



California ISO

Local Market Power Mitigation Enhancements Revised Straw Proposal

Stakeholder Web Conference

November 28, 2018

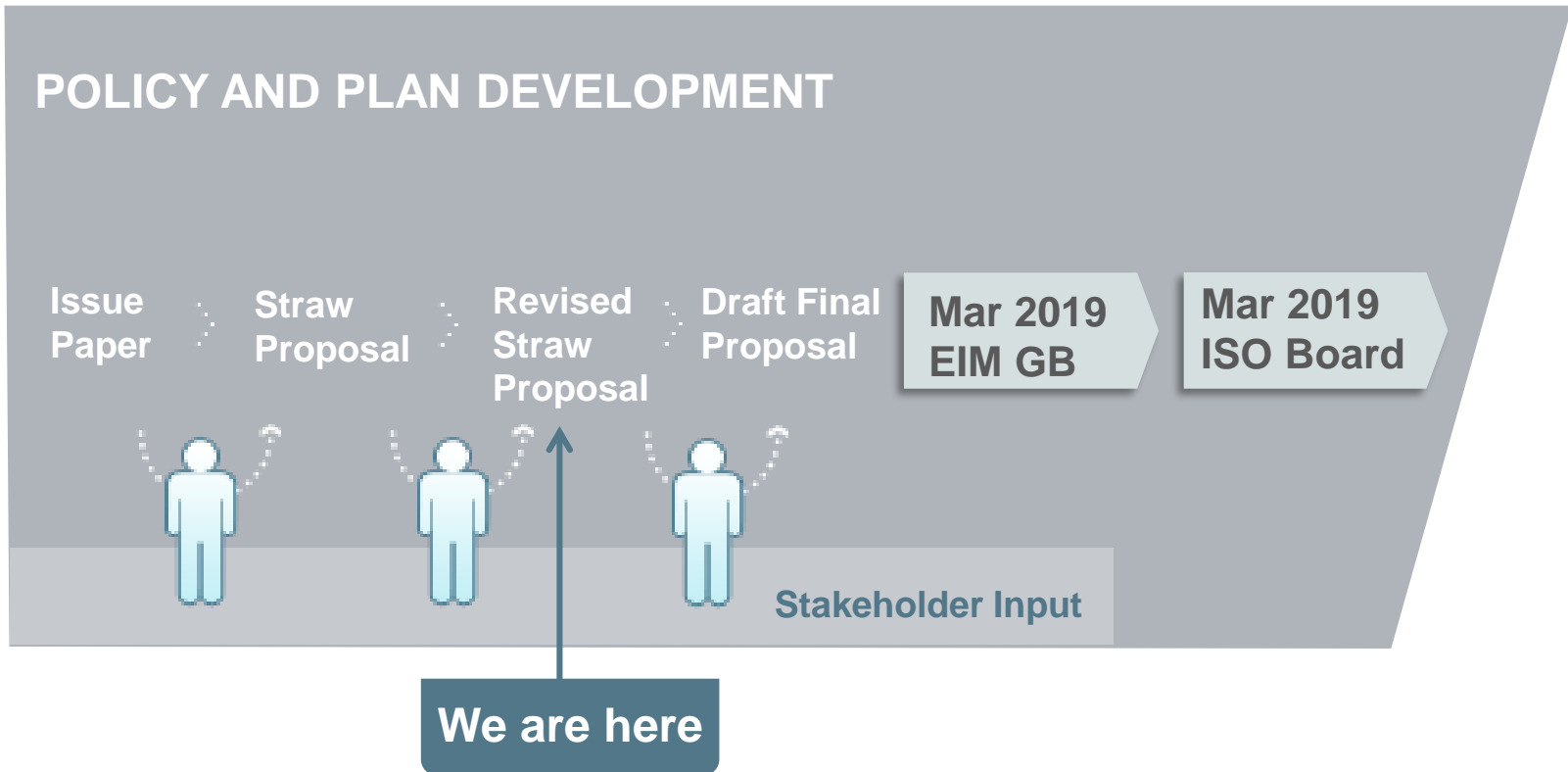
10:00 am - 1:00 pm

Market Design Policy

Agenda

Time	Topic	Presenter
10:00 – 10:05	Welcome and Introductions	Kristina Osborne
10:05 - 10:20	Stakeholder Comments	Brittany Dean
10:20 – 10:30	Principles	Brittany Dean
10:30 – 12:50	Proposals	
	Mitigation Framework Enhancements	Danielle Tavel/Elliott Nethercutt
	Hydro resource default energy bid	Gabe Murtaugh
	Reference level adjustments and gas price indices	Brittany Dean
12:50 – 1:00	EIM Governing Body Classification, Next Steps	Kristina Osborne

CAISO Policy Initiative Stakeholder Process



Local Market Power Mitigation Enhancements

ISSUE/STRAW PROPOSAL STAKEHOLDER COMMENTS

Issue Paper/Straw Proposal stakeholder comments (1 of 2)

- **Market Framework: Prevention of Flow Reversal**
 - Stakeholders generally support the application of the competitive LMP for mitigation in every interval. This includes the elimination of the rule that extends a mitigated interval for the balance of the hour. Some stakeholders are concerned about the nominal bid adder to ensure price separation
- **Market Framework: Economic Displacement**
 - Stakeholders are divided on the proposed approach to address economic displacement by limiting transfers. Specific concerns relate to potential impacts to market based rate authority

Issue Paper/Straw Proposal stakeholder comments (2 of 2)

- Hydro Default Energy Bid
 - Stakeholders support the direction of the proposal for a hydro DEB
 - PWRX, BPA, and IPC support, but request the inclusion of:
 - Opportunities to sell at multiple price locations
 - Different scalars for short-term, medium, and long-term resources
 - California IOUs maintains any DEB should be made available to all participants, not just EIM, and are concerned with how potential headroom could undermine market power mitigation

Local Market Power Mitigation Enhancements

PRINCIPLES

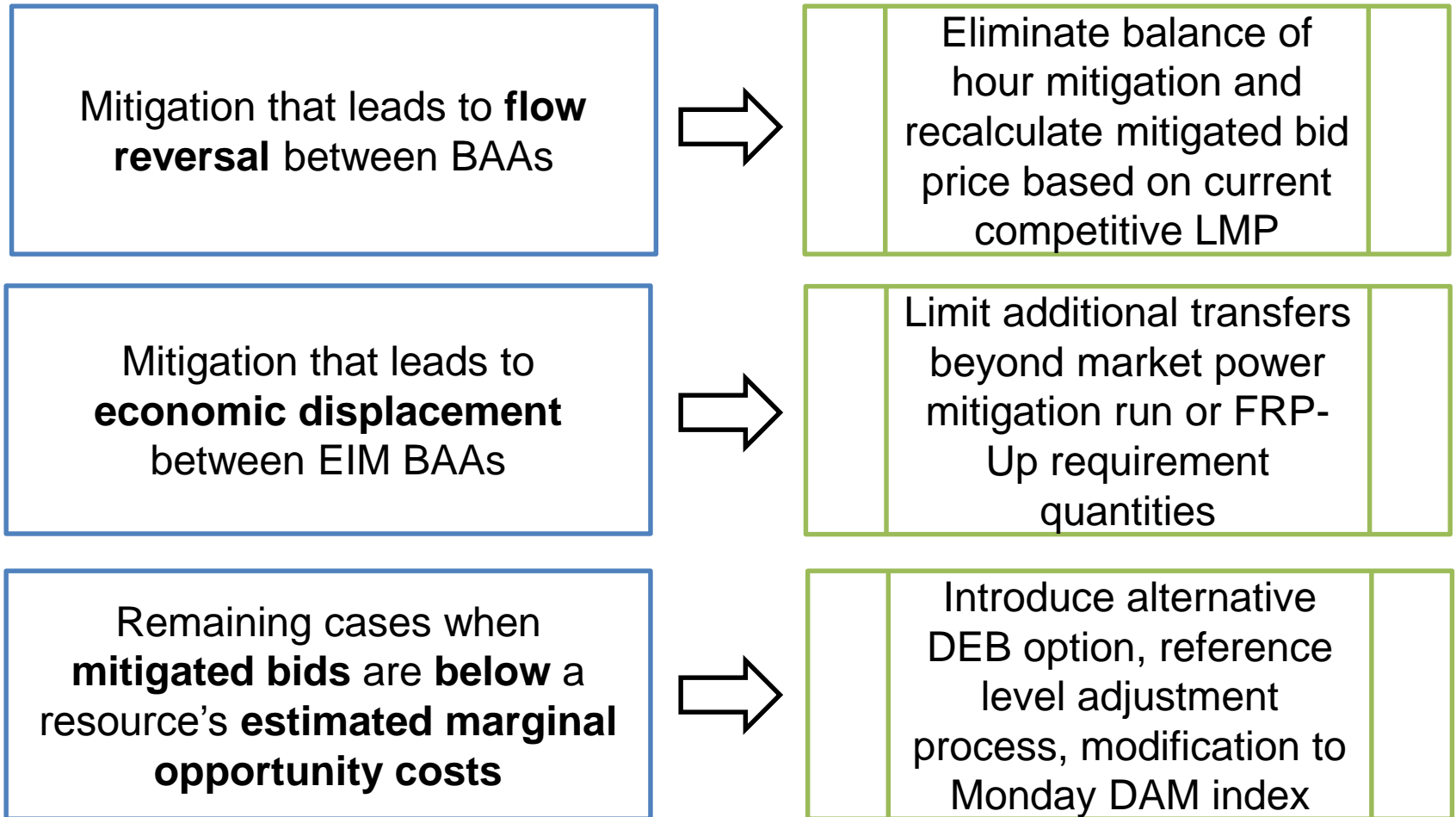
Market design principles for market power mitigation, default energy bids, and reference level adjustments (1 of 2)

- Supply should not be forced to sell power below its bid price if it cannot exert market power. Supply bids should be mitigated to marginal costs to the extent supply has market power
- EIM is a voluntary market but the design assumes sharing of flexibility. In cases of mitigation involving EIM transfers to another balancing authority area, supply should not be forced to sell energy at a mitigated price greater than: **(1) the exporting balancing authority area's flexible ramp upward requirement**; or **(2) the pre-mitigation (MPM) export quantity**. The use of mitigated bids should not result in additional economic displacement of other supply

Market design principles for market power mitigation, default energy bids, and reference level adjustments (2 of 2)

- Mitigated bid prices should be based on a competitive locational marginal price in each interval that accurately reflects market conditions
- The marginal costs used to calculate default energy bids for use-limited resources should include opportunity costs for future market sales
- Gas prices used to calculate reference levels should account for real-time gas prices volatility so that the CAISO efficiently dispatches supply, resulting in accurate market prices that minimize the need for after-the-fact cost recovery

Summary of Proposals – Revised Straw Proposal



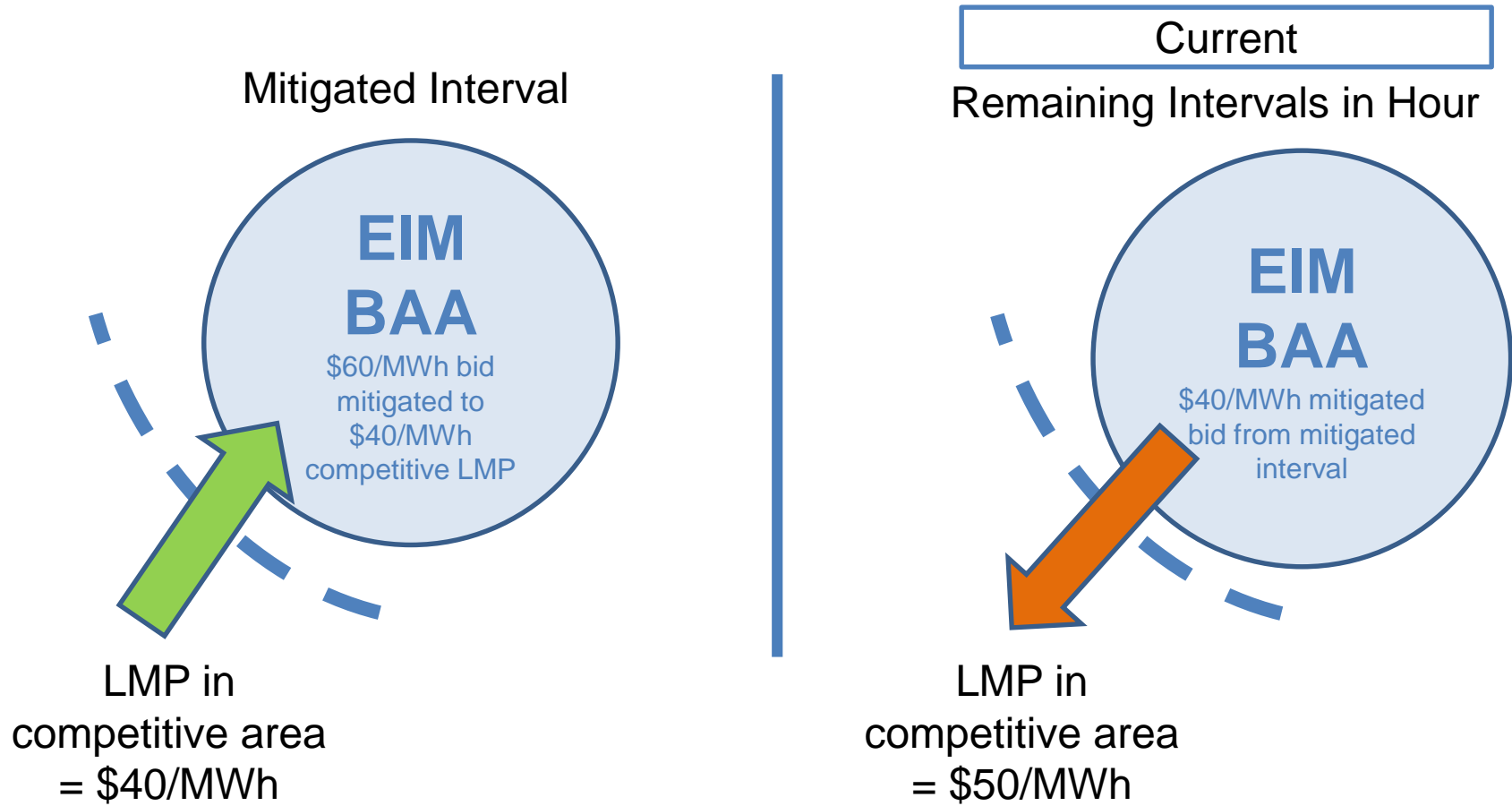
Local Market Power Mitigation Enhancements

MITIGATION FRAMEWORK ENHANCEMENTS

Flow Reversal – description

- Mitigation results cause EIM BAAs to change from importing to exporting at mitigated bid prices during subsequent market runs
 - MPM is triggered when import transfer constraints are binding
 - To protect native imbalances from market power offer prices are replaced with mitigated bids
 - Import constraints may not be binding, and market power mitigation may not be detected in subsequent market runs, but current rules mitigate for the balance of the hour at the originally mitigated bid price
 - Mitigated bid prices compared to the LMP in a competitive area can result in exports that were not previously scheduled

Example A: Extension of mitigated bids for remainder of hour can result in EIM BAAs exporting because of mitigated price (1 of 2)



CAISO proposals to prevent flow reversal

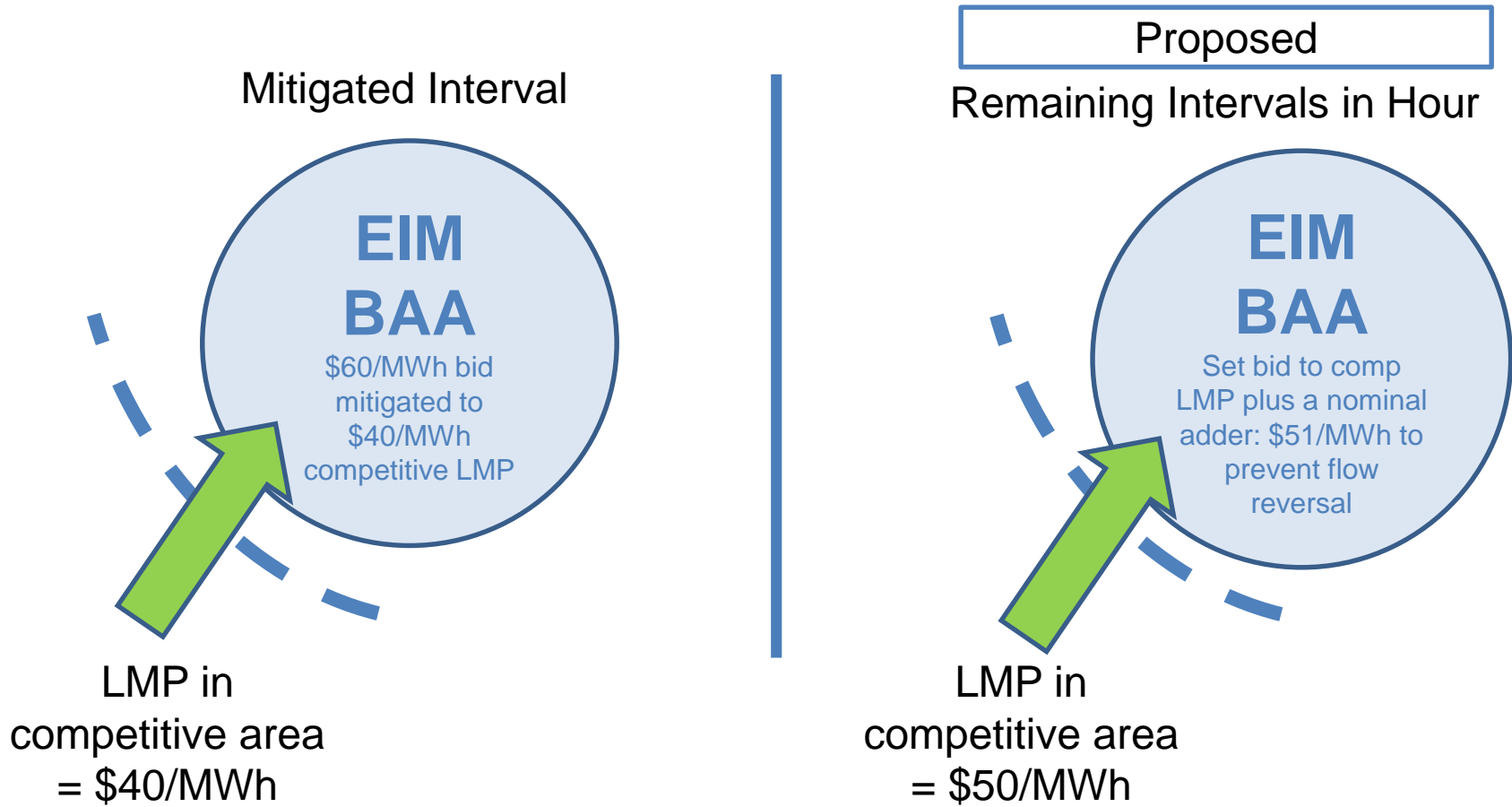
- Modify mitigation extension rules:
 - Eliminate rule that if mitigated in FMM, mitigated in corresponding RTD intervals
 - Eliminate rule to mitigate for:
 - Balance of hour for FMM
 - Balance of 15 minute interval for RTD
- The competitive locational marginal price used to determine mitigated bid price is based on current market run conditions
- Implement a nominal parameter to the mitigated bid calculation to ensure price separation

Proposed mitigation framework enhancements

- Current:
 - Competitive LMP can only decrease if previously mitigated
 - Mitigated bid = MAX (DEB, Competitive LMP)
- Proposed:
 - Competitive LMP will be recalculated in each market interval
 - Mitigated bid = MAX (DEB, Competitive LMP + \$0.xx parameter)

Assumes mitigated bid is less than offer price

Example A: Extension of mitigated bids for remainder of hour can result in EIM BAAs exporting because of mitigated price (2 of 2)



Example B: Mitigation occurs in first fifteen-minute market interval

Current Mitigation Process

FMM	Unmitigated Bid	Actual Competitive LMP	Default Energy Bid	Market Power Detected	Mitigated Bid	Carry Through Rule	Flow Reversal
1	\$60	\$30	\$25	Yes	\$30	No	No
2	\$60	\$60	\$25	No	\$30	Yes	Yes
3	\$60	\$62	\$25	No	\$30	Yes	Yes
4	\$60	\$59	\$25	No	\$30	Yes	Yes

Proposed Mitigation Process

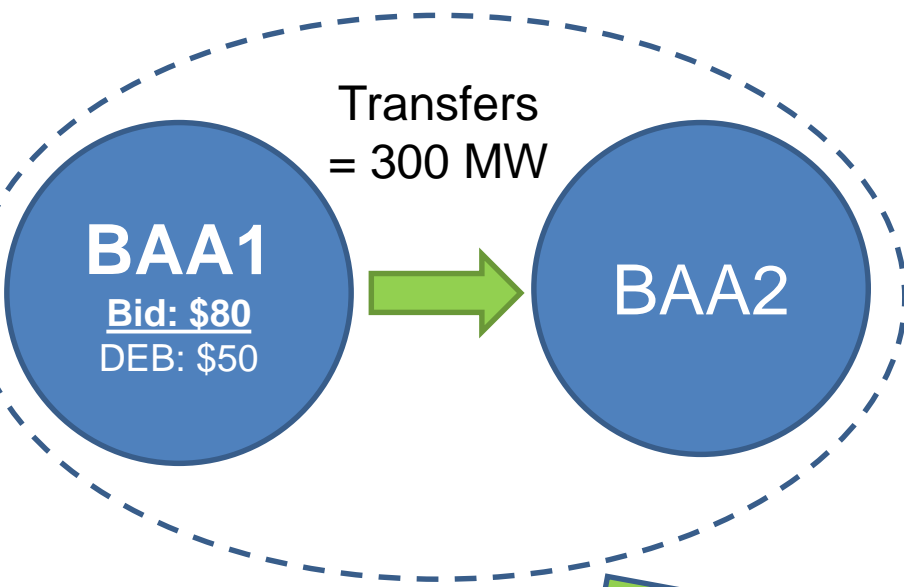
FMM	Unmitigated Bid	Actual Competitive LMP	Default Energy Bid	Market Power Detected	Mitigated Bid	Carry Through Rule	Flow Reversal
1	\$60	\$30	\$25	Yes	\$31	No	No
2	\$60	\$60	\$25	No	\$60	No	No
3	\$60	\$62	\$25	Yes	\$63	No	No
4	\$60	\$59	\$25	No	\$60	No	No

Economic Displacement – description

- Economic displacement due to mitigated bids occurs when energy from one resource is replaced with energy from another
 - This can result in transfers beyond what is necessary to resolve market power
- Mitigated bids that result in additional transfers in a voluntary market can be problematic in cases when a resource's default energy bid is lower than a resource owner's estimate of costs

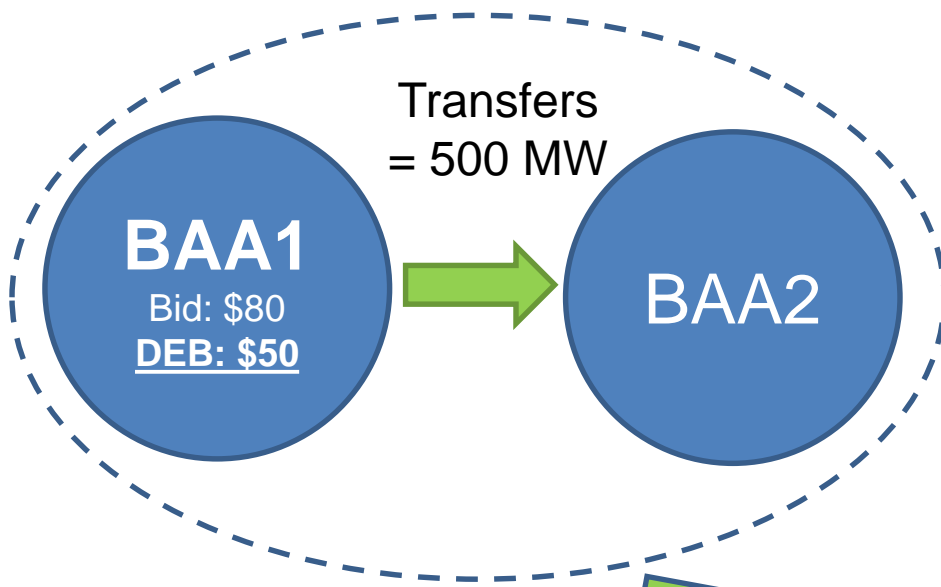
Economic Displacement – Current Framework

Mitigation Run



Market
dispatches 300
MW at \$80/MWh
bid price

Current Market Run



Market
dispatches 500
MW at \$50/MWh
mitigated bid
price

Economic Displacement – proposed rule

- This proposed rule limits transfers to the greater of:
 - Exports scheduled in the market power mitigation run
 - Using a lower amount would contradict market results and potentially result in a solution that would limit transfers so that the receiving balancing authority area would be unable to meet its imbalance energy requirement
 - The exporting balancing authority area's flexible ramping requirement
 - EIM participation assumes sharing of flexible ramping capacity between balancing authority areas
- This proposed rule is optional, allowing each EIM BAA to elect whether to limit transfers during mitigated intervals

Economic Displacement – proposed rule

Mitigation Run

Transfers
= 300 MW

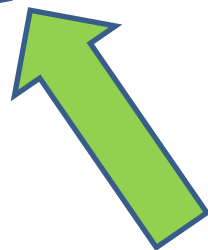
BAA1

Bid: \$80
DEB: \$50

BAA2



Market
dispatches 300
MW at \$80/MWh
bid price



Proposed Market Run

Transfers
= 300 MW

BAA1

Bid: \$80
DEB: \$50

BAA2



Market
dispatches 300
MW at \$50/MWh
mitigated bid
price



Economic Displacement – proposed rule

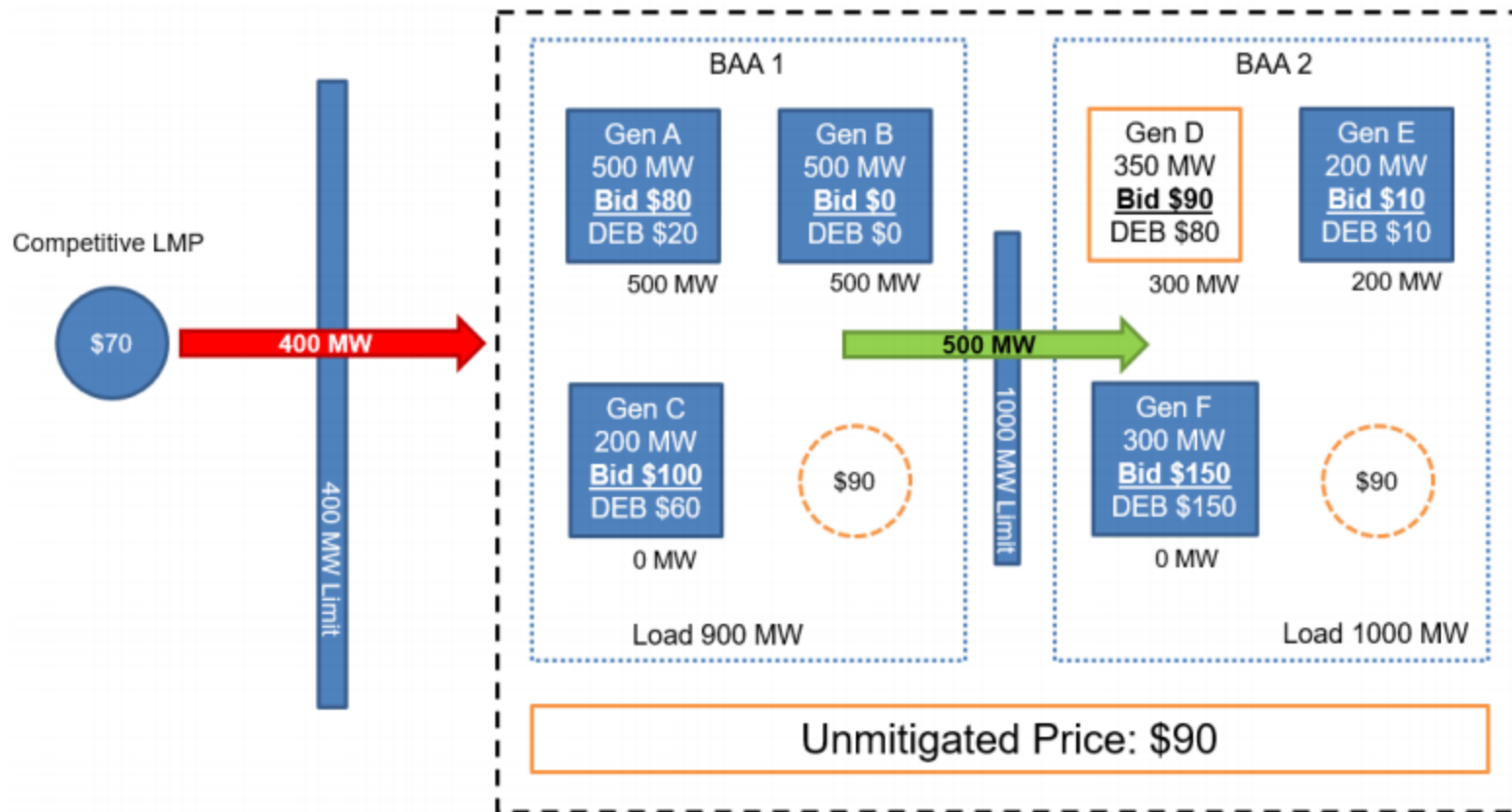
- The CAISO proposes offering all EIM BAAs the option to limit their exports based on the greater of:
 - Base transfers; or
 - Pre-mitigation (MPM) transfers; or
 - Flexible ramping upward awards
- Presented formulaically:

$$\text{Export Limit} = \text{MAX} [\text{Exports}_{\text{Base}}, \text{Exports}_{\text{MPM}}, \Sigma(\text{FRU}_{\text{MPM Award}})]$$

- The exporting BAA will receive congestion rents created by this proposed rule

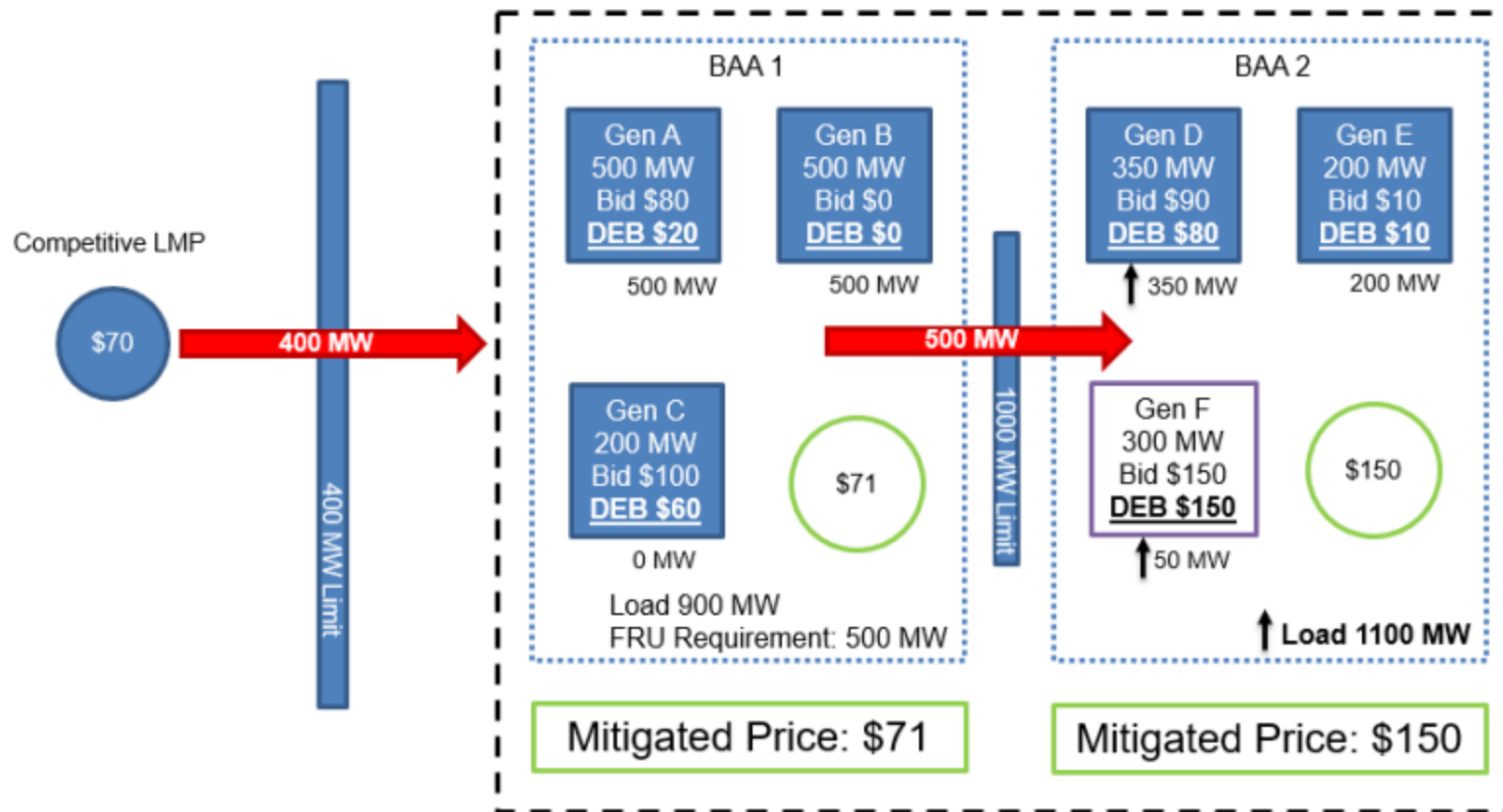
Economic Displacement – Proposed rule with load changes between advisory and RTD (1 of 2)

RTD Market Power Mitigation Triggered in Advisory Interval of Prior RTD Run



Economic Displacement – Proposed rule with load changes between advisory and RTD (2 of 2)

Load Increases by 100 MW in BAA 2 Compared the Prior Market Run



Economic Displacement – Proposed rule with load changes between advisory and RTD (2 of 2)

- The CAISO acknowledges concerns; however, there is an inherent shortcoming of using the advisory interval for mitigation purposes in the real-time dispatch
- Overall impacts expected to be low given that RTD runs every 5- minutes
 - Importing BAA should have sufficient internal resources to balance their load
 - The exporting BAA in hindsight may have wanted to sell additional exports

Congestion rents resulting from proposed rule change

- The exporting BAA will receive congestion rents created by limiting transfers
- This is consistent with the current EIM treatment for congestion rents, in which congestion rents accrue to the balancing authority area where the constraint is located
- The transfer constraint is specific to the source balancing authority area

Local Market Power Mitigation Enhancements

HYDRO DEFAULT ENERGY BID

This initiative includes a proposal for a new default energy bid for hydroelectric resources with storage

- This default energy bid captures the:
 - Maximum storage horizon for a resource
 - Ability to sell in different locations
 - Replacement cost from a local gas resource
 - Short-term limitations for a resource
- These items may not be captured in the existing default energy bid opportunity cost adder
- This default energy bid attempts to address the stakeholder concern that some hydro resources with limited energy were being depleted inefficiently

The default energy bid uses multiple terms to account for opportunity costs

- A resource with a specific storage horizon has the option to save the fuel available to sell electricity immediately or in future months
- Default energy bid uses:
 - Day-ahead prices to proxy for near-term opportunities
 - Monthly futures prices as a proxy for longer-term future sales opportunities
 - Opportunity to sell energy at different bilateral hubs
 - Local gas prices and average heat rate to create a floor

Proposed hydro DEB includes short-term and long-term components

- Resources with storage duration up to 3 months would be eligible for the following default energy bid:

$$\text{MAX}(\text{Gas Floor}, \text{DA Index}, \text{BOM Index}, \text{M Index}_{+1}, \text{M Index}_{+2}, \text{M Index}_{+3}) * 1.35$$

$$\text{Gas Floor} = \text{Gas Heat Rate} * \text{GPI}$$

Where,

- DA Index* – Day-ahead (DA) peak price at the local trading hub
- BOM Index* – Balance-of-month (BOM) futures price
- M Index_{+N}* – Monthly futures index price *N* months in the future
- Gas Heat Rate* – Average heat rate for a typical gas resource
- GPI* – Gas price index for the specific resource

Proposed hydro DEB includes short-term and long-term components

- Resources with storage duration up to 3 months would be eligible for the following default energy bid:

$$\text{MAX}(ST\ DEB, \text{MAX}(M\ Index_{+4}, M\ Index_{+5} \dots M\ Index_{+12}) * 1.1)$$

And,

- ST DEB* – The short-term component, outlined on the prior slide
- M Index_{+N}* – Monthly futures index price *N* months in the future
- Resources will specify a maximum storage duration and will only be eligible for those monthly futures prices
- This is similar to existing DEBs, and calculated daily

There are two terms that are customizable inputs for this default energy bid

- Customizable inputs:
 - Maximum storage horizon
 - Long term bilateral hubs
- These inputs will be established through consultation with the ISO
- Data for the bilateral hub will need to be re-submitted on an annual basis, or as rights ownership changes

A maximum storage horizon is used to determine eligible monthly futures prices

- Maximum storage horizon is a fixed value for a specific resource and represents the amount of time a resource could store energy for a future potential sale
- These values inform the number of monthly futures terms used in the default energy bid
- Storage is bound below by one month and capped at 12 months for calculating the default energy bid
 - Resources that typically cycle water daily or over a few weeks likely will receive one month of storage
 - Resources that have storage capability beyond a year and do not spill during spring likely have 12 months

A resources will be assigned a default bilateral hub for use in the default energy bid

- For simplicity, this default energy bid will only use four bilateral hubs to calculate these default energy bids

Resource Area	Default Bilateral Hub
Idaho, PacifiCorp West, Portland, Powerex, Puget	Mid-Columbia
Arizona, PacifiCorp East, NV Energy	Palo Verde
Northern California	North-of-path 15
Southern California	South-of-path 15

Resources with long-term (more than three months) storage may elect additional bilateral hubs

- Resources with long-term storage may elect for the monthly futures prices in the long-term component of the default energy bid to use a different bilateral hub
- The resource owner is required to submit documentation to the ISO, at least initially and annually thereafter, to show ownership of firm transmission to a bilateral hub
- Transmission to a combination of hubs may also be requested, and a weighted average of those hubs will be used in calculating the default energy bid

The default energy bid includes different scalars on the short-term and long-term components

- The short-term component includes a 35% scalar
 - Analysis shows that this scalar might be appropriate for a resource with 1 month of storage that can generate roughly 20% of intervals or more
 - Similarly for a resource with 3 months of storage, this scalar might be appropriate for a resource that can generate 10% of intervals
- The long-term component includes a 10% scalar
 - This term of the default energy bids represents the opportunity costs for a resource to sell at bilateral energy hubs

The default energy bid contains short and long-term components

- The short-term component captures the variability in EIM market prices compared to bilateral price indices near the resource's location
- The long-term component captures a resource's opportunity cost to sell at other locations that may have higher prices in the future, at different times than the resource's location

Additional details regarding application of this default energy bid to hydro resources with storage

- Hydro systems may be very complex and a relatively “simple” equation may not be sufficient to capture all opportunity costs
- The availability of energy from a resource may change on a daily basis, or within a day
- This default energy bid may not be sufficient to meet some opportunity costs for hydro resources during all intervals
 - Hydro resources may still opt for a negotiated default energy bid or CCE 3 opportunity cost adder

Analysis methodology for the hydro default energy bid

1. Calculated a default energy bid for each day during Oct 2017 – Sept 2018
 - DA Index = Mid-Columbia bilateral hub
 - Gas Floor = Gas Heat Rate * GPI at Sumas
 - 1-month and 3-month storage horizon
2. Compared the daily default energy bid to real-time prices in the PACW
3. Determined percentage of intervals that a resource would be dispatched if bidding into the market at default energy bids

Percent a 1-month storage resource is dispatched less than potential daily availability

Scalar	Energy Availability (Hours/Day; Appx percent of intervals)				
	2.3 Hrs. (10%)	3.5 Hrs. (15%)	4.8 Hrs. (20%)	6 Hrs. (25%)	8 Hrs. (33.3%)
116%	65%	78%	85%	91%	95%
122%	72%	83%	89%	95%	98%
130%	81%	89%	95%	97%	99%
143%	88%	95%	98%	99%	100%
165%	95%	99%	100%	100%	100%

Percent a 3-month storage resource is dispatched less than potential weekly availability

Scalar	Energy Availability (Hours/Week)				
	16.8 Hrs. (10%)	25 Hrs. (15%)	33.5 Hrs. (20%)	42 Hrs. (25%)	50.3 Hrs. (30%)
101%	55%	72%	83%	91%	94%
105%	62%	83%	91%	96%	96%
110%	75%	87%	94%	96%	98%
115%	81%	94%	100%	100%	100%
131%	96%	100%	100%	100%	100%

Local Market Power Mitigation Enhancements

REFERENCE LEVEL ADJUSTMENTS

Commitment Costs and Default Energy Bid Enhancements policy established reference level adjustment process

- CAISO reference levels based on published price information may not always be accurate
 - Suppliers request a before-the-market adjustment to reference level
- Supplier's actual costs must be more than CAISO calculated reference level
 - Retain sufficient justification supporting the need for a reference level adjustment request
- Bidding up to a supplier's reasonableness threshold is not a safe harbor and reference level adjustment requests must be based on actual costs

Reference level adjustments – gas resources proposal

- Recent gas market events, CAISO reconsidered large differences in the price for same-day gas purchases relative to the gas price indices the CAISO uses
- CAISO proposes to proactively update each morning the reasonableness thresholds used for the CAISO's real-time market on same-day gas trading the CAISO observes on ICE
 - Update the reasonableness thresholds for all resources located in a given fuel region if gas prices are greater than 10% compared to the gas price index used in the prior day
- No longer need CCDEBE policy to increase gas prices used to calculate reasonableness thresholds for real-time market by 25% for Mondays

Example

Day/Time	Gas Hub	Gas Price	Trade Date	Proposal
11/1 10:00 pm	SoCal Citygate	\$3	11/2	Current
11/2 8:00 am	SoCal Citygate	\$4	11/2	$\$4 > 10\% =$ Recalculate/update reasonableness thresholds
11/2 8:00 am	SoCal Citygate	\$3.2	11/2	$\$3 < 10\% =$ No recalculation/update

Day-ahead market gas prices

- *Aliso Canyon Phase 3* - NRG has raised concerns with the gas price index the CAISO uses for the day-ahead market run on Sunday for Monday
 - CAISO proposes to adjust its use of gas index costs in its day-ahead market for Mondays by including ICE's Monday-only index
 - No longer need CCDEBE policy to increase gas prices used to calculate reasonableness thresholds for day-ahead market by 25% for Mondays

Reference level adjustments – hydro resource default energy bid proposal

- Previously proposed reference level adjustment process for EIM use-limited default energy bid
 - Account for difference between bilateral electricity price and day-ahead published hub price indices
- CAISO no longer proposes a reference level adjustment process for the hydro resource default energy bids
 - Proposed hydro resource default energy bid includes a scaler that already accounts for these differences

Gas Price Indices

- S&P Global Platts contains information about Intercontinental Exchange (ICE) trades through their daily and monthly North America natural gas indices
 - CAISO proposes to remove references to ICE in real-time market tariff
- Modify requirement of two gas indices to determine a blended gas price used in markets
 - CAISO proposed to allow as few as one index

Local Market Power Mitigation Enhancements

NEXT STEPS

EIM Governing Body Classification

- The following proposals fall within the EIM Governing Body's primary approval authority:
 - Option to limit transfers between EIM BAAs areas
- The following proposals fall within the EIM Governing Body's advisory role:
 - Proposals to prevent flow reversal
 - Hydro resource default energy bid option
 - Reference level adjustment process
 - Gas price indices

Proposed Initiative Schedule



Milestone	Date
Post 2 nd Revised Straw Proposal	November 16, 2018
Stakeholder Call	November 28, 2018
Market Surveillance Committee Meeting and Stakeholder Written Comments Due	December 7, 2018
Post Draft Final Proposal	January 14, 2018
Stakeholder Call	January 21, 2019
Stakeholder Written Comments Due	February 28, 2019
EIM Governing Body Meeting	March 12, 2019
Board of Governors Meeting	March 27-28, 2019

Please submit written comments by
December 7, 2018 to
initiativecomments@caiso.com