



Item 6: Independent Market Monitor (IMM) Report

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Board of Directors Meeting






ERCOT Public

June 12, 2018

Today's topics

- Highlights from the State of the Market report
- Although ERCOT markets are structurally concentrated, they performed competitively in 2017

2017 Thumbnail

- Higher prices: \$28.25/MWh  15%
 - Higher natural gas prices: \$2.98/MMBtu  22%
 - Rare system shortages: ~3.5 hours >\$1000
- Lower peak, continued energy growth
 - Peak demand: 69,512MW  2.2%
 - Average demand:  1.9%
- Small contributions from Reserve and Reliability Adders: \$0.24 & \$0.16 per MWh
- Increased congestion costs  95%

Energy Prices

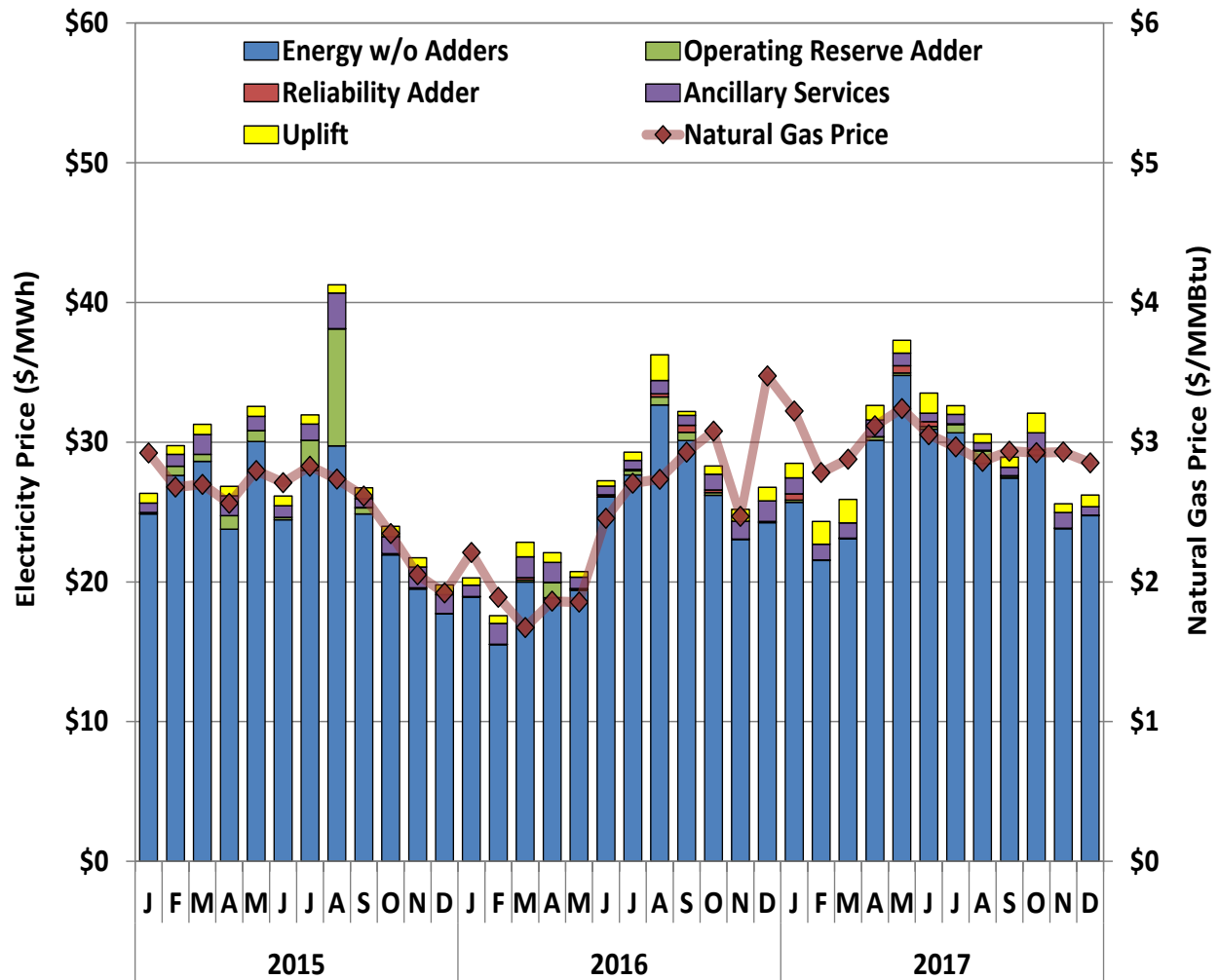
Energy Price:
\$28.25/MWh

Correlation with gas prices expected in competitive market

Ancillary Services:
\$0.87/MWh

Uplift:
\$1.03/MWh

Includes \$0.24/MWh from reserve adder and \$0.17/MWh from reliability adder



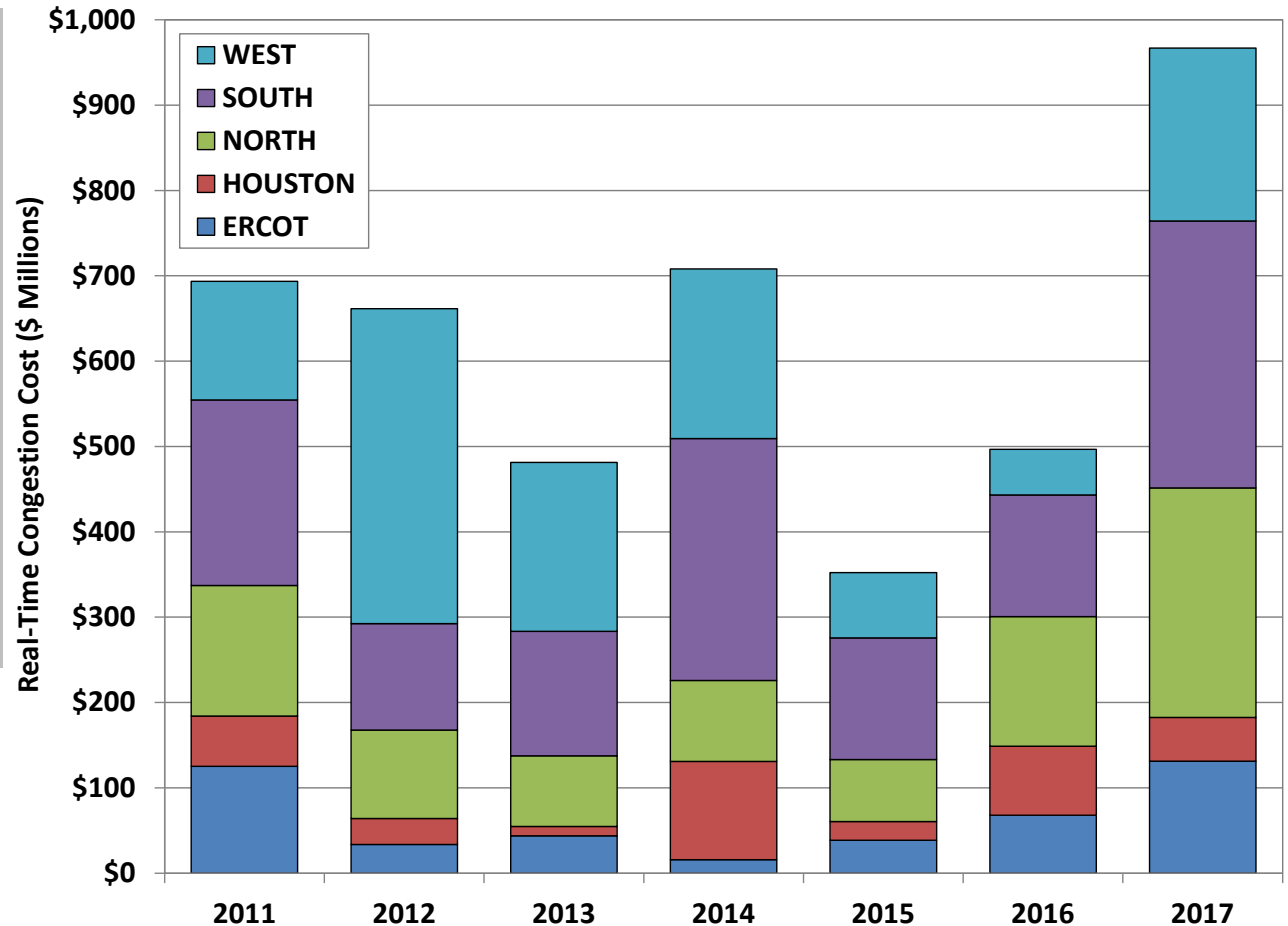
Uplift Details

2017 Total	\$365 Million	\$1.03 /MWh
Admin Fee	\$199	\$0.56
ERS	\$ 50	\$0.14
RENA	\$ 96	\$0.27
2016 RENA	\$ 28	\$0.08

Congestion Costs

Congestion costs increased 95% from 2016.

- 1) Panhandle Exports
- 2) Houston Import construction
- 3) Hurricane Harvey

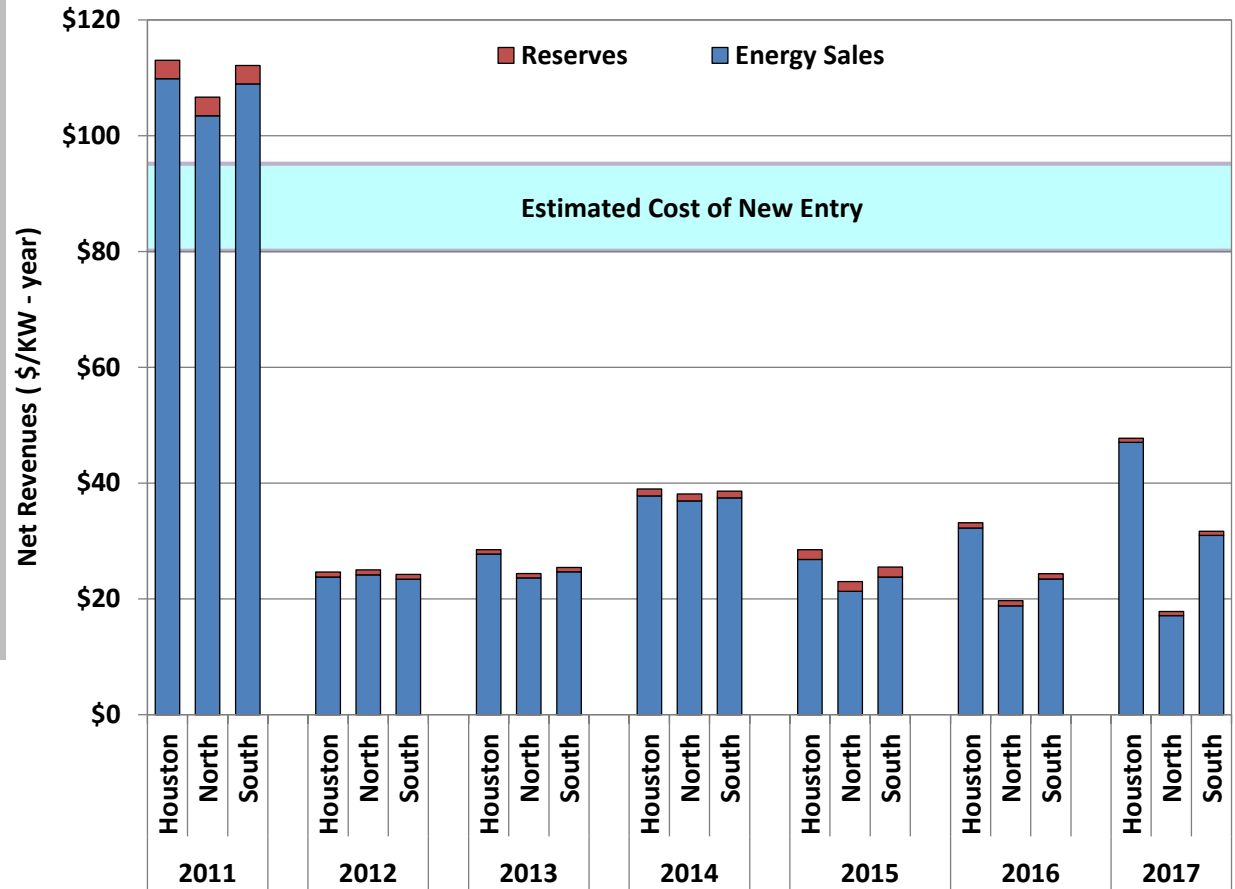


Long-term Economic Signals

Net revenues over past 6 years far less than the costs of building a new peaking unit.

Consistent with capacity surplus.

Market's ability to send local signals should be evaluated.



Recommendations

1. Implement real-time co-optimization of energy and ancillary services
 - *Maximizes utilization of the system's resources*
 - *Lowers costs of satisfying the system's needs*
 - *Allows for efficient shortage pricing when the market cannot satisfy any of its energy or reserve needs*
 - *Allows all supply to participate in the ancillary services markets*

Recommendations

2. Evaluate incentives for loads to reduce demand for reasons unrelated to real-time energy prices

Uneconomic load reductions can undermine price formation in peak demand hours

3. Modify the real-time market to better commit load and fast-starting generating resources

Optimized, coordinated commitment would lower cost and improve price formation

4. Price congestion at all generator locations that affect a transmission constraint (New)

Small generators can have an impact

Recommendations

5. Consider including marginal losses in ERCOT locational marginal prices
 - Improves locational pricing and dispatch of resources - especially at locations very close to or distant from load*
6. Price future ancillary services based on the shadow price of procuring the service
 - Allows prices to reflect the marginal cost to the system of satisfying the ancillary service rqmts.*
7. Evaluate the need for a local reserve product
 - *Improves consistency between market requirements and reliability requirements*
 - *Allows pricing of local shortages to provide economic signals needed in local areas*

To the Public Utility Commission of Texas

ERCOT Wholesale Electricity Market Monthly Report

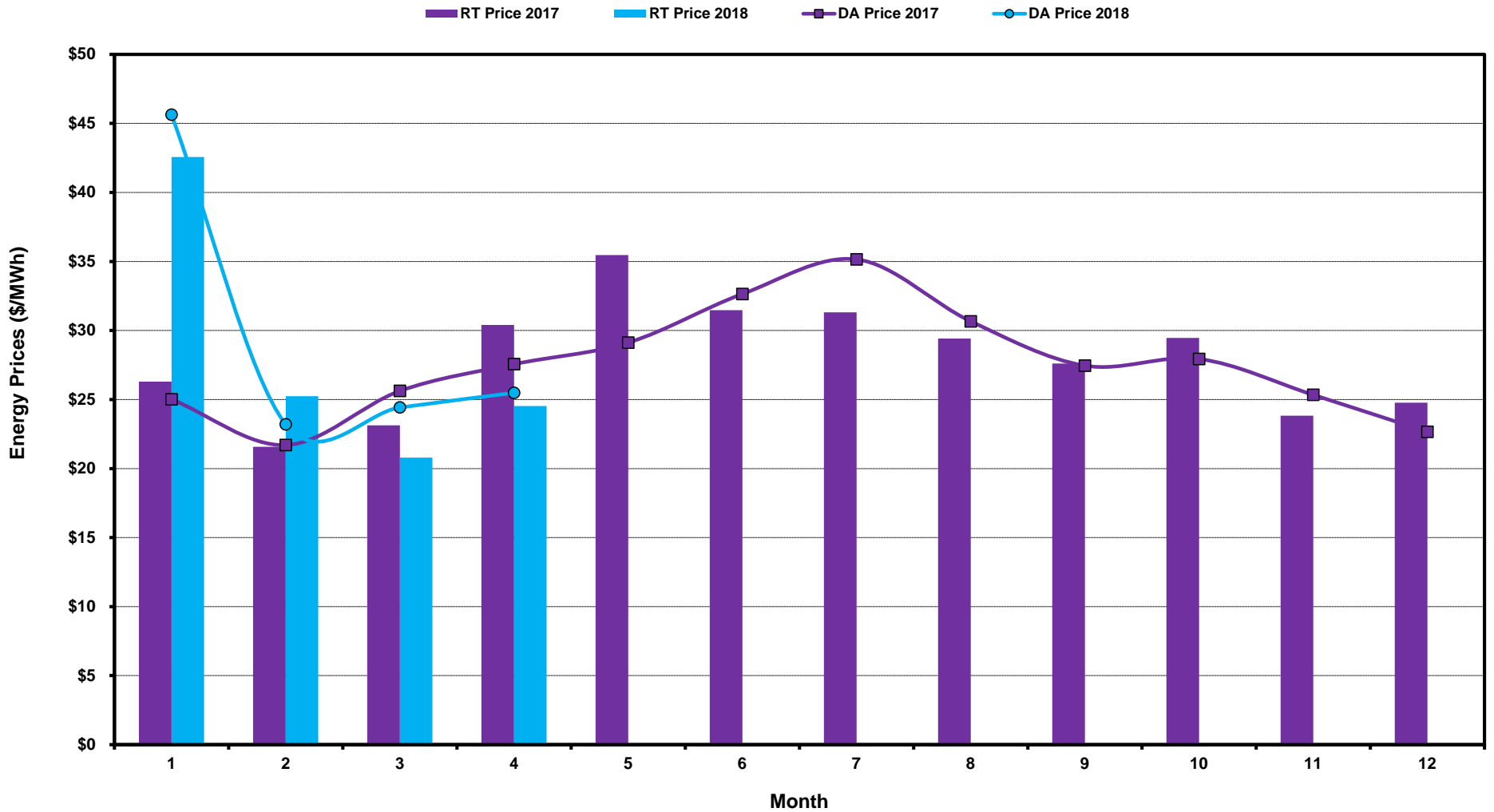
Thursday, May 10, 2018

Potomac Economics, Ltd.
Independent Market Monitor

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ERCOT-wide Average Energy Prices DA vs RT

(avg. DA & RT SPPs weighted by Real Time Settlement Loads)



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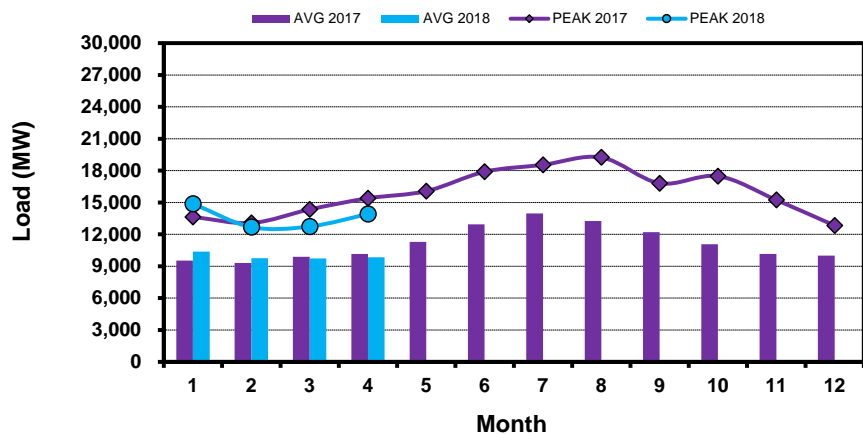
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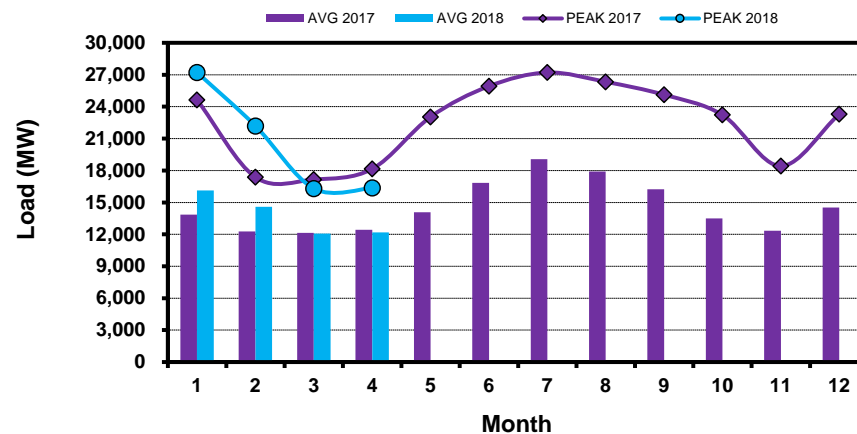
Load Zone Load Statistics

(Nodal load zone made comparable to zonal system Load Zone definitions*)

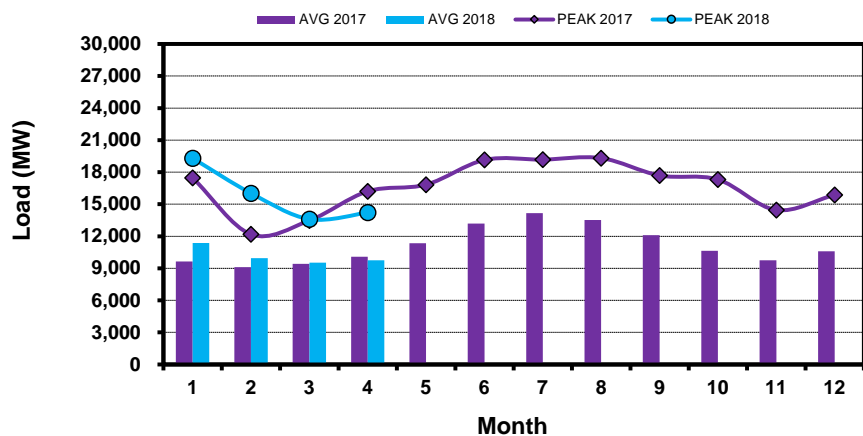
Houston Zone



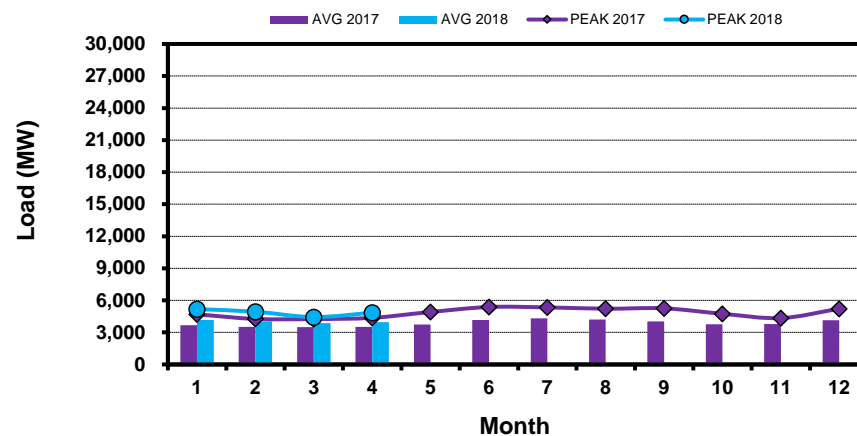
North Zone



South Zone



West Zone



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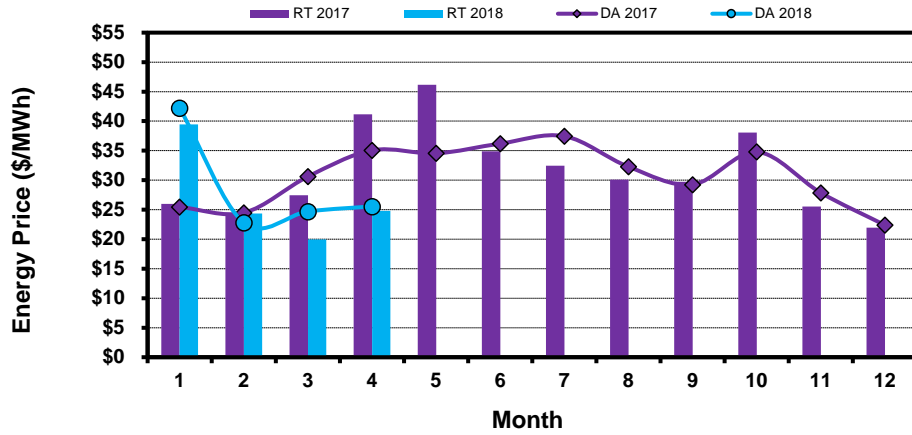
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Note: * Zonal load zone definition vs. Nodal comparable load zone definition: LZ_Houston=LZ_Houston; LZ_West=LZ_West; LZ_North=(LZ_North,LZ_RAYBN); LZ_South=(LZ_South,LZ_CPS,LZ_AEN,LZ_LCRA)

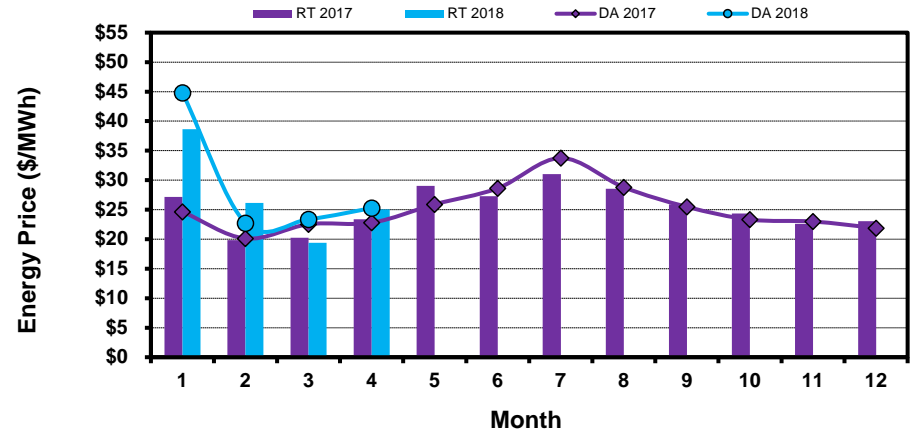
Load Zone Monthly Average Energy Price DA vs RT

(avg. DA & RT SPPs weighted by Real Time Settlement Loads)
 (Nodal load zone made comparable to zonal system Load Zone definitions*)

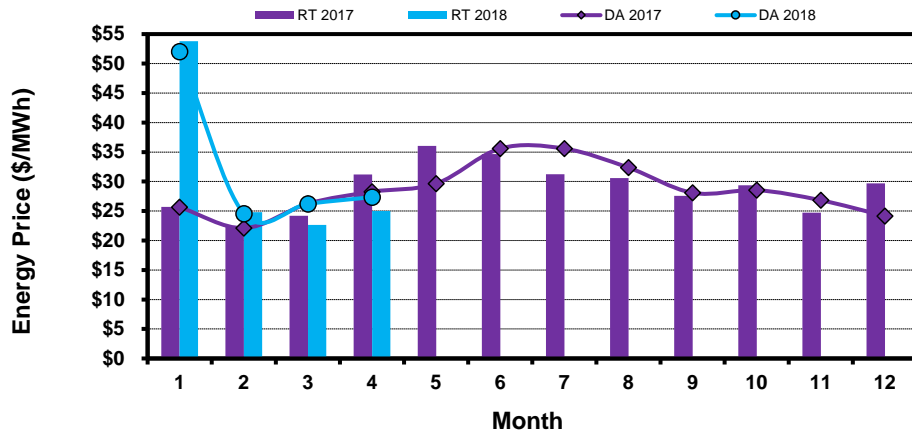
Houston Zone



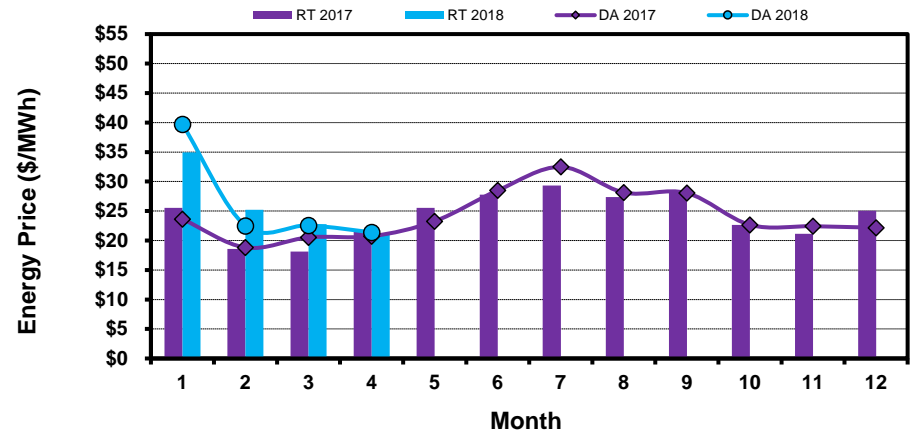
North Zone



South Zone



West Zone



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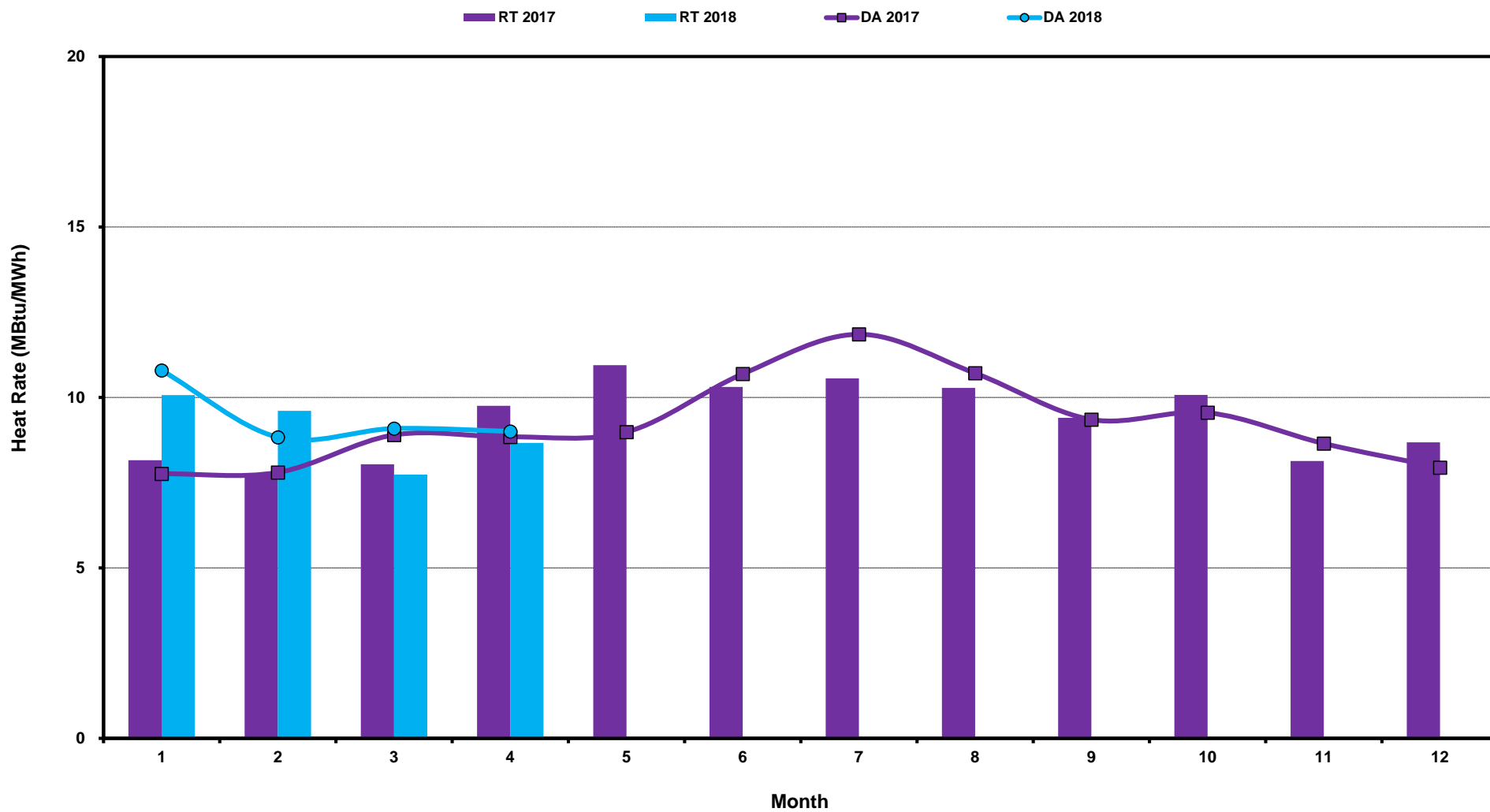
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ERCOT-wide Monthly Implied Heat Rate DA vs RT

(avg. heat rates weighted by Real Time Settlement Loads)



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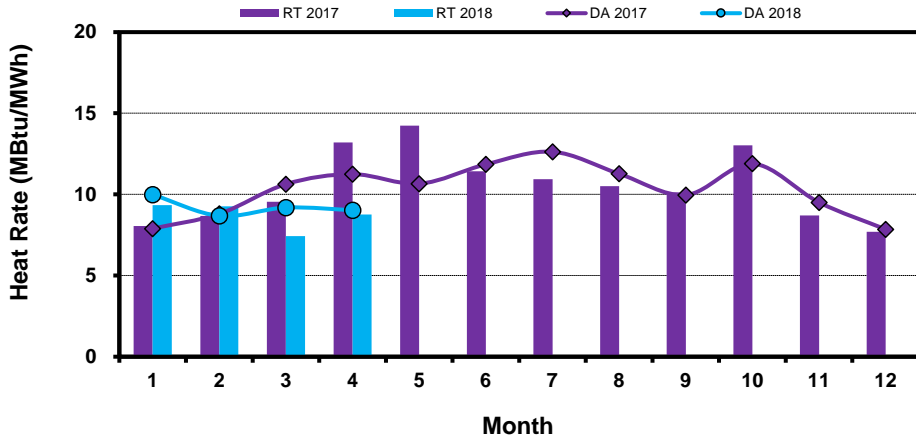
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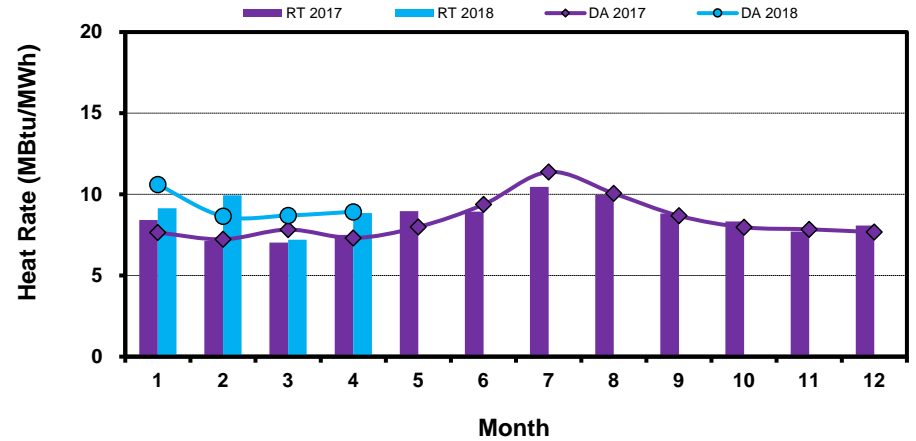
Load Zone Monthly Implied Heat Rate DA vs RT

(avg. heat rates weighted by Real Time Settlement Loads)
 (Nodal load zone made comparable to zonal system Load Zone definitions*)

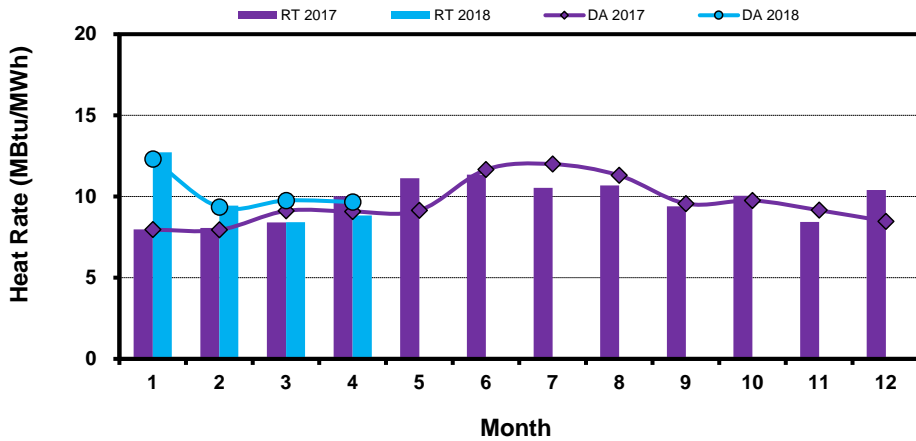
Houston Zone



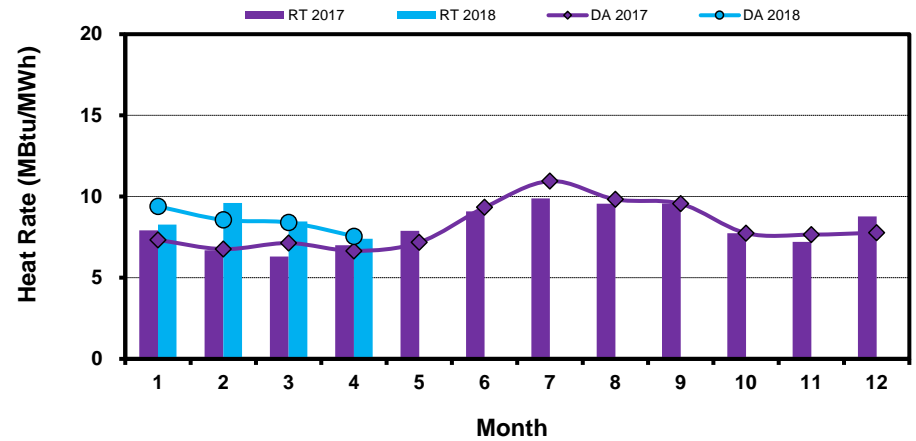
North Zone



South Zone



West Zone



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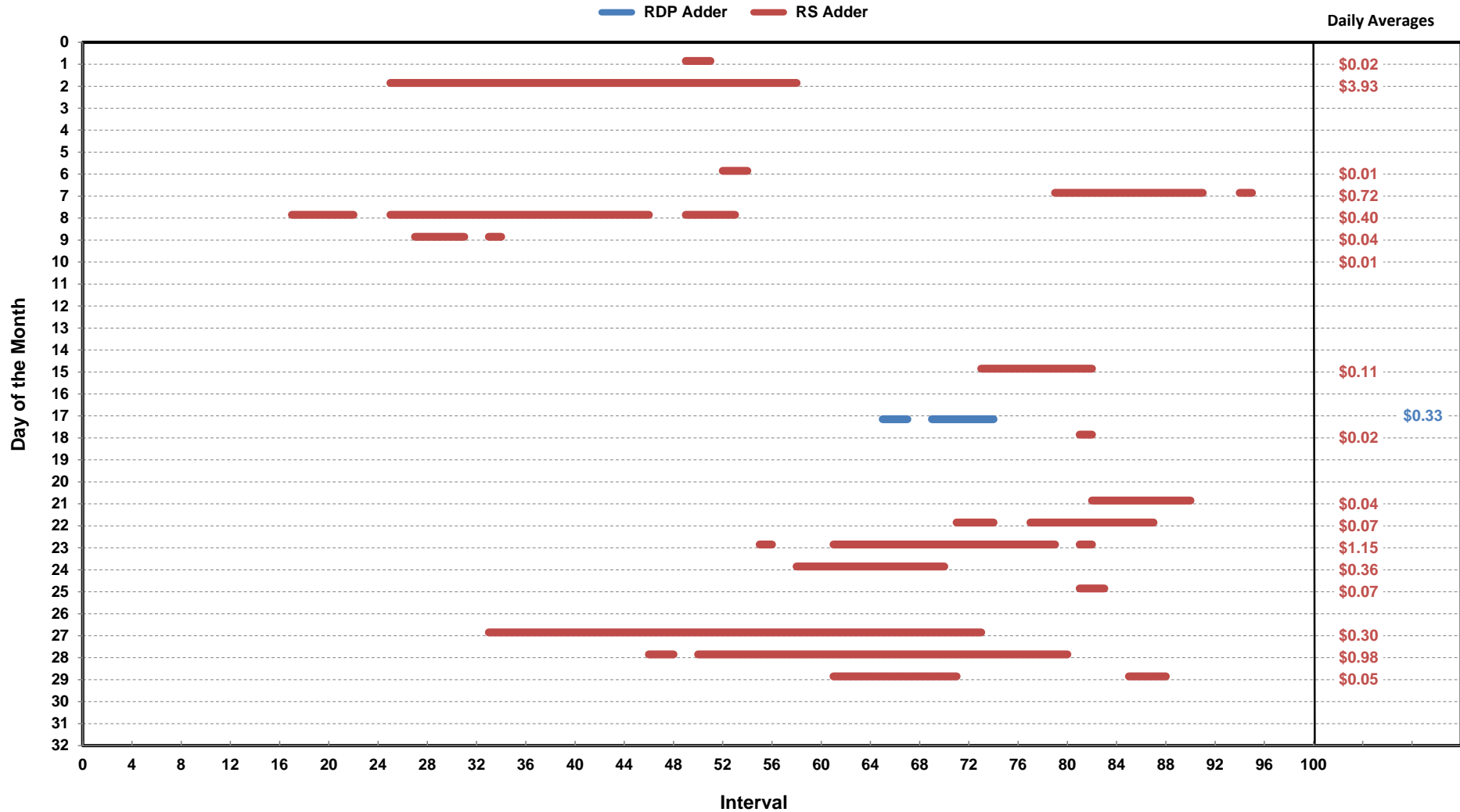
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Daily ORDC Adders Average Values and Interval Duration

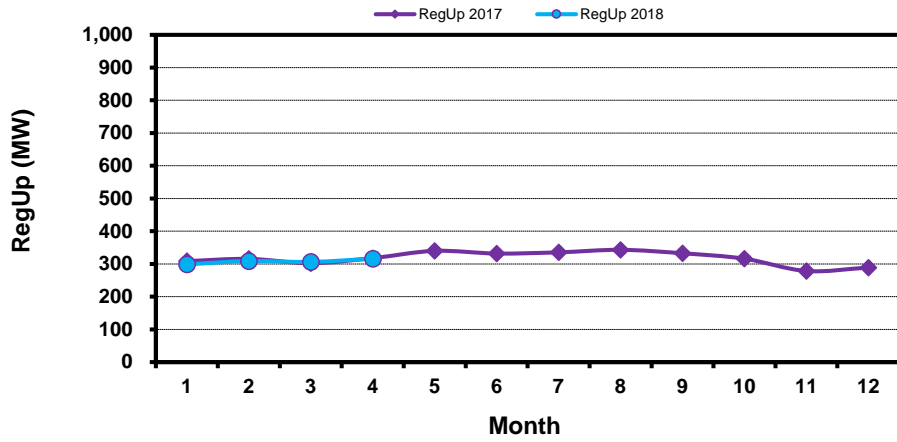
Apr-2018



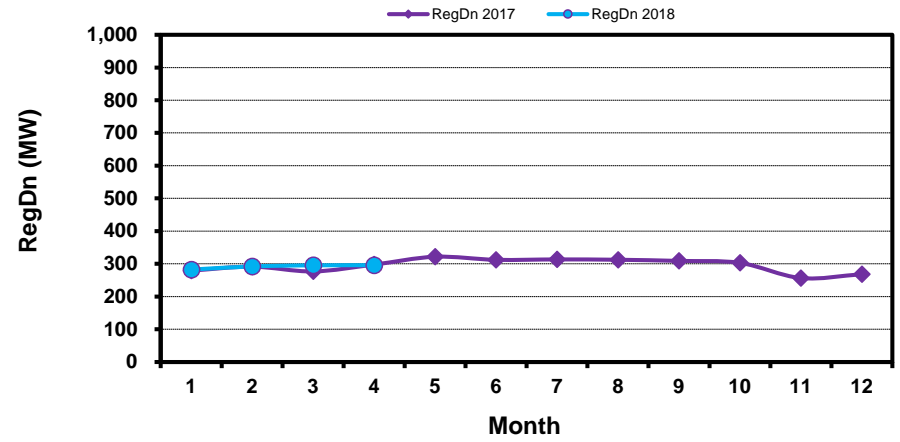
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Monthly Average of Ancillary Services Required MW

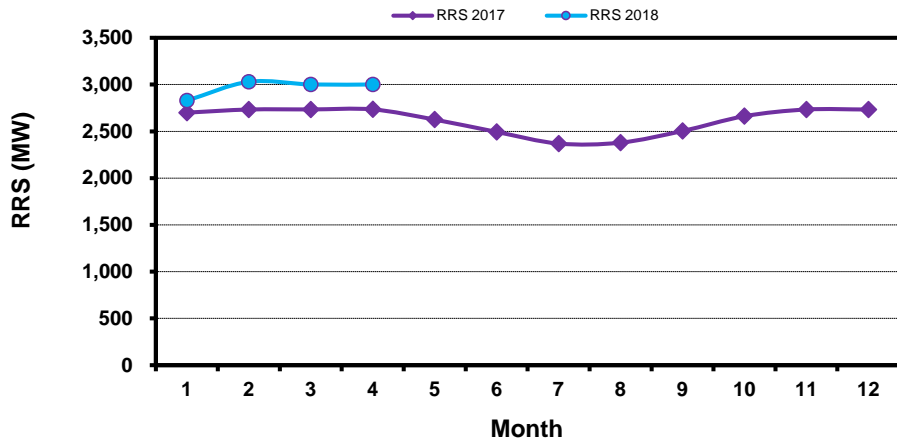
Regulation Up



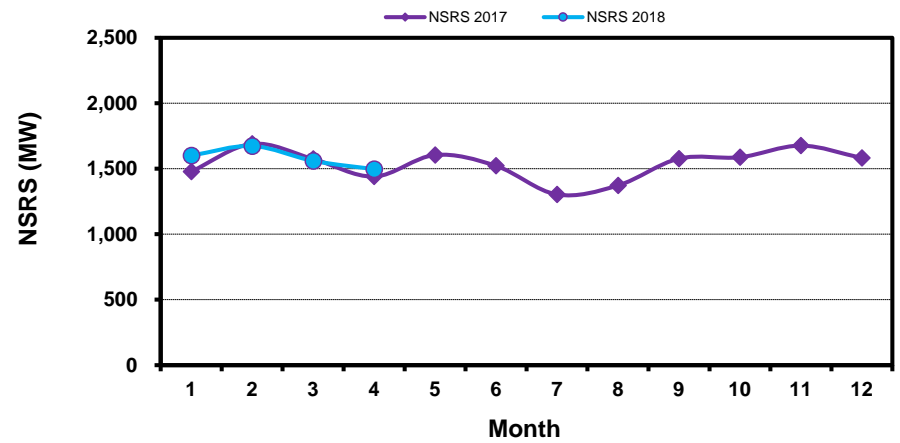
Regulation Down



Responsive Reserve



Non-Spin Reserve



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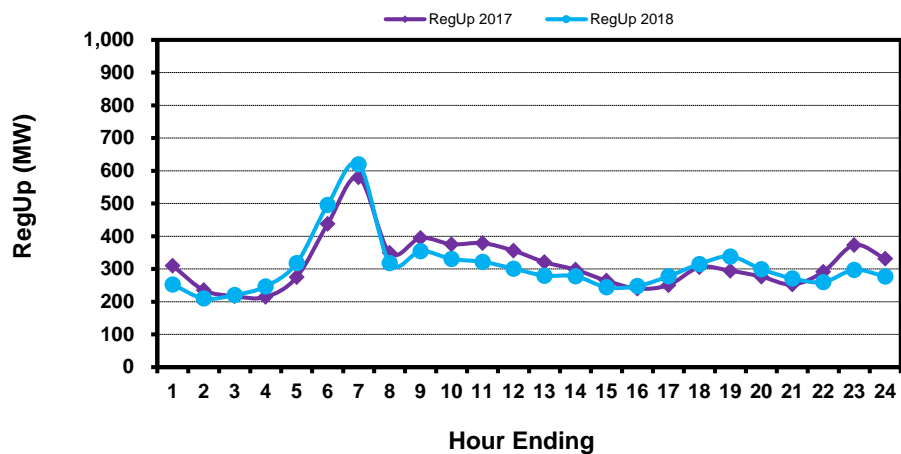
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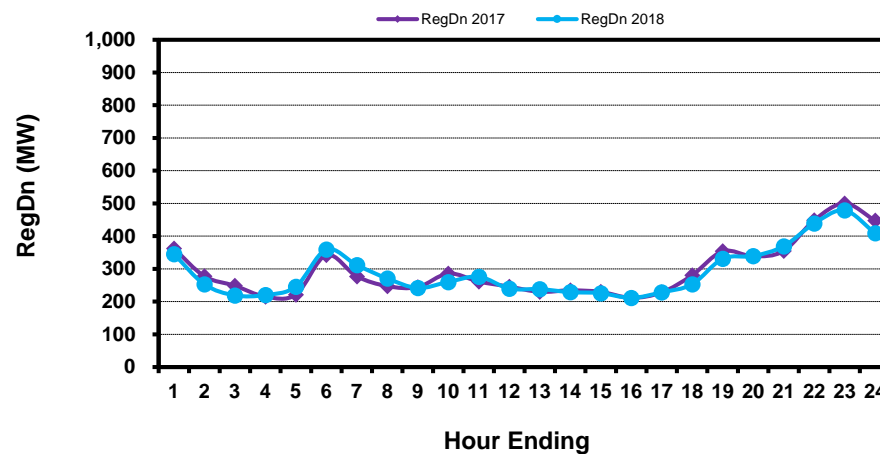
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Hourly Average of Ancillary Services Required MW

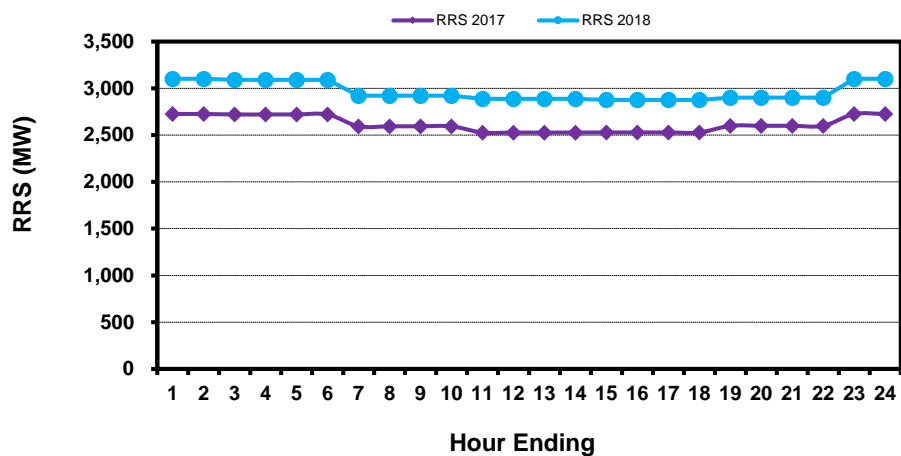
Regulation Up



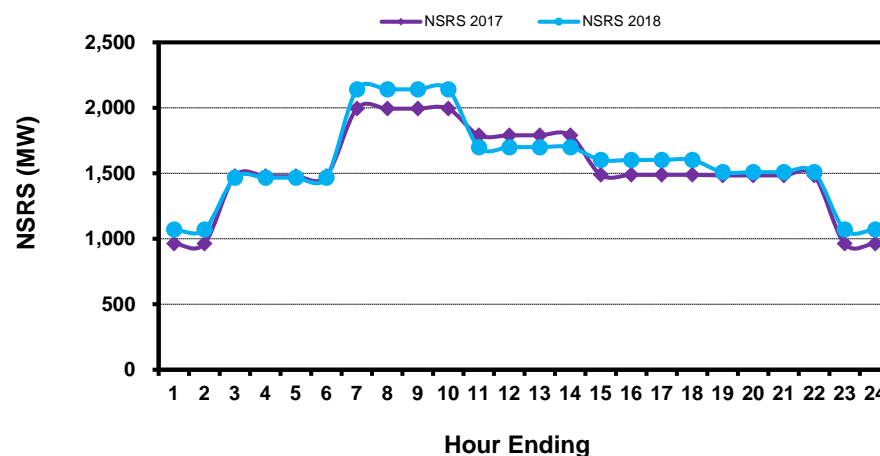
Regulation Down



Responsive Reserve



Non-Spin Reserve



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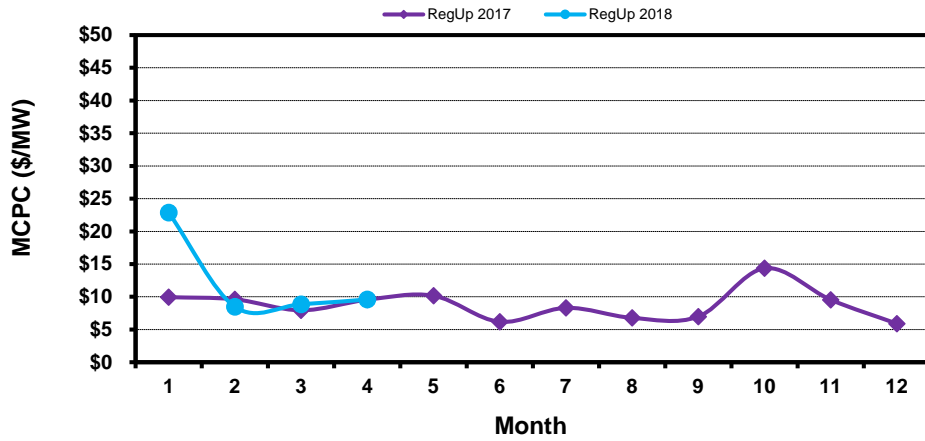
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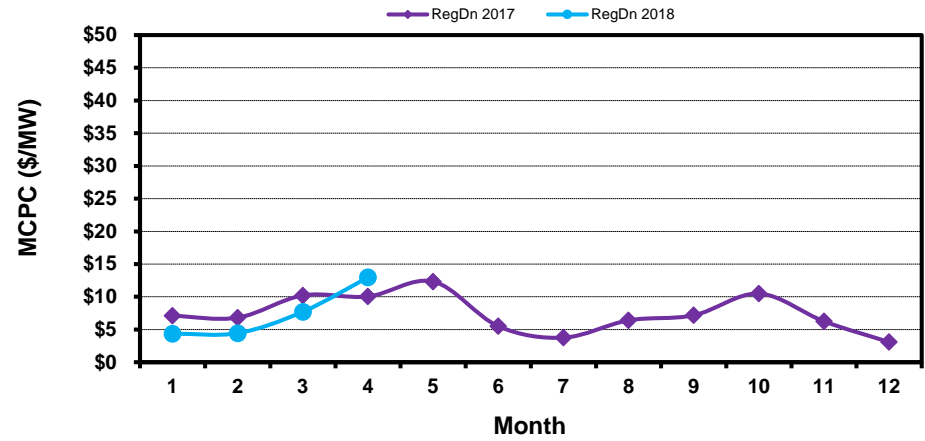
Monthly Average Ancillary Services Price

(weighted by A/S Quantities Required)

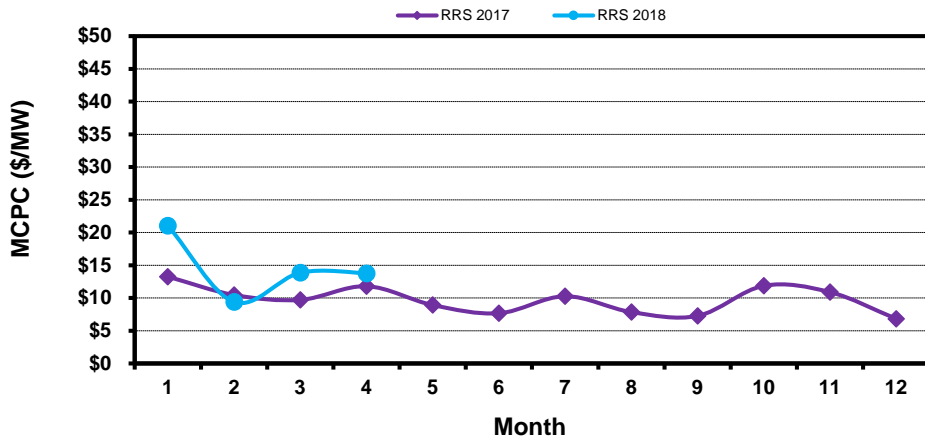
Regulation Up



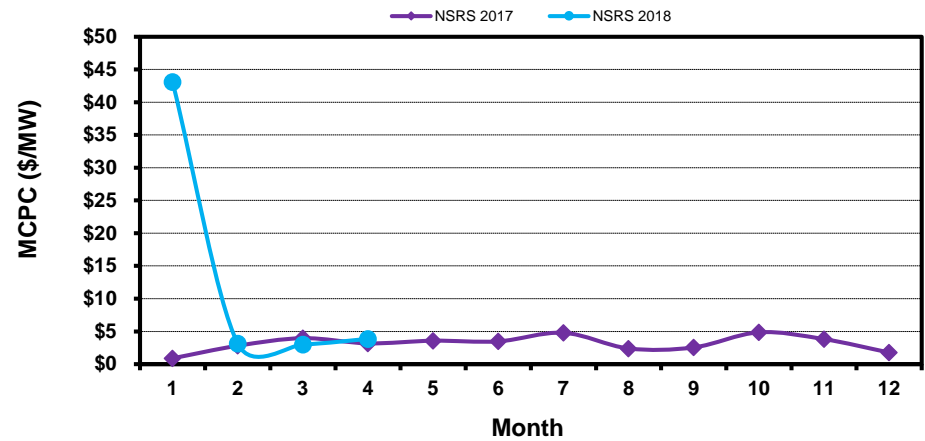
Regulation Down



Responsive Reserve



Non-Spin Reserve



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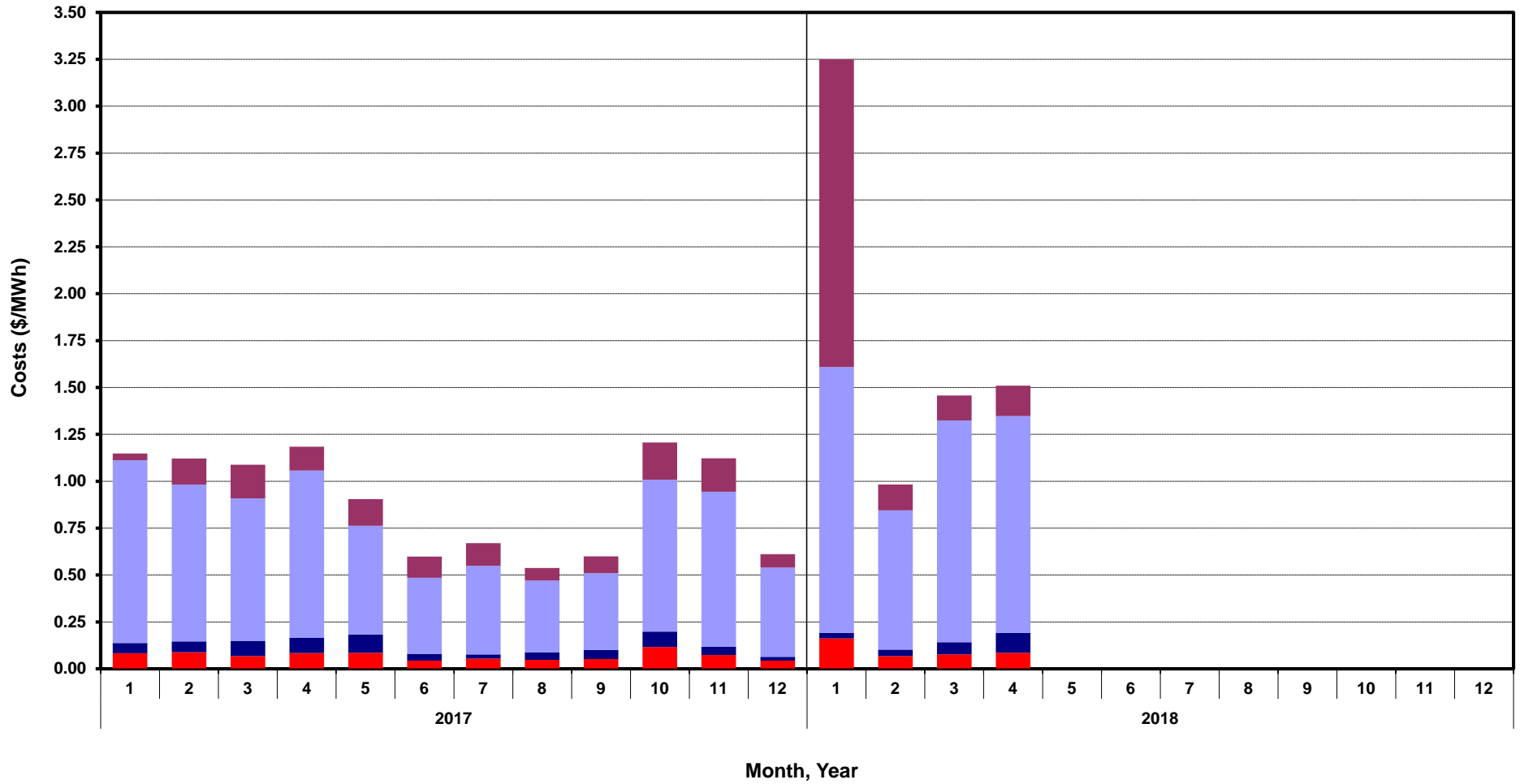
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Monthly Average A/S Cost per MWh Load

RegUp RegDn RRS NonSpin



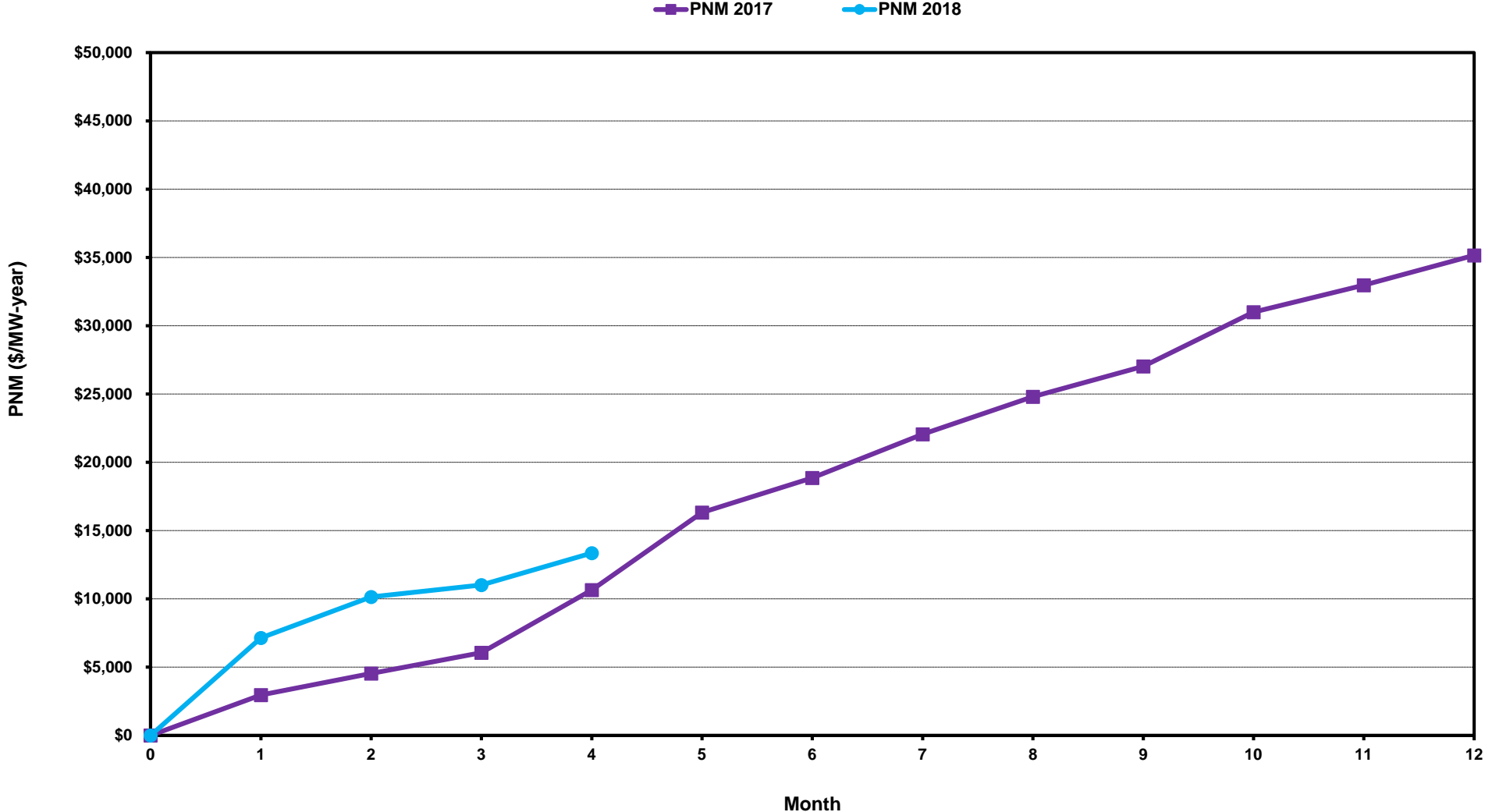
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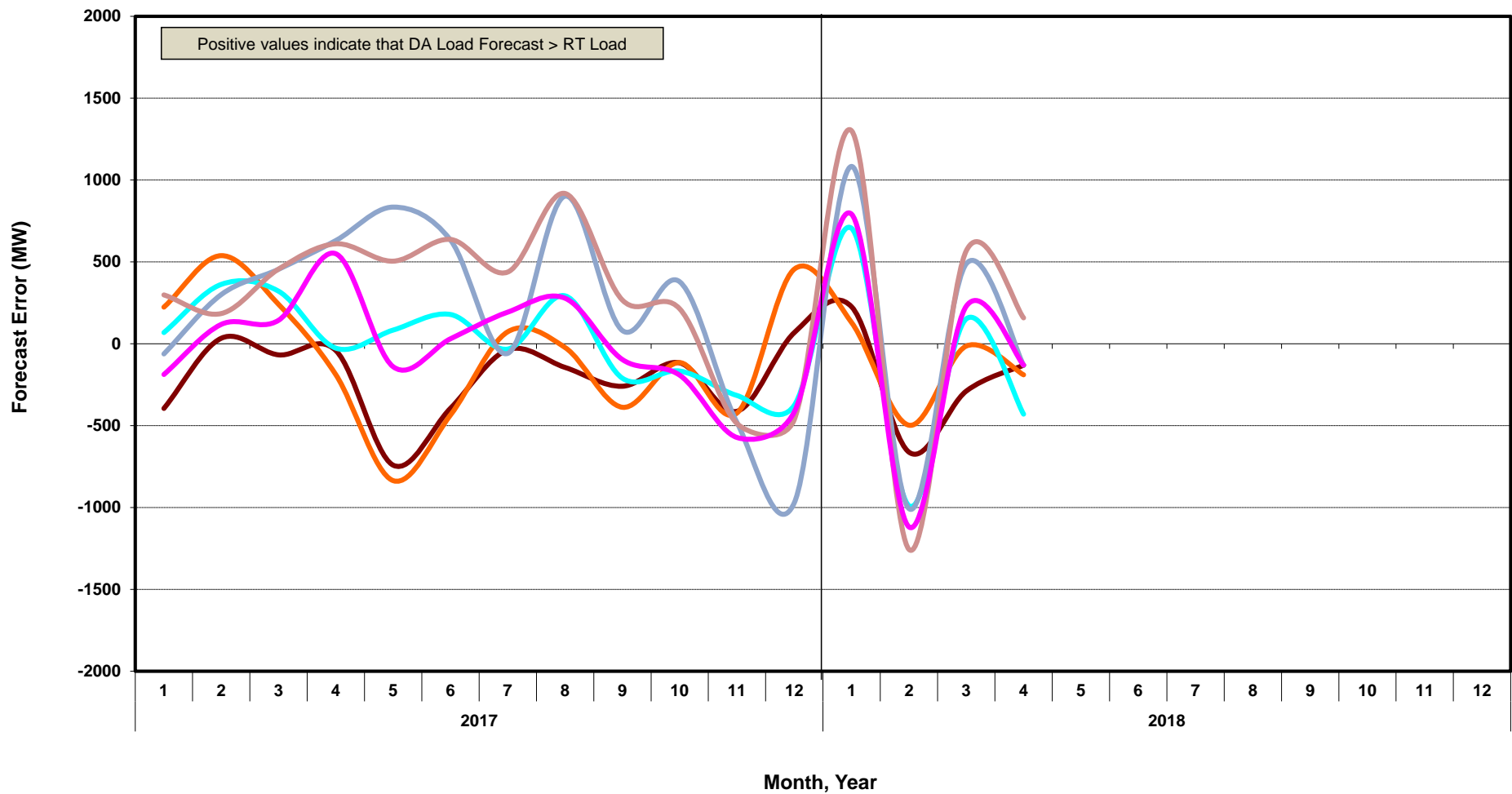
ERCOT-wide Cumulative Peaker Net Margin



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DA vs. RT Load Forecast Error by Hour Ending

HE_1_4 HE_5_8 HE_9_12 HE_13_16 HE_17_20 HE_21_24



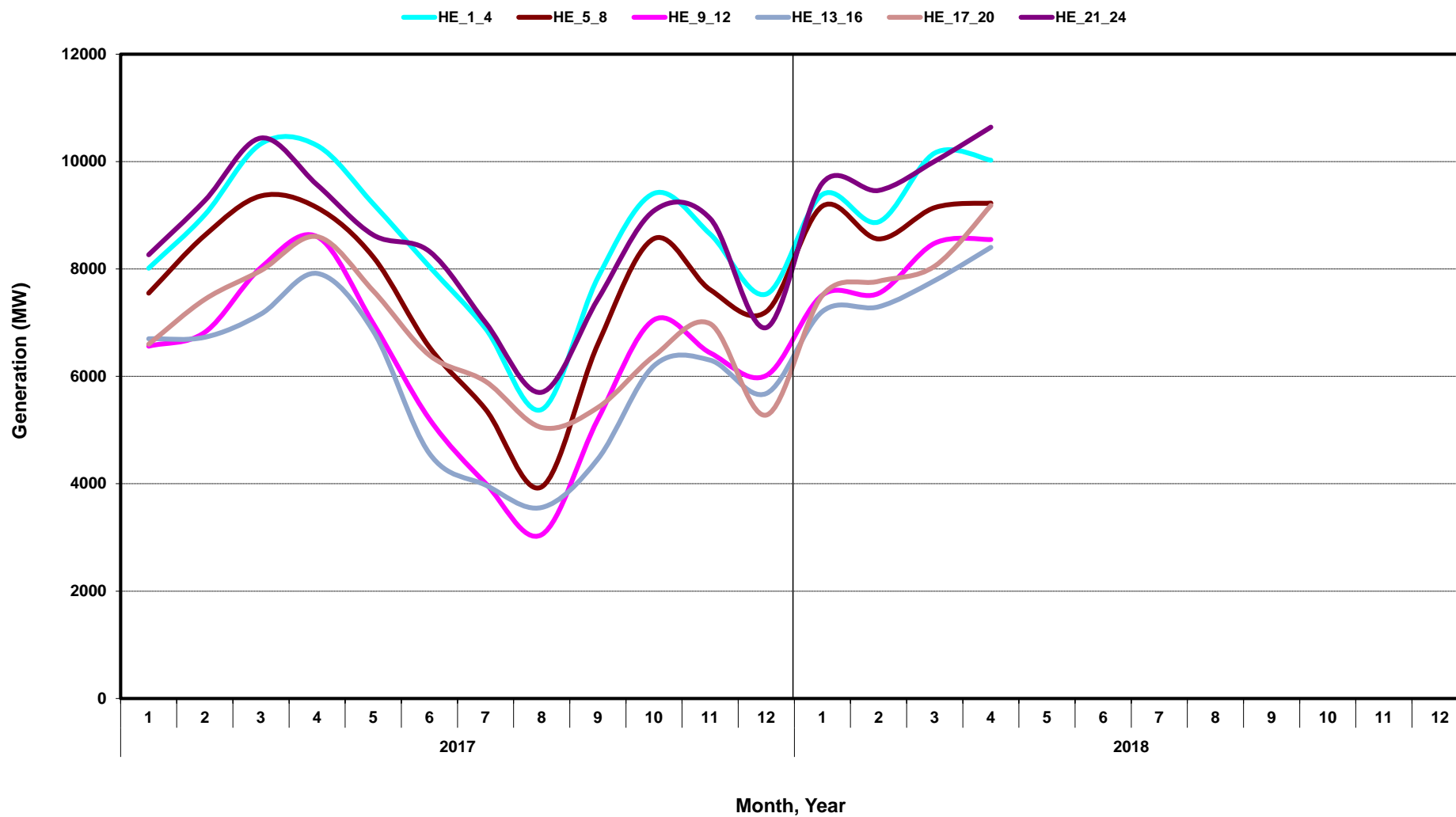
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Monthly Average of Wind Generation by Hour Ending



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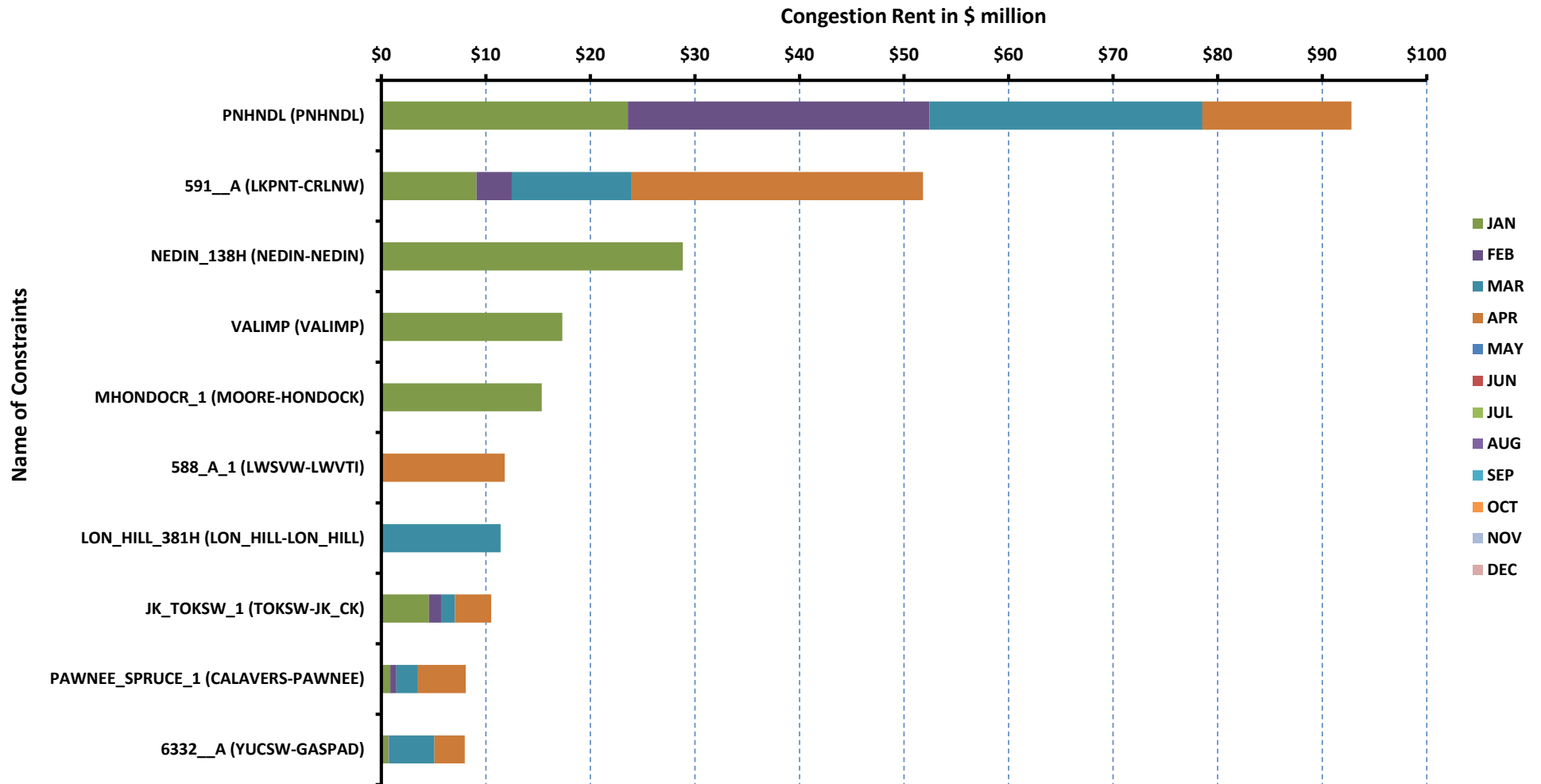
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RT Congestion Constraint Rankings - 1

Top 10 Constraints by Total Congestion Value - 2018



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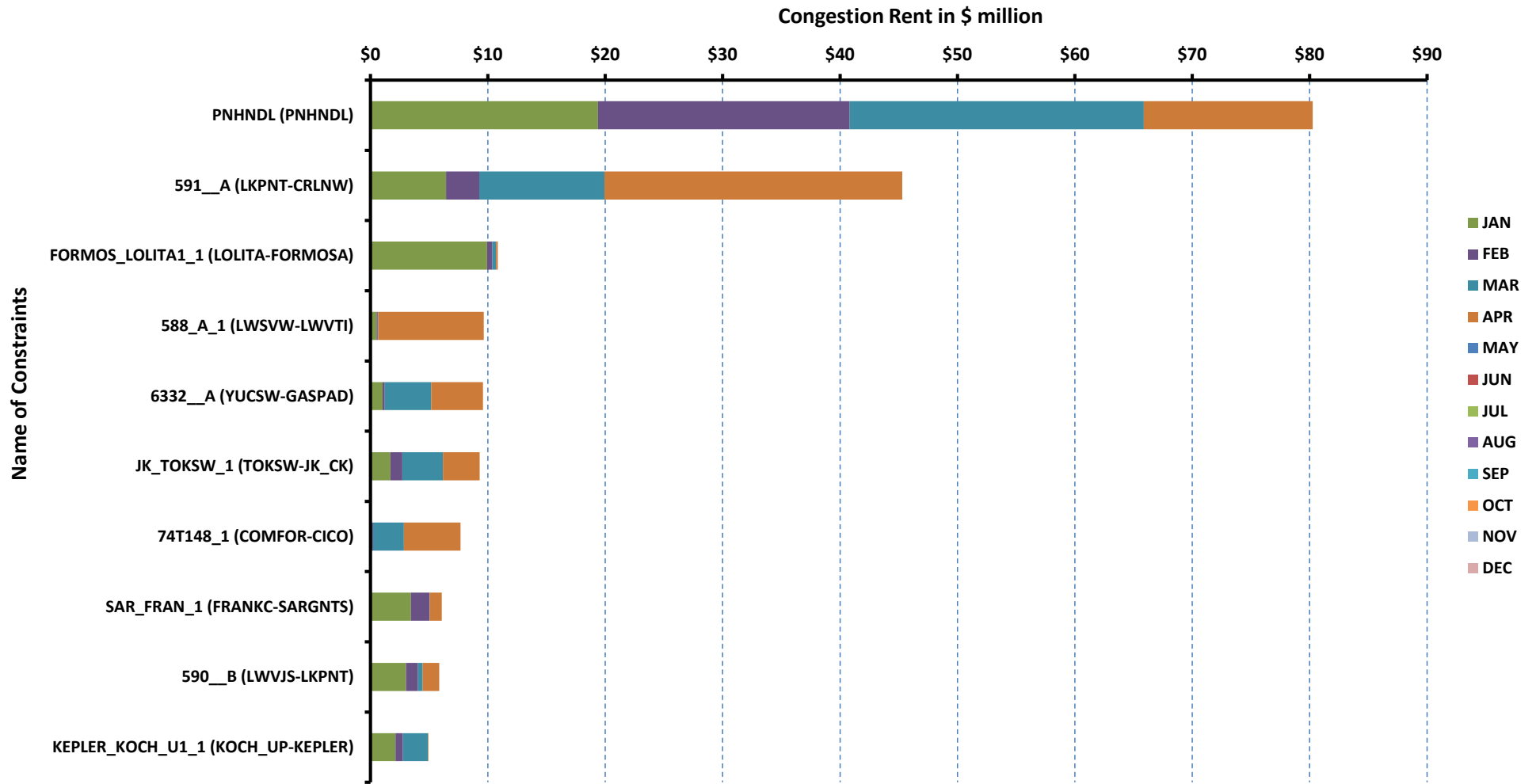
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DA Congestion Constraint Rankings - 1

Top 10 Constraints by Total Congestion Value - 2018



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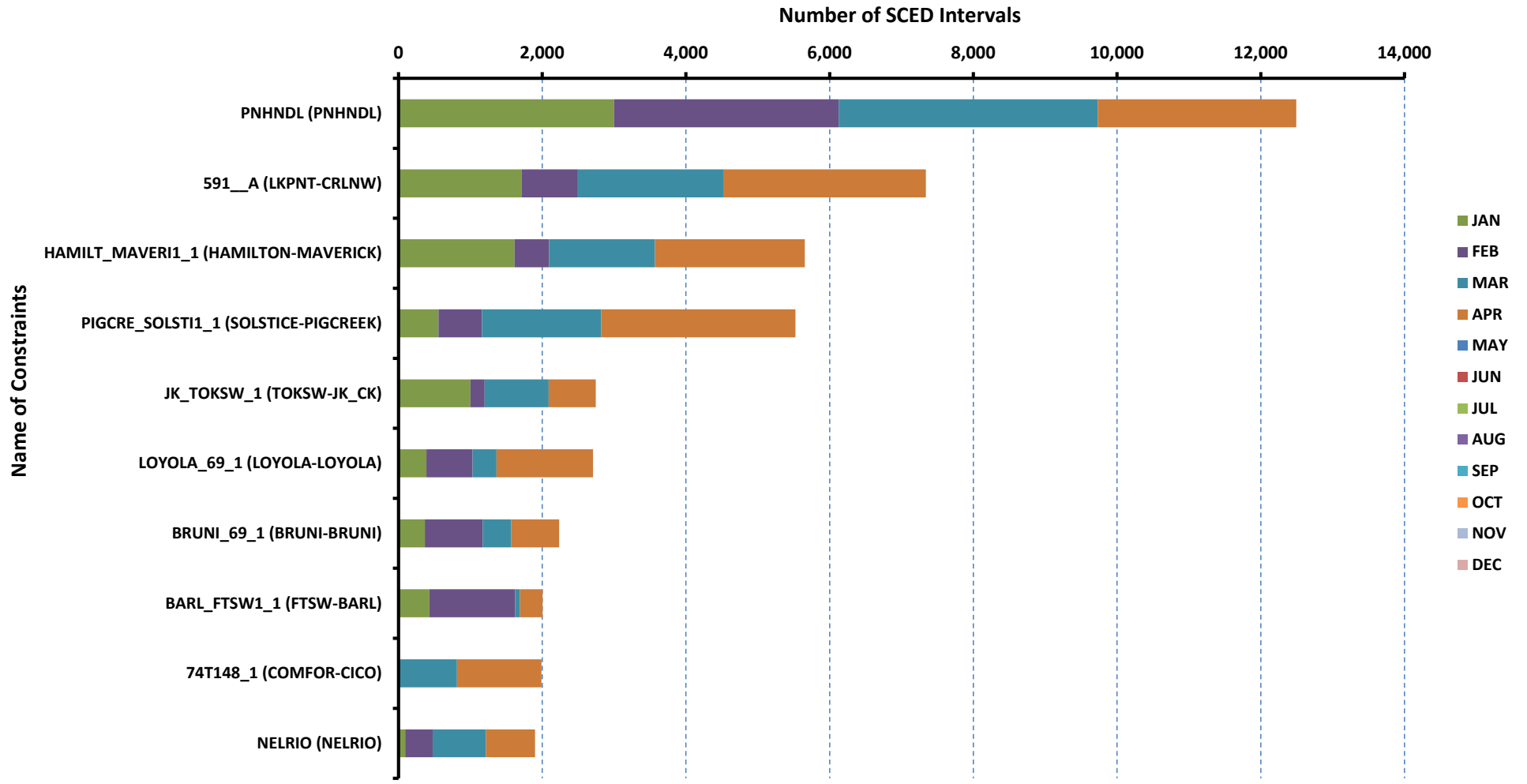
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RT Congestion Constraint Rankings - 2

Top 10 Constraints by Binding Frequency - 2018



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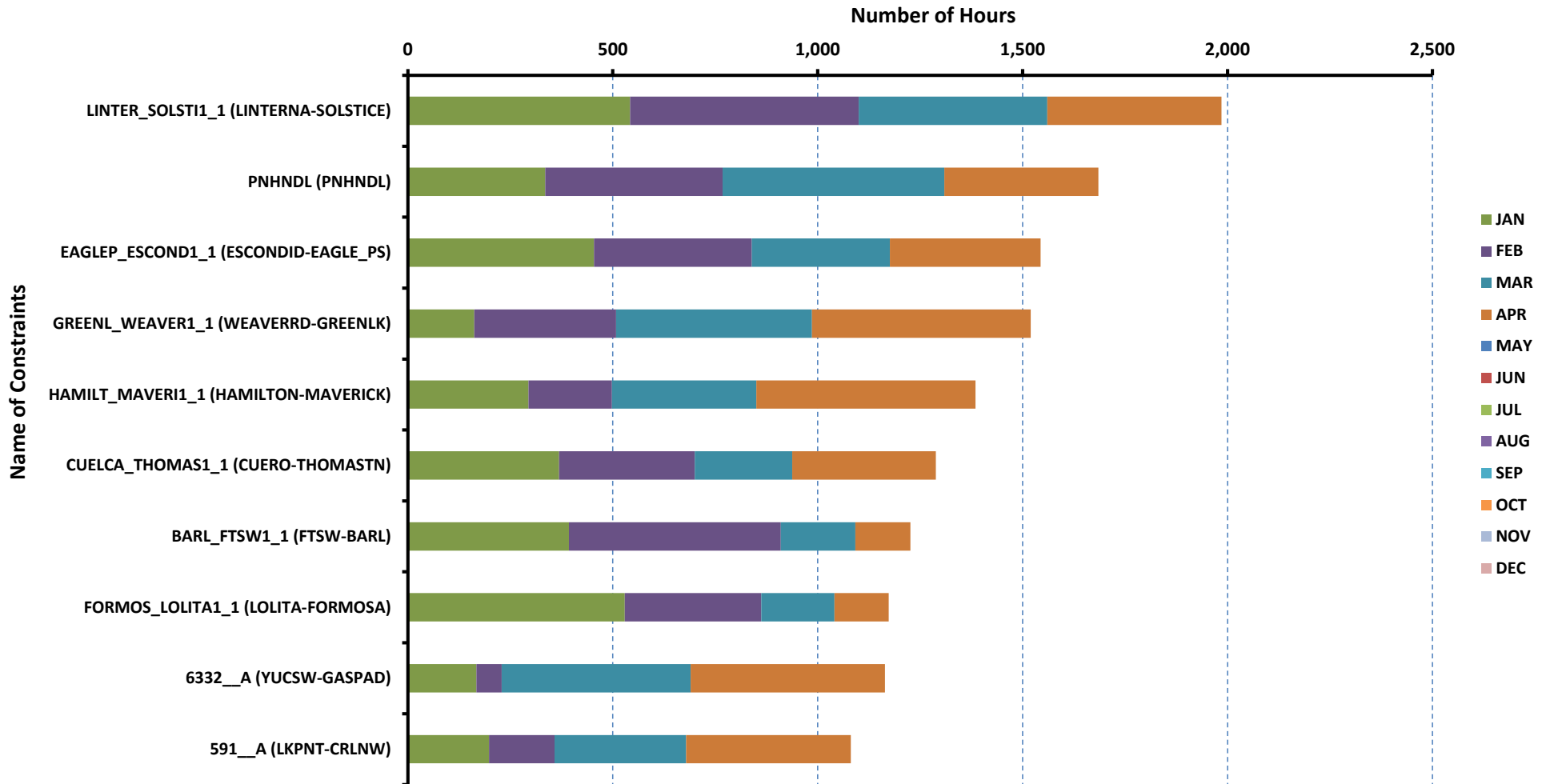
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DA Congestion Constraint Rankings - 2

Top 10 Constraints by Binding Frequency - 2018



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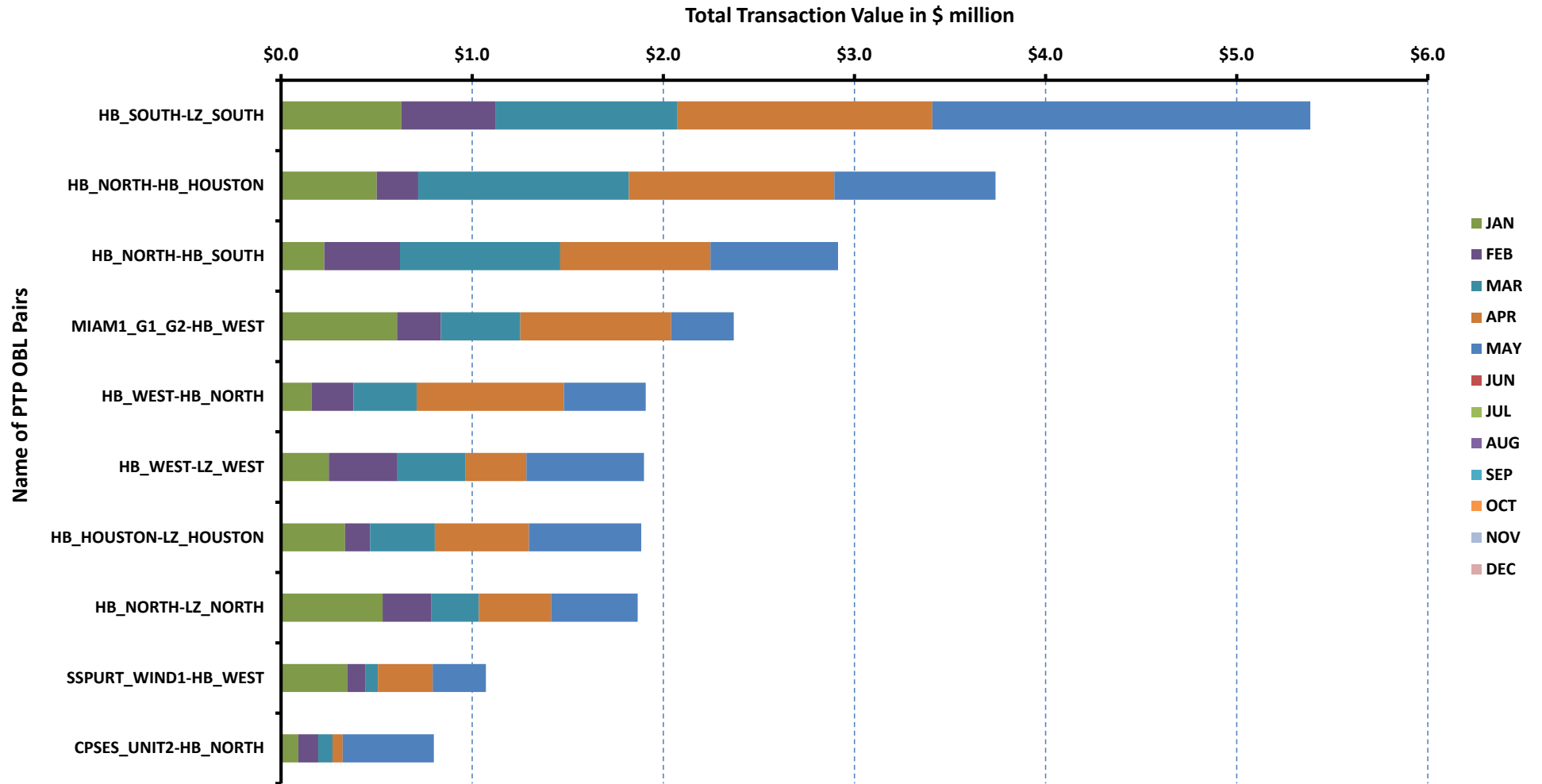
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Top 10 CRR Pairs Ranked by Monthly Auction Values - 1

Top 10 PTP Obligations by Total Transaction Value - 2018



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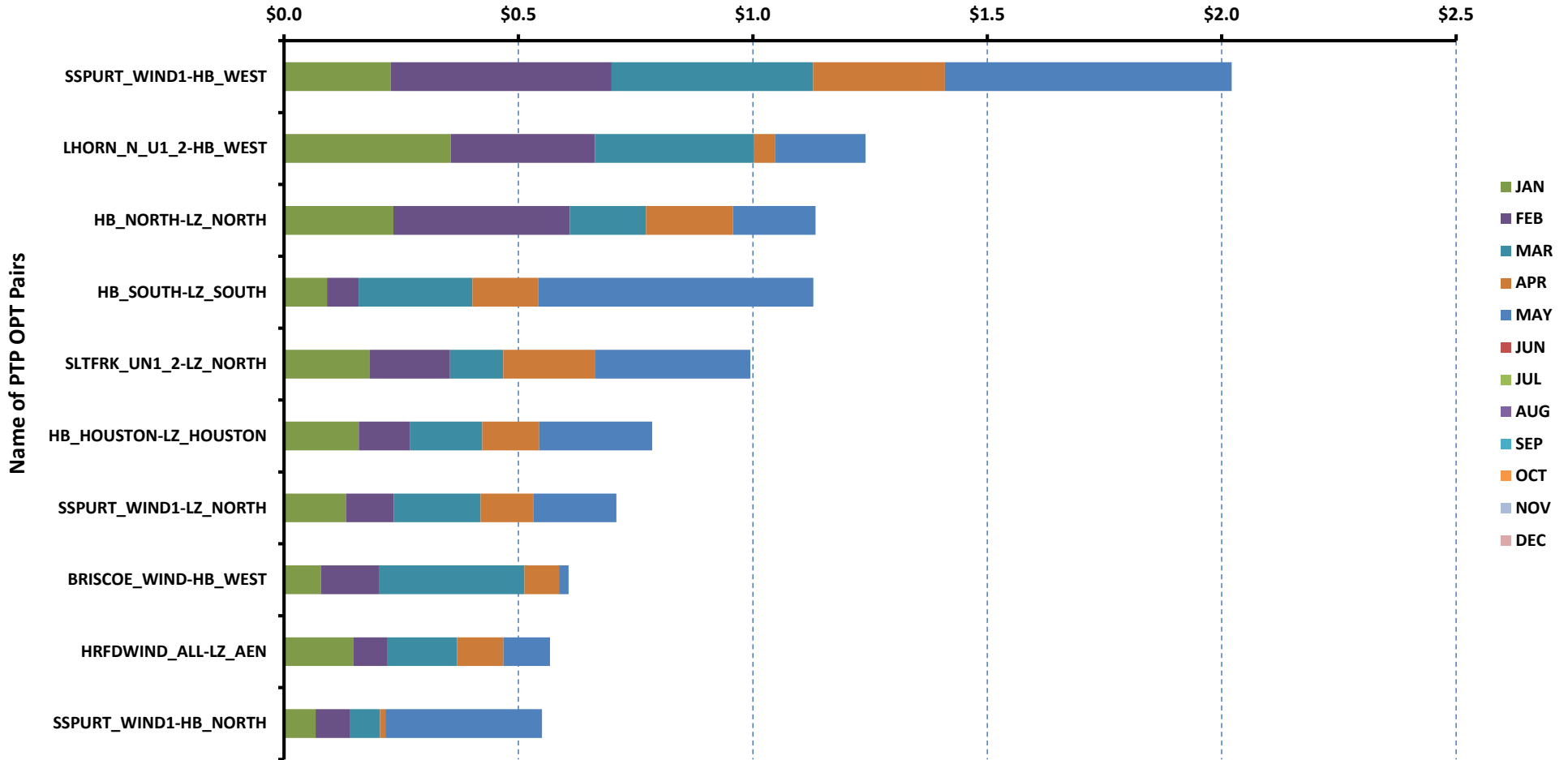
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Top 10 CRR Pairs Ranked by Monthly Auction Values - 2

Top 10 PTP Options by Total Transaction Value - 2018

Total Transaction Value in \$ million



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ERCOT-wide Avg. Energy Price - DA vs. RT			
year	month	dam_spp	rtm_spp
2017	1	\$ 25.01	\$ 26.30
	2	\$ 21.70	\$ 21.57
	3	\$ 25.62	\$ 23.14
	4	\$ 27.56	\$ 30.40
	5	\$ 29.12	\$ 35.47
	6	\$ 32.64	\$ 31.47
	7	\$ 35.15	\$ 31.32
	8	\$ 30.67	\$ 29.43
	9	\$ 27.45	\$ 27.61
	10	\$ 27.94	\$ 29.46
	11	\$ 25.34	\$ 23.84
	12	\$ 22.66	\$ 24.77
2018	1	\$ 45.63	\$ 42.57
	2	\$ 23.21	\$ 25.24
	3	\$ 24.42	\$ 20.79
	4	\$ 25.48	\$ 24.52
	5	\$ -	\$ -
	6	\$ -	\$ -
	7	\$ -	\$ -
	8	\$ -	\$ -
	9	\$ -	\$ -
	10	\$ -	\$ -
	11	\$ -	\$ -
	12	\$ -	\$ -

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Load Zone Load Statistics									
year	month	loadPEAK_Houston	loadPEAK_North	loadPEAK_South	loadPEAK_West	loadAVG_Houston	loadAVG_North	loadAVG_South	loadAVG_West
2017	1	13,640	24,641	17,476	4,693	9,533	13,862	9,650	3,682
	2	13,074	17,377	12,186	4,263	9,319	12,279	9,105	3,517
	3	14,350	17,155	13,474	4,247	9,894	12,145	9,426	3,489
	4	15,397	18,149	16,208	4,366	10,155	12,424	10,090	3,526
	5	16,071	23,038	16,835	4,912	11,298	14,082	11,344	3,734
	6	17,892	25,922	19,144	5,380	12,950	16,838	13,184	4,159
	7	18,546	27,206	19,176	5,343	13,970	19,060	14,172	4,325
	8	19,245	26,332	19,315	5,219	13,249	17,905	13,516	4,199
	9	16,810	25,120	17,691	5,254	12,212	16,242	12,107	4,029
	10	17,482	23,221	17,309	4,746	11,078	13,497	10,632	3,757
	11	15,238	18,420	14,459	4,342	10,154	12,350	9,753	3,794
	12	12,831	23,301	15,875	5,215	9,995	14,528	10,597	4,130
2018	1	14,879	27,220	19,303	5,182	10,382	16,129	11,367	4,167
	2	12,690	22,191	16,030	4,936	9,760	14,589	9,940	4,038
	3	12,738	16,305	13,600	4,436	9,733	12,071	9,535	3,873
	4	13,922	16,372	14,233	4,855	9,850	12,174	9,757	3,960
	5	-	-	-	-	-	-	-	-
	6	-	-	-	-	-	-	-	-
	7	-	-	-	-	-	-	-	-
	8	-	-	-	-	-	-	-	-
	9	-	-	-	-	-	-	-	-
	10	-	-	-	-	-	-	-	-
	11	-	-	-	-	-	-	-	-
	12	-	-	-	-	-	-	-	-

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Load Zone Monthly Average Energy Price - DA vs. RT										
year	month	avgRTMp_Houston	avgRTMp_North	avgRTMp_South	avgRTMp_West	avgDAMp_Houston	avgDAMp_North	avgDAMp_South	avgDAMp_West	
2017	1	\$ 25.97	\$ 27.15	\$ 25.69	\$ 25.52	\$ 25.45	\$ 24.65	\$ 25.65	\$ 23.62	
	2	\$ 24.14	\$ 19.84	\$ 22.43	\$ 18.59	\$ 24.48	\$ 20.12	\$ 22.10	\$ 18.81	
	3	\$ 27.46	\$ 20.23	\$ 24.18	\$ 18.15	\$ 30.61	\$ 22.53	\$ 26.24	\$ 20.54	
	4	\$ 41.17	\$ 23.37	\$ 31.21	\$ 21.80	\$ 35.06	\$ 22.79	\$ 28.27	\$ 20.73	
	5	\$ 46.16	\$ 29.05	\$ 36.05	\$ 25.54	\$ 34.55	\$ 25.91	\$ 29.64	\$ 23.27	
	6	\$ 34.90	\$ 27.27	\$ 34.65	\$ 27.77	\$ 36.20	\$ 28.63	\$ 35.60	\$ 28.49	
	7	\$ 32.45	\$ 31.01	\$ 31.24	\$ 29.34	\$ 37.45	\$ 33.75	\$ 35.58	\$ 32.49	
	8	\$ 30.09	\$ 28.53	\$ 30.59	\$ 27.37	\$ 32.27	\$ 28.79	\$ 32.36	\$ 28.14	
	9	\$ 29.74	\$ 25.89	\$ 27.59	\$ 28.11	\$ 29.25	\$ 25.48	\$ 28.08	\$ 28.05	
	10	\$ 38.08	\$ 24.35	\$ 29.37	\$ 22.64	\$ 34.79	\$ 23.32	\$ 28.53	\$ 22.66	
	11	\$ 25.52	\$ 22.59	\$ 24.71	\$ 21.14	\$ 27.86	\$ 22.99	\$ 26.83	\$ 22.42	
	12	\$ 21.95	\$ 23.04	\$ 29.69	\$ 25.04	\$ 22.38	\$ 21.88	\$ 24.16	\$ 22.17	
2018	1	\$ 39.45	\$ 38.63	\$ 53.81	\$ 34.96	\$ 42.23	\$ 44.82	\$ 52.06	\$ 39.71	
	2	\$ 24.34	\$ 26.14	\$ 24.82	\$ 25.22	\$ 22.81	\$ 22.74	\$ 24.57	\$ 22.50	
	3	\$ 19.97	\$ 19.38	\$ 22.64	\$ 22.75	\$ 24.70	\$ 23.37	\$ 26.22	\$ 22.57	
	4	\$ 24.82	\$ 25.06	\$ 25.00	\$ 20.96	\$ 25.54	\$ 25.27	\$ 27.35	\$ 21.39	
	5	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
	6	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
	7	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
	8	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
	9	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
	10	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
	11	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
	12	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	

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ERCOT-wide Monthly Implied Heat Rate - DA vs. RT						
year	month	gasprice	rtn_spp	HR_rtn	dam_spp	HR_dam
2017	1	\$ 3.22	\$ 26.30	8.16	\$ 25.01	7.76
	2	\$ 2.78	\$ 21.57	7.75	\$ 21.70	7.80
	3	\$ 2.88	\$ 23.14	8.04	\$ 25.62	8.90
	4	\$ 3.12	\$ 30.40	9.75	\$ 27.56	8.84
	5	\$ 3.24	\$ 35.47	10.94	\$ 29.12	8.99
	6	\$ 3.05	\$ 31.47	10.31	\$ 32.64	10.69
	7	\$ 2.97	\$ 31.32	10.56	\$ 35.15	11.85
	8	\$ 2.86	\$ 29.43	10.28	\$ 30.67	10.71
	9	\$ 2.94	\$ 27.61	9.40	\$ 27.45	9.35
	10	\$ 2.93	\$ 29.46	10.07	\$ 27.94	9.55
	11	\$ 2.93	\$ 23.84	8.13	\$ 25.34	8.65
	12	\$ 2.85	\$ 24.77	8.68	\$ 22.66	7.94
2018	1	\$ 4.23	\$ 42.57	10.07	\$ 45.63	10.79
	2	\$ 2.63	\$ 25.24	9.61	\$ 23.21	8.83
	3	\$ 2.69	\$ 20.79	7.74	\$ 24.42	9.09
	4	\$ 2.83	\$ 24.52	8.66	\$ 25.48	9.00
	5	\$ -	\$ -	-	\$ -	-
	6	\$ -	\$ -	-	\$ -	-
	7	\$ -	\$ -	-	\$ -	-
	8	\$ -	\$ -	-	\$ -	-
	9	\$ -	\$ -	-	\$ -	-
	10	\$ -	\$ -	-	\$ -	-
	11	\$ -	\$ -	-	\$ -	-
	12	\$ -	\$ -	-	\$ -	-

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Load Zone Monthly Implied Heat Rate - DA vs. RT									
year	month	HRdam_Houston	HRdam_South	HRdam_North	HRdam_West	HRrtm_Houston	HRrtm_South	HRrtm_North	HRrtm_West
2017	1	7.89	7.96	7.65	7.33	8.06	7.97	8.42	7.92
	2	8.80	7.94	7.23	6.76	8.68	8.06	7.13	6.68
	3	10.63	9.12	7.83	7.13	9.54	8.40	7.03	6.30
	4	11.25	9.07	7.31	6.65	13.21	10.01	7.50	7.00
	5	10.66	9.14	7.99	7.18	14.24	11.12	8.96	7.88
	6	11.85	11.66	9.37	9.33	11.43	11.35	8.93	9.09
	7	12.63	12.00	11.38	10.95	10.94	10.53	10.45	9.89
	8	11.27	11.30	10.06	9.83	10.51	10.68	9.96	9.56
	9	9.96	9.57	8.68	9.55	10.13	9.40	8.82	9.57
	10	11.90	9.75	7.97	7.75	13.02	10.04	8.33	7.74
	11	9.51	9.15	7.85	7.65	8.71	8.43	7.71	7.21
	12	7.85	8.47	7.67	7.77	7.69	10.41	8.08	8.78
2018	1	9.99	12.31	10.60	9.39	9.33	12.73	9.14	8.27
	2	8.68	9.35	8.65	8.56	9.26	9.44	9.95	9.60
	3	9.19	9.76	8.70	8.40	7.43	8.42	7.21	8.47
	4	9.02	9.66	8.93	7.55	8.77	8.83	8.85	7.41
	5	-	-	-	-	-	-	-	-
	6	-	-	-	-	-	-	-	-
	7	-	-	-	-	-	-	-	-
	8	-	-	-	-	-	-	-	-
	9	-	-	-	-	-	-	-	-
	10	-	-	-	-	-	-	-	-
	11	-	-	-	-	-	-	-	-
	12	-	-	-	-	-	-	-	-

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Daily ORDC Adders Average Values and Interval Duration								
YEAR	MONTH	DAY	PRICE_RS	PRICE_RDP	RS_CNT	RDP_CNT	RS_POS	RDP_POS
2018	4	1	\$ 0.02	\$ -	4	0	80	90
2018	4	2	\$ 3.93	\$ -	34	0	80	90
2018	4	3	\$ -	\$ -	0	0	80	90
2018	4	4	\$ -	\$ -	0	0	80	90
2018	4	5	\$ -	\$ -	0	0	80	90
2018	4	6	\$ 0.01	\$ -	4	0	80	90
2018	4	7	\$ 0.72	\$ -	15	0	80	90
2018	4	8	\$ 0.40	\$ -	33	0	80	90
2018	4	9	\$ 0.04	\$ -	7	0	80	90
2018	4	10	\$ 0.01	\$ -	1	0	80	90
2018	4	11	\$ -	\$ -	0	0	80	90
2018	4	12	\$ -	\$ -	0	0	80	90
2018	4	13	\$ -	\$ -	0	0	80	90
2018	4	14	\$ -	\$ -	0	0	80	90
2018	4	15	\$ 0.11	\$ -	10	0	80	90
2018	4	16	\$ -	\$ -	0	0	80	90
2018	4	17	\$ -	\$ 0.33	0	9	80	90
2018	4	18	\$ 0.02	\$ -	2	0	80	90
2018	4	19	\$ -	\$ -	0	0	80	90
2018	4	20	\$ -	\$ -	0	0	80	90
2018	4	21	\$ 0.04	\$ -	9	0	80	90
2018	4	22	\$ 0.07	\$ -	15	0	80	90
2018	4	23	\$ 1.15	\$ -	23	0	80	90
2018	4	24	\$ 0.36	\$ -	13	0	80	90
2018	4	25	\$ 0.07	\$ -	4	0	80	90
2018	4	26	\$ -	\$ -	0	0	80	90
2018	4	27	\$ 0.30	\$ -	43	0	80	90
2018	4	28	\$ 0.98	\$ -	34	0	80	90
2018	4	29	\$ 0.05	\$ -	15	0	80	90
2018	4	30	\$ -	\$ -	0	0	80	90
0	0	0	\$ -	\$ -	0	0	0	0

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Monthly Average of Ancillary Services Required MW					
year	month	ASMW_REGDN	ASMW_NSPIN	ASMW_RRS	ASMW_REGUP
2017	1	279	1,479	2,700	309
	2	291	1,690	2,733	315
	3	277	1,575	2,734	302
	4	298	1,441	2,734	318
	5	322	1,605	2,626	340
	6	312	1,522	2,494	332
	7	314	1,304	2,370	335
	8	313	1,372	2,379	343
	9	309	1,578	2,504	333
	10	303	1,588	2,662	316
	11	257	1,677	2,733	279
	12	268	1,583	2,733	289
2018	1	283	1,601	2,829	299
	2	292	1,674	3,030	309
	3	296	1,560	3,001	306
	4	296	1,497	3,001	316
	5	-	-	-	-
	6	-	-	-	-
	7	-	-	-	-
	8	-	-	-	-
	9	-	-	-	-
	10	-	-	-	-
	11	-	-	-	-
	12	-	-	-	-

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Hourly Average of Ancillary Services Required MW					
year	DELIVERY_HOUR	ASMW_REGDN	ASMW_NSPIN	ASMW_RRS	ASMW_REGUP
2017	1	362	963	2,726	310
	2	278	963	2,726	235
	3	248	1,478	2,720	217
	4	215	1,478	2,721	214
	5	221	1,478	2,721	275
	6	342	1,478	2,721	437
	7	277	1,994	2,594	580
	8	247	1,994	2,594	349
	9	244	1,994	2,594	395
	10	286	1,994	2,594	376
	11	261	1,790	2,527	379
	12	246	1,790	2,527	356
	13	230	1,790	2,527	321
	14	234	1,790	2,527	298
	15	230	1,488	2,528	264
	16	212	1,488	2,528	240
	17	228	1,488	2,528	251
	18	281	1,488	2,528	305
	19	354	1,484	2,599	295
	20	338	1,484	2,599	277
	21	355	1,484	2,599	253
	22	448	1,484	2,599	291
	23	500	963	2,726	373
	24	448	963	2,726	331
2018	1	345	1,070	3,102	252
	2	253	1,070	3,102	210
	3	219	1,467	3,090	221
	4	220	1,467	3,091	247
	5	246	1,467	3,091	318
	6	359	1,467	3,091	496
	7	312	2,141	2,921	620
	8	271	2,141	2,921	318
	9	242	2,141	2,921	355
	10	260	2,141	2,921	330
	11	276	1,700	2,889	322
	12	240	1,700	2,889	301
	13	238	1,700	2,889	280
	14	229	1,700	2,889	278
	15	226	1,602	2,876	244
	16	211	1,602	2,876	248
	17	228	1,602	2,876	278
	18	253	1,602	2,876	315
	19	331	1,509	2,900	338
	20	339	1,509	2,900	299
	21	369	1,509	2,900	271
	22	439	1,509	2,900	260
	23	479	1,070	3,102	297
	24	409	1,070	3,102	277

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Monthly Average Ancillary Services Price					
year	month	MCPC_REGDN	MCPC_NSPIN	MCPC_RRS	MCPC_REGUP
2017	1	\$ 7.10	\$ 0.89	\$ 13.26	\$ 9.94
	2	\$ 6.81	\$ 2.81	\$ 10.47	\$ 9.62
	3	\$ 10.21	\$ 3.96	\$ 9.71	\$ 7.94
	4	\$ 10.04	\$ 3.18	\$ 11.80	\$ 9.55
	5	\$ 12.33	\$ 3.58	\$ 8.92	\$ 10.16
	6	\$ 5.50	\$ 3.48	\$ 7.67	\$ 6.18
	7	\$ 3.75	\$ 4.79	\$ 10.27	\$ 8.31
	8	\$ 6.40	\$ 2.40	\$ 7.85	\$ 6.78
	9	\$ 7.17	\$ 2.55	\$ 7.26	\$ 6.98
	10	\$ 10.49	\$ 4.86	\$ 11.87	\$ 14.36
	11	\$ 6.25	\$ 3.82	\$ 10.89	\$ 9.54
	12	\$ 3.08	\$ 1.78	\$ 6.82	\$ 5.89
2018	1	\$ 4.36	\$ 43.10	\$ 21.06	\$ 22.87
	2	\$ 4.45	\$ 3.14	\$ 9.40	\$ 8.48
	3	\$ 7.71	\$ 3.01	\$ 13.87	\$ 8.86
	4	\$ 12.98	\$ 3.86	\$ 13.76	\$ 9.59
	5	\$ -	\$ -	\$ -	\$ -
	6	\$ -	\$ -	\$ -	\$ -
	7	\$ -	\$ -	\$ -	\$ -
	8	\$ -	\$ -	\$ -	\$ -
	9	\$ -	\$ -	\$ -	\$ -
	10	\$ -	\$ -	\$ -	\$ -
	11	\$ -	\$ -	\$ -	\$ -
	12	\$ -	\$ -	\$ -	\$ -

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Monthly Average A/S Cost per MWh Load					
year	month	AScost_REGDN	AScost_NSPIIN	AScost_RRS	AScost_REGUP
2017	1	\$ 0.05	\$ 0.04	\$ 0.97	\$ 0.08
	2	\$ 0.06	\$ 0.14	\$ 0.84	\$ 0.09
	3	\$ 0.08	\$ 0.18	\$ 0.76	\$ 0.07
	4	\$ 0.08	\$ 0.13	\$ 0.89	\$ 0.08
	5	\$ 0.10	\$ 0.14	\$ 0.58	\$ 0.09
	6	\$ 0.04	\$ 0.11	\$ 0.41	\$ 0.04
	7	\$ 0.02	\$ 0.12	\$ 0.47	\$ 0.05
	8	\$ 0.04	\$ 0.07	\$ 0.38	\$ 0.05
	9	\$ 0.05	\$ 0.09	\$ 0.41	\$ 0.05
	10	\$ 0.08	\$ 0.20	\$ 0.81	\$ 0.12
	11	\$ 0.04	\$ 0.18	\$ 0.83	\$ 0.07
	12	\$ 0.02	\$ 0.07	\$ 0.48	\$ 0.04
2018	1	\$ 0.03	\$ 1.64	\$ 1.42	\$ 0.16
	2	\$ 0.03	\$ 0.14	\$ 0.74	\$ 0.07
	3	\$ 0.06	\$ 0.13	\$ 1.18	\$ 0.08
	4	\$ 0.11	\$ 0.16	\$ 1.16	\$ 0.08
	5	\$ -	\$ -	\$ -	\$ -
	6	\$ -	\$ -	\$ -	\$ -
	7	\$ -	\$ -	\$ -	\$ -
	8	\$ -	\$ -	\$ -	\$ -
	9	\$ -	\$ -	\$ -	\$ -
	10	\$ -	\$ -	\$ -	\$ -
	11	\$ -	\$ -	\$ -	\$ -
	12	\$ -	\$ -	\$ -	\$ -

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ERCOT-wide Cumulative PNM			
year	month	pnm	pnm_accum
2017	0	\$ -	\$ -
	1	\$ 2,964.83	\$ 2,964.83
	2	\$ 1,573.68	\$ 4,538.51
	3	\$ 1,520.94	\$ 6,059.45
	4	\$ 4,590.29	\$ 10,649.74
	5	\$ 5,673.67	\$ 16,323.41
	6	\$ 2,542.93	\$ 18,866.34
	7	\$ 3,189.82	\$ 22,056.16
	8	\$ 2,749.34	\$ 24,805.50
	9	\$ 2,220.00	\$ 27,025.50
	10	\$ 3,969.18	\$ 30,994.68
	11	\$ 1,974.12	\$ 32,968.80
12	\$ 2,188.63	\$ 35,157.43	
2018	0	\$ -	\$ -
	1	\$ 7,139.99	\$ 7,139.99
	2	\$ 3,011.86	\$ 10,151.85
	3	\$ 870.03	\$ 11,021.88
	4	\$ 2,333.76	\$ 13,355.64
	5	\$ -	\$ -
	6	\$ -	\$ -
	7	\$ -	\$ -
	8	\$ -	\$ -
	9	\$ -	\$ -
	10	\$ -	\$ -
	11	\$ -	\$ -
12	\$ -	\$ -	

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DA vs. RT Load Forecast Error by Hour Ending							
year	month	HE_1_4	HE_13_16	HE_17_20	HE_21_24	HE_5_8	HE_9_12
2017	1	(395)	(62)	298	(188)	224	69
	2	34	300	185	118	538	363
	3	(68)	455	456	143	241	321
	4	(41)	631	611	550	(189)	(27)
	5	(741)	835	505	(140)	(836)	84
	6	(394)	634	637	30	(435)	179
	7	(36)	(59)	438	193	73	(32)
	8	(145)	902	918	278	(23)	293
	9	(259)	81	267	(96)	(388)	(210)
	10	(117)	379	213	(192)	(115)	(167)
	11	(412)	(481)	(487)	(572)	(423)	(316)
	12	68	(971)	(462)	(416)	456	(375)
2018	1	226	1,083	1,300	791	129	705
	2	(662)	(1,007)	(1,256)	(1,119)	(497)	(990)
	3	(289)	489	568	229	(14)	152
	4	(131)	(131)	158	(130)	(190)	(430)
	5	-	-	-	-	-	-
	6	-	-	-	-	-	-
	7	-	-	-	-	-	-
	8	-	-	-	-	-	-
	9	-	-	-	-	-	-
	10	-	-	-	-	-	-
	11	-	-	-	-	-	-
	12	-	-	-	-	-	-

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Monthly Average of Wind Generation by Hour Ending							
year	month	HE_1_4	HE_13_16	HE_17_20	HE_21_24	HE_5_8	HE_9_12
2017	1	8,014	6,700	6,599	8,265	7,550	6,562
	2	9,009	6,729	7,434	9,274	8,627	6,821
	3	10,332	7,161	7,971	10,439	9,360	8,027
	4	10,299	7,917	8,602	9,566	9,141	8,602
	5	9,211	6,841	7,592	8,633	8,222	6,984
	6	8,043	4,563	6,393	8,327	6,543	5,205
	7	6,890	3,976	5,906	7,002	5,387	4,007
	8	5,383	3,558	5,047	5,704	3,942	3,052
	9	7,838	4,460	5,419	7,437	6,599	5,200
	10	9,408	6,198	6,379	9,086	8,565	7,053
	11	8,650	6,302	6,979	8,939	7,614	6,438
	12	7,532	5,681	5,279	6,908	7,205	6,015
2018	1	9,387	7,209	7,508	9,601	9,171	7,514
	2	8,876	7,295	7,771	9,462	8,559	7,545
	3	10,159	7,784	8,052	10,006	9,143	8,480
	4	10,025	8,403	9,183	10,641	9,227	8,549
	5	-	-	-	-	-	-
	6	-	-	-	-	-	-
	7	-	-	-	-	-	-
	8	-	-	-	-	-	-
	9	-	-	-	-	-	-
	10	-	-	-	-	-	-
	11	-	-	-	-	-	-
	12	-	-	-	-	-	-

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RT Congestion Constraint Rankings - Top 10 Constraints by Binding Frequency and Top 10 Constraints by Total Congestion Rent																
category	year	item	rankvar	rank	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
FREQ_EXIST	2018	PNHNDL (PNHNDL)	12,495	1	2,999	3,126	3,607	2,763	-	-	-	-	-	-	-	-
FREQ_EXIST	2018	591_A (LKPNT-CRLNW)	7,338	2	1,714	781	2,025	2,818	-	-	-	-	-	-	-	-
FREQ_EXIST	2018	HAMILT MAVER11_1 (HAMILTON-MAVERICK)	5,853	3	1,614	481	1,473	2,085	-	-	-	-	-	-	-	-
FREQ_EXIST	2018	PIGCRE SOLST11_1 (SOLSTICE-PIGCREEK)	5,525	4	555	606	1,659	2,705	-	-	-	-	-	-	-	-
FREQ_EXIST	2018	JK TOKSW 1 (TOKSW-JK CK)	2,744	5	999	199	892	654	-	-	-	-	-	-	-	-
FREQ_EXIST	2018	LOYOLA 69_1 (LOYOLA-LOYOLA)	2,708	6	387	644	332	1,345	-	-	-	-	-	-	-	-
FREQ_EXIST	2018	BRUNI 69_1 (BRUNI-BRUNI)	2,235	7	365	807	398	665	-	-	-	-	-	-	-	-
FREQ_EXIST	2018	BARL_FTSW1_1 (FTSW-BARL)	2,006	8	429	1,193	70	314	-	-	-	-	-	-	-	-
FREQ_EXIST	2018	74T148_1 (COMFOR-CICO)	1,988	9	-	10	803	1,175	-	-	-	-	-	-	-	-
FREQ_EXIST	2018	NELRIO (NELRIO)	1,899	10	93	381	744	681	-	-	-	-	-	-	-	-
TOP10_RENT	2018	PNHNDL (PNHNDL)	\$ 92.80	1	\$ 23.59	\$ 28.83	\$ 26.11	\$ 14.27	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
TOP10_RENT	2018	591_A (LKPNT-CRLNW)	\$ 51.81	2	\$ 9.11	\$ 3.37	\$ 11.47	\$ 27.87	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
TOP10_RENT	2018	NEDIN_138H (NEDIN-NEDIN)	\$ 28.83	3	\$ 28.83	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
TOP10_RENT	2018	VALIMP (VALIMP)	\$ 17.31	4	\$ 17.31	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
TOP10_RENT	2018	MHONDOCR_1 (MOORE-HONDOCK)	\$ 15.34	5	\$ 15.34	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
TOP10_RENT	2018	588_A_1 (LWSVW-LWVTI)	\$ 11.81	6	\$ -	\$ -	\$ -	\$ 11.81	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
TOP10_RENT	2018	LON_HILL_381H (LON_HILL-LON_HILL)	\$ 11.41	7	\$ -	\$ -	\$ 11.41	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
TOP10_RENT	2018	JK TOKSW 1 (TOKSW-JK CK)	\$ 10.52	8	\$ 4.56	\$ 1.16	\$ 1.33	\$ 3.47	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
TOP10_RENT	2018	PAWNEE_SPRUCE_1 (CALAVERS-PAWNEE)	\$ 8.07	9	\$ 0.87	\$ 0.58	\$ 2.06	\$ 4.57	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
TOP10_RENT	2018	6332_A (YUCSW-GASPAD)	\$ 7.97	10	\$ 0.68	\$ 0.04	\$ 4.36	\$ 2.89	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

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DA Congestion Constraint Rankings - Top 10 Constraints by Binding Frequency and Top 10 Constraints by Total Congestion Rent																	
category	year	item	rankvar	rank	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
FREQ_EXIST	2018	LINTER_SOLST11_1 (LINTERNA-SOLSTICE)	1,985	1	542	558	460	425	-	-	-	-	-	-	-	-	
FREQ_EXIST	2018	PNHNDL (PNHNDL)	1,885	2	335	433	541	376	-	-	-	-	-	-	-	-	
FREQ_EXIST	2018	EAGLEP_ESCOND1_1 (ESCONDID-EAGLE PS)	1,544	3	454	385	337	368	-	-	-	-	-	-	-	-	
FREQ_EXIST	2018	GREENL_WEAVER1_1 (WEAVERRD-GREENLK)	1,520	4	162	346	478	534	-	-	-	-	-	-	-	-	
FREQ_EXIST	2018	HAMILT_MAVERI1_1 (HAMILTON-MAVERICK)	1,385	5	294	204	352	535	-	-	-	-	-	-	-	-	
FREQ_EXIST	2018	CUELCA_THOMAS1_1 (CUERO-THOMASTN)	1,288	6	369	331	238	350	-	-	-	-	-	-	-	-	
FREQ_EXIST	2018	BARL_FTSW1_1 (FTSW-BARL)	1,226	7	393	517	182	134	-	-	-	-	-	-	-	-	
FREQ_EXIST	2018	FORMOS_LOLITA1_1 (LOLITA-FORMOSA)	1,173	8	529	333	179	132	-	-	-	-	-	-	-	-	
FREQ_EXIST	2018	6332_A (YUCSW-GASPAD)	1,164	9	167	62	461	474	-	-	-	-	-	-	-	-	
FREQ_EXIST	2018	591_A (LKPNT-CRLNW)	1,081	10	198	160	321	402	-	-	-	-	-	-	-	-	
TOP10_RENT	2018	PNHNDL (PNHNDL)	\$ 80.26	1	\$ 19.37	\$ 21.44	\$ 25.06	\$ 14.39	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
TOP10_RENT	2018	591_A (LKPNT-CRLNW)	\$ 45.29	2	\$ 6.45	\$ 2.83	\$ 10.65	\$ 25.37	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
TOP10_RENT	2018	FORMOS_LOLITA1_1 (LOLITA-FORMOSA)	\$ 10.85	3	\$ 9.94	\$ 0.44	\$ 0.33	\$ 0.15	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
TOP10_RENT	2018	588_A_1 (LWSVW-LWVTI)	\$ 9.65	4	\$ 0.52	\$ 0.09	\$ 0.04	\$ 9.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
TOP10_RENT	2018	6332_A (YUCSW-GASPAD)	\$ 9.58	5	\$ 1.03	\$ 0.19	\$ 3.95	\$ 4.41	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
TOP10_RENT	2018	JK_TOKSW_1 (TOKSW-JK CK)	\$ 9.29	6	\$ 1.70	\$ 1.01	\$ 3.46	\$ 3.12	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
TOP10_RENT	2018	74T148_1 (COMFOR-CICO)	\$ 7.66	7	\$ 0.00	\$ 0.22	\$ 2.62	\$ 4.82	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
TOP10_RENT	2018	SAR_FRAN_1 (FRANKC-SARGNTS)	\$ 6.07	8	\$ 3.44	\$ 1.59	\$ 0.01	\$ 1.03	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
TOP10_RENT	2018	590_B (LWVJS-LKPNT)	\$ 5.86	9	\$ 3.03	\$ 1.01	\$ 0.40	\$ 1.42	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
TOP10_RENT	2018	KEPLER_KOCH_U1_1 (KOCH_UP-KEPLER)	\$ 4.95	10	\$ 2.13	\$ 0.64	\$ 2.13	\$ 0.05	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	

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Top 10 CRR Pairs Ranked by Monthly Auction Values - Top 10 PTP Obligations by Total Transaction Values and Top 10 PTP Options by Total Transaction Values																	
fr_option	year	pair	total_value	rank	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
N	2018	HB SOUTH-LZ SOUTH	\$ 5.38	1	\$ 0.63	\$ 0.49	\$ 0.95	\$ 1.34	\$ 1.98	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
N	2018	HB NORTH-HB HOUSTON	\$ 3.74	2	\$ 0.50	\$ 0.22	\$ 1.10	\$ 1.07	\$ 0.84	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
N	2018	HB NORTH-HB SOUTH	\$ 2.91	3	\$ 0.23	\$ 0.40	\$ 0.84	\$ 0.79	\$ 0.67	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
N	2018	MIAMI G1 G2-HB WEST	\$ 2.37	4	\$ 0.61	\$ 0.23	\$ 0.41	\$ 0.79	\$ 0.33	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
N	2018	HB WEST-HB NORTH	\$ 1.91	5	\$ 0.16	\$ 0.22	\$ 0.33	\$ 0.77	\$ 0.43	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
N	2018	HB WEST-LZ WEST	\$ 1.90	6	\$ 0.25	\$ 0.36	\$ 0.35	\$ 0.32	\$ 0.62	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
N	2018	HB HOUSTON-LZ HOUSTON	\$ 1.88	7	\$ 0.33	\$ 0.13	\$ 0.34	\$ 0.49	\$ 0.59	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
N	2018	HB NORTH-LZ NORTH	\$ 1.87	8	\$ 0.53	\$ 0.26	\$ 0.25	\$ 0.38	\$ 0.45	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
N	2018	SSPURT WIND1-HB WEST	\$ 1.07	9	\$ 0.35	\$ 0.09	\$ 0.07	\$ 0.29	\$ 0.28	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
N	2018	CSPES_UNIT2-HB NORTH	\$ 0.80	10	\$ 0.09	\$ 0.10	\$ 0.07	\$ 0.05	\$ 0.48	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
Y	2018	SSPURT WIND1-HB WEST	\$ 2.02	1	\$ 0.23	\$ 0.47	\$ 0.43	\$ 0.28	\$ 0.61	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
Y	2018	LHORN_N_U1_2-HB WEST	\$ 1.24	2	\$ 0.36	\$ 0.31	\$ 0.34	\$ 0.05	\$ 0.19	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
Y	2018	HB NORTH-LZ NORTH	\$ 1.13	3	\$ 0.23	\$ 0.38	\$ 0.16	\$ 0.19	\$ 0.18	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
Y	2018	HB SOUTH-LZ SOUTH	\$ 1.13	4	\$ 0.09	\$ 0.07	\$ 0.24	\$ 0.14	\$ 0.59	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
Y	2018	SLTFRK_UN1_2-LZ NORTH	\$ 0.98	5	\$ 0.18	\$ 0.17	\$ 0.11	\$ 0.20	\$ 0.33	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
Y	2018	HB HOUSTON-LZ HOUSTON	\$ 0.79	6	\$ 0.16	\$ 0.11	\$ 0.15	\$ 0.12	\$ 0.24	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
Y	2018	SSPURT WIND1-LZ NORTH	\$ 0.71	7	\$ 0.13	\$ 0.10	\$ 0.19	\$ 0.11	\$ 0.18	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
Y	2018	BRISCOE_WIND-HB WEST	\$ 0.61	8	\$ 0.08	\$ 0.12	\$ 0.31	\$ 0.07	\$ 0.02	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
Y	2018	HRFDWIND_ALL-LZ_AEN	\$ 0.57	9	\$ 0.15	\$ 0.07	\$ 0.15	\$ 0.10	\$ 0.10	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
Y	2018	SSPURT_WIND1-HB_NORTH	\$ 0.55	10	\$ 0.07	\$ 0.07	\$ 0.06	\$ 0.01	\$ 0.33	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	

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