



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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Pacific Gas and Electric Company (PG&E) offers the following comments on the California Independent System Operator's (CAISO) Straw Proposal of the Hybrid Resources Initiative.

PG&E appreciates the work the CAISO has done in thinking about rules to integrate and allow for efficient participation of hybrid resources in the market. PG&E understands the CAISO is seeing greater interest and interconnection requests from market participants with multiple technologies or fuel sources at a single point of interconnection. Hybrid resources present a new challenge for the market as market rules for any individual component do not apply entirely to the combined hybrid resource.

PG&E has thought a lot about the issues raised in CAISO's Straw Proposal and points out that given the various combinations of hybrid technologies and operating preferences, creating a blanket approach for all hybrids is difficult and will likely lead to inconsistencies between the forecasting, QC methodology and must-offer obligation (MOO) components. In an attempt to offer more consistency, PG&E offers another way of interpreting the issues by focusing its comments on the most common expected hybrid resource combination: solar plus storage. There may be other use cases (e.g. gas plus storage) which our comments may not capture, and we acknowledge that those may warrant separate treatment. The intent of PG&E's comments is to keep the conversation going and offer CAISO ideas to shape their approach to these issues, rather than offering a

prescriptive alternative proposal. To this point, PG&E supports resolving the complexities with creating hybrid QC methodologies in coordination with the CPUC or at a CPUC-led workshop rather than solely within this initiative.

PG&E's primary feedback to the Straw Proposal can be summarized below:

- As long as the federal Investment Tax Credit (ITC) exists, the CAISO should consider two distinct types of hybrid resource treatment, each representing a bundle of forecasting, QC counting methodology and MOO proposals.
- The two types of hybrid treatment, which PG&E refers to as ITC-Driven and Market-Driven, might be most appropriate given the range of use cases and operating preferences.
- Additional clarification is required from the CAISO on the minimum sizing requirements for hybrid resources.

1. Hybrid Resource Definition

Please provide your organization's feedback on the Hybrid Resource Definition as described in the straw proposal.

PG&E supports the clarifications made by the CAISO to the hybrid resource definition but requests further details on the minimum sizing requirements section.

The CAISO's clarification of the difference between a hybrid resource (single resource ID) and co-located resources was very helpful. One concern, however, is that the minimum requirements section lacks detail in terms of what is expected from each of the hybrid components. For example, what is the minimum size of solar that can be paired with a 100kW battery to qualify as a hybrid resource? Or what is the minimum size of a battery that can be paired with a 500kW solar resource to qualify as a hybrid resource? The footnote on page 7 of the Straw Proposal alludes to this challenge. Thus, PG&E recommends that the CAISO clarify the minimum sizing requirements. For example, PG&E believes that CAISO should consider the impacts of having say a 1 MW battery paired with a 100 MW of storage (or visa versa) if the requirements, market obligations, or compensation of the combined "hybrid" resource are different than the resources larger resource on its own.

It should also be noted that there is a potential advantage for energy storage resources participating under the hybrid resource model related to the variable energy resource (VER) forecast component. Since VER forecasts are updated on both 15-minute and 5-minute intervals, the upper economic limit of the hybrid resource's bid curve can be defined on a more granular basis than the bid curves of energy storage resources which can only modify them on an hourly basis in the NGR model.

2. Hybrid Resources Business Drivers and Use Cases

Please provide your organization's feedback on the Hybrid Resources Business Drivers and Use Cases described in the straw proposal.

PG&E generally supports the presentation of business drivers and use cases described by the CAISO but believes there is value in bundling certain use cases.

Due to the varying use cases of hybrid resources and the out-of-market incentive of the ITC, PG&E suggests that CAISO entertain two scenarios of hybrid treatment, each containing a specific forecasting proposal, QC counting methodology and MOO. The counting methodology should be done in coordination with the CPUC. PG&E believes considering these alternatives could be informative given the different operating and production preferences which may lead to inconsistencies in treatment. As described in the sections below, PG&E refers to these two scenarios as "ITC-Driven" and "Market-Driven", based on the presumed main incentive of creating the resource.

ITC-Driven

As the CAISO points out, hybrid resources seeking to capture the ITC are mandated to charge their storage system from their renewable counterpart more than 75% of the time. These resources may prioritize firming and smoothing or energy shifting, but it is reasonable to assume that they will have a preferred charging schedule to ensure they meet the renewable on-site charging criteria.

Market-Driven

Other hybrid resources may be incentivized to prioritize other revenue streams such as providing Ancillary Services (AS) or capturing Resource Adequacy (RA) value. These resources are assumed to have no restrictions on the amount of grid charging they can perform compared to charging from on-site renewable production. As the ITC phases out, all hybrid resources will eventually be incentivized to become Market-Driven.

PG&E initially suggests that CAISO could offer a one-time choice made by the resource owners/SCs to determine their hybrid treatment, with any ITC-Driven treated resources being converted to Market-Driven when the ITC is phased out. However, more details on these scenarios and roles could be further discussed in CAISO working groups. It is important to point out again that any decision regarding hybrid QC methodology (or methodologies) must be decided at the CPUC within its respective stakeholder process.

3. Forecasting

Please provide your organization's feedback on the forecasting topic as described in the straw proposal.

ITC-Driven

ITC-Driven hybrid resources should self-provide a forecast of total output to the CAISO as per the recommendations in the CAISO's Straw Proposal.

Market-Driven

The CAISO should apply its current practice of forecasting VERs to the VER components of Market-Driven hybrid resources. This approach builds off of existing functionality and ensures consistency between resource types, even when those resource types are components of hybrid resources. SCs should be allowed to pay a forecast fee to receive the CAISO forecasts of the VER components of hybrids.

The Day-Ahead (DA) VER forecast (determined by the CAISO) would be made available to the Scheduling Coordinator and automatically incorporated into the CAISO systems as the VER component of the total Day-Ahead (DA) capability (MW capacity) of the hybrid resource.

Since the energy storage component can be considered the "dispatchable" portion of a hybrid resource, its overall DA capability must be reflected in its DA bids. SCs should submit to CAISO their DA energy storage component bids, then the CAISO could add the DA VER component to arrive at a total DA capability of the single resource ID.

In the Real-time (RT) market, the CAISO's request for hybrid resource forecasts could again be viewed from the perspective of its components. VERs are currently forecasted on an hourly basis (as well as at 15- and 5- minute intervals) and this treatment should be available for VER components of hybrid resources. For the energy storage component, there is less reliable information as to what its output will be, but nevertheless there are some indicators. DA awards and current state-of-charge (SOC) are two such data points that could be useful to determine likely production forecasts. One important point is that the rolling forward basis may depend on the size of the energy storage resource, or else lead to inaccurate results.

4. Markets and Systems

Please provide your organization's feedback on the markets and systems topic as described in the straw proposal.

PG&E recommends that the CAISO consider future enhancements to the Hybrid model to ensure consistency with other models (i.e. NGR, VER and DERP).

The proposal for hybrid resources raises important issues that the CAISO should treat as ongoing and in relation to other initiatives. Rather than creating the hybrid model as only a means of facilitating these new types of resources, the CAISO should take a more holistic approach and incorporate the learnings of other models in future initiatives.

Stranded capacity of co-located resources under a single interconnection constraint may constitute a deliverability conflict that should be resolved in the deliverability rights as designated in the interconnection study process.

PG&E is confused as to why the CAISO is describing stranded capacity as a new issue. If multiple resources are built co-located behind a single point of interconnection (POI) and that POI has a transmission capacity right which is less than the combined Pmax of all the resources at the POI, then the current solution would be that the resources or new resource would have to pay for an interconnection upgrade while existing resources would retain their deliverability. If the new co-located resources paid for a transmission upgrade, then no capacity would be stranded.

It appears that the CAISO is proposing that if co-located resources wanted to reduce costs by not paying for an interconnection upgrade, having an interconnection constraint in the master file would treat the resources more favorably than having to reduce their Pmax capacity in the master file. This problem defined by the CAISO might be better described as a stranded energy or stranded deliverability problem that results from having to limit the Pmax of co-located resources to a given transmission capacity constraint.

PG&E is not sure whether this should be considered in scope of the Hybrid Resources Initiative. The new interconnection rights constraint could possibly apply to other situations and might require further consideration. The interconnection rights constraint issue is similar to how imports are treated at an intertie, but more clarification on how LMPs are calculated would be needed. Normally, this situation would lead to a congestion component.

5. Ancillary Services

Please provide your organization's feedback on the ancillary services topic as described in the straw proposal. (Please indicate Support, Support with caveats, Oppose, or Oppose with caveats)

PG&E is skeptical of the ability of ITC-Driven hybrid resources to offer AS given the strict charging criteria of the energy storage system.

For example, a solar plus storage hybrid resource may struggle to provide or respond to AS signals when operating under a strict charging schedule during daylight hours but may otherwise be available to do so during evening hours.

6. Metering and Telemetry

Please provide your organization's feedback on the metering and telemetry topic as described in the straw proposal.

At this time, PG&E does not have any concerns with the metering configurations described in CAISO's straw proposal so long as the option of metering entity (CAISO or SC) is preserved for all configurations.

7. Resource Adequacy

Please provide your organization's position on the Resource Adequacy topic as described in the straw proposal.

PG&E believes that the CAISO's proposal for hybrid QC counting methodology is inconsistent with its proposal for hybrid must-offer obligation. This inconsistency likely stems from attempting to create a single counting methodology and must-offer obligation which applies to all hybrid resources. This discussion around QC counting methodology will obviously have to be done in concert with the CPUC's discussion of hybrid resources.

Due to the ITC out-of-market incentive, some hybrid resources may choose to use a battery to firm and shape solar production to ensure that they are credited with the full federal incentive. These hybrid resources should not be counted for QC in the same way a market-driven hybrid resource should, and additionally their MOOs should reflect this separate treatment.

PG&E's approach presents the following options:

ITC-Driven

- **QC Counting Methodology** – For ITC-Driven resources it does not make sense to create a QC value that adds the Pmax of the energy storage component to the ELCC of the VER component. These hybrid resources will likely be operated in a way which firms and shapes the output at a consistent or somewhat consistent amount. The purpose of the energy storage component would be to maximize the solar output and shift some of the solar production from the middle of the day to the shoulder hours in the morning and afternoon. The CPUC should look into developing a new ELCC counting methodology for these hybrid resources. We think resource owners and SCs would need to forecast the firmed and shaped level of production of the hybrid resource to assist the CPUC in evaluating a new ELCC calculation. This counting methodology may be simplified to include the ELCC value of the VER resource plus some adder from the storage component, but it would be distinct from the Market-Driven hybrid resource in that the Pmax of the storage component would not be fully added.
- **Must-Offer Obligation** – This issue of a MOO and incentive mechanisms for meeting that obligation are tough issues and PG&E is still grappling with what would be appropriate. Under the current framework of resources having MOOs in the market we think the must-offer obligation for ITC-Driven hybrid resources would be equal to their self-provided forecasts as stated in the CAISO’s Straw Proposal. As proposed by the CAISO, the MOO would be updated to match hybrid resource self-provided forecasts. PG&E has supported the idea of MOOs varying with expected resource availability across the hours of the day in the RA Enhancements Initiative¹, however in the long run we question the effectiveness of using RAIM penalties to guide market participant behavior for certain types of resources.

Market-Driven

- **QC Counting Methodology** – For Market-Driven hybrid resources, PG&E proposes the QC counting methodology would be additive as presented in the CAISO’s Straw Proposal. Assuming no transmission constraints, the RA value would be calculated by adding the ELCC value of the VER component with the Pmax of the energy storage component.
 - PG&E agrees with the CAISO’s counting example that it provided in the Straw Proposal and presentation, however this example was simplistic because the interconnection rights were large enough to accommodate the combined installed capacity of the solar resource and Pmax of the battery component. PG&E would like to see a similar example to the Straw Proposal and presentation where the interconnection rights were only 150 MW rather than 200 MW. What happens to the solar resource’s QC values in this situation with a transmission constraint limiting the simultaneous Pmax’s of the hybrid resource components? Would the combined RA value of the hybrid resource be reduced due to QC reductions even though the

¹ <http://www.aiso.com/Documents/PGComments-ResourceAdequacyEnhancements-RevisedStrawProposal.pdf>

original ELCC + Pmax of the battery would remain lower than the interconnection rights?

- **Must-Offer Obligation**

- **DA MOO** – Again, MOOs and incentive mechanisms for them are tough issues that PG&E is still working though, but under the current framework PG&E thinks that for Market-Driven hybrid resources the DA MOO would be equal to the Pmax of the energy storage component in all hours, consistent with current NGR treatment, with the option but not requirement of adding the DA VER forecast. This is based on the current DA bidding requirements of EIR resources. The RA Enhancements initiative is currently contemplating requiring all RA resources, VER included, to have a MOO in the DA market. This is a major change to bidding requirements for RA resources. The CAISO could decide to only make the VER component of these hybrid resources subject to a DA MOO once the RA Enhancements Initiative is complete and implemented.
- **RT MOO** – The RT MOO would be equal to the realtime forecast for the VER component (provided by the CAISO) plus the Pmax of the battery or storage component. This is illustrated by the following edits to the RTM bidding requirement for NGR (Non-REM) resources:

“Economic Bids or Self-Schedules are to be submitted for any remaining RA Capacity from the resource’s NGR component scheduled in IFM or RUC. Economic Bids or Self-Schedules are to be submitted for all RA Capacity from the resource’s NGR component not scheduled in IFM. The VER component of the hybrid resource must be available consistent with the VER forecast for RA Capacity.”

PG&E’s proposal maintains the following assumptions: (1) it makes sense for NGR components of hybrid resources to submit bids or self-schedules for any remaining RA capacity scheduled in IFM as this is current practice for stand-alone NGRs and (2) the RA obligations of VERs should be tied to hour-ahead forecasts (as is current practice) rather than less accurate DA forecasts. This proposal also ties to PG&E’s comments made in the ‘Forecasting’ section— it is beneficial to both the CAISO and Scheduling Coordinators to utilize the CAISO’s existing VER forecasting functionality.

Additional comments

Please offer any other feedback your organization would like to provide on the Hybrid Resources Initiative.

The CAISO's proposal for the total DA production capability to become the must-offer obligation for Market-Driven hybrid resources does not work in the RTM context.

Example:

A hybrid resource is comprised of a solar (VER) component and an energy storage component. For a particular month, the resource has 15 MW of RA capacity claimed: 10 MW of solar (ELCC) + 5 MW of storage (NQC). On a particular day in the IFM, the CAISO forecasts the solar (VER) component to achieve 4 MW of production in HE18. The SC submits a bid for the energy storage component up to 5 MW in HE18. The total DA production capability in HE18 is 4 MW + 5 MW = 9 MW. The hybrid resource is awarded the full 9 MW in the IFM for HE18. In the RTM during HE17, the SC places a bid for the VER component at Pmax in HE18, which is automatically adjusted to the CAISO's hour-ahead VER forecast of 2MW. The RTM bidding requirement for the VER component is 2 MW and for the energy storage component is 5 MW for a total of 7 MW.

Under PG&E's option, even though the hybrid resource's total DA production capability was 9 MW, its RTM bidding requirement is only 7 MW. Using the CAISO's approach, the RTM requirement would be the full 9 MW, which reflects unrealistic deliverability (if awarded) and penalizes the hybrid resource for the DA forecasting uncertainty inherit with its VER component.