California ISO

Stakeholder Comments Template

Hybrid Resources Initiative: Straw Proposal

This template has been created for submission of stakeholder comments on the **Hybrid Resources Initiative, Straw Proposal** that was held on October 3, 2019. The meeting material and other information related to this initiative may be found on the initiative webpage at:
http://www.caiso.com/informed/Pages/StakeholderProcesses/HybridResources.aspx

Upon completion of this template, please submit it to initiativecomments@caiso.com. Submissions are requested by close of business on October 21, 2019**.**

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CPUC staff appreciate the progress being made by the CAISO on the Hybrid Resources Initiative. While there remain numerous challenges, staff is confident that they can be solved with continued collaborative work. Staff's comments here focus on the model of market participation proposed by the CAISO, but staff may comment on other issues in the future. The model of market participation is critical to determining how other issues are resolved or need to be addressed.

Market model

CAISO's proposed model for market participation of hybrid resources creates significant inefficiencies by requiring each hybrid resource to optimize its own use rather than rely on the market to support optimization decisions. Under the current proposal, hybrid resources would submit forecast output to the day-ahead market and submit bids up to their forecast output that would dictate when they would discharge. The forecast output would combine the output from all parts of the resource, and it would place a constraint on market dispatch. Functionally, the hybrid resource's bids will turn into a self-schedule that will not allow flexible dispatch needed for the market to optimize.

The market's ability to optimize resource use and participant's incentives to maximize profit and reduce risk of potential losses will be distorted by the constraint caused by the resources' forecast output. For a hybrid resource, if it wants to maximize profit, the

resource will likely want to discharge all energy in the high-priced hours of the day. The resource will also not want to be scheduled at times when it may not be able to discharge, or to schedule more energy than it will be able to discharge. Therefore, the resource will most likely submit a forecast to discharge exactly the amount of energy it charges at preselected times, with bids low enough to ensure that the resource is dispatched. The forecast would not allow the market to shuffle or adjust use of the resource to reach an optimal outcome, other than possibly to decrease dispatch at some hours and cause the resource to hold the charge overnight. Staff believes that this proposal will fall short of achieving the most efficient results possible in the day ahead market.

Consider a hybrid resource that includes 100 MWh of energy storage and a solar generation portion of large enough size to charge that storage during the day. The resource can discharge the energy at 25 MW, over 4 hours. In the day ahead market, the resource wants to choose the 4 hours with the highest prices to discharge. If the market participant believes that hours 18, 19, 20, and 21 will have the highest prices, they will submit a forecast and bids that allow them to discharge the storage portion of the resource in those hours. If their expectations are correct, they will achieve a profit maximizing outcome.

If the participant cannot accurately predict which hours will have the highest prices, the participant will face significantly more complicated decisions to optimize its use. Suppose the participant is confident that hours 18, 19, and 20 will see high prices, and that either hour 17 or hour 21 will also be high but they cannot predict which of those two will be the highest. In the proposal, there is no way for the participant to bid and forecast so that the market can optimize their output at the highest priced hour without the risk of incurring a loss. Since the ISO proposes to limit their output to the forecast, if they submit a zero forecast for either hour 17 or hour 21 they will not be able to sell energy in that hour. However, if they submit a maximum of 25 MW in both hours they may be scheduled in both hours and therefore risk suffering a loss by having to buy back one hour in the real time.

Without accurate predictions of prices, hybrid resources cannot forecast the profit maximizing schedule. This is not different than any other resource, although other resources have more flexibility and can bid into the market in a way that allows the market to manage the resource optimally. Because they would have to forecast their output under the CAISO's proposed model, hybrid resources cannot allow the market to optimize their use.

Possible alternatives

State of charge limits for market dispatch, resource determines when to charge

One alternative that may improve the market outcomes would use forecast state of charge limits as a guide for bids and dispatch. Under this proposal, participants would submit a forecast state of charge for the storage portion of the resource at a specified hour. The forecast state of charge would work best if the participant could submit a forecast output and state of charge up to a certain hour and bids for several hours after that. The market could then optimize drawing down the forecast state of charge over the

rest of the day. While this would be an improvement, it would still require the resource to decide when to charge.

Market determines optimal charging and discharging schedule

Another alternative would allow the market to have a greater role in determining optimal resource use to achieve economically efficient results. The market would need to be able to manage both charging and discharging of the storage resource to achieve maximum efficiency. The CAISO may need to design a new resource model specifically for hybrid resources[1] to accomplish this level of efficiency. A new model could represent both storage and generation pieces of the resource explicitly but also contain constraints to ensure that they operate in tandem. This type of model could even feature a constraint that ensures the storage charges exclusively from the on site generation, but still manage that to charge at the lowest priced, most efficient times.

Staff's current understanding is that the CAISO views the new resource model as a significant undertaking and not necessarily a feasible one. In terms of writing out the necessary mathematical formulations that would need to be programmed into the market software, the new resource model does not seem difficult to define. However, CPUC staff are not in a position to determine implementation difficulties that the CAISO may face. Staff would like to better understand, from the CAISO, what obstacles would need to be overcome to pursue the design of a new resource model.

Other solutions may exist that would come to a different compromise between market efficiency and simplicity of implementation. CPUC staff encourage the CAISO to continue to explore other possibilities along with the suggestions provided above.

[1] A model for hybrid resources would need to be able to contain all the standard parameters for each part of the resource such as min and max output, as well as similar constraints on the overall resource. For hybrid resources this could also contain constraints that would ensure the resource charges from the on-site generation only, and that the charging times could be either self-scheduled or set by the market.