

July 2023 market issues and performance

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Body of State Regulators Meeting

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Overview of presentation and discussion

- Overview of CAISO Department of Market Monitoring
- Background: Relevant market design details and definitions for understanding significant July 2023 market issues
- Overview of significant July 2023 market issues impacting WEIM
- Questions and comments

Mission of independent market monitors

“Each independent system operator ... must include a mission statement ... that identifies the Market Monitoring Unit’s goals, including the protection of consumers and market participants by the identification and reporting of market design flaws and market power abuses.”

FERC Order 719

To provide independent oversight and analysis of the CAISO Markets for the protection of consumers and Market Participants by the identification and reporting of market design flaws, potential market rule violations, and market power abuses.

Department of Market Monitoring Mission Statement
CAISO Tariff, Appendix P

Core functions of independent market monitors (FERC Order 719)

1. Review and report on the performance of wholesale markets, including quarterly and annual reports.
2. Evaluate existing and proposed market rules, and provide recommendations.
3. Notify FERC Office of Enforcement when a market participant or the ISO has engaged in conduct that may require investigation.
4. Market monitors may also perform functions related to inputs for market power mitigation.
 - Bids used in mitigation, cost review, etc.

CAISO Department of Market Monitoring

- Independent from CAISO management, as required by FERC Order 719
 - DMM Oversight Committee consists of two CAISO Board members and Governing Body member as an observer
- Internal business unit of the CAISO
 - 18 staff (economics, data analysis, engineering)
 - Access to all CAISO/WEIM market and operational data
 - Work closely with CAISO staff on market design and ongoing monitoring
- Communicate frequently with FERC, state PUCs, WEIM Governing Body, and interested stakeholders

Relevant market design details and terms for understanding significant July 2023 market issues

Imports/Exports vs WEIM transfers in/out

- CAISO Imports/Exports:
 - Schedules based on bid of specific import or export resource at CAISO boundary point
 - Preliminary schedules determined by day-ahead market
 - (For the most part) schedules don't change after CAISO hour-ahead market run
 - Treated by non-CAISO WEIM BAs as fixed supply or load like other bilateral imports or exports
- WEIM transfers in/out:
 - Flows between specific WEIM balancing areas
 - Determined by WEIM market optimization in conjunction with determination of each WEIM BA's optimal generation dispatch

Real-time market composed of three markets

- Hour-ahead market
 - Runs 67 minutes before *start of hour*
 - Solution covers upcoming hour
 - Determines final schedules for hourly block imports/exports
 - Solution includes *advisory* WEIM transfers and generation dispatches across all of WEIM
- 15-minute market
 - Runs 37 minutes before start of each *15 minute interval*
 - Solution covers upcoming 15 minute interval
- 5-minute market
 - Runs 7 minutes before the start of each *5 minute interval*
 - Solution covers upcoming 5 minute interval
 - Determines final generation dispatch schedules and final WEIM transfers

Self-schedules vs market bids

- Self-schedules
 - Market participant wants the schedule to receive market award regardless of market price they would have to pay or get paid
 - Will not always receive market awards due to limited transmission or supply
- Market bids
 - Market participant states bid price
 - Generation/import does not want market award if price < market bid
 - Export does not want market award if price > market bid

Significant July 2023 market issues impacting WEIM

Overview of significant July 2023 market issues impacting WEIM

- High load, particularly in Southwest
- Complex WEIM market dynamics related to CAISO balancing area actions:
 - July 20: Self-scheduled exports out of CAISO balancing area awarded in hour-ahead market cannot be supported by capacity contracted to serve CAISO
 - July 25: CAISO BA significantly increases target load in hour-ahead market above load forecast
 - ISO hour-ahead market does not give awards to all self-scheduled exports out of CAISO balancing area
 - July 26 onwards: CAISO balancing area begins limiting hour-ahead and 15-minute market WEIM transfers into CAISO BA in peak hours
 - Impacts all WEIM balancing area generation dispatch and WEIM transfers

Atypical hydroelectric and weather conditions shift supply and demand



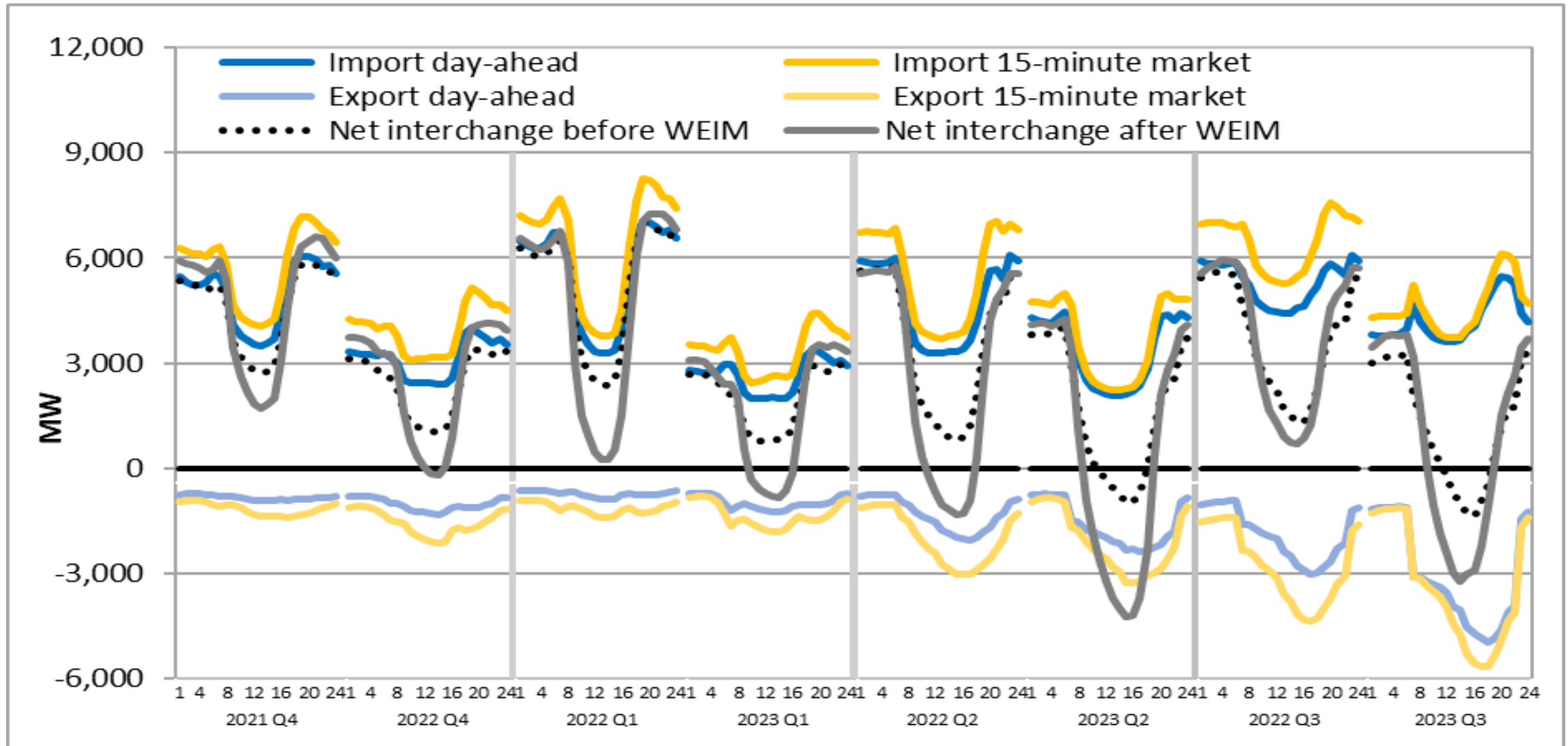
- Hydroelectric availability:
 - High in California
 - Low in Northwest
- Sustained high temperatures:
 - Southwest
- Typical power flows in peak hours:
 - Northwest to system
- Summer 2023:
 - Lower system to California flows

*Avangrid office; generation-only BAA with distribution across multiple states.
Map boundaries are approximate and for illustrative purposes only.

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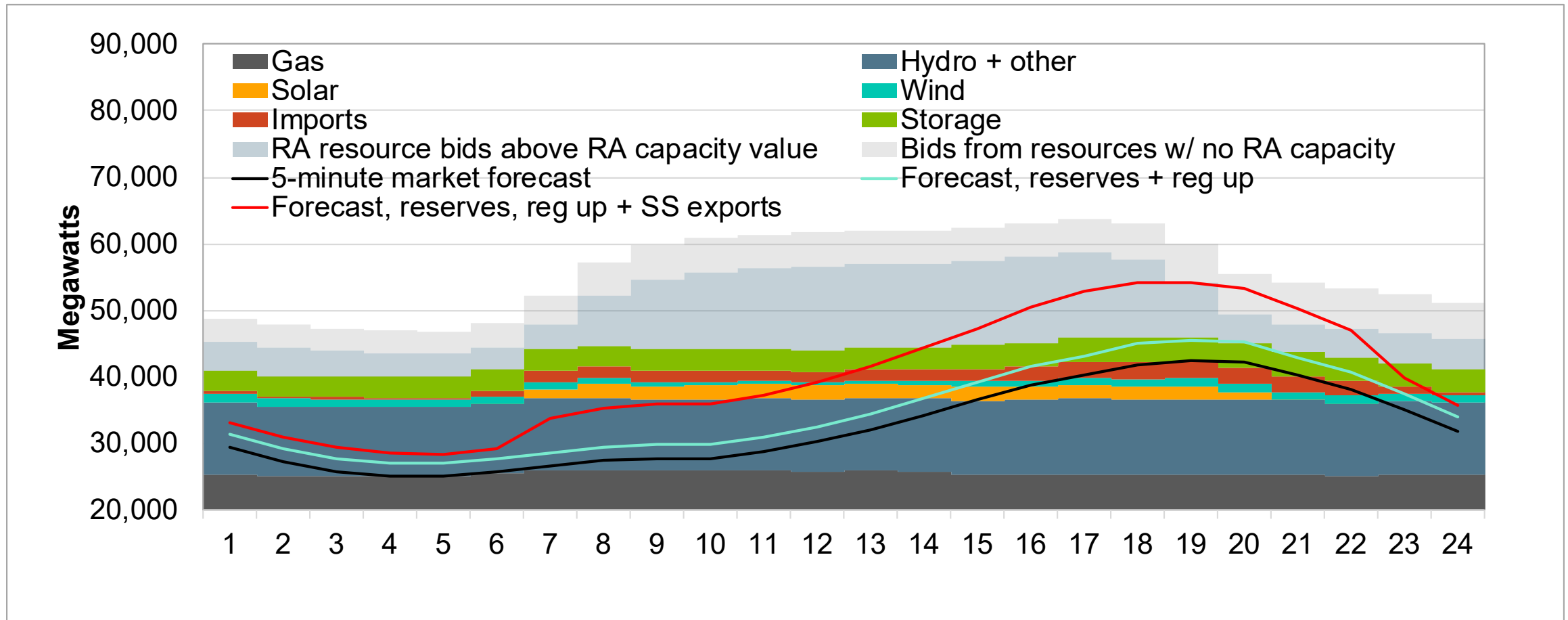
CAISO imports decrease and exports increase

Average CAISO hourly net interchange by quarter



CAISO balancing area July 20, 2023

Atypically high exports push demand above real-time market bid-in resource adequacy supply
CAISO calls an EEA1

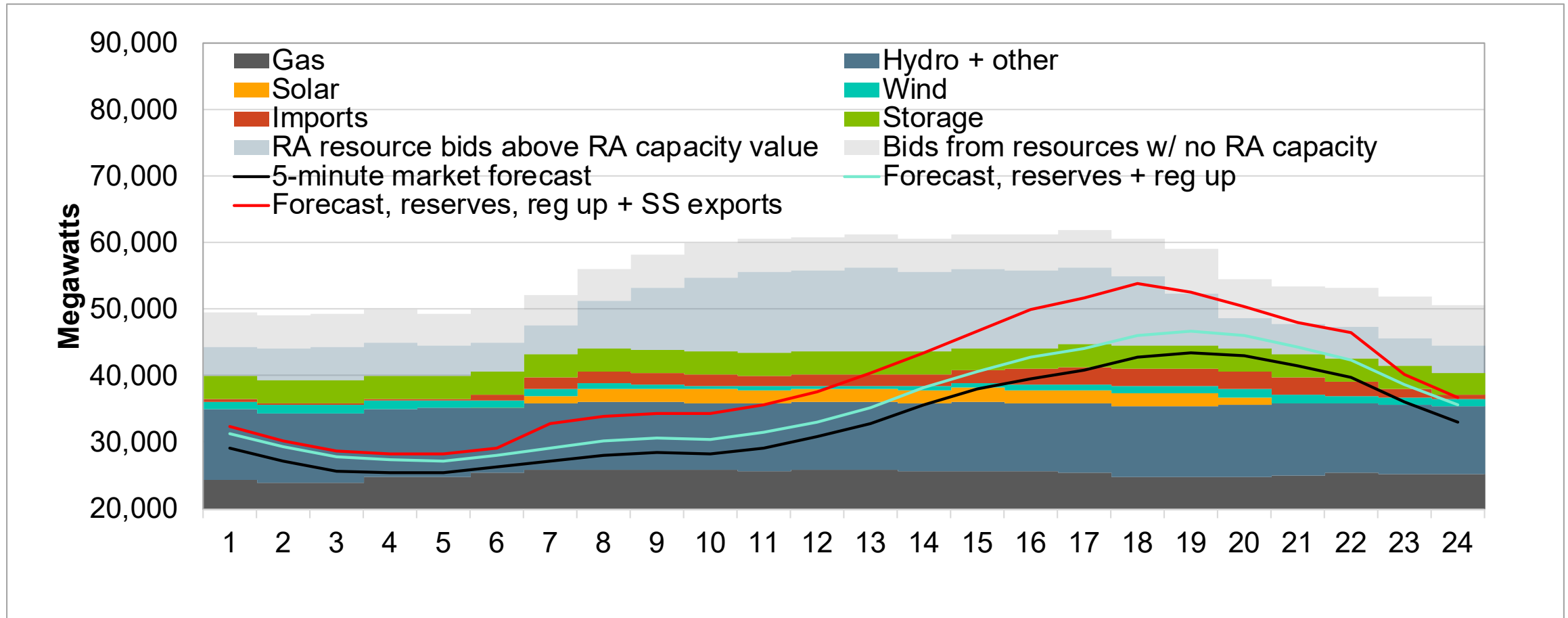


CAISO July 25, 2023

Atypically high exports push demand above resource adequacy supply

CAISO BA increases hour-ahead market load bias

Some self-scheduled exports do not receive hour-ahead market award, CAISO BA calls EEA Watch

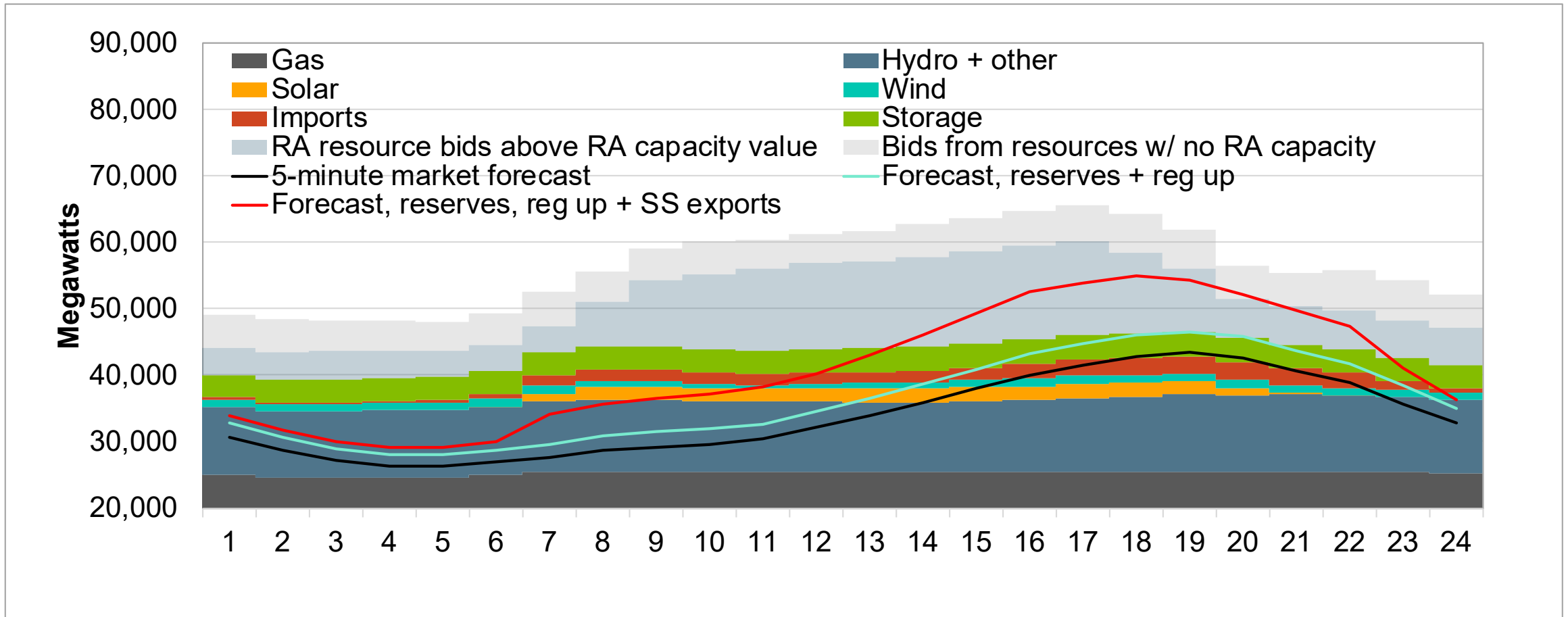


CAISO July 26, 2023

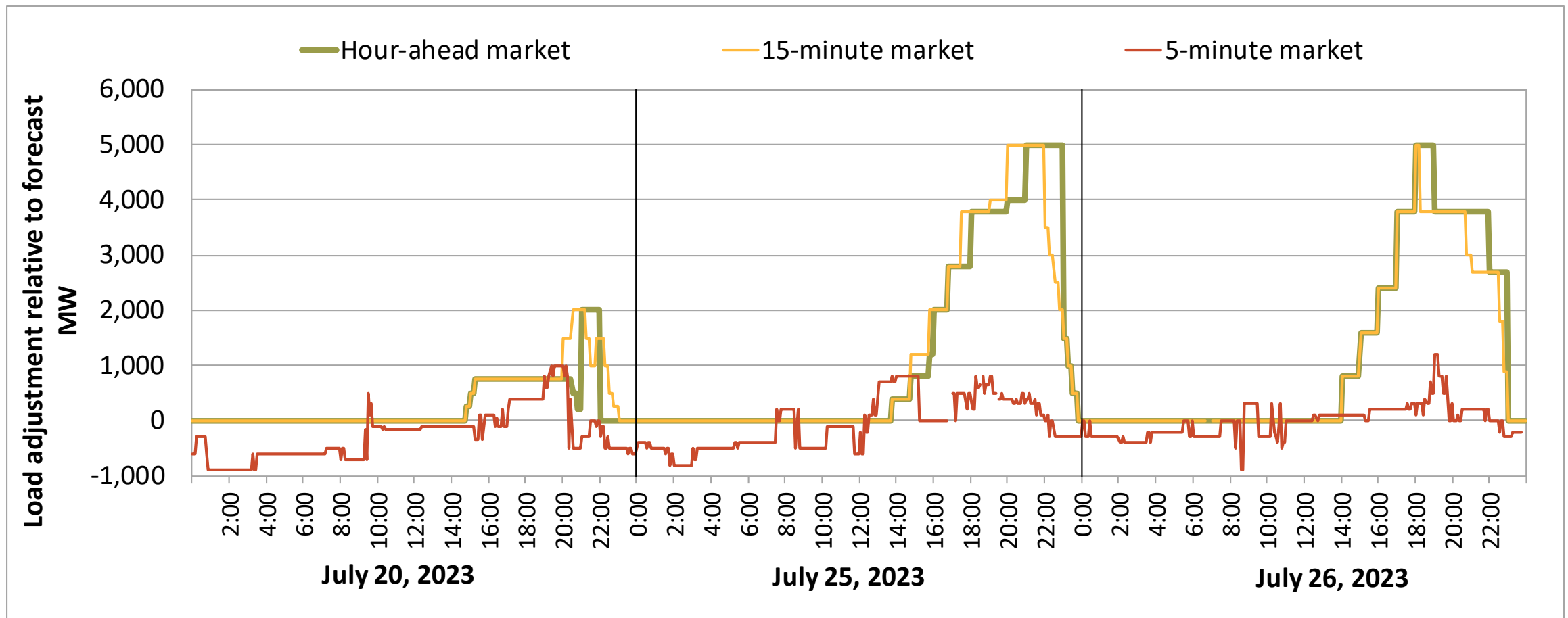
Atypically high exports push demand above resource adequacy supply

Hour-ahead market: CAISO BA continues high load bias, and self-scheduled exports do not get award

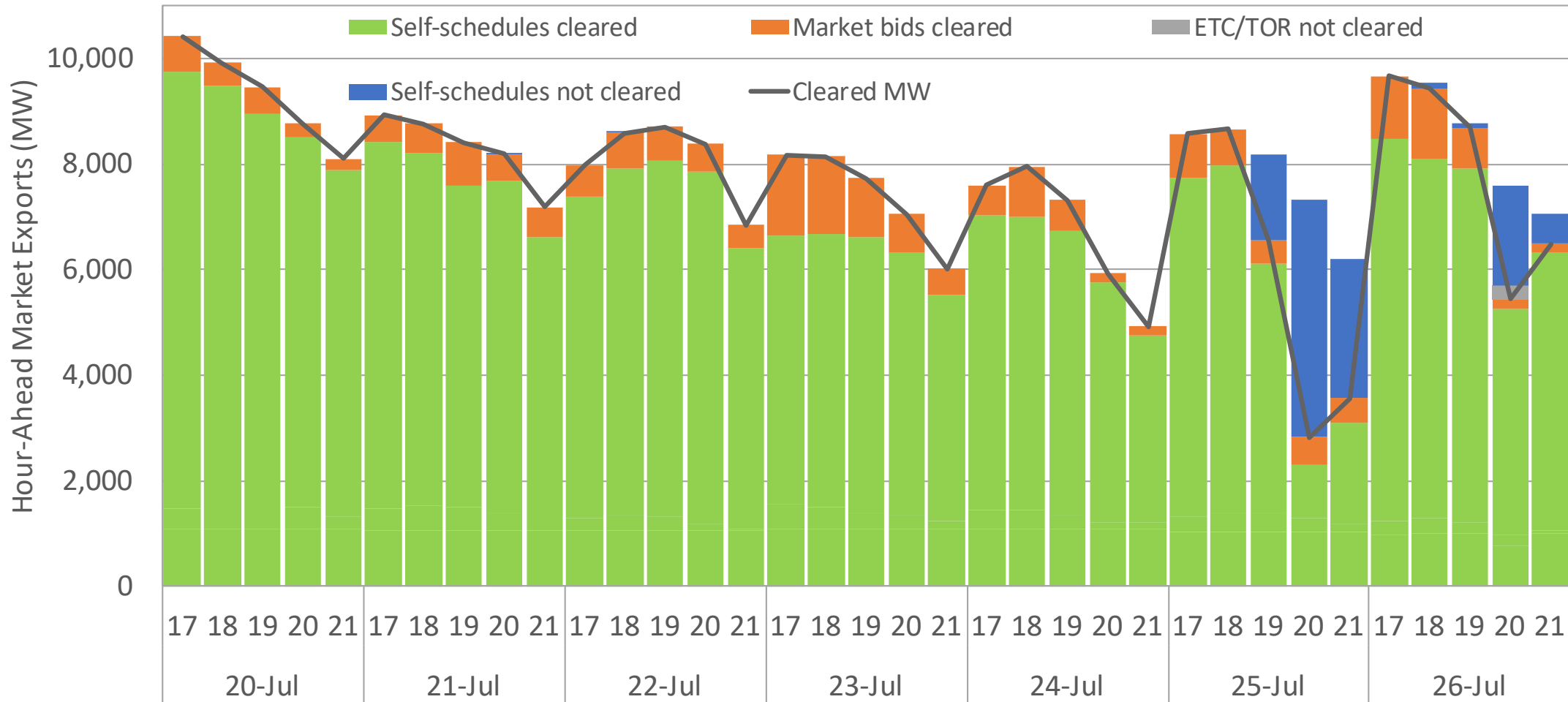
CAISO calls an EEA Watch, begins limiting hour-ahead and FMM WEIM transfers into CAISO



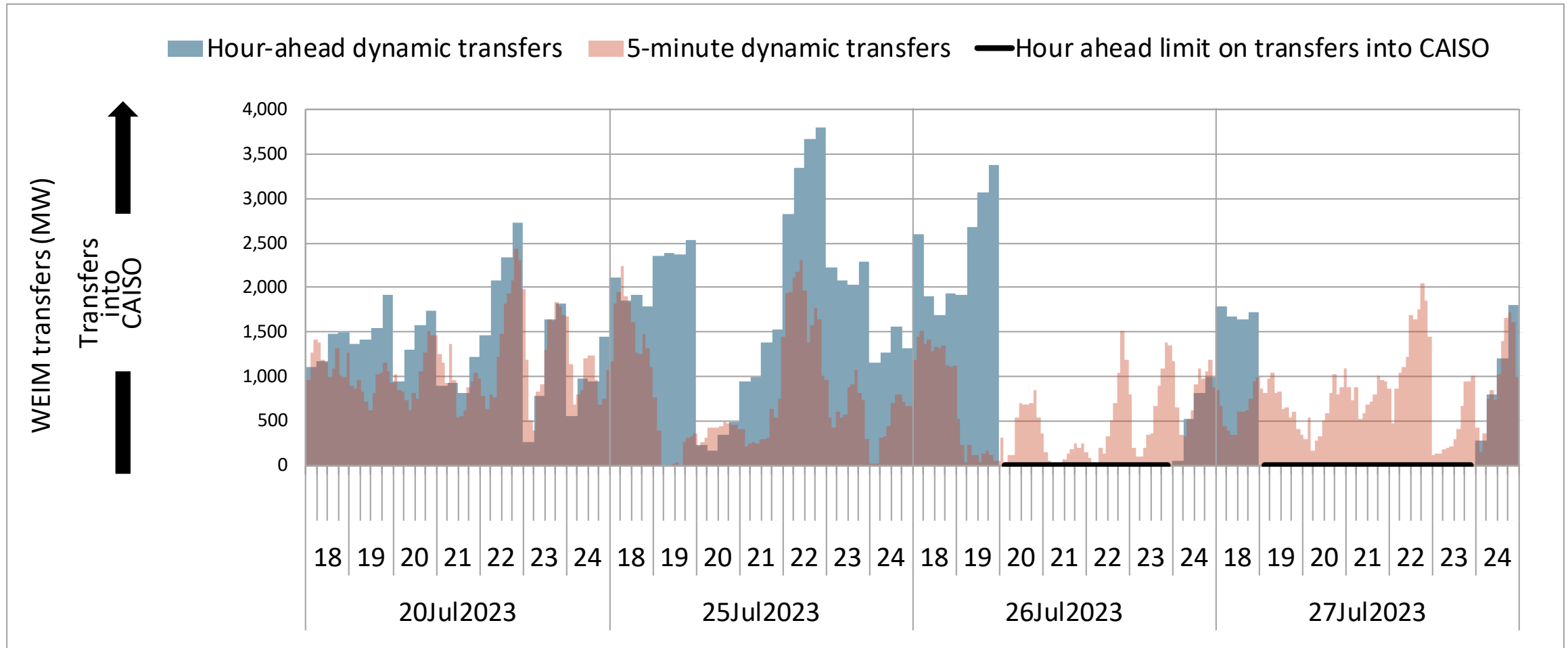
CAISO BA significantly increases hour-ahead market load bias between July 20 and 25



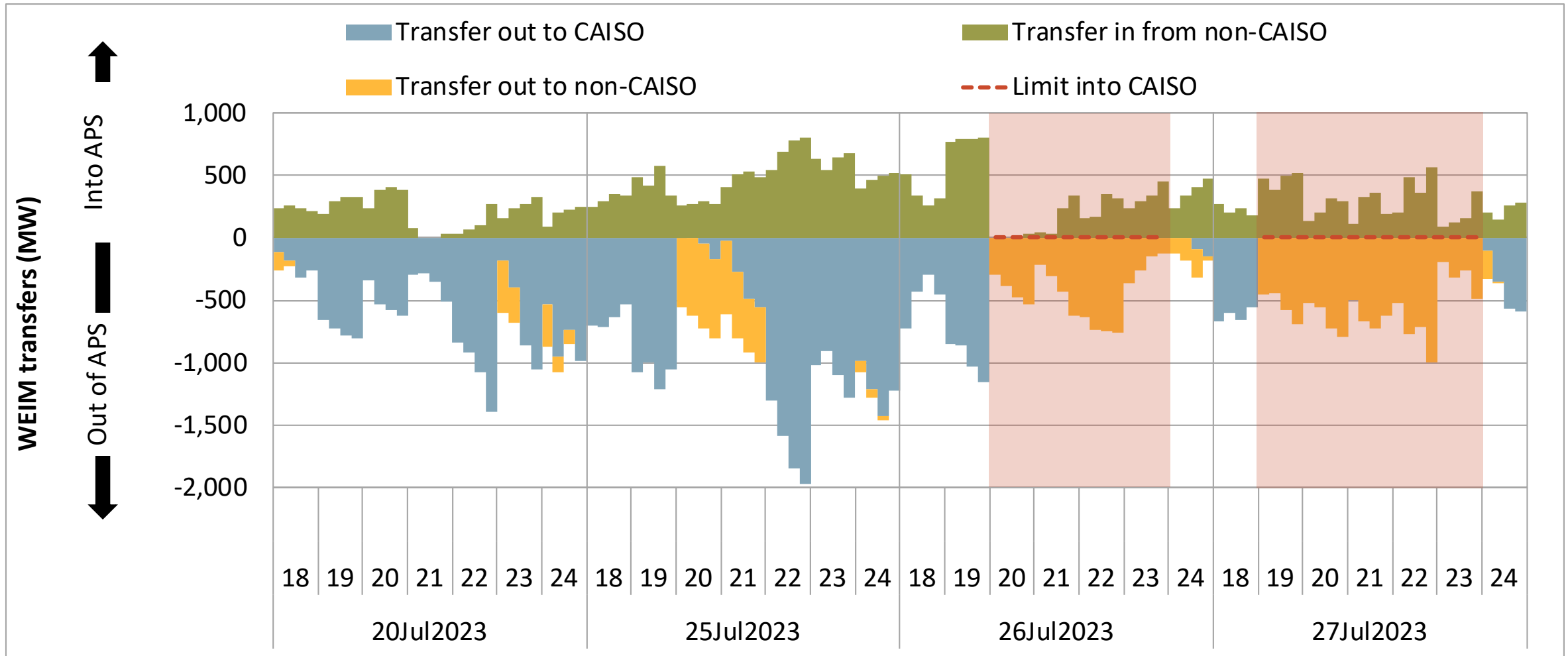
Export summary – CAISO peak hours, hour-ahead market



Hour-ahead and 5-minute market dynamic WEIM transfers into CAISO balancing area



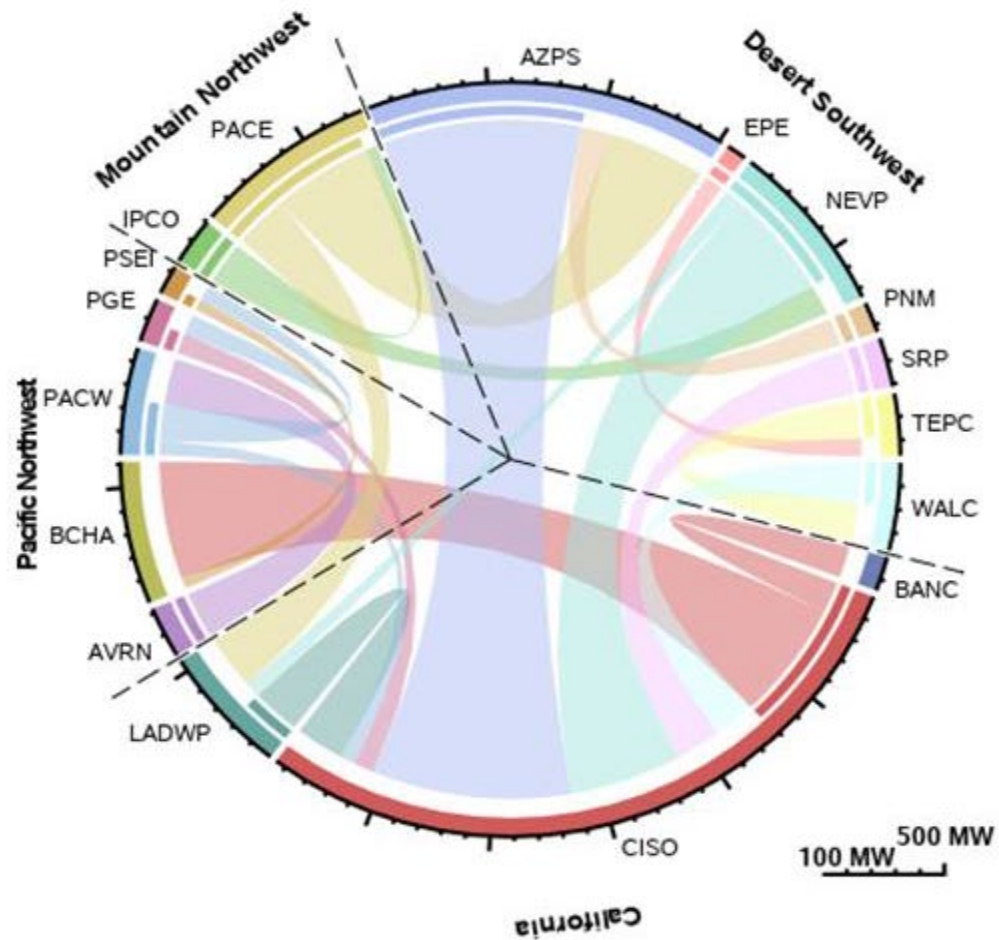
Arizona Public Service dynamic WEIM transfers hour-ahead market



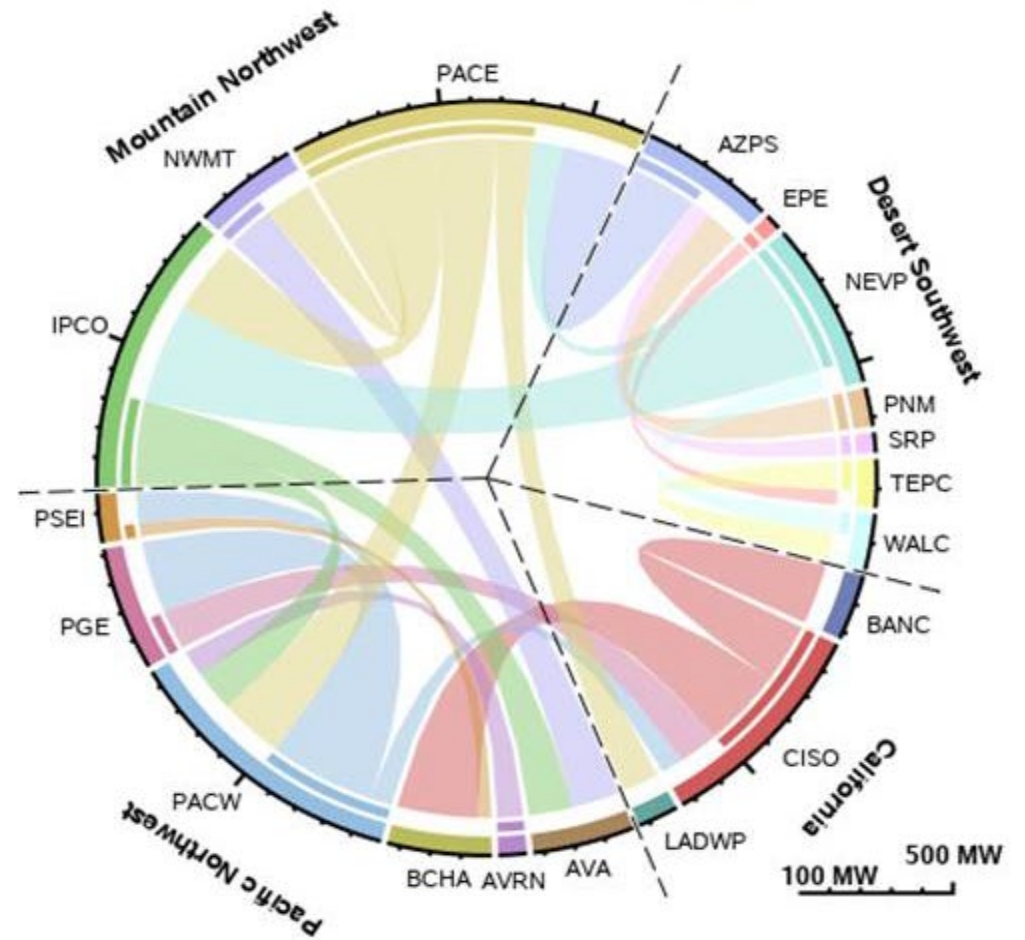
Estimated changes in WEIM transfers due to hour-ahead and 15-minute market limits on dynamic transfers into CAISO BA

(Average for each circle is one 15-minute interval from hour-ahead market per day from July 26 - August 7)

Advisory WEIM transfers in HASP interval immediately prior to ETSR lock

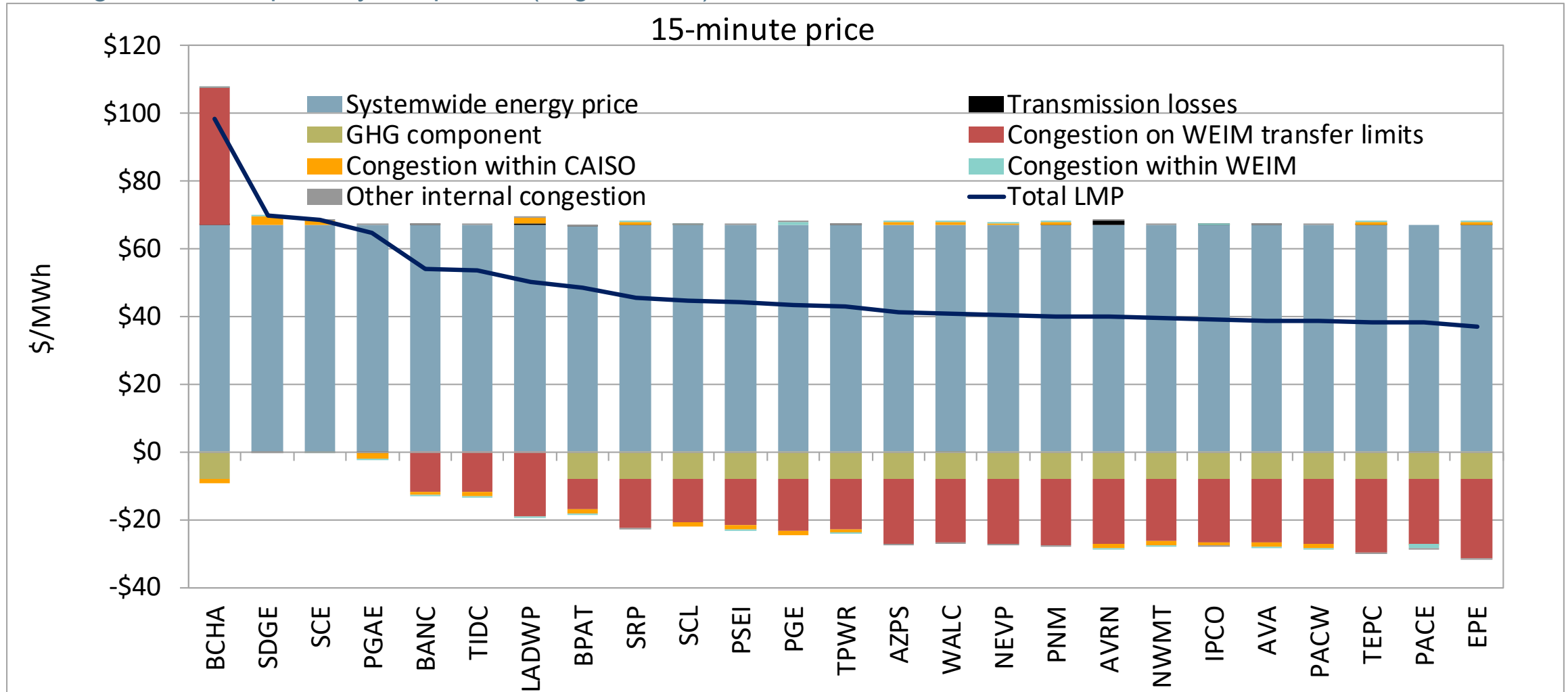


Advisory WEIM transfers in HASP interval immediately following ETSR lock



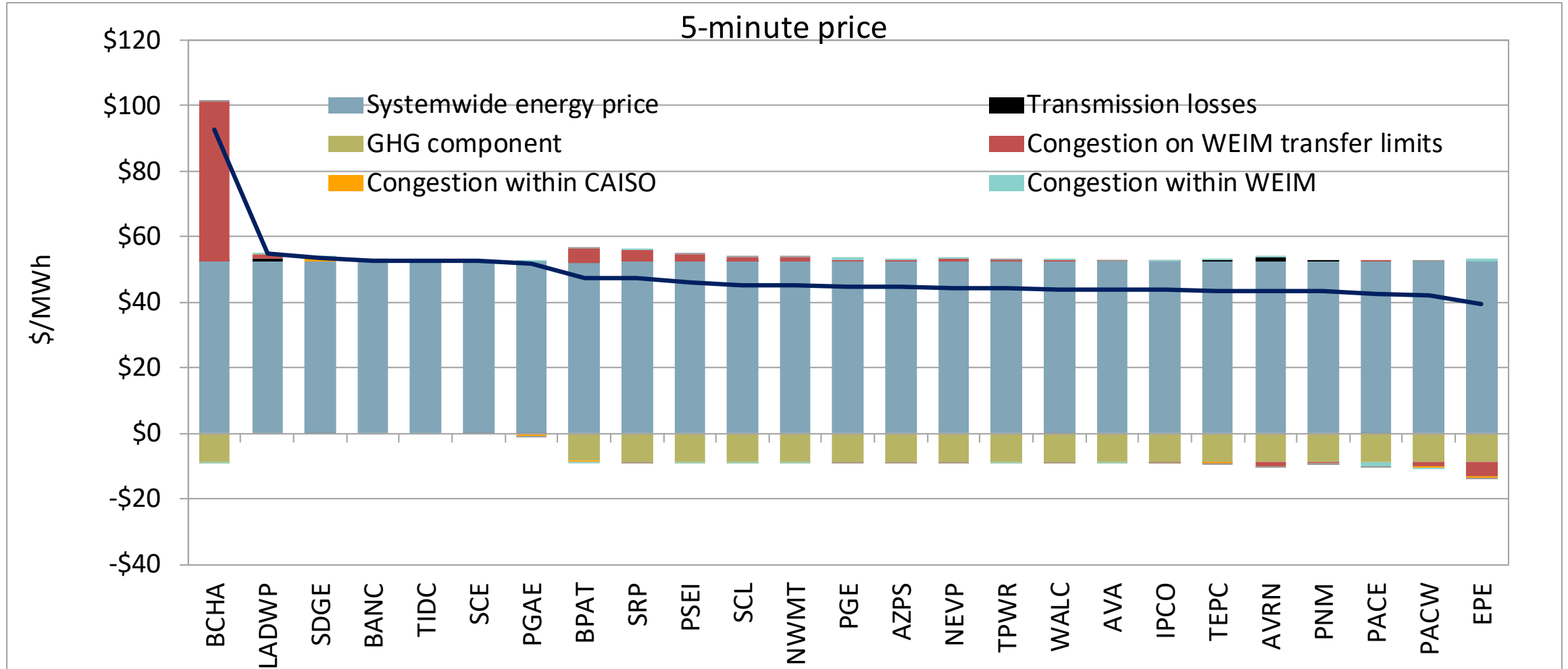
WEIM transfer caps in the 15-minute market affect 15-minute prices

Average 15-minute price by component (August 2023)



5-minute market dynamic transfers to CAISO not capped

Average 5-minute price by component (August 2023)



For more information

- Department of Market Monitoring webpage
 - <http://www.caiso.com/market/Pages/MarketMonitoring/Default.aspx>
- CAISO Tariff, Appendix P
 - http://www.caiso.com/Documents/AppendixP_CAISODepartmentOfMarketMonitoring_as_of_Apr1_2017.pdf
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