

## Introduction

### ***I-1. PURPOSE***

The PG&E Transmission Interconnection Handbook (TIH) documents the technical requirements for the interconnection of loads and generators to PG&E's Power System. The process of maintaining the TIH and publishing timely updates in a manner accessible to all is required in NERC Standard [FAC-001-2](#). See Section 1.9 below. The TIH is based on applicable Federal Energy Regulatory Commission ([FERC](#)) and California Public Utilities Commission ([CPUC](#)) rules and tariffs (e.g. Electric Rules, [2](#), [21](#), and [22](#)), as well as accepted industry practices and standards contained within the Applicable Reliability Criteria<sup>1</sup>. The TIH meets PG&E's technical requirements for reliability, maintenance, operability and PG&E and public safety.

Although the TIH address certain aspects of interconnection cost responsibility, their scope is primarily technical and does not include the commercial requirements for receiving transmission service, distribution service, or any other electric service from PG&E. Tariffs and rules filed with the [FERC](#) and the [CPUC](#) address the rates, terms and conditions under which PG&E or the California Independent System Operator (California ISO) provides these services. If there are any inconsistencies between the TIH and the tariffs and rules, the latter shall control.

### ***I-2. INTRODUCTORY DEFINITIONS***

**PG&E Power System:** For the purposes of these handbooks the PG&E Power System is defined as electric transmission and/or distribution facilities owned by PG&E regardless of whether the facilities are operated by PG&E or are under the Operational Control of the California ISO.

**Load Entity:** A person, company or corporation interconnected to PG&E's Power System owning or operating only power consuming facilities.

**Transmission Entity:** A person, company, or corporation interconnected to PG&E's Power System owning or operating electrical power transmitting facilities.

**Generation Entity:** A person, company, or corporation interconnected to PG&E's Power System owning or operating Generation Facilities (including back-up and emergency generation).

The applicable voltage levels, MW, MVAR capacity or demand at the point of interconnection are included in the relevant sections of these handbooks. Any connected entity owning or operating power consuming, transmission and power generating facilities shall be considered a Generation Entity for the purposes of the TIH. For example, energy storage is treated like a generator. The technical requirements for interconnection of generation sources are most comprehensive. Any Load-only entity or Transmission Entity, which is interconnected to a third party electric system having generation capabilities shall also be considered a Generation Entity for the purposes of the TIH. Technical requirements for multi-interconnected and network systems (systems

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<sup>1</sup> Refer to Glossary for definition of Capitalized terms.

interconnected to the PG&E power system in addition to a third party system) will be determined by PG&E on a case-by-case basis.

### **I-3. HANDBOOK APPLICABILITY**

The TIH applies to Retail and Wholesale Entities which own or operate generation, transmission, and end user facilities that are physically connected to, or desire to physically connect to the PG&E Power System. Applicability is further defined by category below.

#### **I-3.1. New Load, New Transmission and Generation Facilities**

All applicable technical requirements described or referred to in the TIH apply to load entities, transmission facilities and new or decommissioned generation facilities which have not been and are not yet connected with the PG&E Power System. Additional technical requirements may apply to special business arrangements or electrical configurations of the PG&E Power System or the interconnection point(s). Any such technical specifications would be documented through an interconnection agreement.

Decommissioned generation facilities are facilities which were actively connected to the PG&E Power System in the past but are presently neither connected nor actively producing power. Refer to [www.pge.com/b2b/newgenerator/](http://www.pge.com/b2b/newgenerator/) for information regarding procedures for generator interconnection. It is necessary for the decommissioned generator to upgrade existing equipment to adhere to these handbooks if the decommissioned Generating Entity intends on re-powering their facility.

#### **I-3.2. Existing Load or Transmission Facilities**

**Retail:** All applicable technical requirements described or referred to in the TIH apply to existing Load or Transmission Facilities which have previously established an interconnection with the PG&E Power System. To the extent the TIH contain more stringent requirements than were in place at the time the Load or Transmission Facility initially connected, the Load or Transmission Entity (owner of the existing Load or Transmission Facility) shall be responsible for adhering to current requirements. The cost of any upgrading shall be born by either the Load Entity or by PG&E pursuant to applicable Electric Rules and the terms of any executed agreements between the Load or Transmission Entity and PG&E.

**Wholesale:** Existing contracts govern the technical interconnection requirements for existing wholesale loads or transmission facilities. Unless modified through mutual agreement or unless PG&E's current or future requirements apply pursuant to the terms of existing contract, the technical provisions of these existing agreements concerning physical interconnection remain applicable. For information concerning the interconnection and operation of loads under these agreements please contact PG&E's Electric Transmission Contract Management Department (municipal utilities, federal power marketing agencies, and investor-owned utility agreements).

### **I-3.3. Existing Generation Facilities**

All the applicable technical requirements described or referred to in the TIH may not apply to existing Generation Facilities. Existing Generation Facilities are facilities which have previously established an interconnection with the PG&E Power System. Standing decisions of the CPUC grandfather the application of CPUC [Electric Rule 21](#)<sup>2</sup> to certain existing generators which signed certain standard offer power purchase agreements. For information concerning the interconnection and operation of generators under these agreements please contact the Utility Electric Supply Department.

To the extent the TIH contains more stringent requirements than were in place at the time the Generation Facility initially connected, the Generation Entity (owner of the existing Generation Facility) shall be responsible for adhering to current requirements only to the extent that the safety and reliability of the power system or the safety of utility employees would be jeopardized by not adhering to the current requirements. The cost of any upgrading shall be born by either the Generation Entity or by PG&E pursuant to applicable Electric Rules and/or the terms of any executed agreements between the Generation Entity and PG&E.

In cases where the reliability of the PG&E Power System is jeopardized or where compliance with national, regional, or state reliability standards is mandatory, certain technical standards outlined in the TIH may apply irrespective of PG&E's authority to impose the interconnection requirements.

Readers should be aware that the information in the TIH is subject to change. Parties interconnecting to the PG&E Power System should verify with their PG&E representative that they have the latest versions. PG&E will not agree to interconnect new loads, transmission facilities or generators unless all technical and contractual requirements are met. Copies of the current [PG&E Transmission Interconnection Handbooks \(TIH\)](#) and interconnection coordination procedures are available on the [PG&E website](#)<sup>3</sup>.

### **I-4. ELECTRIC INDUSTRY RESTRUCTURING**

In 1998, the California ISO has assumed operational control of the three IOUs (the "ISO Controlled Grid") and is responsible for providing transmission service to Wholesale Load, Transmission, and Generation Entities.

Each of the IOUs remain responsible for interconnection of transmission and distribution facilities.

The California ISO may, from time to time, work with transmission owners to develop new or modify existing technical requirements specified within the TIH. The California ISO also reviews and comments on specific interconnection proposals to the ISO Controlled Grid and may impose specific requirements to ensure system reliability.

<sup>2</sup> [http://www.pge.com/tariffs/tm2/pdf/ELEC\\_RULES\\_21.pdf](http://www.pge.com/tariffs/tm2/pdf/ELEC_RULES_21.pdf)

<sup>3</sup> <http://www.pge.com/>

However, persons interconnecting with transmission or distribution facilities owned by PG&E should continue to contact a representative of PG&E regarding interconnection.

Several new tariffs and contracts apply to the use of transmission and distribution facilities within California:

- (1) [California ISO Tariff](#),
- (2) Transmission Control Agreement ([TCA](#)),
- (3) [Transmission Owner Tariff](#) of the three initial participating transmission owners, and
- (4) Other agreements mandated or approved by regulatory agencies.

If any provision of these FERC-accepted agreements conflict with a provision of the TIH, the provision of the applicable FERC-accepted agreement or tariff shall take precedence. Similarly, the [CPUC](#) will continue to regulate most retail electric service and interconnections. If any provision of PG&E's Tariffs or Electric Rules approved by the [CPUC](#) conflicts with a provision of the TIH, the provision of the applicable rule or tariff shall take precedence. Refer to [www.pge.com/b2b/newgenerator/](http://www.pge.com/b2b/newgenerator/) for information regarding procedures for generator interconnection.

## ***I-5. PROCEDURES FOR DEVELOPING TRANSMISSION PLANS AND COORDINATED JOINT STUDIES***

### **I-5.1. Procedures for Developing Transmission Plans**

California ISO Corporation's Tariff, Section 24, and the business rules set forth in the California ISO Business Practice Manual, require PG&E to participate in the annual California ISO Transmission Planning Process (TPP). PG&E performs the following:

- NERC's Transmission Planner functions,
- Conduct local and bulk transmission planning studies of its service area under the direction of the California ISO for inclusion in the California ISO's TPP;
- Propose new facilities;
- Prepare cost estimates for proposed and alternative facilities;
- Conduct interconnection and facility studies,
- Participate in regional/sub-regional planning groups
- Construct projects when designated under the [CAISO Tariff](#).

Development of PG&E's annual transmission grid expansion plan is coordinated within the California ISO's TPP, which encourages all interested market participants to participate and provide comments and input on PG&E's transmission plans. The California ISO's TPP is structured into three stages:

- Development of Unified Planning Assumptions and California ISO Study Plan

- Performing technical studies for assessment of system reliability
- Documentation of technical study results and development of transmission plans proposals

### **I-5.2. Procedures for Coordinated Joint Studies**

Unless there are conflicts with [FERC](#) or state standards (such as Critical Energy Infrastructure Information—CEII—and/or standards or code of conduct issues), PG&E will:

- Form ad hoc groups
- Distribute results
- Facilitate any required meetings between the entity requesting interconnection, PG&E, California ISO, any potentially affected electric systems, and any governing authorities in accordance with the [FERC](#) Large Generation Interconnection Procedures/Agreements (LGIP/LGIA). This includes requesting potentially affected parties to participate in joint studies and following accepted [WECC](#) regional planning practices.
  - If a potential CEII conflict arises,
    - (1) Require a confidentiality agreement
    - (2) and may require FERC approval

Results of coordinated joint studies shall be documented along with any conclusions and recommendations. Such documentation shall be retained by PG&E and shall be made available, as soon as feasible, if requested by [WECC](#), [NERC](#), or any other entities responsible for the reliability of the interconnected transmission system.

## ***I-6. ORGANIZATION OF TRANSMISSION INTERCONNECTION HANDBOOK***

The interconnection standards are organized into three principal parts:

- The Generation Chapter (Sections G-1 through G-6), which applies to Generation Entities and Scheduling Coordinators
- The Load and Transmission Chapter (Sections L-1 through L-5), which applies to Load Facilities and Transmission Facilities
- Glossary, contacts, appendices, and references

Capitalized terms used throughout these handbooks are defined in the [Glossary](#). Figures, forms, and tables are located at the end of each Section except when otherwise noted.

## ***I-7. STANDARD AND PROJECT-SPECIFIC INTERCONNECTION REQUIREMENTS***

PG&E has established standard operating, metering and equipment protection requirements for loads and generators. The TIH cover such requirements for all transmission-level (60 kilovolts and above) Load, Transmission, and Generation Entities wishing to interconnect with the PG&E Power System. Additional, project-specific requirements may apply. These additional requirements may vary according to the size and nature of the load, transmission facility or generator, or the local configuration of PG&E's existing power system. These requirements, if any, will be identified through studies performed by PG&E prior to interconnection. When entities wish to connect directly to the ISO Controlled Grid, PG&E provides the California ISO with relevant information concerning the proposed interconnection (e.g. interconnection study results, etc.). PG&E will transmit any California ISO comments or suggested requirements to the entity requesting interconnection. For Generation Facilities, PG&E will also follow the relevant [California ISO procedures](#)<sup>4</sup>.

The California ISO may develop its own or additional standards or requirements, in consultation with PG&E and other stakeholders, to assure consistency across the ISO Controlled Grid. PG&E will update the TIH to reflect California ISO standards adopted through the process described in the [California ISO Tariff](#).

### **COSTS AND STUDIES**

Studies will determine whether PG&E will be required to add or modify its transmission and distribution system to interconnect the requesting party. Entities requesting interconnection to the ISO Controlled Grid are responsible for the cost of necessary studies and shall pay for any additions or modifications to the PG&E Power System (special facilities) needed for the interconnection and for those portions of the interconnection facilities owned and maintained by PG&E at the interconnecting entity's request.. Such facilities may include metering and data processing equipment. CPUC Special Facilities Agreements for Load and Transmission Entities are included as Appendices [J](#) and [K](#). [FERC](#) jurisdictional Special Facilities Agreements are unique to each project, but follow similar principles.

Please contact your PG&E representative for details about the study process and additional data requirements which may apply.

## ***I-8. CUSTOMER-OWNED EQUIPMENT REQUIREMENTS***

Interconnected Load, Transmission or Generation Entities are responsible for designing, installing, operating, and maintaining interconnection equipment they own. All protective devices necessary to protect the interconnected entity's facilities are the responsibility of the interconnected entity.

PG&E's requirements specified in the TIH are designed to protect PG&E facilities and maintain grid reliability pursuant to the Applicable Reliability Criteria; they are not designed to protect the facilities of any other interconnected entity.

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<sup>4</sup> <http://www.pge.com/b2b/newgenerator/wholesalegeneratorinterconnection/>

Interconnected entities must satisfy the requirements in the TIH, applicable rules and tariffs of the [CPUC](#), [FERC](#), Western Electricity Coordinating Council ([WECC](#)), the North American Electric Reliability Corporation ([NERC](#)), the [California ISO](#) and any project-specific requirements of PG&E. Disclaimer: PG&E’s review and written acceptance of the interconnected entity’s equipment specifications and detailed plans shall not be construed as confirming or endorsing the interconnected entity’s design, as warranting the equipment’s safety, durability, or reliability, or in any way relieving the interconnecting entity from its responsibility to meet the above requirements. PG&E shall not, by reason of such review or lack of review, be responsible for strength, details of design, adequacy or capacity of equipment built to such specifications, nor shall PG&E’s acceptance be deemed an endorsement of such equipment.

### ***I-9. COMPLIANCE WITH NERC INTERCONNECTION STANDARDS***

NERC Standard FAC-001-2, “Facility Connection Requirements,” Requirement R1 states that PG&E “shall document Facility interconnection requirements, update them as needed”. These facility connection requirements shall be documented and updated from time to time as required. All updates will be documented in the [Update History](#) available on line. Requirement R1 further states that PG&E shall make them available upon request.

NERC Standard [FAC-001-2](#), “Facility Connection Requirements,” requirement R3.1 states, in its Facility interconnection requirements, the Transmission Owner shall address "Procedures for coordinated joint studies of new or materially modified existing interconnections and their impacts on affected system(s)." To meet this requirement, studies performed to achieve the required system performance may include, but are not limited to:

- Short circuit
- Power flow
- Transient stability
- Harmonics
- Voltage

With respect to coordination, the planning of interconnection installations will be coordinated through phone calls and conference calls, meetings, possible site visits, and sharing study results and data with affected transmission owners. WECC policies, procedures, and guidelines governing the coordination of plans are detailed in the WECC, “[Project Coordination, Path Rating and Progress Report Processes](#)”.

#### **Project Coordination, Path Rating and Progress Report Processes**

Requirement 3. 2 further states, that the Transmission Owner will address “Procedures for notifying those responsible for the reliability of the affected system(s) of new or materially modified existing interconnection”. To comply with this requirement, plans for new or modified facilities will be provided to PG&E’s interconnection customer as requested and as governed by PG&E’s tariff. Additionally, plans for new or modified

facilities, which can impact WECC Interconnected System operations will be provided to WECC when they can be made publicly available. Documents governing the coordination of plans, and providing models for modification of new or modified facilities include “WECC Progress Report Policies and Procedures”, “Project Coordination, Path Rating and Progress Report Processes”, “WECC Data Preparation Procedural Manual for Power Flow and Stability Studies”, “WECC Dynamic Modeling Procedure”, and “WECC Approved Dynamic Model Library”.

This document provides for compliance for PG&E with NERC Standard FAC-001-2. This section provides direction to find compliance with the requirements in FAC-001-2. The following Table 1 gives the location in this document where each requirement of FAC-001-2 R1 and R3 is met. Some requirements are general and are addressed in many locations, but at least some of the locations are listed.

**Table 1. NERC Standard FAC-001-2 Facility Connection Requirements**

<b>NERC Standard FAC-001-2 Requirement</b>	<b>Location in Relevant Section/Page</b>
R1. The Transmission Owner shall document Facility interconnection requirements, update them as needed, and make them available upon request.	<ul style="list-style-type: none"> <li>• Introduction, I-1</li> <li>• Introduction, I-3</li> <li>• Introduction, I-7</li> <li>• Introduction, I-8</li> </ul>
R3. Each Transmission Owner shall address the following items in its Facility interconnection requirements:	<ul style="list-style-type: none"> <li>• Introduction, I-5.1</li> </ul>
R3.1 Procedures for coordinated studies of new or materially modified existing interconnections facilities and their impacts on affected system(s).	<ul style="list-style-type: none"> <li>• Introduction, I-5.2</li> </ul>
R3. 2. Procedures for notifying those responsible for the reliability of affected system(s) of new or materially modified existing interconnections.	<ul style="list-style-type: none"> <li>• Introduction, I-5.2</li> </ul>
Procedures for requesting a new Facility interconnection or material modification to an existing interconnection	<ul style="list-style-type: none"> <li>• Introduction, I-3</li> </ul>
Voltage level and MW and MVAR capacity or demand at point of connection.	<ul style="list-style-type: none"> <li>• Introduction, I-2</li> </ul>
Breaker duty and surge protection.	<ul style="list-style-type: none"> <li>• Section L2.1 &amp; L2.4</li> <li>• Section G2</li> </ul>
System protection and coordination.	<ul style="list-style-type: none"> <li>• Section L2</li> <li>• Section G2</li> <li>• Appendix D</li> </ul>
Metering and telecommunications.	<ul style="list-style-type: none"> <li>• Section L1-D</li> <li>• Section L1-T</li> <li>• Section G1</li> <li>• Section L2</li> <li>• Section G2</li> </ul>
Grounding and safety issues.	<ul style="list-style-type: none"> <li>• Appendix D</li> </ul>
Insulation and insulation coordination.	<ul style="list-style-type: none"> <li>• Section L1-D</li> <li>• Section L1-T</li> <li>• Appendix D</li> </ul>
Voltage, Reactive Power, and power factor control.	<ul style="list-style-type: none"> <li>• Section L4.3</li> <li>• Section L3.3-L3.4</li> <li>• Section G3</li> </ul>



<b>NERC Standard FAC-001-2 Requirement</b>	<b>Location in Relevant Section/Page</b>
Power quality impacts.	<ul style="list-style-type: none"> <li>• Section L3.2 &amp; L3.8</li> <li>• Section L4.6</li> <li>• Section G3.3</li> <li>• Section G4.5</li> </ul>
Equipment ratings.	<ul style="list-style-type: none"> <li>• Appendix D</li> </ul>
Synchronizing of facilities.	<ul style="list-style-type: none"> <li>• Section L4.1 &amp; L4.2</li> <li>• Section G3</li> <li>• Section G4.2</li> </ul>
Maintenance coordination.	<ul style="list-style-type: none"> <li>• Section L2.4</li> <li>• Section L3.6</li> <li>• Section L4.5</li> <li>• Section L5.3</li> <li>• Section G2.4, G2.7 &amp; G2.17</li> <li>• Section G4.2</li> <li>• Section G5.4</li> <li>• Appendix F</li> <li>• Appendix S</li> <li>• Appendix T</li> </ul>
Operational issues (abnormal frequency and voltages).	<ul style="list-style-type: none"> <li>• Section L2.1</li> <li>• Section L4.3</li> <li>• Section G2.1 &amp; G2.10</li> <li>• Section G4.2</li> </ul>
Inspection requirements for existing or new facilities.	<ul style="list-style-type: none"> <li>• Section L5</li> <li>• Section G5</li> <li>• Section G6</li> </ul>
Communications and procedures during normal and emergency operating conditions	<ul style="list-style-type: none"> <li>• Section L4.2 &amp; L4.3</li> <li>• Section G4.2</li> </ul>

## **I-10. General Recommendations Concerning the Contents of Local CEQA Documents**

*NOTE: This should not be considered legal advice for a specific project but rather general guidance and observations arising out of past experience with interconnection permitting. The California Public Utilities Commission (“CPUC”), not PG&E, is the entity that will determine whether a CEQA document is adequate for purposes of CPUC permitting or noticing.*

### **I-10.1 EIR adopted with significant and unavoidable impacts in any environmental impact categories**

General Order 131-D provides an exemption from formal permitting requirements if PG&E’s proposed facilities are adequately described and included in the developer’s larger generation project California Environmental Quality Act (“CEQA”) review and “for which the final CEQA document . . . finds no significant unavoidable environmental impacts caused by the proposed line or substation.” (GO 131-D, § III.B.1.f.) Thus, in order for PG&E’s interconnection facilities to qualify for the Notice of Construction (NOC) process under this exemption, the lead agency must include a finding in each impact area that construction of PG&E’s facilities will not result in a potentially-significant impact – even if the larger generation project will. (This can also be accomplished in a summary finding. If the lead agency adopts a mitigated negative declaration or finds that all impacts can be mitigated to less-than-significant, then no separate finding is needed for PG&E’s facilities.) If the lead agency is unable to make that finding for the PG&E facilities, PG&E’s interconnection work will not qualify for the larger project-CEQA exemption. If the interconnection work does not qualify for any other NOC exemptions, PG&E will be obligated to follow the CPUC’s formal permitting and approval process, including CEQA review, prior to construction mobilization on the PG&E interconnection facilities.

### **I10.2 First section in your document**

The first section should clearly indicate what approval is before the lead agency (which is necessarily an approval for an aspect of the generation project) and specifically explain that the facilities that PG&E’s is constructing are not part of the project being approved by the local agency. Rather, because PG&E’s interconnection facilities are necessary for the generation project to operate, those facilities are part of “the whole of [the developer’s] action” that will result in “a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment” and are thus part of the “project” for purposes of CEQA review only.

Sample: The CUP Amendment for the Solar Facility is proposed by XXX Solar Company (Applicant). The County of XX is the lead agency, and the County

Board of Supervisor has the authority to approve the CUP Amendment for the Solar Facility. While the County does not have approval authority over PG&E's Gen Tie-Line, which is under the sole discretionary jurisdiction of the California Public Utilities Commission (CPUC), the County's EIR must include an assessment of the direct and reasonably foreseeable indirect physical changes resulting from the Solar Facility, including PG&E's construction of the Gen Tie-Line. Thus, this [EIR/MND] includes analysis of the impacts from both of the project components: CUP Amendment and Gen Tie-Line.

Further Example: If the first sentence of your document reads "This chapter of the Addendum describes the modifications to the project that have been proposed by the project proponent," we suggest you add "as well as new information concerning the utility facilities and upgrades that may be needed to interconnect the project to PG&E's electrical system." This distinguishes the project proposed by the project proponent from PG&E's facilities.

### **I10.3 Mitigation Measures v. APMs**

Since the local agency does not have jurisdiction over PG&E's facilities, it does not have authority to impose mitigation measures on PG&E's project. However, the lead agency can review the environmental impacts of PG&E's project, including all of PG&E's Avoidance and Protection Measures ("APMs") (which are incorporated into PG&E's project), and determine whether impacts are less than significant. Because the scope of PG&E's interconnection facilities tends to be comparatively small, impacts would ordinarily be less than significant. If the lead agency has concerns that there may be a significant impact in any impact area without further APMs, they should contact PG&E to work out an additional APM or APMs to address that concern and enable the lead agency to make a finding of less-than-significant impacts in that impact area.

### **I10.4 Not Obligating PG&E**

It is important to NOT obligate PG&E to comply with mitigation measures or other requirements to which the PG&E team has not specifically agreed to in the Request For Information (RFI) process.

### **I10.5 Local Ordinances**

Note that PG&E is not subject to local (City or County) ordinances or regulations (including discretionary grading permits, tree ordinances, and design reviews), since the CPUC has preemptive jurisdiction over the siting, design, construction and operation of investor-owned utility facilities. Nothing in the Addendum should indicate otherwise.

## 10.6 Building Code Exemption

Similarly, PG&E's utility equipment is exempt from building code requirements. However, substation/switching station walls (only needed to address aesthetics concerns) and certain buildings or building foundations may require a building permit.

## 10.7 General Worst-Case Assumptions

If design on the interconnection facilities is not yet done, we recommend that you provide general, worst-case assumptions on the sizes of everything described. For example:

- If you refer to underground cable, include "or overhead".
- Don't provide exact dimensions for a switching station, substation or substation expansion. For example, rather than stating that the substation will require X and Y footage dimension, state that the expansion will be up to approximately 5 acres. (In our experience, initial estimates are usually much smaller than what PG&E will need.) That way, the analysis will cover the worst case.
- Include several options (minimum 2) for potential gen-tie routes or switching station locations.
- Figures showing substation expansions might be better deleted, since they may be incorrect.
- When speaking of the need to reconfigure existing lines into a substation, describe the work (e.g., this will require removing existing poles and installing new light duty steel and tubular steel poles) without indicating the number of poles removed and installed. In the alternative, over-estimate.
- Overestimate the number of poles needed for a new line or extension; always use "approximately" even when saying "up to approximately 20 poles." If you provide pole heights, assume they will be at least 100' tall, possibly taller. Always use "approximately." Reference the Interconnection Agreement NU and DA Transmission line scope for guidance and, at a minimum, include everything identified. Be aware, however, that necessary additional facilities may be identified at the walk-down meeting or during the engineering process.
- Generalize descriptions of the equipment: use "a new breaker-and-a-half bus and other new equipment" rather than "a 6-circuit breaker breaker-and-a-half bus" – assuming that you know it will be a breaker-and-a-half bus. Say "typically, this would include . . ." or "preliminary plans include . . . but may include other utility facilities as determined during project engineering" and label any figures as "typical XXX."

**I10.8. Impact analyses sections**

Confirm that PG&E’s facilities are specifically addressed, especially in the areas where the interconnection facilities may have different impacts than those of the generation project. If the PG&E facilities are outside the generation project boundary, then all impact areas (e.g., bio, cultural) will need to be specifically addressed and additional surveys completed. The issues that seem to be most critical for our facilities are aesthetics, air quality/greenhouse gas (GHG), biology, cultural and agricultural.

**I10.9. Aesthetics**

Suggest using a “typical” switching station photograph to assist with the analysis. If there is any chance that fiber and/or a microwave tower and building will be needed to support the project, include a “typical” drawing and analysis. Gen-tie lines should also be included. Overestimate sizes of poles, towers and switching station facilities.

**I10.10 GHG analysis**

The CPUC likes to see a specific discussion with estimates before and after GHG “mitigation”; see partial sample below and include our standard GHG APMs. Remember that new breakers will contain Sulfur Hexafluoride (SF6), a GHG, so there will be less-than-significant impacts if the project includes breakers.

Sample Conclusions using CPUC GHG Guidance:

A summary of GHG emissions from construction activities is presented in Table 10.1. The emissions of N2O and CH4 from construction were not included in the calculations. Emissions of N2O and CH4 from combustion sources are minimal, approximately less than 2 percent of the CO2 emissions (this includes adjusting to CO2-equivalent emissions). Emissions of the majority of GHG will be temporary and limited to the construction period.

TABLE 10.1 -- Estimated Construction Related Greenhouse Gas Emission<sup>1</sup>

<u>Business as Usual (no mitigation)</u>	<u>With 5% Equipment Use Reduction</u>
Tons/Year	Tons/Year
1,722.94	1,648.27

1 – Emissions values are expressed in CO<sub>2</sub> rather than CO<sub>2</sub>e, as the URBEMIS model does not include values for other GHGs. Although not included in these estimates, emissions of GHGs other than CO<sub>2</sub> for construction activities are expected to be less than 1% of total emissions

Emission rates from Project construction were estimated using URBEMIS 2007 9.2.4 software. Daily emissions vary throughout the construction period depending on the type of equipment and duration of use. Project construction criteria pollutant emissions were calculated and have been discussed in Impact III-Air Quality. Equipment shutoff was assumed to reduce use time by five percent. Construction GHG emissions were calculated both before and after implementation of Best Performance Standards (BPS) by the applicant.

#### **I10.11. GHG APMs**

- Encourage construction workers to carpool to the job site to the extent feasible. The ability to develop an effective carpool program for the project will depend upon the proximity of carpool facilities to the area, the geographical commute departure points of construction workers, and the extent to which carpooling will not adversely affect worker arrival time and the project's construction schedule.
- Minimize unnecessary idling time through application of a “common sense” approach to vehicle use—if a vehicle is not required immediately or continuously for construction activities, its engine will be shut off. Construction foremen will include briefings to crews on vehicle use as part of pre-construction conferences. Those briefings will include discussion of a “common sense” approach to vehicle use.
- Maintain construction equipment in good working order
- Minimize construction equipment exhaust by using low-emission or electric construction equipment where feasible. Portable diesel fueled construction equipment with engines 50 hp or larger and manufactured in 2000 or later will be registered under the California Air Resources Board (CARB) Statewide Portable Equipment Registration Program, or shall meet at a minimum US EPA/CARB Tier 1 engine standards.

#### **I10.12. SF<sub>6</sub>-specific APMs**

- Incorporate [Substation/Switching Station Name] into PG&E's system-wide SF<sub>6</sub> emission reduction program. Since 1998, PG&E has implemented a programmatic plan to inventory, track, and recycle SF<sub>6</sub> inputs, and inventory and monitor SF<sub>6</sub> leakage rates in order to facilitate timely replacement of leaking breakers. PG&E has improved its leak detection procedures and increased awareness of SF<sub>6</sub> issues within the company. X-ray technology is now used to inspect internal circuit breaker components to eliminate dismantling of breakers, reducing SF<sub>6</sub> handling and accidental releases. As an active member of EPA's SF<sub>6</sub> Emission Reduction Partnership for Electrical Power Systems, PG&E has focused on reducing SF<sub>6</sub> emissions from its transmission and distribution operations and has reduced the SF<sub>6</sub> leak rate by 89 percent and absolute SF<sub>6</sub> emissions by 83 percent.

- Require that new breakers have a manufacturer's guaranteed leakage rate of 0.5 percent per year or less for SF<sub>6</sub>. [In projects being constructed by the developer, please utilize PG&E substation design criteria and obtain PG&E equipment approval prior to ordering.]
- Maintain substation breakers in accordance with PG&E's maintenance standards.
- Comply with California Air Resources Board Early Action Measures as these policies become effective.