

INTEGRATION OF RENEWABLE RESOURCES PROGRAM (IRRP)

COMMENTS OF THE STAFF OF THE CALIFORNIA PUBLIC UTILITIES COMMISSION Following the January 13, 2009 Webcast/conference

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Introduction

The staff of the California Public Utilities Commission (CPUC) welcomes the opportunity to comment on the California Independent System Operator's January 13 presentation of preliminary results from its Existing Fleet Study regarding integrating renewable generation to meet a 20% renewable portfolio standard (RPS), as well as plans, challenges and desired collaboration for studies and other activities to assess and guide the integration of renewable generation to subsequently achieve a 33% RPS. We especially appreciate the CAISO's efforts to work with the CPUC and other stakeholders starting in the early stages on the important and complex 33% RPS integration process.

The following comments are broken into five sections: Renewable Generation Scenarios, Sources of Flexibility, Operating Processes (modeling, sources of flexibility), Integration of Issues and Studies, and Working Group.

Renewable Generation Scenarios

1. *What Renewable Generation Mix is Assumed?* For the 20% RPS integration study, the assumed renewable generation mix appears to contain somewhat less solar capacity and no central station PV, and somewhat more biomass, relative to projections based on present contracting. The most consequential difference is that while assumed total wind capacity is similar to current expectations based on contracting, the wind generation is apparently assumed to be all located within California, whereas contract developments suggest that almost 2,000 MW will be located out of state. Depending on location and delivery/firming arrangements, this could have implications for the integration of this wind generation, perhaps even reducing the integration challenges.

For 33% RPS generation mix scenarios, the alternative portfolios being developed for the CPUC's 33% RPS study in conjunction with the CPUC's long term procurement planning (LTPP) process should provide a valuable guide, as they are based on RETI information, additional, more granular assessments, and empirical project developments. We agree that it is essential to select and assess the appropriate

“bookend” scenarios that provide sufficient perspective and insight regarding renewables integration challenges, without getting bogged down in too many study cases. We expect that both the mix of renewable generation fuels/technologies, and also their locations, will be key drivers of integration challenges.

At least two 33% renewables mixes should be examined in depth. The key drivers of integration challenges in connection with these mixes will include (but not necessarily be limited to) the amounts and location/diversity of wind generation additions, as well as the amounts and technology (such as PV versus thermal, and storage) of solar generation additions. Another factor is the extent and nature (*e.g.*, delivery, firming and the responsibility for integration) of out-of-state renewables that under some circumstances could reduce California’s integration difficulties while requiring broader regional coordination. The 33% RPS cases being developed for the CPUC’s LTPP proceeding should provide a good basis for covering such a range of integration challenges. It is important that at the outset of this process, the CAISO and its stakeholders actively discuss, and seek to achieve consensus on, the criteria for selecting which, and how many, renewable generation scenarios should be analyzed.

2. *What Wind and Solar Profiles Are Used?* Besides the amounts of different kinds of renewable generation, the output profiles (and their variability) will be a key driver of integration challenges. It would be helpful if the CAISO could provide more information on the five wind profiles apparently used for the 20% integration study, including how the profiles are applied to different subsets of the wind generation. Additionally, in connection with the 33% RPS study, the CAISO and its stakeholders need to consider the possibility, and the value, of obtaining additional or improved wind profiles, including information on the variability/uncertainty associated with these profiles, because such profiles can have a substantial impact on study results. Moreover, it will be important to consider how to model substantial quantities of out-of-state wind generation. Another important question to be addressed is whether all wind generators within each profile category (*e.g.*, within each of the 5 profiles used for the 20% integration study) are assumed to have fully synchronized/correlated outputs (*i.e.*, with no diversity within a profiled group), to what extent this assumption would make conclusions regarding the difficulty of wind integration overly conservative, and to what extent this modeling can be improved upon for the 33% study.

There are additional unanswered questions to be addressed regarding which (and how many) solar profiles will be used, how these profiles will be different for thermal vs. PV, how these profiles will treat

solar generation stochastically for the 33% study, and whether such stochastic treatment is especially important for PV.

3. *How Will (Should) the 33% Integration Studies Address Publicly Owned Utilities' Renewable Generation?* This is a question that the CAISO and its stakeholders need to explicitly address as the 33% study is developed. Otherwise, there could potentially be incomplete consideration of RPS scenarios and their integration implications.

Sources of Flexible Response

4. *Hydro and Imports as Providers of Flexibility.* The CAISO should describe in more detail what was assumed about the ability of hydro and imports to provide flexibility in the Day Ahead and shorter term (10 minute steps) time frames. It was implied in the webcast that the high hydro case (versus low hydro) was more constraining for wind integration. It is not obvious to the CPUC whether this is so, either in general or in the specific study that was run and reported on in the January 13 webcast. The CAISO therefore should explain if and how this is the case, including whether this is true for some hours but not others, and how it might change if greater hydro flexibility is assumed (see below). It was explained that if the 20% RPS study ultimately finds significant violations, a more detailed look would be taken at hydro and imports. The CAISO needs to explain how would this be done, and to what extent it would prolong the study. The CAISO should also explain whether 2006 and 2007 conditions are adequate “bookends” (*i.e.*, as “wet” and “dry” years) to bound hydro uncertainty. Finally, in slide 30 (from the January 13 webcast), the hydro A/S capability appears rather low, even taking into account the fact that hydro commitment was apparently fixed (based on historic pattern). The CAISO should explain whether the “peak hour” hydro A/S capability depicted in this slide is representative of the overall A/S capability from hydro, across other hours.

5. *How Are Assumed Fossil Generator Operating Flexibilities Based on Theoretical/Physical Capabilities versus Historical Behavior?* If there is a significant difference, incentives to elicit desired (versus historical) responses should be investigated.

6. *What Is Assumed about Flexibility Capabilities of Renewable Generation, Including Curtailment, Ramp Control, and Ancillary Services?* An explicit consideration of these questions should be included in 33% RPS studies.

7. *The ability of DR to provide flexibility to support renewable integration requirements should be included in 33% RPS studies.*

8. *What are the Implications of Assuming only Two Generation “Locations” (NP26, SP26) for the 20% RPS Study?* This modeling convention that the CAISO has adopted could understate the impact of congestion on renewables integration, especially when combined with possible retirements of conventional fossil-fired plants that use once-through cooling. The CAISO needs to address whether the use of this convention could pose problems and whether it is adequate for the 33% RPS integration studies. A broader question is whether substantial transmission additions will be needed to integrate (rather than simply to interconnect) renewables, and whether a network (rather than NP26, SP26 bubbles) modeling approach is needed to address this. The CAISO should also explicitly state whether additional Path 15/26 upgrades will be needed to facilitate the integration of renewables.

Modeling System Operating Procedures

9. *How Is Over-generation Treated as a Violation?* The CAISO needs to clarify which actual generators (aggregated as necessary) are simulated to be running when over-generation is expected to occur. Illustrative categories that the CAISO should provide this information on would include, but certainly not be limited to, zero-variable-cost generation (wind, run of river hydro), any must-take generation, local area must-run, slow-start generators needed to run the next day, generators needed to provide ancillary services, etc. The CAISO should also explain the following: (a) what options are modeled to avoid over-generation; (b) whether revised operational procedures, such as procuring additional or new ancillary services (more Reg-Down, a new load-following or ramp-down ancillary service, etc.), would significantly reduce over-generation; (c) whether the low over-generation penalty factor (for optimizing scheduling and dispatch) means that there is essentially no simulated effort to avoid over-generation; (d) whether adding a higher over-generation penalty (or renewable generation opportunity cost) would significantly impact simulated over-generation; and (e) what kinds of problems of physical feasibility the CAISO would actually face in dumping over-generation in the real world. (Would the inability to shut or ramp down enough exiting units give rise to system reliability problems?)

10. *What Kinds of “Low Probability Events” (Slide 57) Are Being Considered for Evaluation?* The CAISO should actively discuss this topic with its stakeholders, and should address whether such an analysis could partially substitute for doing more numerous full simulation cases. However, to accomplish this, there would need to be a specific discussion of whether such events could

be analyzed using limited duration episodes and/or simple sensitivity variations on existing modeling cases, and whether this would require the use of any specialized analytic tools or methods.

11. *To What Extent are Tools and Methods Used for 20% RPS Analysis Inadequate for 33% Analysis?* The 33% analysis may need to focus more on shorter time steps (e.g., to address solar PV), and/or operational changes (including those relating to new kinds of ancillary services, revised scheduling/dispatch, or integration of substantial storage) that may be necessary to effectively integrate the renewable resources needed to meet a 33% RPS. Some of this may be beyond Plexos. The CAISO should accordingly explain what are the advantages and disadvantages of using multiple modeling tools and approaches, especially if the different tools/methods are not fully consistent or transparent in their interrelationship.

12. *For the 10-Minute Time Step Analyses (6-Hour Look-Ahead): What Time Periods (Within the Year) Were Selected for Such Analysis and How?* This question needs to be addressed in order to improve the stakeholders' understanding of the CAISO's methodology, and how this methodology might be improved going-forward.

13. *Is It Possible to Relate Simulation Results To Historical Experience, in Terms of How Closely the System Approaches A/S shortfall and Over-generation?* This question needs to be addressed in order to provide empirical verification for the CAISO's methodology.

14. *Slide 44 Shows Simulated Monthly Reserve Shortfall - - Why is there more spin shortfall than Regulation shortfall, if there are fewer units able to provide Regulation, and Regulation is given a lower penalty when optimizing commitment and dispatch?* This, and similar, specific questions going forward will help the stakeholders understand the CAISO's methodology and its implications.

Integration and Scope

15. *It Was Stated That The Integration Studies Will Address Physical Needs but Not Necessarily Implications for Market Design, Procurement Vehicles, or Costs.* An assessment of physical needs is an essential step in the 33% study, but in order to inform other processes (e.g., procurement, market design, research funding) and even to prioritize the elements of the CAISO's 33% study, it will be essential to assess procurement, market design, research and (especially) cost implications. For example, some infrastructure addition/retirement assumptions, and the way that some kinds of "system flexible response" would actually respond, will depend on economic considerations and incentives. Therefore, a key consideration in the CAISO's discussions with stakeholders going forward

will be how to adequately address economic and process change issues, without requiring excessive or prolonged study effort. Cost and process change assessments might fall into separate study phases from the physical needs assessment; however, the urgency and interrelatedness of physical, economic and process issues will likely require the active consideration and careful coordination of all of these dimensions into the basic study in order to produce reasonable and realistic conclusions that will inform decision-makers.

16. *The Various Separate Topics That Have Been Suggested (e.g., Storage, Fast Regulation, DR, Altered Scheduling on Inerties, Wide Area Storage and Management System, “Additional Studies” on slide 56) Should be Brought Into (and Interrelated Through) the Basic Needs Assessment Methodology.* The incorporation of these topics into the needs assessment methodology is necessary in order to inter-relate all these pieces, both functionally and in terms of timing of future decisions and commitments. Otherwise, each topic may take on a life of its own and become “stovepiped.” This is not to imply that complementary specialized analysis may not be needed for certain topics. (For example, the “wide area storage and management system” needs to be more fully defined.) Some “additional studies” may involve a longer time frame than is envisioned or practical for the release of the initial basic assessment (which is scheduled for October 2009). This, in turn, raises the question of which “additional studies” or topics are critical for accurate and credible results to be included in the basic assessment.

17. *The 33% Integration Study Should Develop and Assess a Chronology of Challenges and Solutions Progressing from 20% Renewables to 33% Renewables by 2020.* Such a chronology should address key drivers of timing, key risks and deadlines, and the lead times for availability of key tools or solutions. However, this should be done in a way that makes efficient use of staff time and resources.

Working Group

18. *A Single Working Group is Appropriate to Address the Basic Study Design (RPS Scenarios, Physical Need/Gap Analysis, Economic and Process Implications).* Although the basic study framework should be developed by a single Working Group, the CPUC recognizes that some complex or important individual topics (e.g., storage) will likely require their own stakeholder processes. Several CPUC staffers are interested in participating in the basic Working Group, which, at least for purposes of developing an initial plan in two months as envisioned by CAISO staff, should convene at least every week, and should meet in person at least every other week.

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