



California ISO

2026 Variable Operations and Maintenance Cost Review

Final Proposal



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ISO Public

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1 EXECUTIVE SUMMARY

Variable operations and maintenance (VOM) adders are the market instrument through which scheduling coordinators can reflect VOM costs for their resources in CAISO's markets. These costs are included in the calculation of default energy bids (DEBs) and default commitment costs. The VOM adders can be negotiated with CAISO; if no negotiation takes place a pre-determined default value is used.

The variable operations cost for energy storage resources is a mechanism that allows scheduling coordinators to reflect costs associated with cycling and cell augmentation. These costs are used in calculating the default energy bid for resources with the storage DEB as the primary ranked option, or where a negotiated default energy bid is in place. Currently, storage resources are required to negotiate a variable operations cost with CAISO; if no value is established, a value of \$0/MWh is applied.

CAISO is committed to reviewing the default VOM adder values once every three years. During the previous VOM Cost Review cycle, CAISO reviewed and updated the default VOM adder values to an inflation reference year of 2023. For this review cycle, CAISO has reviewed the current default VOM adders and determined that an update is warranted to capture the change in inflation rates since 2023. Additionally, in this review cycle CAISO proposes a default value for the variable operations cost for energy storage resources. There is now a large fleet of energy storage resources participating in the market, and CAISO determined that a default variable operations cost is warranted to reduce the administrative costs associated with negotiating a value.

CAISO proposes to apply a 9.84% inflation adjustment to current default VOM adders based on Consumer Price Index (CPI) data from the US Bureau of Labor Statistics (BLS). CAISO also proposes a default variable operations cost for storage resources of \$14.74/MWh based on values negotiated by scheduling coordinators with CAISO.

2 BACKGROUND

The VOM adders represent variable operations and maintenance costs incurred by resources. For storage resources, variable operations cost adders represent the variable cost of operating a storage resource, including cycling and cell augmentation. The VOM adders are used in CAISO's calculation of cost-based DEBs and default commitment costs including minimum load, startup and transition costs. The variable operations cost

for storage resources is used in CAISO's calculation of storage DEBs; there are no commitment costs for storage resources.¹

CAISO offers default VOM adders for the various types of resources participating in the market. The default value is automatically assigned based on a resource's fuel and technology type. If a scheduling coordinator finds the default value unsuitable for their resources they can negotiate a value with CAISO which can be administratively burdensome. The default VOM adders were developed to strike a balance – they should be conservative enough to prevent unwarranted costs while still being attractive in lieu of negotiating a value. CAISO also committed to reviewing the default VOM adder values once every three years to determine whether they remain appropriate.² The previous default VOM adder updates used 2023 values as the reference year, making 2026 the next appropriate reference year.

For energy storage resources, a variable operations cost must be negotiated with CAISO otherwise it is automatically set to \$0/MWh. CAISO believes that the introduction of a non-zero default variable operations cost is appropriate with over 16,000 MW of energy storage currently participating in the market. Like default VOM adders, the default variable operations cost should be sufficiently conservative while also still being attractive in lieu of negotiating a value. The default value would automatically be assigned to eligible energy storage resources – only storage resources designated as non-Regulation Energy Management (non-REM) are eligible for a DEB. Market participants can always negotiate a value with CAISO if they find the default value is inadequate.

3 DEFAULT VOM ADDERS

3.1 Review of current default VOM adder values

Table 1 has the currently effective default VOM adder values. There are three types of adders: the variable energy O&M (VOM-EN) adder, variable minimum load O&M (VOM-ML) adder, and variable start-up O&M (VOM-SU) adder. The default VOM-ML and VOM-SU adders are expressed in \$/run-hour/MW and \$/start/MW units, respectively. To arrive at a resource-specific VOM adder, the default value is multiplied by the Pmax of the resource or configuration. This results in the resource-specific VOM-ML and VOM-SU adders being expressed in \$/run-hour or \$/start units, respectively.

¹ VOM adders and variable operations cost may also be included in the negotiated DEB option. DEBs are used in the local market power mitigation process to adjust bids when a resource is found to wield market power, and default commitment costs are used to cap commitment cost bids.

² This commitment appears in the BPM for Market Instruments but not in the ISO Tariff.

The default VOM adder values were established based on industry-wide cost studies and a variety of external sources and they were reviewed and updated in each triennial review cycle. The default VOM-ML and VOM-SU adders were initially developed by CAISO based on data provided by an external consultant, other external sources and negotiated VOM adders. The values were updated again in 2020 using NYISO’s Cost of New Entry (CONE) studies. The default VOM-EN adders were developed by an external consultant.³ In the last review cycle in 2023, CAISO inflation-adjusted the default values to 2023-year dollars by applying an 18.7% increase.⁴

Table 1: Current default VOM adder values

Technology Type	Default VOM-EN Adder (\$/MWh)	Default VOM-ML Adder (\$/run-hour/MW)	Default VOM-SU 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)	-	-	-

3.2 Stakeholder feedback on proposed default VOM adders

³ CAISO, “Final Proposal – Variable Operations and Maintenance Cost Review”, October 2020, p. 5-6.

⁴ CAISO, “Final Proposal – Variable Operations and Maintenance Cost Review 2023”, Aug 2023, p. 3.

CAISO proposed a 9.84% inflation adjustment to increase the current default VOM adders and presented the methodology in the Straw Proposal published on July 7, 2026.⁵ One set of comments was received from Vistra who expressed support for the proposed increase.

3.3 Final proposal for default VOM adders

CAISO proposes to update the current default VOM adder values with a 9.84% inflation increase based on BLS CPI-U data from June 2023 to May 2026. The proposed default VOM adder values using the updated inflation adjustments are shown in Table 2.

For the proposed update to the default VOM adders in the current review, CAISO considered several factors:

- Inflation: The BLS Consumer Price Index for All Urban Consumers (CPI-U) increased 9.84% from June 2023 to May 2026.⁶ The increased inflation is an indicator that the current default values need to be updated. The inflation-adjustment methodology using BLS CPI-U data is appropriate as it was recommended by external consultant (Nexant) in its 2018 cost report⁷ and is consistent with the methodology used in previous VOM Cost Review cycles. The BLS CPI-U methodology is also consistent with the inflation-adjustment methodologies used by scheduling coordinators for their resources negotiated VOM adders.
- Frequency of negotiations: CAISO 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 CAISO would conduct VOM negotiations infrequently; conversely, if the default VOM values were too low, CAISO would be constantly negotiating VOM adders. Given that the frequency and volume of VOM negotiations falls between these two extremes, this factor does not indicate whether an update is warranted.

⁵ CAISO, "Straw Proposal, 2026 Variable Operations and Maintenance Cost Review", July 2026, p. 6.

⁶ US Bureau of Labor Statistics, Consumer Price Index for All Urban Consumers (CPI-U): All items in U.S. city average, all urban consumers, not seasonally adjusted, <https://www.bls.gov/cpi/data.htm>, accessed July 2026.

⁷ CAISO, "Variable Operations and Maintenance Costs Report", December 2018, p. 9.

- Industry-wide cost study: CAISO 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.

Of the three factors, CAISO believes the inflation factor should be weighed most heavily because it is the most quantitatively rigorous indicator. The frequency of negotiations does not indicate whether an update is warranted, and an updated industry-wide cost study is not necessary. Thus, CAISO's review of the proposed default VOM adders indicates that an update based on inflation is most appropriate.

As a reminder, the default VOM adder values are simply default values to be used if a scheduling coordinator does not wish to go through the negotiation process. Accordingly, if a scheduling coordinator believes the values are too low or otherwise inadequate, they can negotiate a more appropriate resource-specific value.

Table 2: Proposed default VOM adder values

Technology Type	Default VOM-EN Adder (\$/MWh)	Default VOM-ML Adder (\$/run-hour/MW)	Default VOM-SU Adder (\$/start/MW)
Coal	3.50	-	-
Steam turbines	0.43	-	-
Natural gas-fired combined-cycle	0.77	2.27	-
Frame combustion turbines	1.26	-	67.98
Aeroderivative combustion turbines	2.80	5.71	-
Reciprocating internal combustion engines	1.44	-	-
Nuclear	1.41	-	-
Biomass	2.15	-	-
Geothermal	1.52	-	-
Landfill gas	1.58	-	-

Hydroelectric	-	0.85	-
Solar	-	-	-
Wind	0.36	-	-
Other (e.g., demand response)	-	-	-

4 DEFAULT VARIABLE OPERATIONS COST FOR STORAGE RESOURCES

CAISO proposes establishing a default variable operations cost for storage resources to reflect the growing participation of battery storage in the market and to reduce the administrative burden associated with negotiating resource-specific values. With more than 16,000 MW of storage capacity participating in the market and 61 active negotiated storage variable operations cost agreements on file, CAISO believes sufficient experience now exists to establish a default value.

4.1 Options for establishing default variable operations cost

CAISO evaluated four potential options for a default variable operations cost and presented them in the Straw Proposal published on July 7, 2026.⁸ The options are based on a catalog of negotiated variable operations costs approved by CAISO over the past five years. Table 3 and Table 4 summarize the approved negotiated values based on supporting document type and OEM group, respectively. The actual OEM name has been concealed to protect proprietary information.

Table 3: Active variable operations costs 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
Projected costs	16	34.48	30.82
Total	61	23.25	19.43

⁸ CAISO, “Straw Proposal, 2026 Variable Operations and Maintenance Cost Review”, July 2026, p. 9.

Table 4: Active variable operations costs 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

The four options are described below:

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 CAISO's review, LTSA-based registration accounted for 65% of negotiations in the dataset (39 out of 61 values). In this category, the mean value is \$17.87/MWh while the median is \$14.74/MWh. CAISO considers a LTSA-based variable operations cost more appropriate than the other types of supporting documentation, i.e., Power Purchasing Agreement (PPA) and projected costs; the LTSA-based cost comes directly from the manufacturer and is most reflective of actual variable operations costs. CAISO also considers the median a more robust measure of central tendency that is not distorted by outliers or skewed data compared to the mean value. Thus, CAISO recommends the median value from LTSA-based variable operations cost values of \$14.74/MWh as the default variable operations cost for storage resources.

Option 2: All active negotiated values

This option considers all active negotiated values including LTSA-based, PPA-based and projected cost-based values. Among the 61 registered cases, the mean cost is \$23.25/MWh and median cost is \$19.43/MWh. CAISO does not recommend this option because PPA-based and projection cost-based values do not provide visibility into the costs covered and whether any inappropriate costs are included compared to LTSA-based

values. This concern is further supported by the values in Table 3 which show that PPA-based and projection cost-based negotiated values are higher than LTSA-based values.

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 as shown in Table 3. This approach aims to provide more tailored and adaptive benchmarks based on underlying fuel type and technologies.

However, the effectiveness of this approach depends 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. However, Option 3 shows potential for more granular default values by manufacturers, and CAISO will keep gathering information on variable operations costs for storage resources and refine this option for subsequent triennial reviews.

Option 4: Status quo values

This option proposes to defer the default to the next review cycle and keep the existing process where a \$0/MWh variable operations cost is used if a value is not negotiated by the scheduling coordinator. CAISO would continue to gather information on negotiated values and develop a more comprehensive and representative data set until the next review cycle. Armed with a larger dataset, CAISO would revisit the proposed options to establish default variable operations costs for storage resources if warranted. This option minimizes the risk of proposing default values to all storage resources based on limited or incomplete information but is not recommended as it requires scheduling coordinators to continue to negotiate a value which is administratively costly.

4.2 Stakeholder feedback on proposed default variable operations cost

CAISO recommended the median value from Option 1 (LTSA-based values) of \$14.74/MWh in the Straw Proposal published on July 7, 2026.⁸ Stakeholder comments were received from Vistra and Clean Energy States Alliance (CESA) in support of this value. CESA's comments also supported reviewing the recommended default variable operations cost value in the next triennial review for inflation and against future negotiated values.

In Vistra's comments, clarity on future inflation adjustments for the default variable operations cost was requested, as well as whether the inflation adjustment would be applied to the default variable operations cost year over year. The ISO clarifies that an explicit inflation adjustment is not being applied to the proposed default variable operations cost of \$14.74/MWh. This value is based on active LTSA-based costs negotiated by scheduling coordinators over the past five years which CAISO considers up to date and thus reflective of current costs, including inflation. Applying an inflation adjustment to these negotiated values may thus overstate them. However, the ISO does plan to consider an inflation adjustment to the default variable operations cost in all future triennial review cycles. The inflation adjustment would be updated triennially, not year over year. Scheduling coordinators can always request a negotiated variable operations cost to reflect inflation on a more frequent basis.

4.3 Final proposal for default variable operations cost

CAISO proposes a \$14.74/MWh value for the default variable operations cost based on the median value from Option 1 (active LTSA-based negotiated values). This is the CAISO-recommended option as LTSAs are contracts from the manufacturer which describe the operations and maintenance actions covered by the costs; thus LTSA-based values best represent actual costs compared to PPA-based and projected cost-based values.

CAISO recognizes that individual battery variable operations costs can vary based on battery chemistry, manufacturer arrangements, operating profiles, and other factors. In such circumstances, the negotiated option continues to be available for scheduling coordinators to negotiate resource-specific values when the default value does not suffice.

5 DECISIONAL CLASSIFICATION

This initiative proposes to amend the tariff to update the value of the default VOM adders and to establish a default variable operations cost for battery resources which are reflected in market bids. CAISO proposes that 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 CAISO 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 CAISO balancing authority area or to the CAISO-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 CAISO balancing authority area or to the CAISO-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.

6 PROPOSED STAKEHOLDER TIMELINE

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

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

Table 5: Stakeholder timeline

Date	Milestones
May 29, 2026	Published Issue Paper
June 4, 2026	Stakeholder Meeting on Issue Paper
June 18, 2026	Published Stakeholder comments on Issue Paper
July 7, 2026	Published Straw Proposal
July 9, 2026	Stakeholder Call for Straw Proposal
July 23, 2026	Published Stakeholder comments on Straw Proposal
August 6, 2026	Publish Final Proposal and Draft Tariff Language

August 20, 2026	Stakeholder Call for Final Proposal and Draft Tariff Language
September 3, 2026	Stakeholder comments due on Final Proposal and Draft Tariff Language
October 26, 2026	Seek WEM Governing Body approval