Critical Issues For Western Organized Markets:

Fast-Start Pricing

Fast Start Pricing: Key Takeaways

- As of 2022, all bilateral markets and all FERC-jurisdictional organized markets, *except those operated by CAISO*, include the cost of starting and operating gas peakers in market clearing prices (fast start pricing)
- Continuing to exclude gas peakers from CAISO market clearing prices has numerous consequences
  - ***Suppresses the price signal for the installation and availability*** of resources that can efficiently displace gas peakers, harming aggregate societal benefits (from an economic, environmental and reliability perspective)
    - ***Reduces market compensation for battery resources*** by **$15/MWh** or **34%**
    - ***Reduces market compensation for wind resources*** by **$2.30/MWh** or **9%**
  - ***Undermines carbon pricing programs****, by excluding some of the highest emitting resources from market clearing prices, suppressing the incentives to displace these resources with clean supply*
  - ***Results in discriminatory side payments*** (uplift) to thermal units to cover their daily costs, which have totalled about **$125M/year** in CAISO BAA alone
  - ***Results in inter- and intra-regional cost shifts*****:**
    - ***Increases retail rates in the Northwest region*** *by lowering compensation for sales to the CAISO BAA by as much as* ***$93M/year*** *to* ***$185M/year***
    - ***Increases retail rates in the Southwest region*** *by lowering compensation for sales to the CAISO BAA by as much as* ***$95M/year*** *to* ***$235M/year***
    - ***Reduces wholesale costs for load-serving entities*** *in the CAISO BAA, by up to* ***$900M*** *to* ***$1.8B,*** *as these entities are collectively large wholesale purchasers – during the hours that gas peakers are operating – from in-state merchant generation and from the rest of the western region (forward, day-ahead, and real-time)*

Impact Of Price Formation Choices:

Excluding Gas Peakers From Electricity Prices (“Fast-Start Pricing”)

History Of Fast Start Pricing In Organized Markets

- Bilateral markets: parties negotiate transaction price that reflects all short-term costs
  - Including the cost of starting and operating thermal units, or the costs avoided by the transaction
- Organized markets historically calculated prices as just the additional cost to serve "the next MW "
  - Natural gas peakers are usually operated at full output (*i.e.,* inflexible), and were often excluded from market prices (as they were not considered flexible to meet the next MW of demand)
  - Some organized markets (*e.g.,* MISO, NYISO) recognized that excluding gas peakers resulted in market prices that did not reflect the marginal cost of electricity, and began to make changes to the way prices in those markets were calculated
- In 2016, FERC issued a NOPR to require all organized markets to include peaking units in prices ("fast-start pricing")
  - *"some current RTO/ISO practices may fail to accurately reflect the marginal cost of serving load because fast-start resources are inappropriately prevented from setting prices."* FERC NOPR in Docket No. RM17-3, at P37
  - FERC terminated NOPR, but opened proceedings requiring SPP, NYISO and PJM to adopt fast-start pricing
- CAISO and DMM opposed fast-start pricing NOPR
  - CAISO has more recently indicated it *may be open to considering* fast-start pricing as part of EDAM
  - DMM intervened to oppose fast-start pricing in SPP, NYISO and PJM dockets; has not indicated any change in its position

As of 2022, all FERC-jurisdictional organized markets include the cost of gas peakers in market prices, except for the markets operated by the CAISO

Analysis Of Impact Of Excluding Gas Peakers From Market Prices

- Powerex contracted with EnergyGPS to determine the implications of fast-start pricing in the west
- Public Power Council joined this effort shortly afterwards
- EnergyGPS collected and analyzed extensive data on gas peaker operations throughout the West (2017-2020)
  - Used EPA granular gas peaker output data
  - Identified short-duration dispatch of each natural gas unit for every hour of each year
  - Using local natural gas prices, calculated cost of starting and operating gas peakers to meet short-duration dispatch
- Key questions informed by this analysis:
  - How often do gas peakers run?
  - In what seasons, and in what hours, do gas peakers run?
  - Do market-clearing prices in CAISO-operated markets reflect the cost of starting and operating these peakers?
    - If not, how much higher would market prices in CAISO-operated markets be if gas peakers were not excluded?
  - What are the price implications in CAISO-operated markets as a result of excluding the cost of gas peakers?
    - Does it harm one group of participants/ratepayers and benefit a different group? By how much?
    - Does it impact overall economic efficiency, reliability, or environmental goals of the region?

Finding 1: Gas Peakers Are Used Extensively Across The West

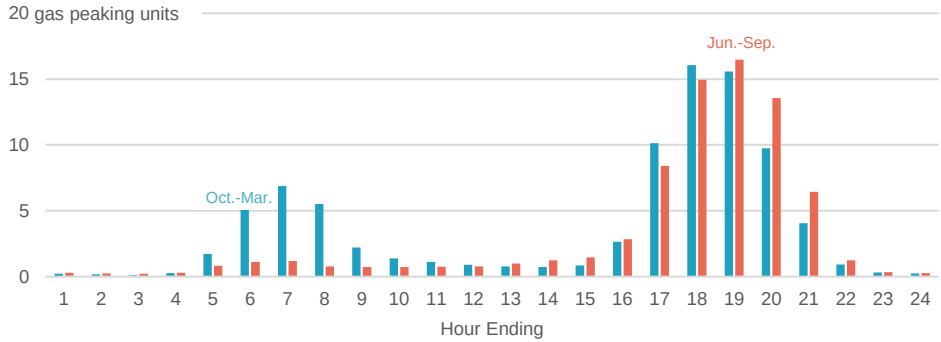
- All regions appear to dispatch gas peakers for short durations (*i.e.,* to meet peak demand) throughout the year
- Highest use is in the Southwest and in Southern California

- In California, gas peakers are used to meet:
  - Evening peak, in all seasons of the year
  - Morning peak, in fall and winter

Number Of Hours With Short Dispatch Of Gas Units

		2017	2018	2019	2020	All Hours
All WECC	Hours	6,012	6,067	5,692	5,953	23,724
	%	*68.6%*	*69.3%*	*65.0%*	*67.8%*	*67.7%*
Pacific Northwest	Hours	1,672	1,431	682	871	4,656
	%	*19.1%*	*16.3%*	*7.8%*	*9.9%*	*13.3%*
NP15	Hours	2,906	3,088	2,618	2,692	11,304
	%	*33.2%*	*35.3%*	*29.9%*	*30.6%*	*32.2%*
SP15	Hours	3,502	3,489	3,486	3,359	13,836
	%	*40.0%*	*39.8%*	*39.8%*	*38.2%*	*39.5%*
Southwest	Hours	4,597	4,251	4,248	4,313	17,409
	%	*52.5%*	*48.5%*	*48.5%*	*49.1%*	*49.6%*

Average Number Of California Gas Units On Short Dispatch



Source: EnergyGPS analysis

Finding 2: Excluding Gas Peakers Suppresses Year-Round Average Market Clearing Prices By More Than $20/MWh In Certain Hours

		Hour Ending																						
	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Average
SP15	2017	0.40	0.34	0.10	0.12	0.33	5.52	10.56	8.11	5.84	4.60	4.42	3.70	3.19	4.03	4.01	3.30	7.10	14.94	21.75	22.23	19.63	5.64	1.78	0.55	6.34
	2018	0.55	0.82	0.20	0.41	2.86	11.23	17.13	13.02	8.42	8.33	5.57	4.69	5.12	5.88	8.47	9.42	14.42	24.47	29.13	27.44	16.11	6.42	2.67	2.21	9.37
	2019	1.69	0.95	0.69	0.43	1.66	8.25	11.21	9.89	7.50	6.06	4.58	4.03	4.86	3.88	3.68	4.59	8.67	17.34	21.21	17.59	11.22	5.54	1.77	0.77	6.59
	2020	1.42	1.62	0.68	0.41	1.15	3.04	6.26	5.66	4.13	3.51	2.21	1.29	1.17	1.37	2.03	3.52	8.92	15.06	19.30	15.46	7.97	2.85	0.91	0.71	4.61
NP15	2017	0.74	0.44	0.13	0.14	0.39	3.37	6.05	3.68	2.26	1.64	1.81	1.49	2.12	1.62	1.17	1.47	6.00	13.58	19.73	16.38	9.45	3.29	0.74	0.30	4.08
	2018	0.49	0.68	0.43	0.72	1.66	5.11	6.66	5.43	2.59	0.85	1.87	2.49	1.85	2.36	1.87	2.69	5.76	11.74	15.19	11.88	7.61	2.86	0.96	0.87	3.94
	2019	0.29	0.39	0.08	0.34	0.40	3.58	5.18	4.14	2.06	1.54	0.70	1.03	1.33	1.02	0.86	1.98	4.70	11.13	12.75	9.10	5.02	1.15	0.63	0.53	2.91
	2020	0.76	0.76	0.24	0.34	0.49	2.09	3.86	2.92	1.35	0.61	0.69	0.94	1.15	0.84	0.63	1.97	5.15	10.50	12.00	7.78	3.99	1.46	0.56	0.32	2.56
Southwest	2017	0.61	0.64	0.79	0.44	0.44	1.03	3.21	5.83	8.29	6.49	3.48	2.64	1.79	1.83	2.11	2.10	2.29	2.74	4.27	5.39	5.34	4.96	2.98	1.41	2.96
	2018	0.28	0.19	0.13	0.05	0.15	0.63	1.47	2.50	2.91	2.18	1.49	0.69	0.84	0.81	1.05	1.07	1.20	1.55	1.73	1.79	1.67	1.45	0.73	0.32	1.12
	2019	0.30	0.05	0.05	0.02	0.03	0.16	0.16	0.47	1.55	1.21	0.77	0.53	0.47	0.52	0.44	0.29	0.42	0.53	0.62	0.62	0.74	0.20	0.01	0.12	0.43
	2020	0.15	0.16	0.14	0.16	0.16	0.32	0.78	0.91	1.88	2.25	1.66	1.15	1.33	0.73	0.76	0.57	0.63	0.85	0.83	0.80	0.55	0.74	0.22	0.19	0.75
Pacific Northwest	2017	0.78	0.75	0.65	0.96	0.71	1.12	2.63	3.20	4.59	4.05	2.54	1.70	1.72	1.38	1.10	1.84	1.76	2.37	2.47	2.99	2.48	2.64	1.79	1.67	2.00
	2018	0.91	0.68	0.73	0.71	0.96	1.99	1.69	3.74	2.86	2.86	2.44	1.97	2.15	1.70	1.68	3.69	1.93	1.91	2.27	1.73	1.20	1.75	1.29	1.12	1.83
	2019	0.14	0.38	0.19	0.31	0.33	0.33	0.49	0.64	0.96	0.93	0.44	0.35	0.33	0.43	0.38	0.33	2.37	2.01	2.30	0.86	0.55	0.41	0.19	0.16	0.66
	2020	0.30	0.45	0.12	0.32	0.17	0.17	0.29	0.61	0.78	0.86	0.99	1.28	0.85	0.77	0.70	0.58	0.81	1.10	1.58	1.10	0.73	0.28	0.10	0.04	0.62

- Table shows *average price impact* across all hours due to excluding gas peakers from price calculation in that region
  - ***Note: Excluding peakers in any one region impacts prices in other regions (through trade) –*** *not included above*
- Greatest impacts occur in the hours that gas peakers are most frequently dispatched:
  - To meet California evening peak demand (observed in all months) and
  - To meet California morning peak demand (observed in fall and winter months)

Source: EnergyGPS analysis

Excluding Gas Peakers From Prices Reduces Energy Purchase Costs For California Loads By Approximately $1.3 Billion Per Year

Although excluding gas peakers from market clearing prices is harmful to society on aggregate, there are some beneficiaries:

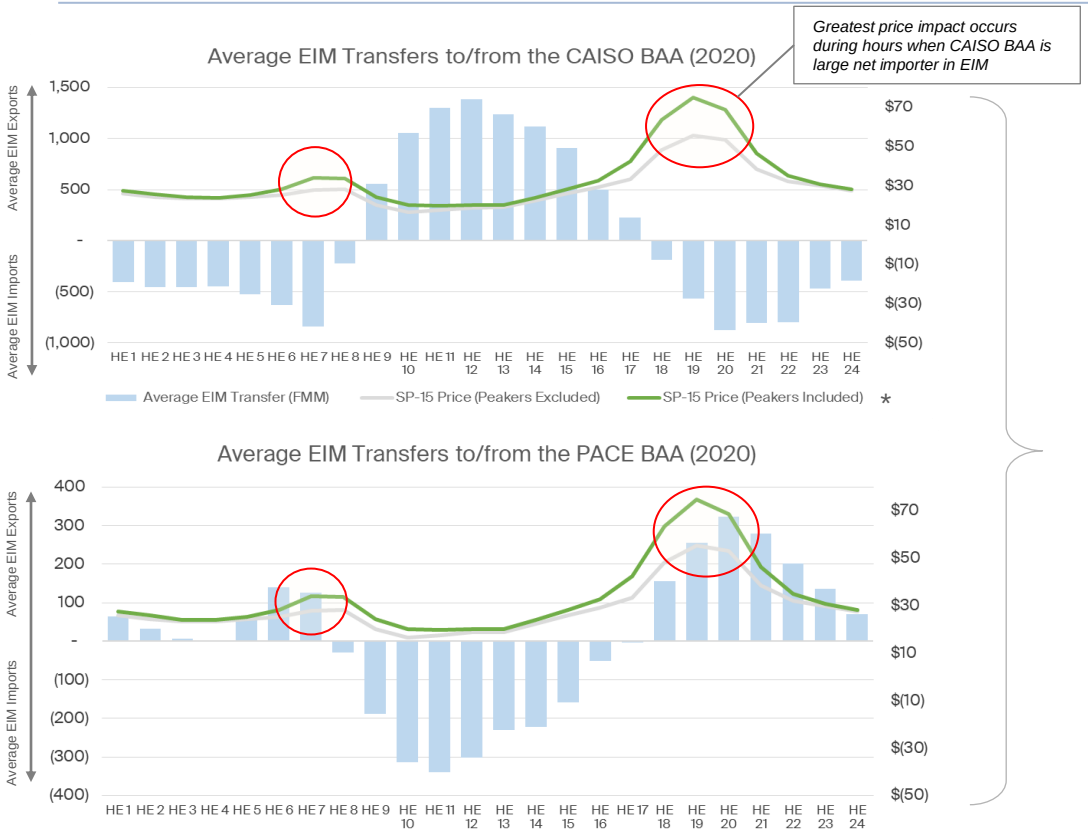
- California LSEs purchase nearly all of the electricity consumed by their customers from the wholesale electricity market (forward, day-ahead, real-time)
  - California LSEs divested nearly all generation as part of 1990s industry restructuring
- Excluding gas peakers from market-clearing prices in CAISO-operated markets reduces the cost of these purchases
  - *Directly,* by lowering the price of energy purchased in the CAISO-operated markets; and
  - *Indirectly,* since forward prices reflect the expected prices in the spot markets operated by the CAISO
- Applying the hourly price impact of excluding gas peakers to hourly CAISO BAA load indicates energy purchase cost savings of $0.9-1.8 Billion per year
  - Only applies hourly price impact for hours where the LMP was greater than $20/MWh
    - At lower prices, short-duration dispatch of gas units may be more likely to indicate local reliability needs
  - This benefit to California loads may be somewhat reduced by any retained generation.
- ***But excluding gas peaks from prices causes extensive harm to other entities***

But Excluding Gas Peakers From Prices Causes Extensive Harm To Other Entities

Harmful Impact:	Consequence:
Suppresses prices received by sellers in the rest of the west on exports to the CAISO BAA*	
Southwest sellers lose $95-$235 million per year	Higher retail rates for Southwest customers
Northwest sellers lose $93-185 million per year	Higher retail rates for Northwest customers
Suppresses market revenue earned by renewable and storage resources*	
Wind resources lose approximately $2.30/MWh, or 9% of market revenue	Discourages wind installation
Battery storage projects lose approximately $15/MWh, or 34% of market revenue (for hypothetical 4-hour battery)	Greatly discourages battery storage
Market prices do not cover the cost of operating gas peakers each day	
CAISO market makes substantial side payments to thermal units. "Bid cost recovery" payments have averaged $125 million per year.	Discriminatory compensation for providing the identical product

**Hourly price impact applied only in hours where LMP was greater than $20/MWh.*

Excluding Gas Peakers From Market Price Shifts Value Of EIM Transfers From NW And SW Entities To The CAISO BAA



*Hourly price impact applied only in hours where LMP was greater than $20/MWh.

BAA	Estimated Annual Impact	Total GWH of EIM Imports/Exports
CISO	$ 23,449,970	2,853
SMUD/BANC	$ 2,456,428	420
PACW	$ 200,141	632
BCHA	$ (63,778)	232
SCL	$ (297,902)	114
PGE	$ (583,574)	438
PSEI	$ (644,183)	365
NEVP	$ (784,223)	542
IPCO	$ (1,944,442)	398
SRP	$ (2,991,742)	827
AZPS	(4,742,880)	775
PACE	(12,315,352)	1,322

*Impacts are **limited by size** of EIM and level of participation in this sub-hourly market*

*Impacts would be **much greater** in a day-ahead market without fast-start pricing*

Harm To Overall Efficiency, Reliability And Environmental Goals

Market prices that do not reflect the cost of using (or the value of avoiding) gas peakers:

- *Fail to provide efficient incentives for the participation of existing supply, and in the right hours*
  - *e.g.,* imports from flexible hydro systems
- *Discourage investments that can reduce the need to run gas peakers*
  - *e.g., batteries, or wind with favorable output profiles*
- *Undermine environmental policy of incorporating GHG costs in electricity price*
  - Gas peakers are among the highest-emitting resources; when these resources are excluded from the market clearing price, so is the cost of their GHG emissions, dampening price signals for investments in clean resources
- *Reduce incentives to invest in transmission*
  - The value of transmission needed for clean deliveries will not reflect the value of reduced operation of gas peakers

Summary & Conclusions

- Excluding the cost of gas peakers—which are very frequently used—inaccurately reduces the wholesale prices that apply to as much as 60,000 GWh of annual sales to the CAISO BAA by other western entities
  - As a result of this price formation practice:
    - Price signals are substantially suppressed, ***undermining overall societal benefits*** and ***carbon pricing programs***
    - Results in ***discriminatory side payments to thermal units*** to cover their costs
    - Reduces market compensation to ***wind resources by 9% and batteries by 34%***
    - Western entities are estimated to be losing approximately ***$300-$400 million per year*** on their trade with entities in the CAISO BAA
  - The major beneficiaries of this price formation choice are the California load interests that have ***disproportionate influence*** over CAISO market rules under CAISO's governance structure
- The ability of one interest group to shape market rules to its benefit is currently a major impediment to a single day-ahead organized market in the west
  - A day-ahead organized market in the west ***must reflect the cost of all resources in prices***—including gas peakers
  - Day-ahead market prices will apply to and/or influence as much as 400,000 GWh—***or $20 Billion worth***—of trade between entities in the west each year
  - Inaccurate market prices will cause ***harm that can far outweigh the benefits*** of operational savings from an organized market with hourly granularity and day-ahead optimized unit commitment

Additional Information

- Powerex and PPC have prepared a report on Fast-Start Pricing that is publicly available on Powerex's and PPC's websites:

  The Importance of Fast Start Pricing In Market Design - June 2022