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November 30, 2020

Advice 6014-E
(Pacific Gas and Electric Company ID U 39 E)

Public Utilities Commission of the State of California

Subject: **Advice Letter Modifying Electric Rule 21 Pursuant to Decision 20-09-035 for Working Group 2 and 3 (due 60 Days from Issuance)**

Purpose

Pacific Gas and Electric Company (PG&E) hereby submits this Tier 2 Advice Letter ("AL") to update Electric Rule 21 - *Generating Facility Interconnections* - in compliance with the California Public Utilities Commission ("CPUC", "Commission") Decision ("D.") D.20-09-035[1] ("WG 2 & 3 Decision") for Those Ordering Paragraphs Ordered to be Addressed in an Advice Letter to be Filed in 60 days from Issuance.

Background

Rulemaking 17-07-007
On July 13, 2017, The Commission adopted Order Instituting Rulemaking (R.) 17-07-007 to consider refinements to Electric Tariff Rule 21 of Pacific Gas and Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E), and Southern California Edison Company (SCE) (jointly, Utilities) regarding the interconnection of distributed energy resources.[2]

ACR Scoping Memo
On October 2, 2017, the Commission issued Scoping Memo of Assigned Commissioner and Administrative Law Judge (Scoping Memo) set forth the scope and schedule of the proceeding. It established the working group process, whereby resolution of the technical issues of the proceeding would be proposed by Working Groups One through Six. In

[1] Decision 20-09-035 - Date of Issuance 9/30/2020 - *Decision Adopting Recommendations from Working Groups Two, Three, and Subgroup*

[2] The Rule 21 tariff describes the interconnection, operating, and metering requirements for certain generating and storage facilities seeking to connect to the electric distribution system. Rule 21 provides customers access to the electric grid to install generating or storage facilities while protecting the safety and reliability of the distribution and transmission systems at the local and system levels. (See R.17-07-007 at p2.)

addition, four issues were assigned to the Smart Inverter Working Group, including issues 5 and 6.[3]

Working Group 2

On February 14, 2018, a Ruling directed that Working Group Two would begin on March 15, 2018 and required that it subsequently file its recommendations report on September 15, 2018. The Ruling also reassigned Issue 6 to Working Group Two.

On August 15, 2018, the Administrative Law Judge issued a Ruling allowing additional time for Working Group Two to resolve issues, including sub-issues encountered, and delaying the filing of the recommendations report to October 31, 2018.

On October 31, 2018, the Working Group 2 final report was issued.[4]

On November 7, 2018, the Administrative Law Judge facilitated a workshop to discuss the recommendations provided in the Working Group 2 Final Report.

On December 7, 2018, in response to the November 7, 2018, workshop on the Working Group Two Report, and parties were directed to respond to questions on the report.

On February 1, 2019, responses to the questions, along with comments on the Working Group Report, were filed by the various parties

On February 22, 2019, replies were filed by the various parties.

Amended Scoping Memo and Working Group 3

On November 16, 2018, a Scoping Memo and Ruling (Amended Scoping Memo) delayed the start of Working Group Three until December 1, 2018 and required Working Group Three to file its recommendations report on June 14, 2019. The Amended Scoping Memo also decreased the number of working groups and redistributed issues across two working groups and the Interconnection Discussion Forum[5] such that Working Group Three was assigned issues 12, 15, 16, 20, 22, 23, 24, 27 28, and New Issues A and B.

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[3] The Smart Inverter Working Group (SIWG) grew out of a collaboration between the Commission and the California Energy Commission in early 2013. The collaboration identified the development of advanced inverter functionality as an important strategy to mitigate the impact of high penetrations of distributed energy resources. [as explained in footnote 2 in D. 20-09-035]

[4] Working Group Two Final Report filed jointly by the Utilities.

[5] In Resolution Administrative Law Judge-347, the Commission established the Interconnection Discussion Forum (formerly known as the Rule 21 Working Group) as a venue to encourage discussion and collaboration between the Utilities and developers. [as explained in footnote 3 in D. 20-09-035]

On June 13, 2019, the Working Group Three Final Report[6] was issued followed by a workshop.

A November 27, 2019 Ruling directed parties to respond to questions on the Working Group Three Report.

On January 13, 2020, the various parties filed responses to the questions contained in the November 27, 2019, ruling, along with comments to the Working Group Three Report.

On January 27, 2020, various parties filed replies to the responses and Working Group Three Report comments

Vehicle to Grid Subgroup

An August 23, 2019 Ruling issued in R. 17-07-007 and in R.18-12-006 (the *Rulemaking to Continue the Development of Rates and Infrastructure for Vehicle Electrification*) established the V2G AC Subgroup with meetings to begin on September 11, 2019. The purpose of this subgroup is to discuss and identify existing standards to fulfill safety requirements for the interconnection of mobile inverters. The ruling directed a final recommendations report from the subgroup to be filed on December 6, 2019.

A workshop on the subgroup report was held on December 17, 2019.

On December 11, 2019, the V2G Final Report was issued[7].

On January 6, 2020, various parties filed comments to the December 6, 2019, Final V2G AC subgroup report.

On January 13, 2020, various parties filed replies to the comments on the V2G AC subgroup report.

Decision 20-09-035

On August 20, 2020, a proposed decision was issued on Working Groups Two and Three. On September 9, 2020 comments were received. On September 22, 2020, replies were received.

On September 24, 2020, the Commission voted out D.20-09-035. D.20-09-035 addressed the recommendations of Working Groups Two and Three and the Vehicle-to-Grid Alternating Current Interconnection Subgroup (V2G AC Subgroup).

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[6] Working Group Three Final Report filed by SDG&E

[7] Final Report of the Vehicle to Grid Alternating Current Interconnection Subgroup.

Working Group one Advice letters was filed [8] and is still are pending, so its changes are pending on Rule 21.

On October 30th, PG&E submitted AL 5988-E[9], a Tier 1 AL 30 days after the issuance of D. 20-09-035, as ordered by that decision. PG&E modified its portals immediately upon submission to comply.

D. 20-09-035 OP 54 (as corrected) requires:

> *"55. Pacific Gas and Electric Company, San Diego Gas & Electric Company, and Southern California Edison Company shall update their respective Electric Rule 21 Tariff and, where necessary, Rules 2, 15, and 16 Tariffs, in compliance with the Ordering Paragraphs of this decision by submitting three advice letters pursuant to the table below The table provides the list of the ordering Paragraphs (OP) in this decision requiring changes to Rule 21. The table also indicates whether the advice letter associated with each ordering paragraph is required to be Tier 1 or Tier 2 and provides the deadline for submitting the Advice Letter."*

Distilling down the referenced table at the end referred to in OP 55 (as corrected) to only include the items germane to this 60-day Advice Letter, the following Ordering Paragraphs will be addressed. However, the table appears to have incorrect references[10] based on the context of discussion as noted in the red text.

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[8] AL 5553-E *Modification to Rule 21 Pursuant to the Working Group 1 D. 19-03-013*. The Rule 21 changes in AL 5553-E is still pending approval. Two other Advice letters (AL 5583-E, and AL 5584-E) were also submitted for Working Group 1 but they did not impact Rule 21.

[9] AL 5988-E *Advice Letter Modifying Electric Rule 21 Pursuant to Decision 20-09-035 for Working Group 2 and 3*

[10] Energy Division was provided notice of these discrepancies in mid-October. It seems the ordering paragraphs in the table after OP 22 should be decremented by 1 since the proposed decision was revised before the CPUC meeting, and the OP 22 was deleted in the final decision. The ALJ is working on getting a corrected decision issued, according to Energy Division.

AL Section	OP	Tier 2 Submit 60 day after issuance of decision	Description
1	1	X	Project below ICA Value (Proposal 8a)
2	2	X	Initial Review to Use ICA and Share Results (Proposal 8b)
3	3	X (if tariff changes are needed) **SCE only**	ICA Labeling & Reporting
4	4	X (if tariff changes are needed)	Outdated ICA Values & Cost Tracking (Issue 12, Proposal 8c)
5	12	X	Screen N Thermal Overload (Proposal 8n)
6	17	X	Single Project ID, etc. (Issue 10, Proposals 2,3,4,5,8)
7	18	X	Expedited Non-Export Storage Process (Issue 11, Proposal A)
8	~~24~~ 23	X (if tariff changes needed)	Standard Design & Construction 60 / 60 BD Timeline (Issue 23, Proposal 12c)
9	~~25~~ 24	X (if tariff changes needed)	Standard NGOM Installation Timeline (Proposal 12d)
10	~~31~~ 30	X	Quarterly Substation Upgrade Updates (Proposal 12j)
11	~~33~~ 32	X	Incorporating Rule 15 Changes (Proposals 16a, 16b, and 16c)
12	~~34~~ 33	X	CPUC (Rule 21) /FERC (WDT) Process Education (Proposal 20a, 20b and 20c)
13	~~38~~ 37	X	V2G and Rules 2, 15, 16 (Proposal 23a)
14	~~39~~ 38	X	Stationary/Mobile Energy Storage (Proposal 23b)
15	~~41~~ 40	X	V2G DC (Proposal 23d)
16	~~47~~ 46	X (for 27.a.iii)	IEEE 1547 & 1547.1 Updates & Default Settings (Proposal 27.a.iii)
	~~55~~ 54	Associated table identifying the above ordering paragraphs as needing to be address in the 60 day advice letter	

Therefore, based on the above identified Ordering Paragraphs, PG&E proposes the tariff revision addressed below.

Tariff Changes

1. **Ordering Paragraph 1 – Project below ICA Value**

Ordering Paragraph 1 requires:

> *1. Proposal 8a is adopted.*
>
> *The **Fast Track eligibility size is eliminated from Electric Rule 21**.*
>
> *An Interconnection project that is sized **below the Integration Capacity Analysis value** may still be required to go through Supplemental Review or Detailed Study, if the project fails the Screens not evaluated by the Integration Capacity Analysis.*
>
> *The elimination of size eligibility shall not increase chances of passing through Initial Review or Supplemental Review if the projects is sized above the Integration Capacity Analysis value.*
>
> ***Net energy metering interconnection projects under 30 kilovolt amperes may use the Fast Track process regardless** of the Integration Capacity Analysis value.*

To address this PG&E proposed
i) modifying the language in Section E.2.b.i)
ii) modify the applicant's options at the beginning of the Rule 21 Interconnection Technical Framework Overview (the Screen flow chart)

For Section E.2.b.i, PG&E proposes to modify the language as shown: (Original Rule 21 Sheet 52)

E. Interconnection Request Submission Process (Continued)

2. Interconnection Request Process (Continued)

b. Applicant Selects a Study Process (Continued)

i) Fast Track Eligibility

Non-Exporting Generating Facilities and NEM-1 Generating Facilities ~~are eligible for~~ shall be evaluated under the Fast Track Interconnection ~~Evaluation~~ Review Process as described under

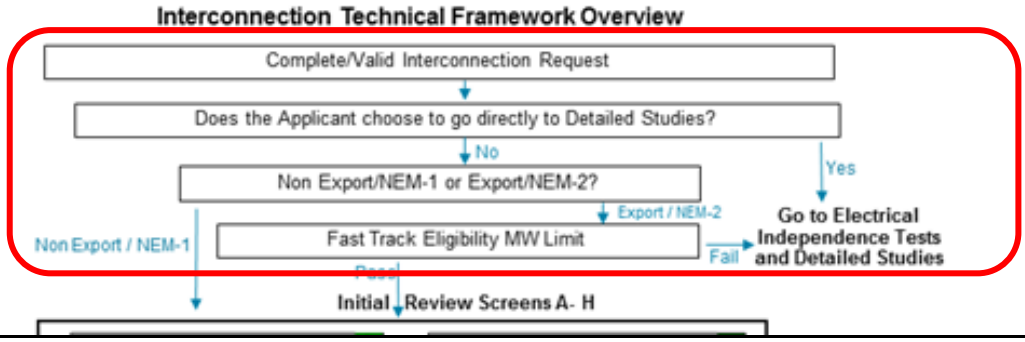
Section F.2. below. ~~regardless of the Gross Nameplate Rating of the proposed Generating Facility.~~

NEM-2 Generating Facilities and Exporting Generating Facilities of any size are eligible for and may elect the Fast Track evaluation if the Applicant believes its Interconnection Request may pass the Fast Track Process as described under Section F.2. below. ~~with a Gross Nameplate Rating no larger than 1.5 MW on a 12 kV interconnection are also eligible for Fast Track evaluation.~~

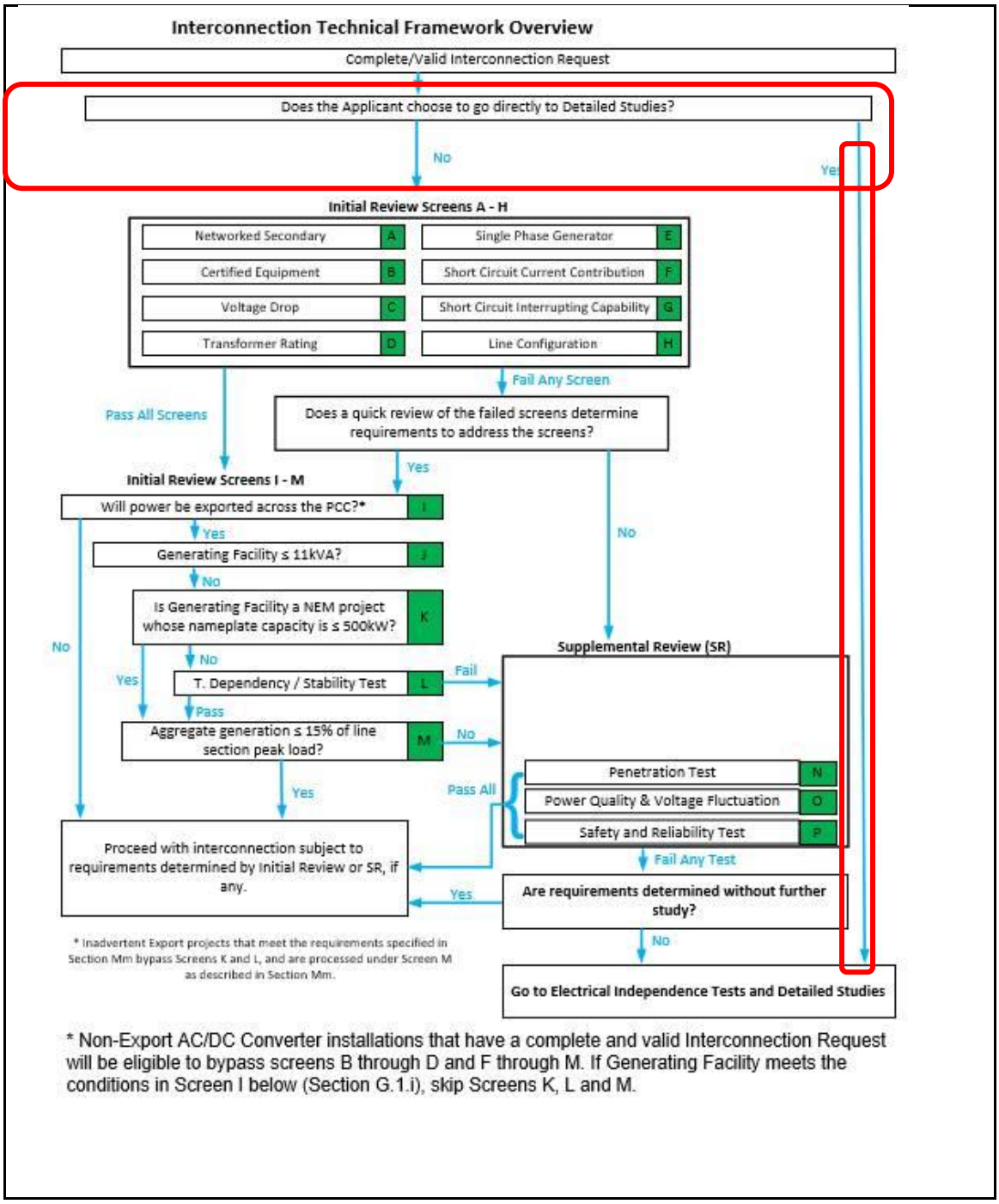
~~For an Exporting Generating Facility that agrees to the installation of Distribution Provider-approved protective devices at Applicant's cost such that the Exporting Generating Facility's net export will never exceed the Fast Track eligibility limits, the Generating Facility's net export will be considered for purposes of Fast Track eligibility. However, these Interconnection Requests will be required to complete Supplemental Review and Applicants should pre-pay for Supplemental Review at the time the Interconnection Request is submitted.~~

ii) Detailed Study Eligibility

The Screen flow chart is simplified given the new requirements. The current process is shown below (the red circled part is changing) (Original Rule 21 Sheet 140):



PG&E proposes the following simplification (circled in red):



* Non-Export AC/DC Converter installations that have a complete and valid Interconnection Request will be eligible to bypass screens B through D and F through M. If Generating Facility meets the conditions in Screen I below (Section G.1.i), skip Screens K, L and M.

2. Ordering Paragraph 2 – Initial Review to Use ICA and Share Results

Ordering Paragraph 2 requires:

> *2. Proposal 8b is adopted.*
>
> *Pacific Gas and Electric Company, San Diego Gas & Electric Company, and Southern California Edison Company (Utilities) shall* ***use the Initial Review process to determine if Integration Capacity Analysis values*** *at the proposed Point of Interconnection need to be updated using the Integration Capacity Analysis tool on the specific electrical node into the Initial Review process or running the Integration Capacity Analysis on all the electrical nodes in the circuit.*
>
> *Utilities shall not perform additional Integration Capacity analyses as part of the interconnection process of projects with less than 30 kilovolt amperes nameplate capacity.*
>
> *Utilities shall* ***share the results of any Integration Capacity Analysis updates*** *with the interconnecting generator and provide an explanation of changes to grid conditions or the interconnection queue.*
>
> *Utilities shall comply with* ***confidentiality*** *provisions and data reduction policies.*
> [Formatting and emphasis added]

PG&E proposes to add the language in Rule 21 Section F.2.a as shown below (Original Rule 21 Sheet 75):

F. REVIEW PROCESS FOR INTERCONNECTION REQUESTS (Cont'd.)

2. Fast Track Interconnection Review Process (Continued)

a. Initial Review (Continued)

No changes may be made to the planned Point of Interconnection or Generating Facility size included in the Interconnection Request during the Fast Track Process, unless such changes are agreed to by Distribution Provider. Where agreement has not been reached, Applicants choosing to change the Point of Interconnection or Generating Facility size must reapply and submit a new Interconnection Request.

As part of the evaluation of Screen M, when Integration Capacity Analysis values are available at the requested Point of Interconnection, Distribution Provider will determine if Integration Capacity Analysis values at the proposed Point of Interconnection need to be updated. If Distribution Provider determines that the Integration Capacity Analysis values at the proposed Point Interconnection need to be updated, the Distribution Provider will update the values for the proposed Point Of Interconnection using the Integration Capacity Analysis tool on the specific electrical node or by running the Integration Capacity Analysis on all the electrical nodes in the circuit. Distribution Provider shall not perform additional Integration Capacity Analysis as part of the interconnection process of projects with less than 30 kilovolt amperes nameplate capacity. Distribution Provider shall share the results of any Integration Capacity Analysis updates with the Applicant and provide an explanation of changes to grid conditions or the interconnection queue which led to the need to obtain updated Integration Capacity Analysis values. Distribution Provider shall comply with confidentiality provisions and data redaction policies.

Applicants that elect to proceed to Supplemental Review, unless the Applicant has pre-paid the Supplemental Review fee, shall provide a nonrefundable Supplemental Review fee set forth in Section E.2.c with their response. The Supplemental Review fee shall be waived for Interconnection Requests requesting Interconnection of NEM-1 or ≤1 MW NEM-2 Generating Facilities and for solar-powered non-NEM ≤1 MW Generating Facilities that do not sell power to Distribution Provider, per Commission D.01-07-027.

Tied with the above OP, OP 11 involves applying a buffer on the Integration Capacity Analysis-Static Grid. OP 54 (as corrected) lists OP 11 as being addressed in a Tier 2 AL due **120 day** after the issuance of the decision. As

OP 11 is being addressed after this AL, this limits how much of the these ICA changes can be implemented in this AL.

> *11. Option B of Proposal 8m is adopted with modification.*
>
> *Pacific Gas and Electric Company, San Diego Gas & Electric Company, and Southern California Edison Company (Utilities) shall* ***apply a 10 percent buffer*** *to the Integration Capacity Analysis-Static Grid profile and to the Integration Capacity Analysis Operational Flexibility profile during review of Screen M of the Rule 21 Interconnection Application Process.*
>
> *The need for the 10 percent buffer to the Integration Capacity Analysis-Operational Flexibility profile will be revisited by the Commission.*
>
> *Utilities shall collect data on the effectiveness of the 10 percent Integration Capacity Analysis-Operational Flexibility buffer (after consulting with the Commission's Energy Division) and provide the data and a recommendation on whether to retain the buffer or adjust it, in the Advice Letter on buffers for Issue 9, as required by Ordering Paragraph 15.*
> [Formatting and emphasis added]

3. Ordering Paragraph 3 – ICA Labeling & Reporting

Ordering Paragraph 3 requires:

> ***Southern California Edison Company (SCE) shall develop a system for labeling Integration Capacity Analysis values*** *that need to be updated.*
>
> *No later than six months from the issuance of this decision, SCE shall submit a report on the status of this work to the Director of the Commission's Energy Division.*
>
> [Formatting and emphasis added]

This OP applies to SCE.

4. Ordering Paragraph 4 –Outdated ICA Values & Cost Tracking

Ordering Paragraph 4 requires:

> *Pacific Gas and Electric Company, San Diego Gas & Electric Company, and Southern California Edison Company (Utilities) shall track when the Integration Capacity Analysis* ***outdated values*** *lead to Interconnection Requests failing the Initial Review.*
>
> *Utilities shall* ***provide the results*** *of the tracking required in Proposal 8c with the Issue 12 reporting required by Ordering Paragraph 22 below.*
>
> *Additionally, Utilities shall also* ***track the costs*** *associated with the updates necessitated by the outdated values and provide the data in the same Issue 12 reporting document.*
>
> *Furthermore, Utilities shall* ***include the actual costs*** *associated with the processing of interconnection applications as referenced in the discussion on Proposal 8s.*

As with OP 2 in Section 2 above, this cannot be implemented until screen M can use ICA, which happens when OP 11 goes into effect in 120 days per OP 54 (as corrected). However, this OP involves tracking, which PG&E will begin to comply with upon the effective date of this AL

5. Ordering Paragraph 12 – Screen N Thermal Overload

Ordering Paragraph 12 requires:

> *12. Proposal 8n is adopted.*
>
> *Pacific Gas and Electric Company, San Diego Gas & Electric Company, and Southern California Edison Company shall update* ***Screen N*** *of the Rule 21 Interconnection Application Process to account* ***for thermal overload****, while adjusting for the following three scenarios:*
>
> *i) when the Interconnection Request is* ***below*** *the updated Integration Capacity Analysis value and passes Screen F1;*
>
> *ii) when the Interconnection Request is* ***above*** *the updated Integration Capacity Analysis value or fails Screen F1; and*
>
> *iii) when Integration Capacity Analysis information is not available.*
> [Formatting and emphasis added]

PG&E propose the following changes:
i) Add new definitions for OP 12, in Rule 21 Section C, Definitions. and
ii) Add language in Rule 21 Section G.2.a.

PG&E proposed the following additions related to the Integration Capacity Analysis to the Definitions in Rule 21 in Section C as shown below (Original Rule 21 Sheets 26):

C. Definitions (Continued)

The Integration Capacity Analysis Static Grid (SG) 576 profile: At a given Point of Interconnection, the minimum Integration Capacity Analysis values at each of the 576 hours for the most limiting of these categories: thermal, voltage, power quality, and protection.

Integration Capacity Analysis Static Grid (ICA-SG) Value: The minimum ICA value in a given Point of Interconnection's ICA-SG 576 Profile.

Integration Capacity Analysis (ICA) Values: Values which represent the maximum capacity that can be interconnected at a given Point of Interconnection without exceeding Distribution Provider equipment thermal limits or any of the Distribution System voltage, power quality, protection, and safety (operational flexibility) limits each which is independently calculated.

PG&E proposes additions to the definition for Section G.2.a for Screen N in Rule 21 as shown below. (Original Rule 21 Sheet 155) Note that Proposal 8m is addressed in OPs 11 and 12. OP 12 is very general, and involves just the Integrated Capacity Analysis Values. The language below extended here very specifically to include 90% of the Integrated Capacity Analysis 576 Profile. Note however, that the language below is also based on OP5, which is to be included and made effective in the 120 day advice letter.

G. Engineering Review Details (Continued)

2. Supplemental Review Screens (Continued)

a. Screen N: Penetration Test

Is Integration Capacity Analysis Values available at the requested Point of Interconnection?

If Yes, evaluate Screen N as follows:

Is the Interconnection Request Gross Nameplate Rating below 90% of the ICA-SG Value (i.e. the minimum value) in the ICA-SG 576 Profile?

Did the Interconnection Request pass Screen F1?

- If the evaluation of the two Screen N questions above are both "yes" (pass), continue to Screen O.
- If "no" to either or both of the above (fail), a quick review of the failure may determine the requirements to address the failure; otherwise Electrical Independence Tests and Detailed Studies are required. Continue to Screen O. (Note: If Electrical Independence tests and Detailed Studies are required, Applicants will continue to the Electrical Independence Tests and Detailed Studies after review of the remaining Supplemental Review Screens if Applicant elects to proceed.)

If No, evaluate Screen N as follows:

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

- If yes (pass), continue to Screen O.
- If no (fail), a quick review of the failure may determine the requirements to address the failure; otherwise Electrical Independence Tests and Detailed Studies are required. Continue to Screen O. (Note: If Electrical Independence tests and Detailed Studies are required, Applicants will continue to the Electrical Independence Tests and Detailed Studies after review of the remaining Supplemental Review Screens if Applicant elects to proceed.)

6. Ordering Paragraph 17 – Single Project ID, Study Start Date, Engineering Advance Invoicing, Mitigation Scope Meeting, and Detailed Reconciliation

Ordering Paragraph 17 requires:

17. The following proposals are adopted to resolve Issue 10:

*a) **Proposal 2,** which requires Pacific Gas and Electric Company, San Diego Gas & Electric Company, and Southern California Edison Company (Utilities) to use a **single project identifier number** from receipt of an interconnection request through permission to operate and applicable for Rules 2, 15, 16 and 21;*

*b) Proposal 3, which requires Utilities to notify the Interconnection customer of **the study start date** for projects studied under these rules;*

*c) Proposal 4, which requires Utilities to **invoice the engineering advance** within five business days of execution of the Interconnection Agreement;*

*d) Proposal 5, which requires Utilities to schedule a **mitigation work scoping meeting** no later than ten business days after receiving the payment for the engineering advance; and*

*e) Proposal 8, which requires Utilities to provide a customer a **detailed reconciliation** of the costs of interconnection facilities and distribution upgrades within 12 months of project completion.*

[Formatting and emphasis added]

D. 20-09-035 states "Issue 10 asks the parties to propose options to coordinate the Integration Capacity Analysis and Rule 21 with Rules 2, 15, and 16 processes to improve the efficiency of the overall interconnection process."[11]

For Ordering Paragraph 17, Proposal 2, PG&E prior to and up until an application is submitted, will have an ACE-IT application portal reference number. After this point when the application is successfully submitted, there will be a single SAP reference number assigned the night of application submittal that will be used to reference the application going forward until permission to operate is granted, or the application is withdraw.

For Ordering Paragraph 17, Proposal 3, PG&E will provide notification to applicants of the study start date. D. 20-09-035 states "Proposal 3 requires a utility to inform an interconnection customer of the start date for a project studied under Rules 2, 15, and/or 16."[12] To address this, PG&E, specifically will notify applicant when studies to be performed for any of these rules are started.

For Ordering Paragraph 17, Proposal 4, PG&E will invoice the engineering advice within 5 business days. Proposal "requires a utility to send an invoice for the engineering advance or the facility costs within five business days of execution of

[11] D. 20-09-035 page 60
[12] D. 20-09-035 page 66

the Interconnection Agreement, unless the request for payment is contained within the agreement. Knowing when to expect the invoice provides certainty to the customer, thus improving transparency of the interconnection process."[13]

For Ordering Paragraph 17, Proposal 5, PG&E will schedule a mitigation work scoping meeting no later than ten business days after receiving the payment for the engineering advance.

7. Ordering Paragraph 18 – Expedited Non-Export Storage Process

Ordering Paragraph 18 requires:

> *18. Proposal A of Issue 11 is adopted.*
>
> *Pacific Gas and Electric Company, San Diego Gas & Electric Company, and Southern California Edison Company (Utilities) shall modify the Rule 21 Fast Track process to* ***include all successful process improvements tested in the Utilities' non-exporting energy storage pilot*** *(Pilot).*
>
> *These improvements shall be applicable to non-exporting standalone storage system projects only.*
> [Formatting and emphasis added]

The final non-exporting energy storage pilot proposal was described in AL 4941-E-A[14] and a report was issued in the post-Pilot AL 5371-E[15]. AL 4941-E-A added Section N to Rule 21 describing the pilot. The specifics of the now-completed pilot are addressed in footnote 1 of Section N, as shown, which we propose to eliminate.

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[13] D. 20-09-035 page 67

[14] AL 4941-E-A - *Supplemental: Modifications to Electric Rule 21 to Incorporate an Expedited Interconnection Process for Non-Exporting Storage, Pursuant to Decision 16-06-052 Attachment C* – submitted February 1, 2017.

[15] AL 5371-E - *Information-Only Report on Rule 21 Expedited Non-Export Storage Pilot* Submitted August 31, 2018.

Additionally, PG&E proposes to modify Rule 21, Section N, to remove the pilot footnote. (Original Rule 21 Sheet 257)

N. EXPEDITED INTERCONNECTION PROCESS FOR NON-EXPORT ENERGY STORAGE GENERATING FACILITIES

Applicants with Interconnection Requests for Non-Export Energy Storage Generating Facilities who meet the requirements outlined below are eligible for expedited interconnection in accordance with the Fast Track Process technical review requirements of Section F.2.~~1~~ Applicants with Non-Export AC/DC Converters that meet the requirements outlined in O. below are also eligible.

…

_____

~~1 In accordance with Advice 4941-E-A, the provisions provided for in Section N are being implemented under a pilot approach with a July 1, 2017 through June 30, 2018 reporting period. As such, the provisions may be continued, modified and/or withdrawn as determined by the Commission~~

8. Ordering Paragraph 23 – Standard Design and Construction 60 / 60 BD Timeline

Ordering Paragraph 23 requires:

> *23. Proposal 12c is adopted, establishing a standard timeline for design and construction of interconnection-related distribution upgrades as follows:*
>
> *i) 60 business days for design and 60 business days for construction, or*
>
> *ii) design and construction timelines as agreed with the customer.*
>
> *The 60-day clock commences upon payment and after the customer has done everything necessary on their end to prepare for construction.*
>
> [Formatting and emphasis added]

PG&E will satisfy this requirement by tracking the milestones in PG&E's workflow management system and use to report to the CPUC quarterly. The Utilities will start meetings with Energy Division to better define the details of the reporting requirements starting in early December.

9. Ordering Paragraph 24 – Standard NGOM Installation Timeline

Ordering Paragraph 24 requires:

> *24. Proposal 12d is adopted, establishing* ***a standard timeline for installation of Net Generation Output Meters*** *as follows:*
>
> *i) 20 business days for design and 20 business days for construction, or*
>
> *ii) design and construction timelines as agreed with the customer.*
>
> *The 20-day clock commences upon payment and after the customer has done everything necessary on their end to prepare for construction.*
>
> [Formatting and emphasis added]

PG&E will satisfy this requirement by tracking the milestones in PG&E's workflow management system and use to report to the CPUC quarterly. The Utilities will start meetings with Energy Division to better define the details of the reporting requirements starting in early December.

10. Ordering Paragraph 30 – Quarterly Substation Upgrade Updates

Ordering Paragraph 30 Language requires:

> *30. Proposal 12j is adopted.*
> ***Rule 21 shall be revised*** *to require Pacific Gas and Electric Company, San Diego Gas & Electric Company, and Southern California Edison Company to provide* ***quarterly updates on substation upgrades*** *to applicants whose projects are dependent on a substation upgrade***.**
> [Formatting and emphasis added]

PG&E will prepare and post a substation construction status report to PG&E's Interconnection website at www.pge.com/gen on a quarterly basis within 30 calendar days of the close of each calendar quarter. Upon the initial posting of this report, following the close of the first quarter of 2021, PG&E will notify Applicants whose projects are dependent on a substation upgrade that updates will be posted quarterly with a link to the report location. Going forward, future Applicants whose projects are dependent on a substation upgrade will be notified of the posting cadence and location of this report when the work is transitioned for implementation.

Quarterly substation construction status will be identified by assigned queue number and/or unique project identifier (see P 17 Section 6 above) and information provided will include project stage per the table below, as well as actual and estimated completion dates for kickoff, walkdown, design/engineering completion, job estimate approval, customer requested operation date, and PG&E expected operation date.

Project Stage	Definition
Initiating	Waiting for the project walkdown to occur.
Engineering	Engineering has started.
Staging	Waiting for construction to start. Leadup to construction is complete.
Construction	Construction has started and is pending completion.
Operative	Job is operative.
Closeout	Project went operative and is pending the completion of closeout activities.
Complete	Project is closed
Pending Cancellation	Job is being cancelled.

Additionally, PG&E proposes to modify Rule 21, Section F.2.e regarding the quarterly Substation updates (Original Rule 21 Sheet 84)

F. REVIEW PROCESS FOR INTERCONNECTION REQUESTS (Cont'd.)

2. FAST TRACK INTERCONNECTION REVIEW PROCESS (Cont'd.)

e. Execution of the Generator Interconnection Agreement (Cont'd.)

Distribution Provider and Producer shall negotiate in good faith concerning a schedule for the construction of Distribution Provider's Interconnection Facilities and Distribution Upgrades.

Distribution Provider shall provide quarterly updates on substation upgrades to Producers whose projects are dependent on a substation upgrade

11. Ordering Paragraph 32 – Incorporating Rule 15 Changes

Ordering Paragraph 32 Language requires:

32. Proposals 16a, 16b, and 16c are adopted. Pacific Gas and Electric Company, San Diego Gas & Electric Company, and Southern California

Edison Company shall revise Rule 21 Interconnection Application Processes as follows:

i) incorporate, by reference, Rule 15 eligibility requirements, specifically minimum contractor qualifications, other contractor qualification, and facility relocation or rearrangement;

ii) ***incorporate, by reference, Southern California Edison's Terms and Conditions Agreement for Installation of Distribution Line Extension by Applicant****;*

iii) ***incorporate, by reference****, Rule 15 competitive bidding provisions Section G.1.a., G.1.e. (part a), and G.1.f.; and iv) revise the language:*

> *"Subject to the approval of Distribution Provider, a Producer may, at its option…" to "Subject to / consistent with Rule 15 contractor selection rules, a Producer may, at its option…"*

[Formatting and emphasis added]

PG&E proposes to modify Rule 21 Section I.2 as shown below (Original Rule 21 Sheet 213):

I. THIRD-PARTY INSTALLATIONS, RESERVATION OF UNUSED FACILITIES, AND REFUND OF SALVAGE VALUE

2. THIRD-PARTY INSTALLATIONS

~~Subject to the approval of Distribution Provider, a~~Producer may, at its option, employ a qualified contractor~~,~~ that meets the Contractor Qualifications set forth under Electric Rule 15, Section G., to provide and install Interconnection Facilities or Distribution Upgrades, to be owned and operated by Distribution Provider, on Distribution Provider's side of the PCC.*

*Only duly authorized employees of utility are allowed to connect to, disconnect from, or perform any work upon Utility's facilities.

12. Ordering Paragraph 33 – CPUC (Rule 21) /FERC (WDT[16]) Process Education

Ordering Paragraph 33 Language requires:

> *33. Proposals 20a, 20b, and 20c are adopted.*
>
> *Pacific Gas and Electric Company, San Diego Gas & Electric Company, and Southern California Edison Company (Utilities) shall use information web pages to* ***educate customers on the transfer processes between the Commission and federal interconnection processes.***
>
> ***Utilities shall add reference language or a soft link within the Rule 21 tariff to these information web pages****.*
>
> [Formatting and emphasis added]

PG&E proposes to add subsection I7 to Rule 21 Section I.2 as shown below (Original Rule 21 Sheet 45):

See redline Rule 21 in teams site. Section D

17. CONVERSION TO FERC WHOLESALE DISTRIBUTION TARIFF PROCESS

Applicant may submit a request to convert their Interconnection Request to the Federal Energy Regulatory Commission (FERC) jurisdiction Wholesale Distribution Tariff (WDT) process subject to PG&E's WDT Section 6.8.1.1 requirements. Additional information is available at: https://www.pge.com/egi

13. Ordering Paragraph 37 – V2G and Rules 2, 15, 16

Ordering Paragraph 37 Language requires:

> *37. Pacific Gas and Electric Company, San Diego Gas & Electric Company, and Southern California Edison Company (Utilities) shall* ***meet and discuss the need for Rule 21 language changes to implement Proposal 23a****.*

[16] FERC is the Federal Energy Regulatory Commission. The WDT is PG&E's Wholesale Distribution Tariff.

> *Utilities shall include any necessary language changes in the Tier 2 Advice Letter required by Ordering Paragraph 56 below*.
> [Emphasis and formatting added][17]

From D. 20-09-035, "Proposal *23a would recognize that* ***Rule 21 does not apply to V1G*** *with no discharge capability. Instead, V1G must comply with Rules 2, 15, and 16. The Working Group Three Report explains that adoption of this proposal would remove any uncertainty about its applicability*."[18]

PG&E discussed with V1G with the other Utilities and addressed this in AL Section 15 on OP 40.

14. Ordering Paragraph 38 – Stationary/Mobile Energy Storage

Ordering Paragraph 38 Language requires:

> *38. Proposal 23b is adopted clarifying that Rule 21 applies to the interconnection of* ***stationary and mobile*** *energy storage systems.*
>
> *Section B.4 of Rule 21 is modified as follows:*
>
> *"For retail customers interconnecting* ***stationary or mobile*** *energy storage devices pursuant to this Rule, the load aspects of the storage devices will be treated pursuant to Rules 2, 3, 15, and 16 just like other load, using the incremental net load for non-residential customers, if any, of the storage devices."*
>
> [Emphasis and formatting added]

PG&E proposes to modify Rule 21 B.4 to add the language shown above: (Original Rule 21 Sheet 16)

B. Applicability

4. Interaction with Other Tariffs for Storage Charging Load Treatment

For retail customers interconnecting stationary or mobile energy storage devices pursuant to this Rule, the load aspects of the storage devices will be treated pursuant to Electric Rules 2, 3, 15 and 16 just like other load, using the incremental net load for non-residential customers, if any, of the storage devices.

[17] PG&E believes the reference to OP 56 in OP 37, should really be to OP 54 as corrected.
[18] D. 20-09-035 page 121

15. Ordering Paragraph 40 – V2G DC

Ordering Paragraph 40 Language requires:

> *40. Proposal 23d is adopted.*
>
> *Vehicle to Grid Electric Vehicle Supply Equipment (EVSE) with stationary inverter for direct current charging of vehicles (V2G DC EVSE) with bidirectional capability may connect as one way managed or smart charging (V1G), load-only, and operate in* ***unidirectional (charge only)*** *mode upon certifying the V2G DC EVSE through applicable UL Power Control Systems and* ***UL 1741 certification*** *testing to ensure that:*
>
> *i) the electric vehicle will not discharge if the V2G DC EVSE is set to unidirectional charging model;*
>
> *ii) the V2G DC EVSE will not inadvertently change to bidirectional mode; and*
>
> *i) factory default settings are set to unidirectional charging mode and cannot be changed without utility authorization.*
>
> [Formatting and emphasis added]

With the conditions outlined OP 40, V2G DC EVSE would operate as unidirectional V1G, in accordance with Section B.4. Therefore, no revisions to the Rule 21 tariff are required to implement Proposal 23d.

16. Ordering Paragraph 46 – IEEE 1547 & 1547.1 Updates & Default Settings

Ordering Paragraph 46 Language requires:

> *46. Proposal 27a is adopted.*
>
> *Pacific Gas and Electric Company, San Diego Gas & Electric Company, and Southern California Edison Company (Utilities) shall revise Rule 21 to:*
>
> *i) specifically allow smart inverter* ***default settings*** *to be changed;* addressed in 30 day AL
>
> *ii)* ***account for IEEE 1547 and IEEE 1547.1 updates*** *being developed by the Smart Inverter Working Group; and (*no action already updating)
>
> *iii) establish a* ***process for requesting and approving non default*** *inverter settings.*

> *Utilities shall include Rule 21 language changes necessary to implement Proposals 27a.i) and **27a.iii)** as directed in Ordering Paragraph 56 below.*[19]
>
> [Formatting and emphasis added]

Issue 27a.i) was addressed in Advice Letter 5988-E that was filed 30 day after the D. 20-09-035 was issued. This advice letter addresses 27a.iii)

Proposal 27. a[20] states:

> *Add within Rule 21 Section Hh language that states, "with mutual agreement, changes to default settings are allowed." And within six months after release of an updated UL 1741 standard that includes IEEE 1547.1-2019, take the following two actions:*
>
> *(1) update Rule 21 to account for IEEE 1547 and IEEE 1547.1 requirements; and*
>
> *(2)* ***determine the process for requesting and approving inverter settings that are different from the default settings, including modifications to generating facility inverter settings requested by either the distribution provider or by the Generating Facility owner or operator.***
>
> [Formatting and emphasis added]

PG&E believes proposal 27.a.iii corresponds to (2) above in Proposal 27.a.

PG&E proposes to modify Rule 21 Section Hh (initial section) to reflect the Proposal 27.a.iii) requirements, as shown below (Original Rule Sheet 182)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS

Section H shall continue to be used for interconnection of inverter based technologies until September 8, 2017. Following such date, Section Hh shall apply for interconnection of inverter based technologies.[21] Until such date, Section Hh may be used in all or in part, for inverter based technologies by mutual agreement of the Distribution Provider and the Applicant.

---

19 The reference to OP 56, should in fact be to OP 54 as corrected.

20 Working Group 1 Report Page 110

21 Distribution Provider may require Section H to apply to interconnection of inverter based technologies where it determines that compliance with Section Hh could create safety and/or reliability issues on Distribution Provider's Distribution System or Transmission System.

The inverter requirements are intended to be consistent with UL 1741 – Supplement SA using Section Hh of Rule 21 as the source requirement document and ANSI/IEEE 1547-2003 and 1547a Standard for Interconnecting Distributed Resources with Electric Power Systems (IEEE 1547 including amendment 1547a), where possible. In the event of conflict between this Rule and UL 1741 – Supplement SA and/or IEEE 1547-2003 or IEEE 1547a, this Rule shall take precedence. Exceptions are taken to IEEE 1547 Clauses 4.1.4.2 Distribution Secondary Spot Networks and Clauses 4.1.8.1 or 5.1.3.1, which address Protection from Electromagnetic Interference. Rule 21 does not adopt the Generating Facility power limitation of 10 MW incorporated in IEEE 1547.

The Smart Inverter default settings and default activation states may be modified upon mutual agreement between Applicant and Distribution Provider.

Process for changing default settings for new Interconnection Requests:

Distribution Provider, in the study process for new Generating Facilities, may determine and provide the optimum Smart Inverter Settings for the reactive power settings, including changes to the reactive power default settings (Example: Deactivate Volt/Var and activate Fixed Power Factor at given power factor).

Distribution Provider, in the study process for new Generating Facilities, may determine and provide the optimum Smart Inverter Settings for the Ramp Rate settings depending on the Generating Facility technology (such as solar, storage).

Distribution Provider, in the study process for new Generating Facilities, may determine the optimum Smart Inverter Settings for the volt//watt settings including changes to the default settings (Example: Change the volt/watt set points). The Applicant may select to agree on the new settings or select to perform upgrades to operate using the existing default volt/watt settings.

Default settings for voltage ride-through, frequency ride-through requirements, and Frequency/Watt should not be modified on an individual project basis unless the Interconnection Studies have determined that the default settings may not meet grid reliability requirements.

Process for changing default settings for existing, operating Generating Facilities authorized to operate per Section D.1:

When grid changes or Generating Facility changes require that the Smart Inverter operating settings be reevaluated, the Distribution Provider or Producer may request changes to the Generating Facility Smart Inverter operating parameters. The request must include the reason for and timing of the proposed changes. The requested changes must be within the Smart Inverter function adjustability limits,

must be within the limits specified in this tariff, and must be mutually agreed on. This may be considered a material modification.

Protests

*****Due to the COVID-19 pandemic and the shelter at home orders, PG&E is currently unable to receive protests or comments to this advice letter via U.S. mail or fax. Please submit protests or comments to this advice letter to EDTariffUnit@cpuc.ca.gov and PGETariffs@pge.com*****

Any party wishing to protest this submittal may do so by letter sent via U.S. mail, facsimile or E-mail, no later than December 21, 2020, which is 21[22] days after the date of this submittal. Protests must be submitted to:

CPUC Energy Division
ED Tariff Unit
505 Van Ness Avenue, 4th Floor
San Francisco, California 94102

Facsimile: (415) 703-2200
E-mail: EDTariffUnit@cpuc.ca.gov

Copies of protests also should be mailed to the attention of the Director, Energy Division, Room 4004, at the address shown above.

The protest shall also be sent to PG&E either via E-mail or U.S. mail (and by facsimile, if possible) at the address shown below on the same date it is mailed or delivered to the Commission:

Erik Jacobson
Director, Regulatory Relations
c/o Megan Lawson
Pacific Gas and Electric Company
77 Beale Street, Mail Code B13U
P.O. Box 770000
San Francisco, California 94177

Facsimile: (415) 973-3582
E-mail: PGETariffs@pge.com

[22] The 20-day protest period concludes on a weekend, therefore, PG&E is moving this date to the following business day.

Any person (including individuals, groups, or organizations) may protest or respond to an advice letter (General Order 96-B, Section 7.4). The protest shall contain the following information: specification of the advice letter protested; grounds for the protest; supporting factual information or legal argument; name, telephone number, postal address, and (where appropriate) e-mail address of the protestant; and statement that the protest was sent to the utility no later than the day on which the protest was submitted to the reviewing Industry Division (General Order 96-B, Section 3.11).

Effective Date

Pursuant to Decision 20-09-035 Ordering Paragraph 54 (as corrected), this advice letter is submitted with a Tier 2 designation. PG&E requests that this advice submittal become effective (as the effective date is tied directly to our online application upgrade date) within 60 days of final approval established, in order to afford PG&E latitude to implement the tariff changes and the associated software changes in the manner most expeditious, cost effective and coordinated with other proceeding software changes. (Consolidating changes to minimize software upgrade dates is the least disruptive for applicants.) If a supplemental advice letter is needed, PG&E would like to request for the same reasons, the opportunity to establish a revised final effective date window.

Notice

In accordance with General Order 96-B, Section IV, a copy of this advice letter is being sent electronically and via U.S. mail to parties shown on the attached list and the parties on the service list for R.17-07-007 (Rule .21), R. 14-07-002 (NEM Successor) and R.19-09-009 (Microgrid). Address changes to the General Order 96-B service list should be directed to PG&E at email address PGETariffs@pge.com. For changes to any other service list, please contact the Commission's Process Office at (415) 703-2021 or at Process_Office@cpuc.ca.gov. Send all electronic approvals to PGETariffs@pge.com. Advice letter submittals can also be accessed electronically at: http://www.pge.com/tariffs/.

/S/
Erik Jacobson
Director, Regulatory Relations

cc: Service List R.17-07-007
Service List R.14-07-002
Service List R.19-09-009

Attachments:
Attachment A –Clean version of updated Tariffs
Attachment B – Redline Tariff Revisions

California Public Utilities Commission

ADVICE LETTER SUMMARY

ENERGY UTILITY

MUST BE COMPLETED BY UTILITY (Attach additional pages as needed)

Company name/CPUC Utility No.: Pacific Gas and Electric Company (ID U39E)

Utility type:
☑ ELC ☐ GAS ☐ WATER
☐ PLC ☐ HEAT

Contact Person: Kimberly Loo
Phone #: (415)973-4587
E-mail: PGETariffs@pge.com
E-mail Disposition Notice to: KELM@pge.com

EXPLANATION OF UTILITY TYPE
ELC = Electric GAS = Gas WATER = Water
PLC = Pipeline HEAT = Heat

(Date Submitted / Received Stamp by CPUC)

Advice Letter (AL) #: 6014-E

Tier Designation: 2

Subject of AL: Advice Letter Modifying Electric Rule 21 Pursuant to Decision 20-09-035 for Working Group 2 and 3 (due 60 Days from Issuance)

Keywords (choose from CPUC listing): Compliance, Rule 21

AL Type: ☐ Monthly ☐ Quarterly ☐ Annual ☑ One-Time ☐ Other:

If AL submitted in compliance with a Commission order, indicate relevant Decision/Resolution #: D.20-09-035

Does AL replace a withdrawn or rejected AL? If so, identify the prior AL: No

Summarize differences between the AL and the prior withdrawn or rejected AL:

Confidential treatment requested? ☐ Yes ☑ No

If yes, specification of confidential information:
Confidential information will be made available to appropriate parties who execute a nondisclosure agreement. Name and contact information to request nondisclosure agreement/ access to confidential information:

Resolution required? ☐ Yes ☑ No

Requested effective date:

No. of tariff sheets: 113

Estimated system annual revenue effect (%): N/A

Estimated system average rate effect (%): N/A

When rates are affected by AL, include attachment in AL showing average rate effects on customer classes (residential, small commercial, large C/I, agricultural, lighting).

Tariff schedules affected: See Attachment 1

Service affected and changes proposed[1]: N/A

Pending advice letters that revise the same tariff sheets: N/A

[1]Discuss in AL if more space is needed.

Clear Form

Protests and all other correspondence regarding this AL are due no later than 20 days after the date of this submittal, unless otherwise authorized by the Commission, and shall be sent to:

CPUC, Energy Division
Attention: Tariff Unit
505 Van Ness Avenue
San Francisco, CA 94102
Email: EDTariffUnit@cpuc.ca.gov

Name: Erik Jacobson, c/o Megan Lawson
Title: Director, Regulatory Relations
Utility Name: Pacific Gas and Electric Company
Address: 77 Beale Street, Mail Code B13U
City: San Francisco, CA 94177
State: California Zip: 94177
Telephone (xxx) xxx-xxxx: (415)973-2093
Facsimile (xxx) xxx-xxxx: (415)973-3582
Email: PGETariffs@pge.com

Name:
Title:
Utility Name:
Address:
City:
State: District of Columbia Zip:
Telephone (xxx) xxx-xxxx:
Facsimile (xxx) xxx-xxxx:
Email:

Clear Form

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47915-E	ELECTRIC RULE NO. 21 GENERATING FACILITY INTERCONNECTIONS Sheet 13	42310-E
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48020-E	ELECTRIC RULE NO. 21 GENERATING FACILITY INTERCONNECTIONS Sheet 266	47712-E
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B. APPLICABILITY (Cont'd.)

3. APPLICABLE CODES AND STANDARDS

This Rule has been harmonized with the requirements of American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) 1547-2003 Standards for Interconnecting Distributed Resources with Electric Power Systems. In some sections, IEEE 1547 language has been adopted directly, in others, IEEE 1547 requirements were interpreted and this Rule's language was changed to maintain the spirit of both documents.

UL1741- Supplement SA has been utilized for certification of phase I Smart Inverters (Phase 1 Smart Inverter Functions) as outlined in section Hh.

The language from IEEE 1547 that has been adopted directly (as opposed to paraphrased language or previous language that was determined to be consistent with IEEE 1547) is followed by a citation that lists the clause from which the language derived. For example, IEEE 1547-4.1.1 is a reference to Clause 4.1.1.

In the event of any conflict between this Rule, any of the standards listed herein, or any other applicable standards or codes, the requirements of this Rule shall take precedence.

4. RETAIL CUSTOMER ENERGY STORAGE DEVICES

For retail customers interconnecting stationary or mobile energy storage devices pursuant to this Rule, the load aspects of the storage devices will be treated pursuant to Rules 2, 3, 15, and 16 just like other load, using the incremental net load for non-residential customers, if any, of the storage devices. (T)

C. DEFINITIONS

The definitions in this Section C are applicable only to this Rule, the Interconnection Request, Study Agreements and Generator Interconnection Agreements.

Added Facilities: See Special Facilities.

Affected System: An electric system other than Distribution Provider's Distribution or Transmission System that may be affected by the proposed Interconnection.

(Continued)

C. DEFINITIONS (Cont'd.)

Interconnection Request: An Applicant's request to interconnect a new Generating Facility, or to increase the capacity of, or make a Material Modification to the operating characteristics of, an existing Generating Facility that is interconnected with Distribution Provider's Distribution or Transmission System.

Interconnection Study: A study to establish the requirements for Interconnection of a Generating Facility with Distribution Provider's Distribution System or Transmission System, pursuant to this Rule.

Interconnection System Impact Study: An engineering study conducted by Distribution Provider for an Interconnection Customer under the Independent Study Process that evaluates the impact of the proposed interconnection on the safety and reliability of Distribution Provider's Distribution and/or Transmission System and, if applicable, an Affected System. The scope of the study is defined in Section G.3.c.i.

The Integration Capacity Analysis Static Grid (SG) 576 profile: At a given Point of Interconnection, the minimum Integration Capacity Analysis values at each of the 576 hours for the most limiting of these categories: thermal, voltage, power quality, and protection. (N)

Integration Capacity Analysis Static Grid (ICA-SG) Value: The minimum ICA value in a given Point of Interconnection's ICA-SG 576 Profile.

Integration Capacity Analysis (ICA) Values: Values which represent the maximum capacity that can be interconnected at a given Point of Interconnection without exceeding Distribution Provider equipment thermal limits or any of the Distribution System voltage, power quality, protection, and safety (operational flexibility) limits each which is independently calculated. (N)

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

Large Generating Facility: A Generating Facility having a Generating Facility Capacity of more than 20 MW.

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

(Continued)

C. DEFINITIONS (Cont'd.)

Local Furnishing Bond: Tax-exempt bonds utilized to finance facilities for the local furnishing of electric energy, as described in Internal Revenue Code, 26 U.S.C. § 142(f). (L)

Local Furnishing Distribution Provider: Any Distribution Provider that owns facilities financed by Local Furnishing Bonds.

Mandatory Operation: 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. (L)

Material Modification: Those modifications that have a material impact on cost or timing of any Interconnection Request with a later queue priority date or a change in Point of Interconnection. A Material Modification does not include a change in ownership of a Generating Facility.

Metering: The measurement of electrical power in kilowatts (kW) and/or energy in kilowatt-hours (kWh), and if necessary, reactive power in kVAR at a point, and its display to Distribution Provider, as required by this Rule.

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

Momentary Cessation: The Smart Inverter momentarily reduces current output to the Distribution Provider's Transmission or 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 Transmission or Distribution System without any intentional reconnection delay once voltage exits the Momentary Cessation region and enters a Permissive Operation region or Continuous Operation region.

Momentary Parallel Operation: The Interconnection of a Generating Facility to the Distribution and Transmission 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. (L)

(L)

(Continued)

C. DEFINITIONS (Cont'd.)

Net Energy Metering (NEM): Metering for the receipt and delivery of electricity between Producer and Distribution Provider pursuant to California Public Utilities Code (PUC) sections 2827, 2827.1 (as currently implemented by Commission Decision (D.)16-01-044), 2827.8, or 2827.10. (L)

NEM-1: Refers to Interconnection Requests for service pursuant to Schedules NEM, NEMV, and NEMVMASH.

NEM-2: Refers to Interconnection Requests for service pursuant to Schedules NEM2, NEM2V, NEM2VMSH, and NEM2VSOM. (L)

Net Rating or Net Nameplate Rating: The Gross Rating minus the consumption of electrical power of the auxiliary load.

Network Upgrades: Delivery Network Upgrades and Reliability Network Upgrades.

Networked Secondary System: 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 for additional detail.

Non-Emergency: Conditions or situations that are not Emergencies, including but not limited to meter reading, inspection, testing, routine repairs, replacement, and maintenance.

Nominal: Standard frequency and voltage.

Non-Export; Non-Exporting: When the Generating Facility is sized and designed such that the Generator output is used for Host Load only and is designed to prevent the transfer of electrical energy from the Generating Facility to Distribution Provider's Distribution or Transmission System.

(Continued)

D. GENERAL, RULES, RIGHTS AND OBLIGATIONS (Cont'd.)

13. SPECIAL PROVISIONS APPLICABLE TO NET ENERGY METERED APPLICANTS (Cont'd.)

    f. Applicants with an Interconnection Request for a Net Energy Metering Generating Facility, or a Non-Export Generating Facility, shall have the opportunity to select the Cost Envelope Option in accordance with Section F.7. Applicants who are determined to not have responsibility for any applicable upgrade costs will be automatically withdrawn from the Cost Envelope Option.

14. SPECIAL PROVISIONS APPLICABLE TO NON-EXPORT ENERGY STORAGE GENERATING FACILITIES

    Applicants with Non-Export Energy Storage Generating Facilities that meet the criteria listed in Section N shall be eligible to select expedited processing in their Interconnection Request and to utilize the corresponding form of Interconnection Agreement, subject to the terms and conditions of Section N.

15. COMPLIANCE WITH ESTABLISHED TIMELINES

    Distribution Provider shall use Reasonable Efforts in meeting all the timelines provided for under this Rule. In the event Distribution Provider is not able to meet a particular timeline set forth in this Rule, Distribution Provider shall notify Applicant as soon as practicable and provide an estimated completion date with an explanation of the reasons why additional time is needed. Any Applicant dissatisfied with the Reasonable Efforts of Distribution Provider may use the informal procedures set out in Section F.1.d and/or the Dispute Resolution process in Section K.

16. MODIFICATION OF TIMELINES

    Distribution Provider and Applicant, for good cause, may agree to modify any of the timelines in this Rule. The modified timeline shall be mutually agreed upon, in writing, between Distribution Provider and Applicant.

17. CONVERSION TO FERC WHOLESALE DISTRIBUTION TARIFF PROCESS (N)

    Applicant may submit a request to convert their Interconnection Request to the Federal Energy Regulatory Commission (FERC) jurisdiction Wholesale Distribution Tariff (WDT) process subject to WDT Section 6.8.1.1 requirements. Additional information is available at: https://www.pge.com/egi (N)

(Continued)

E. INTERCONNECTION REQUEST SUBMISSION PROCESS (Cont'd.)

2. INTERCONNECTION REQUEST PROCESS (Cont'd.)

b. Applicant Selects a Study Process

An Applicant may select one of two interconnection evaluation processes in accordance with the following eligibility requirements:

i) Fast Track Eligibility

Non-Exporting Generating Facilities and NEM-1 Generating Facilities shall be evaluated under the Fast Track Review Process as described under Section F.2. below. (T) (T)

NEM-2 Generating Facilities and Exporting Generating Facilities of any size are eligible for and may elect the Fast Track evaluation if the Applicant believes its Interconnection Request may pass the Fast Track Process as described under Section F.2. below. (T) (T)

(D) (D)

ii) Detailed Study Eligibility

Interconnection Requests that are not eligible for Fast Track evaluation must apply for Detailed Study. An Applicant may also choose to apply directly for Detailed Studies. Detailed Study shall require (i) an Independent Study Process, (ii) a Distribution Group Study Process, or (iii) a Transmission Cluster Study Process. The specific study process used will depend on the results of the Electrical Independence Tests for the Transmission and Distribution Systems.

(Continued)

F. REVIEW PROCESS FOR INTERCONNECTION REQUESTS (Cont'd.)

1. OVERVIEW OF THE INTERCONNECTION REVIEW PROCESS (Cont'd.)

b. Fast Track Review

Fast Track evaluation allows for rapid review of the Interconnection of those Generating Facilities that do not require Detailed Study. Regardless of study process, all Generating Facilities shall be designed to meet the applicable requirements of Section H or Hh, which identifies Generating Facility Design and Operation Requirements. (T)

Fast Track review consists of an Initial Review and, if required, a Supplemental Review. The need for Supplemental Review will be determined based on the results of Initial Review Screens A through M in Section G.1. Applicants that successfully pass Initial Review Screens A through M will be allowed to interconnect without Supplemental Review.

Non-Export AC/DC Converter installations that have a complete and valid Interconnection Request will be eligible to bypass screens B through D and F through M.

If Supplemental Review is required, unless the Applicant has pre-paid the Supplemental Review fee, Distribution Provider will notify Applicant and Applicant must pay a nonrefundable Supplemental Review fee, per Table E-1 or withdraw its Interconnection Request. Supplemental Review shall consist of the application of Screens N through P in Section G.2. Applicants that pass Screens N through P will be allowed to interconnect without additional review.

If Supplemental Review reveals that a proposed Generating Facility cannot be interconnected to Distribution Provider's Distribution System by means of Fast Track evaluation, Distribution Provider will notify Applicant that Detailed Study will be required.

Failure to pass Fast Track evaluation means only that further review and/or study are required before the Generating Facility can be interconnected with Distribution Provider's Distribution System. It does not mean that the Generating Facility cannot be interconnected.

(Continued)

F. REVIEW PROCESS FOR INTERCONNECTION REQUESTS (Cont'd.)

2. FAST TRACK INTERCONNECTION REVIEW PROCESS

a. Initial Review (Cont'd.)

For Interconnection Requests that fail Initial Review, Distribution Provider shall provide the technical reason, data and analysis supporting the Initial Review results in writing and provide Applicant the option to either attend an Initial Review results meeting or proceed directly to Supplemental Review, unless the Applicant has pre-paid the Supplemental Review fee. NEM-1 and ≤1 MW NEM-2 Applicants covered under Section D.13.a, and Applicants that have pre-paid the Supplemental Review fee, shall proceed directly to Supplemental Review without an Initial Review results meeting. Applicant shall notify Distribution Provider within ten (10) Business Days following such notification whether to (i) proceed to an Initial Review results meeting, (ii) proceed to Supplemental Review, or (iii) withdraw the Interconnection Request. Applicant may request one extension of no more than ten (10) Business Days to respond. If Applicant fails to notify Distribution Provider within ten (10) Business Days of such notification, or at the end of the extension, if one was requested, the Interconnection Request shall be deemed withdrawn.

No changes may be made to the planned Point of Interconnection or Generating Facility size included in the Interconnection Request during the Fast Track Process, unless such changes are agreed to by Distribution Provider. Where agreement has not been reached, Applicants choosing to change the Point of Interconnection or Generating Facility size must reapply and submit a new Interconnection Request.

As part of the evaluation of Screen M, when Integration Capacity Analysis values are available at the requested Point of Interconnection, Distribution Provider will determine if Integration Capacity Analysis values at the proposed Point of Interconnection need to be updated. If Distribution Provider determines that the Integration Capacity Analysis values at the proposed Point Interconnection need to be updated, the Distribution Provider will update the values for the proposed Point Of Interconnection using the Integration Capacity Analysis tool on the specific electrical node or by running the Integration Capacity Analysis on all the electrical nodes in the circuit. Distribution Provider shall not perform additional Integration Capacity Analysis as part of the interconnection process of projects with less than 30 kilovolt amperes nameplate capacity. Distribution Provider shall share the results of any Integration Capacity Analysis updates with the Applicant and provide an explanation of changes to grid conditions or the interconnection queue which led to the need to obtain updated Integration Capacity Analysis values. Distribution Provider shall comply with confidentiality provisions and data redaction policies. (N) (N) (L)

(Continued)

F. REVIEW PROCESS FOR INTERCONNECTION REQUESTS (Cont'd.)

2. FAST TRACK INTERCONNECTION REVIEW PROCESS (Cont'd.)

a. Initial Review (Cont'd.)

Applicants that elect to proceed to Supplemental Review, unless the Applicant has pre-paid the Supplemental Review fee, shall provide a nonrefundable Supplemental Review fee set forth in Section E.2.c with their response. The Supplemental Review fee shall be waived for Interconnection Requests requesting Interconnection of NEM-1 or ≤1 MW NEM-2 Generating Facilities and for solar-powered non-NEM ≤1 MW Generating Facilities that do not sell power to Distribution Provider, per Commission D.01-07-027. (L)

b. Optional Initial Review Results Meeting

Within five (5) Business Days of Applicant's request for an Initial Review results meeting, Distribution Provider shall contact Applicant and offer to convene a meeting at a mutually acceptable time to review the Initial Review screen analysis and related results to determine what modifications, if any, may permit the Generating Facility to be connected safely and reliably without Supplemental Review.

In the event the Applicant has pre-paid the Supplemental Review fee, the Distribution Provider will proceed, if necessary, with Supplemental Review upon completion of Initial Review and shall not be required to offer an Initial Review results meeting.

If modifications that obviate the need for Supplemental Review are identified, and Applicant and Distribution Provider agree to such modifications, Distribution Provider shall provide Applicant with a Generator Interconnection Agreement within fifteen (15) Business Days of the Initial Review results meeting if no Interconnection Facilities or Distribution Upgrades are required. If Interconnection Facilities or Distribution Upgrades are required, Distribution Provider shall provide Applicant with a non-binding cost estimate of any Interconnection Facilities or Distribution Upgrades within fifteen (15) Business Days of the Initial Review results meeting. For those Interconnection Requests where Applicant has selected the Cost Envelope Option, within ten (10) Business Days of providing Applicant the non-binding cost estimate for the required Interconnection Facilities and/or Distribution Upgrades, Applicant shall provide the Distribution Provider the Cost Envelope Option deposit, in accordance with Section F.7.a.i.3. If Applicant fails to provide the Cost Envelope Option deposit in accordance with Section F.7.a.i.3, Applicant's request for the Cost Envelope Option shall be deemed withdrawn and the Interconnection Request shall not be eligible for the Cost Envelope Option. (L) (L)

(Continued)

F. REVIEW PROCESS FOR INTERCONNECTION REQUESTS (Cont'd.)

2. FAST TRACK INTERCONNECTION REVIEW PROCESS (Cont'd.)

b. Optional Initial Review Results Meeting (Cont'd.)

For all Interconnection Requests that pass Initial Review, refer to Section F.2.e for cost responsibility and time frames for completing the Generator Interconnection Agreement. (L)

If Applicant and Distribution Provider are unable to identify or agree to modifications that enable Applicant to pass Initial Review, Applicant shall notify Distribution Provider within ten (10) Business Days of the Initial Review results meeting whether it would like to proceed with Supplemental Review or withdraw its Interconnection Request. Applicant may request one extension of no more than ten (10) Business Days to respond. If Applicant fails to notify Distribution Provider within ten (10) Business Days of the Initial Review results meeting, or at the end of the extension, if one was requested, the Interconnection Request shall be deemed withdrawn.

c. Supplemental Review

i) If Applicant requests Supplemental Review and submits a nonrefundable Supplemental Review fee, if required, Distribution Provider shall complete Supplemental Review within twenty (20) Business Days, absent extraordinary circumstances, following authorization and receipt of the fee. Supplemental Review determines if (i) the Generating Facility qualifies for Fast Track Interconnection, or (ii) the Generating Facility requires Detailed Study. If the Applicant paid the Supplemental Review fee concurrently with the Initial Review Fee, Distribution Provider will complete the Supplemental Review, if required, within twenty (20) Business Days from the completion of the Initial Review.

ii) If the Applicant chooses to move to Supplemental Review or has pre-paid the non-refundable Supplemental Review fee, they have the option to elect that the Distribution Provider provide a fault current study as part of the Supplemental Review. This fault current study would extend the Supplemental Review time by up to ten (10) Business Days, and would require an additional nonrefundable fee of $1,000. (L)

(L)

(Continued)

F. Review Process For Interconnection Requests (Cont'd.)

2. Fast Track Interconnection Review Process (Cont'd.)

c. Supplemental Review (Cont'd.)

ii) This fault current study will determine if the Generating Facility can detect phase and ground faults on the Distribution Provider's Distribution System or the distribution feeder breaker where the Applicant proposes to connect the Generating Facility. The result of the fault current study will determine if direct transfer trip (DTT) will be required from the Distribution System to the Generating Facility site. Note that for Applicants proposing to interconnect to the Distribution System where there is expected to be power backfeed to the Transmission System, DTT from the transmission may still be required and a Detailed Interconnection Study will be required to make this determination. (L)

Should the Applicant request a Supplemental Review results meeting, as described in Section F.2d, the optional fault current study analysis and related results shall, at the Applicant's request, be reviewed to determine what modifications, if any, may permit the Generating Facility to be connected safely and reliably.

If the Applicant chooses to move to Supplemental Review, or has pre-paid the non-refundable Supplemental Review fee, or has pre-paid the non-refundable Supplemental Review feethey have the option to elect that the Distribution Provider provide a fault current study as part of the Supplemental Review. This fault current study would extend the Supplemental Review time by up to ten (10) Business Days, and would require an additional nonrefundable fee of $1,000.

The Applicant must provide the following data to Distribution Provider when requesting Supplemental Review in order to select this option:

Generator:
MVA Rating
kV Rating
Base MVA
Base kV
Xd" (direct axis subtransient reactance)
Xd' (direct axis transient reactance)
Xd (Synchronous reactance)
X2 (Negative Sequence reactance)
X0 (Zero Sequence reactance) (L)
(L)

(Continued)

F. Review Process For Interconnection Requests (Cont'd.)

2. Fast Track Interconnection Review Process (Cont'd.)

c. Supplemental Review (Cont'd.)

ii) XFMR Data: (L)
Winding configuration (delta-Wye grd or Wye grd-Delta)
MVA Rating
KV Rating
Base MVA
Base KV
Z1 HV-LV
Z0 HV-LV (L)

If the Applicant chooses to move to Supplemental Review, they have the option to elect that the Distribution Provider provide a fault current study as part of the Supplemental Review. This fault current study would extend the Supplemental Review time by up to ten (10) Business Days, and would require an additional nonrefundable fee of $1,000. (Cont'd.)

Line Data:
Impedance data for line from XFMR to POI (if applicable)
Z1
Z0

POI Location:

iii) For Interconnection Requests that pass Supplemental Review and do not require Interconnection Facilities or Distribution Upgrades, Distribution Provider shall provide Applicant with a Generator Interconnection Agreement within fifteen (15) Business Days of providing notice of Supplemental Review results. For Interconnection Requests that pass Supplemental Review and do require Interconnection Facilities or Distribution Upgrades, within fifteen (15) Business Days of providing notice of Supplemental Review results, Distribution Provider shall provide Applicant with a non-binding cost estimate of any Interconnection Facilities or Distribution Upgrades. For those Interconnection Requests where Applicant has selected the Cost Envelope Option, within ten (10) Business Days of providing Applicant the non-binding cost estimate for the required Interconnection Facilities and/or Distribution Upgrades, Applicant shall provide the Distribution Provider the Cost Envelope Option deposit, in accordance with Section F.7.a.i.3 If Applicant fails to provide the Cost Envelope Option deposit in accordance with Section F.7.a.i.3, Applicant's request for the Cost Envelope Option shall be deemed withdrawn and the Interconnection Request shall not be eligible for the Cost Envelope Option. (L)
(L)

(Continued)

F. REVIEW PROCESS FOR INTERCONNECTION REQUESTS (Cont'd.)

2. FAST TRACK INTERCONNECTION REVIEW PROCESS (Cont'd.)

c. Supplemental Review (Cont'd.)

iii) For all Interconnection Requests that pass Supplemental Review, refer to Section F.2.e for cost responsibility and time frames for completing the Generator Interconnection Agreement. (L) | (L)

iv) For Interconnection Requests that fail Supplemental Review, Distribution Provider shall provide the technical reason, data and analysis supporting the Supplemental Review results in writing, including, if Distribution Provider can make the determination, which Detailed Study track Applicant qualifies for, and provide Applicant the option to attend a Supplemental Review results meeting or proceed directly to Detailed Study. Applicant shall notify Distribution Provider within fifteen (15) Business Days following such notification whether to (i) proceed to a Supplemental Review results meeting, (ii) proceed to Detailed Study, or (iii) withdraw the Interconnection Request. Applicant may request one extension of no more than fifteen (15) Business Days to respond. If Applicant fails to notify Distribution Provider within fifteen (15) Business Days of such notification, or at the end of the extension, if one was requested, the Interconnection Request shall be deemed withdrawn.

Applicants that elect to proceed to Detailed Study shall provide the applicable study deposit set forth in Section E.3.a with their response. Detailed Study fees for solar Generating Facilities up to 1 MW interconnecting to the Distribution System that do not sell power to Distribution Provider will be waived up to the amount of $5,000. Except as provided for in Section F.3.d, NEM-1 and ≤1 MW NEM-2 Generating Facilities are exempt from any costs associated with Detailed Studies.

(Continued)

F. REVIEW PROCESS FOR INTERCONNECTION REQUESTS (Cont'd.)

2. FAST TRACK INTERCONNECTION REVIEW PROCESS (Cont'd.)

e. Execution of the Generator Interconnection Agreement (Cont'd.)

shall negotiate concerning the cost estimate, or any disputed provisions of the appendices to a draft Generator Interconnection Agreement, for not more than ninety (90) Calendar Days after Distribution Provider provides Applicant with the Generator Interconnection Agreement. If Applicant determines that negotiations are at an impasse, it may request termination of the negotiations and initiate Dispute Resolution procedures pursuant to Section K. If Applicant fails to sign the Generator Interconnection Agreement or initiate Dispute Resolution within ninety (90) Calendar Days, the Interconnection Request shall be deemed withdrawn.

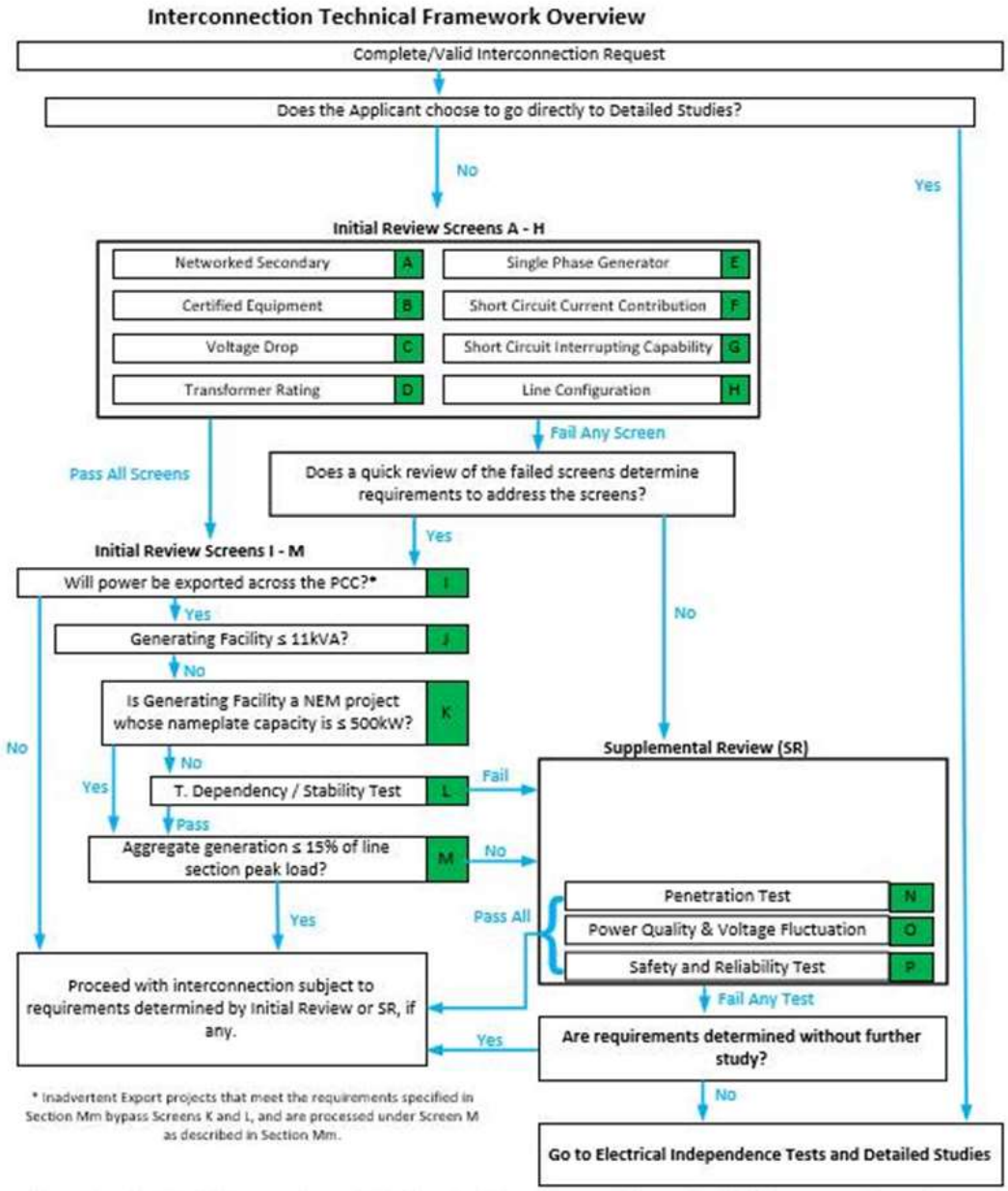
After Applicant, or a Producer where those are different entities, has executed the Generator Interconnection Agreement, Distribution Provider will commence design, procurement, construction and installation of Distribution Provider's Distribution Upgrades and/or Interconnection Facilities that have been identified in the Generator Interconnection Agreement. Distribution Provider and Producer will use good faith efforts to meet schedules in accordance with the requirements of the Generator Interconnection Agreement and estimated costs as appropriate. Producer is responsible for all applicable costs associated with Parallel Operation to support the safe and reliable operation of the Distribution System and Transmission System as set forth in Section E.4.

Distribution Provider and Producer shall negotiate in good faith concerning a schedule for the construction of Distribution Provider's Interconnection Facilities and Distribution Upgrades.

Distribution Provider shall provide quarterly updates on substation upgrades to Producers whose projects are dependent on a substation upgrade. (N) | (N)

(Continued)

G. ENGINEERING REVIEW DETAILS



*Non-Export AC/DC Converter installations that have a complete and valid Interconnection Request will be eligible to bypass screens B through D and F through M. If Generating Facility meets the conditions in Screen I below (Section G.1.i), skip Screens K, L and M.

(Continued)

G. ENGINEERING REVIEW DETAILS (Cont'd.)

2. SUPPLEMENTAL REVIEW SCREENS (Cont'd.)

a. Screen N: Penetration Test

Is Integration Capacity Analysis Values available at the requested Point of Interconnection? (N)

If Yes, evaluate Screen N as follows:

Is the Interconnection Request Gross Nameplate Rating below 90% of the ICA-SG Value (i.e. the minimum value) in the ICA-SG 576 Profile?

Did the Interconnection Request pass Screen F1?

- If the evaluation of the two Screen N questions above are both "yes" (pass), continue to Screen O.
- If no to either or both of the above (fail), a quick review of the failure may determine the requirements to address the failure; otherwise Electrical Independence Tests and Detailed Studies are required. Continue to Screen O. (Note: If Electrical Independence tests and Detailed Studies are required, Applicants will continue to the Electrical Independence Tests and Detailed Studies after review of the remaining Supplemental Review Screens if Applicant elects to proceed.)

If No, evaluate Screen N as follows: (N)

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

- If yes (pass), continue to Screen O.

(L)
(L)

(Continued)

G. ENGINEERING REVIEW DETAILS (Cont'd.)

2. SUPPLEMENTAL REVIEW SCREENS (Cont'd.)

a. Screen N: Penetration Test (Cont'd.)

- If no (fail), a quick review of the failure may determine the requirements to address the failure; otherwise Electrical Independence Tests and Detailed Studies are required. Continue to Screen O. (Note: If Electrical Independence tests and Detailed Studies are required, Applicants will continue to the Electrical Independence Tests and Detailed Studies after review of the remaining Supplemental Review Screens, if Applicant elects to proceed.)

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

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, that may flow across the Point of Common Coupling into Distribution Provider's Distribution System will be considered as part of the aggregate generation. (L)

Note 4: Distribution Provider 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.

Note 5: NEM Generating Facilities with net export less than or equal to 500 kW that may flow across the Point of Common Coupling into Distribution Provider's Distribution or Transmission System will not be studied in the Transmission Cluster Study Process, but may be studied under the Independent Study Process.

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. (L)

(Continued)

G. Engineering Review Details (Cont'd.)

2. Supplemental Review Screens (Cont'd.)

b. Screen O: Power Quality and Voltage Tests

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

i) Can it be determined within the Supplemental Review that the voltage regulation on the line section can be maintained in compliance with Commission Rule 2 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 IEEE1453?iii) (L)

iii) Can it be determined within the Supplemental Review that the harmonic levels meet IEEE 519 limits at the Point of Common Coupling (PCC)?

iv) Are any voltage impacts created by the project mitigated considering the settings of the Volt-Var function and the characteristics of the circuit segment?

- If yes to all of the above (pass), continue to Screen P.
- If no to any of the above (fail), a quick review of the failure may determine the requirements to address the failure; otherwise Electrical Independence Tests and Detailed Studies are required. Continue to Screen P. (Note: If Electrical Independence tests and Detailed Studies are required, Applicants will continue to the Electrical Independence Tests and Detailed Studies after review of the remaining Supplemental Review Screens.)

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

(L)
(L)

(Continued)

G. ENGINEERING REVIEW DETAILS (Cont'd.)

2. SUPPLEMENTAL REVIEW SCREENS (Cont'd.)

c. Screen P: 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 Detailed Study? (L)

- If yes (fail), review of the failure may determine the requirements to address the failure; otherwise Electrical Independence Tests and Detailed Studies are required. Continue to Section G.3.

If no (pass), Supplemental Review is complete. (L)

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

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

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

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

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.)

The inverter requirements are intended to be consistent with UL 1741 - Supplement SA using Section Hh of Rule 21 as the source requirement document and ANSI/IEEE 1547-2003 and 1547a Standard for Interconnecting Distributed Resources with Electric Power Systems (IEEE 1547 including amendment 1547a), where possible. In the event of conflict between this Rule, and UL 1741 - Supplement SA, and/or IEEE 1547-2003 or IEEE 1547a, this Rule shall take precedence. Exceptions are taken to IEEE 1547 Clauses 4.1.4.2 Distribution Secondary Spot Networks and Clauses 4.1.8.1 or 5.1.3.1, which address Protection from Electromagnetic Interference. Rule 21 does not adopt the Generating Facility power limitation of 10 MW incorporated in IEEE 1547.

The Smart Inverter default settings and default activation states may be modified upon mutual agreement between Applicant and Distribution Provider.

Process for changing default settings for new Interconnection Requests: (N)

Distribution Provider, in the study process for new Generating Facilities, may determine and provide the optimum Smart Inverter Settings for the reactive power settings, including changes to the reactive power default settings (Example: Deactivate Volt/Var and activate Fixed Power Factor at given power factor).

Distribution Provider, in the study process for new Generating Facilities, may determine and provide the optimum Smart Inverter Settings for the Ramp Rate settings depending on the Generating Facility technology (such as solar, storage).

Distribution Provider, in the study process for new Generating Facilities, may determine the optimum Smart Inverter Settings for the volt//watt settings including changes to the default settings (Example: Change the volt/watt set points). The Applicant may select to agree on the new settings or select to perform upgrades to operate using the existing default volt/watt settings.

Default settings for voltage ride-through, frequency ride-through requirements, and Frequency/Watt should not be modified on an individual project basis unless the Interconnection Studies have determined that the default settings may not meet grid reliability requirements. (N)

(L)
(L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.)

Process for changing default settings for existing, operating Generating Facilities authorized to operate per Section D.1: (N)

When grid changes or Generating Facility changes require that the Smart Inverter operating settings be reevaluated, the Distribution Provider or Producer may request changes to the Generating Facility Smart Inverter operating parameters. The request must include the reason for and timing of the proposed changes. The requested changes must be within the Smart Inverter function adjustability limits, must be within the limits specified in this tariff, and must be mutually agreed on. This may be considered a material modification. (N)

1. GENERAL INTERCONNECTION AND PROTECTIVE FUNCTION REQUIREMENTS (L)

The Protective Functions and requirements of this Rule are designed to protect Distribution Provider's Distribution and Transmission System and not the Generating Facility. A Producer shall be solely responsible for providing adequate protection for its Generating Facility and Interconnection Facilities. Producer's Protective Functions shall not impact the operation of other Protective Functions on Distribution Provider's Distribution and Transmission System in a manner that would affect Distribution Provider's capability of providing reliable service to its customers.

a. Protective Functions Required

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

(i) Over and under voltage trip functions and over and under frequency trip functions; (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

1. GENERAL INTERCONNECTION AND PROTECTIVE FUNCTION REQUIREMENTS (Cont'd.)

a. Protective Functions Required (Cont'd.)

(ii) A voltage and frequency sensing and time-delay function to prevent the Smart Inverter from energizing a de-energized Distribution or Transmission System circuit and to prevent the Smart Inverter from reconnecting with Distribution Provider's Distribution or Transmission System unless Distribution Provider'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 58.5 Hz to 60.5 Hz, inclusive, and are stable for at least 15 seconds; and

(iii) A function to prevent the Smart Inverter from contributing to the formation of an Unintended Island, and cease to energize Distribution Provider's Distribution System within two seconds of the formation of an Unintended Island.

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

b. Momentary Paralleling Generating Facilities

With Distribution Provider's approval, the transfer switch or scheme used to transfer Producer's loads from Distribution Provider's Distribution or Transmission System to Producer's Generating Facility may be used in lieu of the Protective Functions required for Parallel Operation. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

1. GENERAL INTERCONNECTION AND PROTECTIVE FUNCTION REQUIREMENTS (Cont'd.)

c. Suitable Equipment Required

Circuit breakers or other interrupting equipment located at the Point of Common Coupling (PCC) 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. Producer's Smart Inverter and Interconnection Facilities shall be designed so that the failure of any single device or component shall not potentially compromise the safety and reliability of Distribution Provider's Distribution and Transmission 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).

d. Visible Disconnect Required

When required by Distribution Provider's operating practices, Producer shall furnish and install a ganged, manually-operated isolating switch (or a comparable device mutually agreed upon by Distribution Provider and Producer) near the Point of Interconnection to isolate the Smart Inverter from Distribution Provider's Distribution or Transmission 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.) (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

1. GENERAL INTERCONNECTION AND PROTECTIVE FUNCTION REQUIREMENTS (Cont'd.)

   d. Visible Disconnect Required (Cont'd.)

      (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 Distribution Provider personnel for construction, operation, maintenance, inspection, testing or to isolate the Smart Inverter from Distribution Provider's Distribution or Transmission 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. Distribution Provider, 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 Distribution Provider prior to installation. If the device is not adjacent to the PCC, permanent signage must be installed at a Distribution Provider approved location providing a clear description of the location of the device. If the switch is not accessible outside the locked premises, signage with contact information and a Distribution Provider approved locking device for the premises shall be installed.

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

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

1. GENERAL INTERCONNECTION AND PROTECTIVE FUNCTION REQUIREMENTS (Cont'd.)

   e. Drawings Required

      Prior to Parallel Operation or Momentary Parallel Operation of the Smart Inverter, Distribution Provider shall approve Producer's Protective Function and control diagrams. Generating Facilities equipped with Protective Functions and a control scheme previously approved by Distribution Provider for system-wide application or only Certified Equipment may satisfy this requirement by reference to previously approved drawings and diagrams.

   f. Generating Facility Conditions Not Identified

      In the event this Rule does not address the Interconnection conditions for a particular Smart Inverter, Distribution Provider and Producer may agree upon other arrangements.

2. PREVENTION OF INTERFERENCE

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

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

a. Voltage Regulation

If approved by the Distribution Provider, the Smart Inverter may actively regulate the voltage at the PCC while in parallel with Distribution Provider'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).

b. Voltage Trip and Ride-Through Settings

The voltage ranges in Table Hh-.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 Distribution Provider'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 Distribution Provider'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 Hh-.1 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. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

b. Voltage Trip and Ride-Through Settings (Cont'd.)

(ii) Voltage Disturbances

Whenever Distribution Provider's Distribution System voltage at the PCC varies from and remains outside near Nominal voltage for the predetermined parameters set forth in Table Hh-.1, the Smart Inverter's Protective Functions shall cause the Smart Inverter(s) to become isolated from Distribution Provider's Distribution System:

1. The Smart Inverter shall stay connected to the Distribution Provider's Transmission or Distribution System while the grid remains within the "Ride-Through Until" voltage-time range and must stay connected in the corresponding "Operating Mode.

2. 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.

3. In the HV1 region, the Smart Inverter is permitted to reduce power output as a function of voltage under mutual agreement between the Producer and the Distribution Provider.

4. If the 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.

5. If the Distribution Provider's Transmission or 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.

6. Different voltage-time settings could be permitted by the Distribution Provider. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

b. Voltage Trip and Ride-Through Settings (Cont'd.)

(ii) Voltage Disturbances (Cont'd.)

Table Hh.1: Voltage Ride-Through Table

Region	Voltage at Point of Common Coupling (% Nominal Voltage)	Ride-Through Until	Operating Mode	Maximum Trip Time
High Voltage 2 (HV2)	V ≥120			0.16 seconds
High Voltage 1 (HV1)	110 < V < 120	12 seconds	Momentary Cessation	13 seconds
Near Nominal (NN)	88 ≤ V ≤ 110	Indefinite	Continuous Operation	Not Applicable
Low Voltage 1 (LV1)	70 ≤ V < 88	20 seconds	Mandatory Operation	21 seconds
Low Voltage 2 (LV2)	50 ≤ V < 70	10 seconds	Mandatory Operation	11 seconds
Low Voltage 3 (LV3)	V < 50	1 seconds	Momentary Cessation	1.5 seconds

(L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

c. Paralleling

The Generating Facility shall parallel with Distribution Provider's Distribution or Transmission System without causing a voltage fluctuation at the PCC greater than plus/minus 5% of the prevailing voltage level of Distribution Provider's Distribution or Transmission System at the PCC, and meet the flicker requirements of Section H.2.d. Section L, Certification and Testing Criteria, 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 Distribution Provider's Distribution or Transmission 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 Distribution Provider's Distribution or Transmission 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 Distribution Provider'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 Distribution Provider's Distribution System and shall not disrupt the coordination of the ground fault protection on Distribution Provider's Distribution System (IEEE 1547-4.1.2) (See Section G.1.i, line configuration). (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

f. Frequency

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

(i) Frequency Ride-Through Requirements

Smart Inverter based systems shall remain connected to the Distribution Provider's Distribution or Transmission System while the grid is within the frequency-time range indicated in Table Hh-.2, 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 Hh.2. 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 the Distribution Provider. Islands and microgrids may need different default frequency settings. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

f. Frequency (Cont'd.)

(i) Frequency Ride-Through Requirements(Cont'd.)

Table Hh.2: Frequency Ride-Through and Trip Settings Table

System Frequency Default Settings (Hz)	Minimum Range of Adjustability (Hz)	Ride-Through Until	Ride-Through Operational Mode	MaximumTrip Time
f > 62	62 - 64	No Ride Through	Not Applicable	0.16 seconds
60.5 < f ≤ 62	60.1 - 62	299 seconds	Mandatory Operation	300 seconds
58.5 ≤ f ≤ 60.5	Not Applicable	Indefinite	Continuous Operation	Not Applicable
57.0 ≤ f < 58.5	57 - 59.9	299 seconds	Mandatory Operation	300 seconds
f < 57.0	53 - 57	No Ride Through	Not Applicable	0.16 seconds

g. Harmonics

When the Smart Inverter is serving balanced linear loads, harmonic current injection into Distribution Provider's Distribution or Transmission System at the PCC shall not exceed the limits stated in Table Hh-.43. The harmonic current injections shall be exclusive of any harmonic currents due to harmonic voltage distortion present in Distribution Provider's Distribution or Transmission 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. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

g. Harmonics (Cont'd.)

Table Hh.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

Smart Inverter should not inject direct current greater than 0.5% of rated output current into Distribution Provider's Distribution or Transmission System.

i. Fixed Power Factor

Producer shall provide adequate reactive power compensation on site to maintain the Smart Inverter power factor near unity at rated output or a Distribution Provider specified power factor in accordance with the following requirements:

(i) Default Power Factor setting: Absorbing reactive power at 0.95 lagging power factor.

(ii) Aggregate generating facility is greater than 15 kW: 1.0 +/- 0.15 (0.85 Lagging to 0.85 Leading) down to 20% rated power irrespective of Real Power Production. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

i. Fixed Power Factor (Cont'd.)

(iii) 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 irrespective of Real Power Production.

j. 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 active power, and +/- 0.9 PF for smaller systems (≤15 kW), down to 20% of rated active power, irrespective of Real Power Production. This dynamic Volt/VAR capability shall be able to be activated or deactivated in accordance with Distribution Provider requirements.

The Distribution Provider 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 the Distribution Provider.

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

- 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 per the range irrespective of real power production, but the maximum reactive power provided to the system shall be as directed by the Distribution Provide
- Reduction of real power production is allowed to meet the required reactive power ranges. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

j. Dynamic Volt/VAR Operations (Cont'd.)

Dynamic Volt/Var Operations Default Settings

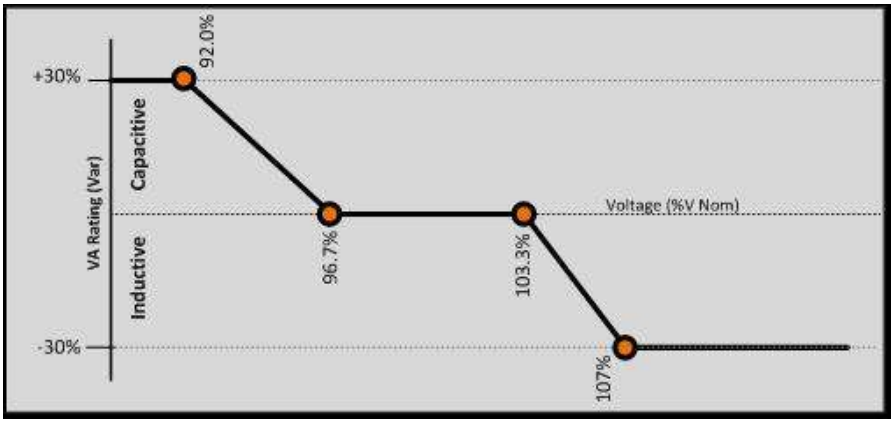
Table Hh-4 and Figure Hh-1 depict the default settings, which should be applied for all inverter sizes. Specific volt/var settings may be required for larger Generating Facilities (such as 100 kw or greater), or for specific areas with the Distribution Systems as determined by the Distribution Provider.

Default Open Loop Response Time for volt/var operation should be five (5) seconds.

Table Hh-4: Voltage and Reactive Default Settings

Voltage Setpoint	Voltage Value	Reactive Setpoint	Reactive Value	Operation
V1	92.0%	Q1	30%	Reactive Power Injection
V2	96.7%	Q2	0	Unity Power Factor
V3	103.3%	Q3	0	Unity Power Factor
V4	107.0%	Q4	30%	Reactive Power Absorption

Figure Hh-1: Voltage and Reactive Default Settings



(L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

k. Ramp Rate Requirements

The Smart Inverter is required to have the following ramp controls for at least the following four 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 the Distributor Provider and the Producer.

- 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. The default value is 2% of maximum current output per second, with specific settings as mutually agreed upon by the Distribution Provider and the Producer.

l. Frequency-Watt Requirements

This requirement will become mandatory for Generating Facilities utilizing inverter-based technologies for which an Interconnection Request is submitted on or after February 22, 2019, nine (9) months following the approval of the SunSpec Alliance Communication Protocol Certification Test Standard.

The utilization of this function is permissible under mutual agreement between the utility and the generating facility before the effective date.

Smart Inverters shall reduce their real power production as a function of system frequency, in accordance with the following:

- When system frequency exceeds 60.036 Hz, the active power output produced by the Smart Inverter shall be reduced by 50% of real power nameplate rating per hertz (5% of real power nameplate rating reduction per 0.1 hertz) (L)

(Continued)

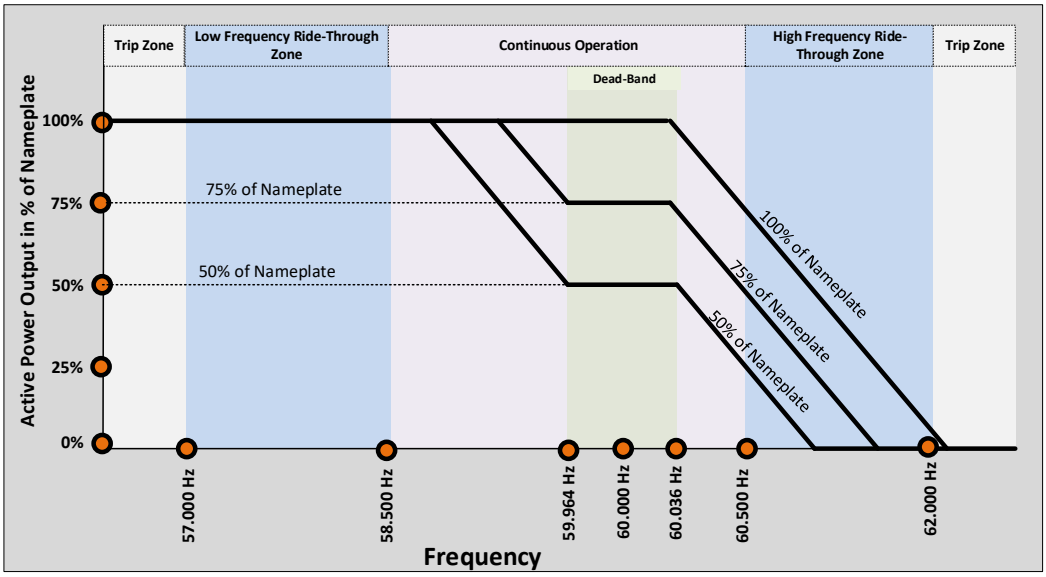
Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

l. Frequency-Watt Requirements (Cont'd.)

- When system frequency moves under 59.964 Hz, the active power output produced by the Smart Inverter shall be increased by 50% of real power nameplate rating per hertz (5% of real power nameplate rating increase per 0.1 hertz) when inverter is capable of increasing real power production.
- The default dead-band should be +/- 0.036 Hz from 60 Hertz (59.964 Hz to 60.036 Hz). When the system frequency is in range of 59.964 Hz and 60.036 Hz, the Smart Inverter is not required to decrease power as a function of system frequency.
- Open loop response time for Frequency –Watt shall be 5 seconds.
- Figure Hh-2 illustrated this requirement for three levels of output power. Figure Hh-2 is for illustration purposes only.

Figure Hh-2: Active Power as a Function of System Frequency



Note: the frequency markers on the horizontal axis are not drawn to scale. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

m. Voltage-Watt Default Settings Requirements

This requirement will become mandatory for Generating Facilities utilizing inverter-based technologies for which an Interconnection Request is submitted on or after February 22, 2019, nine (9) months following the approval of the SunSpec Alliance Communication Protocol Certification Test Standard.

The utilization of this function is permissible under mutual agreement between the utility and the generating facility before the effective date.

Smart Inverters shall reduce their real power production as a function of measured voltage at the inverter terminals or at the Generating Facility Point of Common Coupling (PCC) in accordance with the following:

- When the measured voltage is greater than 106% of nominal voltage (for example: 127.2 volts on a 120 volts nominal), the export of active power at the PCC or the production of active power by the Smart Inverter shall be reduced at a rate of 25% of active power nameplate rating per one percent of nominal voltage. Figure Hh-3 – Volt-Watt Requirements – illustrates the required rate of reduction. When export of active power is controlled, a certified inverter and control system shall be used. (L)

(Continued)

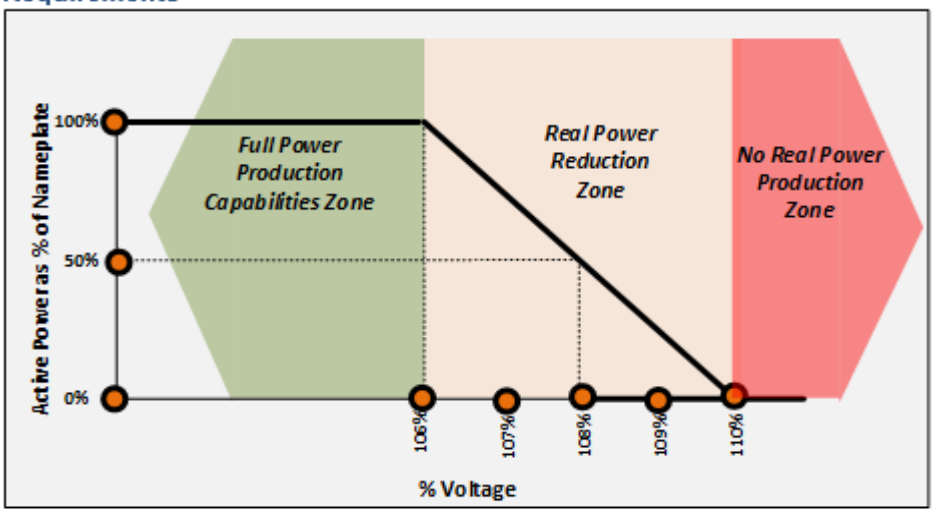
Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

m. (Cont'd.)

- When the measured voltage is greater than 110% of nominal voltage (Example: 132 volts on a 120 volts nominal), the export of active power output to the grid at the PCC or the production of active power by the Smart Inverter shall be reduced to 0 watts

Figure HH-3 – Volt-Watt Requirements



Percent (%) of nominal voltage (L)

(Continued)

ELECTRIC RULE NO. 21 Sheet 201
GENERATING FACILITY INTERCONNECTIONS

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

n. Dynamic Reactive Power Support Function

The capability for this requirement will become mandatory for Generating Facilities utilizing inverter-based technologies for which an Interconnection Request is submitted twelve (12) months after approval of a nationally recognized standard that includes the function.

The utilization of this function is allowed and optional upon the mutual agreement of the Distribution Provider and the Applicant, before the effective date.

o. Default Activation States

Unless otherwise provided by Distribution Provider, pursuant to Distribution Provider's Distribution Generation Interconnection Handbook, the default settings will be as follows:

	Function	**State**
1	Anti-islanding	activated
2	Low/High Voltage Ride-Through	activated
3	Low/High Frequency Ride-Through	activated
4	Dynamic Volt/VAR operations	activated
5	Ramp rates	activated
6	Fixed power factor	deactivated
7	Reconnect by "soft-start" methods	activated
8	Frequency-Watt*	activated
9	Volt/Watt*	activated
10	Set Active Power Function Mode (Optional)	activated under mutual agreement
11	Dynamic Reactive Power Support Mode (Optional)	activated under mutual agreement

These default activation states may be modified by mutual agreement between Distribution Provider and Producer. (L)

* These functions must be activated for Interconnection Requests submitted on or after February 22, 2019.

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

p. Phase 3 Functions

Table of Phase 3 Effective Dates Pursuant to Resolution E-4898 and Resolution E-5000 and CPUC Letter of March 20, 2020 responding to a request to extend the date for Functions 1, 2, 3 and 8:

Phase 3 Function #		
	Description	**Effective Date (note)**
1	Monitor Key DER Data	**June 22, 2020**
2	DER Disconnect and Reconnect Command (Cease to Energize and Return to Service)	**June 22, 2020**
3	Limit Maximum Active Power Mode	**June 22, 2020**
4	Set Active Power Mode	12 months after approval of a nationally recognized standard that includes the function.
5	Frequency Watt Mode	**February 22, 2019**, which is 9 months following SunSpec Alliance Communication Protocol Certification Test Standard.
6	Volt Watt Mode	**February 22, 2019**, which is 9 months following SunSpec Alliance Communication Protocol Certification Test Standard.
7	Dynamic Reactive Support	12 months after approval of a nationally recognized standard that includes the function.
8	Scheduling Power Values and Modes	**June 22, 2020**

Note: The utilization of any of these functions is permissible under mutual agreement between the utility and the generating facility before the effective date. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

q. Load Shedding or Transfer

The voltage and frequency ride-through requirements of Hh.2.b.(ii) and Hh.2.f.(i) 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 the Distribution Provider's T&D system, along with Generation Facility load, such that the net change in real power flow from or to the Distribution Provider 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. TECHNOLOGY SPECIFIC REQUIREMENTS

Grid-interactive inverters do not require separate synchronizing equipment. Non grid-interactive or "stand-alone" inverters shall not be used for Parallel Operation with Distribution Provider's Distribution or Transmission System. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

4. SUPPLEMENTAL SMART INVERTER REQUIREMENTS

a. Fault Detection

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

b. Transfer Trip

For a Generating Facility that cannot detect Distribution or Transmission System faults (both line-to-line and line-to-ground) or the formation of an Unintended Island, and cease to energize Distribution Provider's Distribution or Transmission System within two seconds, Distribution Provider 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, Distribution Provider may require additional Protective Functions, including, but not limited to reclose-blocking on some of the automatic reclosing devices. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

5. COMMUNICATION REQUIREMENTS

a. The communication protocol requirements included in this section Hh.5 shall become mandatory for Generating Facilities utilizing inverter-based technologies for which an Interconnection Request is submitted June 22, 2020. Until such date, this subsection may be used in all or in part by inverter-based technologies by mutual agreement of the Distribution Provider and the Applicant. The communications requirements herein shall be between:

(i) the Distribution Provider and the individual Generating Facility's inverter control or energy management system;

(ii) the Distribution Provider and communication to the Generating Facility through an aggregator not co-located or part of the Generating Facility; or

(iii) other communication options as are mutually agreed to are by Applicant and the Distribution Provider. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

5. COMMUNICATION REQUIREMENTS (Cont'd.)

b. Generating Facilities utilizing inverter-based technologies must adhere to all of the following communication protocol requirements for communications between Distribution Provider and communication option selected in section Hh. 5. This Rule does not specify the communication between the selected communication option and Smart Inverter but performance will be enforced by in compliance with this Rule:

(i) Shall be capable of communications;

(ii) Software shall be updateable via communications remotely;

(iii) The transport level protocol shall be TCP/IP; and,

(iv) The default application-level protocol shall be IEEE 2030.5 (i.e., Smart Energy Profile 2.0 (SEP 2)) as defined in the California IEEE 2030.5 Implementation Guide, but other application-level protocols may be used by mutual agreement of the parties including IEEE 1815/DNP3 for SCADA real-time monitoring and control and IEC 61850. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

5. COMMUNICATION REQUIREMENTS (Cont'd.)

c. Additional communication protocol requirements shall also apply to Generating Facilities utilizing inverter-based technologies as provided in the following documents:

(i) Distribution Provider Generation Interconnection Handbook, which shall include:

a) Details and guidelines for the implementation of communications with Generating Facilities utilizing inverter-based technologies;

b) Cybersecurity and privacy requirements (these may additionally or alternatively be included in the application-level protocol implementation guide); and,

c) Generic device communications registration management requirements, including how to register individual Generating Facilities, Generating Facilities with energy management systems, and aggregators (these requirements additionally or alternatively may be included in the application-level protocol implementation guide).

(ii) Application-Level Protocol Implementation Guide, which shall provide:

a) Communication requirements and implementation guidelines to ensure consistent interoperability of the Generating Facilities with all California investor-owned utilities under the Commission's jurisdiction. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

6. SCHEDULING CAPABILITY REQUIREMENTS

a. Generating Facilities which incorporate Smart Inverters shall incorporate scheduling capabilities with a minimum scheduling memory capability of at least 24 events. The capability for this requirement will be mandatory for Generating Facilities utilizing inverter-based technologies for which an Interconnection Request is submitted on or after June 22, 2020.

The utilization of this function is permissible under mutual agreement between the utility and the generating facility before the effective date.

Each event is composed of modifications to each, selected group of, or all of the following Smart Inverter function.

(i) Modifications to the voltage and reactive set-points of the Dynamic volt/var function.

(ii) Modifications to the reactive power set-points for the fixed power factor function.

(iii) Modifications to the voltage and watt-reduction level set-points for the volt/watt function. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

6. SCHEDULING CAPABILITY REQUIREMENTS (Cont'd.)

b. The Generating Facility's scheduling capability requirement herein shall be met by one or more of the following options.

(i) Scheduling capability requirements may be stored at the Generating Facility Energy Management System (GFEMS). The GFEMS shall communicate the necessary commands to the Smart Inverters within 10 minutes from when GFEMS received the scheduling information:

(ii) Scheduling capability requirements may be stored at the Smart Inverter Control Unit (SMCU) within the Generating Facility. The SMCU shall communicate necessary commands to the Smart Inverters within 10 minutes from when SCMU received the scheduling information.

(iii) Scheduling capability requirements may be stored at an aggregator not co-located within the Generating Facility. The aggregator shall communicate the necessary commands to the Smart Inverters within 15 minutes of the aggregator receiving the scheduling information.

(iv) Other options may be utilized by mutual agreement between the Applicant and Distribution Provider.

c. The selected scheduling control system shall store the schedules and shall send operational commands to the Smart Inverters as required by the schedule received from the Distribution Provider. The Smart Inverter shall respond by changing its mode of operation as commanded at the schedule start time with no unreasonable delay.

Each scheduled mode of operation shall include and start-time and duration. The Smart Inverter should return to its default settings at the end of the duration time or shall enter a new operational mode as directed by the scheduling control system. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

7. MONITORING AND TELEMETRY REQUIREMENTS

a. The capability for this requirement will be mandatory for Generating Facilities utilizing inverter-based technologies for which an Interconnection Request is submitted on or after June 22, 2020.

The utilization of this function is permissible under mutual agreement between the utility and the generating facility before the effective date.

Smart Inverter shall have the capability to communicate its performance information including:

(i) Smart Inverter production or consumption of active power (Watts).

(ii) Smart Inverter consumption or production of reactive power (VARs)

(iii) Phase measured at the AC terminals of the Smart Inverter (Volts)

(iv) Frequency measured at the AC terminals of the Smart Inverter (Hz) (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

7. MONITORING AND TELEMETRY REQUIREMENTS (Cont'd.)

b. When the Generating Facility includes energy-storage with Smart Inverters, the following monitoring and telemetry capability are required:

(i) The Smart Inverter shall be capable of communicating the operational state of charge as a percentage of energy storage capacity.

c. Operational State as In-Service or not In-service communication capability requirements. The Smart Inverter shall be capable of communicating when the Smart Inverter is capable of providing electric services as follows:

(i) In-Service state: An operational state which indicates that the Smart Inverter is connected to the electric system and operating as determined locally by the Generating Facility operator or by a scheduling control system as outlined in section Hh.6

(ii) Not In-Service state: An operating state which indicates that the Smart Inverter is not capable of connecting to the electric system and not capable of providing any type of electrical support as required locally or as commanded by a scheduling control system as outlined in section Hh. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

7. MONITORING AND TELEMETRY REQUIREMENTS (Cont'd.)

d. Monitoring and performance information should be communicated in aggregate at the Generating Facility as follows:

(i) When the Generating Facility includes only Smart Inverters: The production or consumption of active and reactive power shall be communicated as an aggregate of all Smart Inverters within the Generating Facility.

(ii) When a Generating Facility includes Smart Inverters and other technologies such as synchronous or induction generation systems, the Generating Facility should communicate the following:

a) The production or consumption of active and reactive power shall be communicated in aggregate of all Smart Inverters within the Generating Facility

b) The production or consumption of active and reactive power shall be communicated in aggregate of all the other technologies within the Generating Facility

(iii) When the Generating Facility with Smart Inverters includes one or multiple energy storage systems: The available operational energy should be communicated as an aggregate of all the energy storage systems. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

8. CONTROL THROUGH COMMUNICATION CAPABILITIES

a. The capability for these requirements will be mandatory for Generating Facilities utilizing inverter-based technologies for which an Interconnection Request is submitted on or after the earlier of the dates shown in the "Table of Phase 3 Effective Dates Pursuant to Resolution E-4898" in Section Hh.2.p.

The utilization of these functions is permissible under mutual agreement between the utility and the generating facility before the effective date.

Smart Inverters shall have the capabilities of accepting an operational controls through communications in accordance to the following:

(i) Cease to energize control command. When the Smart Inverter receives a cease-to-energize command through communication it must enter into a cease-to-energize state of operation or shall initiate the opening of the DER switch referenced in the ECP in order to galvanically isolate the DER system from the Distribution System

(ii) Return to service control command. When the Smart Inverter receives a return-to-service control command, the Smart Inverter may return to service operation as required by Generating Facility operator or as required by the scheduling control system as required by section H.6

(iii) Limit Active Power command. When the Smart Inverter receives a command to limit its production of real power, the Smart Inverter shall reduce its real power production to the specified percent of real power capacity of the Smart Inverter or to a specified real power value.

(iv) Set Active Power Level Mode Function. The capability for this requirement will become mandatory for Generating Facilities utilizing inverter-based technologies for which an Interconnection Request is submitted twelve (12) months after approval of a nationally recognized standard that includes the function.

(v) Suspension of Active Power restriction. When the Smart Inverter receives a command to suspend the command for active power reduction, the Smart Inverter may return to normal operation as required by Generating Facility operator or as required by the scheduling control system as required by section H.6. (L)

(Continued)

ELECTRIC RULE NO. 21 Sheet 214
GENERATING FACILITY INTERCONNECTIONS

I. THIRD-PARTY INSTALLATIONS, RESERVATION OF UNUSED FACILITIES, AND REFUND OF SALVAGE VALUE (L)

1. INTERCONNECTION FACILITIES AND DISTRIBUTION UPGRADES

Except as provided for in the Generator Interconnection Agreement of this Rule, Interconnection Facilities connected to Distribution Provider's side of the PCC and Distribution Upgrades shall be provided, installed, owned, and maintained by Distribution Provider at Producer's expense.

2. THIRD-PARTY INSTALLATIONS (L)

Producer may, at its option, employ a qualified contractor that meets the Contractor Qualifications set forth under Electric Rule 15, Section G., to provide and install Interconnection Facilities or Distribution Upgrades, to be owned and operated by Distribution Provider, on Distribution Provider's side of the PCC.* Such Interconnection Facilities and Distribution Upgrades shall be installed in accordance with Distribution Provider's design and specifications. Upon final inspection and acceptance by Distribution Provider, Producer shall transfer ownership of such Producer installed Interconnection Facilities or Distribution Upgrades to Distribution Provider and such facilities shall thereafter be owned and maintained by Distribution Provider at Producer's expense. Producer shall pay Distribution Provider's reasonable cost of design, administration, and monitoring of the installation for such facilities to ensure compliance with Distribution Provider's requirements. Producer shall also be responsible for all costs, including any income tax liability, associated with the transfer of Producer installed Interconnection Facilities and Distribution Upgrades to Distribution Provider. (T)/(L) (T)/(L) (L) (L) (T)/(L) (L) (L)

* Only duly authorized employees of utility are allowed to connect to, disconnect from, or perform any work upon Utility's facilities. (N) (N)

(Continued)

I. THIRD-PARTY INSTALLATIONS, RESERVATION OF UNUSED FACILITIES, AND REFUND OF SALVAGE VALUE (Cont'd.) (L)

3. RESERVATION OF UNUSED FACILITIES

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

4. REFUND OF SALVAGE VALUE

When a Producer elects to abandon the Special Facilities or Added Facilities for which it has either advanced the installed costs or constructed and transferred to Distribution Provider, Producer shall, at a minimum, receive from Distribution Provider a credit for the net salvage value of the Added Facilities.

J. METERING, MONITORING AND TELEMETERING

1. GENERAL REQUIREMENTS

All Generating Facilities shall be metered in accordance with this Section J and shall meet all applicable standards of Distribution Provider contained in Distribution Provider's applicable tariffs and published Distribution Provider manuals dealing with Metering specifications.

2. METERING BY NON-DISTRIBUTION PROVIDER PARTIES

The ownership, installation, operation, reading, and testing of revenue Metering Equipment for Generating Facilities shall be by Distribution Provider except to the extent that the Commission authorizes any or all these services be performed by others. (L)

(Continued)

J. METERING, MONITORING AND TELEMETERING (Cont'd.) (L)

3. NET GENERATION OUTPUT METERING

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

However, Generating Facility customers do not need to install Net Generation Output Metering where less intrusive and/or more cost effective options, for Producer/Customer, are available for providing generator data to Distribution Provider. These Generating Facilities may opt to have Distribution Provider estimate load data in accordance with Distribution Provider'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 Distribution Provider's estimate of the Generator(s) output, the customer may elect to install the Net Generation Output Metering, or have Distribution Provider install Net Generation Output Metering at the customer's expense.

(a) All metering options available to the customer must conform to the requirements set forth in Distribution Provider's Rule 22. If Distribution Provider does not receive meter data in accordance with Rule 22, Distribution Provider shall have the right to install Distribution Provider-owned Net Generation Output Metering at the customer's expense. The relevant factors in determining the need for Net Generation Output Metering are as listed below:

i) Data requirements in proportion to need for information;

ii) Producer's election to install equipment that adequately addresses Distribution Provider's operational requirements; (L)

(Continued)

J. METERING, MONITORING AND TELEMETERING (Cont'd.) (L)

3. NET GENERATION OUTPUT METERING (Cont'd.)

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

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

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

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

vii) Requirements under any Generator Interconnection Agreement with Producer.

The requirements in this Section may not apply to Metering of Generating Facilities operating under Distribution Provider's Net Energy Metering tariffs. Nothing in this Section J.3 supersedes Section D.4, Compliance with Laws, Rules and Tariff Schedules.

Distribution Provider will report to the Commission or designated authority, on a quarterly basis, the rationale for requiring Net Generation Output Metering equipment in each instance along with the size and location of the facility.

4. POINT OF COMMON COUPLING (PCC) METERING

For purposes of assessing Distribution Provider's charges for retail service, Producer's PCC Metering shall be reviewed by Distribution Provider, 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 Producer's site can be separately recorded. Alternately, (L)

(Continued)

J. METERING, MONITORING AND TELEMETERING (Cont'd.) (L)

4. POINT OF COMMON COUPLING (PCC) METERING (Cont'd.)

Producer may, at its sole option and cost, require Distribution Provider to install multi-metering equipment to separately record power deliveries to Distribution Provider's Distribution System and retail purchases from Distribution Provider. Where necessary, such PCC Metering shall be designed to prevent reverse registration.

Generating Facilities participating in Net Energy Metering shall have metering provided pursuant to the terms of the applicable Net Energy Metering tariff schedule.

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 Producer's expense. If the Generating Facility is Interconnected to a portion of Distribution Provider's Distribution System operating at a voltage below 10 kV, then Telemetering equipment may be required on Generating Facilities 250 kW or greater. Distribution Provider 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. Distribution Provider 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 Distribution Provider-owned Metering is located on Producer's premises, Producer shall provide, at no expense to Distribution Provider, a suitable location for all such Metering Equipment. (L)

(Continued)

J. METERING, MONITORING AND TELEMETERING (Cont'd.) (L)

7. COSTS OF METERING

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 J.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-1, NEM-2, NEMBIO, NEMFC), or where a Generating Facility consists of one or more NEM-eligible generators in combination with one or more non-NEM eligible generators without Non-Export relays ("Reverse Power Protection"). To ensure proper tariff administration, metering will be required at the PCC and at each of the NEM eligible generator groups eligible for service under the same NEM tariff schedule. For combinations of multiple NEM eligible generators under different tariffs, billing administration and metering requirements will be as specified in the appropriate NEM tariff schedule.

Where a Generating Facility consists of one or more NEM eligible generator groups in combination with one or more non-NEM generators, metering of the non-NEM generators is not required, except as specified in Section J.3. (L)

(Continued)

K. DISPUTE RESOLUTION PROCESS (L)

In addition to the informal procedures for timeline-related disputes set out in Section F.1.d, the following procedures will apply for disputes arising from this Rule:

1. SCOPE

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

2. PROCEDURES

Any dispute arising between Distribution Provider and Producer (individually referred to in Section K as "Party" and collectively "the Parties") regarding Distribution Provider'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:

a. The dispute shall be documented in a written notice ("notice") by the aggrieved Party 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 this Section. The notice shall be sent to the Party's email address and physical address set forth in the Generator Interconnection Agreement or Interconnection Request, if there is no Generator Interconnection Agreement. A copy of the notice shall also be sent to the Energy Division, Office of the Director, at the Commission. The receiving Party shall acknowledge the notice within five (5) Calendar Days of its receipt. (L)

(Continued)

ELECTRIC RULE NO. 21 Sheet 221
GENERATING FACILITY INTERCONNECTIONS

K. DISPUTE RESOLUTION PROCESS (Cont'd.) (L)

2. PROCEDURES (Cont'd.)

a 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 seven (7) Calendar Days. In addition, upon receipt of the notice, Distribution Provider shall provide the aggrieved Party with all relevant regulatory and/or technical details and analysis regarding any Distribution Provider interconnection requirements under dispute within twenty-one (21) Calendar Days.

Within forty-five (45) Calendar Days of the date of the notice, the Parties' authorized representatives will be required to meet and confer to try to resolve the dispute. Parties are expected to operate in good faith and use best efforts to resolve the dispute.

b. If a resolution is not reached in forty-five (45) Calendar Days from the date of the notice, either 1) a Party may request to continue negotiations for an additional forty-five (45) Calendar Days or 2) the Parties may by mutual agreement make a written request for mediation to the ADR Coordinator in the Commission's ALJ Division. The request may be submitted by electronic mail to adr_program@cpuc.ca.gov. 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. At any time, either Party may file a formal complaint before the Commission pursuant to California PUC section 1702 and Article 4 of the Commission's Rules of Practice and Procedure.

Nothing in this section shall be construed to limit the rights of any Party to exercise rights and remedies under Commission law. (L)

(Continued)

K. DISPUTE RESOLUTION PROCESS (Cont'd.) (L)

3. PERFORMANCE DURING DISPUTE

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 Interconnection Request and implementation of this Section shall be subject to resolution pursuant to the procedures set forth in this Section.

L. CERTIFICATION AND TESTING CRITERIA

1. INTRODUCTION

This Section describes the test procedures and requirements for equipment used for the Interconnection of Generating Facilities to Distribution Provider's Distribution or Transmission 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 B, this Rule has been revised to be consistent with ANSI/IEEE 1547-2003 Standard for Interconnecting Distribution Resources with Electric Power Systems. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

1. INTRODUCTION (Cont'd.)

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

Section L also provides criteria for "Certifying" Generators, inverters or converters. Once a Generator, inverter or converter has been Certified per this Rule, it may be considered suitable for Interconnection with Distribution Provider's Distribution or Transmission System. Subject to the exceptions described in Section L, Distribution Provider 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 for Section H, except for Non-Export AC/DC Converters seeking an expedited process, but it is a prerequisite for inverters installed after September 8, 2017, pursuant to Section Hh of this Rule. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

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 Distribution Provider's Distribution or Transmission 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). (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

2. CERTIFIED AND NON-CERTIFIED INTERCONNECTION EQUIPMENT (Cont'd.)

a. Certified Equipment (Cont'd.)

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);

(8) If the equipment is Certified as Non-Islanding; and

(9) If the equipment is Certified as a Non-Export AC/DC Converter.

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 Distribution Provider for each Generating and/or Interconnection Facility. The manufacturer or a laboratory acceptable to Distribution Provider may perform these tests. Test results for non-Certified equipment must be submitted to Distribution Provider for the Supplemental Review. Approval by Distribution Provider for equipment used in a particular Generating and/or Interconnection Facility does not guarantee Distribution Provider's approval for use in other Generating and/or Interconnection Facilities. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

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 L.1 defines the test criteria by Generator or inverter technology. While UL 1741(1) and UL 1741 – Supplement SA were 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, Distribution Provider or NRTL shall adopt the procedures referenced in Table L.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 L.2.

Non-Export AC/DC Converters must satisfy the requirements in its definition in Section C. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

3. TYPE TESTING (Cont'd.)

a. Type Tests and Criteria for Interconnection Equipment Certification (Cont'd.)

Table L.1, Type Test and Requirements for Interconnection Equipment Certification

Type Test	Reference 1	Inverter (6)	Smart Inverter (7)	Synchronous Generators	Induction Generators
Utility Interaction	UL 1741 – 39, 40	X	X	X	X
Utility Compatibility (Required testing to 1547 & 1547.1)	UL 1741 - 46	X	X	X	X
DC Isolation	IEEE 1547.1(8) -5.6	X	X	-	-
Dielectric Voltage Withstand	IEEE 1547.1(8) -5.5.3	X	X	X	X
Harmonic Distortion	IEEE 1547.1(8) -5.11	X	X	X	X
DC Injection	IEEE 1547.1(8) -5.6	X	X	-	-
Distribution Provider Voltage Variation	IEEE 1547.1(8) -5.2	X	-	X	X
Distribution Provider Frequency Variation	IEEE 1547.1(8) -5.3	X	-	X	X
Abnormal Tests	UL 1741 – 47				
Loss of Control Circuit	UL 1741 – 47.8	X	X	X	X
Short Circuit	UL 1741 - 47.3	X	X	X	X
Load Transfer	UL 1741 - 47.7	X	X	X	X
Surge Withstand Capability	L.3.e	X	X	X	X
Anti-Islanding (non-Smart Inverters)	L.3.b	(2)	-	(2)	(2)
Non-Export	L.3.c	(3)	(3)	(3)	(3)
In-rush Current	L.3.d	-	-	-	(4)
Synchronization	L.3.f	(5)	(5)	X	(5)
Anti-islanding (Smart Inverters)	UL 1741 SA - SA8	-	X	-	-
Low and High Voltage Ride-through (L/H VRT)	UL 1741 SA – SA9	-	X	-	-
Low and High Frequency Ride-through (L/H FRT)	UL 1741 SA - SA10	-	X	-	-
Normal and Soft-Start Ramp Rate (RR)	UL 1741 SA - SA11	-	X	-	-
Specified Power Factor	UL 1741 SA - SA12	-	X	-	-
Volt/Var Mode (Q(V))	UL 1741 SA - SA13	-	X	-	-
Frequency-Watt(FW) - optional	UL 1741 SA - SA14	-	X	-	-
Volt-Watt (VW) - optional	UL 1741 SA - SA15	-	X	-	-
Markings and Instructions	UL 1741 SA6, SA16	-	X	-	-

Table Notes:

(1) References are to section numbers in either UL 1741 and/or UL 1741-Supplement SA (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 Distribution Provider 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 Distribution Provider's Distribution or Transmission System.
(6) Inverters compliant with Section H.
(7) Inverters compliant with Section Hh.
(8) IEEE 1547.1 refers to 2005 revision.

"X" = Required "-" = Not Required

(L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

3. TYPE TESTING (Cont'd.)

a. Type Tests and Criteria for Interconnection Equipment Certification (Cont'd.)

Table L.2 Type Tests Sequence for Interconnection Equipment Certification

Test No.	Type Test
1	Distribution Provider Voltage and Frequency Variation
2	Synchronization
3	Surge Withstand Capability
4	Distribution Provider Voltage and Frequency Variation, including ride through
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 L.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. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

3. TYPE TESTING (Cont'd.)

d. In-rush Current Test

Generation equipment that utilizes Distribution Provider power to motor up to speed will be tested using the procedure defined in Section L.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 H.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. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

3. TYPE TESTING (Cont'd.)

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 Distribution Provider's Distribution or Transmission 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 L.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 L.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 Distribution Provider's Distribution or Transmission 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. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

3. TYPE TESTING (Cont'd.)

f. Synchronization Test (Cont'd.)

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

Aggregate Rating of Generator Units (kVA)	Frequency Difference (Δf, Hz)	Voltage Difference Phase Angle (ΔV, %)	Difference (ΔΦ,°)
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 L.1 shall be performed on the paralleling device to ensure compliance with those requirements specified in Section H.1.c (IEEE 1547-5.1.3.3).

h. Backfeed Test

Non-Export AC/DC Converters must satisfy the requirements in its definition in Section C.

4. PRODUCTION TESTING

At a minimum, each interconnection system shall be subjected to Distribution Provider Voltage and Frequency Variation Test procedure described in UL1741 under Manufacturing and Production Tests, Section 68 and the Synchronization test specified in Section L.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 L.5). (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

5. COMMISSIONING TESTING

a. Commissioning Testing

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.

Distribution Provider may require written Commissioning test procedure be submitted to Distribution Provider at least 10 working days prior to the performance of the Commissioning Test. Distribution Provider has the right to witness Commissioning Test. Distribution Provider 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:

(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 (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

5. COMMISSIONING TESTING (Cont'd.)

a. Commissioning Testing (Cont'd.)

(6) Time delay on restart after Distribution Provider source is stable

(7) Distribution Provider system fault detection (if used)

(8) Synchronizing controls (if applicable)

(9) Other Interconnection Protective Functions that may be required as part of the Generator Interconnection Agreement

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

b. 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 E of this Rule. If the initial Commissioning Test verification is not successful through no fault of Distribution Provider, Distribution Provider may impose upon 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 Distribution Provider's invoice. The invoice provided by Distribution Provider shall consist of the hourly rate multiplied by the hours incurred by Distribution Provider and will separately specify the amount of time spent on-site from that spent in roundtrip travel to the Commissioning Test site. Additional cost, if any, will be specified on the invoice. If the initial Commissioning Test verification is not successful through the fault of Distribution Provider, that visit will not be considered the initial Commissioning Test verification. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

5. COMMISSIONING TESTING (Cont'd.)

c. Other Checks and Tests

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

(1) Verifying final Protective Function settings

(2) Trip test (L.5.g)

(3) In-service tests (L.5.h)

d. Certified Equipment

Generating Facilities qualifying for interconnection through the Fast Track process 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 Distribution Provider's Distribution or Transmission 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 Distribution Provider voltage or frequency, or varying the set points to show that the device trips at the measured (actual) Distribution Provider 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 Distribution Provider's Distribution or Transmission System and does not re-energize it for the required time delay after the switch is closed. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

5. COMMISSIONING TESTING (Cont'd.)

d. Certified Equipment (Cont'd.)

(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.

e. Non-Certified Equipment

Non-certified Equipment shall be subjected to the appropriate tests described in Type Testing (Section L.3) as well as those described in Certified Equipment Commissioning Tests (Section L.5.d). With Distribution Provider's approval, these tests may be performed in the factory, in the field as part of commissioning, or a combination of both. Distribution Provider, 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.

f. Verification of Settings

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

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

5. COMMISSIONING TESTING (Cont'd.)

g. 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.

h. 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. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

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. Producer shall maintain Periodic Test reports or a log for inspection by Distribution Provider. Periodic Testing conforming to Distribution Provider test intervals for the particular Line Section may be specified by Distribution Provider 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 I, 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. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

7. TYPE TESTING PROCEDURES NOT DEFINED IN OTHER STANDARDS (Cont'd.)

a. Non-Exporting Test Procedures (Cont'd.)

i) 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 I. It should be understood that in the reverse power application, the relay will provide a trip output with power flowing in the export (toward Distribution Provider's Distribution or Transmission System) direction.

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). (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

7. TYPE TESTING PROCEDURES NOT DEFINED IN OTHER STANDARDS (Cont'd.)

a. Non-Exporting Test Procedures (Cont'd.)

i) Discrete Reverse Power Relay Test (Cont'd.)

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.

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 Ia at 180, Ib at 60 and Ic at 300 degrees). Remove phase-1 voltage and observe that the relay does not operate. Repeat for phases-2 and 3. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

7. TYPE TESTING PROCEDURES NOT DEFINED IN OTHER STANDARDS (Cont'd.)

a. Non-Exporting Test Procedures (Cont'd.)

i) Discrete Reverse Power Relay Test (Cont'd.)

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 Ia at 180, Ib at 300 and Ic 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 Va at 0 degrees, Vb and Vc at 180 degrees, Ia at 180 degrees, Ib at 0 degrees, and Ic 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. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

7. TYPE TESTING PROCEDURES NOT DEFINED IN OTHER STANDARDS (Cont'd.)

a. Non-Exporting Test Procedures (Cont'd.)

i) Discrete Reverse Power Relay Test (Cont'd.)

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 L.3.e.

ii) 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 I. A trip output will be provided when import power (toward 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. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

7. TYPE TESTING PROCEDURES NOT DEFINED IN OTHER STANDARDS (Cont'd.)

a. Non-Exporting Test Procedures (Cont'd.)

ii) Discrete Underpower Relay Test (Cont'd.)

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).

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. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

7. TYPE TESTING PROCEDURES NOT DEFINED IN OTHER STANDARDS (Cont'd.)

a. Non-Exporting Test Procedures (Cont'd.)

ii) Discrete Underpower Relay Test (Cont'd.)

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 Va at 0 degrees, Vb and Vc at 180 degrees, Ia at 0 degrees, Ib at 180 degrees, and Ic at 0 degrees). Observe that the relay (especially single-phase types) operates properly. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

7. TYPE TESTING PROCEDURES NOT DEFINED IN OTHER STANDARDS (Cont'd.)

a. Non-Exporting Test Procedures (Cont'd.)

ii) Discrete Underpower Relay Test (Cont'd.)

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 L.3.e. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

7. TYPE TESTING PROCEDURES NOT DEFINED IN OTHER STANDARDS (Cont'd.)

a. Non-Exporting Test Procedures (Cont'd.)

iii) 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 L.7.a.i 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.

iv) Tests for Inadvertent Export Inverters

Test requirements for certified inverters with integrated functions for Inadvertent Export shall verify the performance requirements specified in Section Mm of this Rule.

(L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

7. TYPE TESTING PROCEDURES NOT DEFINED IN OTHER STANDARDS (Cont'd.)

a. Non-Exporting Test Procedures (Cont'd.)

v) Interim Tests for Non-Export AC/DC Converters ("Converter")

Step 1: Limitation of Back-feed Under Steady State Conditions

Apply the nominal DC operating voltage of the Converter across its DC terminals with a battery source or simulated equivalent of a battery source. Vary the battery source by 100%, 75%, 50%, 25%, and 10% of Converter rated output power. The measured steady-state DC current component at each of the AC terminals of the Converter is required to be less than 0.5% of the Converter's rated RMS AC current. This test is to be repeated for 80% nominal DC operating voltage and for 125% nominal DC operating voltage. Testing requirements can be modified upon mutual agreement of the Distribution Provider and the Applicant.

Step 2: Back-feed Under Fault Conditions – DC Output Shorted

With a battery source or simulated equivalent of a battery source connected to the DC terminals, apply rated conditions of the Converter then short its DC terminals for 200 milliseconds. After 5 cycles of inducing the short circuit, record the measured peak current at each of the AC terminals of the Converter. These peak currents within this time interval are each required to be less than 0.5% of the Converter's rated RMS AC current. Testing requirements can be modified upon mutual agreement of the Distribution Provider and the Applicant. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

7. TYPE TESTING PROCEDURES NOT DEFINED IN OTHER STANDARDS (Cont'd.)

a. Non-Exporting Test Procedures (Cont'd.)

v) Interim Tests for Non-Export AC/DC Converters ("Converter") (Cont'd.)

Step 3: Back-feed Under Fault Conditions – AC Input Shorted: Phase-Ground, Phase-Phase, and 3-Phase

With a battery source or simulated equivalent of a battery source connected to the DC terminals, apply rated conditions of the Converter, then apply a short between any two phases on the grid side of the Converter for 200 milliseconds. After 5 cycles of inducing the short circuit, record the measured peak current at each of the AC terminals of the Converter. These peak currents within this time interval are each required to be less than 0.5% of the Converter's rated RMS AC current. This test is to be repeated for phase-ground and 3-phase shorts. Testing requirements can be modified upon mutual agreement of the Distribution Provider and the Applicant.

Step 4: Back-feed Under Fault Conditions – Component Faults

Distribution Provider can elect to test for back-feed under the condition of a short circuit across certain components which are internal to the Converter. Potential tests can include inducing a short circuit across different terminals for electronic switches and/or across different terminals for internal transformers. Ultimately, the components used for testing will be chosen on a case-by-case basis and will depend on the Converter's circuit topology. Testing requirements can be modified upon mutual agreement of the Distribution Provider and the Applicant.

Step 5: Harmonics Testing

Under normal loading conditions at 10%, 25%, 50%, 75%, and 100% of the Converter's rated power output, conduct harmonic current distortion measurements on each of the AC terminals. Measurements should be below the maximum harmonic current distortion requirements given in IEEE 1547-4.3.3. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

7. TYPE TESTING PROCEDURES NOT DEFINED IN OTHER STANDARDS (Cont'd.)

b. In-rush Current Test Procedures

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

i) Locked-Rotor Method

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

ii) 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 Distribution Provider's Distribution or Transmission 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 Distribution Provider during the startup process, using a 10-cycle moving average. During the test, Distribution Provider 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 Distribution Provider. (L)

(Continued)

M. INADVERTENT EXPORT (L)

Under certain operating conditions, an Applicant may choose to completely offset their facility load by installing generation systems which are optimally sized to meet their peak demand with load following functionality on the Generator controls to ensure conditional export of electrical power from the Generating Facility to Distribution Provider's Distribution or Transmission System. In situations where the loading changes rapidly and/or the Generator cannot ramp down quickly enough, the Generating Facility may need to export small amounts of power for limited duration. The event of exporting uncompensated power for a short time is referred to as Inadvertent Export.

The following are the minimum requirements for Inadvertent Export systems. Other factors relevant to the interconnection study process (e.g. 15% screen results, short circuit current ratio, etc.) may necessitate additional technical requirements (e.g. reclose block, transfer trip, ground bank, etc.) that are not explicitly noted here. Inadvertent Export may not be available for interconnections to Networked Secondary Systems.

1. For Inadvertent Export interconnection requests, additional Protective Functions and equipment to detect Distribution or Transmission System faults (per Distribution Provider's standard practices) may be required over and above the basic Protective Functions and equipment associated with the four options in the Export Screen. Protective Functions may include, but are not limited to, directional overcurrent/voltage-restraint overcurrent Protective Functions for line-to-line fault detection and overcurrent/overvoltage Protective Functions for line-to-ground detection. The addition of a ground bank or ground detector may also be necessary. (L)

(Continued)

M. INADVERTENT EXPORT (Cont'd.) (L)

2. The effect on equipment ratings can be mitigated by limiting the amount of inadvertent export allowed. To a large degree, Voltage Regulation may be similarly handled. The amount of Inadvertent Export is dependent on specific Distribution Provider requirements and should be limited to the lesser of the following values:

   a. 50% of the Generating Facility Capacity, or

   b. 10% of the continuous conductor rating in watts at 0.9 power factor for the lowest rated feeder conductor upstream of the GF (i.e. 200kW @ 12kV), or

   c. 110% of the largest load block in the facility, or

   d. 500kW or some other maximum level indicated by Distribution Provider

3. In addition to the limits above, the following are required:

   a. A reverse power Protective Function will be provided to trip the connected Generator(s) within two seconds if the proposed amount of Inadvertent Export is exceeded.

   b. The frequency of Inadvertent Export occurrences should be less than two occurrences per 24-hour period.

   c. A separate reverse power or underpower Protective Function will be required (in addition to the reverse power Protective Function described in 3a. above) to trip the connected Generator(s) if the duration of reverse power or underpower (i.e. ANY export) exceeds 60 seconds. (L)

(Continued)

Mm. INADVERTENT EXPORT FOR INTERCONNECTION REQUESTS UTILIZING UL-1741 CERTIFIED OR SA LISTED GRID SUPPORT (NON-ISLANDING) INVERTERS (L)

The following are the minimum requirements for Inadvertent Export systems that meet the criteria specified below. Other factors relevant to the interconnection study process (e.g., 15% screen results, short circuit current ratio, etc.) may necessitate additional technical requirements (e.g., reclose block, transfer trip, ground bank, etc.) that are not explicitly noted here. Inadvertent Export may not be available for interconnections to Networked Secondary Systems.

The certified control functions internal to the inverter control or external control system may be used to replace the discrete reverse/under power relay functions described in Section M provided the requirements outlined below are met.

1) All of the following requirements must be met by the Generating Facility to qualify for Inadvertent Export under this Section.

   a. The Generating Facility must utilize only UL-1741 certified or UL-1741 SA listed grid support non-islanding inverters; and,

   b. The Generating Facility must have an aggregate maximum nameplate capacity of 500 kVA or less; and,

   c. The Generating Facility's total energy export must not exceed its nameplate rating (kVA-gross) multiplied by 0.1 hours per day over a rolling 30-day period (e.g., for a 100 kVA-gross nameplate Generating Facility, the maximum energy allowed to be exported for a 30-day period is 300 kWh) ; and,

   d. Export from the Generating Facility across the PCC to the Distribution System is less than 100 kVA. (L)

(Continued)

Mm. INADVERTENT EXPORT FOR INTERCONNECTION REQUESTS UTILIZING UL-1741 CERTIFIED OR SA LISTED GRID SUPPORT (NON-ISLANDING) INVERTERS (Cont'd.) (L)

2) To govern the level of Inadvertent Export allowable under this Section, the Generating Facility must utilize a NRTL-certified control system or NRTL-certified inverter system that meets all of the following requirements.

   a. Must result in the Generating Facility disconnecting from the Distribution System, ceasing to energize the Distribution System or halting energy production within two (2) seconds after either:

      i. The period of continuous export exceeds 30 seconds;

      or,

      ii. The level of export exceeds 100 kVA.

   b. Must monitor that the total energy export is maintained within the allowable energy export outlined above 1.c and provide an indication or notification (e.g., electronic, alarm) if that energy export limit is exceeded.

   c. Failure of the of the control or inverter system for more than thirty (30) seconds, resulting from loss of control signal, loss of control power or a single component failure or related control sensing of the control circuitry, must result in the Generating Facility entering Non-Export operation where no energy is exported across to the PCC to the Distribution System.

   Interim approval of the control or inverter system may be permitted upon mutual agreement of PG&E and the Producer. (L)

(Continued)

Mm. INADVERTENT EXPORT FOR INTERCONNECTION REQUESTS UTILIZING UL-1741 CERTIFIED OR SA LISTED GRID SUPPORT (NON-ISLANDING) INVERTERS (Cont'd.) (L)

3) Applicability of Engineering Review Screens.

Inadvertent Export systems that meet the requirements described herein are processed under Initial Review Screens A through J as described in Section H. If these systems fail Screen J, they then bypass Screens K and L and are processed under Screens M and M1 as described below.

Screen M: Is the aggregate Generating Facility capacity on the Line Section less than 15% of Line Section peak load for all line sections bound by automatic sectionalizing devices?

- If Yes (pass), Initial Review is complete.
- If No (fail), continue to Screen M1.

Screen M1: Is the aggregate of all distributed energy resources (DER) causing reverse power flow (1) at a line section with a voltage regulator device(s) or (2) at a protection device, including the circuit breaker / field recloser?*,**

- If No (pass), existing DER does not cause reverse power flow at (1) or (2) and Initial Review is complete.
- If Yes (fail), existing DER causes reverse power flow at (1) or (2); fail Initial Review and Supplemental Review is required.

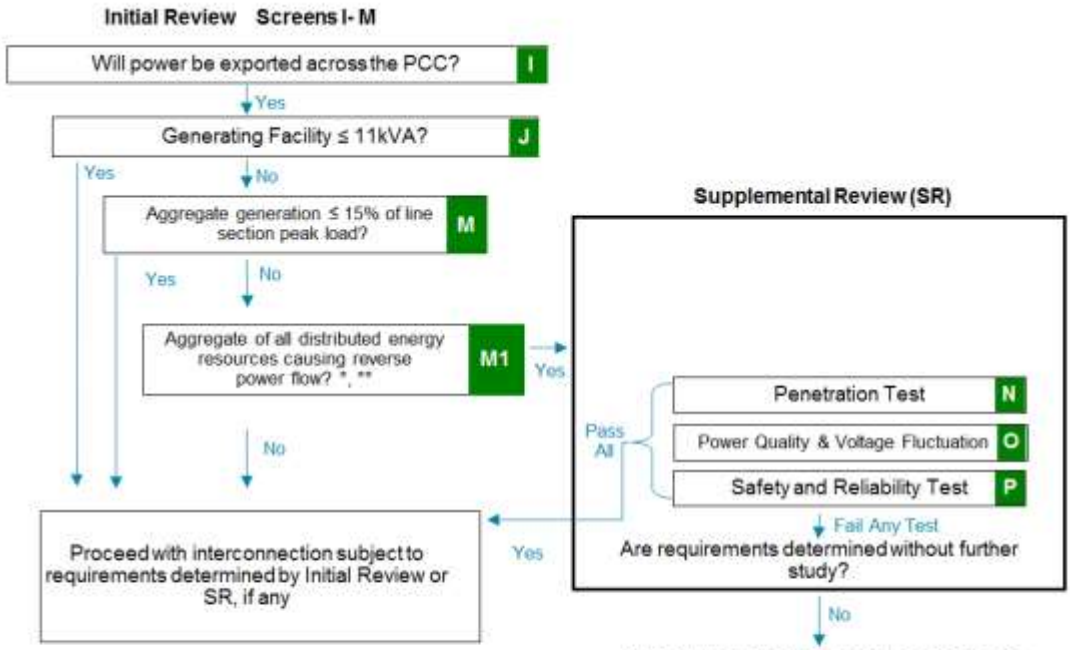
* For the purposes of applying Screen M1 herein, Distribution Provider shall utilize a zero coincidence factor when considering the impact of other Inadvertent Export systems that meet the requirements of Section Mm (i.e., projects that qualify for Option 6 under Section G.1.i) such that those Inadvertent Export systems do not impact Screen M1's aggregate analysis determination for the individual Inadvertent Export project being evaluated.

** The presence of existing non-certified DER on the line section may require additional review to ensure safe and reliable grid operation. (L)

(Continued)

Mm. INADVERTENT EXPORT FOR INTERCONNECTION REQUESTS UTILIZING UL-1741 CERTIFIED OR SA LISTED GRID SUPPORT (NON-ISLANDING) INVERTERS (Cont'd.) (L)

3) Applicability of Engineering Review Screens. (Cont'd.)



* For the purposes of applying Screen M1 herein, Distribution Provider shall utilize a zero coincidence factor when considering the impact of other Inadvertent Export systems that meet with the requirements of Section Mm (i.e., projects that qualify for Option 6 under Section G.1.i) such that those Inadvertent Export systems do not impact Screen M1's aggregate analysis determination for the individual analysis determination for the individual Inadvertent Export project being evaluated.

** The presence of existing non-certified DER on the line section may require additional review to ensure safe and reliable grid operation. (L)

(Continued)

Mm1. NON-EXPORT UTILIZING CERTIFIED POWER CONTROL SYSTEMS (L)

Generating Facilities that use certified power control systems to meet the **non-export** requirements shall meet the following six specifications.

i. Uses a power control system that has passed the requirements of the most recent UL Power Control Systems CRD test protocol;

ii. The power control system has an open-loop response time of no more than 2(two) seconds as provided in the power control system specification and certification data sheets;

iii. The Generating Facility uses only UL 1741 certified and/or UL 1741 SA listed grid-support non-islanding inverters;

iv. The power control system is set to zero-export;

v. The power control system must reduce export to below zero export in two seconds or less;

vi. The operation of the Generating Facility power control system shall maintain voltage fluctuations limits specified in Electric Rule 2.

Once satisfying the first six specifications above, the evaluation of **a non-export** Generating Facility requesting interconnection under this section shall also:

i. Omit evaluation for Screen D.

ii. Utilize the Generating Facility's gross nameplate rating for Screens F and G

Once satisfying the first six specifications above, the evaluation of a **limited export** Generating Facility requesting interconnection under this section shall also utilize the:

i. Approved limited export value to determine the impacts to the grid and in Screens D, I, J, K, M, N, O, and P;

ii. Generating Facility's gross nameplate rating for Screens F and G. (L)

(Continued)

Mm2. INADVERTENT EXPORT UTILIZING CERTIFIED POWER CONTROL SYSTEMS (L)

Generating Facilities that use certified power control systems to meet the inadvertent export requirements shall meet the following seven specifications:

i. The Generating Facility aggregate maximum gross nameplate capacity shall not exceed 1000KVA;

ii. Use power control systems that have passed the requirements of the most recent UL Power Control Systems CRD test protocol;

iii. The power control system has an open-loop response time of no more than 10(ten) seconds as provided in the control system specification and certification data sheets;

iv. The Generating Facility uses only UL 1741 certified and/or UL 1741 SA listed grid-support non-islanding inverters;

v. The power control system is set to zero-export;

vi. The power control system must reduce export to below zero export in 10(ten) second or less;

vii. The operation of the Generating Facility power control system shall maintain voltage fluctuations limits specified in Electric Rule 2.

The Distribution Provider evaluating Generating Facilities requesting interconnection under this section shall:

i. Apply Screens A through M using the aggregate inverter nameplate rating;

ii. If Supplemental Review is required, within 15 BD days of being notified by the Distribution Provider, the applicant shall identify and provide to the Distribution Provider the frequency of inadvertent export, the real power level in watts of inadvertent export and the time duration of inadvertent export;

iii. If distribution upgrades are identified, Screen P shall recognize power control parameters taking into account local feeder conditions, customer's operating profile and the magnitude, duration, and frequency of anticipated export during the review of Screen P; (L)

(Continued)

Mm2. INADVERTENT EXPORT UTILIZING CERTIFIED POWER CONTROL SYSTEMS (Cont'd) (L)

The Distribution Provider evaluating Generating Facilities requesting interconnection under this section shall (Cont'd):

iv. Complete Supplemental Review within 15 days of receiving the required information specified under ii. above in this section;

v. If the Interconnection Customer does not provide the operating profile information within the specified 15 Business Days, Distribution Provider will perform Supplemental Review based on information included in the Interconnection Request within 30 Business Days of the request for customer operating profile information;

vi. Only the largest facility operating under this Rule 21 section in the line section shall be used for aggregate evaluation for subsequent interconnection requests. (L)

(Continued)

N. EXPEDITED INTERCONNECTION PROCESS FOR NON-EXPORT ENERGY STORAGE GENERATING FACILITIES (L)

Applicants with Interconnection Requests for Non-Export Energy Storage Generating Facilities who meet the requirements outlined below are eligible for expedited interconnection in accordance with the Fast Track Process technical review requirements of Section F.2. Applicants with Non-Export AC/DC Converters that meet the requirements outlined in O. below are also eligible. (L) (T)/(L) (L)

1. ELIGIBILITY REQUIREMENTS

Applicants seeking to interconnect a Generating Facility under the provisions of this Section N must meet the following eligibility requirements.

a. Applicant must electronically submit a completed Interconnection Request, including completing all application fields and submitting all supporting documentation necessary to facilitate the expedited review as required by Distribution Provider. Such documentation may include, but is not limited to, single line diagrams with specific details, manufacturer data sheets for proposed equipment, description of control systems, validation of the right to do business in the state, etc. Distribution Provider shall clearly communicate these requirements as part of the application process. Applicant shall select this process option in the Interconnection Request.

b. Applicant's Generating Facility must meet the requirements outlined in Section N.2 below.

c. Applicant's Interconnection Request must be eligible for and select the Fast Track Process.

d. Applicant's Interconnection Request must pass Fast Track Initial Review and not require any Interconnection Facilities, Distribution Upgrades or Network Upgrades to remain eligible under this Section. As such, Interconnection Requests that select the Cost Envelope Option are not eligible.

e. Applicants selecting this section shall use the corresponding interconnection agreement type provided for eligible Generating Facilities. (L)

(D)

(D)

(Continued)

N. EXPEDITED INTERCONNECTION PROCESS FOR NON-EXPORT ENERGY STORAGE GENERATING FACILITIES (Cont'd.) (L)

2. GENERATING FACILITY ELIGIBILITY CRITERIA

An Applicant's Generating Facility must meet and adhere to the following criteria.

a. The Generating Facility must be comprised solely of the following specific categories of generation technology: Non-Exporting battery storage.

b. The Generating Facility must have an aggregate maximum inverter nameplate rating of no greater than 500 kW. There is no limitation on an energy storage device's kWh capacity rating.

c. The Generating Facility must be located behind an existing single retail meter and Point of Common Coupling with a single, clearly marked and accessible disconnect. No other Generators, other than isolated back-up Generators, may be at the same Point of Interconnection or Point of Common Coupling.

d. The Generating Facility must utilize Option 3 or Option 4 to meet the non-export protection requirements of Screen I in Section G.1.i.

e. The Generating Facility must have a single or coordinated control system for all charging functions if utilizing multiple inverters. The control system must also ensure that there is no increase in the Interconnection Customer's existing peak load demand.

f. The Generating Facility must utilize only inverter-based, UL 1741 and UL 1741 SA-listed equipment. Additionally, all installed equipment must meet Distribution Provider's current electric service requirements with no violations or variances. (L)

(Continued)

O. Non-Export AC/DC CONVERTER ELIGIBILITY CRITERIA (L)

Applicants with Non-Export AC/DC Converters who meet the eligibility criteria below qualify for the expedited interconnection process outlined in Section N of this Rule.

1. The Non-Export AC/DC Converter must have an aggregate maximum inverter nameplate rating of no greater than 500 kW. There is no limitation on an energy storage device's kWh capacity rating.

2. Applicant's Interconnection Request must be eligible for and select the Fast Track Process.

3. Applicant's Interconnection Request must pass Fast Track Initial Review and not require any Interconnection Facilities, Distribution Upgrades or Network Upgrades to remain eligible under this Section.

4. Applicants selecting this section shall use the corresponding interconnection agreement type provided for Non-Export AC/DC Converters eligible under this Section. As such, Interconnection Requests that select the Cost Envelope Option are not eligible.

5. Applicant's Non-Export AC/DC converter must meet the Certification requirements in the Section C Definition of "Non-Export AC/DC Converters". (L)

(Continued)

ELECTRIC RULE NO. 21 Sheet 261
GENERATING FACILITY INTERCONNECTIONS

(L)

Appendix A Forms Associated with Rule 21 Generating Facility Interconnections			
Form Number	Title	Associated Tariffs	Use Guidance
Pre-Application Request			
79-1181	Rule 21 Pre-Application Report Request	Rule 21	For Generator Developer to request basic info about local distribution circuit
Study Agreement			
79-1162	Rule 21 Detailed Study Agreement	Rule 21	Independent Study and Distribution Group Study Process Study Agreement
NEM and Non-Export Interconnection Forms			
79-978	Interconnection Agreement for Net Energy Metering of Solar or Wind Electric Generating Facilities of 1,000 kW or Less, Other Than Facilities of 30 kW or Less	NEM, Rule 21	Solar and/or Wind > 30 kW and ≤ 1 MW expanded NEM used with Form 79-1174-02
79-978-02	Interconnection Agreement for Net Energy Metering (NEM2) of Solar or Wind Electric Generating Facilities of 1,000 Kilowatts or Less, Other than Facilities of 30 Kilowatts or Less	NEM2, Rule 21	Solar and/or Wind > 30 kW and ≤ 1 MW expanded NEM2 used with Form 79-1174-02
79-997	Interconnection Agreement for Net Energy Metering of Biogas Digester Generating Facilities	NEM, Rule 21	NEMBIO (Closed to new applicants), NEMBIOA Interconnection Agreement used with Form 79-1174
79-1010	Interconnection Agreement for Net Energy Metering of Fuel Cell Generating Facilities	NEM, Rule 21	NEMFC Interconnection Agreement used with Form 79-1174
79-1069	Generating facility Interconnection Agreement (Multiple Tariff)	NEM, Rule 21	NEMMT Interconnection Agreement used with Form 79-1174
79-1069-02	Generating Facility Interconnection Agreement (Multiple Tariff NEM2MT)	NEM2, Rule 21	NEM2MT Interconnection Agreement used with Form 79-1174-02
79-1109 ***	Virtual Net Energy Metering Application and Interconnection Agreement For The Building Owner of Multifamily Affordable Housing With A Solar Generating Facility of 1 Megawatt or Less	NEM, Rule 21	NEMV Interconnection Agreement used with Form 79-974

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(Continued)

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Appendix A (Cont'd.) Forms Associated with Rule 21 Generating Facility Interconnections			
Form Number	Title	Associated Tariffs	Use Guidance
NEM and Non-Export Interconnection Forms (Cont'd.)			
79-1109-02***	NEM2VMSH Virtual Net Energy Metering Application and Interconnection Agreement for the Building Owner of Multifamily Affordable Housing with a Solar Generating Facility of 1 Megawatt or Less	NEM2VMSH, Rule 21	NEM2VMSH Interconnection Agreement used with Form 79-1174-02
79-1151A	Net Energy Metering Interconnection for Solar And/or Wind Electric Generating Facilities Of 30 Kilowatts Or Less Agreement and Customer Authorization	NEM, Rule 21	NEMS Interconnection Agreement be used with 79-1151B Application
79-1151A-02	Agreement And Customer Authorization - Net Energy Metering (NEM2) Internconnection For Solar And/Or Wind Electric Generating Facilities Of 30 Kilowatts Or Less	NEM2, Rule 21	NEM2S Application to be used with 79-1151A Interconnection Agreement
79-1151B	Net Energy Metering Interconnection For Solar And/or Wind Electric Generating Facilities Of 30 Kilowatts Or Less Application	NEM, Rule 21	NEMS Application to be used with 79-1151A Interconnection Agreement
79-1151B-02	Application - Net Energy Metering (NEM2) Interconnection For Solar And/Or Wind Electric Generating Facilities Of 30 Kilowatts Or Less	NEM2, Rule 21	NEM2S Application to be used with 79-1151A-02 Interconnection Agreement
79-1124 ***	Eligible Low Income Development Virtual Net Energy Metering Application and Interconnection Agreement for Multifamily Affordable Housing with Solar Generation Totaling 1 Megawatt or Less	NEMVMASH, Rule 21	NEMVMASH Interconnection Agreement
79-1124-02***	Eligible Low Income Development Virtual Net Energy Metering (NEM2VMSH) Application and Interconnection Agreement for Multifamily Affordable Housing with Solar Generation Totaling 1 Megawatt or Less	NEM2VMSH, Rule 21	NEM2VMSH Interconnection Agreement
79-1131 ***	NEMV Application and Interconnection Agreement for a Solar (PV) or Wind Generating Facility of 1 MW or Less *Serving Multiple Tenants Served at a Single Property Delivery Point*	NEM, Rule 21	NEMV Interconnection Agreement
79-1131-02***	NEM2V Application and Interconnection Agreement for a Solar (PV) or Wind Generating Facility of 1 MW or Less *Serving Multiple Tenants Served at a Single Property Delivery Point*	NEM2V, Rule 21	NEM2V Interconnection Agreement

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(Continued)

Appendix A (Cont'd.)
Forms Associated with Rule 21
Generating Facility Interconnections

Form Number	Title	Associated Tariffs	Use Guidance
NEM and Non-Export Interconnection Forms (Cont'd.)			
79-1137	Interconnection Agreement for Net Energy Metering for a Renewable Electrical Generation Facility of 1,000 kW or Less, Except Solar or Wind (SB 489)	NEM, Rule 21	NEMV, NEMEXP, NEMEXPM Interconnection Agreement typically used with Forms 79-974 and 79-1142 Applications
79-1137-02	Interconnection Agreement for Net Energy Metering (NEM2/NEM2V) for a Renewable Electricity Generation Facility of 1,000 Kilowatts or Less, Except Solar or Wind	NEM2, NEM2V, Rule 21	NEM2V, NEM2EXP, NEM2EXPM Interconnection Agreement typically used with Forms 79-1174-02
79-1142 ***	NEMV Interconnection Application for a Renewable Electrical Generation Facility of 1 Megawatt or Less	NEM, Rule 21	Used with Form 79-1137 (L)
79-973	Generating Facility Interconnection Agreement For Non-Export Generating Facilities (Rule 21 Interconnection Agreement)	Rule 21	Interconnection Agreement used for RESBCT and non-NEM generation with Application 79-974 and 79-1112
79-992	Customer Generation Agreement (Third party Generator on Premises, Non-Exporting)	Rule 21	Used with Forms 79-1174
79-1070	Export Addendum to Generating Facility Interconnection Agreement for Non-Export Generating Facilities (Form 79-973) Sized 2 Megawatts or Less	Rule 21	Export addendum used with Form 79-973
79-1136	PG&E Interconnection Agreement For an Existing Small Generating Facility Interconnecting to the Distribution System under Rule 21	Rule 21	Used for existing QFs with Form 79-974 (L)
79-1192	Interconnection Agreement for Non-Export Storage Generating Facilities 500KW or Less	Rule 21	Used for expedited interconnection of non-export energy storage, pursuant to Rule 21 Section N, PG&E AL 4941-E & E-A and D.16-06-052, & Attachment C, Section II.1
79-1199	Agreement And Customer Authorization Non-Export Stand-Alone Energy Storage Of 30 Kilowatts Or Less	Rule 21	Interconnection Agreement For non-export storage ≤ 30 kW
79-1206-02	Eligible Low-Income Development Virtual Net Energy Metering (NEM2VSOM) Interconnection Agreement For The Solar On Multifamily Affordable Housing (SOMAH) Program With Solar Generation Totaling 1 Mw Or Less	NEM2VSOM	NEM2VSOM Interconnection agreement for solar 1 MW or less.

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(Continued)

Appendix A (Cont'd.)
Forms Associated with Rule 21
Generating Facility Interconnections

Form Number	Title	Associated Tariffs	Use Guidance
Other NEM and Non-Export Forms (Cont'd.)			
79-1130	Request to Opt-out of / Opt-in to Compensation for Surplus Electricity	NEM	AB 920- Opt not to receive compensation for net annual excess energy
79-1202 ****	Load Aggregation Appendix	NEM, NEM2, Rule 21	Use as an Appendix with Form 79-1151A, 79-1151A-02, 79-978, 79-978-02,79-1137, 79-1137-02, 79-1069 or 79-1069-02
79-1155	Schedules NEM, NEMV, NEMVMASH, Net Surplus Electricity (NSE) Renewable Energy Credits Compensation	NEM, Rule 21	
79-1155-02	Schedules NEM2, NEM2V, NEM2VMSH, Net Surplus Electricity (NSE) Renewable Energy Credits Compensation	NEM2 NEM2V NEM2VMSH, Rule 21	
79-1174	Rule 21 Generator Interconnection Application	NEM (NEMEXP, NEMMT and NEMA), NEMFC, NEMV, NEMVMASH, RES-BCT, Rule 21	Rule 21 customer interconnection application form for expanded net-energy metered (all NEM > 30 kw and all non-Solar/Wind NEM), NEMFC, NEMV, NEMVMASH, RES-BCT, and non-export and limited export Rule 21 generation. (Standard NEM for solar and/or wind ≤ 30 kw will continue to use the 79-1151B application.)
79-1174-02	Rule 21 Generator Interconnection Application	NEM2 (NEM2EXP, NEM2MT and NEM2A), NEMFC, NEM2V, NEM2VMSH, RES-BCT, Rule 21	Rule 21 customer interconnection application form for expanded net-energy metered (all NEM2 > 30 kw and all non-Solar/Wind NEM), NEMFC, NEM2V, NEM2VMSH, RES-BCT, and non-export and limited export Rule 21 generation. (Standard NEM for solar and/or wind ≤ 30 kw will continue to use the 79-1151B application.)

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ELECTRIC RULE NO. 21 Sheet 265
GENERATING FACILITY INTERCONNECTIONS

(L)

Appendix A (Cont'd.) Forms Associated with Rule 21 Generating Facility Interconnections			
Form Number	Title	Associated Tariffs	Use Guidance
Export for Sale Interconnection Forms			
79-1145	Rule 21 Exporting Generator Interconnection Request	Rule 21	Preferred online application: https://www.pge.com/en_US/large-business/services/alternatives-to-pge/electric-generation-interconnection.page
79-1197	Local Government Renewable Energy Self-Generation Bill Credit Transfer (RES-BCT) Re-Allocation Request	RES-BCT	Use to establish RES-BCT benefiting account re-allocations
79-1198-02	Interconnection Agreement For Net Energy Metering (NEM2) And Renewable Electrical Generating Facility Sized Greater Than 1,000 Kw	NEM2	FT and Detailed Study Interconnection Agreement for >1MW NEM2 Generating Facilities
79-1200	Rule 21 Generator Interconnection Agreement For Exporting Generating Facilities	Rule 21	FT and Detailed Study Interconnection Agreement for Exporting Generating Facilities
Other Agreements			
79-280	Agreement for Installation of Allocation of Special Facilities for Parallel Operation of Non-Utility-Owned Generation and/or Electrical Standby Service (Electric Rules 2 and 21)	Rule 21	Special Facilities Agreement to be used with Form 79-702
79-702	Appendix A: Detail of Special Facilities Charges to be used in concert with form 79-280	Rule 21	Used with Form 79-280

*** The application section of these forms is replaced by 79-1174.
**** For NEMA expanded customers, use the online 79-1174 form.

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(Continued)

APPENDIX B (L)

Unit Cost Guide

Distribution Provider shall publish a Unit Cost Guide for facilities generally required to interconnect generation in Distribution Provider's Distribution System. The Unit Cost Guide shall not be binding for actual facility costs and is provided only for additional cost transparency, developer reference, and Distribution Provider's reference when preparing the cost estimate provided in any applicable studies. The Unit Cost Guide shall not replace the estimated cost provided by Distribution Provider in an Interconnection Study or an initial or supplemental review under the Fast Track Process.

The Unit Cost Guide shall include the anticipated cost of procuring and installing Interconnection Facilities and Distribution Upgrades generally utilized by the Applicant. An annual adjustment shall be performed within the Unit Cost Guide for five (5) years to account for the anticipated timing of procurement to accommodate a potential range of Commercial Operation Dates.

The Unit Cost Guide shall be updated annually in accordance with the process set forth in D.16-06-052. (L)

(Continued)

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Attachment 2

Redline Tariff Revisions

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b. Transfer Trip 204~~3~~

c. Reclose Blocking 204~~3~~

5. COMMUNICATION REQUIREMENTS 205~~4~~

a. Generating Facilities utilizing inverter-based technologies must adhere to all of the following communication protocol requirements: 205~~4~~ (T)

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(Continued)

ELECTRIC RULE NO. 21 Sheet 11
GENERATING FACILITY INTERCONNECTIONS

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B. APPLICABILITY (Cont'd.)

3. APPLICABLE CODES AND STANDARDS

This Rule has been harmonized with the requirements of American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) 1547-2003 Standards for Interconnecting Distributed Resources with Electric Power Systems. In some sections, IEEE 1547 language has been adopted directly, in others, IEEE 1547 requirements were interpreted and this Rule's language was changed to maintain the spirit of both documents.

UL1741- Supplement SA has been utilized for certification of phase I Smart Inverters (Phase 1 Smart Inverter Functions) as outlined in section Hh.

The language from IEEE 1547 that has been adopted directly (as opposed to paraphrased language or previous language that was determined to be consistent with IEEE 1547) is followed by a citation that lists the clause from which the language derived. For example, IEEE 1547-4.1.1 is a reference to Clause 4.1.1.

In the event of any conflict between this Rule, any of the standards listed herein, or any other applicable standards or codes, the requirements of this Rule shall take precedence.

4. RETAIL CUSTOMER ENERGY STORAGE DEVICES

For retail customers interconnecting stationary or mobile energy storage devices pursuant to this Rule, the load aspects of the storage devices will be treated pursuant to Rules 2, 3, 15, and 16 just like other load, using the incremental net load for non-residential customers, if any, of the storage devices. (T)

C. DEFINITIONS

The definitions in this Section C are applicable only to this Rule, the Interconnection Request, Study Agreements and Generator Interconnection Agreements.

Added Facilities: See Special Facilities.

Affected System: An electric system other than Distribution Provider's Distribution or Transmission System that may be affected by the proposed Interconnection.

(Continued)

C. DEFINITIONS (Cont'd.)

Interconnection Request: An Applicant's request to interconnect a new Generating Facility, or to increase the capacity of, or make a Material Modification to the operating characteristics of, an existing Generating Facility that is interconnected with Distribution Provider's Distribution or Transmission System.

Interconnection Study: A study to establish the requirements for Interconnection of a Generating Facility with Distribution Provider's Distribution System or Transmission System, pursuant to this Rule.

Interconnection System Impact Study: An engineering study conducted by Distribution Provider for an Interconnection Customer under the Independent Study Process that evaluates the impact of the proposed interconnection on the safety and reliability of Distribution Provider's Distribution and/or Transmission System and, if applicable, an Affected System. The scope of the study is defined in Section G.3.c.i.

The Integration Capacity Analysis Static Grid (SG) 576 profile: At a given Point of Interconnection, the minimum Integration Capacity Analysis values at each of the 576 hours for the most limiting of these categories: thermal, voltage, power quality, and protection. (N)

Integration Capacity Analysis Static Grid (ICA-SG) Value: The minimum ICA value in a given Point of Interconnection's ICA-SG 576 Profile.

Integration Capacity Analysis (ICA) Values: Values which represent the maximum capacity that can be interconnected at a given Point of Interconnection without exceeding Distribution Provider equipment thermal limits or any of the Distribution System voltage, power quality, protection, and safety (operational flexibility) limits each which is independently calculated. (N)

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

Large Generating Facility: A Generating Facility having a Generating Facility Capacity of more than 20 MW.

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

(Continued)

C. DEFINITIONS (Cont'd.)

Local Furnishing Bond: Tax-exempt bonds utilized to finance facilities for the local furnishing of electric energy, as described in Internal Revenue Code, 26 U.S.C. § 142(f). (L)

Local Furnishing Distribution Provider: Any Distribution Provider that owns facilities financed by Local Furnishing Bonds.

Mandatory Operation: 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. (L)

Material Modification: Those modifications that have a material impact on cost or timing of any Interconnection Request with a later queue priority date or a change in Point of Interconnection. A Material Modification does not include a change in ownership of a Generating Facility.

Metering: The measurement of electrical power in kilowatts (kW) and/or energy in kilowatt-hours (kWh), and if necessary, reactive power in kVAR at a point, and its display to Distribution Provider, as required by this Rule.

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

Momentary Cessation: The Smart Inverter momentarily reduces current output to the Distribution Provider's Transmission or 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 Transmission or Distribution System without any intentional reconnection delay once voltage exits the Momentary Cessation region and enters a Permissive Operation region or Continuous Operation region.

Momentary Parallel Operation: The Interconnection of a Generating Facility to the Distribution and Transmission 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.

(Continued)

C. DEFINITIONS (Cont'd.)

Net Energy Metering (NEM): Metering for the receipt and delivery of electricity between Producer and Distribution Provider pursuant to California Public Utilities Code (PUC) sections 2827, 2827.1 (as currently implemented by Commission Decision (D.)16-01-044), 2827.8, or 2827.10. (L)

NEM-1: Refers to Interconnection Requests for service pursuant to Schedules NEM, NEMV, and NEMVMASH.

NEM-2: Refers to Interconnection Requests for service pursuant to Schedules NEM2, NEM2V, NEM2VMSH, and NEM2VSOM. (L)

Net Rating or Net Nameplate Rating: The Gross Rating minus the consumption of electrical power of the auxiliary load.

Network Upgrades: Delivery Network Upgrades and Reliability Network Upgrades.

Networked Secondary System: 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 for additional detail.

Non-Emergency: Conditions or situations that are not Emergencies, including but not limited to meter reading, inspection, testing, routine repairs, replacement, and maintenance.

Nominal: Standard frequency and voltage.

Non-Export; Non-Exporting: When the Generating Facility is sized and designed such that the Generator output is used for Host Load only and is designed to prevent the transfer of electrical energy from the Generating Facility to Distribution Provider's Distribution or Transmission System.

(Continued)

D. GENERAL, RULES, RIGHTS AND OBLIGATIONS (Cont'd.)

13. SPECIAL PROVISIONS APPLICABLE TO NET ENERGY METERED APPLICANTS (Cont'd.)

    f. Applicants with an Interconnection Request for a Net Energy Metering Generating Facility, or a Non-Export Generating Facility, shall have the opportunity to select the Cost Envelope Option in accordance with Section F.7. Applicants who are determined to not have responsibility for any applicable upgrade costs will be automatically withdrawn from the Cost Envelope Option.

14. SPECIAL PROVISIONS APPLICABLE TO NON-EXPORT ENERGY STORAGE GENERATING FACILITIES

    Applicants with Non-Export Energy Storage Generating Facilities that meet the criteria listed in Section N shall be eligible to select expedited processing in their Interconnection Request and to utilize the corresponding form of Interconnection Agreement, subject to the terms and conditions of Section N.

15. COMPLIANCE WITH ESTABLISHED TIMELINES

    Distribution Provider shall use Reasonable Efforts in meeting all the timelines provided for under this Rule. In the event Distribution Provider is not able to meet a particular timeline set forth in this Rule, Distribution Provider shall notify Applicant as soon as practicable and provide an estimated completion date with an explanation of the reasons why additional time is needed. Any Applicant dissatisfied with the Reasonable Efforts of Distribution Provider may use the informal procedures set out in Section F.1.d and/or the Dispute Resolution process in Section K.

16. MODIFICATION OF TIMELINES

    Distribution Provider and Applicant, for good cause, may agree to modify any of the timelines in this Rule. The modified timeline shall be mutually agreed upon, in writing, between Distribution Provider and Applicant.

17. CONVERSION TO FERC WHOLESALE DISTRIBUTION TARIFF PROCESS (N)

    Applicant may submit a request to convert their Interconnection Request to the Federal Energy Regulatory Commission (FERC) jurisdiction Wholesale Distribution Tariff (WDT) process subject to WDT Section 6.8.1.1 requirements. Additional information is available at: https://www.pge.com/egi (N)

(Continued)

E. INTERCONNECTION REQUEST SUBMISSION PROCESS (Cont'd.)

2. INTERCONNECTION REQUEST PROCESS (Cont'd.)

b. Applicant Selects a Study Process

An Applicant may select one of two interconnection evaluation processes in accordance with the following eligibility requirements:

i) Fast Track Eligibility

Non-Exporting Generating Facilities and NEM-1 Generating Facilities ~~are eligible for~~ shall be evaluated under the Fast Track ~~evaluation~~Review Process as described under Section F.2. below. ~~regardless of the Gross Nameplate Rating of the proposed Generating Facility.~~ (T)

NEM-2 Generating Facilities and Exporting Generating Facilities of any size are eligible for and may elect the Fast Track evaluation if the Applicant believes its Interconnection Request may pass the Fast Track Process as described under Section F.2. below. ~~with a Gross Nameplate Rating no larger than 3.0 MW on a 12 kV or higher voltage interconnection point for PG&E are also eligible for Fast Track evaluation~~. (T)

~~For an Exporting Generating Facility that agrees to the installation of Distribution Provider-approved protective devices at Applicant's cost such that the Exporting Generating Facility's net export will never exceed the Fast Track eligibility limits, the Generating Facility's net export will be considered for purposes of Fast Track eligibility. However, these Interconnection Requests will be required to complete Supplemental Review and Applicants should pre-pay for Supplemental Review at the time the Interconnection Request is submitted.~~ (D)

ii) Detailed Study Eligibility

Interconnection Requests that are not eligible for Fast Track evaluation must apply for Detailed Study. An Applicant may also choose to apply directly for Detailed Studies. Detailed Study shall require (i) an Independent Study Process, (ii) a Distribution Group Study Process, or (iii) a Transmission Cluster Study Process. The specific study process used will depend on the results of the Electrical Independence Tests for the Transmission and Distribution Systems.

(Continued)

F. REVIEW PROCESS FOR INTERCONNECTION REQUESTS (Cont'd.)

1. OVERVIEW OF THE INTERCONNECTION REVIEW PROCESS (Cont'd.)

b. Fast Track Review

Fast Track evaluation allows for rapid review of the Interconnection of those Generating Facilities that do not require Detailed Study. Regardless of study process, all Generating Facilities shall be designed to meet the applicable requirements of Section H or Hh, which identifies Generating Facility Design and Operation Requirements. (T)

Fast Track review consists of an Initial Review and, if required, a Supplemental Review. The need for Supplemental Review will be determined based on the results of Initial Review Screens A through M in Section G.1. Applicants that successfully pass Initial Review Screens A through M will be allowed to interconnect without Supplemental Review.

Non-Export AC/DC Converter installations that have a complete and valid Interconnection Request will be eligible to bypass screens B through D and F through M.

If Supplemental Review is required, unless the Applicant has pre-paid the Supplemental Review fee, Distribution Provider will notify Applicant and Applicant must pay a nonrefundable Supplemental Review fee, per Table E-1 or withdraw its Interconnection Request. Supplemental Review shall consist of the application of Screens N through P in Section G.2. Applicants that pass Screens N through P will be allowed to interconnect without additional review.

If Supplemental Review reveals that a proposed Generating Facility cannot be interconnected to Distribution Provider's Distribution System by means of Fast Track evaluation, Distribution Provider will notify Applicant that Detailed Study will be required.

Failure to pass Fast Track evaluation means only that further review and/or study are required before the Generating Facility can be interconnected with Distribution Provider's Distribution System. It does not mean that the Generating Facility cannot be interconnected.

(Continued)

F. REVIEW PROCESS FOR INTERCONNECTION REQUESTS (Cont'd.)

2. FAST TRACK INTERCONNECTION REVIEW PROCESS

a. Initial Review (Cont'd.)

For Interconnection Requests that fail Initial Review, Distribution Provider shall provide the technical reason, data and analysis supporting the Initial Review results in writing and provide Applicant the option to either attend an Initial Review results meeting or proceed directly to Supplemental Review, unless the Applicant has pre-paid the Supplemental Review fee. NEM-1 and ≤1 MW NEM-2 Applicants covered under Section D.13.a, and Applicants that have pre-paid the Supplemental Review fee, shall proceed directly to Supplemental Review without an Initial Review results meeting. Applicant shall notify Distribution Provider within ten (10) Business Days following such notification whether to (i) proceed to an Initial Review results meeting, (ii) proceed to Supplemental Review, or (iii) withdraw the Interconnection Request. Applicant may request one extension of no more than ten (10) Business Days to respond. If Applicant fails to notify Distribution Provider within ten (10) Business Days of such notification, or at the end of the extension, if one was requested, the Interconnection Request shall be deemed withdrawn.

No changes may be made to the planned Point of Interconnection or Generating Facility size included in the Interconnection Request during the Fast Track Process, unless such changes are agreed to by Distribution Provider. Where agreement has not been reached, Applicants choosing to change the Point of Interconnection or Generating Facility size must reapply and submit a new Interconnection Request.

(N)

As part of the evaluation of Screen M, when Integration Capacity Analysis values are available at the requested Point of Interconnection, Distribution Provider will determine if Integration Capacity Analysis values at the proposed Point of Interconnection need to be updated. If Distribution Provider determines that the Integration Capacity Analysis values at the proposed Point Interconnection need to be updated, the Distribution Provider will update the values for the proposed Point Of Interconnection using the Integration Capacity Analysis tool on the specific electrical node or by running the Integration Capacity Analysis on all the electrical nodes in the circuit. Distribution Provider shall not perform additional Integration Capacity Analysis as part of the interconnection process of projects with less than 30 kilovolt amperes nameplate capacity. Distribution Provider shall share the results of any Integration Capacity Analysis updates with the Applicant and provide an explanation of changes to grid conditions or the interconnection queue which led to the need to obtain updated Integration Capacity Analysis values. Distribution Provider shall comply with confidentiality provisions and data redaction policies.

(N)

(Continued)

F. REVIEW PROCESS FOR INTERCONNECTION REQUESTS (Cont'd.)

2. FAST TRACK INTERCONNECTION REVIEW PROCESS (Cont'd.)

a. Initial Review (Cont'd.)

Applicants that elect to proceed to Supplemental Review, unless the Applicant has pre-paid the Supplemental Review fee, shall provide a nonrefundable Supplemental Review fee set forth in Section E.2.c with their response. The Supplemental Review fee shall be waived for Interconnection Requests requesting Interconnection of NEM-1 or ≤1 MW NEM-2 Generating Facilities and for solar-powered non-NEM ≤1 MW Generating Facilities that do not sell power to Distribution Provider, per Commission D.01-07-027. (L) (L)

b. Optional Initial Review Results Meeting

Within five (5) Business Days of Applicant's request for an Initial Review results meeting, Distribution Provider shall contact Applicant and offer to convene a meeting at a mutually acceptable time to review the Initial Review screen analysis and related results to determine what modifications, if any, may permit the Generating Facility to be connected safely and reliably without Supplemental Review.

In the event the Applicant has pre-paid the Supplemental Review fee, the Distribution Provider will proceed, if necessary, with Supplemental Review upon completion of Initial Review and shall not be required to offer an Initial Review results meeting.

If modifications that obviate the need for Supplemental Review are identified, and Applicant and Distribution Provider agree to such modifications, Distribution Provider shall provide Applicant with a Generator Interconnection Agreement within fifteen (15) Business Days of the Initial Review results meeting if no Interconnection Facilities or Distribution Upgrades are required. If Interconnection Facilities or Distribution Upgrades are required, Distribution Provider shall provide Applicant with a non-binding cost estimate of any Interconnection Facilities or Distribution Upgrades within fifteen (15) Business Days of the Initial Review results meeting. For those Interconnection Requests where Applicant has selected the Cost Envelope Option, within ten (10) Business Days of providing Applicant the non-binding cost estimate for the required Interconnection Facilities and/or Distribution Upgrades, Applicant shall provide the Distribution Provider the Cost Envelope Option deposit, in accordance with Section F.7.a.i.3. If Applicant fails to provide the Cost Envelope Option deposit in accordance with Section F.7.a.i.3, Applicant's request for the Cost Envelope Option shall be deemed withdrawn and the Interconnection Request shall not be eligible for the Cost Envelope Option.

(Continued)

F. REVIEW PROCESS FOR INTERCONNECTION REQUESTS (Cont'd.)

2. FAST TRACK INTERCONNECTION REVIEW PROCESS (Cont'd.)

b. Optional Initial Review Results Meeting (Cont'd.)

For all Interconnection Requests that pass Initial Review, refer to Section F.2.e for cost responsibility and time frames for completing the Generator Interconnection Agreement. (L) (L)

If Applicant and Distribution Provider are unable to identify or agree to modifications that enable Applicant to pass Initial Review, Applicant shall notify Distribution Provider within ten (10) Business Days of the Initial Review results meeting whether it would like to proceed with Supplemental Review or withdraw its Interconnection Request. Applicant may request one extension of no more than ten (10) Business Days to respond. If Applicant fails to notify Distribution Provider within ten (10) Business Days of the Initial Review results meeting, or at the end of the extension, if one was requested, the Interconnection Request shall be deemed withdrawn.

c. Supplemental Review

i) If Applicant requests Supplemental Review and submits a nonrefundable Supplemental Review fee, if required, Distribution Provider shall complete Supplemental Review within twenty (20) Business Days, absent extraordinary circumstances, following authorization and receipt of the fee. Supplemental Review determines if (i) the Generating Facility qualifies for Fast Track Interconnection, or (ii) the Generating Facility requires Detailed Study. If the Applicant paid the Supplemental Review fee concurrently with the Initial Review Fee, Distribution Provider will complete the Supplemental Review, if required, within twenty (20) Business Days from the completion of the Initial Review.

ii) If the Applicant chooses to move to Supplemental Review or has pre-paid the non-refundable Supplemental Review fee, they have the option to elect that the Distribution Provider provide a fault current study as part of the Supplemental Review. This fault current study would extend the Supplemental Review time by up to ten (10) Business Days, and would require an additional nonrefundable fee of $1,000.

(Continued)

F. REVIEW PROCESS FOR INTERCONNECTION REQUESTS (Cont'd.)

2. FAST TRACK INTERCONNECTION REVIEW PROCESS (Cont'd.)

c. Supplemental Review (Cont'd.)

ii) This fault current study will determine if the Generating Facility can detect phase and ground faults on the Distribution Provider's Distribution System or the distribution feeder breaker where the Applicant proposes to connect the Generating Facility. The result of the fault current study will determine if direct transfer trip (DTT) will be required from the Distribution System to the Generating Facility site. Note that for Applicants proposing to interconnect to the Distribution System where there is expected to be power backfeed to the Transmission System, DTT from the transmission may still be required and a Detailed Interconnection Study will be required to make this determination. (L)

Should the Applicant request a Supplemental Review results meeting, as described in Section F.2d, the optional fault current study analysis and related results shall, at the Applicant's request, be reviewed to determine what modifications, if any, may permit the Generating Facility to be connected safely and reliably.

If the Applicant chooses to move to Supplemental Review, or has pre-paid the non-refundable Supplemental Review fee, or has pre-paid the non-refundable Supplemental Review feethey have the option to elect that the Distribution Provider provide a fault current study as part of the Supplemental Review. This fault current study would extend the Supplemental Review time by up to ten (10) Business Days, and would require an additional nonrefundable fee of $1,000. (L)

The Applicant must provide the following data to Distribution Provider when requesting Supplemental Review in order to select this option:

Generator:
- MVA Rating
- kV Rating
- Base MVA
- Base kV
- Xd" (direct axis subtransient reactance)
- Xd' (direct axis transient reactance)
- Xd (Synchronous reactance)
- X2 (Negative Sequence reactance)
- X0 (Zero Sequence reactance)

(Continued)

F. REVIEW PROCESS FOR INTERCONNECTION REQUESTS (Cont'd.)

2. FAST TRACK INTERCONNECTION REVIEW PROCESS (Cont'd.)

c. Supplemental Review (Cont'd.)

ii) XFMR Data:
Winding configuration (delta-Wye grd or Wye grd-Delta)
MVA Rating
KV Rating
Base MVA
Base KV
Z1 HV-LV
Z0 HV-LV

(L)
(L)

If the Applicant chooses to move to Supplemental Review, they have the option to elect that the Distribution Provider provide a fault current study as part of the Supplemental Review. This fault current study would extend the Supplemental Review time by up to ten (10) Business Days, and would require an additional nonrefundable fee of $1,000. (Cont'd.)

Line Data:
Impedance data for line from XFMR to POI (if applicable)
Z1
Z0

POI Location:

iii) For Interconnection Requests that pass Supplemental Review and do not require Interconnection Facilities or Distribution Upgrades, Distribution Provider shall provide Applicant with a Generator Interconnection Agreement within fifteen (15) Business Days of providing notice of Supplemental Review results. For Interconnection Requests that pass Supplemental Review and do require Interconnection Facilities or Distribution Upgrades, within fifteen (15) Business Days of providing notice of Supplemental Review results, Distribution Provider shall provide Applicant with a non-binding cost estimate of any Interconnection Facilities or Distribution Upgrades. For those Interconnection Requests where Applicant has selected the Cost Envelope Option, within ten (10) Business Days of providing Applicant the non-binding cost estimate for the required Interconnection Facilities and/or Distribution Upgrades, Applicant shall provide the Distribution Provider the Cost Envelope Option deposit, in accordance with Section F.7.a.i.3 If Applicant fails to provide the Cost Envelope Option deposit in accordance with Section F.7.a.i.3, Applicant's request for the Cost Envelope Option shall be deemed withdrawn and the Interconnection Request shall not be eligible for the Cost Envelope Option.

(Continued)

F. REVIEW PROCESS FOR INTERCONNECTION REQUESTS (Cont'd.)

2. FAST TRACK INTERCONNECTION REVIEW PROCESS (Cont'd.)

c. Supplemental Review (Cont'd.)

iii) For all Interconnection Requests that pass Supplemental Review, refer to Section F.2.e for cost responsibility and time frames for completing the Generator Interconnection Agreement. (L) (L)

iv) For Interconnection Requests that fail Supplemental Review, Distribution Provider shall provide the technical reason, data and analysis supporting the Supplemental Review results in writing, including, if Distribution Provider can make the determination, which Detailed Study track Applicant qualifies for, and provide Applicant the option to attend a Supplemental Review results meeting or proceed directly to Detailed Study. Applicant shall notify Distribution Provider within fifteen (15) Business Days following such notification whether to (i) proceed to a Supplemental Review results meeting, (ii) proceed to Detailed Study, or (iii) withdraw the Interconnection Request. Applicant may request one extension of no more than fifteen (15) Business Days to respond. If Applicant fails to notify Distribution Provider within fifteen (15) Business Days of such notification, or at the end of the extension, if one was requested, the Interconnection Request shall be deemed withdrawn.

Applicants that elect to proceed to Detailed Study shall provide the applicable study deposit set forth in Section E.3.a with their response. Detailed Study fees for solar Generating Facilities up to 1 MW interconnecting to the Distribution System that do not sell power to Distribution Provider will be waived up to the amount of $5,000. Except as provided for in Section F.3.d, NEM-1 and ≤1 MW NEM-2 Generating Facilities are exempt from any costs associated with Detailed Studies.

(Continued)

F. REVIEW PROCESS FOR INTERCONNECTION REQUESTS (Cont'd.)

2. FAST TRACK INTERCONNECTION REVIEW PROCESS (Cont'd.)

e. Execution of the Generator Interconnection Agreement (Cont'd.)

shall negotiate concerning the cost estimate, or any disputed provisions of the appendices to a draft Generator Interconnection Agreement, for not more than ninety (90) Calendar Days after Distribution Provider provides Applicant with the Generator Interconnection Agreement. If Applicant determines that negotiations are at an impasse, it may request termination of the negotiations and initiate Dispute Resolution procedures pursuant to Section K. If Applicant fails to sign the Generator Interconnection Agreement or initiate Dispute Resolution within ninety (90) Calendar Days, the Interconnection Request shall be deemed withdrawn.

After Applicant, or a Producer where those are different entities, has executed the Generator Interconnection Agreement, Distribution Provider will commence design, procurement, construction and installation of Distribution Provider's Distribution Upgrades and/or Interconnection Facilities that have been identified in the Generator Interconnection Agreement. Distribution Provider and Producer will use good faith efforts to meet schedules in accordance with the requirements of the Generator Interconnection Agreement and estimated costs as appropriate. Producer is responsible for all applicable costs associated with Parallel Operation to support the safe and reliable operation of the Distribution System and Transmission System as set forth in Section E.4.

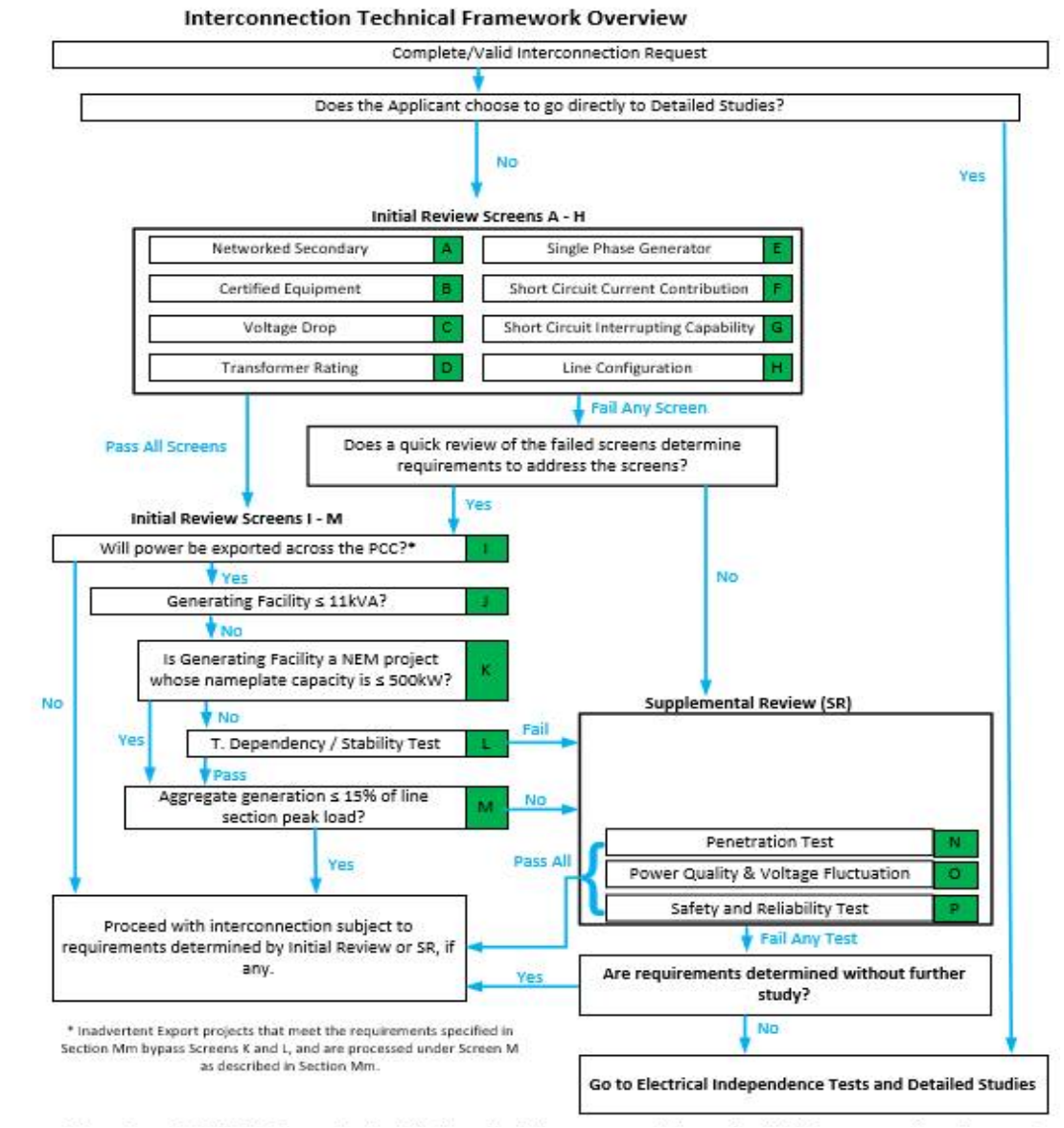
Distribution Provider and Producer shall negotiate in good faith concerning a schedule for the construction of Distribution Provider's Interconnection Facilities and Distribution Upgrades.

Distribution Provider shall provide quarterly updates on substation upgrades to Producers whose projects are dependent on a substation upgrade. (N)

(Continued)

G. ENGINEERING REVIEW DETAILS

(T)



(T)

* Non-Export AC/DC Converter installations that have a complete and valid Interconnection Request will be eligible to bypass screens B through D and F through M. If Generating Facility meets the conditions in Screen I below (Section G.1.i), skip Screens K, L and M.

(Continued)

G. ENGINEERING REVIEW DETAILS (Cont'd.)

2. SUPPLEMENTAL REVIEW SCREENS (Cont'd.)

a. Screen N: Penetration Test

Is Integration Capacity Analysis Values available at the requested Point of Interconnection? (N)

If Yes, evaluate Screen N as follows:

Is the Interconnection Request Gross Nameplate Rating below 90% of the ICA-SG Value (i.e. the minimum value) in the ICA-SG 576 Profile?

Did the Interconnection Request pass Screen F1?

- If the evaluation of the two Screen N questions above are both "yes" (pass), continue to Screen O.
- If no to either or both of the above (fail), a quick review of the failure may determine the requirements to address the failure; otherwise Electrical Independence Tests and Detailed Studies are required. Continue to Screen O. (Note: If Electrical Independence tests and Detailed Studies are required, Applicants will continue to the Electrical Independence Tests and Detailed Studies after review of the remaining Supplemental Review Screens if Applicant elects to proceed.)

If No, evaluate Screen N as follows: (N)

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

- If yes (pass), continue to Screen O.

(Continued)

G. ENGINEERING REVIEW DETAILS (Cont'd.)

2. SUPPLEMENTAL REVIEW SCREENS (Cont'd.)

a. Screen N: Penetration Test (Cont'd.)

- If no (fail), a quick review of the failure may determine the requirements to address the failure; otherwise Electrical Independence Tests and Detailed Studies are required. Continue to Screen O. (Note: If Electrical Independence tests and Detailed Studies are required, Applicants will continue to the Electrical Independence Tests and Detailed Studies after review of the remaining Supplemental Review Screens, if Applicant elects to proceed.)

(L)

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

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, that may flow across the Point of Common Coupling into Distribution Provider's Distribution System will be considered as part of the aggregate generation.

(L)

Note 4: Distribution Provider 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.

Note 5: NEM Generating Facilities with net export less than or equal to 500 kW that may flow across the Point of Common Coupling into Distribution Provider's Distribution or Transmission System will not be studied in the Transmission Cluster Study Process, but may be studied under the Independent Study Process.

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.

(Continued)

G. ENGINEERING REVIEW DETAILS (Cont'd.)

2. SUPPLEMENTAL REVIEW SCREENS (Cont'd.)

b. Screen O: Power Quality and Voltage Tests

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

i) Can it be determined within the Supplemental Review that the voltage regulation on the line section can be maintained in compliance with Commission Rule 2 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 IEEE1453? (L)

iii) Can it be determined within the Supplemental Review that the harmonic levels meet IEEE 519 limits at the Point of Common Coupling (PCC)?

iv) Are any voltage impacts created by the project mitigated considering the settings of the Volt-Var function and the characteristics of the circuit segment?

- If yes to all of the above (pass), continue to Screen P.
- If no to any of the above (fail), a quick review of the failure may determine the requirements to address the failure; otherwise Electrical Independence Tests and Detailed Studies are required. Continue to Screen P. (Note: If Electrical Independence tests and Detailed Studies are required, Applicants will continue to the Electrical Independence Tests and Detailed Studies after review of the remaining Supplemental Review Screens.)

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

c. Screen P: 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 Detailed Study?

(Continued)

- If yes (fail), review of the failure may determine the requirements to address the failure; otherwise Electrical Independence Tests and Detailed Studies are required. Continue to Section G.3.
- If no (pass), Supplemental Review is complete.

(Continued)

G. ENGINEERING REVIEW DETAILS (Cont'd.)

2. SUPPLEMENTAL REVIEW SCREENS (Cont'd.)

c. Screen P: 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 Detailed Study? (L)

- If yes (fail), review of the failure may determine the requirements to address the failure; otherwise Electrical Independence Tests and Detailed Studies are required. Continue to Section G.3.

If no (pass), Supplemental Review is complete. (L)

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

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

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

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

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.)

The inverter requirements are intended to be consistent with UL 1741 - Supplement SA using Section Hh of Rule 21 as the source requirement document and ANSI/IEEE 1547-2003 and 1547a Standard for Interconnecting Distributed Resources with Electric Power Systems (IEEE 1547 including amendment 1547a), where possible. In the event of conflict between this Rule, and UL 1741 - Supplement SA, and/or IEEE 1547-2003 or IEEE 1547a, this Rule shall take precedence. Exceptions are taken to IEEE 1547 Clauses 4.1.4.2 Distribution Secondary Spot Networks and Clauses 4.1.8.1 or 5.1.3.1, which address Protection from Electromagnetic Interference. Rule 21 does not adopt the Generating Facility power limitation of 10 MW incorporated in IEEE 1547.

The Smart Inverter default settings and default activation states may be modified upon mutual agreement between Applicant and Distribution Provider.

Process for changing default settings for new Interconnection Requests: (N)

Distribution Provider, in the study process for new Generating Facilities, may determine and provide the optimum Smart Inverter Settings for the reactive power settings, including changes to the reactive power default settings (Example: Deactivate Volt/Var and activate Fixed Power Factor at given power factor).

Distribution Provider, in the study process for new Generating Facilities, may determine and provide the optimum Smart Inverter Settings for the Ramp Rate settings depending on the Generating Facility technology (such as solar, storage).

Distribution Provider, in the study process for new Generating Facilities, may determine the optimum Smart Inverter Settings for the volt//watt settings including changes to the default settings (Example: Change the volt/watt set points). The Applicant may select to agree on the new settings or select to perform upgrades to operate using the existing default volt/watt settings.

Default settings for voltage ride-through, frequency ride-through requirements, and Frequency/Watt should not be modified on an individual project basis unless the Interconnection Studies have determined that the default settings may not meet grid reliability requirements. (N)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.)

Process for changing default settings for existing, operating Generating Facilities authorized to operate per Section D.1: (N)

When grid changes or Generating Facility changes require that the Smart Inverter operating settings be reevaluated, the Distribution Provider or Producer may request changes to the Generating Facility Smart Inverter operating parameters. The request must include the reason for and timing of the proposed changes. The requested changes must be within the Smart Inverter function adjustability limits, must be within the limits specified in this tariff, and must be mutually agreed on. This may be considered a material modification. (N)

(L)

1. GENERAL INTERCONNECTION AND PROTECTIVE FUNCTION REQUIREMENTS

The Protective Functions and requirements of this Rule are designed to protect Distribution Provider's Distribution and Transmission System and not the Generating Facility. A Producer shall be solely responsible for providing adequate protection for its Generating Facility and Interconnection Facilities. Producer's Protective Functions shall not impact the operation of other Protective Functions on Distribution Provider's Distribution and Transmission System in a manner that would affect Distribution Provider's capability of providing reliable service to its customers.

a. Protective Functions Required

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

(i) Over and under voltage trip functions and over and under frequency trip functions; (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

1. GENERAL INTERCONNECTION AND PROTECTIVE FUNCTION REQUIREMENTS (Cont'd.)

a. Protective Functions Required (Cont'd.)

(ii) A voltage and frequency sensing and time-delay function to prevent the Smart Inverter from energizing a de-energized Distribution or Transmission System circuit and to prevent the Smart Inverter from reconnecting with Distribution Provider's Distribution or Transmission System unless Distribution Provider'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 58.5 Hz to 60.5 Hz, inclusive, and are stable for at least 15 seconds; and

(iii) A function to prevent the Smart Inverter from contributing to the formation of an Unintended Island, and cease to energize Distribution Provider's Distribution System within two seconds of the formation of an Unintended Island.

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

b. Momentary Paralleling Generating Facilities

With Distribution Provider's approval, the transfer switch or scheme used to transfer Producer's loads from Distribution Provider's Distribution or Transmission System to Producer's Generating Facility may be used in lieu of the Protective Functions required for Parallel Operation. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

1. GENERAL INTERCONNECTION AND PROTECTIVE FUNCTION REQUIREMENTS (Cont'd.)

c. Suitable Equipment Required

Circuit breakers or other interrupting equipment located at the Point of Common Coupling (PCC) 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. Producer's Smart Inverter and Interconnection Facilities shall be designed so that the failure of any single device or component shall not potentially compromise the safety and reliability of Distribution Provider's Distribution and Transmission 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).

d. Visible Disconnect Required

When required by Distribution Provider's operating practices, Producer shall furnish and install a ganged, manually-operated isolating switch (or a comparable device mutually agreed upon by Distribution Provider and Producer) near the Point of Interconnection to isolate the Smart Inverter from Distribution Provider's Distribution or Transmission 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.) (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

1. GENERAL INTERCONNECTION AND PROTECTIVE FUNCTION REQUIREMENTS (Cont'd.)

d. Visible Disconnect Required (Cont'd.)

(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 Distribution Provider personnel for construction, operation, maintenance, inspection, testing or to isolate the Smart Inverter from Distribution Provider's Distribution or Transmission 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. Distribution Provider, 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 Distribution Provider prior to installation. If the device is not adjacent to the PCC, permanent signage must be installed at a Distribution Provider approved location providing a clear description of the location of the device. If the switch is not accessible outside the locked premises, signage with contact information and a Distribution Provider approved locking device for the premises shall be installed.

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

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

1. GENERAL INTERCONNECTION AND PROTECTIVE FUNCTION REQUIREMENTS (Cont'd.)

   e. Drawings Required

      Prior to Parallel Operation or Momentary Parallel Operation of the Smart Inverter, Distribution Provider shall approve Producer's Protective Function and control diagrams. Generating Facilities equipped with Protective Functions and a control scheme previously approved by Distribution Provider for system-wide application or only Certified Equipment may satisfy this requirement by reference to previously approved drawings and diagrams.

   f. Generating Facility Conditions Not Identified

      In the event this Rule does not address the Interconnection conditions for a particular Smart Inverter, Distribution Provider and Producer may agree upon other arrangements.

2. PREVENTION OF INTERFERENCE

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

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

a. Voltage Regulation

If approved by the Distribution Provider, the Smart Inverter may actively regulate the voltage at the PCC while in parallel with Distribution Provider'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).

b. Voltage Trip and Ride-Through Settings

The voltage ranges in Table Hh-.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 Distribution Provider'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 Distribution Provider'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 Hh-.1 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. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

b. Voltage Trip and Ride-Through Settings (Cont'd.)

(ii) Voltage Disturbances

Whenever Distribution Provider's Distribution System voltage at the PCC varies from and remains outside near Nominal voltage for the predetermined parameters set forth in Table Hh-.1, the Smart Inverter's Protective Functions shall cause the Smart Inverter(s) to become isolated from Distribution Provider's Distribution System:

1. The Smart Inverter shall stay connected to the Distribution Provider's Transmission or Distribution System while the grid remains within the "Ride-Through Until" voltage-time range and must stay connected in the corresponding "Operating Mode.

2. 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.

3. In the HV1 region, the Smart Inverter is permitted to reduce power output as a function of voltage under mutual agreement between the Producer and the Distribution Provider.

4. If the 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.

5. If the Distribution Provider's Transmission or 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.

6. Different voltage-time settings could be permitted by the Distribution Provider. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

b. Voltage Trip and Ride-Through Settings (Cont'd.)

(ii) Voltage Disturbances (Cont'd.)

Table Hh.1: Voltage Ride-Through Table

Region	Voltage at Point of Common Coupling (% Nominal Voltage)	Ride-Through Until	Operating Mode	Maximum Trip Time
High Voltage 2 (HV2)	V ≥120			0.16 seconds
High Voltage 1 (HV1)	110 < V < 120	12 seconds	Momentary Cessation	13 seconds
Near Nominal (NN)	88 ≤ V ≤ 110	Indefinite	Continuous Operation	Not Applicable
Low Voltage 1 (LV1)	70 ≤ V < 88	20 seconds	Mandatory Operation	21 seconds
Low Voltage 2 (LV2)	50 ≤ V < 70	10 seconds	Mandatory Operation	11 seconds
Low Voltage 3 (LV3)	V < 50	1 seconds	Momentary Cessation	1.5 seconds

(L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

c. Paralleling

The Generating Facility shall parallel with Distribution Provider's Distribution or Transmission System without causing a voltage fluctuation at the PCC greater than plus/minus 5% of the prevailing voltage level of Distribution Provider's Distribution or Transmission System at the PCC, and meet the flicker requirements of Section H.2.d. Section L, Certification and Testing Criteria, 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 Distribution Provider's Distribution or Transmission 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 Distribution Provider's Distribution or Transmission 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 Distribution Provider'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 Distribution Provider's Distribution System and shall not disrupt the coordination of the ground fault protection on Distribution Provider's Distribution System (IEEE 1547-4.1.2) (See Section G.1.i, line configuration). (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

f. Frequency

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

(i) Frequency Ride-Through Requirements

Smart Inverter based systems shall remain connected to the Distribution Provider's Distribution or Transmission System while the grid is within the frequency-time range indicated in Table Hh-.2, 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 Hh.2. 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 the Distribution Provider. Islands and microgrids may need different default frequency settings. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

f. Frequency (Cont'd.)

(i) Frequency Ride-Through Requirements(Cont'd.)

Table Hh.2: Frequency Ride-Through and Trip Settings Table

System Frequency Default Settings (Hz)	Minimum Range of Adjustability (Hz)	Ride-Through Until	Ride-Through Operational Mode	MaximumTrip Time
f > 62	62 - 64	No Ride Through	Not Applicable	0.16 seconds
60.5 < f ≤ 62	60.1 - 62	299 seconds	Mandatory Operation	300 seconds
58.5 ≤ f ≤ 60.5	Not Applicable	Indefinite	Continuous Operation	Not Applicable
57.0 ≤ f < 58.5	57 - 59.9	299 seconds	Mandatory Operation	300 seconds
f < 57.0	53 - 57	No Ride Through	Not Applicable	0.16 seconds

g. Harmonics

When the Smart Inverter is serving balanced linear loads, harmonic current injection into Distribution Provider's Distribution or Transmission System at the PCC shall not exceed the limits stated in Table Hh-.43. The harmonic current injections shall be exclusive of any harmonic currents due to harmonic voltage distortion present in Distribution Provider's Distribution or Transmission 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. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

g. Harmonics (Cont'd.)

Table Hh.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

Smart Inverter should not inject direct current greater than 0.5% of rated output current into Distribution Provider's Distribution or Transmission System.

i. Fixed Power Factor

Producer shall provide adequate reactive power compensation on site to maintain the Smart Inverter power factor near unity at rated output or a Distribution Provider specified power factor in accordance with the following requirements:

(i) Default Power Factor setting: Absorbing reactive power at 0.95 lagging power factor.

(ii) Aggregate generating facility is greater than 15 kW: 1.0 +/- 0.15 (0.85 Lagging to 0.85 Leading) down to 20% rated power irrespective of Real Power Production. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

i. Fixed Power Factor (Cont'd.)

(iii) 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 irrespective of Real Power Production.

j. 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 active power, and +/- 0.9 PF for smaller systems (≤15 kW), down to 20% of rated active power, irrespective of Real Power Production. This dynamic Volt/VAR capability shall be able to be activated or deactivated in accordance with Distribution Provider requirements.

The Distribution Provider 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 the Distribution Provider.

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

- 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 per the range irrespective of real power production, but the maximum reactive power provided to the system shall be as directed by the Distribution Provide
- Reduction of real power production is allowed to meet the required reactive power ranges. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

j. Dynamic Volt/VAR Operations (Cont'd.)

Dynamic Volt/Var Operations Default Settings

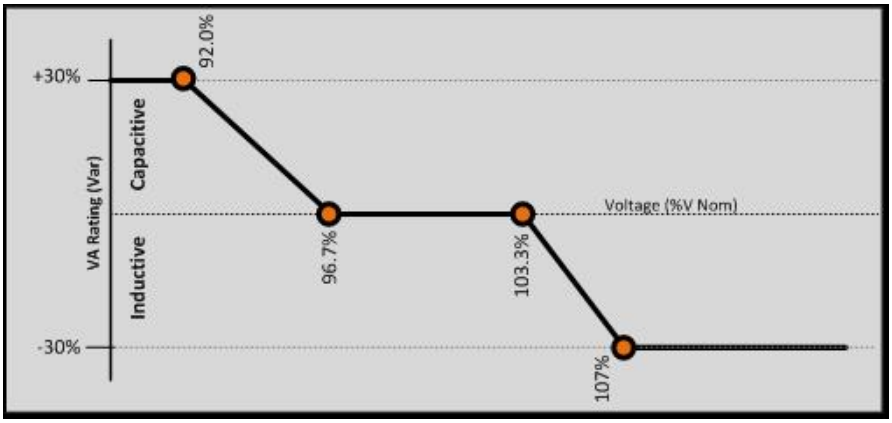
Table Hh-4 and Figure Hh-1 depict the default settings, which should be applied for all inverter sizes. Specific volt/var settings may be required for larger Generating Facilities (such as 100 kw or greater), or for specific areas with the Distribution Systems as determined by the Distribution Provider.

Default Open Loop Response Time for volt/var operation should be five (5) seconds.

Table Hh-4: Voltage and Reactive Default Settings

Voltage Setpoint	Voltage Value	Reactive Setpoint	Reactive Value	Operation
V1	92.0%	Q1	30%	Reactive Power Injection
V2	96.7%	Q2	0	Unity Power Factor
V3	103.3%	Q3	0	Unity Power Factor
V4	107.0%	Q4	30%	Reactive Power Absorption

Figure Hh-1: Voltage and Reactive Default Settings



(L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

k. Ramp Rate Requirements

The Smart Inverter is required to have the following ramp controls for at least the following four 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 the Distributor Provider and the Producer.

- 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. The default value is 2% of maximum current output per second, with specific settings as mutually agreed upon by the Distribution Provider and the Producer.

l. Frequency-Watt Requirements

This requirement will become mandatory for Generating Facilities utilizing inverter-based technologies for which an Interconnection Request is submitted on or after February 22, 2019, nine (9) months following the approval of the SunSpec Alliance Communication Protocol Certification Test Standard.

The utilization of this function is permissible under mutual agreement between the utility and the generating facility before the effective date.

Smart Inverters shall reduce their real power production as a function of system frequency, in accordance with the following:

- When system frequency exceeds 60.036 Hz, the active power output produced by the Smart Inverter shall be reduced by 50% of real power nameplate rating per hertz (5% of real power nameplate rating reduction per 0.1 hertz) (L)

(Continued)

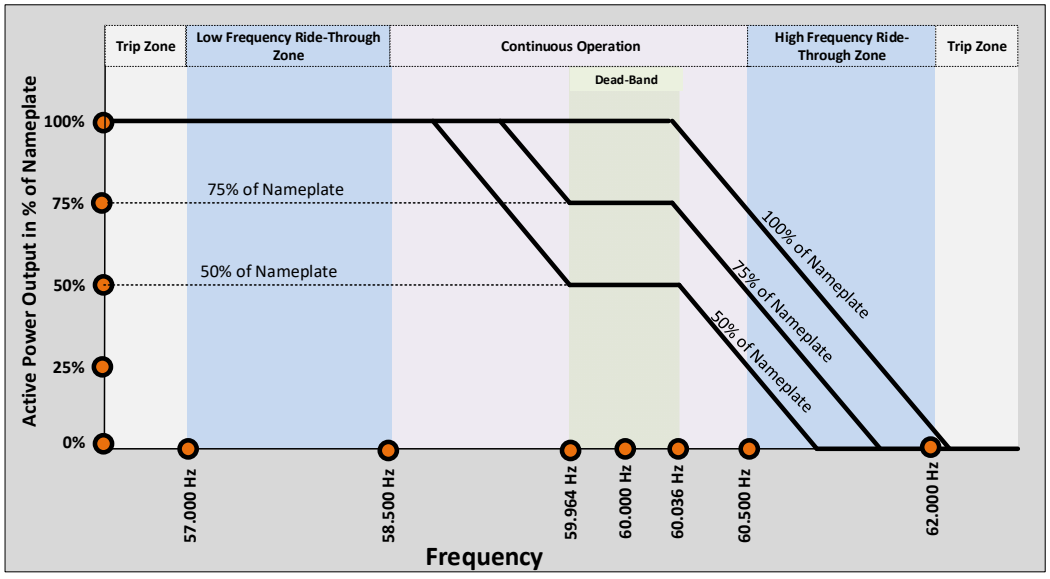
Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

I. Frequency-Watt Requirements (Cont'd.)

- When system frequency moves under 59.964 Hz, the active power output produced by the Smart Inverter shall be increased by 50% of real power nameplate rating per hertz (5% of real power nameplate rating increase per 0.1 hertz) when inverter is capable of increasing real power production.
- The default dead-band should be +/- 0.036 Hz from 60 Hertz (59.964 Hz to 60.036 Hz). When the system frequency is in range of 59.964 Hz and 60.036 Hz, the Smart Inverter is not required to decrease power as a function of system frequency.
- Open loop response time for Frequency –Watt shall be 5 seconds.
- Figure Hh-2 illustrated this requirement for three levels of output power. Figure Hh-2 is for illustration purposes only.

Figure Hh-2: Active Power as a Function of System Frequency



Note: the frequency markers on the horizontal axis are not drawn to scale. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

m. Voltage-Watt Default Settings Requirements

This requirement will become mandatory for Generating Facilities utilizing inverter-based technologies for which an Interconnection Request is submitted on or after February 22, 2019, nine (9) months following the approval of the SunSpec Alliance Communication Protocol Certification Test Standard.

The utilization of this function is permissible under mutual agreement between the utility and the generating facility before the effective date.

Smart Inverters shall reduce their real power production as a function of measured voltage at the inverter terminals or at the Generating Facility Point of Common Coupling (PCC) in accordance with the following:

- When the measured voltage is greater than 106% of nominal voltage (for example: 127.2 volts on a 120 volts nominal), the export of active power at the PCC or the production of active power by the Smart Inverter shall be reduced at a rate of 25% of active power nameplate rating per one percent of nominal voltage. Figure Hh-3 – Volt-Watt Requirements – illustrates the required rate of reduction. When export of active power is controlled, a certified inverter and control system shall be used. (L)

(Continued)

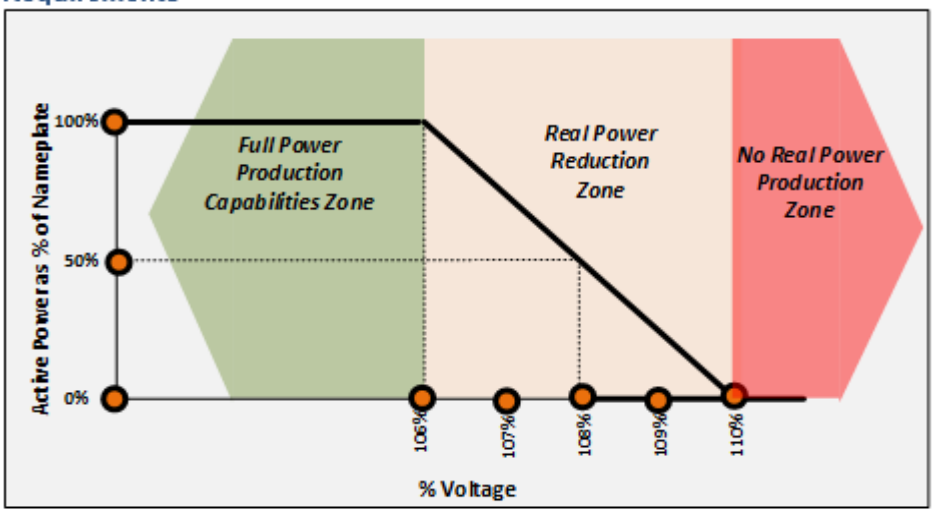
Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

m. (Cont'd.)

- When the measured voltage is greater than 110% of nominal voltage (Example: 132 volts on a 120 volts nominal), the export of active power output to the grid at the PCC or the production of active power by the Smart Inverter shall be reduced to 0 watts

Figure HH-3 – Volt-Watt Requirements



Percent (%) of nominal voltage (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

n. Dynamic Reactive Power Support Function

The capability for this requirement will become mandatory for Generating Facilities utilizing inverter-based technologies for which an Interconnection Request is submitted twelve (12) months after approval of a nationally recognized standard that includes the function.

The utilization of this function is allowed and optional upon the mutual agreement of the Distribution Provider and the Applicant, before the effective date.

o. Default Activation States

Unless otherwise provided by Distribution Provider, pursuant to Distribution Provider's Distribution Generation Interconnection Handbook, the default settings will be as follows:

	Function	**State**
1	Anti-islanding	activated
2	Low/High Voltage Ride-Through	activated
3	Low/High Frequency Ride-Through	activated
4	Dynamic Volt/VAR operations	activated
5	Ramp rates	activated
6	Fixed power factor	deactivated
7	Reconnect by "soft-start" methods	activated
8	Frequency-Watt*	activated
9	Volt/Watt*	activated
10	Set Active Power Function Mode (Optional)	activated under mutual agreement
11	Dynamic Reactive Power Support Mode (Optional)	activated under mutual agreement

These default activation states may be modified by mutual agreement between Distribution Provider and Producer.

(L)

* These functions must be activated for Interconnection Requests submitted on or after February 22, 2019.

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

p. Phase 3 Functions

Table of Phase 3 Effective Dates Pursuant to Resolution E-4898 and Resolution E-5000 and CPUC Letter of March 20, 2020 responding to a request to extend the date for Functions 1, 2, 3 and 8:

Phase 3 Function #		
	Description	**Effective Date (note)**
1	Monitor Key DER Data	**June 22, 2020**
2	DER Disconnect and Reconnect Command (Cease to Energize and Return to Service)	**June 22, 2020**
3	Limit Maximum Active Power Mode	**June 22, 2020**
4	Set Active Power Mode	12 months after approval of a nationally recognized standard that includes the function.
5	Frequency Watt Mode	**February 22, 2019**, which is 9 months following SunSpec Alliance Communication Protocol Certification Test Standard.
6	Volt Watt Mode	**February 22, 2019**, which is 9 months following SunSpec Alliance Communication Protocol Certification Test Standard.
7	Dynamic Reactive Support	12 months after approval of a nationally recognized standard that includes the function.
8	Scheduling Power Values and Modes	**June 22, 2020**

Note: The utilization of any of these functions is permissible under mutual agreement between the utility and the generating facility before the effective date. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

2. PREVENTION OF INTERFERENCE (Cont'd.)

q. Load Shedding or Transfer

The voltage and frequency ride-through requirements of Hh.2.b.(ii) and Hh.2.f.(i) 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 the Distribution Provider's T&D system, along with Generation Facility load, such that the net change in real power flow from or to the Distribution Provider 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. TECHNOLOGY SPECIFIC REQUIREMENTS

Grid-interactive inverters do not require separate synchronizing equipment. Non grid-interactive or "stand-alone" inverters shall not be used for Parallel Operation with Distribution Provider's Distribution or Transmission System. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

4. SUPPLEMENTAL SMART INVERTER REQUIREMENTS

a. Fault Detection

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

b. Transfer Trip

For a Generating Facility that cannot detect Distribution or Transmission System faults (both line-to-line and line-to-ground) or the formation of an Unintended Island, and cease to energize Distribution Provider's Distribution or Transmission System within two seconds, Distribution Provider 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, Distribution Provider may require additional Protective Functions, including, but not limited to reclose-blocking on some of the automatic reclosing devices. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

5. COMMUNICATION REQUIREMENTS

a. The communication protocol requirements included in this section Hh.5 shall become mandatory for Generating Facilities utilizing inverter-based technologies for which an Interconnection Request is submitted June 22, 2020. Until such date, this subsection may be used in all or in part by inverter-based technologies by mutual agreement of the Distribution Provider and the Applicant. The communications requirements herein shall be between:

(i) the Distribution Provider and the individual Generating Facility's inverter control or energy management system;

(ii) the Distribution Provider and communication to the Generating Facility through an aggregator not co-located or part of the Generating Facility; or

(iii) other communication options as are mutually agreed to are by Applicant and the Distribution Provider. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

5. COMMUNICATION REQUIREMENTS (Cont'd.)

b. Generating Facilities utilizing inverter-based technologies must adhere to all of the following communication protocol requirements for communications between Distribution Provider and communication option selected in section Hh. 5. This Rule does not specify the communication between the selected communication option and Smart Inverter but performance will be enforced by in compliance with this Rule:

(i) Shall be capable of communications;

(ii) Software shall be updateable via communications remotely;

(iii) The transport level protocol shall be TCP/IP; and,

(iv) The default application-level protocol shall be IEEE 2030.5 (i.e., Smart Energy Profile 2.0 (SEP 2)) as defined in the California IEEE 2030.5 Implementation Guide, but other application-level protocols may be used by mutual agreement of the parties including IEEE 1815/DNP3 for SCADA real-time monitoring and control and IEC 61850. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

5. COMMUNICATION REQUIREMENTS (Cont'd.)

c. Additional communication protocol requirements shall also apply to Generating Facilities utilizing inverter-based technologies as provided in the following documents:

(i) Distribution Provider Generation Interconnection Handbook, which shall include:

a) Details and guidelines for the implementation of communications with Generating Facilities utilizing inverter-based technologies;

b) Cybersecurity and privacy requirements (these may additionally or alternatively be included in the application-level protocol implementation guide); and,

c) Generic device communications registration management requirements, including how to register individual Generating Facilities, Generating Facilities with energy management systems, and aggregators (these requirements additionally or alternatively may be included in the application-level protocol implementation guide).

(ii) Application-Level Protocol Implementation Guide, which shall provide:

a) Communication requirements and implementation guidelines to ensure consistent interoperability of the Generating Facilities with all California investor-owned utilities under the Commission's jurisdiction. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

6. SCHEDULING CAPABILITY REQUIREMENTS

a. Generating Facilities which incorporate Smart Inverters shall incorporate scheduling capabilities with a minimum scheduling memory capability of at least 24 events. The capability for this requirement will be mandatory for Generating Facilities utilizing inverter-based technologies for which an Interconnection Request is submitted on or after June 22, 2020.

The utilization of this function is permissible under mutual agreement between the utility and the generating facility before the effective date.

Each event is composed of modifications to each, selected group of, or all of the following Smart Inverter function.

(i) Modifications to the voltage and reactive set-points of the Dynamic volt/var function.

(ii) Modifications to the reactive power set-points for the fixed power factor function.

(iii) Modifications to the voltage and watt-reduction level set-points for the volt/watt function. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

6. SCHEDULING CAPABILITY REQUIREMENTS (Cont'd.)

b. The Generating Facility's scheduling capability requirement herein shall be met by one or more of the following options.

(i) Scheduling capability requirements may be stored at the Generating Facility Energy Management System (GFEMS). The GFEMS shall communicate the necessary commands to the Smart Inverters within 10 minutes from when GFEMS received the scheduling information:

(ii) Scheduling capability requirements may be stored at the Smart Inverter Control Unit (SMCU) within the Generating Facility. The SMCU shall communicate necessary commands to the Smart Inverters within 10 minutes from when SCMU received the scheduling information.

(iii) Scheduling capability requirements may be stored at an aggregator not co-located within the Generating Facility. The aggregator shall communicate the necessary commands to the Smart Inverters within 15 minutes of the aggregator receiving the scheduling information.

(iv) Other options may be utilized by mutual agreement between the Applicant and Distribution Provider.

c. The selected scheduling control system shall store the schedules and shall send operational commands to the Smart Inverters as required by the schedule received from the Distribution Provider. The Smart Inverter shall respond by changing its mode of operation as commanded at the schedule start time with no unreasonable delay.

Each scheduled mode of operation shall include and start-time and duration. The Smart Inverter should return to its default settings at the end of the duration time or shall enter a new operational mode as directed by the scheduling control system. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

7. MONITORING AND TELEMETRY REQUIREMENTS

a. The capability for this requirement will be mandatory for Generating Facilities utilizing inverter-based technologies for which an Interconnection Request is submitted on or after June 22, 2020.

The utilization of this function is permissible under mutual agreement between the utility and the generating facility before the effective date.

Smart Inverter shall have the capability to communicate its performance information including:

(i) Smart Inverter production or consumption of active power (Watts).

(ii) Smart Inverter consumption or production of reactive power (VARs)

(iii) Phase measured at the AC terminals of the Smart Inverter (Volts)

(iv) Frequency measured at the AC terminals of the Smart Inverter (Hz) (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

7. MONITORING AND TELEMETRY REQUIREMENTS (Cont'd.)

b. When the Generating Facility includes energy-storage with Smart Inverters, the following monitoring and telemetry capability are required:

(i) The Smart Inverter shall be capable of communicating the operational state of charge as a percentage of energy storage capacity.

c. Operational State as In-Service or not In-service communication capability requirements. The Smart Inverter shall be capable of communicating when the Smart Inverter is capable of providing electric services as follows:

(i) In-Service state: An operational state which indicates that the Smart Inverter is connected to the electric system and operating as determined locally by the Generating Facility operator or by a scheduling control system as outlined in section Hh.6

(ii) Not In-Service state: An operating state which indicates that the Smart Inverter is not capable of connecting to the electric system and not capable of providing any type of electrical support as required locally or as commanded by a scheduling control system as outlined in section Hh. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

7. MONITORING AND TELEMETRY REQUIREMENTS (Cont'd.)

d. Monitoring and performance information should be communicated in aggregate at the Generating Facility as follows:

(i) When the Generating Facility includes only Smart Inverters: The production or consumption of active and reactive power shall be communicated as an aggregate of all Smart Inverters within the Generating Facility.

(ii) When a Generating Facility includes Smart Inverters and other technologies such as synchronous or induction generation systems, the Generating Facility should communicate the following:

a) The production or consumption of active and reactive power shall be communicated in aggregate of all Smart Inverters within the Generating Facility

b) The production or consumption of active and reactive power shall be communicated in aggregate of all the other technologies within the Generating Facility

(iii) When the Generating Facility with Smart Inverters includes one or multiple energy storage systems: The available operational energy should be communicated as an aggregate of all the energy storage systems. (L)

(Continued)

Hh. SMART INVERTER GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.) (L)

8. CONTROL THROUGH COMMUNICATION CAPABILITIES

a. The capability for these requirements will be mandatory for Generating Facilities utilizing inverter-based technologies for which an Interconnection Request is submitted on or after the earlier of the dates shown in the "Table of Phase 3 Effective Dates Pursuant to Resolution E-4898" in Section Hh.2.p.

The utilization of these functions is permissible under mutual agreement between the utility and the generating facility before the effective date.

Smart Inverters shall have the capabilities of accepting an operational controls through communications in accordance to the following:

(i) Cease to energize control command. When the Smart Inverter receives a cease-to-energize command through communication it must enter into a cease-to-energize state of operation or shall initiate the opening of the DER switch referenced in the ECP in order to galvanically isolate the DER system from the Distribution System

(ii) Return to service control command. When the Smart Inverter receives a return-to-service control command, the Smart Inverter may return to service operation as required by Generating Facility operator or as required by the scheduling control system as required by section H.6

(iii) Limit Active Power command. When the Smart Inverter receives a command to limit its production of real power, the Smart Inverter shall reduce its real power production to the specified percent of real power capacity of the Smart Inverter or to a specified real power value.

(iv) Set Active Power Level Mode Function. The capability for this requirement will become mandatory for Generating Facilities utilizing inverter-based technologies for which an Interconnection Request is submitted twelve (12) months after approval of a nationally recognized standard that includes the function.

(v) Suspension of Active Power restriction. When the Smart Inverter receives a command to suspend the command for active power reduction, the Smart Inverter may return to normal operation as required by Generating Facility operator or as required by the scheduling control system as required by section H.6. (L)

(Continued)

ELECTRIC RULE NO. 21 Sheet 214
GENERATING FACILITY INTERCONNECTIONS

I. THIRD-PARTY INSTALLATIONS, RESERVATION OF UNUSED FACILITIES, AND REFUND OF SALVAGE VALUE (L)

1. INTERCONNECTION FACILITIES AND DISTRIBUTION UPGRADES

Except as provided for in the Generator Interconnection Agreement of this Rule, Interconnection Facilities connected to Distribution Provider's side of the PCC and Distribution Upgrades shall be provided, installed, owned, and maintained by Distribution Provider at Producer's expense. (L)

2. THIRD-PARTY INSTALLATIONS (T)/(L)

~~Subject to the approval of Distribution Provider, a~~ Producer may, at its option, employ a qualified contractor that meets the Contractor Qualifications set forth under Electric Rule 15, Section G., to provide and install Interconnection Facilities or Distribution Upgrades, to be owned and operated by Distribution Provider, on Distribution Provider's side of the PCC.* Such Interconnection Facilities and Distribution Upgrades shall be installed in accordance with Distribution Provider's design and specifications. Upon final inspection and acceptance by Distribution Provider, Producer shall transfer ownership of such Producer installed Interconnection Facilities or Distribution Upgrades to Distribution Provider and such facilities shall thereafter be owned and maintained by Distribution Provider at Producer's expense. Producer shall pay Distribution Provider's reasonable cost of design, administration, and monitoring of the installation for such facilities to ensure compliance with Distribution Provider's requirements. Producer shall also be responsible for all costs, including any income tax liability, associated with the transfer of Producer installed Interconnection Facilities and Distribution Upgrades to Distribution Provider. (T)/(L) (L) (L) (T)/(L) (L) (L)

* Only duly authorized employees of utility are allowed to connect to, disconnect from, or perform any work upon Utility's facilities.

(Continued)

I. THIRD-PARTY INSTALLATIONS, RESERVATION OF UNUSED FACILITIES, AND REFUND OF SALVAGE VALUE (Cont'd.) (L)

3. RESERVATION OF UNUSED FACILITIES

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

4. REFUND OF SALVAGE VALUE

When a Producer elects to abandon the Special Facilities or Added Facilities for which it has either advanced the installed costs or constructed and transferred to Distribution Provider, Producer shall, at a minimum, receive from Distribution Provider a credit for the net salvage value of the Added Facilities.

J. METERING, MONITORING AND TELEMETERING

1. GENERAL REQUIREMENTS

All Generating Facilities shall be metered in accordance with this Section J and shall meet all applicable standards of Distribution Provider contained in Distribution Provider's applicable tariffs and published Distribution Provider manuals dealing with Metering specifications.

2. METERING BY NON-DISTRIBUTION PROVIDER PARTIES

The ownership, installation, operation, reading, and testing of revenue Metering Equipment for Generating Facilities shall be by Distribution Provider except to the extent that the Commission authorizes any or all these services be performed by others. (L)

(Continued)

J. METERING, MONITORING AND TELEMETERING (Cont'd.) (L)

3. NET GENERATION OUTPUT METERING

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

However, Generating Facility customers do not need to install Net Generation Output Metering where less intrusive and/or more cost effective options, for Producer/Customer, are available for providing generator data to Distribution Provider. These Generating Facilities may opt to have Distribution Provider estimate load data in accordance with Distribution Provider'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 Distribution Provider's estimate of the Generator(s) output, the customer may elect to install the Net Generation Output Metering, or have Distribution Provider install Net Generation Output Metering at the customer's expense.

(a) All metering options available to the customer must conform to the requirements set forth in Distribution Provider's Rule 22. If Distribution Provider does not receive meter data in accordance with Rule 22, Distribution Provider shall have the right to install Distribution Provider-owned Net Generation Output Metering at the customer's expense. The relevant factors in determining the need for Net Generation Output Metering are as listed below:

i) Data requirements in proportion to need for information;

ii) Producer's election to install equipment that adequately addresses Distribution Provider's operational requirements; (L)

(Continued)

J. METERING, MONITORING AND TELEMETERING (Cont'd.) (L)

3. NET GENERATION OUTPUT METERING (Cont'd.)

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

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

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

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

vii) Requirements under any Generator Interconnection Agreement with Producer.

The requirements in this Section may not apply to Metering of Generating Facilities operating under Distribution Provider's Net Energy Metering tariffs. Nothing in this Section J.3 supersedes Section D.4, Compliance with Laws, Rules and Tariff Schedules.

Distribution Provider will report to the Commission or designated authority, on a quarterly basis, the rationale for requiring Net Generation Output Metering equipment in each instance along with the size and location of the facility.

4. POINT OF COMMON COUPLING (PCC) METERING

For purposes of assessing Distribution Provider's charges for retail service, Producer's PCC Metering shall be reviewed by Distribution Provider, 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 Producer's site can be separately recorded. Alternately, (L)

(Continued)

J. METERING, MONITORING AND TELEMETERING (Cont'd.) (L)

4. POINT OF COMMON COUPLING (PCC) METERING (Cont'd.)

Producer may, at its sole option and cost, require Distribution Provider to install multi-metering equipment to separately record power deliveries to Distribution Provider's Distribution System and retail purchases from Distribution Provider. Where necessary, such PCC Metering shall be designed to prevent reverse registration.

Generating Facilities participating in Net Energy Metering shall have metering provided pursuant to the terms of the applicable Net Energy Metering tariff schedule.

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 Producer's expense. If the Generating Facility is Interconnected to a portion of Distribution Provider's Distribution System operating at a voltage below 10 kV, then Telemetering equipment may be required on Generating Facilities 250 kW or greater. Distribution Provider 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. Distribution Provider 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 Distribution Provider-owned Metering is located on Producer's premises, Producer shall provide, at no expense to Distribution Provider, a suitable location for all such Metering Equipment. (L)

(Continued)

J. METERING, MONITORING AND TELEMETERING (Cont'd.) (L)

7. COSTS OF METERING

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 J.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-1, NEM-2, NEMBIO, NEMFC), or where a Generating Facility consists of one or more NEM-eligible generators in combination with one or more non-NEM eligible generators without Non-Export relays ("Reverse Power Protection"). To ensure proper tariff administration, metering will be required at the PCC and at each of the NEM eligible generator groups eligible for service under the same NEM tariff schedule. For combinations of multiple NEM eligible generators under different tariffs, billing administration and metering requirements will be as specified in the appropriate NEM tariff schedule.

Where a Generating Facility consists of one or more NEM eligible generator groups in combination with one or more non-NEM generators, metering of the non-NEM generators is not required, except as specified in Section J.3. (L)

(Continued)

K. DISPUTE RESOLUTION PROCESS (L)

In addition to the informal procedures for timeline-related disputes set out in Section F.1.d, the following procedures will apply for disputes arising from this Rule:

1. SCOPE

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

2. PROCEDURES

Any dispute arising between Distribution Provider and Producer (individually referred to in Section K as "Party" and collectively "the Parties") regarding Distribution Provider'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:

a. The dispute shall be documented in a written notice ("notice") by the aggrieved Party 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 this Section. The notice shall be sent to the Party's email address and physical address set forth in the Generator Interconnection Agreement or Interconnection Request, if there is no Generator Interconnection Agreement. A copy of the notice shall also be sent to the Energy Division, Office of the Director, at the Commission. The receiving Party shall acknowledge the notice within five (5) Calendar Days of its receipt. (L)

(Continued)

K. DISPUTE RESOLUTION PROCESS (Cont'd.) (L)

2. PROCEDURES (Cont'd.)

a 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 seven (7) Calendar Days. In addition, upon receipt of the notice, Distribution Provider shall provide the aggrieved Party with all relevant regulatory and/or technical details and analysis regarding any Distribution Provider interconnection requirements under dispute within twenty-one (21) Calendar Days.

Within forty-five (45) Calendar Days of the date of the notice, the Parties' authorized representatives will be required to meet and confer to try to resolve the dispute. Parties are expected to operate in good faith and use best efforts to resolve the dispute.

b. If a resolution is not reached in forty-five (45) Calendar Days from the date of the notice, either 1) a Party may request to continue negotiations for an additional forty-five (45) Calendar Days or 2) the Parties may by mutual agreement make a written request for mediation to the ADR Coordinator in the Commission's ALJ Division. The request may be submitted by electronic mail to adr_program@cpuc.ca.gov. 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. At any time, either Party may file a formal complaint before the Commission pursuant to California PUC section 1702 and Article 4 of the Commission's Rules of Practice and Procedure.

Nothing in this section shall be construed to limit the rights of any Party to exercise rights and remedies under Commission law. (L)

(Continued)

K. DISPUTE RESOLUTION PROCESS (Cont'd.) (L)

3. PERFORMANCE DURING DISPUTE

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 Interconnection Request and implementation of this Section shall be subject to resolution pursuant to the procedures set forth in this Section.

L. CERTIFICATION AND TESTING CRITERIA

1. INTRODUCTION

This Section describes the test procedures and requirements for equipment used for the Interconnection of Generating Facilities to Distribution Provider's Distribution or Transmission 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 B, this Rule has been revised to be consistent with ANSI/IEEE 1547-2003 Standard for Interconnecting Distribution Resources with Electric Power Systems. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

1. INTRODUCTION (Cont'd.)

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

Section L also provides criteria for "Certifying" Generators, inverters or converters. Once a Generator, inverter or converter has been Certified per this Rule, it may be considered suitable for Interconnection with Distribution Provider's Distribution or Transmission System. Subject to the exceptions described in Section L, Distribution Provider 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 for Section H, except for Non-Export AC/DC Converters seeking an expedited process, but it is a prerequisite for inverters installed after September 8, 2017, pursuant to Section Hh of this Rule. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

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 Distribution Provider's Distribution or Transmission 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). (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

2. CERTIFIED AND NON-CERTIFIED INTERCONNECTION EQUIPMENT (Cont'd.)

a. Certified Equipment (Cont'd.)

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);

(8) If the equipment is Certified as Non-Islanding; and

(9) If the equipment is Certified as a Non-Export AC/DC Converter.

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 Distribution Provider for each Generating and/or Interconnection Facility. The manufacturer or a laboratory acceptable to Distribution Provider may perform these tests. Test results for non-Certified equipment must be submitted to Distribution Provider for the Supplemental Review. Approval by Distribution Provider for equipment used in a particular Generating and/or Interconnection Facility does not guarantee Distribution Provider's approval for use in other Generating and/or Interconnection Facilities. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

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 L.1 defines the test criteria by Generator or inverter technology. While UL 1741(1) and UL 1741 – Supplement SA were 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, Distribution Provider or NRTL shall adopt the procedures referenced in Table L.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 L.2.

Non-Export AC/DC Converters must satisfy the requirements in its definition in Section C. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.)

3. TYPE TESTING (Cont'd.)

a. Type Tests and Criteria for Interconnection Equipment Certification (Cont'd.)

Table L.1, Type Test and Requirements for Interconnection Equipment Certification

Type Test	Reference 1	Inverter (6)	Smart Inverter (7)	Synchronous Generators	Induction Generators
Utility Interaction	UL 1741 – 39, 40	X	X	X	X
Utility Compatibility (Required testing to 1547 & 1547.1)	UL 1741 - 46	X	X	X	X
DC Isolation	IEEE 1547.1(8) -5.6	X	X	-	-
Dielectric Voltage Withstand	IEEE 1547.1(8) -5.5.3	X	X	X	X
Harmonic Distortion	IEEE 1547.1(8) -5.11	X	X	X	X
DC Injection	IEEE 1547.1(8) -5.6	X	X	-	-
Distribution Provider Voltage Variation	IEEE 1547.1(8) -5.2	X	-	X	X
Distribution Provider Frequency Variation	IEEE 1547.1(8) -5.3	X	-	X	X
Abnormal Tests	UL 1741 – 47				
Loss of Control Circuit	UL 1741 – 47.8	X	X	X	X
Short Circuit	UL 1741 - 47.3	X	X	X	X
Load Transfer	UL 1741 - 47.7	X	X	X	X
Surge Withstand Capability	L.3.e	X	X	X	X
Anti-Islanding (non-Smart Inverters)	L.3.b	(2)	-	(2)	(2)
Non-Export	L.3.c	(3)	(3)	(3)	(3)
In-rush Current	L.3.d	-	-	-	(4)
Synchronization	L.3.f	(5)	(5)	X	(5)
Anti-islanding (Smart Inverters)	UL 1741 SA - SA8	-	X	-	-
Low and High Voltage Ride-through (L/H VRT)	UL 1741 SA – SA9	-	X	-	-
Low and High Frequency Ride-through (L/H FRT)	UL 1741 SA - SA10	-	X	-	-
Normal and Soft-Start Ramp Rate (RR)	UL 1741 SA - SA11	-	X	-	-
Specified Power Factor	UL 1741 SA - SA12	-	X	-	-
Volt/Var Mode (Q(V))	UL 1741 SA - SA13	-	X	-	-
Frequency-Watt(FW) - optional	UL 1741 SA - SA14	-	X	-	-
Volt-Watt (VW) - optional	UL 1741 SA - SA15	-	X	-	-
Markings and Instructions	UL 1741 SA6, SA16	-	X	-	-

Table Notes:

(1) References are to section numbers in either UL 1741 and/or UL 1741-Supplement SA (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 Distribution Provider 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 Distribution Provider's Distribution or Transmission System.
(6) Inverters compliant with Section H.
(7) Inverters compliant with Section Hh.
(8) IEEE 1547.1 refers to 2005 revision.

"X" = Required "-" = Not Required

(L)

(L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

3. TYPE TESTING (Cont'd.)

a. Type Tests and Criteria for Interconnection Equipment Certification (Cont'd.)

Table L.2 Type Tests Sequence for Interconnection Equipment Certification

Test No.	Type Test
1	Distribution Provider Voltage and Frequency Variation
2	Synchronization
3	Surge Withstand Capability
4	Distribution Provider Voltage and Frequency Variation, including ride through
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 L.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. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

3. TYPE TESTING (Cont'd.)

d. In-rush Current Test

Generation equipment that utilizes Distribution Provider power to motor up to speed will be tested using the procedure defined in Section L.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 H.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. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

3. TYPE TESTING (Cont'd.)

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 Distribution Provider's Distribution or Transmission 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 L.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 L.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 Distribution Provider's Distribution or Transmission 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. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

3. TYPE TESTING (Cont'd.)

f. Synchronization Test (Cont'd.)

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

Aggregate Rating of Generator Units (kVA)	Frequency Difference (Δf, Hz)	Voltage Difference (ΔV, %)	Phase Angle Difference (ΔΦ,°)
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 L.1 shall be performed on the paralleling device to ensure compliance with those requirements specified in Section H.1.c (IEEE 1547-5.1.3.3).

h. Backfeed Test

Non-Export AC/DC Converters must satisfy the requirements in its definition in Section C.

4. PRODUCTION TESTING

At a minimum, each interconnection system shall be subjected to Distribution Provider Voltage and Frequency Variation Test procedure described in UL1741 under Manufacturing and Production Tests, Section 68 and the Synchronization test specified in Section L.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 L.5). (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

5. COMMISSIONING TESTING

a. Commissioning Testing

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.

Distribution Provider may require written Commissioning test procedure be submitted to Distribution Provider at least 10 working days prior to the performance of the Commissioning Test. Distribution Provider has the right to witness Commissioning Test. Distribution Provider 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:

(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 (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

5. COMMISSIONING TESTING (Cont'd.)

a. Commissioning Testing (Cont'd.)

(6) Time delay on restart after Distribution Provider source is stable

(7) Distribution Provider system fault detection (if used)

(8) Synchronizing controls (if applicable)

(9) Other Interconnection Protective Functions that may be required as part of the Generator Interconnection Agreement

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

b. 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 E of this Rule. If the initial Commissioning Test verification is not successful through no fault of Distribution Provider, Distribution Provider may impose upon 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 Distribution Provider's invoice. The invoice provided by Distribution Provider shall consist of the hourly rate multiplied by the hours incurred by Distribution Provider and will separately specify the amount of time spent on-site from that spent in roundtrip travel to the Commissioning Test site. Additional cost, if any, will be specified on the invoice. If the initial Commissioning Test verification is not successful through the fault of Distribution Provider, that visit will not be considered the initial Commissioning Test verification. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

5. COMMISSIONING TESTING (Cont'd.)

c. Other Checks and Tests

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

(1) Verifying final Protective Function settings

(2) Trip test (L.5.g)

(3) In-service tests (L.5.h)

d. Certified Equipment

Generating Facilities qualifying for interconnection through the Fast Track process 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 Distribution Provider's Distribution or Transmission 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 Distribution Provider voltage or frequency, or varying the set points to show that the device trips at the measured (actual) Distribution Provider 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 Distribution Provider's Distribution or Transmission System and does not re-energize it for the required time delay after the switch is closed. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

5. COMMISSIONING TESTING (Cont'd.)

d. Certified Equipment (Cont'd.)

(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.

e. Non-Certified Equipment

Non-certified Equipment shall be subjected to the appropriate tests described in Type Testing (Section L.3) as well as those described in Certified Equipment Commissioning Tests (Section L.5.d). With Distribution Provider's approval, these tests may be performed in the factory, in the field as part of commissioning, or a combination of both. Distribution Provider, 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.

f. Verification of Settings

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

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

5. COMMISSIONING TESTING (Cont'd.)

g. 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.

h. 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. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

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. Producer shall maintain Periodic Test reports or a log for inspection by Distribution Provider. Periodic Testing conforming to Distribution Provider test intervals for the particular Line Section may be specified by Distribution Provider 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 I, 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. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

7. TYPE TESTING PROCEDURES NOT DEFINED IN OTHER STANDARDS (Cont'd.)

a. Non-Exporting Test Procedures (Cont'd.)

i) 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 I. It should be understood that in the reverse power application, the relay will provide a trip output with power flowing in the export (toward Distribution Provider's Distribution or Transmission System) direction.

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). (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

7. TYPE TESTING PROCEDURES NOT DEFINED IN OTHER STANDARDS (Cont'd.)

a. Non-Exporting Test Procedures (Cont'd.)

i) Discrete Reverse Power Relay Test (Cont'd.)

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.

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 Ia at 180, Ib at 60 and Ic at 300 degrees). Remove phase-1 voltage and observe that the relay does not operate. Repeat for phases-2 and 3. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

7. TYPE TESTING PROCEDURES NOT DEFINED IN OTHER STANDARDS (Cont'd.)

a. Non-Exporting Test Procedures (Cont'd.)

i) Discrete Reverse Power Relay Test (Cont'd.)

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 Ia at 180, Ib at 300 and Ic 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 Va at 0 degrees, Vb and Vc at 180 degrees, Ia at 180 degrees, Ib at 0 degrees, and Ic 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. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

7. TYPE TESTING PROCEDURES NOT DEFINED IN OTHER STANDARDS (Cont'd.)

a. Non-Exporting Test Procedures (Cont'd.)

i) Discrete Reverse Power Relay Test (Cont'd.)

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 L.3.e.

ii) 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 I. A trip output will be provided when import power (toward 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. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

7. TYPE TESTING PROCEDURES NOT DEFINED IN OTHER STANDARDS (Cont'd.)

a. Non-Exporting Test Procedures (Cont'd.)

ii) Discrete Underpower Relay Test (Cont'd.)

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).

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. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

7. TYPE TESTING PROCEDURES NOT DEFINED IN OTHER STANDARDS (Cont'd.)

a. Non-Exporting Test Procedures (Cont'd.)

ii) Discrete Underpower Relay Test (Cont'd.)

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 Va at 0 degrees, Vb and Vc at 180 degrees, Ia at 0 degrees, Ib at 180 degrees, and Ic at 0 degrees). Observe that the relay (especially single-phase types) operates properly. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

7. TYPE TESTING PROCEDURES NOT DEFINED IN OTHER STANDARDS (Cont'd.)

a. Non-Exporting Test Procedures (Cont'd.)

ii) Discrete Underpower Relay Test (Cont'd.)

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 L.3.e. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

7. TYPE TESTING PROCEDURES NOT DEFINED IN OTHER STANDARDS (Cont'd.)

a. Non-Exporting Test Procedures (Cont'd.)

iii) 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 L.7.a.i 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.

iv) Tests for Inadvertent Export Inverters

Test requirements for certified inverters with integrated functions for Inadvertent Export shall verify the performance requirements specified in Section Mm of this Rule. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

7. TYPE TESTING PROCEDURES NOT DEFINED IN OTHER STANDARDS (Cont'd.)

a. Non-Exporting Test Procedures (Cont'd.)

v) Interim Tests for Non-Export AC/DC Converters ("Converter")

Step 1: Limitation of Back-feed Under Steady State Conditions

Apply the nominal DC operating voltage of the Converter across its DC terminals with a battery source or simulated equivalent of a battery source. Vary the battery source by 100%, 75%, 50%, 25%, and 10% of Converter rated output power. The measured steady-state DC current component at each of the AC terminals of the Converter is required to be less than 0.5% of the Converter's rated RMS AC current. This test is to be repeated for 80% nominal DC operating voltage and for 125% nominal DC operating voltage. Testing requirements can be modified upon mutual agreement of the Distribution Provider and the Applicant.

Step 2: Back-feed Under Fault Conditions – DC Output Shorted

With a battery source or simulated equivalent of a battery source connected to the DC terminals, apply rated conditions of the Converter then short its DC terminals for 200 milliseconds. After 5 cycles of inducing the short circuit, record the measured peak current at each of the AC terminals of the Converter. These peak currents within this time interval are each required to be less than 0.5% of the Converter's rated RMS AC current. Testing requirements can be modified upon mutual agreement of the Distribution Provider and the Applicant. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

7. TYPE TESTING PROCEDURES NOT DEFINED IN OTHER STANDARDS (Cont'd.)

a. Non-Exporting Test Procedures (Cont'd.)

v) Interim Tests for Non-Export AC/DC Converters ("Converter") (Cont'd.)

Step 3: Back-feed Under Fault Conditions – AC Input Shorted: Phase-Ground, Phase-Phase, and 3-Phase

With a battery source or simulated equivalent of a battery source connected to the DC terminals, apply rated conditions of the Converter, then apply a short between any two phases on the grid side of the Converter for 200 milliseconds. After 5 cycles of inducing the short circuit, record the measured peak current at each of the AC terminals of the Converter. These peak currents within this time interval are each required to be less than 0.5% of the Converter's rated RMS AC current. This test is to be repeated for phase-ground and 3-phase shorts. Testing requirements can be modified upon mutual agreement of the Distribution Provider and the Applicant.

Step 4: Back-feed Under Fault Conditions – Component Faults

Distribution Provider can elect to test for back-feed under the condition of a short circuit across certain components which are internal to the Converter. Potential tests can include inducing a short circuit across different terminals for electronic switches and/or across different terminals for internal transformers. Ultimately, the components used for testing will be chosen on a case-by-case basis and will depend on the Converter's circuit topology. Testing requirements can be modified upon mutual agreement of the Distribution Provider and the Applicant.

Step 5: Harmonics Testing

Under normal loading conditions at 10%, 25%, 50%, 75%, and 100% of the Converter's rated power output, conduct harmonic current distortion measurements on each of the AC terminals. Measurements should be below the maximum harmonic current distortion requirements given in IEEE 1547-4.3.3. (L)

(Continued)

L. CERTIFICATION AND TESTING CRITERIA (Cont'd.) (L)

7. TYPE TESTING PROCEDURES NOT DEFINED IN OTHER STANDARDS (Cont'd.)

b. In-rush Current Test Procedures

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

i) Locked-Rotor Method

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

ii) 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 Distribution Provider's Distribution or Transmission 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 Distribution Provider during the startup process, using a 10-cycle moving average. During the test, Distribution Provider 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 Distribution Provider. (L)

(Continued)

M. INADVERTENT EXPORT (L)

Under certain operating conditions, an Applicant may choose to completely offset their facility load by installing generation systems which are optimally sized to meet their peak demand with load following functionality on the Generator controls to ensure conditional export of electrical power from the Generating Facility to Distribution Provider's Distribution or Transmission System. In situations where the loading changes rapidly and/or the Generator cannot ramp down quickly enough, the Generating Facility may need to export small amounts of power for limited duration. The event of exporting uncompensated power for a short time is referred to as Inadvertent Export.

The following are the minimum requirements for Inadvertent Export systems. Other factors relevant to the interconnection study process (e.g. 15% screen results, short circuit current ratio, etc.) may necessitate additional technical requirements (e.g. reclose block, transfer trip, ground bank, etc.) that are not explicitly noted here. Inadvertent Export may not be available for interconnections to Networked Secondary Systems.

1. For Inadvertent Export interconnection requests, additional Protective Functions and equipment to detect Distribution or Transmission System faults (per Distribution Provider's standard practices) may be required over and above the basic Protective Functions and equipment associated with the four options in the Export Screen. Protective Functions may include, but are not limited to, directional overcurrent/voltage-restraint overcurrent Protective Functions for line-to-line fault detection and overcurrent/overvoltage Protective Functions for line-to-ground detection. The addition of a ground bank or ground detector may also be necessary. (L)

(Continued)

M. INADVERTENT EXPORT (Cont'd.) (L)

2. The effect on equipment ratings can be mitigated by limiting the amount of inadvertent export allowed. To a large degree, Voltage Regulation may be similarly handled. The amount of Inadvertent Export is dependent on specific Distribution Provider requirements and should be limited to the lesser of the following values:

   a. 50% of the Generating Facility Capacity, or

   b. 10% of the continuous conductor rating in watts at 0.9 power factor for the lowest rated feeder conductor upstream of the GF (i.e. 200kW @ 12kV), or

   c. 110% of the largest load block in the facility, or

   d. 500kW or some other maximum level indicated by Distribution Provider

3. In addition to the limits above, the following are required:

   a. A reverse power Protective Function will be provided to trip the connected Generator(s) within two seconds if the proposed amount of Inadvertent Export is exceeded.

   b. The frequency of Inadvertent Export occurrences should be less than two occurrences per 24-hour period.

   c. A separate reverse power or underpower Protective Function will be required (in addition to the reverse power Protective Function described in 3a. above) to trip the connected Generator(s) if the duration of reverse power or underpower (i.e. ANY export) exceeds 60 seconds. (L)

(Continued)

Mm. INADVERTENT EXPORT FOR INTERCONNECTION REQUESTS UTILIZING UL-1741 CERTIFIED OR SA LISTED GRID SUPPORT (NON-ISLANDING) INVERTERS (L)

The following are the minimum requirements for Inadvertent Export systems that meet the criteria specified below. Other factors relevant to the interconnection study process (e.g., 15% screen results, short circuit current ratio, etc.) may necessitate additional technical requirements (e.g., reclose block, transfer trip, ground bank, etc.) that are not explicitly noted here. Inadvertent Export may not be available for interconnections to Networked Secondary Systems.

The certified control functions internal to the inverter control or external control system may be used to replace the discrete reverse/under power relay functions described in Section M provided the requirements outlined below are met.

1) All of the following requirements must be met by the Generating Facility to qualify for Inadvertent Export under this Section.

   a. The Generating Facility must utilize only UL-1741 certified or UL-1741 SA listed grid support non-islanding inverters; and,

   b. The Generating Facility must have an aggregate maximum nameplate capacity of 500 kVA or less; and,

   c. The Generating Facility's total energy export must not exceed its nameplate rating (kVA-gross) multiplied by 0.1 hours per day over a rolling 30-day period (e.g., for a 100 kVA-gross nameplate Generating Facility, the maximum energy allowed to be exported for a 30-day period is 300 kWh) ; and,

   d. Export from the Generating Facility across the PCC to the Distribution System is less than 100 kVA. (L)

(Continued)

Mm. INADVERTENT EXPORT FOR INTERCONNECTION REQUESTS UTILIZING UL-1741 CERTIFIED OR SA LISTED GRID SUPPORT (NON-ISLANDING) INVERTERS (Cont'd.) (L)

2) To govern the level of Inadvertent Export allowable under this Section, the Generating Facility must utilize a NRTL-certified control system or NRTL-certified inverter system that meets all of the following requirements.

a. Must result in the Generating Facility disconnecting from the Distribution System, ceasing to energize the Distribution System or halting energy production within two (2) seconds after either:

i. The period of continuous export exceeds 30 seconds;

or,

ii. The level of export exceeds 100 kVA.

b. Must monitor that the total energy export is maintained within the allowable energy export outlined above 1.c and provide an indication or notification (e.g., electronic, alarm) if that energy export limit is exceeded.

c. Failure of the of the control or inverter system for more than thirty (30) seconds, resulting from loss of control signal, loss of control power or a single component failure or related control sensing of the control circuitry, must result in the Generating Facility entering Non-Export operation where no energy is exported across to the PCC to the Distribution System.

Interim approval of the control or inverter system may be permitted upon mutual agreement of PG&E and the Producer. (L)

(Continued)

Mm. INADVERTENT EXPORT FOR INTERCONNECTION REQUESTS UTILIZING UL-1741 CERTIFIED OR SA LISTED GRID SUPPORT (NON-ISLANDING) INVERTERS (Cont'd.) (L)

3) Applicability of Engineering Review Screens.

Inadvertent Export systems that meet the requirements described herein are processed under Initial Review Screens A through J as described in Section H. If these systems fail Screen J, they then bypass Screens K and L and are processed under Screens M and M1 as described below.

Screen M: Is the aggregate Generating Facility capacity on the Line Section less than 15% of Line Section peak load for all line sections bound by automatic sectionalizing devices?

- If Yes (pass), Initial Review is complete.
- If No (fail), continue to Screen M1.

Screen M1: Is the aggregate of all distributed energy resources (DER) causing reverse power flow (1) at a line section with a voltage regulator device(s) or (2) at a protection device, including the circuit breaker / field recloser?*,**

- If No (pass), existing DER does not cause reverse power flow at (1) or (2) and Initial Review is complete.
- If Yes (fail), existing DER causes reverse power flow at (1) or (2); fail Initial Review and Supplemental Review is required.

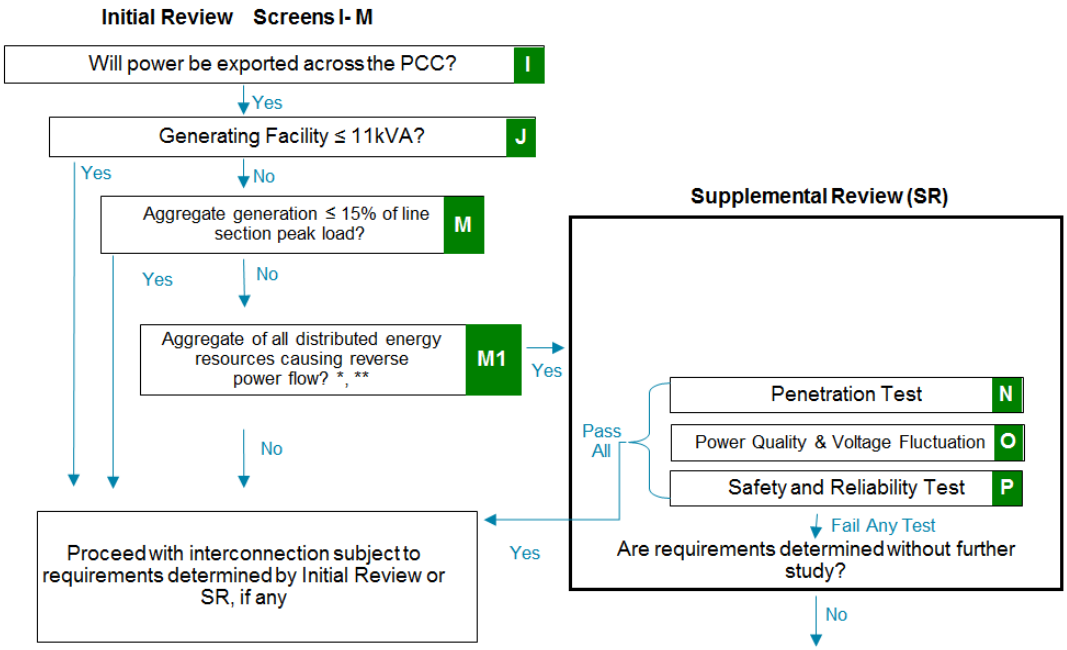
* For the purposes of applying Screen M1 herein, Distribution Provider shall utilize a zero coincidence factor when considering the impact of other Inadvertent Export systems that meet the requirements of Section Mm (i.e., projects that qualify for Option 6 under Section G.1.i) such that those Inadvertent Export systems do not impact Screen M1's aggregate analysis determination for the individual Inadvertent Export project being evaluated.

** The presence of existing non-certified DER on the line section may require additional review to ensure safe and reliable grid operation. (L)

(Continued)

Mm. INADVERTENT EXPORT FOR INTERCONNECTION REQUESTS UTILIZING UL-1741 CERTIFIED OR SA LISTED GRID SUPPORT (NON-ISLANDING) INVERTERS (Cont'd.) (L)

3) Applicability of Engineering Review Screens. (Cont'd.)



* For the purposes of applying Screen M1 herein, Distribution Provider shall utilize a zero coincidence factor when considering the impact of other Inadvertent Export systems that meet with the requirements of Section Mm (i.e., projects that qualify for Option 6 under Section G.1.i) such that those Inadvertent Export systems do not impact Screen M1's aggregate analysis determination for the individual analysis determination for the individual Inadvertent Export project being evaluated.

** The presence of existing non-certified DER on the line section may require additional review to ensure safe and reliable grid operation. (L)

(Continued)

Mm1. NON-EXPORT UTILIZING CERTIFIED POWER CONTROL SYSTEMS (L)

Generating Facilities that use certified power control systems to meet the **non-export** requirements shall meet the following six specifications.

i. Uses a power control system that has passed the requirements of the most recent UL Power Control Systems CRD test protocol;

ii. The power control system has an open-loop response time of no more than 2(two) seconds as provided in the power control system specification and certification data sheets;

iii. The Generating Facility uses only UL 1741 certified and/or UL 1741 SA listed grid-support non-islanding inverters;

iv. The power control system is set to zero-export;

v. The power control system must reduce export to below zero export in two seconds or less;

vi. The operation of the Generating Facility power control system shall maintain voltage fluctuations limits specified in Electric Rule 2.

Once satisfying the first six specifications above, the evaluation of **a non-export** Generating Facility requesting interconnection under this section shall also:

i. Omit evaluation for Screen D.

ii. Utilize the Generating Facility's gross nameplate rating for Screens F and G

Once satisfying the first six specifications above, the evaluation of a **limited export** Generating Facility requesting interconnection under this section shall also utilize the:

i. Approved limited export value to determine the impacts to the grid and in Screens D, I, J, K, M, N, O, and P;

ii. Generating Facility's gross nameplate rating for Screens F and G. (L)

(Continued)

Mm2. INADVERTENT EXPORT UTILIZING CERTIFIED POWER CONTROL SYSTEMS (L)

Generating Facilities that use certified power control systems to meet the inadvertent export requirements shall meet the following seven specifications:

i. The Generating Facility aggregate maximum gross nameplate capacity shall not exceed 1000KVA;

ii. Use power control systems that have passed the requirements of the most recent UL Power Control Systems CRD test protocol;

iii. The power control system has an open-loop response time of no more than 10(ten) seconds as provided in the control system specification and certification data sheets;

iv. The Generating Facility uses only UL 1741 certified and/or UL 1741 SA listed grid-support non-islanding inverters;

v. The power control system is set to zero-export;

vi. The power control system must reduce export to below zero export in 10(ten) second or less;

vii. The operation of the Generating Facility power control system shall maintain voltage fluctuations limits specified in Electric Rule 2.

The Distribution Provider evaluating Generating Facilities requesting interconnection under this section shall:

i. Apply Screens A through M using the aggregate inverter nameplate rating;

ii. If Supplemental Review is required, within 15 BD days of being notified by the Distribution Provider, the applicant shall identify and provide to the Distribution Provider the frequency of inadvertent export, the real power level in watts of inadvertent export and the time duration of inadvertent export;

iii. If distribution upgrades are identified, Screen P shall recognize power control parameters taking into account local feeder conditions, customer's operating profile and the magnitude, duration, and frequency of anticipated export during the review of Screen P; (L)

(Continued)

Mm2. INADVERTENT EXPORT UTILIZING CERTIFIED POWER CONTROL SYSTEMS (Cont'd) (L)

The Distribution Provider evaluating Generating Facilities requesting interconnection under this section shall (Cont'd):

iv. Complete Supplemental Review within 15 days of receiving the required information specified under ii. above in this section;

v. If the Interconnection Customer does not provide the operating profile information within the specified 15 Business Days, Distribution Provider will perform Supplemental Review based on information included in the Interconnection Request within 30 Business Days of the request for customer operating profile information;

vi. Only the largest facility operating under this Rule 21 section in the line section shall be used for aggregate evaluation for subsequent interconnection requests. (L)

(Continued)

N. EXPEDITED INTERCONNECTION PROCESS FOR NON-EXPORT ENERGY STORAGE GENERATING FACILITIES (L)

Applicants with Interconnection Requests for Non-Export Energy Storage Generating Facilities who meet the requirements outlined below are eligible for expedited interconnection in accordance with the Fast Track Process technical review requirements of Section F.2.[1] Applicants with Non-Export AC/DC Converters that meet the requirements outlined in O. below are also eligible. (L) (T)/(L) (L)

1. ELIGIBILITY REQUIREMENTS

Applicants seeking to interconnect a Generating Facility under the provisions of this Section N must meet the following eligibility requirements.

a. Applicant must electronically submit a completed Interconnection Request, including completing all application fields and submitting all supporting documentation necessary to facilitate the expedited review as required by Distribution Provider. Such documentation may include, but is not limited to, single line diagrams with specific details, manufacturer data sheets for proposed equipment, description of control systems, validation of the right to do business in the state, etc. Distribution Provider shall clearly communicate these requirements as part of the application process. Applicant shall select this process option in the Interconnection Request.

b. Applicant's Generating Facility must meet the requirements outlined in Section N.2 below.

c. Applicant's Interconnection Request must be eligible for and select the Fast Track Process.

d. Applicant's Interconnection Request must pass Fast Track Initial Review and not require any Interconnection Facilities, Distribution Upgrades or Network Upgrades to remain eligible under this Section. As such, Interconnection Requests that select the Cost Envelope Option are not eligible.

e. Applicants selecting this section shall use the corresponding interconnection agreement type provided for eligible Generating Facilities. (L)

[1] ~~In accordance with Advice 4941-E-A, the provisions provided for in Section N are being implemented under a pilot approach with a July 1, 2017 through June 30, 2018 reporting period. As such, the provisions may be continued, modified and/or withdrawn as determined by the Commission~~ (D) (D)

(Continued)

N. EXPEDITED INTERCONNECTION PROCESS FOR NON-EXPORT ENERGY STORAGE GENERATING FACILITIES (Cont'd.) (L)

2. GENERATING FACILITY ELIGIBILITY CRITERIA

An Applicant's Generating Facility must meet and adhere to the following criteria.

a. The Generating Facility must be comprised solely of the following specific categories of generation technology: Non-Exporting battery storage.

b. The Generating Facility must have an aggregate maximum inverter nameplate rating of no greater than 500 kW. There is no limitation on an energy storage device's kWh capacity rating.

c. The Generating Facility must be located behind an existing single retail meter and Point of Common Coupling with a single, clearly marked and accessible disconnect. No other Generators, other than isolated back-up Generators, may be at the same Point of Interconnection or Point of Common Coupling.

d. The Generating Facility must utilize Option 3 or Option 4 to meet the non-export protection requirements of Screen I in Section G.1.i.

e. The Generating Facility must have a single or coordinated control system for all charging functions if utilizing multiple inverters. The control system must also ensure that there is no increase in the Interconnection Customer's existing peak load demand.

f. The Generating Facility must utilize only inverter-based, UL 1741 and UL 1741 SA-listed equipment. Additionally, all installed equipment must meet Distribution Provider's current electric service requirements with no violations or variances. (L)

(Continued)

O. Non-Export AC/DC CONVERTER ELIGIBILITY CRITERIA (L)

Applicants with Non-Export AC/DC Converters who meet the eligibility criteria below qualify for the expedited interconnection process outlined in Section N of this Rule.

1. The Non-Export AC/DC Converter must have an aggregate maximum inverter nameplate rating of no greater than 500 kW. There is no limitation on an energy storage device's kWh capacity rating.

2. Applicant's Interconnection Request must be eligible for and select the Fast Track Process.

3. Applicant's Interconnection Request must pass Fast Track Initial Review and not require any Interconnection Facilities, Distribution Upgrades or Network Upgrades to remain eligible under this Section.

4. Applicants selecting this section shall use the corresponding interconnection agreement type provided for Non-Export AC/DC Converters eligible under this Section. As such, Interconnection Requests that select the Cost Envelope Option are not eligible.

5. Applicant's Non-Export AC/DC converter must meet the Certification requirements in the Section C Definition of "Non-Export AC/DC Converters". (L)

(Continued)

ELECTRIC RULE NO. 21 Sheet 261
GENERATING FACILITY INTERCONNECTIONS

Appendix A Forms Associated with Rule 21 Generating Facility Interconnections			
Form Number	Title	Associated Tariffs	Use Guidance
Pre-Application Request			
79-1181	Rule 21 Pre-Application Report Request	Rule 21	For Generator Developer to request basic info about local distribution circuit
Study Agreement			
79-1162	Rule 21 Detailed Study Agreement	Rule 21	Independent Study and Distribution Group Study Process Study Agreement
NEM and Non-Export Interconnection Forms			
79-978	Interconnection Agreement for Net Energy Metering of Solar or Wind Electric Generating Facilities of 1,000 kW or Less, Other Than Facilities of 30 kW or Less	NEM, Rule 21	Solar and/or Wind > 30 kW and ≤ 1 MW expanded NEM used with Form 79-1174-02
79-978-02	Interconnection Agreement for Net Energy Metering (NEM2) of Solar or Wind Electric Generating Facilities of 1,000 Kilowatts or Less, Other than Facilities of 30 Kilowatts or Less	NEM2, Rule 21	Solar and/or Wind > 30 kW and ≤ 1 MW expanded NEM2 used with Form 79-1174-02
79-997	Interconnection Agreement for Net Energy Metering of Biogas Digester Generating Facilities	NEM, Rule 21	NEMBIO (Closed to new applicants), NEMBIOA Interconnection Agreement used with Form 79-1174
79-1010	Interconnection Agreement for Net Energy Metering of Fuel Cell Generating Facilities	NEM, Rule 21	NEMFC Interconnection Agreement used with Form 79-1174
79-1069	Generating facility Interconnection Agreement (Multiple Tariff)	NEM, Rule 21	NEMMT Interconnection Agreement used with Form 79-1174
79-1069-02	Generating Facility Interconnection Agreement (Multiple Tariff NEM2MT)	NEM2, Rule 21	NEM2MT Interconnection Agreement used with Form 79-1174-02
79-1109 ***	Virtual Net Energy Metering Application and Interconnection Agreement For The Building Owner of Multifamily Affordable Housing With A Solar Generating Facility of 1 Megawatt or Less	NEM, Rule 21	NEMV Interconnection Agreement used with Form 79-974

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Appendix A (Cont'd.)
Forms Associated with Rule 21
Generating Facility Interconnections

Form Number	Title	Associated Tariffs	Use Guidance
NEM and Non-Export Interconnection Forms (Cont'd.)			
79-1109-02***	NEM2VMSH Virtual Net Energy Metering Application and Interconnection Agreement for the Building Owner of Multifamily Affordable Housing with a Solar Generating Facility of 1 Megawatt or Less	NEM2VMSH, Rule 21	NEM2VMSH Interconnection Agreement used with Form 79-1174-02
79-1151A	Net Energy Metering Interconnection for Solar And/or Wind Electric Generating Facilities Of 30 Kilowatts Or Less Agreement and Customer Authorization	NEM, Rule 21	NEMS Interconnection Agreement be used with 79-1151B Application
79-1151A-02	Agreement And Customer Authorization - Net Energy Metering (NEM2) Internconnection For Solar And/Or Wind Electric Generating Facilities Of 30 Kilowatts Or Less	NEM2, Rule 21	NEM2S Application to be used with 79-1151A Interconnection Agreement
79-1151B	Net Energy Metering Interconnection For Solar And/or Wind Electric Generating Facilities Of 30 Kilowatts Or Less Application	NEM, Rule 21	NEMS Application to be used with 79-1151A Interconnection Agreement
79-1151B-02	Application - Net Energy Metering (NEM2) Interconnection For Solar And/Or Wind Electric Generating Facilities Of 30 Kilowatts Or Less	NEM2, Rule 21	NEM2S Application to be used with 79-1151A-02 Interconnection Agreement
79-1124 ***	Eligible Low Income Development Virtual Net Energy Metering Application and Interconnection Agreement for Multifamily Affordable Housing with Solar Generation Totaling 1 Megawatt or Less	NEMVMASH, Rule 21	NEMVMASH Interconnection Agreement
79-1124-02***	Eligible Low Income Development Virtual Net Energy Metering (NEM2VMSH) Application and Interconnection Agreement for Multifamily Affordable Housing with Solar Generation Totaling 1 Megawatt or Less	NEM2VMSH, Rule 21	NEM2VMSH Interconnection Agreement
79-1131 ***	NEMV Application and Interconnection Agreement for a Solar (PV) or Wind Generating Facility of 1 MW or Less *Serving Multiple Tenants Served at a Single Property Delivery Point*	NEM, Rule 21	NEMV Interconnection Agreement
79-1131-02***	NEM2V Application and Interconnection Agreement for a Solar (PV) or Wind Generating Facility of 1 MW or Less *Serving Multiple Tenants Served at a Single Property Delivery Point*	NEM2V, Rule 21	NEM2V Interconnection Agreement

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Appendix A (Cont'd.)
Forms Associated with Rule 21
Generating Facility Interconnections

Form Number	Title	Associated Tariffs	Use Guidance
NEM and Non-Export Interconnection Forms (Cont'd.)			
79-1137	Interconnection Agreement for Net Energy Metering for a Renewable Electrical Generation Facility of 1,000 kW or Less, Except Solar or Wind (SB 489)	NEM, Rule 21	NEMV, NEMEXP, NEMEXPM Interconnection Agreement typically used with Forms 79-974 and 79-1142 Applications
79-1137-02	Interconnection Agreement for Net Energy Metering (NEM2/NEM2V) for a Renewable Electricity Generation Facility of 1,000 Kilowatts or Less, Except Solar or Wind	NEM2, NEM2V, Rule 21	NEM2V, NEM2EXP, NEM2EXPM Interconnection Agreement typically used with Forms 79-1174-02
79-1142 ***	NEMV Interconnection Application for a Renewable Electrical Generation Facility of 1 Megawatt or Less	NEM, Rule 21	Used with Form 79-1137 (L)
79-973	Generating Facility Interconnection Agreement For Non-Export Generating Facilities (Rule 21 Interconnection Agreement)	Rule 21	Interconnection Agreement used for RESBCT and non-NEM generation with Application 79-974 and 79-1112
79-992	Customer Generation Agreement (Third party Generator on Premises, Non-Exporting)	Rule 21	Used with Forms 79-1174
79-1070	Export Addendum to Generating Facility Interconnection Agreement for Non-Export Generating Facilities (Form 79-973) Sized 2 Megawatts or Less	Rule 21	Export addendum used with Form 79-973
79-1136	PG&E Interconnection Agreement For an Existing Small Generating Facility Interconnecting to the Distribution System under Rule 21	Rule 21	Used for existing QFs with Form 79-974 (L)
79-1192	Interconnection Agreement for Non-Export Storage Generating Facilities 500KW or Less	Rule 21	Used for expedited interconnection of non-export energy storage, pursuant to Rule 21 Section N, PG&E AL 4941-E & E-A and D.16-06-052, & Attachment C, Section II.1
79-1199	Agreement And Customer Authorization Non-Export Stand-Alone Energy Storage Of 30 Kilowatts Or Less	Rule 21	Interconnection Agreement For non-export storage ≤ 30 kW
79-1206-02	Eligible Low-Income Development Virtual Net Energy Metering (NEM2VSOM) Interconnection Agreement For The Solar On Multifamily Affordable Housing (SOMAH) Program With Solar Generation Totaling 1 Mw Or Less	NEM2VSOM	NEM2VSOM Interconnection agreement for solar 1 MW or less.

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Appendix A (Cont'd.) Forms Associated with Rule 21 Generating Facility Interconnections			
Form Number	Title	Associated Tariffs	Use Guidance
Other NEM and Non-Export Forms (Cont'd.)			
79-1130	Request to Opt-out of / Opt-in to Compensation for Surplus Electricity	NEM	AB 920- Opt not to receive compensation for net annual excess energy
79-1202 ****	Load Aggregation Appendix	NEM, NEM2, Rule 21	Use as an Appendix with Form 79-1151A, 79-1151A-02, 79-978, 79-978-02,79-1137, 79-1137-02, 79-1069 or 79-1069-02
79-1155	Schedules NEM, NEMV, NEMVMASH, Net Surplus Electricity (NSE) Renewable Energy Credits Compensation	NEM, Rule 21	
79-1155-02	Schedules NEM2, NEM2V, NEM2VMSH, Net Surplus Electricity (NSE) Renewable Energy Credits Compensation	NEM2 NEM2V NEM2VMSH, Rule 21	
79-1174	Rule 21 Generator Interconnection Application	NEM (NEMEXP, NEMMT and NEMA), NEMFC, NEMV, NEMVMASH, RES-BCT, Rule 21	Rule 21 customer interconnection application form for expanded net-energy metered (all NEM > 30 kw and all non-Solar/Wind NEM), NEMFC, NEMV, NEMVMASH, RES-BCT, and non-export and limited export Rule 21 generation. (Standard NEM for solar and/or wind ≤ 30 kw will continue to use the 79-1151B application.)
79-1174-02	Rule 21 Generator Interconnection Application	NEM2 (NEM2EXP, NEM2MT and NEM2A), NEMFC, NEM2V, NEM2VMSH, RES-BCT, Rule 21	Rule 21 customer interconnection application form for expanded net-energy metered (all NEM2 > 30 kw and all non-Solar/Wind NEM), NEMFC, NEM2V, NEM2VMSH, RES-BCT, and non-export and limited export Rule 21 generation. (Standard NEM for solar and/or wind ≤ 30 kw will continue to use the 79-1151B application.)

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Appendix A (Cont'd.)
Forms Associated with Rule 21
Generating Facility Interconnections

Form Number	Title	Associated Tariffs	Use Guidance
Export for Sale Interconnection Forms			
79-1145	Rule 21 Exporting Generator Interconnection Request	Rule 21	Preferred online application: https://www.pge.com/en_US/large-business/services/alternatives-to-pge/electric-generation-interconnection.page
79-1197	Local Government Renewable Energy Self-Generation Bill Credit Transfer (RES-BCT) Re-Allocation Request	RES-BCT	Use to establish RES-BCT benefiting account re-allocations
79-1198-02	Interconnection Agreement For Net Energy Metering (NEM2) And Renewable Electrical Generating Facility Sized Greater Than 1,000 Kw	NEM2	FT and Detailed Study Interconnection Agreement for >1MW NEM2 Generating Facilities
79-1200	Rule 21 Generator Interconnection Agreement For Exporting Generating Facilities	Rule 21	FT and Detailed Study Interconnection Agreement for Exporting Generating Facilities
Other Agreements			
79-280	Agreement for Installation of Allocation of Special Facilities for Parallel Operation of Non-Utility-Owned Generation and/or Electrical Standby Service (Electric Rules 2 and 21)	Rule 21	Special Facilities Agreement to be used with Form 79-702
79-702	Appendix A: Detail of Special Facilities Charges to be used in concert with form 79-280	Rule 21	Used with Form 79-280

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*** The application section of these forms is replaced by 79-1174.
**** For NEMA expanded customers, use the online 79-1174 form.

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APPENDIX B

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Unit Cost Guide

Distribution Provider shall publish a Unit Cost Guide for facilities generally required to interconnect generation in Distribution Provider's Distribution System. The Unit Cost Guide shall not be binding for actual facility costs and is provided only for additional cost transparency, developer reference, and Distribution Provider's reference when preparing the cost estimate provided in any applicable studies. The Unit Cost Guide shall not replace the estimated cost provided by Distribution Provider in an Interconnection Study or an initial or supplemental review under the Fast Track Process.

The Unit Cost Guide shall include the anticipated cost of procuring and installing Interconnection Facilities and Distribution Upgrades generally utilized by the Applicant. An annual adjustment shall be performed within the Unit Cost Guide for five (5) years to account for the anticipated timing of procurement to accommodate a potential range of Commercial Operation Dates.

The Unit Cost Guide shall be updated annually in accordance with the process set forth in D.16-06-052.

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PG&E Gas and Electric
Advice Submittal List
General Order 96-B, Section IV

AT&T
Albion Power Company

Alta Power Group, LLC
Anderson & Poole

Atlas ReFuel
BART

Barkovich & Yap, Inc.
California Cotton Ginners & Growers Assn
California Energy Commission

California Hub for Energy Efficiency Financing

California Alternative Energy and Advanced Transportation Financing Authority
California Public Utilities Commission
Calpine

Cameron-Daniel, P.C.
Casner, Steve
Cenergy Power
Center for Biological Diversity

Chevron Pipeline and Power
City of Palo Alto

City of San Jose
Clean Power Research
Coast Economic Consulting
Commercial Energy
Crossborder Energy
Crown Road Energy, LLC
Davis Wright Tremaine LLP
Day Carter Murphy

Dept of General Services
Don Pickett & Associates, Inc.
Douglass & Liddell

Downey & Brand
East Bay Community Energy
Ellison Schneider & Harris LLP
Energy Management Service
Engineers and Scientists of California

GenOn Energy, Inc.
Goodin, MacBride, Squeri, Schlotz & Ritchie
Green Power Institute
Hanna & Morton
ICF
IGS Energy
International Power Technology
Intestate Gas Services, Inc.
Kelly Group
Ken Bohn Consulting
Keyes & Fox LLP
Leviton Manufacturing Co., Inc.

Los Angeles County Integrated Waste Management Task Force
MRW & Associates
Manatt Phelps Phillips
Marin Energy Authority
McKenzie & Associates

Modesto Irrigation District
NLine Energy, Inc.
NRG Solar

Office of Ratepayer Advocates
OnGrid Solar
Pacific Gas and Electric Company
Peninsula Clean Energy

Pioneer Community Energy

Redwood Coast Energy Authority
Regulatory & Cogeneration Service, Inc.
SCD Energy Solutions
San Diego Gas & Electric Company

SPURR
San Francisco Water Power and Sewer
Sempra Utilities

Sierra Telephone Company, Inc.
Southern California Edison Company
Southern California Gas Company
Spark Energy
Sun Light & Power
Sunshine Design
Tecogen, Inc.
TerraVerde Renewable Partners
Tiger Natural Gas, Inc.

TransCanada
Utility Cost Management
Utility Power Solutions
Water and Energy Consulting Wellhead Electric Company
Western Manufactured Housing Communities Association (WMA)
Yep Energy