Appendix A
Transmission Network Upgrade

Appendix A

Hydrogen Energy International LLC (HEI or Applicant) submitted an Interconnection Request to the California Independent System Operator (CAISO) as required per Federal Energy Regulatory Commission's (FERC) Order No. 2003 for Large Generating Facility interconnections to the CAISO-Controlled Grid. The Interconnection Request was received 29 January 2008 along with a $10,000 initial deposit and $10,000 deposit in lieu of evidence of site control (deposits were received 4 February 2008). Following the Scoping Meeting, the Project executed an Interconnection Feasibility Study Agreement on 28 March 2008. The result of the Feasibility Study was to determine network upgrades and estimated cost and time to construct the facilities required to connect to the CAISO-Controlled Grid. Assuming timelines posted in Large Generator Interconnection Procedures (LGIP) tariff, the Project expected to receive this report for inclusion into this Application for Certification (AFC). However, with the genesis of the Generator Interconnection Process Reform (GIPR) Initiative, CAISO is proposing to suspend work on all projects that do not have System Impact Study Agreements completed before 1 May 2008. Because the Project has not advanced through the LGIPs to this point, the CAISO will likely not deliver a Feasibility Study Report for inclusion into this AFC. In an effort to facilitate the issuance of the Feasibility Study Report in light of the GIPR Initiative, the Applicant filed formal comments with CAISO to address the potential negative impacts of the proposed initiative on the Project.

As part of the overall Project development, a study was commissioned by the Applicant for the feasibility and associated impacts of providing a grid connection for the Project. The study is included in this section. The technical analysis performed in this study was similar to the analysis that would have been performed during the Interconnection Feasibility Study. The study, carried out by Navigant Consulting Inc., (NCI) concluded that connecting the Project to the CAISO-Controlled Grid would overload the 230 kilovolt (kV) circuit from Los Banos to Westley under Category A conditions (N-0 or no outage). The Project would be responsible for mitigating this overload by re-conductoring the circuit over a distance of approximately 34 miles. This work would be carried out by Pacific Gas & Electric (PG&E), in accordance with their normal standards/requirements.

In addition to this new overload condition, the Project would increase the overloads on eight other 230 kV and 115 kV circuits, which become overloaded under Category A conditions. However, the overloads on these circuits should be mitigated by the connection of other proposed generation projects in this area, as listed in CAISO's generation interconnection queue as of 14 December 2007. Should any or all of these projects fail to materialize, the Applicant would be responsible for mitigating some of these overloads. The extent to which this may apply will not be known until a formal connection offer is received from CAISO. Should FERC approve the conditions of the GIPR and associated process timelines, as proposed by CAISO, the Project will be presented with the required network upgrades and cost responsibilities for connecting to the grid in August 2009.

HYDROGEN ENERGY INTERNATIONAL LLC
HYDROGEN ENERGY CALIFORNIA PROJECT
ASSESSMENT OF POTENTIAL IMPACTS ON PG&E SYSTEM

BACKGROUND AND SUMMARY OF RESULTS

At the request of Hydrogen Energy International LLC (HEI), Navigant Consulting, Inc., (NCI) has assessed the transmission-related impacts associated with interconnecting 250 megawatts (MW) or 500 MW of generation with Pacific Gas & Electric's (PG&E) Midway Substation located northwest of Bakersfield, California.

This assessment addressed potential impacts for Category A (N-0 or no outage), Category B (N-1 or single outage), and Category C (N-2 or double outage) conditions. This report discusses the results of this assessment and concludes that, for the summer peak and off-peak load conditions studied, the addition of the Hydrogen Energy California Project (the "Project"):

- Would result in the 34 mile long Los Banos-Westley 230 kilovolt (kV) line becoming overloaded for Category A conditions (this line is overloaded for Category C conditions without the addition of the Project).
- Would exacerbate pre-existing overloads on eight 230 kV and 115 kV lines.

Mitigation of the above noted overload on the Los Banos-Westley 230 kV overload is assumed to be the responsibility of the Project. Mitigation of the other increased overloads is assumed to be the responsibility of other generation projects in the area listed in the California Independent System Operator's (CAISO) generation interconnection queue (CAISO queue) as of 14 December 2007. If portions of this queued generation did not materialize, the Project might be responsible for mitigating the impacts on some of these other facilities.

Study Description

The Project Site is located in the general proximity of PG&E's Midway 500/230/115 kV Substation. This study assumed that the Project's generating facilities would be interconnected with the Midway Substation via a single 230 kV line.

Both a 2012 Summer Peak load base case and 2012 Summer Off-Peak load base case, developed as part of PG&E's 2007 Transmission Expansion Planning process, were used to analyze the Project's potential impacts on the transmission system. The peak load base case modeled 1-in-10 year peak load conditions for the southern portion of the PG&E system while the loads modeled in the off-peak case were equal to about 50 percent of those modeled in the on-peak case. For the purposes of this study both the on-peak and off-peak load cases were modified, as necessary, to stress the southern portion of the PG&E system. This approach is similar to that which would be used by PG&E and the CAISO in any studies they might conduct to assess Project-related impacts should the

Project ultimately request an interconnection with the PG&E system at Midway Substation.

Specifically, the modified on-peak case modeled:

- Rated south-bound power transfers of 4,000 MW [1] on Path 26 (the three 500 kV lines extending southward from the Midway Substation into the Southern California Edison (SCE) service area).
- Approximately 700 MW of northbound flows on Path 15 (the group of 500 kV and 230 kV lines between the Midway area and central California).
- All existing generation in the southern portion of the PG&E system on-line.
- Approximately 4,600 MW of queued generation in the southern portion of the PG&E system on-line (the assumed on-line queued generation is summarized in Appendix 1).

The off-peak case modeled:

- Rated northbound power transfers of 5,400 MW over Path 15.
- Approximately 860 MW of northbound power transfers on Path 26.
- All existing generation in the southern portion of the PG&E system on-line.
- Approximately 360 MW of queued generation in the southern portion of the PG&E system on-line.
- The Helms Pumped Storage Plant, located in the Fresno area, in a pumping mode with a 620 MW load.

The two "pre-Project" cases resulting from the above were then modified to develop four "post-Project" cases modeling the Project with either 250 MW or 500 MW of output. In all post-Project cases it was assumed that the Project output was scheduled to the SCE area and that the amounts of other generation on-line in the southern portion of the PG&E system would not change. The effects of these assumptions were as follows:

- For the on-peak load cases (in which Path 26 was operating at its rated capacity of 4,000 MW in the north-to-south direction), the northbound flows over Path 15 increased by either 250 MW or by 500 MW. This tended to increase the stress on the PG&E system but had no impact on the SCE system.
- For the off-peak load cases (in which Path 15 was operating at its rated capacity of 5,400 MW in the south-to-north direction), the northbound flows on Path 26 were decreased by either 250 MW or 500 MW. As a result there was no additional stress placed on the PG&E or the SCE system.

[1] 4,000 MW is the non-simultaneous rating for Path 26. As discussed in the report entitled "Assessment of Deliverability into the SCE System" prepared for the Project the amounts of power that can be delivered southward over Path 26: (i) is influenced by the amounts of power being transferred into Southern California over the other major transmission paths into the area; and (ii) could be as low as 3,000 MW if the power transfers over the various paths into Southern California were allocated on a pro-rata basis factoring in the non-simultaneous ratings of each of these paths.

Approximately 190 Category B (N-1) and 30 Category C (N-2) contingencies were simulated on facilities located in PG&E's Kern Division for the pre- and post-Project cases summarized above. The results of these studies and any overloads noted for Category A, Category B, and Category C conditions on the cases were summarized and compared to identify any impacts the proposed Project might have on the PG&E transmission system.

Study Results

2012 Summer Peak Load Conditions

The results of studies on the three summer peak load cases are summarized and compared in Table 1, Overloaded Lines in Summer Peak Studies. As shown in Table 1:

- For the pre-Project summer peak load case:
    - Eight 230 kV or 115 kV lines on the PG&E system would be overloaded for Category A (no outage) conditions
    - One PG&E 230 kV line would be overloaded for Category B conditions
    - Seven PG&E 115 kV or 230 kV lines would be overloaded for Category C conditions
- For the post-Project case with 250 MW of HECA Project generation on-line:
    - For Category A conditions the eight pre-Project overloads noted above would increase (by 1 to 3%) and one new 230 kV line overload (4%) would occur
    - For Category B conditions the single pre-Project overload noted above would increase by 3%
    - For Category C conditions the seven pre-Project overloads noted above would increase (by 3 to 9%) and one new 115 kV line overload (1%) would occur
- For the post-Project case with 500 MW of HECA Project generation on-line:
    - For Category A conditions the eight pre-Project overloads noted above would increase (by 3 to 6%) and one new 230 kV line overload (9%) would occur
    - For Category B conditions the single pre-Project overload noted above would increase (by 6%)
    - For Category C conditions the seven pre-Project overloads noted above would increase (by 6 to 20%) and one new 115 kV line overload (3%) would occur

Table 1
Overloaded Lines in Summer Peak Studies

Impacted Lines	Pre-Project Overload (%)	Project @ 250 MW Overload (%)	Project @ 250 MW Change (%)	Project @ 500 MW Overload (%)	Project @ 500 MW Change (%)
Category A Conditions					
Warnerville-Cottle B 230-kV	133	135	2	138	5
Gregg-Storey 1 230-kV	129	131	2	133	4
Storey 2-Borden 230-kV	129	131	2	133	4
Wilson-Warnerville 230-kV	125	128	3	131	6
Bellota-Cottle B 230-kV	122	124	2	127	5
Storey 2-Wilson 230-kV	117	118	1	120	3
Storey 1-Wilson 230-kV	104	106	2	108	4
Le Grande-Wilson A 115-kV	103	104	1	106	3
Los Banos-Westley 230-kV	100	104	4	109	9
Category B Conditions					
Wilson-Warnerville 230-kV	111	114	3	117	6
Category C Conditions					
Wilson-Warnerville 230-kV	132	136	4	142	6
Warnerville-Cottle B 230-kV	131	135	4	139	8
Gregg-Storey 1 230-kV	127	130	3	134	7
Storey 2-Borden 230-kV	125	128	3	131	6
Bellota-Cottle B 230-kV	121	125	4	129	8
Los Banos-Westley 230-kV	118	128	9	138	20
Storey 1-Wilson 230-kV	107	110	3	113	6
Le Grande-Wilson A 115-kV	99	101	2	103	4

Notes:
% = percent
kV = kilovolts
MW = megawatt

2012 Off-Peak Conditions

Studies performed on the off-peak base cases showed that addition of the Project did not exacerbate any overloads noted in the pre-Project case or result in any new overloads on the PG&E system.

Summary and Conclusions

For the purposes of this assessment it was assumed that the Project would be responsible for mitigating:

- Any new Category A overloads caused by the addition of the Project even if the impacted element(s) exhibited Category B or Category C overloads in the pre-Project studies.
- Any new Category B overloads caused by the addition of the Project if:

- The impacted element(s) did not exhibit any Category A overloads in the pre-Project studies
- The impacted element(s) exhibited any Category C overloads in the pre-Project studies

- Any new Category C overloads caused by the addition of the Project only if the impacted element(s) did not exhibit any Category A or Category B overloads in the pre-Project studies.

Based on the above criteria, these studies indicate that:

- The addition of the Project results in one new Category A overload (on the Los Banos-Westley 230 kV line), which would be the Project's responsibility to mitigate (even though this line would be overloaded for pre-Project Category C outage conditions).
- The Project would not be responsible for mitigation of the other increased overloads; they are assumed to be mitigated by generation projects that are currently in the CAISO's generation interconnection queue (CAISO queue). However, if portions of this queued generation did not materialize, the Project might be responsible for mitigating some of these impacts.

PRELIMINARY COST ESTIMATES

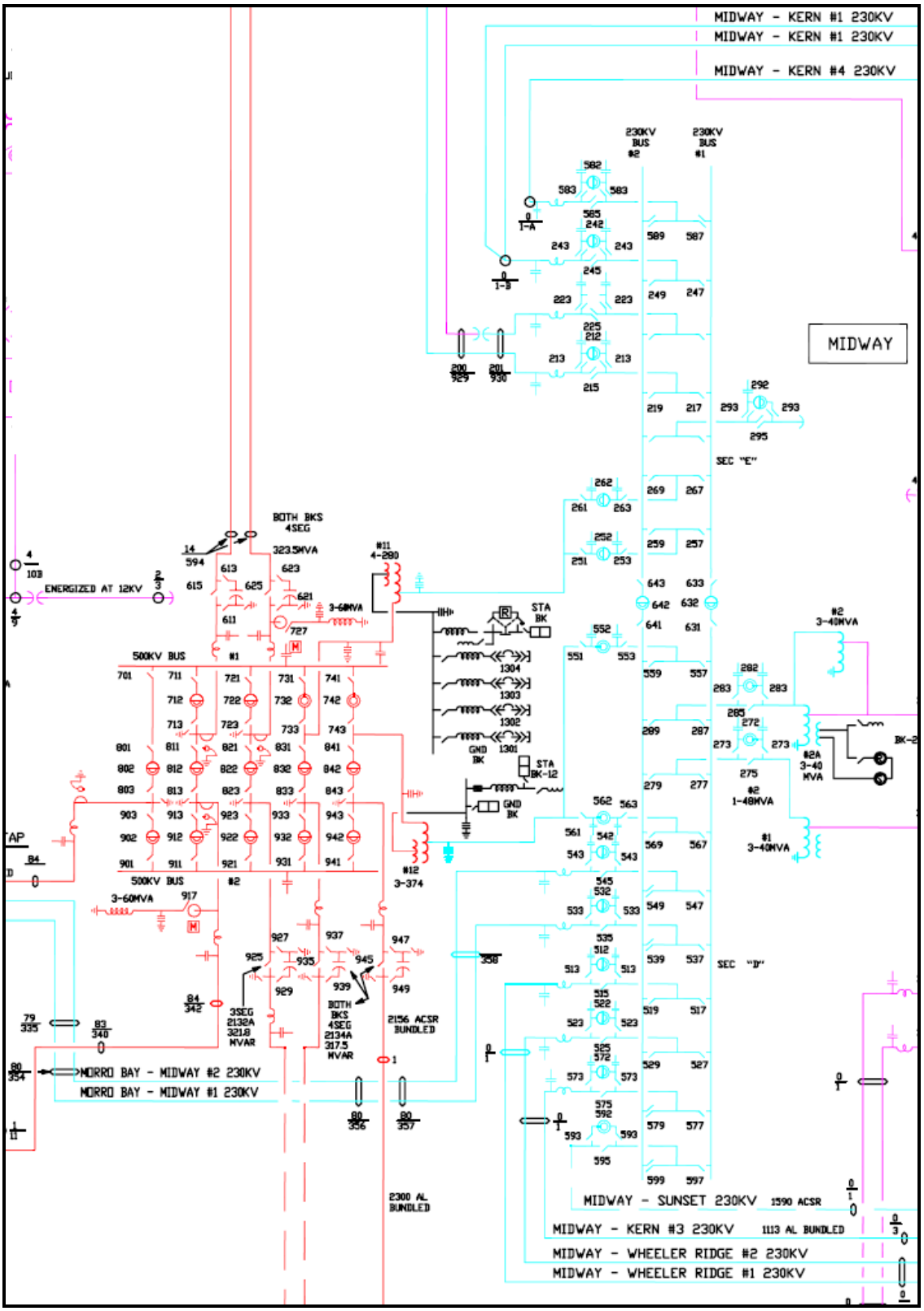
Project Interconnection

The existing Midway 230 kV switchyard is configured in a double-bus/single-breaker arrangement (refer to Figure 1). Therefore it has been assumed that the Project interconnection could be accomplished by adding one 230 kV breaker and associated equipment (such as switches).

Potential Network Upgrades

As noted above these studies have assumed that the Project would be responsible for mitigating post-Project Category A overloads on the Los Banos-Westley 230 kV line (which is 34 miles in length).

Figure 1
Midway 500 kV and 230 kV Switchyards



APPENDIX 1
QUEUED GENERATION IN SOUTHERN PORTION OF THE PG&E AREA
AS OF DECEMBER 14, 2007

APPENDIX 1
CAISO GENERATION INTERCONNECTION QUEUE AS OF DECEMBER 14, 2007
PROJECTS SOUTH OF TESLA AREA

Queue Position	Interconnection Request Receive Date	Queue Date	Application Status	Type	Fuel	Capacity (MW)			Location (County)	Interconnection Point	Current On-line Date
						Per Request	As Modeled				
							On-Peak	Off-peak			
9	12/1/2000	12/1/2000	Active	CC	NG	1,200	0	0	San Luis Obispo	Morro Bay Substation	1/1/2008
16	3/11/2003	3/11/2003	Active	WT	W	120	118	118	Santa Barbara	Cabrillo	10/1/2008
42	11/24/2004	11/26/2004	Active	CT	NG	300	308	0	Fresno	McCall Substation	3/31/2013
47	12/1/2004	12/1/2004	Active	CT	NG	201	205	0	Fresno	Herndon - Kearney 230 kV line	6/30/2008
52	12/1/2004	12/21/2004	Active	CT	NG	401	410	0	Fresno	Panoche Sub Station	9/30/2009
54	11/11/2004	1/12/2005	Active	CT	NG	120	122	0	Fresno	Panoche Substation	1/1/2009
60	3/28/2005	3/28/2005	Active	CT	NG	94	94	94	Kern	Kern Oil Substation 115 kV	1/31/2009
61	3/28/2005	3/30/2005	Complete	ST	NG	73	73	0	Fresno	70kV Helm-Kerman	5/31/2006
75	4/28/2005	7/15/2005	Active	ST	B	11	11	0	Madera	Le Grand-Chowcilla 115 kV	10/5/2007
76	4/28/2005	7/15/2005	Active	ST	B	11	11	0	Merced	PG&E Merced #1 70 kV circuit	10/5/2007
102	4/19/2006	4/19/2006	Active	WT	W	210	210	0	Monterey	PG&E Coburn 230 kV Sub	11/30/2008
111	6/23/2006	6/26/2006	Active	ST	B	20	20	0	Kern	Tap of Chevron 70kv tran line	8/31/2009
128	9/1/2006	9/1/2006	Active	CT	NG	565	565	0	Fresno	McCall Substation	12/1/2010
152	11/22/2006	11/22/2006	Active	WT	W	105	105	105	Santa Barbara	No. 1 & No. 2 Mesa-Divide 115kV Lines	12/31/2009
166	1/23/2007	1/23/2007	Active	PV	S	210	210	0	San Luis Obispo	Morrow Bay-Midway 230kV line	12/31/2010
178	2/27/2007	2/28/2007	Active	WT	W	100	100	0	Merced	Los Banos 230kV bus near Pacheco Pass	12/31/2011
194	4/5/2007	4/5/2007	Active	ST	S	190	0	0	San Luis Obispo	230kV lines near Carrizo Plain Substation	12/31/2011
196	4/13/2007	4/13/2007	Active	CT	NG	508	507	0	Madera	230kV bus at Borden Substation	7/1/2011
238	7/11/2007	7/11/2007	Active	PV	S	45	0	0	San Luis Obispo	Temblor-San Luis Obispo 115kV line	12/1/2008
239	7/11/2007	7/11/2007	Active	PV	S	250	250	0	San Luis Obispo	Midway-Morro Bay 230kV line	12/1/2010
242	7/13/2007	7/13/2007	Active	PV	S	390	390	0	San Luis Obispo	Morro Bay-Midway 230kV line	9/1/2012
247	7/30/2007	7/30/2007	Active	CC	NG	67	67	0	Madera	Borden Substation 230kV Bus	7/1/2011
249	7/30/2007	7/30/2007	Active	WT	W	200	200	0	Monterey	Moss-Linding-Salinas-Soledad 115kV #1 and #2 lines	2/1/2010
253	8/13/2007	8/13/2007	Active	WT	W	40	40	40	Santa Barbara	Cabrillo Substation 115kV	12/31/2011
254	8/21/2007	8/21/2007	Active	CC	NG	600	612	0	Kings	Gates Substation 230kV bus	6/1/2012
261A	10/9/2007	10/9/2007	Active	PV	S	5	0	0	Fresno	Mendota Biomass Substation 70kV	4/15/2009
272	11/1/2007	11/1/2007	Active	ST	NG	150	0	0	Kings	Henrietta Substation	5/1/2010
273	11/1/2007	11/1/2007	Active	ST	NG	100	0	0	Kings	Henrietta-Kingsburg 115-kV lines	5/1/2010
				Total		***6,285***	***4,627***	***357***			

Summary by Resource Type

Thermal (Gas-fired)	4,379	2,963	94
Thermal (Biomass)	41	41	0
Wind	775	773	263
Solar	1,090	850	0
Total	***6,285***	***4,627***	***357***