VOM Examples

MIC
June 6, 2018

Joel Romero Luna
Catherine Tyler
Joe Bowring

Monitoring Analytics

Comments on PJM Cost Impacts

- **A full cost impact of either proposal on LMP requires a full rerunning of the market and assumptions about offer behavior.**
  - **Simplistic estimates are misleading.**
- **Per the SOM, 0.3 percent of annual MWh are offer capped for energy.**
  - **When price offer greater than cost offer.**
  - **Approximately one third of generators offer below the cost-based offer.**
  - **Price offers increase when cost offers increase.**
- **PJM ignores start and no load costs.**
- **PJM ignores cyclic starting and peaking factors.**

Monitoring Analytics

Comments on PJM Cost Impacts

- **PJM approved maintenance adders already exceed EIA benchmarks, without major maintenance and overhauls.**
  - **Average CT approved adder: $48.42/MWh.**
    - 45 percent of reviewed CTs have an adder between 1x and 10x EIA's $3.50/MWh.
    - 16 percent of reviewed CTs have an adder greater than 10x EIA's $3.50/MWh.
  - **Average CC approved adder: $3.59/MWh**
    - 19 percent of reviewed CTs have an adder between 1x and 20x EIA's $3.50/MWh.

Monitoring Analytics

Potential Impacts Ignored by PJM

- **In 2017, 7,756 GWh were made whole via day-ahead uplift. The average payment was $9.88/MWh. An increase of $1/MWh results in an increase of $8 million in uplift.**

- **In 2017, 6,357 GWh were made whole via balancing operating reserves (uplift). The average payment was $9.00/MWh. An increase of $1/MWh results in an increase of $6 million in uplift.**

- **In 2017, an increase of $1/MWh in offers results in an increase of $14 million in uplift.**

Monitoring Analytics

Potential Impacts Ignored by PJM

- **High maintenance costs will allow more units to be offered above $1,000 per MWh. For example, a 100 MW unit with a $6 per MWh maintenance adder and a 2 MW peaking segment can calculate a $900 per MWh adder.**
  - **$6/MWh is equivalent to $600/hour for a 100 MW CT**
  - **Manual 15 peaking maintenance adder equation:**

Peak Incremental Maintenance Rate

$$= \frac{\text{Cyclic Peaking Factor}}{\text{Peak Pickup}} * \text{Equivalent Hourly Maintenance Cost}$$

  - **3 / (2 MW) * $600/hour = $900 per MWh**

Monitoring Analytics

Maintenance Cost Calculation Overview

- **Total maintenance dollars calculated annually**

- **Maintenance dollars are applied to energy MWh, starts, hourly no load, and peaking energy MWh.**

- **Starts and peaking energy hours use a multiplier to reach an equivalent service hour.**

- **PJM allows generators to adjust their allocation of maintenance dollars among starts, hours, energy, and peaking energy.**

Monitoring Analytics

Example 1: CONE CT

		CONE CT
ICAP	MW	205
Total Maintenance	$	2,998,740
Assumptions		
Run Hours	hours	2,952
Peaking hours	hours	20
Starts	starts	170
Peaking Segment	MW	10

Monitoring Analytics

Example 1: CONE CT

		CONE CT
ICAP	MW	205
Total Maintenance	$	2,998,740
Assumptions		
Run Hours	hours	2,952
Peaking hours	hours	20
Starts	starts	170
Peaking Segment	MW	10

		CONE CT
Maintenance Cost Allocation per Manual 15		
In $ per hour (applied to the no load cost)	$/hour	636
In $ per start (applied to the start cost)	$/start	6,364
In $ per MWh (applied to peaking MW)	$/MWh	191

Monitoring Analytics

Example 1: CONE CT

		CONE CT
ICAP	MW	205
Total Maintenance	$	2,998,740
Assumptions		
Run Hours	hours	2,952
Peaking hours	hours	20
Starts	starts	170
Peaking Segment	MW	10

		CONE CT
Maintenance Cost Allocation per Manual 15		
In $ per hour (applied to the no load cost)	$/hour	636
In $ per start (applied to the start cost)	$/start	6,364
In $ per MWh (applied to peaking MW)	$/MWh	191
Maintenance Cost Allocation Result		
Effective Cost in $/MWh for a 2 hour run		
Allocation per Manual 15	$/MWh	27.94
All allocated in the incremental curve	$/MWh	4.96
All allocated in the start cost	$/MWh	43.02

Monitoring Analytics

Example 2: $3.50/MWh

		EIA CT
ICAP	MW	150
Total Maintenance	$	1,000,000
Assumptions		
Run Hours	hours	1,905
Peaking hours	hours	20
Starts	starts	170
Peaking Segment	MW	15

Monitoring Analytics

Example 2: $3.50/MWh

		EIA CT
ICAP	MW	150
Total Maintenance	$	1,000,000
Assumptions		
Run Hours	hours	1,905
Peaking hours	hours	20
Starts	starts	170
Peaking Segment	MW	15

		EIA CT
Maintenance Cost Allocation per Manual 15		
In $ per hour (applied to the no load cost)	$/hour	273
In $ per start (applied to the start cost)	$/start	2,729
In $ per MWh (applied to peaking MW)	$/MWh	54.57

Monitoring Analytics

Example 2: $3.50/MWh

		EIA CT
ICAP	MW	150
Total Maintenance	$	1,000,000
Assumptions		
Run Hours	hours	1,905
Peaking hours	hours	20
Starts	starts	170
Peaking Segment	MW	15

		EIA CT
Maintenance Cost Allocation per Manual 15		
In $ per hour (applied to the no load cost)	$/hour	273
In $ per start (applied to the start cost)	$/start	2,729
In $ per MWh (applied to peaking MW)	$/MWh	54.57
Maintenance Cost Allocation Result		
Effective Cost in $/MWh for a 2 hour run		
Allocation per Manual 15	$/MWh	16.37
All allocated in the incremental curve	$/MWh	3.50
All allocated in the start cost	$/MWh	19.61

Monitoring Analytics

Other Issues with Status Quo and Proposals

- **Unclear definition of which costs are includable:**
  - **"Directly tied to electric production" is ambiguous.**
  - **Not clear what type of maintenance is excluded (e.g. preventative, routine).**
  - **Not clear what type of equipment is excluded (e.g. substation, communications).**
- **Requires extensive documentation of costs to allow required review by the IMM.**
- **Requires detailed understanding of rules in order to define allowable costs properly and allow required review by the IMM.**

Monitoring Analytics

Other Issues with Status Quo and Proposals

- **Confusing and overlapping terms:**

OA Schedule 2	Manual 15
Peak-prepared-for maintenance cost	VOM
Incremental maintenance cost	Maintenance adder
Maintenance Adders	Start maintenance adder
Incremental labor cost	Other fuel related costs
Other incremental operating costs	Incremental adjustment parameter
	Start additional labor cost
	Operating costs *

* Proposed term

Monitoring Analytics

Monitoring Analytics, LLC

2621 Van Buren Avenue

Suite 160

Eagleville, PA

19403

(610) 271-8050

MA@monitoringanalytics.com

www.MonitoringAnalytics.com

Monitoring Analytics