



## **Stakeholder Comments Template**

### **Subject: Integration of Renewables Report**

<b>Submitted by (Name and phone number)</b>	<b>Company or Entity</b>	<b>Date Submitted</b>
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**Comments of Pacific Gas and Electric Company  
On California ISO Draft Report Entitled “Integration of Renewable Resources  
Report. September 2007. Transmission and Operating issues and recommendations  
for integrating renewable resources on the CAISO Control Grid”**

#### General Comments

Pacific Gas and Electric Company (PG&E) appreciates the opportunity to provide comments on the CAISO draft renewable resources integration report. The CAISO’s integration study is instructive on issues associated with the integration of a large amount of intermittent wind generation. The CAISO’s determination of additional regulation and ramping requirements, and the need for a deeper supplemental energy stack intuitively makes good sense. PG&E also agrees with many of the CAISO’s recommendations such as the need for advancement in wind generation forecasting.

Regarding the conclusions of the draft report, PG&E would like to recommend further studies to investigate the impacts of intermittency generation, and operation changes, facilities and infrastructures needed to support integration. These studies should include an analysis of the cost integration of intermittency generation.

The draft report may have over estimated the ability of existing resources to compensate for the effects of increased renewable penetration. The report correctly considers the fact that many of the currently operational conventional steam units may be retired in the relatively near future, but should note that the operating characteristics of new conventional units may not provide the same flexibility of existing units.

Finally, the draft report should be expanded to include the effect of a number of WECC and NERC standards.

## Detailed Comments

### 1. As the CAISO Acknowledges, Continued Investigations and Studies are Needed

The CAISO correctly recommends additional transmission planning studies as well as studies to review the operational issues. PG&E concurs that such studies are necessary and is committed to working with CAISO and other stakeholders in this process.

In fact, the CAISO's conclusion that "integrating 20% renewables in the CAISO Control Area is operationally feasible" may be premature. The CAISO's analysis evaluates the addition of 4,000 MW of new wind generation. This may not be the same as 20 percent renewables.

To address this, the CAISO should expand its integration analysis to include the impact of solar power intermittency and a higher level of new wind generation such as 5,000 MW and 6,000 MW. Studying a higher level of new wind generation should provide additional insight into the capability of the CAISO grid. This is especially important in testing the CAISO's finding that the existing grid is adequate to support the additional renewable resources if there is enough water for hydro generation, if new thermal units have the right operating characteristics, and if existing thermal units continue to operate at certain level.

Specifically, the CAISO should look carefully at how wind generation would be integrated during each season in each year, over the period from 2010 through at least 2014. In each year the CAISO should recognize generation additions, generation retirements, and transmission improvements that are expected to occur. The CAISO should also consider the impacts of both dry and wet year hydro availability. The CAISO should identify 1) potential additional sources of ancillary services, 2) potential sources for the bid stack, and 3) potential out of CAISO generation that can be displaced or pumping that can occur. The CAISO should then discuss with operators of the sources or displacement of power production if in fact they expect the CAISO assumptions to be realistic.

### 2. The Cost of Integration Should be Analyzed

The CAISO should include a quantitative analysis of the cost of integrating these resources, as well. In addition to acknowledging the increase in ramping and regulation requirements associated with increased intermittency generation, the CAISO report concluded that the integration of additional new wind generation could increase market prices. PG&E recommends the CAISO quantify these integration costs. It is important for the CAISO and stakeholders to understand the impacts of intermittency generation on both an economic as well as an operational basis. This will help inform state initiatives to assess future renewable penetration goals. This will also help those responsible for procurement to plan for the costs of renewable integration.

### 3. Assumptions Regarding Current Resources Should be Carefully Reviewed

The CAISO draft report concludes that additional ramping and regulation capacity would be needed, but that “the CAISO current generating resources seem adequate to meet these requirements.” PG&E recommends the CAISO publish an inventory of the current generating resources that the CAISO assumes, in its draft report, will be providing such ramping and regulation capacity. Such an inventory will enable a confirmation that the integration of renewables is indeed feasible, and to provide guidance to ensure that the proper amount and type of new resources can be procured and constructed in time. This is important, as the existing thermal generators in California continue to age and some may eventually be retired.

### 4. The Operating Characteristics of New and Existing Resources

It appears the CAISO may have over estimated the ability of existing resources to compensate for the effects of increased renewable penetration. If this is the case, then the CAISO will have underestimated the impact and costs of renewable integration.

### The CAISO may have Overstated the Flexibility of PG&E’s Helms Pumped Storage Hydroelectric Project

The draft report makes several references to PG&E’s Helms Pumped Storage Hydroelectric Project. Specifically, the draft report discusses how Helms may be integrated with new wind generation in the Tehachapi. However, Helms operation is integrated with PG&E’s existing generation and demand side portfolio to meet PG&E’s electric load obligations reliably and at least cost. Using Helms principally as a “sink for the excess off-peak wind energy” is not consistent with least cost dispatch. In addition, Helms pumping typically occurs in the spring. Helms may not be incrementally available to absorb excess wind energy produced in the off-peak hours when future off-peak issues are expected to become most severe.

Also, Helms has several operating constraints including: 1) turbine efficiency curves that result in units usually generating at more than 200 MW, 2) a 30-minute lag between successive pump starts, and 3) a limitation of one start per day in each mode to minimize loss of service life. Further, Helms has a lower efficiency when multiple units are pumping, and the amount of pumping available may be limited by hydro conditions and runoff.

In addition, as the draft report notes, individual Helms pumps can only operate at 300 MW or off-line at 0 MW. Therefore Helms pumping, which typically occurs off-peak, does not contribute to solving the regulation issue.

### Operating Flexibility of PG&E’s Existing Conventional Hydro Electric Power Plants may be Overstated, as Well

The ability to use the existing hydroelectric system to meet future ramping and regulation requirements is limited. Limitations occur for a variety of reasons. FERC requirements

limit the daily fluctuations from some plants during various seasons, particularly when fisheries and/or recreation would be adversely impacted. When spill is expected to occur, or is occurring, plants are operated at full output to maximize the value of the output. During these periods ramping and regulation are not available. Optimization of watersheds over a yearly period causes the water to be used when it is most valuable, and hence providing ramping or regulation when wind energy is most variable, may not be consistent with least cost dispatch. Overhaul of units, and outages, also limit the ability of units to provide ramping or regulation. PG&E is concerned that the hydroelectric system may not be able to provide ramping or regulation to accommodate an influx of intermittent resources. Spilling of water past plants for short periods of time, resulting in rapid fluctuations in river flows, may not be allowed per FERC license requirements.

Finally, if additional fossil units must be operated to provide the regulation and load following services needed to effectively integrate additional wind generation into the grid in a reliable manner; this could result in the spilling of hydro.

#### Operating Assumptions For Conventional Steam Units From Which PG&E Purchases Power Are Not Fully Analyzed

Significant ramping and load following is currently provided by these units during certain times of the year. While these units have ramping and load following capability and such operation may be used to support intermittent wind generation, it does so at a cost – the cost of burning natural gas, and the added wear and tear on the equipment. Another uncertainty is whether these units will be retired and replaced by newer technology such as combined cycles or combustion turbines, which may not have operating characteristics that fully support integration of intermittent wind generation as noted below.

Further, changes in the operation of gas-fired generation affect the operation of the interstate and California gas transmission system. The operation of gas-fired generation must be in compliance with the FERC-approved tariffs of interstate pipelines, and the CPUC approved tariffs of California's gas utilities. This is especially relevant with respect to nomination and balancing provisions.

#### Operating Characteristics of New Resources may not Have the Same Flexibility As Current Resources

New conventional resources, typically combustion turbines and combined cycle facilities, are not expected to have ramping capacities or operating characteristics similar to those of the existing steam units. New combined cycles and combustion turbines are most efficient at full load and may have emissions issues at partial load.

Operation of these newer facilities in conjunction with least cost dispatch is expected to result in operation at or near full energy production capacity, limiting their ability to provide regulation. The economics of these units will drive them toward daily cycling, limiting the opportunity to use them to provide regulation or load following during the off-peak hours. Also, least cost dispatch of combustion turbines is expected to result in

their commitment for peak energy needs, not for morning or evening ramps or ancillary services.

### The CAISO Should Consider the Changing Character of Resources in Future Years

The draft report notes the “regulation capacity requirements would increase noticeably during certain hour ranges” and a greater a larger bid stack will be necessary. Many of the conventional steam units which provide these services are expected to be retired from service just as these needs increase. The economic use of new resources is not expected to allow them to provide significant amounts of these services.

Therefore, the CAISO should carefully evaluate current sources of ancillary service and the bid stacks. Some of these sources maybe retired just as the need for them increases. Sources the CAISO is assuming will be available may in fact not be available in the future to the CAISO because of equipment limitations, various environmental or regulatory limitations, or economic limitations.

### The CAISO Study Should be Expanded to Include WECC and NERC Reliability Requirements

The WECC and NERC are considering revising reliability requirements. They have begun a process to develop frequency response requirements. Additional wind power may make meeting these developing requirements more difficult. The CAISO should investigate the potential for a frequency response requirement and how it would meet this requirement.

The CAISO covers a number of contingencies in the Post-Transient Voltage Stability Analysis in its draft report. However, it is not clear from the draft report whether compliance with NERC/WECC Planning Standard<sup>1</sup> I.D, which addresses voltage support and reactive power, has been established.

Specifically, for a “Q-V” analysis, the WECC methodology outlined in several publications, including the guide to WECC/NERC planning standards I.D relating to voltage support and reactive power<sup>2</sup> calls for first establishing a reactive power margin requirement at a bus to form the basis against which the system performance can be assessed. Then, compliance can be demonstrated by comparing the reactive power margin (RPM) at that bus against the established RPM requirement.<sup>3</sup>

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<sup>1</sup> [http://www.wecc.biz/documents/library/procedures/planning/WECC-NERC\\_Planning%20Standards\\_4-10-03.pdf](http://www.wecc.biz/documents/library/procedures/planning/WECC-NERC_Planning%20Standards_4-10-03.pdf)

<sup>2</sup> <http://www.wecc.biz/documents/library/procedures/VoltageStabilityGuideMar-30-2006.pdf>

<sup>3</sup> For example, the RPM requirement for a “category B” disturbance at the critical bus under consideration is equal to the change in the RPM between the following two:

- RPM of the scenario case depicting the Category B disturbance with 100 percent forecast loading or path transfer
- RPM of the scenario case depicting the same Category B disturbance as above with 105 percent forecast loading or path transfer increase

The draft report documents the RPM at various buses for various contingencies. However, it is not clear what the RPM requirements would be. RPMs by themselves do not demonstrate compliance without comparing against the respective requirements.

In addition, NERC/WECC Planning Standards I.D.WECC-S1 and I.D.WECC-2 require that either the transfer path flow or the load in a load area be modeled at 105 percent of the path rating or the load for Category A system conditions and Category B contingencies, and at 102 percent of the path rating or load for Category C contingencies.

These RPM requirements may have been established, but if so they need to be included in the report for completeness. If not, they should be addressed.

### Conclusion

The CAISO's study is an excellent first step in assessing the impacts of integrating large quantities of intermittent renewable resources into the electric grid. PG&E recommends that the CAISO continue its work, in coordination with the CEC, CPUC, and market participants, to complete a broader and deeper investigation of the impacts and costs of intermittency generation, and the operational changes, facilities and infrastructure needed to achieve such integration. For follow-up or questions, please contact Brian Hitson (415-973-7720).

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