

Manual 15, Cost Development Guidelines

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Performance Compliance

Members Committee
August 20, 2025

Revision 47 (10/01/2025):**All changes are conforming to Regulation Redesign Phase I**

- Section 2.8:
 - Rename Regulation Performance to Regulation Mileage
 - Cost increase in VOM is for Regulation Only Resources
 - Corrected units from MMBtu/kWh to Btu/kWh, from 12, 5000 to 12, 500 for Heat Rate @ RegMin and update VOM from \$3.50 to \$0 in an example for a sub-critical coal-fired steam unit providing Regulation Service for the last seven years.
 - Rename Historic Mileage from Reg. Historic Mileage (RegA) to Reg.Mileage
 - Update Regulation VOM Adder from \$3.50 to \$0
 - Updated calculated value for Exhibit 3: Regulation Maximum Allowable Cost Adder Example

- Section 2.8:
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The cost-based regulation offer is split into two portions:

- The Regulation Capability portion consists of the fuel cost increase and unit specific heat rate degradation due to operating at lower loads and the margin risk adder;
- The Regulation ~~MileagePerformance~~ portion consists of the cost increase in VOM for Regulation Only Resources, cost increase due to heat rate increase during non-steady state operation and, where applicable, energy losses for energy storage devices. The \$/MW value determined in the ~~mileageperformance~~ offer will be converted to cost per mileage \$/ΔMW by dividing the value by the mileage ΔMW/MW for the applicable signal for that offer as described in Manual 11.
- Regulation Capability costs to provide Regulation Service from a unit shall include the following components up to but not exceeding:

$$\text{RegulationCapabilityCosts}(\$/MWh) \leq$$

(Fuel Cost Increase and UnitSpecific Heat Rate Degradation due to Operating at Lower Loads)

+MarginRisk Adder

- Regulation ~~MileagePerformance~~ costs to provide Regulation Service from a unit shall include the following components up to but not exceeding:

$$\text{Regulation Mileage Costs} \left(\frac{\$}{\Delta MW} \right) \leq$$

{Cost Increase in VOM For Regulation Only Resources + Cost Increase due to Heat Rate Increase during nonsteady state operation

(above heat rate factor not to exceed 0.35%) + (Energy Storage Unit Losses)} / Δ MW / MW

- Section 2.8:
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Cost increase in VOM for Regulation Only Resources

The cost increase (in \$/MWh of Regulation) of variable operations and maintenance (VOM) cost resulting from operating the unit at lower MW output incurred from the provision of Regulation.

~~This cost component is zero for units participating in the energy market as these VOM costs are already recoverable in a unit's cost based energy offer. VOM costs shall be calculated by the following methods and shall not exceed these levels below:~~

~~For any unit that does not have a PJM approved Maintenance Adder, the following variable operation and maintenance (VOM) costs can be applied by unit type to the following:~~

Unit Type	VOM
Super-critical Steam:	\$10.00 per MWh of Regulation
Sub-critical Steam:	\$3.50 per MWh of Regulation
Combined Cycle:	\$2.50 per MWh of Regulation
Combustion Turbine:	\$2.00 per MWh of Regulation
Hydro:	\$1.00 per MWh of Regulation
Energy Storage:	Based on OEM estimates initially and actual as history is available

~~Exhibit 1: VOM for all Hydro Units or Non-Hydro Units providing service for less than 10 years~~

- Section 2.8:
 - Cost increase in VOM is for Regulation Only Resources

~~Any unit that has a PJM approved Maintenance Adder can use the VOM rates above if the annual VOM dollar amounts resulting from those rates included in Regulation cost based offers, are subtracted from the escalated 10 or 20 year historical total VOM accounts and the Regulation MWh based on the average of the last three years.~~

Energy storage units that participate only in regulation Service ~~may~~shall include all their VOM Cost increase in VOM adder in Regulation cost offers ~~based on actual maintenance cost history. These maintenance costs must be submitted and approved by PJM in the annual VOM review process as outlined in Manual 15 Section 2.6 prior to use in the offer.~~

~~For example, a 100-MW sub-critical coal-fired steam unit that has been providing Regulation Service for 30 years. The unit averaged 5,000 MWh of Regulation Service over the last three years and the escalated 20-year historical total VOM = \$10,000,000.~~

Annual VOM Costs to Subtract
=(\$3.50 per Regulation MWh * 5,000 MWh) * 20 years
= \$17,500 per year * 20 years
= \$350,000
20-year balance of historical total VOM accounts
= \$10,000,000 — \$350,000
= \$ 9,650,000

~~Exhibit 2: Example of VOM for Non-Hydro Units providing Regulation for more than 10 years~~

~~Actual Regulation VOM incremental costs submitted and evaluated pursuant to the Cost Methodology and Approval Process.~~

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~~For An Example~~ For a Sub-critical Coal-Fired Steam Unit providing Regulation Service for the last seven years:

Data Submitted by Participant	Value	Units
Fuel	\$1.50	\$/MMBtu
Heat Rate @ EcoMax	9,000.00	MM Btu/KWh
Heat Rate @ RegMin	12,500 0 .00	MM Btu/KWh
VOM	\$3.50	\$/MW of Regulation

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$$\text{UnitBaseLoadHeatRateFuelInput} =$$

$$\text{UnitBaseLoadHeatRate} * \text{RegMin} * 1 \text{ MMBtu} / 1,000,000 \text{ Btu} * 1,000 \text{ kW} / \text{MW}$$

$$\text{UnitBaseLoadHeatRateFuelInput} =$$

$$9,000 \text{ Btu} / \text{kWh} * 40 \text{ MW} * 1 \text{ MMBtu} / 1,000,000 \text{ Btu} * 1,000 \text{ kW} / \text{MW} = 360 \text{ MMBtu} / \text{Hr}$$

$$\text{UnitReducedLoadHeatRateFuelInput} =$$

$$\text{UnitReducedLoadHeatRate} * \text{RegMin} * 1 \text{ MMBtu} / 1,000,000 \text{ Btu} * 1,000 \text{ kW} / \text{MW}$$

$$\text{UnitReducedLoadHeatRateFuelInput} =$$

$$12,500 \text{ Btu} / \text{kWh} * 40 \text{ MW} * 1 \text{ MMBtu} / 1,000,000 \text{ Btu} * 1,000 \text{ kW} / \text{MW} = 500 \text{ MMBtu} / \text{Hr}$$

$$\text{Difference} = \text{UnitBaseLoadHeatInput} - \text{UnitReducedLoadHeatInput}$$

$$\text{Difference} = 500 \text{ MMBtu} / \text{Hr} - 360 \text{ MMBtu} / \text{Hr} = 140 \text{ MMBtu} / \text{Hr}$$

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Heat Rate Adjustment (Non-Steady State Operation)	Value	Units
Total Operating Point Heat Rate	9,000.0	MM Btu/kWh
Heat Rate Loss Factor (Max per M15)	0.35%	
Heat Rate Loss	3.15	MMBtu/Hr

HeatRateLoss =

*(EconomicMaximumHeatRate*0.35%)*1MMBtu / 1,000,000Btu*1,000kW / MW*EconomicMaximumMW*

Heat Rate Loss =

*(9,000Btu / kWh*0.35%)*1MMBtu / 1,000,000Btu*1,000kW / MW* 100MW = 3.15 MMBtu / Hr*

- Section 2.8:
 - Rename Historic Mileage from Reg. Historic Mileage (RegA) to Reg.Mileage

Historic Mileage	Value
Reg. MileageA	5

Maximum Mileage Performance Offer	Value	Units
(c+d)/ Reg. Historic Mileage	\$0. 180	\$/ΔMW

MaximumPerformanceOffer =

[FuelCostAdder (NonSteadyStateOperation) + RegulationVOMAdder for Regulation Only Resources] / Reg. Mileage

- Section 2.8:
 - Update Regulation VOM Adder from \$3.50 to \$0

(d) VOM Adder	Value	Units
Regulation VOM Adder	\$3.50	\$/Hr/MW of Regulation

- Section 2.8:
 - Updated calculated value for Exhibit 3: Regulation Maximum Allowable Cost Adder Example

MaximumPerformanceOffer =

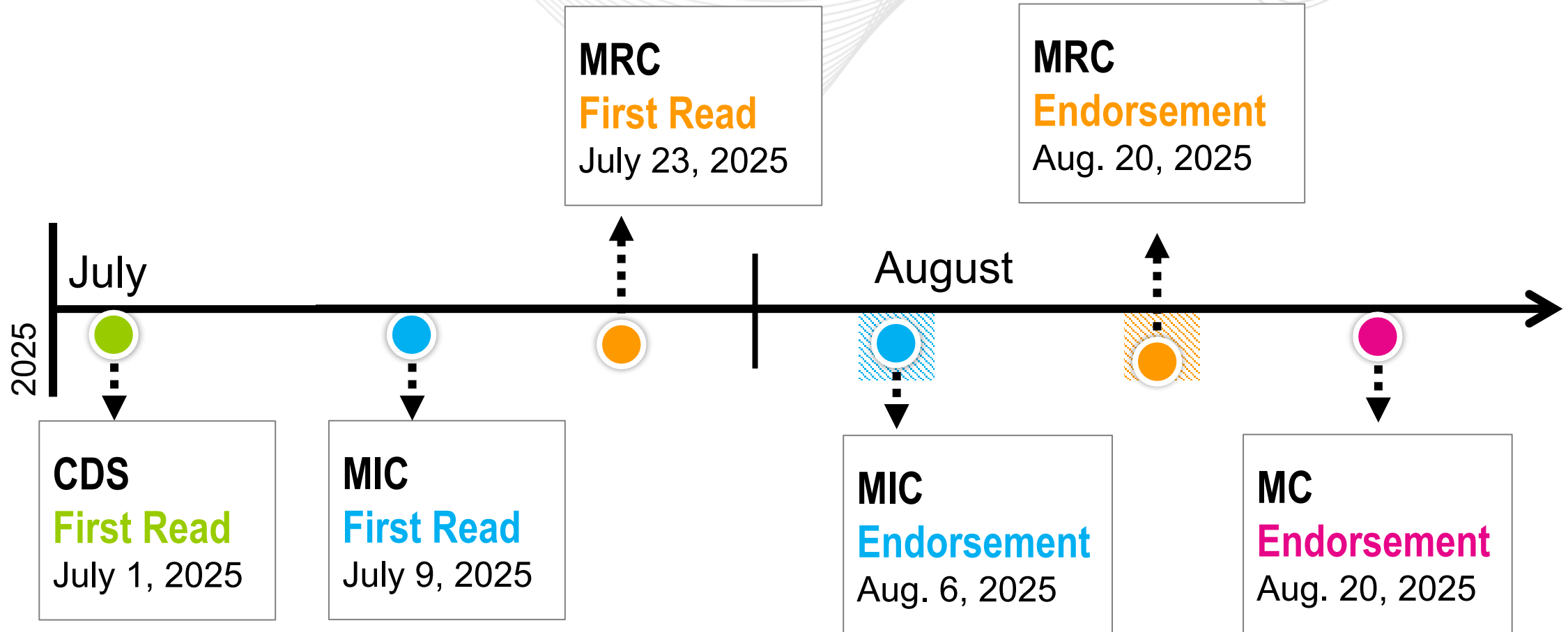
[FuelCostAdder (NonSteadyStateOperation) + RegulationVOMAdder for Regulation Only Resources] / Reg. Mileage

Regulation Maximum Allowable Cost Adder Example:

FuelCostAdder =

[\$0.50 / Hr / MW + \$0 / Hr / MW] / 5 Δ MW / MW = \$0.10 / Hr / MW of Regulation

Exhibit 3: Regulation Maximum Allowable Cost Adder Example



SME/Presenter:

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**Manual 15, Rev 47 – Regulation
Redesign Phase I**

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Member Hotline

(610) 666 – 8980

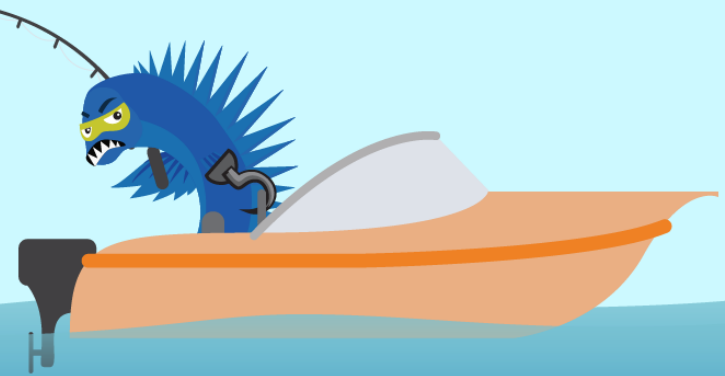
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