2026 Variable Operations and Maintenance Cost Review

Issue Paper

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I. EXECUTIVE SUMMARY

Variable operations and maintenance (VOM) adders are the market instrument through which scheduling coordinators can reflect their variable operations and maintenance (O&M) costs in the ISO's markets. These costs are a component of most resources' default energy bids (DEBs) and all default commitment costs. VOM adders can be negotiated with the ISO or, if no negotiation takes place, the VOM adders are automatically set to a pre-determined default value.

The ISO has committed to reviewing the default VOM adder values once every three years. During the previous VOM Cost Review cycle[1], the ISO reviewed and updated the default VOM adder values to an inflation reference year of 2023. For this new cycle, the ISO is proposing to update the current default VOM adder values. The ISO has reviewed the current default VOM adders and determined that an update is warranted to capture the change in inflation rates since 2023, by applying an 8.2% inflation adjustment based on Consumer Price Index (CPI) data from the US Bureau of Labor Statistics.

The ISO also plans to assess default values for variable operations costs for storage resources and is exploring four options for a new default variable operations cost applicable to eligible storage resources. The variable operations cost is used in the Storage DEB. Storage resources designated as Non-Regulation Energy Management may choose the Storage DEB option as the primary methodology to calculate their DEB. The WEM Governing Body has joint authority with the ISO Board of Governors over the proposed changes.

II. BACKGROUND

VOM adders are a component of most resources' DEBs and default commitment costs (default minimum load costs, default startup costs, and default transition costs). Variable operations cost adders are a component of storage resources' DEBs.[2] DEBs are used in the local market power mitigation process to adjust scheduling coordinators' bids when a resource is found to wield market power. Default commitment, including minimum load cost bids, start-up cost bids, and transition cost bids, are used by the ISO's market processes in its determination of whether to commit the resource.

Currently the pre-determined VOM adders vary based on the resource's fuel and generation technology type (natural gas combined cycle gas turbine, hydro, etc.), while

[1] https://stakeholdercenter.caiso.com/StakeholderInitiatives/Variable-operations-maintenance-cost-review-2023

[2] There are several types of DEB options in the ISO's markets. VOM adders are included in the variable cost-based DEB option and may be included in the negotiated DEB option. Variable operations cost for non-REM storage resources is included in the storage DEB option and may be included in the negotiated DEB option.

the variable operations cost for storage resources is automatically set to $0/MWh. The default VOM adder and variable operations cost adder are simply default values if a scheduling coordinator finds them sufficient for their resource and has no need to negotiate a different cost. Accordingly, if a scheduling coordinator believes the values are too low or otherwise inadequate, they can always negotiate a more appropriate resource-specific value.

III. REVIEW OF CURRENT DEFAULT VOM ADDER VALUES

The ISO has committed to reviewing the default VOM adder values once every three years. This commitment appears in the BPMs but not in the tariff. The previous default VOM adder updates used 2023 values as the reference year, making 2026 the next appropriate reference year.

Table 1 has the currently effective default VOM adder values. There are three types of adders: the variable energy O&M adder, variable minimum load O&M adder, and variable start-up O&M adder.

Table 1 – Current default VOM adder values

Technology Type	**Default Variable Energy O&M Adder *($/MWh)***	**Default Variable Minimum Load O&M Adder *($/run-hour/MW)***	**Default Variable Start-up O&M Adder *($/start/MW)***
Coal	3.19	-	-
Steam turbines	0.39	-	-
Natural gas-fired combined-cycle	0.70	2.07	-
Frame combustion turbines	1.15	-	61.89
Aeroderivative combustion turbines	2.55	5.20	-
Reciprocating internal combustion engines	1.31	-	-
Nuclear	1.28	-	-
Biomass	1.96	-	-
Geothermal	1.38	-	-
Landfill gas	1.44	-	-
Hydroelectric	-	0.77	-
Solar	-	-	-
Wind	0.33	-	-
Other (*e.g.*, demand response)	-	-	-

During the VOM Cost Review stakeholder process in 2020, the ISO determined VOM adders based on data provided by an external consultant as well as values gathered from other external sources such as the NYISO's Cost of New Entry (CONE) studies. The ISO also used data from VOM adders that were negotiated directly with scheduling coordinators. All of these sources were inflation-adjusted to 2019-year dollars using CPI data available from the US Bureau of Labor Statistics (BLS). Then in 2023, the ISO applied an 18.7% inflation adjustment to all default values.

To determine whether an update to the currently existing values is warranted, the ISO considered several factors:

- Inflation: The BLS Consumer Price Index for All Urban Consumers increased 8.2% from June 2023 to March 2026[3]. This is the same reference used in the previous review cycle. The increased inflation is an indicator that the current default values need to be updated.
- Frequency of negotiations: The ISO continues to conduct a steady but not an abnormally high number of negotiations for VOM adders. If the default VOM adders were too high for many resources, this will indicate that negotiations aren't needed and thus the ISO would conduct VOM negotiations infrequently; conversely, if the default VOM values were too low, the ISO would be constantly negotiating VOM adders.
- Industry-wide cost study: The ISO observed that the technology types of generating resources participating in the market and using VOM adders are captured sufficiently by the technology types comprising the existing default VOM adders, such that another industry-wide cost study is not necessary.

Although the frequency of negotiations is not a conclusive factor, the inflation rate is indicative of the need for an update. The ISO believes the inflation factor should be weighted most heavily because it is the most quantitatively rigorous indicator. As such, the ISO's review of the current VOM and variable operations cost adder values indicated that updating default VOM adder is appropriate, and proposing a new variable operations cost adder is optional.

IV. PROPOSED UPDATE TO DEFAULT VOM ADDERS

The ISO proposes to update the default VOM adder values with an 8.2% inflation increase. This increase is based on the BLS Consumer Price Index for all Urban Consumers from June 2023 to March 2026.

The proposed default VOM adder values are shown in Table 2.

[3] BLS Consumer Price Index for All Urban Consumers (https://www.bls.gov/cpi/data.htm)

Table 2 – Proposed default VOM adder values

Technology Type	Default Variable Energy O&M Adder *($/MWh)*	Default Variable Minimum Load O&M Adder *($/run-hour/MW)*	Default Variable Start-up O&M Adder *($/start/MW)*
Coal	3.45	-	-
Steam turbines	0.42	-	-
Natural gas-fired combined-cycle	0.76	2.24	-
Frame combustion turbines	1.24	-	66.96
Aeroderivative combustion turbines	2.76	5.63	-
Reciprocating internal combustion engines	1.42	-	-
Nuclear	1.38	-	-
Biomass	2.12	-	-
Geothermal	1.49	-	-
Landfill gas	1.56	-	-
Hydroelectric	-	0.83	-
Solar	-	-	-
Wind	0.36	-	-
Other (*e.g.*, demand response)	-	-	-

The ISO believes that the BLS Consumer Price Index is appropriate because it is consistent with the inflation adjustment methodology used in the previous VOM Cost Review cycle. The ISO corroborated the appropriateness of this reference for inflation by comparing it to the existing set of negotiated VOM adder values. In addition, the BLS CPI methodology is consistent with the inflation adjustments made by scheduling coordinators to adjust their resources' negotiated VOM adders for inflation.

The ISO also compared the proposed inflation-adjusted VOM adders to the average of the existing set of negotiated VOM adder values. The existing negotiated VOM adders provide a good point of reference to determine the reasonableness of the proposed default VOM adder values. The proposed default VOM adder values are slightly more conservative (i.e., lower) than the average of existing negotiated VOM adders for some technology types but slightly higher for others. This is appropriate because the default VOM adder values should strike a balance between being sufficiently conservative while also high enough to be useful by scheduling coordinators in lieu of negotiating a resource specific VOM adder value. The ISO does not propose making any changes to the cost categorization principles included in the ISO tariff, nor do we propose any changes to the VOM cost framework.

V. PROPOSED DEFAULT VARIABLE OPERATIONS COSTS FOR STORAGE RESOURCES

With more than 15,000 MW of energy storage resources participating in the market as of 2026, many of which have negotiated variable operations costs for storage resources, the ISO believes that the introduction of a default adder for energy storage resources is appropriate. The primary reason is that most storage resources use the Storage DEB option which does include a variable operations cost component[4]. A default variable operations cost option would provide a sufficient estimate of these costs for many batteries and reduce the administrative burden required for negotiations. The ISO understands that the proposed default value may not be sufficient for all storage resources due to different battery chemistry, manufacturer contracts, operational profiles, or other factors. In such circumstances, the negotiated option continues to be available for scheduling coordinators to negotiate resource-specific variable operations cost values.

In the past five years, the ISO has been gathering information on variable operations costs for storage resources by supporting document type and OEMs, respectively. Table 3 has the currently effective values based on supporting document type, and Table 4 shows the effective values based on OEM group (the actual OEM name has been concealed).

Table 3 – Active variable operations cost for storage resources by supporting document

Supporting Document Type	Number of Resources with active negotiated value	Average Value ($/MWh)	Median Value ($/MWh)
LTSA	39	17.87	14.74
PPA	6	28.23	31.20
Projection	16	34.48	30.82
Total	61	23.25	19.43

[4] The storage DEB option is a separate option available only to energy storage resources. It relies primarily on the charging costs and the opportunity costs of discharging but also uses the variable storage operations costs as an input.

Table 4 – Active variable operations cost for storage resources by OEM group

OEM Group	Number of resources *with active negotiated value*	Average Value ($/MWh)	Median Value ($/MWh)
OEM 1	10	22.32	25.00
OEM 2	24	22.82	16.00
OEM 3	14	20.84	28.05
OEM 4	13	27.36	14.74
Total	61	23.25	19.43

Currently there are 61 active variable operations costs for storage resources.
The ISO proposes to explore the following four different options for the default variable operations cost for storage resources and seeks feedback from stakeholders on each option.

Option 1: Long-term service agreements (LTSA)-based values

LTSA is a contractual arrangement between a resource owner/operator and a service provider for the maintenance and support of major power equipment over a multi-year period. For some units, maintenance is predefined based on OEM recommendations and contractually assigned to a service provider through LTSAs.

Based on the ISO's review, LTSA-based variable operations cost is more appropriate than PPA-based and projection-based since it is reflective of actual variable operations costs directly from the manufacturer. Besides, LTSA-based registration accounted for the majority, representing 39 out of the 61 cases. In this category, the average cost is $17.87/MWh while the median cost is $14.74/MWh. The ISO would recommend Option 1 – the median value from LTSA-based variable operations cost, i.e., $14.74/MWh, as default value, since it is a robust measure of central tendency that is not distorted by outliers or skewed data.

Option 2: All active negotiated values

Option 2 accounts for all active negotiated values to ensure broader applicability across different scenarios. Among the 61 registered cases, the average cost is $23.25/MWh and median cost is $19.43/MWh. Since the distribution may be impacted by a limited number of extreme cases, the median cost $19.43/MWh is considered a more robust and representative value as option 2.

The main advantage of this approach is that it reflects the full set of active negotiated values while minimizing the impact of outliers, resulting in a more stable and representative benchmark. However, the median may not fully capture cost differences across specific cost categorizations, operating conditions, or other factors.

Option 3: Manufacturer-based values

Due to variations in cost structure across different OEMs, Option 3 introduces an approach using different values according to the manufacturer. The median value of each group varies from $14.74/MWh to $28.05/MWh depending on OEM group, as shown in Table 4. This approach is conceptually similar to the VOM categorization approach, as it aims to provide more tailored and adaptive benchmarks based on underlying fuel type and technologies.

However, the effectiveness of this approach depends heavily on the availability of sufficient sample data within each category. At the current stage, the dataset is not large enough to support statistically robust categorization and validation. Although Option 3 shows potential for more granular default values by manufacturers, it is not a recommended option due to complexity of implementation. The ISO will keep gathering information on variable operations costs for storage resources and refine this option for subsequent triennial reviews.

Option 4: Status quo values

Option 4 proposes to keep the existing default VOM adders and the existing variable operations cost default value of $0/MWh. All negotiations will continue to be reviewed and recorded on an ongoing basis to ensure sufficient oversight and date collection. This option minimizes the risk of proposing default values to all storage resources based on limited or incomplete information and helps maintain consistency in the current process. Continuing to evaluate incoming negotiation cases will allow for the development of a more comprehensive and representative data set over time. Once a sufficiently large and reliable data set has been established, the ISO will revisit the available options and determine whether proposing default variable operations costs for storage resources are warranted. Therefore, maintaining the status quo is considered a conservative yet stable approach.

VI. DECISIONAL CLASSIFICATION

This initiative proposes to amend the tariff to update the value of the VOM adder and to establish a default variable operations cost for battery resources which are reflected in market bids. The ISO proposes these tariff changes will be subject to the primary authority of the WEM Governing Body for decision because they apply to the Extended Day Ahead Market (EDAM) and Western Energy Imbalance Market (WEIM) as explained below.

The Western Energy Markets Governing Body has primary authority over any proposal to change or establish any the ISO tariff rule(s) applicable to EDAM or WEIM balancing authority areas, EDAM or WEIM entities, or other market participants within the EDAM or WEIM Entity balancing authority areas. This scope excludes from primary authority, without limitation, any proposals to change or establish tariff rule(s) applicable only to the ISO balancing authority area or to the ISO-controlled grid per charter for WEIM and EDAM

Governance § 2.2.1. The tariff rule changes contemplated in this initiative would be "applicable to WEIM/EDAM Entity balancing authority areas, WEIM/EDAM Entities, or other market participants within WEIM/EDAM Entity balancing authority areas, in their capacity as participants in the WEIM/EDAM." None of the proposed tariff rules would be applicable "only to the ISO balancing authority area or to the ISO-controlled grid." Accordingly, the matters scheduled for decision fall solely within the scope of primary authority.

This proposed classification reflects the current state of this initiative and could change as the stakeholder process moves ahead. Stakeholders are encouraged to submit a response in their written comments to the proposed classification as described above, particularly if they have concerns or questions.

VI. PROPOSED STAKEHOLDER TIMELINE

The proposed schedule for stakeholder engagement is detailed below in Table 5.

Please note that the dates below are tentative until the ISO publishes a notice formally confirming them.

Table 5 – Stakeholder timeline

Date	Milestones
May 29, 2026	Publish Issue Paper
June 4, 2026	Stakeholder Meeting on Issue Paper
June 18, 2026	Stakeholder comments due on Issue Paper
July 2, 2026	Publish Final Proposal and Draft Tariff Language
July 9, 2026	Stakeholder Call for Final Proposal and Draft Tariff Language
July 23, 2026	Stakeholder comments due on Final Proposal
October 26, 2026	Seek Board of Governors / WEM Governing Body approval