

E&AS Revenue Offset Update

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MIC Special Session – Reserve Price
Formation Order

August 14, 2020

- Data and slides were posted late yesterday. We apologize for the delay.
- PJM plans to file these data with the FERC as soon as possible. Likely early next week.
- We are still refining the regulation modeling and would like feedback on that specifically.

- In general, forward electricity prices are low relative to historic values.
 - All else equal, this will lower net revenues.
- Projected EAS Dispatch is significantly more flexible than Peak-Hour Dispatch.
 - All else equal, this will likely increase net revenues for model units.
- Inclusion of reserve and regulation market revenues were previously omitted.
 - All else equal, this will likely increase net revenues.
 - PJM would like feedback on quantifiable regulation costs. Small changes in these costs significantly impact regulation revenues.
- On average, this results in increased net revenues for the reference CT and a corresponding reduction in the Net CONEs.

- Finalized forward price development
- Finalized resource parameters
- Finalized DA/RT dispatch on reference resource
- Finalized ancillary service methodology
- Finalized resource-specific methodology
- Filed methodology August 5
- Posted results
 - Forward Energy Projections
 - Forward Gas Projections
 - Net CONE Values and Indicative EAS Offset Workbook
 - Planning Parameters Comparison
 - Energy & Ancillary Services Run Details

- **Develop forward prices, hourly by zone**
 - Monthly on and off peak LMP forwards for delivery year from liquid hubs
 - Western, Northern Illinois and AEP-Dayton hubs
 - Use long-term FTRs to reflect expected annual congestion between each zone and its respective hub
 - Add losses to congestion to yield the total basis differential
 - Develop forward losses by scaling historical losses by ratio of forward price to historical price
 - Monthly forwards are shaped to hourly values using historical hourly DA and RT LMP shapes from most recent 3 years
 - Use ratio of hourly price to monthly average on/off peak price
 - Conduct for each of 3 years individually

- Forward prices from 6 liquid hubs: Dominion South, Chicago Citygates, MichCon, Transco Zone 6 Non-NY, Tetco M3 and Columbia-Appalachia TCO
- Basis to highest correlated local hub using monthly prices from three most recent years
- Shaped with three most recent historical years, individually, using daily prices

- Develop future hourly DA and RT AS prices
 - Forward RT Regulation price determined by multiplying historical RTO RT AS price by the ratio of hourly forward and historical RT energy prices at Western Hub
 - Forward DA & RT price determined by unscaled, historical RT Synchronized Reserve and Non-Synchronized Reserve prices
 - DA and RT 30 minute reserve price is modeled as \$0/MWh
 - Hourly AS prices used in a co-optimized dispatch with DA and RT energy prices

Projected E&AS Dispatch at Forward LMPs

- CT
- CC
- Coal
- Storage

Assumed Output Model Applied to Forward LMPs

- Nuclear
- Solar (Fixed and Tracking)
- Wind (Onshore)
- Wind (Offshore)

Other

- Energy Efficiency
- Demand Response - Generation



Table 1 – Average Zonal Net CONE – Capacity Value Basis

Resource Type	Gross CONE (\$/MW-Day) (Nameplate)	Average Zonal E&AS Net Revenue Offset (\$/MW-Day) (Nameplate)	Net CONE (\$/MW-Day) (Nameplate)	Capacity Value (Percent of Nameplate)	Net CONE (\$/ICAP MW-Day)
Combustion Turbine	294	68	226		226
Combined Cycle	320	204	116		116
Coal	1,068	45	1,023		1,023
Battery Storage	532	438	93	40%	233
Nuclear	2,000	429	1,570		1,570
Solar PV (Tracking)	290	162	128	60%	213
Solar PV (Fixed)	271	103	168	42%	400
Onshore Wind	420	212	208	17.6%	1,182
Offshore Wind	1,155	293	862	26%	3,315



Table 2 – Net CONE Values – ICAP Basis

Resource Type	Gross CONE (\$/ICAP MW-Day) (Nameplate)	Avg. Zonal E&AS Net Revenue Offset (\$/ICAP MW-Day) (Nameplate)	Net CONE (\$/ICAP MW-Day)
Energy Efficiency	644	517	127
Demand Response (Gen)	254	0	254

	Resource	Gross Revenue**				Run Hours
		Energy	Regulation	Reserves	Total, \$/MW-Yr	Average
Projected E&AS	Reference CT	86%	11%	3%	33,421,948	2,408
	MOPR CC	90%	9%	1%	239,226,351	8,013
	MOPR Coal	98%	2%	0%	34,896,705	1,374
	MOPR Battery*	19%	78%	3%	156,758	5,063

* MOPR Battery Run Hours represent discharge hours

** Reactive services value not included in Gross Revenue, it is added to Net Revenue



Comparison of March 18 values to Today's values

RTO Average Results

	Resource	Net E&AS (\$/MW-Day)*			Net CONE (\$/ICAP MW-Day)		
		March	August	Delta	March	August	Delta
Projected E&AS	Reference CT	48	68	42%	246	226	-8%
	MOPR CC	168	204	21%	152	116	-24%
	MOPR Coal	43	45	5%	1,025	1,023	0%
	MOPR Battery	116	438	277%	1,040	233	-78%
Assumed Output	MOPR Nuclear	517	429	-17%	1,483	1,570	6%
	MOPR Onshore Wind	240	212	-12%	1,023	1,182	16%
	MOPR Offshore Wind	337	293	-13%	3,146	3,315	5%
	MOPR Fixed-Tilt Solar PV	117	103	-12%	367	400	9%
	MOPR Tracking Solar PV	185	162	-12%	175	213	22%

* Net E&AS includes reactive services



Comparison of BRA Planning Parameters

RTO Results

	Resource	Net E&AS (\$/MW-Yr)			Net CONE (\$/MW-Day) UCAP		
		March	August	Delta	March	August	Delta
	Reference CT	17,726	17,162	-3%	260.43	262.07	1%

- A resource-specific E&AS calculation is needed for:
 - MOPR resource-specific exception requests for New Entry
 - MOPR resource-specific exception requests for Cleared Resources
 - MOPR Default ACR elections for Cleared Resources (resource-specific E&AS offset)
 - Offer Cap unit-specific exception requests

In-service Units	Planned Units
<p>Standard Model: Projected E&AS Dispatch or Assumed Output Model, as applicable to resource type</p> <p>Standard Inputs: Unit's actual operating parameters, cost data, pricing points, etc. are used in model</p> <ul style="list-style-type: none"> • Deviations from those values allowed in unit-specific exception requests with supporting documentation 	<p>Standard Model: Projected E&AS Dispatch or Assumed Output Model, as applicable to resource type</p> <p>Standard Inputs: Capacity Market Seller will need to provide applicable operating parameters, cost data, etc. to use in the model with supporting documentation</p> <ul style="list-style-type: none"> • e.g. OEM specs, operating data from similar units, etc.
<p>Alternatively, Capacity Market Sellers may also rely upon their own models in unit-specific requests to determine the net E&AS offset with supporting documentation</p>	

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