ERCOT Price Formation with ORDC

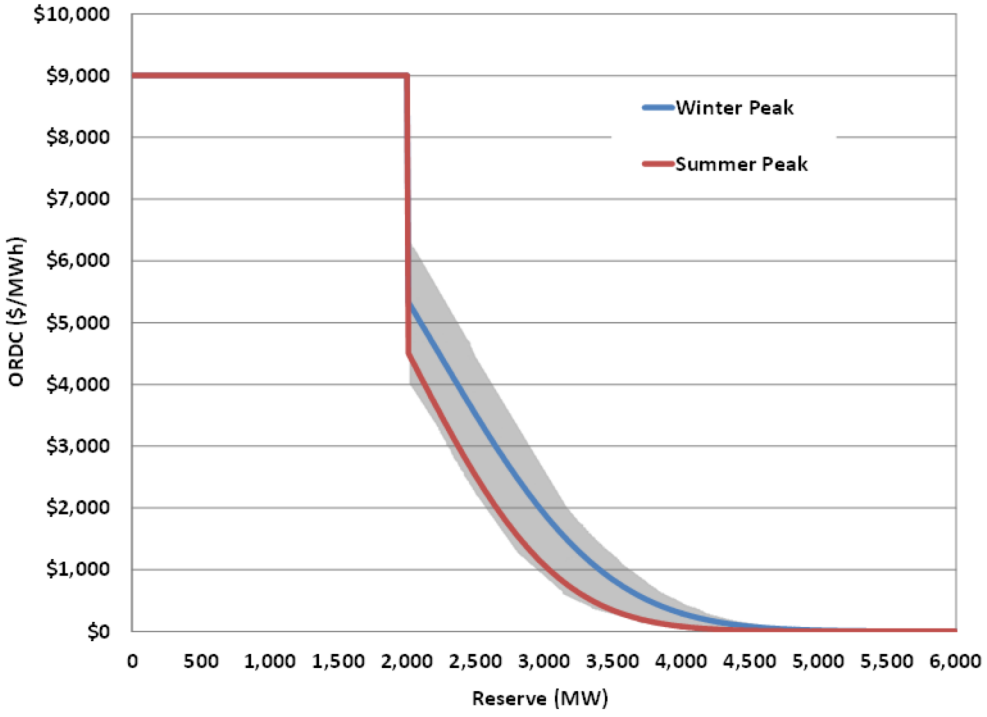
Beth Garza
ERCOT IMM
bgarza@potomaceconomics.com
512-225-7077

Harvard Electricity Policy Group
December 12, 2019

ERCOT's ORDC

The Operating Reserve Demand Curve (ORDC) is a scarcity pricing mechanism that reflects the loss of load probability (LOLP) at varying levels of operating reserves multiplied by the deemed value of lost load (VOLL).

Selected at the time as an easier to implement alternative to real-time co-optimization of energy and ancillary services, the ORDC places an economic value on the reserves being provided, with separate pricing for online and offline reserves.



The figure reflects the range of 24 curves in place during 2018. Starting in March of 2019, the mechanism changed to a single, shifted curve.
A second shift will be implemented in March 2010.

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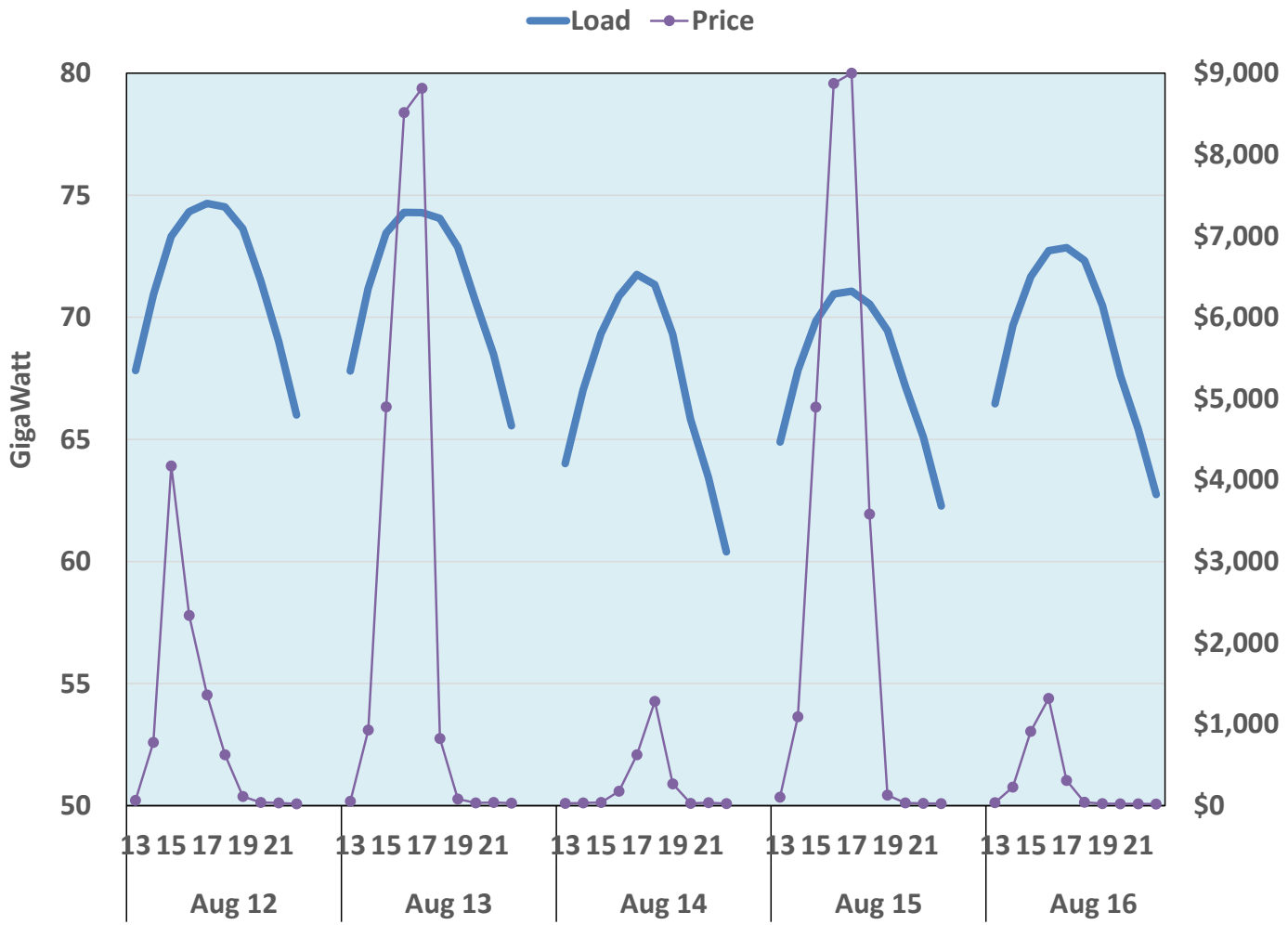
Summary of events August 12-16, 2019

- A new record peak demand was set on Monday, August 12
  - RT prices (HB_BUSAVG) reached $6500 for one 15-minute period, and averaged ~$1000 for the afternoon
- ERCOT declared Emergency conditions (EEA-1) on Tuesday and Thursday, August 13 and 15
  - Tuesday: RT prices reached $9000 for six periods and averaged ~$2500 for the afternoon
  - Thursday: RT prices reached $9000 for seven periods and averaged ~ $2900 for the afternoon
- Emergency Response Service (ERS) was deployed as part of the EEA conditions

EEA conditions were not on the highest load days



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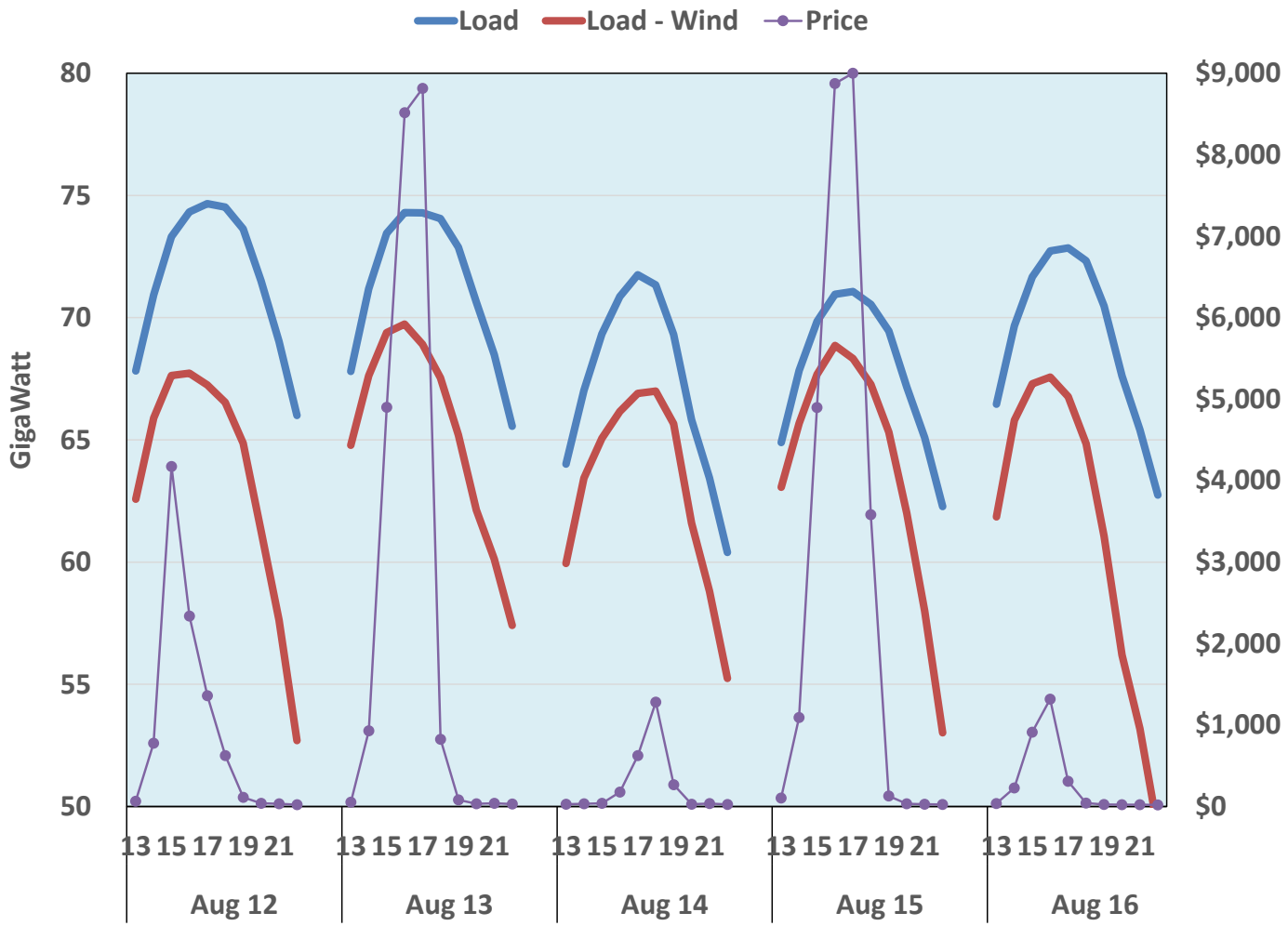
Net Load (Load – Wind) is a better predictor of high prices



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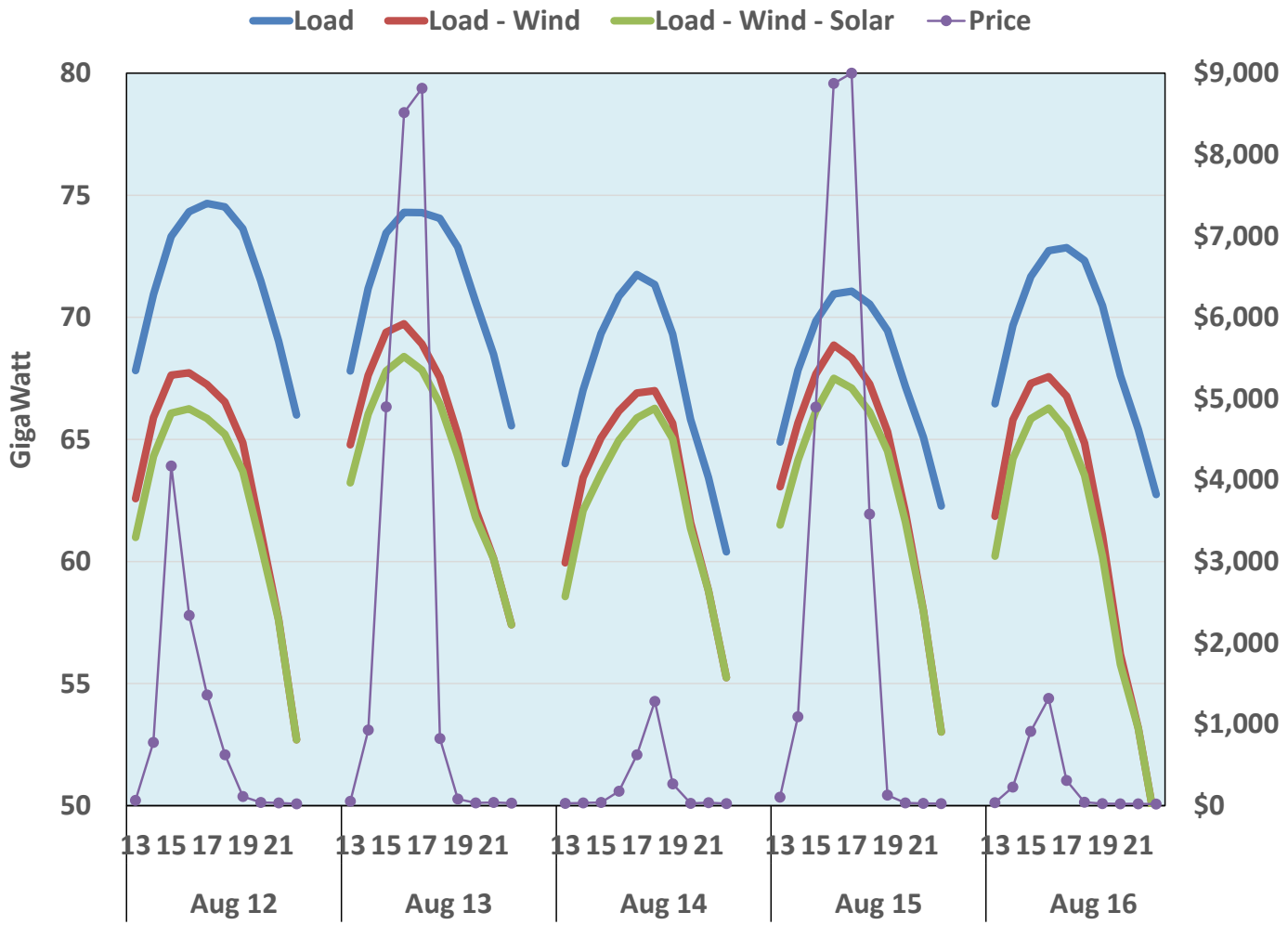
Highest prices are no longer associated with highest loads



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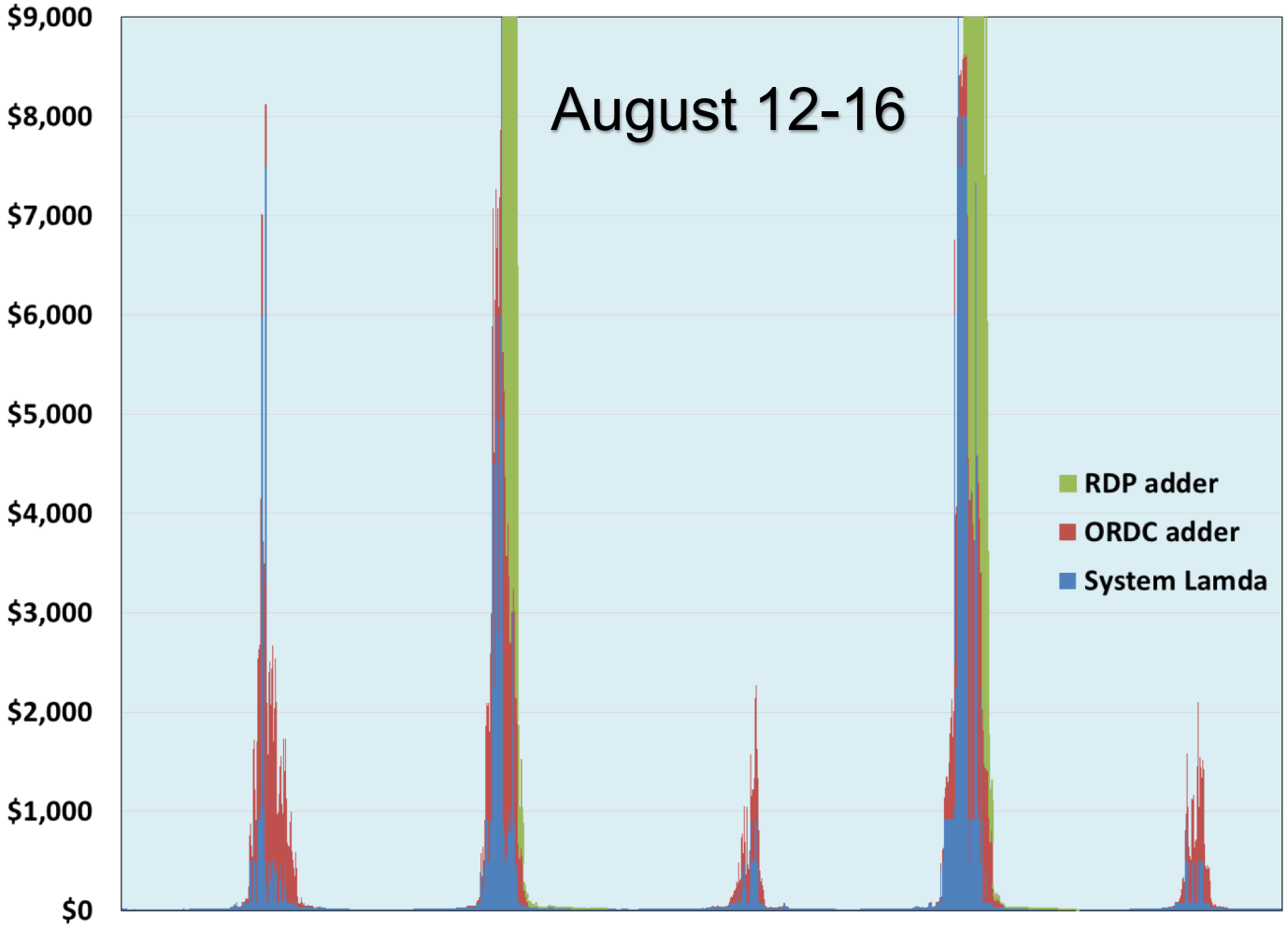
Three components of real-time prices



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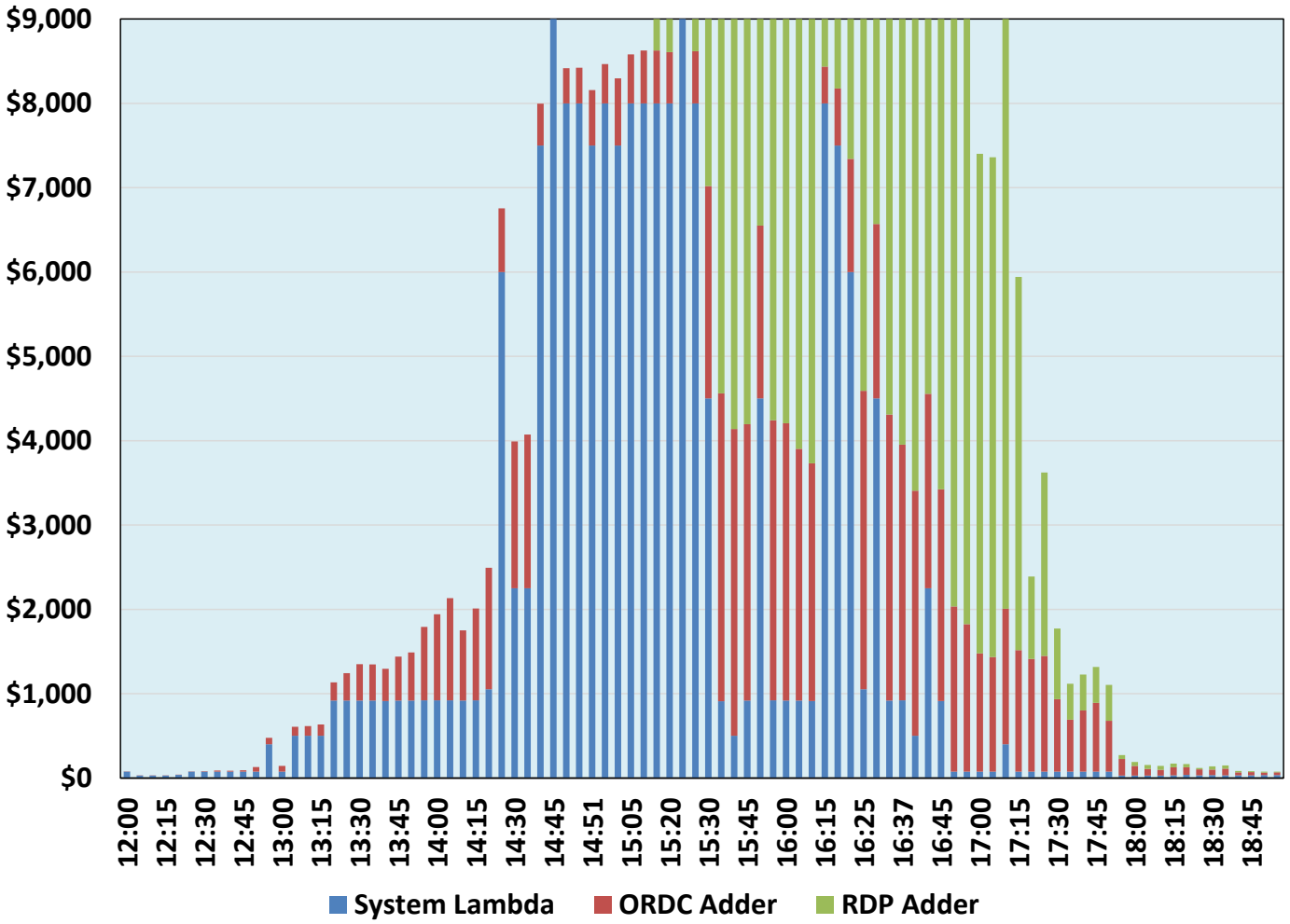
August 15 real-time prices



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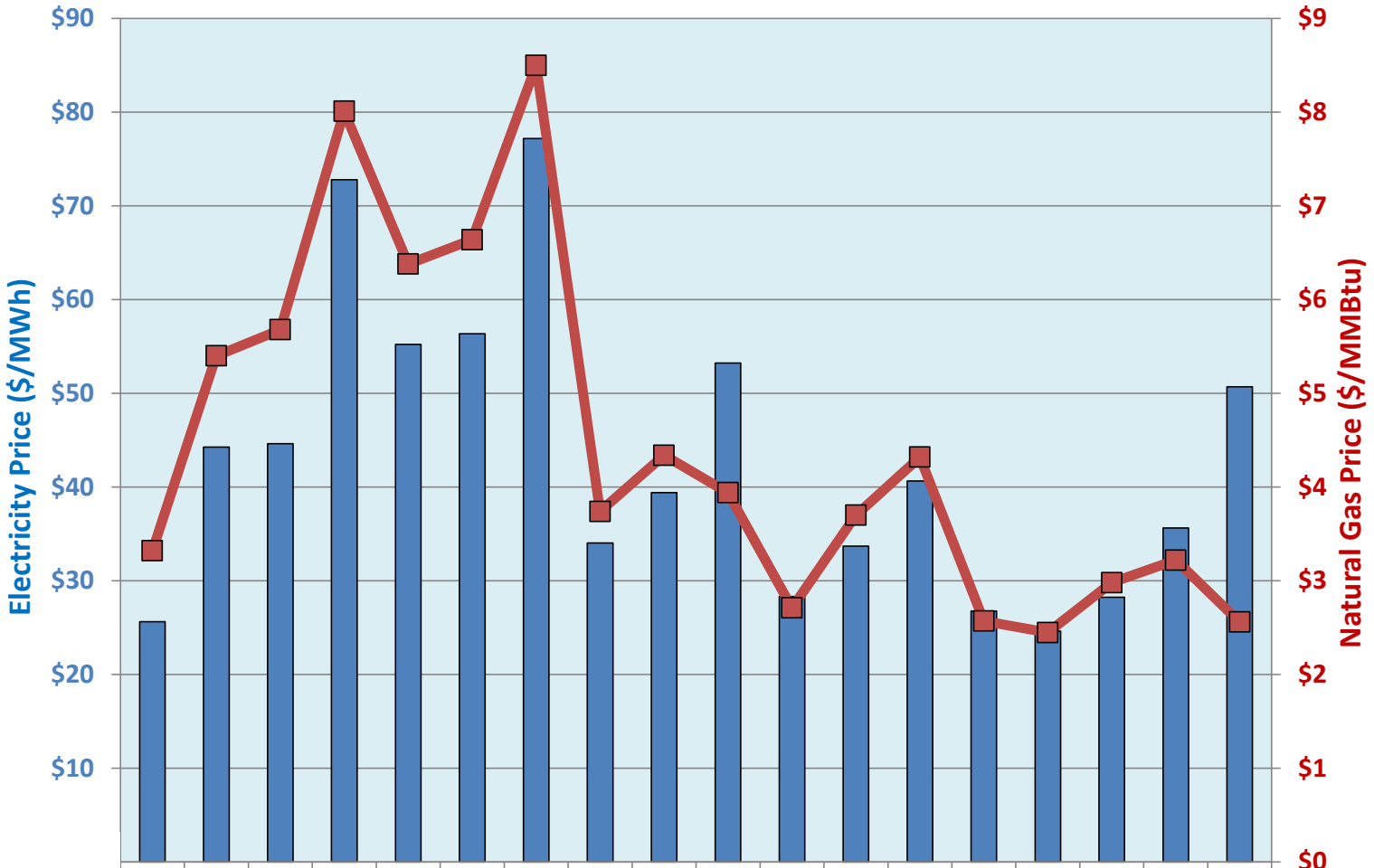
2019 Prices (through August) highest since 2011



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	8M19
ERCOT	25.6	44.3	44.6	72.8	55.2	56.4	77.2	34.0	39.4	53.2	28.3	33.7	40.6	26.8	24.6	28.3	35.6	50.7
Gas	3.32	5.40	5.68	8.01	6.38	6.64	8.50	3.74	4.34	3.94	2.71	3.70	4.32	2.57	2.45	2.98	3.22	2.56

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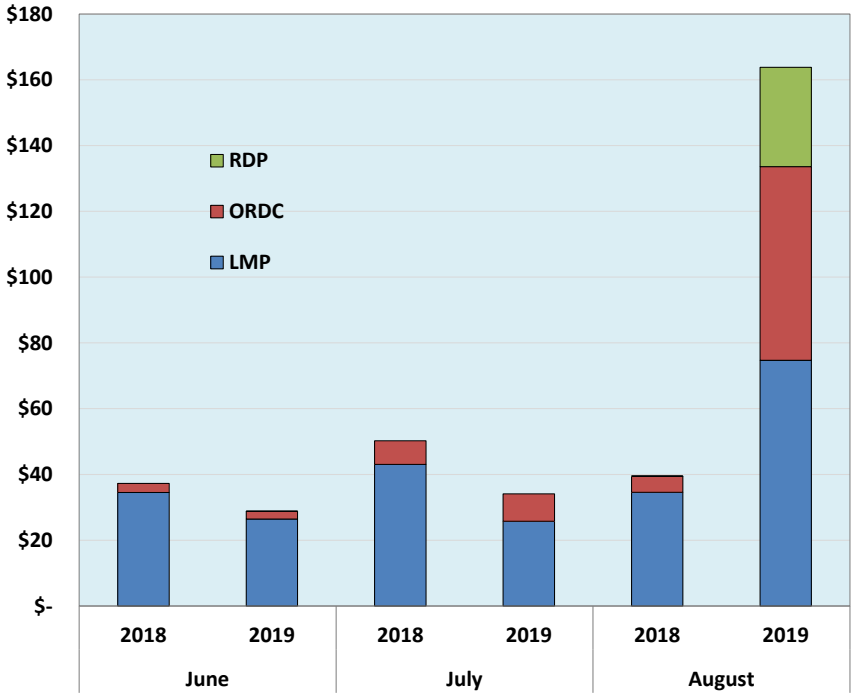
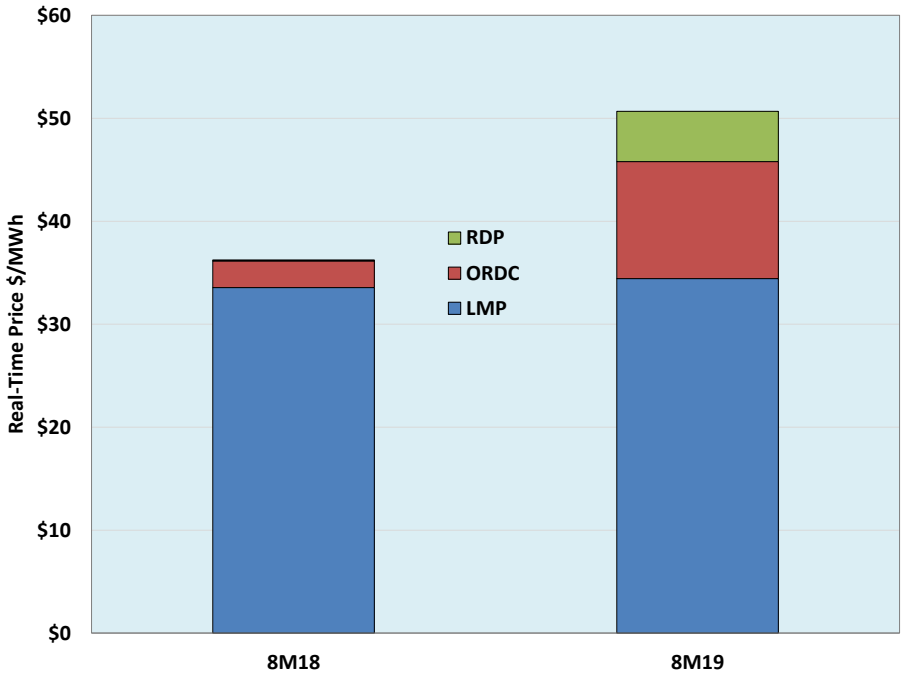
Larger adders contribute to higher 2019 prices





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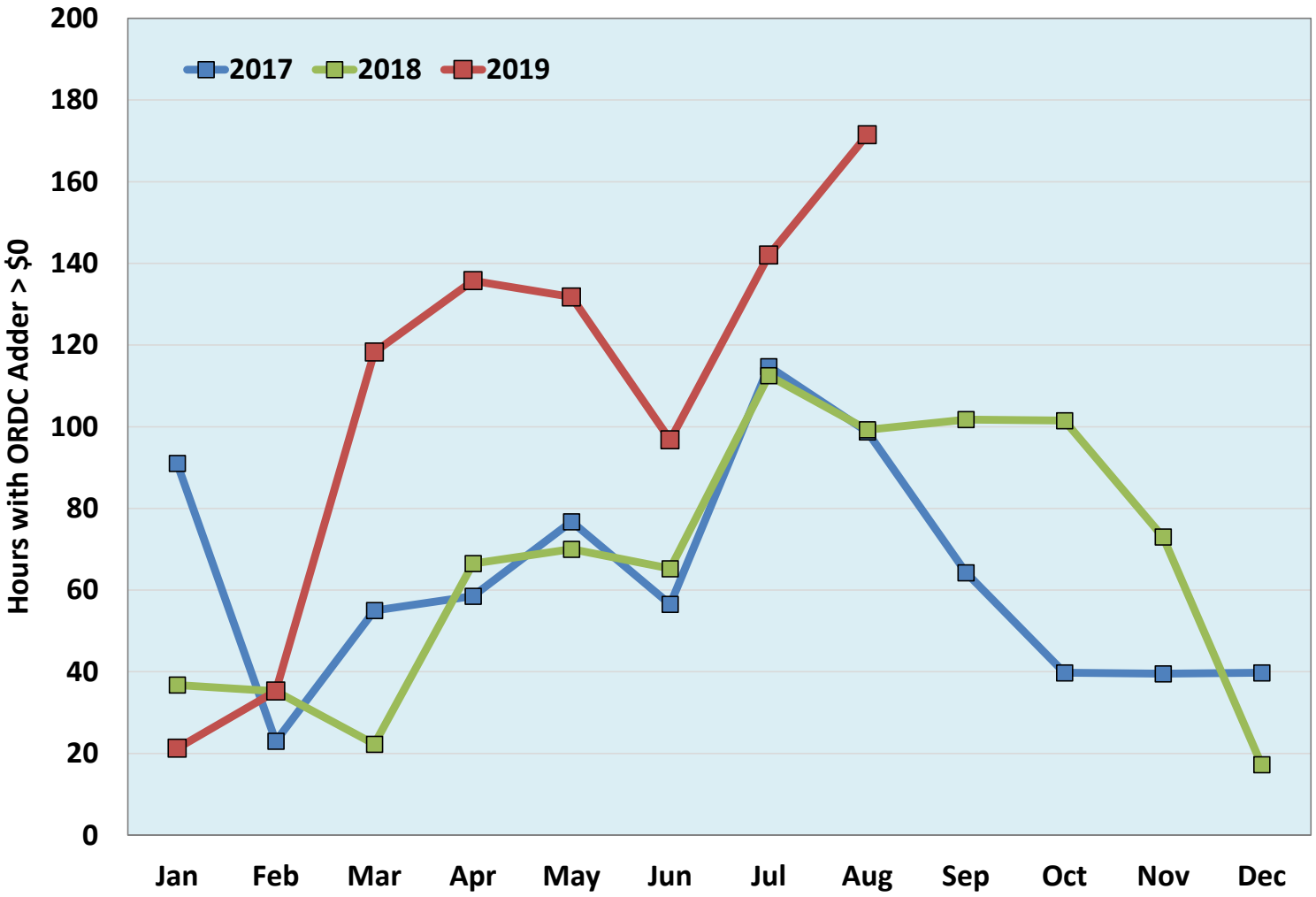
ORDC Adder is a more frequent contributor to price



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IMM estimate of the impacts of changes to the ORDC adder

- Instructions received at the January 17, 2019 Open Meeting[1] were to "implement a .25 standard deviation shift in the loss of load probability (LOLP) calculation using a single blended ORDC curve as soon as practicable with a second step of .25 in the spring of 2020."
- ERCOT implemented the single curve and first step of the ORDC changes on March 1, 2019.
- The IMM has estimated the effects of these ORDC changes on real-time energy prices for the period March – August 2019.
- The RDP adder is a separate contributor to real-time energy prices and was non-zero for several hours in August, including hours when real-time prices were capped at $9000.
- Given the uncertainty of the magnitude of the 'uncapped' RDP adder, the IMM has developed a range of ORDC effects for periods when real-time prices were capped.
- The effects of the move to a single ORDC curve are larger than the effects of the .25 standard deviation change. The impacts of an additional .25 standard deviation change are expected to be smaller than what has occurred.

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[1] and documented in the Chairman's memo filed in Project Nos. 48551, 48539, and 48540, dated January 16, 2019.

IMM estimate of the impacts of changes to the ORDC adder

	Average RT Price $/MWh	ORDC contrib $/MWh	ORDC Price increase $/MWh	Percent Price increase	Total RT Market Cost $M	RT Market Cost Increase $M
March	30	<1	<.1	<1	838	<1
April	28	<1	.5	2	751	13
May	28	1	.8	3	907	25
June	29	2	1.6	6	1,010	58
July	34	8	5.6	17	1,332	221
August	164	59	26 - 32	15 - 19	7,259	1,084 – 1,342
Six month	**58**	**19**	**7 - 8**	**12 – 14 %**	**$12,098**	**$1,402 – 1,660**

Effects during Aug 12-16	
RT Market Cost $M	$5,269
Cost Increase $M	$572 - $839

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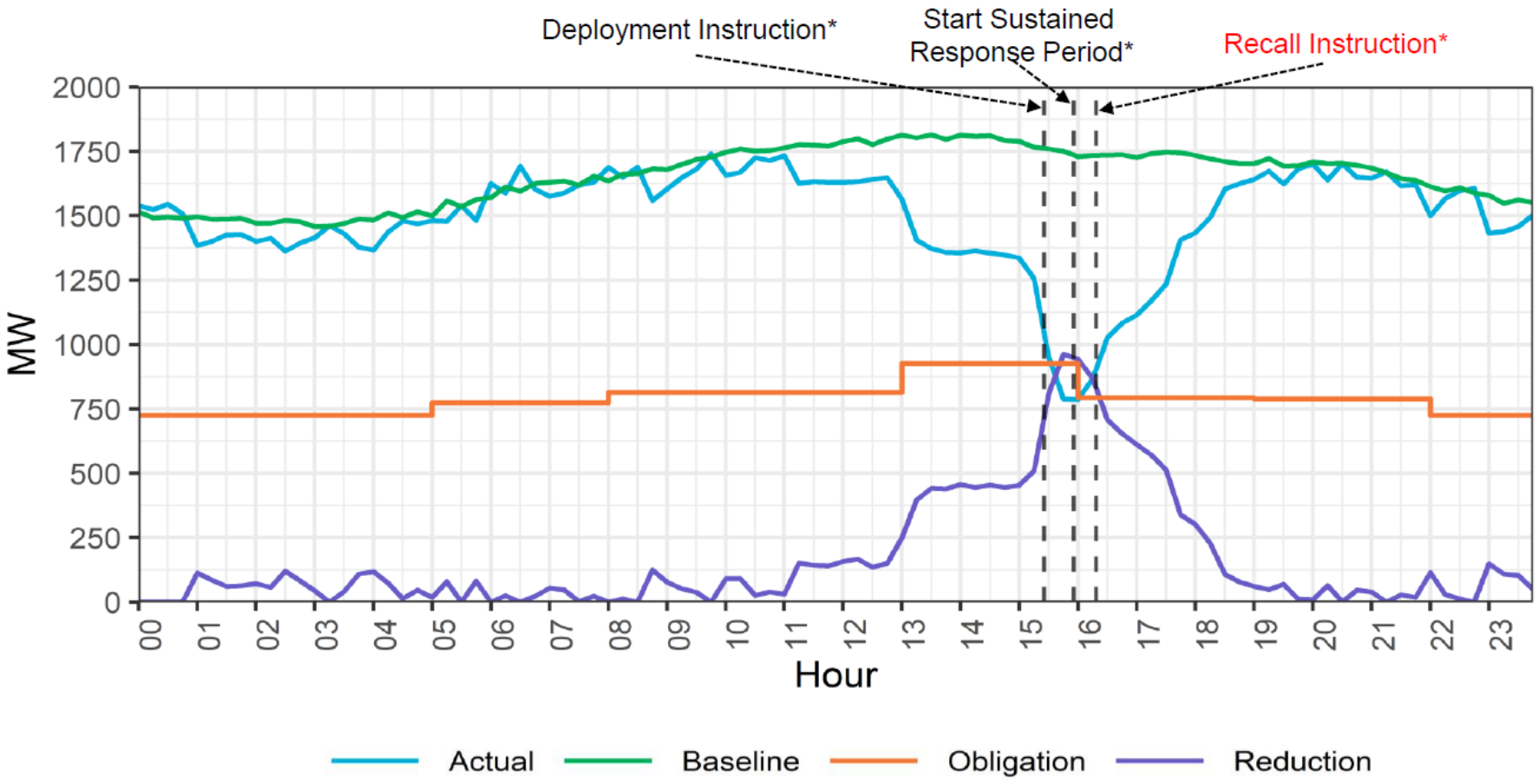
Preliminary Load Reduction Observations for Peak Week

- The information needed to accurately evaluate demand response during 2019 is not yet available.
  - Customer-level data is needed to evaluate the occurrence and load reductions in response to various factors. Data and results for summer are expected to be available by December 2019.
- Reductions shown below are estimates of the total of all load reduction (including ERS, 4CP and for high prices), calculated using regression baseline estimates of ERCOT total load.
  - Load reductions are small relative to the total load, so the accuracy of the load reduction estimates is relatively low.

Date	Characteristics	Max RT Load Zone SPP	Estimated HE 17 Load Reduction
Aug. 12	Actual 4CP Day	$6,537	2,500 MW
Aug. 13	EEA1/Near 4CP	$9,159	3,100 MW
Aug. 14	-	$1,807	200 MW
Aug. 15	EEA1	$9,053	1,800 MW
Aug. 16	Near 4CP	$1,583	1,600 MW

Aug. 13 ERS Deployment

- Fleet-wide, ERS deployment exceeded the obligation.



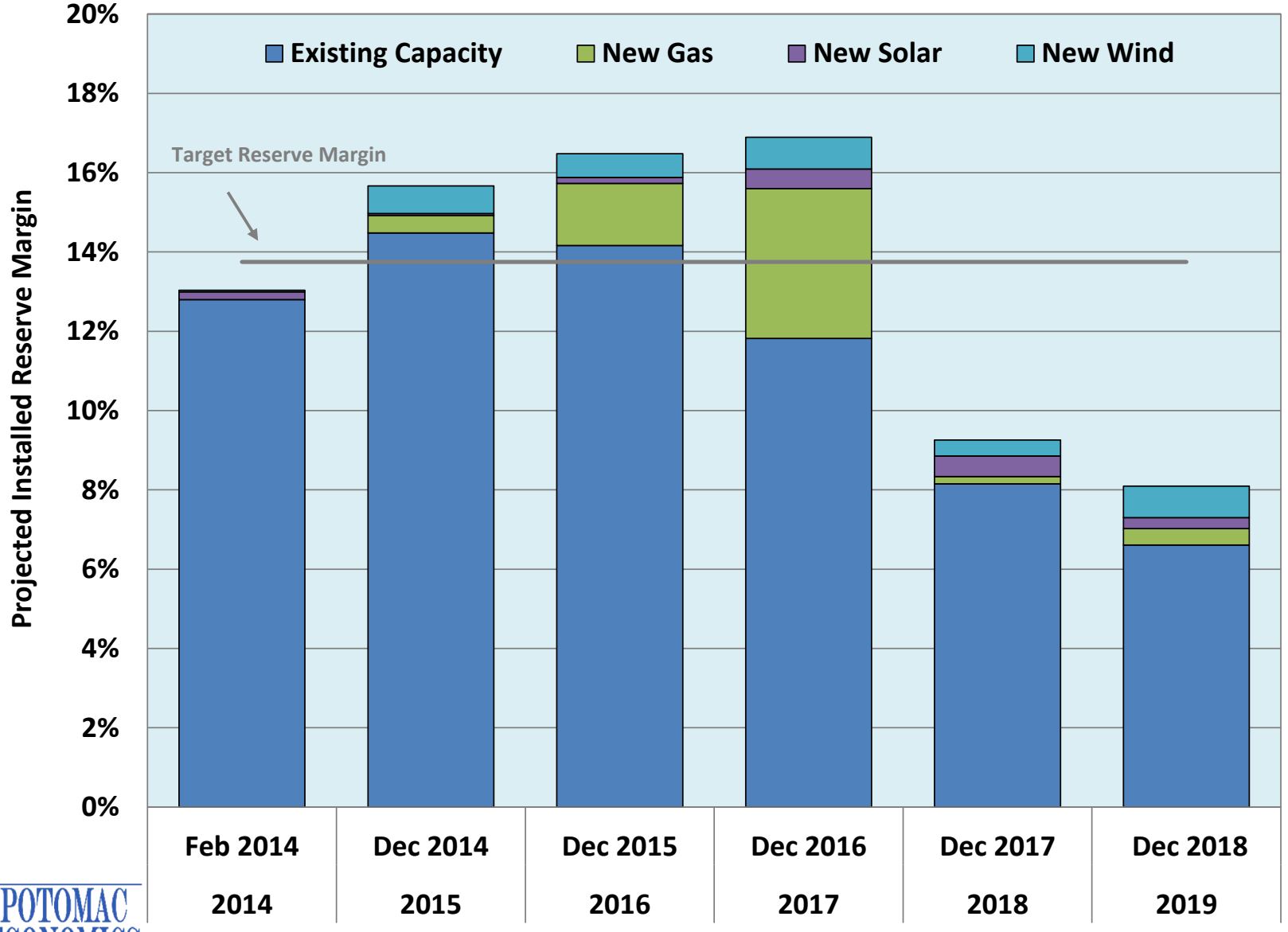
*Refers to ERS-30 only. All MW quantities include both ERS-30 and ERS-10.

Background Slides

Pre-summer thoughts

- High expectations for scarcity conditions during summer 2018 were largely unfulfilled
- Would similar high expectations for summer 2019 come to fruition?
- Would generation availability in 2019 be at the high levels experienced in 2018?

History of summer reserve margin expectations



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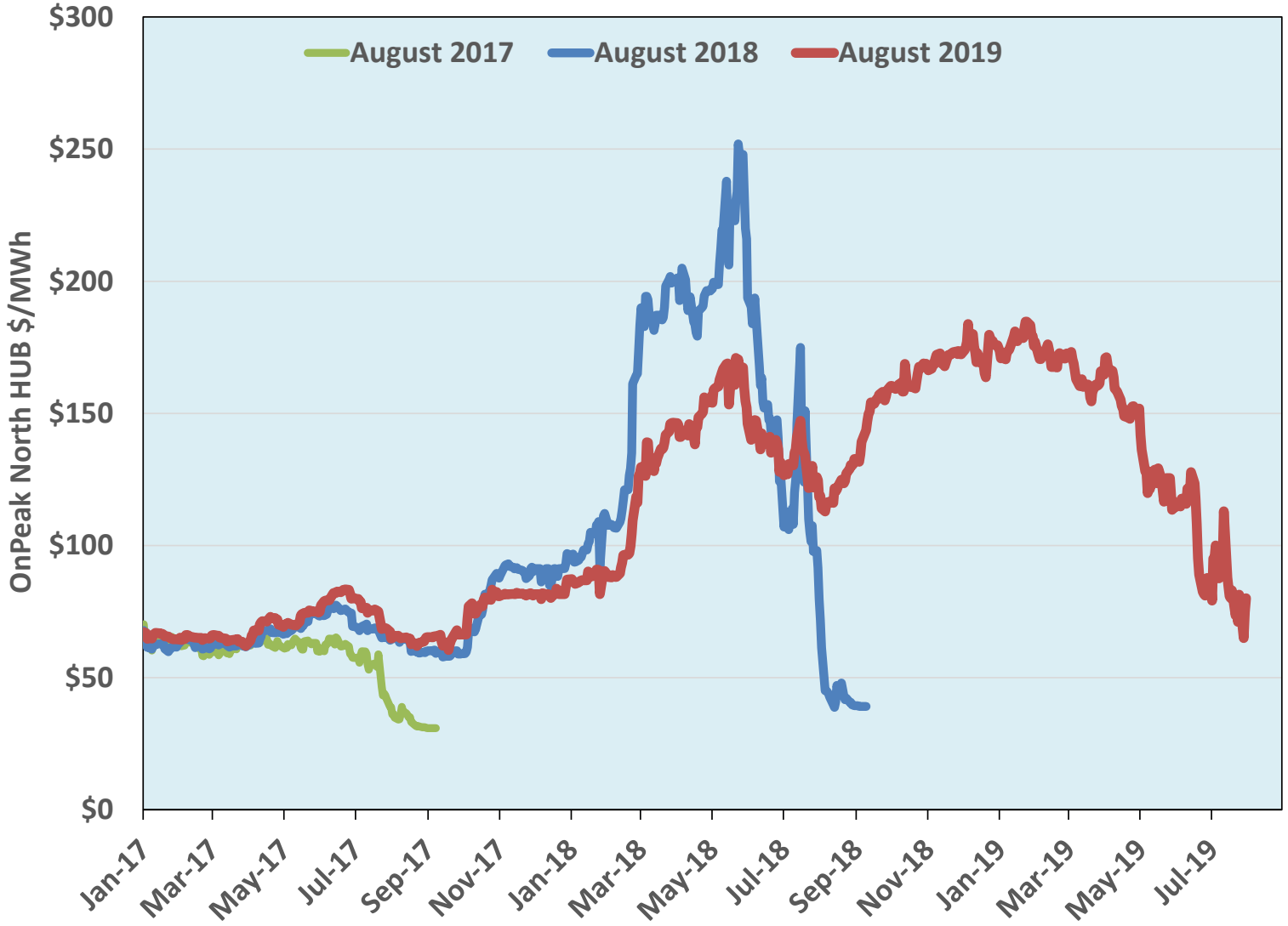
August forward prices



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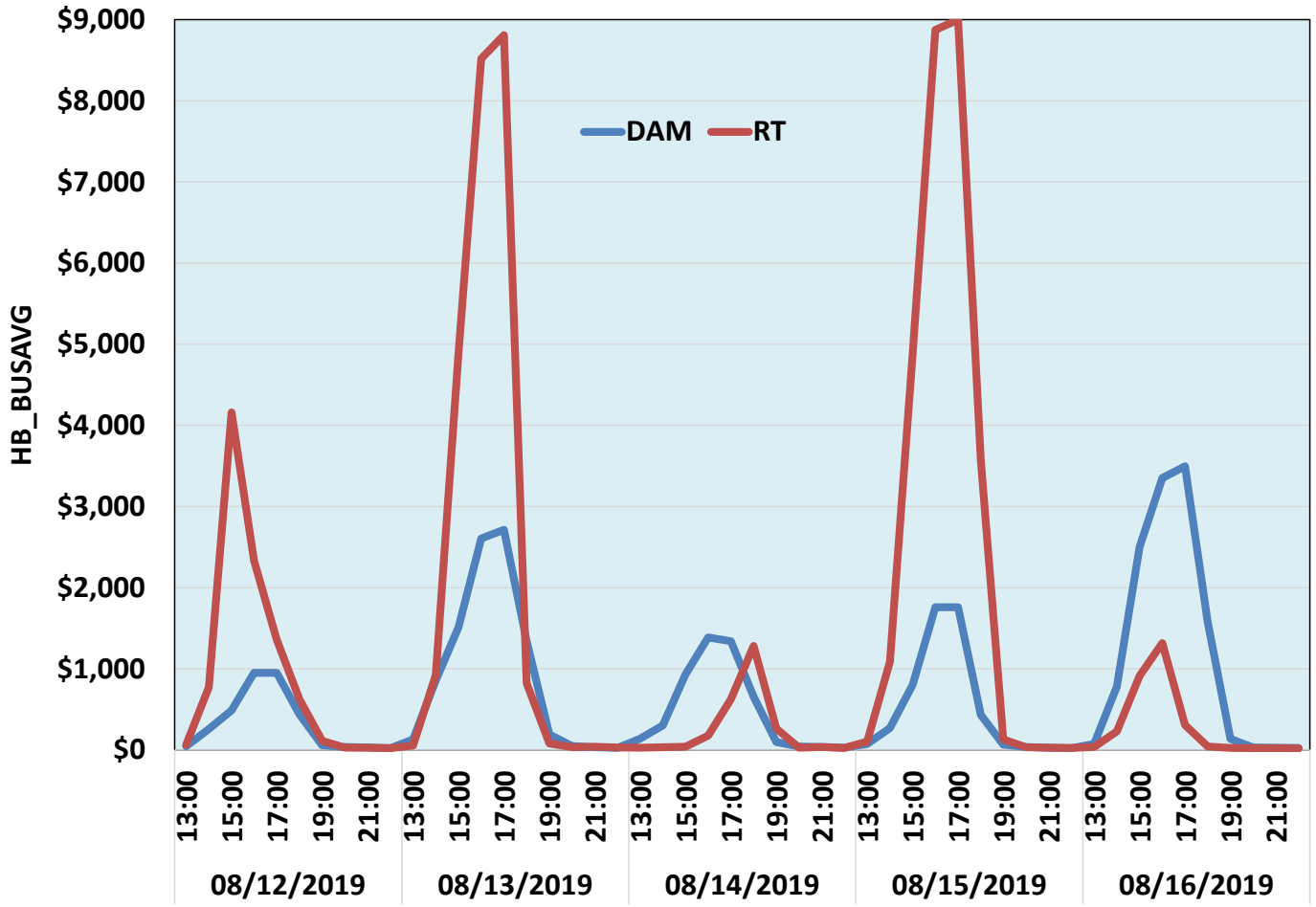
After-event questions

- Were pricing outcomes reflective of system conditions?
- Did the ORDC and RDP price adders contribute appropriately to real-time prices?
- Did the various mechanisms ERCOT used to ensure demand/supply balance work as intended?
  - ERS
  - RRS deployments
- Did market participants effectively manage their price exposure?
- What does the future hold? Will enough new generation be built in ERCOT to meet forecasted increased demand?

Day Ahead vs Real-Time Prices



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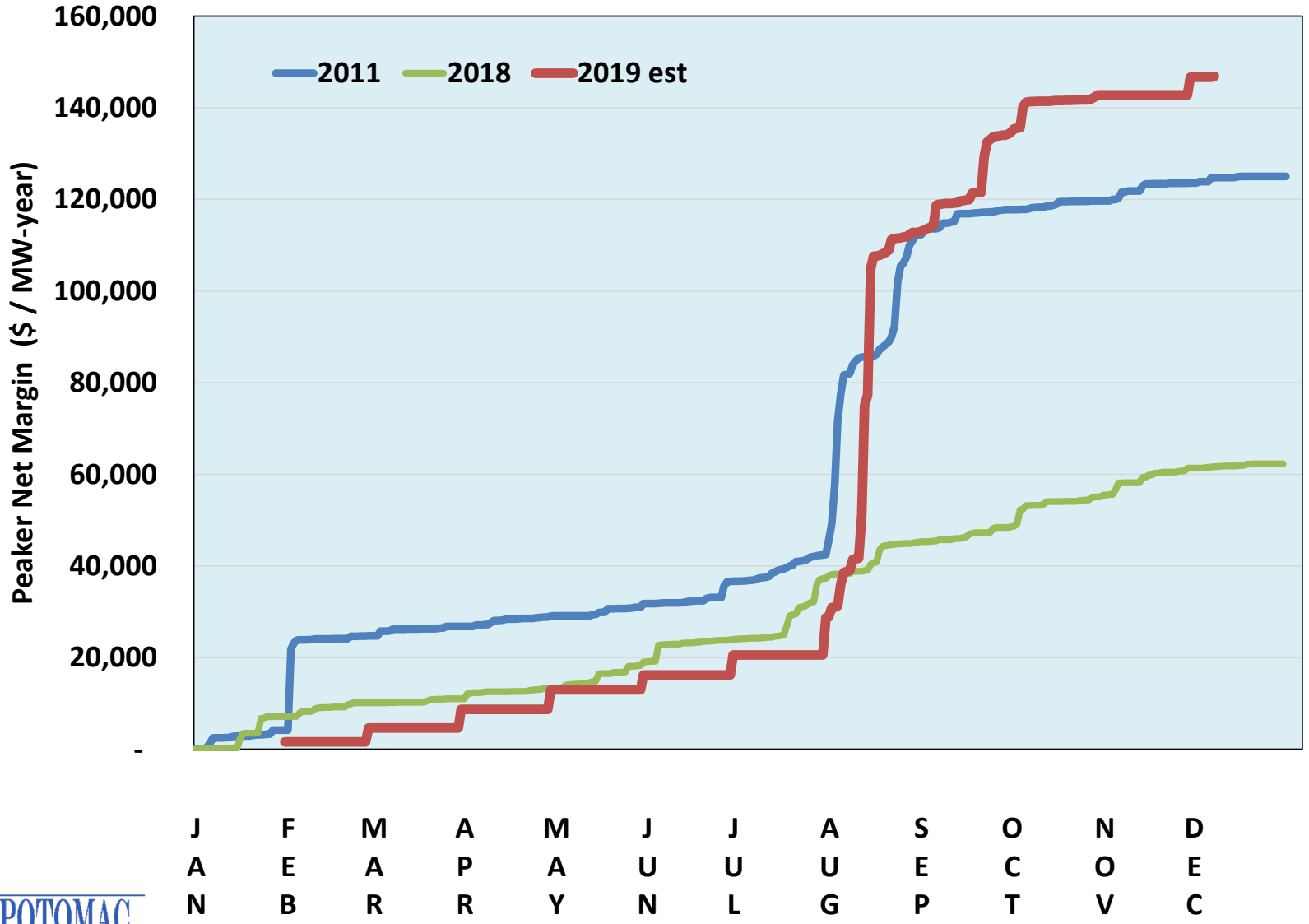
Peaker net margin is the highest ever



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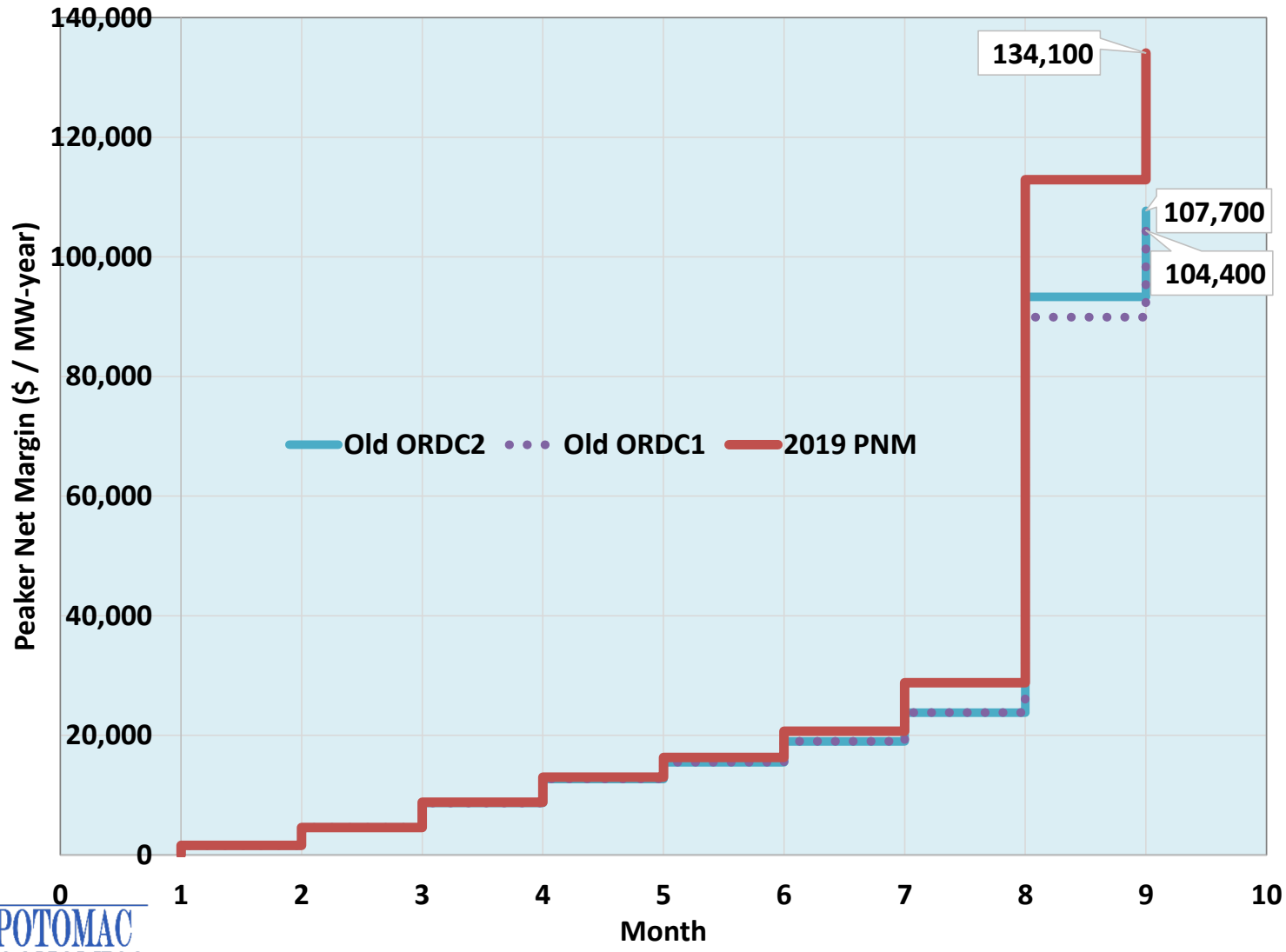
ORDC Change has resulted in higher PNM ($26 - $30K increase)



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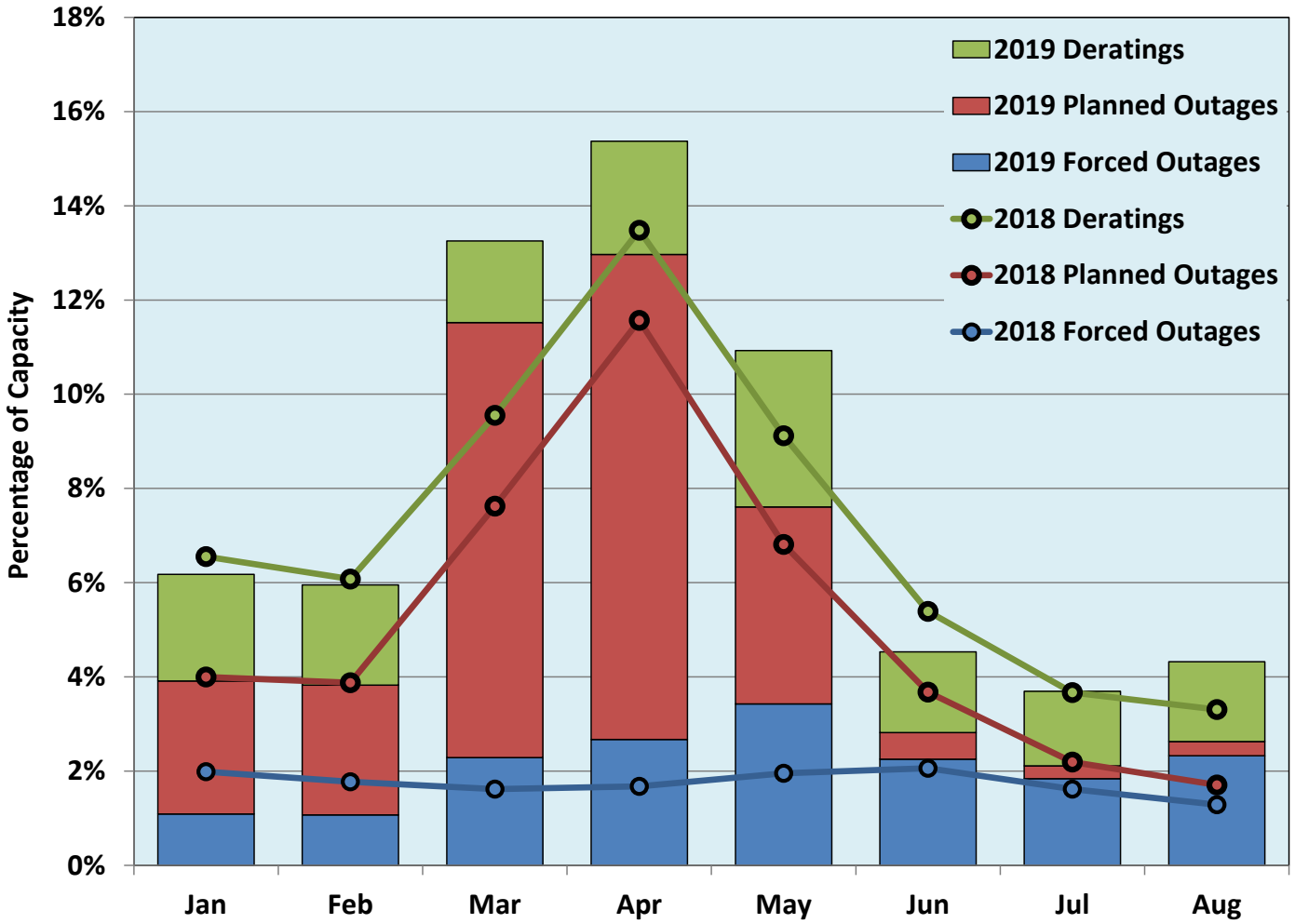
Low generator outage rates during summer months, but not as low as 2018



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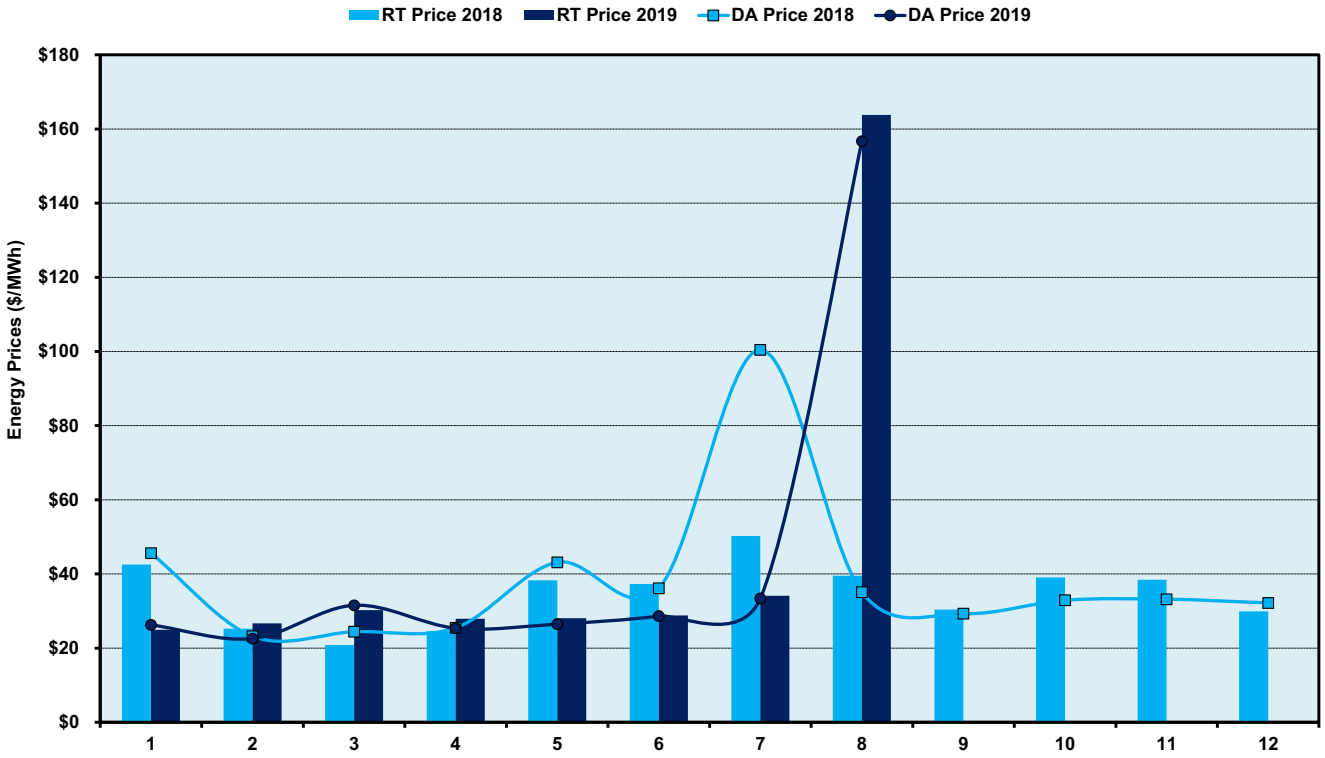
Higher energy prices due to scarcity

Real Time Prices
8M18: $36.2/MWh
2018: $35.6/MWh

8M19: $50.7/MWh
~ 40% increase

Natural Gas Prices
~15% lower so far in 2019



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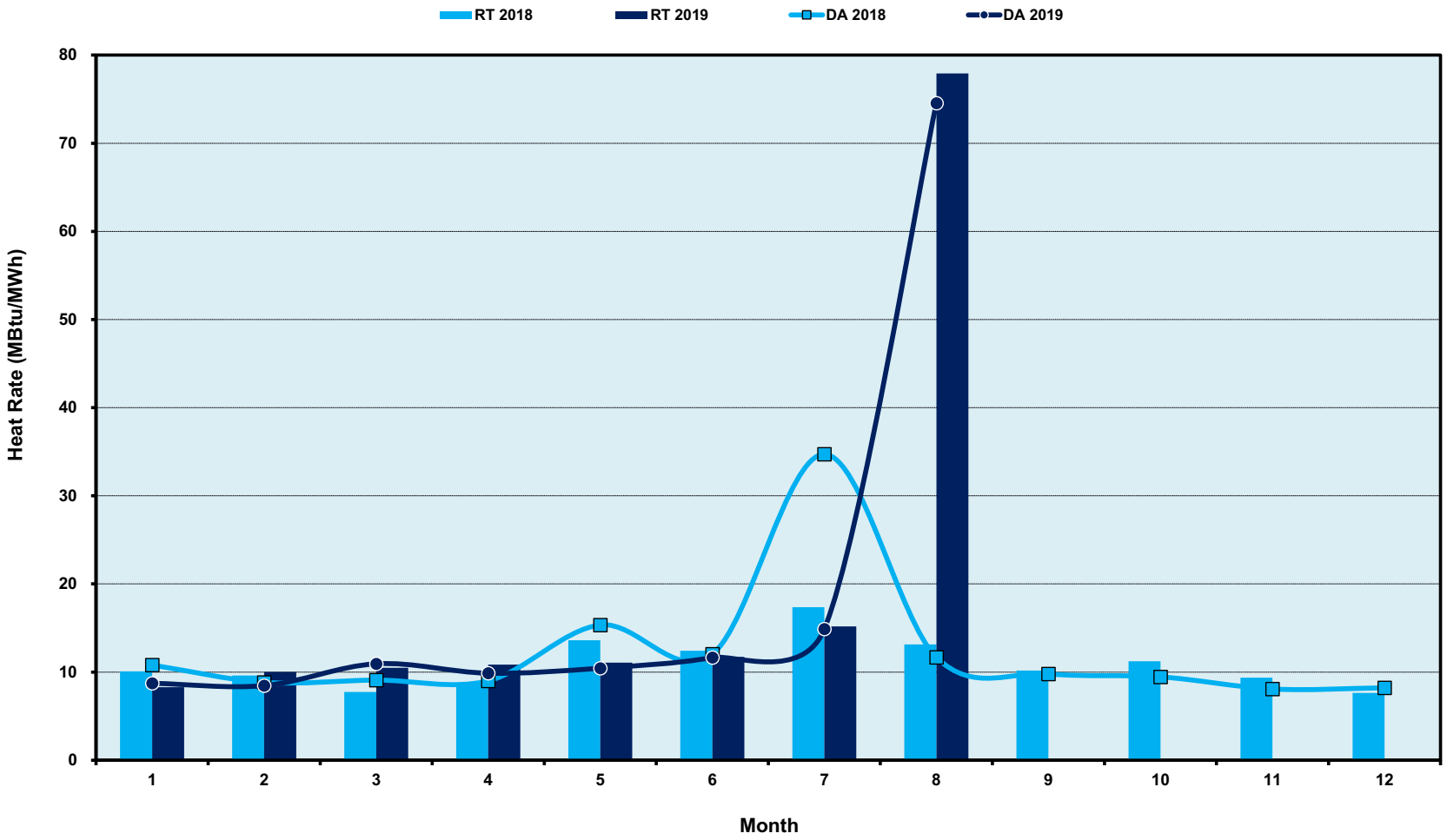
Lower 2019 gas prices results in much higher implied heat rate



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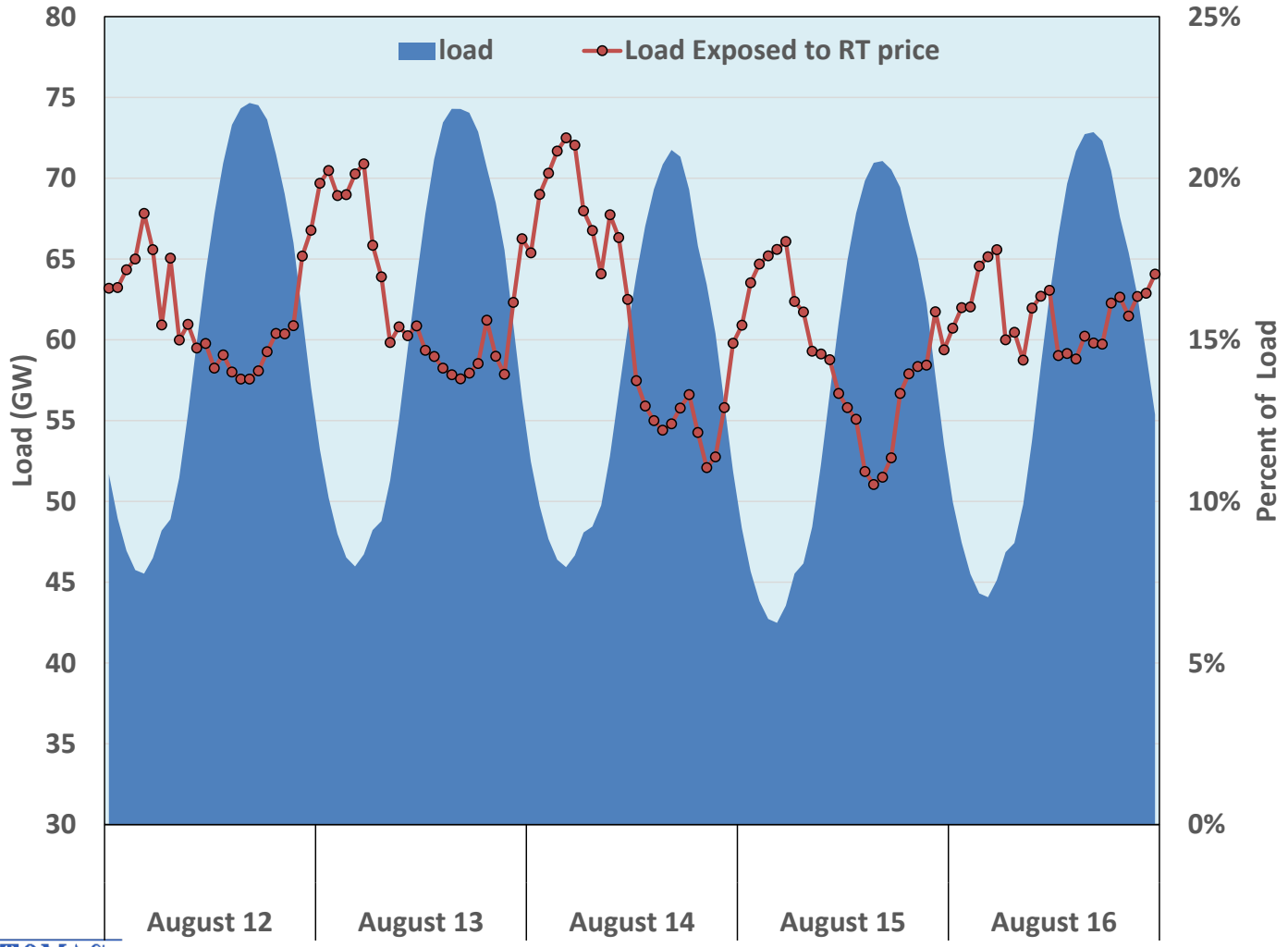
Load exposure to RT prices



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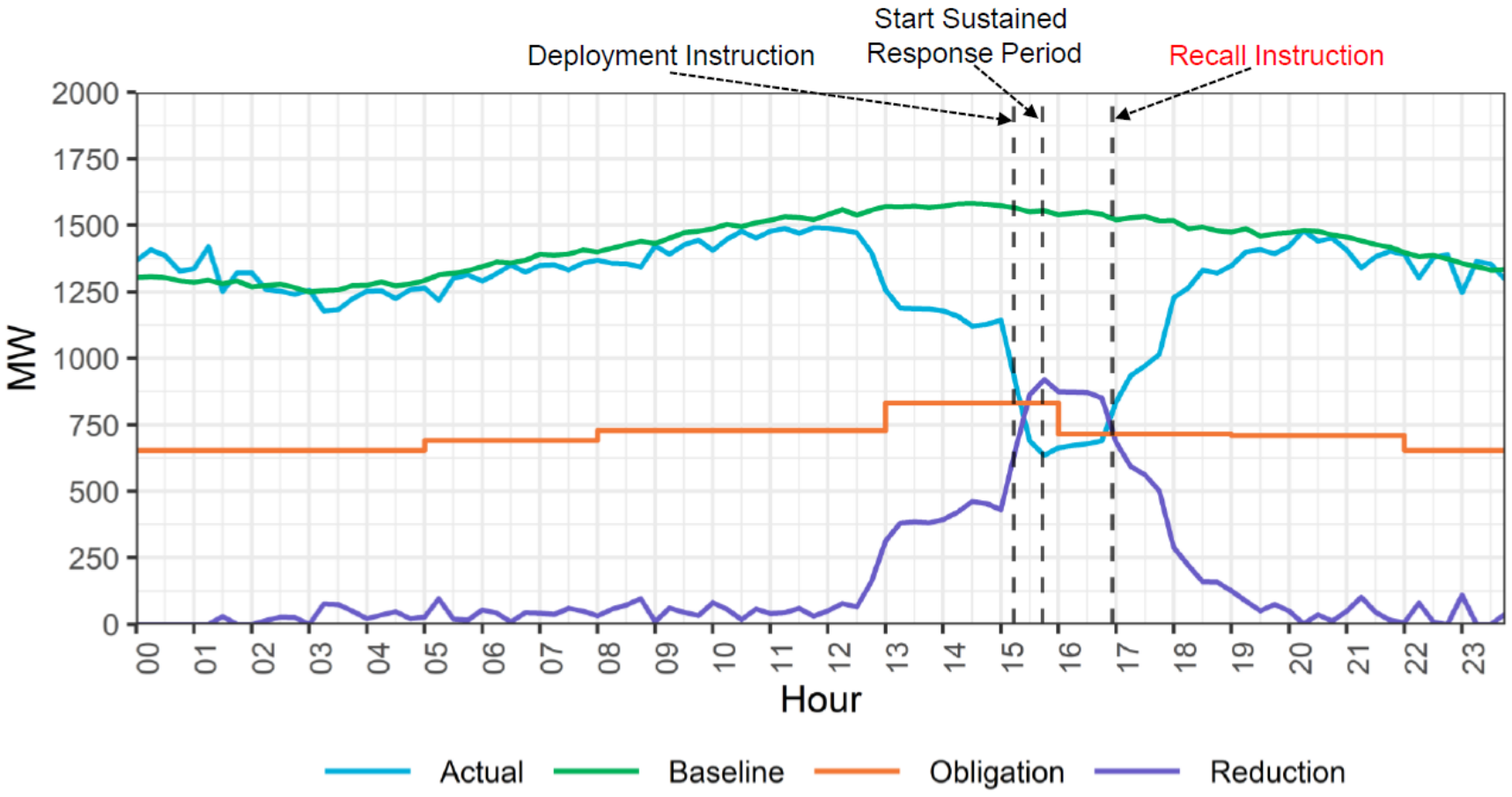
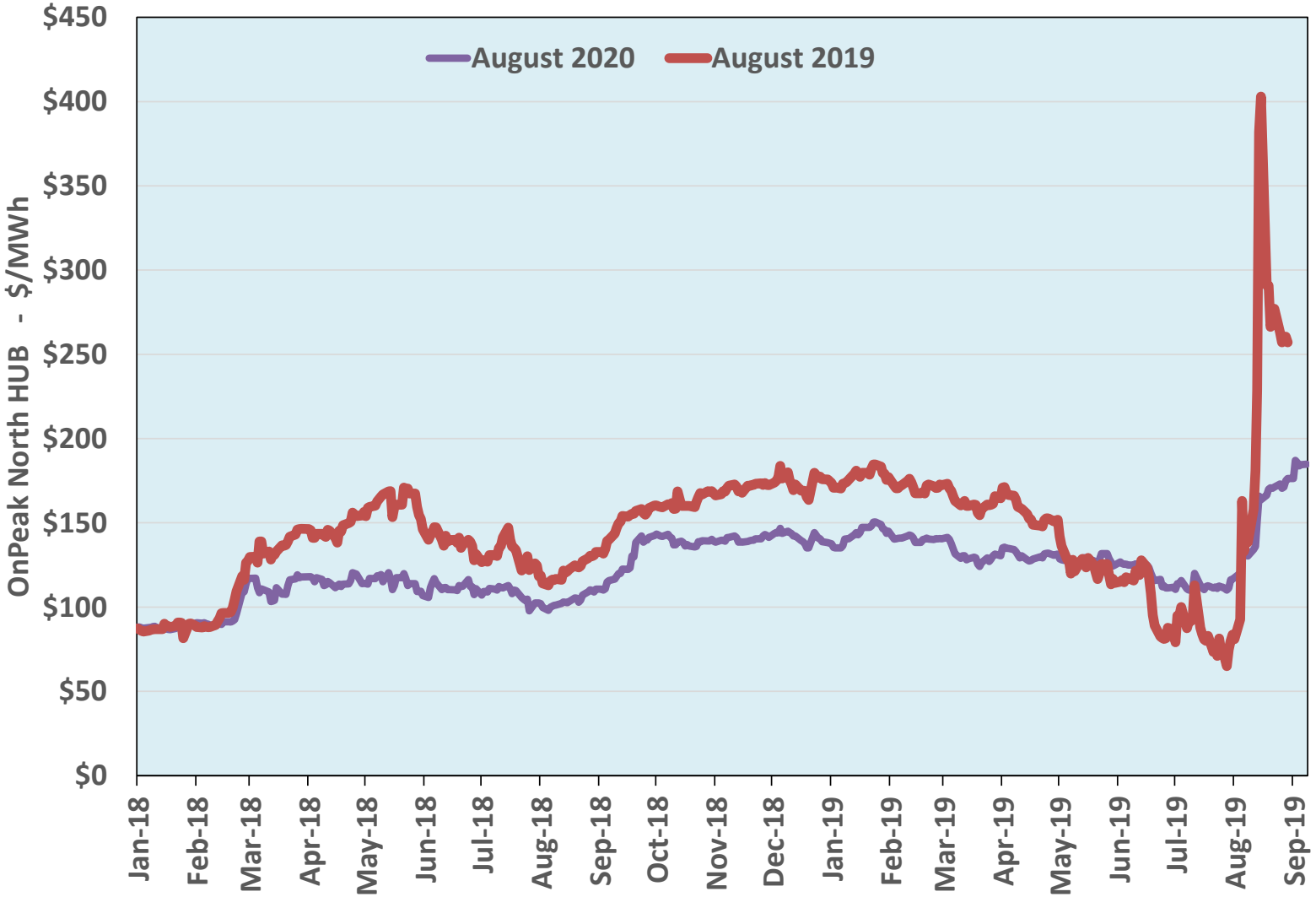
Aug. 15 ERS Deployment*

- Fleet-wide, ERS deployment exceeded the obligation.



*Note: Weather sensitive and non-weather sensitive ERS-30 deployed

Looking Ahead to Summer 2020



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Areas for continued review, analysis and discussion

- Should the amount spent for ERS be adjusted?
- Should the RDP-related assumptions for ERS deployments be adjusted?
- Are there short term (pre-RTC) adjustments to be made to improve access to lower quality reserves (NFRC) for energy while maintaining frequency responsive capacity as reserves?
- Is there a risk of consuming ‘too much’ Reg-Up when the Power Balance Penalty Curve sets LMP for ‘lengthy’ durations? If so, should the PBPC be adjusted?