

CESA Comments

on

Frequency Response Phase 2 Initiative Working Group

Submitted by	Company	Date Submitted
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The California Energy Storage Alliance (CESA)¹ offers these comments on the CAISO Frequency Response Phase 2 initiative efforts². CESA provides comments on key directional issues as well as responses to questions raised by the CAISO in the Comments Response Template.

CESA appreciates the CAISO's efforts to develop a smart and efficient design for Primary Frequency Response, and to manage a robust, technical, and thoughtful stakeholder process.

CESA's Comments:

- 1) **A changing fleet will necessitate new rules to position units to provide PFR.** Primary Frequency Response (PFR) is a critical reliability service. As the fleet changes, the CAISO will need to adapt and develop rules to ensure the fleet provides sufficient frequency response capability. As the CAISO primarily has jurisdiction over commitment, scheduling, positioning, and dispatch of participating units, CESA believes that an in-market solution to provide some or all of the PFR is essential. Without an in-market solution, the CAISO cannot know the units are positioned to provide PFR. Without guarantees and financial structures in place to confirm PFR capabilities and positioning, the CAISO could find itself in a position of hoping PFR is provided. Hope is probably a sub-optimal strategy for PFR in an environment with major fleet transformation.
- 2) **Resources with the capability should be able to compete and be compensated to provide PFR.** The CAISO should pursue an in-market solution that allows resources

¹ CESA represents over 60 companies, some of which may have different opinions than those expressed by CESA. www.storagealliance.org.

² <http://www.aiso.com/informed/Pages/StakeholderProcesses/FrequencyResponsePhase2.aspx>

with the capability and interest to provide PFR and to receive compensation for it. This approach will yield much more efficiency than an interconnection-based requirement for provide PFR which could incur high and unnecessary costs on *all* generators, many of which may be uneconomic to provide PFR. A principle of market and dispatch efficiency should guide the CAISO in this effort, rather than a standards-based approach.

3) Forward planning and ‘outsourcing’ approaches may need CPUC consideration.

CESA is concerned that forward planning solutions for PFR as well as ‘outsourcing’ approaches for PFR such as payments to transfer the PFR obligation to other BAAs may end up both precluding internal resources from competing to provide PFR and could overlap with forward or capacity planning efforts. Planning fleet needs in month or year-ahead forward time-frames appear may replicate aspects of fleet planning which have, in California, historically been managed by Local Regulatory Authorities, at least in part. Thus forward-planning efforts may be beyond the scope of this initiative insofar as they require tight coordination and consideration of roles and responsibilities in fleet planning.

Solutions that only involve forward planning or ‘outsourcing’ may also be problematic insofar as they may not promote market efficiency through competition with physical in-state resources or pseudo-tied resources. This lack of competition results from the timing of the decision to outsource, which apparently must occur well in advance in order to ensure adjust Balancing Area Authority obligations under the BAL-003 standard. Presumably, at some point, adjustments to BAL-003 could occur such that accounting-focused ‘outsourcing’ is decided on in concert with CAISO market-runs, commitments, and scheduling or dispatch of physical units.

4) CAISO should develop an in-market product in line with the ideas CESA expressed at the 2/9/17 workshop.

CESA provided a framework and basic outline for an ‘in-market solution’ which could serve to structure a solution for a PFR product or constraint.³ While a product is likely preferable and could yield a more efficient overall market solution, the main benefits of either constraint or a product is to identify, select, and position or reserve such units to provide PFR while also compensating them for opportunity costs. An in-market solution ensures the pricing aspects of reserving a unit’s capacity to provide PFR manifest, providing price signals which should be deemed as essential if the CAISO is to ‘get’ the PFR it needs. Heretofore, the lack of a price signal has purportedly incited some resources to disable PFR capability.

Instead of a stand-alone ‘in-market solution’, the CAISO may need to consider hybrid solutions in the near-term until sufficient in-market solutions exist. In very short-run cases where the current fleet appears to lack the capability to provide PFR capacity in addition to other in-market obligations for meeting supply needs for energy and Ancillary Services, the CAISO could consider a hybrid approach between an in-market solution and a blend of ‘outsourcing’ or forward planning approaches. A study should be used to determine the amount of ‘outsourcing’ needed. To ensure California plans its fleet

³ CESA Presentation at February 6 CAISO Workshop, <http://www.aiso.com/Documents/CESAPresentation-FrequencyResponseWorkingGroupMeeting.pdf>

appropriately, PFR considerations should likely be added to LRA planning efforts, e.g. the CPUC's Resource Adequacy planning suite, and a sunset should be placed on the 'outsourcing' so that California can re-assess the need or preference for outsourcing periodically. This sunset provision will also help California and the CAISO to plan for grid changes outside the state and for cases where ongoing 'outsourcing' presents problems or improper price signals.

5. The CAISO's next straw proposal should include a PFR 'efficiency ratio' structure as part of an 'in-market' solution to apply to bidders of PFR in the market. As CESA explained in its 2/9/17 presentation⁴, units provide PFR differently. As such, procurement of PFR can be challenging if done based solely on MWs procured. In many cases, such as with non-inverter based resources, a reservation of a MW amount of capacity from a unit may offer only a small amount of PFR, whereas a reservation of the same MW amount of capacity from an inverter-based unit like energy storage can guarantee a very large amount of PFR. An efficiency metric captures this physical feature of a participating resource's operations and helps translate a MW procurement amount as needed by the CAISO's optimization (for an in-market solution) into a least-cost procurement of the capabilities needed to comply with BAL-003 on an ongoing basis.

6. Electrical engineering details on the 'deliverability' of PFR may require further documentation. A highly critical determinant in electrical system operations is the 'deliverability' of energy *or of a grid service* from the point of its provision to the area of need. As CESA understands it, CAISO staff believe that deliverability is *not* a required or relevant feature of PFR. This engineering finding is very critical to the design of a solution to BAL-003. As such, CESA respectfully requests further engineering explanations for why PFR need not be 'deliverable'.

If deliverability, or even some amount of deliverability, is found to be important for the frequency stability benefits of PFR services, the CAISO will need to factor this important aspect into its designs for PFR.

CESA Responses to CAISO Comments Response Template:

Question 1: The ISO seeks stakeholder input on the brainstormed options for a potential solution to the ISO need to take proactive action to ensure its frequency response is sufficient to support reliability in the event of a loss of two Palo Verde units (BAL-003-1 requirement). These include

⁴ *Ibid.*

- a. Provide description of view of advantages, disadvantages, or position on option 1
- Annual Forward Procurement - external BAAs.
- b. Provide description of view of advantages, disadvantages, or position on option 2
- Annual Forward Procurement - external BAAs and internal resources.
- c. Provide description of view of advantages, disadvantages, or position on option 3
- Day-ahead or Real-Time Market Product.
- d. Provide description of view of advantages, disadvantages, or position on option 4
- Day-ahead and Real-Time Constraint.
- e. Provide description of view of advantages, disadvantages, or position on option 5
- Combination Annual for externals and Day-ahead/Real-Time Product.
- f. Provide description of view of advantages, disadvantages, or position on option 6
- Combination Annual for externals and Day-ahead/Real-Time Constraint.
- g. Provide description of view of advantages, disadvantages, or position on option 7
- "Do nothing".

CESA Response: Please refer to Appendix A:

* MERGEFORMAT Table 11 at the end of this template.

Question 2: ISO seeks stakeholder input on the proposed frequency response service specifications for fast frequency response, primary frequency response and fast regulation attached separately in the draft frequency control product specifications document found [here](#).

CESA Response: Please refer to Appendix B: Table 112 at the end of this template. Kudos to the CAISO staff for this deliberate and informative approach to assessing plausible options for PFR solutions.

Question 3: ISO seeks stakeholder input on the proposed scope of services for which a procurement mechanism would be designed. The proposed scope shown in the product specification handout is that the ISO only needs to evaluate procurement of primary frequency response whether from external BAAs or internal resource and does not need to procure fast frequency response or fast regulation capable of providing the secondary response shown on

slide 47 in the appendices to the working group presentation. If any stakeholders believe that the scope should include the fast frequency response or fast regulation services under its evaluation of a procurement mechanism please provide an explanation.

CESA Response: CESA believes that Fast Frequency Response (FFR) could be an important product for the ongoing stability of the power system. As synchronous generation reduces, FFR could be required to provide ‘synthetic inertia’ which is a requirement not necessarily met by the presumed PFR solutions from Question #1, as reflected in the technical specifications. For market efficiency, a *smaller* amount of FFR could be better and *more economical* at arresting frequency excursions than a larger amount of ‘plain’ PFR. FERC Order 755 focused on how ‘faster and more accurate’ resources, even with less total capacity, could provide superior regulation capabilities. With FFR, the situation could be somewhat similar. Additionally, a FFR product thus can provide the frequency response required for FFR while continuing to operate into the PFR timeframe, providing greater value to the system.

CESA believes an in-market solution will be required to procure, position, and dispatch FFR because few resources, other than power electronics/inverter based systems, can provide a fast-enough response. Thus to access these benefits, the CAISO’s solution needs to focus on procurement from physical resources, rather than from a BAA. (Functionally and for clarity, the CAISO’s Phase 1 Frequency Response solution doesn’t actually procure PFR from a BAA but pays to shift PFR accounting obligations to another BAA.) In addition, as mentioned, in cases where a FFR resource displaces or reduce the total need for PFR, an in-market solution can optimize around this trade-off.

Question 4: ISO seeks stakeholder input on whether load responsive devices can perform with a proportional response or does it require shedding load at a specific trigger point? Also, whether there has been any exploration of the concept of stopping non-critical processes for short periods has been evaluated?

CESA Response: CESA understands that loads can be ‘shed’ with the use of a relay that has a set under-frequency threshold or due to a ‘rate of change of frequency’. In this sense, even today, schemes to drop loads are basically last-ditch frequency response solutions.

The CAISO should explore and likely authorize active and precise load participation in the meeting of PFR needs. For instance, inverter based behind the meter distributed energy resources, which appear as a load or Proxy Demand Resources (PDRs) from CAISO’s perspective, can, if properly incented, act to provide PFR through frequency-watt inverter operation. Distributed energy storage can have this capability.

Additionally, loads and microgrids, including those with back-up generation, could utilize a relay or circuit breaker with a higher frequency threshold to disconnect load if incentivized to so and provide primary frequency response services. This study⁵ provides one investigation into demand response for PFR.

⁵ http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-21152.pdf

Question 5: ISO seeks stakeholder input on whether pump storage hydro is pumping rather than generating would frequency control device perform with a proportional response or require shedding load at specific trigger points?

CESA Response: Modern pump-hydro resources have highly dynamic pumping action and can, if programmed and incented to, provide some amount of PFR in either pumping or generation modes, as CESA understands it. as well as generation-adjustment PFR. In some cases, the CAISO may need to consider the ‘efficiency metric’ for some resources seeking to provide this service.

Question 6: ISO seeks stakeholder input on the statement made on Slide 15 of the ISO presentation, “Frequency control services require reserves above operating reserves that are not procured for RA”. The ISO stated that it believes that resource adequacy or flexible resource adequacy capacity procured to ensure RA to ensure energy deliverability cannot be awarded frequency responsive reserves since these reserves cannot be released by ISO dispatch to ensure deliverability during peak or ramping needs. If any stakeholders hold a different belief, the ISO asks that additional information and explanation be provided to continue to move the dialogue forward.

CESA Response: the CAISO should compensate all providers of PFR or FFR, regardless of if they have forward participation contracts, such as for RA. Current RA rules compensate a suite of resources for ‘showing up to the market’.⁶ The receipt of an RA payment does not foreclose market rents for services provided. In fact, it is only in the case of RUC that RA units are directed to *bid* \$0 since the bidding into CAISO markets is basically synonymous with the RA contracts’ must offer obligation. Generally, RA serves to get the ‘right’ or a sufficient amount of resources to the market, but not to preclude resources from providing any market serve.

Looking beyond this initiative’s scope, CESA maintains that state planning exercises should reasonably consider the myriad operating needs of the grid so that the CAISO has a truly workable fleet by which to operate the grid. Such operating realities should include ramping, over-generation, frequency-response, etc. For purposes here, on the issue of whether RA units are or should be eligible to provide PFR or FFR, CESA believes the correct actions for the CAISO now is to establish in-market rules to position and compensate resources for the provision of PFR. Expanding the scope to include changes to LRA planning efforts may be counter-productive at this time.

⁶ This phrase attempts to capture the MOO role for RA resources.

APPENDIX A:

Table 11

provides a summary of the advantages and disadvantages for question 1.

Table 1

Option	Advantages	Disadvantages
Annual Forward Procurement - external BAAs		
1	<ul style="list-style-type: none"> Shifts compliance risk away from CAISO 	<ul style="list-style-type: none"> No guarantee it is the most cost effective solution. Annual forward efforts can be rigid and build CAISO dependence on other BAAs, particularly if no internal capability is developed. The frequency response needs of the system are dynamic as load and generation change. Any annual procurement over procures PFR for much of the year. No clear price signal to develop internal to capability No guarantee internal resources are positioned to provide PFR, e.g. CAISO hopes resources with internal capabilities turn them on. Out of state PFR deliverability may be a risk and depends on interconnection (Refer to South Australia Blackout 2016⁷)
Annual Forward Procurement - external BAAs and internal resources		
2	<ul style="list-style-type: none"> More diverse and flexible. Develops internal capability to offer choice in the future. CAISO can ensure PFR exists rather than hoping resources provide PFR Manages CAISO's compliance risk 	<ul style="list-style-type: none"> No guarantee this is the most cost effective solution. The frequency response needs of the system are dynamic as load and generation change. Any annual procurement over procures PFR for much of the year. May extend CAISO into non-emergency fleet planning in contracting
Day-ahead or Real-Time Market Product		
3	<ul style="list-style-type: none"> Provides presumably most efficient and tailored PFR. 	<ul style="list-style-type: none"> Unclear how BAs or non pseudo-tied resources can compete

⁷ <https://www.aemo.com.au/Media-Centre/AEMO-publishes-preliminary-recommendations-following-the-South-Australian-state-wide-power-outage>

	<ul style="list-style-type: none"> • Can include both internal and external if pseudo-tied • Guarantees required PFR is available and CAISO's compliance • Develops requirements internally to offer choice in the future. • Opportunity cost are compensated 	
Day-ahead and Real-Time Constraint		
4	<ul style="list-style-type: none"> • Provide somewhat efficient solution based on opportunity costs of foregone energy and A/S sales • Ensures units are position to deliver PFR and addresses compliance concerns. • Can include both internal and pseudo-tied external. • Develops requirements internally to offer choice in the future. • Opportunity cost are compensated 	<ul style="list-style-type: none"> • Unclear how BAs or non pseudo-tied resources can compete • Weaker price signal to develop an internal product
Combination Annual for externals and Day-ahead/Real-Time Product		
5	<ul style="list-style-type: none"> • See pros for DA/RT product • Can include both internal and external. • 	<ul style="list-style-type: none"> • Hard to say if most efficient solution. • Not clear on how requirements are divided between internal and external • Out of state PFR deliverability is a risk and depends on interconnection • Other cons with Annual for externals
Combination Annual for externals and Day-ahead/Real-Time Constraint		
6	<ul style="list-style-type: none"> • See pros for DA/RT constraint • Can include both internal and external. • Develops requirements internally to offer choice in the future. 	<ul style="list-style-type: none"> • No guarantee it is the most cost effective solution. • Complex to integrate as external needs to be annual and internal needs to be day ahead. Distorts a lowest cost. • How do you divide up the requirements?
"Do nothing"		
7	<ul style="list-style-type: none"> • Easy on CAISO staff! 	<ul style="list-style-type: none"> • CAISO fails compliance • Risks reliability • Future PFR may be a rushed emergency solution in reaction to an outage, yielding a suboptimal solution. e.g. South Australia is

now by-passing the ISO with a government controlled solution in response to outages.

APPENDIX B:

CESA Response: CESA's notes are in **RED** in Table 1 and Table 2 below.

Table 1: Frequency Control Product Specifications

Product	Synchronized to Grid	Deployment Method	Full AS Obligation	Deploy Deadline	Full AS Obligation Delivery Deadline	Sustain Provision
Fast Frequency Response <i>This should be in scope! See CESA's comments above on FFR</i>	Yes – Synchronized means connected, online (i.e. breaker closed)	Frequency event triggers automatic, autonomous response from frequency response control systems	The awarded amount would set the full AS obligation for fast frequency response at a rate and a maximum drop the seller is willing to provide that rate: X MW/0.1Hz X 0.1Hz	NERC recommended 18mHz	60 cycles	Respond until frequency recovers above required deadband or until re-dispatched by the ISO <i>There should be a time-limit on FFR provision, e.g. 30-seconds. If longer 'burst' is needed, energy settlements should be considered.</i>
Primary Frequency Response	Yes – Synchronized means connected, online (i.e. breaker closed)	Frequency deviation event triggers automatic, autonomous response from frequency response control systems	The awarded amount would set the full AS obligation for fast frequency response at a rate and a maximum drop the seller is willing to provide that rate: X MW/0.1Hz X 0.1Hz	NERC recommended 18mHz	Deliver by beginning of NERC post-event measurement period	Respond until frequency recovers above required deadband or until re-dispatched by the ISO <i>There should be a time-limit on FFR provision, e.g. 30-seconds. If longer 'burst' is needed, energy settlements should be considered.</i>
Fast Regulation (Up or Down)	Yes – Synchronized means connected, online (i.e. breaker closed)	Automatic Generation Control (AGC) signal where resource will provide its entire AS obligation to return frequency to nominal value and minimize unscheduled transient power flows Must have primary frequency response control systems	MW Amount	4 seconds to meet the most recently sent signal	60 cycles after receiving signal	Dispatchable on continuous basis for 10 minutes <i>Should include energy settlement.</i>

Table 2: Considerations on Current AS products

Product	Synchron ized to Grid	Deployment Method	Full AS Obligation	Deploy Deadline	Full AS Obligation Delivery Deadline	Sustain Provision Once Reached Full As Obligation	Questions for consideration under frequency response design effort
Regulation (Up and Down) ⁸	Yes - Synchron ized means connected , online (i.e. breaker closed)	Automatic Generation Control (AGC) signal sends 4 second signals where resource will provide its entire AS obligation by the full delivery deadline based on its ramp rate.	MW Amount	4 seconds to meet the most recently sent signal	10 minutes	Dispatchable on continuous basis for 60 minutes (DAM) and 30 minutes (RTM)	ISO proposes that regulation should not offset the frequency response provided by procured amounts in FR and amounts contributing to regulating frequency in 20-52 should be used to reduce FR requirement. What needs to be evaluated to achieve these goals? Other goals? <i>CESA Response: CESA agrees, the capacity reservation for Regulation should differ and not overlap with PFR or FFR.</i>
Spinning Reserves ⁹	Yes - Synchron ized means connected , online (i.e. breaker closed)	Contingency Dispatch Operating Target (DOT) Replaces Real-time Market DOT	MW Amount	Immediately	10 minutes	At least 30 minutes	How should the ISO incorporate the amount of frequency response these reserves would provide merely from being unloaded capacity? <i>CESA Response: If Spin resources offer PFR for free as part of providing unloaded spin capacity, that could be allowed. Spin resources should be able to select to NOT provide free PFR if so determined.</i>
Non-Spinning Reserves ¹⁰	No	Contingency Dispatch Operating Target (DOT) Replaces Real-time Market DOT	MW Amount	Immediately	10 minutes	At least 30 minutes	None

⁸ Tariff Section 8.4.1.1

⁹ Tariff Section 8.4.3(a)

¹⁰ Tariff Section 8.4.3(a)