



DPS Technology Panel

May 26, 2016

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Optimizing the Delivery System

Generation



Transmission



Distribution



EDGE of the Grid

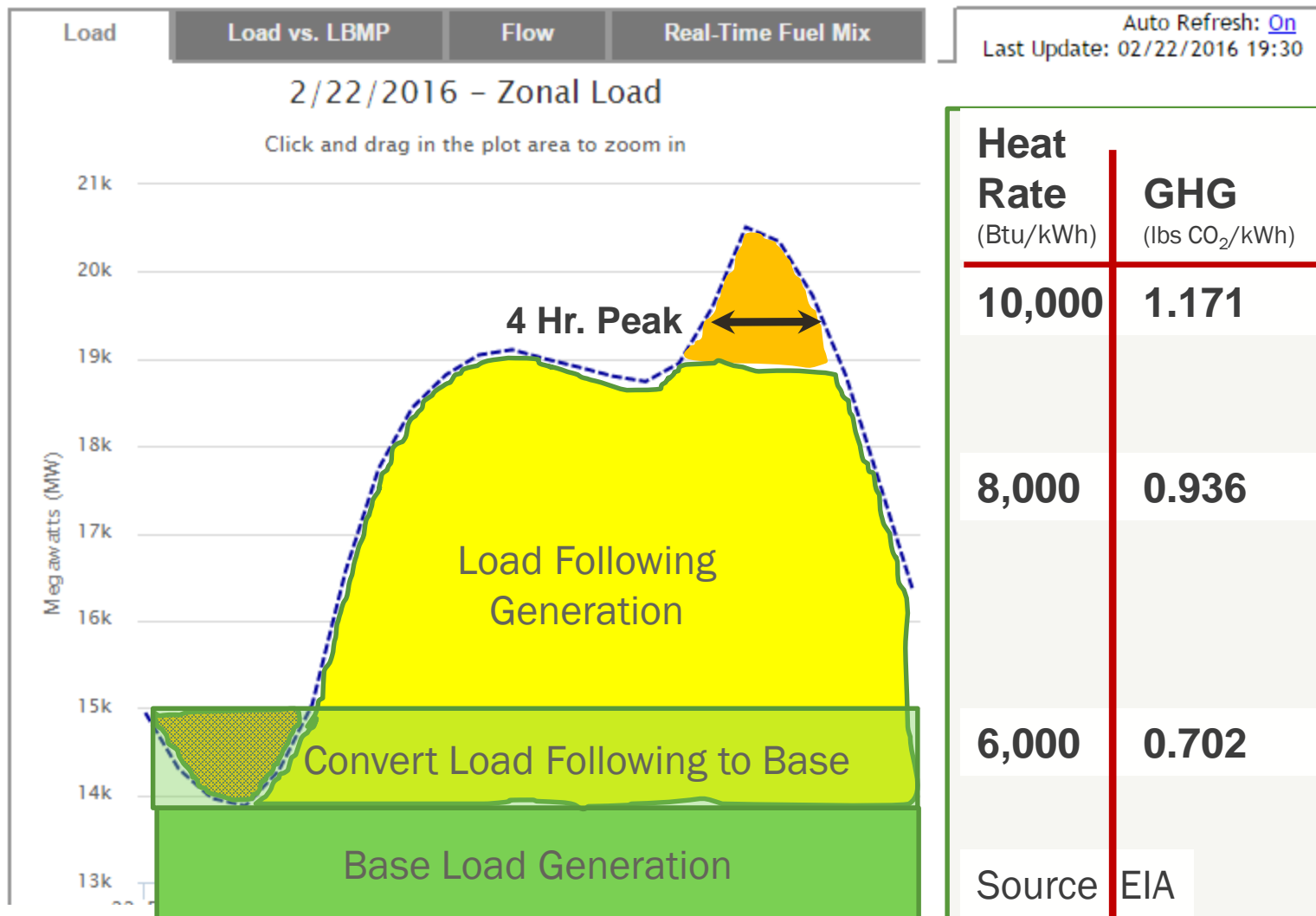


Known benefits to storage integration

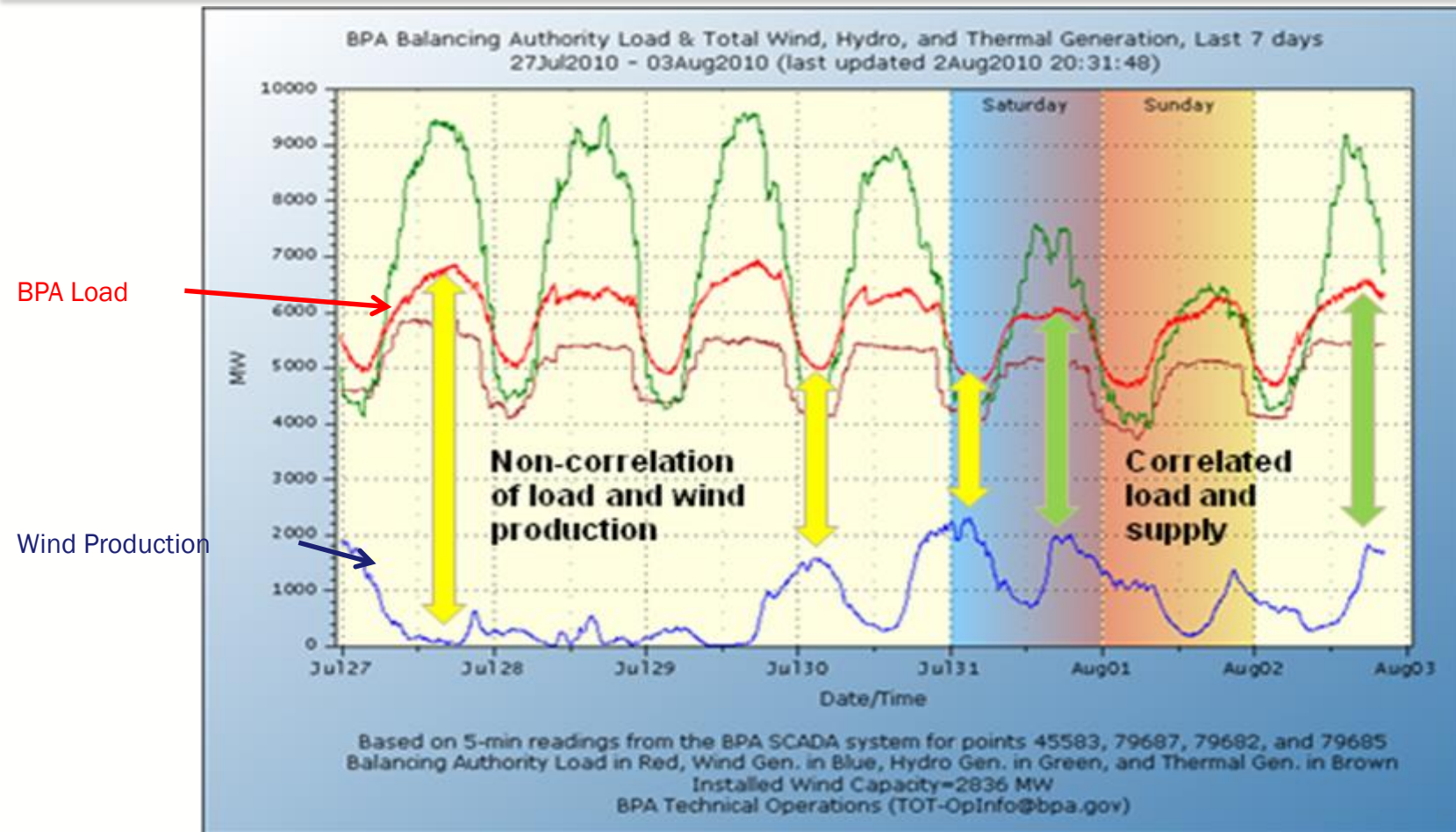
- | | | | |
|---|---|--|--|
| <ul style="list-style-type: none"> • Move Load Following to Base Generation • Ramp rate support • Minimize Spinning Reserve • Wind Integration • Solar Integration • Frequency Control • Black Start support | <ul style="list-style-type: none"> • Reduce Congestion • Reduce Line Loss by shifting more load to off peak hours • Reduce Substation Loading • Power Quality | <ul style="list-style-type: none"> • Reduce Distribution Substation Stress • Reduce Line Loss • Voltage Support • Support distributed generation • Power Factor Support | <ul style="list-style-type: none"> • Leverage TOU pricing • Demand Charge Reduction • Demand Response • Firm Distributed Solar • Critical Backup power • Aggregation for Virtual Dist. Utility model |
|---|---|--|--|

Increasing Locational Value

New York Load- Generator Optimization



Wind Production in BPA Area



Value of Line Loss Reduction

Line Loss is often Averaged

- ✓ Energy Generated-Energy Delivered

Energy Generated

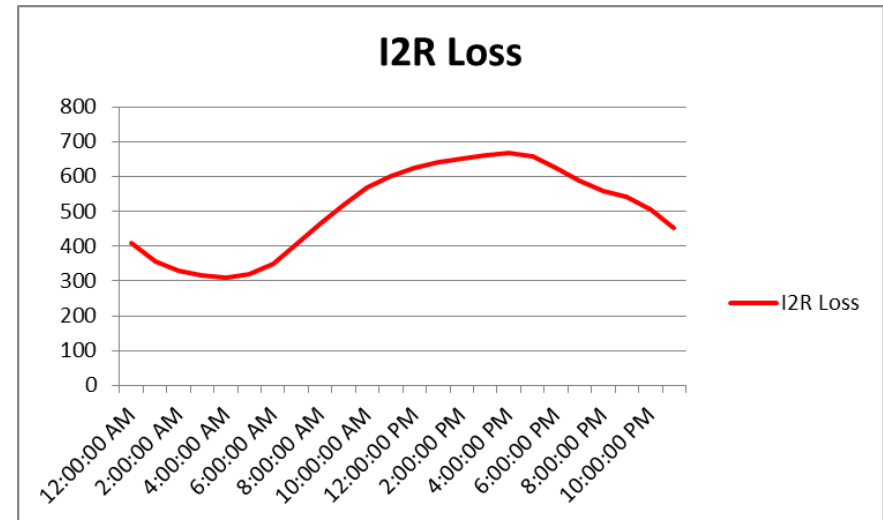
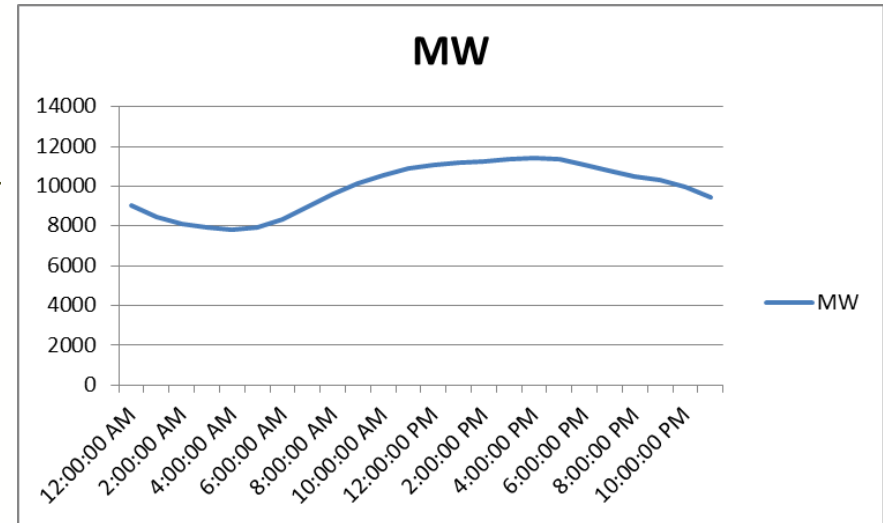
Measured over a set time period (24 Hrs)

- ✓ Line Loss is not Linear to Load

Peak Load $\frac{11441 \text{ MW}}{7827 \text{ MW}} = 1.46$

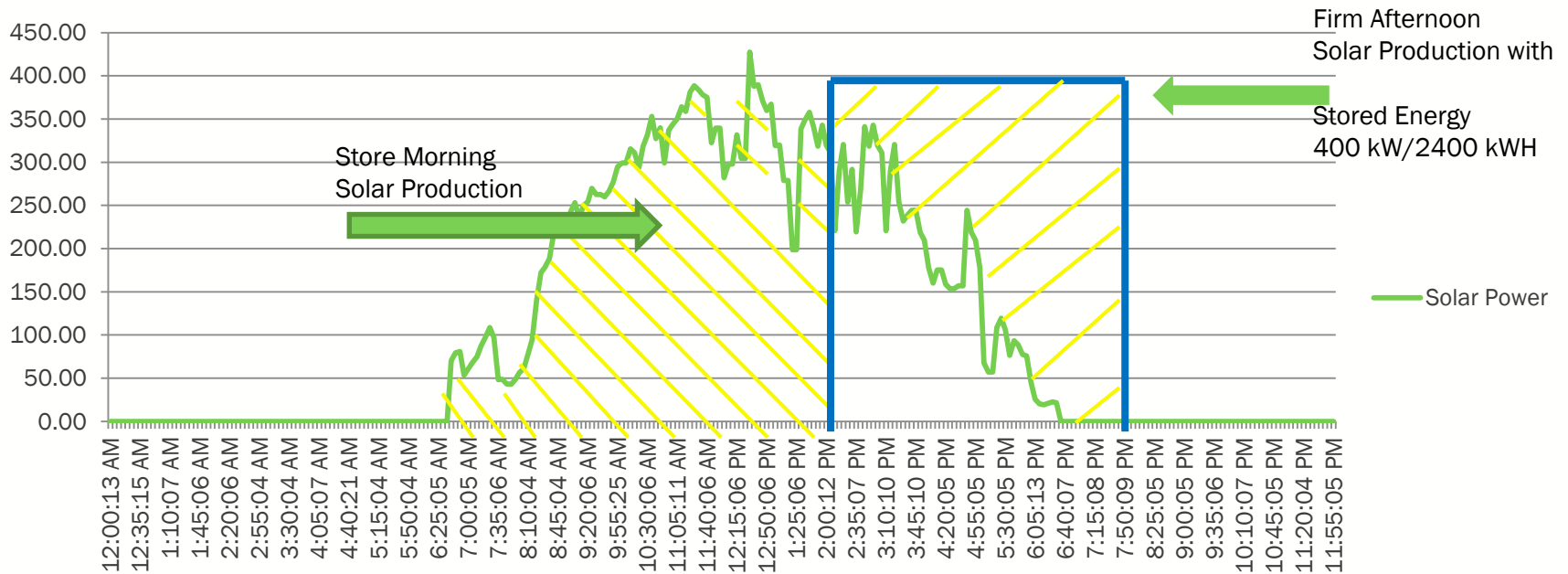
Trough Load

Peak Loss $\frac{670 \text{ MW}}{310 \text{ MW}} = 2.15$



Solar Peaker Plant

Solar Power



- ✓ Solar Production- Time shifted to period of highest benefit
- ✓ All intermittent performance removed
- ✓ Allows the resource to be scheduled and dispatched

Rate Evolution

Monthly

Electricity you used during this 29 day billing period from Apr 03, 2012 to May 02, 2012
 Rate: EL9 General Large Meter# 8023664
 We measure your electricity by how many kilowatt hours (kWh) you use. One kWh will light a 100 watt bulb for 10 hours. The meter multiplier is the factor by which the meter reading difference is multiplied to determine your usage. Demand or kW is the highest amount of electric usage in any half hour during the billing period.
 May 02, 12 actual reading 8227 18.46
 Apr 03, 12 actual reading -7987 -17.97
 Reading difference 240 .49
 Meter multiplier X800 X800
 Your electricity use 192,000 kWh 392.00 kW

Total delivery charges \$18,817.50
 ▶▶ Total electricity charges \$18,817.50

Daily

Name: BARCLAY ST DEVELOPMENT LLC Account Number: 49-4313-8030-0000-5 Billing period ending: Aug 30, 2013
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As Used Daily Demand

DATE	WD-Weekday or WE-Weekend	PERIOD 1: MON - FRI 8 AM - 6 PM			PERIOD 2: MON - FRI 8 AM - 10 PM		
		DAILY DEMAND kW	STANDBY	MAC	DAILY DEMAND kW	STANDBY	MAC
08/02/2013	WD	355.6	\$158.60	\$17.73	372.9	\$347.79	\$46.83
08/03/2013	WE	-	\$0.00	\$0.00	-	\$0.00	\$0.00
08/04/2013	WE	-	\$0.00	\$0.00	-	\$0.00	\$0.00
08/05/2013	WD	348.5	\$150.03	\$16.67	353.3	\$358.32	\$39.78
08/06/2013	WD	348	\$150.68	\$16.74	355.6	\$356.73	\$38.94
08/07/2013	WD	372	\$161.08	\$17.89	381.6	\$376.37	\$41.79
08/08/2013	WD	391.5	\$169.56	\$18.94	421.9	\$416.12	\$46.20
08/09/2013	WD	432	\$191.20	\$20.16			
08/10/2013	WE	-	\$0.00	\$0.00			
08/11/2013	WE	-	\$0.00	\$0.00			
08/12/2013	WD	367.2	\$167.20	\$18.18			
08/13/2013	WD	381.6	\$172.80	\$18.72			
08/14/2013	WD	335.5	\$153.50	\$17.11			
08/15/2013	WD	331.2	\$150.56	\$16.67			
08/16/2013	WD	356.6	\$162.28	\$17.44			
08/17/2013	WE	-	\$0.00	\$0.00			
08/18/2013	WE	-	\$0.00	\$0.00			
08/19/2013	WD	366.7	\$165.03	\$17.67			
08/20/2013	WD	382.5	\$173.25	\$18.63			
08/21/2013	WD	394.5	\$178.26	\$19.14			
08/22/2013	WD	402.2	\$181.00	\$19.62			
08/23/2013	WD	374.4	\$170.40	\$18.24			
08/24/2013	WE	-	\$0.00	\$0.00			
08/25/2013	WE	-	\$0.00	\$0.00			
08/26/2013	WD	374.8	\$170.56	\$18.26			
08/27/2013	WD	409.9	\$184.50	\$19.90			
08/28/2013	WD	408.5	\$183.80	\$19.82			
08/29/2013	WD	404.6	\$182.08	\$19.61			
08/30/2013	WD	410.4	\$184.72	\$19.84			
			\$3.4				

Hourly

▶ Your supply charges

These charges are for the delivery portion of your electricity bill. You will receive a separate bill for your electricity supply. If you have a question about your supply bill, please call CONEDISON SOLUTIONS at (800) 789-1565.

▶ Your delivery charges

Energy delivery 192,000 kWh \$9,080.73
 Charge for maintaining the system through which Con Edison delivers electricity to you.
 Demand delivery 392.0 kW \$6,882.36
 Charge for maintaining the system through which Con Edison delivers electricity to you.

Day Ahead Market Zonal LBMP

Zonal Prices		--- LBMP \$												--- Marginal Cost of Losses												--- Marginal Cost of Congestion												Date: 04/28/2015		
		Name	PTID	00:00 EDT	01:00 EDT	02:00 EDT	03:00 EDT	04:00 EDT	05:00 EDT	06:00 EDT	07:00 EDT	08:00 EDT	09:00 EDT	10:00 EDT	11:00 EDT	12:00 EDT	13:00 EDT	14:00 EDT	15:00 EDT	16:00 EDT	17:00 EDT	18:00 EDT	19:00 EDT	20:00 EDT	21:00 EDT	22:00 EDT	23:00 EDT													
CAPITL 61757		19.98	18.18	17.39	16.58	17.65	20.59	32.91	35.00	28.59	29.22	31.15	32.13	31.22	26.50	26.76	25.83	27.04	26.62	25.55	28.08	36.75	27.37	23.87	21.55															
		0.74	0.73	0.74	0.74	0.77	0.84	1.02	1.18	1.59	1.55	1.66	1.60	1.52	1.38	1.21	1.21	1.29	1.35	1.45	1.57	2.18	1.50	1.31	0.83															
		-3.89	-2.33	-1.91	-0.96	-1.54	-2.66	-11.12	-10.31	-1.36	-2.75	-2.80	-5.52	-5.64	-2.84	-6.11	-5.03	-4.51	-3.14	-0.77	-1.59	0.00	0.00	0.00	-3.71															
CENTRL 61754		15.76	15.40	15.00	15.07	15.57	17.45	21.78	24.82	26.64	25.74	28.29	26.47	25.34	23.42	20.13	20.19	21.74	22.53	23.61	25.46	35.61	26.41	22.85	17.32															
		0.18	0.15	0.15	0.13	0.14	0.21	0.37	0.49	0.59	0.60	0.61	0.55	0.51	0.47	0.33	0.31	0.26	0.22	0.23	0.45	1.04	0.54	0.29	0.10															
		-0.22	-0.13	-0.11	-0.05	-0.09	-0.15	-0.64	-0.81	-0.40	-0.22	-0.98	-0.92	-0.77	-0.68	-0.35	-0.29	-0.26	-0.18	-0.04	-0.09	0.00	0.00	0.00	-0.21															
DUNTWOD 61760		19.90	18.41	17.65	17.05	18.02	20.85	31.55	34.09	29.87	30.14	32.16	32.31	31.34	27.23	26.50	25.83	27.27	27.23	26.69	29.23	38.96	29.00	25.24	21.69															
		1.55	1.50	1.43	1.43	1.49	1.71	2.20	2.63	3.18	3.09	3.31	3.05	2.93	2.76	2.35	2.37	2.57	2.68	2.78	3.09	4.39	3.13	2.68	1.82															
		-3.00	-1.80	-1.47	-0.74	-1.19	-2.05	-8.58	-7.94	-1.05	-2.12	-2.16	-4.26	-4.35	-2.19	-4.71	-3.88	-3.48	-2.42	-0.59	-1.22	0.00	0.00	0.00	-2.87															
GENESE 61753		15.23	14.89	14.53	14.60	15.06	16.90	20.82	23.50	25.24	24.65	26.26	24.82	23.92	22.07	19.34	19.42	20.83	21.58	22.62	24.47	34.43	25.43	21.95	16.61															
		-0.29	-0.33	-0.29	-0.33	-0.35	-0.31	-0.44	-0.47	-0.46	-0.40	-0.56	-0.43	-0.39	-0.33	-0.37	-0.39	-0.59	-0.69	-0.75	-0.52	-0.14	-0.44	-0.61	-0.56															
		-0.17	-0.10	-0.08	-0.04	-0.07	-0.12	-0.49	-0.45	-0.06	-0.12	-0.12	-0.24	-0.25	-0.12	-0.27	-0.22	-0.20	-0.14	-0.03	-0.07	0.00	0.00	0.00	-0.17															
HQ 61844		15.00	14.79	14.42	14.57	15.02	16.70	20.25	22.86	24.74	24.03	25.76	24.13	23.24	21.54	18.84	18.98	20.61	21.51	22.70	24.12	33.22	25.04	21.90	16.64															
		-0.35	-0.33	-0.32	-0.31	-0.32	-0.39	-0.52	-0.66	-0.90	-0.90	-0.94	-0.88	-0.82	-0.73	-0.60	-0.61	-0.62	-0.62	-0.63	-0.80	-1.35	-0.83	-0.65	-0.36															
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00															

Conclusion

- ✓ Focus On Value
 - ✓ Storage is here and can respond as Load or Generation
 - ✓ Allow Storage to earn FLEC Credits Based on Value Delivered
 - ✓ Storage can respond remotely- does not require colocation
 - ✓ Value focused on GHG Reductions from Current Generation Fleet
 - ✓ Optimize Wind Generation and move Off-Peak Power to edge of the Grid
 - ✓ Replace inefficient Gas Peaker fleet with Solar+Storage
 - ✓ Time based rate structures that represent true marginal cost

Let's Move Forward

