than 2.5% for primary Interconnections and 5% for secondary Interconnections.


Significance:

1. This screen addresses potential voltage fluctuation problems that may be caused by Generators that start by motoring.
2. When starting, Generating Facilities should have minimal impact on the service voltage to other SMUD Customers.

**Screen 3: Is the transformer or secondary conductor rating exceeded?**

Do the maximum aggregated Nameplate Ratings for all the Generating Facilities connected to a secondary distribution transformer exceed the transformer or secondary conductor rating, modified per established SMUD practice, absent any Generating Facilities?

Significance: This screen addresses potential secondary transformer or secondary conductor overloads.

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**Screen 4: Is the Short Circuit Current Contribution Ratio within acceptable limits?**

When measured at the primary side (high side) of the Dedicated Distribution Transformer serving a Generating Facility, the sum of the Short Circuit Contribution Ratios of all Generating Facilities connected to SMUD’s Distribution System circuit that serves the Generating Facility must be less than or equal to 0.1.

Significance: This screen addresses SMUD’s Distribution System’s short circuit duty, fault detection sensitivity, relay coordination or fuse-saving schemes.

**Screen 5: Is the short circuit interrupting capability exceeded?**

Does the proposed Generating Facility, in aggregate with other Generating Facilities on the distribution circuit, cause any distribution protective devices and equipment (including, but not limited to, substation breakers, fuse cutouts, and line reclosers), or Interconnection Request equipment on the system to exceed 87.5 % of the short circuit interrupting capability; or is the Interconnection proposed for a circuit that already exceeds 87.5 % of the short circuit interrupting capability?

Significance: If the Generating Facility passes this screen, it can be expected that it will not cause any of SMUD’s equipment to be overstressed.


**Screen 6: Is the line configuration compatible with the Interconnection type?**

Line configuration screen: Identify primary distribution line configuration that will serve the Generating Facility. Based on the type of Interconnection to be used for the Generating Facility, determine if the proposed Generating Facility passes the screen.

*Table 13 - Type of Interconnection Appendix B*

Primary Distribution Line Type	Type of Interconnection to Primary Distribution Line	Result/Criteria
Three-phase, three wire	Any	Pass screen
Three-phase, four wire	Single-phase, line-to-neutral	Pass screen
Three-phase, four wire  (For any line that has such a section OR mixed 3 wire & 4 wire)	All others	To pass, aggregate Generating Facility Capacity must be less than or equal to 10% of Line Section Peak Load.

Significance: If the primary distribution line serving the Generating Facility is of a “three-wire” configuration, or if the Generating Facility’s distribution transformer is single-phase and connected in a line-to-neutral configuration, then there is no concern about over-voltages to SMUD’s, or other Customer’s equipment caused by loss of system neutral grounding during the operating time of the Non-Islanding Protective Function.

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### Supplemental Review Screening Process

The Supplemental Review Screens are required for evaluation of generators with proposed export to the grid. Some examples of utility solutions that may be available are

1. Add a capacitor bank, or replace a fixed capacitor bank with a switched capacitor bank
2. Install line regulator, or adjust existing line regulation settings
3. Reconfigure the distribution circuit
4. Reconductor
5. Modify protection, such as a transfer trip

### Screen 7: Penetration Test

Where 12 months of Line Section minimum load data is available, can be calculated, can be estimated from existing data, or can be determined from a power flow model, is the aggregate Generating Facility capacity on the Line Section less than 100% of the minimum load for all line sections bounded by automatic sectionalizing devices upstream of the Generating Facility?

Note 1: The type of Generating Facility technology will be taken into account when calculating, estimating, or determining circuit or Line Section minimum load relevant for the application of this screen. As an example, for solar Generating Facilities with no battery storage, daytime minimum load will be used (i.e., 10 am to 4 pm for fixed panel solar Generating Facilities and 8 am to 6 pm for solar Generating Facilities utilizing tracking systems), while absolute minimum load will be used for all other Generating Facility technologies.


Note 2: It is expected that SMUD will have already captured any other generating capacity at the site.

Significance: Penetration of Generating Facility capacity that does not result in power flow from the circuit back toward the substation will have a minimal impact on equipment loading, operation, and protection of the Distribution System.

### Screen 8: Power Quality and Voltage Tests

In aggregate with existing Generating Facility capacity on the Line Section, distribution circuit, and/or substation.

- i. Can it be determined within the Supplemental Review that the voltage regulation on the Line Section can be maintained in compliance with SMUD standards (ANSI C84, Range A) under all anticipated system conditions?

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- ii. Can it be determined within the Supplemental Review that the voltage fluctuation is within acceptable limits as defined by IEEE 1453 or utility practice similar to IEEE 1453?
- iii. Can it be determined within the Supplemental Review that the harmonic levels meet IEEE 519 limits at the PCC?

Significance: Adverse voltages and undesirable interference may impact other Customers on SMUD's Distribution System caused by operation of the Generating Facility(ies).

**Screen 9: Safety and Reliability Tests**


Does the location of the proposed Generating Facility or the aggregate generation capacity on the Line Section create impacts to safety or reliability that cannot be adequately addressed without an Interconnection Study?

Significance: In the safety and reliability test, there are several factors that may affect the nature and performance of an Interconnection. These include, but are not limited to:

1. Generating Facility energy source
2. Modes of synchronization
3. Unique system topology
4. Possible impacts to critical load customers
5. Possible safety impacts

The specific combination of these factors will determine if any system study requirements are needed. The following are some examples of the items that may be considered under this screen:

1. Does the Line Section have significant minimum loading levels dominated by a small number of customers (i.e. several large commercial customers)?
2. Is there an even or uneven distribution of loading along the feeder?
3. Is the proposed Generating Facility located in close proximity to the substation (i.e. < 2.5 electrical line miles), and is the distribution line from the substation to the customer composed of large conductor/cable (i.e. 600A class cable)?

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4. Does the Generating Facility incorporate a time delay function to prevent reconnection of the generator to the system until system voltage and frequency are within normal limits for a prescribed time?
5. Is operational flexibility reduced by the proposed Generating Facility, such that transfer of the Line Section(s) of the Generating Facility to a neighboring distribution circuit/substation may trigger overloads or voltage issues?
6. Does the Generating Facility utilize certified anti-islanding functions and equipment?


### Interconnection Study Process

When the combined Initial and Supplemental Review indicates that the installations of the proposed generation will require a detailed Interconnection Study, an estimate of the cost of the Interconnection Study is prepared. The Interconnection Study involves computer simulation of the proposed Generating Facility and the system to which it is to be interconnected and testing various mitigation measures. The results of this study include other options available and estimated of the cost of these measures and an estimate of the time to deploy these (where solutions area available).

### Appendix C – Operational Requirements for Generating Facilities that can be Intentionally Islanded

Intentionally Islanded Generating facilities are capable of operating in island mode and capable of being interconnected to SMUD’s distribution system while operating in interactive mode, which includes the ability to disconnect from and reconnect to a primary source and operate in island mode. This is synonymous with electrical system islanding or formation of a microgrid. Since these energized systems present potential hazards to personnel who may be working on the electric grid to restore outages, their design needs to be carefully reviewed and tested to ensure safe and reliable operation. Such generating facilities when operated in a way where they isolate and island intentionally from the Distribution System to serve Host Load must also adhere to all of the following requirements:

- (i) Shall not energize other SMUD customers without SMUD’s prior approval; any such approval by SMUD will be consistent with other applicable rules or tariffs.
- (ii) Paralleling Device shall be capable of withstanding 220% of the rated voltage across the Paralleling Device.
- (iii) Paralleling Device shall not be closed until synchronization with the grid has met the parameters in accordance with section 3.3.

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(iv) Paralleling Device shall not be closed into a de-energized grid when inverters are producing or absorbing active power and/or exchanging reactive power. Closing of the Paralleling Device into a de-energized grid when inverters are producing or absorbing active power and/or exchanging reactive power shall cause the inverter to cease to energize or trip automatically.

(v) Upon closing Paralleling Device, Smart Inverters must return to Grid Following Mode within sixty (60) cycles.

(vi) When operating isolated from the grid (intentional islanded operation or microgrid in islanded operating mode or grey sky mode), failure of communications between the Paralleling Device and DER plant controller system or microgrid control system shall result in Generating Facility Smart Inverters to cease to energize or trip within two (2) seconds of loss of communications.


(vii) Smart Inverters shall not change or modify the approved operating parameters from Grid Following Mode to Grid Forming Mode until such time the inverters have verified that the Paralleling Device has opened, via Paralleling Device mechanical provisions, to isolate the Generating Facility from the Distribution System.

## **Appendix D – Generating facilities that use a Power Control System (PCS)**

### **Non-Export or Limited Export Utilizing Certified Power Control Systems**

The following are the minimum requirements for Non-Export or Limited Export systems that use certified power control systems (PCS) with an OLRT no more than two seconds. It should be noted that other factors relevant to the Interconnection Study process may necessitate additional technical requirements that are not explicitly noted here.

1. Use a PCS that passes the requirements of the 2019 Underwriters Laboratories (UL) Power Control Systems Certification Requirements Decision (CRD) test protocol. Non-Export or Limited Export systems may use a PCS that passes later published revisions to the CRD test protocol or may use a PCS that is certified to the UL 1741 certification standard, if UL incorporates the test protocol for PCS into UL 1741 in the future. The NRTL evaluation must have determined that the PCS conforms to the non-exporting or limited exporting functionality (as applicable) in accordance with the relevant CRD or UL published standard.
2. Use a PCS that is certified with an OLRT of two seconds or less, as provided in the PCS's specification data sheets.

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3. The PCS must reduce export to zero or less within two seconds of commencing export. A PCS that is certified with an OLRT of two seconds or less, and a time to reach steady state of 10 seconds or less, meets this requirement.
4. Set the PCS to not export (zero-export) or set the PCS to not exceed the proposed level of export, as applicable.
5. Use only UL 1741 listed grid-support non-islanding inverters as approved by these Interconnection Guidelines.
6. Maintain voltage fluctuations at the limits specified in SMUD Rule 2.

#### Non-Export or Limited Export with Incidental Export Utilizing Certified Power Control Systems

The following are the minimum requirements for Non-Export or Limited Export systems that use certified power control systems (PCS) with an OLRT between two and ten seconds. It should be noted that other factors relevant to the Interconnection Study process may necessitate additional technical requirements that are not explicitly noted here.

1. Have a nameplate capacity equal to or less than 1,000 kVA.
2. Use a PCS that passes the requirements of the 2019 Underwriters Laboratories (UL) Power Control Systems Certification Requirements Decision (CRD) test protocol. Non-Export or Limited Export may use a PCS that pass later published revisions to the CRD test protocol or may use a PCS that is certified to the UL 1741 certification standard, if UL incorporates the test protocol for PCS into UL 1741 in the future. The NRTL evaluation must have determined that the PCS conforms to the non-exporting or limited exporting functionality (as applicable) in accordance with the relevant CRD or UL published standard.
3. Use a PCS that is certified with an OLRT of no more than ten seconds, as provided in the PCS's specification data sheets.
4. Set the PCS to not export (zero-export) or set the PCS to not to exceed the proposed level of export.
5. Use only UL 1741-SB listed grid-support non-islanding inverters as approved by these Interconnection Guidelines.
6. Maintain voltage fluctuations at the limits specified in SMUD Rule 2.

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## Appendix E – Storage Charging Operational Modes

In the Interconnection Request, the Applicant describes the charging behavior of the proposed energy storage system. This behavior can be grouped into three Operating Modes which are relevant to interconnection. Determining the Operating Mode is a critical factor in determining the extent that SMUD will need to study the charging of the storage system. These studies will use information from the Interconnection Request to assess whether the operating characteristics of the storage system could impact the customer’s Service Facilities and/or the Distribution System.

- **Operational Mode 1: No Grid Charging** – This mode of operation involves a storage system that is coupled with on-site generation, whereby the storage system is charged without the use of SMUD’s Distribution System. Because such storage systems are solely charged by the on-site generation there is no increase to the customer’s instantaneous load under this Operating Mode. As such, a load review is not required. However, it is important for SMUD to review the storage discharging characteristics for any impacts on the SMUD Distribution System as a result of this storage system operating while physically connected with the utility grid. These impacts are evaluated according to the study process as detailed in these interconnection guidelines.

- **Operational Mode 2: Peak Shaving** – The storage system is charged by the SMUD grid. Under this Operating Mode, the storage system is then discharged during times of peak customer load with the intent of reducing the net load needed from SMUD’s system at that time. This includes use cases referred to as: “demand management”; “peak load reduction” or “peak shaving”; and “load shifting,” all of which serve to decrease the customer’s measured and billed demand per the customer’s applicable SMUD rate schedule. SMUD’s review of this type of application will include a study of both the storage device’s load (charging) characteristics, as well as its generation (discharging) characteristics, to determine impact to the customer’s service facilities and Distribution System. For a storage system that does not cause the total facility load to exceed the existing peak demand, the impact on the existing system is expected to be negligible. The Applicant will need to describe how this will be achieved. For instance, this description could include programming the storage device to charge only between 10 P.M. and 10 A.M., when site loads are minimal; monitoring total facility power flows in the storage system’s control scheme; and controlling the ramp rate for charging at no more than 10 percent/second (from zero to rated value).

- **Operational Mode 3: Unrestricted Charging** – This Operating Mode is the most flexible for the customer, as it implies that the storage system could charge from SMUD’s system at any time, including when other on-site loads are high. This means that the storage device is a new, additional load on the SMUD system, subject to SMUD

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Rules and Regulations, which govern new load. Thus, the choice of this Operating Mode results in the most rigorous review and has the potential to impact the electrical grid the most, therefore it results in the highest likelihood of requiring upgrades to service facilities. Applicants should also keep in mind that charging in such a fashion could result in additional demand or energy charges on their electric bill. While future programs could motivate customers to request unrestricted charging, Applicants should only request this additional service capacity if they expect to use it. The interconnection process could be significantly longer and/or more costly in order to safely accommodate unrestricted charging.


**b. Study Process Details**

The details of the Study Process step depend on the Operational Mode selected as follows:

1) Study Process for Operational Mode 1 (No Grid Charging): All Operational Mode 1 applications, regardless of size, avoid the Charging Load Review, for both primary and secondary facilities. The Applicant’s commitment not to use the grid to charge the storage device will be memorialized in the interconnection agreement. As such, no further technical review of load aspects is needed. For all cases, SMUD’s Distribution Planning Engineer will still analyze the operation of the storage facility under the interconnection guidelines study process. The goal of the review is to determine the impact the discharging (or generation) aspects of the storage system would have on the Service Facilities or Distribution System with respect to voltage, flicker, fault duty, etc. The study will also evaluate modifications needed to address those impacts. Once the study is complete, the Project Manager will forward it to the Applicant. If needed, then SMUD will confirm with the Applicant whether they wish to proceed to a Supplemental Review.

2) Study Process for Operational Mode 2 (Peak Shaving): Operational Mode 2 storage facilities may not require charging load review, depending on the power rating of the storage devices. A cursory review suffices if the load associated with the charging of the storage system can quickly be deemed to have negligible impact on SMUD’s Electric System. The thresholds to qualify for such a cursory review are based on the voltage of the project’s local SMUD distribution system, as compared to the storage facility’s aggregate nameplate charging power capacity rating (including all storage devices at the same Point of Common Coupling), as follows:

- For projects with a SMUD Distribution System voltage of 4 kilovolts (kV), the review threshold is less than 50 kilovolt-ampere (kVA), for the storage facility capacity.
- For projects with a SMUD Distribution System voltage of 12 kV or 21 kV, the review threshold is less than 200 kVA, for the storage facility capacity.

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- For projects with a SMUD Distribution System voltage of 69 kV, the review threshold is less than 1000 kVA, for the storage facility capacity.

Operational Mode 2 Storage facilities that exceed the above thresholds will require a Charging Load Review. Under this scenario, it cannot be known whether the storage charging load would impact the customer’s electric service equipment rating and load requirements., or SMUD’s Distribution System until after the study is complete. In this review SMUD’s Distribution Planning group compares the load characteristics of the storage facility to the existing loading on the respective distribution circuit and substation to determine if there is an impact to the Distribution System. As stated above, SMUD will also study the generation aspects of the storage. The study will combine the results of both aspects, reconciling any overlap, and describe the resulting impacts and requirements in the communication provided to the customer. This process assumes no service panel upgrade, relocation, or a new service. In the event of any of these scenarios, then the application would follow the process described for Operational Mode 3. Generally, installations under Operational Mode 2 can be accomplished without a panel upgrade, so long as the storage device adds no new peak load to the panel.

3) Study Process for Operational Mode 3 (Unrestricted Charging): Existing and Unmodified Service Panels Applicants requesting the ability to charge storage devices at any time, regardless of other site loads, will be treated as new added load to the SMUD system. This net incremental increase in peak load demand is subject to SMUD Rules and Regulations, which govern how SMUD provides service to new load. If the Applicant proposes to add new charging load without modifying their existing service panel, SMUD considers this a notification of added load and will perform a Charging Load Review to ensure that all primary and secondary voltage facilities serving the project are adequate. With the complete Interconnection Request, the assigned Project Manager will request Charging Load Review for both primary facilities (the review performed by SMUD Distribution Planning) and for secondary service/facilities (the review performed by SMUD Service Planning). Due to the additional impact on the SMUD system which may be caused by this new load being added to the system, additional review time may be required beyond the timelines governing only the generation aspects.

Charging load review for secondary/service facilities should be expected to require up to 30 business days when no field visit is necessary to obtain the requisite technical detail for impact assessment. When a field visit is required to verify the capability of existing facilities, the Charging Load Review will require up to 60 business days. These timelines will progress concurrently with the interconnection timelines which apply to the generation screens. However, in order to provide the Applicant with complete information, the Initial Review may be delayed to allow incorporation of the Charging Load Review. SMUD will notify the Applicant in advance and specify an expected

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delivery date. For cases with added load, Applicants should expect a minimum of 30 business days.


If the project includes a service panel upgrade, relocation, or a new service, then there are additional steps in order to address the complete service requirements. This includes a separate Application for Service, which will address—at the service and secondary level—both the charging load and the other service facility needs related to the panel. Applications for Service which include a new energy storage device must clearly identify its charging load, along with its other technical submittals. DER Planning or Generation Interconnection Services Department will advise the Applicant to submit an Application for Service. SMUD will follow its established procedures for reviewing these types of applications. This procedure involves the local Service Planning team who will analyze the electric service facilities to meet the customer’s site loads, including the storage facility. This local Service Planning Representative will also contact the Applicant directly regarding the service application and SMUD’s electric service requirements and standards. This representative will also coordinate with local SMUD teams regarding SMUD design and construction requirements to accommodate the service application and will keep the Applicant updated on progress. The charging load impacts at the primary level (including distribution circuit and substation impacts) will be evaluated concurrently to determine the complete requirements for the project. In addition to these two studies, SMUD will also review the discharging operations of the storage facility under these interconnection guidelines. For projects with service panel work, the reconciliation of load- and generation-related work scope is done during the detailed estimating step, rather than in the review stage.

### **Appendix F – Vehicle to Grid (V2G)**

For retail customers interconnecting stationary or mobile energy storage devices pursuant to these Interconnection Guidelines, the load aspects of the storage devices will be treated pursuant to SMUD Rules and Regulations just like other load, using the incremental net load for non-residential customers, if any, of the storage devices.

Any DC Vehicle to Grid (V2G-DC) Electric Vehicle Power Export Equipment (EVPE) or Electric Vehicle Supply Equipment (EVSE) that does not have UL 1741 SA certification, any subsequent UL 1741 supplement certification required in these Interconnection Guidelines or other SMUD-recommended smart inverter functions - may interconnect initially for the purpose of demonstration or limited pilot projects, subject to all other interconnection requirements.

Upon initial Parallel Operation of such a Generating Facility, or at any time the interface hardware, firmware or software is changed that may affect the functions listed in section 9.3; a Commissioning Test must be performed.

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An individual qualified in testing protective equipment (professional engineer, factory-certified technician, or licensed electrician with experience in testing protective equipment) must perform commissioning testing in accordance with the manufacturer’s recommended test procedure to prove the settings and requirements of these Interconnection Guidelines. The applicant must submit written certification by the installer describing which tests were performed and their results. SMUD has the right to witness commissioning tests.


SMUD will not allow this pathway to interconnect once the market has developed to provide multiple V2G capable EVPEs / EVSEs that meet the full smart inverter certification standards required in these Interconnection Guidelines and to subsequent UL 1741 supplements. SMUD terminating this interconnection pathway would not affect previously interconnected EVSE, and they may continue to operate parallel to the grid as per their Interconnection Agreement as long as the EVPE / EVSE meets all applicable requirements of these Interconnection Guidelines and does not pose any safety risks due to not complying with applicable requirements at the time of interconnection.

The CEC recently created a webpage for UL compliant bidirectional inverters for EVs at <https://v2gel.energy.ca.gov/Home/ProcessView>

## 12. Recent Revision History

### 12.1 Revision 10: Major update to policy and procedure document

- Split document into Net Energy Metering Interconnections and Non-Net Energy Metering Interconnections.
- Updated the Table of Contents.
  - Net Energy Metering Interconnections
  - Non-Net Energy Metering Interconnections
- Added two new Table of Contents.
  - Tables
  - Figures
- Added new definition terms.
- Moved the Initial Review Screen Processes to Appendices A & B.
- Updated Table for Interconnection Agreement Requirement in the Interconnection Agreement definition.
- Updated transferability of interconnection requirement for PPA, which requires the applicant to notify the Interconnection Project Manager and include the PPA agreement.
- Updated language about Waiving Fees for PPAs to say that SMUD at its sole discretion may waive certain fees.

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### 12.2 Revision 11: Minor cleanup effort to the document

- Added and updated miscellaneous definition terms.
- Replaced smart inverter with inverter and fast track process with standard process throughout the document.
- Updated addresses for the CEO and Legal in the Dispute Resolution Process.
- Minor edits to the following sections for NEM & Non-NEM:
  - 1.9 Curtailment, Disconnection, or Termination
  - 1.11 Compliance with Established Timelines
  - 2.9 Upon Execution of Agreements
  - 2.10 Interconnection Facilities Cost Payment
  - 3.4 Supplemental Generating Facility Requirements
  - 6.0 Conditions of Facility Operations
  - 8.4 Telemetry
  - 8.6 Location
- Modifications specific to the NEM section:
  - 2.0 Application Process – Added language to state that SMUD reserves the right to cancel an application where the project has no progress withing twelve months.
- Modifications specific to the Non-NEM section:
  - Minor changes to the following section:
    - 1.8 Prudent Operation and Maintenance Required
  - Updated section 2.1. Initial Review
    - Added language to state that if the proposed facility can be interconnected based on the initial review, that SMUD will provide a written description of the requirements for interconnection.
    - Added a reference to Table 7 Interconnection Application Fees for review timeframes.
  - Table 8 Summary of Facility Owner Interconnection Costs – Added two rows:
    - Interconnection Facility Operations and Maintenance Costs
    - Distribution Operations and Maintenance Cost

### 12.3 Revision 12: Minor update to include the new Interconnection Fees

- Added a new Table 1 for Interconnection Fees effective March 1, 2022.
- Interconnection Application Timelines (now Table 2) their own tables.
- Made commercial customers  $\geq 500$  kW threshold consistent throughout the document (process is unchanged).
- Updated nomenclature for Net Energy Metering (Renewable Electrical Generating Facility) and Non-Net Energy Metering (Non-Qualified Generation Facility) throughout the document.

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- Added definitions for Non-Qualified Generation Facility and Renewable Electrical Generation Facility and updated definition for Storage.
- Updated table numbers and table references throughout the document.
- Added new section 12. Recent Revision History.

#### **12.4 Revision 13: Major Update related to Standards, Definitions, and Rate Changes**

- Update applicable UL, and IEEE references
  - UL1741 Supplement SB, IEEE 1547-2018, and 1547.1-2020
- Definition changes and additions
  - Add Business Day, Calendar Day, Solar and Storage Rate (SSR)
  - Updated NEM and added reference to SSR
- Definition deletes
  - Emergency, defined under “System Emergency”
  - SMUD Distribution System, defined under “Distribution System”

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