

Stakeholder Comments Template

Subject: Integration of Renewables Report

| Submitted by (Name and phone number) | Company or Entity | Date Submitted |
|---|------------------------------------|------------------|
| Nancy Rader 510-845-5077 | California Wind Energy Association | October 12, 2007 |

CAISO seeks written stakeholder comments on its Draft Integration of Renewable Resources Report, which was posted on September 20, 2007 at <http://www.caiso.com/1c51/1c51c7946a480.html>.

Stakeholders should use this Template to submit written comments and or suggestions. In order to be considered, written comments must be submitted no later than Close of Business on Friday, October 5, 2007 to: vjetmalani@caiso.com.

The subject areas upon which CAISO seeks stakeholder input are:

1. Transmission Planning Issues associated with the integration of Renewables

At the outset, CalWEA would like to thank the CAISO for drafting a wide-ranging and impartial report, "Integration of Renewable Resources" (CAISO Report), which aims to "[address] the operational and transmission impacts of increased renewable capacity and how the system can successfully integrate these increased resources."

The CAISO took on the responsibility to perform a restudy of the Tehachapi Renewable Transmission Project (TRTP) based on updated and more realistic assumptions about wind generation technologies that are expected to be employed in the Tehachapi Wind Resource Area (TWRA). One of the main conclusions from the restudy states that:

"With adequate dynamic reactive capability and reasonable assumptions of wind plant operation, system transient stability performance is acceptable with fewer capacitors (and possibly smaller/fewer SVCs). This suggests that wind plants with some dynamic reactive capability may reduce or eliminate the need for dynamic reactive devices on the transmission system. Dynamic reactive power supplied close to where it is needed (e.g., at the Type 1 wind turbine generator terminals) will be more effective than the dynamic reactive power at a remote location for the potential problems identified in this transient stability analysis. This will require further analysis to determine the optimal size and location for the dynamic reactive support."

We are hopeful that this added information will be taken into consideration as SCE and the CAISO enter into the actual building of the TRTP, leading to savings in that project's overall cost and/or the interconnection of more MWs to these facilities.

CalWEA appreciates the conclusion of the CAISO Report that the Tehachapi Transmission Project is technically sound and can support 4,200 MW of wind generation in this important wind resource area. Given recent trends in the wind industry in California and nationally, the CAISO should assume that most

of the new wind turbines to be installed in the Tehachapi wind resource area will be Type 3 and 4 generators, thus providing adequate dynamic reactive support to meet applicable WECC transient stability performance standards.

2. Grid Operations Issues

The Importance of Forecasting and Flexible Generation. The draft CAISO Report concludes that the CAISO grid can integrate successfully the amount of wind generation that is anticipated to be developed in the state if California is to meet its goal of 20% renewable generation by 2010, provided that there are certain changes to operating practices. Many of the CAISO Report's recommendations parallel those made by the final report of the CEC's Intermittency Analysis Project (IAP), which was released in July 2007. Importantly, both reports highlight that the successful integration of wind generation into the CAISO's scheduling and dispatching activities will require:

- Continued improvements in the ability to forecast wind generation on a day-ahead, hour-ahead, and real-time basis, and
- Increasing the flexibility and quantity of generation that can follow load.

CalWEA agrees that these will be central elements in the successful integration of 20% renewable generation in California.

The CAISO's Approach to Determining Regulation Needs. CalWEA offers the following comments on the CAISO's overall approach to determining regulation capacity requirements in 2010:

- The Report does not present the details of the actual methodology that the CAISO has used to estimate the added regulation requirement for the planned Tehachapi wind generation. Understanding the details of the approach is particularly critical in distinguishing between the regulation and the ramping needs of the planned Tehachapi wind generation as what may be considered as regulation need may simply be ramping need. We believe that ramping needs can be more readily addressed by less costly and more effective measures. This is especially true considering the significant sophistication of the CAISO's various market and scheduling procedures under the MRTU which will be in place by 2010.
- The Report does not indicate whether the approach it has used for determining the regulation capacity needs for the planned Tehachapi wind generation is the same one that is used today for determining the regulation reserve needs for the CAISO system. Neither has the Report specified whether it has used the same methodology to estimate the future regulation needs for the CAISO system without the planned Tehachapi wind generation for the 2010 studies.
- The Report does not indicate as to whether it has fully accounted for the vast geography where the planned Tehachapi wind turbines will be located when forecasting rapid variations in wind generation output in the area. It is well documented in the literature that spreading wind turbines over a large geography, such as that of Tehachapi, have a significant smoothing effect on the fast variations of the output of individual wind turbines.
- The Report does not clearly indicate whether it has modeled planned Tehachapi wind generation simply as an "uncontrollable negative load" or as a generating plant whose output, especially when using Type-3 and Type-4 generators as expected in the Tehachapi area, can be readily controlled. We believe that accounting for even limited controllability of the wind generator output can have a significant impact on mitigating its regulation (as well as ramping) capacity needs, and particularly downward regulation capacity needs.
- The Report does not indicate for how many hours in a year the extreme level of upward and downward regulation capacity (at or around +250MW and -500MW) will be needed.

Understanding the number of hours will help the industry to determine whether the need for such extreme values of regulation capacity can be completely mitigated by simply controlling more carefully Tehachapi wind generation output for those hours.

- While the need for more frequent telemetry of meteorological and production data is understandable, we do not understand the need for 4-second telemetry of such data, particularly given that the report has developed its findings and recommendations based on modeling wind generation as an "uncontrollable negative load" anyway.

Solar and Wind Are Complementary. CalWEA also is concerned that the draft CAISO Report may overstate the need for additional load following and regulation resources by focusing solely on the impacts of additional wind generation. The state also plans to add significant new solar resources, both to meet the 20% by 2010 goal and continuing into the next decade. The California Solar Initiative (CSI) aims to add 3,000 MW of solar photovoltaic (PV) capacity over the next ten years (2007 - 2016), and the investor-owned utilities have contracted for significant capacity from central station plants using a variety of concentrating solar thermal (CS) technologies.¹ The IAP projected that the state will have 630 MW of PV and 1,200 MW of CS on-line in 2010 in its 20% renewables case (Scenario 2010T). The CEC forecast of renewables additions in Table 1 of the CAISO Report are consistent with the IAP's numbers, including about 1,900 MW of solar generation in 2010. CalWEA believes that this projection is generally reasonable. As a result, the IAP report looked at the integration impacts in 2010 of the combined profile of solar and wind generation. Wind and solar output often are complementary – wind generation decreases in the morning as solar output is rising, and wind output rises in the late afternoon as solar generation is waning. The IAP study found that the impacts of the combination of intermittent wind and solar generation in 2010 on load following and regulation requirements generally were modest. For example, the impact of wind and solar resources on load following were less than the impact due to load growth. Regulation requirements in 2010 would increase by just 3% to 7% as a result of new intermittent generation, according to the IAP results.

CalWEA strongly disagrees with the CAISO Report's assumption, at page 44, that no significant solar additions are expected by the 2010 time frame. From 1981 through 2006, California installed about 200 MW of solar PV. Based on data through mid-September 2007, applications for solar incentives under the new CSI program are expected easily to exceed 200 MW in 2007 alone, and the pace of new applications is accelerating.² The IOUs have signed more than 1,500 MWs of contracts with CS plants. CalWEA is concerned that the CAISO's focus on the operational impacts of wind generation alone fails to present an accurate picture of the true impacts of integrating the complete portfolio of new renewables that are expected to be operational in 2010. Due to its focus on wind generation alone, CalWEA believes that the CAISO Report overstates the impacts of intermittent renewables on morning and evening ramps, on intra-hour load following, and on regulation requirements. Commenting on the IAP study, the CAISO Report says, at page 20, that "it is very encouraging to see how the combination of wind and solar together can reduce the variability of the entire fleet of intermittent resources." The CAISO Report later concedes that "solar...could be beneficial in alleviating some of the expected ramping concerns" (page 54; this point is also repeated on page 91). Yet rather than studying the impacts of expected solar generation, the CAISO Report simply urges additional research to drive down the costs of solar (page 20), and lists the intermittency impacts of solar as an action item (page 48, Recommendation No. 7) . The best way to drive down the cost of any technology is to bring it to the market, in quantity, which appears to be happening with solar technologies. The state's ambitious CSI program and the substantial amount of CS capacity now subscribed in contracts should be enough to convince the CAISO that solar is no longer a technology still in R&D.

¹ CalWEA is aware that PG&E has signed three solar thermal RPS contracts totaling 560 MW, and SCE and SDG&E have contracts for 500-850 MW and 500-900 MW, respectively, with Stirling Energy Systems. Other major solar thermal projects in California have been announced, some have filed for siting permits at the CEC (see <http://www.energy.ca.gov/siting/solar/index.html>), and there are more than 18,000 MW of solar projects in the CAISO's interconnection queue.

² See the CPUC's recent CSI update, at http://www.cpuc.ca.gov/static/energy/solar/california_solar_initiative_staff_progress_report_september_2007.pdf.

Minimizing Wind Curtailments. Both the IAP and the CAISO Report highlight the potential for the growth in wind generation to increase the potential for over-generation conditions during periods of low loads and high wind output. Curtailment of wind generation is one means to respond to an over-generation condition. However, curtailment will result in the loss of renewable energy, which is contrary to the state's policy goals, and may result in undue discrimination against wind generators. Both the IAP and the CAISO Report make a number of constructive recommendations for minimizing the potential need for wind curtailments:

- Increase the ability of pumped-storage units to use excess off-peak generation,
- Explore the deployment of new storage technologies and off-peak loads (such as flywheels, compressed-air storage, plug-in hybrid vehicles, and off-peak cooling), and
- Improve wind forecasting to allow over-generation problems to be resolved in the day-ahead market.

CalWEA urges the CAISO to consider additional measures that the IAP study recommends to minimize over-generation conditions:

- Encourage new thermal generation with lower minimum turndown points and a greater ability to start-up and shut-down every day,
- Allow more frequent and flexible changes in import/export schedules on the interties,
- Replace the artificially inflexible Department of Water Resources (DWR) contracts with more responsive generation as the DWR contracts expire in the coming years,
- Increase the ability of DWR pumping loads to respond to system conditions, and
- Enhance the flexibility of hydro resources.

More specifically, the CAISO needs to consider whether the current "minimum loads" of all types of generation are appropriate: whether the minimum turndown points of gas-fired generators really are minimums, whether "minimum" levels of imports can be lowered, and even whether nuclear generation can be reduced during critical periods. Finally, CalWEA is aware that some QF contracts have provisions that allow for a limited number of hours of curtailments by the utilities each year.

CalWEA appreciates the recognition in both the IAP and the CAISO Report that, if wind curtailment is to be considered as a means to deal with over-generation before the CAISO's own over-generation protocol is used, the number of hours of annual curtailment should be limited to no more than 100 hours. CalWEA strongly supports the IAP's recommendations that the limits on wind curtailments should be clearly defined, and that wind generators should be appropriately compensated when curtailment of wind generation alone is used to provide decremental generation.

Beyond a strictly limited number of hours of curtailments for which wind generators are compensated, the CAISO must look to its own over-generation protocol to reduce generation when the market for decremental generation has been exhausted. The key feature of the over-generation protocol – which the CAISO must be vigilant to enforce – is non-discrimination: the protocol does not single out any particular generation source. So, for example:

- Curtailment of generators operating above schedule, whatever their fuel source, should precede any other non-market curtailment.
- Curtailment of wind generation should not be placed ahead of curtailment of any other generation operating at or below schedule.
- The ISO should ensure that all generators with PGAs, which are obligated to comply with this and other ISO protocols, are able to reduce generation when needed, not just wind generators. This includes both utility-owned and merchant generation. For example, utility-owned hydro plants can curtail their generation, even during high-runoff conditions, by spilling water rather than running it through the turbines.

In addition, some wind QFs may have "must-take" status under the ISO tariff, which the CAISO must consider as well. That status will not change if those contracts are repowered to produce more energy.

3. Forecasting Issues

No comments.

4. Implementation Issues

CalWEA commends the CAISO for this study and encourages it to recalibrate its results based on an assumption that California will see the development of significant solar generation in addition to wind. The CAISO also should re-visit this work after the results from the operation of the first projects from the planned Tehachapi wind generation are in. Only then should the CAISO consider setting actual requirements for added regulation capacity to integrate Tehachapi wind generation and the significant other renewable resources that will be developed in California in the coming years.

5. Other Issues

No comments.