



# Incorporating resource flexibility into energy market prices

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CREPC-WIRAB Webinar

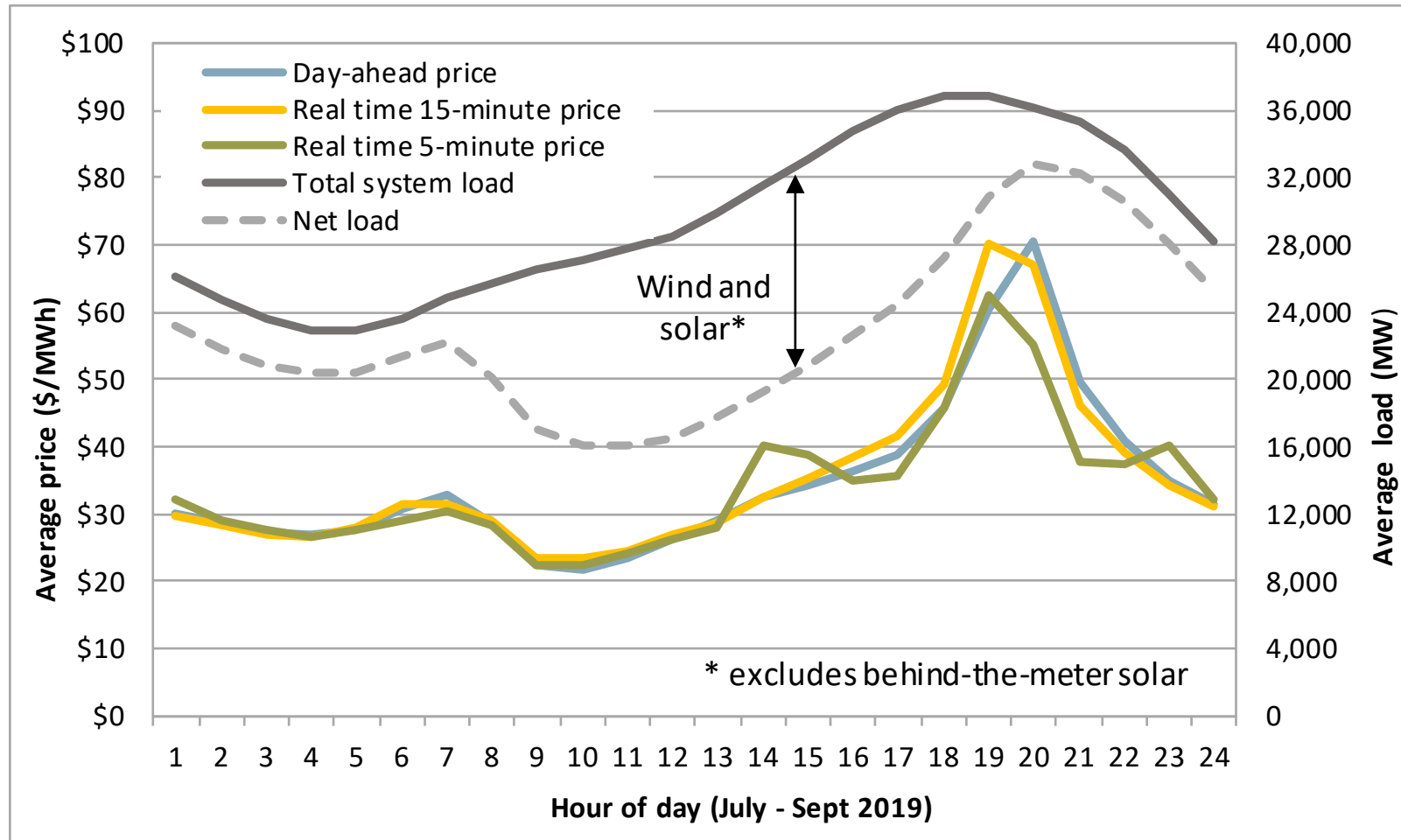
Price Formation in Wholesale Electricity Markets

April 24, 2020

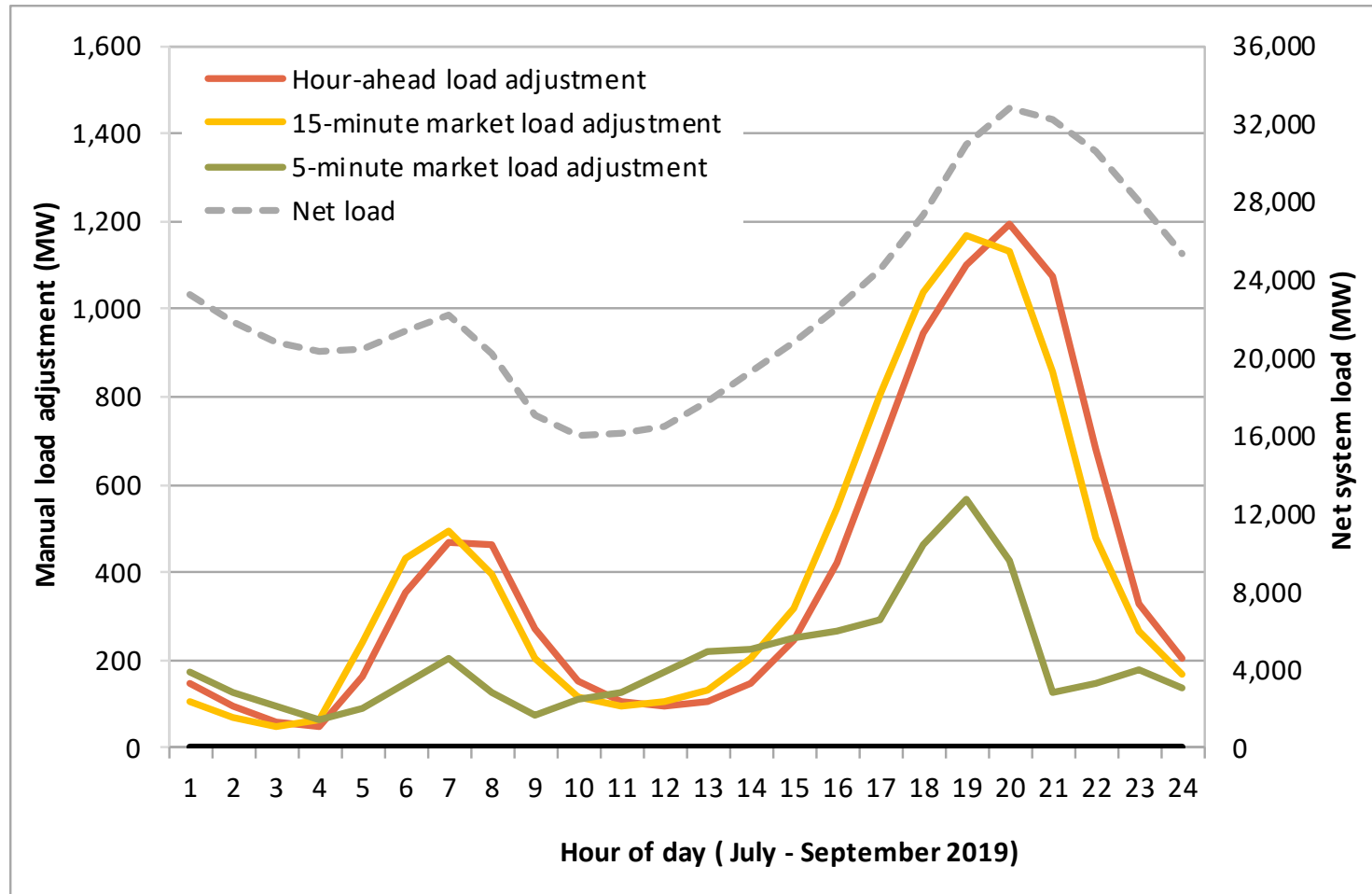
# Overview

- CAISO and EIM balancing areas facing increased need for flexible capacity that can be ramped up/down quickly to manage high level of renewable resources (e.g. wind, solar).
- To manage need for more flexible ramping capacity, CAISO grid operators make significant manual or *out-of-market* actions which can have a significant impact on energy market prices.
- CAISO seeking to develop market products to allow flexible ramping capacity to be procured and compensated through the ISO's market.
  - This would allow the cost/value of flexible ramping capacity to be incorporated in energy market prices and reduce need for manual and out-of-market actions.
- DMM recommends changes in the design of these flexible ramping products to address issues that are limiting the effectiveness of these market mechanisms.

# Energy market prices throughout the West are now driven by “net loads” (i.e. total loads *less* wind and solar)

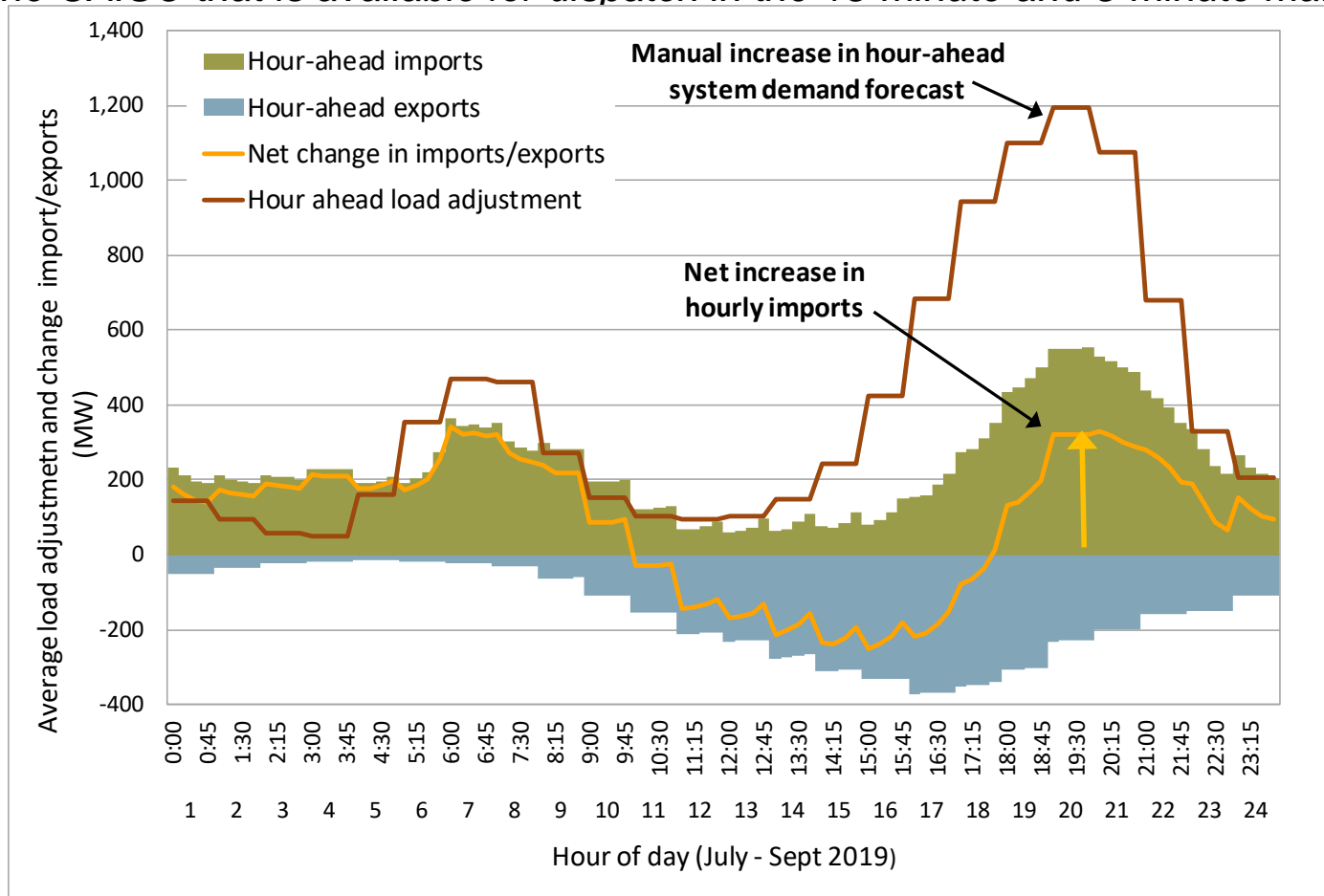


To increase upward flexible ramping capacity, CAISO grid operators make significant upward adjustments to the demand for energy used by the real-time market software to dispatch bids.



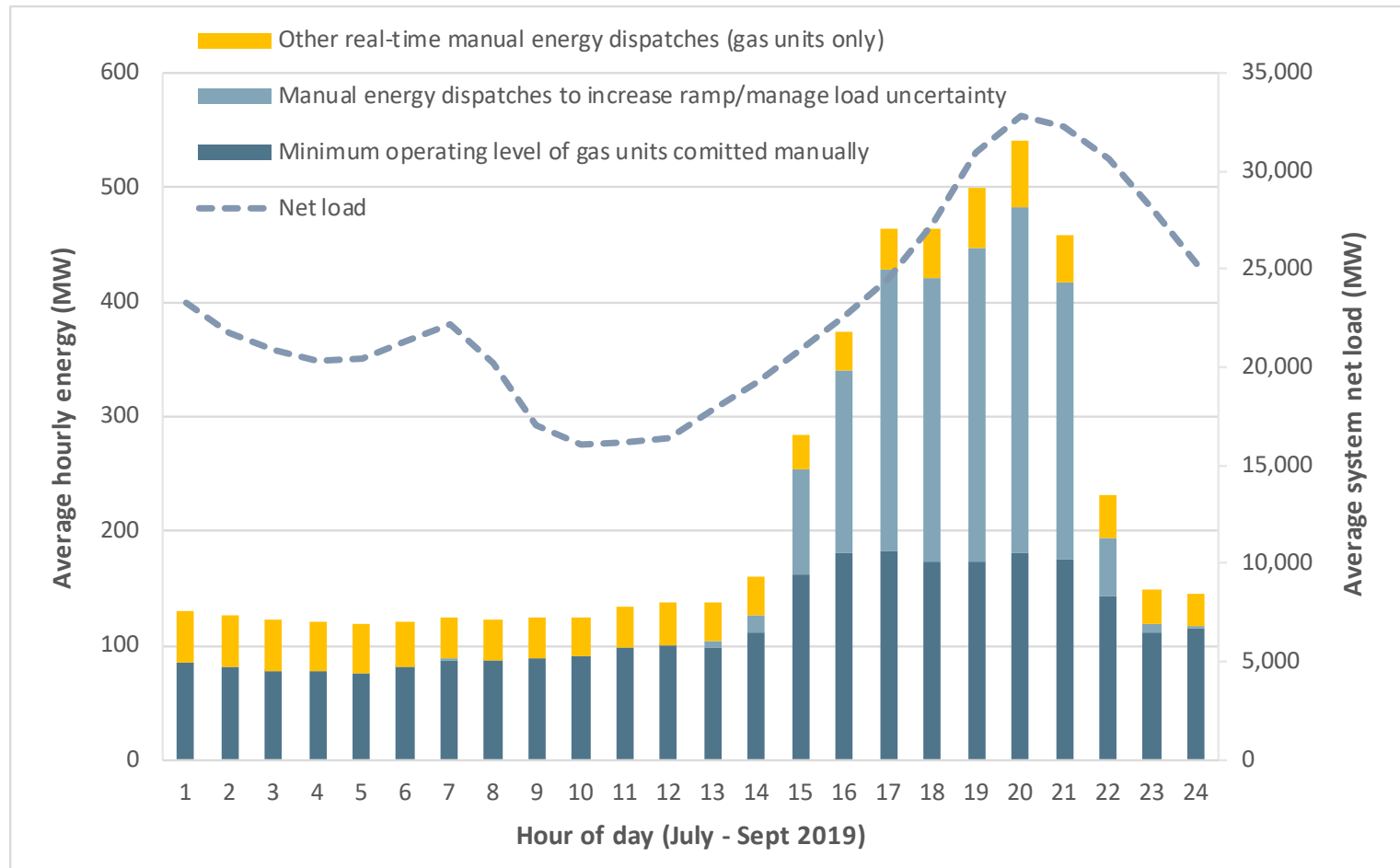
Upward adjustments of the hour-ahead load forecast are aimed at increasing imports in the hour ahead scheduling process.

*The increase in hourly imports then increases the amount of flexible ramping capacity within the CAISO that is available for dispatch in the 15-minute and 5-minute markets.*



CAISO operators also commit extra gas-fired capacity after the day-ahead and ramp units up in real-time to create more upward ramping capacity.

These are referred to as **out-of-market** or **exceptional dispatches**.



## The Flexible Ramping Product (FRP) is designed to create and compensate more flexible capacity in the real-time market.

- The amount of upward FRP that is procured by the market software is designed to cover the expected change in net loads plus a margin to account for net load uncertainty.
- Procurement of FRP can cause changes in short term dispatches that directly or indirectly creates extra ramping capacity in next 15-minute interval.
- Prices for FRP are based on the “shadow price” of procuring ramping capacity (or incremental change in market costs due to provision of FRP).
- Prices for FRP also cover any opportunity costs incurred by units with lower priced energy bids which are “held back” to provide flexible ramping capacity.
- FRP requirements are set for each balancing area in the Western EIM, as well as for overall CAISO/EIM system.
  - Additional FRP supply from one balancing area can be used to meet overall system ramping requirements.

The FRP appears to be having limited impact in terms of creating and compensating more flexible capacity in real-time market.

- In 2019, the FRP constraint for CAISO/EIM system was rarely binding (which creates a positive FRP price):
  - Positive price for upward FRP in only 6% of 15-minute intervals.
  - Positive price for downward FRP in only 1% of 15-minute intervals.
- Total FRP payments in 2019 were only \$6.3 million for entire CAISO/EIM system.
- Since FRP was implemented in 2016, manual load adjustments and out-of-market dispatches by operators to increase ramping capacity in real-time market appear to have increased – not decreased.
- Fortunately, since 2016 the growth of the Western EIM has added significant amount of 15-minute and 5-minute transfer capacity that can quickly address the ramping needs of different balancing areas in real time market.



DMM has recommended improvements in the FRP design to improve price signals and reduce manual operator actions.

1. Implement locational procurement of FRP which takes transmission constraints into account.
  - Currently, a large portion of FRP is procured in EIM balancing areas which have limited unused transmission to rest of CAISO/EIM system (e.g. Northwest).
  - This creates “stranded” FRP capacity which cannot be used in other areas, and artificially lowers overall FRP prices and compensation.
  - CAISO addressing this issue as part of ongoing market initiative.
  
2. Extend the time horizon of the FRP beyond 15-minutes
  - Grid operators take manual and out-of-market actions more than 15-minutes in advance due to lead times needed for actions to position resources to provide more ramping capacity.
  - DMM recommends longer period for FRP that allows resources to be “positioned” to ramp up or down more quickly (e.g. 1-3 hours?).

The new day-ahead product (called Imbalance Reserves) is being designed to increase ramping capacity in real-time.

- This new Imbalance Reserve product is part of CAISO's effort to enhance day-ahead market and then extend day-ahead market to entities participating in the Energy Imbalance Market.
- Similar to FRP, but will be procured for each hour as part of 24-hour optimization used in day-ahead market.
- DMM recommendations on day-ahead Imbalance Reserve product:
  - Unless the time frame of the real-time FRP is increased, units positioned or “held back” to provide ramping in day-ahead market will be re-dispatched by real-time software based on the unit's bid prices.
  - This re-dispatch is likely to “undo” much of extra ramping capacity that was created in day-ahead market schedules by the Imbalance Reserve product.
  - Thus, procurement of Imbalance Reserve product may increase day-ahead market costs and prices, while providing limited benefits.

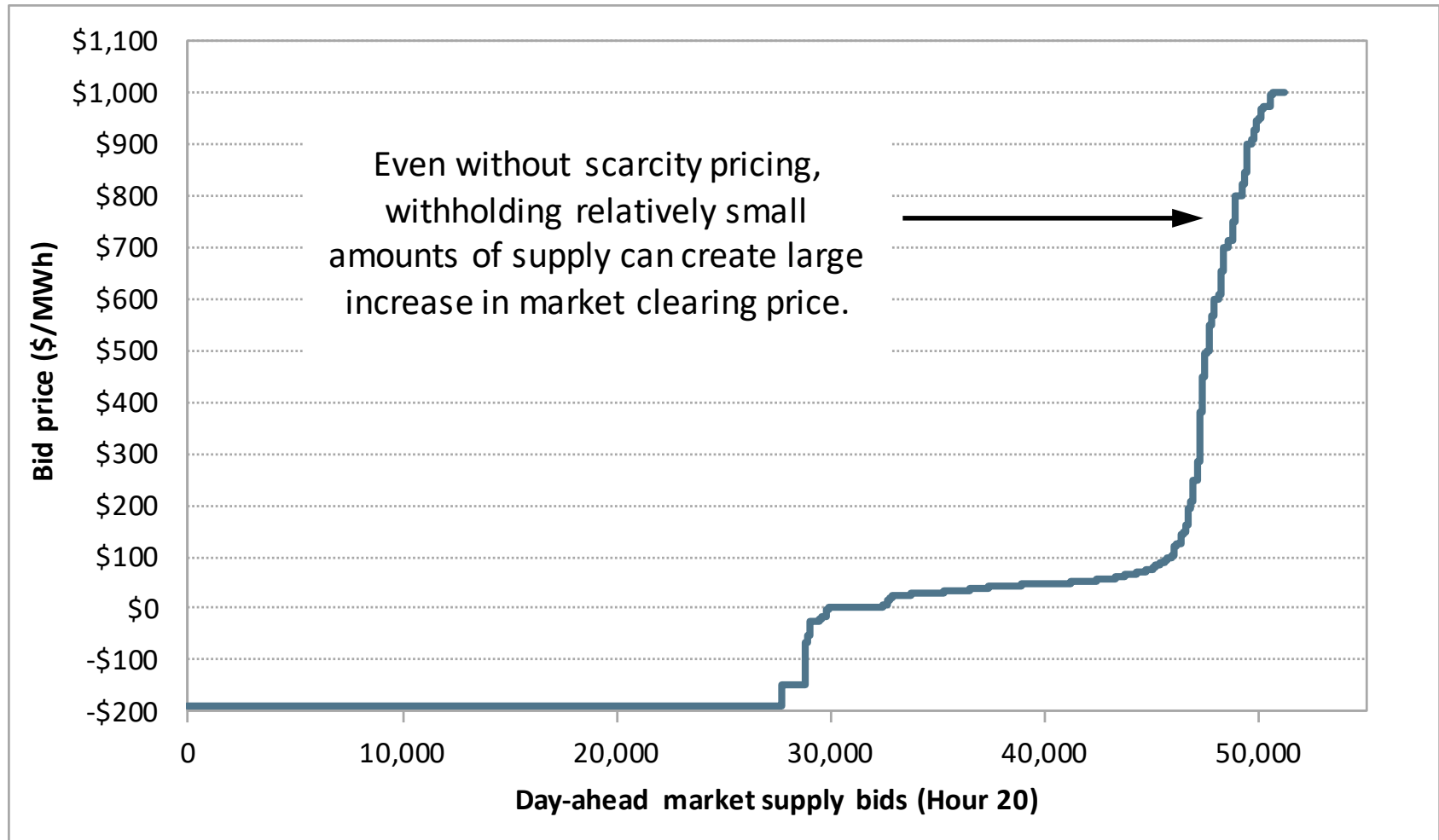
## A few comments on scarcity pricing ...

Good in theory but .....

- Scarcity pricing is actually highly administrative – not market driven.
- Energy bid cap already \$1,000/MW (up to \$2,000/MW)
- Energy-only markets (such as Texas) require extreme price spikes to incent new generation, but Western states have adopted a resource adequacy/capacity market design.
- Scarcity pricing creates even stronger incentive for strategic withholding of energy from market at high load levels.
  - Withholding small amount of energy can trigger very large price spikes.
  - No must offer requirement in EIM to prevent withholding.
  - Impossible for CAISO or market monitor to accurately account for all potential supply.

Bids and market clearing prices increase sharply (above actual costs) as supply becomes tight but no scarcity exists.

*Scarcity pricing can increase incentive to withhold even more supply at high load levels.*



## For more information .....

- Department of Market Monitoring webpage
  - <http://www.caiso.com/market/Pages/MarketMonitoring/Default.aspx>
- Comments on flexible ramping issue.
  - *Comments on Flexible Ramping Product Refinements: Issue Paper and Straw Proposal*, December 5, 2019
    - <http://www.caiso.com/InitiativeDocuments/DMMComments-FlexibleRampingProductRefinements-IssuePaper-StrawProposal.pdf>
  - *Comments on Issue Paper on Extending the Day-Ahead Market to EIM Entities*, November 22, 2019.
    - <http://www.caiso.com/InitiativeDocuments/DMMComments-ExtendedDay-AheadMarket-IssuePaper.pdf>