



Stakeholder Comments Template

Hybrid Resources

This template has been created for submission of stakeholder comments on the Hybrid Resources Issue Paper that was published on July 18, 2018. The paper, stakeholder meeting presentation, 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 **August 13, 2019**.

Submitted by	Organization	Date Submitted
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Pacific Gas and Electric (PG&E) offers the following comments on the California Independent System Operator's (CAISO) Hybrid Resources initiative issue paper. PG&E understands that the CAISO is seeing greater interest and interconnection requests from these hybrid resources with multiple technologies or fuel sources at a single point of interconnection. While the demand to connect these types of resources is currently high, it must also be considered that there are few concrete examples and data from such resources on how they perform and what issues they face.

At a high-level PG&E asks whether the CAISO may be rushing into this initiative. It may be valuable to separate the elements that need to go forward now from those that could wait until more data and experience with hybrid resources is gathered. In the interim, exceptions could be made and certain rules applied on a pilot basis until more information is available and without setting precedence.

PG&E also asks the CAISO to consider whether it may be more prudent to focus specifically on rules for solar-plus-storage if that is the dominant technology comprising this hybrid resources group. This may simplify the rulemaking process and allow the rules to more accurately reflect the specific resources under consideration. While consistency and transparency are principles important to maintain in market processes, the variable and diverse nature of different types of hybrid projects as defined in this initiative may make the creation of universal rules at this moment difficult to implement while maintaining market efficiency and equitable treatment of various resources.

While PG&E thinks big picture considerations of necessity and scope should be the focus, the following comments reflect PG&E's preliminary thoughts on the specific sections for which the CAISO requested feedback.

Please provide your organization's comments on the following issues and questions. For all topics please explain your rationale and include examples if applicable.

1. Interconnection

Please provide your organization's feedback on the interconnection topic as described in section 3.2.

PG&E supports the description of the modification processes for the addition of battery storage described in the issue paper, however, we would like clarification on the steps that occur once a Material Modification Assessment (MMA) or modification provision is approved.

Does the addition of battery storage and plant controller through modification provision result in an implementation schedule? If so, PG&E suggests that the "best case" schedule be based on the PTO and the CAISO teams' needs and preferences to ensure that interconnection customers have clear insight into the schedule of their project.

2. Forecasting and Operations

Please provide your organization's feedback on the forecasting and operations topics as described in section 3.3.

Depending on the specific resource type PG&E generally supports hybrid resources having a requirement that intermittent output meter data and storage charging meter data be provided under a separate metering configuration to the CAISO but does not believe this requirement necessarily implies a multiple resource ID hybrid model. The CAISO should be able to use accurate intermittent output data in its forecasts of production from the intermittent components of hybrid resources. Likewise, it should be able to use storage charge and discharge data to make its estimates of battery state of charge as accurate as needed.

Forecasting:

PG&E is concerned that...

- A single resource ID is not eligible for EIR/PIR status.

Depending on the CAISO's need for forecasts, PG&E believes that the CAISO should have the ability to forecast the intermittent components of hybrid resources given the appropriate metering and telemetry. The CAISO's argument for not providing forecasts for hybrid resource VERs is similar to the one made in the

recent CCE3 Tariff filing at FERC.¹ The CAISO argued that run-of-river hydro resources shouldn't be treated as VERs (e.g. maintain their RAIM exempt status) because they lacked a forecast of MW output. FERC ultimately rejected this portion of the filing.² Based on this decision, PG&E recommends that the CAISO either: (1) work with Scheduling Coordinators to arrive at an appropriate forecasting methodology for the non-intermittent component of hybrid resources or (2) allow Scheduling Coordinators to input this information.

Operations:

The CAISO stated the following concern in the Issue Paper...

- There is no certainty that a single resource ID could provide the energy or A/S awarded through the market.

PG&E believes the CAISO should clarify that this concern is in reference to the single resource ID scenario without separate metering and telemetry points for generation and storage. In contrast, separate metering should provide the CAISO with the transparency necessary for the CAISO to have confidence in the hybrid resource responding to energy or A/S market awards. This should be added to the straw proposal.

3. Markets and Systems

Please provide your organization's feedback on the markets and systems topics as described in section 3.4.

The CAISO should clarify whether it intends to reach stakeholder consensus on only allowing the multiple resource ID scenario or if it will allow generators/SCs the choice to operate under a single resource ID. **PG&E recommends that the CAISO allow for both scenarios, but to consider the advantages that the single resource ID scenario has over the multiple resource ID scenario** (described in the examples below).

The CAISO may benefit from looking at precedents such as the precedent of the Multi-State Generation (MSG) model initiative in formulating a single resource ID model of hybrid storage resources. In fact, the hybrid storage resource has some attributes in common with MSG resources: the states of "intermittent only," "storage only," and "combined intermittent and storage" are non-overlapping in any single interval, and the resource may be modeled using existing resource models in the first two states. The third state may be plausibly represented as dispatchable storage with a time-varying

¹ See page 8 of Hybrid Resources Issue Paper

² See FERC Order: <https://www.ferc.gov/CalendarFiles/20190401161411-ER19-951-000.pdf>

dispatch range. This is not unlike a resource subject to dynamic ambient derates and with the possibility of state of charge changing without energy delivery from the grid, either due to unilateral action by the resource owner or due to market rules representing the requirement to charge the battery from the intermittent source when available.

PG&E also suggests that the CAISO look at re-using or making modifications to the existing Non-Generating Resource (NGR) model to enable a single resource ID hybrid model. As an example, the CAISO could enable hybrid storage to use the available “NGR no State of Charge (SOC) management” model to enable bidding and scheduling of hybrid storage. The CAISO has pointed out shortcomings of this model, notably the management of deviations of the intermittent portion of the resource from its forecast, but market participants may be able to manage such deviations and minimize their costs by prudent control of the hybrid combination, particularly if the battery is primarily charging from the intermittent portion of the resource. Such charging will tend to mitigate the risks caused by forecast error, at some cost in “optimality” but a cost outweighed by the ITC benefits of such charging. Of course, the market participant cannot at the same time ask the CAISO to manage the battery SOC using this model, but in general such management might not be necessary from the market participant’s perspective, or desirable from the CAISO’s.

Operations:

The CAISO stated the following concern...

- Single resource ID hybrid resources are less-dispatchable than a traditional dispatchable resource.

PG&E believes describing the single resource ID configuration as “less dispatchable” than the multiple resource ID configuration prejudices the correctness of one model over the other and presumes that any constraints on dispatchability under the single resource ID model are incorrect, whereas constraints on dispatchability under the multiple resource ID model would be correct, or at least more correct. A single resource ID configuration may be more correct than a multiple resource ID configuration if it better describes constraints on the operations of the hybrid resource. PG&E asks for further consideration on how the single vs multiple resource ID options might play out.

Included below are three examples of when a hybrid single resource ID might be preferred by either the CAISO or the resource:

Example 1: A battery at site is used to firm intermittent energy production, reduce ramping volatility, or otherwise improve intermittent production and reduce its responsibility for integration costs.

Battery charging and discharge is used to mitigate intermittent volatility, to the extent possible. For example, the “less intermittent” resource seen by the CAISO might be able to self-schedule generation rather than requiring “as delivered” treatment and receive reduced allocation of flexible ramping costs in return. The resource model may be analogous to the solar thermal model but with less volatility, and the resource can also provide limited generation above intermittent levels, for example in evening peak hours.

This model has the battery unilaterally run by the market participant to “smooth” or otherwise modify the energy delivery of the intermittent resource as seen by the CAISO. Outside of intermittent production hours, the battery could in theory be used independently as an NGR. Of course, the resource would have to take on the responsibility of bidding into the market and not be treated ‘as available’ for the purposes of forecasting and settling output.

Example 2: A battery at site is used to shift energy production into high value hours without intermittent production or with reduced intermittent production.

If the only value of shifted production were energy, there may be no need for a combined resource model in this case. However, capacity values such as Resource Adequacy (RA) or real-time flexible ramping capability generally carry a must-offer bidding requirement that might be best served by a single resource bid for the hybrid resource, with the response to dispatch instructions being managed by the resource control system based on scheduling coordinator objectives. This example also applies to renewable curtailment—a single resource bid would be better fit to utilize would-be curtailed intermittent output by diverting it to on-site charging. Again, the resource would have to take on the responsibility of bidding into the market and not be treated ‘as available’ for the purposes of forecasting and settling.

Example 3: A battery/intermittent hybrid single resource ID enables provision of ancillary services, such as spin or regulation.

A hybrid peaking resource in SCE’s territory has demonstrated that a single resource approach to modeling a hybrid resource enables a resource that would otherwise be unable to provide spinning reserves at all (the peaker) to provide spin at the hybrid resource aggregation in almost all hours.

4. Ancillary Services

Please provide your organization's feedback on the ancillary services topic as described in section 3.5.

The CAISO's Issue Paper has helpfully described the options available to existing resource types for provision of spinning reserves. **PG&E believes hybrid resources may have frequency response capabilities closer to those on inverter-based resources than to requirements for participating loads.** The responsiveness of hybrid resources should be somewhere in the range between inverter-based resources (requiring an explicit Frequency Response capability) and participating loads, which require curtailment of only 10% of awarded capacity within 8 seconds and a change in power output within one second, which would appear clearly within the capability of any hybrid resource controls.

PG&E believes the CAISO should make a more data-driven case for the minimum storage generation sizing requirements on hybrid resources providing regulation. Such a need has not previously been raised in the CAISO's own published work with NREL on provision of regulation by solar resources. A resource operator's decisions on storage sizing would be influenced by what level of regulation capability it could certify for and when to bid regulation into the CAISO markets. If a new sizing requirement is to be included, the CAISO should further explain its reasoning and explain the need with existing data.

PG&E also notes that minimum sizing requirements on ancillary service certification are likely to be mitigated by the combination of resources into single hybrid resources, whereas the "dual resource ID" approach is bound to have difficulty with minimum sizes of individual resource components of the hybrid.

5. Deliverability

Please provide your organization's feedback on the deliverability topic as described in section 3.6.

The CAISO should ensure alignment with the assumptions of this initiative and other active stakeholder processes. For example, the CAISO is concurrently proposing to modify its deliverability assessment methodology to account for the changing system conditions that would allow more resources to obtain Full Capacity Deliverability Status (FCDS). In that initiative, the CAISO is seeking to adjust the intermittent resource output to coincide with a different dispatch at a specific time of the day. This would permit more intermittent resources to obtain FCDS with fewer transmission upgrades. The CAISO recognizes that fewer network upgrades could result in an increase of renewable generation curtailment and is proposing a methodology to address this risk. The proposed study would assume that energy storage resources would be set at 0 MW and would be available to dispatch existing

energy storage resources to their full four-hour charging capacity. The CAISO should provide examples of how it envisions these two processes will integrate to ensure consistency across these overlapping platforms.

6. Resource Adequacy

Please provide your organization's feedback on the resource adequacy topic as described in section 3.7.

RA counting for a multiple ID hybrid resource:

With respect to RA counting, it is unclear what would distinguish a multiple ID hybrid resource from multiple distinct resources. Insofar as the distinction is non-existent, PG&E believes the CAISO's proposal to maintain existing technology type-based RA counting methodologies is appropriate; at least within the scope of the initiative. The CPUC RA Proceeding – workshops thereof – and RA Enhancements would be the appropriate venues to examine the suitability of counting methodologies.

PG&E notes that *advantages* apparently offered by hybridizing resources (e.g. using storage to firm EIR output) – which stakeholders argue should be rewarded and reflected in improved RA counting values – may not be currently acknowledged and reflected as *disadvantages* in the RA counting of resources (e.g. intermittency does not negatively impact ELCC). Thus, the hybrid resource RA counting conversation begs a broader conversation on RA counting.

RA counting for a single ID hybrid resource:

All CPUC and CAISO RA counting methodologies are based on resource technology type. Hybrid resources are a market participation model, within which any combination of technology types can participate. The CAISO seems to be suggesting it would be appropriate to develop a single RA counting methodology for the hybrid resources market participation model, putting forward the exceedance methodology as one possible approach.

It does not make sense to establish an NQC for a certain resource type on a completely different basis (market model vs technology) from all other resources. Moreover, assuming a single RA counting methodology for a single ID hybrid resource is not fundamentally flawed based on the above principle: state law requires an ELCC methodology for wind and solar, a cornerstone technology type in this Hybrid Resources initiative. Why is exceedance appropriate for hybrid resources?

Must-offer Obligation

PG&E would like to reiterate its comments to the RA Enhancements Revised Straw Proposal.³ PG&E urges the CAISO to clearly define the relationship between the planning requirements for RA and the operational requirements (must-offer obligations

³ See PG&E Comments – RA Enhancements Revised Straw Proposal, 3.
<http://www.aiso.com/Documents/PGECComments-ResourceAdequacyEnhancements-RevisedStrawProposal.pdf>

(MOOs)). The CAISO should develop MOOs that are consistent with capacity counting values and provide certainty for forward planning yet are consistent with and reflect the operational capabilities of resources.

As the CAISO moves to explicitly considering hourly energy sufficiency – in acknowledgement of the growing fleet of availability-limited resources – its existing MOO requirements, and particularly the 24/7 requirement, become an unworkable, redundant anachronism.

PG&E recommends a more realistic approach, whereby MOOs vary with expected resource availability across the hours of the day and reflect changing load requirements. An approach along these lines would better achieve the CAISO's goals and reflect the actual operational constraints of these resources.

7. Metering, Telemetry and Settlements

Please provide your organization's feedback on the metering, telemetry and settlements topics as described in section 3.8.

As stated above, PG&E believes there should be metering of both the individual components of a hybrid resource to capture and verify the value provided by such resources.

8. Additional comments

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

Hybrid Resources definition. PG&E wonders whether the definition of hybrid resources presented by the CAISO is too broad. Could a large solar field add a small battery to the same interconnection and be considered a hybrid resource? If so, rules should ensure that any financial gains from doing so reflect the value added to the system. Additionally, the CAISO may want to consider whether it is more prudent to focus specifically on rules for solar plus storage if that is the dominant technology making up this hybrid resources group. This may simplify the rule making process and allow the rules to more accurately reflect the specific resources under consideration.

RPS Reporting. In line with the CAISO's comments and the CEC RPS Eligibility Guidebook, PG&E is concerned with any scenarios where the on-site (renewable) charging of an NGR in a hybrid resource can't be differentiated from grid charging. PG&E looks forward to hearing the CAISO's proposals for developing new metering requirements or associated practices needed to ensure adequate RPS reporting.

Information Visualization. The CAISO may consider representing some information presented in the Issue Paper as Venn diagrams instead of tables. This may help stakeholders visualize and comprehend the material more easily. Included below are two examples:

Figure 1: Bidding Interval Example

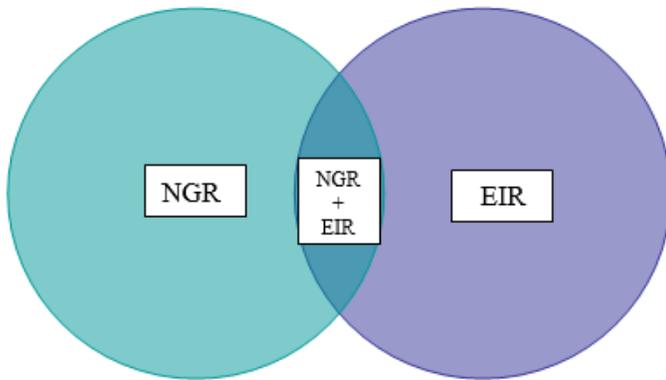


Figure 1 shows how a hybrid resource can be represented by three configurations in a given market or bidding interval

Figure 2: Plant Operation Example

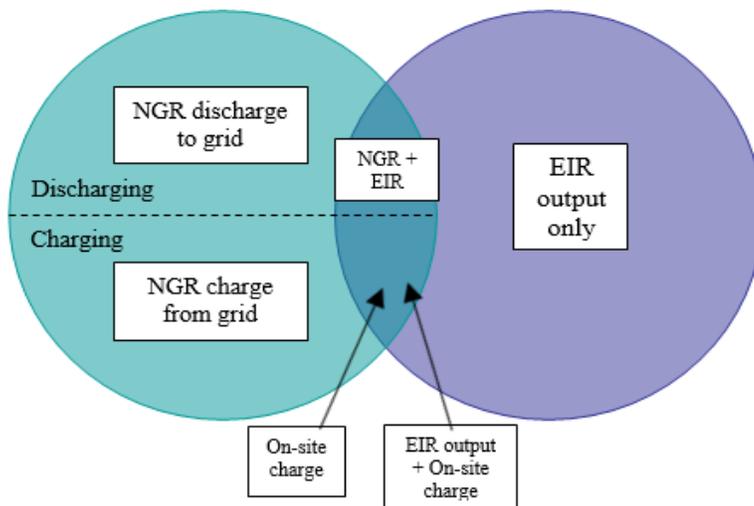


Figure 2 shows the potential operational configurations of a hybrid resource at the plant level.