



California ISO

2026 Variable Operations and Maintenance Cost Review

Straw Proposal



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I. 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 a storage ranking of 1, 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 default 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.

II. 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 resources¹.

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 appropriate². 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.

III. 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 adder, variable minimum load O&M adder, and variable start-up O&M adder. The default Minimum Load and Startup O&M Adders are expressed in \$/run-hour/MW and \$/startup/MW units, respectively. To arrive at a resource-specific O&M Adder, the default value is multiplied by the Pmax of the resource or configuration. This results in the resource-specific Minimum Load and Startup O&M Adders being expressed in \$/run-hour or \$/startup 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 values were established based on industry-wide cost studies and a variety of external sources and they have been reviewed and updated in each triennial review cycle. The default Minimum Load and Startup O&M 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 Energy O&M adders were developed by an external consultant³. In the last review cycle in 2023, CAISO inflation-adjusted the default values to 2023-year dollars by applying an 18.7% increase⁴.

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 Startup 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)	-	-	-

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.

For the 2026 review CAISO considers several factors:

- Inflation: The BLS CPI for All Urban Consumers increased 9.84% from June 2023 to May 2026⁵. The increased inflation is an indicator that the current default values need to be updated. The inflation-adjustment methodology using BLS CPI data is appropriate as it was recommended by external consultant (Nexant) in its 2018 cost report⁶ and is consistent with the methodology used in previous VOM Cost Review cycles. The BLS CPI 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.
- 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 weighted 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 current default VOM adders indicates that an update based on inflation is most appropriate.

IV. PROPOSED UPDATE TO DEFAULT VOM ADDERS

CAISO proposes an inflation adjustment to increase the current default VOM adders and presented the methodology in the Issue Paper published on May 29, 2026.⁷

Stakeholder Feedback

⁵ US Bureau of Labor Statistics Consumer Price Index for All Urban Consumers (<https://www.bls.gov/cpi/data.htm>)

⁶ CAISO, "Variable Operations and Maintenance Costs Report", December 2018, p. 9.

⁷ CAISO, "Issue Paper, 2026 Variable Operations and Maintenance Cost Review", May 2026

CAISO received one set of comments from stakeholders. CAISO appreciates that Idaho Power Company (IPCO) took the time to review the proposal and provide detailed comments. IPCO suggests that CAISO provide additional transparency regarding the underlying data including recent negotiated VOM adders and the specific industry-wide cost metrics used to inform the proposal to fully assess the validity of the proposed default VOM values. CAISO does not use the underlying negotiated VOM adders to determine the proposed default VOM adders. The negotiated VOM adders reflect resource-specific information submitted by market participants and may reflect unique operational characteristics, technology configurations, maintenance practices, and cost structures. As a result, these values are not necessarily representative of the broader population of generating resources and are not the basis of establishing default values. Rather, these data are used as a cross-validation for the proposed default VOM values, consistent with the previous review cycle to demonstrate. The specific industry-wide cost metrics are from two reports, a 2012 cost study by Utilicast³ and a 2018 cost report by Nexant.

IPCO also suggested that CAISO quantitatively characterize how much the proposed defaults compare to the median of existing negotiated adders and provide transparency into how CAISO positioned some values above the median and some below it. CAISO uses the qualitative comparison to existing negotiated values only as an appropriateness check; whether the proposed values are slightly more conservative or slightly higher is not a factor used to determine the proposed default VOM adder values. CAISO also performed the comparison consistent with previous VOM cost review cycles, to check if any default values exceeded the median of the existing negotiated adders. However, CAISO did not use the comparison as factor in the determination of the default VOM adder values. CAISO clarifies that the default values were not intentionally positioned relative to the median; CAISO simply shared how the default values compared with the median. The information shared by CAISO on the existing negotiated VOM adders seeks to strike a balance between providing transparency into the methodology and the factors considered with a desire to protect proprietary information.

IPCO suggests that the proposed values be anchored slightly higher than historical inflation in anticipation of expected increases in inflation over the next three years till the next review cycle. CAISO supports using historical inflation that has been actually realized, rather than a forward-looking indicator, given the uncertainty of future inflation rates driven by an unstable geopolitical climate. However, CAISO does believe it is appropriate to use the most recently available BLS CPI data for May 2026, which results in a higher inflation adjustment of 9.84% compared to the 8.2% based on March 2026 data.

Proposal

CAISO proposes to update the default VOM adder values with a 9.84% inflation increase. This increase is based on the BLS CPI for all Urban Consumers from June 2023 to May 2026. In the Issue Paper, CAISO proposed an 8.2% inflation rate increase based on the latest available BLS CPI data from March 2026. The ISO has updated the proposed increase to 9.84% based on the latest available data from May 2026.

The proposed default VOM adder values using the updated inflation adjustments are shown in Table 2.

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	3.50	-	-
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)	-	-	-

The proposed default VOM adders were cross-validated against existing negotiated VOM adder values consistent with previous VOM cost reviews. In this review, the proposed default VOM adder values are slightly more conservative than the median of existing negotiated VOM adders for some technology types but slightly higher for others. Unlike in previous cycles, however, CAISO proposes not to cap the higher default VOM adders at the median of existing negotiated values. Despite the proposed default values being slightly higher, they are appropriate since they are based on a comprehensive industry-wide cost study.

V. PROPOSED DEFAULT VARIABLE OPERATIONS COSTS 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.

CAISO evaluated four potential approaches for a default storage variable operations cost and presented them in the Issue Paper published on May 29, 2026.⁸

Stakeholder Feedback

CAISO appreciates the various helpful comments submitted by stakeholders related to the default variable operations cost. CAISO considered these comments but believes the value proposed in the Issue Paper is still appropriate.

In its comments, IPCO did not oppose Option 1 but suggests that all active negotiated values should be included under Option 2, as these values have been reviewed and approved by CAISO. CAISO does not recommend Option 2 because the dataset includes negotiated values based on PPA and projected costs, neither of which reflect the actual costs of variable operations for storage resources compared to LTSA-based values.

IPCO also suggests that, for Option 1 using LTSA-based values, a mean is more appropriate than the median if the dataset has already been vetted. IPCO suggested that the mean is also better than the median for Option 3's manufacturer-based approach assuming the values were reviewed and approved and are thus valid. CAISO appreciates IPCO's comment regarding the use of mean for LTSA based values. CAISO believes a median is still appropriate because it is

⁸ CAISO, "Issue Paper, 2026 Variable Operations and Maintenance Cost Review", May 2026

less sensitive to unusually high or low negotiated values. Taking Option 1 for instance, even though the values in the LTSA-based dataset were reasonable and approved by CAISO, the influence of outliers specific to individual resources still exists and using a mean would inflate the default value. The default variable operations cost should be conservative to minimize excess revenues collected by market participants above actual costs, while also still being attractive for use in lieu of negotiating a value. Similarly for Option 3 the presence of outliers in the dataset supports a median value rather than a mean, however, this is not a recommended option.

Comments by NV Energy suggest that Option 2 is preferred because a variable operations cost based from all active negotiated values is more reflective of market operations. LTSA-based costs in Option 1 may be the result of negotiations between the owner/operator and service provider aiming to achieve goals unrelated to market operations. Moreover, the comments suggest that if values were negotiated directly with CAISO and approved, they are meant for market purposes. In CAISO's experience, the negotiations most reflective of actual variable operations costs for storage resources are LTSA-based. LTSA-based values provide transparency into the scope of costs covered and can be assessed for whether they are unrelated to market operations, while PPA-based values cannot. Projected-cost based values are more transparent than PPA-based but are not based on actual costs. Consequently, CAISO maintains the recommendation for Option 1 using the LTSA-based median value.

Comments were also submitted by CESA who suggest an inflation adjustment for the default variable operations cost similar to the adjustment being applied to the default VOM adders. CAISO does not plan to make an inflation adjustment to the default variable operations cost because the underlying dataset of active LTSA-based applications already factors in inflation. CAISO expects that variable operations costs negotiated by scheduling coordinators are up to date and reflective of ongoing operations costs including any inflation and performing an additional inflation adjustment may misrepresent the values negotiated by scheduling coordinators.

Proposal

In the past five years, the ISO has been gathering information on variable operations costs negotiated by storage resources. Currently, there are 61 active negotiated variable operations costs for storage resources. Table 3 and Table 4 summarize the 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
Projection	16	34.48	30.82
Total	61	23.25	19.43

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

CAISO provides four different options for the default variable operations cost for storage resources based on these data. CAISO proposes a \$14.74/MWh value based on Option 1. This value is the median of LTSA-supported negotiated values and is the CAISO-recommended option as LTSA based costs best represent actual costs since they are derived from the actual manufacture maintenance agreements.

CAISO recognizes that 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 is not true representation for their storage resources.

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 the majority of negotiations, representing 39 out of the 61 cases which is about 65% of total negotiations. In this category, the mean value is \$17.87/MWh while the median is \$14.74/MWh. CAISO considers LTSA-based variable operations cost more appropriate than PPA-based and projection-based as it comes directly from the manufacturer and is therefore more reflective of actual variable operations costs. CAISO also considers the median to be 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, i.e., \$14.74/MWh, to be the default variable operations cost.

Option 2: All active negotiated values

This option considers all active negotiated values including LTSA-based, PPA-based and projection 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. The default variable operations cost should be sufficiently conservative to avoid excess revenues collected by market participants above actual costs, while also still being attractive for use in lieu of negotiating a value.

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 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. 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

Option 4 proposes to make no changes and to continue using \$0/MWh variable operations cost if a value is not negotiated by the scheduling coordinator with CAISO. All negotiations will continue to be reviewed and recorded on an ongoing basis to ensure sufficient oversight and data collection. 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, CAISO will revisit the available options and determine whether proposing default variable operations costs for storage resources are 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.

VI. 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.

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 CAISO 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 7, 2026	Publish Straw Proposal
July 9, 2026	Stakeholder Call for Straw Proposal
July 23, 2026	Stakeholder comments due 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