System Impact Study

Generation Interconnection

Cinergy Solutions, Inc

Bullard Energy Center

May 17, 2005

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Appendices:

1. Summary

Cinergy Solutions, Inc. (Cinergy) proposes to interconnect a new 200 MW generating facility to Pacific Gas & Electric's (PG&E's) Herndon-Kearney 230 kV line in Fresno, California. The project is called the Bullard Energy Center Project (Bullard EC Project). The planned operational date of this project is June 1, 2008. Cinergy has requested that PG&E conduct a System Impact Study (SIS) for this project. The SIS determined:

- The transmission system impacts caused solely by the interconnection of the Bullard EC Project.
- The system reinforcement necessary to mitigate any adverse impact of the Bullard EC Project under various system conditions.

To determine the system impacts caused by the addition of the Bullard EC Project, studies were performed using the following full loop base cases:

- 2008 Summer Peak
- 2008 Summer Off Peak
- 2009 Spring Peak

The studies performed included:

- Steady State Power Flow
- Dynamic Stability
- System Protection
- Substation Evaluation

PG&E's evaluation has concluded that the interconnection of the Bullard Project would cause one normal overload and three (3) emergency overloads during conditions studied for 2008 and 2009.

Dynamic Stability Study results indicated that the transmission system's transient performance would not be significantly impacted by the Bullard EC Project following selected disturbances.

The System Protection Study has concluded that the protection requirements for the Bullard EC Project would consist of replacing the existing line protection and carrier equipment at Kearney and Herndon. The Herndon – Bullard EC 230kV line would have a fully redundant, double-pilot current differential scheme utilizing dual fiber optic communications and the Bullard EC – Kearney 230kV line would utilize a two terminal carrier scheme.

The Substation Evaluation found that the addition of the Bullard EC Project would overstress four (4) 115 kV breakers at Herndon Substation.

2. Project and Interconnection Information

The Cinergy Bullard Energy Center Project consists of two gas turbine generators rated for 205.2 MW with a plant auxiliary load of 5.2 MW. The maximum net output to the grid will be 200 MW. The generators will have a 13.8/230 kV step-up transformer. The proposed project will loop into PG&E's Herndon-Kearney 230 kV line via a new substation to be built by Cinergy. A conceptual one-line diagram of the project is shown in Figure 2-1.

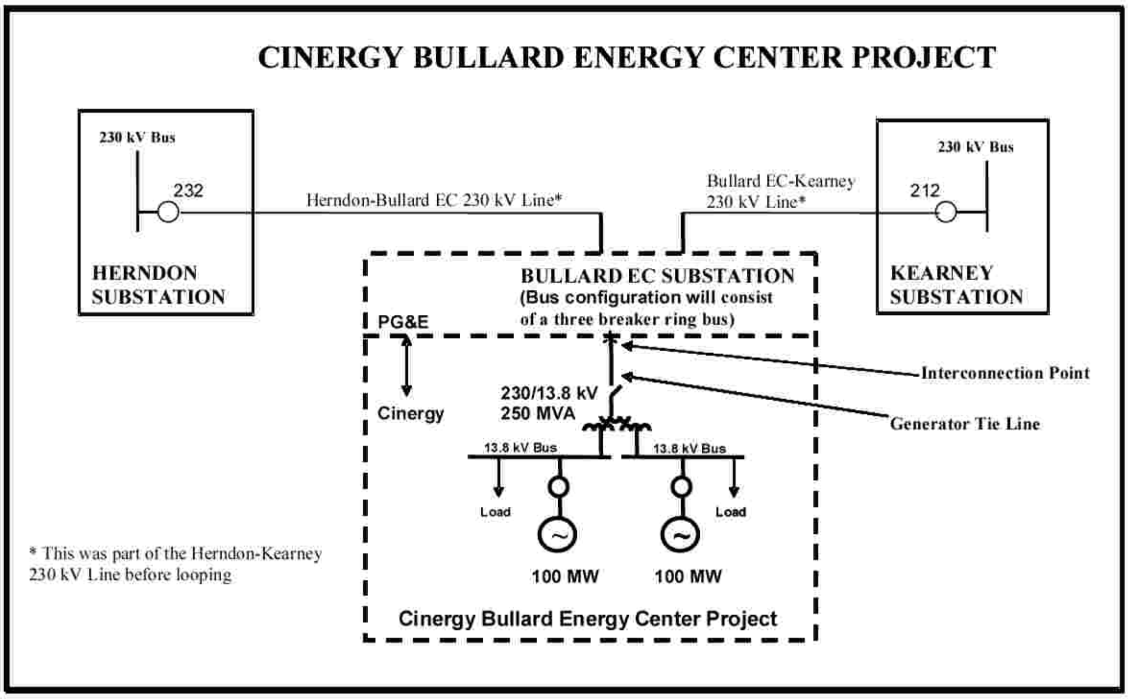

Figure 2-1: Conceptual one-line Diagram

A map showing the transmission facilities in the vicinity of the project is provided in Figure 2-2.

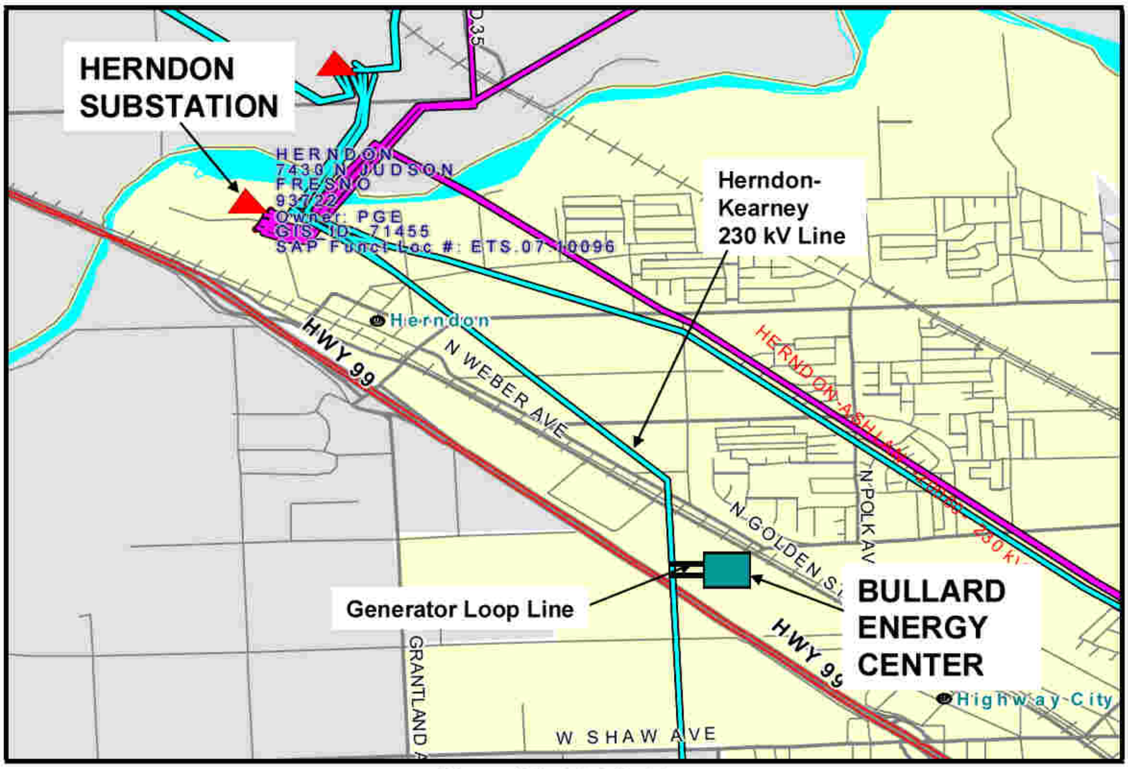

Figure 2-2: Vicinity Map

3. Study Assumptions

PG&E conducted the SIS using the following assumptions:

1) Bullard EC will consist of two gas turbine generators, each rated for 102.6 MW. The total expected plant out put is 205.2 MW. The total plant load is 5.2 MW. The maximum net output to the grid is 200 MW.

2) The commercial operating date is June 1, 2008.

3) The step-up transformer is a three phase, 13.8/230 kV transformer, rated 150/200/250 MVA (OA/FA/FA) with an impedance of 9% @ 150 MVA base.

4) Cinergy Inc. will engineer, procure, construct, own, and maintain its project facility.

5) 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.

4. Power Flow Study Base Case

Three power flow base cases were used to evaluate the transmission system impacts of the Cinergy Bullard EC 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 reasonable loading and generation conditions for the study area.

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

Power flow analysis and governor power flow analysis was conducted using all three base cases. The 2008 Summer Peak Full Loop Base Case was used for dynamic stability analysis.

- **2008 Summer Peak Base Case:**

  Power flow analysis and dynamic stability analysis were performed using PG&E's 2008 Summer Peak Area 6 Base Case (in General Electric Power Flow format). This base case was developed from PG&E's 2004 base case series and had a 1-in-10 year extreme weather load level for the Greater Fresno areas.

- **2009 Spring Peak Base Case:**

  Power flow analysis were performed using the 2009 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. Typical Spring season peak load were applied in this Spring Base Case. Hydro generation was modeled in a very high level as typical in the spring season.

- **2008 Summer Off-Peak Base Case:**

  Power flow analysis were performed using the 2008 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 were modeled at 50 % of 2008 summer peak load level in the Greater Fresno areas. The Path 15 flows were around 5,000 MW in a south-to-north direction. Two units at Helms PGP (620 MW total) were assumed in pumping mode.

These three base cases modeled all the approved PG&E transmission reliability projects that would be operational by June 2008.

Base Case Key Generation Assumptions

These three base cases modeled all proposed generation projects that would be operational by June 2008. However, some generation projects that were electrically far from the proposed project were either turned off or modeled with reduced generation to balance the loads and resources in the power flow model. The major generation projects included can be found in Attachment 1 of Appendix A.

5. Study Criteria Summary

The CAISO Controlled Grid Reliability Criteria, which incorporate the Western Electricity Coordinating Council (WECC) and the North American Electric Reliability Council (NERC) planning criteria, were used to evaluate the impact of the project on the PG&E transmission system.

5.1 Steady State Study Criteria – Normal Overloads

Normal overloads are those that exceed 100 percent of normal ratings. The CAISO Controlled Grid Reliability Criteria requires the loading of all transmission system facilities be within their normal summer ratings.

5.2 Steady State Study Criteria – Emergency Overloads

Emergency overloads are those that exceed 100 percent of emergency ratings. The emergency overloads refer to overloads that occur during single element contingencies (Category "B") and multiple element contingencies (Category "C").

5.3 Dynamic Stability Study Criteria

According to the WECC Disturbance-Performance Table of Allowable Effects on Other Systems[1], after a Category "B" disturbance, the transmission system performance should meet the following criteria:

- Transient voltage dip should not be below 25 percent at load buses or 30 percent at non-load buses at any time.
- The duration of the transient voltage dip greater than 20 percent should not exceed 20 cycles at load buses.
- The minimum transient frequency should not fall below 59.6 Hz for more than 6 cycles at load buses.

After a Category "C" disturbance, the transmission system performance should meet the following criteria:

- Transient voltage dip should not be below 30 percent at any bus at any time.

[1] Cited from Draft Western Electricity Coordinating Council (WECC) Planning Standards published in December 2, 1999.

- The duration of a transient voltage dip greater than 20 percent should not exceed 40 cycles at load buses.
- The minimum transient frequency should not fall below 59.0 Hz for more than 6 cycles at load buses.

6. Steady State Power Flow Study and Results

The SIS studied the impact of the Cinergy Bullard EC Project on the PG&E transmission system. Three base cases were used to simulate the impact of the new facility during normal operating conditions, as well as, single and multiple (Categories "B" and "C") outages:

- 2008 Summer Peak
- 2008 Summer Off-Peak
- 2009 Heavy Spring

These base cases are described in Section 4 ("Base Case Information"). The SIS covered the transmission facilities within PG&E's Fresno Division.

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

6.1 Contingencies

The Category "B" and "C" contingencies used in this analysis are provided in Appendix B. The single (Category "B") and selected multiple (Category "C") contingencies include the following outages:

6.1.1 Category "B"

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

6.1.2 Category "C"

- Selected bus outages within the study area.
- Selected outages of double circuit tower lines within the study area.

6.2 Results

Appendix B provides a list of the contingencies studied. Appendix C shows the steady state power flow analysis results. Appendix D includes selected power flow plots.

6.2.1 Normal Overloads (Category "A")

The addition of the Cinergy Bullard EC Project normally overloads the new Herndon-Bullard EC 230 kV line under 2008 summer off-peak conditions. The following table summarizes the normal overload condition.

Over Loaded Component	Rating (Amps)	Pre- Project Loading (Amps |%Rating)		Post-Project Loading (Amps |%Rating)		% Change from Pre-Project Loading
Category A Normal Overloads – 2008 Summer Off-Peak						
Herndon – Bullard Energy Center 230kV Line	826	501[2]	52%	840	102%	+61%

Table 6-1: Normal Overloads

6.2.2 Emergency Overloads (Category "B")

During the 2009 Spring Peak, the addition of the Cinergy Bullard EC Project overloads three 70 kV lines under emergency conditions and exacerbates emergency overloads on one 70 kV line following Category B contingencies. The following table summarizes the emergency overload conditions. Facilities with pre-project overloads are shown as shaded in the table.

Over Loaded Component	Contingency	Rating (Amps)	Pre- Project Loading (Amps |%Rating)		Post-Project Loading (Amps |%Rating)		% Change from Pre-Project Loading
Category B Emergency Overloads – Spring Peak 2009							
Glass – Madera 70kV Line	Kearney 230/70kV Transformer	377	411	109%	436	116%	+7%
Glass – Madera 70kV Line	Kearney – Bullard Energy Center 230kV Line	377	407[2]	108%	461	122%	+14%
Glass – Biola 70kV Line (Canandga – Glass)	Kearney – Bullard Energy Center 230kV Line	379	337[2]	89%	394	104%	+15%
Kingsburg – Corcoran #1 or #2 115kV Line	Kingsburg – Corcoran #2 or #1 115kV Line	398	387	97%	411	103%	+6%

Table 6-2: B Contingency Overloads

6.2.3 Emergency Overloads (Category "C")

During the 2008 Summer Peak, the addition of the Cinergy Bullard EC Project overloads three 230/115 kV transformers under emergency conditions following a Category C contingency.

[2] Pre-project loading is based on the Herndon – Kearney 230kV line flow. Post-project loading is based Herndon – Bullard Energy Center 230 kV and Kearney – Bullard Energy Center 230 kV line flows.

During the 2008 Summer Off-Peak, the addition of the Bullard EC Project overloads three 230 kV lines under emergency conditions following a Category C contingency.

During the 2009 Spring Peak, the addition of the Bullard EC Project overloads four 70 kV lines under emergency conditions and exacerbates emergency overloads on three 230/115 kV transformers and one 70 kV line following a Category C contingency. These overloads are summarized in Table 6-3. Facilities with pre-project overloads are shown as shaded in the table.

Over Loaded Component	Contingency	Rating (Amps)	Pre- Project Loading (Amps |%Rating)		Post-Project Loading (Amps |%Rating)		% Change from Pre-Project Loading
Category C Emergency Overloads: Summer Peak 2008							
Warnerville 230/115kV #1 Transformer	Bellota – Melones 230kV Bellota - Warnerville 230kV	150 MVA	148 MVA	99%	162 MVA	108%	+9%
Warnerville 230/115kV #2 or #3 Transformer		75 MVA	74 MVA	99%	81 MVA	108%	+9%
Category C Emergency Overloads: Summer Off-Peak 2008							
Herndon – Bullard Energy Center 230kV Line	Gates E1 Bus Fault	976	737	76%	1036	106%	+30%
Los Banos – Westley 230kV	Herndon - Bullard Energy Center 230kV Line & Gates – Gregg 230kV	1700	1629	97%	1735	102%	+5%
Herndon – Ashlan 230kV (Herndon – Fgrdn T1)	Gregg – Herndon #1 & #2 230kV	850	656	77%	858	101%	+24%
Category C Emergency Overloads: Spring Peak 2009							
Warnerville 230/115kV Transformer #1	Bellota – Melones 230kV #1 Bellota – Warnerville 230kV #1	150 MVA	160 MVA	106%	174 MVA	116%	+10%
Warnerville 230/115kV Transformer #2 or #3		75 MVA	80 MVA	106%	87 MVA	116%	+10%
Glass – Madera 70kV Line	Bullard Energy Center – Kearney 230kV Line & Herndon – Ashlan 230kV Line	377	406	108%	460	122%	+14%
Glass – Biola 70kV Line (Canandga – Glass)		379	337	89%	393	104%	+15%
Helm – Kermann 70kV Line (SNJQTP – Agrico Jct)	Panoche – Kearney 230kV Line Helm – Mc Call 230kV Line	379	345	91%	417	110%	+19%
Kearney – Caruthers 70kV Line	Mc Call – Kingsburg #1 & #2 230kV Lines	296	286	96%	305	103%	+7%
Glass – Madera 70kV Line	Bullard Energy Center – Kearney 230kV Line & Gates – Gregg 230kV Line	377	355	94%	441	117%	+23%

Table 6-3: C Contingency Overloads

7. Dynamic Stability Study and Results

Dynamic stability studies were conducted using the 2008 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. This full loop base case was developed from PG&E's 2004 base case series. The generator dynamic data used for the study can be found shown in Appendix E.

7.1 Dynamic Stability Study Scenarios

Disturbance simulations were 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:

7.1.1 Category "B" Contingencies:

1) Full load rejection of the proposed Bullard EC Project.

2) A three-phase close-in fault on the Herndon-Bullard EC 230 kV line at Herndon Substation 230 kV bus with normal clearing time followed by loss of the Herndon-Bullard EC 230 kV line.

3) A three-phase close-in fault on the Bullard EC-Kearney 230 kV line at Kearney Substation 230 kV bus with normal clearing time followed by loss of the Bullard EC-Kearney 230 kV line.

7.1.2 Category "C" Contingencies:

1) A three-phase fault on Herndon Substation 230 kV bus with normal clearing time.

2) A three-phase fault on Kearney Substation 230 kV bus with normal clearing time.

3) A three-phase fault on Herndon Substation 230 kV bus with normal clearing time followed by loss of the Herndon-Bullard EC and Gates-Gregg 230 kV lines.

4) A three-phase fault on Kearney Substation 230 kV bus with normal clearing time followed by loss of the Bullard EC-Kearney and Gates-Gregg 230 kV lines.

7.2 Parameters Monitored to Evaluate System Stability Performance

7.2.1 Rotor Angle

The rotor angle plots shown in Appendix F provide a measure for determining how the proposed generation units would swing with respect to one another. The plots also provide a measure of how the units would swing with respect to other generation units in the area.

7.2.2 Bus Voltage

The bus voltage plots, in conjunction with the relative rotor angle plots, also shown in Appendix F, provide a means of detecting out-of-step conditions. The bus voltage plots are useful in assessing the magnitude and the duration of post disturbance voltage dips and peak-to-peak voltage oscillations. The bus voltage plots also give an indication of system damping and the level to which voltages are expected to recover in steady state conditions.

7.2.3 Bus Frequency

The bus frequency plots, also shown in Appendix F, provide information on the magnitude and the duration of post fault frequency swings with the Cinergy Bullard EC Project in service. These plots indicate the extent of possible over-frequency or under-frequency, which can occur because of the imbalance between the generation and load within an area.

7.2.4 Other Parameters

- Generator Terminal Power
- Generator Terminal Voltage
- Generator Rotor Speed
- Generator Field Voltage
- Bus Angle
- Line Flow
- Voltage Spread
- Frequency Spread

7.3 Results

Dynamic stability studies were conducted using the 2008 Summer Peak base case described in Section 4 and the generator models shown in Appendix E to determine whether the transmission system would attain operating equilibrium following selected outages.

It was determined that the Cinergy Bullard EC Project would have no adverse impact on the stable operation of the transmission system. Dynamic stability studies also indicated that the transmission system's transient stability performance would not be significantly impacted by the Bullard EC Project following the selected contingencies. The results of the study are provided in the form of plots in Appendix F.

8. System Protection Study

Short circuit studies were performed to determine the impact of adding the Cinergy Bullard EC Project to the transmission system. The fault duties were calculated before and after the project.

8.1 System Protection Study Input Data

The following input data provided by the Applicant was used in this study:

GE LMS 100 Gas Turbine Generator

- Synchronous reactance (X_d) = 1.555 pu @ 108.2 MVA
- Transient reactance (X'_d) = 0.186 pu @ 108.2 MVA
- Sub-transient reactance (X''_d) = 0.121 pu @ 108.2 MVA
- Negative Sequence reactance (X_2) = 0.132 pu @ 108.2 MVA
- Zero Sequence reactance (X_0) = 0.079 pu @ 108.2 MVA

Step-up Transformer

- 13.8/230 kV, 250 MVA on OA, Z = 9 % on 150 MVA base

8.2 Results

Table 8-1 lists the available short circuit duty at the buses electrically adjacent to the Cinergy Bullard EC Project. This data was used to determine if any equipment would be overstressed by the addition of the Bullard EC Project.

Fault Location	Pre-Project		Post-Project (Phase 1)			
	3∅	L-G	3∅	% Increase	L-G	% Increase
Ashlan 230 kV	13,544	11,742	15,074	11%	12,921	10%
Barton 115 kV	12,540	10,423	12,722	1%	10,513	1%
Borden 230 kV	13,736	14,472	14,930	9%	15,582	8%
Bullard 115 kV	10,211	9,399	10,502	3%	9,588	2%
Bullard EC 230 kV	-	-	19,729	n/a	20,400	n/a
Gates 230 kV	32,684	29,373	32,847	0%	29,465	0%
Gregg 230 kV	18,528	18,130	21,445	16%	21,846	20%
Helms PGP 230 kV	14,258	16,335	14,574	2%	16,612	2%
Henrietta 230 kV	13,301	10,995	13,441	1%	11,078	1%
Herndon 115 kV	26,091	27,019	28,023	7%	29,495	9%
Herndon 230 kV	18,408	18,118	21,387	16%	22,147	22%
Kearney 230 kV	11,429	9,828	12,445	9%	10,838	10%
Manchester 115 kV	12,231	9,656	12,460	2%	9,764	1%
Mc Mullin 230 kV	8,961	7,055	9,323	4%	7,303	4%
New Kearny 70 kV	9,904	11,052	10,030	1%	11,201	1%
Panoche 230 kV	25,478	18,211	25,673	1%	18,284	0%
Pinedale TB3 115 kV	12,678	11,121	13,126	4%	11,406	3%

Fault Location	Pre-Project		Post-Project (Phase 1)			
	3∅	L-G	3∅	% Increase	L-G	% Increase
Storey 1230 kV	10,540	9,164	11,217	6%	9,618	5%
Wilson 230 kV	12,033	11,276	12,373	3%	11,489	2%
Woodward 115 kV	10,420	9,144	10,583	2%	9,237	1%

Table 8-1: Short circuit study results

8.3 Preliminary Protection Requirements

Per Section G2.1 of the PG&E Interconnection Handbook, PG&E protection requirements are designed and intended to protect PG&E's system only. The applicant is responsible for the protection of its own system and equipment and must meet the requirements in the PG&E Interconnection Handbook.

The preliminary protection requirements will consist of replacing the existing line protection and carrier equipment at Kearney and Herndon. The Herndon – Bullard EC 230kV Line will have a fully redundant, double-pilot current differential scheme utilizing dual fiber optic communications. The Bullard EC – Kearney 230kV Line will utilize a two terminal carrier scheme. These preliminary protection requirements are based upon an interconnection plan as shown in Figure 2-1. Appendix G provides a detailed description of the preliminary protection requirements.

9. Substation Evaluation

9.1 Overstressed Breakers

Using the results of the System Protection Study in Section 8, the substation evaluation identified four (4) 115 kV breakers at Herndon Substation and two (2) 230 kV breakers at Panoche which the addition of the Bullard EC Project would exacerbate the overstressed condition.

Table 9-1 summarizes the breaker fault duties and the actual % increases for these breakers.

Substation & Breaker #	Interruptible Rating (Amps)	Before Bullard EC Project (Amps)	Before %	After Bullard EC Project (Amps)	After %	Increase %
Herndon CB 122	22,969	26,908	117%	29,393	128%	9%
Herndon CB 132	22,969	25,526	111%	27,948	122%	9%
Herndon CB 142	22,969	25,511	111%	27,935	122%	10%
Herndon CB 152	22,969	25,450	111%	27,904	121%	10%
Panoche CB 222	22,969	23,431	102%	23,624	103%	1%
Panoche CB 322	22,969	23,471	102%	23,632	103%	1%

Table 9-1: Overstressed Breaker Evaluations at Fresno Area Substations

PG&E uses the following policy to allocate breaker replacement responsibility for projects that overstress or increase the level of overstress[3] on existing circuit breakers:

- If a breaker is not overstressed and a project results in an overstressed condition of the breaker.
- If a breaker is already overstressed and a project increases the overstress by 5% or more, or the overstress level exceeds 25%.

Based on this policy the Bullard EC Project will be responsible for the breaker replacement of CBs 122, 132, 142, and 152 at Herndon Substation.

9.2 Bus Loading Evaluation

Bus loading analysis was performed on the Herndon 230 kV bus to identify any bus overloads that would occur with the addition of Bullard EC Project. During 2008 Summer Peak conditions, the maximum current flowing through the bus is less than 1160 Amps. The Herndon 230 kV bus is made up of bundled 1113 AL conductor which has a rating of 1,650 A (Normal) and 1,950 A (Emergency). Therefore, Herndon 230 kV bus conductors are large enough to accommodate the addition of the Bullard EC Project.

9.3 Interconnection Feasibility Evaluation

As shown in Section 2, the study assumed a looped connection of the Cinergy Bullard EC Project to the Herndon-Kearney 230 kV line. Initial inspection finds the interconnection to be technically feasible. A Detailed Facilities Study will determine the full impacts of the direct interconnection proposal.

9.4 Substation Configuration

The substation evaluation determined the recommended bus configuration requirements for the new looped substation required to interconnect the Bullard Energy Center Project to PG&E's transmission grid. The recommended configuration is a three (3) breaker ring bus as shown in Figure 9-1.

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[3] Overstressed Circuit Breaker – The percent of overstress, or level of overstress, is the percent of maximum fault current above the breaker's nameplate rating. For example, a breaker rated at 40,000 amps symmetrical current interrupting a 44,000 amp symmetrical fault is overstressed by 10%.

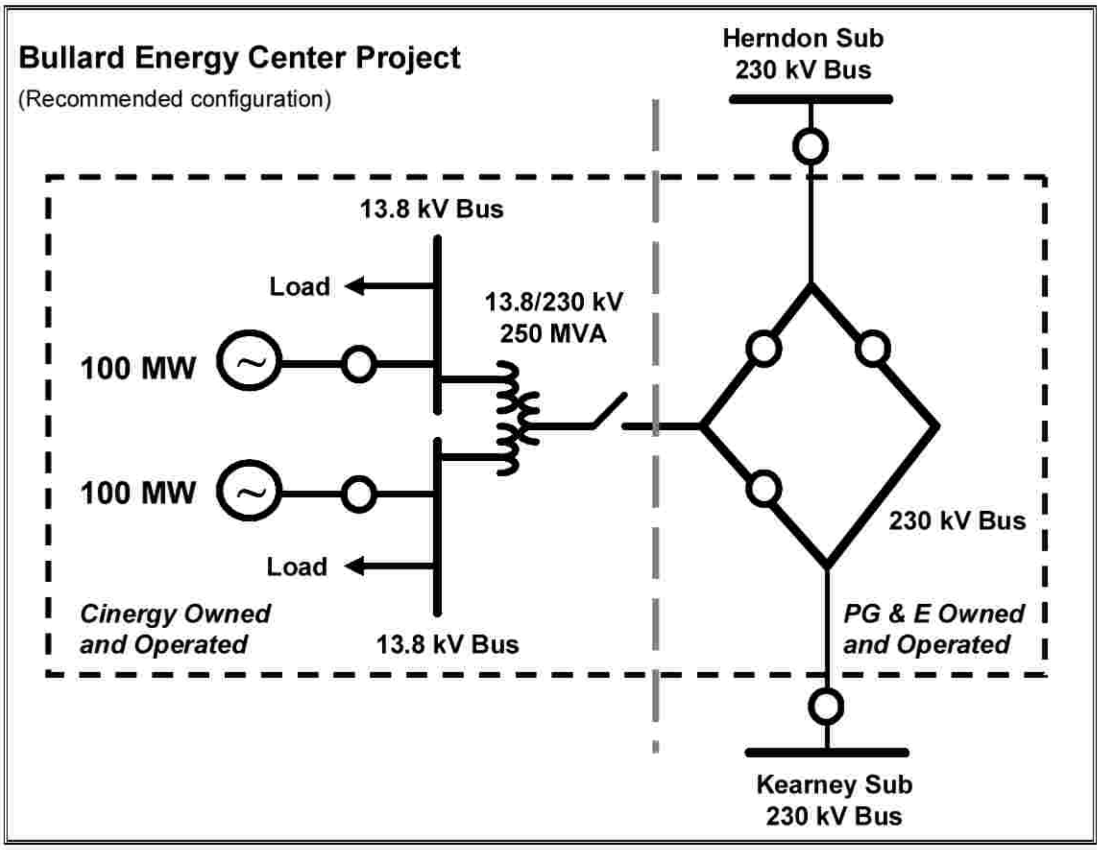

Figure 11-1: Conceptual one-line of bus configuration

10. Reactive Power Deficiency Analysis

The power flow studies of Category "B" and "C" contingencies indicated that the Cinergy Bullard EC Project did not cause voltage drops of 5% or more from the pre-project levels, or cause the PG&E system to fail to meet applicable voltage criteria.

11. Mitigation

This section presents alternatives available for mitigating the normal and Category "B" emergency overloads of the facilities described in Section 6.

Mitigation alternatives have been developed for the Category "A" (normal) and "B" contingency overloads. For CAISO Category "C" outages (according to WECC reliability criteria), the overloads may be mitigated by load shedding or generation dropping. PG&E or CAISO or both may require new generators to take part in and be responsible for the costs of operating procedures and/or Special Protection Schemes (SPS) for the Category "C" emergency overloads caused by the Bullard EC Project.

11.1 Pre-existing Line Overloads

11.1.1 Glass-Madera 70 kV Line

Limiting Factor		3/0 CU at 2 fps wind speed rating 325 Amps Normal / 377 Amps Emergency (2.6 miles[4])	
Pre-Project Emergency Loading	407 Amps (108%)	Post Project Emergency Loading	461 Amps (122%)
Worst Contingency		Kearney– Bullard Energy Center 230kV Line	
Overload Condition		Spring Peak	

11.2 New Line Overloads

11.2.1 Herndon–Bullard Energy Center 230kV Line

Limiting Factor		1113 AL at 2 fps wind speed rating 825 Amps Normal / 975 Amps Emergency (1.6 miles)	
Pre-Project Normal Loading	501 Amps (52%)	Post Project Normal Loading	840 Amps (102%)
Worst Contingency		N/A	
Overload Condition		Summer Off-Peak	

11.2.2 Glass–Biola 70kV Line (Canandga–Glass Line Section)

Limiting Factor		3/0 CU at 2 fps wind speed rating 325 Amps Normal / 377 Amps Emergency (0.8 miles)	
Pre-Project Emergency Loading	379 Amps (89%)	Post Project Emergency Loading	394 Amps (104%)
Worst Contingency		Kearney–Bullard Energy Center 230kV Line	
Overload Condition		Spring Peak	

11.2.3 Kingsburg-Corcoran No. 1 & 2 115 kV Lines

Limiting Factor		266 AL at 2 fps wind speed rating 344 Amps Normal / 400 Amps Emergency (27 miles[5])	
Pre-Project Emergency Loading	387 Amps (97%)	Post Project Emergency Loading	411 Amps (103%)
Worst Contingency		Kingsburg-Corcoran 115 kV Parallel Line	
Overload Condition		Spring Peak	

11.3 Mitigation Alternative 1 - Reduce Generation

The first mitigation alternative considers reducing the generation output of the Bullard Energy Center Project. Power flow analysis shows that reducing the Bullard Energy Center Project generation output to 98 MW avoids causing any new Category A or Category B overloads. Appendix C shows the steady state power flow analysis results from Mitigation Alternative 1.

[4] Remaining 0.4 miles of this line is 397 AL conductor.
[5] Remaining 0.6 miles of this line is 715 AL conductor.

11.4 Mitigation Alternative 2 – Transmission Reinforcement

The second mitigation alternative considers reinforcing the transmission system by reconductoring one (1) 230 kV line and three (3) 70 kV lines. The transmission system reinforcements for Alternative 2 are shown in Table 11-1.

Facility	New Facility	Miles Reconductored
Herndon–Bullard Energy Center 230kV Line	1113 SSAC	1.6
Glass-Madera 70 kV Line	397 AL	2.6
Glass–Biola 70kV Line (Canandga–Glass Line Section)	397 AL	0.8
Kingsburg-Corcoran No. 1 & 2 115 kV Lines	715 AL	27.0

Table 11-1: Mitigation Alternative 2 - Transmission Reinforcement

Appendix C shows the steady state power flow analysis results from Mitigation Alternative 2.

11.5 Mitigation Alternative 3 – Operating Solution

The third mitigation alternative considers mitigating Category B overloads through an operating solution. This operating solution is normally applied under summer operating conditions and involves opening Corcoran CB 142, Kearney CB 32, Biola CB 12, and Caruthers CB 22. Appendix C shows the steady state power flow analysis results from Mitigation Alternative 3.

11.6 Overstress Breakers

As summarized in Section 9.1, the replacement of four (4) overstressed breakers at Herndon Substation is needed as a result of the Bullard EC Project.

12. Environmental Evaluation/ Permitting

12.1 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, switchyards, etc.). This includes 230 kV facilities to be constructed by others and deeded to PG&E. The Order requires PG&E to obtain a Certificate of Pubic Convenience and Necessity (CPCN) from the CPUC if the PG&E facilities being constructed are designed for immediate or eventual operation at 200 kV or more. Projects with 230 kV facilities that are excepted from obtaining a CPCN are those involving the replacement of existing power line facilities or supporting structures with equivalent facilities or structures, the minor relocation of existing facilities, the conversion of existing overhead lines (greater than 200 kV) to underground, or the placing of new or additional conductors, insulators, or their accessories on or replacement of supporting structures already built. Obtaining a CPCN can take as much as 18 months or more if the CPUC needs to conduct its own environmental evaluation pursuant to the California Environmental Quality Act (CEQA). PG&E recommends including PG&E's interconnection facilities in the local or CEC's CEQA process, which may allow a shortened CPCN process should a CPCN be necessary.

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

12.2 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.

13. Study Updates

This System Impact Study is performed according to the assumptions shown in the Sections titled "Study Assumptions" and "Power Flow Study Base Case". In the event such that these assumptions are changed, an updating study may be required to re-evaluate Cinergy Bullard EC Project's impact on PG&E's transmission grid. Cinergy would be responsible for paying for any such updating study. Examples of changes that might prompt such a study are:

- Change in interconnection date.
- Change in Interconnection Queue position.
- Change in project's MW size
- Change in interconnection plan

14. Stand-by Power

This study does not address any requirements for stand-by power that the project may require. The Applicant should contact their Generation Interconnection Services Representative regarding this service.

Note: The Applicant 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.