

ATTACHMENT A

ISO WORKSHOP PRESENTATION

*CAISO Market Design Initiatives Update
CPUC Storage Proceeding
January 14, 2013*



California ISO
Shaping a Renewed Future

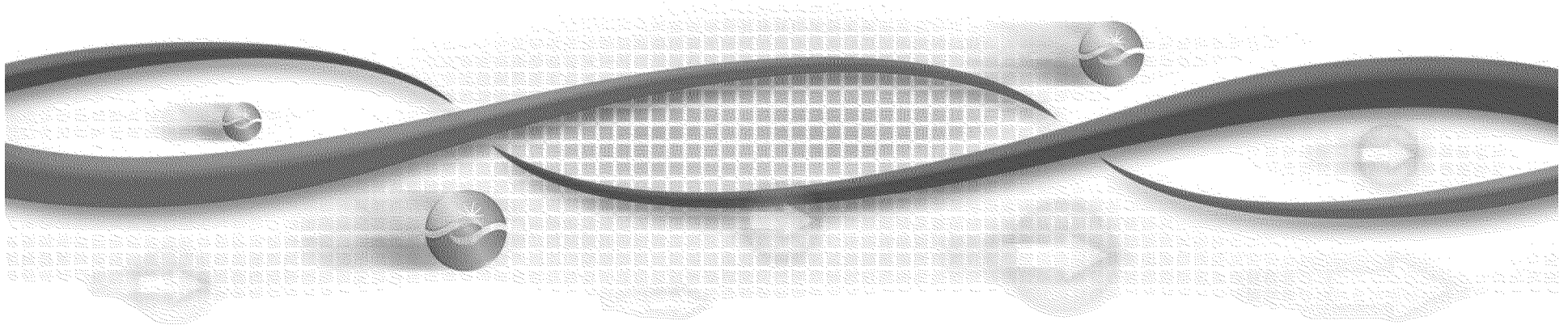
CAISO Market Design Initiatives Update

Donald Tretheway

Senior Market Design and Policy Specialist

CPUC Storage Proceeding

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The ISO is removing barriers and incentivizing flexible resources

- Non-Generator Resources in Ancillary Services
- Regulation Energy Management
 - New Resource Model
- Lower Bid Floor
- Flexible Ramping Constraint
- Pay for Performance Regulation (FERC Order 755)
- 15-Minute Scheduling & Settlement (FERC Order 764)
- Flexible Ramping Product
- Flexible RA Capacity Must Offer Obligations
- Stakeholder Initiative Catalog

Ancillary services modifications to support non-generation resources

- Removed resource type restrictions and reduced minimum rated capacity to 500 kW from 1 MW
- Reduced minimum continuous energy requirement from 2 hours to:
 - Day-Ahead Regulation Up/Down: 60 minutes
 - Real-Time Regulation Up/Down: 30 minutes
 - Spin and Non-Spin: 30 minutes
- Minimum continuous energy measured from the period that the resource reaches the awarded energy output
 - Measurement starts once resource reaches awarded energy, not end of 10 minute ramp requirement

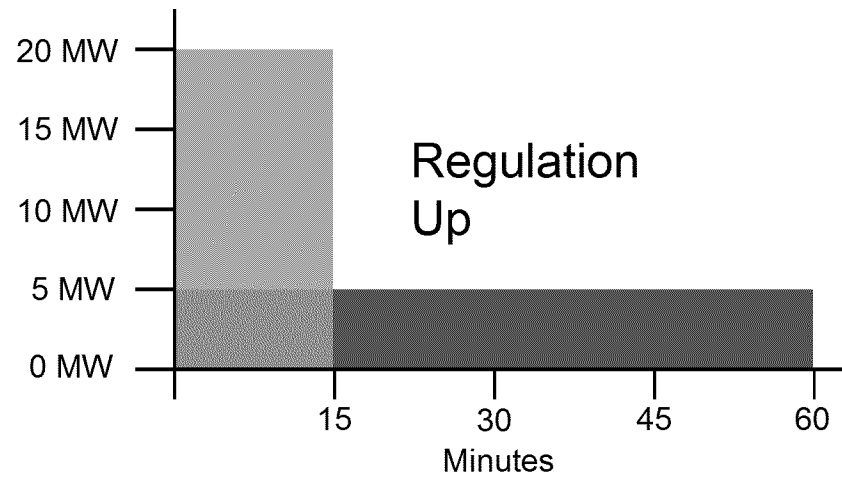
Regulation energy management provides additional functionality to address limitations of storage resources.

- Limited energy resources unable to participate in day-ahead regulation market at full capacity w/o REM
- Regulation dispatch and real time energy keep state of charge near midpoint

*Example: 20 MW / 5 MWh
limited energy resource*

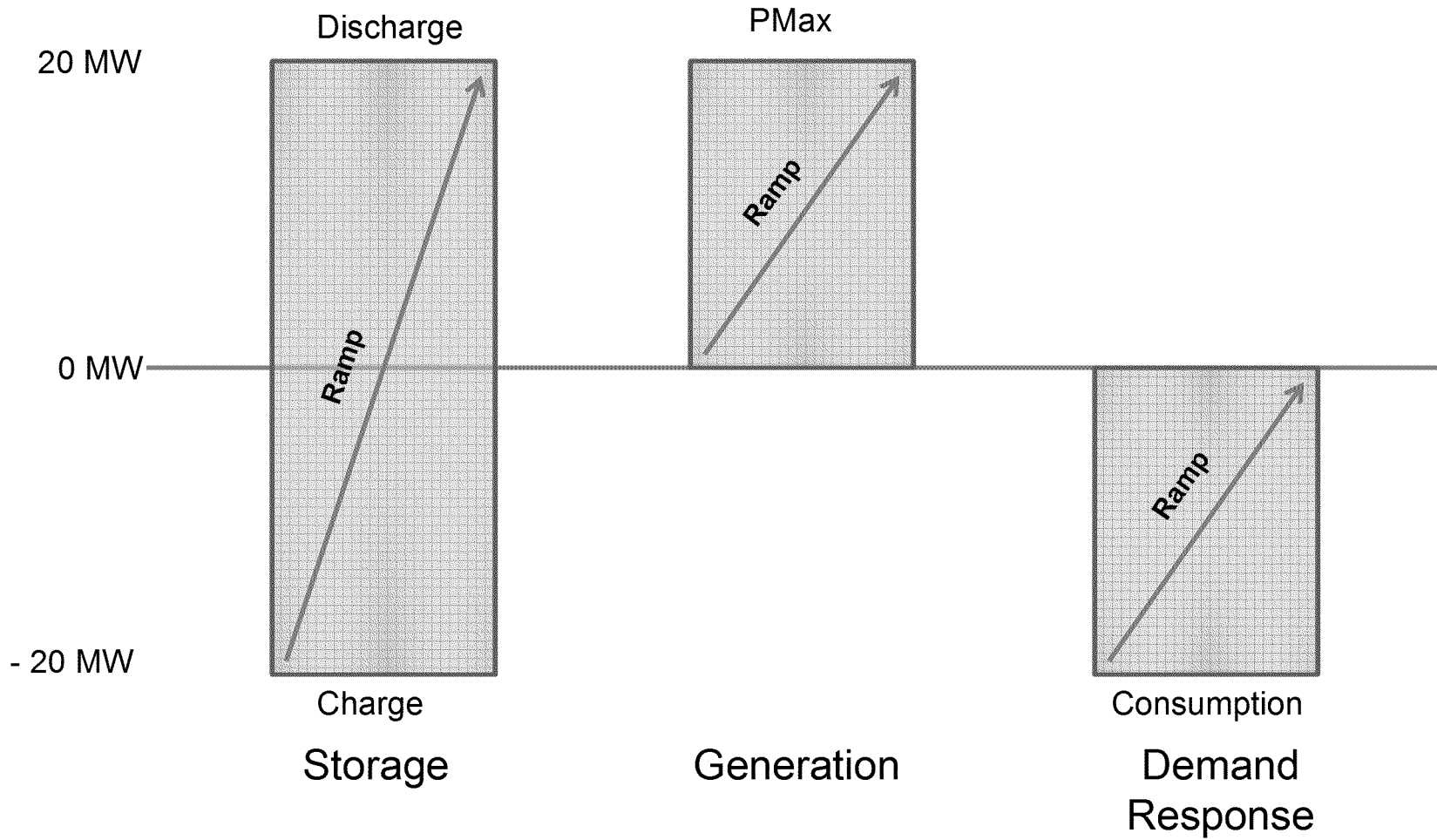
Green – prior requirement

*Yellow – regulation energy
management*



Approved by FERC November 2011. Implemented Fall 2012

Resource model that recognizes a resource can move seamlessly from load to generation



Lower bid floor to incentivize decremental dispatch during over-generation

- Reduction in bid floor approved by BOG in Renewable Integration Market and Product Review Phase 1
 - Current floor (\$30.00), Step 1 (\$150.00), Step 2 (\$300.00)
- Lower bid floor dependent on bid cost recovery split in to day-ahead and real-time
 - BOG approved BCR changes December 2012

FERC Approval Pending. Implementation Fall 2013

Flexible ramping constraint to ensure sufficient upward ramping capability is committed

- Constraint is enforced in real-time pre-dispatch and managed in real-time dispatch
- Ramping needs met through market optimization versus out of market operator actions
- Includes compensation mechanism designed to recover opportunity costs of resources providing ramp
- FERC settlement modified:
 - Compensation algorithm
 - Cost allocation split 75% Load and 25% Supply

FERC settlement approved and implemented December 2012

Pay for performance regulation introduces two part compensation – capacity and accurate movement

- Currently, faster resources may receive more regulation dispatches than slower resources, but paid the same capacity price
- Two part payment for frequency regulation:
 1. A payment for regulation capacity and
 2. A payment for performance of the resource in response to a regulation signal.
 - Mileage: resource movement as measured by the absolute change in regulation signals between 4 second intervals
 - Accuracy: comparison of regulation signal to actual telemetry

Approved by FERC September 2012. Implementation Spring 2013

Order 764 provides opportunity to address real-time market inefficiencies and facilitate renewable integration

- FERC Order 764 has two main components:
 - Allow 15-minute scheduling
 - Variable energy resources must provide meteorological data
- Maximize existing functionality to allow 15 minute schedule updates that doesn't create seams issues
- Three settlements by making "RTUC" financially binding
 - HASP energy/AS settlement is replaced by 15-minute market
- Convergence Bidding allowed to return to interties assuming Dual Constraint issue resolved

Stakeholder initiative ongoing

Flexible ramping product improves upon constraint

- Compensation based upon “real ramp” or the actual movement between 5 minute RTD dispatch
- Procures flexible ramping in both upward and downward direction in the day-ahead and real-time market
- Allows capacity bids in the day-ahead market
- Combines IFM and RUC for day-ahead FRP procurement and improved market efficiency
- Improves cost allocation consistent with guiding principles

Stakeholder initiative will recommence after FERC Order 764 completed

Flexible resource adequacy capacity must offer obligation two stage process

- The first stage, for 2014 RA compliance, focuses on:
 - Default provisions for LRA's without flexible capacity procurement obligations
 - Backstop procurement authority
- The second stage, for 2015 RA compliance, will focus on:
 - Enhanced performance obligations for flexible capacity resources, including must-offer obligations
 - Backstop procurement compensation for flexible capacity resource obligations, and
 - Revisions to the ISO Standard Capacity Product tariff provisions to apply to flexible RA capacity resources.

Stakeholder initiative ongoing

Annual process categorizes and ranks identified market design and infrastructure policy enhancements

- BOG briefed on stakeholder initiative catalog in December 2012

| Initiative Status | Initiative Type |
|--------------------------|---|
| In progress (12) | <ul style="list-style-type: none">• FERC-mandated (5)• Non-discretionary (7) |
| Not yet in progress (45) | <ul style="list-style-type: none">• FERC-mandated (7)• Non-discretionary (2)• Discretionary<ul style="list-style-type: none">• Infrastructure policy (3)• Market design (33) |
| Completed (25) | <ul style="list-style-type: none">• Stakeholder process completed (but may still be pending other processes) |

- Stakeholders can submit new initiatives into catalog

Sources for additional ISO information (1 of 3)

- Participation of Non-Generator Resources in A/S
 - <http://www.caiso.com/informed/Pages/StakeholderProcesses/CompletedStakeholderProcesses/NonGeneratorResourcesAncillaryServicesMarket.aspx>
- Renewables Integration Market and Product Review
 - Phase 1 (Lower Bid Floor)
 - <http://www.caiso.com/informed/Pages/StakeholderProcesses/RenewablesIntegrationMarketProductReviewPhase1.aspx>
 - Phase 2
 - <http://www.caiso.com/2b3d/2b3d8b92f940.html>
- Regulation Energy Management
 - <http://www.caiso.com/2b05/2b05e7075f6d0.pdf>

Sources for additional ISO information (2 of 3)

- **Flexible Ramping Constraint**
 - <http://www.caiso.com/informed/Pages/StakeholderProcesses/CompletedStakeholderProcesses/FlexibleRampingConstraint.aspx>
- **Pay for Performance Regulation (FERC Order 755)**
 - <http://www.caiso.com/informed/Pages/StakeholderProcesses/PayforPerformanceRegulation.aspx>
- **15-Minute Market & Settlement (FERC Order 764)**
 - <http://www.caiso.com/informed/Pages/StakeholderProcesses/FERCOrderNo764MarketChanges.aspx>
- **Flexible Ramping Product**
 - <http://www.caiso.com/informed/Pages/StakeholderProcesses/FlexibleRampingProduct.aspx>

Sources for additional ISO information (3 of 3)

- Flexible RA Capacity Must Offer Obligations
 - <http://www.caiso.com/informed/Pages/StakeholderProcesses/FlexibleResourceAdequacyCriteria-MustOfferObligations.aspx>
- Stakeholder Initiatives Catalog
 - <http://www.caiso.com/informed/Pages/StakeholderProcesses/StakeholderInitiativesCatalogProcess.aspx>