



Manual 15 Cost Development Guidelines Update FERC Order 841: Electric Storage Participation in Markets

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- Manual 15 documents the business rules for cost offer development
 - Section 7 (hydro) and Section 11 (batteries/flywheels) were modified in support of Order 841

- Clarifying update on pumping cost equations in Section 7.3

Basic Pumped Storage Fuel Cost – Pumped storage fuel cost shall be calculated on a seven (7) day rolling basis by multiplying the real time bus LMP at the plant node by the actual power consumed when pumping divided by the pumping efficiency. The pumping efficiency is determined annually based on actual pumping operations or by OEM curves if annual data is not available due to the immaturity of the unit. The following equations govern pumping storage fuel cost:

$$\text{Pumping Power Cost } (\$/\text{MWh}) = \text{Real Time LMP } (\$/\text{MWh}) * \text{Pumping Power (MWh)}$$

$$\text{Pumping Power Cost } \left(\frac{\$}{\text{MWh}} \right) = \frac{\sum_{168}^1 \text{Real Time LMP } \left(\frac{\$}{\text{MWh}} \right) * \text{Pumping Power (MWh)}}{\sum_{168}^1 \text{Pumping Power (MWh)}}$$

$$\text{Pumped Storage Fuel Cost } (\$/\text{MWh}) = \frac{\text{Pumping Power Cost } (\$/\text{MWh})}{\text{Pumping Efficiency}}$$

- Updates to define Efficiency Factor, Fuel Cost, VOM and Ancillary Service costs
 - Efficiency factors measure the ratio of generation produced to the amount of electricity used to charge
 - Fuel cost using the average charging cost and defined in resource's FCP
 - Maintenance and Operating cost inclusion and exclusion guidelines and submitted in resource's VOM template
 - Ancillary Services – status quo definitions

Appendix

Section 11: ~~Energy Storage Resource~~ Batteries and Flywheels

This section contains information for the development of ~~Energy Storage Resource~~ battery and flywheel cost offers. . Regulation only resources should see Section 11.8.

Battery- device to store electrical energy via chemicals

Flywheel- mechanical device for storing rotational energy

11.1 ~~Heat Rates~~ Efficiency Factor

Efficiency factor is a battery or flywheel version of a heat rate. Efficiency factors measure the ratio of generation produced to the amount of electricity used to charge.

$$\text{Efficiency Factor} = \frac{\text{MWh Discharged}}{\text{MWh Charged}}$$

Efficiency factors can be calculated over the time period specified by the Market Seller in the Fuel Cost Policy. A Market Seller must make the choice of method in their fuel cost policy and cannot change to another method for a period specified in Section 2.1

~~Energy Storage Resources do not burn fuel so heat rates are not applicable.~~

11.2 Performance Factors

Note:

The information in Section 2.2 contains basic Performance Factor information relevant for all unit types. The following additional information only pertains to batteries and flywheels ~~Energy Storage Resources~~.

~~Energy Storage Resources~~ Battery and flywheel ~~do not burn fuel so~~ Performance Factors are equal to 1.0.

11.3 Fuel Cost

Note:

The information in Section 2.3 contains basic Fuel Cost information relevant for all unit types. The following additional information only pertains to **Energy Storage Resources batteries and flywheels**:

Energy Storage Resource's fuel costs are equal to zero.

To be consistent throughout the manual, the term fuel cost is used to account for the energy necessary to charge the battery or flywheel.

11.3.1 Total Fuel Cost

Market Sellers for batteries and flywheels must identify in their Fuel Cost Policies the methodology they are using to calculate fuel cost (charging cost).

$$\text{Fuel Cost} \left(\frac{\$}{MWh} \right) = \left(\text{average charge cost} \left(\frac{\$}{MWh} \right) * \text{efficiency factor} \right)$$

11.3.2 Operating Costs

Operating Costs may include, but are not limited to: acids and lithium ion replacements

11.4 Start-up Cost

~~Energy Storage Resource's~~ Battery and flywheel Start Fuel and Total Fuel Related Costs are equal to zero.

11.5 No-Load Cost

~~Energy Storage Resources do not have No-load costs.~~ Battery and flywheel no-load costs are equal to zero.

11.6 Maintenance

Note:

The information in Section 2.6 contains basic Maintenance Cost information relevant for all unit types. The following additional information only pertains to ~~Energy Storage Resources~~ batteries and flywheels.

Batteries and flywheels cannot include costs that can be included in their capacity offer such as straight time labor. Maintenance costs for batteries and flywheels may include, but are not limited to: cell repairs/replacements, inverter maintenance, and generation owned GSU/ Interconnection Transmission maintenance.

11.7 Synchronized Reserve Cost

Note:

The information in Section 2.7 contains basic Synchronized Reserve Cost information relevant for all unit types. The following additional information only pertains to ~~Energy Storage Resources~~ batteries and flywheels if applicable.

The cost to provide synchronous reserves from battery or flywheel resources shall be equal to the margin up of \$7.50 per MWh of reserves offered plus the maintenance adder

11.8 Regulation Cost

Note:

The information in Section 2.8 contains basic Regulation Cost information relevant for all unit types. The following additional information only pertains to ~~Energy Storage Resources~~ batteries and flywheels.

~~Energy Storage Resources~~ Batteries and flywheels shall calculate Energy Storage Unit Losses in accordance with the equation below. The “Cost Increase due to Heat Rate Increase