

Market Monitor Report

MC Webinar

June 21, 2021

IMM



Monitoring Analytics

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

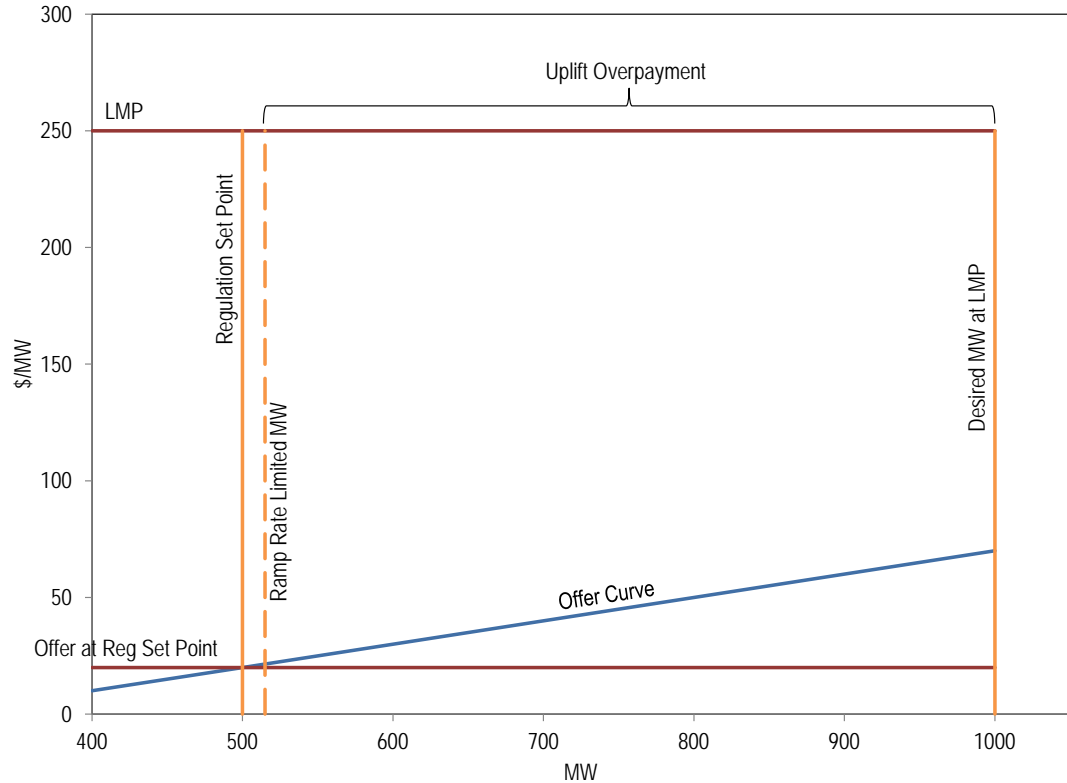
$$= |LMP - Offer_{RegSetPoint}|$$

$$* |DesiredMW@LMP - MW@RegSetPoint|$$

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



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.**

Regulation Mileage Issue

- **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.**

Regulation Mileage Issue

- **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)**

Regulation Mileage Issue

- **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).**

Regulation Mileage Issue

- 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.



Regulation Mileage Issue

- **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.**

Regulation Mileage Issue

- **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)						
	RegA	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		
	RegA	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	1.00	1.94	967.86	967.86
Median	5.29	29.13	1.00	0.94	9.57	9.57
Mean	5.43	29.08	1.00	0.71	13.65	13.66

Percent of Hours
Affected 99.99%

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

Full Range Statistics (no limits or caps on mileage or mileage ratios)						
	RegA	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				5.5		
	RegA	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	5.50	1.94	967.86	969.53
Median	5.29	29.13	5.47	0.94	9.57	12.02
Mean	5.43	29.08	4.87	0.71	13.65	16.22
Percent of Hours Affected						
	49.66%					

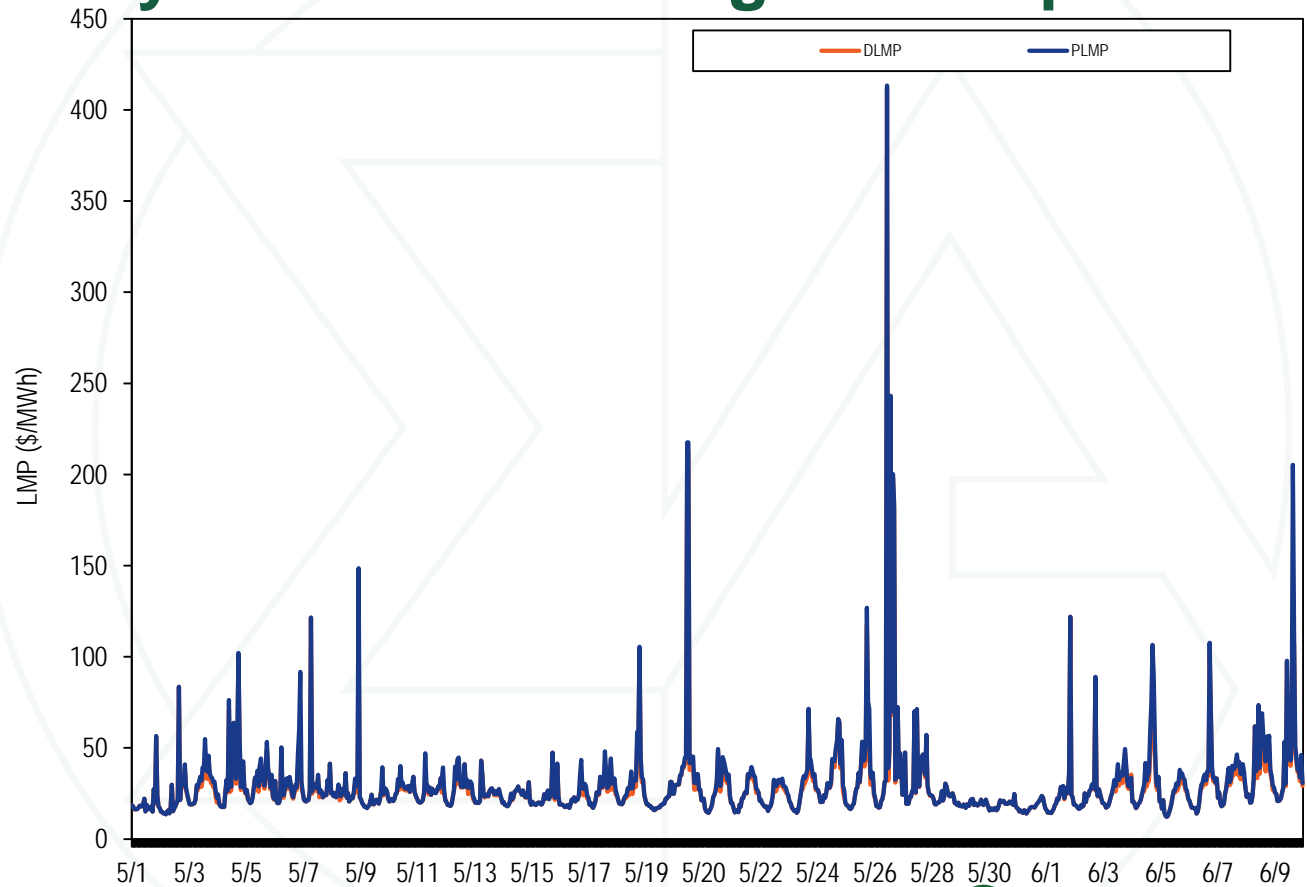
RegD Overpayment per Effective MW

RegD Settlement Payments						
Year	Month	Mileage Based	Marginal Rate of Technical	RegA	Percent RegD	Total RegD
		RegD	Substitution Based			
		(\$/Effective MW)	(\$/Effective MW)	(\$/Effective MW)	(\$/Effective MW)	(\$)
2020	Jan	\$19.61	\$13.05	\$13.05	50.3%	\$3,822,718
	Feb	\$25.79	\$9.57	\$9.57	169.5%	\$6,060,440
	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	\$59.18	\$16.30	\$16.30	263.0%	\$37,758,352

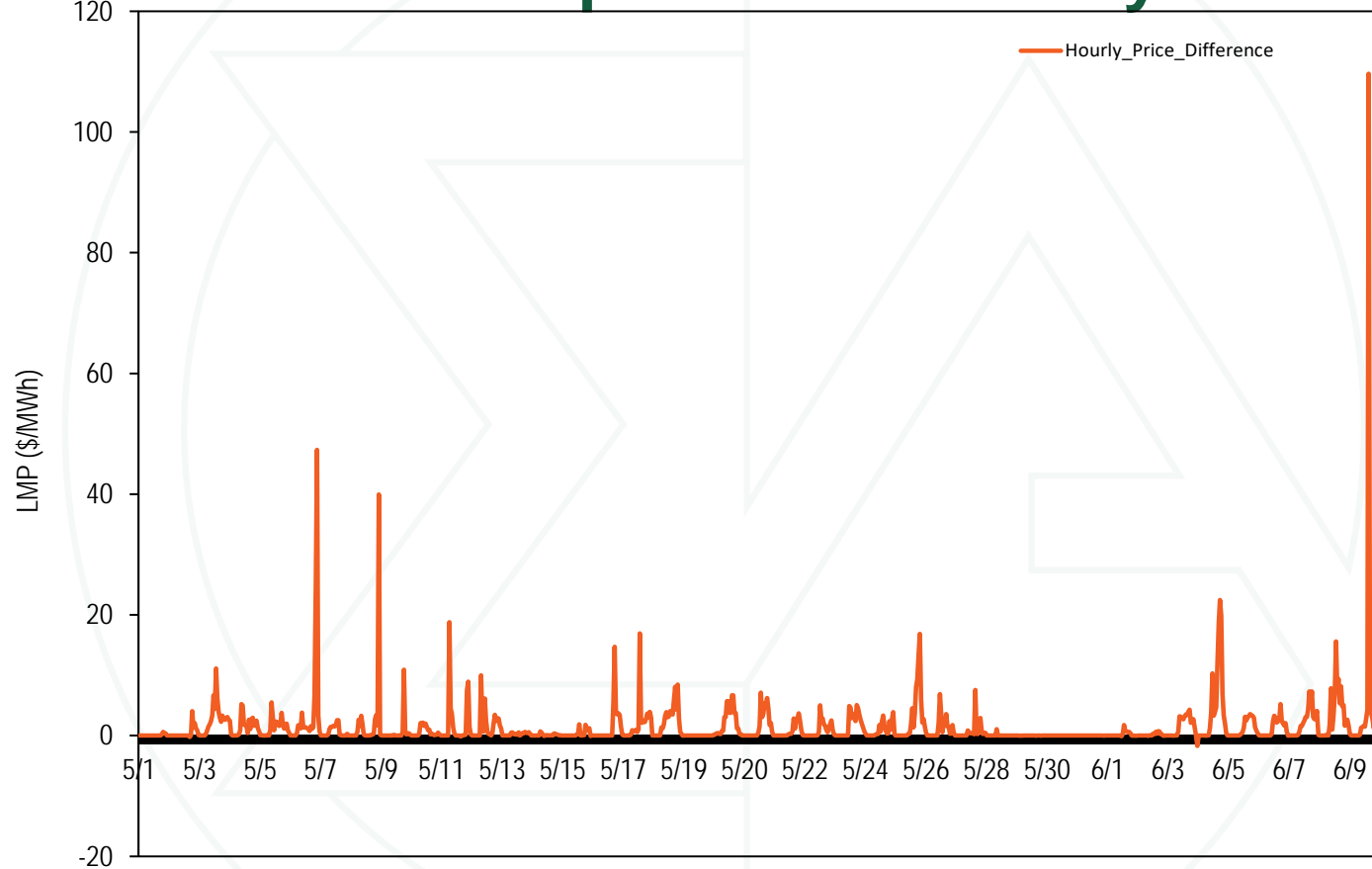
Fast Start Pricing

Date	Average Dispatch LMP	Average Fast Start LMP	Difference	Percent	Date	Average Dispatch LMP	Average Fast Start LMP	Difference	Percent
All Days	28.61	30.05	1.44	5.0%	May 21	24.51	25.28	0.77	3.1%
May 01	19.80	19.87	0.07	0.3%	May 22	23.85	24.82	0.96	4.0%
May 02	23.31	23.70	0.39	1.7%	May 23	27.43	29.16	1.72	6.3%
May 03	28.32	31.05	2.73	9.7%	May 24	33.99	34.93	0.94	2.8%
May 04	35.91	37.44	1.54	4.3%	May 25	34.86	37.85	3.00	8.6%
May 05	29.77	31.10	1.33	4.5%	May 26	70.09	71.21	1.11	1.6%
May 06	28.68	32.93	4.25	14.8%	May 27	33.76	34.49	0.72	2.1%
May 07	29.93	30.55	0.62	2.1%	May 28	22.35	22.40	0.05	0.2%
May 08	28.38	30.82	2.45	8.6%	May 29	19.32	19.32	(0.00)	0.0%
May 09	21.59	22.16	0.57	2.6%	May 30	18.75	18.75	(0.00)	0.0%
May 10	26.58	27.21	0.63	2.4%	May 31	17.67	17.67	0.00	0.0%
May 11	25.33	27.28	1.95	7.7%	Jun 01	25.76	25.96	0.20	0.8%
May 12	27.30	28.96	1.66	6.1%	Jun 02	25.30	25.44	0.14	0.6%
May 13	24.85	25.09	0.24	1.0%	Jun 03	28.33	29.91	1.58	5.6%
May 14	23.33	23.45	0.12	0.5%	Jun 04	32.02	36.71	4.69	14.6%
May 15	23.31	23.61	0.30	1.3%	Jun 05	23.00	24.24	1.24	5.4%
May 16	21.77	23.29	1.52	7.0%	Jun 06	30.71	31.96	1.25	4.1%
May 17	26.32	28.30	1.99	7.6%	Jun 07	30.31	32.46	2.15	7.1%
May 18	30.58	33.07	2.49	8.1%	Jun 08	37.93	41.48	3.56	9.4%
May 19	34.05	35.14	1.09	3.2%	Jun 09	43.66	49.98	6.32	14.5%

Hourly Fast Start Pricing and Dispatch LMP



Fast Start and Dispatch LMP Hourly Difference



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