Simplifying Flexible RA: Alternative Methods for Assessing Need

Flexible Capacity Workshop
November 9, 2016

Agenda

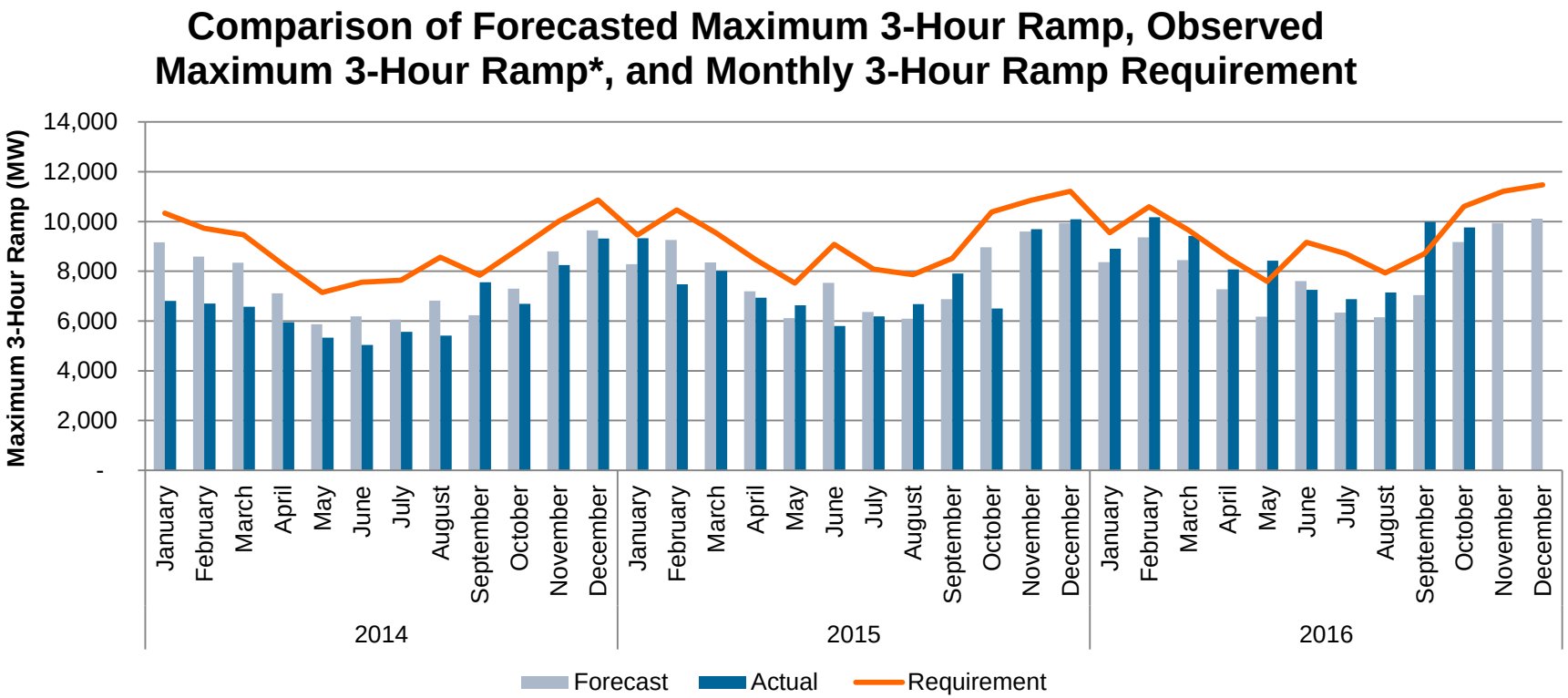
1. Assessing Flexibility Needs
   - Guiding principles
   - Existing methodology
   - CAISO identified drivers
2. Alternative Ways to Assess Flexible Needs
   - Day-ahead ramping capabilities
   - Real-time deviations
3. Potential Requirement
   - Proposed areas of studies
4. Appendix

Existing Methodology and CAISO Identified Drivers

ASSESSING FLEXIBILITY NEEDS

- Requirements be based on thorough data analysis
  - Uses the best available data
  - Identifies specific flexible need
- Simple to understand, procure, and administer
- Focused on providing reliability in monthly and year-ahead timeframe

Existing Flexibility Need Calculation



*Observed ramps calculated using hourly data from CAISO's daily Renewable's Watch report.

- Requirement above actual ramps in 2014 and 2015 lead to over-procurement
- Ramps exceeded requirement in some months in 2016; however, without observed reliability impacts

CAISO Identified Drivers of Flexibility Needs

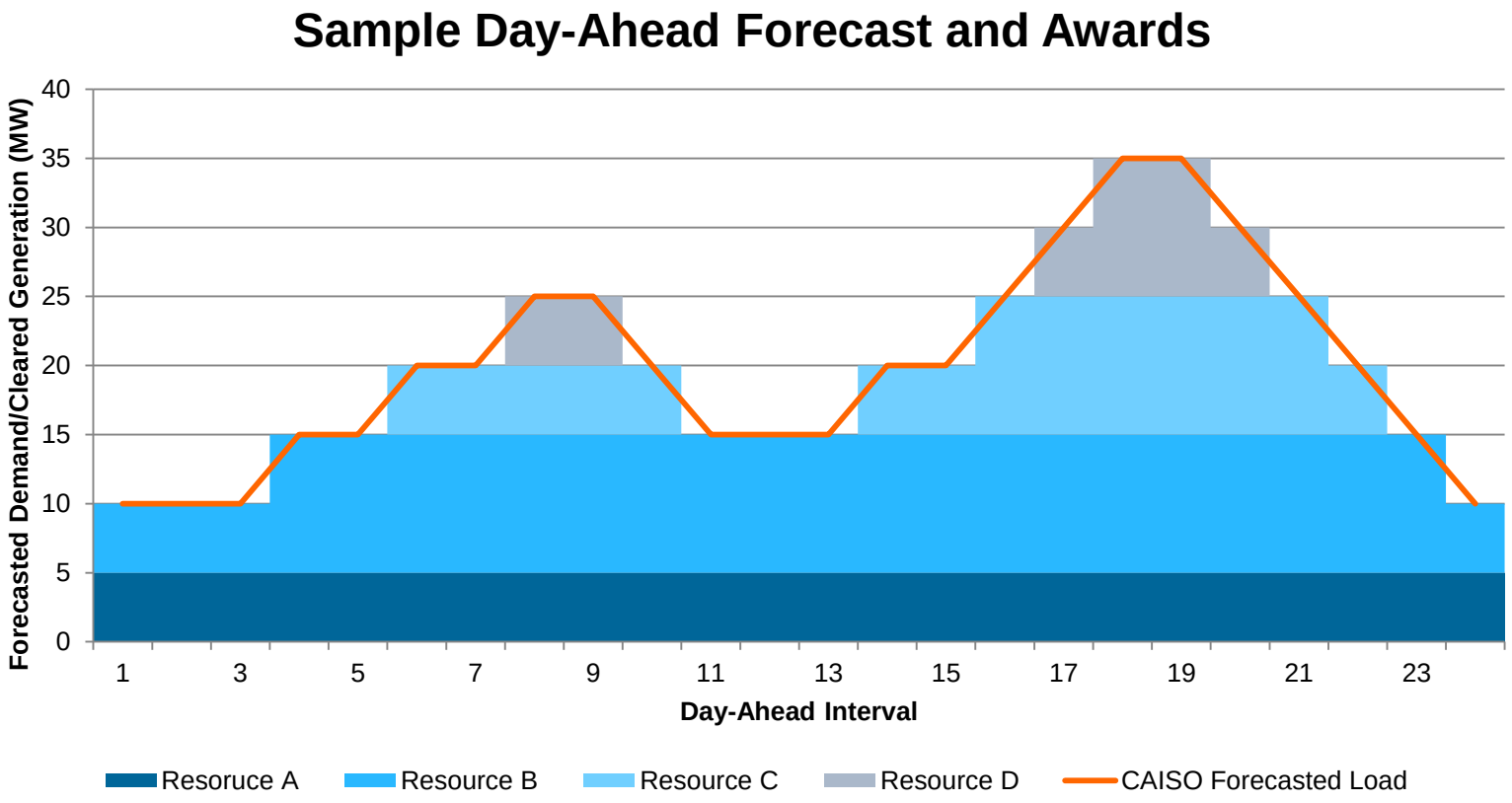
CAISO identified 4 drivers of flexibility needs in the April workshop:

1. Three-hour net load ramps
2. Single-hour net load ramps
3. Upward and downward dispatchable range during low net load periods and the transition between low net load periods and three hour ramps
4. Five-minute upward and downward deviations during the 3-hour net load ramps

Focusing on Forecast Error

ALTERNATIVE WAYS TO ASSESS FLEXIBILITY NEEDS

Day-ahead Ramping Capabilities

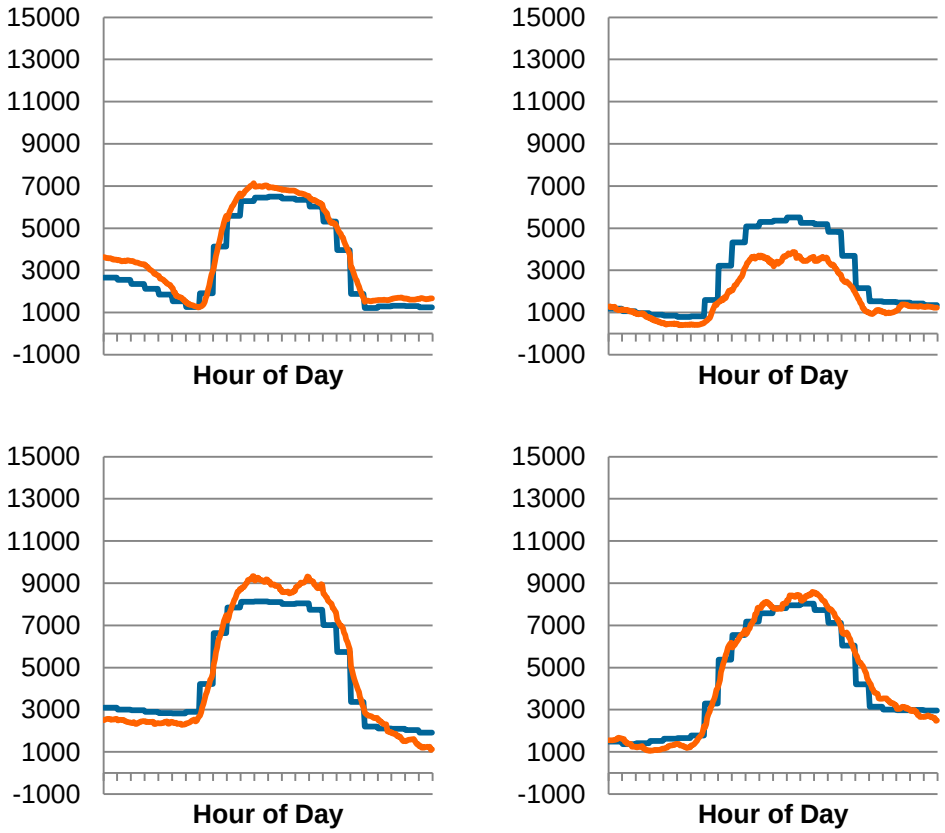


To the extent that CAISO can meet the day-ahead forecasted ramp through the IFM/RUC process, CAISO should not need to meet the entirety of the ramp with real-time flexibility.

Real-Time Deviations: Sample Spring Days (1/2)

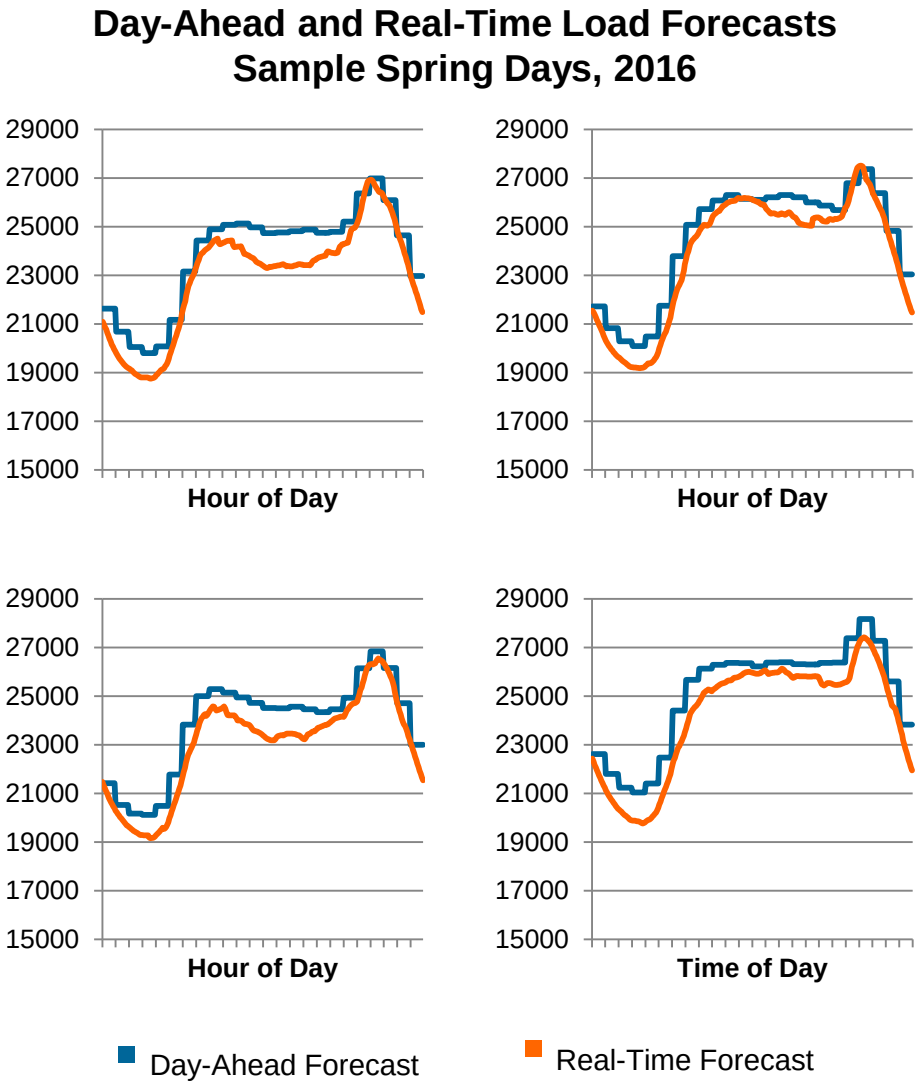
If the ramp can be met to the day-ahead forecast through the day-ahead market, what other factors drive the need for real-time flexibility?

Day-Ahead and Real-Time Renewable Forecasts
Sample Spring Days, 2016



Real-Time Deviations: Sample Spring Days (2/2)

If the ramp can be met to the day-ahead forecast through the day-ahead market, what other factors drive the need for real-time flexibility?

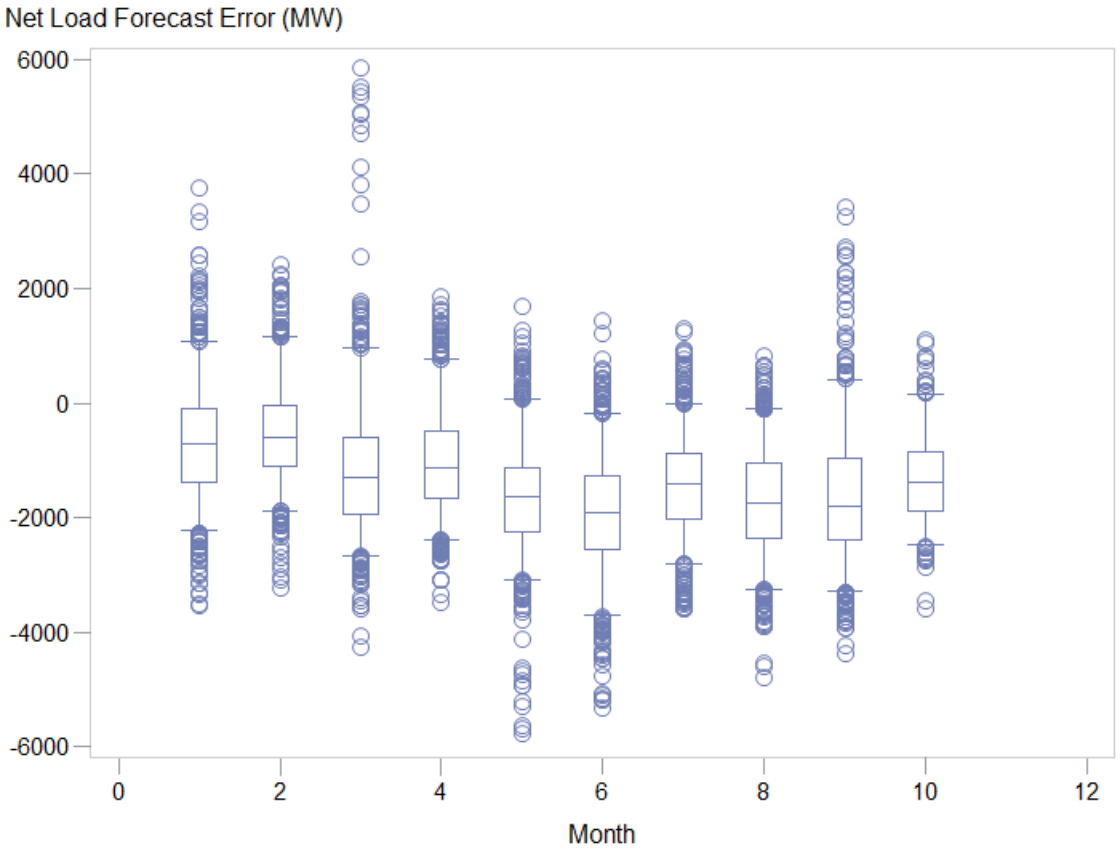


Forecast Error Volumes

How does the volume of forecast errors compare to ramping needs volumes?

- Real-time load following is essential to meet reliability, but the quantity needed might be smaller than the three-hour ramp volumes.

Distribution of Net Load Forecast Errors between Day-ahead and Five-Minute Markets, 2016

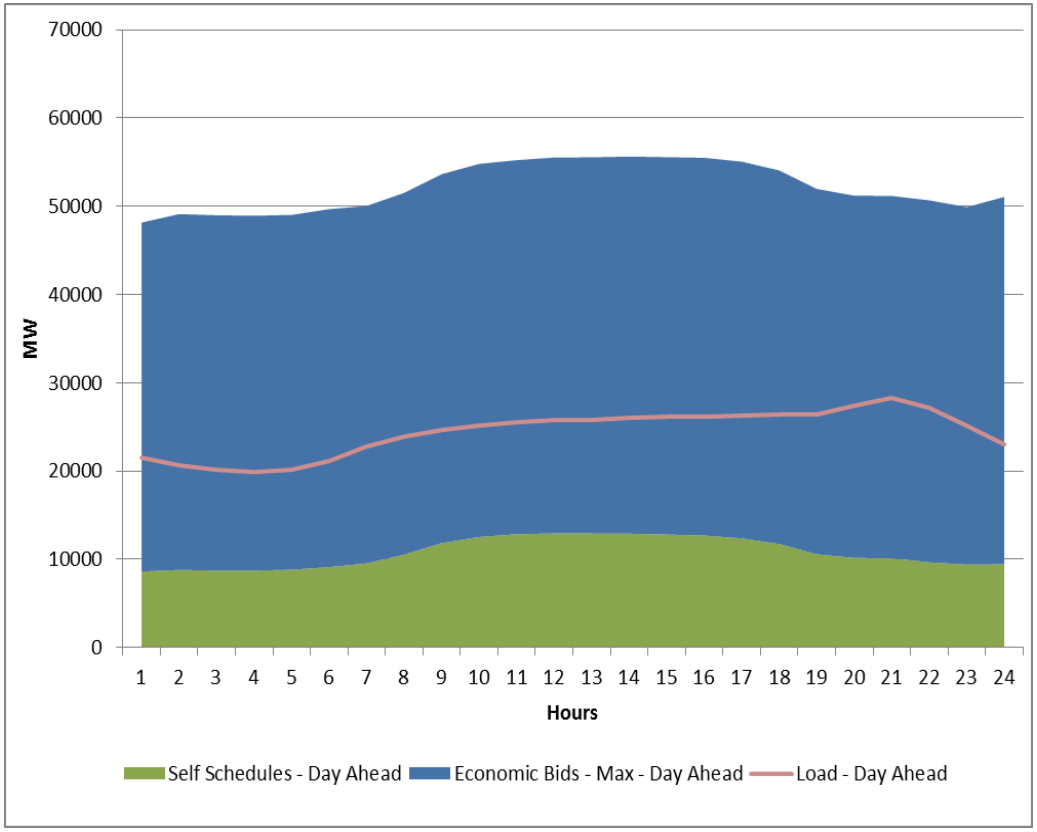


Note: Positive values indicate a need for upward ramp. Negative values indicate a need for downward ramp.

Areas of Future Study

POTENTIAL REQUIREMENT

Average Day Ahead Hourly Economic Bids and Self Schedules - April 2016



Note: Public Bid Data from CAISO OASIS Database.

Potentially Useful Data:

Total Bids and Self-Schedules by Hour

Bids by Resource Type by Hour

Bidding Differences between RA Resources and Non-RA Resources

Bidding Differences between Flexible RA Resources and System RA Resources

Bidding Differences of Renewable Resources by Online Date

Results from Initial Data Analysis

- CAISO is the only entity that can cross-reference bids with RA plans.
- Questions these data can answer:
  - Is the three hour ramping requirement is needed?
  - Are there sufficient real time bids without flexible RA requirements?
  - Is there a difference between supply of Day-Ahead and Real-Time economic bids?
  - How many MWs of economic bids would be needed in Day-Ahead vs. Real-Time Markets?
  - Which hours of the day have limited flexibility?
  - Is operational flexibility getting better or worse over time? Why?

Potential Requirement to Address Needs

- Can the drivers of flexibility needs identified by CAISO be addressed by focusing on forecast error instead of net load ramp?
- Which aspects of flexibility should be addressed through the forward market? Through the spot market?

CAISO Flexible Capacity Need	Forward Market Requirements	Spot Market Design Changes
Three-hour net load ramps	• None	• 15-minute day-ahead scheduling • Downward RUC
Single-hour net load ramps	• 'Highly Flexible' capacity?	• Flexible ramping product (new)
Upward and downward dispatchable range		• Flexible ramping product (new)
Five-minute upward and downward deviations		• Increased economic curtailment based on bids

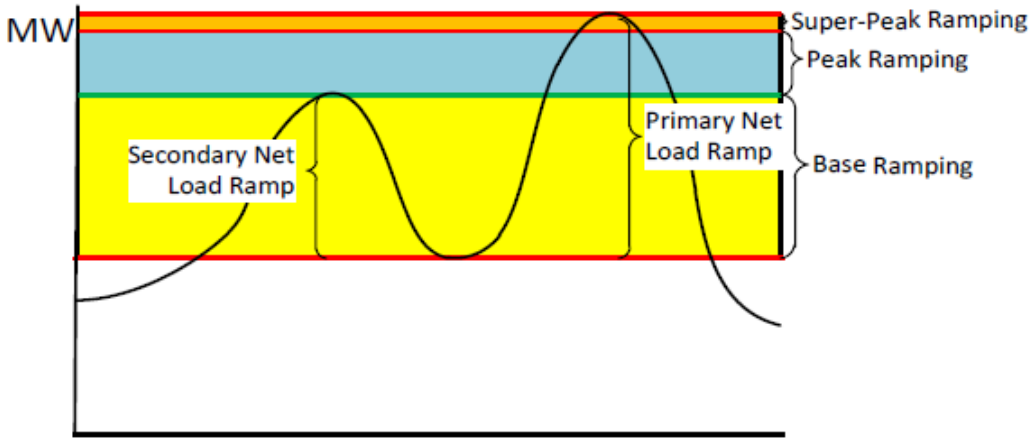
Q&A

APPENDIX

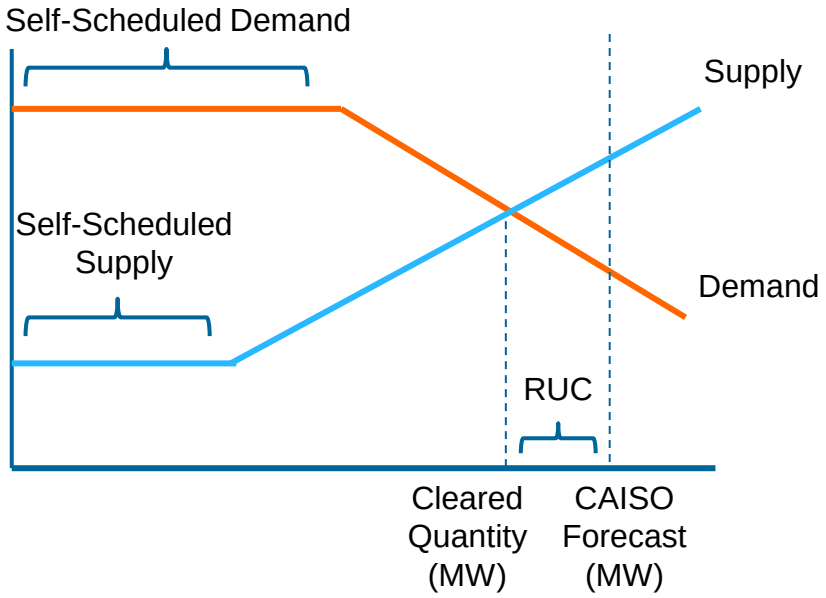
Complex Flexible Resource Requirements

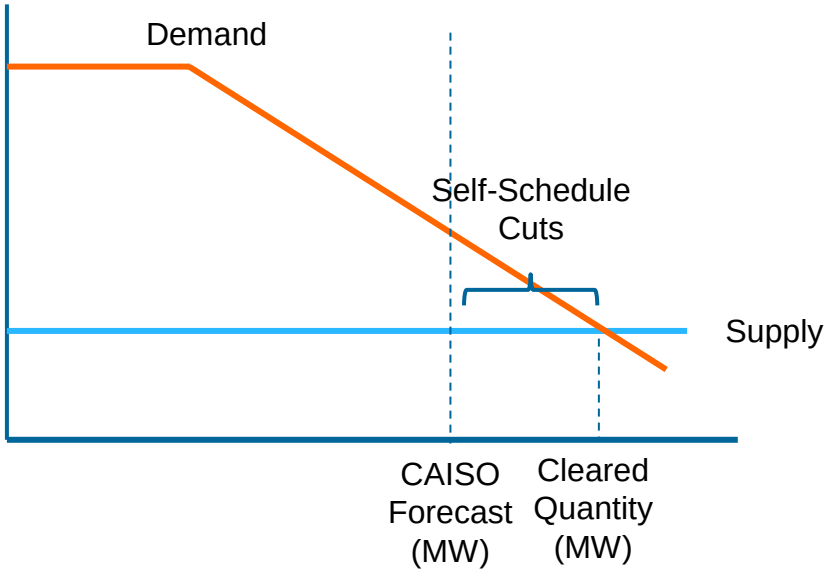
- Resources divided into categories depending on capabilities
- Complicated rules regarding the mix of categories that can be shown to ensure CAISO meets its ramp

	Must Offer Obligation
Availability Requirements	
Category 1 (Base)	17 hours (HE05-21); daily; 2 starts/day
Category 2 (Peak)	5 hours (varies seasonally); daily; 1 start/day
Category 3 (Super Peak)	5 hours (varies seasonally); non-holiday weekdays; 5 starts/month
Assessment Criteria	
	Economic bid in day-ahead and real-time up to filed RA value Self-schedule quantities do not meet obligation
Exemptions (Resource Type)	
	< 1 MW, RMR, Pumping Load, Acquired Resources
Exemptions (Hours)	
	Approved outage or pending request for outage at T+45 Nature of work outage (i.e., ambient not due to temperature, transmission outage, use-limit reached) Short-term use-limit reached



Day-ahead Ramping Capabilities





In the day-ahead timeframe, CAISO clears bid in demand against bid in supply for each hour.

1. What happens if insufficient supply clears the day-ahead market?
   - CAISO issues residual unit commitment awards up the to CAISO Forecast of CAISO Demand

2. What happens if too much supply self-schedules?
   - CAISO can cut self-schedules