



California ISO

Price Formation Enhancements: BAA-level Market Power Mitigation (MPM)


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- Please keep comments professional and respectful.
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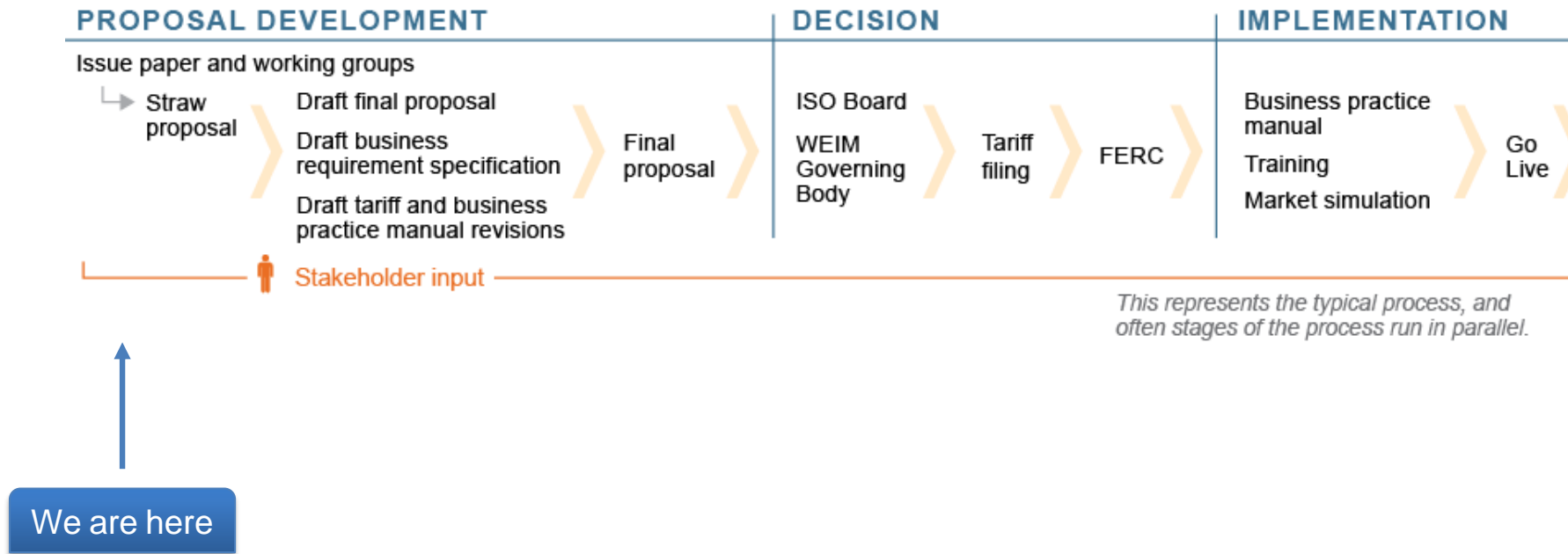
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- Please remember to state your name and affiliation before making your comment.
- You may also send your question via chat to either **Brenda Marquez** or to all panelists.
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Today's Working Group Agenda

Time	Topic	Presenter
1:00 – 1:05	Welcome, Today's Agenda	Brenda Marquez
1:05 – 1:15	Stakeholder Comments	Sylvie Spewak Senior Policy Developer
1:15 – 1:40	Principles and problem statements	
1:40 – 2:35	ISO's structural MPM design	
2:35 – 3:55	Questions	Daniel Johnson Market Design Sector Manager James Friedrich Lead Policy Developer
3:55 – 4:00	Close out	Brenda Marquez

CAISO Policy Initiative Stakeholder Process



Stakeholder comments on considering an impact test

- Support for continued discussion, different perspectives on the value and potential design
- Perspectives on what problem an impact test would solve:
 - Lower frequency of mitigation? Frequency doesn't mean there's an impact to offer price
 - Lower degree of impact to mitigated bids? Today this depends on DEB/CLMP
 - Consider correlation of mitigation with overall price levels: does correlation indicate a problem? If so, what problem?
 - Improve outcomes for non-pivotal suppliers
- Design questions to consider:
 - How and when would an impact test be applied?
 - How would the mitigation procedure change for bids that fall above/below the threshold?
 - How should the threshold be determined? Is it feasible to design a dynamic impact threshold based on salient system conditions?

Stakeholder comments on the competitive LMP

- Generally identify a need to align on a definition to inform and assess the way the CLMP is determined and the outcome of that process
- Specific concerns with CLMP determination:
 - Need clarity on how the BAA-level vs LMPM competitive component interacts
 - There may be instances when a competitive LMP may not exist

Goals for today based on stakeholder feedback

- Conceptually define and compare the concept of a **competitive LMP** with the stakeholder suggested **impact test**
- Assess:
 - The opportunities to improve how the competitive LMP is identified
 - The potential value of integrating an impact test into the ISO's MPM design
- Discuss key takeaways and next steps: grouping approach, pivotal supplier test

PRINCIPLES AND PROBLEM STATEMENTS

Principles and goals of market power mitigation policy design

- A supplier can exercise market power by increasing its offer price above cost
 - In competitive conditions, supply with an uncompetitive (inflated) offer would not be dispatched
 - Only in uncompetitive conditions would the supplier be able to profit from an uncompetitive offer price
- If a supplier has no ability to exercise market power or has adequately mitigated this ability, then it can be paid market-based (as opposed to cost-based) prices
 - ie if a supplier has the ability to exercise market power, then it should not be paid market-based prices

Potential problem statements reflect two types of potential error

Type I: False positive	Type II: False negatives
Test identifies market power when there is none, which may result in over-mitigating offers	Test fails to identify market power, which may result in economic withholding

- The potential for false positives/false negatives does not necessarily indicate the (potential) impact of error
- Solutions might:
 - address the root cause, ie attempt to reduce the frequency of Type I/II error, or
 - mitigate the impact of error when it occurs
- This is why we don't consider frequency of error independently from degree of impact

Basics of designing a market power test

- 1. Define the relevant market**
- 2. Define what a competitive offer is**
- 3. Define conditions when market power should be mitigated**

THE ISO'S STRUCTURAL MPM DESIGN

Basics of the ISO's structural MPM design

- 1. Define the relevant market:** local (physical limits), BAA (scheduling limits)
- 2. Define what a competitive offer is:** two distinct proxies limit offer mitigation to 'competitive levels'— default energy bid (DEB) and competitive LMP (CLMP)
- 3. Define conditions when market power should be mitigated:** suppliers have the ability to exercise market power and the offer level indicates economic withholding

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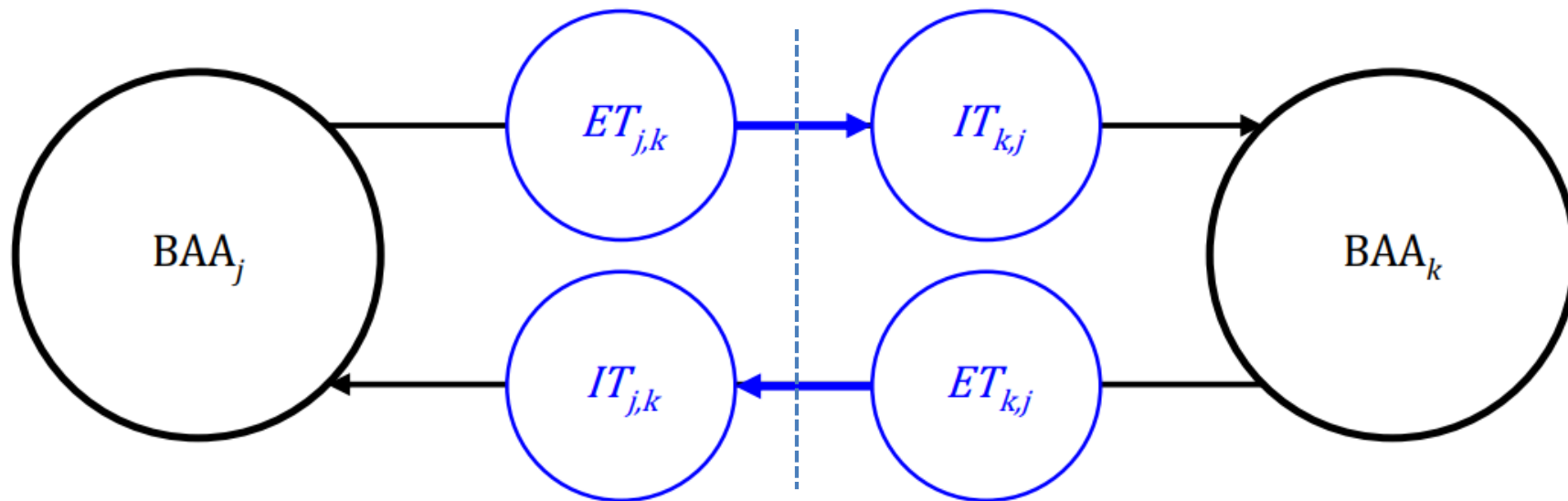
The ISO tests for both local and BAA-level market power

- Both procedures include a structure test (DCPA using the 3PS as an input) and identification of the competitive contribution to the competitive LMP
- Procedures differ in terms of
 - Market definition, ie the structural barrier reducing competition
 - Contribution to the competitive LMP

Local market power mitigation	BAA-level market power mitigation
<ul style="list-style-type: none">• Competition constrained by physical transmission constraints• Relevant constraint impacts the congestion component of the LMP	<ul style="list-style-type: none">• Competition is constrained by scheduling limitations• Relevant constraint, ie the power balance constraint, impacts the MEC

Physical vs scheduling limits

- An intertie is made up of multiple physical scheduling points at the border of a BAA
- The ISO nets intertie transfers for modeling and settlement purposes. BAA to BAA interties are a modeling convention based on, but not fully or practically captured by, individual metered transmission lines.



Need to consider the power balance constraint separately from transmission congestion

- WEIM transfer constraints bind due to scheduling limits, which are often lower than physical transmission limitations
- A binding transmission constraint cannot be used to indicate whether a BAA has access to competitive external supply:
 - A BAA can access external supply even if a constraint on the border binds because there may be multiple scheduling points
 - An otherwise unconstrained BAA may be closed off from external competitive supply due to a constraint on a different BAA border
- A binding scheduling limit that restricts additional competitive supply may create price separation

Need to consider the MEC separately from congestion

- All resources internal to a tested BAA provide counter-flow to the power balance constraint, but may have different shift factors relative to a given local constraint
 - Absent internal congestion, a supplier with market power could still impact energy prices via the PBC **(the MEC)**
 - Within a competitive BA, suppliers may be able to exercise market power only within constrained load pockets **(congestion)**
- The BAA-level MPM contribution to the competitive LMP being used for mitigation should be the competitive energy price (MEC) of import supply if transfer capacity were available

Competitive contributions from the relevant, distinct 'sub-markets' form the competitive LMP

The competitive LMP = competitive MEC (via BAA-level MPM) + competitive congestion component (via LMPM)

- **Local market power alone is insufficient to address all market power mitigation concerns**

Basics of the ISO's structural MPM design

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The Default Energy Bid reflects resource-specific cost-based offers

- DEBs use resource-specific operating costs to proxy a resources competitive incremental energy offer
- DEBs are calculated once per market and apply to all 24 hours of that market (unless a scheduling coordinator requests adjustments)
- A DEB multiplier is intended to cover most potential cost variation that might occur throughout the day, or
 - can be tailored to technology-specific cost variation
 - Can be customized based on historical observations of resource-specific cost variation

A DEB multiplier is intended to cover technology or resource-specific cost variation

	Default Energy Bids	DEB Multiplier	Reasonableness Threshold
Gas	(Heat rate * Fuel Cost + VO&M + misc. adders) * DEB multiplier	110% DEB multiplier based on observations of aggregate gas price data– day-over-day variation and price dispersion– targeting ~95% of costs covered	125% of GPI covers incremental fuel cost volatility
Hydro	Max(gas floor, short term opportunity costs, long-term opportunity costs) * DEB multipliers	110%,140% DEB multipliers based on analysis determining the number of intervals a resource would run given different scalars, targeting 95-99% efficiency	N/A
Battery Storage	Max(cost to charge, LMP-based opportunity cost) * DEB multiplier	110% DEB multiplier intended to variation between day-ahead and real-time prices	N/A

Competitive LMP reflects interval specific competitive conditions

- The market-based (unmitigated) price in structurally competitive areas can serve as a proxy for dynamic, competitive market conditions
 - DEBs may not capture dynamic market conditions in each interval
- Using the CLMP in mitigation allows offers in the market that reflect a value above the DEB so long as the offer cannot impact competitive market outcomes
 - High prices do not necessarily indicate lack of competition-- may reflect opportunity costs or tight conditions in commodity markets

Bids above the CLMP are mitigated to the higher of the DEB or CLMP

Resource	Bid	CLMP	DEB	Offer passed to market	Rule applied
Unit 1	\$35	\$45	\$25	\$35	Bid < CLMP
Unit 2	\$50	\$45	\$35	\$45	CLMP > DEB
Unit 3	\$60	\$45	\$50	\$50	DEB > CLMP

- CLMP can reduce the impact of type I error when actual costs are significantly higher than reference levels
 - le battery storage, gas resources when intra-day prices increase

Basics of the ISO's structural MPM design

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The structure test indicates where suppliers have the ability to exercise market power

- The structure test includes the dynamic competitive path assessment (DCPA) which uses the 3PS test as an input
 - Binding constraint (physical, scheduling) cuts off access to supply that would otherwise dilute an individual suppliers' residual supply
 - Low prices do not indicate a lack of market power, high prices do not indicate market power
- Structure test does not tell us if, and/or to what extent, a supplier might actually be exercising market power
 - Does not attempt to assess the profitability of offers or impact of offers on prices

The CLMP indicates whether suppliers are exercising their market power

DCPA (3PS)

Conditions for mitigation = **structural**

- Ability of suppliers to exercise market power due to constrained competition
- Offer prices (in excess of competitive levels) have the ability to impact market prices

Competitive LMP

Conditions for mitigation = **economic**

- Potential profitability of offer prices that exceed cost-based offers
- Profitability negatively impacts consumers

A supply offer is only mitigated if the offer > CLMP

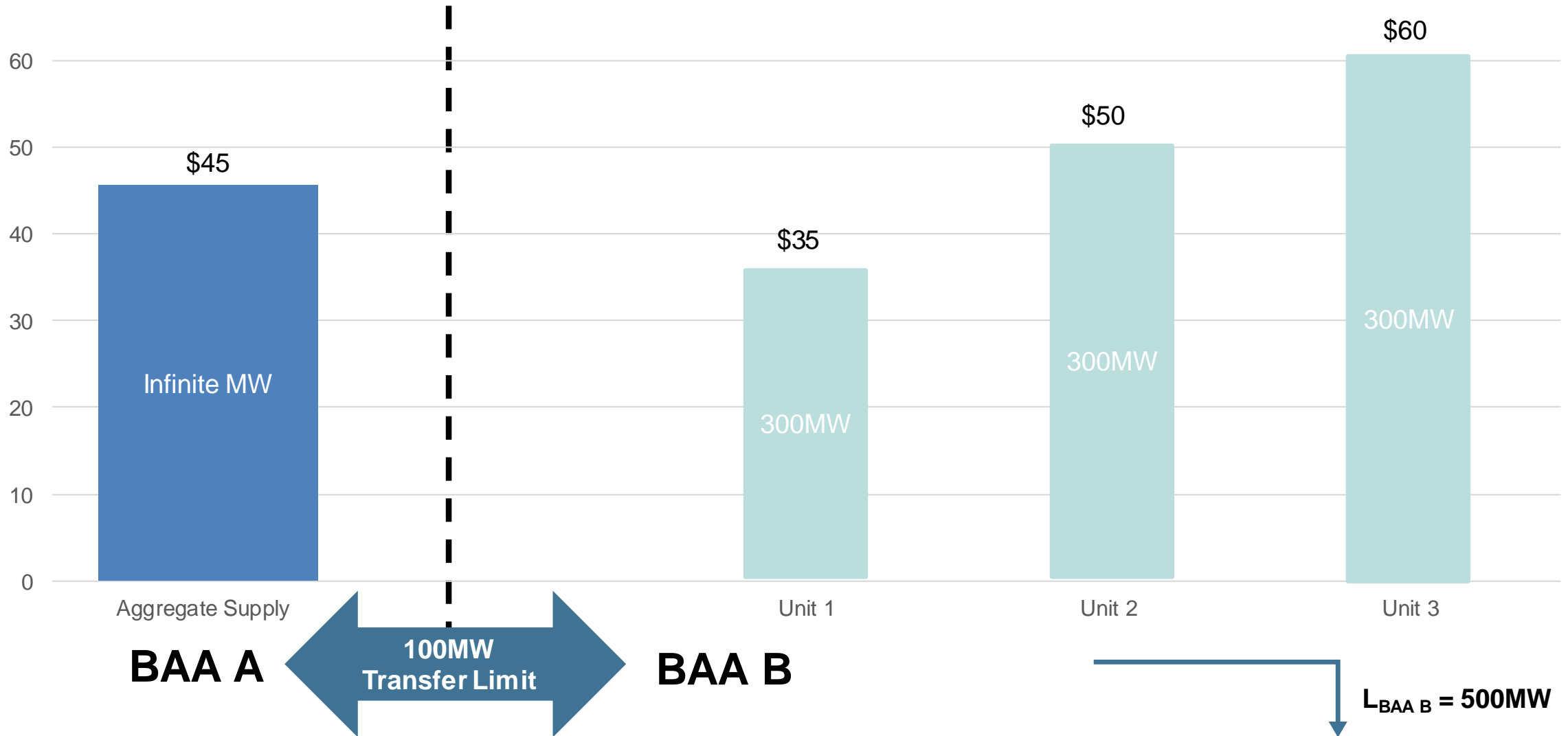
- The DCPA indicates where, and through what sub-market, suppliers can exercise market power
- In uncompetitive conditions, a supplier attempting to exert market power could be dispatched and the uncompetitive offer would
 - impact clearing prices
 - yield incrementally profitable outcomes for the supplier
- The competitive LMP serves as
 - a proxy for competitive prices and
 - the efficient cut-off point between not exercising and exercising market power

Bids above the CLMP are mitigated to the higher of the DEB or CLMP

Resource	Bid (\$/MWh)	CLMP (\$/MWh)	DEB (\$/MWh)	Offer passed to market	Rule applied
Unit 1	35	45	25	\$35/MWh	Bid < CLMP
Unit 2	50	45	35	\$45/MWh	CLMP > DEB
Unit 3	60	45	50	\$50/MWh	DEB > CLMP

- Bids only get mitigated if they could impact market outcomes when dispatched:
 - **Unit 1 does not get mitigated** even though its offer exceeds its DEB
 - **Unit 3 does need to be mitigated** just in case dispatch deviates between the MPM and binding market run

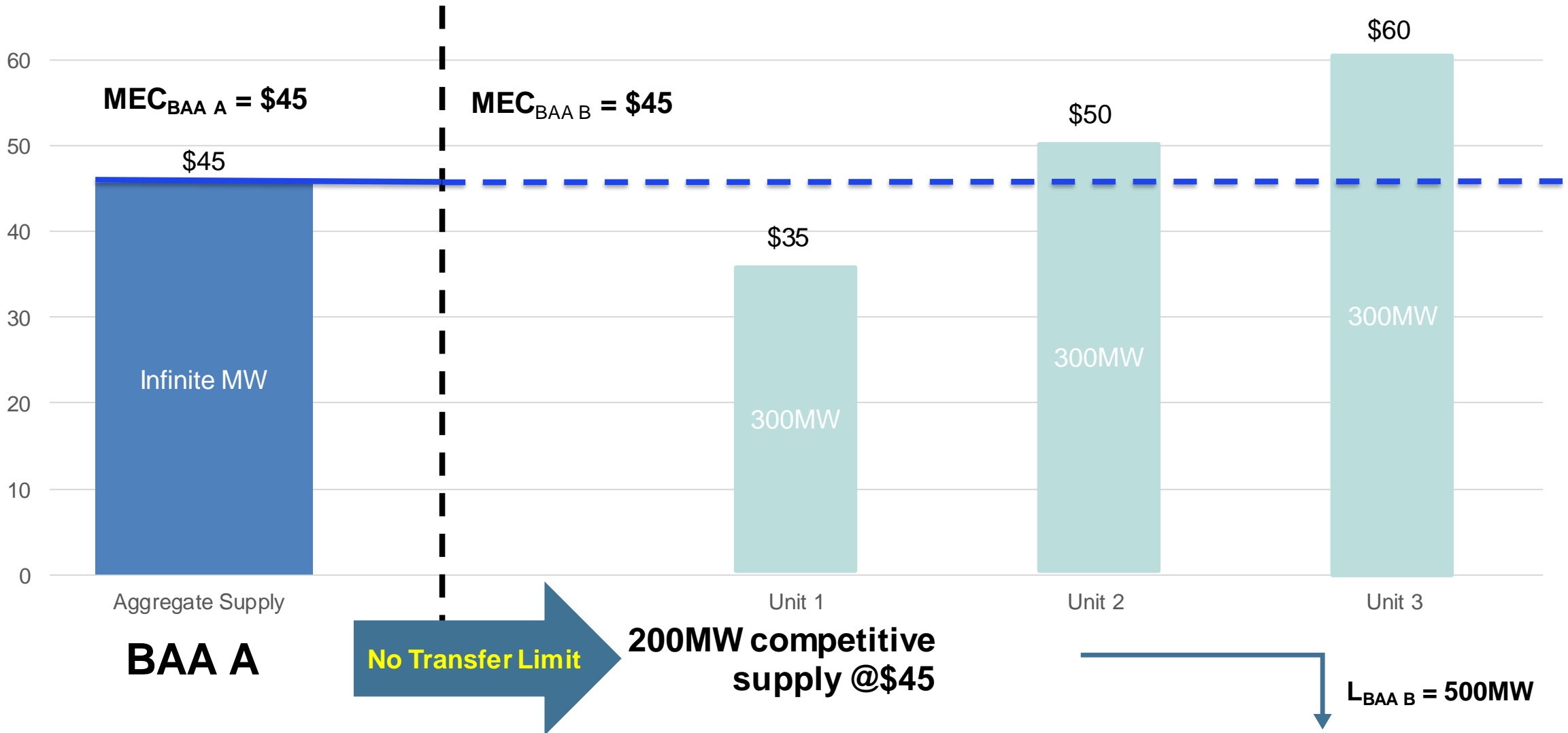
Example set up



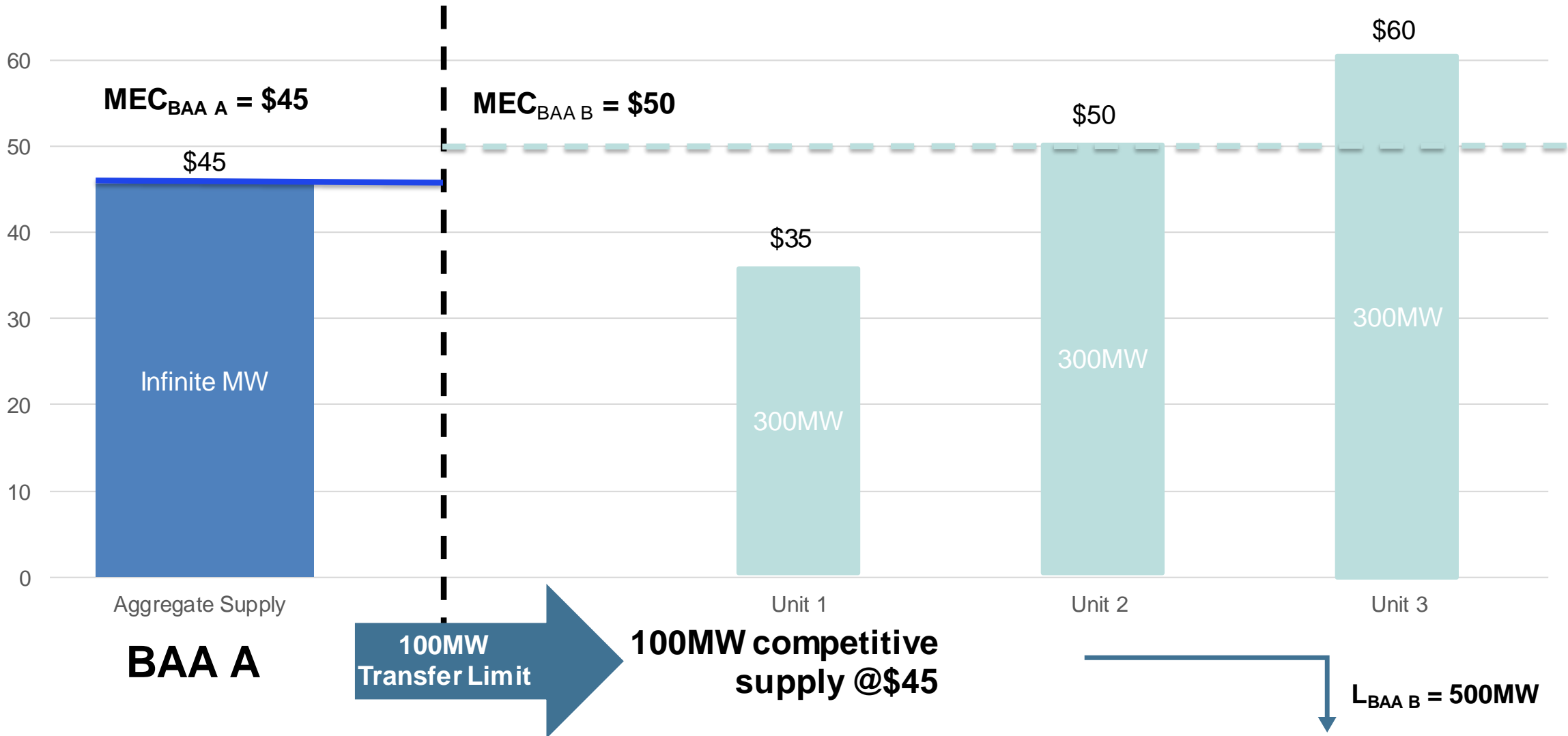
Bids > CLMP indicate market power exercise

- The CLMP would be the prevailing price if the relevant constraints were not enforced
- When constraints are enforced, uncompetitive offers clear **and impact prices**
 - We would not expect to see a change in dispatch from a supplier not exercising market power
 - We would expect to see an increase in dispatch from a supplier exercising market power

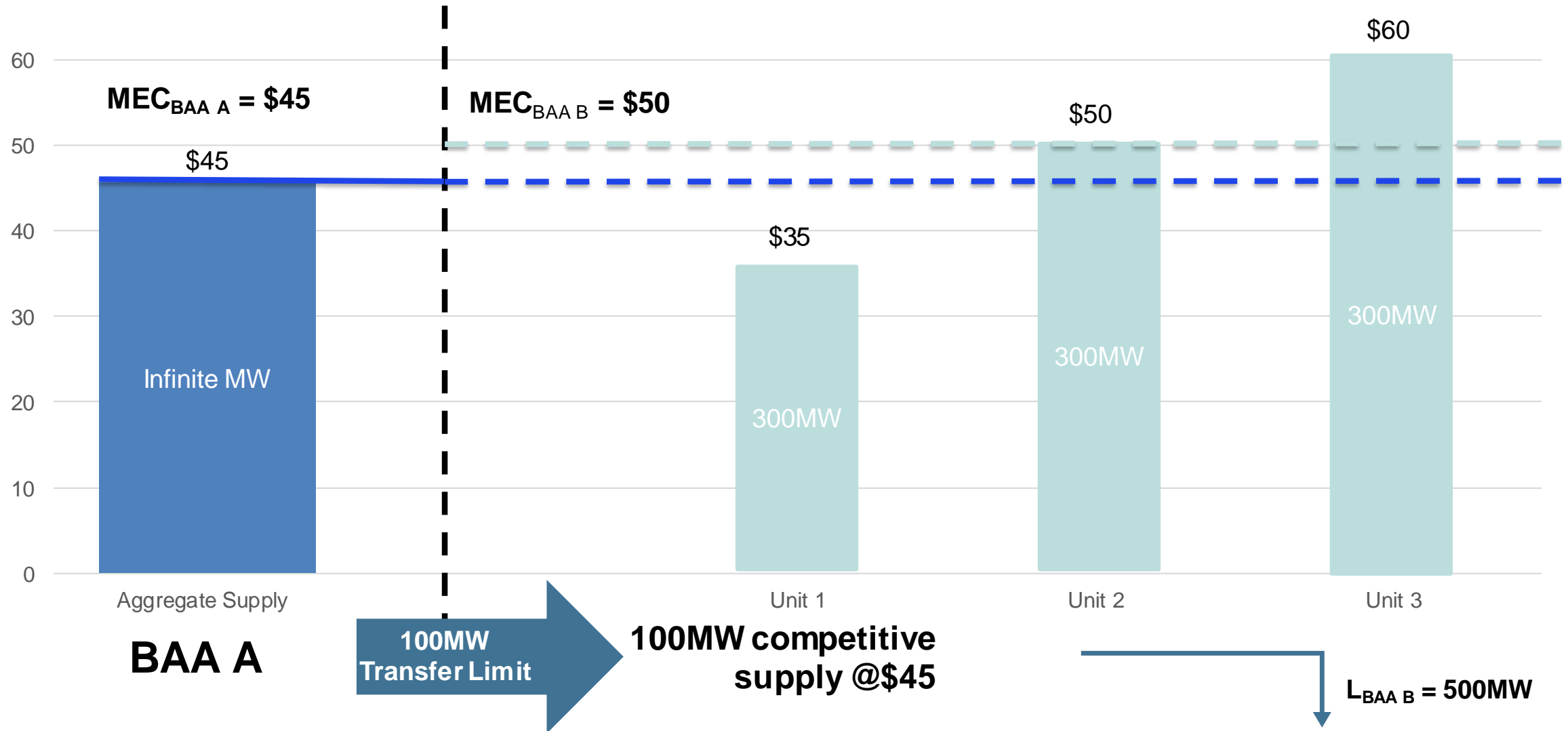
Without a transfer limit, the MEC reflects competitive supply



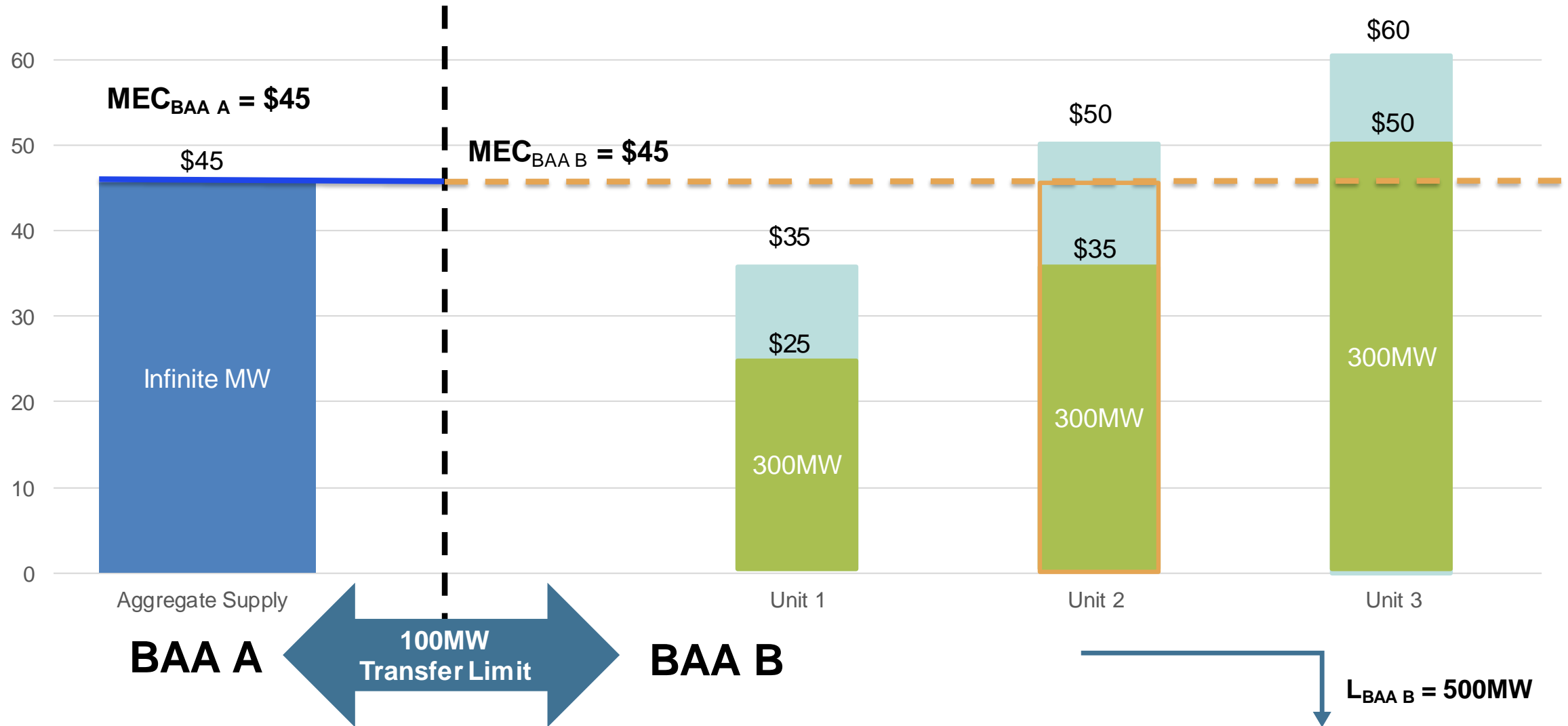
When the transfer limit is enforced, we see an increase in dispatch from G2



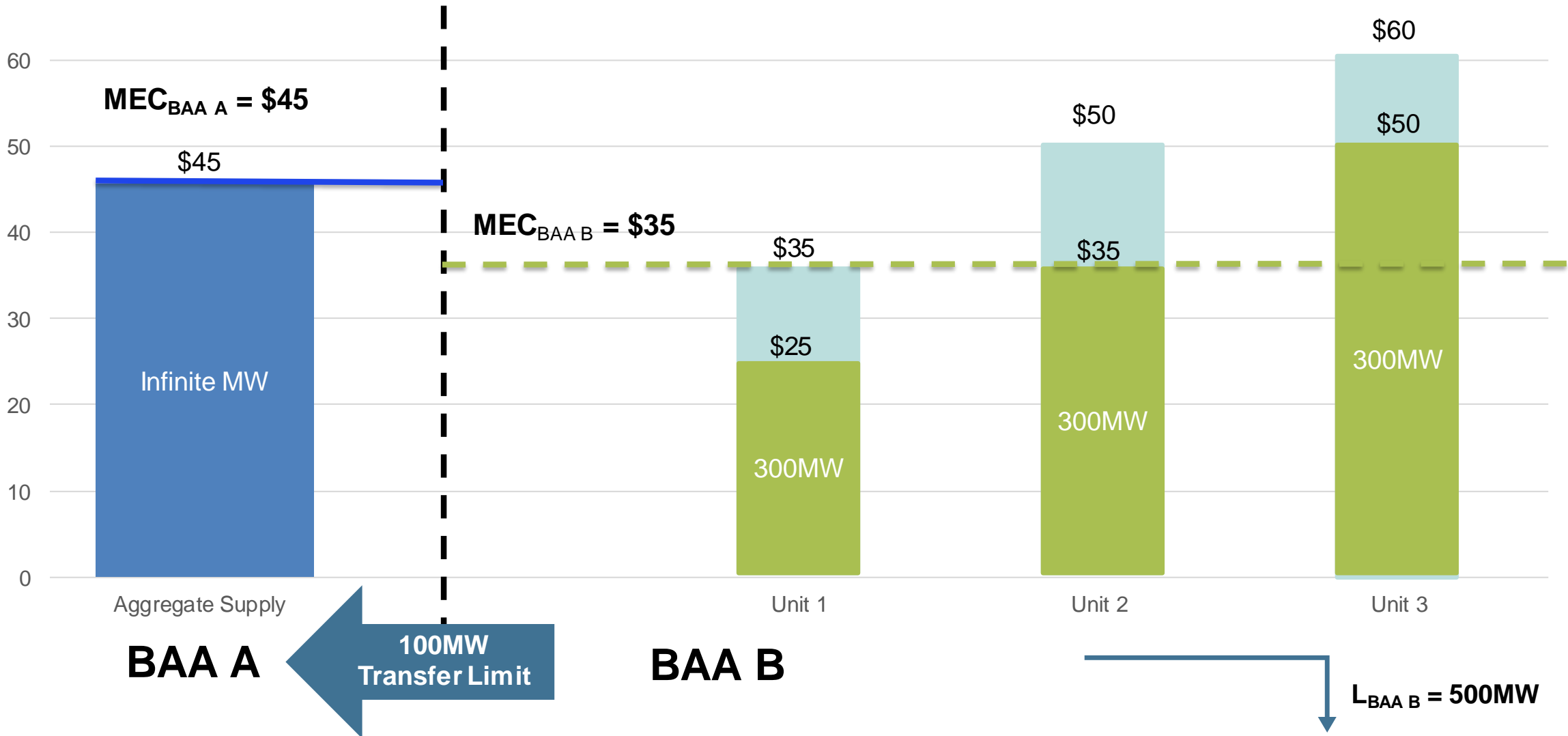
Unmitigated, BAA B is price separated from BAA A



When resources in BAA B are appropriately mitigated,



The solution changes if G2 is mitigated down to the DEB instead of the CLMP



The CLMP limits mitigation to only what is necessary to offer competitive counter-flow to a non-competitive constraint

- Bids from units with market power but below the CLMP indicate the bidding unit is not exercising market power
 - EX: Unit 1 does not benefit from increasing its offer price above its DEB, nor does the inflated offer above its DEB impact market prices
- Mitigating an offer below the CLMP could economically displace supply that does not have the ability to exercise market power, and mute efficient price signals

Together, the DCPA and competitive LMP reduce the potential for over-mitigation

- **DCPA reduces over-mitigation in competitive conditions** by allowing market-based prices to prevail in competitive conditions
 - Reduces frequency of mitigation
 - Precision relies on definition of pivotal, elasticity of residual supply
 - Impact depends on how mitigation is implemented
- **Competitive LMP reduces over-mitigation in conditions when suppliers have the ability to exercise market power**
 - Reduces impact of mitigation
 - Precision relies on being able to accurately identify the competitive contribution to the CLMP

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- 3. Define conditions when market power should be mitigated:** suppliers have the ability to exercise market power and the offer level indicates economic withholding ✓

OPPORTUNITIES FOR EVOLUTION

FERC approved MPM philosophies are fairly similar in principle

DCPA + CLMP	Conduct and Impact
<p>Competitive offer =</p> <ul style="list-style-type: none">• Cost-based offer, validated against reference levels• Prevailing market price absent the binding constraint (unlikely to impact market prices)	<p>Competitive offer =</p> <ul style="list-style-type: none">• Cost-based offer, validated against reference levels• Market-based offer that cannot impact prevailing market prices
<p>Conditions for mitigation = barriers to competition</p> <ul style="list-style-type: none">• Ability of suppliers to exercise market power due to constrained competition• Offer prices (in excess of competitive levels) have the ability to impact market prices	<p>Conditions for mitigation = economic assessment</p> <ul style="list-style-type: none">• Potential profitability of offer prices that exceed cost-based offers• Profitability negatively impacts consumers
<p>Mitigation procedure =</p> <ul style="list-style-type: none">• Mitigated to max (cost-based offer, competitive market price)	<p>Mitigation procedure =</p> <ul style="list-style-type: none">• Mitigated down to cost-based offer

But somewhat divergent in practice

DCPA + CLMP

- The impact of mitigation should be limited to only what is necessary to resolve a non-competitive constraint (no benefit from withholding, no market impact)
- Supply offers can reflect an offer value that does not result in economic withholding

- The market-based price in structurally competitive areas serves as a proxy for interval specific market conditions

Conduct and impact

- Impact of mitigation should be limited to instances when the supplier benefit and/or consumer harm can be identified
- Supply offers can reflect an offer value that does not harm consumers, or benefit the supplier
- Threshold design may be static, and/or based on historical structural evaluation

Competitive LMP facilitates a computationally simple solution

- Bids below the competitive LMP are unlikely to impact market prices, so no need to test the impact of each resource in uncompetitive conditions
- Only mitigating to what is necessary to provide counter-flow avoids risk of economic displacement and re-dispatch between the MPM run and the binding market run
 - Basically, we replace what could otherwise be guess-and-check process with a one-step procedure that estimates the cutoff value where a supply offer would fail an impact test

Solutions to reduce potential sources of type I/type II error : **CLMP**

- Potential for error if the way we determine the BAA-level MPM contribution to the competitive LMP is wrong, we risk
 - Over-mitigating: ($CLMP_{\text{efficient}} > CLMP_{\text{identified}} > DEB$)
 - Under-mitigating: ($CLMP_{\text{identified}} > CLMP_{\text{efficient}} > DEB$)
- Solutions associated with increasing the precision of the CLMP reduce both type I and II error:
 1. Consider a grouping methodology to derive the efficient MEC for mitigation
 2. Consider characterization of the pivotal supplier

Solutions to CLMP problem statements that address the potential for type I errors only

- Potential over-mitigation if suppliers are getting mitigated when they do not have the ability to exercise market power
 - Solution: Small fish swim free
- Potential over-mitigation if suppliers are getting over-mitigated when the CLMP serves the binding mitigation floor
 - Solution: Grouping approach
 - Stakeholder recommended solution: Add an impact threshold to the CLMP
- Potential trade-offs:
 - Increase in under-mitigation
 - Computational intensity

Remember: offers above the CLMP impact market outcomes.

In mitigating down to $CLMP + \$X$, the $\$X$ represents an impact threshold

Solutions to reduce potential sources of type I/type II error : **DEB**

- Potential for over-mitigation/under-mitigation occurs if the DEB is greater/less than a resource's true cost-based offer
- Existing solutions:
 - Only mitigate bids above the CLMP
 - Opportunities for DEB customization, adjustments
- Stakeholder recommended solution: add impact test to CLMP
 - May not solve the problem
 - May increase type II error

How would we solve a resource-specific problem with modifications to the CLMP?

Example: Competitive LMP reflects over-supply of VERs

- If the CLMP = \$0
 - what would the ‘impact adder’ need to be?

Remember: today, a location specific CLMP applies to all resources at the relevant pricing node

Resource	DEB	Real cost	Problem statement	CLMP ‘impact adder’
Gas 1	\$55	\$50	DEB > cost > CLMP	(-\$5)
Gas 2	\$70	\$75	Cost > DEB > CLMP	\$5
Hydro 1	\$197	\$230	Cost > DEB > CLMP	\$33

Example: formulating an impact adder to VER-informed CLMP

	Type of formulation	Policy challenges
Solution 1: common composite function <ul style="list-style-type: none"> • min CLMP *200%, CLMP + \$300 • CLMP + \$25 	static	<ul style="list-style-type: none"> • % threshold would not be effective when CLMP = 0 • \$300 adder would over-estimate all costs • \$25 adder would not solve the problem
Solution 2: CLMP + max error (\$33) or average error (\$11)	Dynamic: <ul style="list-style-type: none"> - Needs to be based on bids submitted that interval - Requires knowledge of real cost-based offers vs DEB values 	<ul style="list-style-type: none"> • Increases potential for type II error • Any formulation besides max error would not solve the problem • Information on real costs could be used to update DEBs through existing processes
Solution 3: resource specific	Dynamic, and resource specific: <ul style="list-style-type: none"> - CLMP is not resource specific 	<ul style="list-style-type: none"> • How much market power are we willing to tolerate • DEB multipliers serve this purpose already

Existing solutions: Opportunities for DEB adjustments

- **DEB multipliers:** by default, most DEB calculations use a multiplier to account for most regular cost variation
 - Resource type multipliers can be evaluated/modified via policy process
 - SCs can establish a resource-specific multiplier via the negotiated DEB process
- **Resource-specific hourly/daily cost adjustments** via the reference level change request process
 - Responsibility is on the SC to ensure that their DEB inputs and formula capture their costs

Existing solutions: Opportunities for DEB adjustments (cont.)

- ISO-initiated modifications in exceptional circumstances
 - Same-day gas price increases
 - Multiple manual requests
 - Frequently mitigated unit adjustment

Key takeaways

1. LMPM and BAAMPM are necessary and distinct market tests; local market power mitigation alone is not sufficient.
2. Price separation between 'markets' alone does not indicate market power; *just as conduct alone is not sufficient, structure test alone not sufficient*
3. Overall (or relative) level of offer prices does not indicate ability and/or exercise of market power; *absolute price level is not a reflection of market power exercise*
4. There are existing tools to prevent mitigation below cost.

For reference

- All meeting material and notices are available on the Price Formation Enhancements Initiative webpage:
<https://stakeholdercenter.caiso.com/StakeholderInitiatives/Price-formation-enhancements>
- If you have any questions, please contact Brenda Marquez bmarquez@caiso.com, or ISOStakeholderAffairs@caiso.com

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