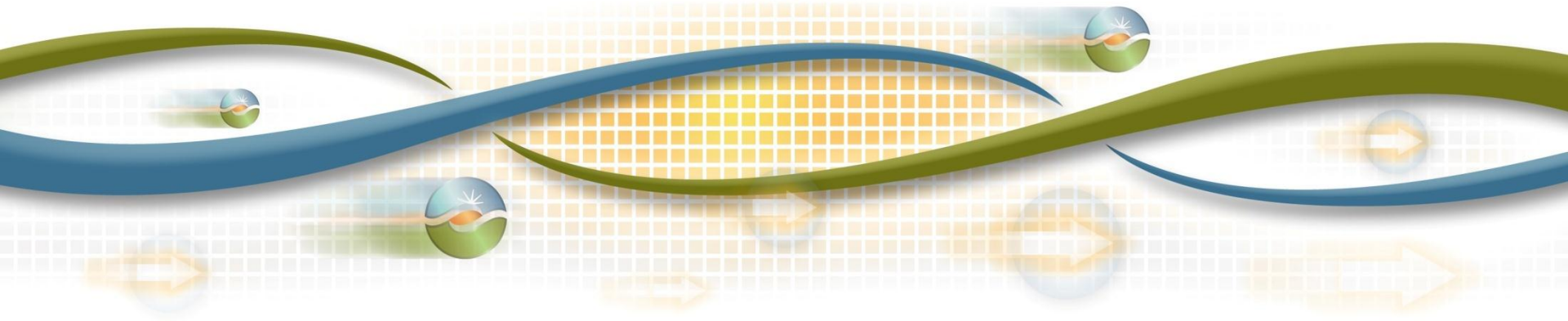




California ISO
Shaping a Renewed Future

Energy Imbalance Market Bid Cost Recovery Technical Workshop

Conference Call: September 16, 2013



EIM Entity cannot opt out of unit commitment

- Change will be reflected in Draft Final Proposal
- This workshop is based on the Draft Final Proposal

The ISO markets recognize three basic components of an energy bid.

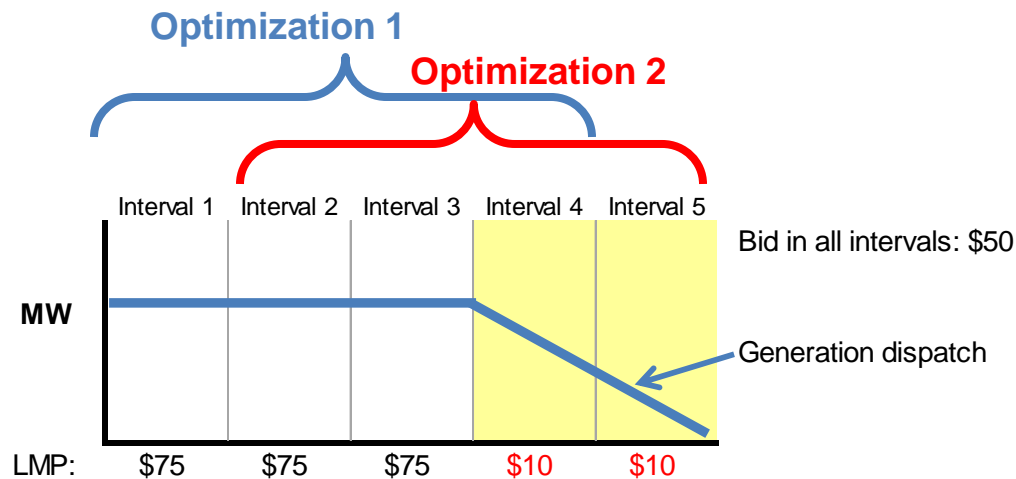
- Generating units submit the following three costs:
 - Energy output above minimum operating level
 - Start-up
 - Operating at minimum output level
- Market allows participants to separately submit these costs so market efficiently considers incremental energy costs once it commits a generator.

Revenues may not cover total costs because of “lumpy” unit commitment.

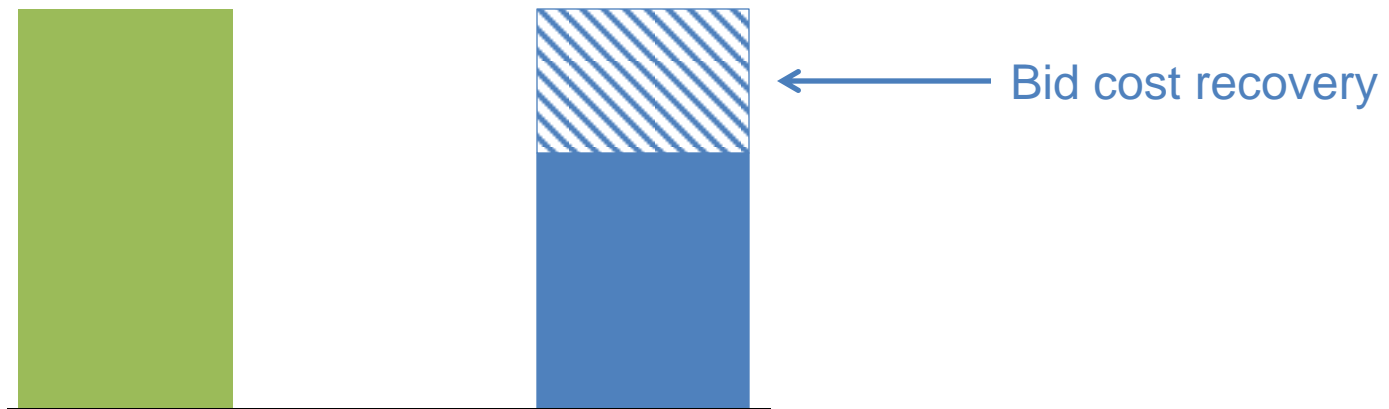
- In this event, market has two choices:
 - (1) Relatively higher energy prices
 - (2) Commit additional generator, lowers energy prices but generator’s minimum load and start-up costs not covered
- Market will pick (2) if it results in lower total market costs, but energy prices may not cover minimum load and start-up costs

Revenues in the real-time market may not cover total costs for two additional reasons, both related to ramping

- First, real-time market cannot forecast perfectly (e.g., change in load level). This can lead to prices being inconsistent with a generator's bid until the generator can ramp in response dispatch
- Second, real-time optimization occurs over several intervals looking ahead that are always changing.
 - For example, generator economic at different output levels in successive optimizations, price will be inconsistent with bid as generator ramps



Bid cost recovery provides for a make-whole payment when a resource's revenues do not cover its costs.



All market costs

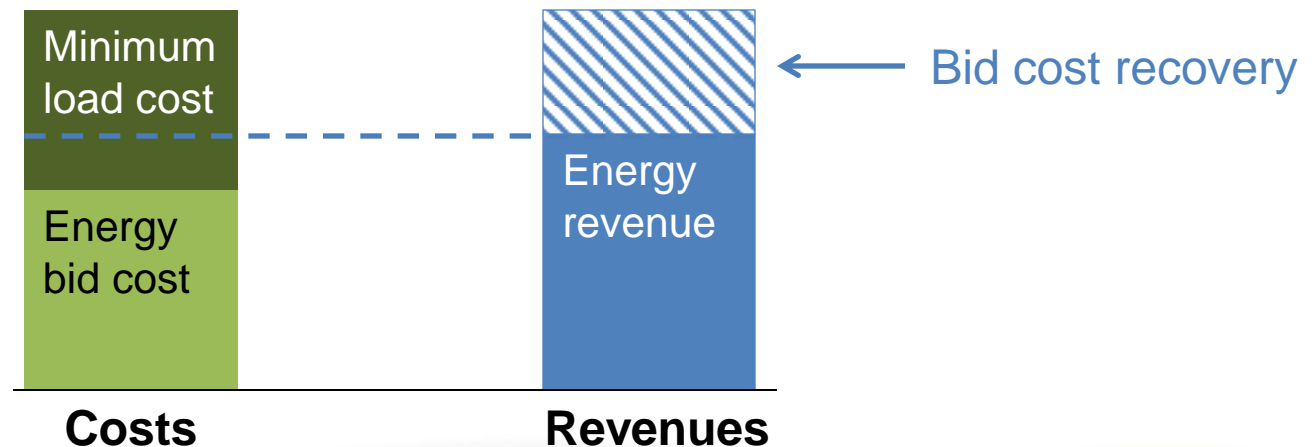
- Start-up costs
- Minimum load costs
- Energy bid costs
- A/S bid costs (ISO)
- GHG bid costs (EIM)

All market revenues

- Energy revenues
- Flexible ramping constraint revenues
- Ancillary Services Revenue (ISO)
- GHG payments (EIM)

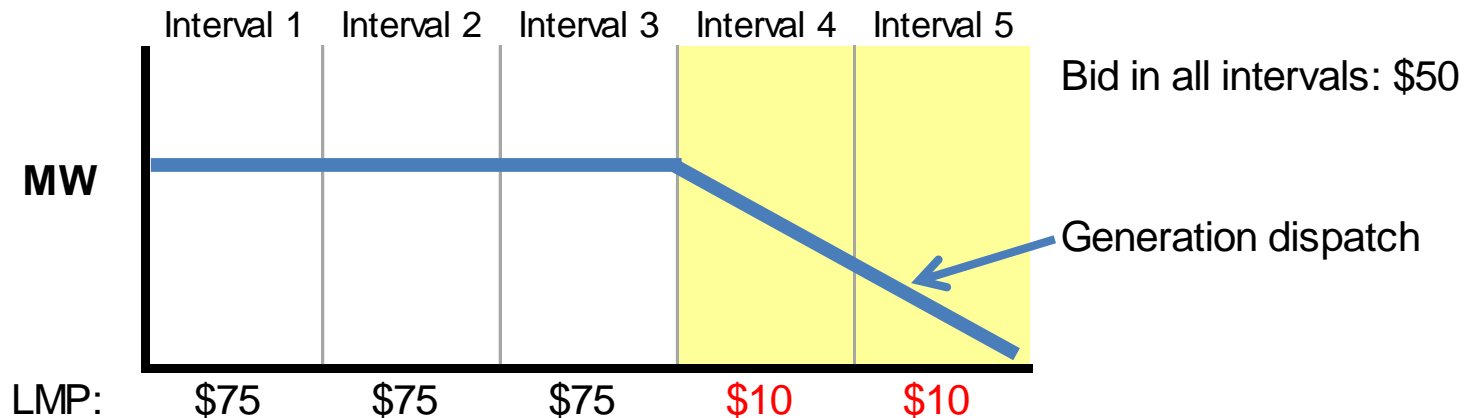
Example 1: Bid cost recovery is needed when market revenues do not cover minimum load costs.

- Locational marginal price based on energy bids, but does not incorporate minimum load and start-up costs.
- Example:
 - LMP is greater than resource's energy bid cost so energy revenues are greater than bid costs.
 - However, adding in minimum load costs result in revenue shortfall so resource receives bid cost recovery.



Example 2: Bid cost recovery is needed when market energy revenues do not cover energy bid costs.

- Generator is eligible for bid cost recovery if there is a shortfall over the entire day in the real-time market.



Bid Cost Recovery Mitigation Measures initiative

- Approved by board in December 2012
- Will be filed with FERC along with September 2013
- Supplements protections from emergency filings in 2011
- Includes metrics to adjust BCR payments in the event:
 - Energy is dispatched but not delivered
 - Generator persistently deviates from dispatch to inflate bid cost recovery payments
 - Generator does not shutdown when instructed
- Implementation planned for Spring 2014
- Additional information available at <http://www.caiso.com/informed/Pages/StakeholderProcesses/BidCostRecoveryMitigationMeasures.aspx>

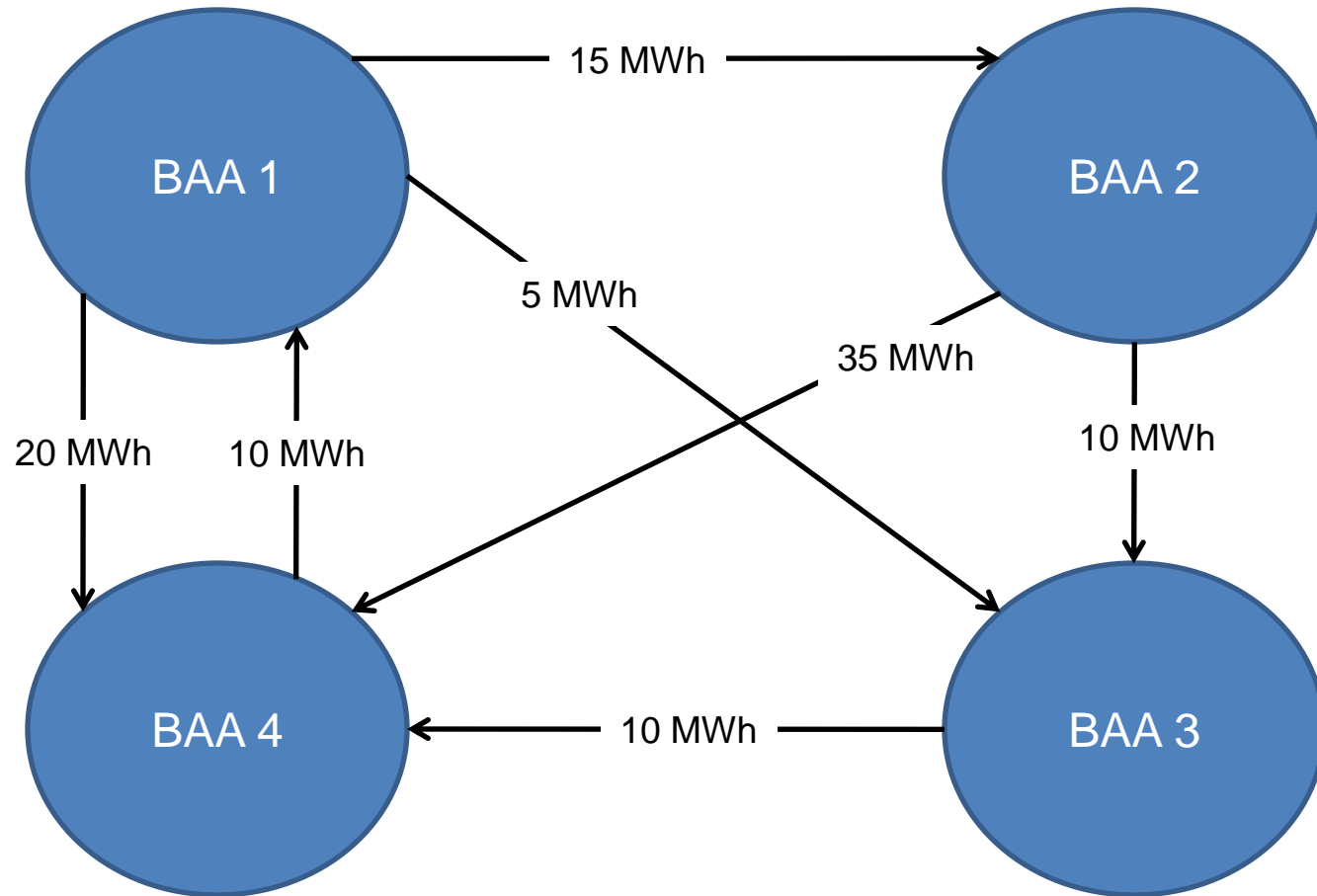
Example of Bid Cost Recovery

All costs and revenues are netted over the day

	Cost	Daily Revenue	BCR
Generator A	\$ 2,200	\$ 2,200	\$ -
Generator B	\$ 1,800	\$ 1,300	\$ 500
Generator C	\$ 2,000	\$ 3,100	\$ -
Generator D	\$ 1,500	\$ 1,300	\$ 200
Generator E	\$ 1,800	\$ 1,650	\$ 150
Total			\$ 850

Calculation for BAA 1

Example – EIM 5-Min Transfers between BAAs in EIM



Assumptions to Calculate BCR transfer between BAA for a five minute interval

MWh	BAA 1	BAA 2	BAA 3	BAA 4
IIE	90	105	40	90
UIE	-60	-75	-40	-145
UFE	10	-5	-10	0
EIM Transfer Out	30	30	0	0
EIM Transfer In	0	0	5	55
EIM Transfer Denominator	100	110	N/A	N/A

Calculate the Bid Cost Recovering by BAA for a five minute interval

	BAA 1	BAA 2	BAA 3	BAA 4	Total
Daily BCR Recovery	\$850	\$400	\$100	\$150	\$1500
5-Min BCR	\$2.95	\$1.39	\$0.35	\$0.52	\$5.21
5-Min Transfer	30 MWh Export	30 MWh Export	5 MWh Import	55 MWh Import	
Proportion Out	30/100	30/110	N/A	N/A	
Transfer Out	(\$0.89)	(\$0.38)	\$0	\$0	(\$1.26)
Proportion In	N/A	N/A	5/60	55/60	
Transfer In	\$0	\$0	\$0.11	\$1.16	\$1.26
5-Min Total	\$2.07	\$1.01	\$0.45	\$1.68	\$5.21

Transfer calculated and settled on a 5 minute basis

Assumptions to Calculate BCR transfer between BAA for a next five minute interval

MWh	BAA 1	BAA 2	BAA 3	BAA 4
IIE	90	105	40	90
UIE	-60	-75	-40	-145
UFE	10	-5	-10	0
EIM Transfer Out	-30	0	-5	0
EIM Transfer In	0	10	0	25
EIM Transfer Denominator	100	N/A	55	N/A

EIM Transfers Change

Calculate the Bid Cost Recovering by BAA for a five minute interval

	BAA 1	BAA 2	BAA 3	BAA 4	Total
Daily BCR Recovery	\$850	\$400	\$100	\$150	\$1500
5-Min BCR	\$2.95	\$1.39	\$0.35	\$0.52	\$5.21
5-Min Transfer	30 MWh Export	10 MWh Import	5 MWh Export	25 MWh Import	
Proportion Out	30/100	N/A	5/55	N/A	
Transfer Out	(\$0.89)	\$0	(\$0.03)	\$0	(\$0.92)
Proportion In	N/A	10/35	N/A	25/35	
Transfer In	\$0	\$0.26	\$0	\$0.65	\$0.92
5-Min Total	\$2.07	\$1.65	\$0.32	\$1.18	\$5.21

Transfer calculated and settled on a 5 minute basis