

CONE, Operating Parameters for Net EAS, and Net CONE Updates

Market Implementation Committee
August 22, 2025

Skyler Marzewski
Lead Market Design Specialist
Market Design

1)	<p>Gross CONE Comparison</p> <ul style="list-style-type: none"> Values from April CONE report compared to Brattle/S&L updated CONE values
2)	<p>Reference Resource unit parameters for E&AS</p> <ul style="list-style-type: none"> Updated operating unit parameters to reflect technology changes and GE specifications Net EAS comparison calculated using the same forwards as in the April CONE report and updated forwards
3)	<p>Updated Net CONE estimates</p>

- August Gross CONE values reflect the following changes:
 - Inlet pressure update
 - Wet compression added
 - GE operating parameters
 - Bonus depreciation due to the One Big Beautiful Bill Act (OBBBA)
- Brattle considered escalating overnight costs based on observed inflation, but there was a negligible impact

Gross CONE Comparison

		April Gross CONE Values			August Gross CONE Values		
CONE Area	Technology	Overnight Capital Cost (\$/kW)	Gross CONE (\$/MW-Day ICAP)	Gross CONE (\$/MW-Day UCAP)	Overnight Capital Cost (\$/kW)	Gross CONE (\$/MW-Day ICAP)	Gross CONE (\$/MW-Day UCAP)
1. EMAAC	Gas CT	\$1,395	\$670	\$848	\$1,278	\$596	\$754
	Gas CC	\$1,517	\$816	\$1,008	\$1,449	\$752	\$928
	BESS 4-hr	\$1,832	\$680	\$1,047	\$1,832	\$667	\$1,026
2. SWMAAC	Gas CT	\$1,339	\$676	\$855	\$1,235	\$608	\$769
	Gas CC	\$1,411	\$819	\$1,011	\$1,354	\$761	\$939
	BESS 4-hr	\$1,753	\$671	\$1,032	\$1,753	\$658	\$1,013
3. Rest of RTO	Gas CT	\$1,361	\$663	\$839	\$1,247	\$590	\$747
	Gas CC	\$1,419	\$813	\$1,004	\$1,363	\$757	\$934
	BESS 4-hr	\$1,750	\$652	\$1,004	\$1,750	\$640	\$984
4. WMAAC	Gas CT	\$1,390	\$664	\$841	\$1,274	\$592	\$749
	Gas CC	\$1,476	\$814	\$1,005	\$1,415	\$754	\$931
	BESS 4-hr	\$1,784	\$667	\$1,027	\$1,784	\$655	\$1,007
5. COMED	Gas CT	\$1,495	\$789	\$998	\$1,369	\$679	\$860
	Gas CC	\$1,649	\$953	\$1,177	\$1,579	\$860	\$1,061
	BESS 4-hr	\$1,980	\$726	\$1,116	\$1,980	\$711	\$1,093
RTO (Average)	Gas CT	\$1,396	\$692	\$876	\$1,280	\$613	\$776
	Gas CC	\$1,495	\$843	\$1,041	\$1,432	\$777	\$959
	BESS 4-hr	\$1,820	\$679	\$1,045	\$1,820	\$666	\$1,025

Full details in posted Brattle CONE model

Nominal\$ for 2028 Online Year

- Changes shown in red reflect the updated operating parameters for CT and CC that include wet compression and (ii) GE's latest strategy of increasing the firing temperature by allowing NO_x limits (from 25 to 33 ppm).
- These changes have resulted in significantly higher power output compared to [previous reported operating parameters.](#)
- Additional NO_x reduction measures to achieve environmental regulations regardless have been accounted for in the SCR and ammonia O&M costs.
- Net EAS values are calculated with wet compression turned off due to the limited expected run hours.



Reference Resource Operating Parameters: Combustion Turbine

Parameter	Value	Notes
Configuration	GE Frame 7HA.03 CT with evaporative cooling + wet compression, SCR/CO, dual fuel	
Max Capacity	431.9 MW 439.8 MW 413.9 MW	at ISO conditions (59oF, 14.7 psia); average of 5 CONE areas; Wet Compression OFF, Evap Cooler OFF at Max Summer conditions; average of 5 CONE areas; Wet Compression ON, Evap Cooler ON at Max Summer conditions; average of 5 CONE areas; Wet Compression OFF, Evap Cooler ON
Min Stable Level	170 MW	Sargent & Lundy
Ramp Rate	20 MW/min	Estimated S&L Note: confirm unit offers referenced are specific to technology (CT vs CC) and size (MW).
Heat Rate	12,400 Btu/kWh 9,153 Btu/kWh 9,300 Btu/kWh 9,199 Btu/kWh	at Min Stable Load at ISO conditions (59oF, 14.7 psia); average of 5 CONE areas; Wet Compression OFF, Evap Cooler OFF at Max Summer conditions; average of 5 CONE areas; Wet Compression ON, Evap Cooler ON at Max Summer conditions; average of 5 CONE areas; Wet Compression OFF, Evap Cooler ON
Min Run	2 hr	Minimum Unit-Specific Operating Parameters for Generation Capacity Resources
Min Down	1 hr	
Time to Start	21 min	Per GE published data, assumes Rapid Response start on a hot unit. Actual time to reach min load from warm, cold, or ambient conditions will be longer.
VO&M	\$2.65/MWh	Consumables & major maintenance; 2025 Quadrennial Review (2025\$) with Wet Compression; average of 5 CONE areas
Start Fuel	515 MMBtu/start	Average fuel use of CONE Area units per S&L 2025 Quadrennial Review with Wet Compression. Since the Plexos setup is requested to operate with Wet Compression OFF and Evap Cooler ON in Summer, the startup fuel is calculated based on that scenario.
Fuel Pricing Points	See Manual 18, Section 3.3.2	
NOx	0.0093 lb/MMBtu	2018 CONE Study; historical allowance prices escalated for forward
	55 lb/start	
SO2	0.0006 lb/MMBtu	EPA; historical allowance prices escalated for forward
CO2	117 lb/MMBtu	EPA; RGGI ECR trigger price applied to RGGI units
Forced Outages (EFORd)	6.33%	PJM 2015 - 2019 Weighted Average EFORd by Fuel Type, Class Average Values Effective June 1, 2020 S&L Note: S&L 2022 CONE Study Update assumed 2.2% EFORd for CTs
Maintenance Outages	First two weeks in October	

Reference Resource Operating Parameters: Combined Cycle

Parameter	Value	Notes
Configuration	Two Trains of 1x1 GE Frame 7HA.03 single shaft CC with evaporative cooling + wet compression and SCR - Dry ACC, Firm Gas	
Max Capacity	1,260.7 MW w/o Duct Burner; 1,382.6 MW w/ Duct Burner 1,275.7 MW w/o Duct Burner; 1,401.0 MW w/ Duct Burner 1,205.6 MW w/o Duct Burner; 1,330.4 MW w/ Duct Burner	at ISO conditions (59°F, 14.7 psia); average of 5 CONE areas; Wet Compression OFF, Evap Cooler OFF at Max Summer conditions; average of 5 CONE areas; Wet Compression ON, Evap Cooler ON at Max Summer conditions; average of 5 CONE areas; Wet Compression OFF, Evap Cooler ON
Min Stable Level	194 MW	S&L Note: this is the Min Stable Load for one 1x1x1 CC train = 33% single train MCR (assumes the 2nd train is not operating)
Ramp Rate	40 MW/min	Estimated (20 MW/min per turbine) S&L Note: confirm existing unit offers referenced are appropriately scaled to technology (class of CT) and number of trains (two trains should ramp 2x faster than one).
Heat Rate	7,804 Btu/kWh 6,196 Btu/KWh w/o Duct Firing; 6,398 Btu/kWh w/ Duct Firing 6,337 Btu/KWh w/o Duct Firing; 6,509 Btu/kWh w/ Duct Firing 6,242 Btu/KWh w/o Duct Firing; 6,434 Btu/kWh w/ Duct Firing	at Min Stable Load at ISO conditions (59°F, 14.7 psia); average of 5 CONE areas; Wet Compression OFF, Evap Cooler OFF at Max Summer conditions; average of 5 CONE areas; Wet Compression ON, Evap Cooler ON At Max Summer conditions; average of 5 CONE areas; Wet Compression OFF, Evap Cooler ON
Min Run	4 hr	Minimum Unit-Specific Operating Parameters for Generation Capacity Resources
Min Down	3.5 hr	
Time to Start	120 min	Time from ignition to base load, assumes appropriate steam cycle design. S&L Note: GE published startup time for these units is 60 min which assumes rapid response hot and optimal conditions. 120 min has been suggested as a more realistic time to be expected for a 1x1x1 single-shaft CC.
VO&M	\$2.09/MWh	Consumables & major maintenance; 2025 Quadrennial Review (2025\$)
Start Fuel	4,481 MMBtu/start/train (double to account for 2nd train)	Average fuel use of CONE Area units Sargent & Lundy 2025 Quadrennial Review (adjusted for 120 min assumed Time to Start) with Wet Compression . Since the Plexos setup is requested to operate with Wet Compression OFF (& Unfired) and Evap Cooler ON in Summer , the startup fuel is calculated based on that scenario.
Fuel Pricing Points	See Manual 18, Section 3.3.2	
NOx	0.0074 lb/MMBtu 160 lb/start	2018 CONE Study; historical allowance prices escalated for forward
SO2	0.0006 lb/MMBtu	EPA; historical allowance prices escalated for forward
CO2	117 lb/MMBtu	EPA; RGGI ECR trigger price applied to RGGI units
Forced Outages (EFORd)	3.05%	PJM 2015 - 2019 Weighted Average EFORd by Fuel Type, Class Average Values Effective June 1, 2020 Note: S&L Assumed 2.0% EFOR for 1x1x1 CC in cost estimate assumptions
Maintenance Outages	First two weeks in October	

Reference Resource Operating Parameters: Battery Energy Storage

Parameter	Value	Notes
Configuration	50 MW utility scale, Li, 200 MWh rating – EIA (Case 18) – - https://www.eia.gov/analysis/studies/powerplants/capitalcost/	
Max Capacity	Modeled as 1 MW / 4 MWh resource	
Charged Efficiency*	92.2%	*Used to represent an 85% round trip efficiency in the dispatch model Wesley Cole & A. Will Frazier, Cost Projections for Utility-Scale Battery Storage: 2020 Updated, National Renewable Energy Laboratory (June 2020), https://www.nrel.gov/docs/fy20osti/75385.pdf
Discharge Efficiency*	92.2%	
State of Charge	Between 95% and 5%	
Forced & Maintenance Outages	None at this time	

No Changes

The following slide includes multiple versions of Net EAS simulations

April Net EAS: The values are calculated using forwards from 30 trade dates that conclude in January and use previously posted unit parameters for the reference resource technologies. These values are included in the April CONE Report

Updated Unit Parameters: These values are calculated using forwards from 30 trade dates that conclude in January but with updated unit parameters found in these slides. These Net EAS values would have been used in the April CONE report if the reference resource used the updated unit parameters.

Updated Unit Parameters and Forwards: These values are calculated using forwards from 30 trade dates that conclude in August but with updated unit parameters found in these slides. These Net EAS values are our current estimates using the most recent data.

	CT Net EAS (\$/MW-Day ICAP)		
	Original	Updated Parameters	Updated Parameters and Forwards
AECO	\$57.60	\$147.39	\$126.30
AEP	\$278.64	\$453.98	\$405.36
APS	\$340.63	\$553.70	\$472.29
ATSI	\$214.91	\$381.25	\$343.35
BGE	\$302.24	\$443.24	\$392.42
COMED	\$107.61	\$247.92	\$214.44
DAY	\$259.76	\$434.65	\$391.73
DEOK	\$240.64	\$402.35	\$358.94
DOM	\$276.09	\$450.82	\$399.06
DPL	\$142.26	\$272.80	\$244.76
DUQ	\$200.94	\$364.39	\$305.51
EKPC	\$219.73	\$379.43	\$345.03
JCPL	\$54.89	\$142.25	\$122.16
METED	\$157.87	\$331.59	\$263.09
OVEC	\$250.91	\$420.61	\$364.07
PECO	\$90.05	\$263.08	\$212.58
PENELEC	\$311.44	\$509.89	\$435.30
PEPCO	\$152.59	\$283.61	\$244.10
PPL	\$105.43	\$282.72	\$223.84
PSEG	\$49.36	\$134.34	\$115.61
RECO	\$63.79	\$158.28	\$132.94

	CC Net EAS (\$/MW-Day ICAP)		
	Original	Updated Parameters	Updated Parameters and Forwards
AECO	\$218.57	\$352.33	\$283.91
AEP	\$534.12	\$709.18	\$660.75
APS	\$603.78	\$807.16	\$723.82
ATSI	\$476.89	\$649.23	\$603.67
BGE	\$608.43	\$766.24	\$666.93
COMED	\$326.81	\$476.39	\$411.04
DAY	\$529.29	\$708.52	\$659.03
DEOK	\$505.55	\$672.06	\$619.71
DOM	\$576.03	\$761.40	\$690.59
DPL	\$343.98	\$490.90	\$422.86
DUQ	\$434.69	\$616.58	\$538.46
EKPC	\$481.49	\$645.93	\$603.32
JCPL	\$222.72	\$356.79	\$289.65
METED	\$415.63	\$597.84	\$499.18
OVEC	\$500.05	\$672.63	\$614.01
PECO	\$311.21	\$513.43	\$435.14
PENELEC	\$570.57	\$763.17	\$685.18
PEPCO	\$425.40	\$561.54	\$485.94
PPL	\$348.04	\$542.50	\$446.53
PSEG	\$207.77	\$337.39	\$270.42
RECO	\$251.72	\$381.54	\$309.65

	BESS Net EAS (\$/MW-Day ICAP)	
	Original	Updated Forwards
AECO	\$234.84	\$253.55
AEP	\$237.74	\$253.97
APS	\$250.67	\$266.44
ATSI	\$235.56	\$250.93
BGE	\$350.53	\$363.75
COMED	\$257.45	\$271.69
DAY	\$246.34	\$263.43
DEOK	\$243.57	\$258.20
DOM	\$338.21	\$361.20
DPL	\$328.30	\$353.19
DUQ	\$239.06	\$252.89
EKPC	\$239.16	\$254.60
JCPL	\$225.31	\$243.95
METED	\$250.90	\$265.28
OVEC	\$233.98	\$249.24
PECO	\$241.29	\$261.32
PENELEC	\$239.59	\$254.50
PEPCO	\$327.92	\$345.30
PPL	\$228.21	\$243.68
PSEG	\$228.47	\$246.91
RECO	\$244.56	\$261.26

Removing the 40% capacity factor constraint allow CTs to have more run hours.

Net EAS Comparison

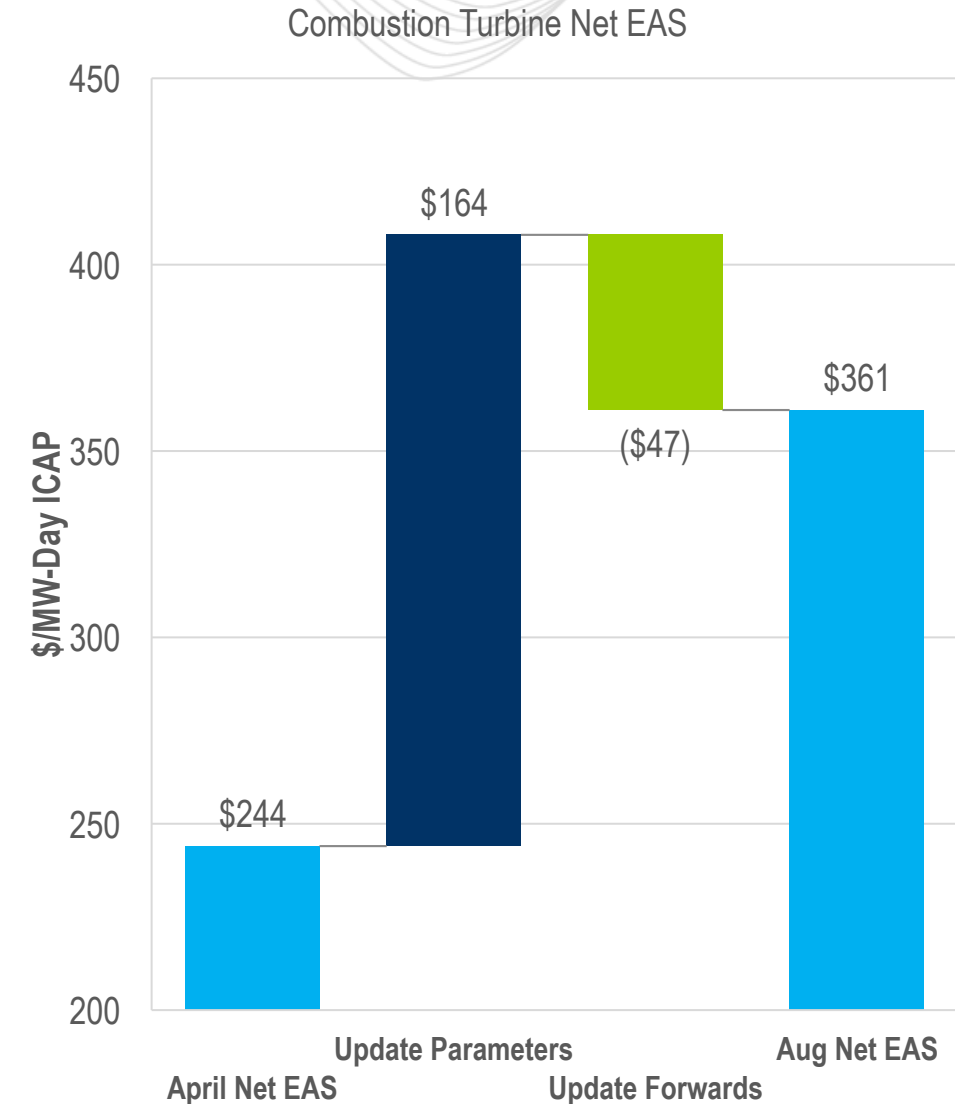
		April Net EAS Values		August Net EAS Values	
CONE Area	Technology	Net EAS (\$/MW-Day ICAP)	Net EAS (\$/MW-Day UCAP)	Net EAS (\$/MW-Day ICAP)	Net EAS (\$/MW-Day UCAP)
1. EMAAC	Gas CT	\$73	\$92	\$159	\$202
	Gas CC	\$272	\$335	\$347	\$429
	BESS 4-hr	\$242	\$373	\$261	\$402
2. SWMAAC	Gas CT	\$252	\$319	\$343	\$434
	Gas CC	\$547	\$676	\$607	\$749
	BESS 4-hr	\$343	\$528	\$358	\$550
3. Rest of RTO	Gas CT	\$265	\$336	\$394	\$499
	Gas CC	\$531	\$655	\$660	\$814
	BESS 4-hr	\$244	\$376	\$260	\$400
4. WMAAC	Gas CT	\$209	\$265	\$320	\$406
	Gas CC	\$467	\$577	\$561	\$693
	BESS 4-hr	\$243	\$374	\$258	\$397
5. COMED	Gas CT	\$108	\$136	\$214	\$271
	Gas CC	\$327	\$403	\$411	\$507
	BESS 4-hr	\$257	\$396	\$272	\$418
RTO 67 th Percentile	Gas CT	\$244	\$309	\$361	\$457
	Gas CC	\$502	\$620	\$616	\$760
	BESS 4-hr	\$248	\$381	\$264	\$406

Net EAS are the 67th Percentile for each area.

Updated Reference Resource Parameters and unconstrained dispatch are the largest driver of the change in Net EAS

- Max Capacity increased by 24.2 MW, 389.7 MW to 413.9 MW
- Heat Rate increased by 49 Btu/kWh at max output, 9,150 BTU/kWh to 9,199 BTU/kWh
- VOM increased by \$1.65/MWh and removed a start cost, \$1.00/MWh to \$2.65/MWh
- Start fuel increased by 13 MMBtu/start, 502 MMBtu/start to 515 MMBtu/start

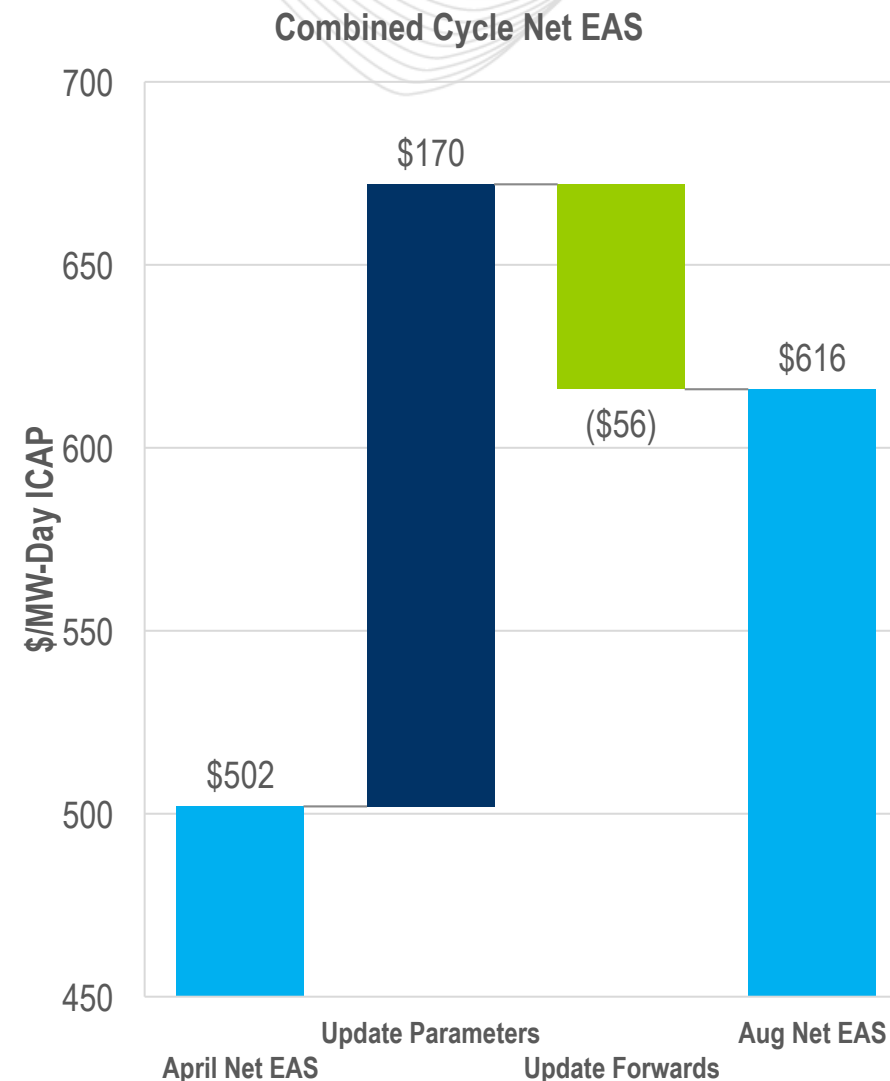
Updated forwards decreased the calculated Net EAS



Updated Reference Resource Parameters is the largest driver of the change in Net EAS

- Max Capacity increased by 48.0 MW, 1,282.4 MW to 1,330.4 MW
- Heat Rate decreased by 160 Btu/kWh at max output, 6,594 BTU/kWh to 6,434 BTU/kWh
- VOM decreased by \$0.33/MWh, \$2.42/MWh to \$2.09/MWh
- Start fuel increased by 69 MMBtu/start, 4,412 MMBtu/start to 4,481MMBtu/start

Updated forwards decreased the calculated Net EAS



Net CONE Comparison

		April Net CONE Values		August Net CONE Values	
CONE Area	Technology	Net CONE (\$/MW-Day ICAP)	Net CONE (\$/MW-Day UCAP)	Net CONE (\$/MW-Day ICAP)	Net CONE (\$/MW-Day UCAP)
1. EMAAC	Gas CT	\$597	\$756	\$438	\$554
	Gas CC	\$545	\$673	\$403	\$498
	BESS 4-hr	\$438	\$673	\$404	\$622
2. SWMAAC	Gas CT	\$423	\$536	\$265	\$336
	Gas CC	\$272	\$335	\$155	\$191
	BESS 4-hr	\$328	\$505	\$300	\$461
3. Rest of RTO	Gas CT	\$397	\$503	\$195	\$247
	Gas CC	\$283	\$349	\$97	\$119
	BESS 4-hr	\$408	\$628	\$381	\$586
4. WMAAC	Gas CT	\$455	\$576	\$271	\$343
	Gas CC	\$346	\$427	\$192	\$237
	BESS 4-hr	\$424	\$652	\$397	\$610
5. COMED	Gas CT	\$681	\$862	\$465	\$589
	Gas CC	\$603	\$744	\$449	\$555
	BESS 4-hr	\$468	\$720	\$438	\$674
RTO 33 rd Percentile	Gas CT	\$418	\$530	\$228	\$289
	Gas CC	\$312	\$385	\$140	\$173
	BESS 4-hr	\$412	\$634	\$385	\$593

Net CONEs are the 33rd Percentile for each area.

Chair:

David Anders,

David.Anders@pjm.com

Secretary:

Medha Pai,

Medha.Pai@pjm.com

SME/Presenter:

Skyler Marzewski,

Skyler.Marzewski@pjm.com

**CONE, Operating Parameters for Net EAS, and Net
CONE Updates**



Member Hotline

(610) 666 – 8980

(866) 400 – 8980

custsvc@pjm.com

**PROTECT THE
POWER GRID**
**THINK BEFORE
YOU CLICK!**



**BE ALERT TO
MALICIOUS PHISHING
EMAILS**



Report suspicious email activity to PJM.
Call (610) 666-2244 or email it_ops_ctr_shift@pjm.com