Rule 21 Sheet 10 (T)
GENERATING FACILITY INTERCONNECTIONS

(Continued)

D. Generating Facility Design and Operating Requirements. (Continued)

2. Prevention of Interference: The Producer shall not operate Generating or Interconnection Facilities that superimpose a voltage or current upon SCE's Distribution System that interferes with SCE operations, service to SCE Customers, or communication facilities. If such interference occurs, the Producer must diligently pursue and take corrective action at its own expense after being given notice and reasonable time to do so by SCE. If the Producer does not take corrective action in a timely manner, or continues to operate the facilities causing interference without restriction or limit, SCE may, without liability, disconnect the Producer's facilities from SCE's Distribution System, in accordance with Section B.9 of this Rule. To eliminate undesirable interference caused by its operation, each Generating Facility shall meet the following criteria:

a. Voltage Regulation. The GF shall not actively regulate the voltage at the PCC while in parallel with SCE's Distribution System. The GF 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).

b. Operating Voltage Range: The voltage ranges in Table D.1 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 SCE'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.

(1) Generating Facilities (30 kVA or less): Generating Facilities with a Gross Nameplate Rating of 30 kVA or less shall be capable of operating within the voltage range normally experienced on SCE's Distribution System. The operating range shall be selected in a manner that minimizes nuisance tripping between 106 volts and 132 volts on a 120-volt base (88%-110% of nominal voltage). Voltage shall be detected at either the PCC or the Point of Interconnection.

(2) Generating Facilities (greater than 30 kVA): SCE may have specific operating voltage ranges for Generating Facilities with Gross Nameplate Ratings greater than 30 kVA, and may require adjustable operating voltage settings. In the absence of such requirements, the Generating Facility shall operate at a range between 88% and 110% of the applicable interconnection voltage. Voltage shall be detected at either the PCC or the Point of Interconnection, with settings compensated to account for the voltage at the PCC. Generating Facilities that are Certified Non-Islanding or that meet one of the options of the Export Screen (Section I.3.b) may detect voltage at the Point of Interconnection without compensation.

(3) Voltage Disturbances: Whenever SCE's Distribution System voltage at the PCC varies from and remains outside normal (Nominally 120 volts) for the predetermined parameters set forth in Table D-1, the Generating Facility's Protective Functions shall cause the Generator (s) to become isolated from SCE's Distribution System:

(Continued)

(Continued)

D. Generating Facility Design and Operating Requirements. (Continued)

2. Prevention of interference. (Continued)

b. Operating Voltage Range (Continued)

Table D.1 – Voltage Trip Settings

Voltage at Point of Common Coupling		Maximum Trip Time*	
(Assuming 120V base)	% of Normal Voltage	# of Cycles (Assuming 60Hz Nominal)	Seconds
Less than 60 Volts	Less than 50%	10 Cycles	0.16 Seconds
Greater than or equal to 60 volts but less than 106 Volts	Greater than or equal to 50% but less than 88%	120 Cycles	2 Seconds
Greater than or equal to 106 volts but less than 132 Volts	Greater than or equal to 88% but less than or equal to 110%	Normal Operation	
Greater than 132 Volts but less than or equal to 144 Volts	Greater than 110% but less than or equal to 120%	60 Cycles	1 Second
Greater than 144 Volts	Greater than 120%	10 Cycles	0.16 Seconds

* *"Maximum Trip time" refers to the time between the onset of the abnormal condition and the Generating Facility ceasing to energize SCE's Distribution System. Protective Function sensing devices and circuits may remain connected to SCE's Distribution System to allow sensing of electrical conditions for use by the "reconnect" feature. The purpose of the allowed time delay is to allow a Generating Facility to "ride through" short-term disturbances to avoid nuisance tripping. Set points shall not be user adjustable (though they may be field adjustable by qualified personnel) For Generating Facilities with a Gross Nameplate Rating greater than 30 kVA, set points shall be field adjustable and different voltage set points and trip times from those in Table D.1 may be negotiated with SCE.*

c. Paralleling: The Generating Facility shall parallel with SCE's Distribution System without causing a voltage fluctuation at the PCC greater than plus/minus 5% of the prevailing voltage level of SCE's Distribution System at the PCC, and meet the flicker requirements of Section D.2.d. Section J provides technology-specific tests for evaluating the paralleling Function. (IEEE 1547-4.1.3)

d. Flicker: The Generating Facility shall not create objectionable flicker for other customers on SCE's Distribution System. To minimize the adverse voltage effects experienced by other customers (IEEE 1547-4.3.2), 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 519-1992 (IEEE Recommended Practices and Requirements for Harmonic Control in Electric Power Systems, IEEE STD 519-1992). This requirement is necessary to minimize the adverse voltage affects experienced by other Customers on SCE's Distribution System. Generators may be connected and brought up to synchronous speed (as an induction motor) provided these flicker limits are not exceeded.

e. Integration with SCE's Distribution System Grounding: The grounding scheme of the Generating Facility interconnection shall not cause over-voltages that exceed the rating of the equipment connected to SCE's Distribution System and shall not disrupt the coordination of the ground fault protection on SCE's Distribution System (IEEE 1547-4.1.2) (See Section I.3.h).

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D. Generating Facility Design and Operating Requirements (Continued)

2. Prevention of interference. (Continued)

f. Frequency: SCE controls system frequency, and the Generating Facility shall operate in synchronism with SCE's Distribution System. Whenever SCE's Distribution System frequency at the PCC varies from and remains outside normal (nominally 60 Hz) by the predetermined amounts set forth in Table D.2, the Generating Facility's Protective Functions shall cease to energize SCE's Distribution System within the stated maximum trip time.

Table D.2: Frequency Trip Settings

Generating Facility Rating	Frequency Range (Assuming 60Hz Nominal)	Maximum Trip Time *[1]* (Assuming 60 Cycles per Second)
Less or equal to 30kW	Less than 59.3 Hz	10 Cycles
	Greater than 60.5 Hz	10 Cycles
Greater than 30 kW	Less than 57.0 Hz	10 Cycles
	Less than an adjustable value between 59.8 Hz and 57 Hz but greater than 57 Hz. *[2]*	Adjustable between 10 and 18,000 Cycles. *[2, 3]*
	Greater than 60.5 Hz.	10 Cycles

[1] – "Maximum Trip time" refers to the time between the onset of the abnormal condition and the Generating Facility ceasing to energize SCE's Distribution System. Protective Function sensing equipment and circuits may remain connected to SCE's Distribution System to allow sensing of electrical conditions for use by the "reconnect" feature. The purpose of the allowed time delay is to allow a Generating Facility to "ride through" short-term disturbances to avoid nuisance tripping. Set points shall not be user adjustable (though they may be field adjustable by qualified personnel). For Generating Facilities with a Gross Nameplate Rating greater than 30 kVA, set points shall be field adjustable and different voltage set points and trip times from those in Table D.2 may be negotiated with SCE.

[2] – Unless otherwise required by SCE, a trip frequency of 59.3 Hz and a maximum trip time of 10 cycles shall be used.

[3] – When a 10 cycle Maximum trip time is used, a second under frequency trip setting is not required.

g. Harmonics: When the Generating Facility is serving balanced linear loads, harmonic current injection into SCE's Distribution System at the PCC shall not exceed the limits stated below in Table D.3. The harmonic current injections shall be exclusive of any harmonic currents due to harmonic coltage distortion present in SCE's Distribution System without the Generating Facility connected (IEEE 1547-4.3.3.). The harmonic distortion of a Generating Facility located at a Customer's site shall be evaluated using the same criteria as for the Host Loads.

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Rule 21 Sheet 13 (T)
GENERATING FACILITY INTERCONNECTIONS

(Continued)

D. Generating Facility Design and Operating Requirements (Continued)

2. Prevention of interference. (Continued)

Table D.3: Maximum harmonic current distortion in percent of current (I) *[1,2]*

Individual harmonic order, h (odd harmonics) *[3]*	h<11	11≤ h<17	17≤ h<23	23≤ h<35	35≤ h	Total demand distortion
Max Distortion (%)	4.0	2.0	1.5	0.6	0.3	5.0

[1] – IEEE1547-4.3.3
[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.

h. Direct Current Injection: Generating Facilities should not inject direct current greater than 0.5% of rated output current into SCE's Distribution System.

i. Power Factor: Each Generator in a Generating Facility shall be capable of operating at some point within a power factor range from 0.9 leading to 0.9 lagging. Operation outside this range is acceptable provided the reactive power of the Generating Facility is used to meet the reactive power needs of the Host Loads or that reactive power is otherwise provided under tariff by SCE. The `Producer shall notify SCE if it is using the Generating Facility for power factor correction. Unless otherwise agreed upon by the Producer and SCE, Generating Facilities shall automatically regulate power factor, not voltage, while operating in parallel with SCE's Distribution System.

3. Technology Specific Requirements

a. Technology Specific Requirements

Three-Phase Synchronous Generators: For three phase Generators, the Generating Facility circuit breakers shall be three-phase devices with electronic or electromechanical control. The Producer shall be responsible for properly synchronizing its Generating Facility with SCE's Distribution System by means of either manual or automatic synchronous equipment. Automatic synchronizing is required for all synchronous Generators that have a Short Circuit Contribution Ratio (SCCR) exceeding 0.05. Loss of synchronism protection is not required except as may be necessary to meet Section D.2.d (Flicker) (IEEE1547-4.2.5). Unless otherwise agreed upon by the Producer and SCE, synchronous Generators shall automatically regulate power factor, not voltage, while operating in parallel with SCE's Distribution System. A power system stabilization Function is specifically not required for Generating Facilities under 10 MW Net Nameplate Rating.

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(Continued)

D. Generating Facility Design and Operating Requirements (Continued)

3. Technology Specific Requirements (Continued)

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

c. Inverters: Utility-interactive inverters do not require separate synchronizing equipment. Non-utility-interactive or "stand-alone" inverters shall not be used for Parallel Operation with SCE's Distribution System.

d. Single-Phase Generators: For single-phase Generators connected to a shared single-phase secondary system, the maximum Net Nameplate Rating of the Generating Facilities shall be 20 kVA. Generators connected to a center-tapped neutral 240-volt service must be installed such that no more than 6 kVA of imbalanced power is applied to the two "legs" of the 240-volt service. For Dedicated Distribution Transformer services, the maximum Net Nameplate Rating of a single-phase Generating Facility shall be the transformer nameplate rating.

4. Supplemental Generating Facility Requirements

a. Fault Detection: A Generating Facility with an SCCR exceeding 0.1 or one that does not cease to energize SCE's Distribution System within two 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 SCE's Distribution System within two seconds of the initiation of a fault.

b. 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 SCE's Distribution System within two seconds, SCE may require a Transfer Trip system or an equivalent Protective Function.

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

(Continued)

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E. Interconnection Facility and Distribution System Modification, Ownership and Financing

1. Scope and Ownership of Interconnection Facilities and Distribution System Modifications

a. Scope: Parallel Operation of Generating Facilities may require Interconnection Facilities or modifications to SCE's Distribution System ("Distribution System modifications"). The type, extent and costs of Interconnection Facilities and Distribution System modifications shall be consistent with this Rule and determined through the Supplemental Review and/or Interconnection Study described in Section C.

b. Ownership: Interconnection Facilities installed on Producer's side of the PCC may be owned, operated and maintained by the Producer or SCE. Interconnection Facilities installed on SCE's side of the PCC and Distribution System modifications shall be owned, operated, and maintained only by SCE.

2. Responsibility of Costs of Interconnecting a Generating Facility

a. Review, Study, and Additional Commissioning Test Verification Costs: A Producer shall be responsible for the reasonably incurred costs of the reviews, studies and additional Commissioning Test verifications conducted pursuant to Section C.1 of this Rule. If the initial Commissioning Test verification is not successful through no fault of SCE, SCE may impose upon the Producer a cost-based charge for subsequent Commissioning Test verifications. All Costs for additional Commissioning Test verifications shall be paid by Producer within thirty days of receipt of SCE's invoice. The invoice provided by SCE shall consist of the hourly rate multiplied by the hours incurred by SCE and will separately specify the amount of time spent on-site from that spent in roundtrip travel to the project site. Additional cost, if any, will be specified on the invoice. If the initial Commissioning Test verification is not successful through the fault of SCE, that visit will not be considered the initial Commissioning Test verification.

b. Facility Costs: A Producer shall be responsible for all costs associated with Interconnection Facilities owned by the Producer. The Producer shall also be responsible for any costs reasonably incurred by SCE in providing, operating, or maintaining the Interconnection Facilities and Distribution System modifications required solely for the interconnection of the Producer's Generating Facility with SCE's Distribution System. Generating Facilities eligible for Net Energy Metering under Public Utilities Code Sections 2827, 2827.9 or 2827.10 are exempt from any costs associated with Distribution System modifications.

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Rule 21 Sheet 16 (T)
GENERATING FACILITY INTERCONNECTIONS

(Continued)

E. Interconnection Facility and Distribution System Modification, Ownership and Financing

2. Responsibility of Costs of Interconnecting a Generating Facility (Continued)

c. Separation of Costs: Should SCE combine the installation of Interconnection Facilities or Distribution System modifications required for the Interconnection of a Generating Facility with modifications to SCE's Distribution System to serve other Customers or Producers, SCE shall not include the costs of such separate or incremental facilities in the amounts billed to the Producer.

d. Reconciliation of Costs and Payments: If the Producer selected a fixed price billing for the Interconnection Facilities or Distribution System modifications, no reconciliation will be necessary. If the Producer selected actual cost billing, a true up will be required. Within a reasonable time after the Interconnection of a Producer's Generating Facility, SCE will reconcile its actual costs related to the Generating Facility against any advance payments made by the Producer. The Producer will receive either a bill for any balance due or a reimbursement for overpayment as determined by SCE's reconciliation. The Producer shall be entitled to a reasonably detailed and understandable account for the payments.

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Rule 21 Sheet 17 (T)
GENERATING FACILITY INTERCONNECTIONS

(Continued)

E. Interconnection Facility and Distribution System Improvement Ownership and Financing (Continued)

3. Installation and Financing of Interconnection Facilities and Distribution System Modifications

a. Agreement Required: The costs for Interconnection Facilities and Distribution System modifications shall be paid by the Producer pursuant to the provisions contained in the Interconnection Agreement. Where the type and extent of the Interconnection Facilities or Distribution System modifications warrant additional detail, Producer and SCE shall execute separate agreement(s) to more fully describe and allocate the parties' responsibilities for installing, owning, operating, and maintaining the Interconnection Facilities and Distribution System modifications. The separate agreements shall be the following: SCE's "Interconnection Facilities Financing and Ownership Agreement", and SCE's applicable Tariff Schedules and Rules for Added Facilities.

b. Interconnection Facilities and Distribution System Modifications: Except as provided for in Sections E.2.b and E.3.c. of this Rule, Interconnection Facilities connected to SCE's side of the PCC and Distribution System modifications shall be provided, installed, owned, and maintained by SCE at Producer's expense.

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

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Rule 21 Sheet 18 (T)
GENERATING FACILITY INTERCONNECTIONS

(Continued)

E. Interconnection Facility and Distribution System Improvement Ownership and Financing (Continued)

3. Installation and Financing of Interconnection Facilities and Distribution System Modifications (Continued)

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

e. Refund of Salvage Value: When a Producer elects to abandon the Added Facilities for which it has either advanced the installed costs or constructed and transferred to SCE, the Producer shall, at a minimum, receive from SCE a credit for the net salvage value of the Added Facilities.

F. Metering, Monitoring and Telemetering

1. General Requirements: All Generating Facilities shall be metered in accordance with this Section F and shall meet all applicable standards of SCE contained in SCE's applicable tariffs and published SCE manuals dealing with Metering specifications.

2. Metering by Non-SCE Parties: The ownership, installation, operation, reading, and testing of revenue Metering Equipment for Generating Facilities shall be by SCE except to the extent that the Commission authorizes any or all these services be performed by others.

3. Net Generation Output Metering (NGOM): Generating Facility customers may be required to install NGOM for evaluation, monitoring, and verification purposes and to determine applicable standby and non-bypassable charges as defined in SCE's tariffs, to satisfy applicable California Independent System Operator (CAISO) reliability requirements, and for Distribution System planning and operations.

(Continued)

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F. Metering, Monitoring and Telemetering (Continued)

3. Net Generation Output Metering (NGOM): (Continued)

However, Generating Facility customers do not need to install NGOM where less intrusive and/or more cost effective options, for the Producer/Customer, are available for providing generator data to SCE. These Generating Facilities may opt to have SCE estimate load data in accordance with SCE's applicable tariffs to determine or meet applicable standby and non-bypassable and other applicable charges and tariff requirements. However, if a Generating Facility customer objects to SCE's estimate of the Generator(s) output, the customer may elect to install the NGOM, or have SCE install NGOM at the customer's expense.

All metering options available to the customer must conform to the requirements set forth in SCE's Rule 22. If SCE does not receive meter data in accordance with Rule 22, SCE shall have the right to install utility-owned NGOM at the customer's expense.

The relevant factors in determining the need for NGOM are as listed below:

(a) Data requirements in proportion to need for information;

(b) Producer's election to install equipment that adequately addresses SCE's operational requirements;

(c) Accuracy and type of required Metering consistent with purposes of collecting data;

(d) Cost of Metering relative to the need for and accuracy of the data;

(e) The Generating Facility's size relative to the cost of the Metering/monitoring;

(f) Other means of obtaining the data (e.g. Generating Facility logs, proxy data, etc.);

(g) Requirements under any Interconnection Agreement with the Producer.

(Continued)

Rule 21 Sheet 20 (T)
GENERATING FACILITY INTERCONNECTIONS

(Continued)

F. Metering, Monitoring and Telemetering (Continued)

(L)

3. Net Generation Output Metering: (Continued)

The requirements in this Section may not apply to Metering of Generating Facilities operating under SCE's Net Energy Metering tariff pursuant to California Public Utilities Code Section 2827, et seq. Nothing in this Section F.3 supercedes Section B.4. (L) | (L)(T)

SCE will report to the Commission or designated authority, on a quarterly basis, the rationale for requiring NGOM equipment in each instance along with the size and location of the facility. (L) | (L)

4. Point of Common Coupling (PCC) Metering: For purposes of assessing SCE's charges for retail service, the Producer's PCC Metering shall be reviewed by SCE, and if required, replaced to ensure that it will appropriately measure electric power according to the provisions of the Customer's electric service Tariff. Where required, the Customer's existing meter may be replaced with a bi-directional meter so that power deliveries to and from the Producer's site can be separately recorded. Alternately, the Producer may, at its sole option and cost, require SCE to install multi-metering equipment to separately record power deliveries to SCE's Distribution System and retail purchases from SCE. Where necessary, such PCC Metering shall be designed to prevent reverse registration.

Generating Facilities for Net Energy Metering under Public Utilities Code Sections 2827, et seq. shall have metering provided pursuant to the terms of the applicable Net Energy Metering Tariff Schedule. (T)

(Continued)

Rule 21 Sheet 21 (T)
GENERATING FACILITY INTERCONNECTIONS

(Continued)

F. Metering, Monitoring and Telemetering (Continued)

5. Telemetering: If the nameplate rating of the Generating Facility is 1 MW or greater, Telemetering equipment at the Net Generation Output Metering location may be required at the Producer's expense. If the Generating Facility is Interconnected to a portion of SCE's Distribution System operating at a voltage below 10 kV, then Telemetering equipment may be required on Generating Facilities 250 kW or greater. SCE shall only require Telemetering to the extent that less intrusive and/or more cost effective options for providing the necessary data in real time are not available. SCE will report to the Commission or designated authority, on a quarterly basis, the rationale for requiring Telemetering equipment in each instance along with the size and location of the facility.

6. Location: Where SCE-owned Metering is located on the Producer's premises, Producer shall provide, at no expense to SCE, a suitable location for all such Metering Equipment.

7. Costs of Metering: The Producer will bear all costs of the Metering required by this Rule, including the incremental costs of operating and maintaining the Metering Equipment.

8. Multiple Tariff Metering

The requirements of Section F.3 may not apply where a Generating Facility includes multiple generators eligible for service under more than one Net Energy Metering (NEM) tariff schedule (e.g. NEM, NEM-BIO, NEM-FC), or where a Generating Facility consists of one or more NEM generators. To ensure proper tariff administration, metering will be required at the PCC and at each of the NEM eligible generator tariff schedule groups. For combinations of multiple NEM eligible tariffs, all of which are located at a single premises, billing administration and metering requirements will be as specified in the appropriate NEM tariff schedule.

G. Dispute Resolution Process

The following procedures will apply for disputes arising from this Rule:

1. The Commission shall have initial jurisdiction to interpret, add, delete or modify any provision of this Rule or of any agreements entered into between SCE and the Producer to implement this tariff ("Implementing Agreements") and to resolve disputes regarding SCE's performance of its obligations under its tariffs, the applicable agreements, and requirements related to the interconnection of the Producer's Generating or Interconnection Facilities pursuant to this Rule.

2. Any dispute arising between SCE and the Producer (individually "Party" and collectively "the Parties") regarding SCE's or Producer's performance of its obligations under its tariffs, the Implementing Agreements, and requirements related to the interconnection of Producer's Facilities pursuant to this Rule shall be resolved according to the following procedures:

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Rule 21 Sheet 22 (T)
GENERATING FACILITY INTERCONNECTIONS

(Continued)

G. Dispute Resolution Process (Continued)

2. (Continued)

a. 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 G.2. Upon the aggrieved Party notifying the other Party of the dispute, each Party must designate a representative with the authority to make decisions for its respective Party to review the dispute within 7 calendar days. In addition, upon receipt of the dispute letter, SCE shall provide the aggrieved Party with all relevant regulatory and/or technical detail regarding any SCE interconnection requirements under dispute within 21 calendar days. Within 45 calendar days of the date of the dispute letter, the Parties' authorized representatives will be required to meet and confer to try to resolve the dispute.

b. If a resolution is not reached in 45 calendar days from the date of the dispute letter, either Party may request to 1) continue negotiations for an additional 45 calendar days or 2) make a written request to the Chief Administrative Law Judge of the Commission for mediation. Alternatively, both Parties by mutual agreement may request mediation from an outside third-party mediator with costs to be shared equally between the Parties.

c. If the Parties do not resolve their dispute within 90 calendar days after the date of the dispute letter, either Party may file a Formal Complaint before the Commission pursuant to the Commission's Rules of Practice and Procedure Applicable to Customer Complaints.

3. Pending resolution of any dispute under this Section, the Parties shall proceed diligently with the performance of their respective obligations under this Rule and the Implementing Agreements, unless the Implementing Agreements have been terminated. Disputes as to the application and implementation of this Section shall be subject to resolution pursuant to the procedures set forth in this Section.

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G. Dispute Resolution Process (Continued)

4. The California Energy Commission (CEC) will maintain a website for the purpose of public disclosure of the resolution of the disputes submitted pursuant to Section G.2. Within 30 calendar days of resolution of the dispute, SCE will present to the Producer a summary of the dispute including project-specific parameters such as generator technology, generator size, requested operational protocol, voltage service level, circuit type, the disputed issue and the agreed-upon resolution including the executed resolution documents that are non-confidential, if any. If the Producer and SCE reach agreement on the dispute summary, SCE will forward it to the CEC for posting. If the Producer and SCE cannot agree on the dispute summary within 30 calendar days, SCE will notify the CEC that there was a dispute that was resolved but agreement was not reached between SCE and the Producer on the dispute summary.

H. Definitions

The definitions in this Section H are applicable only to this Rule, the Application, and Interconnection Agreements.

Added Facilities: As Defined in SCE's Rule 2

Anti-Islanding: A control scheme installed as part of the Generating or Interconnection Facility that senses and prevents the formation of an Unintended Island.

Applicant: The entity submitting an Application for Interconnection pursuant to this Rule.

Application: A Commission-approved form submitted to SCE for Interconnection of a Generating Facility.

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H. Definitions (Continued)

Certification Test: A test pursuant to this Rule that verifies conformance of certain equipment with Commission-approved performance standards in order to be classified as Certified Equipment. Certification Tests are performed by NRTLs.

Certification; Certified; Certificate: The documented results of a successful Certification Testing.

Certified Equipment: Equipment that has passed all required Certification Test.

Commission: The Public Utilities Commission of the State of California.

Commissioning Test: A test performed during the commissioning of all or part of a Generating Facility to achieve one or more of the following:

- Verify specific aspects of its performance;
- Calibrate its instrumentation;
- Establish instrument or Protective Function set-points.

Customer: The entity that receives or is entitled to receive Distribution Service through SCE's Distribution System.

Dedicated Transformer; Dedicated Distribution Transformer: A transformer that provides electricity service to a single Customer. The Customer may or may not have a Generating Facility.

Device: A mechanism or piece of equipment designed to serve a purpose or perform a function. The term may be used interchangeably with the terms "equipment" and function without intentional difference in meaning. See also Function and Protective Function

Distribution Service: All services required by, or provided to, a Customer pursuant to the approved tariffs of SCE other than services directly related to the Interconnection of a Generating Facility under this Rule.

Distribution System: All electrical wires, equipment, and other facilities owned or provided by SCE, other than Interconnection Facilities, by which SCE provides Distribution Service to its Customers.

Emergency: An actual or imminent condition or situation, which jeopardizes SCE's Distribution System integrity.

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H. Definitions (Continued)

Field Testing: Testing performed in the field to determine whether equipment meets SCE's requirements for safe and reliable Interconnection.

Function: Some combination of hardware and software designed to provide specific features or capabilities. Its use, as in Protective Function, is intended to encompass a range of implementations from a single-purpose device to a section of software and specific pieces of hardware within a larger piece of equipment to a collection of devices and software.

Generating Facility: All Generators, electrical wires, equipment, and other facilities owned or provided by Producer for the purpose of producing electric power.

Generator: A device converting mechanical, chemical, or solar energy into electrical energy, including all of its protective and control functions and structural appurtenances. One or more Generators comprise a Generating Facility.

Gross Nameplate Rating; Gross Nameplate Capacity: The total gross generating capacity of a Generator or Generating Facility as designated by the manufacturer(s) of the Generator(s).

Host Load: The electrical power, less the Generator auxiliary load, consumed by the Customer, to which the Generating Facility is connected.

Initial Review: The review by SCE, following receipt of an Application, to determine the following: a) the Generating Facility qualifies for Simplified Interconnection; or b) if the Generating Facility can be made to qualify for Interconnection with a Supplemental Review determining any additional requirements.

In-rush Current: The current determined by the In-rush Current Test.

Interconnection Agreement: An agreement between SCE and the Producer providing for the Interconnection of a Generating Facility that give certain rights and obligations to effect or end Interconnection. For the purpose of this Rule, Net Energy Metering or Power Purchase Agreements authorized by the Commission are also defined as Interconnection Agreements.

Interconnection; Interconnected: The physical connection of a Generating Facility in accordance with the requirements of this Rule so that Parallel Operation with SCE's Distribution System can occur (has occurred).

Interconnection Facilities: The electrical wires, switches and related equipment that are required in addition to the facilities required to provide electric Distribution Service to a Customer to allow Interconnection. Interconnection Facilities may be located on either side of the Point of Common Coupling as appropriate to their purpose and design. Interconnection Facilities may be integral to a Generating Facility or provided separately.

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H. Definitions (Continued)

Interconnection Study: A study to establish the requirements for Interconnection of a Generating Facility with SCE's Distribution System.

Island; Islanding: A condition on SCE's Distribution System in which one or more Generating Facilities deliver power to Customers using a portion of SCE's Distribution System that is electrically isolated from the remainder of SCE's Distribution System.

Line Section: That portion of SCE's Distribution System connected to a Customer bounded by automatic sectionalizing devices or the end of the distribution line.

Load Carrying Capability: The maximum electrical load that may be carried by a section of SCE's Distribution System consistent with reliability and safety under the circumstances being evaluated.

Metering: The measurement of electrical power in kW and/or energy in kWh, and if necessary, reactive power in kVAR at a point, and its display to SCE, as required by this Rule.

Metering Equipment: All equipment, hardware, software including meter cabinets, conduit, etc., that are necessary for Metering.

Momentary Parallel Operation: The Interconnection of a Generating Facility to the Distribution System for one second (60 cycles) or less.

Nationally Recognized Testing Laboratory (NRTL): A laboratory accredited to perform the Certification Testing requirements under this Rule.

Net Energy Metering: Metering for the receipt and delivery of electricity between the Producer and SCE pursuant to Sections 2827, 2827.8, 2827.9, or 2827.10 of the Public Utilities Code.

Net Generation Output Metering: Metering of the net electrical power output in kW or energy in kWh, from a given Generating Facility. This may also be the measurement of the difference between the total electrical energy produced by a Generator and the electrical energy consumed by the auxiliary equipment necessary to operate the Generator. For a Generator with no Host Load and/or Public Utilities Code Section 218 Load (Section 218 Load), Metering that is located at the Point of Common Coupling. For a Generator with Host Load and/or Section 218 Load, Metering that is located at the Generator but after the point of auxiliary load(s) and prior to serving Host Load and/or Section 218 Load.

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H. Definitions (Continued)

Net Nameplate Rating: The Gross Nameplate Rating minus the consumption of electrical power of a Generator or Generating Facility as designated by the manufacturer(s) of the Generator(s).

Network Service: More than one electrical feeder providing Distribution Service at a Point of Common Coupling.

Non-Export; Non-Exporting: Designed to prevent the transfer of electrical energy from the Generating Facility to SCE's Distribution System.

Non-Islanding: Designed to detect and disconnect from a stable Unintended Island with matched load and generation. Reliance solely on under/over voltage and frequency trip is not considered sufficient to qualify as Non-Islanding.

Parallel Operation: The simultaneous operation of a Generator with power delivered or received by SCE while Interconnected. For the purpose of this Rule, Parallel Operation includes only those Generating Facilities that are Interconnected with SCE's Distribution System for more than 60 cycles (one second).

Paralleling Device: An electrical device, typically a circuit breaker, operating under the control of a synchronization function or by a qualified operator to connect an energized generator to an energized electric power system or two energized power systems to each other.

Periodic Test: A test performed on part or all of a Generating Facility/Interconnection Facilities at pre-determined time or operational intervals to achieve one or more of the following: 1) verify specific aspects of its performance; 2) calibrate instrumentation; and 3) verify and re-establish instrument or Protective Function set-points.

Point of Common Coupling (PCC): The transfer point for electricity between the electrical conductors of SCE and the electrical conductors of the Producer.

Point of Common Coupling Metering: Metering located at the Point of Common Coupling. This is the same Metering as Net Generation Output Metering for Generating Facilities with no Host Load and/or Section 218 Load.

Point of Interconnection: The electrical transfer point between a Generating Facility and SCE's Distribution System. This may or may not be coincident with the Point of Common Coupling.

Producer: The entity that executes an Interconnection Agreement with SCE. The Producer may or may not own or operate the Generating Facility, but is responsible for the rights and obligations related to the Interconnection Agreement.

Production Test: A test performed on each device coming off the production line to verify certain aspects of its performance.

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H. Definitions (Continued)

Protective Function(s): 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.

Prudent Electrical Practices: Those practices, methods, and equipment, as changed from time to time, that are commonly used in prudent electrical engineering and operations to design and operate electric equipment lawfully and with safety, dependability, efficiency, and economy.

Scheduled Operation Date: The date specified in the Interconnection Agreement when the Generating Facility is, by the Producer's estimate, expected to begin operation pursuant to this Rule.

Secondary Network: A network supplied by several primary feeders suitably interlaced through the area in order to achieve acceptable loading of the transformers under emergency conditions and to provide a system of extremely high service reliability. Secondary Networks usually operate at 600 V or lower.

Section 218 Load: Electrical power that is supplied in compliance with California Public Utilities Code Section 218. Public Utilities Code Section 218 defines an “Electric Corporation” and provides conditions under which a transaction involving a Generating Facility would not classify a Producer as an Electric Corporation. These conditions relate to “over-the-fence” sale of electricity from a Generating Facility without using SCE’s Distribution System.

Short Circuit Contribution Ratio (SCCR): The ratio of the Generating Facility’s short circuit contribution to the short circuit contribution provided through SCE’s Distribution System for a three-phase fault at the high voltage side of the distribution transformer connecting the Generating Facility to SCE’s Distribution System.

Simplified Interconnection: Interconnection conforming to the Initial Review requirements under this Rule, as determined by Section I.

Single Line Diagram; Single Line Drawing: A schematic drawing, showing the major electric switchgear, Protective Function 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.

Starting Voltage Drop: The percentage voltage drop at a specified point resulting from In-rush Current. The Starting Voltage Drop can also be expressed in volts on a particular base voltage, (e.g. 6 volts on a 120-volt base, yielding a 5% drop).

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H. Definitions (Continued)

Supplemental Review: A process wherein SCE further reviews an Application that fails one or more of the Initial Review Process screens. The Supplemental Review may result in one of the following: a) approval of Interconnection; b) approval of Interconnection with additional requirements; or c) cost and schedule for an Interconnection Study.

System Integrity: The condition under which SCE's Distribution System is deemed safe and can reliably perform its intended functions in accordance with the safety and reliability rules of SCE.

Telemetering: The electrical or electronic transmittal of Metering data on a real-time basis to SCE.

Transfer Trip: A Protective Function that trips a Generating Facility remotely by means of an automated communications link controlled by SCE.

Type Test: A test performed on a sample of a particular model of a device to verify specific aspects of its design, construction and performance.

Unintended Island: The creation of an Island, usually following a loss of a portion of SCE's Distribution System, without the approval of SCE.

Unsafe Operating Conditions: 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.

(Continued)

Rule 21 Sheet 30 (T)
GENERATING FACILITY INTERCONNECTIONS

(Continued)

I. Review Process For Applications To Interconnect Generating Facilities

1. Introduction

This Review Process allows for rapid approval for the Interconnection of those Generating Facilities that do not require an Interconnection Study. The review process includes a screening to determine if a Supplemental Review is required.

Note: Failure to pass any screen of the review process means only that further review and/or studies are required before the Generating Facility can be approved for Interconnection with SCE's Distribution System. It does not mean that the Generating Facility cannot be Interconnected. Though not explicitly covered in the Initial Review Process, the Generating Facility shall be designed to meet all of the applicable requirements in Section D.

2. Purpose

The review determines the following:

a. If a Generating Facility qualifies for Simplified Interconnection;

b. If a Generating Facility can be made to qualify for Interconnection with a Supplemental Review determining any additional requirements, or

c. If an Interconnection Study is required, the cost estimates and schedule for performing the Interconnection Study.

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Rule 21 — Sheet 31 (T)

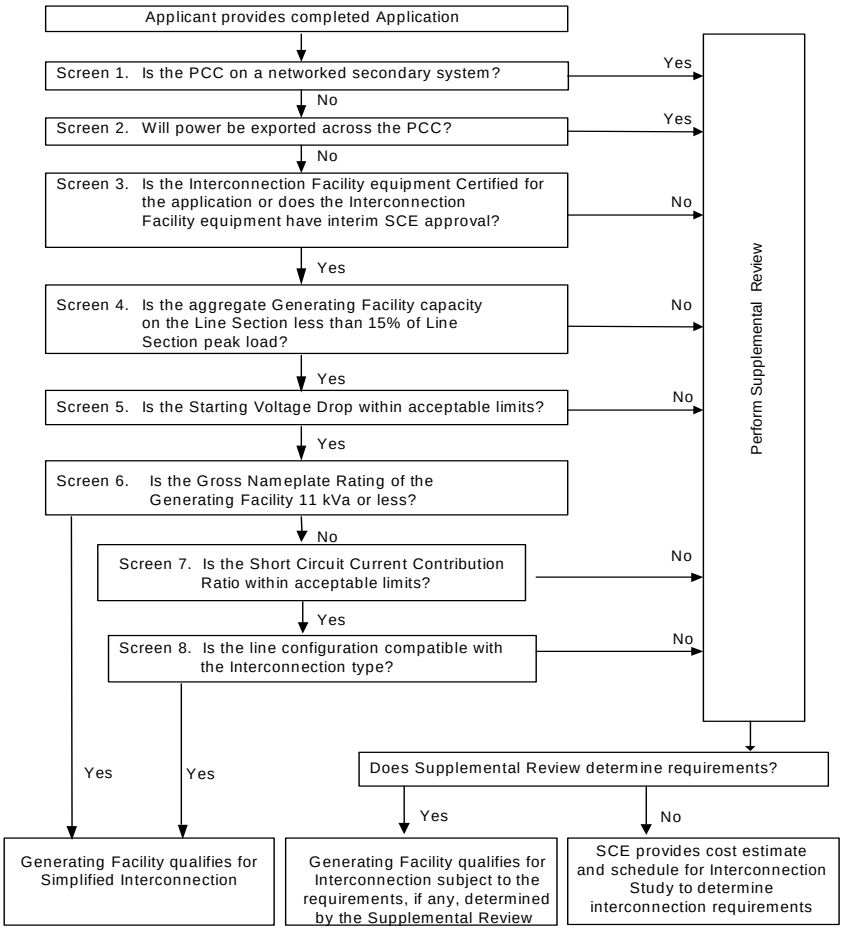
GENERATING FACILITY INTERCONNECTIONS

(Continued)

I. Review Process For Applications To Interconnect Generating Facilities (Continued)

3. Review Process Details

Initial and Supplemental Review Process Flow Chart



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I. Review Process For Applications To Interconnect Generating Facilities (Continued)

3. Review Process Details

a. Screen 1: Is the PCC on a Networked Secondary System?

- If Yes, Generating Facility does not qualify for Simplified Interconnection. Perform Supplemental Review.
- If No, continue to next screen.

Significance: Special considerations must be given to Generating Facilities proposed to be installed on networked secondary Distribution Systems because of the design and operational aspects of network protectors. There are no such considerations for radial Distribution Systems.

b. Screen 2: Will power be exported across the PCC?

- If Yes, Generating Facility does not qualify for Simplified Interconnection. Perform Supplemental Review.
- If No, Generating Facility must incorporate one of the following four options:

Option 1 ("Reverse Power Protection"): To insure power is never exported across the PCC, a reverse power Protective Function may be provided. The default setting for this Protective Function, when used, shall be 0.1% (export) of the service transformer's rating, with a maximum 2.0 second time delay. For multiple tariff interconnections refer to Section F.8.

Option 2 ("Minimum Power Protection"): To insure 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, when used, shall be 5% (import) of Generating Facility's total Gross Nameplate Rating, with a maximum 2.0 second time delay.

Option 3 (Certified Non-Islanding Protection): To insure the incidental export of power is limited to acceptable levels, this option, when used, requires that all of the following conditions be met: a) the total Gross Nameplate Capacity of the Generating Facility must be no more than 25% of the nominal ampere rating of the Producer's service equipment; b) the total Gross Nameplate Capacity of the Generating Facility must be no more than 50% of the Producer'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.

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 be increasing the size of the customer's service panel, without separate approval for the resize.

Option 4 (Relative Generating Facility Rating): This option, when used, requires the Net 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 insure that power will not be exported to SCE's Distribution System. This option requires the Generating Facility capacity to be no greater than 50% of the Producer's verifiable minimum Host Load over the past 12 months.

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I. Review Process For Applications To Interconnect Generating Facilities (Continued)

3. Review Process Details (Continued)

b. Screen 2: Will power be exported across the PCC? (Continued)

Significance:

1. If it can be assured that the Generating Facility will not export power, SCE's Distribution System does not need to be studied for load-carrying capability or Generating Facility power flow effects on SCE 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 Simplified Interconnection without implementing reverse power or minimum power Protective Functions (Option 3).

c. Screen 3: Is the Interconnection Facility equipment Certified for the application or does the Interconnection Facility equipment have interim SCE approval?

- If Yes, continue to next screen.
- If No, Generating and/or Interconnection Facility does not qualify for Simplified Interconnection. Perform Supplemental Review.

Interim approval allows SCE to treat equipment that has not completed the Rule 21 Certification requirements as having met the intent of this screen. Interim approval is granted at SCE's discretion on case by case bases, and approval for one Generating Facility does not guarantee approval for any other Generating Facility.

Significance:

If the Generating and/or Interconnection Facility has been Certified or previously approved by SCE, SCE 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 insure that the Protective Functions are working properly.

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

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I. Review Process For Applications To Interconnect Generating Facilities (Continued)

3. Review Process Details (Continued)

d. Screen 4: Is the aggregate Generating Facility capacity on the Line Section less than 15% of Line Section peak load?

- If Yes, continue to next screen.
- If No, Generating Facility does not qualify for Simplified Interconnection. Perform Supplemental Review to determine cumulative impact on Line Section.

Significance:

1. Low penetration of Generating Facility installations will have a minimal impact on the operation and load restoration efforts of SCE's Distribution System.

2. The operating requirements for a high penetration of Generating Facilities may be different since the impact on SCE's Distribution System will no longer be minimal, therefore requiring additional study or controls.

e. Screen 5: Is the Starting Voltage Drop within acceptable limits?

- If Yes, continue to next screen.
- If No, Generating Facility does not qualify for Simplified Interconnection. Perform Supplemental Review.

Note: This Screen only applies to Generating Facilities that start by motoring the Generator(s).

SCE has two options in determining whether Starting Voltage Drop is acceptable. The option to be used is at SCE's discretion.

Option 1: SCE 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: SCE 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, SCE may use tables or nomographs to determine the voltage drop. Voltage drops caused by starting a Generator as a motor must be less than 2.5% for primary Interconnections and 5% for secondary Interconnections.

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I. Review Process For Applications To Interconnect Generating Facilities (Continued)

3. Review Process Details (Continued)

e. Screen 5: Is the Starting Voltage Drop within acceptable limits? (Continued)

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 SCE Customers.

3. Passing this Screen does not relieve the Producer from ensuring that its Generating Facility complies with the flicker requirements of this Rule, Section D.2.d.

f. Screen 6: Is the Gross Nameplate Rating of the Generating Facility 11 kVA or less?

- If Yes, Generating Facility qualifies for Simplified Interconnection. Skip remaining screens.
- If No, continue to next screen.

Significance:

The Generating Facility will have a minimal impact on fault current levels and any potential line overvoltages from loss of SCE's Distribution System neutral grounding.

g. Screen 7: Is the Short Circuit Current Contribution Ratio within acceptable limits?

- If Yes, continue to next screen.
- If No, Generating Facility does not qualify for Simplified Interconnection. Perform Supplemental Review.

The Short Circuit Current Contribution Ratio Screen consists of two criteria; both of which must be met when applicable:

1. When measured at 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 SCE's Distribution System circuit that serves the Generating Facility must be less than or equal to 0.1, and

2. When measured at the secondary side (low side) of a shared distribution transformer, the short circuit contribution of the proposed Generating Facility must be less than or equal to 2.5% of the interrupting rating of the Producer's Service Equipment.

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I. Review Process For Applications To Interconnect Generating Facilities (Continued)

3. Review Process Details (Continued)

g. Screen 7: Is the Short Circuit Current Contribution Ratio within acceptable limits? (Continued)

Significance:

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

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

- If Yes, Generating Facility qualifies for Simplified Interconnection.
- If No, then Generating Facility does not qualify for Simplified Interconnection. Perform Supplemental Review.

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 I.1 if the proposed Generating Facility passes the Screen.

Table I.1

Primary Distribution Line Type Configuration	Type of Interconnection to be made to Primary Distribution Line	Result/Criteria
Three-phase, three-wire	Any type	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 three-wire & four-wire)	All others	To pass, aggregate Generating Facility nameplate rating must be less than or equal to 10% of Line Section peak load

Significance:

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

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J. Certification And Testing Criteria

1. Introduction

This Section describes the test procedures and requirements for equipment used for the Interconnection of Generating Facilities to SCE's Distribution System. Included are Type Testing, Production Testing, Commissioning Testing, and Periodic Testing. The procedures listed rely heavily on those described in appropriate Underwriters Laboratory (UL), Institute of Electrical and Electronic Engineers (IEEE), and International Electrotechnical Commission (IEC) documents—most notably UL 1741 and IEEE 929 as well as the testing described in *May 1999 New York State Public Service Commission's Interconnection Requirements.* As noted in Section A, this Rule has been revised to be consistent with ANSI/IEEE 1547-2003 Standard for Interconnecting Distribution Resources with Electric Power Systems.

The tests described here, together with the technical requirements in Section D of this Rule, are intended to provide assurance that the Generating Facility's equipment will not adversely affect SCE's Distribution System and that a Generating Facility will cease providing power to SCE's Distribution System under abnormal conditions. The tests were developed assuming a low level of Generating Facility penetration or number of connections to SCE's Distribution System. At high levels of Generating Facility penetration, additional requirements and corresponding test procedures may need to be defined.

Section J. also provides criteria for "Certifying" Generators or inverters. Once a Generator or inverter has been Certified per this Rule, it may be considered suitable for Interconnection with SCE's Distribution System. Subject to the exceptions described in Section J., SCE will not repeat the design review or require retesting of such Certified Equipment. It should be noted that the Certification process is intended to facilitate Generating Facilities Interconnections. Certification is not a prerequisite to interconnect a Generating Facility.

The revisions made to this Rule relative to IEEE 1547-2003 has resulted in changes in set points, test criteria, test procedures, and other requirements that will impact previously certified or listed equipment as well as equipment currently under evaluation. These changes were made to provide consistency with IEEE 1547. Equipment that is certified or that has been submitted to a Nationally Recognized Testing Laboratory (NRTL) for testing prior to the adoption of the revised Underwriters Laboratories (UL) 1741 standard titled "Inverters, Converters, Controllers and Interconnection Systems Equipment for use with Distributed Energy Resources" and that subsequently meets the previous Rule 21 certification requirements will continue to be accepted as Certified Equipment for Interconnection Applications submitted through May 7, 2007, the effective date of the revised "UL 1741."

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J. Certification And Testing Criteria (Continued)

2. Certified and Non-Certified Interconnection Equipment

a. Certified Equipment

Equipment tested and approved (i.e. "Listed") by an accredited NRTL as having met both the Type Testing and Production Testing requirements described in this document is considered to be Certified Equipment for purposes of Interconnection with SCE's Distribution System. Certification may apply to either a pre-packaged system or an assembly of components that address the necessary functions. Type Testing may be done in the manufacturer's factory or test laboratory, or in the field. At the discretion of the testing laboratory, field-certification may apply only to the particular installation tested. In such cases, some or all of the tests may need to be repeated at other installations.

When equipment is Certified by a NRTL, the NRTL shall provide to the manufacturer, at a minimum, a Certificate with the following information for each device:

Administrative:

(1) The effective date of Certification or applicable serial number (range or first in series), and/or other proof that certification is current;
(2) Equipment model number(s) of the Certified equipment;
(3) The software version utilized in the equipment, if applicable;
(4) Test procedures specified (including date or revision number); and
(5) Laboratory accreditation (by whom and to what standard).

Technical (As appropriate):

(1) Device ratings (kW, kV, Volts, amps, etc.);
(2) Maximum available fault current in amps;
(3) In-rush Current in amps;
(4) Trip points, if factory set (trip value and timing);
(5) Trip point and timing ranges for adjustable settings;
(6) Nominal power factor or range if adjustable;
(7) If the equipment is Certified as Non-Exporting and the method used (reverse power or underpower); and
(8) If the equipment is Certified as Non-Islanding

It is the responsibility of the equipment manufacturer to ensure that Certification information is made publicly available by the manufacturer, the testing laboratory, or by a third party.

b. Non-Certified Equipment

For non-Certified equipment, some or all of the tests described in this Rule may be required by SCE for each Generating and/or Interconnection Facility. The manufacturer or a laboratory acceptable to SCE may perform these tests. Test results for non-Certified equipment must be submitted to SCE for the Supplemental Review. Approval by SCE for equipment used in a particular Generating and/or Interconnection Facility does not guarantee SCE's approval for use in other Generating and/or Interconnection Facilities.

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J. Certification And Testing Criteria (Continued)

3. Type Testing

a. Type Tests and Criteria for Interconnection Equipment Certification

Type testing provides a basis for determining that equipment meets the specifications for being designated as Certified equipment under this Rule. The requirements described in this Section cover only issues related to Interconnection and are not intended to address device safety or other issues.

Table J.1 defines the test criteria by Generator or inverter technology. While UL 1741(1) was written specifically for inverters, the requirements are readily adaptable to synchronous Generators, induction Generators, as well as single/multi-function controllers and protection relays. Until a universal test standard is developed, SCE or NRTL shall adapt the procedures referenced in Table J.1 as appropriate and necessary for a Generating Facility and/or Interconnection Facilities or associated equipment performance and its control and Protection Functions. These tests shall be performed in the sequence shown in Table J.2 on the next page.

Table J.1 Type Test and Requirements for Interconnection Equipment Certification

Type Test	Reference (1)	Inverter	Synchronous Generator	Induction Generator
Utility Interaction	UL 1741 – 39	X	X	X
DC Isolation	UL 1741 – 40.1	X	—	—
Simulated PV Array (Input) Requirements	UL 1741 – 41.2	X	—	—
Dielectric Voltage Withstand	UL 1741 – 44	X	X	X
Power Factor	UL 1741 – 45.2.2	X	X	X
Harmonic Distortion	UL 1741 – 45.4	X	X	X
DC Injection	UL 1741 – 45.5	X	—	—
Utility Voltage and Frequency Variation	UL 1741 – 46.2	X	X	X
Reset Delay	UL 1741 – 46.2.3	X	X	X
Loss of Control Circuit	UL 1741 – 46.4	X	X	X
Short Circuit	UL 1741 – 47.3	X	X	X
Load Transfer	UL 1741 – 47.7	X	X	X
Surge Withstand Capability	J.3.e	X	X	X
Anti-Islanding	J.3.b	(2)	(2)	(2)
Non-Export	J.3.c	(3)	(3)	(3)
In-rush Current	J.3.d	—	—	(4)
Synchronization	J.3.f	(5)	X	(5)

Table Notes: (1) References are to section numbers in either UL 1741 (Inverters, Converters and Charge Controllers for Use in Independent Power Systems) or this Rule. References in UL 1741 to “photovoltaics” or “inverter” may have to be adapted to the other technologies by the testing laboratory to appropriately apply in the tests to other technologies.
(2) Required only if Non-Islanding designation
(3) Required only if Non-Export designation is desired.
(4) Required for Generators that use SCE power to motor to speed.
(5) Required for all self-excited induction Generators as well as Inverters that operate as voltage sources when connected to SCE’s Distribution System.
X = Required
- = Not Required

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J. Certification And Testing Criteria (Continued)

3. Type Testing (Continued)

Table J.2 Type Tests Sequence for Interconnection Equipment Certification

Test No.	Type Test
1	Utility Voltage and Frequency Variation
2	Synchronization
3	Surge Withstand Capability
4	Utility Voltage and Frequency Variation
5	Synchronization
6	Other Required and Optional Tests

Tests 1, 2, and 3 must be done first and in the order shown. Tests 4 and on follow in order convenient to the test agency.

b. Anti-Islanding Test

Devices that pass the Anti-Islanding test procedure described in UL 1741 Section 46.3 will be considered Non-Islanding for the purposes of these Interconnection requirements. The test is required only for devices for which a Certified Non-Islanding designation is desired.

c. Non-Export Test

Equipment that passes the Non-Export test procedure described in Section J.7.a. will be considered Non-Exporting for the purposes of these Interconnection requirements. This test is required only for devices for which a Certified Non-Export designation is desired.

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J. Certification And Testing Criteria (Continued)

3. Type Testing (Continued)

d. In-rush Current Test

Generation equipment that utilizes SCE power to motor up to speed will be tested using the procedure defined in Section J.7.b. to determine the maximum current drawn during this startup process. The resulting In-rush Current is used to estimate the Starting Voltage Drop.

e. Surge Withstand Capability Test

The interconnection equipment shall be tested for the surge withstand requirement in Section D.1.c in all normal operating modes in accordance with IEEE Std C62.45-2002 for equipment rates less than 1000 V to confirm that the surge withstand capability is met by using the selected test level(s) from IEEE Std C62.41.2-2002. Interconnection equipment rated greater than 1000 V shall be tested in accordance with manufacturer or system integrator designated applicable standards. For interconnection equipment signal and control circuits, use IEEE Std C37.90.1-2002. These tests shall confirm the equipment did not fail, did not misoperate, and did not provide misinformation (IEEE 1547-5.1.3.2).

The location/exposure category for which the equipment has been tested shall be clearly marked on the equipment label or in the equipment documentation. External surge protection may be used to protect the equipment in harsher location/exposure categories.

f. Synchronization Test

This test is applied to synchronous Generators, self-excited induction generators, and inverters capable of operating as voltage-source while connected to SCE's Distribution System. The test is also applied to the resynchronization Function (transition from stand-alone to parallel operation) on equipment that provides such functionality. This test may not need to be performed on both the synchronization and re-synchronization functions if the manufacturers can verify to the satisfaction of the testing organization that monitoring and controls hardware and software are common to both functions. This test is not necessary for induction generators or current-source inverters. Instead, the In-rush Current test Section J.3.d shall be applied to those generators.

This test shall demonstrate that at the moment of the paralleling-device closure, all three synchronization parameters in Table J.3 are within the stated limits. This test shall also demonstrate that if any of the parameters are outside of the limits stated in the table, the paralleling-device shall not close (IEEE 1547-5.1.2A). The test will start with only one of the three parameters: (1) voltage difference between Generating Facility and SCE's Distribution System; (2) frequency difference; or (3) phase angle outside of the synchronization specification. Verify that the Generating Facility is brought within specification prior to synchronization. Repeat the test five times for each of the three parameters. For manual synchronization with synch check or manual control with auto synchronization, the test must verify that paralleling does not occur until the parameters are brought within specifications.

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J. Certification And Testing Criteria (Continued)

3. Type Testing (Continued)

Table J.3. Synchronization Parameter Limits *[1]*

Aggregate Rating of Generator Units (kVA)	Frequency Difference (Δf, Hz)	Voltage Difference (ΔV, %)	Phase Angle Difference ($\Delta\Phi$,°)
0-500	0.3	10	20
> 500-1,500	0.2	5	15
> 1,500-10,000	0.1	3	10

[1] – IEEE 1547-5.1.1B

g. Paralleling Device Withstand Test

The di-electric voltage withstand test specified in Section J.1 shall be performed on the paralleling device to ensure compliance with those requirements specified in Section D.1.c (IEEE 1547-5.1.3.3).

4. Production Testing

As a minimum, each interconnection system shall be subjected to the Utility Voltage and Frequency Variation Test procedure described in UL1741 under Manufacturing and Production Tests, Section 68 and the Synchronization test specified in Section J.3.f Interconnection systems with adjustable set points shall be tested at a single set of set points as specified by the manufacturer. This test may be performed in the factory or as part of a Commissioning Test (Section J.5.).

5. Commissioning Testing

a. 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 verify the settings and requirements per this Rule.

SCE may require written Commissioning test procedure be submitted to SCE at least 10 working days prior to the performance of the Commissioning Test. SCE has the right to witness Commissioning Test, SCE may also require written certification by the installer describing which tests were performed and their results. Protective Functions to be tested during commissioning, particularly with respect to non-Certified equipment, may consist of the following:

(Continued)

(Continued)

J. Certification And Testing Criteria (Continued)

5. Commissioning Testing (Continued)

(1) Over and under voltage
(2) Over and under frequency
(3) Anti-Islanding function (if applicable)
(4) Non-Exporting function (if applicable)
(5) Inability to energize dead line
(6) Time delay on restart after utility source is stable
(7) Utility system fault detection (if used)
(8) Synchronizing controls (if applicable)
(9) Other Interconnection Protective Functions that may be required as part of the Interconnection Agreement

Commissioning Test shall include visual inspections of the interconnection equipment and protective settings to confirm compliance with the interconnection requirements.

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

(1) Verifying final Protective Function settings
(2) Trip test (J.5.f)
(3) In-service tests (J.5.g)

c. Certified Equipment

Generating Facilities qualifying for Simplified Interconnection incorporate Certified Equipment that have, at a minimum, passed the Type Tests and Production Tests described in this Rule and are judged to have little or no potential impact on SCE's Distribution System. For such Generating Facilities, it is necessary to perform only the following tests:

(1) Protective Function settings that have been changed after Production Testing will require field verification. Tests shall be performed using injected secondary frequencies, voltages and currents, applied waveforms, at a test connection using a Generator to simulate abnormal utility voltage or frequency, or varying the set points to show that the device trips at the measured (actual) utility voltage or frequency.

(2) The Non-Islanding function shall be checked by operating a load break disconnect switch to verify the Interconnection equipment ceases to energize SCE's Distribution System and does not re-energize it for the required time delay after the switch is closed.

(3) The Non-Exporting function shall be checked using secondary injection techniques. This function may also be tested by adjusting the Generating Facility output and local loads to verify that the applicable Non-Exporting criteria (i.e., reverse power or underpower) are met.

The Supplemental Review or an Interconnection Study may impose additional components or additional testing.

(Continued)

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J. Certification And Testing Criteria (Continued)

5. Commissioning Testing (Continued)

d. Non-Certified Equipment

Non-certified Equipment shall be subjected to the appropriate tests described in Type Testing (Section J.3.) as well as those described in Certified Equipment Commissioning Tests (Section J.5.c.). With SCE's approval, these tests may be performed in the factory, in the field as part of commissioning, or a combination of both. SCE, at its discretion, may also approve a reduced set of tests for a particular Generating Facility or, for example, if it determines it has sufficient experience with the equipment.

e. Verification of Settings

At the completion of Commission testing, the Producer shall confirm all devices are set to SCE-approved settings. Verification shall be documented in the Commissioning Test Certification.

f. Trip Tests

Interconnection Protective Functions and devices (e.g. reverse power relays) that have not previously been tested as part of the Interconnection Facilities 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 Function devices or between interrupting devices shall be similarly tested unless they are part of a system that has been tested and approved during manufacturing.

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J. Certification And Testing Criteria (Continued)

5. Commissioning Testing (Continued)

g. In-service Tests

Interconnection Protective Functions and devices that have not previously been tested as part of the Interconnection Facilities 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 Alternating Current (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 report 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.

6. Periodic Testing

Periodic Testing of Interconnection-related Protective Functions shall be performed as specified by the manufacturer, or at least every four years. All Periodic Tests prescribed by the manufacturer shall be performed. The Producer shall maintain Periodic Test reports or a log for inspection by SCE. Periodic Testing conforming to SCE test intervals for the particular Line Section may be specified by SCE under special circumstances, such as high fire hazard areas. Batteries used to activate any Protective Function 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.

7. Type Testing Procedures Not Defined in Other Standards

This Section describes the additional Type Tests necessary to qualify a device as Certified under this Rule. These Type Tests are not contained in Underwriters Laboratories UL 1741 Standard *Inverters, Converters and Controllers for Use in Independent Power Systems,* or other referenced standards.

a. Non-Exporting Test Procedures

The Non-Exporting test is intended to verify the operation of relays, controllers and inverters designed to limit the export of power and certify the equipment as meeting the requirements of Screen 2, Options 1 and 2, of the review process. Tests are provided for discrete relay packages and for controllers and inverters with the intended Functions integrated.

(1) Discrete Reverse Power Relay Test

This version of the Non-Exporting test procedure is intended for discrete reverse power and underpower relay packages provided to meet the requirements of Options 1 and 2 of Screen 2. It should be understood that in the reverse power application, the relay will provide a trip output with power flowing in the export (toward SCE's Distribution System) direction.

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J. Certification And Testing Criteria (Continued)

7. Type Testing Procedures (Continued)

a. Non-Exporting Test Procedures (Continued)

(1) Discrete Reverse Power Relay Test (Continued)

Step 1: Power Flow Test at Minimum, Midpoint and Maximum Pickup Level Settings

Determine the corresponding secondary pickup current for the desired export power flow of 0.5 secondary watts (the minimum pickup setting, assumes 5 amp and 120V CT/PT secondary). Apply nominal voltage with minimum current setting at zero (0) degrees phase angle in the trip direction. Increase the current to pickup level. Observe the relay's (LCD or computer display) indication of power values. Note the indicated power level at which the relay trips. The power indication should be within 2% of the expected power. For relays with adjustable settings, repeat this test at the midpoint, and maximum settings. Repeat at phase angles of 90, 180 and 270 degrees and verify that the relay does not operate (measured watts will be zero or negative).

Step 2: Leading Power Factor Test

Apply rated voltage with a minimum pickup current setting (calculated value for system application) and apply a leading power factor load current in the non-trip direction (current lagging voltage by 135 degrees). Increase the current to relay rated current and verify that the relay does not operate. For relays with adjustable settings, this test should be repeated at the minimum, midpoint, and maximum settings.

Step 3 Minimum Power Factor Test

At nominal voltage and with the minimum pickup (or ranges) determined in Step 1, adjust the current phase angle to 84 or 276 degrees. Increase the current level to pickup (about 10 times higher than at 0 degrees) and verify that the relay operates. Repeat for phase angles of 90, 180 and 270 degrees and verify that the relay does not operate.

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J. Certification And Testing Criteria (Continued)

7. Type Testing Procedures (Continued)

a. Non-Exporting Test Procedures (Continued)

(1) Discrete Reverse Power Relay Test (Continued)

Step 4 Negative Sequence Voltage Test

Using the pickup settings determined in Step 1, apply rated relay voltage and current at 180 degrees from tripping direction, to simulate normal load conditions (for three-phase relays, use I_a at 180, I_b at 60 and I_c at 300 degrees). Remove phase-1 voltage and observe that the relay does not operate. Repeat for phases-2 and 3.

Step 5 Load Current Test

Using the pickup settings determined in Step 1, apply rated voltage and current at 180 degrees from the tripping direction, to simulate normal load conditions (use I_a at 180, I_b at 300 and I_c at 60 degrees). Observe that the relay does not operate.

Step 6: Unbalanced Fault Test

Using the pickup settings determined in Step 1, apply rated voltage and 2 times rated current, to simulate an unbalanced fault in the non-trip direction (use V_a at 0 degrees, V_b and V_c at 180 degrees, I_a at 180 degrees, I_b at 0 degrees, and I_c at 180 degrees). Observe that the relay, especially single phase, does operate properly.

Step 7: Time Delay Settings Test

Apply Step 1 settings and set time delay to minimum setting. Adjust the current source to the appropriate level to determine operating time, and compare against calculated values. Verify that the timer stops when the relay trips. Repeat at midpoint and maximum delay settings.

(Continued)

(Continued)

J. Certification And Testing Criteria (Continued)

7. Type Testing Procedures (Continued)

a. Non-Exporting Test Procedures (Continued)

(1) Discrete Reverse Power Relay Test (Continued)

Step 8: Dielectric Test

Perform the test described in IEC 414 using 2 kV RMS for 1 minute.

Step 9: Surge Withstand Test

Perform the surge withstand test described in IEEE C37.90.1.1989 or the surge withstand capability test described in J.3.e.

(2) Discrete Underpower Relay Test

This version of the Non-Exporting test procedure is intended for discrete underpower relay packages and meets the requirements of Option 2 of Screen 2. A trip output will be provided when import power (toward the Producer's load) drops below the specified level.

Note: For an underpower relay, pickup is defined as the highest power level at which the relay indicates that the power is less than the set level.

Step 1: Power Flow Test at Minimum, Midpoint and Maximum Pickup Level Settings

Determine the corresponding secondary pickup current for the desired power flow pickup level of 5% of peak load minimum pickup setting. Apply rated voltage and current at 0 (zero) degrees phase angle in the direction of normal load current.

Decrease the current to pickup level. Observe the relay's (LCD or computer display) indication of power values. Note the indicated power level at which the relay trips. The power indication should be within 2% of the expected power. For relays with adjustable settings, repeat the test at the midpoint, and maximum settings. Repeat at phase angles of 90, 180 and 270 degrees and verify that the relay operates (measured watts will be zero or negative).

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J. Certification And Testing Criteria (Continued)

7. Type Testing Procedures (Continued)

a. Non-Exporting Test Procedures (Continued)

(2) Discrete Under Power Relay Test (Continued)

Step 2: Leading Power Factor Test

Using the pickup current setting determined in Step 1, apply rated voltage and rated leading power factor load current in the normal load direction (current leading voltage by 45 degrees). Decrease the current to 145% of the pickup level determined in Step 1 and verify that the relay does not operate. For relays with adjustable settings, repeat the test at the minimum, midpoint, and maximum settings.

Step 3: Minimum Power Factor Test

At nominal voltage and with the minimum pickup (or ranges) determined in Step 1, adjust the current phase angle to 84 or 276 degrees. Decrease the current level to pickup (about 10% of the value at 0 degrees) and verify that the relay operates. Repeat for phase angles 90, 180 and 270 degrees and verify that the relay operates for any current less than rated current.

Step 4: Negative Sequence Voltage Test

Using the pickup settings determined in Step 1, apply rated relay voltage and 25% of rated current in the normal load direction, to simulate light load conditions. Remove phase 1 voltage and observe that the relay does not operate. Repeat for Phases-2 and 3.

Step 5: Unbalanced Fault Test

Using the pickup settings determined in Step 1, apply rated voltage and two times rated current, to simulate an unbalanced fault in the normal load direction (use V_a at 0 degrees, V_b and V_c at 180 degrees, I_a at 0 degrees, I_b at 180 degrees, and I_c at 0 degrees). Observe that the relay (especially single-phase types) operates properly.

(Continued)

(Continued)

J. Certification And Testing Criteria (Continued)

7. Type Testing Procedures (Continued)

a. Non-Exporting Test Procedures (Continued)

(2) Discrete Under Power Relay Test (Continued)

Step 6: Time Delay Settings Test

Apply Step 1 settings and set time delay to minimum setting. Adjust the current source to the appropriate level to determine operating time, and compare against calculated values. Verify that the timer stops when the relay trips. Repeat at midpoint and maximum delay settings.

Step 7: Dielectric Test

Perform the test described in IEC 414 using 2 kV RMS for 1 minute.

Step 8: Surge Withstand Test

Perform the surge withstand test described in IEEE C37.90.1.1989 or the surge withstand test described in Section J.3.e.

(3) Tests for Inverters and Controllers with Integrated Functions

Inverters and controllers designed to provide reverse or underpower functions shall be tested to certify the intended operation of this function. Two methods are acceptable:

Method 1: If the inverter or controller utilizes external current/voltage measurement to determine the reverse or underpower condition, then the inverter or controller shall be functionally tested by application of appropriate secondary currents and potentials as described in the Discrete Reverse Power Relay Test, Section J.7.a.(1) of this Rule.

Method 2: If external secondary current or voltage signals are not used, then unit-specific tests must be conducted to verify that power cannot be exported across the PCC for a period exceeding two seconds. These may be factory tests, if the measurement and control points are integral to the unit, or they may be performed in the field.

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J. Certification And Testing Criteria (Continued)

7. Type Testing Procedures (Continued)

b. In-rush Current Test Procedures

This test will determine the maximum In-rush Current drawn by the Generator.

(1) Locked-Rotor Method

Use the test procedure defined in NEMA MG-1 (manufacturer's data is acceptable if available).

(2) Start-up Method

Install and setup the Generating Facility equipment as specified by the manufacturer. Using a calibrated oscilloscope or data acquisition equipment with appropriate speed and accuracy, measure the current draw at the Point of Interconnection as the Generating Facility starts up and parallels with SCE's Distribution System. Startup shall follow the normal, manufacturer-specified procedure. Sufficient time and current resolution and accuracy shall be used to capture the maximum current draw within 5%. In-rush Current is defined as the maximum current draw from SCE during the startup process, using a 10-cycle moving average. During the test, the utility source, real or simulated, must be capable of maintaining voltage within +/- 5% of rated at the connection to the unit under test. Repeat this test five times. Report the highest 10-cycle current as the In-rush Current. A graphical representation of the time-current characteristic along with the certified In-rush Current must be included in the test report and made available to SCE.

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GENERATING FACILITY INTERCONNECTION AGREEMENT
Continuous – Export Agreement

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