Market monitoring and market power mitigation

Eric Hildebrandt, Ph.D.

Executive Director, Department of Market Monitoring

California Independent System Operator

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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 – but ISO decides what market rules are filed at FERC.

3. Notify FERC Office of Enforcement when a market participant or the ISO has engaged in conduct that may require review or investigation.

4. Market monitors may also perform functions related to preparation of inputs for market power mitigation.
   – Bids used in mitigation, cost review, etc.

CAISO Department of Market Monitoring

- ## Internal business unit of the CAISO
  - 16 staff (economics, data analysis, engineering)

  - Access to all CAISO/EIM market and operational data

  - Work closely with ISO staff on market design and ongoing monitoring.

- ## Independent from CAISO management, as required by FERC Order 719.

- ## Communicate closely with FERC, state utility commissions and EIM Governing Body.

DMM role in developing inputs to mitigation

- DMM works with participants and CAISO to develop some inputs to mitigation.
  - DMM role focused on customized inputs requiring special calculations and cost review.
  - CAISO has complete authority over what is approved and used in market.

- Inputs to mitigation include:
  - Major Maintenance Adders for start-up/minimum load bids
  - Customized variable O&M values ($/MWh)
  - Negotiated Default Energy Bids used in mitigation
    - Opportunity costs for limited energy resources
    - Special fuel costs (gas and non-gas)

Current EIM market design issues/recommendations

- Flexible ramping requirements for each EIM balancing area.

- Market power mitigation modifications:
  - Reduce some causes of mitigation (e.g. "carryover")
  - Address concerns about "flow reversal" and "economic displacement" due to mitigation.
  - More flexibility in setting/updating unit specific bid limits.

- Compliance with FERC Order 831.
  - Don't raise price cap for imports into CAISO from $1,000/MW to $2,000/MW without cost justification.

- EIM day ahead market

Market Power Mitigation

Market power mitigation in the EIM

- Required to protect third party transmission customers reliant on EIM entity for imbalance energy service.

- Most participants must file for special EIM market based rate authority from FERC.

- No *must offer* obligation for generation, but must offer enough to meet flexible ramping requirements for each EIM balancing area.

- Mitigation in EIM based on same dynamic mitigation approach used in CAISO.
  - Bid mitigation triggered when EIM areas are separated by congestion from rest of CAISO/EIM system and are structurally uncompetitive.

Conduct and impact test used in some other ISOs

- *Reference level bids* for each unit supposed to represent estimated marginal cost (including opportunity costs).

- *Conduct test* – based on increase in bid over reference level.

- *Impact test* – based on increase in LMP due to bids over reference level.

- Thresholds used in conduct/impact tests:
  - $100 per MWh for constraints that are not chronic
  - $10 to $100 for chronically constrained areas
  - $25 per MWh for offers resulting in uplift

Issues with conduct and impact test

- Conduct thresholds set to be triggered only by "a substantial deviation from a competitive offer price."
  - Suppliers can bid right up to threshold without triggering mitigation.

- Impact test only triggered if price impact is also very substantial (e.g. +$100/MWh).

- Areas with "chronic" congestion statically defined *ex ante.*

- Commitment costs mitigated *ex post* and mitigated only if unit was committed
  - Does not mitigate full impact of *economic withholding*

Dynamic market power mitigation in CAISO/EIM

- Market power mitigation (MPM) run of market software performed with unmitigated bids.

- Congested constraints in MPM run tested for structural market power (3 pivotal supplier test).

- Congestion component of each resource's LMP decomposed into competitive vs. uncompetitive constraints.

- Units are subject to bid mitigation if resource's LMP is increased by congestion on uncompetitive constraint(s).

- Competitive LMP from MPM run is used as bid floor for mitigation.

Testing for structural market power on congested constraints

- CAISO uses 3 pivotal supplier test (without any price screen).
  - Without the largest three suppliers, can congestion on a constraint still be relieved with the *residual supply* of counterflow?

- Residual supply of counterflow calculated for each constraint is the total supply of counterflow without largest three suppliers.

- Demand for counterflow needed to relieve congestion is calculated using MPM results (scheduled MW x shift factors).

$$\text{Residual Supply Index (RSI)} = \frac{residual\ supply\ of\ counterflow}{total\ demand\ for\ counterflow}$$

- If RSI < 1 then constraint is structurally non-competitive:

LMP decomposition used in mitigation

- LMPs for each unit from MPM run are *decomposed* into (1) energy, (2) losses, (3) competitive congestion and (4) non-competitive congestion.

- Non-competitive congestion is based on shift factors (-SF$_{c,j}$) and shadow prices (λ$_{n,c}$)for non-competitive constraints in BAA.

$$LMP_j = SMEC + loss_j + \sum_c (-SF_{c,j}) * \lambda_c + \sum_{nc} (-SF_{nc,j}) * \lambda_{nc}$$

Congestion on competitive constraints

Congestion on non-competitive constraints

- If sum of congestion from *non-competitive* constraints is positive, then the resource is subject to potential bid mitigation.
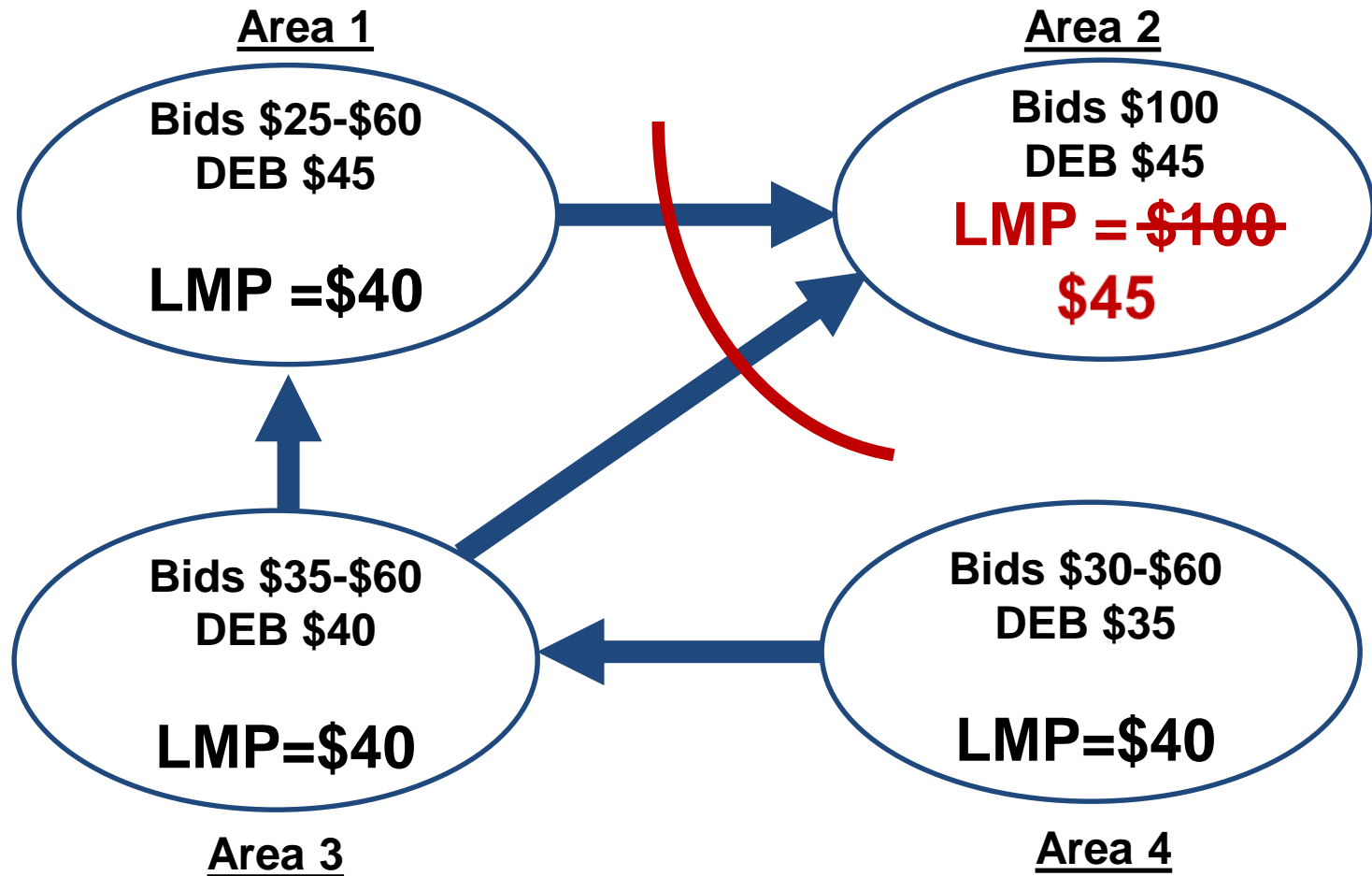
Competitive LMP is used as floor in bid mitigation

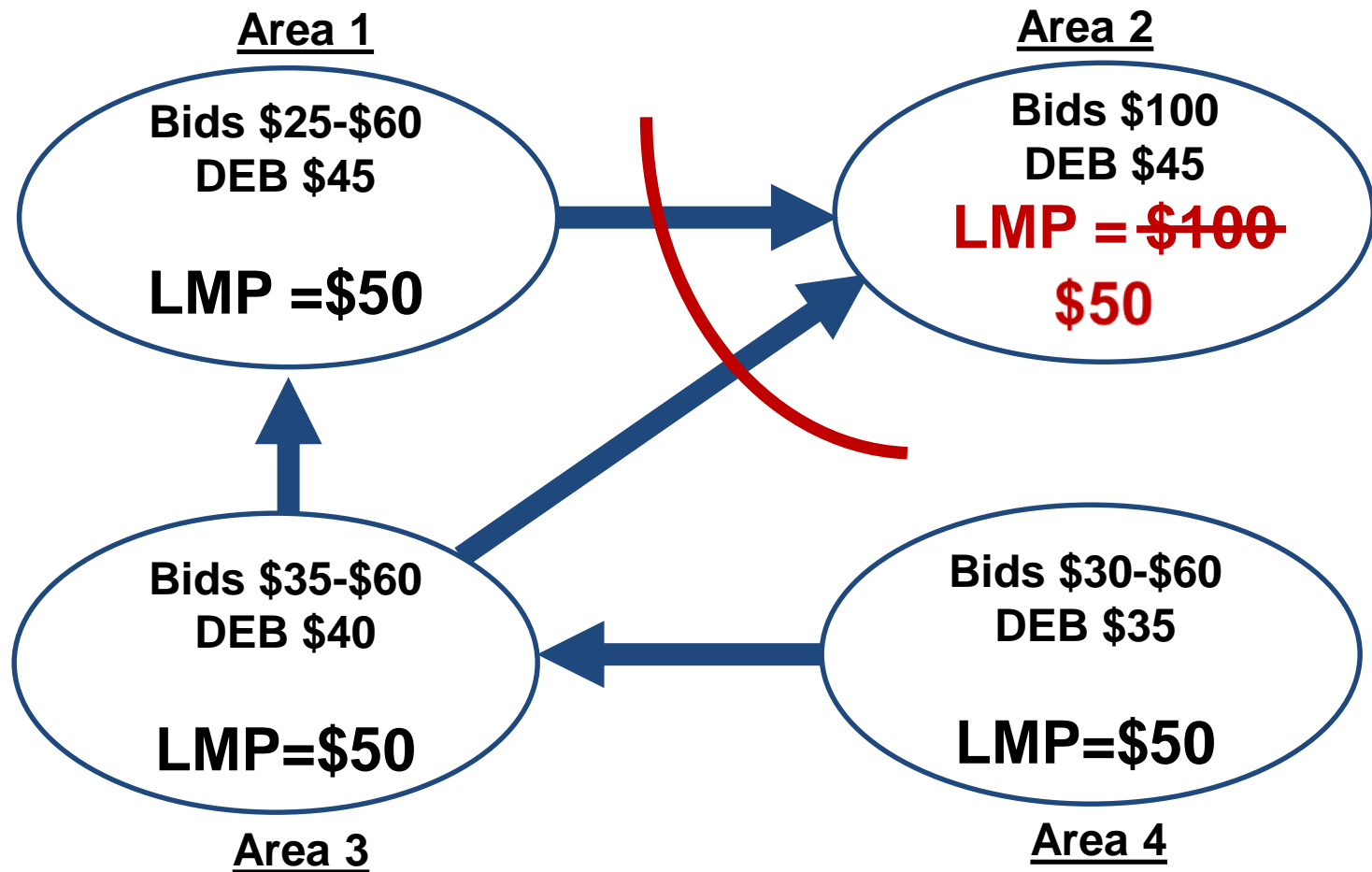- Competitive LMP from MPM run includes congestion on competitive constraints.

$$LMP_j = \underbrace{SMEC + loss_j + \sum_c (-SF_{c,j}) * \lambda_c}_{\text{Competitive LMP}_j} + \underbrace{\sum_{nc} (-SF_{nc,j}) * \lambda_{nc}}_{\substack{\text{Congestion on} \\ \text{non-competitive constraints}}}$$

- Bid cap for each unit subject to mitigation:

    Unit bid cap$_j$ = Max (Competitive LMP$_j$, DEB$_j$)

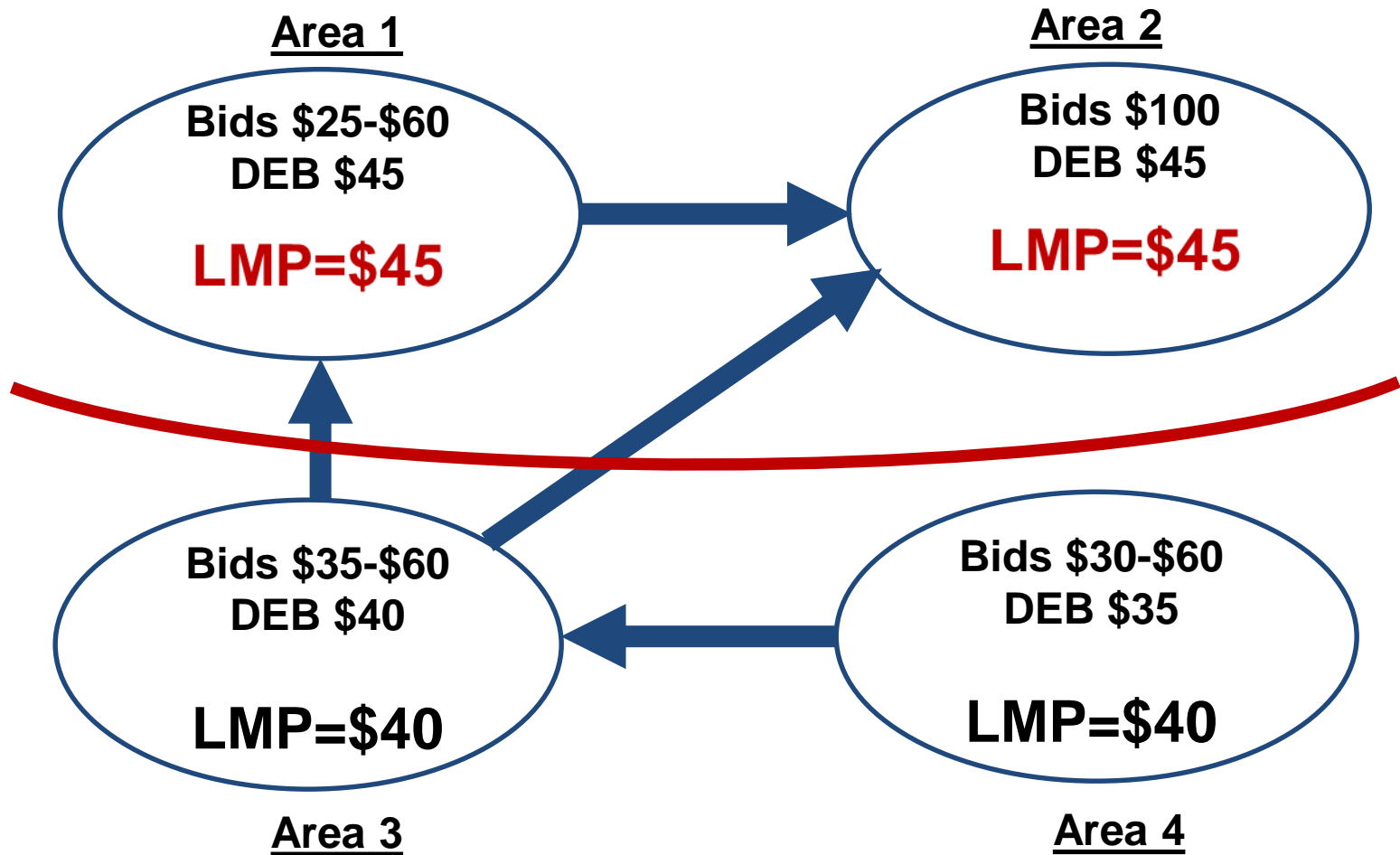California ISO

Example #1: LMP within constrained area set by DEB

Area 1

Bids $25-$60
DEB $45

LMP =$40

Area 2

Bids $100
DEB $45
LMP = ~~$100~~
$45

Area 3

Bids $35-$60
DEB $40

LMP=$40

Area 4

Bids $30-$60
DEB $35

LMP=$40

Example #2: LMP for constrained area set by competitive LMP

Area 1

Bids $25-$60
DEB $45

LMP =$50

Area 2

Bids $100
DEB $45
LMP = ~~$100~~
$50

Area 3

Bids $35-$60
DEB $40

LMP=$50

Area 4

Bids $30-$60
DEB $35

LMP=$50

Example #3: Mitigation in multiple constrained areas.

Area 1

Bids $25-$60
DEB $45

LMP=$45

Area 2

Bids $100
DEB $45

LMP=$45

Bids $35-$60
DEB $40

LMP=$40

Bids $30-$60
DEB $35

LMP=$40

Area 3

Area 4

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_asof_Apr1_2017.pdf

- Presentation Default Energy Bids
  - http://www.caiso.com/Documents/DMMDefaultEnergyBidPresentation1-EnergyImbalanceMarketofferRulesTechnicalWorkshop.pdf

- Eric Hildebrandt, Executive Director
  - ehildebrandt@caiso.com
  - 916-608-7132