

Center for Energy Efficiency and Renewable Technologies
Comments on the CAISO's
"Discussion & Scoping Paper on Renewable Integration:
Market and Product Review Phase 2" of April 15, 2011

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The Center for Energy Efficiency and Renewable Technologies (CEERT) appreciates the opportunity to comment on the CAISO's "Discussion & Scoping Paper on Renewable Integration: Market and Product Review Phase 2" of April 5, 2011. CEERT would like to commend the CAISO for initiating this comprehensive round of proposed initiatives aimed at addressing market design changes needed to support renewable integration. Our comments are organized below by issue and use the section numbers from the whitepaper:

2.2.1 Hourly Contingency-Only Election for Operating Reserves: We encourage the CAISO to look for additional sources of system flexibility, and enabling hourly contingency-only elections for operating reserves appears to be a relatively minor market modification that could potentially provide such system benefits.

2.2.2 Multi-Settlement System for Ancillary Services (AS): A multi-settlement system for AS that provides added flexibility to the CAISO and to market participants by allowing trading of AS closer to real-time would provide significant system benefits and support VER integration. For this reason CEERT encourages the CAISO to explore implementing such functionality.

2.2.3 Enhancements to the Residual Unit Commitment (RUC) Process: Efficient unit commitment, efficient commitment of ramping capacity and accurate accounting of Variable Energy Resources (VER) forecast uncertainties in unit commitment would ultimately result in optimal use of VER and limited thermal generation units. For these reasons, CEERT would like to recommend that the CAISO explore the possibility of developing market processes that simultaneously solve the Integrated Forward Market (IFM) and RUC processes, despite the potential challenges posed by this optimization. In addition, CEERT would also like to strongly encourage the CAISO to continue exploring ways of moving to 15 minute real time markets, and for providing opportunities for all resources, but especially VERs, to bid closer to real-time. Such measures may provide low cost mechanisms for reducing VER forecast uncertainties that may naturally lead to more efficient unit commitment.

2.3.1 Pay for Performance Regulation: The proposed two-part payment structure may help incentivize the development of new storage products on the grid. While CEERT believes that storage solutions may be of great value in assisting with VER integration, we also believe that the benefits and costs of such storage solutions need to be carefully evaluated within the

context of other lower cost options. However, if a two-part payment structure is able to reasonably provide the financial incentive that will economically and cost effectively lead to the introduction of such valuable products on the grid, then CEERT is in support of such an approach. In addition, because cleared bids for regulation will receive a single market clearing price that reflects the total marginal costs of the marginal cleared resource, compensation for fast regulation solutions will likely evolve to lower levels as more storage resources come online, so the market may naturally prevent excessively high compensation for fast acting regulation products. Compensating regulation products for cross product opportunity costs and for Inter-temporal opportunity costs makes a good deal of sense in a competitive market, however CEERT has some concern that an overly complex market will impede the efficient functioning of such markets.

2.3.2 Load Following Reserve: The need to explicitly define a load following constraint is critical precisely because without such a valid constraint, regulation may be used inefficiently or uneconomically. For example, the failure to accurately model the predictable solar diurnal ramping may lead to excessive reliance on regulation. A valid load following constraint would allow the solar diurnal ramping to be managed more efficiently within the existing energy markets, without excessive reliance on regulation resources.

2.3.3 System Inertia and Frequency Response: While certain VERs provide minimal frequency regulation, the CAISO should account for modern wind turbine design, which in some cases may provide better frequency regulation than conventional thermal generation.

2.3.4 Flexible Ramping Constraint: CEERT recognizes the need for addressing the increasingly challenging ramping constraints that will result from variability and forecasting uncertainties associated with increasing VER penetration. CEERT would like to encourage the CAISO to explore market mechanisms for addressing some of these ramping considerations. For example, diurnal ramping events from solar PV and to a lesser extent, solar thermal, will arguably pose one of the largest single challenges to VER integration. We would like to encourage the CAISO to think of creative solutions to this problem. For example, the diurnal ramp rates could be significantly mitigated by using flexible load, such as hot water heaters or freezer storage facilities, to bid in during the morning ramp event and to more slowly exit the system in a manner that optimally utilizes existing thermal or hydro resources; and contrariwise incentivizing flexible load to bid in slowly prior to the evening ramp and then drop off with the evening solar ramp rate. Such creative solutions might provide relief to critical ramping constraints that such resources may pose to the system as solar VER penetration increases. Wind may have less significant effect on such extreme ramp rates since wind variability typically occurs over tens of minutes, and not minutes like the diurnal solar ramp. By developing flexible products able to address such issues, and by creating appropriate compensation mechanisms based on the realized system benefit, the CAISO may be able to incentivize products able to mitigate issues associated with solar diurnal ramping.

2.3.5 Reflecting Constraints in Market Prices: CEERT encourages the CAISO to continue to explore mechanisms for the just and reasonable compensation of resources serving load.

2.4 Allocation of Integration Costs: CEERT strongly believes that all integration costs should be broadly allocated to load. Such an approach is consistent with the way in which non-variable generator integration costs and the costs of most other ancillary services, including regulation and contingency reserves, are currently allocated. There is no compelling reason why VER integration costs should be allocated in a manner that is different from the broad way in which these costs are currently allocated. And to broadly allocate one resource's integration costs while a competing, similarly situated resource is forced to pay its integration costs is *per se* discrimination and not just and reasonable.

Furthermore, integration costs are based in large part on the extent to which creative, low cost solutions can be exploited for the purposes of lowering these costs. For VERs, such low cost solutions might involve the aggressive and creative use of Demand Response, and the sharing of variability and balancing resources across adjacent Balancing Authority Areas (BAAs). Should the CAISO assess VER integration costs directly to the VER generators, there would be no incentive for the CAISO to aggressively explore ways in which to pursue such mitigation solutions.

2.4.1 Integration costs for VER Imports: Importing VER variability into the CAISO BAA will tend to mitigate the total variability of VERs resources balanced within CAISO, as it is well established that aggregating geographically distributed VERs will tend to reduce overall variability in the aggregated output. CEERT encourages the CAISO to consider how importing such VER variability should be priced equitably in a manner that reflects the benefit to the CAISO system.

2.5.1 Full Hour Ahead Market: While shorter market intervals closer to real-time would certainly be beneficial for scheduling all resources, it is not clear whether a full hour market would enable such functionality. Therefore it is not clear whether the costs and/or added complexity of such a market enhancement are warranted at this time.

2.5.2 15 minute Market in Real-Time: Moving to 15 minute real time markets may provide a cost effective and relatively efficient way in which to integrate increasing amounts of VERs over the current day ahead or hour ahead market structures used by the CAISO, and would also be consistent with the recent FERC VER integration Notice of Proposed Rulemaking (NOPR) that will ultimately affect adjacent BAAs. Specifically, providing bidding opportunities for all resources closer to real time may result in greatly diminished forecast errors as well as more efficient unit commitment. For these reasons, CEERT strongly encourages the CAISO to move towards 15 minute real time markets, and for exploring ways in which to provide bidding opportunities closer to real time for all system resources. However, it is not entirely clear whether the proposed 15 minute real time market is for settlement purposes alone, or whether the market would actually be used for efficient unit commitment. Nor is it clear how the existence of a 15 minute real time market would affect the proposed full hour ahead market.

2.5.3 Uneconomic Adjustment Priority for VERs: Prioritizing VER self-scheduling over self-scheduled thermal resources may enable keeping low or zero marginal cost energy on the system, and at the same time may minimize Greenhouse Gas emissions. For these reasons, CEERT would like to encourage the CAISO to explore uneconomic adjustment priorities for VERs.

2.6.1 Capacity Market: As increasing amounts of zero marginal cost energy interconnect to the grid, energy prices will tend to become suppressed when averaged over time, and capacity payments may increasingly become the dominant mechanism by which generation is financially compensated. In such an environment, a transparent mechanism for capacity payments able to differentiate between the various performance characteristics of capacity will be essential for the efficient compensation of such resources. A multi-year forward Central Capacity Market (CCM) could be one such transparent and efficient solution. In principle, the CPUC's Resource Adequacy (RA) program could be modified so that it is able to differentiate between the various performance characteristics of capacity. However the CPUC's yearly, bilateral process would not be able to provide the transparency or efficiency of a CCM. For this reason, CEERT would like to encourage the CAISO to explore the possibility of developing a CCM with the following considerations: First, we are concerned with how the CAISO intends to develop such a CCM given the CPUC's denial of their prior request. Second, while capacity markets represent an efficient mechanism for procuring RA, one unintended consequence of capacity markets is that fully amortized thermal resources are able to continue receiving capacity payments well after such resources are due to retire. Such an unintended consequence is a highly undesirable feature of CCMs.

2.6.2 Forward Reserve Market (FRM): CEERT encourages the CAISO to explore ways in which generation developers can be compensated by the markets in a manner in which valuable AS resources are appropriately incentivized. Such an FRM as proposed here would also have the benefit of being able to incentivize development of energy efficiency products, which by reducing load, performs an equivalent function as capacity.

In summary, the suite of initiatives proposed here by the CAISO is an essential and comprehensive step towards integrating increasing levels of VER penetration. However, we have one significant additional suggestion for the proposed approach: The CAISO is not aggressively pursuing what could be considered the lowest cost VER integration tool available, namely, balancing area coordination and consolidation. Within WECC there is currently an effort to examine the cost effectiveness of an Energy Imbalance Market (EIM) and Efficient Dispatch Toolkit (EDT). Such an EIM / EDT solution when applied across the entire western interchange could serve to minimize balancing resources needed to integrate increasing amounts of VERs in a cost effective and efficient manner. For this reason CEERT strongly encourages the CAISO to continue to participate in this effort, and to explore ways of coordinating with its neighboring BAAs, including and in some sense especially those within California. Even with the most optimal market structures present within the CAISO BAA, it is unlikely that the level of VER

penetration required by western RPS policy by 2020 and beyond can be integrated at reasonable cost without an EIM / EDT, and without participation by all western BAs.

We commend the CAISO for taking such a sweeping and progressive look at the market changes that will be needed to integrate increasing levels of renewable energy, and look forward to continuing our participation in the development of these solutions.