



# Price Formation Enhancements discussion

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Market Surveillance Committee Meeting

General Session

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## Purpose of this Discussion

- CAISO has been organizing stakeholder working groups to explore concepts, principles, and problem statements related to this initiative
- Since we are in the exploratory stage with stakeholders, there are no concrete proposals to present to the MSC
- The staff presentation aims to introduce broad themes of scarcity pricing to the MSC that have been discussed in the working group

# Price Formation: A Brief Overview

- **Price formation** is the process through which prices are determined in electricity markets
- Price formation is crucial for efficient market operations because it:
  - Maximizes market surplus
  - Incentivizes participants to adhere to commitment and dispatch instructions
  - Promotes system reliability
  - Enhances transparency about costs to serve load

# Price Formation Enhancements Initiative Topics

 **Scarcity pricing:** establishing prices when there is insufficient supply to meet energy and reserve requirements

- **BAA-level market power mitigation:** assessing competitiveness of EDAM/WEIM transfer constraints
- **Fast-start pricing:** incorporating fast-start generators and their commitment costs into market prices
- **Extended FRP:** increasing look-ahead horizon of flexible ramping product
- **Storage + multi-interval optimization:** improving market dispatch and pricing outcomes of storage resources under multi-interval optimization

# Scarcity Pricing: Preview of Topics for MSC Discussion

- **Topic 1:** What conditions should trigger the application of scarcity pricing?
- **Topic 2:** When scarcity pricing is triggered, what is the appropriate price signal?
- **Topic 3:** How should non-market demand response and strategic reserve resources be accounted for in price formation?

# Topic 1: What conditions should trigger the application of scarcity pricing?

- Under normal system conditions, prices are set by the intersection of supply and demand
  - Under competitive conditions, market prices represent the marginal cost of production
- Under scarcity conditions, there is insufficient supply to meet demand for energy and reserves
  - How should prices be set during periods of supply scarcity?

# Scarcity prices are effectuated in different ways

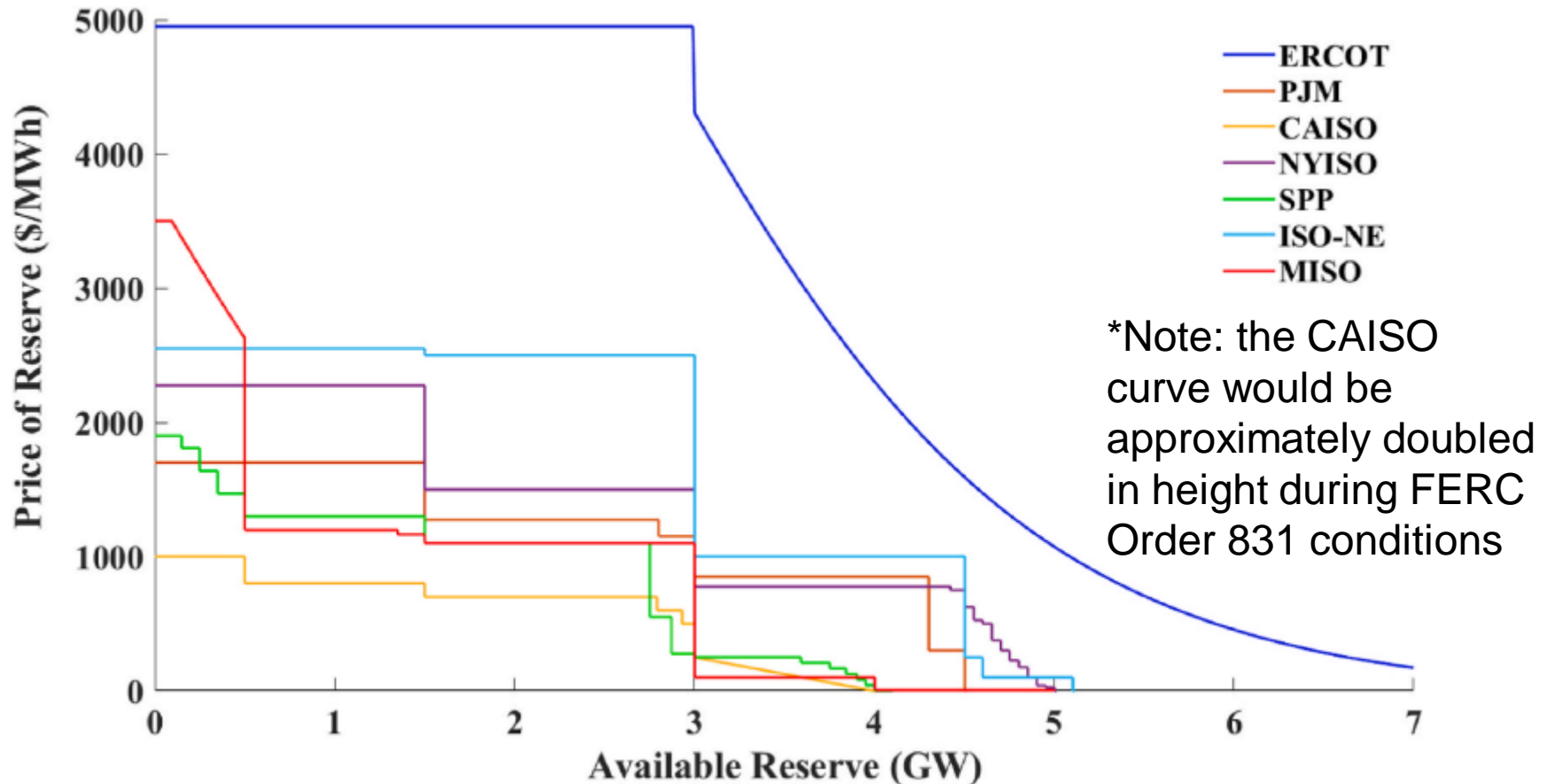
- Reserve shortage pricing (operating reserve demand curves)
- Power balance constraint violations
- Specific events such as load shedding or activation of demand response
- FERC Order 831 conditions

# What conditions should trigger the application of scarcity pricing?

- Reserve shortage pricing effectuates energy scarcity pricing through opportunity costs
- CAISO's reserve (ancillary service) shortage pricing **may not be fully effective** for several reasons:
  - CAISO market only ancillary service (AS) shortage pricing during an actual shortage
  - CAISO market only procures incremental AS in the real-time market
  - CAISO market only procures incremental AS in FMM and not RTD
  - Western Energy Imbalance Market does not procure AS outside of CAISO

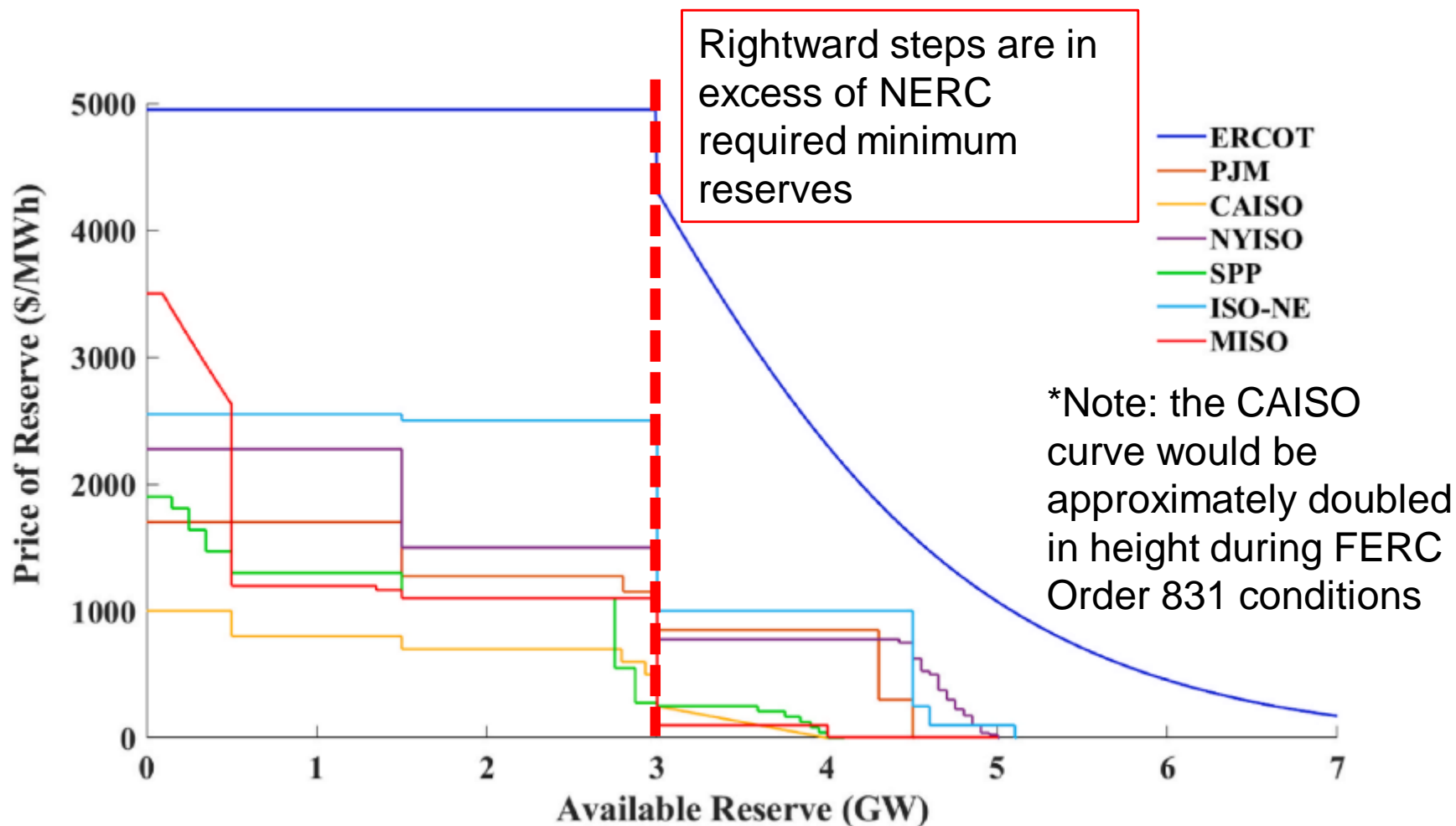


# Reserve shortage pricing in ISO/RTO markets



Mehrtash, Mahdi, Benjamin F. Hobbs, and Erik Ela. "Reserve and energy scarcity pricing in United States power markets: A comparative review of principles and practices." *Renewable and Sustainable Energy Reviews* (2023)

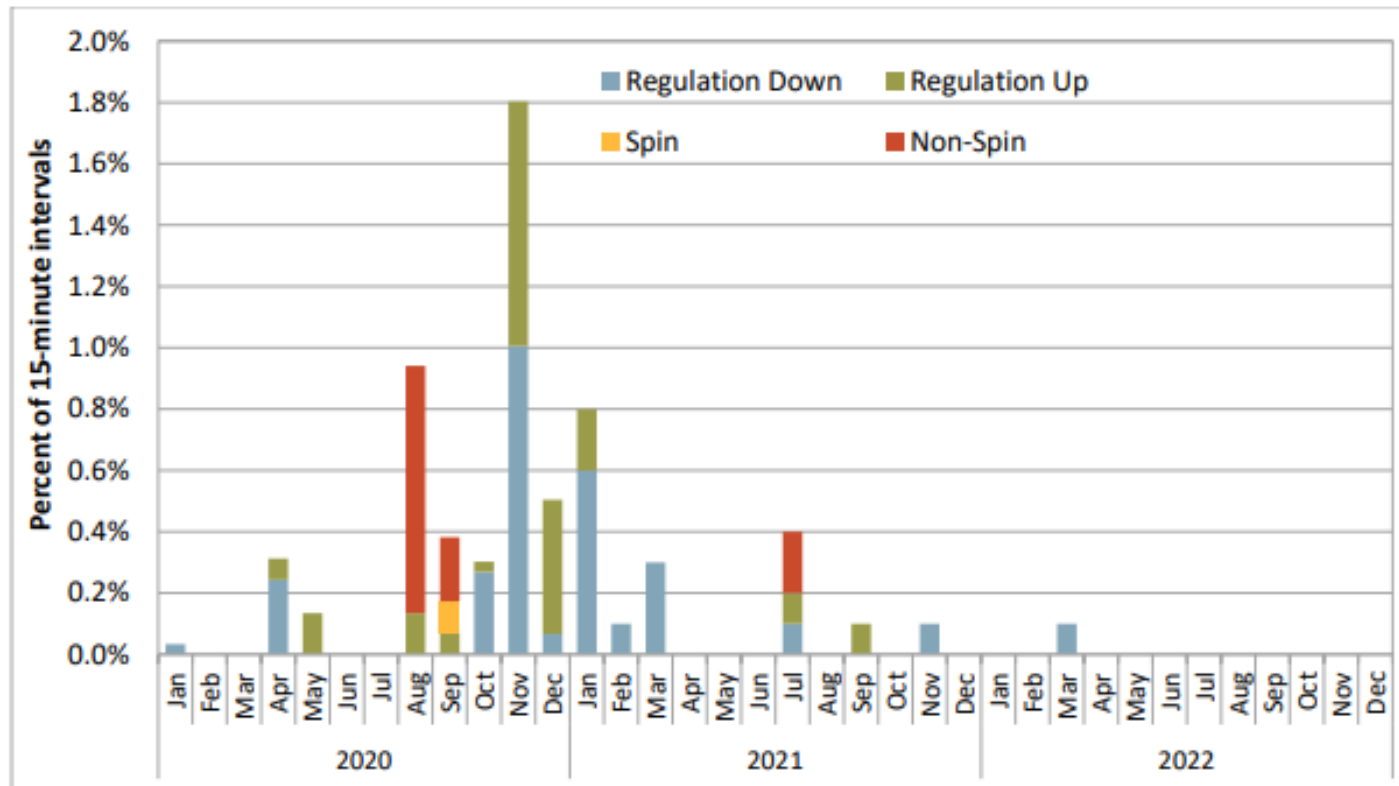
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September 2022 there were 0 ancillary service scarcity events

**Figure 4.8** Frequency of ancillary service scarcities (15-minute market)



[2022-Annual-Report-on-Market-Issues-and-Performance-Jul-11-2023.pdf \(caiso.com\)](#)

## When scarcity pricing is triggered, what is the appropriate price signal?

- During periods when supply is insufficient to meet demand, prices should rise to reflect the **value** of electricity
- Some stakeholders suggest the CAISO price signals are not high enough and should incorporate a **Value of Lost Load** methodology
- Other stakeholders suggest the current price signals are just fine and CAISO should address scarcity issues with **resource adequacy** and not through market pricing

## How should non-market demand response and strategic reserve resources be accounted for in price formation?

- Activation of these resources should **complement** the markets objectives
- Some stakeholders suggest CAISO should activate energy price floors when emergency resources are activated