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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 Public Utility Commission (CPUC) and California Energy Commission’s (CEC) 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 (American National Standards Institute, Institute of Electrical Electronic Engineers (ANSI/IEEE) 1547-2018 Standards for Interconnecting Distributed Resources with Electrical Power Systems), SMUD will allow the interconnection of Generating Facilities with its Distribution System.


## 3. Definitions

<b>Advanced Distribution Management System (ADMS)</b>	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.
<b>Applicant</b>	The entity submitting an Application for Interconnection process. The applicant may be the Facility Owner, Developer and/or Customer.
<b>Application</b>	A SMUD-approved standard form submitted to SMUD for Interconnection of a Generating Facility.
<b>Board</b>	The publicly elected Board of Directors of the Sacramento Municipal Utility District.
<b>Certification Test</b>	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).

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<b>Certification; Certified; Certificate</b>	The documented results of a successful Certification Test.
<b>Certified Equipment</b>	Equipment that has passed all required Certification Tests.
<b>Commercial Operation</b>	The period of operation of the Facility following the Commercial Operation Date until the time the facility has shut down or the Agreement has terminated, whichever occurs first.
<b>Commercial Operation Date</b>	The date specified in the Commercial Operation Date Confirmation Letter on which the Facility shall conform to the requirements for Commercial Operation.
<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 Smart Inverter operates indefinitely without tripping. Any functions that protect the Smart 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.

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<b>Dispatchability</b>	The ability of a generating unit 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 generating unit 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 Customer owned or Facility Owner "owned" electric generator, inverter, storage or generating 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.
<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.
<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>Emergency</b>	An actual or imminent condition or situation which jeopardizes the Distribution System Integrity.
<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 or host of the Generating Facility, who has an Interconnection Agreement with SMUD.
<b>Fast Track Interconnection</b>	Interconnection conforming to the minimum requirements under SMUD's 11-01 Interconnection Guidelines, as determined by Appendix A - NEM Initial Review Screening Process for Applications to Interconnect a Generating Facility.

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<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 secondary Network 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, Gross Capacity, and Gross 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).
<b>Initial Review</b>	The review by SMUD, following receipt of an Application, to determine one of the following: a) Whether the Generating Facility qualifies for Fast Track Interconnection; or b) Whether the Generating Facility can be made to qualify for Interconnection with a Supplemental Review that determines any potential additional requirements; or c) Whether the Generating Facility requires an Interconnection Study.
<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>	A power electronic device that converts Direct Current (DC) power to Alternating Current (AC) by means of electronic switching. The only static inverters acceptable for interconnection with SMUD are those inverters that are designed to automatically separate from SMUD's Distribution System upon loss of voltage from SMUD and to reclose with SMUD only after SMUD's voltage has been restored.
<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 its Generating Facility in parallel with SMUD’s Distribution System. Interconnection Agreements are required for all Generating Facilities. See the chart below.

Interconnection Agreement Requirement		
Criteria	Included as part of the Application	Separate Interconnection Agreement
NEM (Renewable energy/fuel source) less than 500kW	X	
NEM (Renewable energy/fuel source) 500kW or more		X
All generation sources of any size connected directly to the grid (SMUD side of electric service point if the customer exists).		X
Non-NEM generation 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 Cost Payment.

**Interconnection Facilities Costs Payment** The Interconnection Facilities Cost charged to the Facility Owner/Seller through one of two options: a monthly Interconnection Facilities Cost Payment or a one-time Interconnection Facilities Cost Payment based on actual SMUD 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 Customers using a portion of the Distribution System that is electrically isolated from the remainder of 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 Smart 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 Smart 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, 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>Momentary Cessation</b>	The Smart Inverter momentarily reduces current output to the Distribution System to below 10% of the maximum continuous output current rating. The Smart 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.
<b>Nationally Recognized Testing Laboratory (NRTL)</b>	A laboratory accredited to perform the certification testing requirements under these Interconnection Guidelines.

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<b>Net Energy Metering (NEM)</b>	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>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>Parallel Operation</b>	The simultaneous operation of a Generator with power delivered or received by SMUD while Interconnected. Under 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).
<b>Periodic Test</b>	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: <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.

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<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 PPA. In the case of an interconnection for a PPA, the PPA must be accepted by SMUD for “formal review” as a condition for SMUD starting any Interconnection Study efforts.
<b>Pre-Commercial Energy</b>	Energy delivered to SMUD from the Facility prior to the Commercial Operation Date. Sometimes referred to as test energy.
<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>Prudent Utility Practices</b>	Those practices, methods and acts that would be implemented and followed by prudent operators of electric energy generating facilities in the Western United States, similar to the Facility, during the relevant time period, which practices, methods and acts, in the exercise of prudent and responsible professional judgment in the light of the facts known at the time the decision was made, could reasonably have been expected to accomplish the desired result consistent with prudent business practices, reliability, and safety. Seller acknowledges that the

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use of Prudent Utility Practice by Seller does not exempt Seller from any obligations set forth in this Agreement.

Prudent Utility Practice includes, at a minimum, those professionally responsible practices, methods and acts described in the preceding paragraph that comply with manufacturers' warranties, restrictions in this Agreement, the interconnection requirements of SMUD, the requirements of governmental authorities, and WECC and NERC standards.

Prudent Utility Practice also includes taking reasonable steps in accordance with the first sentence of this definition to ensure that:

Equipment, materials, resources, and supplies, including spare parts inventories, are available to meet the Facility's needs;

Sufficient operating personnel are available at all times and are adequately experienced and trained and licensed as necessary to operate the Facility properly and efficiently, and are capable of responding to reasonably foreseeable Emergency conditions at the Facility and emergencies whether caused by events on or off the Facility site;

Preventive, routine, and non-routine maintenance and repairs are performed on a basis that ensures reliable, long-term and safe operation of the Facility, and are performed by knowledgeable, trained, and experienced personnel utilizing proper equipment and tools;

Appropriate monitoring and testing are performed to ensure equipment is functioning as designed;

Equipment is not operated in a reckless manner, in violation of manufacturer's guidelines or in a manner unsafe to workers, the general public, or the connecting utility's Electric System or contrary to environmental laws, permits or regulations or without regard to defined limitations such as, flood conditions, safety inspection requirements, operating voltage, current, volt ampere reactive (VAR) loading, frequency, rotational speed, polarity, synchronization, and control system limits; and equipment and components are designed and manufactured to meet or exceed the standard of durability that is generally used for solar photovoltaic electric energy generating facilities

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operating in the Western United States and will function properly over the full range of ambient temperature and weather conditions reasonably expected to occur at the Facility site and under both normal and Emergency conditions.

**Remote Terminal Unit (RTU)**

The device that interfaces between the Generating Facility and SMUD's system by transmitting telemetry data.

**Rule and Regulation 21**

Refers to requirements for distributed generation interconnection to the Distribution System as established by SMUD.

**Scheduled Commercial Operation Date**

The date when the Generating Facility is, by the Applicant's estimate, expected to begin commercial operation.

**Short Circuit Contribution Ratio (SCCR)**

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.

**Single Line Diagram; Single Line Drawing**

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.

**Site Aggregate**

Generating Facility(ies) on one parcel or one contiguous property defined under SMUD Campus Billing Policy.

**Site Layout**

The drawing showing the physical location of the Generating Facility components in relation to the SMUD Distribution System.

**Small Commercial**

Distributed Generation project with a gross site aggregate name plate AC rating less than 500kW.

**Smart Inverter**

A Generating Facility's inverter 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.

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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. SMUD provides electrical service in its defined service territory of Sacramento County and small portions of Placer and Yolo counties.
<b>SMUD Distribution System</b>	The wires, transformers, and related equipment owned and operated by SMUD, and used to deliver electric power to SMUD's retail customers, typically at 69kV and below.
<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>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. Energy storage qualifies for NEM only when paired with a NEM qualified generation source capable of fully charging the storage device over a typical day.
<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 remote control and telemetry used to monitor and control SMUD's Distribution System.
<b>Supplemental Review</b>	A process wherein SMUD further reviews an Application that fails one or more Initial Review Process screens. The Supplemental Review may result in one of the following: approval of Interconnection with additional requirements; or cost and schedule for an Interconnection Study.

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**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. System Emergency includes:

- (a) That in SMUD's or Seller'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 Seller, 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 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.

**Telemetry**

The electrical or electronic transmittal of Metering data in real-time to SMUD.

**Telemetry**

Continuous distributed generation data connected to SMUD's Energy Management System and/or SMUD's Advanced Distribution Management System (ADMS).

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<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. This meter is capable of separately recording power flow into, 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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## Net Energy 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 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 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 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

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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) or Commercial Distributed Generation-Engineering Specifications T015 (T015).

**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 or T015. 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.

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### 1.8. 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.

### 1.9. 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. However, SMUD must provide written notice when possible following such disconnection.

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. Upon Customer's written request, SMUD shall provide an explanation of the reason for such curtailment or disconnection. 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.

### 1.10. Transferability of Interconnection Request

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.

### 1.11. 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. Any Applicant dissatisfied with the reasonable effort by SMUD may use the procedures set out in the Dispute Resolution process in Section 10.

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## 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 6 – Interconnection Application Fees

*Table 1 – NEM Interconnection Application Fees*

Generation Facility Type	Initial Review	Supplemental Review	Interconnection Study
NEM 1.0	\$0	\$0	\$0
Study Path	Eligibility	Studies	Timelines
Fast Track	Residential <20kW, single phase Commercial <500kW	Initial Review (IR)	IR—10 Business Days
Standard Process	Residential >20kW, on a shared secondary Commercial >499kW Fuel cells	IR Supplemental Review (SR)	Residential IR & SR—10 Business Days Commercial IR & SR--20 Business Days
Non-Standard Process	Rotating Machinery Non-NEM generation for export 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.

SMUD performs an Initial Review and develops preliminary cost estimates and interconnection requirements.

### 2.1. Initial Review

Upon receipt of a completed Application, applicable fees as outlined in Section 2.5, Table 2 - Summary of NEM Facility Owner Interconnection Costs, and any additional

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information necessary to evaluate the Interconnection of a Generating Facility, SMUD shall perform an Initial Review using the process defined in Appendix A - NEM Initial Review Screening Process for Applications to Interconnect a Generating Facility. The Initial Review determines if

- the Generating Facility qualifies for Fast Track Interconnection,
- the Generating Facility requires a Supplemental Review, or
- the Generating Facility will require an Interconnection Study to determine 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 Fast Track Interconnection. If the Initial Review determines that the proposed facility can be interconnected by means of a Fast Track Interconnection, SMUD will provide the Applicant with a written description of the requirements for Interconnection.

## 2.3. Fast Track

Fast Track evaluation allows for rapid review of the Interconnection of those Generating Facilities that do not require an Interconnection Study. Fast Track 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 Fast Track evaluation, SMUD will notify Applicant that an Interconnection Study will be required. Fast Track, 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 - NEM Initial Review Screening Process for Applications to Interconnect a Generating Facility, for information regarding each Screen.

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## 2.4. Supplemental Review

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

## 2.5. 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 2 - Summary of NEM Facility Owner Interconnection Costs below.

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 2 - Summary of NEM Facility Owner Interconnection Costs*

Generation Facility Type (Site AC Aggregate)	NEM 1.0 1 ≤ 499kW	NEM 1.0 500kW ≤ 1MW	NEM 1.0 > 1MW	After 12/31/18 1 ≤ 499kW	After 12/31/18 500kW ≤ 1MW	After 12/31/18 > 1MW	Non- exporting standalone storage	Non- exporting Fuel Cell
Initial Review	No	No	No	Yes	Yes	Yes	Yes	Yes
Supplemental Review	No	No	No	No	No	Yes	No	Yes
Interconnection Study	No	No	No	No	No	No	No	Yes
Interconnection Facility Costs (Customer side)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Telemetry Costs	N/A	No	Yes	N/A	Yes	Yes	TBD	Yes
Distribution Upgrades Cost (Line side)	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Yes

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## 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.

## 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 Section 2.6.

## 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, 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 installing equipment or facilities (Interconnection Facilities) which allow the interconnection and operation of the Facility Owner’s Generator in parallel with

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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.

### **2.11. Ownership, O&M, 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 Prudent Utility Practices and then-current SMUD practices, unless when special conditions are negotiated with the Facility Owner.

### **2.12. Testing of Generating Facilities**

The Facility Owner is responsible for all testing of Generating Facilities and associated Interconnection Facilities, according to Section 9 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 installed 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 Interconnection Facilities Charge. Facility Owner shall pay this monthly Cost of Service Charge for the Interconnection Facilities which is based on the installed cost. 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.

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A monthly Interconnection Facilities Costs Payment, calculated as follows: \$5.40/\$1,000\* 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:

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

And:

In addition to the options above, a recurring charge will be paid to SMUD for reimbursement to maintain the EMS/ADMS SCADA and metering communication, an annual 2% escalation will be applied. This charge will be based on the number of Power Production Meters required for the Generating Facility.

**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**

The inverter requirements are intended to be consistent with ANSI/IEEE 147-2003 and 1547a Standard for Interconnecting Distributed Resources with Electric Power Systems (IEEE 1547 including amendment 1547a). In the event of conflict between these Interconnection Guidelines and IEEE 1547-2003, 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.

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### 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;
- 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. Smart Inverter Protective Functions Required

Smart 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 Smart Inverter to be automatically disconnected from SMUD's Distribution System or to prevent the Smart 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 Smart Inverter from energizing a de-energized Distribution System circuit and to prevent the Smart 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

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- 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 Smart 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 Smart Inverter shall cease to energize SMUD's Distribution System for faults on SMUD's Distribution System circuit to which it is connected (IEEE 1547-4.2.1). The Smart Inverter shall cease to energize SMUD's Distribution circuit prior to re-closure by SMUD's Distribution System equipment (IEEE 1547-4.2.2).

### 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 so that the failure of any one device shall not potentially compromise the safety and reliability of SMUD's Distribution System.

The Smart Inverter paralleling-device shall be capable of withstanding 220% of the Interconnection Facility rated voltage (IEEE 1547-4.1.8.3). The Interconnection Facility shall have the capability to withstand voltage and current surges in accordance with the environments defined in IEEE Std C62.41.2-2002 or IEEE Std C37.90.1-2002 as applicable and as described in L.3.e (IEEE 1547-4.1.8.2).

### 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

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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:
  - 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 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 Gross 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

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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 particular Generating Facility, SMUD and the Facility Owner may agree upon other requirements.

## 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 Smart Inverter may actively regulate the voltage at the PCC while in parallel with SMUD's Distribution System. The Smart Inverter shall not cause the service voltage at other customers to go outside the requirements of ANSI C84.1-1995, Range A (IEEE 1547-4.1.1).

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

The voltage ranges in Table 3 - Smart Inverter Voltage Trip 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 on all phases to which the Generating Facility is connected.

- i. Smart Inverters. Smart 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

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- tripping in accordance with Table 4 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 4, the Smart Inverter's Protective Functions shall cause the Smart Inverter(s) to become isolated from SMUD's Distribution System:
- The Smart 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.
  - For voltage excursions beyond the near nominal (NN) magnitude range and within the range of the HV1 or LV3 regions, the Smart Inverter shall momentarily cease to energize within 0.16 seconds.
  - In the HV1 region, the Smart Inverter is permitted to reduce power output as a function of voltage under mutual agreement between the Facility Owner and SMUD.
  - If SMUD's Distribution System voltage does not exit the ride-through region and recovers to normal system voltage, the Smart Inverter shall restore continuous operation within 2 seconds.
  - 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 Smart Inverter shall restore available current within 2 seconds.
  - Different voltage-time settings could be permitted by SMUD.

*Table 3 - Smart Inverter Voltage Trip Settings*

Region	Voltage at PCC (% Nominal Voltage)	Ride-Through Until	Operating Mode	Maximum Trip time
High Voltage 2 (HV2)	$V \geq 120\%$			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	11 sec
Low Voltage 3 (LV3)	$V < 50\%$	1 sec	Momentary Cessation	1.5 sec

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### 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 1547-4.1.3)

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 1547-4.3.2), 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 519-1992, Institute of Electrical and Electronic Engineers). 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 1547-4.1.2) (See Appendix B, Screen 8, line configuration).

### 3.2.5. Frequency

SMUD controls system frequency, and the Generating Facility shall operate in synchronism with the Distribution System. Generating Facilities with a Gross Nameplate Rating of 11 kVA or less shall have a fixed operating frequency range of 59.3-60.5 Hertz. 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 should Distribution System remain outside of the frequency limits or stated maximum trip time (see Table 4 - Smart Inverter Frequency Trip Settings). The purpose of the time delay is to allow the Generating Facility to ride through short-term disturbances to avoid nuisance tripping. SMUD may require adjustable operating frequency settings for Generating Facilities with a Gross Nameplate Rating greater than 11 kVA.

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### 3.2.6. Frequency Ride-Through Requirements for Smart 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 4 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 4 - Smart Inverter Frequency Trip Settings. These values provide default interconnection system response to abnormal frequencies. The inverter shall disconnect by the default clearing times. In the high frequency range between 60.2 Hz and 61.5 Hz, or some other mutually agreed range, the Smart 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.

*Table 4 - Smart Inverter Frequency Trip Settings*

System Frequency Default Settings (Hz)	Minimum Range of Adjustment (Hz)	Ride-Through Until	Ride-Through Operational Mode	Maximum Trip Time
$f > 62$	62 - 64	No Ride Through	Not Applicable	0.16 sec
$60.5 < f \leq 62$	60.1 - 62	299 sec	Mandatory Operation	300 sec
$58.5 \leq f \leq 60.5$	Not Applicable	Indefinite	Continuous Operation	Not Applicable
$57.0 \leq f < 58.5$	57 - 59.9	299 sec	Mandatory Operation	300 sec
$f < 57.0$	53 - 57	No Ride Through	Not Applicable	0.16 sec

### 3.2.7. Harmonics

Harmonic distortion shall be in compliance with IEEE 519. Exception: 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.

When the Smart 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 5. The harmonic current injections shall be exclusive of any harmonic currents due to harmonic voltage distortion present in SMUD's Distribution System without the Smart Inverter connected (IEEE 1547-4.3.3.). The harmonic distortion of a Smart Inverter shall be evaluated using the same criteria as for the Host Loads.

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*Table 5 - Maximum Harmonic Current Distortion in Percent of Current (I) [1,2]*

Individual harmonic order, h						Total demand distortion
(odd harmonics) [3]	$h < 11$	$11 \leq h < 17$	$17 \leq h < 23$	$23 \leq h < 35$	$35 \leq h$	
Max Distortion (%)	4.0	2.0	1.5	0.6	0.3	5.0
[1] - IEEE 1547-4.3.3						
[2] - I = the greater of the maximum Host load current average demand over 15 or 30 minutes without the 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 25% of the odd harmonic limits 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 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.

### 3.2.10. Smart Inverter Power Factor Requirements

Facility Owner shall provide adequate reactive power compensation on site to maintain the Smart 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.

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### 3.2.11. Dynamic Volt/VAR Operations.

The Smart 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 ( $\leq 15$  kW), down to 20% of rated power, based on available reactive power. This dynamic Volt/VAR capability shall be able to be activated or deactivated in accordance with SMUD requirements. SMUD may permit or require the Smart 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.

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

- The Smart Inverter shall not cause the line voltage at the point of common coupling to go outside the requirements of the latest version of ANSI C84.1, Range A.
- The Smart Inverter shall be able to consume reactive power in response to an increase in line voltage and produce reactive power in response to a decrease in line voltage.
- 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.

### 3.2.12. Ramp Rate Requirements

The Smart 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 Smart 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 for Phase 1 Functions

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

- Anti-islanding – activated
- Low/High Voltage Ride-Through – activated
- Low/High Frequency Ride-Through – activated
- Dynamic Volt/VAR operations – deactivated
- Ramp rates – activated
- Fixed power factor – activated
- Reconnect by “soft-start” methods – activated

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

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

The voltage and frequency ride-through requirements of 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 Smart Inverters connected to the Generation Facility prior to any voltage disturbance, and the Generation Facility disconnects from SMUD’s Distribution system, along with Generation Facility load, such that the net change in real power flow from or to SMUD is less than 10% of the aggregate Smart Inverter capacity; or b) Generation Facility load real power demand equal to 90% to 120% of the pre-disturbance aggregate Smart Inverter real power output is shed within 0.1 seconds of Smart 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.

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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 ferroresonance. 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.

### 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 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

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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 Smart Inverter Requirements

#### 3.4.1. Fault Detection

A Smart Inverter 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 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

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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.

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 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.

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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. Such approval shall not be unreasonable 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.

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

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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.

**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. The parties expressly agree that the Facility Owner's charges and payments for Interconnection Facilities under this Agreement represent the additional cost associated with the Interconnection Facilities and are not to be construed as guarantying any level of service or reliability.

**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.

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### 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 2 - Summary of NEM 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.

#### 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 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

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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 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.

The requirements in this section apply to Metering of Generating Facilities with a site aggregate of 500 kW or greater (Gross AC Nameplate Rating).

### 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

Except for NEM Generating Facilities of less than 500kW, 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.

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#### 8.4. Telemetering

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

#### 8.5. Cost of Telemetering

See Table 2 - Summary of NEM 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 Telemetering equipment. Customer switchgear installed to accommodate SMUD meters shall be EUSERC-compliant. Facility Owner shall receive SMUD approval of the switchgear design.

### 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 SA and IEEE 1547.

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 SA 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 (<http://www.gosolarcalifornia.ca.gov/equipment/inverters.php>).

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### 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, 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.

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.

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#### 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 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.

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## 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 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) 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 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 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 Care. Protests must be received by the Director, Customer Care 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.

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## 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 Care by email, overnight courier, certified mail, or personal delivery:

Sacramento Municipal Utility District  
 Director, Customer Care  
 Re: Protest Under Interconnection Guidelines  
 6301 S Street, MS A151  
 Sacramento, CA 95817

Or by email to [InterconnectionPM@smud.org](mailto:InterconnectionPM@smud.org)

### 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 Care 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 Care 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 Care may also meet informally with a protesting party to better understand the claim or attempt to resolve the protest.

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#### 10.4.4. Communication of Decision

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

The Director, Customer Care's 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 Care's 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 Care's 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:

Sacramento Municipal Utility District  
 CEO and GM  
 Re: Appeal of the Director, Customer Care Decision  
 6301 S Street, MS A312  
 Sacramento, CA 95817  
 Email: CorpFiles@smud.org

Sacramento Municipal Utility District  
 Office of the General Counsel  
 Re: Appeal of the Director, Customer Care Decision  
 6301 S Street, MS A311  
 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.

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### 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 Care's decision, the documentation reviewed by the Director, Customer Care 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.

## 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

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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.

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## Non-Net Energy 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 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 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 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. Interconnection with SMUD’s Distribution System under these Interconnection Guidelines does, at SMUD’s discretion, provide SMUD the right to use the Interconnection Facility and in some cases the Generator or its auxiliary equipment for grid reliability.

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**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) or Commercial Distributed Generation-Engineering Specifications T015 (T015).

**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 or T015. 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

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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 Prudent Utility 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. However, SMUD must provide written notice when possible following such disconnection.

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. Upon customer's written request, SMUD shall provide an explanation of the reason for such curtailment or disconnection. 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.

### 1.10. Curtailment and Dispatchability

Generating Facilities with a Site Aggregate of 500 kW (Gross AC Nameplate Rating) or greater will have necessary telemetry and other mechanisms and controls, as specified by SMUD, to be controlled by SMUD's Energy Management System (EMS) or Advanced Distribution Management System (ADMS). SMUD EMS Control of generator may be in support of SMUD participation in energy markets.

### 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

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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. Any Applicant dissatisfied with the reasonable effort by SMUD may use the Dispute Resolution process in Section 10.

## 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 6 – Interconnection Application Fees

*Table 6 – Interconnection Application Fees*

Generation Facility Type	Initial Review	Supplemental Review	Interconnection Study
Non-NEM	\$800	\$2,500 (no size limit)	\$10,000
Study Path	Eligibility	Studies	Timelines
Standard Process	Commercial >499kW Fuel cells	Initial Review (IR) Supplemental Review (SR)	IR & SR—20 Business Days
Non-Standard Process	Rotating Machinery Non-NEM generation for export 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

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reject any Application that does not address identified deficiencies within a reasonable time period.

SMUD performs an Initial Review and develops preliminary cost estimates and interconnection requirements.

### 2.1. Initial Review

Upon receipt of a completed Application, applicable fees as outlined in Section 2.4 - 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.

### 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 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.

### 2.3. 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 a draft Interconnection Agreement, 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

### 2.4. 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

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reliable operation of the Distribution System. See Table 7 – 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 7 – Summary of Facility Owner Interconnection Costs*

Generation 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
Telemetry Costs	Yes	Yes	Yes
Distribution Upgrades Cost (Line Side)	Yes	Yes	Yes

**2.5. 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 2.6.

**2.6. 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

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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.

**2.7. Upon Execution of Agreements**

After executing the Interconnection Agreement, 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.

**2.8. Interconnection Facilities Cost Payment**

The Facility Owner will be required to pay SMUD’s estimated costs (including loadings) prior to SMUD 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.

**2.9. 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 Prudent Utility Practices and then-current SMUD practices, unless otherwise negotiated in the Interconnection Agreement.

**2.10. Testing of Generating Facilities**

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

**2.11. 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

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any required inspections or tests as described herein or in the agreements formed between the Facility Owner and SMUD.

### 2.12. 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. Facility Owner shall pay this monthly Cost of Service Charge for the Interconnection Facilities which is based on the installed cost. 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.

### 2.13. 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:  $\$5.40/\$1,000$  \* 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:

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

And:

In addition to the options above, a recurring charge will be paid to SMUD for reimbursement to maintain the EMS/ADMS SCADA and metering communication, an annual 2% escalation will be applied. This charge will be based on the number of Power Production Meters required for the Generating Facility.

### 2.14. 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

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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

The inverter requirements are intended to be consistent with ANSI/IEEE 1547-2018 and 1547a Standard for Interconnecting Distributed Resources with Electric Power Systems (IEEE 1547 including amendment 1547a). In the event of conflict between these Interconnection Guidelines and IEEE 1547-2018, 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;
- 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

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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. Smart Inverter Protective Functions Required

Smart 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 Smart Inverter to be automatically disconnected from SMUD's Distribution System or to prevent the Smart 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 Smart Inverter from energizing a de-energized Distribution System circuit and to prevent the Smart 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 Smart 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 Smart Inverter shall cease to energize SMUD's Distribution System for faults on SMUD's Distribution System circuit to which it is connected (IEEE 1547-4.2.1). The Smart Inverter shall cease to energize SMUD's Distribution circuit prior to re-closure by SMUD's Distribution System equipment (IEEE 1547-4.2.2).

### 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.

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### 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 Smart Inverter paralleling-device shall be capable of withstanding 220% of the Interconnection Facility rated voltage (IEEE 1547-4.1.8.3). The Interconnection Facility shall have the capability to withstand voltage and current surges in accordance with the environments defined in IEEE Std C62.41.2-2002 or IEEE Std C37.90.1-2002 as applicable and as described in L.3.e (IEEE 1547-4.1.8.2).

### 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:
  - 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

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- 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.

## 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.

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### 3.2.1. Voltage Regulation

If approved by SMUD, the Smart Inverter may actively regulate the voltage at the PCC while in parallel with SMUD's Distribution System. The Smart Inverter shall not cause the service voltage at other customers' PCC's to go outside the requirements of ANSI C84.1-1995, Range A (IEEE 1547-4.1.1).

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

The voltage ranges in Table 3 - Smart Inverter Voltage Trip 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.

- i. Smart Inverters. Smart 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 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 4, the Smart Inverter's Protective Functions shall cause the Smart Inverter(s) to become isolated from SMUD's Distribution System:
  - a. The Smart 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 Smart Inverter shall momentarily cease to energize within 0.16 seconds.

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- c. In the HV1 region, the Smart 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 Smart 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 Smart Inverter shall restore available current within 2 seconds.
- f. Different voltage-time settings could be permitted by SMUD.

*Table 8 - Smart Inverter Voltage Trip Settings*

Region	Voltage at PCC (% Nominal Voltage)	Ride-Through Until	Operating Mode	Maximum Trip time
High Voltage 2 (HV2)	$V \geq 120\%$			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	11 sec
Low Voltage 3 (LV3)	$V < 50\%$	1 sec	Momentary Cessation	1.5 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 1547-4.3.2), 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 519-1992, Institute of Electrical and Electronic Engineers). 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.

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### 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 1547-4.1.2) (See Appendix A, Screen 8, line configuration).

### 3.2.5. Frequency

SMUD controls system frequency, and the Generating Facility shall operate in synchronism with the Distribution System. Generating Facilities with a Gross Nameplate Rating of 11 kVA or less shall have a fixed operating frequency range of 59.3-60.5 Hertz. 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 should Distribution System remain outside of the frequency limits or stated maximum trip time (see Table 4 - Smart Inverter Frequency Trip Settings). The purpose of the time delay is to allow the Generating Facility to ride through short-term disturbances to avoid nuisance tripping. SMUD may require adjustable operating frequency settings for Generating Facilities with a Gross Nameplate Rating greater than 11 kVA.

### 3.2.6. Frequency Ride-Through Requirements for Smart 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 9 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 9 - Smart Inverter Frequency Trip Settings. These values provide default interconnection system response to abnormal frequencies. The inverter shall disconnect by the default clearing times. In the high frequency range between 60.2 Hz and 61.5 Hz, or some other mutually agreed range, the Smart 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.

*Table 9 - Smart Inverter Frequency Trip Settings*

System Frequency Default Settings (Hz)	Minimum Range of Adjustment (Hz)	Ride-Through Until	Ride-Through Operational Mode	Maximum Trip Time
$f > 62$	62 - 64	No Ride Through	Not Applicable	0.16 sec
$60.5 < f \leq 62$	60.1 - 62	299 sec	Mandatory Operation	300 sec
$58.5 \leq f \leq 60.5$	Not Applicable	Indefinite	Continuous Operation	Not Applicable
$57.0 \leq f < 58.5$	57 - 59.9	299 sec	Mandatory Operation	300 sec
$f < 57.0$	53 - 57	No Ride Through	Not Applicable	0.16 sec
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### 3.2.7. Harmonics

Harmonic distortion shall be in compliance with IEEE 519. Exception: 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.

When the Smart 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 10. The harmonic current injections shall be exclusive of any harmonic currents due to harmonic voltage distortion present in SMUD's Distribution System without the Smart Inverter connected (IEEE 1547-4.3.3.). The harmonic distortion of a Smart Inverter shall be evaluated using the same criteria as for the Host Loads.

*Table 10 - Maximum Harmonic Current Distortion in Percent of Current (I) [1,2]*

Individual harmonic order, h						Total demand distortion
(Odd harmonics) [3]	$h < 11$	$11 \leq h < 17$	$17 \leq h < 23$	$23 \leq h < 35$	$35 \leq h$	
Max Distortion (%)	4.0	2.0	1.5	0.6	0.3	5.0
[1] - IEEE 1547-4.3.3						
[2] - I = the greater of the maximum Host load current average demand over 15 or 30 minutes without the 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 25% of the odd harmonic limits 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.

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### 3.2.10. Smart Inverter Power Factor Requirements

Facility Owner shall provide adequate reactive power compensation on site to maintain the Smart 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.

### 3.2.11. Dynamic Volt/VAR Operations

The Smart 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 ( $\leq$ 15 kW), down to 20% of rated power, based on available reactive power. This dynamic Volt/VAR capability shall be able to be activated or deactivated in accordance with SMUD requirements. SMUD may permit or require the Smart 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.

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

- The Smart Inverter shall not cause the line voltage at the point of common coupling to go outside the requirements of the latest version of ANSI C84.1, Range A.
- The Smart Inverter shall be able to consume reactive power in response to an increase in line voltage and produce reactive power in response to a decrease in line voltage.
- 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.

### 3.2.12. Ramp Rate Requirements

The Smart Inverter is required to have the following ramp controls for at least the following two conditions. These functions can be established by multiple control

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functions or by one general ramp rate control function. Ramp rates are contingent upon sufficient energy available from the Smart 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.

### 3.2.13. Default Activation States for Phase 1 Functions

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

- Anti-islanding – activated
- Low/High Voltage Ride-Through – activated
- Low/High Frequency Ride-Through – activated
- Dynamic Volt/VAR operations – deactivated
- Ramp rates – activated
- Fixed power factor – activated
- Reconnect by “soft-start” methods – activated

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

### 3.2.14. 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 Smart Inverters connected to the Generation Facility prior to any voltage disturbance, and the Generation Facility disconnects from SMUD’s Distribution system, along with Generation Facility load, such that the net change in real power flow from or to SMUD is less than 10% of the aggregate Smart Inverter capacity; or b) Generation Facility load real power demand equal to 90% to 120% of the pre-disturbance aggregate Smart Inverter real power output is shed within 0.1 seconds of Smart Inverter disconnection.

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### 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 ferroresonance. 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.

#### 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.

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### 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 Smart Inverter Requirements

#### 3.4.1. Fault Detection

A Smart Inverter 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 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.

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#### 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.

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

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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 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. Such approval shall not be unreasonable 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. 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

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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 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.

#### **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

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Distribution System, as further specified in Section 2. The parties expressly agree that the Facility Owner's charges and payments for Interconnection Facilities under this Agreement represent the additional cost associated with the Interconnection Facilities and are not to be construed as guarantying any level of service or reliability.

### 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 7 – 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.

### 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 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 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

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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 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.

The requirements in this section apply to Metering of Generating Facilities with a site aggregate of 500 kW or greater (Gross AC Nameplate Rating).

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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 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 which is 500 kW or greater (Gross AC Nameplate Rating), individually or site aggregate. 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 7 – 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 accommodate SMUD meters shall be EUSERC-compliant. Facility Owner shall receive SMUD approval of the switchgear design.

# 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),

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Institute of Electrical and Electronic Engineers (IEEE), and International Electrotechnical Commission (IEC) documents—most notably UL 1741 SA and IEEE 1547.

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 SA 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 (<http://www.gosolarcalifornia.ca.gov/equipment/inverters.php>).

### 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, 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.

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

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- 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 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

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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 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,

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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) 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 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 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 Care. Protests must be received by the Director, Customer Care 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 Care by email, overnight courier, certified mail, or personal delivery:

Sacramento Municipal Utility District  
 Director, Customer Care  
 Re: Protest Under Interconnection Guidelines  
 6301 S Street, MS A151  
 Sacramento, CA 95817

Or by email to [InterconnectionPM@smud.org](mailto:InterconnectionPM@smud.org)

**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

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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 Care 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 Care 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 Care 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 Care is empowered to: i) deny the protest on either procedural or substantive grounds, or ii) grant the protest. The Director, Customer Care’s 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 Care’s 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 Care’s 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:

Sacramento Municipal Utility District  
 CEO and GM  
 Re: Appeal of the Director, Customer Care Decision  
 6301 S Street, MS A312  
 Sacramento, CA 95817

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Email: CorpFiles@smud.org

Sacramento Municipal Utility District  
Office of the General Counsel  
Re: Appeal of the Director, Customer Care Decision  
6301 S Street, MS A311  
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 Care’s decision, the documentation reviewed by the Director, Customer Care 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.

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

### A. 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.

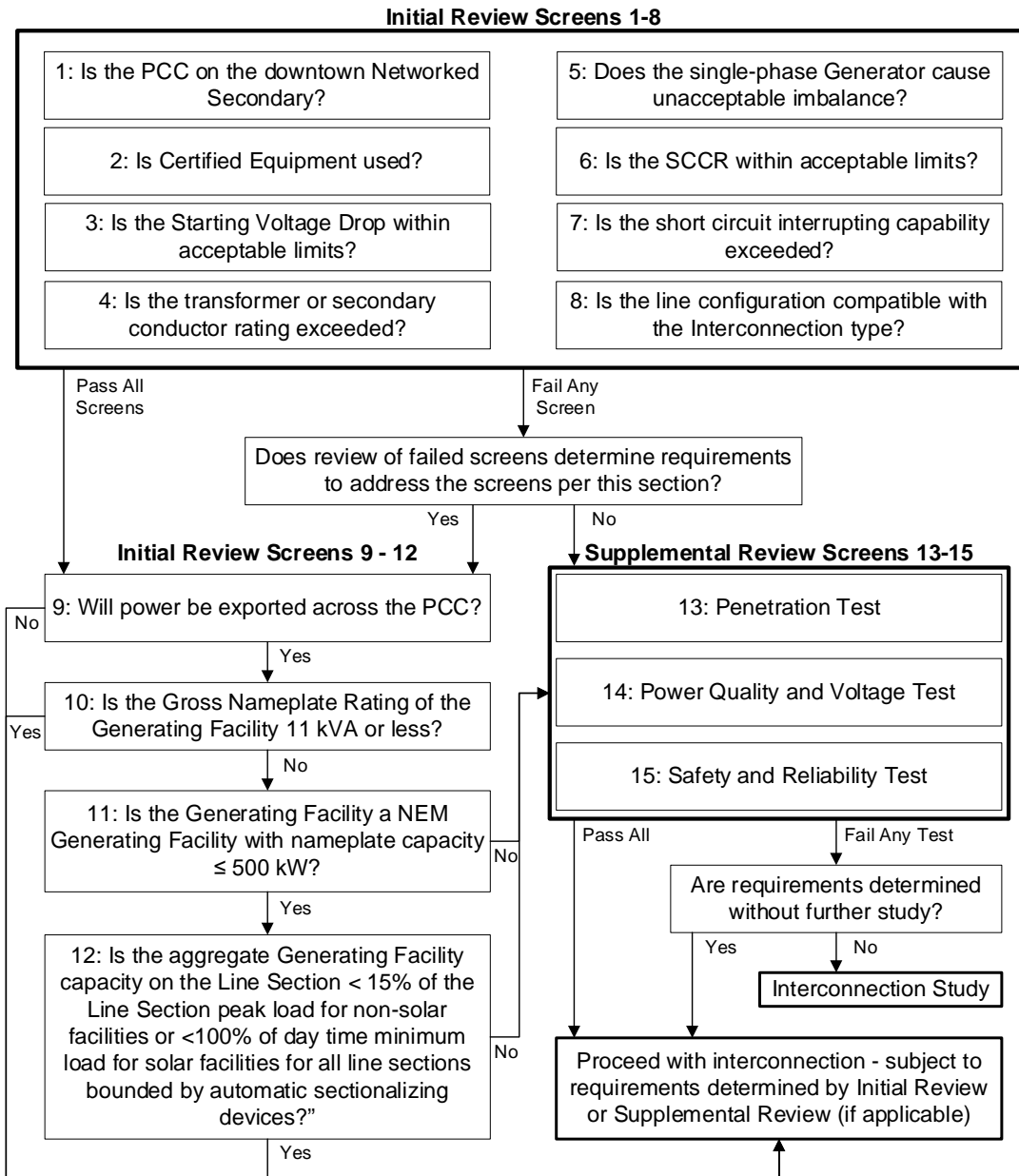
### B. Purpose

The Initial Review determines:

- If a Generating Facility qualifies for Fast Track 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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**C. Engineering Review Details**
*Figure 1 - Technical Review Process*


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#### D. 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 actually 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 0

Testing and Certification Criteria Section 9 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.

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

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.

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**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?

- 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 3 - Smart Inverter Voltage Trip Settings if the proposed Generating Facility passes the screen.

*Figure 2 – Type of Interconnection*

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.

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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.

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.

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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).
3. This screen allows, under certain defined conditions, for Generating Facilities that incorporate Certified Non-Islanding protection to qualify for interconnection through the Fast Track 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 NEM 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 NEM 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.

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**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.

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?

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- 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 NEM Generating 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.

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?

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- 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:

- Generating Facility energy source
- Modes of synchronization
- Unique system topology
- Possible impacts to critical load customers
- 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:

- Does the Line Section have significant minimum loading levels dominated by a small number of customers (i.e. several large commercial customers)?
- Is there an even or uneven distribution of loading along the feeder?
- 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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- 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.

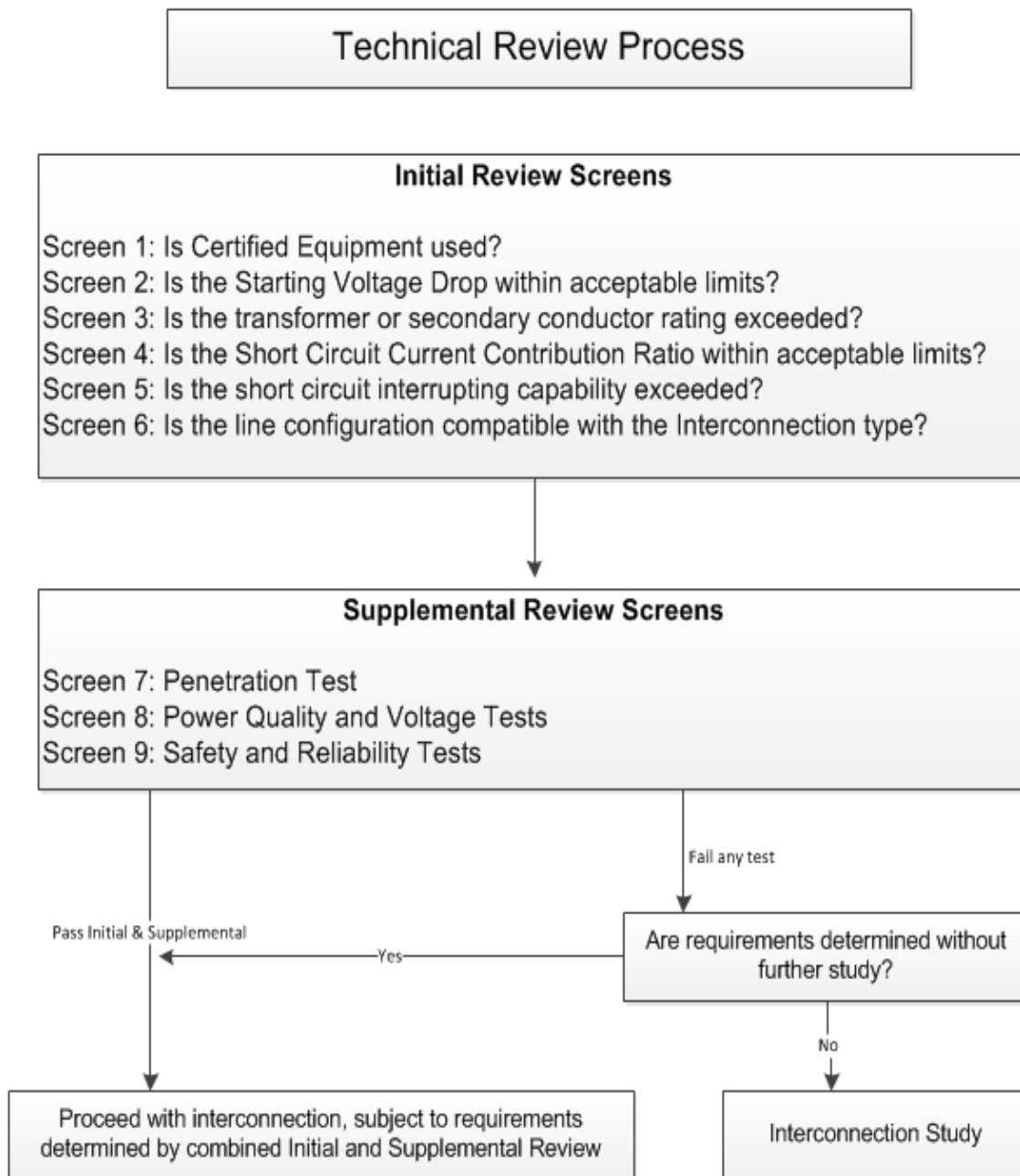
**Purpose**

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 6.1 Technical Review Process



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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?

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

**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 from Table 8-1 if the proposed Generating Facility passes the screen.

*Table 8-1 Type of Interconnection*

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.

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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.

### 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.

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**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?
- 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)?

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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)?
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 estimated of the cost of the Interconnection Study is prepared. The Interconnection Study involves computer simulation of the proposed Generation 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).

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