

Market Settlements - Advanced

Generation Regulation Billing Examples Module



PJM State & Member Training Dept.

- Generation Billing Examples
 - Regulation

Regulation Credit

CREDITS	ADJ	BILLING LINE ITEM NAME	SOURCE BILLING PERIOD START	AMOUNT
2100		Network Integration Transmission Service		\$0.00
2130		Firm Point-to-Point Transmission Service		\$0.00
2140		Non-Firm Point-to-Point Transmission Service		\$0.00
2210		Transmission Congestion		\$0.00
2220		Transmission Losses		\$0.00
2320		Transmission Owner Scheduling, System Control and Dispatch Service		\$0.00
2330		Reactive Supply and Voltage Control from Generation and Other Sources Service		\$2,291,666.67
2340		Regulation and Frequency Response Service		\$2,073,743.53

Regulation Charge

CHARGES	ADJ	BILLING LINE ITEM NAME	SOURCE BILLING PERIOD START	AMOUNT
1340		Regulation and Frequency Response Service		\$715,912.53
1360		Synchronized Reserve		\$0.00
1365		Day-ahead Scheduling Reserve		\$0.00
1370		Day-ahead Operating Reserve		\$0.00

Regulation – MSRS Reports



MSRS Report Catalog

Customer Account: PJM Interconnection

Customer: ▼

Report Category: ▼

Report

Load Response Regulation Credits

Regulation Credits

Regulation Summary

Apply To All Selected Reports

Download Selected Reports

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Shopping Cart Contains: 0 Reports

Regulation Summary

9 Supporting Calculations

Adjusted Reg Obligation (1340.14) = Reg Obligation (1340.11) + Bilateral Reg Sales (1340.12) - Bilateral Reg Purchases (1340.13)

Mileage Ratio Adder (1340.23) = Total Mileage Reg Adder (1340.21) * (Adjusted Reg Obligation (1340.14) / Total PJM Adjusted Reg Obligation (MWh) (1340.22))

RMCCP Charge (1340.03) = Adjusted Reg Obligation (1340.14) * RMCCP (3001.44)

RMPCP Charge (1340.04) = (Adjusted Reg Obligation (1340.14) + Mileage Ratio Adder (1340.23)) * RMPCP (3001.45)

Reg Purchases (1340.15) = MAX (Adjusted Reg Obligation (1340.14) - Self-Scheduled Reg (2340.14),0)

Reg Lost Opportunity Cost Charge (1340.02) = Total PJM Reg Lost Opportunity Cost Credit (1340.17) * (Reg Purchases (1340.15) / Total PJM Reg Purchase (1340.16))

RMCCP Credit (2340.32) = See Regulation Credits report documentation

RMPCP Credit (2340.33) = See Regulation Credits report documentation

Regulation Summary

4000.05	4000.06	1340.18	1340.21	1340.19	1340.2	1340.11	1340.12	1340.13	1340.14	1340.22	1340.23
EPT Hour Ending	GMT Hour Ending	Total Assigned Reg (MWh)	Total Mileage Reg Adder (MWh)	RT Load (MWh)	Total PJM RT Load (MWh)	Reg Obligation (MWh)	Bilateral Reg Sales (MWh)	Bilateral Reg Purchases (MWh)	Adjusted Reg Obligation (MWh)	Total PJM Adjusted Reg Obligation (MWh)	Mileage Ratio Adder (MWh)
07/31/2016 14	07/31/2016 18	551.655	246.668	0	111636.505	0	129	0	129	551.655	57.681
07/31/2016 15	07/31/2016 19	511.179	156.303	0	115258.221	0	115	0	115	511.179	35.163
07/31/2016 16	07/31/2016 20	548.88	277.791	0	118361.117	0	97	0	97	548.88	49.092
07/31/2016 17	07/31/2016 21	560.548	342.415	0	120399.7151	0	96	0	96	560.548	58.642
07/31/2016 18	07/31/2016 22	545.148	149.453	0	120566.111	0	78	0	78	545.148	21.384
07/31/2016 19	07/31/2016 23	542.498	311.044	0	118260.02	0	77	0	77	542.498	44.148
07/31/2016 20	08/01/2016 00	530.532	218.511	0	114941.4269	0	127	0	127	530.532	52.308
07/31/2016 21	08/01/2016 01	546.012	274.087	0	111994.8331	0	151	0	151	546.012	75.799
07/31/2016 22	08/01/2016 02	592.777	1741.159	0	109302.403	0	150	0	150	592.777	440.594
07/31/2016 23	08/01/2016 03	502.798	165.886	0	102943.122	0	137	0	137	502.798	45.2
07/31/2016 24	08/01/2016 04	521.566	179.363	0	95085.07496	0	148	0	148	521.566	50.896

Modified by Performance Score

3001.44	3001.45	1340.03	1340.04	2340.13	2340.14	1340.15	1340.16	1340.17	1340.02	2340.32	2340.33	2340.16
RMCCP (\$/MWh)	RMPCP (\$/MWh)	RMCCP Charge (\$)	RMPCP Charge (\$)	PJM- Assigned Reg (MWh)	Self- Scheduled Reg (MWh)	Reg Purchases (MWh)	Total PJM Reg Purchase (MWh)	Total PJM Reg Lost Opportunity Credit (\$)	Reg Lost Opportunity Cost Charge (\$)	RMCCP Credit (\$)	RMPCP Credit (\$)	Reg Lost Opportunity Cost Credit (\$)
72.2	0.04	9313.8	7.47	81.745	52.333	76.667	555.998	0	0	9680.48	5.37	0
43.56	0	5009.4	0	106.56	38.221	76.779	519.836	0	0	6306.64	0	0
51.06	0	4952.82	0	171.221	15.802	81.198	556.361	0	0	9549.39	0	0
29.55	0.04	2836.8	6.19	221.604	16.677	79.323	564.62	0	0	7041.2	9.53	0
12.77	0	996.06	0	207.278	0	78	551.052	0	0	2646.94	0	0
14.52	0.06	1118.04	7.27	201.904	0	77	550.018	8.65	1.21	2931.64	12.11	0
35.45	6.6	4502.15	1183.43	0	50.193	76.807	540.067	17.91	2.55	1779.33	331.27	0
79.67	5.45	12030.17	1236.05	78.559	54.157	96.843	573.566	138.53	23.39	10573.53	723.31	95.51
34.16	2.13	5124	1257.96	0	94.848	55.152	573.847	1047.08	100.63	3239.99	202.03	0
27.1	8.15	3712.7	1484.93	0	58.221	78.779	519.623	506.39	76.77	1577.79	474.5	0
10.83	4.79	1602.84	952.71	0	78.546	69.454	527.357	2312.46	304.56	850.65	376.23	0

The sum of the following hourly charge columns equals the Regulation and Frequency Response Service charge on the PJM Bill (BLI 1340)

1. RMCCP Charge
2. RMPCP Charge
3. Reg Lost Opportunity Charge

The sum of the following hourly credit columns equals the Regulation and Frequency Response Service credit on the PJM Bill (BLI 2340)

1. RMCCP Credit
2. RMPCP Credit
3. Reg Lost Opportunity Credit

Regulation Summary

4000.05	4000.06	1340.18	1340.21	1340.19	1340.2	1340.11	1340.12	1340.13	1340.14	1340.22	1340.23
EPT Hour Ending	GMT Hour Ending	Total Assigned Reg (MWh)	Total Mileage Reg Adder (MWh)	RT Load (MWh)	Total PJM RT Load (MWh)	Reg Obligation (MWh)	Bilateral Reg Sales (MWh)	Bilateral Reg Purchases (MWh)	Adjusted Reg Obligation (MWh)	Total PJM Adjusted Reg Obligation (MWh)	Mileage Ratio Adder (MWh)
07/31/2016 14	07/31/2016 18	551.655	246.668	0	111636.505	0	129	0	129	551.655	57.681
07/31/2016 15	07/31/2016 19	511.179	156.303	0	115258.221	0	115	0	115	511.179	35.163
07/31/2016 16	07/31/2016 20	548.88	277.791	0	118361.117	0	97	0	97	548.88	49.092
07/31/2016 17	07/31/2016 21	560.548	342.415	0	120399.7151	0	96	0	96	560.548	58.642
07/31/2016 18	07/31/2016 22	545.148	149.453	0	120566.111	0	78	0	78	545.148	21.384
07/31/2016 19	07/31/2016 23	542.498	311.044	0	118260.02	0	77	0	77	542.498	44.148
07/31/2016 20	08/01/2016 00	530.532	218.511	0	114941.4269	0	127	0	127	530.532	52.308
07/31/2016 21	08/01/2016 01	546.012	274.087	0	111994.8331	0	151	0	151	546.012	75.799
07/31/2016 22	08/01/2016 02	592.777	1741.159	0	109302.403	0	150	0	150	592.777	440.594
07/31/2016 23	08/01/2016 03	502.798	165.886	0	102943.122	0	137	0	137	502.798	45.2
07/31/2016 24	08/01/2016 04	521.566	179.363	0	95085.07496	0	148	0	148	521.566	50.896

- Company has a 151 MW Bilateral Regulation sale for HE 21
 - Supported with self-scheduled resources
- The Self-Scheduled Regulation is only 54.157 MW
- Therefore there is a 96.843 MW Regulation Purchase

Modified by Performance Score

3001.44	3001.45	1340.03	1340.04	2340.13	2340.14	1340.15	1340.16	1340.17	1340.02	2340.32	2340.33	2340.16
RMCCP (\$/MWh)	RMPCP (\$/MWh)	RMCCP Charge (\$)	RMPCP Charge (\$)	PJM- Assigned Reg (MWh)	Self-Scheduled Reg (MWh)	Reg Purchases (MWh)	Total PJM Reg Purchase (MWh)	Total PJM Reg Opportunity Credit (\$)	Reg Lost Opportunity Cost Charge (\$)	RMCCP Credit (\$)	RMPCP Credit (\$)	Reg Lost Opportunity Cost Credit (\$)
72.2	0.04	9313.8	7.47	81.745	52.333	76.667	555.998	0	0	9680.48	5.37	0
43.56	0	5009.4	0	106.56	38.221	76.779	519.836	0	0	6306.64	0	0
51.06	0	4952.82	0	171.221	15.802	81.198	556.361	0	0	9549.39	0	0
29.55	0.04	2836.8	6.19	221.604	16.677	79.323	564.62	0	0	7041.2	9.53	0
12.77	0	996.06	0	207.278	0	78	551.052	0	0	2646.94	0	0
14.52	0.06	1118.04	7.27	201.904	0	77	550.018	8.65	1.21	2931.64	12.11	0
35.45	6.6	4502.15	1183.43	0	50.193	76.807	540.067	17.91	2.55	1779.33	331.27	0
79.67	5.45	12030.17	1236.05	78.559	54.157	96.843	573.566	138.53	23.39	10573.53	723.31	95.51
34.16	2.13	5124	1257.96	0	94.848	55.152	573.847	1047.08	100.63	3239.99	202.03	0
27.1	8.15	3712.7	1484.93	0	58.221	78.779	519.623	506.39	76.77	1577.79	474.5	0
10.83	4.79	1602.84	952.71	0	78.546	69.454	527.357	2312.46	304.56	850.65	376.23	0

- RMCCP and RMPCP Credits are calculated on a unit basis and can be found on the Regulation Credit Report

Regulation Credits

9 Supporting Calculations

Performance Score (2340.35) = $(1/3 * \text{Accuracy Score (2340.51)}) + (1/3 * \text{Delay Score (2340.52)}) + (1/3 * \text{Precision Score (2340.53)})$

If Performance Score (2340.35) < .25, then

RMCCP Credit (2340.36) = 0

RMPCP Credit (2340.37) = 0

Reg Offer Amount (2340.22) = 0

Regulation Lost Opportunity Cost Credit (2340.24) = 0

Regulation Credits

9 Supporting Calculations

If Performance Score (2340.35) >= .25, then

RMCCP Credit (2340.36) = (PJM-Assigned Reg (2340.17) + Self-Scheduled Reg (2304.18)) * Performance Score (2340.35) * RMCCP (3001.44)

RMPCP Credit (2340.37) = (PJM-Assigned Reg (2340.17) + Self-Scheduled Reg (2304.18)) * Mileage Ratio (2340.46) * Performance Score (2340.35) * RMPCP (3001.45))

Reg Offer Amount (2340.22) = PJM-Assigned Reg (2340.17) * Reg Offer Price (2340.21)

Non-Hydro Units:

Regulation Lost Opportunity Cost Credit (2340.24) = MAX((Ramp-In Regulation Lost Opportunity Cost (2340.38) + (Intra-Hour Regulation Lost Opportunity Cost (2340.39) * Unit Specific Benefits Factor (2340.45) * Performance Score (2340.35)) + Ramp-Out Regulation Lost Opportunity Cost (2340.40) + Reg Offer Amount (2340.22)) – (PJM-Assigned Reg (2340.17) * Performance Score (2340.35) * RMCCP (3001.44)) – (PJM-Assigned Reg (2340.17) * Performance Score (2340.35) * Mileage Ratio (2340.46) * RMPCP (3001.45))),0)

Hydro Units:

Regulation Lost Opportunity Cost Credit (2340.24) = MAX((Ramp-In Regulation Lost Opportunity Cost (2340.38) + Intra-Hour Regulation Lost Opportunity Cost (2340.39) + Ramp-Out Regulation Lost Opportunity Cost (2340.40) + Reg Offer Amount (2340.22)) – (PJM-Assigned Reg (2340.17) * Performance Score (2340.35) * RMCCP (3001.44)) – (PJM-Assigned Reg (2340.17) * Performance Score (2340.35) * Mileage Ratio (2340.46) * RMPCP (3001.45))),0)

Regulation Credits

4000.05	4000.06	4000.63	4000.64	3000.8	2340.17	2340.18	2340.46	2340.45	2340.51	2340.52	2340.53	2340.35
EPT Hour End	GMT Hour End	Unit ID	Unit Name	Unit Ownership Share	PJM- Assigned Reg (MWh)	Self- Scheduled Reg (MWh)	Mileage Ratio (MWh)	Unit Specific Benefits Factor	Accuracy Score	Delay Score	Precision Score	Performance Score
07/01/2016 01	07/01/2016 05	99999999	NIXON 1	1	0	5.447	1	1				0.798948
07/31/2016 20	08/01/2016 00	99999998	LINCOLN 1	1	0	25	1	1	0.795304	0.91037	0.712726	0.806134
07/31/2016 20	08/01/2016 00	99999997	LINCOLN 2	1	0	25	1	1	0.764446	0.834907	0.611667	0.737007
07/31/2016 20	08/01/2016 00	99999996	LINCOLN 3	1	0	15	1	1	0.847035	0.900926	0.574865	0.774275
07/31/2016 21	08/01/2016 01	99999995	TRUMP 1	1	25	0	1	1	0.673824	0.902828	0.313841	0.630164
07/31/2016 21	08/01/2016 01	99999994	BUSH 1	1	80	0	1	1	0.836889	0.905556	0.612749	0.785064
07/31/2016 21	08/01/2016 01	99999998	LINCOLN 1	1	0	25	1	1	0.805555	0.902593	0.635849	0.781332
07/31/2016 21	08/01/2016 01	99999997	LINCOLN 2	1	0	25	1	1	0.783208	0.860278	0.619149	0.754211
07/31/2016 21	08/01/2016 01	99999996	LINCOLN 3	1	0	15	1	1	0.815309	0.885741	0.499866	0.733638
07/31/2016 21	08/01/2016 01	99999993	KENNEDY 1	1	0	5.889	1	1				0.809019
07/31/2016 22	08/01/2016 02	99999998	LINCOLN 1	1	0	25	1	1	0.834264	0.9225	0.814585	0.857116
07/31/2016 22	08/01/2016 02	99999997	LINCOLN 2	1	0	25	1	1	0.864996	0.947037	0.787904	0.866645
07/31/2016 22	08/01/2016 02	99999996	LINCOLN 3	1	0	15	1	1	0.87529	0.963056	0.813807	0.884051

This report shows the hourly Regulation detail for the generating units

PJM-Assigned and Self Scheduled Reg (MWh) are NOT modified by the performance Score

3001.44	3001.45	2340.36	2340.37	2340.2	4000.67	2340.21	2340.22	2340.38	2340.39	2340.4	2340.24
RMCCP (\$/MWh)	RMPCP (\$/MWh)	RMCCP Credit (\$)	RMPCP Credit (\$)	Bias Factor	Hydro Spill Indicator	Reg Offer Price (\$/MWh)	Reg Offer Amount (\$)	Ramp-In Regulation Lost Opportunity Cost (\$)	Intra-Hour Regulation Lost Opportunity Cost (\$)	Ramp-Out Regulation Lost Opportunity Cost (\$)	Regulation Lost Opportunity Cost Credit (\$)
6.7	0.41	29.16	1.78	0.17		2.63	0	0	0		0
35.45	6.6	714.44	133.01	0.02		2.63	0	0	0		0
35.45	6.6	653.17	121.61	0.02		2.63	0	0	0		0
35.45	6.6	411.72	76.65	0.02		2.63	0	0	0		0
79.67	5.45	1255.13	85.86	-0.08		2.63	65.75	143.77	1944.03	1.92	95.51
79.67	5.45	5003.68	342.29	-0.08		2.63	210.4	243.84	4907.94	116.94	0
79.67	5.45	1556.22	106.46	-0.08		2.63	0	0	0	0	0
79.67	5.45	1502.2	102.76	-0.08		2.63	0	0	0	0	0
79.67	5.45	876.73	59.97	-0.08		2.63	0	0	0	0	0
79.67	5.45	379.57	25.97	-0.08		2.63	0	0	0	0	0
34.16	2.13	731.98	45.64	-0.96		2.63	0	0	0	0	0
34.16	2.13	740.11	46.15	-0.96		2.63	0	0	0	0	0
34.16	2.13	452.99	28.25	-0.96		2.63	0	0	0	0	0

The Regulation Lost Opportunity Cost Credit is calculated using the details in this report which is also displayed on the Regulation Summary Report

Lost Opportunity Cost (RegLOC)

- RegLOC – is the foregone revenue or increase in costs relative to the energy market for providing regulation.
 - Uses $\min(\text{price schedule}, \max(\text{available cost schedules}))$
 - Calculated only for resources providing energy along with regulation service
 - Calculated only for pool scheduled regulation resources
 - Is \$0 for DR, and self-schedule and Non-Energy Regulation resources
 - Can only be positive, else zero
 - Calculated only within Eco limit range
 - Economic Minimum to Economic Maximum range
 - RegLOC is a component of the Regulation Market Clearing Price

Intra-Hour Regulation Lost Opportunity Cost

- Simplified formula

$$|LMP - MC| * GENOFF$$

Where:

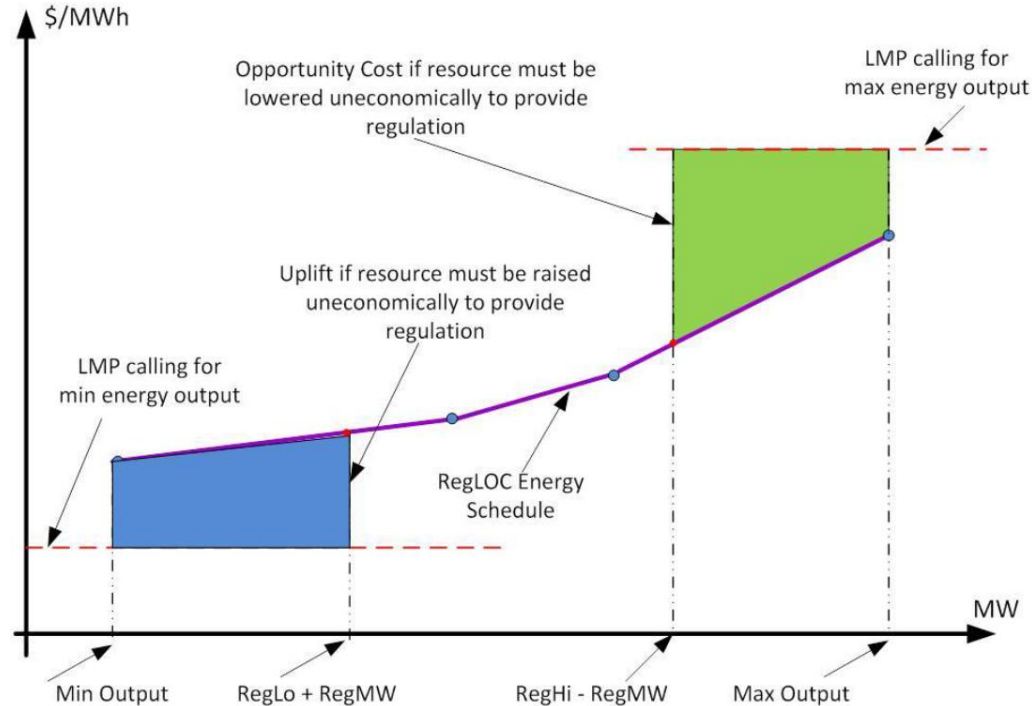
LMP – is the 5 minute LMP at the resource bus;

MC – is the resource cost at the regulation set point;

GENOFF – is the MW deviation from the economic dispatch and the regulation set point

Note:

- In the clearing process, forecasted LMP is used
- In the pricing, Real-Time LMP is used



Shoulder Hour Lost Opportunity Cost

- PJM calculates shoulder hours' lost opportunity costs incurred by each generator providing pool-scheduled Regulation for the preceding and following hour.
 - Note that the energy offer referred to below is the generator's incremental energy offer curve that is associated with the price-based or cost-based schedule used in the real-time dispatch of the unit.
- CT and hydro generators are not eligible for shoulder hour lost opportunity costs.

Ramp-In Regulation Lost Opportunity Cost

A generator is eligible for preceding shoulder hour lost opportunity costs when:

1. It is online the hour prior to regulating
2. The Regulation assignment starts at the top of the hour
3. It is not regulating during the preceding hour
4. The LMP Desired from the prior hour is not already within the regulation hour regulation limits

Ramp-In Regulation Lost Opportunity Cost

- In the preceding hour of regulation, if a generator must reduce its output to provide regulation and foregoes revenues, its shoulder hour lost opportunity cost equals the amount of its energy offer at the preceding hour economically desired level in excess of its energy offer at its Regulation setpoint at the start of the regulation hour adjusted by the percentage of the shoulder hour during which the reduction in output occurred.
- In the preceding hour of regulation, if a generator must increase its output to provide regulation and incurs additional costs, its shoulder hour lost opportunity cost equals the amount of its energy offer at its Regulation setpoint at the start of the regulating hour in excess of its energy offer at the preceding hour economically desired level adjusted by the percentage of the shoulder hour during which the increase in output occurred.

Ramp-Out Regulation Lost Opportunity Cost

A generator is eligible for following shoulder hour lost opportunity costs when:

1. It is online the hour following regulating
2. The Regulation assignment ends at the top of the following hour
3. It is not regulating during the following hour
4. The LMP Desired from the following hour is not already within the regulation hour regulation limits

Ramp-Out Regulation Lost Opportunity Cost

- In the following hour of regulation, if a generator increased its output to provide regulation and incurs additional costs, its shoulder hour lost opportunity cost equals the amount of its energy offer at its Regulation setpoint at the end of the regulating hour in excess of its energy offer at the following hour economically desired level adjusted by the percentage of the shoulder hour during which the decrease in output occurred.
- In the following hour of regulation, if a generator reduced its output to provide regulation and foregoes revenues, its shoulder hour lost opportunity cost equals the amount of its energy offer at the following hour economically desired level in excess of its energy offer at its Regulation setpoint at the end of the regulating hour adjusted by the percentage of the shoulder hour during which the increase in output occurred

Percentage of the Shoulder Hour

The percentage of the shoulder hour in which the resource would have to operate uneconomically is determined by dividing the reduction or increase in output by the resource's submitted ramp rate.

Regulation Set Point

If the economically desired level, LMP desired MW, is less than or equal to the regulation low limit in the hour the unit regulated, the regulation set point equals the regulation low limit plus the regulation assigned MW in the hour the unit regulated.

If the LMP desired MW is greater than or equal to the regulation high limit in the hour the unit regulated, the regulation set point equals the regulation high limit minus the regulation assigned MW in the hour the unit regulated.

Regulation Lost Opportunity Cost Credits

4000.05	4000.06	4000.63	4000.64	3000.8	2340.17	2340.18	2340.46	2340.45	2340.51	2340.52	2340.53	2340.35	
EPT Hour End	GMT Hour End	Unit ID	Unit Name	Unit Ownership Share	PJM- Assigned Reg (MWh)	Self- Scheduled Reg (MWh)	Mileage Ratio (MWh)	Unit Specific Benefits Factor	Accuracy Score	Delay Score	Precision Score	Performance Score	
07/01/2016 01	07/01/2016 05	99999999	NIXON 1	1	1	0	5.447	1	1			0.798948	
07/31/2016 20	08/01/2016 00	99999998	LINCOLN 1	1	1	0	25	1	1	0.795304	0.91037	0.712726	0.806134
07/31/2016 20	08/01/2016 00	99999997	LINCOLN 2	1	1	0	25	1	1	0.764446	0.834907	0.611667	0.737007
07/31/2016 20	08/01/2016 00	99999996	LINCOLN 3	1	1	0	25	1	1	0.847035	0.900926	0.574865	0.774275
07/31/2016 21	08/01/2016 01	99999995	TRUMP 1	1	1	25	0	1	1	0.673824	0.902828	0.313841	0.630164
07/31/2016 21	08/01/2016 01	99999994	BUSH 1	1	1	80	0	1	1	0.836889	0.905556	0.612749	0.785064
07/31/2016 21	08/01/2016 01	99999998	LINCOLN 1	1	1	0	25	1	1	0.805555	0.902593	0.635849	0.781332
07/31/2016 21	08/01/2016 01	99999997	LINCOLN 2	1	1	0	25	1	1	0.783208	0.860278	0.619149	0.754211
07/31/2016 21	08/01/2016 01	99999996	LINCOLN 3	1	1	0	15	1	1	0.815309	0.885741	0.499866	0.733638
07/31/2016 21	08/01/2016 01	99999993	KENNEDY 1	1	1	0	5.889	1	1				0.809019
07/31/2016 22	08/01/2016 02	99999998	LINCOLN 1	1	1	0	25	1	1	0.834264	0.9225	0.814585	0.857116
07/31/2016 22	08/01/2016 02	99999997	LINCOLN 2	1	1	0	25	1	1	0.864996	0.947037	0.787904	0.866645
07/31/2016 22	08/01/2016 02	99999996	LINCOLN 3	1	1	0	15	1	1	0.87529	0.963056	0.813807	0.884051

3001.44	3001.45	2340.36	2340.37	2340.2	4000.67	2340.21	2340.22	2340.38	2340.39	2340.4	2340.24
RMCCP (\$/MWh)	RMPCP (\$/MWh)	RMCCP Credit (\$)	RMPCP Credit (\$)	Bias Factor	Hydro Spill Indicator	Reg Offer Price (\$/MWh)	Reg Offer Amount (\$)	Ramp-In Regulation Lost Opportunity Cost (\$)	Intra-Hour Regulation Lost Opportunity Cost (\$)	Ramp-Out Regulation Lost Opportunity Cost (\$)	Regulation Lost Opportunity Cost Credit (\$)
6.7	0.41	29.16	1.78	0.17		2.63	0		0		0
35.45	6.6	714.44	133.01	0.02		2.63	0		0		0
35.45	6.6	653.17	121.61	0.02		2.63	0		0		0
35.45	6.6	411.72	76.65	0.02		2.63	0		0		0
79.67	5.45	1255.13	85.86	-0.08		2.63	65.75	143.77	1944.03	1.92	95.51
79.67	5.45	5003.68	342.29	-0.08		2.63	210.4	243.84	4907.94	116.94	0
79.67	5.45	1556.22	106.46	-0.08		2.63	0		0		0
79.67	5.45	1502.2	102.76	-0.08		2.63	0		0		0
79.67	5.45	876.73	59.97	-0.08		2.63	0		0		0
79.67	5.45	379.57	25.97	-0.08		2.63	0		0		0
34.16	2.13	731.98	45.64	-0.96		2.63	0		0		0
34.16	2.13	740.11	46.15	-0.96		2.63	0		0		0
34.16	2.13	452.99	28.25	-0.96		2.63	0		0		0

Regulation Lost Opportunity Cost Credits

Regulation Lost Opportunity Cost Credit (2340.24) = MAX((Ramp-In Regulation Lost Opportunity Cost (2340.38) + (Intra-Hour Regulation Lost Opportunity Cost (2340.39) * Unit Specific Benefits Factor (2340.45) * Performance Score (2340.35)) + Ramp-Out Regulation Lost Opportunity Cost (2340.40) + Reg Offer Amount (2340.22)) – (PJM-Assigned Reg (2340.17) * Performance Score (2340.35) * RMCCP (3001.44)) – (PJM-Assigned Reg (2340.17) * Performance Score (2340.35) * Mileage Ratio (2340.46) * RMPCP (3001.45))),0)

Regulation Lost Opportunity Cost Credit (2340.24) = MAX((143.77+ 1944.03 * 1 * 0.630164) + 1.92 + 65.75) – (25 * 0.630164 * 79.67) – (25 * 0.630164 * 1 * 5.45)),0) = 95.51

Questions?

PJM Client Management & Services
Telephone: (610) 666-8980
Toll Free Telephone: (866) 400-8980
Website: www.pjm.com



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