Market Monitor Report

MC Webinar June 21, 2021 IMM



Regulation Uplift Overpayment

- The current rules result in the overpayment of uplift in the regulation market in some cases.
- Regulating units are paid uplift if the regulation market clearing price does not cover the units' offered cost plus lost opportunity cost (LOC) from the energy market.
- Some regulating units paid uplift LOC based on a target energy output that they cannot achieve based on current output and ramp rates.



Regulation Uplift Overpayment

- PJM calculates intrahour LOC uplift based on the difference between the desired MW of the regulating unit at LMP, and the current MW output at the regulation set point:
 - RegLOC
 - $= |LMP Offer_{RegSetPoint}|$
 - * |DesiredMW@LMP MW@RegSetPoint|
- Where the DesiredMW@LMP is based on energy offer curve but does not consider the ramp rate of the unit.
- The result is an LOC uplift payment based on an output level that cannot be met.



Regulation Uplift Overpayment Example

- LMP = \$250/MW
- Offer_{RegSetPoint} = \$20/MW
- DesiredMW@LMP = 1,000 MW
- MW@RegSetPoint = 500 MW
- |\$250/MW \$20/MW| *
 |1,000 MW 500 MW| =
 \$115,000
- If the unit has a 3 MW/minute ramp rate, it would only be able to get to 515 MW ramping through the interval.
- |\$250/MW \$20/MW| * |515 MW - 500 MW| = \$3,450



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Impacts of Regulation Uplift Overpayment

- Can significantly affect the amount of uplift credits received by units.
- Largest effect for coal units.
- Uplift overpayment of \$1.6M in Q1 2021.
 - Based on recalculation using a ramp rate limited DesiredMW@LMP,
- Use of the ramp rate limited MW will eliminate the overpayment
 - Pay units for uplift based on actual lost opportunity.
 - Based on ramp rates.



- The IMM proposes a cap of 5.5 on the realized mileage ratio in all hours.
- The cap would eliminate the current undefined mileage ratio result.
- The cap would reduce the market distortion that results from the use of mileage ratios when they incorrectly represent regulation output.
- Based on data from January 1, 2020, through March 31, 2021 this cap would affect less than 50 percent of hours.





- RegA resources are paid (on a performance score adjusted basis):
 - RegA MW x RMCCP + RegA MW x RMPCP.
- RegD resources are paid (on a performance score adjusted basis):
 - RegD MW x RMCCP + RegD MW x RMPCP x Mileage Ratio.
 - Mileage Ratio = (Mileage of RegD)/(Mileage of RegA)

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- RegA and RegD signals are interdependent.
- Reg A moves slowly to maintain ACE and to support the 30 minute conditional neutrality of RegD.
- The RegD signal is set equal to the difference between ACE and RegA, which PJM enforcing 30 conditional neutrality of the RegD signal if it can.
- The combination of the RegA and RegD signal maintain ACE.
- There are times when the RegA signal does not change (pegging), while RegD signal moves (equal to the difference between ACE and RegA).

Monitoring Analytics

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- The RegA signal to support the conditional neutrality of RegD can cause large and/or undefined values for the mileage ratio (mileage D/mileage A).
- When RegA is pegged for a full hour (mileage of Reg A = 0), the mileage ratio is undefined.



- The mileage ratio is not a measure of relative work done for purposed of supporting ACE control, as the full interaction between the A and D signals controls ACE.
- When pegged, for instance, RegA is still supporting ACE control (per the signal design) and it also supporting the conditional neutrality of the RegD signal.



- The relative contribution to regulation is measured by the MRTS or MBF, not the mileage ratio.
- The MRTS/MBF is used for the relative valuation of the RegA and RegD in the market clearing and the setting of price, but not the market settlement.
- The current market design is flawed and causes an overpayment of RegD relative to RegA in most hours.



Mileage Ratio Statistics: January 1, 2020, to March 31, 2021 (Cap at 1.0)

Full Range Statistics (no limits or caps on mileage or mileage ratios)										
Reg		RegD Mileage			\$/Reg A	\$/Reg D				
Metric	Mileage	mileage	Ratio	MBF	MW	MW				
Minimum	0.00	1.29	0.65	0.65	0.00	0.00				
Maximum	14.29	59.71	9,999.00	1.94	967.86	969.97				
Median	5.29	29.13	5.47	0.94	9.57	12.46				
Mean	5.43	29.08	7.39	0.71	13.65	16.71				
Statistics if Max Mileage Ratio Limited to 1										
Statistics if Max	x Mileage Ratio	o Limited t	0	1						
Statistics if Max	x Mileage Ratio RegA	o Limited t RegD	o Mileage	1	\$/Reg A	\$/Reg D				
Statistics if Max Metric	x Mileage Ratio RegA Mileage	o Limited t RegD mileage	o Mileage Ratio	1 MBF	\$/Reg A MW	\$/Reg D MW				
Statistics if Max Metric Minimum	x Mileage Ratio RegA Mileage 0.00	o Limited t RegD mileage 1.29	o Mileage Ratio 0.65	1 MBF 0.65	\$/Reg A MW 0.00	\$/Reg D MW 0.00				
Statistics if Max Metric Minimum Maximum	x Mileage Ratio RegA Mileage 0.00 14.29	o Limited t RegD mileage 1.29 59.71	o Mileage Ratio 0.65 1.00	1 MBF 0.65 1.94	\$/Reg A MW 0.00 967.86	\$/Reg D MW 0.00 967.86				
Statistics if Max Metric Minimum Maximum Median	x Mileage Ration RegA Mileage 0.00 14.29 5.29	o Limited t RegD mileage 1.29 59.71 29.13	o Mileage Ratio 0.65 1.00 1.00	1 MBF 0.65 1.94 0.94	\$/Reg A MW 0.00 967.86 9.57	\$/Reg D MW 0.00 967.86 9.57				

Percent of Hours

Affected 99.99%





Mileage Ratio Statistics: January 1, 2020, to March 31, 2021 (Cap at 5.5)

Metric Minimum	RegA Mileage	RegD mileage	Mileage Ratio	MDE	\$/Reg A	\$/Reg D			
Metric Minimum	Mileage	mileage	Ratio	MDE					
Minimum Aoximum	0.00		Ratio	MBF	MW	MW			
Aovimum	0.00	1.29	0.65	0.65	0.00	0.00			
νιαλιπιμπ	14.29	59.71	9,999.00	1.94	967.86	969.97			
Vedian	5.29	29.13	5.47	0.94	9.57	12.46			
Mean	5.43	29.08	7.39	0.71	13.65	16.71			
Statistics if Max Mileage Ratio Limited to 5.5									
	RegA	RegD	Mileage		\$/Reg A	\$/Reg D			
Metric	Mileage	mileage	Ratio	MBF	MW	MW			
Vinimum	0.00	1.29	0.65	0.65	0.00	0.00			
Maximum	14.29	59.71	5.50	1.94	967.86	969.53			
Vedian	5.29	29.13	5.47	0.94	9.57	12.02			
Vlean	5.43	29.08	4.87	0.71	13.65	16.22			
Statistics if Max N Metric Minimum Maximum Median Mean	Jileage Ra RegA Mileage 0.00 14.29 5.29 5.43	tio Limited RegD mileage 1.29 59.71 29.13 29.08	to Mileage Ratio 0.65 5.50 5.47 4.87	0.71 5.5 MBF 0.65 1.94 0.94 0.71	\$/Reg A MW 0.00 967.86 9.57 13.65	\$/Reg 1 969 11			

Percent of Hours

Affected

49.66%





RegD Overpayment per Effective MW

			RegD Settlement Page					
Year	Month		Mileage Based RegD (\$/Effective MW)	Marginal Rate of Technical Substitution Based RegD (\$/Effective MW)	RegA (\$/Effective MW)	Percent RegD Overpayment (\$/Effective MW)	Total RegD Overpayment (\$)	
	Jan		\$19.61	\$13.05	\$13.05	50.3%	\$3,822,718	
	Feb		\$25.79	\$9.57	\$9.57	169.5%	\$6,060,440	
2020	Mar		\$29.47	\$8.60	\$8.60	242.6%	\$7,982,625	
	Apr		\$38.85	\$11.45	\$11.45	239.4%	\$8,946,335	
	May		\$37.37	\$12.46	\$12.46	199.9%	\$8,953,641	
	Jun		\$25.00	\$11.85	\$11.85	111.0%	\$6,584,760	
	Jul		\$34.99	\$15.63	\$15.63	123.9%	\$7,891,533	
	Aug		\$31.78	\$14.83	\$14.83	114.4%	\$9,038,391	
	Sep		\$28.51	\$10.33	\$10.33	175.9%	\$7,942,871	
	Oct		\$69.18	\$17.31	\$17.31	299.6%	\$18,415,455	
	Nov		\$63.11	\$15.25	\$15.25	313.8%	\$15,834,343	
	Dec		\$43.39	\$15.34	\$15.34	182.9%	\$10,642,479	
	Yearly		\$37.30	\$13.00	\$13.00	186.9%	\$112,115,592	
2021	Jan		\$30.47	\$11.43	\$11.43	166.6%	\$6,700,761	
	Feb		\$88.91	\$19.90	\$19.90	346.7%	\$15,723,391	
	Mar		\$61.03	\$17.93	\$17.93	240.4%	\$15,334,201	
Average		www.monitor	\$59.18	\$16.30	\$16.30 (\ Moni	263.0% toring Analytics	\$37,758,352	

Fast Start Pricing

Average	Average Fast				Average	Average Fast		
Dispatch LMP	Start LMP	Difference	Percent	Date	Dispatch LMP	Start LMP	Difference	Percent
28.61	30.05	1.44	5.0%	May 21	24.51	25.28	0.77	3.1%
19.80	19.87	0.07	0.3%	May 22	23.85	24.82	0.96	4.0%
23.31	23.70	0.39	1.7%	May 23	27.43	29.16	1.72	6.3%
28.32	31.05	2.73	9.7%	May 24	33.99	34.93	0.94	2.8%
35.91	37.44	1.54	4.3%	May 25	34.86	37.85	3.00	8.6%
29.77	31.10	1.33	4.5%	May 26	70.09	71.21	1.11	1.6%
28.68	32.93	4.25	14.8%	May 27	33.76	34.49	0.72	2.1%
29.93	30.55	0.62	2.1%	May 28	22.35	22.40	0.05	0.2%
28.38	30.82	2.45	8.6%	May 29	19.32	19.32	(0.00)	0.0%
21.59	22.16	0.57	2.6%	May 30	18.75	18.75	(0.00)	0.0%
26.58	27.21	0.63	2.4%	May 31	17.67	17.67	0.00	0.0%
25.33	27.28	1.95	7.7%	Jun 01	25.76	25.96	0.20	0.8%
27.30	28.96	1.66	6.1%	Jun 02	25.30	25.44	0.14	0.6%
24.85	25.09	0.24	1.0%	Jun 03	28.33	29.91	1.58	5.6%
23.33	23.45	0.12	0.5%	Jun 04	32.02	36.71	4.69	14.6%
23.31	23.61	0.30	1.3%	Jun 05	23.00	24.24	1.24	5.4%
21.77	23.29	1.52	7.0%	Jun 06	30.71	31.96	1.25	4.1%
26.32	28.30	1.99	7.6%	Jun 07	30.31	32.46	2.15	7.1%
30.58	33.07	2.49	8.1%	Jun 08	37.93	41.48	3.56	9.4%
34.05	35.14	1.09	3.2%	Jun 09	43.66	49.98	6.32	14.5%
	Average Dispatch LMP 28.61 19.80 23.31 28.32 35.91 29.77 28.68 29.93 28.38 21.59 26.58 25.33 27.30 24.85 23.33 23.31 21.77 26.32 30.58 34.05	AverageAverageFastDispatch LMPStart LMP28.6130.0519.8019.8723.3123.7028.3231.0535.9137.4429.7731.1028.6832.9329.9330.5528.3830.8221.5922.1626.5827.2125.3327.2827.3028.9624.8525.0923.3123.6121.7723.2926.3228.3030.5833.0734.0535.14	Average Dispatch LMPAverage Fast Start LMPDifference28.6130.051.4419.8019.870.0723.3123.700.3928.3231.052.7335.9137.441.5429.7731.101.3328.6832.934.2529.9330.550.6228.3830.822.4521.5922.160.5726.5827.210.6325.3327.281.9527.3028.961.6624.8525.090.2423.3123.610.3021.7723.291.5226.3228.301.9930.5833.072.4934.0535.141.09	Average Dispatch LMPAverage Fast Start LMPDifference DifferencePercent28.6130.051.445.0%19.8019.870.070.3%23.3123.700.391.7%28.3231.052.739.7%35.9137.441.544.3%29.7731.101.334.5%28.6832.934.2514.8%29.9330.550.622.1%28.3830.822.458.6%21.5922.160.572.6%26.5827.210.632.4%25.3327.281.957.7%27.3028.961.666.1%24.8525.090.241.0%23.3123.610.301.3%21.7723.291.527.0%26.3228.301.997.6%30.5833.072.498.1%34.0535.141.093.2%	Average Dispatch LMPAverage Fast Start LMPDifference PercentDate28.6130.051.445.0%May 2119.8019.870.070.3%May 2223.3123.700.391.7%May 2328.3231.052.739.7%May 2435.9137.441.544.3%May 2529.7731.101.334.5%May 2628.6832.934.2514.8%May 2729.9330.550.622.1%May 2828.3830.822.458.6%May 2921.5922.160.572.6%May 3026.5827.210.632.4%May 3125.3327.281.957.7%Jun 0127.3028.961.666.1%Jun 0224.8525.090.241.0%Jun 0323.3123.610.301.3%Jun 0521.7723.291.527.0%Jun 0626.3228.301.997.6%Jun 0730.5833.072.498.1%Jun 0834.0535.141.093.2%Jun 09	Average Dispatch LMPStart LMPDifference DifferencePercentDateDispatch LMP28.6130.051.445.0%May 2124.5119.8019.870.070.3%May 2223.8523.3123.700.391.7%May 2327.4328.3231.052.739.7%May 2433.9935.9137.441.544.3%May 2534.8629.7731.101.334.5%May 2670.0928.6832.934.2514.8%May 2733.7629.9330.550.622.1%May 2822.3528.3830.822.458.6%May 2919.3221.5922.160.572.6%May 3018.7526.5827.210.632.4%May 3117.6725.3327.281.957.7%Jun 0125.7627.3028.961.666.1%Jun 0225.3024.8525.090.241.0%Jun 0328.3323.3123.610.301.3%Jun 0523.0021.7723.291.527.0%Jun 0630.7126.3228.301.997.6%Jun 0730.3130.5833.072.498.1%Jun 0837.9334.0535.141.093.2%Jun 0943.66	AverageAverage FastAverageAverageAverage FastDispatch LMPStart LMPDifferencePercentDateDispatch LMPStart LMP28.6130.051.445.0%May 2124.5125.2819.8019.870.070.3%May 2223.8524.8223.3123.700.391.7%May 2327.4329.1628.3231.052.739.7%May 2433.9934.9335.9137.441.544.3%May 2534.8637.8529.7731.101.334.5%May 2670.0971.2128.6832.934.2514.8%May 2733.7634.4929.9330.550.622.1%May 2822.3522.4028.3830.822.458.6%May 2919.3219.3221.5922.160.572.6%May 3018.7518.7526.5827.210.632.4%May 3117.6717.6725.3327.281.957.7%Jun 0125.7625.9627.3028.961.666.1%Jun 0328.3329.9123.3123.610.301.3%Jun 0523.0024.2421.7723.291.527.0%Jun 0630.7131.9626.3228.301.997.6%Jun 0730.3132.4630.5833.072.498.1%Jun 0837.9341.48<	AverageAverage FastAverageAverage FastDispatch LMPStart LMPDifferencePercentDateDispatch LMPStart LMPDifference28.6130.051.445.0%May 2124.5125.280.7719.8019.870.070.3%May 2223.8524.820.9623.3123.700.391.7%May 2327.4329.161.7228.3231.052.739.7%May 2433.9934.930.9435.9137.441.544.3%May 2534.8637.853.0029.7731.101.334.5%May 2670.0971.211.1128.6832.934.2514.8%May 2733.7634.490.7229.9330.550.622.1%May 2822.3522.400.0528.3830.822.458.6%May 2919.3219.32(0.00)21.5922.160.572.6%May 3018.7518.75(0.00)25.3327.281.957.7%Jun 0125.7625.960.2027.3028.961.666.1%Jun 0225.3025.440.1424.8525.090.241.0%Jun 0328.3329.911.5823.3123.610.301.3%Jun 0523.0024.241.2421.7723.291.527.0%Jun 0630.7131.961.2526.

Hourly Fast Start Pricing and Dispatch LMP



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Fast Start and Dispatch LMP Hourly Difference



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