



Interconnecting Large 2-20MW Generation Systems

Summary

This bulletin provides clarifications, updates and new criteria to the [Distribution Interconnection Handbook \(DIH\)](#) to address interconnecting larger and more generation at distribution voltages, in particular PV Solar.

It has been updated to edit the document's applicability and general background, and the allowable restart timing and ramp rates. This bulletin applies to all technologies and for all exporting generating facilities.

Affected Document

[Distribution Interconnection Handbook \(DIH\)](#)

Target Audience

In response to interconnection requests, employees must utilize the information contained in this bulletin, including but not limited to the following functions: performing studies, planning, protection, design engineering, operations, mapping, and testing.

The following requirements are effective immediately

What you need to know

Background

In April 2010, the CPUC granted final approval for PG&E's PV Solar Program, which will interconnect 500MW of PV Solar generation on the distribution system over a 5-year span. PG&E anticipates the majority of these interconnections to be in the 2 – 20 MW range.

Historically this large size of generation has rarely occurred on the distribution system, if ever, and definitely not with distributed inverter technology. In addition, the program will greatly proliferate the number of these units; 250 MW by PG&E and 250MW by third party entities.

PG&E commissioned a cross-functional technical team to clearly define and resolve any technical criteria for these new type interconnections. This resulted in creating an internal engineering design criteria document, along with some additional SGIP process improvements, methodologies and study templates.

PG&E's various other power purchase agreement programs has also created more demand than anticipated by PG&E. The large volume of requests has challenged PG&E in several ways many of which served as the foundation for the WDT reform that resulted in Attachment I of the Wholesale Distribution Tariff titled Generator Interconnection Procedures (GIP) (FERC approved April 29, 2011 and effective as of March 3, 2011).

Summary of WDT Reform

- Combine the Large Generator and Small Generator Interconnection Procedures
 - Create a methodology and timeline to study generator interconnections in clusters. The studies will be conducted in coordination with and along the same timelines as the transmission-level studies.
 - Establish an Independent Study Process that allows for smaller and electrically independent generator interconnection requests to finish studies faster.
 - Expand the existing fast track process for generator interconnections that have no impacts on the greater distribution system or on the transmission system.



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- Allow all projects a path to count for resource adequacy - by coordinating with the CAISO to offer a deliverability assessment.
- Establish study deposits and financial security posting requirements that provide an incentive for viable projects to apply for and remain in the interconnection process.

Information

To make this information available to external entities in a concise manner, the following updates and clarifications are listed in alphabetical order:

Circuit back-tie consideration:

For special consideration of generating during a back-tie circuit configuration (emergency switching), any required transfer trip protection would have to also be on the back-tie circuit. Also any planning considerations (voltage regulations) would also have to be met by the back-tie.

Circuit capability limits:

Limiting gen size per circuit to PG&E-standard equipment capabilities:

- 12MW @ 12 kV
- 20MW @ 21 kV

Dedicated circuits:

Dedicated circuits for the larger generator sites have been instituted. Dedicated circuits to be owned by PG&E (can be built by developer per utility standards though). Therefore the Point of Ownership Change (also referred to as Point of Common Coupling) is at the generator site and the Point of Interconnection (POI) is where the Interconnection Facilities meet with the Distribution System as defined in Attachment I of PG&E's Wholesale Distribution Tariff.

Direct Transfer Trip (DTT) communication requirements:

DTT may be required when the proposed generation cannot detect a Ground or Phase fault on the line section when separated from the PG&E system within 1.5-2.0 seconds, or cannot detect an island condition and trip within 2.0 seconds. Refer to PG&E bulletin, TD-2306B-002 Distributed Generation Protection Requirements for additional protection requirements.

Effective Jan. 2010, PG&E telecom requires:

- Type 4 Voice Grade 36 / 4 wire Metering Circuit with C6 conditioning
- terminated through 150 pads (Telco-provided) that work with no ac power required and don't provide loopback
- protection is HVPA4 (if Telco-provided), or A4 (if PG&E-provided)

Minimum load:

A standard methodology has been developed to calculate minimum load in reference to PV generation, and is included in the System Impact Study (SIS) template.

Monitoring true load:

Substation metering schemes must be designed to provide monitoring of true loading on circuits and transformers (planning visibility).



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Overload not allowed on equipment:

Special protection (operating) tripping schemes are not allowed, which could provide more flexible (hourly) transformer loading (overload tripping schemes are historically never utilized on transformers).

Queue process for study requests: Now established.

Ramp rate for inverter:

SET the inverter ramp rate to 10% per second, or less.

Restart timing for multiple inverters:

SET the restart timing for inverters no less than 15 seconds for each 1 MW block, to ease possible power quality impacts.

RTU needs for status points:

Having multiple transfer trips on one circuit due to multiple, separate PCCs may complicate the status requirements of typical industry equipment (requiring additional RTUs)

Scoping consistency:

A scoping template has been developed for study consistency

Study templates: Now established for consistency

Threshold methodology for 15% peak load:

Peak load is monitored and recorded by PG&E for all distribution circuits. The minimum load hasn't traditionally been monitored, yet has been made available in recent years on a few installations via remote metering. Minimum load on radial circuits is typically 30% of the peak load. The data sampling period should be at least one year and represent typical system loading conditions.

Islanding becomes a power quality and protection concern when the maximum aggregate generation on a radial distribution circuit approaches 50% of the minimum load. Therefore, planning engineers use a 15% of peak load screen (50% of 30%) to quickly identify if the interconnection request poses a potential islanding and power quality concern. If the interconnection request and aggregated generation exceed 15% of peak load, PG&E can re-evaluate this screen using minimum load if available as opposed to peak load. Failing this screen a second time would indicate that further study is necessary and special protection requirements may result to allow the interconnection.

Tripping generation automatically under loss of communication:

Defined that any loss of communication (for 10 seconds) on singular transfer trip signals (no redundancy) requires immediate tripping of generation (i.e. cannot guarantee anti-islanding under loss of communication).

Underfrequency concerns:

Avoid interconnecting to existing underfrequency load-shed (UFLS) blocks; this prevents tripping significant generation along with load.

Voltage flicker concerns:

Any dramatic change in current will cause a dramatic change in voltage. This can occur



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whenever the generator main breaker opens, or during clouding. Flicker is limited to 2 volts (2.5%) on 120V base in urban areas or 5 volts (4.17%) on a 120V base in rural areas.

Definitions

CPUC -- California Public Utility Commission
FERC – Federal Energy Regulatory Commission
GIP – Generator Interconnection Procedures
LGIP – Large Generator Interconnection Procedures
SGIP – Small Generator Interconnection Procedures

References

[Distribution Interconnection Handbook \(DIH\)](#)

TD-2306B-002 Distributed Generation Protection Requirements

[Transmission Interconnection Handbook \(TIH\)](#)

[Wholesale Generation Interconnection Services Webpage](#)

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Inclusion Plan This bulletin superseded and canceled bulletin TD-2306B-001 revision 0. This bulletin will be uploaded along with the DIH on PG&E's external web page.

The information in this bulletin will be incorporated into the next revision of the [DIH](#), and then it will be canceled.
