

A State-of-Charge Firming Ancillary Service Product

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Rationale for the SOC Firming AS Product

- Opportunity costs of shifting energy from DA awarded hours to other hours (captured through price arbitrage for other energy-limited resources) cannot presently be compensated for SOC-managed resources. CAISO's management of SOC imposes limits on dispatch awards beyond those contained in bids alone.
- An SOC firming AS product allows CAISO to pay resources for forgoing shifting opportunities, and also allows other market participants to “step in” and firm dispatch energy availability if awarded NGR resources choose not to firm their own awards.

Definition of the SOC Firming AS product

- In the current market timeline, SOC firming can reasonably be procured only in the day ahead market.
- SOC firming requirements must thus be defined in advance of, and so independent of, day ahead market awards on SOC-managed resources.
- SOC firming imposes a minimum SOC on awarded resources. This minimum SOC must be consistent with market awards, and should be published along with market awards.
- For SOC-managed resources, an SOC firming award will be enforced in the real time market processes (using the existing MSOC logic). Enforcement may result in uneconomic charging, which may or may not be subject to BCR. Straw proposal: uneconomic charging should be not subject to BCR as long as SOC firming AS bids are compensated.

DA Formulation including SOC Firming

Minimize currently defined costs

+ Sum(price of SOC firming in hour t * quantity of SOC firming procured in hour t)

Subject to

Currently defined constraints and

Sum(Firm SOC procured in hour t) \geq Sum(firm SOC required in hour t)

RT Formulation including SOC Firming

SOC firming procured from each providing NGR resource becomes minimum state of charge constraint implemented as current MSOC is implemented

Implementation Concerns

- Should non-SOC managed resources be able to provide SOC firming, and if so how would their awards be ensured in the real time market processes?
- If non-SOC managed resources are able to provide SOC firming, there may be an overlap between capacity unloaded for SOC firming and capacity unloaded for flexible ramping. Straw proposal: limit SOC firming to SOC-managed resources to avoid this issue.
- In case of outages, should CAISO be enabled to procure SOC firming prior to real time? Straw proposal: Use exceptional dispatch.
- Should SOC firming be included as part of an SOC-managed resource's RA must offer? For all hours or only some? Should its bid be at zero?

Future Applications of SOC Firming

- End of day SOC availability for following day (use multi-day RUC to determine procurement needs).
- Payment for SOC reserves maintained by long duration storage.
- Longer term: hourly SOC firming procurement, combined with load forecast, renewables forecast, and other AS procurement requirements, may enable stable and efficient pricing in a zero-marginal cost electricity market.