POTOMAC ECONOMICS

Item 6: IMM Report

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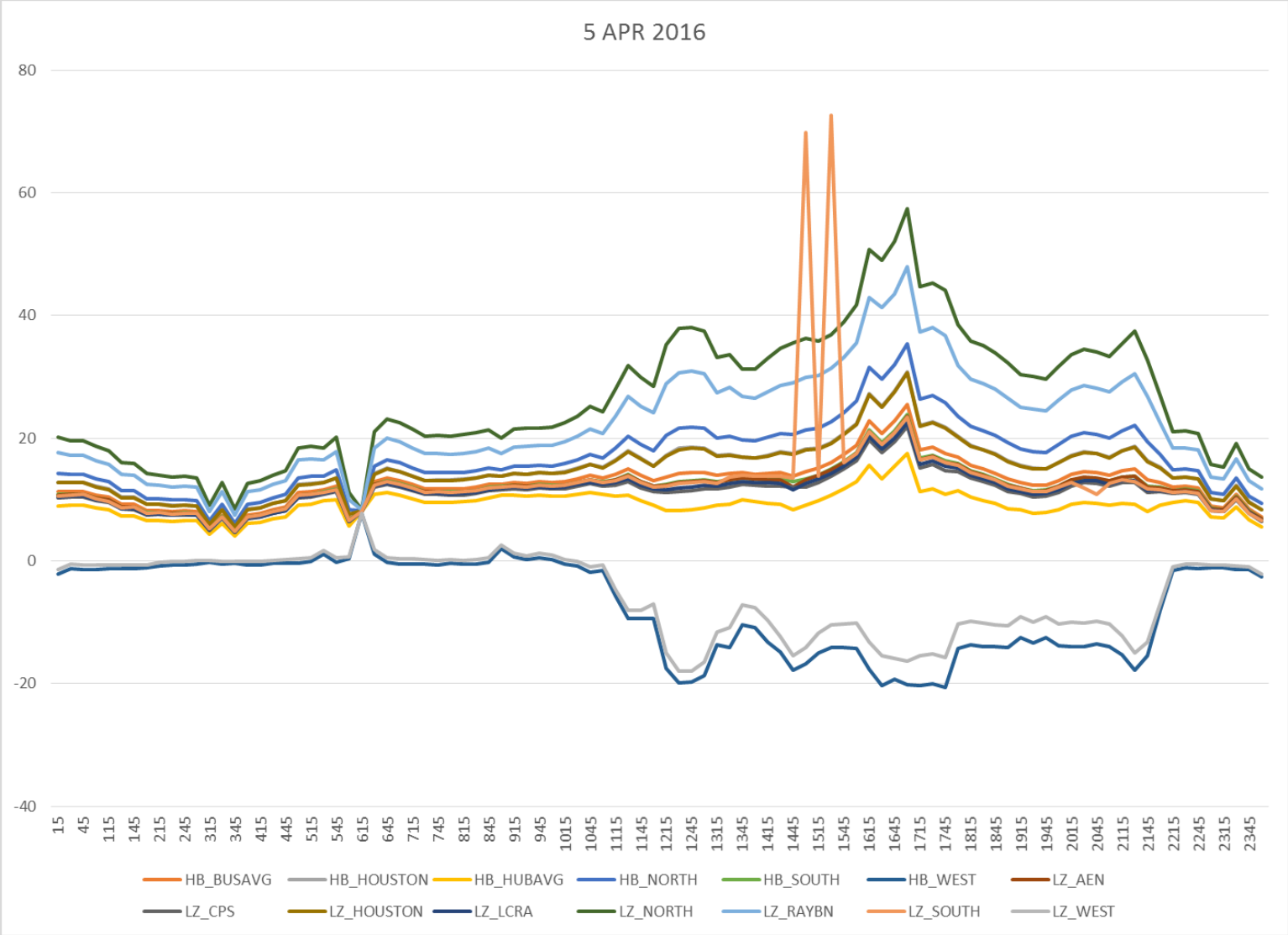
sreedy@potomaceconomics.com
512-225-7139

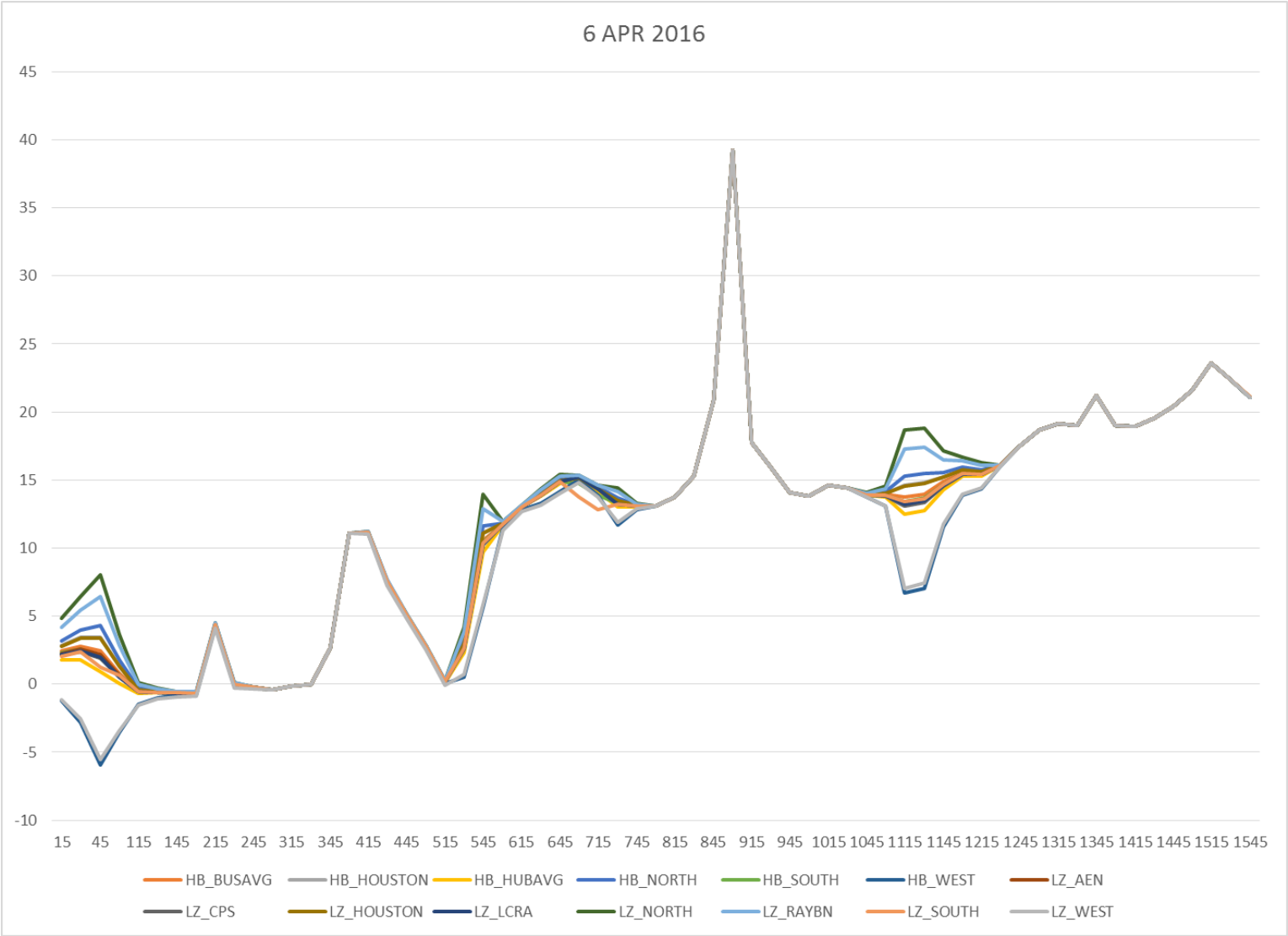
Board of Directors Meeting
April 19, 2016

ERCOT Public

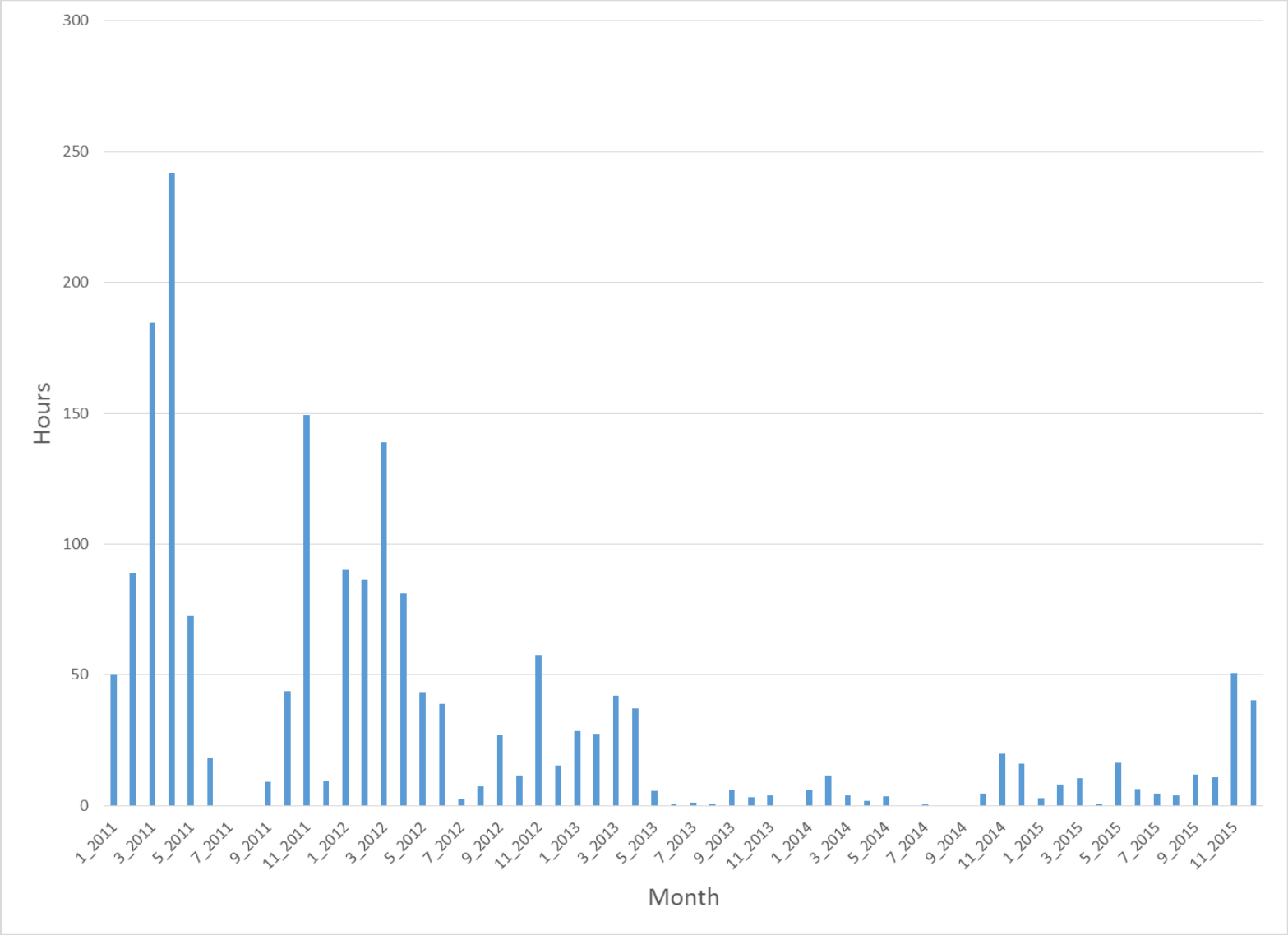
West Zone Example



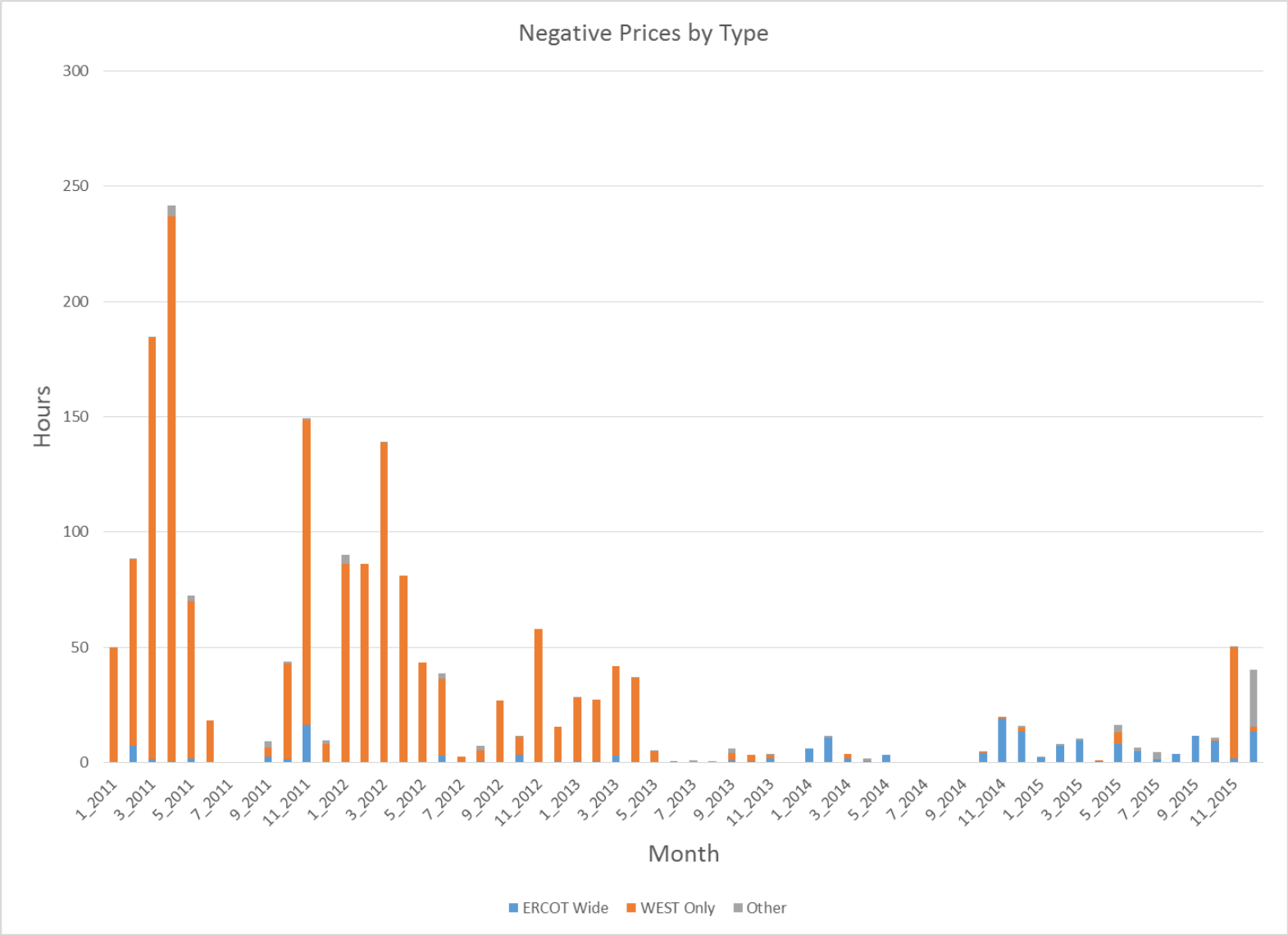
ERCOT Wide Example



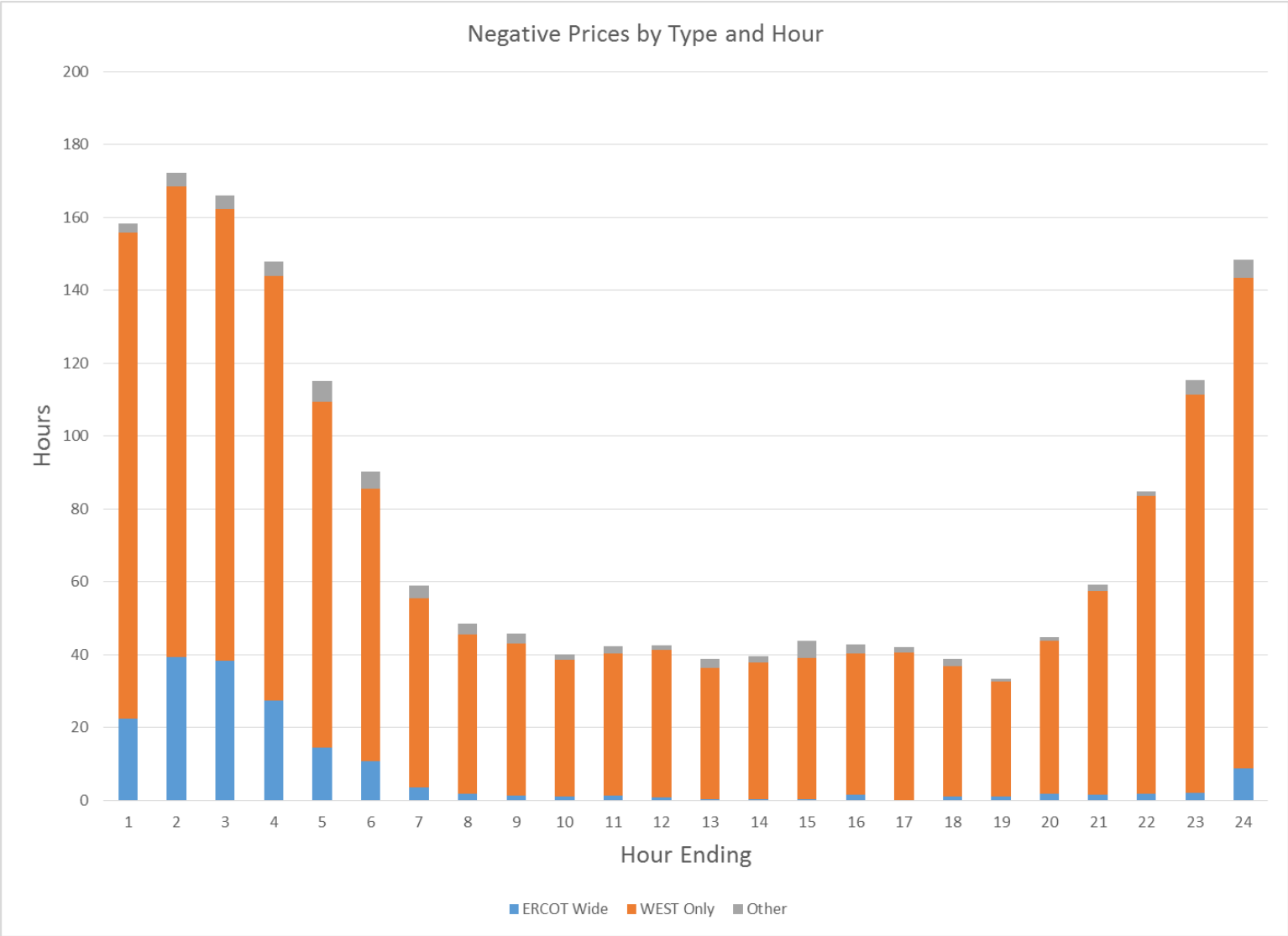
Negative Price Events in ERCOT



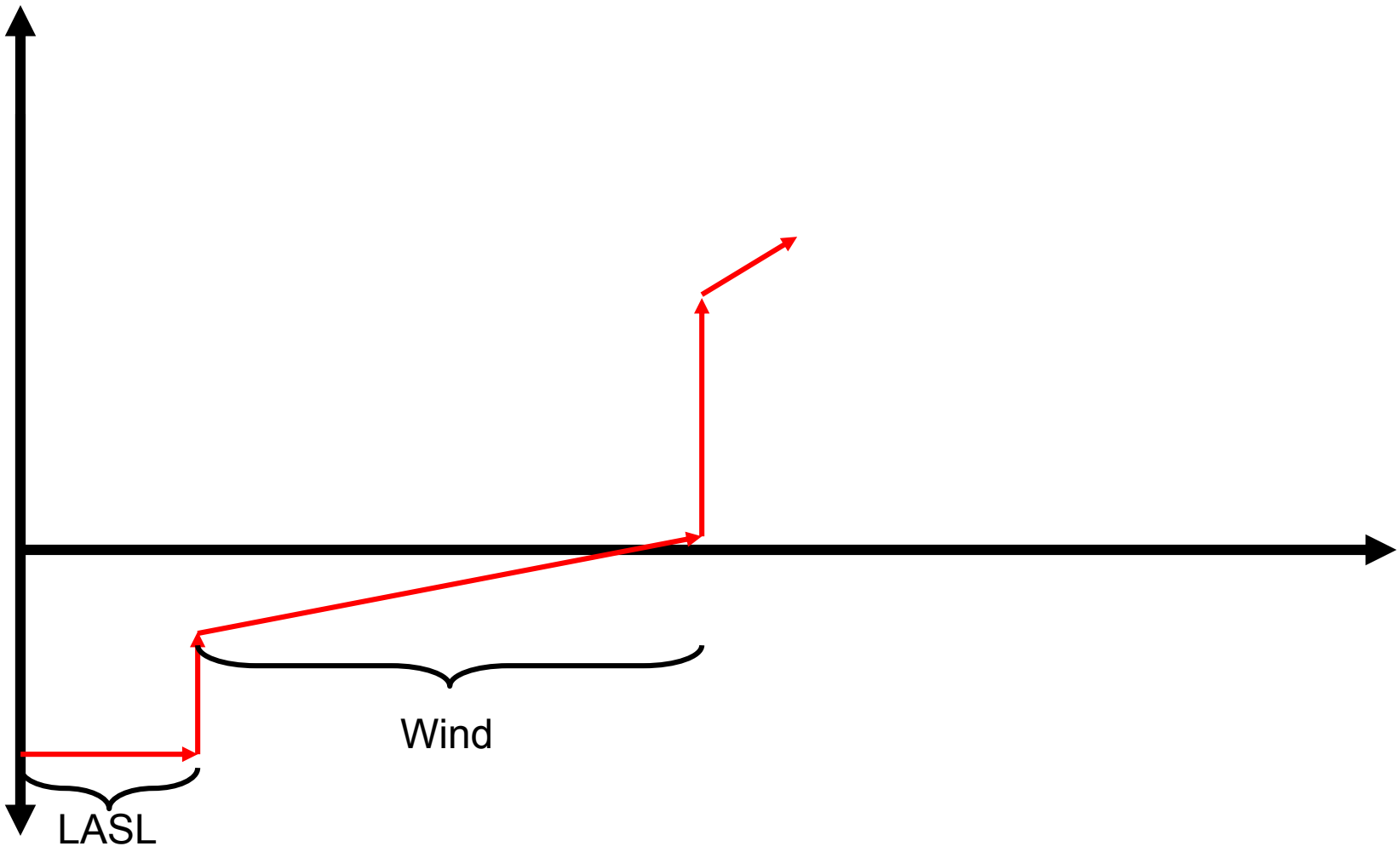
Negative Price Events in ERCOT



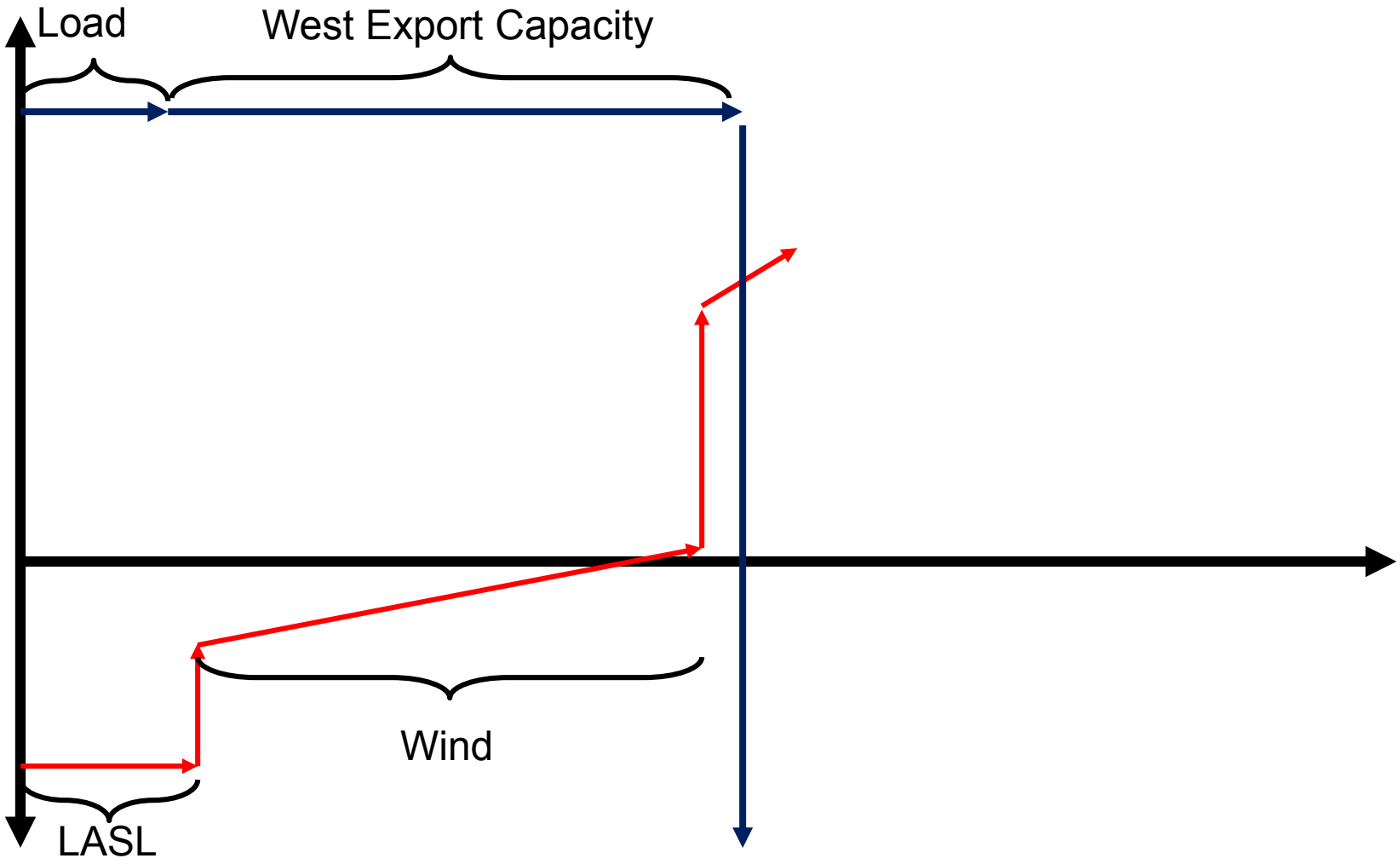
Negative Prices by Hour Ending



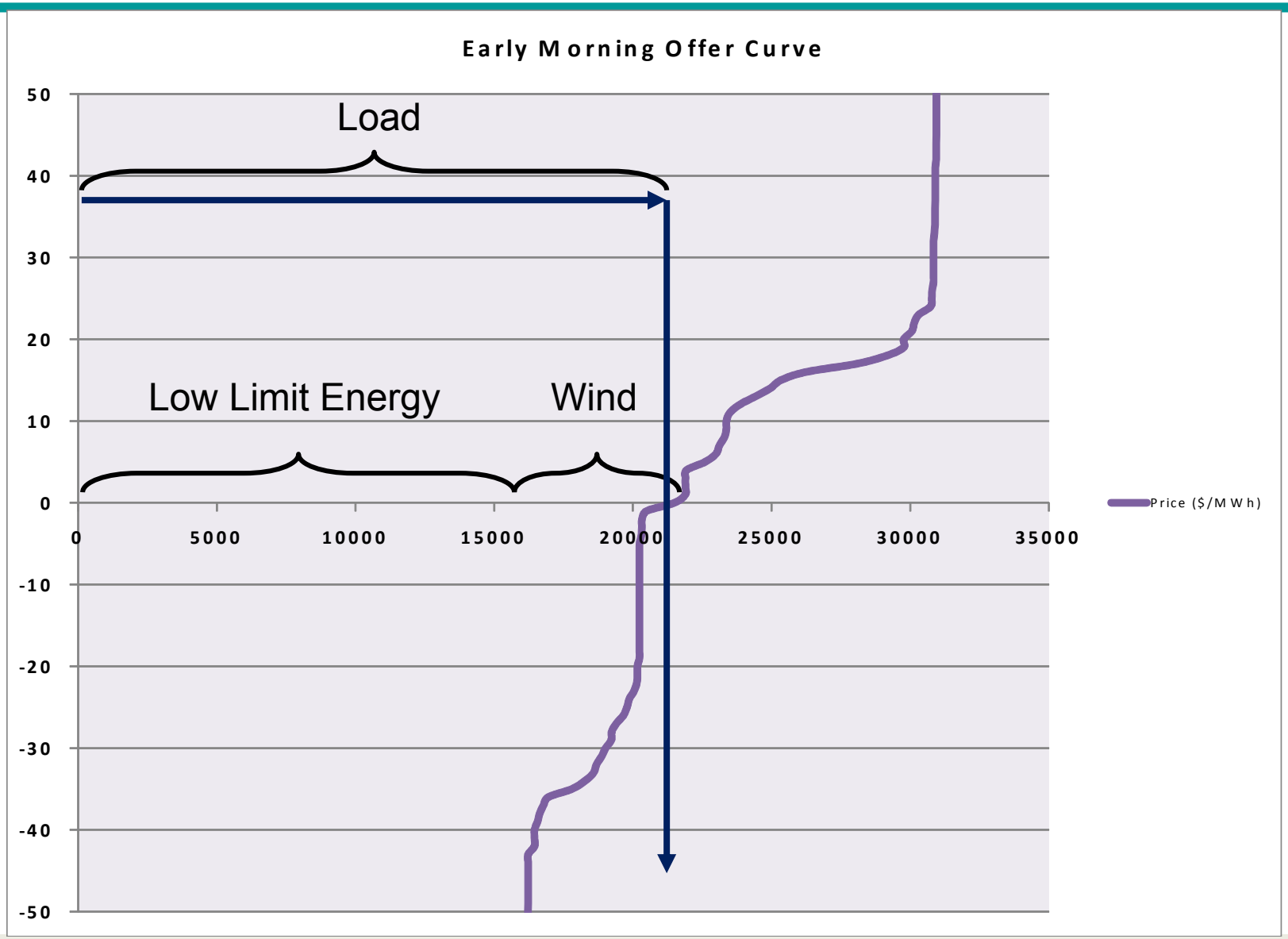
Typical Aggregated West Offer Curve



Typical Aggregated West Offer Curve



Typical Early Morning ERCOT Offer Curve



To the Public Utility Commission of Texas

ERCOT Wholesale Electricity Market Monthly Report

Monday, April 11, 2016

Potomac Economics, Ltd.
Independent Market Monitor

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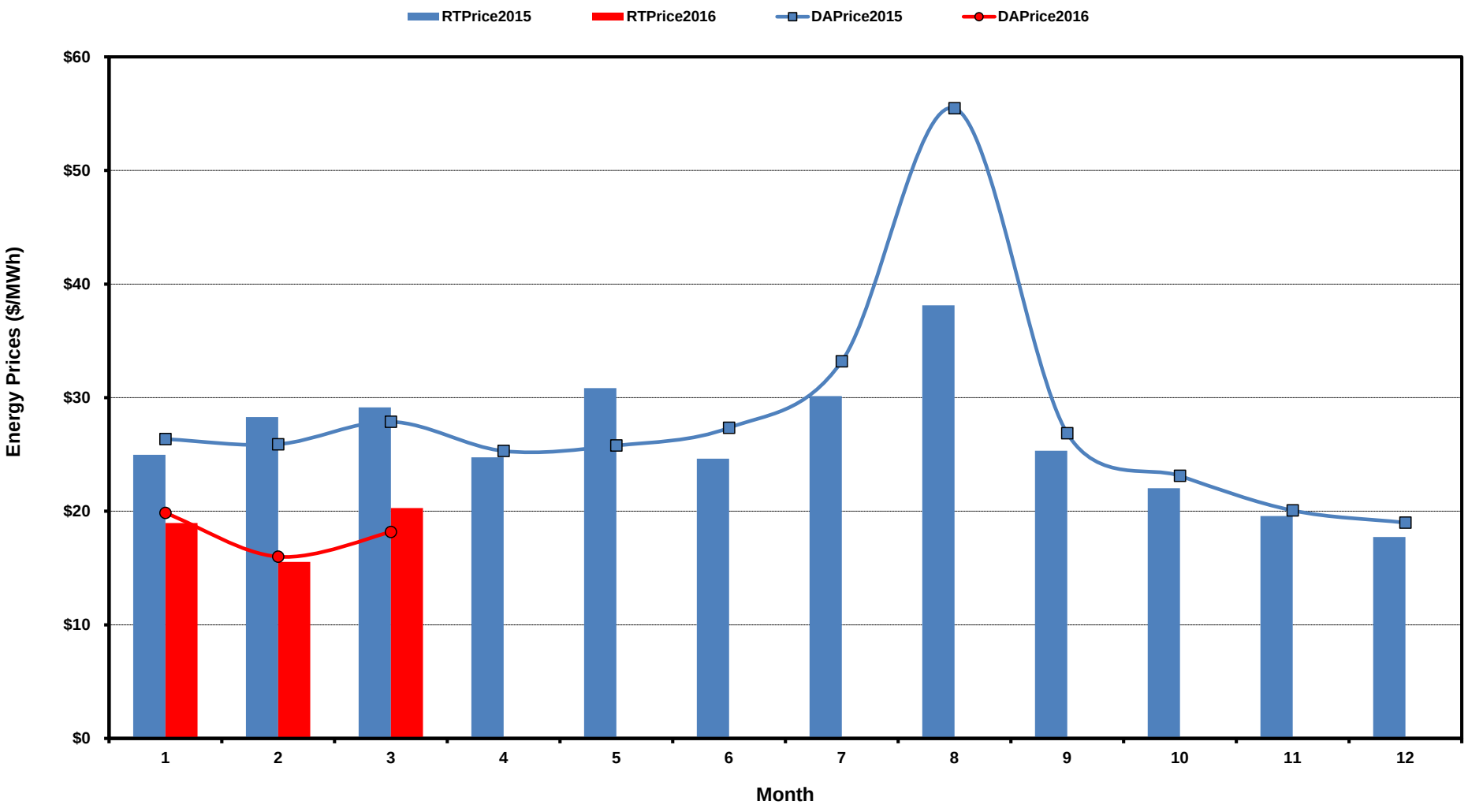
ERCOT-wide Average Energy Prices DA vs RT

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



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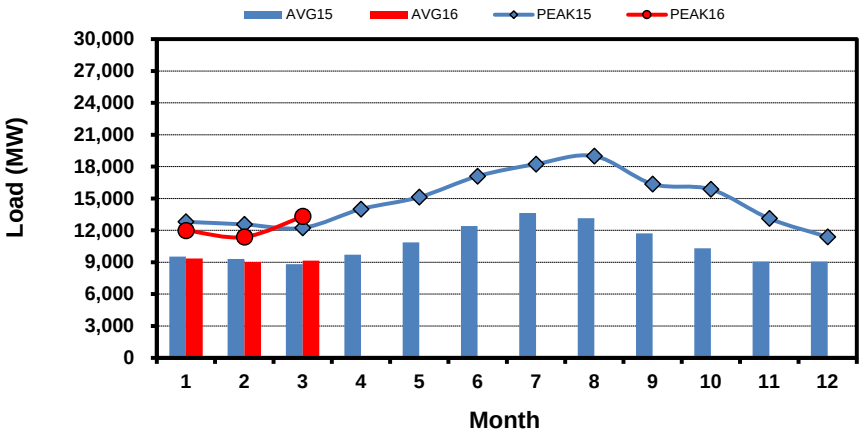
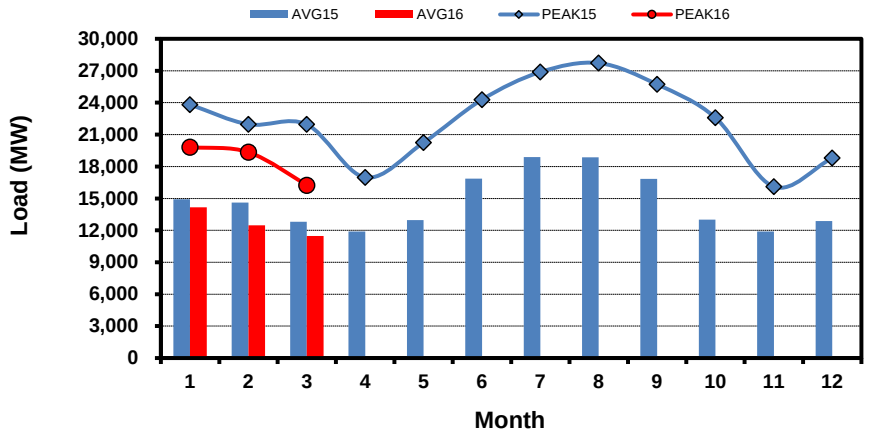
Load Zone Load Statistics

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

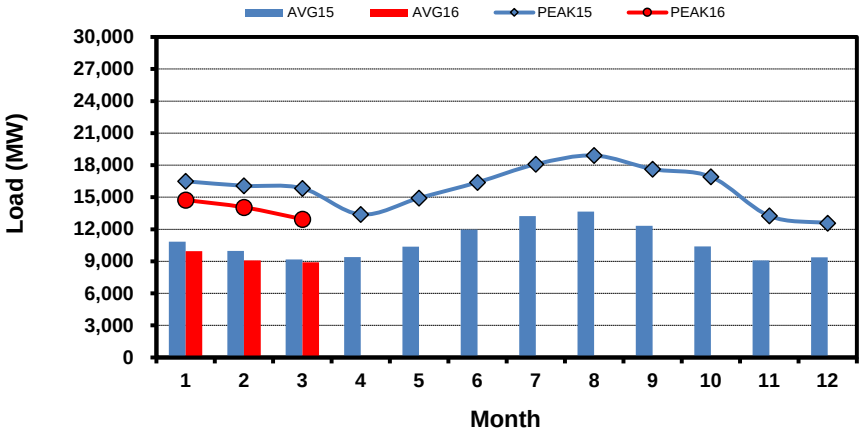
Houston Zone



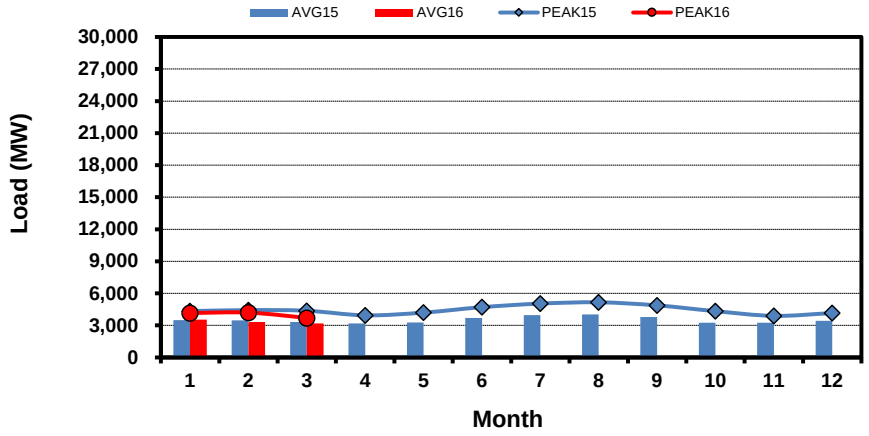
North Zone



South Zone



West Zone



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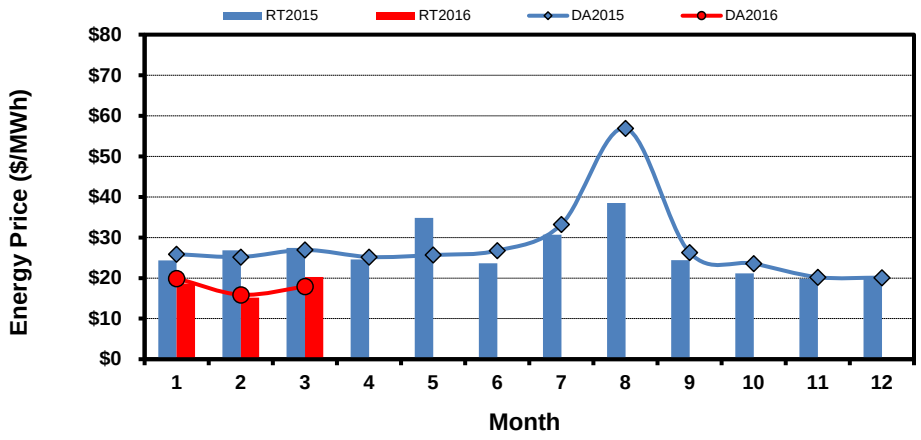
data

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)

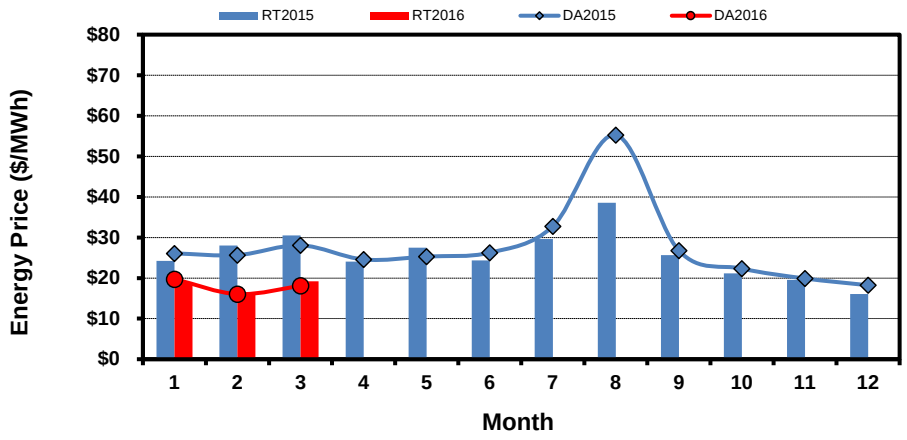
Load Zone Monthly Average Energy Price DA vs RT

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

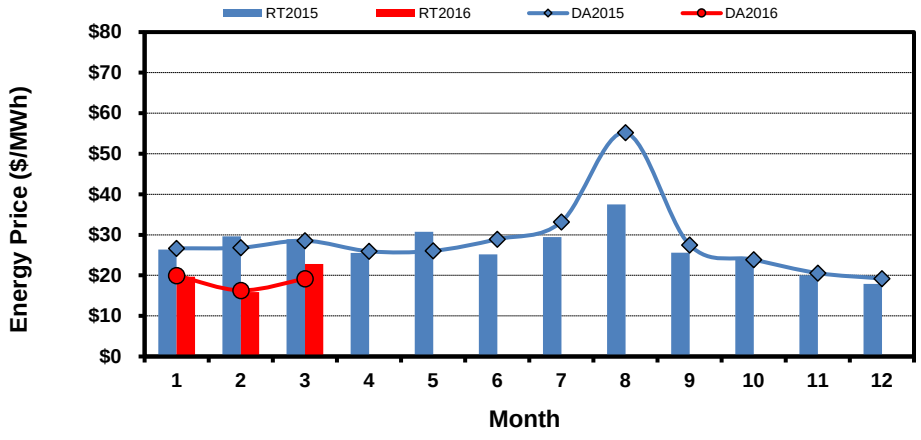
Houston Zone



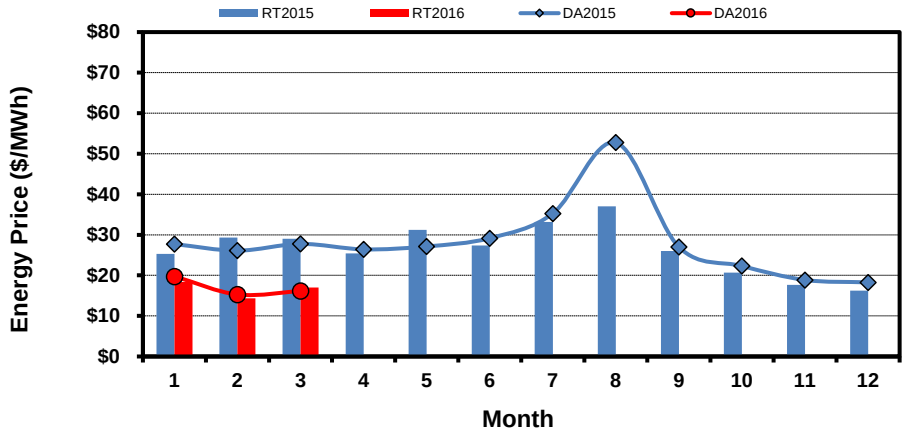
North Zone



South Zone



West Zone



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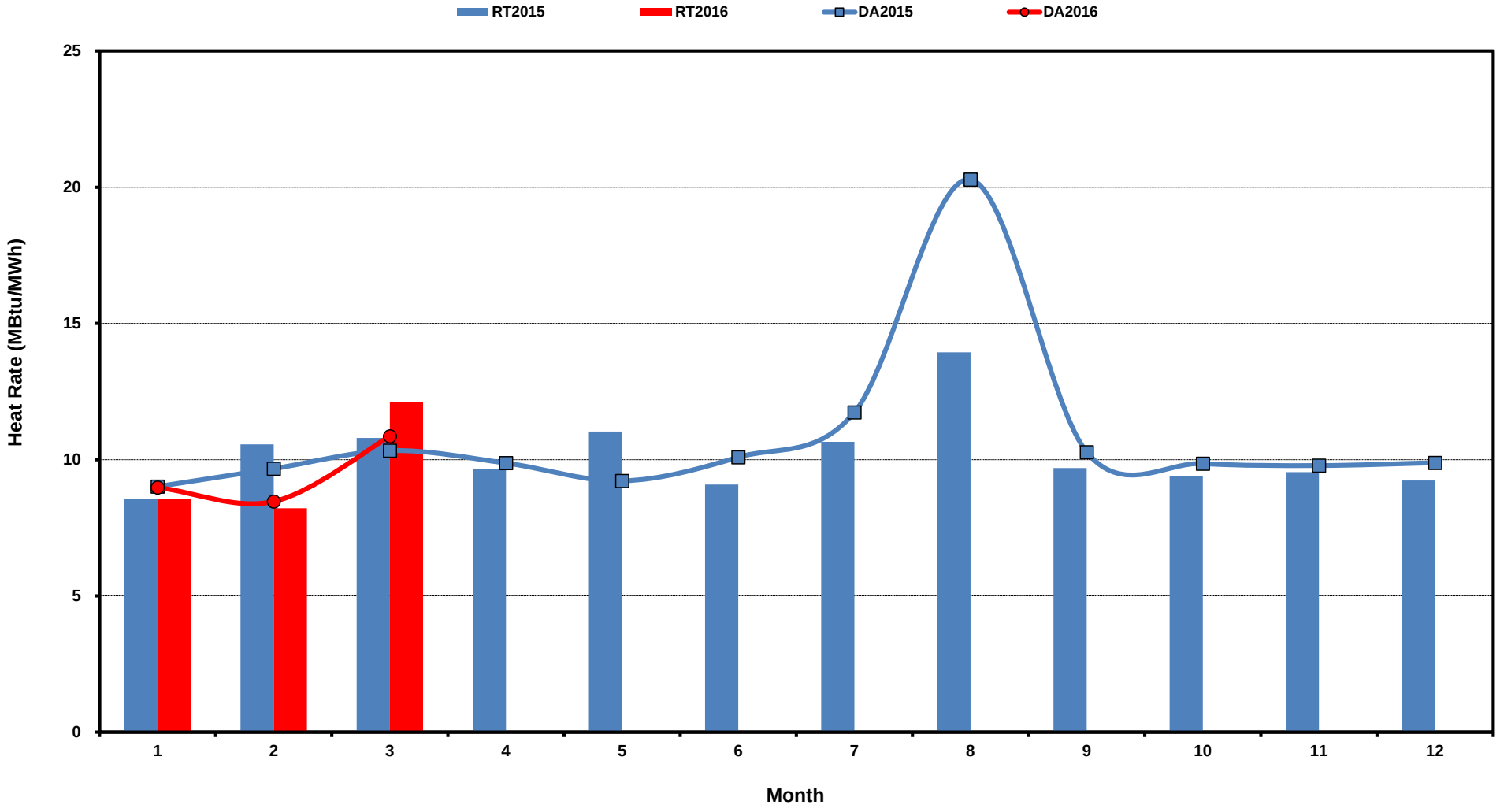
Note: * Zonal load zone definition vs. Nodal comparable load zone definition: LZ_Houston=LZ_Houston; LZ_West=LZ_West; LZ_North=(LZ_North,LZ_RAYBN); LZ_South=(LZ_South,LZ_CPS,LZ_AEN,LZ_LCRA)

ERCOT-wide Monthly Implied Heat Rate DA vs RT

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



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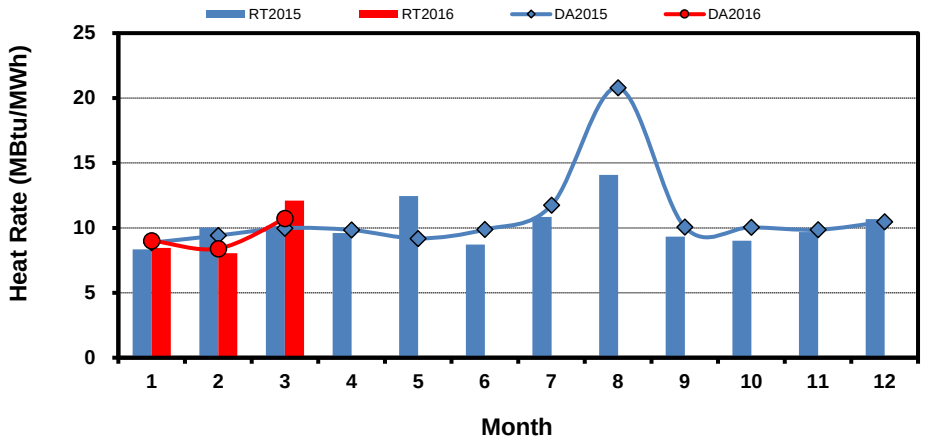
data

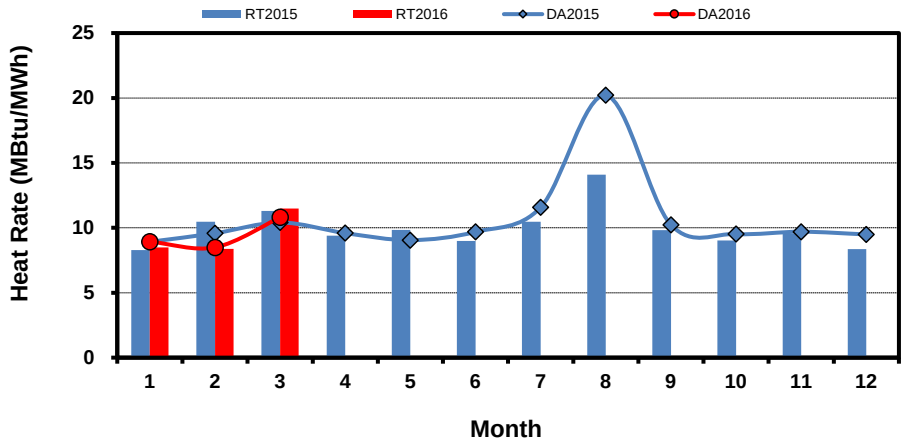
Load Zone Monthly Implied Heat Rate DA vs RT

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

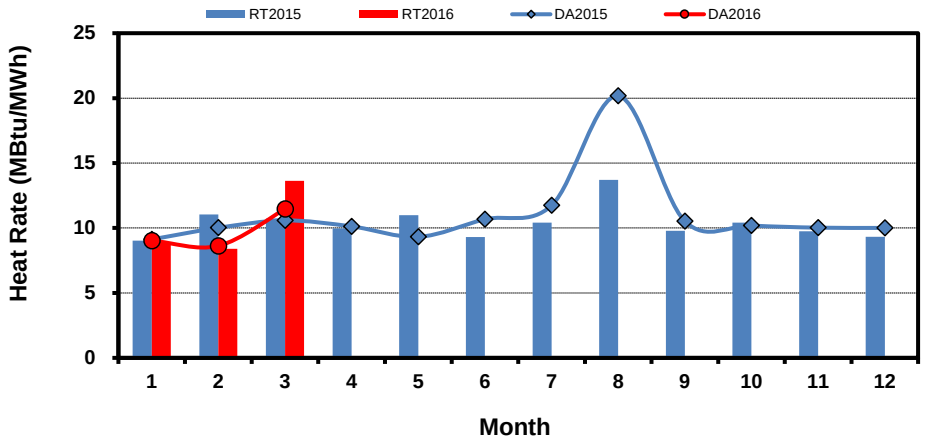
Houston Zone



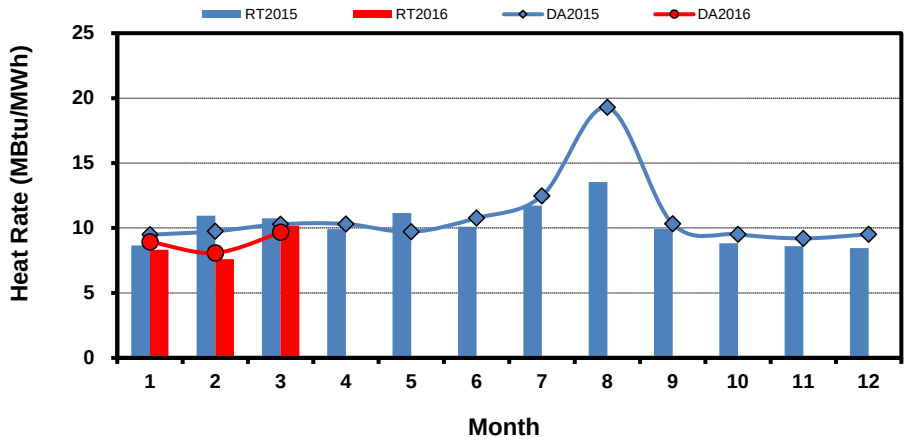
North Zone



South Zone



West Zone



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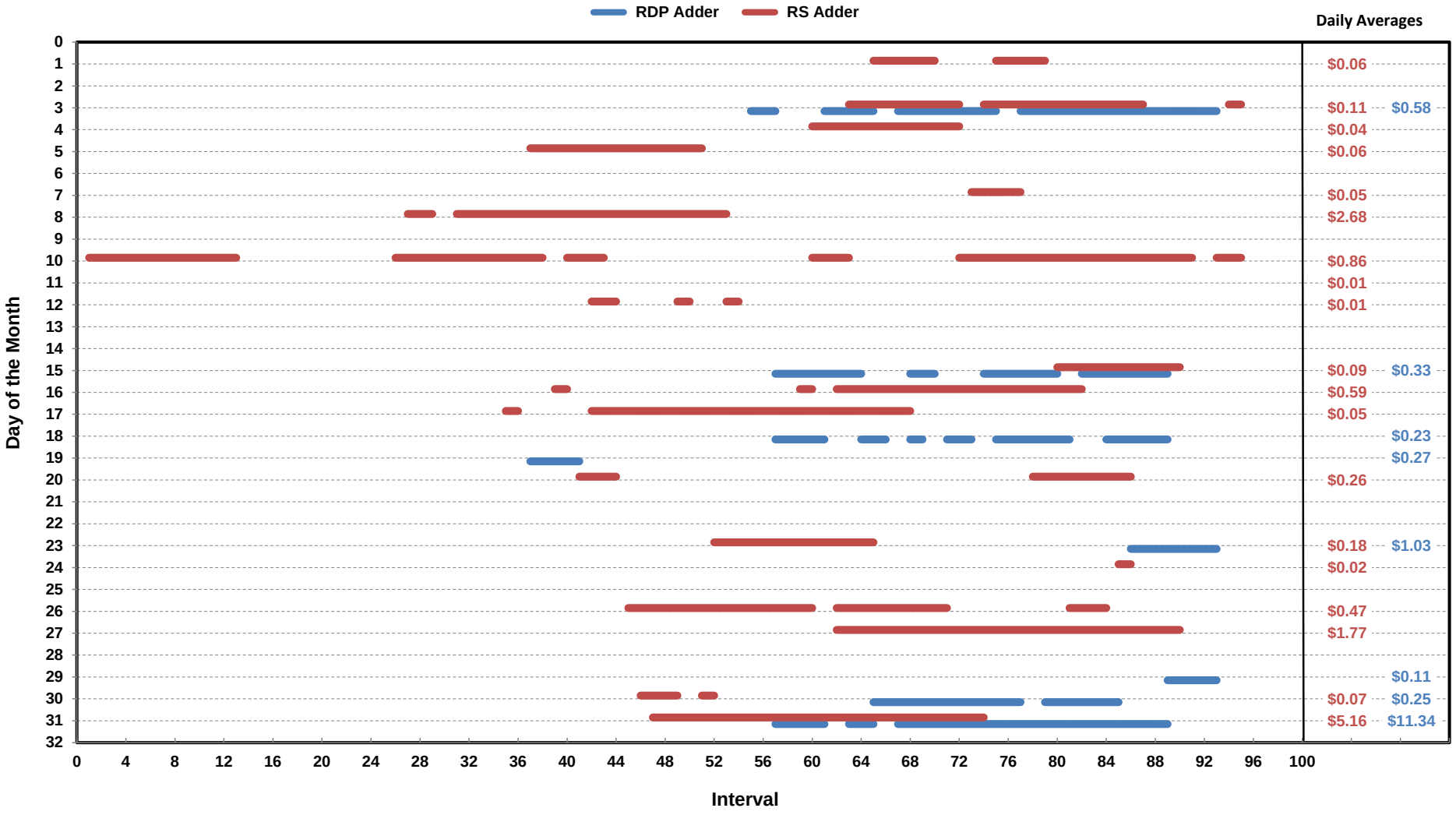
Daily ORDC Adders Average Values and Interval Duration

Mar-2016



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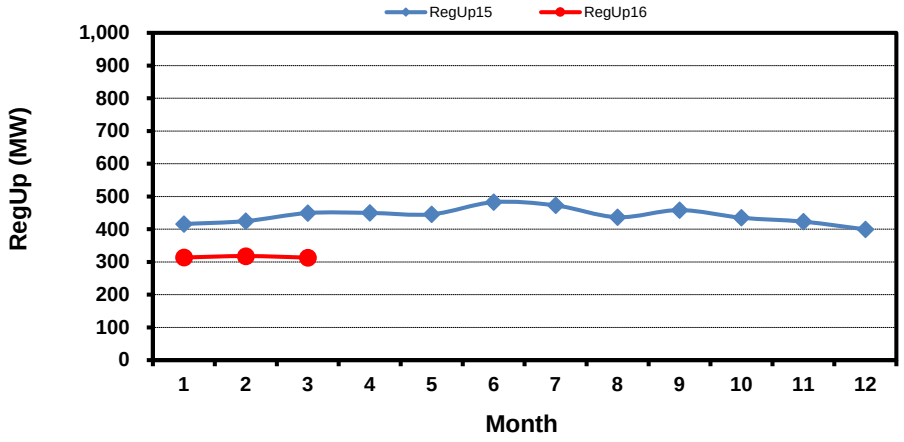
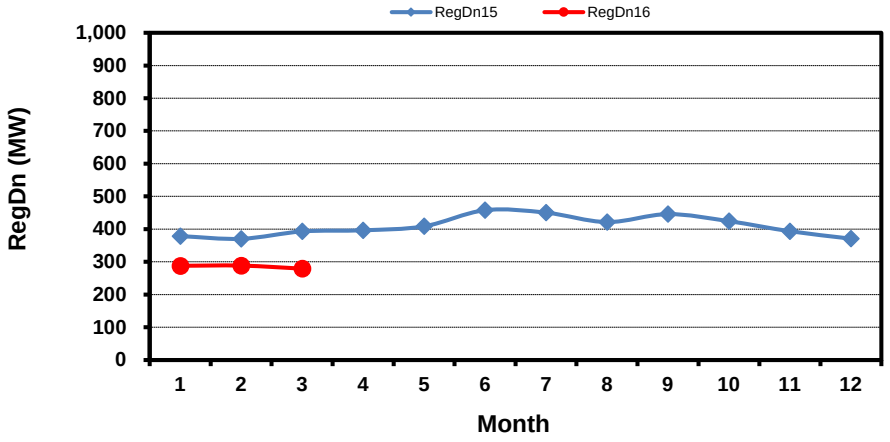
Monthly Average of Ancillary Services Required MW

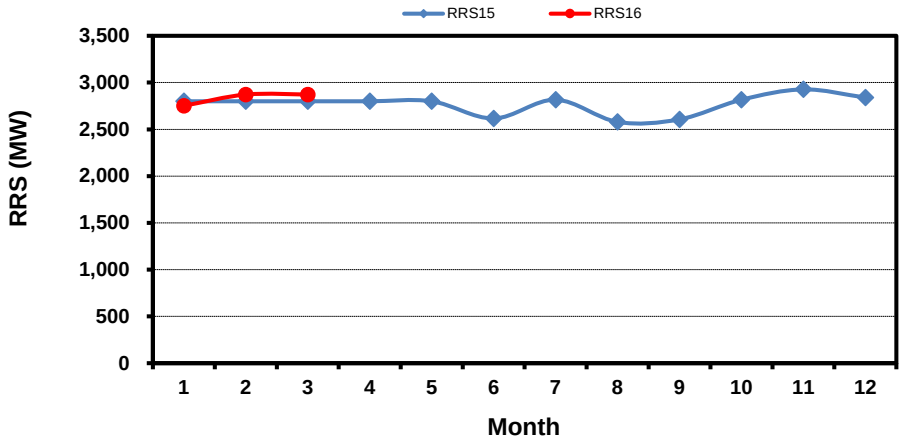
Regulation Up



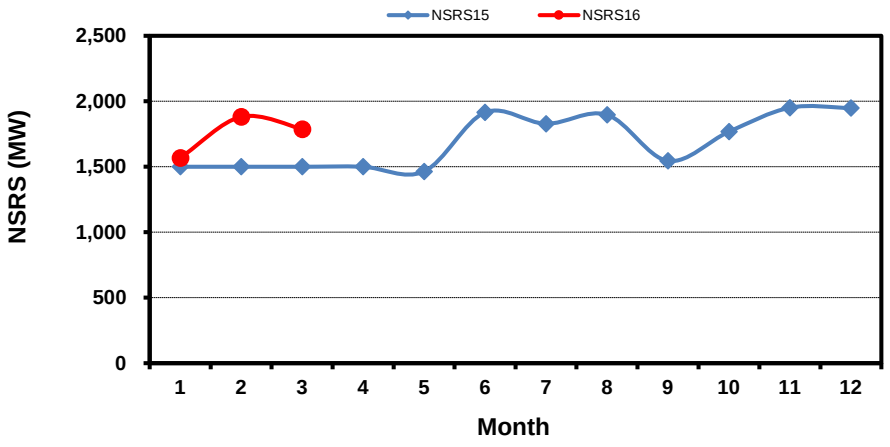
Regulation Down



Responsive Reserve



Non-Spin Reserve



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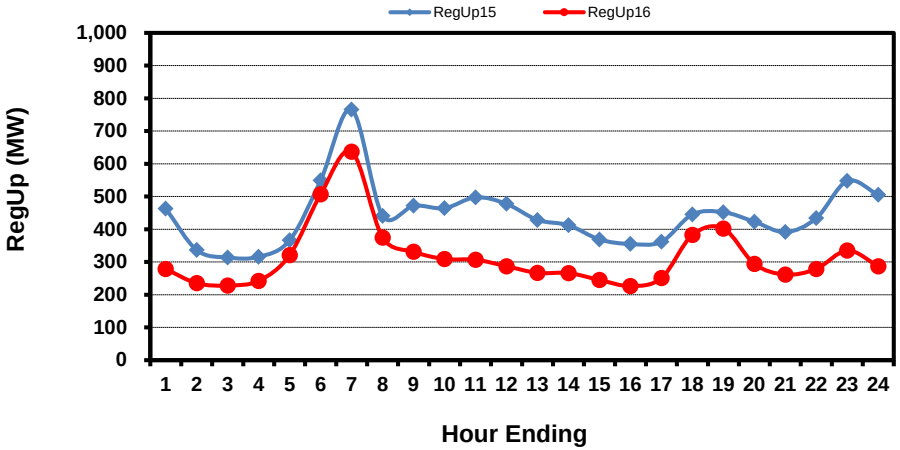
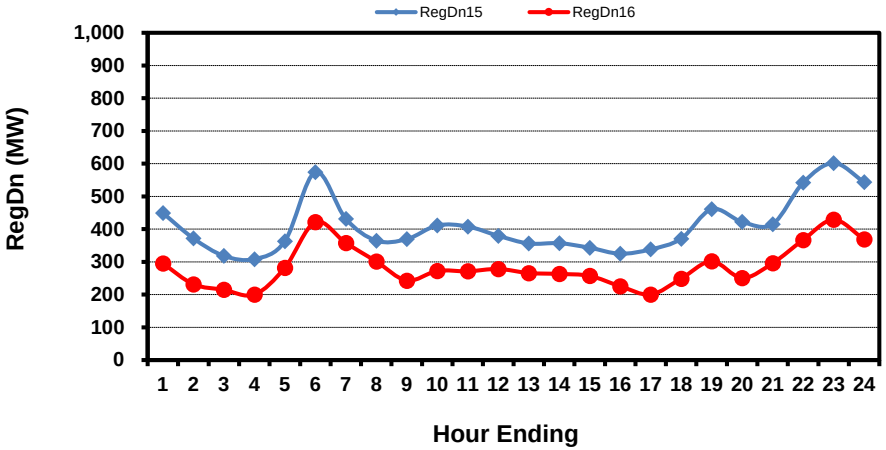
data

Hourly Average of Ancillary Services Required MW

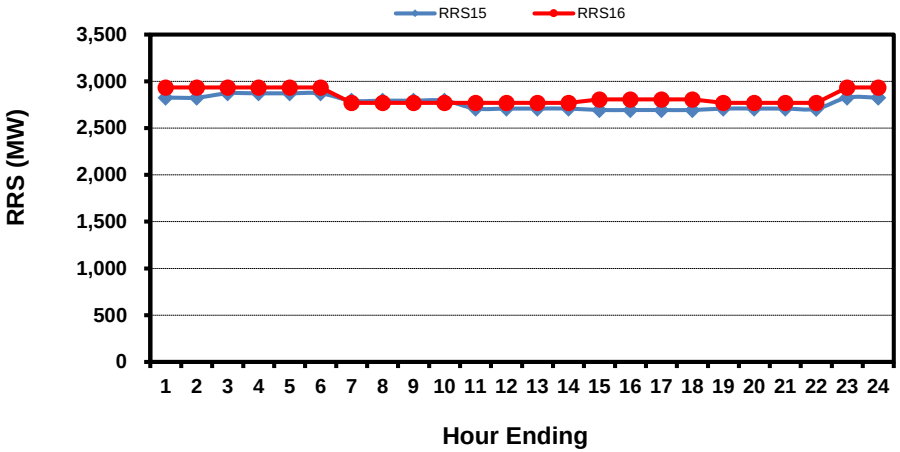
Regulation Up



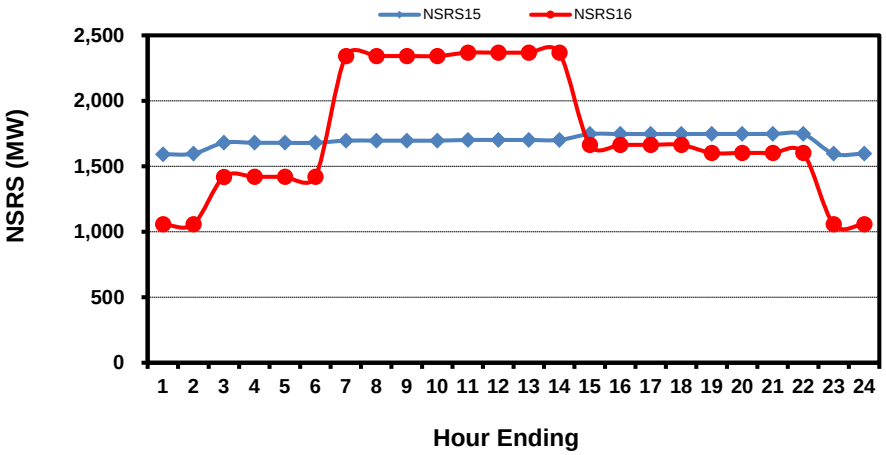
Regulation Down



Responsive Reserve



Non-Spin Reserve



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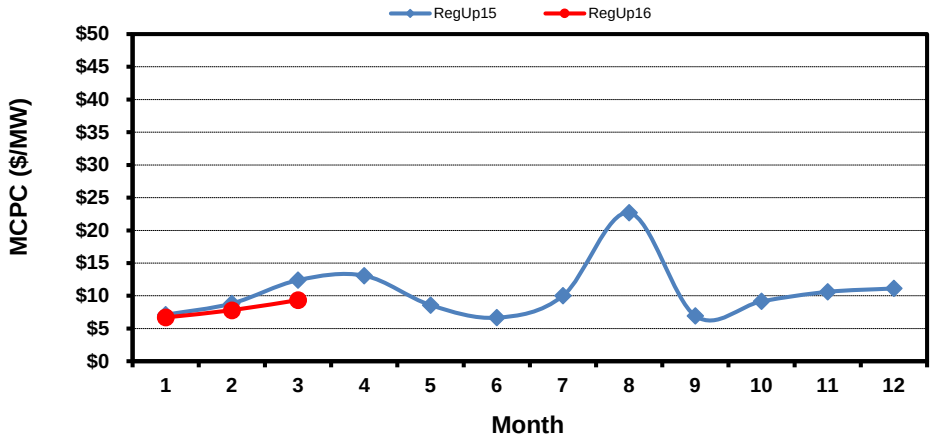
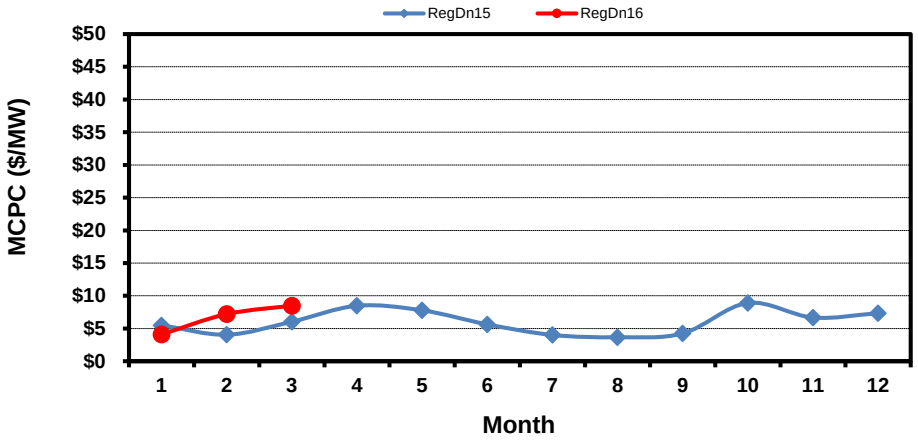
Monthly Average Ancillary Services Price

(weighted by A/S Quantities Required)

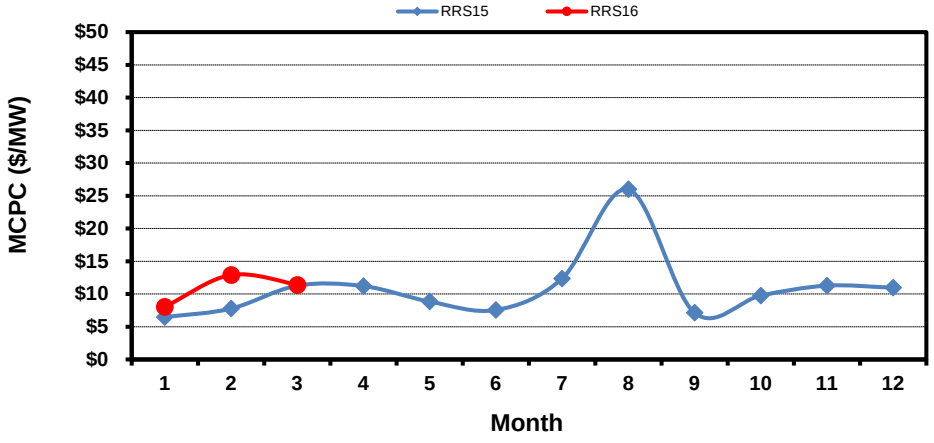
Regulation Up



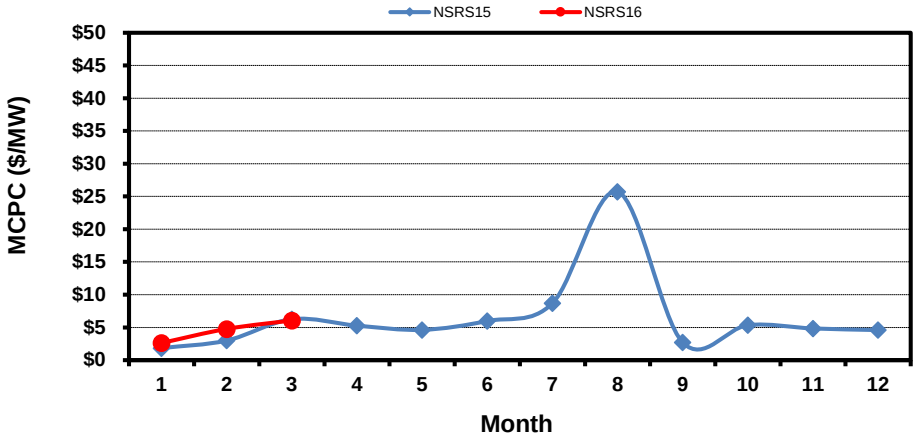
Regulation Down



Responsive Reserve



Non-Spin Reserve



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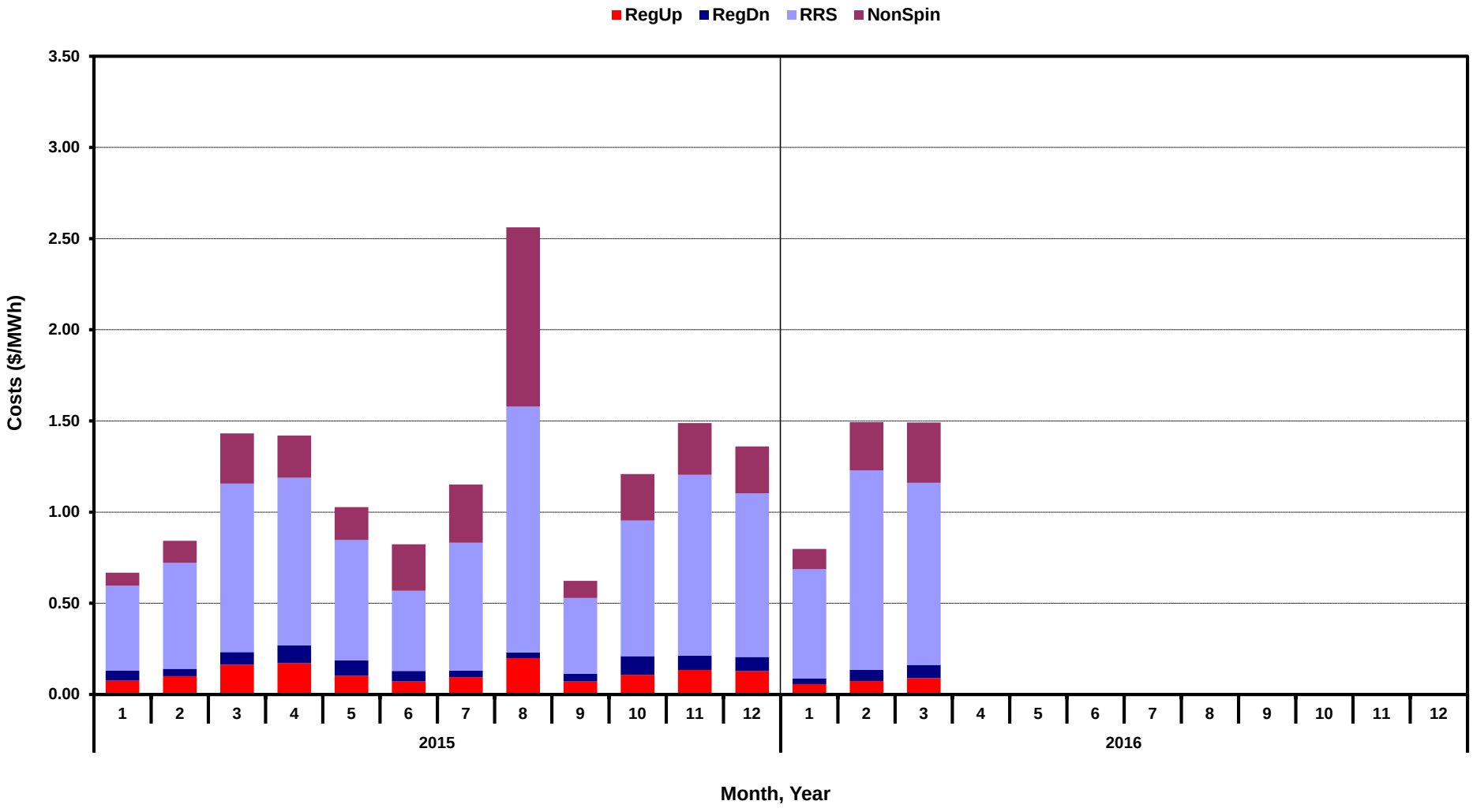
data

Monthly Average A/S Cost per MWh Load



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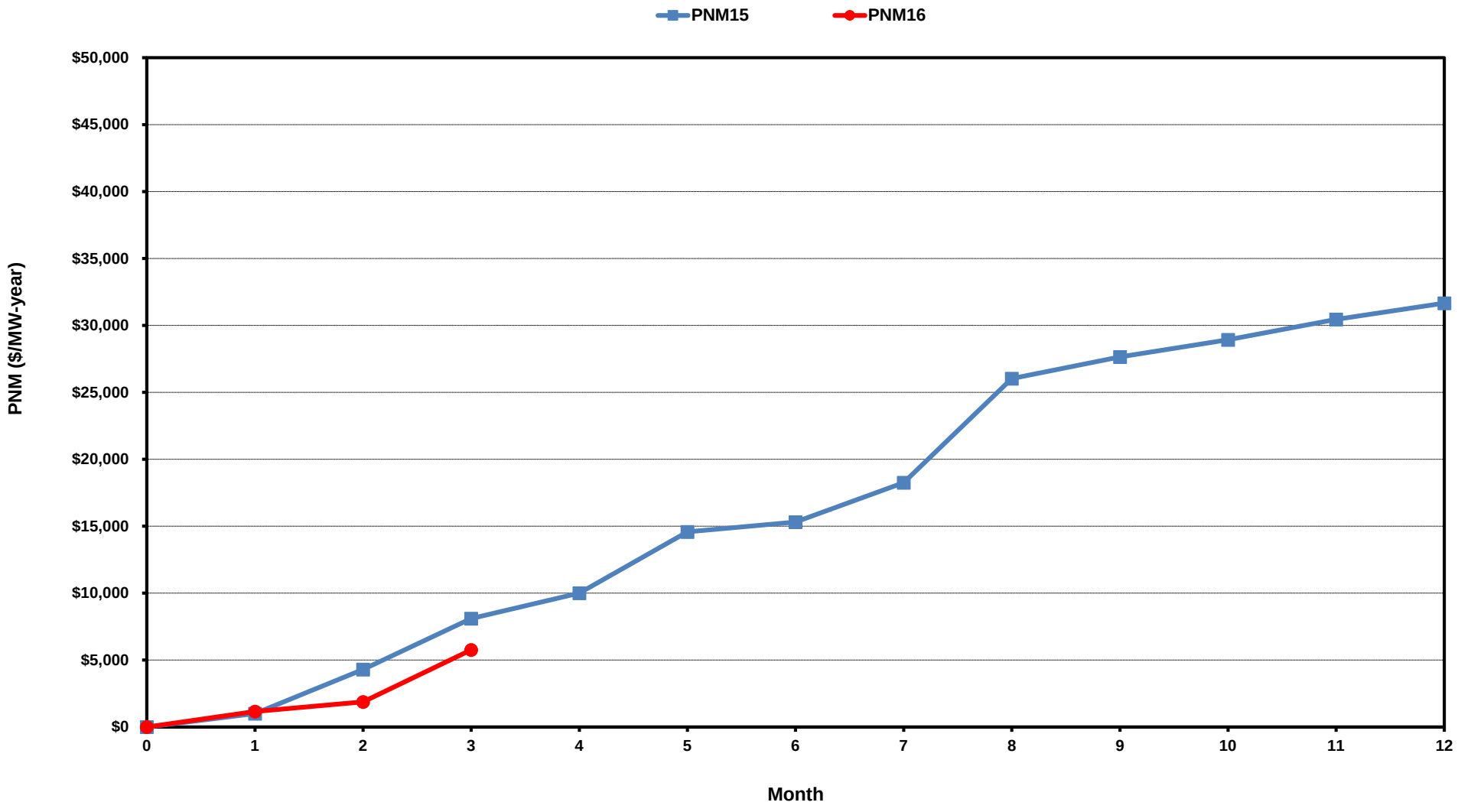
ERCOT-wide Cumulative Peaker Net Margin



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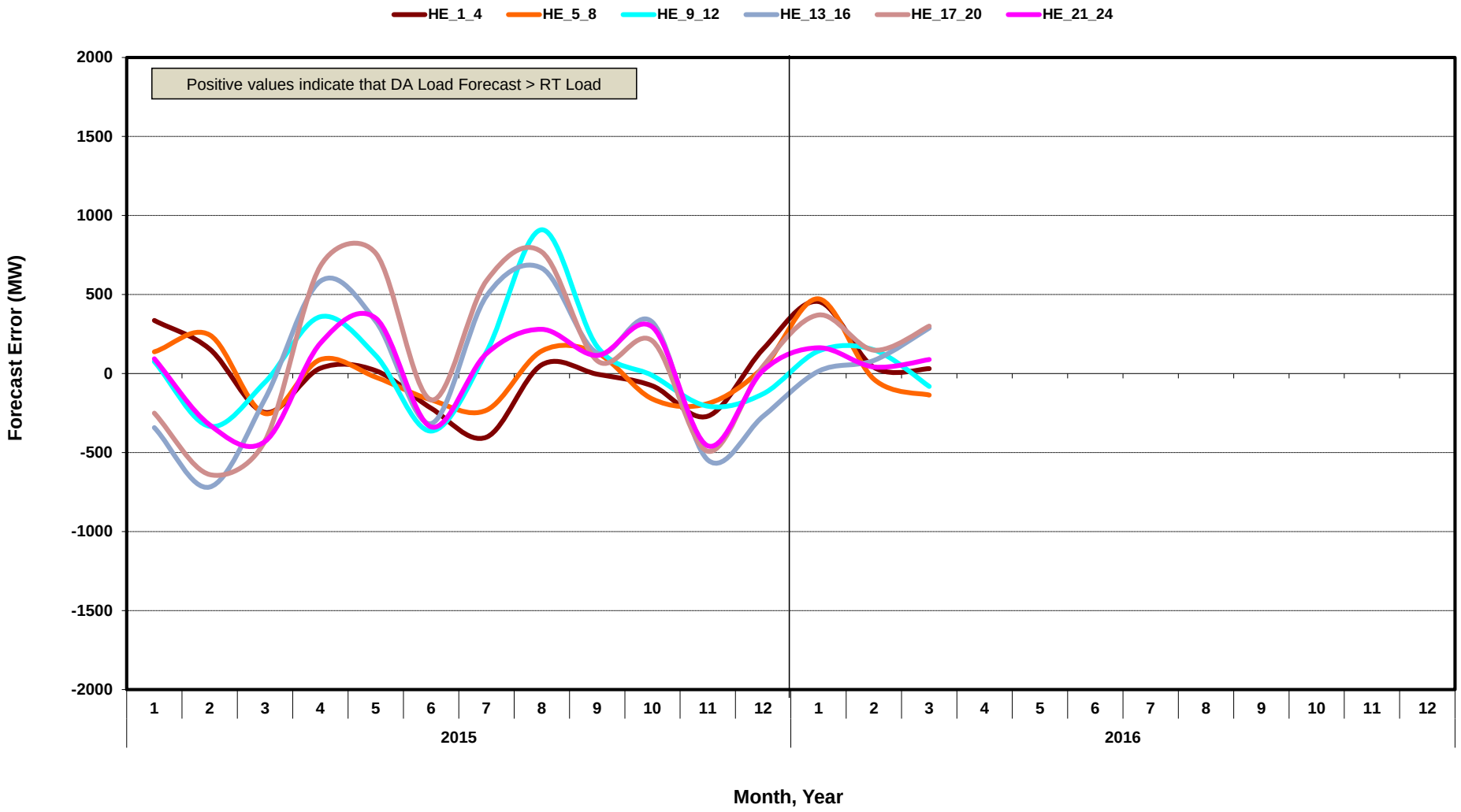
data

DA vs. RT Load Forecast Error by Hour Ending



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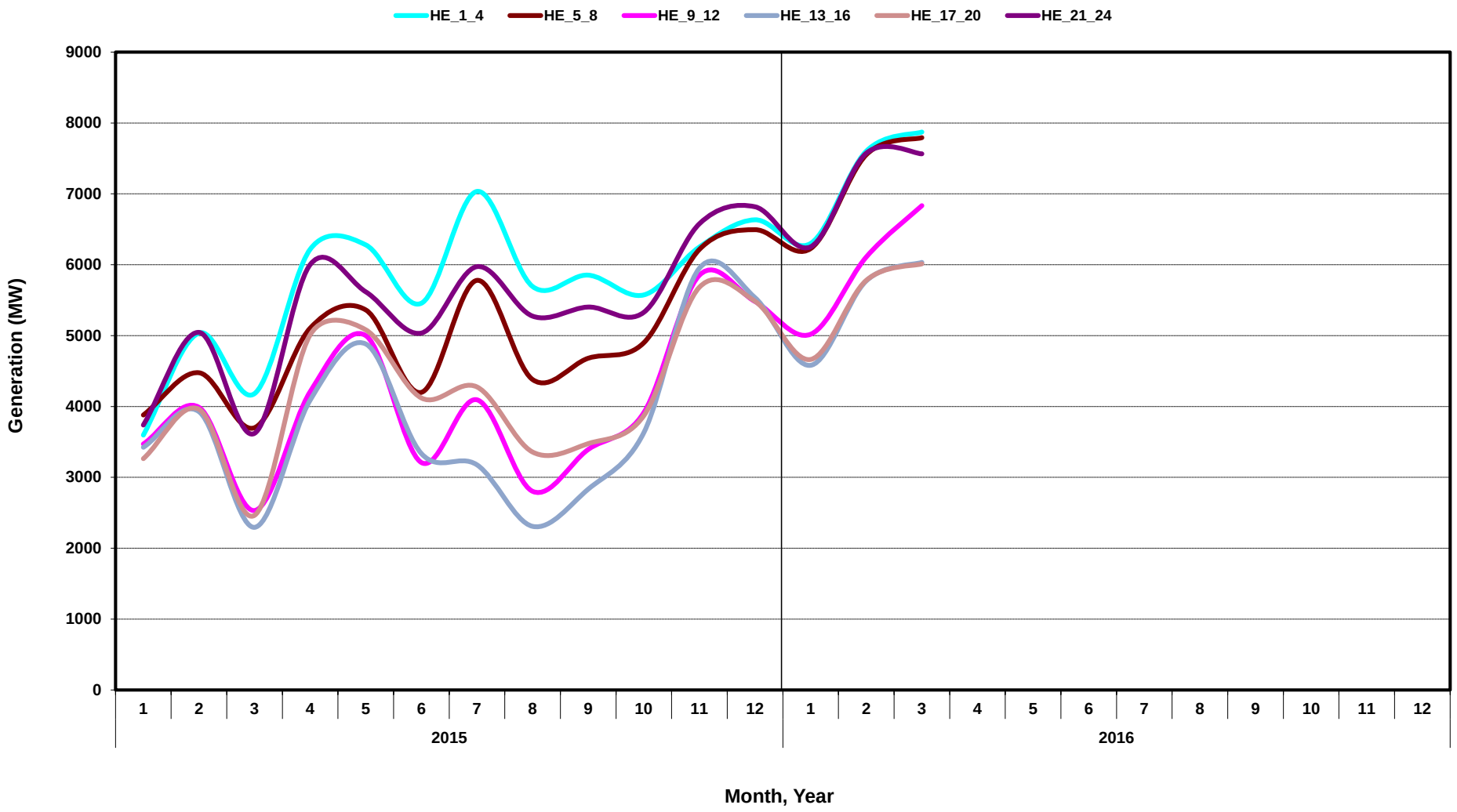
Monthly Average of Wind Generation by Hour Ending



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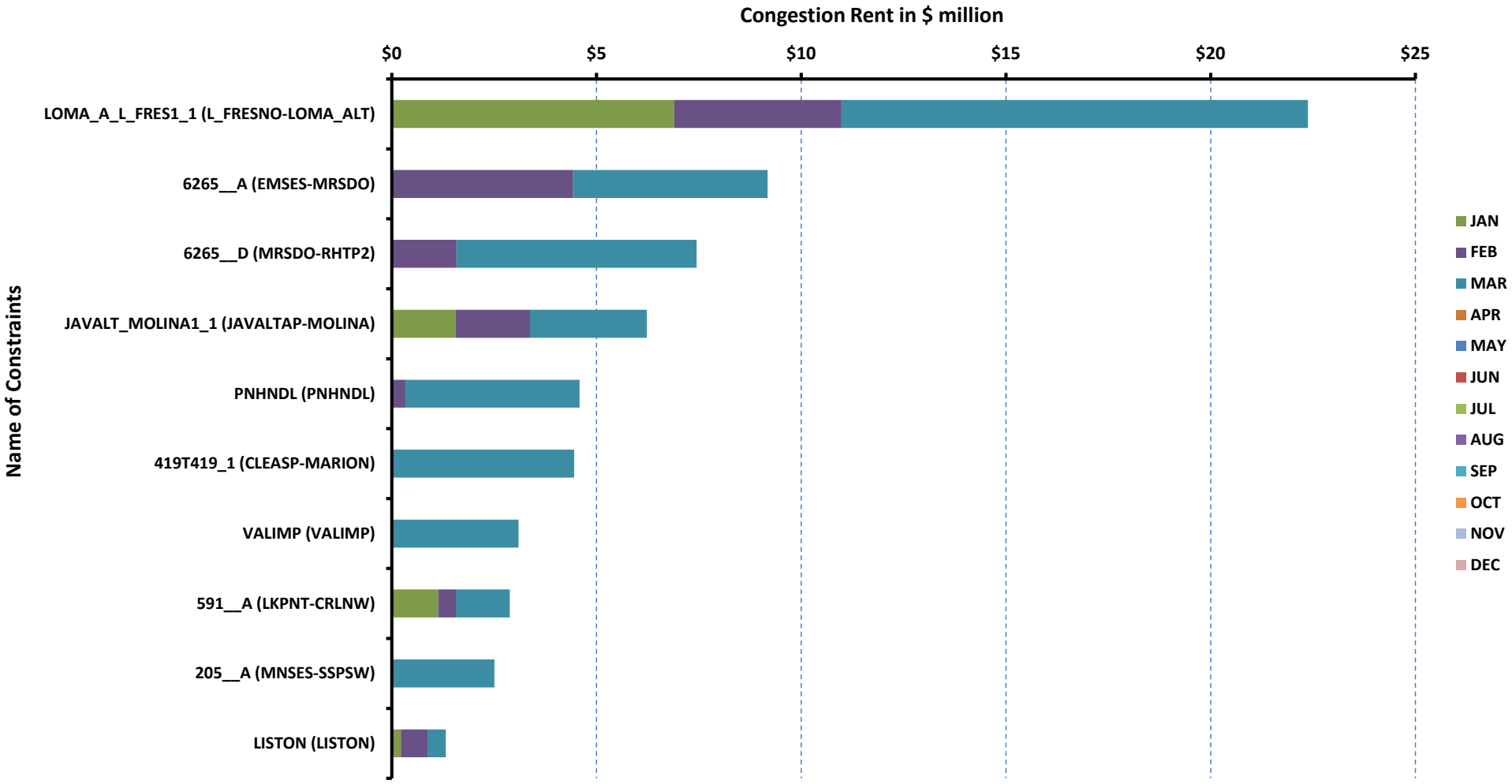
RT Congestion Constraint Rankings - 1

Top 10 Constraints by Total Congestion Rent



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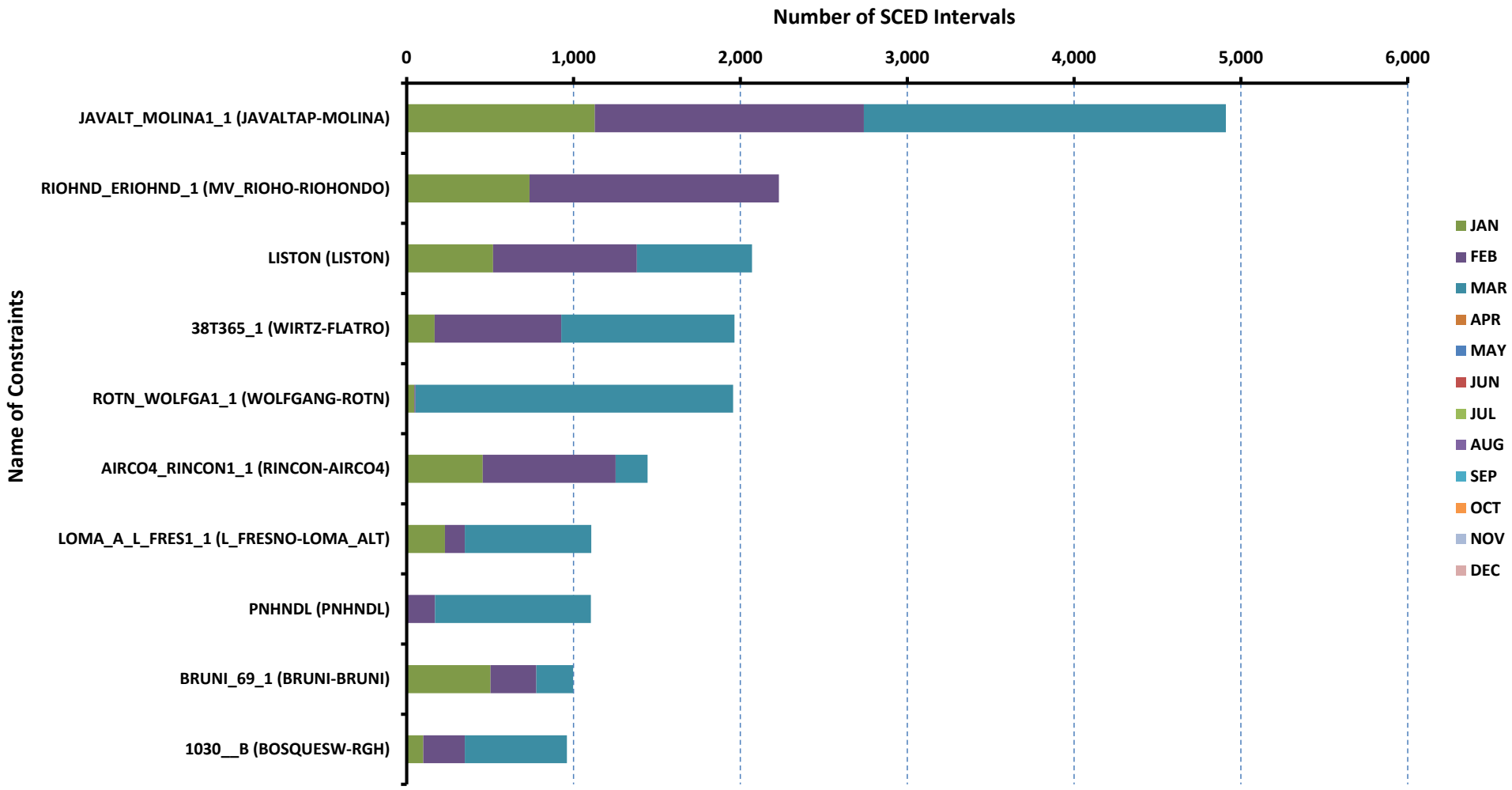
data

RT Congestion Constraint Rankings - 2

Top 10 Constraints by Binding Frequency



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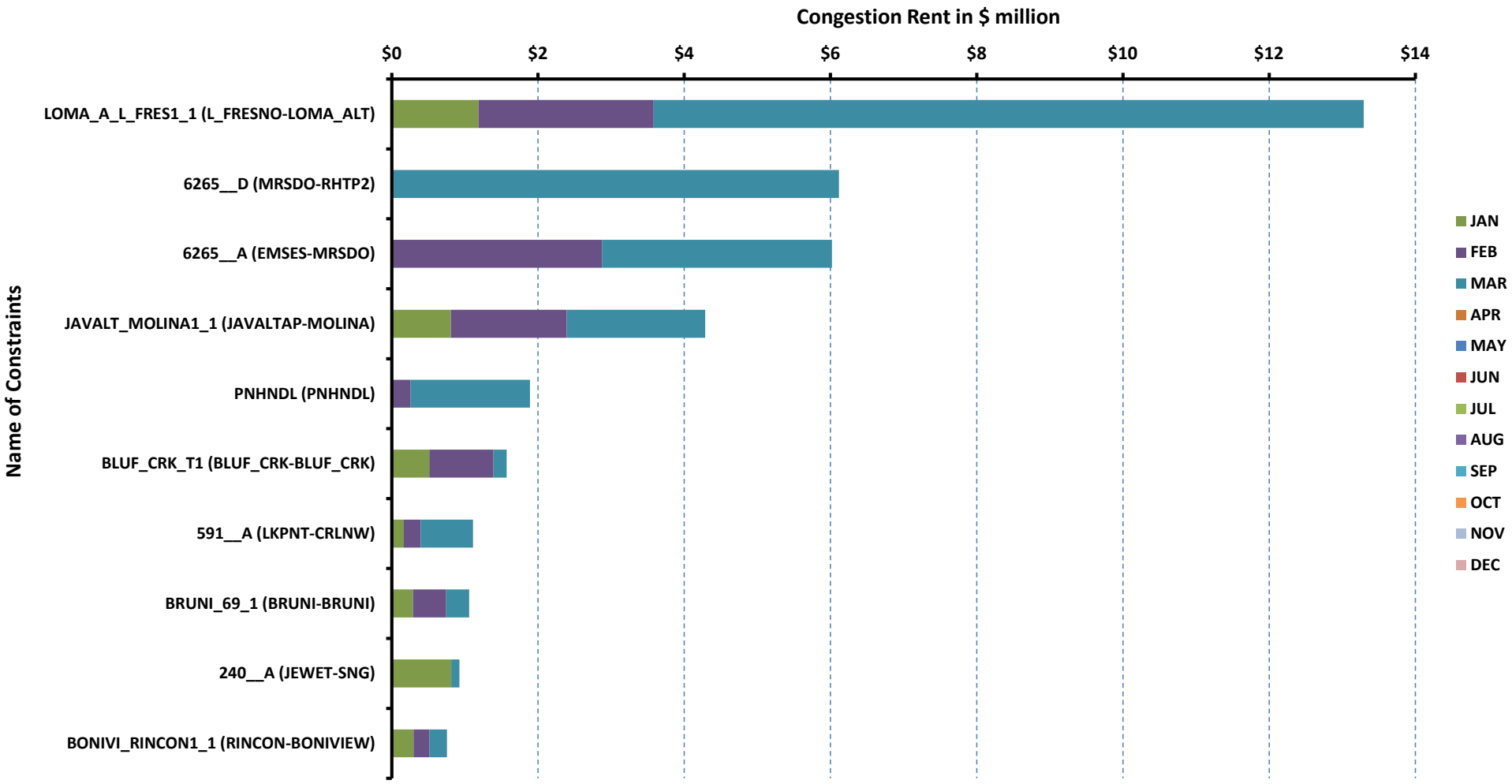
data

DA Congestion Constraint Rankings - 1

Top 10 Constraints by Total Congestion Rent



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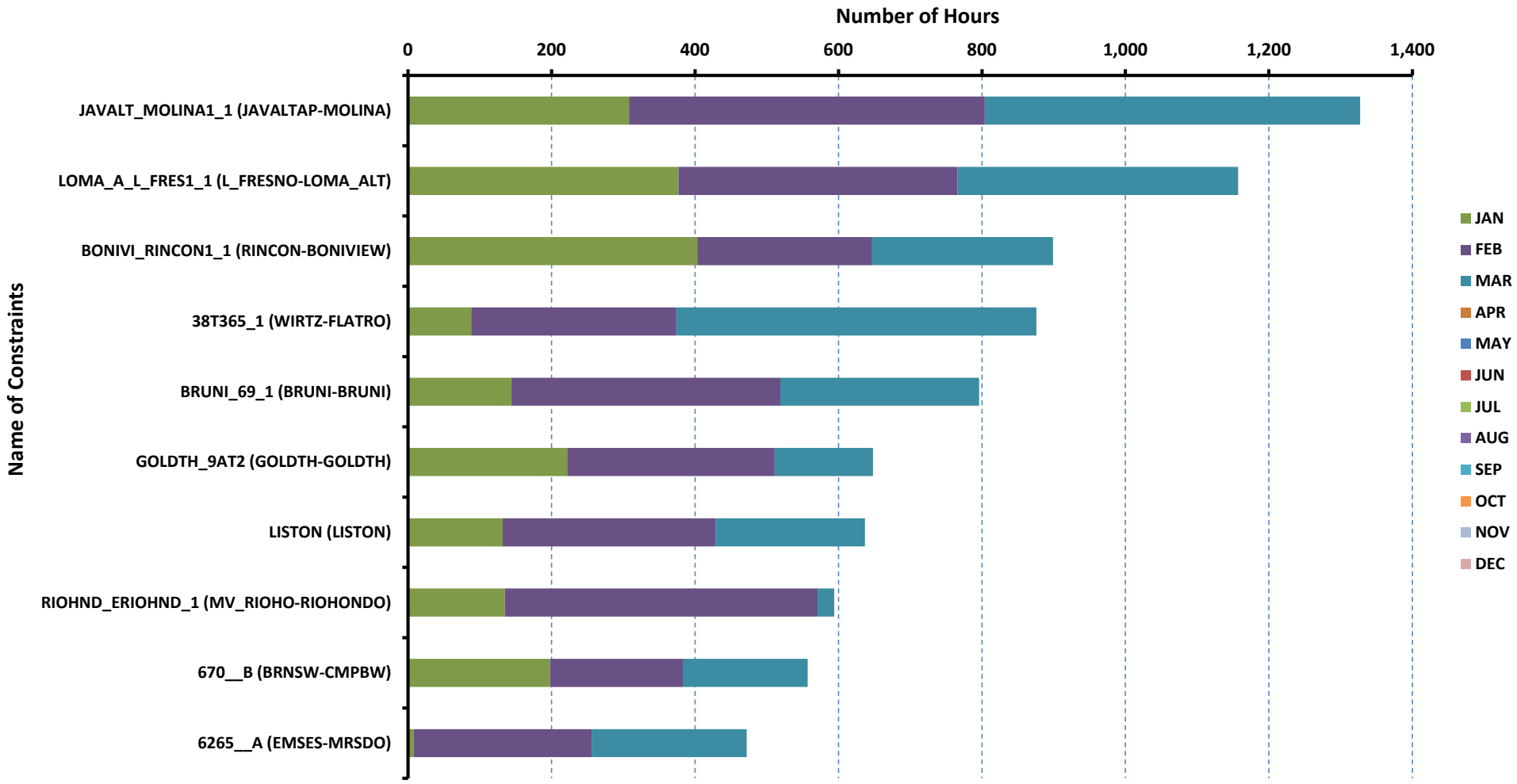
data

DA Congestion Constraint Rankings - 2

Top 10 Constraints by Binding Frequency



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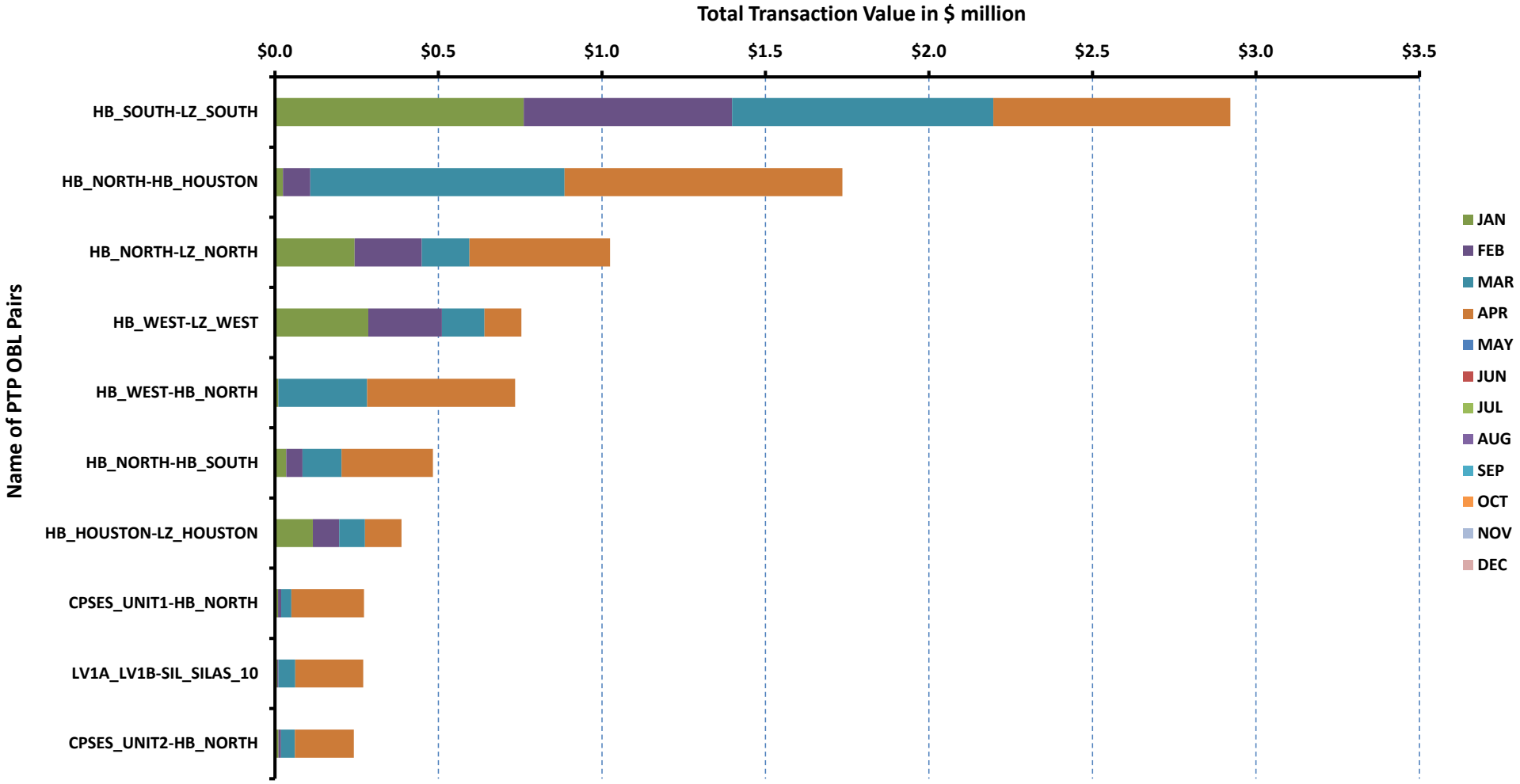
Top 10 CRR Pairs Ranked by Monthly Auction Values - 1

Top 10 PTP Obligations by Total Transaction Value



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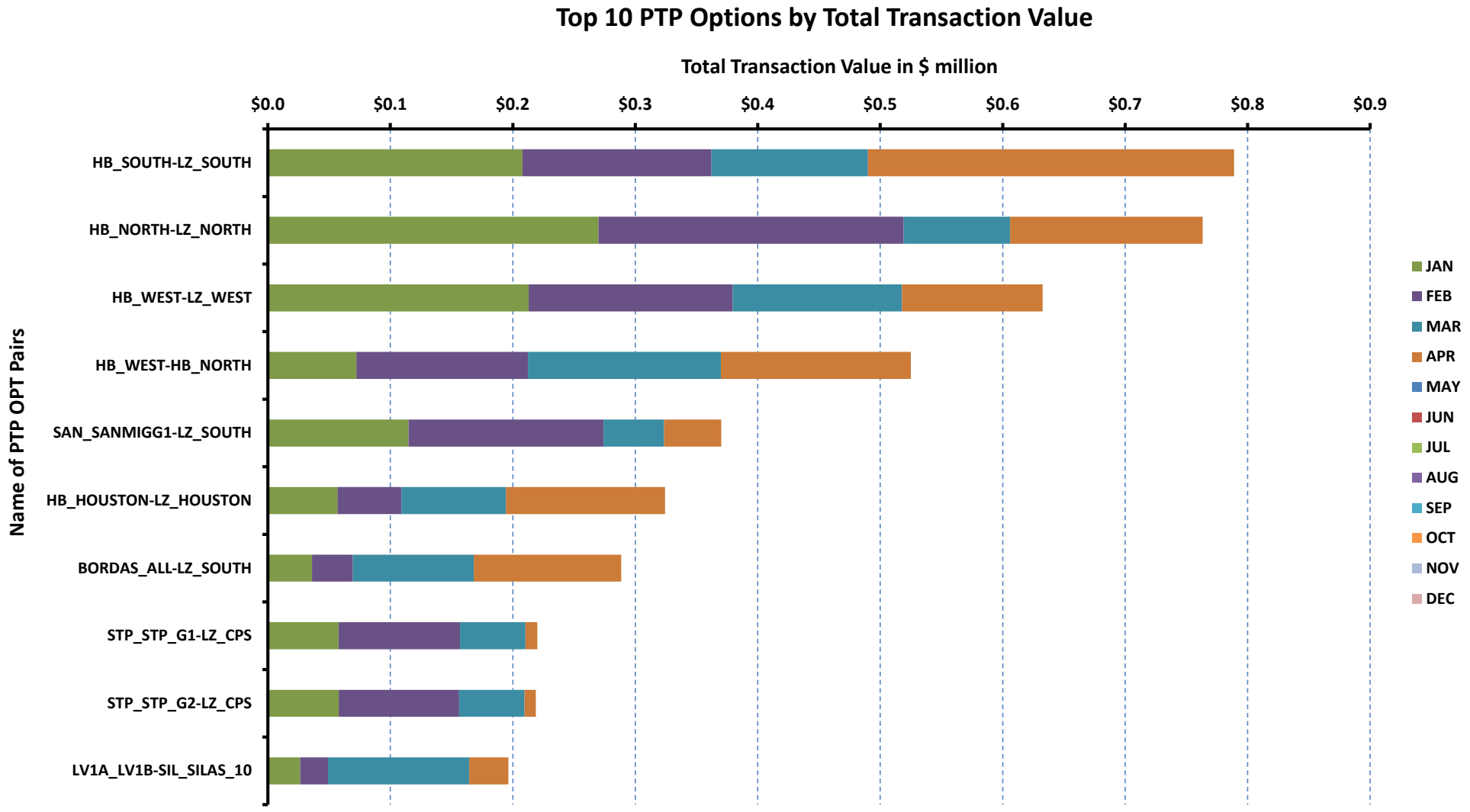
Top 10 CRR Pairs Ranked by Monthly Auction Values - 2



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data

ERCOT-wide Avg. Energy Price - DA vs. RT			
year	month	dam_spp	rtm_spp
2015	1	$ 26.35	$ 24.97
	2	$ 25.90	$ 28.28
	3	$ 27.88	$ 29.14
	4	$ 25.30	$ 24.74
	5	$ 25.78	$ 30.84
	6	$ 27.35	$ 24.63
	7	$ 33.20	$ 30.14
	8	$ 55.48	$ 38.12
	9	$ 26.87	$ 25.33
	10	$ 23.11	$ 22.02
	11	$ 20.07	$ 19.58
	12	$ 18.99	$ 17.74
2016	1	$ 19.85	$ 18.96
	2	$ 16.00	$ 15.53
	3	$ 18.18	$ 20.28
	4	$ -	$ -
	5	$ -	$ -
	6	$ -	$ -
	7	$ -	$ -
	8	$ -	$ -
	9	$ -	$ -
	10	$ -	$ -
	11	$ -	$ -
	12	$ -	$ -

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chart

Load Zone Load Statistics									
year	month	loadPEAK_Houston	loadPEAK_North	loadPEAK_South	loadPEAK_West	loadAVG_Houston	loadAVG_North	loadAVG_South	loadAVG_West
2015	1	12,803	23,814	16,491	4,339	9,538	14,918	10,830	3,496
	2	12,561	21,965	16,070	4,433	9,308	14,612	9,980	3,477
	3	12,235	21,950	15,837	4,372	8,827	12,810	9,182	3,318
	4	14,001	16,971	13,386	3,944	9,708	11,901	9,397	3,177
	5	15,128	20,253	14,926	4,199	10,879	12,956	10,381	3,265
	6	17,100	24,285	16,392	4,708	12,402	16,870	11,974	3,702
	7	18,236	26,878	18,084	5,043	13,643	18,882	13,232	3,958
	8	18,994	27,717	18,902	5,164	13,139	18,853	13,665	4,029
	9	16,361	25,718	17,631	4,876	11,726	16,837	12,322	3,782
	10	15,857	22,580	16,908	4,335	10,304	13,014	10,383	3,252
	11	13,117	16,102	13,250	3,893	9,074	11,890	9,086	3,261
	12	11,381	18,792	12,572	4,157	9,057	12,885	9,374	3,421
2016	1	11,994	19,818	14,739	4,162	9,365	14,157	9,953	3,535
	2	11,378	19,345	14,059	4,200	9,028	12,462	9,082	3,324
	3	13,316	16,242	12,948	3,701	9,145	11,479	8,919	3,181
	4	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-
	6	-	-	-	-	-	-	-	-
	7	-	-	-	-	-	-	-	-
	8	-	-	-	-	-	-	-	-
	9	-	-	-	-	-	-	-	-
	10	-	-	-	-	-	-	-	-
	11	-	-	-	-	-	-	-	-
	12	-	-	-	-	-	-	-	-

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chart

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
2015	1	$ 24.37	$ 24.24	$ 26.39	$ 25.32	$ 25.89	$ 26.09	$ 26.67	$ 27.72
	2	$ 26.86	$ 28.03	$ 29.60	$ 29.35	$ 25.21	$ 25.66	$ 26.83	$ 26.10
	3	$ 27.42	$ 30.50	$ 28.93	$ 29.01	$ 26.93	$ 28.08	$ 28.55	$ 27.76
	4	$ 24.59	$ 24.08	$ 25.53	$ 25.39	$ 25.21	$ 24.58	$ 25.94	$ 26.41
	5	$ 34.82	$ 27.49	$ 30.72	$ 31.20	$ 25.68	$ 25.30	$ 26.05	$ 27.14
	6	$ 23.61	$ 24.36	$ 25.20	$ 27.36	$ 26.76	$ 26.26	$ 28.92	$ 29.18
	7	$ 30.68	$ 29.60	$ 29.44	$ 33.16	$ 33.21	$ 32.75	$ 33.20	$ 35.27
	8	$ 38.50	$ 38.54	$ 37.49	$ 37.05	$ 56.90	$ 55.28	$ 55.18	$ 52.76
	9	$ 24.39	$ 25.66	$ 25.57	$ 25.98	$ 26.30	$ 26.75	$ 27.52	$ 27.00
	10	$ 21.14	$ 21.16	$ 24.41	$ 20.69	$ 23.57	$ 22.33	$ 23.89	$ 22.31
	11	$ 19.86	$ 19.57	$ 20.01	$ 17.64	$ 20.22	$ 19.89	$ 20.57	$ 18.87
	12	$ 20.50	$ 16.07	$ 17.91	$ 16.24	$ 20.10	$ 18.23	$ 19.22	$ 18.27
2016	1	$ 18.68	$ 18.77	$ 19.69	$ 18.39	$ 19.93	$ 19.74	$ 19.95	$ 19.76
	2	$ 15.20	$ 15.83	$ 15.89	$ 14.36	$ 15.89	$ 16.05	$ 16.30	$ 15.28
	3	$ 20.27	$ 19.21	$ 22.83	$ 17.03	$ 17.95	$ 18.11	$ 19.21	$ 16.20
	4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	10	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	11	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	12	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

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chart

ERCOT-wide Monthly Implied Heat Rate - DA vs. RT						
year	month	gasprice	rtm_spp	HR_rtm	dam_spp	HR_dam
2015	1	$ 2.92	$ 24.97	8.54	$ 26.35	9.01
	2	$ 2.68	$ 28.28	10.56	$ 25.90	9.67
	3	$ 2.70	$ 29.14	10.80	$ 27.88	10.33
	4	$ 2.56	$ 24.74	9.66	$ 25.30	9.87
	5	$ 2.80	$ 30.84	11.03	$ 25.78	9.22
	6	$ 2.71	$ 24.63	9.09	$ 27.35	10.09
	7	$ 2.83	$ 30.14	10.66	$ 33.20	11.74
	8	$ 2.74	$ 38.12	13.94	$ 55.48	20.28
	9	$ 2.61	$ 25.33	9.69	$ 26.87	10.28
	10	$ 2.35	$ 22.02	9.39	$ 23.11	9.86
	11	$ 2.05	$ 19.58	9.55	$ 20.07	9.78
	12	$ 1.92	$ 17.74	9.23	$ 18.99	9.89
2016	1	$ 2.21	$ 18.96	8.58	$ 19.85	8.98
	2	$ 1.89	$ 15.53	8.22	$ 16.00	8.46
	3	$ 1.67	$ 20.28	12.12	$ 18.18	10.86
	4	$ -	$ -	-	$ -	-
	5	$ -	$ -	-	$ -	-
	6	$ -	$ -	-	$ -	-
	7	$ -	$ -	-	$ -	-
	8	$ -	$ -	-	$ -	-
	9	$ -	$ -	-	$ -	-
	10	$ -	$ -	-	$ -	-
	11	$ -	$ -	-	$ -	-
	12	$ -	$ -	-	$ -	-

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chart

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
2015	1	8.86	9.12	8.92	9.48	8.34	9.03	8.29	8.66
	2	9.41	10.02	9.58	9.75	10.03	11.05	10.47	10.96
	3	9.98	10.58	10.41	10.29	10.16	10.72	11.30	10.75
	4	9.84	10.12	9.59	10.31	9.60	9.96	9.40	9.91
	5	9.19	9.32	9.05	9.70	12.45	10.99	9.83	11.16
	6	9.87	10.67	9.69	10.76	8.71	9.30	8.99	10.09
	7	11.74	11.74	11.58	12.47	10.85	10.41	10.47	11.72
	8	20.80	20.17	20.21	19.29	14.08	13.70	14.09	13.55
	9	10.06	10.53	10.23	10.33	9.33	9.78	9.82	9.94
	10	10.05	10.19	9.52	9.51	9.01	10.41	9.02	8.82
	11	9.86	10.03	9.70	9.20	9.68	9.75	9.54	8.60
	12	10.47	10.01	9.49	9.51	10.67	9.32	8.36	8.46
2016	1	9.02	9.02	8.93	8.94	8.45	8.91	8.49	8.32
	2	8.41	8.62	8.49	8.08	8.04	8.41	8.37	7.60
	3	10.72	11.47	10.82	9.68	12.11	13.64	11.48	10.17
	4	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-
	6	-	-	-	-	-	-	-	-
	7	-	-	-	-	-	-	-	-
	8	-	-	-	-	-	-	-	-
	9	-	-	-	-	-	-	-	-
	10	-	-	-	-	-	-	-	-
	11	-	-	-	-	-	-	-	-
	12	-	-	-	-	-	-	-	-

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chart

Daily ORDC Adders Average Values and Interval Duration								
YEAR	MONTH	DAY	PRICE_RS	PRICE_RDP	RS_CNT	RDP_CNT	RS_POS	RDP_POS
2016	3	1	$ 0.06	$ -	14	0	80	90
2016	3	2	$ -	$ -	0	0	80	90
2016	3	3	$ 0.11	$ 0.58	27	34	80	90
2016	3	4	$ 0.04	$ -	13	0	80	90
2016	3	5	$ 0.06	$ -	16	0	80	90
2016	3	6	$ -	$ -	0	0	80	90
2016	3	7	$ 0.05	$ -	6	0	80	90
2016	3	8	$ 2.68	$ -	26	0	80	90
2016	3	9	$ -	$ -	0	0	80	90
2016	3	10	$ 0.86	$ -	57	0	80	90
2016	3	11	$ 0.01	$ -	1	0	80	90
2016	3	12	$ 0.01	$ -	8	0	80	90
2016	3	13	$ -	$ -	0	0	80	90
2016	3	14	$ -	$ -	0	0	80	90
2016	3	15	$ 0.09	$ 0.33	11	26	80	90
2016	3	16	$ 0.59	$ -	26	0	80	90
2016	3	17	$ 0.05	$ -	32	0	80	90
2016	3	18	$ -	$ 0.23	0	26	80	90
2016	3	19	$ -	$ 0.27	0	5	80	90
2016	3	20	$ 0.26	$ -	14	0	80	90
2016	3	21	$ -	$ -	0	0	80	90
2016	3	22	$ -	$ -	0	0	80	90
2016	3	23	$ 0.18	$ 1.03	14	8	80	90
2016	3	24	$ 0.02	$ -	2	0	80	90
2016	3	25	$ -	$ -	0	0	80	90
2016	3	26	$ 0.47	$ -	30	0	80	90
2016	3	27	$ 1.77	$ -	29	0	80	90
2016	3	28	$ -	$ -	0	0	80	90
2016	3	29	$ -	$ 0.11	0	5	80	90
2016	3	30	$ 0.07	$ 0.25	7	20	80	90
2016	3	31	$ 5.16	$ 11.34	29	31	80	90

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chart

Monthly Average of Ancillary Services Required MW					
year	month	ASMW_REGDN	ASMW_NSPIN	ASMW_RRS	ASMW_REGUP
2015	1	379	1,500	2,800	416
	2	370	1,500	2,800	425
	3	393	1,500	2,800	449
	4	396	1,500	2,800	450
	5	409	1,464	2,800	446
	6	458	1,915	2,616	483
	7	450	1,828	2,817	473
	8	422	1,897	2,579	437
	9	446	1,545	2,607	458
	10	424	1,768	2,817	435
	11	394	1,951	2,927	423
	12	371	1,949	2,840	400
2016	1	288	1,568	2,752	314
	2	289	1,882	2,872	318
	3	279	1,787	2,872	313
	4	-	-	-	-
	5	-	-	-	-
	6	-	-	-	-
	7	-	-	-	-
	8	-	-	-	-
	9	-	-	-	-
	10	-	-	-	-
	11	-	-	-	-
	12	-	-	-	-

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chart

Hourly Average of Ancillary Services Required MW					
year	DELIVERY_HOUR	ASMW_REGDN	ASMW_NSPIN	ASMW_RRS	ASMW_REGUP
2015	1	449	1,592	2,826	463
	2	372	1,596	2,826	336
	3	318	1,680	2,872	314
	4	308	1,680	2,872	316
	5	363	1,680	2,872	367
	6	574	1,680	2,872	549
	7	432	1,696	2,793	766
	8	365	1,696	2,793	441
	9	369	1,696	2,793	472
	10	411	1,696	2,793	464
	11	408	1,701	2,709	498
	12	380	1,701	2,709	478
	13	356	1,701	2,709	428
	14	357	1,701	2,709	412
	15	343	1,746	2,693	369
	16	325	1,746	2,693	355
	17	338	1,746	2,693	362
	18	371	1,746	2,693	445
	19	461	1,747	2,709	452
	20	422	1,747	2,709	423
	21	415	1,747	2,709	391
	22	542	1,747	2,706	434
	23	602	1,596	2,826	547
	24	544	1,596	2,826	505
2016	1	295	1,058	2,935	278
	2	232	1,058	2,935	235
	3	215	1,419	2,934	228
	4	200	1,420	2,935	242
	5	282	1,420	2,935	321
	6	422	1,420	2,935	507
	7	358	2,342	2,770	637
	8	302	2,342	2,770	375
	9	243	2,342	2,770	331
	10	272	2,342	2,770	309
	11	271	2,368	2,770	307
	12	278	2,368	2,770	287
	13	266	2,368	2,770	267
	14	263	2,368	2,770	266
	15	257	1,664	2,808	245
	16	226	1,664	2,808	226
	17	200	1,664	2,808	251
	18	249	1,664	2,808	382
	19	302	1,602	2,770	402
	20	251	1,602	2,770	294
	21	296	1,602	2,770	262
	22	367	1,602	2,770	279
	23	429	1,058	2,935	335
	24	369	1,058	2,935	287

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chart

Monthly Average Ancillary Services Price					
year	month	MCPC_REGDN	MCPC_NSPIN	MCPC_RRS	MCPC_REGUP
2015	1	$ 5.49	$ 1.84	$ 6.47	$ 7.10
	2	$ 4.05	$ 3.00	$ 7.77	$ 8.83
	3	$ 6.04	$ 6.26	$ 11.27	$ 12.39
	4	$ 8.47	$ 5.27	$ 11.21	$ 13.08
	5	$ 7.78	$ 4.63	$ 8.84	$ 8.58
	6	$ 5.63	$ 5.98	$ 7.56	$ 6.65
	7	$ 4.01	$ 8.69	$ 12.37	$ 10.00
	8	$ 3.67	$ 25.73	$ 25.98	$ 22.70
	9	$ 4.25	$ 2.70	$ 7.13	$ 6.93
	10	$ 8.90	$ 5.34	$ 9.76	$ 9.15
	11	$ 6.67	$ 4.84	$ 11.28	$ 10.60
	12	$ 7.33	$ 4.59	$ 10.97	$ 11.12
2016	1	$ 4.10	$ 2.62	$ 8.05	$ 6.69
	2	$ 7.21	$ 4.77	$ 12.91	$ 7.80
	3	$ 8.47	$ 6.06	$ 11.39	$ 9.34
	4	$ -	$ -	$ -	$ -
	5	$ -	$ -	$ -	$ -
	6	$ -	$ -	$ -	$ -
	7	$ -	$ -	$ -	$ -
	8	$ -	$ -	$ -	$ -
	9	$ -	$ -	$ -	$ -
	10	$ -	$ -	$ -	$ -
	11	$ -	$ -	$ -	$ -
	12	$ -	$ -	$ -	$ -

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chart

Monthly Average A/S Cost per MWh Load					
year	month	AScost_REGDN	AScost_NSPIN	AScost_RRS	AScost_REGUP
2015	1	$ 0.05	$ 0.07	$ 0.47	$ 0.08
	2	$ 0.04	$ 0.12	$ 0.58	$ 0.10
	3	$ 0.07	$ 0.28	$ 0.92	$ 0.16
	4	$ 0.10	$ 0.23	$ 0.92	$ 0.17
	5	$ 0.08	$ 0.18	$ 0.66	$ 0.10
	6	$ 0.06	$ 0.25	$ 0.44	$ 0.07
	7	$ 0.04	$ 0.32	$ 0.70	$ 0.10
	8	$ 0.03	$ 0.98	$ 1.35	$ 0.20
	9	$ 0.04	$ 0.09	$ 0.42	$ 0.07
	10	$ 0.10	$ 0.26	$ 0.74	$ 0.11
	11	$ 0.08	$ 0.28	$ 0.99	$ 0.13
	12	$ 0.08	$ 0.26	$ 0.90	$ 0.13
2016	1	$ 0.03	$ 0.11	$ 0.60	$ 0.06
	2	$ 0.06	$ 0.27	$ 1.09	$ 0.07
	3	$ 0.07	$ 0.33	$ 1.00	$ 0.09
	4	$ -	$ -	$ -	$ -
	5	$ -	$ -	$ -	$ -
	6	$ -	$ -	$ -	$ -
	7	$ -	$ -	$ -	$ -
	8	$ -	$ -	$ -	$ -
	9	$ -	$ -	$ -	$ -
	10	$ -	$ -	$ -	$ -
	11	$ -	$ -	$ -	$ -
	12	$ -	$ -	$ -	$ -

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chart

ERCOT-wide Cumulative PNM			
year	month	pnm	pnm_accum
2015	0	$ -	$ -
	1	$ 1,009.59	$ 1,009.59
	2	$ 3,289.14	$ 4,298.73
	3	$ 3,800.54	$ 8,099.27
	4	$ 1,900.94	$ 10,000.21
	5	$ 4,578.64	$ 14,578.85
	6	$ 738.37	$ 15,317.22
	7	$ 2,945.67	$ 18,262.89
	8	$ 7,767.43	$ 26,030.32
	9	$ 1,612.54	$ 27,642.86
	10	$ 1,283.56	$ 28,926.42
	11	$ 1,529.59	$ 30,456.01
	12	$ 1,209.77	$ 31,665.78
2016	0	$ -	$ -
	1	$ 1,160.69	$ 1,160.69
	2	$ 720.57	$ 1,881.26
	3	$ 3,883.41	$ 5,764.67
	4	$ -	$ -
	5	$ -	$ -
	6	$ -	$ -
	7	$ -	$ -
	8	$ -	$ -
	9	$ -	$ -
	10	$ -	$ -
	11	$ -	$ -
	12	$ -	$ -

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chart

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
2015	1	336	(342)	(251)	93	137	75
	2	155	(718)	(639)	(325)	244	(334)
	3	(246)	(160)	(425)	(430)	(253)	(54)
	4	34	585	680	192	88	359
	5	18	330	761	350	(23)	114
	6	(219)	(317)	(166)	(338)	(167)	(364)
	7	(403)	490	587	126	(232)	136
	8	55	667	769	280	143	910
	9	(4)	130	81	114	129	171
	10	(78)	324	206	294	(161)	(13)
	11	(270)	(547)	(492)	(457)	(190)	(207)
	12	156	(270)	47	20	38	(128)
2016	1	455	14	371	163	473	142
	2	39	83	148	42	(36)	150
	3	31	288	300	89	(136)	(82)
	4	-	-	-	-	-	-
	5	-	-	-	-	-	-
	6	-	-	-	-	-	-
	7	-	-	-	-	-	-
	8	-	-	-	-	-	-
	9	-	-	-	-	-	-
	10	-	-	-	-	-	-
	11	-	-	-	-	-	-
	12	-	-	-	-	-	-

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chart

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
2015	1	3,597	3,424	3,264	3,738	3,879	3,471
	2	5,036	3,927	3,961	5,045	4,476	3,988
	3	4,182	2,295	2,465	3,622	3,701	2,532
	4	6,218	4,090	5,011	6,002	5,105	4,209
	5	6,280	4,882	5,081	5,617	5,362	5,000
	6	5,457	3,335	4,120	5,036	4,199	3,209
	7	7,034	3,176	4,275	5,973	5,779	4,094
	8	5,692	2,309	3,357	5,275	4,380	2,803
	9	5,853	2,834	3,476	5,403	4,681	3,394
	10	5,574	3,631	3,871	5,329	4,899	3,913
	11	6,250	5,952	5,683	6,578	6,216	5,852
	12	6,634	5,535	5,484	6,817	6,494	5,481
2016	1	6,300	4,581	4,663	6,253	6,228	5,019
	2	7,602	5,772	5,779	7,573	7,552	6,109
	3	7,872	6,033	6,013	7,565	7,793	6,833
	4	-	-	-	-	-	-
	5	-	-	-	-	-	-
	6	-	-	-	-	-	-
	7	-	-	-	-	-	-
	8	-	-	-	-	-	-
	9	-	-	-	-	-	-
	10	-	-	-	-	-	-
	11	-	-	-	-	-	-
	12	-	-	-	-	-	-

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chart

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	2016	JAVALT_MOLINA1_1 (JAVALTAP-MOLINA)	4,910	1	1,127	1,613	2,170	-	-	-	-	-	-	-	-	-
FREQ_EXIST	2016	RIOHND_ERIOHND_1 (MV_RIOHO-RIOHONDO)	2,231	2	736	1,495	-	-	-	-	-	-	-	-	-	-
FREQ_EXIST	2016	LISTON (LISTON)	2,070	3	518	862	690	-	-	-	-	-	-	-	-	-
FREQ_EXIST	2016	38T365_1 (WIRTZ-FLATRO)	1,965	4	167	759	1,039	-	-	-	-	-	-	-	-	-
FREQ_EXIST	2016	ROTN_WOLFGA1_1 (WOLFGANG-ROTN)	1,957	5	46	7	1,904	-	-	-	-	-	-	-	-	-
FREQ_EXIST	2016	AIRCO4_RINCON1_1 (RINCON-AIRCO4)	1,444	6	456	796	192	-	-	-	-	-	-	-	-	-
FREQ_EXIST	2016	LOMA_A_L_FRES1_1 (L_FRESNO-LOMA_ALT)	1,106	7	229	119	758	-	-	-	-	-	-	-	-	-
FREQ_EXIST	2016	PNHNDL (PNHNDL)	1,104	8	5	165	934	-	-	-	-	-	-	-	-	-
FREQ_EXIST	2016	BRUNI_69_1 (BRUNI-BRUNI)	998	9	503	274	221	-	-	-	-	-	-	-	-	-
FREQ_EXIST	2016	1030__B (BOSQUESW-RGH)	960	10	100	248	612	-	-	-	-	-	-	-	-	-
TOP10_RENT	2016	LOMA_A_L_FRES1_1 (L_FRESNO-LOMA_ALT)	$ 22.37	1	$ 6.90	$ 4.08	$ 11.39	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOP10_RENT	2016	6265__A (EMSES-MRSDO)	$ 9.18	2	$ 0.00	$ 4.43	$ 4.75	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOP10_RENT	2016	6265__D (MRSDO-RHTP2)	$ 7.44	3	$ -	$ 1.58	$ 5.86	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOP10_RENT	2016	JAVALT_MOLINA1_1 (JAVALTAP-MOLINA)	$ 6.23	4	$ 1.57	$ 1.81	$ 2.86	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOP10_RENT	2016	PNHNDL (PNHNDL)	$ 4.59	5	$ 0.01	$ 0.31	$ 4.26	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOP10_RENT	2016	419T419_1 (CLEASP-MARION)	$ 4.45	6	$ -	$ -	$ 4.45	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOP10_RENT	2016	VALIMP (VALIMP)	$ 3.09	7	$ -	$ -	$ 3.09	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOP10_RENT	2016	591__A (LKPNT-CRLNW)	$ 2.88	8	$ 1.13	$ 0.44	$ 1.31	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOP10_RENT	2016	205__A (MNSES-SSPSW)	$ 2.51	9	$ -	$ -	$ 2.51	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOP10_RENT	2016	LISTON (LISTON)	$ 1.32	10	$ 0.22	$ 0.65	$ 0.45	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

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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	2016	JAVALT_MOLINA1_1 (JAVALTAP-MOLINA)	1,327	1	308	496	523	-	-	-	-	-	-	-	-	-
FREQ_EXIST	2016	LOMA_A_L_FRES1_1 (L_FRESNO-LOMA_ALT)	1,157	2	377	389	391	-	-	-	-	-	-	-	-	-
FREQ_EXIST	2016	BONIVI_RINCON1_1 (RINCON-BONIVIEW)	899	3	403	244	252	-	-	-	-	-	-	-	-	-
FREQ_EXIST	2016	38T365_1 (WIRTZ-FLATRO)	876	4	88	286	502	-	-	-	-	-	-	-	-	-
FREQ_EXIST	2016	BRUNI_69_1 (BRUNI-BRUNI)	796	5	144	375	277	-	-	-	-	-	-	-	-	-
FREQ_EXIST	2016	GOLDTH_9AT2 (GOLDTH-GOLDTH)	648	6	222	289	137	-	-	-	-	-	-	-	-	-
FREQ_EXIST	2016	LISTON (LISTON)	637	7	132	297	208	-	-	-	-	-	-	-	-	-
FREQ_EXIST	2016	RIOHND_ERIOHND_1 (MV_RIOHO-RIOHONDO)	594	8	135	436	23	-	-	-	-	-	-	-	-	-
FREQ_EXIST	2016	670__B (BRNSW-CMPBW)	557	9	198	185	174	-	-	-	-	-	-	-	-	-
FREQ_EXIST	2016	6265__A (EMSES-MRSDO)	472	10	8	248	216	-	-	-	-	-	-	-	-	-
TOP10_RENT	2016	LOMA_A_L_FRES1_1 (L_FRESNO-LOMA_ALT)	$ 13.29	1	$ 1.18	$ 2.40	$ 9.71	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOP10_RENT	2016	6265__D (MRSDO-RHTP2)	$ 6.11	2	$ -	$ 0.02	$ 6.10	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOP10_RENT	2016	6265__A (EMSES-MRSDO)	$ 6.02	3	$ 0.02	$ 2.85	$ 3.15	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOP10_RENT	2016	JAVALT_MOLINA1_1 (JAVALTAP-MOLINA)	$ 4.29	4	$ 0.81	$ 1.58	$ 1.90	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOP10_RENT	2016	PNHNDL (PNHNDL)	$ 1.89	5	$ 0.00	$ 0.25	$ 1.63	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOP10_RENT	2016	BLUF_CRK_T1 (BLUF_CRK-BLUF_CRK)	$ 1.57	6	$ 0.51	$ 0.88	$ 0.18	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOP10_RENT	2016	591__A (LKPNT-CRLNW)	$ 1.11	7	$ 0.17	$ 0.23	$ 0.72	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOP10_RENT	2016	BRUNI_69_1 (BRUNI-BRUNI)	$ 1.06	8	$ 0.29	$ 0.46	$ 0.31	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOP10_RENT	2016	240__A (JEWET-SNG)	$ 0.92	9	$ 0.81	$ -	$ 0.11	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOP10_RENT	2016	BONIVI_RINCON1_1 (RINCON-BONIVIEW)	$ 0.75	10	$ 0.30	$ 0.22	$ 0.24	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

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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																
ftr_option	year	pair	total_value	rank	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
N	2016	HB_SOUTH-LZ_SOUTH	$ 2.92	1	$ 0.76	$ 0.64	$ 0.80	$ 0.72	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
N	2016	HB_NORTH-HB_HOUSTON	$ 1.74	2	$ 0.02	$ 0.08	$ 0.78	$ 0.85	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
N	2016	HB_NORTH-LZ_NORTH	$ 1.02	3	$ 0.24	$ 0.21	$ 0.15	$ 0.43	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
N	2016	HB_WEST-LZ_WEST	$ 0.75	4	$ 0.29	$ 0.23	$ 0.13	$ 0.11	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
N	2016	HB_WEST-HB_NORTH	$ 0.73	5	$ 0.01	$ 0.00	$ 0.27	$ 0.45	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
N	2016	HB_NORTH-HB_SOUTH	$ 0.48	6	$ 0.03	$ 0.05	$ 0.12	$ 0.28	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
N	2016	HB_HOUSTON-LZ_HOUSTON	$ 0.39	7	$ 0.12	$ 0.08	$ 0.08	$ 0.11	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
N	2016	CPSES_UNIT1-HB_NORTH	$ 0.27	8	$ 0.01	$ 0.01	$ 0.03	$ 0.22	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
N	2016	LV1A_LV1B-SIL_SILAS_10	$ 0.27	9	$ 0.01	$ 0.00	$ 0.05	$ 0.21	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
N	2016	CPSES_UNIT2-HB_NORTH	$ 0.24	10	$ 0.01	$ 0.01	$ 0.04	$ 0.18	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Y	2016	HB_SOUTH-LZ_SOUTH	$ 0.79	1	$ 0.21	$ 0.15	$ 0.13	$ 0.30	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Y	2016	HB_NORTH-LZ_NORTH	$ 0.76	2	$ 0.27	$ 0.25	$ 0.09	$ 0.16	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Y	2016	HB_WEST-LZ_WEST	$ 0.63	3	$ 0.21	$ 0.17	$ 0.14	$ 0.11	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Y	2016	HB_WEST-HB_NORTH	$ 0.52	4	$ 0.07	$ 0.14	$ 0.16	$ 0.16	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Y	2016	SAN_SANMIGG1-LZ_SOUTH	$ 0.37	5	$ 0.11	$ 0.16	$ 0.05	$ 0.05	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Y	2016	HB_HOUSTON-LZ_HOUSTON	$ 0.32	6	$ 0.06	$ 0.05	$ 0.09	$ 0.13	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Y	2016	BORDAS_ALL-LZ_SOUTH	$ 0.29	7	$ 0.04	$ 0.03	$ 0.10	$ 0.12	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Y	2016	STP_STP_G1-LZ_CPS	$ 0.22	8	$ 0.06	$ 0.10	$ 0.05	$ 0.01	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Y	2016	STP_STP_G2-LZ_CPS	$ 0.22	9	$ 0.06	$ 0.10	$ 0.05	$ 0.01	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Y	2016	LV1A_LV1B-SIL_SILAS_10	$ 0.20	10	$ 0.03	$ 0.02	$ 0.12	$ 0.03	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

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