



California ISO
Shaping a Renewed Future

Flexible Ramping Product Technical Workshop

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Agenda

Time	Topic	Presenter
10:00 – 10:10	Introduction	Chris Kirsten
10:10 – 12:00	Integrated Day-Ahead Market Discussion	George Angelidis
12:00 – 1:00	Lunch Break	
1:00 – 3:00	Product Design Discussion	Lin Xu
3:00 – 3:55	PIRP Dec Bidding and Cost Allocation Discussion	Don Tretheway
3:55 – 4:00	Wrap-up and Next Steps	Chris Kirsten

Changes to address stakeholder comments

- Eliminated interactions between the regulation service and flex ramp
 - Regulation service cannot participate as flex ramp
 - Flex ramp bid does not depend on regulation bid
- Flex ramp maximum requirement
 - The ISO will develop a flex ramp maximum requirement forecast to cover 95% confidence level
 - The maximum requirement is NOT the 95% variation of the historical net system demand
- Eliminated the constraint that RUC schedule is not less than the IFM schedule

Frequently asked questions

- What are the benefits from flex ramp?
 - Increase dispatch flexibility and reliability
 - Accommodate increasing penetration of variable energy resources
 - Reduce uneconomic price volatility (price set by penalties)
 - Improve price consistency
- Why not use regulation service to address ramping need?
 - Regulation capacity is NOT available for RTD dispatch
 - Regulation is not dispatched based upon energy bids
 - More regulation will decrease the ISO's dispatch flexibility
- Why not use Non-Contingent Spin to address ramping need?
 - False opportunity cost payment
 - Does not address downward ramping need

Frequently asked questions

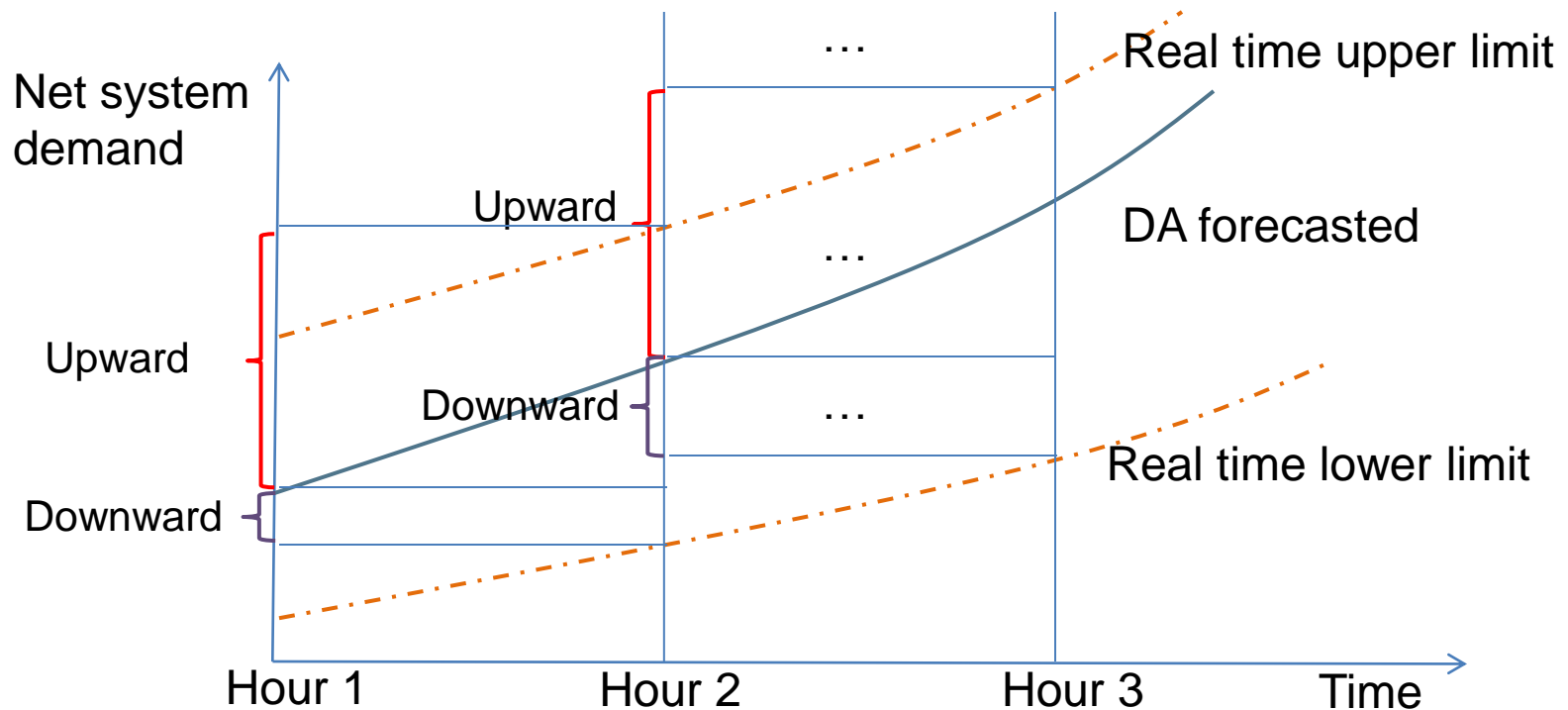
- Will energy ramping will be counted as flex ramp?
 - Not necessarily
 - Energy ramping into the advisory interval is an advisory energy dispatch or an advisory flex ramp deployment
 - Flex ramp is the ramping capability based on the binding dispatch in the binding interval, and is independent of the advisory energy ramp
 - Generally, capacity procurement does not preclude dispatching resources that did not get capacity award, and dispatching resources does not guarantee capacity payment. Example: spinning reserve.
 - Similarly, having an advisory energy ramping does not necessarily guarantee the flex ramp award and payment
 - Energy ramping will be counted as flex ramp only if the ramping capability in the binding interval is economic (cost less than the flex ramp shadow price)

Frequently asked questions

- What are the incentives?
 - Increase market participation from flexible resources
 - Reduce non-dispatchable schedules, and increase economic bids
 - If the resource prefers self schedules or static interchanges, then it is better to schedule them in the direction of reducing net system movement
 - A resource providing flex ramp will be paid the marginal market price, which may have a profit margin over its own bid plus opportunity cost, so the resource should reflect its true cost in the flex ramp bid
 - A resource can participate in both the day-ahead market and real-time market to provide flex ramp without being worse off in real-time

Frequently asked questions

- Day-ahead maximum procurement
 - Cover potential net demand difference between day-ahead forecast in hour t and real-time band in hour $t+1$



- Alternative idea: allow SC to bid flex ramp demand in IFM

Frequently asked questions

- Rationale for real ramp modeling
 - Correct compensation
 - Uniform compensation for resources providing ramping capability
 - Resources get compensated for the real opportunity cost
 - Economic and faster resources will be most compensated
 - Aligned with system conditions
 - Procure upward ramping when net demand increases over time
 - Procure downward ramping when net demand decreases over time
 - Aligned with cost causation allocation
 - Real ramp is the basis for allocating cost based on net system movement
 - Avoid false opportunity cost payment
 - Resolve the double payment issue existing for flex ramp constraint
 - Produce efficient prices and improve price consistency

Frequently asked questions

- Should a self-schedule or static intertie following load be paid FRP?
 - No. FRP is not to compensate a resource's movement, it is to compensate a resource's capability to move pending the ISO's dispatch instruction.
 - Self-schedule or static intertie following load will not be allocated flex ramp cost in the load movement direction
 - Load moving up gets allocated flex ramp up
 - Self schedule and static intertie following load will not be allocated flex ramp up
- What is the basis for allowing capacity bids?
 - Upcoming MSC discussion at the October 19 MSC meeting

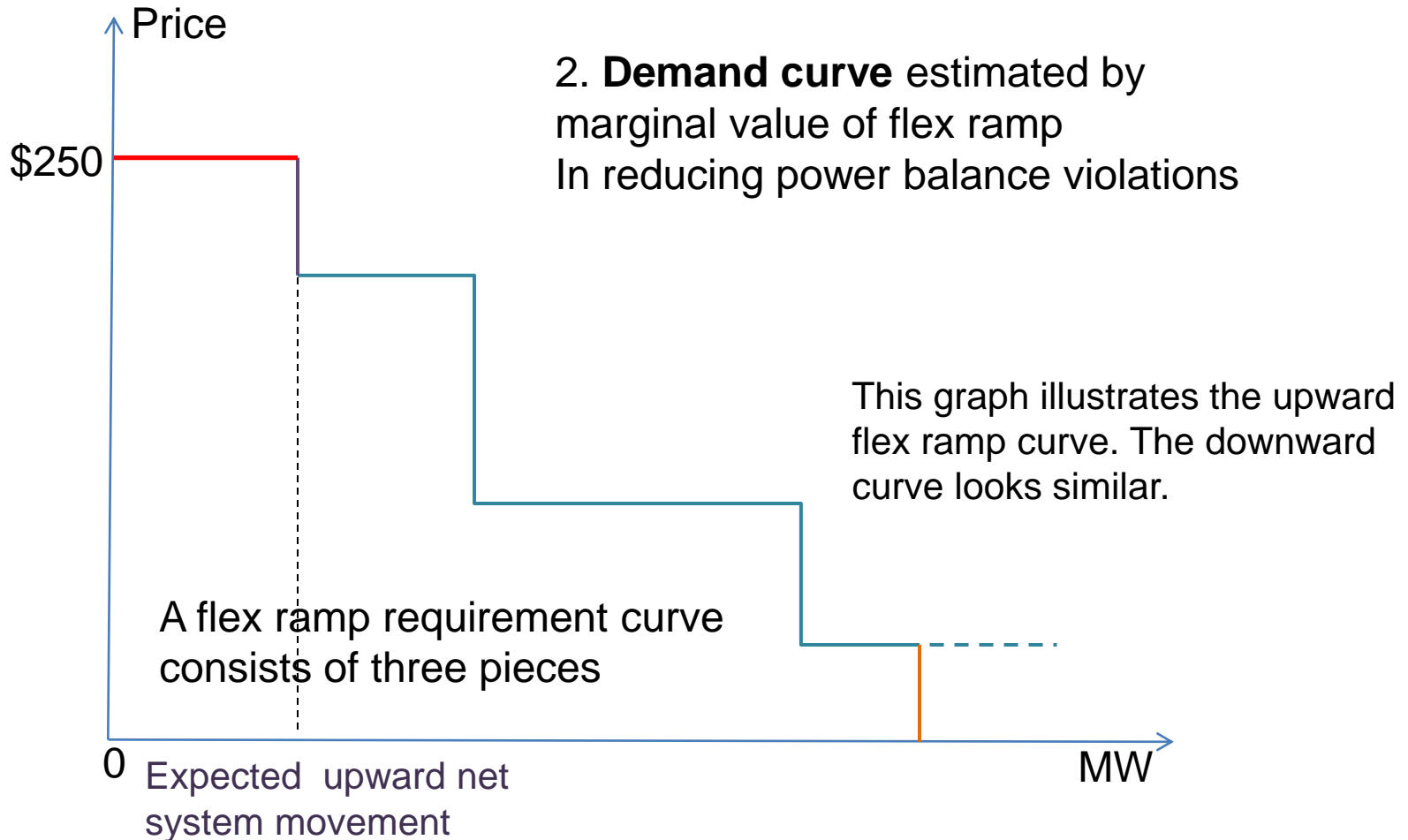
Bidding rules

- Allow flex ramp capacity bids in both upward and downward direction (subject to discussion at the MSC meeting on October 19)
- Any 5-minute dispatchable resource with energy bids can provide flex ramp
 - Such a resource without explicit flex ramp bids will be assumed to have a zero bid for flex ramp
- Bid cap \$250, bid floor \$0
- Do not allow self providing flex ramp
- In real-time markets, a flex ramp bid only applies to incremental award from the day-ahead award
 - In real-time markets, day-ahead flex ramp award will be assumed to have a zero bid

Optimization and modeling

- Flex ramp will be co-optimized with energy and ancillary services
 - Ramp constraint
 - Flex ramp is within the average 5-minute ramping capability over the market clearing interval taking into consideration the ramp rate to support ancillary services in the same direction
 - Capacity constraints
 - In any interval t , upward flex ramp from t to $t+1$ plus energy at t plus upward ancillary services at t less than or equal to P_{max}
 - In any interval t , energy at t minus downward flex ramp from t to $t+1$ minus regulation down at t greater or equal to P_{min}
- No cascading or substitution between flex ramp and ancillary services
- Flex ramp will be modeled in all intervals in a multi-interval optimization
- A resource cannot provide flex ramp in any non-dispatchable process, such as startup, shutdown, forbidden region, or MSG transition process

Flex Ramp Requirement and Demand Curve



1. Minimum requirement
reliability related

3. Maximum requirement
a forecast to cover 95% confidence level

Settlement

- Two settlement system
 - Day-ahead flex ramp award will be paid the day-ahead flex ramp price
 - RTD flex ramp incremental/decremental award from the day-ahead award will be paid/charged the RTD flex ramp price
- Unavailable flex ramp will be charged the RTD flex ramp price

Changes to address stakeholder comments

- Clarified PIRP not eligible for monthly netting if awarded FRD
- VERs can submit their own 15 minute expected energy for FRP cost allocation, but will be monitored for gaming cost allocation
- Internal self-schedules are in the supply category only
- Gross UIE + hourly SS changes will be used to allocate within the supply category

PIRP Decremental Bidding

- On an hourly basis, PIRP resource submits:
 - Real-time self-schedule equal to 3rd party forecast
 - Maximum MW curtailment
 - Ramp rate
 - Energy bid price willing to be decremented
 - Flexible ramping down bid price
- The ISO will use the ISO 15 minute forecast for RTUC FRP headroom and to assess availability for decremental dispatch
- If resource is dispatched or awarded FRD, the 10 minute settlement interval is not included in monthly netting

Cost Allocation – Align movement and metering

1. DA and RT FRP costs initially split in to three categories based upon net movement

2. Allocate each category
 - A. Load (hourly meter) category allocated to gross UIE

 - B. Supply (10 minute meter) category allocated to gross deviations and self-schedule changes

 - C. Fixed Ramp category is allocated to SC's net static imports/exports

Cost Allocation – Supply Category

- In the Master File, VERs can elect 15 minute expected energy update for baseline to measure deviations
- 10 minute gross (UIE + Hourly SS change / 6)
- Threshold: minimum of 3% Instruction or 5MW/6

Cost Allocation - Other

- Monthly resettlement for each hour
- Functionality to allow cost obligation to be transferred between SCs

Next Steps

Item	Date
Stakeholder Technical Workshop	October 2, 2012
Stakeholder Comments Due	October 12, 2012
Post 2 nd Revised Draft Final Proposal	October 24, 2012
Stakeholder Meeting	October 31, 2012
Stakeholder Comments Due	November 7, 2012
Board of Governors Meeting	December 13-14, 2012

Submit written comments to FRP@caiso.com

Questions

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