Energy Storage and Distributed Energy Resources Phase 4

Gabe Murtaugh
Sr. Infrastructure & Regulatory Policy Developer

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The ISO is proposing a methodology to calculate default energy bids for storage resources in ESDER 4

- The ISO currently does not calculate default energy bids for storage resources
- There is a considerable amount of storage in the new generation queue for the system
- Storage is often suggested as a solution for local issues to mitigate for retirement of essential resources
- Planning models used by the CPUC and the ISO tend to include 4-hour storage ‘moving’ generation from peak solar hours to peak net load hours
  - Generally the existing battery fleet is not doing this

DMM published data showing that storage was scheduled for energy infrequently in 2018

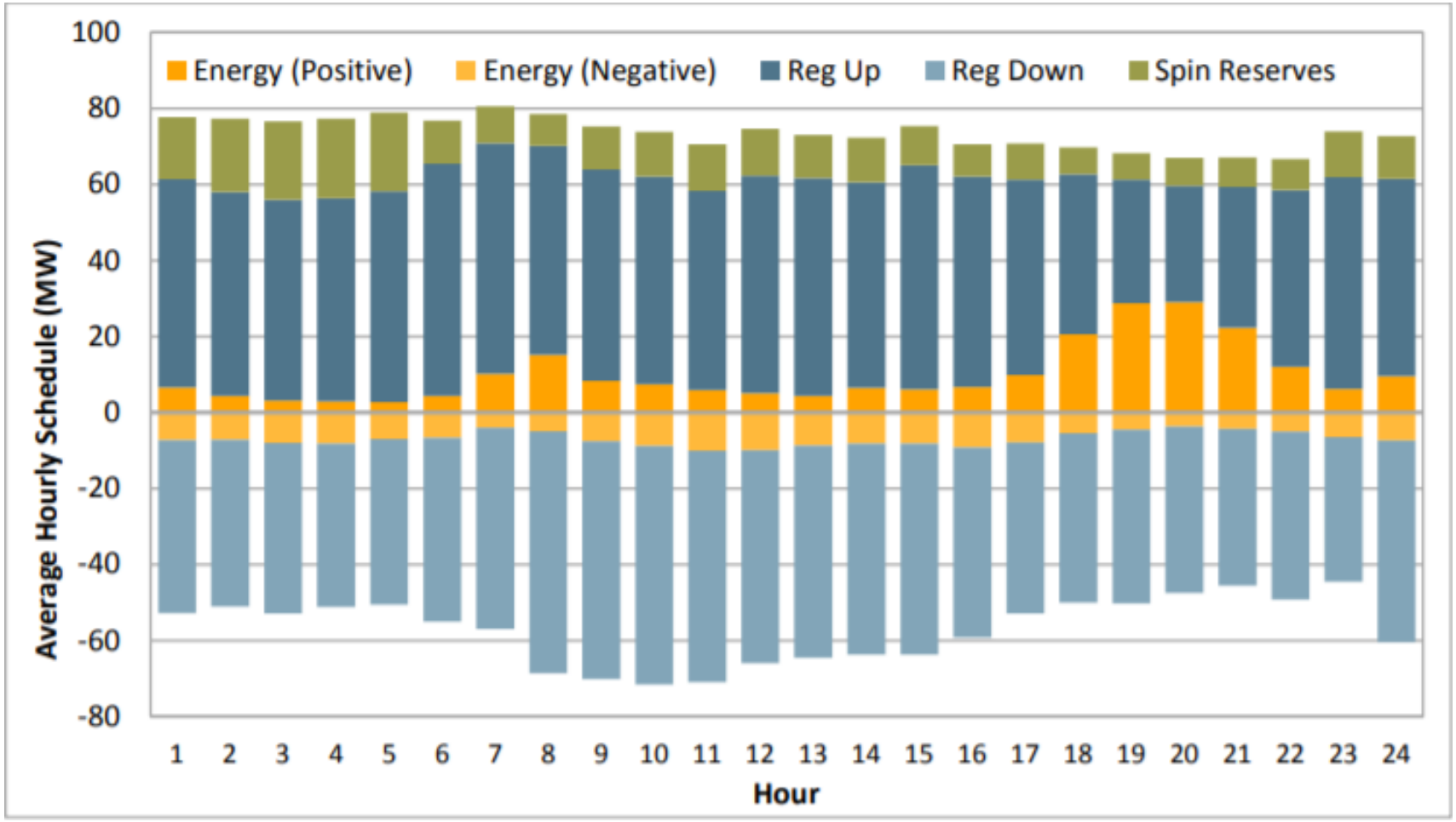

Figure taken from DMM 2018 Annual Report on Market Issues and Performance, Figure 1.11

The ISO identified three primary cost categories for storage resources

- Energy
  - Energy likely procured through the energy market
- Losses
  - Round trip efficiency losses
  - Parasitic losses
- Cycling costs
  - Battery cells degrade with each “cycle” they run
  - Cells may degrade more with “deeper” cycles
  - Unclear if these costs should be included in the DEBs
  - Including these costs may not make it efficient for storage resources to capture small price spreads

Variable costs for storage resources may be significantly higher than gas resources

- Storage resources currently online may have warranty agreements with manufactures
  - i.e. Cells may be guaranteed at 90% of nameplate capacity if resources are only cycled once per day
- Feedback from stakeholders suggests that the bids we currently see may be reflective contractual penalties rather than true costs to operate resources
  - Arguments for DEB methodology reflective of the variable costs (including opportunity costs) to operate the resource
- Data may indicate that storage resources could move load from peak solar hours to peak net-load, but it may be expensive

The ISO contemplated 3 potential solutions to calculate a default energy bid for storage resources

1. The **ISO proposes** that DEBs for storage resources to limit the amount of time a resource runs
   - Use discharge duration as an input to determine expected prices when storage resources 'should' run
   - Use forecast prices for DEB calculation
2. **Considered** using the variable cost option DEB with a storage resource specific adder
   - Include a new/hybrid adder similar to VOM and MMA
3. **Considered** using the variable cost option DEB calculating specific costs for individual storage facilities
   - Similar to the methodology we use for gas resources, with costs outlined for storage resources

The proposed default energy bid is semi-customizable for all storage resources

- The ISO will verify the length of discharge for a storage resource based on maximum storage power and PMax
  - The calculation for the default energy bid will be calculated use 50% of the maximum discharge
  - The DEB will contain an additional 10% adder
  - Anecdotally, the ISO found that many LI batteries could operate profitably by cycling once per day
  - The ISO will develop a process to use forecast prices to calculate a default energy bid for storage resources

Example: A resource that can discharge for 4 hours will have a DEB matching the expected price for the second highest hour in the day

Non-generator resource end-of-hour state-of-charge parameter

Perry Servedio
Lead Market Design Developer

Market Surveillance Committee
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Proposal

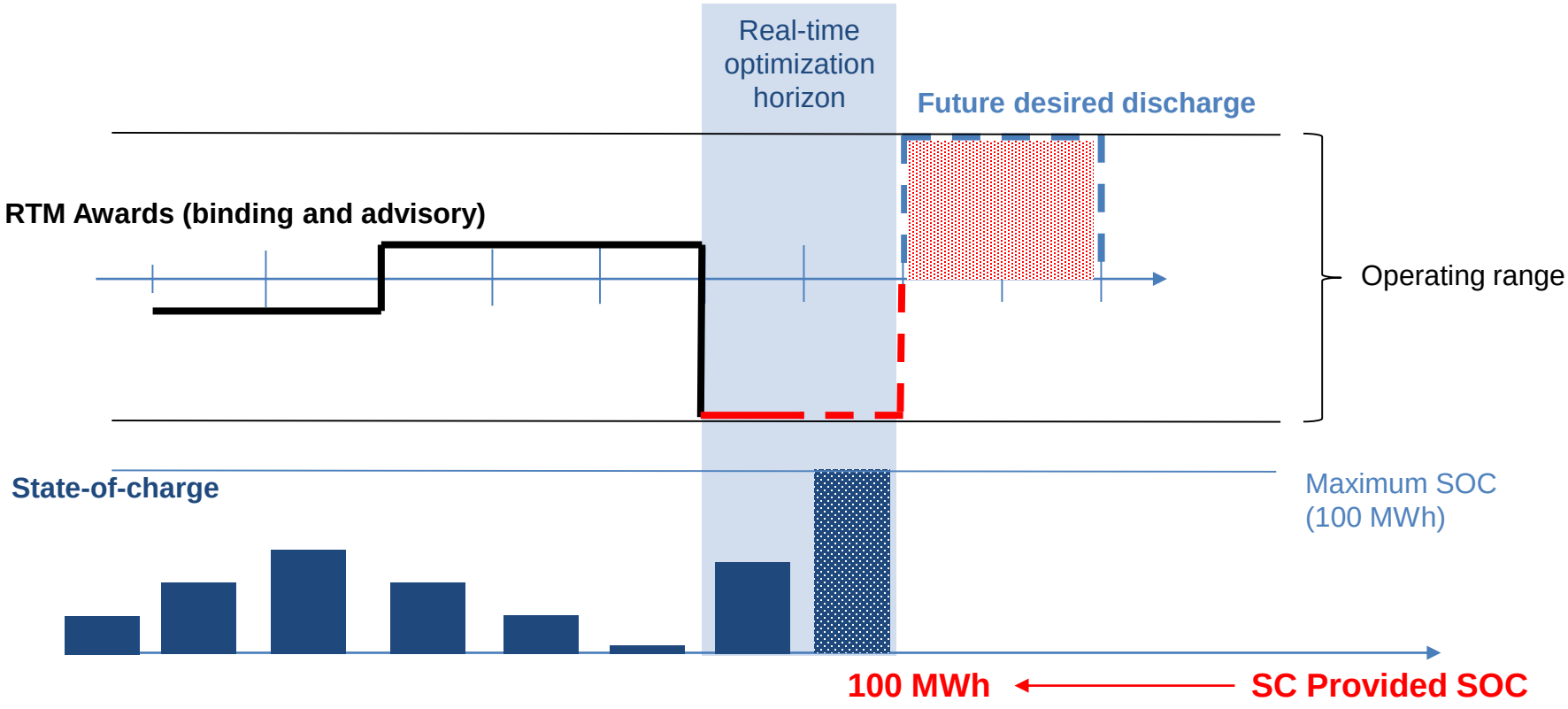
The ISO is exploring an end of hour or end of day SOC parameter to inform policy design of SATA, MUA, and other needs identified by stakeholders.

Real-time state-of-charge management

- Scheduling coordinator to submit end-of-hour SOC
- Bid parameter is optional
- SOC parameter will take precedence over economic outcomes in the market optimization
- Market will respect all resource constraints in addition to the SOC parameter
  - SOC required to fulfill ancillary service awards will be maintained

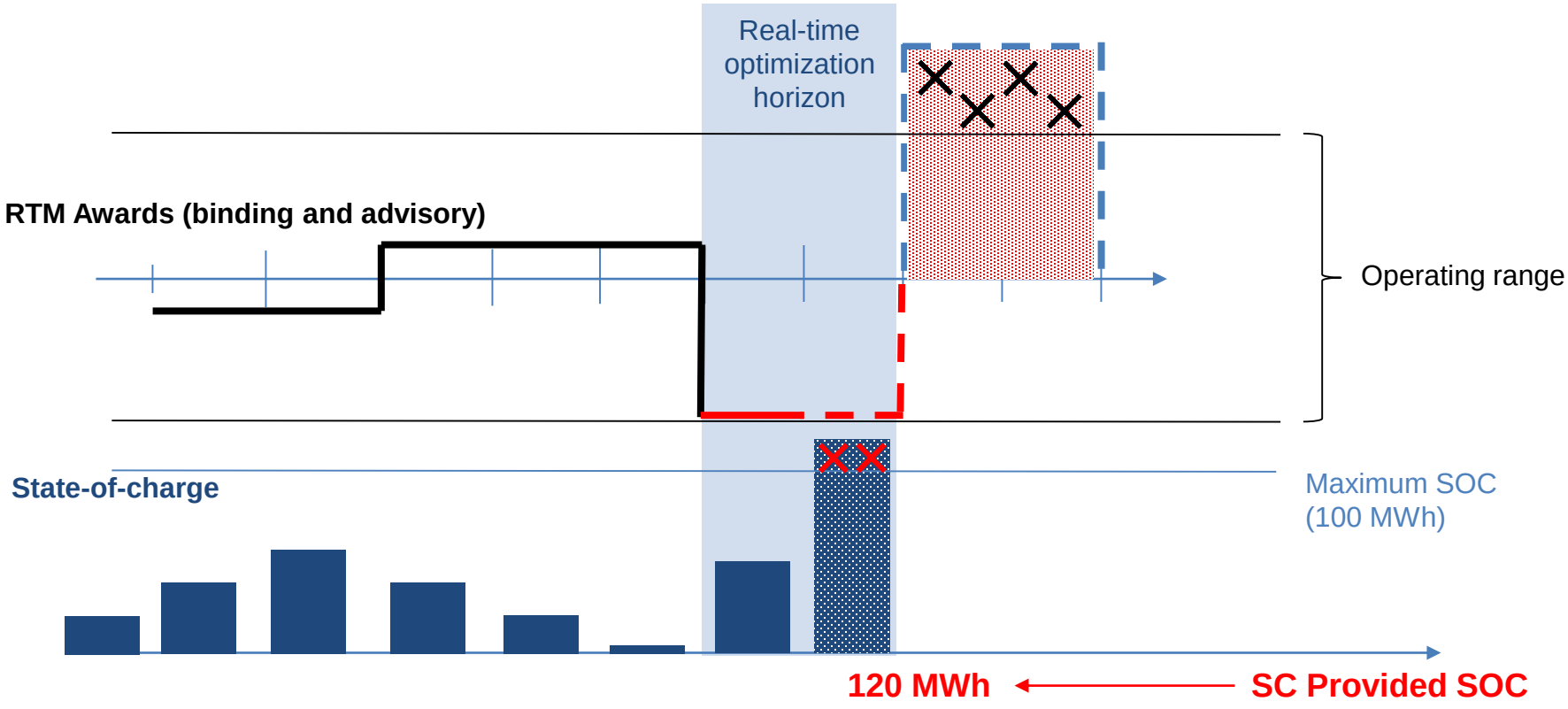
NGR enhancements: real-time SOC management

- In order to meet future desired discharge, NGR provides desired state of charge of 100 MWh in interval prior to discharge.



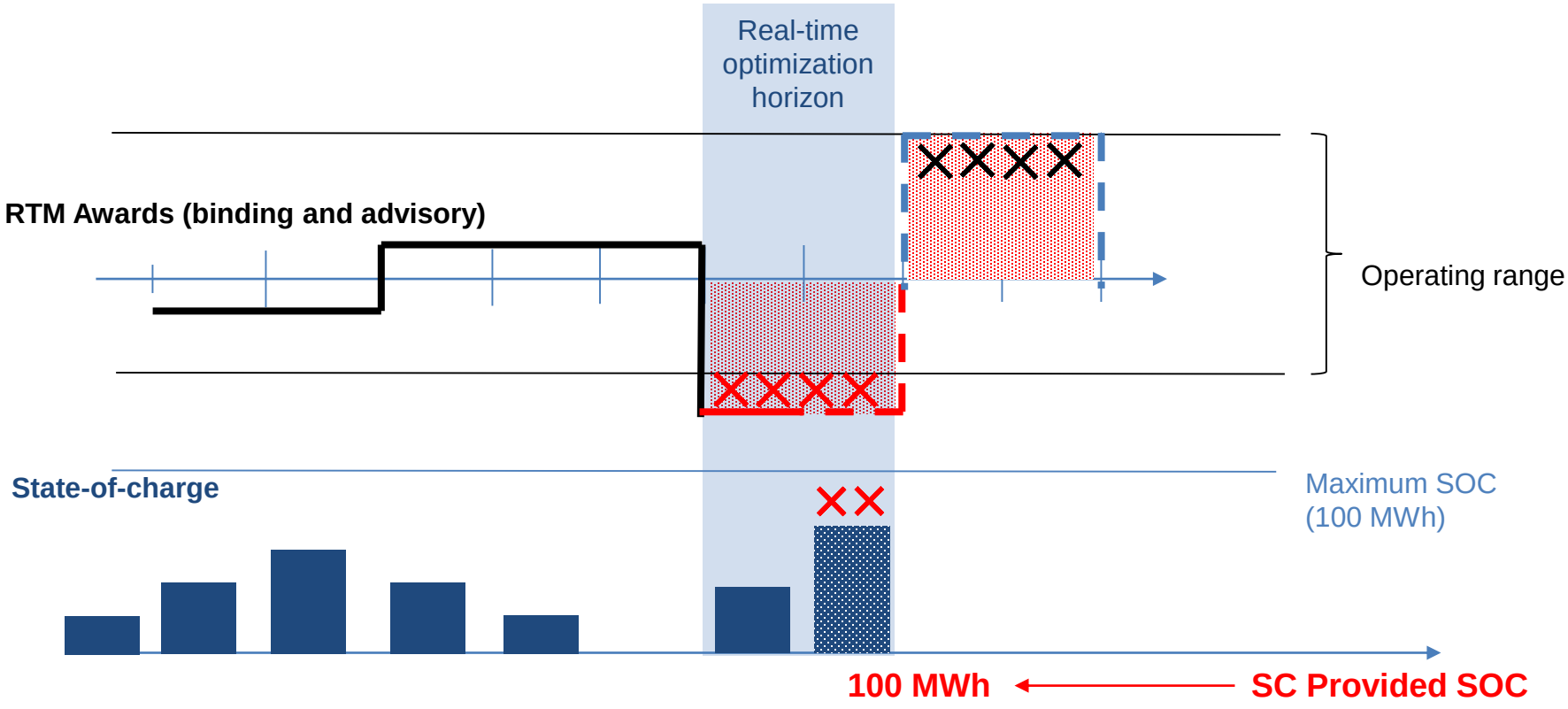
Respecting resource minimum and maximum SOC values

- If the submitted hourly SOC values falls outside of minimum and maximum SOC values, market will only charge to the maximum.



Feasible physical minimum dispatch

- Market will respect the SOC parameter up to its ability to charge



NGR will be ineligible to receive bid-cost recovery if dispatched uneconomically due to SOC parameter or self-schedules

ISO currently evaluating two approaches

Approach 1 (simple)

- Ineligible for BCR with market award due to SOC bid
  1. Charge or discharge is uneconomic;
  2. SOC bid is greater than the current SOC while the awarded value is at physical minimum; or
  3. SOC bid is less than current SOC while the awarded value is at the physical maximum.

NGR will be ineligible to receive bid-cost recovery if dispatched uneconomically due to SOC parameter or self-schedules

Approach 2 (more complex)

- Ineligible for BCR while charging
  - If dispatched uneconomically in interval t, and
  - If submitted end-of-hour SOC is greater than or equal to achievable SOC as of interval t

$$Achievable\ SOC_t = SOC_t + \sum_{i}^{N} \left(\frac{PMIN_i}{4} \right)$$

$$N = number\ of\ intervals\ remaining\ in\ hour$$

- Similar calculation for discharging