

Exhibit No.: \_\_\_\_\_  
Commissioner: Michael R. Peevey  
Administrative Law Judge: Hallie Yacknin  
Witness: David L. Hawkins

**BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF  
CALIFORNIA**

Application of Pacific Gas and Electric Company For  
Approval of Long-term Request for Offer Results and For  
Adoption of Cost Recovery and Ratemaking Mechanisms.

Application 06-04-012

**REPLY TESTIMONY OF DAVID L. HAWKINS  
ON BEHALF OF THE  
CALIFORNIA INDEPENDENT  
SYSTEM OPERATOR**

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**Attorneys for the California  
Independent System Operator**

Dated: August 10, 2006

**1. Q. What is your name and business address?**

A. My name is David L. Hawkins and my business address is 151 Blue Ravine Road, Folsom, California, 95630.

**2. Q. By whom are you employed and in what capacity?**

A. I am employed by the California Independent System Operator (CAISO) as the Lead Industry Affairs Representative- External Affairs.

**3. Q. Please provide a brief description of your educational and employment background.**

A. I have worked for the CAISO since 1997, beginning as a Principal Engineer in Operations and Engineering and then as a Manager in the Special Projects Engineering group. Immediately prior to coming to the CAISO, I worked for Intergraph Corporation and then the Electric Power Research Institute (EPRI). I began my engineering career with Consolidated Edison in New York and then moved to California to work for Pacific Gas & Electric Company (PG&E) starting in 1979.

I have a BS degree in Electrical Engineering from the University of Michigan and am a licensed professional engineer in the state of New York.

**4. Q. What is the purpose of your reply testimony?**

A. On behalf of the CAISO, I will respond to portions of the direct testimony filed by some of the parties to this case with respect to whether the resources being procured through the seven long-term commitments presented by PG&E in this application will promote grid reliability in accordance with the recommendations made by the CAISO in R.06-02-013. In particular, I will discuss whether these resources will help to meet the operational needs of the CAISO by 2009 and beyond.

5. **Q. What materials did you review to prepare your reply testimony?**

A. I reviewed the PG&E testimony and exhibits submitted as part of the application filed in this proceeding. I also reviewed the initial testimony filed on July 28, 2006 by The Utility Reform Network (TURN), the Division of Ratepayer Advocates (DRA), Merced Irrigation District (Merced ID) and Aglet Consumer Coalition. Given the press of other business, I was not able to conduct an in-depth analysis of the contracts submitted as appendices to the PG&E testimony.

6. **Q. Please briefly summarize the recommendations made by the CAISO in Phase I of R.06-02-013 (the long term procurement [LTPP] proceeding) that are pertinent to your analysis of the PG&E RFO results.**

A. Certainly. In comments filed on April 7, 2006, the CAISO suggested that for reliable grid operations, the Commission should look beyond the resources necessary to meet peak load and consider the three elements that are crucial to reliable operation of the transmission grid: Right Mix of Resources, (in) Right Location, (in) Right Amount.

To achieve the “right mix” of resources, the Commission was urged to require its jurisdictional utilities to acquire a reasonable amount of short-start resources within their service territory. Such units provide greater operating flexibility in daily operations and in emergency situations than base-load generators, which are available at all times to serve load, or generators that are available to serve intermediate load levels. Short-start units can be started quickly and can return to acceptable operating limits following a single contingency and without having to interrupt firm load. They also provide an efficient mechanism to protect against load forecast errors and can be used as regulation for intermittent resources such as wind turbines. Based on the CAISO’s experience for the control area, there should be 3000 to 4000 MW of short start resources with availability factors of at least 90% and run-time limits of no less than 1000-2000 hours per year, at full output.

The variability in the output of renewable resources must be taken into account when adopting procurement policies and targets. Accordingly, as the number of intermittent resources in the resource mix grows, any adopted target should be revisited. In particular, policies should address this concern through corollary procurement of generating technologies that complement the unique operating characteristics of some renewable resources. For example, fast-ramping regulating units, such as pump storage, storage technologies, and combustion turbines can complement wind technologies.

Additionally, specific in-area resources should be identified in the procurement plans so that the cost of transmission upgrades needed to ensure deliverability are appropriately factored into the least-cost, best fit analysis. As I discuss in further detail below, while the CAISO generally supports the PG&E projects that have been brought to the Commission for approval, deliverability studies have not yet been completed.

To consider whether the resources are in the “right location,” the CAISO recommended that the Commission consider the 2007 LCR study approved in R. 05-12-013. And while the CAISO agreed that the CEC load forecast could be used to determine the “right amount” of resources, it was suggested that the forecasts be adjusted for higher outage rates and the retirement of older units.

**7. Q. Did you review and analyze the resources being procured as a result of the PG&E RFO in the context of the CAISO comments described in the previous questions?**

**A.** Yes, I did.

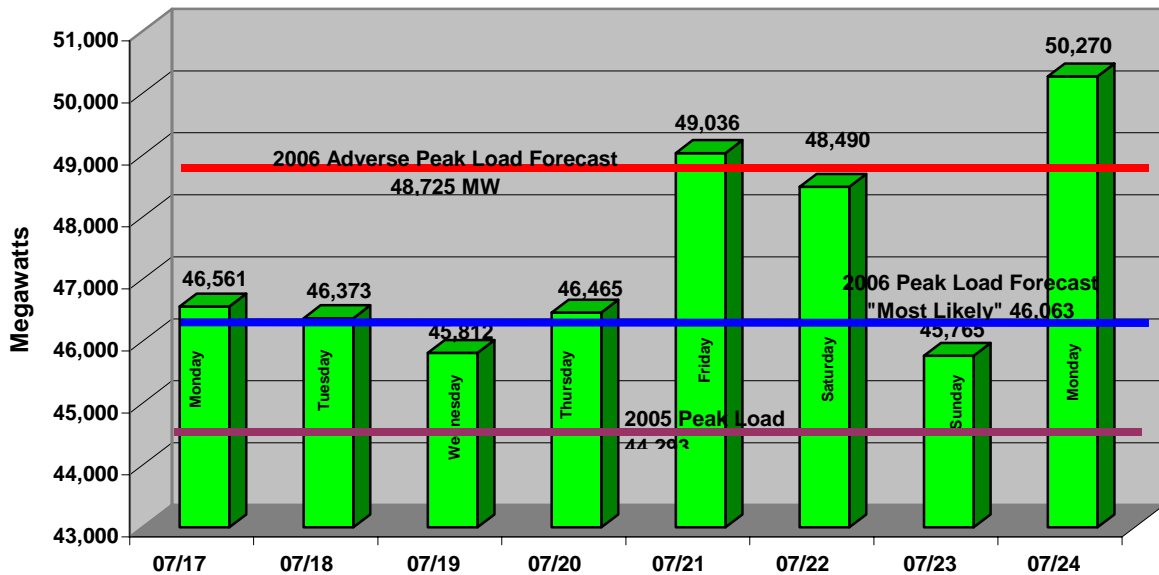
**8. Q. What is your general conclusion?**

**A.** PG&E proposes to procure 2,250 MW of generation resources by 2010 and subsequently increased the amount to 2,800 MW. The CAISO supports this

request for approval of additional resources over the 2250 MW previously identified as PG&E's "need" for new generation by 2009.

This summer's recent heat wave has taught us that the need for new generation is critical. The CAISO Summer 2006 "Most Likely" load forecast was 46,063 megawatts and the 1 in 10 year Adverse Peak Load Forecast was 48,725 MW. While the CAISO has not evaluated recent loads on a temperature-adjusted basis, as can be seen in the chart below, even the 1 in 10 adverse forecast numbers were exceeded during the July 2006 heat storm.

**Summer 2006 Peak Loads**



The size of the load increases we have seen in the summer 2006 is a compelling argument for the need for a substantial investment in new generating facilities in the CAISO area that provide sufficient "insurance" to meet adverse conditions. We therefore support the basic argument PG&E has presented for the need to procure an additional 2800 MWs for deployment by 2010.

**9. Q. Do the peak loads experienced during the July 2006 heat storm reflect that load is growing faster than the CAISO/CEC forecasts?**

**A.** No, not necessarily. As noted above, we have not finished our analysis, but so far we believe that the forecasts were fairly accurate when adjusted for

temperature (within a normal range of error). Based on information from the end of June and early July, it appears that the forecast was tracking the temperatures pretty well.

**10. Q. Does the recent heat wave have resource adequacy (RA) and system resource planning implications?**

**A.** Yes, quite possibly. Load in the CAISO control area is highly temperature dependent, and it moves at about 1000 MW per degree. During the heat storm, the average temperatures may have been as much as 5 degrees hotter than the 1 in 2 system-wide planning criteria. According to our preliminary findings, the month-ahead RA showings for July came in at 125% rather than 115%. The CEC Summer Electricity Outlook calculated a planning reserve margin in excess of 125% and the CAISO Summer Assessment had a 124.7% planning reserve. Thus, it appears that we were able to make it through an extreme load situation because of reserve margins greater than the 115% mandated by the Commission. Indeed, it is likely that as the effect of resource adequacy on investment occurs over time, a reserve margin of greater than 115% will be necessary merely to meet a 1 in 5 or 1 in 10 year temperature level. This reality provides further support for approval of the resources that PG&E is proposing to bring on line.

**11. Q. In addition to contributing to overall system resource needs, do the resources proposed by PG&E meet some of the other criteria recommended by the CAISO?**

**A.** Yes, they do. In particular, the PG&E products provide a “mix” of resources along the lines suggested by the CAISO. PG&E’s procurement plan covers the procurement of three different types of conventional generating resources: combined cycle units, combustion turbines, and reciprocating engines. Each type of generator has both advantages and disadvantages.

Combined cycle generating units typically have very low heat rates and are very cost effective to serve base load at low cost. They usually have very limited ramping capability and have long start times. Combined cycle generating units normally are not a “black start” resource and they have very limited load pick up capability for rapid system restoration.

By contrast, reciprocating engines have very fast start up and shut down capabilities. They are very stable for large load pickups and can provide voltage support and stability for remote areas. This type of unit is ideally suited for the Humboldt area that is served by very limited amount of transmission. In the event there is a transmission contingency, these units can be rapidly started to provide reliability to the local area. If they are already online, their governors can rapidly respond to the need to pick up the local loads in the event the major transmission lines to the area are forced out of services. The current generation in the Humboldt area has some limitations in meeting this objective so the installation of these new reciprocating engines should increase the reliability of the energy supply to customers in this area.

Combustion turbines are most effective as peaking units. They have fast start capability, are very useful for managing large ramps, provide local voltage/VAR support at peak hours, and they can provide “black start” capability. They typically have higher heat rate curves so are more expensive to operate and they are typically used to supply energy to loads for peak hours. These types of units will be needed for successful integration of large amounts of wind generation in the near future as the CAISO will see 2000 MW to 3000 MW hourly load/generation ramps during the 7 AM to 9 AM morning hours when wind generation will be rapidly ramping down while the morning loads are ramping up. Procurement of this type of generating resources is an essential part of the generation portfolio required for the integration of renewable intermittent resources.

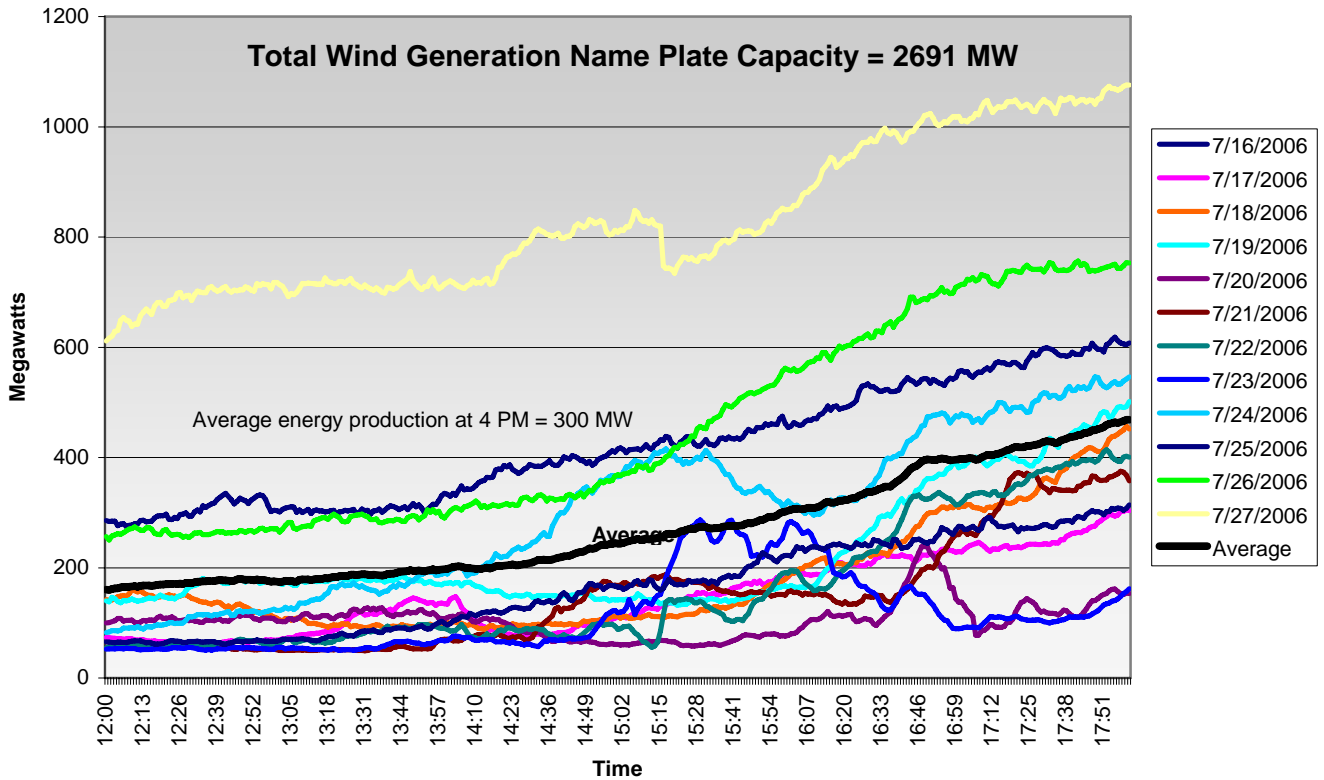
**12. Q. How will PG&E's portfolio of resources contribute to the CAISO's needs for reliable grid operation, particularly with respect to the integration of renewables?**

**A.** It is my understanding that PG&E and the other IOUs will be presenting the results of their RFOs for renewable resources in other Commission dockets. Both conventional and renewable types of generation are needed and the objective is to have a balanced portfolio of resources. The optimum portfolio must have net dependable generation to meet peak load conditions; energy from renewable resources; quick start generation for peaking and fast ramps; black start capability for rapid system restoration; and units that can be ramped down to minimum levels when the wind generation ramps up. We also need units that can be shut down and easily restarted when system conditions change rapidly. We do not yet have the tools to determine the exact quantities of the different types of generation resources in an optimum portfolio. Studies are currently in progress to determine what generation mix will be required to reliably integrate 20% of energy from renewable resources by 2010 and 33% from renewable resources by 2020. Nonetheless, the PG&E portfolio of resources includes the short-start and fast ramping capabilities that will be necessary for renewable integration.

For example, we do know that during the July 2006 heat storm the energy production from wind generation was approximately 10% of the total wind generation capacity during the system peak hour. As can be seen from the attached chart, the wind generation varied between 100 MW and 400 MW and the average production was approximately 300 MW.



July 2006 Heat Wave - Peak Hours  
Wind Generation Energy Production



While there is great value in renewable resources and the utilities are required to meet the state mandate for procurement of renewable energy, we absolutely need other types of generation to guarantee the reliability for system for peak load hours.

**13. Q. Does the PG&E application present any issues that should be brought to the attention of the Commission for future consideration?**

**A.** Yes. The deliverability of new generating resources is an important criteria identified by the CAISO in the LTPP comments. From our review of the PG&E supporting testimony, it appears that several of the selected projects are not in the CAISO interconnection queue and that the transmission impact studies performed for the projects were not done in conjunction with the CAISO.

Because we have not yet had an opportunity to evaluate the transmission upgrades that might be necessary to support the deliverability of these generation resources, the Commission should be aware that the costs of transmission upgrades might change once the necessary studies have been performed and to the extent capacity is included in the value of the selected resources.

**14. Q. Did the other parties to this proceeding raise issues in their testimony that warrant a response by the CAISO?**

A. Yes. Both TURN and the DRA have suggested that PG&E has procured too many resources, and that the Commission should consider making adjustments to the selection of resources presented for approval.<sup>1</sup> Specifically, TURN witness Kevin Woodruff states:

Q. Do you believe that PG&E is proposing to procure, between this LTRFO and the Contra Costa 8 proceedings, an appropriate level of resources to meet its bundled customers' needs, and the needs of its service territory generally?

A. No. I believe that PG&E is procuring too many resources, at too great a cost to its customers. ...PG&E is proposing to spur development of 2,780 MW of new capacity on-line in Northern California over the years 2008 through 2010. However, in D.04-12-048, the Commission authorized PG&E to procure only 2,200 MW of new capacity by 2010.

Mr. Woodruff goes on to note that while the Commission did authorize PG&E to procure resources in excess of the 2,200 MW, the quality of the contracts does not, in his opinion, warrant Commission approval (Woodruff testimony, 13-14).

Similarly, in its Summary of Recommendations (page 1-2), the DRA recommends that the Commission use the 2,200 MW authorized in the LTPP proceeding as the upper limit for approval and that, consequently, 500-600 MW should be removed from PG&E's requested long term contracts.

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<sup>1</sup> The CAISO is not taking a position on the issues raised by the Merced ID and the Aglet Consumer Coalition testimony.

**14. Q. Do you agree with these recommendations?**

**A.** No, I do not at least with respect to the value of procurement above the 2,200 MW level. I do not have an opinion on whether the “quality” of particular contracts justifies procuring in excess of that level. As discussed above, the lesson that we have learned not only from the recent heat storm, but also from a very preliminary assessment of implementation of the Commission’s resource adequacy program, is that the current system resource planning criteria on a 1 in 2 basis could be producing reserve margins that are inadequate to provide adequate levels of reliability. Decision 04-12-48 expressly rejected that “all demand forecasting should switch to the 1-in-10 peak weather standard.”<sup>2</sup> In so doing, that decision stated, “existing resource planning uses average weather (1-in-2) and then adds a reserve margin which, in part, provides the cushion should hotter than average weather occur. This is not quite accurate. Traditional resource planning on a system-wide basis utilizes a 1 in 5 weather scenario. Planning to be wrong every other year does not seem prudent. But, more important, the reserve margin does not adequately compensate for the use of an improperly low demand forecast. The Commission’s adopted 15% planning reserve margin<sup>3</sup> must account for Operating Reserves (spin and non-spin) of approximately 7% and regulation service of approximately 2%. Forced outage rates can frequently consume the remaining 6%, but even if it did not, the remaining reserve margin must accommodate forecast error as implied by the Commission. However, this is not temperature forecast error. The error relates to other factors such as economic growth, population growth, etc. Accordingly, the CAISO believes that until a proper “loss of load probability” study is completed for the CAISO Control Area, planning should assume a greater than 1 in 2 weather scenario. This bodes in favor of viewing the 2,200 MW of capacity “need” in the PG&E service territory by 2009 (and beyond) should be viewed as the minimum level of resource procurement, and the additional increments of capacity proposed by PG&E should be approved.

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<sup>2</sup> D.04-12-048 at 30.

<sup>3</sup> See, e.g., D.04-10-035.

**15. Q. Does this conclude your reply testimony?**

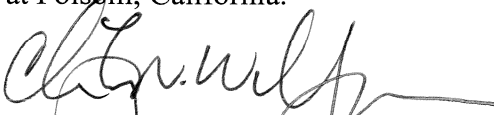
**A. Yes, it does.**

## CERTIFICATE OF SERVICE

I hereby certify that I have served, by electronic mail, Reply Testimony of David L. Hawkins on behalf of the California Independent System Operator in Docket No.

A.06-04-012.

Executed on August 10, 2006, at Folsom, California.



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