**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 |
|---|---|---|
| Julie Love<br>Interconnection Project Engineer<br>(415) 496-4914 | SPower | August 13, 2019 |

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

Before answering the CAISO's specific questions, SPower would like to state some principles on which its answers are based.

**First, SPower agrees with CESA that developers of hybrid resources should be able to select either a single-Resource ID or multiple-Resource ID configuration – whichever meets its business needs – without adverse settlement consequences or restrictions on the services they can offer.** Conversely, CAISO should be able to obtain the information it needs to maintain reliability regardless of resource configuration, and to have confidence that these resources can provide those services.

**Second, single-Resource ID hybrids should have operational and market features that reflect their individual components.** For example, solar/storage hybrids should have Resource Adequacy, information/forecasting/bidding requirements, Must-Offer Obligations, etc. that are consistent with, and proportional to, the solar and storage components of the resource, with an adjustment for situations where total capacity at the POI cannot accommodate full output from each component.

**Finally, if CAISO wishes to encourage multiple-Resource ID hybrid configurations, it must fix the inherent disadvantages with current CAISO systems for those configurations.** It is clear that multiple Resource IDs for a given project will have to be linked (e.g., in the CAISO Master File) to allow the significant advantages of fuel-type co-location to be obtained. Given the severe disadvantages under the CAISO's current systems and rules, it's hard to see how a multiple-Resource ID could possibly be economically feasible under situations where the combined installed capacity exceeds the maximum project output at the POI – an extremely common proposed situation.

The responses below are consistent with these overall positions.

**0.  Background:**  Please provide your organization's feedback on the interconnection topic as described in section 3.1. *(This comment template starts below at Section 3.2, but SPower wishes to comment on the topic below from Section 3.1.)*

**RPS Reporting:**  The Proposal at p.10 states that the CEC RPS Eligibility Guidebook (Section 3F) provides guidance about how energy storage can be integrated into a RPS facility.  The Proposal says the Guidebook allows the renewable resource component to charge the storage, and the storage component to then discharge that energy to the grid, with the output of both components qualifying for RPS reporting, as follows:

> The reportable RPS energy from this hybrid resource configuration would be equal to the renewable energy produced net of any losses from storage.

SPower disagrees that this interpretation is reasonable for a configuration where the renewable and storage components of a hybrid are scheduled and settled under separate Resource IDs, since this would discriminate against the renewable Resource ID simply for being co-located with a storage Resource ID.

To illustrate this point, consider a situation with Project A, a solar project, and Project B, an energy storage project.  The two projects connect to the CAISO grid through separate generation tie-lines into the same or nearby substations.

In this situation, all of Project A's generation (netted to the POI through meter adjustments) fully counts as reportable RPS energy, and none of Project B's discharge energy counts.  This is true even though physically it's likely that at least some of the solar energy is flowing into the storage when the later is in charging mode.  In other words, the reportable RPS energy for Project A is not diminished by flows of some of this energy into Project B (or other storage), with incurrence of round-trip losses, before reaching consumers.

Now, consider a hybrid project with two components: Component A (solar generation under Resource ID A), and Component B (energy storage under Resource ID B).  If the above interpretation applied to situations with separate Resource IDs, then solely because some of the energy generated by Component A may go through the Component B storage before reaching consumers, the RPS energy attributable to component A would be reduced for the Component B round-trip losses.

SPower maintains that this "co-location penalty" would be unreasonable even where the two components are under a single Resource ID, but it is particularly unreasonable when the two components are scheduled and settled as entirely different resources.  The fact that they may share a gen-tie line or other interconnection arrangements is an efficiency that should be encouraged, and it certainly does not justify disadvantaging the solar component.

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

**Modification to add storage:**  The CAISO has not clearly explained why the materiality standards for adding storage to a project after COD (per the GIA) are slightly different from those for adding storage before COD (per the GIDAP).  However, in practice this process seems to be working well, so SPower has no objections to its continuation.

**Output limitations:**  SPower agrees that it is reasonable to require inclusion of output limiting mechanisms to energy storage addition requests when the maximum output at the Point of Interconnection (POI) is not being increased.

2.  **Forecasting and Operations:** Please provide your organization's feedback on the forecasting and operations topics as described in section 3.3.

**Information requirements for single-Resource ID hybrids:**  Much of the Proposal and meeting presentation bemoan CAISO's seeming inability to "see into" single-Resource ID hybrids in order to verify the ability of these resources to meet Energy, Ancillary Services, and Flexible Ramping Product market awards.  SPower believes it would be reasonable for the CAISO to require the same information from the components of hybrid resources as if they were stand-alone resources of the same type providing the same services.

These resources can then qualify to provide grid services (Energy, A/S, FRP) and the CAISO can be confident of their ability to do so at any given time.  So, for example:

- Hybrids with solar or wind components can be required to provide the same meteorological and other data as if they were VERs.

- Hybrids with energy storage components can be required to provide the same charging, discharging, and State of Charge (SoC) information as if they were Non-Generating Resources (NGRs).

Likewise, operating obligations for single-Resource ID hybrids should mirror their composition.  For example, the obligation for such resources to follow their Dispatch Operating Target should reflect the resource composition – e.g., for a solar/storage hybrid, the solar capacity should be allowed to exceed its share of the resource DOT, while the storage capacity should be required to follow it.

Assume, for example, a 100 MW single-Resource ID hybrid with 100 MW of solar and 100 MW of storage.  The bid and awarded schedules of the resource should reflect forecasted values for the solar portion and bid amounts for the storage portion, and the combined schedules should not exceed services available beyond those that can be provided with a 100 MW output to the grid.

In real time, the DOT for the combined Resource ID should be adjusted based on a revised forecast for the VER capacity (the same as for any VER).  There should be sufficient metering to verify that, if the resource exceeded the DOT for output to the grid, it did so only due to above-DOT generation from the solar capacity.

**Multiple Resource ID hybrids:** As noted above, the respective Resource IDs must be linked in the Master File. The CAISO should require reasonable metering to determine the degree to which energy from a generation Resource ID is injected into an on-site storage Resource ID facility. Such injections should be allowed to be scheduled in advance (since CAISO should want to know about them) and not limited to Uninstructed Imbalance Energy (UIE); any UIE charges due to unscheduled injections should not carry charges to the storage Resource ID beyond the energy, e.g., additional charges allocated based on UIE are not justified since the energy never physically "touched" the grid.

3. **Markets and Systems:** Please provide your organization's feedback on the markets and systems topics as described in section 3.4.

**Master file and related issues:** If CAISO expects any hybrids with less capacity at the POI than the combined capacity of the hybrid components to use multiple Resource IDs, then it must modify the Master File structure and market-optimization algorithms to allow any hybrid component to use up to the maximum allowed output at the POI. Much of the inherent efficiency of hybrids – for both the resource owner/operator and the CAISO as grid operator – is due to the flexibility to switch between components to more fully utilize the capacity at the POI and provide services to the grid accordingly.

It is hard to see how such projects could ever be economic if this problem is not fixed, and these modifications should be among the top priorities (if not the top priority) for the CAISO from this effort. The need for these changes is so great, and so obvious, that the CAISO should not wait for the conclusion of this initiative to start them; instead, it should begin designing these changes now, and should implement them as soon as possible.

**Default Energy Bids, Unit Commitment Costs, etc:** These market parameters for hybrids should reflect the composition of their respective components and their configuration.

- The parameters for single-Resource ID hybrids should combine the methodologies applicable to the components as though they were stand-alone resources, with an adjustment (e.g., proportional) to reflect situations the combined installed capacity exceeds the capacity at the POI.

- The parameters for each resource of multiple-Resource ID hybrids likewise should reflect the methodologies applicable to each technology, with an adjustment (e.g., proportional) to reflect situations where the combined installed capacity exceeds the capacity at the POI.

4. **Ancillary Services (A/S):** Please provide your organization's feedback on the ancillary services topic as described in section 3.5.

SPower agrees that the CAISO should have sufficient data to determine the ability of a hybrid resource (regardless of the number of Resource IDs) to provide A/S, both in the certification process and in actual bidding and operations, and to rescind payments where those services are not provided. Again, SPower supports reasonable metering and telemetry requirements for CAISO verification and monitoring.

While the "Plant Potential" data point was not well-defined, it should be the same as the CAISO requires for VERs providing A/S, and SPower has no objection to a requirement to provide SOC information for hybrids providing A/S that include energy storage. Similarly, governor settings and/or resource response times applicable to stand-along resources of the same technology providing these A/S could also apply to hybrid resources.

However, certification or monitoring requirements that go <u>beyond</u> those applicable to stand-alone resources do not seem justified. For example, it seems obvious that A/S reliability from a single-Resource ID 100 MW solar/100 MW (400 MWh) storage hybrid should meet or exceed that from a stand-alone resource of either a 100 MW solar or a 100 MW (400 MWh) storage facility, so it's not clear why data requirements should exceed those required for stand-alone facilities with the same technologies.

Likewise, the CAISO's proposed 10% storage minimum for hybrids providing Regulation does not appear to be well-considered. First, this requirement is not applicable, for example, to stand-alone VERs (which CAISO studies have shown are well capable of providing this service). Second, the 10% figure is arbitrary and has not been justified.

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

The modeling assumptions proposed by the CAISO seem reasonable. However, SPower strongly disagrees that addition of "Behind-the-Meter" (BTM) (or, more accurately, "Behind-the-Interconnection" (BTI)) capacity should convert the deliverability status of the combined resource from Full Capacity Deliverability Status (FCDS) to Partial Capacity Deliverabilty Status (PCDS), since the services and reliability of the combined resource should be at least as great as before the addition. Downgrading the deliverability status of the resource when capacity has been added that should actually increase its reliability seems illogical and misleading.

Instead, SPower supports a continuing FCDS designation for such hybrids using a single Resource ID. Their NQC should be based on the level for which the resource would have qualified if still a single-technology resource.

SPower agrees that the deliverability status for multiple-Resource ID hybrids should reflect any deliverability transfers between the technologies (see below). (SPower believes that CAISO should publish more examples of how the deliverability-transfer process works and is considering submitting Proposed Revision Requests (PRRs) in the BPM Change Management Process to clarify the mechanics of the process.)

**6. Resource Adequacy (RA):** Please provide your organization's feedback on the resource adequacy topic as described in section 3.7.

<u>General position:</u> The methodologies adopted for hybrids should:

(1) Yield roughly the same RA value whether a project has has one or multiple Resource IDs, since the reliability value to the CAISO should be about the same either way.

(2) Reflect adopted RA counting rules for stand-alone resources of the technologies included in the hybrids, to avoid project selection of the number of Resource IDs solely to maximize RA value.

## RA value for multiple-Resource ID hybrids

- **If a hybrid has sufficient capacity at the POI to accommodate full simultaneous output from all the Resource IDs**, then the RA value for each Resource ID should be the same as if they were stand-alone resources.

- **If a hybrid has less capacity at the POI than needed to accommodate full simultaneous output from all the Resource IDs, and it was studied as a hybrid in the project Interconnection Studies**, the RA for each Resource ID should be up to the value as if they were stand-alone resources, but the combined RA value cannot exceed the POI limitation. If the combined RA value would otherwise exceed the POI limitation, the resource owner should have the ability to choose how to reduce the stand-alone RA values for each Resource ID to reach the POI limit.

- **If a hybrid has less capacity at the POI than needed to accommodate full simultaneous output from all the Resource IDs, and BTM/BTI capacity was added after the project Interconnection Studies**, CAISO should continue its current practice of assuming that the added capacity is Energy Only unless the resource owner requests a deliverability transfer from the original to the added capacity.

## RA value for single-Resource ID hybrids:

SPower strongly opposes CAISO's proposed use of the Exceedance methodology to determine RA value for single-Resource ID hybrids, because: (1) The reliability value of the hybrid components to CAISO should be the same under either single or multiple Resource IDs, as noted above; and (2) adoption of the CAISO proposal could encourage project selection of Resource ID configuration or the other just to maximize RA value. Instead, the methodology for single-Resource ID hybrids should reflect approved stand-alone methodologies for the different components that make up the resource.

A simple and fair approach would be to assign QC for the resource based on the CAISO's hybrid modeling approach in project Interconnection Studies, i.e., add the QC for each component but limit the combined RA value to the maximum output at the POI. Here are some examples, assuming that the resources were studied at the specified configurations in the project Interconnection Studies.

**Project A:** A 100 MW (at the POI) hybrid consisting of 75 MW of solar and 25 MW/100 MWh of storage. The RA for the combined resource could be calculated as follows:

**QC = (RA QC for 75 MW solar project) + (RA QC for 25 MW/100 MWh storage project)**

Using published Solar Technology Factors for June 2019, the June QC would be:

**June 2019 QC = (75 MW x .448) + (25 MW four-hr sustainable output) = 58.6 MW**

**Project B:**  A 75 MW (at the POI) hybrid consisting of 75 MW of solar and 25 MW/100 MWh of storage.  The RA for the combined resource could be calculated as follows:

**QC = (RA QC for 75 MW solar project) + (RA QC for 25 MW/100 MWh storage project),**
but not more than 75 MW

Using published Solar Technology Factors for June 2019, the June QC would be the same as for Project A:

**June 2019 QC =  (75 MW x .448) + (25 MW four-hr sustainable output) = 58.6 MW**

**Project C:**  A 75 MW (at the POI) hybrid consisting of 75 MW of solar and 75 MW/300 MWh of storage.  The RA for the combined resource could be calculated as follows:

**QC = (RA QC for 75 MW solar project) + (RA QC for 75 MW/300 MWh storage project),**
but not more than 75 MW

Using published Solar Technology Factors for June 2019, the June QC would be calculated as follows:

**June 2019 QC =  (75 MW x .448) + (75 MW four-hr sustainable output) = 133.6 MW,**
but RA QC limited to 75 MW

**Must-Offer Obligations:**  Should also reflect the different components that make up the resource.  Here are two examples, based on the hypothetical Projects A-C above.

**Project A:**  The MOOs for the combined resource should be calculated as follows:

- DA MOO: Same as for a stand-alone storage resource (since solar has no DA MOO):

  **DA MOO = DA MOO for a 25 MW/100 MWh storage project**

- RT MOO:  Same as for the separate resources, i.e.:

  **RT MOO = (RT MOO for a 75 MW solar project) + (RT MOO for a 25 MW/100 MWh storage project)**

**Project B:**  The MOOs should be calculated as follows:

- DA MOO: Same as for a stand-alone storage resource (since solar has no DA MOO):

  **DA MOO = DA MOO for a 25 MW/100 MWh storage project**

- RT MOO:  Same as for the separate resources, i.e.:

  **RT MOO = (RT MOO for a 75 MW solar project) + (RT MOO for a 25 MW/100 MWh storage project),**
  **but not more than 75 MW**

**Project C:**  The MOOs should be calculated as follows:

- DA MOO: Same as for a stand-alone storage resource (since solar has no DA MOO):

  **DA MOO = DA MOO for a 75 MW/300 MWh storage project**

- RT MOO:  Same as for the separate resources, i.e.:

  **RT MOO = (RT MOO for a 75 MW solar project) + (RT MOO for a 75 MW/300 MWh storage project),**
  **but not more than 75 MW**

7. **Metering, Telemetry and Settlements:** Please provide your organization's feedback on the metering, telemetry and settlements topics as described in section 3.8.

**Multiple Resource ID hybrids:**  As noted above, the respective Resource IDs must be linked in the Master File.  The CAISO should use reasonable metering requirements to determine the amount of energy from a generation Resource ID is injected into an on-site storage Resource ID facility.

Such injections should be allowed to be scheduled in DA or RT markets (since the CAISO should want to know about them in advance) and not limited to RT UIE.  In addition, any UIE due to unscheduled injections should be paid and charged the same amount.  In other words, the storage Resource ID should only pay the energy cost, not additional charges allocated based on UIE, since the energy never physically "touched" the grid.

In addition, project owners should be allowed to specify a maximum amount of grid-energy charging of storage Resource IDs, instead of having to choose either zero or unlimited grid-energy charging, to accommodate Investment Tax Credit (ITC) requirements without unduly limiting resource or CAISO flexibility.

Failure to make these changed in the CAISO systems will otherwise push resource owners into a single-Resource ID configuration just to avoid the additional charges described above.

8. **Additional comments:**  Please offer any other feedback your organization would like to provide on the Hybrid Resources Issue Paper.

**DC meters:**  Given the likely prevalence of DC-coupled storage and lack of even one CAISO-certified DC meter, CAISO should actively solicit proposals from major meter manufacturers to certify one or more DC meters, so Resource IDs consisting of DC-coupled storage capacity can be CAISO-Metered Entities.