

CAISO System Market Power Mitigation

Simon Ou & Tyson Brown



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Agenda

1. Need for a System Market Power Mitigation Initiative
 - Market Conditions & Impacts
 - Initiative Principles & Objectives

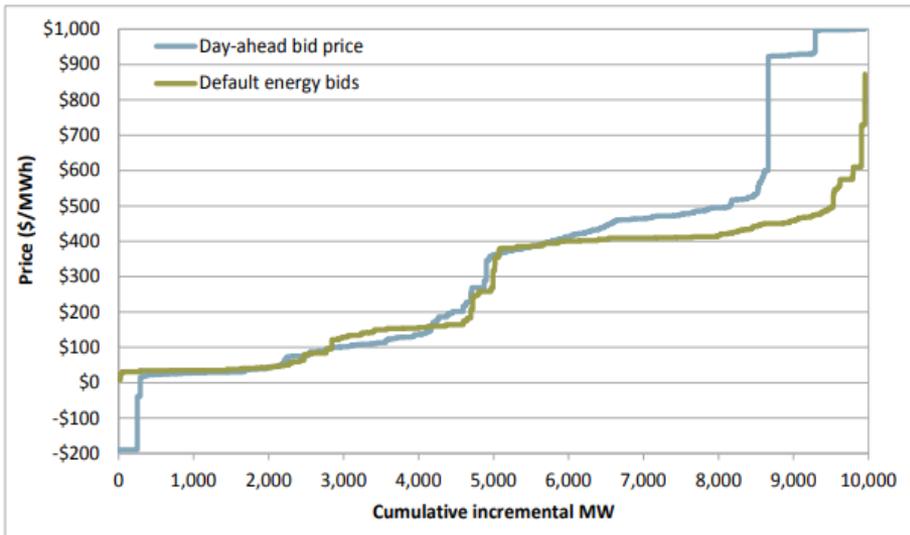
2. PG&E's Straw Proposal for System Market Power Mitigation
 - Illustrative Proposal for Import DEBs

3. Conclusions & Takeaways



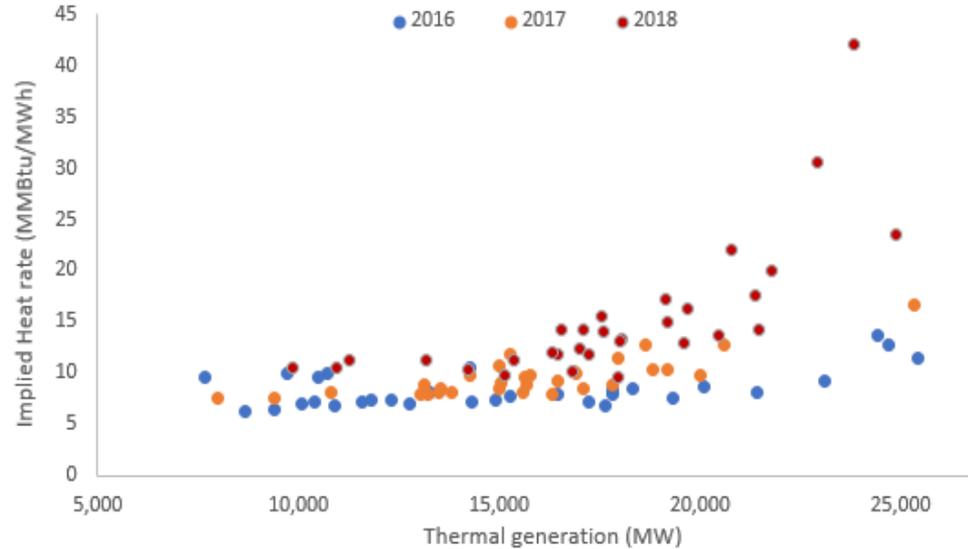
Market Conditions & Impact

Figure 7.2 Net sellers supply input bid and reference, July 24, 2018 hour 20



Source: DMM 2018 Annual Report

Peak Daily Implied Heat Rate vs. Thermal Generation in July



Source: CAISO OASIS Data

Table 1. Day Ahead Market System Costs due to non-competitive pricing in 2017 and 2018

Year	Number of Hours*	Weighted Avg Price (\$/MWh)	Average Implied Heat Rate	Calculated Competitive Price (\$/MWh)**	Load (MWh)	Excess Rent (\$M)
2017	42	\$230	33.28	\$142	1,651,646	\$145
2018	15	\$570	25.75	\$449	676,269	\$82

* Non-competitive hours were counted as day ahead intervals in which the implied heat rate was >20 and the amount of thermal generation was <25,000 MW

** The competitive price was calculated using a default implied heat rate of 20 multiplied by the greater of the PGE2 or SCE1 gas price

Source: CAISO OASIS Data



Need for System MPM Initiative

Principles of System MPM

- Maintain efficient dispatch
 - Default Energy Bid would not be below marginal + opportunity cost
 - Mitigation limited to hours when market power exists
- Just and reasonable prices
 - Energy prices reflect marginal costs of incremental energy

Proposed Objectives of this Initiative

1. Stakeholder-vetted metric for measuring the existence of market power
2. Evaluate different mitigation measures and select based on the risks and benefits of different options



Elements of System MPM

Elements of System MPM

1. Measure to determine the existence of market power
2. Mitigation Measures
 - Bid Caps
 - Default Energy Bids
 - Internal resources
 - Imports

Existing Initiative/Tools

1. Analysis of Structural System-Level Competitiveness
2. Import Bid Cost Verification
3. CCDEBE/Local MPM



System Market Power Mitigation Initiative: leverage existing methodologies and tools



PG&E Straw Proposal - System Market Power Mitigation

1. Market Power Test - 3 Pivotal Supplier Test conducted in all hours based on the DMM's Methodology
2. All Internal Supply Bid's subject to mitigation if it exceeds 125% of DEB
 - Negotiation of DEB with DMM available in advance if opportunity costs not reflected in the 125% buffer
 - Opportunity for ex-post recovery at FERC if mitigated below actual costs
3. Import bids subject to mitigation (including DEB) or costs justification rules



Elements of *any* Default Energy Bid

1. Commodity Cost (e.g. Natural gas, carbon cost, etc.)
2. Delivery Cost (e.g. pipeline transport charge, etc.)
3. Opportunity Cost (e.g. limited starts, future energy value)

How these elements apply to Imports?

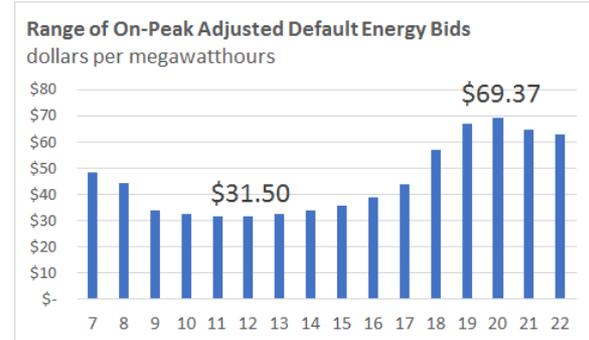
1. Trading Hub Index Price(e.g. Palo Verde On Peak, etc.), shaped by CAISO net load forecast
2. Transmission Tariff Rate (e.g. BPA Non-Firm Rate)
3. Max of the Delivered and Shaped trading hub price and the 75th percentile of the LMP at that import node.



Illustrative Proposal: Import DEB

	Source Hub	Palo Verde	
	Sink Intertie	Palo Verde	
A	Transmission Rate**	0	
	TOU	On Peak	Off Peak
	Market	DAM	DAM
B	Price (\$/MWh)	\$43.11	\$20.92
C=A+B	Delivered Price (\$/MWh)	\$43.11	\$20.92
D	Net Load Average (MWh)	17,333	20,119

On Peak



Off Peak

	Hour	1	2	3	4	5	6	23	24
E	CAISO Net Load Forecast (MWh)	20,917	19,713	18,929	18,454	18,555	18,951	23,603	21,833
F	Opportunity Cost Adder (\$/MWh)	\$ 37.50	\$ 35.44	\$ 34.38	\$ 34.20	\$ 35.43	\$ 40.22	\$ 43.51	\$ 39.77
G=(1+(E-D/D))*C	Default Energy Bid (\$/MWh)	\$ 21.75	\$ 20.50	\$ 19.68	\$ 19.19	\$ 19.29	\$ 19.70	\$ 24.54	\$ 22.70
Max(F,G)	Adjusted DEB (\$/MWh)	\$ 37.50	\$ 35.44	\$ 34.38	\$ 34.20	\$ 35.43	\$ 40.22	\$ 43.51	\$ 39.77

*Opportunity Cost Adder is the 75 percentile of the past 12 months of LMPs at the intertie location

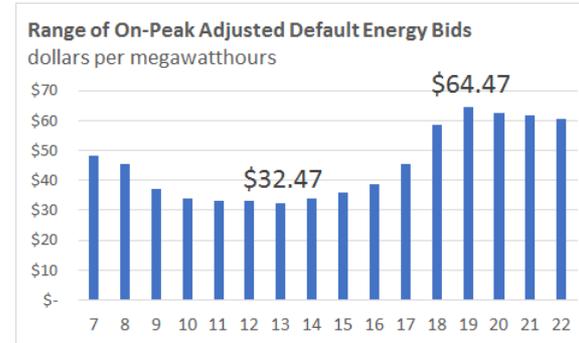
**For Palo Verde there is no transmission cost.



Illustrative Proposal: Import DEB

	Source Hub	Mid-C	
	Sink Intertie	NOB	
A	Transmission Rate**	14.45	
	TOU	On Peak	Off Peak
	Market	DAM	DAM
B	Price (\$/MWh)	\$26.92	\$25.60
C=A+B	Delivered Price (\$/MWh)	\$41.37	\$40.05
D	Net Load Average (MWh)	17,333	20,119

On Peak



Off Peak

	Hour	1	2	3	4	5	6	23	24
E	CAISO Net Load Forecast (MWh)	20,917	19,713	18,929	18,454	18,555	18,951	23,603	21,833
F	Opportunity Cost Adder (\$/MWh)	\$ 37.69	\$ 35.98	\$ 34.59	\$ 34.56	\$ 35.74	\$ 40.52	\$ 43.15	\$ 39.07
$G=(1+(E-D/D))*C$	Default Energy Bid (\$/MWh)	\$ 41.64	\$ 39.24	\$ 37.68	\$ 36.73	\$ 36.94	\$ 37.72	\$ 46.99	\$ 43.46
Max(F,G)	Adjusted DEB (\$/MWh)	\$ 41.64	\$ 39.24	\$ 37.68	\$ 36.73	\$ 36.94	\$ 40.52	\$ 46.99	\$ 43.46

*Opportunity Cost Adder is the 75 percentile of the past 12 months of LMPs at the intertie location

**BPA transmission rate for non-firm energy available at:

<https://www.bpa.gov/Finance/RateInformation/RatesInfoTransmission/FY18-19/2018%20Rate%20Schedule%20Summary.pdf>



Key Takeaway

1. There is a problem right now and it is only getting worse.
2. Instead of debating about how big the problem is, we should work on implementing a solution that maintains the principles and objectives previously listed.
3. We need to work now so that we have vetted solutions in place before the problem worsens.

Thank You!

