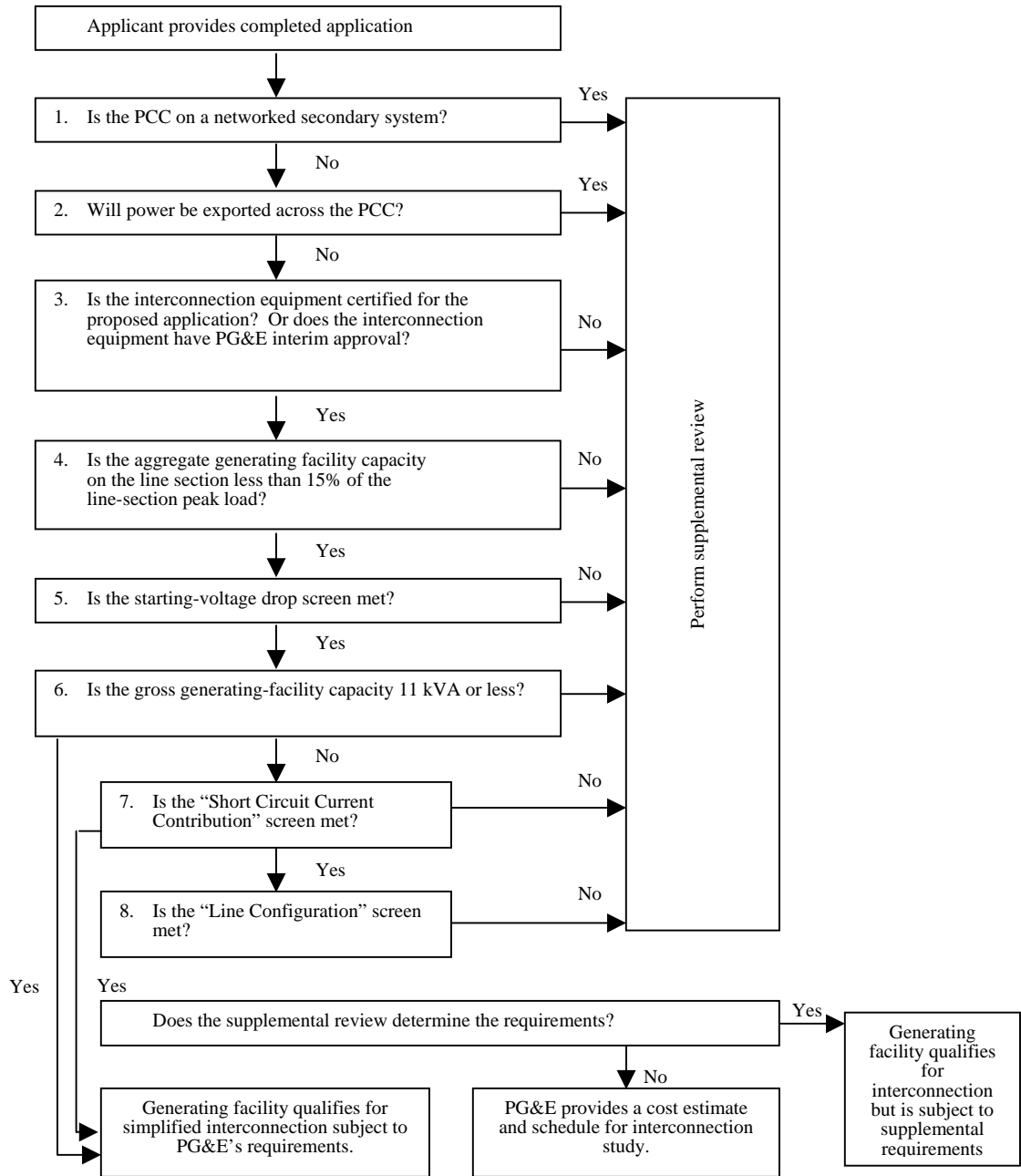


Rule 21-Generating Facility Interconnections

Initial Review Process for Applications to Interconnect Generating Facilities

Initial Review Process Flow Chart



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A Sample of the Initial Review Process

Initial Review Process Details-Martinez Detention Facility Cogen:

Section I.3 (Screen 1): Is the point of common coupling (PCC) on a networked secondary system?

No.

- If **Yes**, the distributed generation (DG) does not qualify for simplified interconnection.
 - Perform a supplemental review.
- If **No**, continue to the next screen.

Significance

PG&E gives special consideration to the DG on networked, secondary-distribution systems because of the design and operational aspects of network protectors. There are no such considerations for radial-distribution systems.

Section I.4 (Screen 2): Will power be exported across the PCC?

No, per “Generating Facility Interconnection Application,” Question B. The customer selected Answer 1.

- If **Yes**, the DG does not qualify for a simplified interconnection.
 - Perform a supplemental review.
- If **No**, the DG must incorporate one of the following four options:

- **Option 1**

To ensure that power is never exported, a reverse-power protective function must be implemented at the PCC.

The default setting must be 0.1 % (export) of the transformer rating, with a maximum time delay of 2 seconds.

- **Option 2**

To ensure at least a minimum import of power, an under-power protective function must be implemented at the PCC.

The default setting must be 5 % (import) of the DG gross nameplate rating, with a maximum time delay of 2 seconds.

○ **Option 3**

To limit the incidental export of power, the customer must ensure that all of the following conditions are met:

- ✓ The aggregate DG capacity of the generating facility must be no more than 25 % of the nominal ampere (A) rating of the customer's service equipment.
- ✓ The total aggregate DG capacity must be no more than 50% of the transformer rating. (This capacity requirement does not apply to a customer taking primary service without an intervening transformer.)
- ✓ The DG must be certified as non-islanding.

○ **Option 4**

To ensure that the relative size (capacity) of the DG compared to facility load results in no export of power without using additional devices, the DG capacity must be no greater than 50 % of the customer's verifiable minimum annual load.

Yes, per "Generating Facility Interconnection Application," Question C. The customer minimum load is 350 kW:

50 % x 350 kW = 175 kW. DG capacity is 145 kW

Significance

PG&E's distribution system does not need to be studied for load-carrying capability or DG power-flow effects on PG&E's distribution-system voltage regulators since on-site DG reduces PG&E's distribution-system load.

PG&E permits use of reverse-power relaying at the PCC as positive, anti-islanding protection.

Section I.5 (Screen 3): Is the interconnection equipment certified for the application or does the interconnection equipment have PG&E's distribution system interim approval?

Yes, it has Xantrex Trace Technologies, PV-100208 (100 kW) and PV-45208 (45 kW) inverters, which are included in the "List of Certified Inverters" 04/03/2002.

- If **Yes**, continue to the next screen.
- If **No**, the DG does not qualify for simplified interconnection.
 - Perform a supplemental review.

Significance

PG&E does not need to review, or test, the DG's protective-function scheme. However, site-commissioning tests may still be required to ensure that the system is connected properly and that the following requirements are met:

- Basic protective function requirements
- Harmonic distortion limits
- Synchronizing requirements
- Flicker limitation requirements
- Powerfactor (Pf) regulation requirements
- Non-islanding requirements
- Reverse-power function requirement, if used
- Under-power function requirement, if used

Section I.6 (Screen 4): Is the aggregate-DG capacity on the line section less than 15 % of the line section peak load?

No.

Source Side Protective Device: Fuse 2,825, load: 20 A

$15\% \times 20\text{ A} = 3.0\text{ A @ }21\text{ kV}$

DG capacity is 145 kW = 3.8 A @ 21 kV

- If **Yes**, continue to the next screen.
- If **No**, perform a supplemental review to determine the cumulative impact on the line section.

Significance

The DG's low penetration will have a minimal impact on operation and load restoration.

Section I.7 (Screen 5): Is the starting-voltage drop screen met?

Yes, this screen only applies to generating facilities that start by motoring the units.

Section I.8 (Screen 6): Is the DG capacity 11 kVA or less?

No, the DG capacity is 145 kW.

- If **Yes**, the DG qualifies for simplified interconnection.
- If **No**, continue to the next screen.

Significance

The DG has minimal impact on the fault current levels and any potential line over-voltages from the loss of the system neutral grounding.

Section I.9 (Screen 7): Is the “Short Circuit Current Contribution” screen met?

Yes.

- If **Yes**, continue to the next screen.
- If **No**, the DG does not qualify for simplified interconnection.
 - Perform a supplemental review.

“Short Circuit Current Contribution” Screen:

At the primary side (high side) of the specified feeder’s dedicated, distribution transformer, the sum of the short-circuit contribution ratios (SCCR) of all DG’s on the feeder must be less than or equal to 0.1.

The SCCR = three-phase fault contribution of all generation on the circuit/(PG&E's three-phase fault contribution).

Three-phase fault contribution of all generation on the circuit = 150 A (per application Question D). See summary note. This number appears to be load current, not fault current.

$$150 \text{ A (@ 480 V)} = 150 \text{ A} (480/21,600) = 3.33 \text{ A (@ 21 kV)}$$

$$\text{PG\&E's three-phase fault contribution} = 5,086 \text{ A (@ 21 kV)}$$

$$\text{SCCR} = 3.33/5,086 = 0.0006$$

At the secondary side (low side) of a shared-distribution transformer, the short-circuit contribution of the proposed DG must be less than or equal to 2.5 % of the interrupting rating of the customer’s service equipment.

$$150 \text{ A (@ 480 V)} / 25,000 = 0.6 \%$$

Significance

There is no significant DG impact on the following functions of the distribution system:

- Short circuit duty
- Fault detection sensitivity
- System relay coordination
- System fuse-saving schemes

Section I.10 (Screen 8): Is the “Line Configuration” screen met?

No. See the table below for three-phase, 4-wire – three-phase interconnection:

Line section peak load is 20 A @ 21 kV. Fuse 5,086: $10\% \times 20\text{ A} = 2\text{ A}$
DG capacity is 145 kVA=3.8 A @ 21 kV

- If **Yes**, then the DG qualifies for simplified interconnection.
- If **No**, then the DG does not qualify for simplified interconnection.
 - Perform a supplemental review.

“Line Configuration” Screen

PG&E identifies the primary-distribution line configuration. Based on the proposed interconnection type, PG&E determines from the table below if the DG passes the screen.

Primary-Distribution Line Type	Type of Interconnection to Primary-Distribution Line	Result/Criteria
Three-phase, 3-wire	Any	Pass screen
Three-phase, 4-wire	Single-phase, line-to-neutral	Pass screen
Three-phase, 4-wire (For any line that has such a section or mixed 3-wire and 4-wire)	All others	To pass, aggregate DG capacity must be less than or equal to 10 % of the line section’s peak load.

Significance

If PG&E’s primary distribution system is 3-wire, or the DG interconnection transformer is single-phase (line-to-neutral), then there is no concern about over-voltages to PG&E’s, or to other customers’ equipment caused by the loss of a system’s neutral grounding while anti-islanding protection is in operation.

An Example of a Summary that PG&E Provides to the Customer as Part of the Initial Review Process

Initial Review Process Details-Martinez Detention Facility Cogen:

Summary

After a review of the 145 kW photovoltaic (PV) system at the Contra Costa County Detention Center in Martinez, the application does not pass the Rule 21 checklist for several items. Refer to the attached document for more details. In addition, the customer should verify the answer to Question D in the application.

Section I.6 (Screen 4): Is the aggregate DG capacity on the line section less than 15 % of line section peak load?

No, the DG capacity is 19 %.

Section I.10 (Screen 8): Is the “Line Configuration” screen met?

No, the DG capacity is 19 %.

A supplemental review will be performed to assess the issues from Section I.6 and Section I.10 (Screen 4 and Screen 8).

Before PG&E can complete the supplemental review, the customer must verify Question D on the “PG&E Generating Facility Interconnection Application” form and provide the calculation for the fault current.

For Question D, the customer indicated that the maximum, three-phase fault current is approximately 150 A @ 480 V. This appears to be load current, not fault current. The customer must provide supporting calculations for the fault current contributed by the generator. The results of this may change the findings from Section I.9 (Screen 7).