NRG Energy, Inc. Comments on
August 29, 2011 Renewable Integration and Market Product Review Phase 2 Revised Straw Proposal

Submitted By	Company	Date
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Scope. The CAISO has proposed to reset the scope and schedule of the Phase 2 effort. Instead of developing design proposals for new renewable integration products by the end of 2011, as originally proposed, the CAISO is now proposing to:

- Develop a "roadmap" for Board consideration in December 2011;
- Defer starting detailed design processes until 2012.

The CAISO has also proposed to separate the Phase 2 processes into three "terms":

"Near-term" initiatives:

- Lowering the bid floor
- Separating Day-Ahead (DA) and Real-Time (RT) Bid Cost Recovery (BCR)
- Allocating PIRP costs to the LSE contracting with the PIRP resources or to the PIRP resource's LSE if the contracting LSE refuses the allocation

"Mid-term" initiatives:

- Biddable flexi-ramp product
- Intertie settlement
- Regulation "pay for performance"
- More granular schedules for interties
- Dec bids from PIRP resources
- Frequency Response

"Long-term" initiatives:

- Forward procurement of "flexibility"
- Work with "west" to identify and coordinate market needs

Additionally, CAISO has proposed to adopt an "incremental design" approach (add incrementally to existing market design) rather than a "big bang" approach (wholly new market products and platforms).

NRG will comment on specific elements of the CAISO's near-, mid- and long-term initiatives below.

While the implementation horizon for the forward procurement of flexibility may be five to ten years off, there are a host of difficult issues that must be addressed now, rather than waiting to meet the timeline envisioned in the implementation horizon. As the CAISO recognizes, the lead time for designing, siting, permitting, constructing, testing, and commissioning new capital-intensive resources can easily be in the order of seven to ten years. Deferring a redesign or development of markets which will support the

procurement of those resources may push the deployment of those resources beyond the time when they are needed to come online. The jurisdictional and market design issues that will underlie this procurement have been previously discussed but have not yet been resolved. These issues will not be resolved in a timely fashion by simply deferring them to a later phase of this comprehensive market redesign process. If the CAISO is serious about developing a forward market for flexible capacity, NRG urges the CAISO not to defer the difficult design process, but begin that process now.

Addition of "Cost Causation" Principle. The CAISO has proposed to add a seventh principle to its list of guiding principles – the principle that costs should be allocated on the basis of causation. This would bring the list of guiding principles to:

- Technology agnostic
- Transparent
- Deep and liquid
- Durable and sustainable
- Flexible and scalable
- Cost-effective and implementable
- Cost causation

In general, NRG supports the addition of "cost-causation" as a seventh principle. However, NRG believes that this principle could be reflected not only by allocating costs to the resource (or demand) that is giving rise to costs, but by allocating costs to the party contracting with the resource that is giving rise to those costs. This would create incentives for parties to contract with resources that have lower integration costs. Cost causation is a reasonable general guiding proposal – but in a market driven by bilateral contracting it introduces additional complexities that must be considered.

Immovable Objects. The CAISO has proposed that certain "immovable objects" – the operational, political or commercial realities of the electric power industry in the West – be identified so that market redesign can accommodate these realities, rather than expecting that they can be changed within the time frame proposed in this process.

- *Hourly WECC Interchange Scheduling.* The CAISO's proposed 30-minute pilot project for intertie scheduling on the California Oregon Intertie notwithstanding, the prospects for WECC-wide sub-hour interchange scheduling are uncertain. Consequently, the CAISO should view the current WECC scheduling timelines as an "immovable object".

Integration of RIMPR2 and the Market Initiatives Catalog. In addition to the CAISO's RIMPR Phase 2 effort currently underway, the CAISO has identified a number of market design changes, some of which have been mandated by the Federal Energy Regulatory Commission, in its 2011 Market Design Initiatives Catalog (http://www.caiso.com/Documents/2011MarketDesignInitiativeCatalog.pdf). The ISO should indicate how it intends to prioritize the work called for in the RIMPR Phase 2 process relative to the

work called for in the Market Design Initiatives Catalog. NRG suggests the CAISO update the Market Design Initiatives Catalog to reflect the priorities that will emerge from the RIMPR Phase 2 process.

"Near-term" initiatives. NRG has offered comments on the Phase 1 alternatives. See http://www.caiso.com/Documents/Comments%20on%20fourth%20revised%20straw%20proposal/NRGComments_RenewableIntegrationMarketandProductReviewPhase1FourthRevisedStrawProposal.pdf.

"Mid-term" initiatives:

First, NRG supports accelerating (1) the creation of a biddable flexi-ramp product and (2) revising the settlement of interties, as the CAISO has proposed. NRG supports implementing revised real-time intertie settlements prior to Summer 2012.

- **Biddable flexi-ramp product**

  As a general principle – if flexibility, rather than mere generic capacity value, is going to take on additional importance as the percentage of energy that comes from variable energy resources increases, then it is important that the CAISO's spot market design adapt to that reality. Some stakeholders have argued that the CAISO need not create a market for a product (ramping capability) that market participants heretofore have provided for free. However, it would seem folly to NOT create a ramping product if ramping capability, as expected, will become the predominant operational constraint in the new variable energy resource-centric bulk power supply system. Moreover, creating a ramping product may help support the discussion about allocation of integration costs. NRG supports the creation of a biddable ramping product as a proper step in addressing the needs of the evolving market.

  Alternative to flexiramp.

  CAISO: First, it likely requires that the ISO treat contingent and non-contingent capacity bids differently, with a constraint on the amount of contingent spinning reserves that could be purchased to ensure a sufficient supply of non-contingent capacity. This likely means different prices for contingent and non-contingent reserves. Second, such a mechanism only provides upward ramping capacity, and does not address the need for downward ramping capacity. This is not a trivial concern given the recent studies which indicate that over-generation is already a problem and likely to increase as more renewable resources interconnect to the grid. The ISO seeks comments on whether such a mechanism would resolve enough of the issues and if easier to implement. (34-35)

  NRG: As an alternative to creating a flexible ramping (flexiramp) product, the CAISO has proposed it could procure additional "non-contingent" spinning reserves. Operationally, the CAISO must ensure that it procures and maintains a sufficient quantity of spinning reserve capacity from which energy has not been dispatched to meet WECC requirements. This means that it cannot dispatch energy from its non-contingent reserves to the point that it has less

spinning reserve than the mandated requirement. However, ramping capability – at least in the upward direction – effectively is non-contingent spinning reserve. Instead of implementing the flexible ramping constraint prior to the creation of a biddable flexible ramping product, the CAISO could procure an additional amount of non-contingent spinning reserve in its RTUC process. Further, the CAISO could simply mandate that any spinning reserve procured in its real-time market is non-contingent spinning reserve.

Is non-contingent spinning reserve a different market product than contingent spinning reserve? Perhaps, but perhaps not. Market participants could reflect their desire to have energy dispatched from spinning reserve capacity through their energy bids associated with the spinning reserve capacity instead of through a contingency flag. The issue of whether the desire to have energy dispatched from spinning reserve capacity through bids rather than through a contingency flag should be a central part of the CAISO's discussion around a ramping capacity product. Using price signals as a means to express a desire to supply a product is preferable to using non-price signals.

Cost allocation. The need for ramping capability stems from the variation of load, generation, and interchange. However, in a market in which the levels of generation and interchange vary from hour to hour based on market results, assigning ramping costs to generation and interchange on the basis of hour-to-hour schedule changes does not seem appropriate, unless the CAISO changes the objective function of its market optimization to minimize hour-to-hour movement instead of cost. NRG is not recommending such a change, but instead noting that allocating integration costs on the basis of hour-hour variation in output would be inequitable if the hour-to-hour variation is a function of market results.

However, allocating a portion of the ramping costs to generation and demand based on their deviations from instruction or schedule would seem appropriate. The obvious question is – what portion of ramping costs should be allocated to deviations?

Time frame. If the ramping product is a MW/min product – over how many minutes should the market be conducted? NRG initially suggests that a five minute interval is too granular. A meaningful portion of that time will be taken up by communications latency. Assessing performance over a five minute period will be a complex process. Settling this product every five minutes will also be a complex process. While NRG has not arrived at a final position regarding the optimal flexiramp delivery period, NRG suggests the CAISO evaluate this product over a ten-minute period (consistent with CPS requirements) or a fifteen minute period.

Non-performance. As noted elsewhere in these comments, NRG encourages the CAISO to have a discussion about non-performance – or uninstructed deviations – that is not focused on a single product. In regards to flexiramp, NRG offers that a resource should surrender a proportionate amount of the capacity payment awarded associated with the non-performance.

For example, if a resource is awarded 20 MW of flexi-ramp capacity over a ten-minute period, and provides just ten MW of movement when dispatched by the CAISO to the full amount (20 MW) of awarded capacity over that period, it should surrender half of the awarded capacity payment. However, if the resource is awarded 20 MW of flexiramp capacity, is dispatched to provide 10 MW of energy from the 20 MW of awarded capacity, and provides only 5 MW of the 10 MW dispatched, it should forfeit one-quarter (5/20) of its capacity payment.

CAISO: If the energy costs are taken into consideration when procuring flexiramp, then the meaning of the marginal prices for the flexiramp product needs to be carefully understood. It should be noted that including energy costs may result in flexiramp shadow prices that could be higher level than the shadow price of the load balance equation or the system energy marginal clearing price. Therefore, the settlement implications of considering the energy costs corresponding to flexiramp capacity should be carefully considered and linked to locational marginal prices used to compensate the dispatched flexiramp energy in the 5-min RTD. The ISO seeks stakeholder comments on whether they agree with this assessment, and invites suggestions as to how appropriate optimization and pricing could be done. (31)

NRG: Is the CAISO asking whether the energy opportunity cost associated with a flexi-ramp capacity bid should be used in calculating the flexi-ramp price? If so, flexi-ramp is not different than other ancillary services products for which the price includes the energy opportunity cost.

CAISO: Determining procurement targets for flexi-ramp and RUC must be done together since the capacity procured under each of these mechanisms will generally offset the need for the other resources. The ISO seeks comments on the co-optimization of RUC and flexi-ramp in the day-ahead market. (31)

NRG: As with the current ancillary service markets and the RUC process, the CAISO should not procure RUC until after it has run its ancillary service markets. RUC is not a product; the CAISO should not co-optimize a market product with a process that happens outside of the CAISO's markets. The CAISO does not co-optimize RUC and its other ancillary service products; assuming flexi-ramp becomes a new ancillary service, it should not be co-optimized with RUC. As with the current design, RUC should be run after the day-ahead market processes – including procurement of a market-based flexi-ramp product - are complete.

CAISO: In order for this to be effective, the energy bids used in the optimization should not change from the integrated forward market to the real-time market, at least for the capacity that is awarded flexi-ramp. Otherwise, gaming opportunities arise in which resources could put in a low energy bid in the day-ahead market to ensure they were awarded flexi-ramp capacity payments, but in real-time, could modify those bids to be very

high, knowing that there is a good chance that they would be needed in real time to provide energy. Thus, the ISO proposes that for units selected to provide flexi-ramp, their energy bids for the real-time markets cannot exceed the bids submitted to the day-ahead market corresponding to the capacity that was awarded flexi-ramp. The ISO seeks comments on this. (31)

NRG: If the CAISO treats energy bids from the existing ancillary services this way, such treatment would be reasonable for energy bids associated with flexi-ramp capacity. It should be noted that the intent of this product is to primarily address the substantial issues that arise when substantial amounts of renewable resources are integrated into the market. The one product which aids in this integration should not be singled out and treated differently than the resources causing the product to be developed.

CAISO: The ISO seeks stakeholder input on how flexi-ramp capacity would fit into the structure of all ancillary services. Specifically, the ISO is interested in how flexi-ramp capacity might be incorporated into the cascading provisions whereby higher-quality ancillary services may be procured to meet the procurement targets for lower-quality services.

NRG: Flexi-ramp could substitute for all ancillary service products except regulation.

CAISO: ISO proposes to use a 95% confidence interval in selecting the target amounts of flexi-ramp to procure. That is, the ISO would procure sufficient flexi-ramp capacity to manage the expected range of real-time variability in load and resource output that would be exceeded statistically by no more than 5% of the time. The ISO seeks stakeholder comments on the factors that should be used in creating these statistical estimates and whether 95% is an acceptable confidence interval. (32)

NRG: One possible interpretation of using a 95% percent confidence level for procuring flexible ramping capability is that the CAISO would expect to have insufficient ramping capability in 5% of the intervals – one in every twenty intervals. It does not seem reasonable that the CAISO would fail to have enough ramping capability in one in every twenty intervals. However, it seems likely that the CAISO would have adequate "latent" ramping capability, and no need for "incremental" ramping capability, in many intervals, through the resources that are committed and dispatched through its markets. It is difficult to speculate as to whether a 95% confidence level for procuring flexible ramping capability is adequate without knowing how the CAISO will be procuring flexible ramp.

- **Intertie Settlement**

The timing of interchange scheduling and check-out is, especially in the near- to mid-term, an "immovable object". Consequently, it will be necessary to retain some form of near-real-time scheduling process for the interties. However, NRG strongly urges the CAISO to eliminate the separate pricing and settlement for near-real-time interchange schedules and instead settle interties at real-time prices. This separate pricing creates disconnected markets in which different suppliers feel the effect of CAISO actions in different ways – as on July 6, when HASP prices exceeded $1,000/MWh while real-time market prices for the exact same delivery period were a tiny fraction of that price.

NRG supports the application of the NYISO approach to real-time intertie pricing. Intertie suppliers should not be exposed to receiving less than their bid price, consistent with bid cost recovery treatment for generating units within the CAISO's Balancing Authority. Providing BCR will lead to uplifts – but BCR uplifts are different than the Real Time Imbalance Energy Offset Uplifts. The RTIEO uplifts stem from the difference in price between one pseudo-market (HASP), the outcomes of which are driven entirely by CAISO action, and the real-time price.

NRG does not support the proposal to settle interties at real-time prices only for the off-peak hours. There is no legitimate reason to formulate intertie prices differently based on the time of day.

- **Regulation "pay for performance"**

NRG views "pay for performance" regulation as a solution in search of a problem. What is the problem the CAISO is trying to solve with "pay for performance" regulation? Is it that the existing regulation units are not adequately responding to the CAISO's control signals? Is it that the cost of procuring the existing regulation products is too high? Is it that the CAISO is seeking to create a market product to benefit a particular technology type that is not well suited to provide the other existing CAISO market products? Any discussion of a new regulation product should be built on a clear understanding of what the problem the CAISO is trying to solve it before market participants are asked to weigh in on the details of a proposed product.

- **More granular schedules and schedule updates for variable energy resources**

CAISO: To launch this discussion, it is important to recognize that in the ISO dynamic transfers stakeholder process, intermittent resources located outside of the ISO and utilizing the dynamic transfers option have two methods to update their availability in the real-time market. One option is to have the ISO use a persistence forecast based on the latest telemetry as the instructed dispatch. The other option is to have the dynamically transferred intermittent resource submit its own forecast of availability every 5-minutes and have this forecast returned to its stated availability during the next 5-minute dispatch interval, including downward adjustments if necessary. Dispatch based on stated availability would be the operating point for the next interval and the basis for financial settlement of

instructed and uninstructed energy. This option allows the ISO to utilize the transmission capacity at the interties more efficiently, which raises a question as to whether a similar option should be made available to all intermittent resources. The ISO seeks stakeholder comment on this. (35)

NRG: NRG continues to question why the ability to modify schedules close to real time is being offered only to variable energy resources. If the purpose of allowing more frequent schedule changes closer to the operating hour is to address uncertainty, NRG asserts that considerable uncertainty can arise between the time day-ahead schedules are set and the hour in which they are delivered. The time period between issuance of day-ahead schedules and the delivery hour can exceed 24 hours. In that time, equipment can fail, fuel supplies can be interrupted or the fuel price for real-time dispatch can change substantially - a problem which is exacerbated by being forced to use the CAISO Proxy Cost for gas. Limiting near-real-time schedule change opportunities to only those resources that have no control over their output discriminates against the kinds of dispatchable, predictable resources that are needed to deal with the operational uncertainty created by variable energy resources. The CAISO has not yet provided adequate justification why opportunities to make near-real-time schedule changes must or should be limited to variable energy resources.

CAISO: A less radical option for intermittent resources is to allow the existing hour-ahead forecast provided 75 minutes before the operating hour to consist of four different forecasts for each of the 15-minute periods within the operating hour. This would allow solar resources to better match their forecast output to the morning and evening ramps, for example. This option would also allow the ISO to adjust its procurement of flexi-ramp for the operating hour. Further, if deviations from the hour-ahead forecast are used to allocate flexi-ramp costs, this option could provide variable resources a method to reduce expected deviations and thus the allocation of costs. This option would obviously be easier to implement than 5-minute availability updates. The ISO seeks stakeholder comment on how this proposal compares to allowing the 5-minute availability updates provided for dynamic transfers and or whether some other timing for availability updates would make better sense. For example, in the initial straw proposal, the ISO suggested that perhaps 15-minutes was an optimal update under the 15-minute real-time market proposal. (35)

NRG: NRG has not finalized a position on the optimal period for schedule updates.

- **Dec bids from PIRP resources**

NRG supports the further exploration of allowing PIRP resources to submit decremental energy bids and settling those resources based on their following dispatch instructions, when issued.

CAISO: A resource that fails to follow the decremental instruction is at risk for 1) the greater of its deviation from either the hour-ahead schedule or 2) the instruction it received. As long

as the resource is moving in the correct direction, it won't be charged for positive deviation. If it fails to reduce to where it was instructed, the resource loses some payment for not following the decremental instruction. The ISO seeks stakeholder comments on both the general concept and the specific proposed formulas. (38)

NRG: The discussion of penalties for PIRP resources failing to follow decremental instructions should be part of a larger conversation about uninstructed deviation penalties and non-performance penalties and not simply part of the proposal to allow PIRP resources to submit decremental energy bids.

- **Frequency Response**

Frequency response will be an increasingly important ancillary service as the number of variable energy resources increases. However, given that NERC is exploring this subject at this time (http://www.nerc.com/filez/standards/Frequency_Response.html), the CAISO should wait to see what comes out the NERC process before expending a lot of effort to consider this product.

- **Other**

CAISO: The ISO seeks comments on what specific, incremental changes are necessary to efficiently and reliably operate the grid in an environment where a large number of renewable, variable energy resources are interconnected to the transmission and distribution systems. (5)

NRG believes the following changes are needed:

(1) Implementation of a ramping market product. Such a product should reflect the increasing value of ramping capacity to deal with increased variability.
(2) Reducing incentives to self-schedule and increasing incentives to provide economic bids.
(3) Implementation of a procurement mechanism that ensures that the flexible and dispatchable generation capacity needed to reliable operate the system remains viable.
(4) Incorporation of all operational constraints into the CAISO's market optimization. This will help ensure that market prices reliably reflect operational realities and thereby support the development of the right market products.