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## Appendix A

# Panoche Energy Center Project System Impact Study Plan

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# Interconnection System Impact Re-study Plan

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Panoche Energy Center, LLC

Panoche Energy Center Project

REVISION 1 (PG&E)



California ISO  
Your Link to Power

October 3, 2006

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[Attachment 1 - Generation Projects](#)

## 1. Project Summary

Panoche Energy Center, LLC, an Interconnection Customer (IC), has submitted a re-study request to the California Independent System Operator Corporation (CAISO) for the Panoche Energy Center Project (the Project). There is no change to the existing four gas turbine generators and the maximum net output of 401 MW to the grid. The Point of Interconnection is remained at the same 230 kV bus at PG&E’s Panoche Substation. However the re-study request changed the type and size of step-up transformers and the commercial operation date to September 2009.

## 2. Interconnection System Impact Re-study Scope Summary

Under CAISO’s Large Generator Interconnection Procedures (LGIP) and due to higher queued generation projects dropping out of the queue, both CAISO and PG&E have agreed that an Interconnection System Impact Re-study (ISIR) is required to re-evaluate the impact of the Project on PG&E’s transmission grid. This re-study plan will form the basis for the ISIR Agreement (ISIRA) by defining the scope, content, assumptions, and terms of reference of this ISIR. This ISIR will:

- Identify transmission system impacts caused solely by the Project, and
- Identify the system reinforcements, if any, necessary to mitigate the adverse impact of the Project under various system conditions.

## 3. Re-study Schedule

The following table shows the milestones/schedules required for the ISIR.

Task	Milestone Description	Target Date
1	Establish study commencement date	September 21, 2006
2	Draft report for CAISO review	November 5, 2006
3	Issue SIS report	November 20, 2006

Table 3-1: Study Schedule

## 4. Project and Interconnection Information

Table 5-1 provides general information about the Project:

Project Location	In the immediate vicinity of PG&E's Panoche Substation, Firebaugh, California
PG&E Planning Area	San Joaquin Valley Region
Number and Type of Generators	Four (4) gas turbine generators; Type: GE-LMS100
Maximum Generator Output	102.5 MW each or 410 MW total
Generator Auxiliary Load	9 MW
Maximum Net Output to Grid	401 MW
Power Factor	0.85
Step-up Transformer	Four step-up transformers (one for each generator). Each is a three-phase, 13.8/230 kV, and 75/100/125 MVA.
Description Of Interconnection Configuration	Interconnecting to the 230 kV bus at PG&E's Panoche Substation
Connection Voltage	230 kV

Table 5-1: The Panoche Energy Center General Information

Figure 5-1 provides the map for the Project and the transmission facilities in the vicinity area. A conceptual one-line diagram of the Project is shown in Figure 5-2.

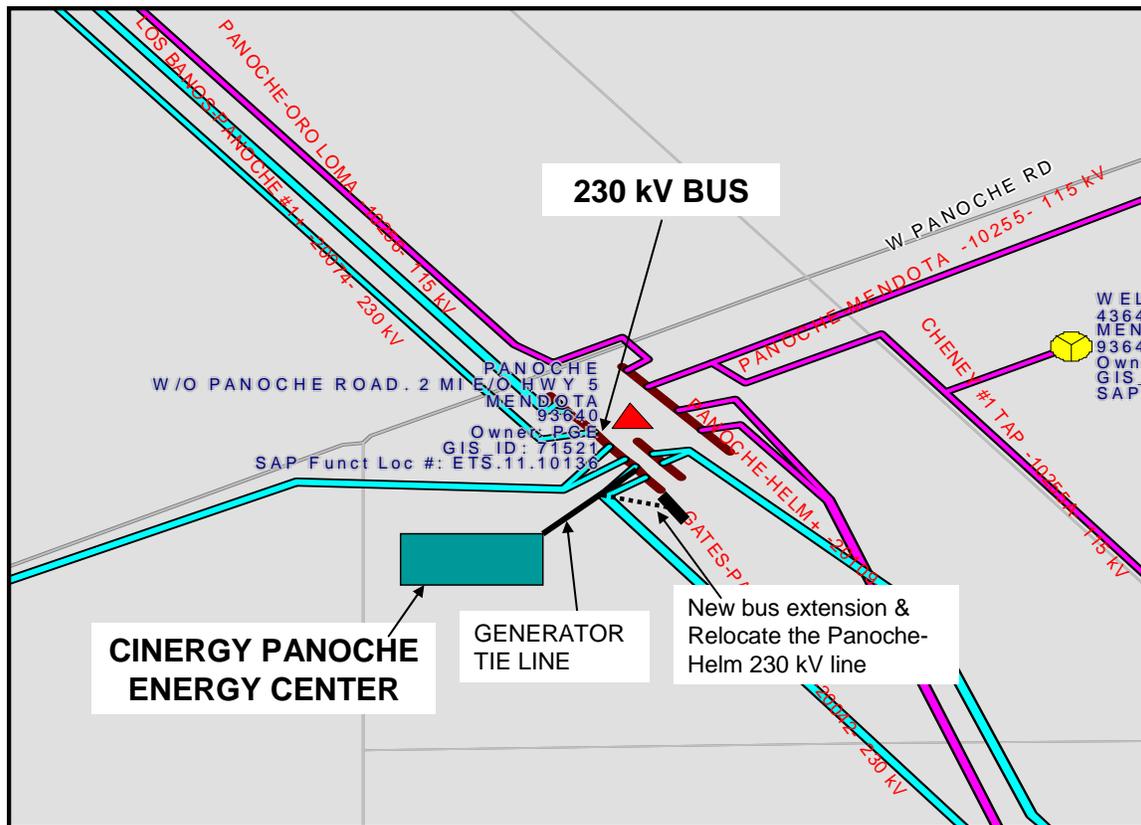


Figure 5-1: Map of the Panoche Energy Center Project

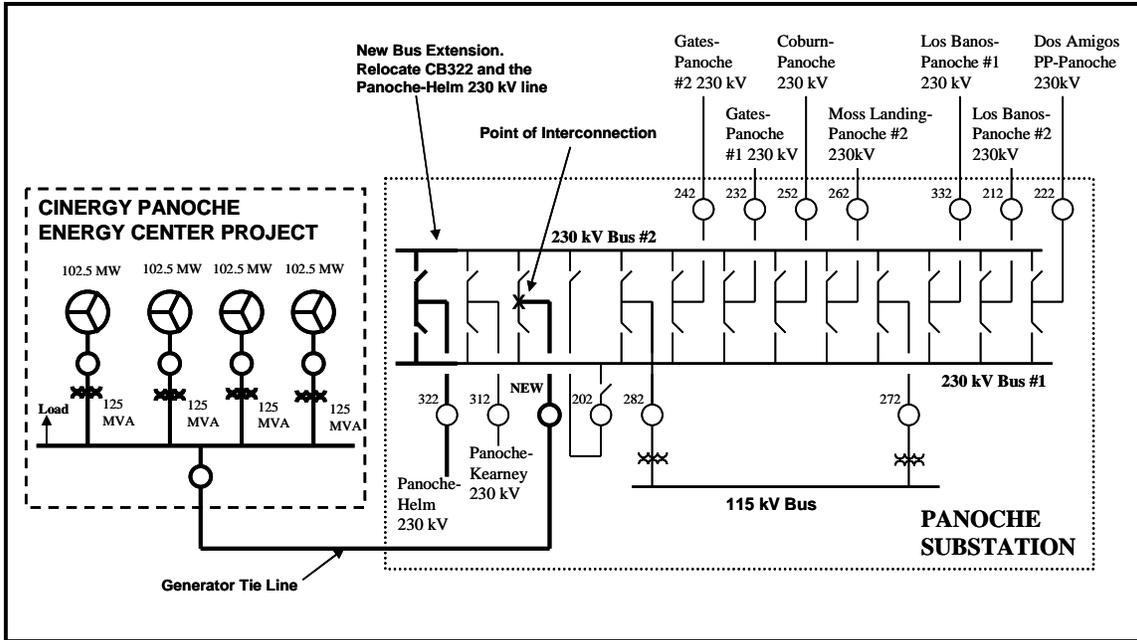


Figure 5-2: Conceptual One-Line Diagram

## 5. Interconnection System Impact Re-study Assumptions

PG&E will conduct this ISIR using the following assumptions:

1. The Project consists of four gas turbine generators, and each is rated for 102.5 MW. The total maximum total output is 410 MW with an expected total plant load of 9 MW. Therefore, the maximum net output to the grid is 401 MW.
2. The expected commercial operation date is September 2009.
3. The Project employs four step-up transformers and one for each generator. Each transformer is a three phase, 13.8/230 kV transformer, rated 75/100/125 MVA (OA/FA/FA). The impedance is about 10% at 75 MVA base.
4. The IC will engineer, procure, construct, and maintain its project facility.
5. The IC will engineer, procure, and construct the generator tie line (from the Project to Panoche Substation). The generator tie line is about 1,000' long with 795 ACSS or equivalent conductors.
6. This study will take into account the planned generating facilities in PG&E's service territory whose schedules are concurrent with or precede the Project's schedule.
7. **This study assumed that the Project could be interconnected using the existing bus configuration at this substation. The final configuration of the substation bus will be determined in the Interconnection Facility Study (IFAS) process. The final configuration may be different in order to conform to PG&E's existing standards for bus design. Any additional**

**interconnection costs resulting from a new bus configuration will be the responsibility of the Project.**

## 6. Power Flow Base Cases

Three power flow base cases will be used to evaluate the transmission system impacts of the Project. While it is impossible to study all combinations of system load and generation levels during all seasons and at all times of the day, these three base cases represent extreme loading and generation conditions for the study area.

PG&E cannot guarantee that the Project can operate at maximum rated output 24 hours a day, year round, without system impacts, nor can PG&E guarantee that the Project will not cause system impacts during the times and seasons not studied in the ISIR.

- **2010 Summer Peak Base Case:**

Power flow analysis will be performed using PG&E's 2010 Summer Peak Area 6 Base Case (in General Electric Power Flow format). This base case was developed from PG&E's 2005 base case series and has a 1-in-10 year extreme weather load level for the Greater Fresno areas.

- **2010 Spring Peak Base Case:**

Power flow analysis will be performed using the 2010 Spring Base Case in order to evaluate the potential congestion on transmission facilities under reduced load and increased generation levels during a typical Spring season. Hydro generation will be modeled in a very high level as typical in the spring season.

- **2010 Summer Off-Peak Base Case:**

Power flow analysis will be performed using the 2010 Summer Off-Peak base case in order to evaluate potential congestion on transmission facilities during the off-peak system condition. The Summer Off-Peak load will be modeled at 50% of the summer peak load in the Greater Fresno area. The Path 15 flows will be around 5,000 MW in a south-to-north direction. Two units at Helms PGP (620 MW total) will be assumed in pumping mode, and the Madera Unit is generating at 28 MW.

These three base cases will model all approved PG&E transmission reliability projects that will be operational by 2010. These three base cases will also model all proposed generation projects that will be operational by 2010. However, some generation projects that are electrically far from the Project will be either turned off or modeled with reduced generation to balance the loads and resources in the power flow model. The major generation projects included are shown in [Attachment 1](#).

## 7. Detailed Interconnection System Impact Re-study Scope

The ISIR will determine the impact of the Project on PG&E's transmission system. In addition, the ISIR will perform a revised informational assessment, as needed, of other utilities' portions of the CAISO Controlled Grid, as directed by the CAISO in consultation with the potentially impacted utilities. The ISIR will provide a list of facilities on the PG&E portion of the CAISO Controlled Grid, a non-binding good faith estimate of cost responsibility, and a non-binding good faith estimated time to construct.

The specific studies conducted are outlined below:

### 7.1 Steady State Power Flow Analysis

Power Flow analysis will be performed using the three base cases described in [Section 6](#). The three base cases will be used to simulate the impact of the new facility during normal operating conditions, as well as, single (CAISO Categories "B") and selected multiple (CAISO Categories "C") outages. The study will cover the transmission facilities within PG&E's Greater Fresno areas.

The single (CAISO Category "B") and selected multiple (CAISO Category "C") contingencies include the following outages:

#### 7.1.1 CAISO Category "B"

- All single generator outages within the study area.
- All single (60 - 230 kV) transmission circuit outages within the study area.
- All single transformer outages within the study area.
- Selected overlapping single generator and transmission circuit outages for the transmission lines and generators within the study area.

#### 7.1.2 CAISO Category "C"

- Selected bus (60-230 kV) outages within the study area.
- Selected outages caused by selected breaker failures (excluding bus tie and sectionalizing breakers) at the same above bus section.
- Selected combination of any two-generator/transmission line/transformer outages (except ones included above in Category "B") within the study area
- Selected outages of double circuit tower lines (60-230 kV) within the study area.

## 7.2 System Protection Analysis

Short circuit studies will be performed to determine the maximum fault currents on various buses in the vicinity of the Project. The ISIR will assess the impact of increased fault duty resulting from the added generation. Equipment that may become overstressed because of the added generation will be identified.

Preliminary system protection requirements will be provided.

## 7.3 Reactive Power Deficiency Analysis

With the generation project included in the system model, CAISO Category "B" and "C" contingencies will be analyzed to identify any reactive power deficiency:

- If they result in voltage drops of 5% or more from the pre-project levels, or
- If they fail to meet applicable voltage criteria.

A post-transient power flow analysis will be performed, if deemed necessary, after considering the network topology or power transfer paths involved when a significant amount of power transfer occurs.

## 7.4 Dynamic Stability Analysis

Dynamic stability studies will be conducted using the 2010 Summer Peak Full Loop Base Case, to ensure that the transmission system remains in operating equilibrium through abnormal operating conditions after the new facility begins operation.

Disturbance simulations will be performed for a study period of up to 20 seconds to determine whether the new facility will create any system instability during the following line and generator outages:

### 7.4.1 CAISO Category "B"

- Full load rejection 401 MW of the Project.
- A three-phase close-in fault on the Gates-Panoche #1 230 kV line at the Panoche Substation 230 kV bus with normal clearing time followed by loss of the Gates-Panoche #1 230 kV line.
- A three-phase close-in fault on the Los Banos-Panoche #1 230 kV line at the Panoche Substation 230 kV bus with normal clearing time followed by loss of the Los Banos-Panoche #1 230 kV line.
- A three-phase close-in fault on the Panoche-Kearney 230 kV line at the Panoche Substation 230 kV bus with normal clearing time followed by loss of the Panoche-Kearney 230 kV line.

- A three-phase close-in fault on the Moss Landing-Panoche 230 kV line at the Panoche Substation 230 kV bus with normal clearing time followed by loss of the Moss Landing-Panoche 230 kV line.

#### 7.4.2 CAISO Category "C"

- A three-phase fault on Panoche Substation 230 kV bus with normal clearing time.
- A three-phase fault on Panoche Substation 230 kV bus with normal clearing time followed by loss of the Gates-Panoche #1 and #2 230 kV lines.
- A three-phase fault on Panoche Substation 230 kV bus with normal clearing time followed by loss of the Los Banos-Panoche #1 and #2 230 kV lines.
- A three-phase fault on Panoche Substation 230 kV bus with normal clearing time followed by loss of the Panoche-Helm and Panoche-Kearney 230 kV lines.

### 7.5 Transmission Line Evaluation

PG&E's transmission line evaluation will identify any existing equipment requiring upgrades to mitigate overload or overstress due to the new generation, if any.

### 7.6 Substation Evaluation

PG&E's substation evaluation will identify any existing equipment requiring upgrades, if any, to mitigate problems caused by overstress or overload due to the Project.

The substation evaluation for the ISIR will not include the work scope and cost estimates of the new equipment at existing PG&E substations needed to accommodate the Project.

### 7.7 Land Evaluation

For the ISIR, PG&E's Corporate Real Estate Department will not perform an evaluation to determine if any new land rights are necessary to upgrade PG&E facilities that may be impacted by the Project, such as constructing the new generator tie line and re-conductoring of existing PG&E transmission lines, if required.

### 7.8 Deliverability Assessment

A Deliverability Assessment will be performed which shall determine the Project's ability to deliver its energy to the CAISO Controlled Grid under peak load condition. The Deliverability Assessment results will provide the IC:

- A deliverability level with no Network Upgrades
- The required Network Upgrades to support 100% deliverability

**CAISO will provide the Deliverability Assessment.**

## 8. Environmental Evaluation/ Permitting

### 8.1 CPUC General Order 131-D

Pacific Gas and Electric Company (PG&E) is subject to the jurisdiction of the California Public Utilities Commission (CPUC); and must comply with CPUC General Order 131-D (Order) on the construction, modification, alteration, or addition of all electric transmission facilities (i.e., lines, substations, etc.). This includes facilities to be constructed by others and deeded to PG&E. The Order exempts PG&E from obtaining a formal permit from the CPUC on facilities over 200 kV provided the planned facilities involve the replacement of existing facilities or supporting structures with equivalent facilities or structures, the minor relocation of existing facilities, the conversion of existing facilities to underground or the placing of new or additional conductors, insulators, or their accessories on or replacement of structures already built. These exemptions do not apply under certain circumstances when significant environmental impacts may be caused by the work. If the project does not qualify for an exemption, PG&E will need to seek formal approval from the CPUC (i.e., Certificate of Public Convenience and Necessity) taking as much as 18 months or more since the CPUC may decide to conduct its own environmental evaluation (i.e., Negative Declaration or Environmental Impact Report).

For cases where PG&E can claim a valid exemption, PG&E would file an Advice Letter with the CPUC and publish public notice of the proposed construction of the facilities. The noticing process takes about 90 days if no protests are filed, but should be done as early as possible so that a protest does not delay construction. PG&E has no control over the time it takes the CPUC to respond when issues arise. If the protest is granted, PG&E will then need to apply for a formal permit to construct the project (i.e., Certificate of Public Convenience and Necessity).

Facilities built or modified under this procedure must also be designed to include electric and magnetic field (EMF) mitigation measures pursuant to PG&E "EMF Design Guidelines of New Electrical Facilities: Transmission, Substation and Distribution".

Please see Section III, B.1(f) in General Order 131-D. This document can be found in the CPUC's web page at:

[http://www.cpuc.ca.gov/PUBLISHED/GENERAL\\_ORDER/589.htm](http://www.cpuc.ca.gov/PUBLISHED/GENERAL_ORDER/589.htm)

## 8.2 CPUC Section 851

Pacific Gas and Electric Company (PG&E) is subject to the jurisdiction of the California Public Utilities Commission (CPUC) and must comply with Public Utilities Code Section 851, which among other things requires CPUC approval of leases and licenses to use PG&E property. This includes rights-of-way granted to third parties for interconnection facilities. Obtaining CPUC approval for a Section 851 application can take several months, and requires compliance with the California Environmental Quality Act (CEQA). PG&E recommends that Section 851 issues be identified as early as possible so that the necessary application can be prepared and processed.

## 9. Stand-by Power

The ISIR will not address any requirements for stand-by power that the Project may require. The IC should contact their Generation Interconnection Services Representative regarding this service.

Note: The IC is urged to contact their Generation Interconnection Services Representative promptly regarding stand-by service in order to ensure its availability for the Project's start-up date.

## 10. Study Updates

This SIS is performed according to the assumptions shown in the Sections titled "[Interconnection System Impact Re-study Assumptions](#)" and "[Power Flow Base Cases](#)". In the event that these assumptions are changed, a re-study according to the LGIP may be required to re-evaluate the Project's impact on PG&E's transmission grid. The IC would be responsible for paying for any such updating study.

## Attachment 1 – Generation Projects

<b>PG&amp;E Generation Projects</b>						
<b>PG&amp;E Queue Position</b>	<b>Applicant Name</b>	<b>Project Name</b>	<b>Nearest Substation</b>	<b>Capacity (MW)</b>	<b>Latest Expected On-Line Date</b>	<b>Modeled In Study Cases</b>
1	Mirant	Contra Costa Power Plant Unit 8 Power Project	Contra Costa	590	2009	Yes
2	Midway Power, LLC	Tesla Power Project	Tesla	1156	2010	Yes
3	Duke Energy Morro Bay LLC	Morro Bay Modernization Project	Morro Bay	1200	2008	Yes
4	Federal Power Avenal, LLC	Avenal Energy Project	Gates	620	2009	Yes
5	Sacramento Municipal Utility District	Solano Wind Project	Russell	92	2007	Yes

<b>Non-PG&amp;E Generation Projects to Be Modeled in Base Case per On-line Year</b>						
	<b>Applicant Name</b>	<b>Project Name</b>	<b>Nearest Substation</b>	<b>Capacity (MW)</b>	<b>Latest Expected On-Line Date</b>	<b>Modeled In Study Cases</b>
SMUD	Sacramento Municipal Utility District	Consumns Power Plant	Rancho Seco (SMUD)	500	2006	Yes
TID	Turlock Irrigation District	Walnut Energy Center	Walnut (TID)	250	2006	Yes
SVP	Silicon Valley Power	Los Esteros Critical Energy Facility	SSS (SVP)	320	2008	Yes

## Attachment 1 – Generation Projects

<b>PG&amp;E Generation Projects - ISO Generation Interconnection Queue</b>						
<b>Project ID #</b>	<b>Applicant Name</b>	<b>Project Name</b>	<b>Nearest Facility</b>	<b>Capacity (MW)</b>	<b>Latest Expected On-Line Date</b>	<b>Modeled In Study Cases</b>
P0301	Confidential	Confidential	Birds' Landing Switchyard	150	2006	Yes
P0302	Gaviota Energy / Global Renewable	Lompoc Wind Power Project	Cabrillo	119	2008	Yes
P0304	FPL Energy, LLC	High Winds III	Birds' Landing Switchyard	38	2007	Yes
P0401	Confidential	Confidential	Birds' Landing Switchyard	150	2006	Yes
P0402	City and County of San Francisco	San Francisco Electric Reliability Power Project	Potrero	145.1	2008	Yes
P0403	Confidential	Confidential	Collector Station at Geysers #17 & Fulton Line	201	2006	Yes
P0404	City and County of San Francisco	San Francisco Airport Electric Reliability Project	San Francisco Airport	48.7	2008	Yes
P0406	Confidential	Confidential	Panoche	49.9	2006	Yes
P0408	Confidential	Confidential	Tesla-Stockton 115 kV Line	60	2006	Yes
P0409	D. Milne Associated, LLC	Ripon Generation	Tesla	96.9	2007	Yes
P0411	Confidential	Confidential	Humboldt Power Plant Substation	166	2008	Yes
P0412	Confidential	Confidential	Birds' Landing Switchyard	200	2008	Yes
P0413	Confidential	Confidential	East Shore	118	2007	Yes
P0418	Confidential	Confidential	McCall	302	2008	Yes
P0424	Calpine	Russell City Energy Center	East Shore	361	2010	Yes
P0427	Calpine	East Altamont Energy Center	Tracy Substation	531	2008	Yes
P0429	Confidential	Confidential	Herndon-Kearney 230 kV Line	200	2008	Yes

