



Stakeholder Comments Template

Variable Operations and Maintenance Cost Review Working Group – Solar and Wind Resources

This template has been created for submission of stakeholder comments on the VOM Cost Review working group for solar and wind resources that was held on July 19, 2019. The workshop, stakeholder meeting presentations, and other information related to this initiative may be found on the initiative webpage at:

<http://www.caiso.com/informed/Pages/StakeholderProcesses/VariableOperations-MaintenanceCostReview.aspx>.

Upon completion of this template, please submit it to initiativecomments@caiso.com. Submissions are requested by close of business on **August 2, 2019**.

Note: Upon submission, please indicate if you would like your comments to be confidential.

Submitted by	Organization	Date Submitted
<i>Nate Moore (425) 456-2622</i>	<i>Puget Sound Energy</i>	<i>August 2, 2019</i>

Please provide your organization’s comments on the following topics and questions.

- 1. Appendix A to this template contains a list of maintenance activities for solar and wind resources. What maintenance activities are missing from this list that should be included for consideration?**

Please see comments in Appendix A.

- 2. Appendix A also allocates the maintenance activities to three cost components (Major Maintenance [green], Other Maintenance – Variable [yellow], Other Maintenance – Fixed [red]). Please review and note whether you disagree with our proposed allocation and why.**

Please see comments in Appendix A.

3. Please provide any comments or updates you may have to the definitions of Major Maintenance Costs, Variable Operations Costs, and General and Administrative Costs, if any, listed in the July 2, 2019 report found on the stakeholder initiative website.

Fixed cost

Straight-time labor costs are incurred irrespective of the operational status of a unit or plant, and should be considered fixed at the baseline staffing level. Where staffing is supplemented for around-the-clock operations, whether by contractors or crew reassignment, then such labor costs should be considered variable.

Preventive maintenance, which is work regularly performed based on pre-determined time intervals to reduce the likelihood of functional failure, does not vary with energy production or run time and should be considered a fixed cost.

Routine inspections and performance monitoring during operations are performed regardless of energy production or run-time and should be considered a fixed cost. Maintenance work identified during such inspections should be considered variable.

Variable Operations

In addition to consumables, there may be other costs that are incurred only when a plant is operating that could be considered variable operations costs (e.g., production-based fees associated with permits, licenses or leases, or supplemental labor cost in support of plant operations).

Other Maintenance - Variable

Maintenance costs are not typically defined by the granularity of energy markets (day-ahead, hour-ahead, 15 minute, 5 minute), so defining them as “short-run” or “long-run” is not particularly relevant. It may be helpful to discuss maintenance costs in terms of corrective, preventive, and predictive maintenance and consider the drivers of those costs to determine what should be considered variable or fixed. Some maintenance costs (e.g., straight time labor) are unrelated to production. But other maintenance costs, such as repairing broken equipment (wear & tear and/or functional failures), are incurred only because a plant has operated, so are related to energy production and should be included in variable cost.

Corrective maintenance, which is work that is performed to restore performance or function after a failure has occurred, should be also considered a variable maintenance cost, because these expenditures would not be incurred if the plant had not operated.

Predictive maintenance should also be considered a variable maintenance cost. Predictive maintenance is work performed based on the results of inspection or performance monitoring to reduce the likelihood of functional failure. It is performed when functional deterioration is identified in order to maintain equipment performance and/or function.

Major Maintenance

The definition of major maintenance offered by CAISO in the Variable Operations and Maintenance Cost Definitions Report mentions only the prime mover (such as an engine or turbine), which is only a portion of the equipment that requires routine maintenance and prolonged outages. This is a significant limitation on costs related to run-hour production or startup of the unit. Examples of other equipment that should be considered for major maintenance costing include electrical generators, steam boilers, condensers, cooling towers, fuel handling/forwarding equipment, exhaust gas clean-up systems, and dams and waterways. Please align the written definition of major maintenance with Appendix A.

- 4. Please provide any comments or updates to the categories/sub-categories of generation technologies for VOM adders. Should the categories currently found in the CAISO BPM for Market Instruments be further disaggregated into sub-categories (e.g. Solar PV and Solar Thermal)?**

The existing category of Solar/Wind is sufficient. Market participants can negotiate specific default energy bids for particular plants if they deem it is necessary.

- 5. Please offer your feedback on structure of this stakeholder initiative and working groups.**

PSE appreciates CAISO's efforts to address the feedback that stakeholders provided about the Nexant report published in December 2018, and looks forward to working with CAISO and the other stakeholders as this initiative moves forward.

Additional comments

Please offer any other feedback your organization would like to provide on the topics discussed during the working group.

Appendix A:

Cost Component Allocation		
Major Maintenance	Other Maintenance - Variable	Other Maintenance - Fixed

Maintenance Activity	Please note if you disagree and why
Inspections, Repairs and Overhauls, and Replacements:	
1) Alignment Checks	Turbine-generator alignment should be considered Major Maintenance, accessory equipment alignment should be considered Other Maintenance - Variable.
2) Battery System	Agree
3) Bearings	Turbine Main Shaft and Generator bearing work should be considered Major maintenance, accessory equipment bearings should be considered Other Maintenance - Variable.
4) Clutches and Gears	Agree
5) Communication Systems	Agree
6) Device Calibrations	Agree
7) Distributed Control Systems	Depending on the scope of work, this work could be Major Maintenance or Other Maintenance – Variable
8) Generator Field Rewinds	Suggest this item be re-titled to “Generator.” While some issues can be serviced up-tower, wind turbine generators are not typically rewound in-situ. They are simply replaced allowing the failed generator to be rewound/rebuilt on the ground.
9) Panels, Inverters, and Trackers	Agree
10) Plant Electrical Systems	Depending on the scope of work, this work could be Major Maintenance, Other Maintenance – Variable, or Fixed.
11) Transformer	<p><u>Turbine Step-up Transformer:</u> Wind turbines will have a step-up transformer located on a pad at the base of the tower, or located up-tower per the design of the turbine manufacturer. Transformer maintenance in either case should be considered Major Maintenance.</p> <p><u>In the Substation:</u> Depending on the scope of work, this work could be Major Maintenance or Other Maintenance – Variable. For example, replacement of a bushing should be considered Major Maintenance. Replacement of a cooling fan should be considered Other Maintenance – Variable.</p>

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12) Turbine Blades	Depending on the scope of work, this work could be Major Maintenance or Other Maintenance – Variable. For example, recoating or taping the leading edge should be considered Major Maintenance. Repairing minor erosion damage should be considered Other Maintenance – Variable.
13) Vibration Analysis Monitoring	Agree

Other	
14) Balance-of-Plant	Depending on the component, this work should be considered Major Maintenance, Other Maintenance – Variable, or Fixed. For example, work on road maintenance or week control should be considered Fixed, while work on the dynamic VAR control system (power quality) should be considered either Major Maintenance or Other Maintenance – Variable.
15) Spare Parts	Spare parts may support Major Maintenance, Other Maintenance – Variable, and Fixed Maintenance activities, but cannot be classified prior to use.

Materials	
16) Instruments	Agree
17) Safety Equipment	Agree
18) Shop Supplies	Agree
19) Tools	Agree

Other Maintenance Activities for CAISO Consideration	
20) Aviation Warning Lights	This should be considered Fixed Maintenance
21) Met Towers	Depending on the scope of work, this work could be Major Maintenance, Other Maintenance – Variable, or Fixed. For example, replacement of data network cabling should be considered Major Maintenance. Replacement of an anemometer should be considered Other Maintenance – Variable. Replacement of tower lighting should be considered Fixed.
22) Hydraulic pressure system	This should be considered Major Maintenance.
23) Generator cooling system	This should be considered Major Maintenance.
24) Fire Protection system (up-tower)	This should be considered Fixed Maintenance.
25) Yaw system	Depending on the scope of work, this should be considered Major Maintenance or Other Maintenance – Variable.

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26) Pumps & Motors	Depending on the scope of work, this work could be Major Maintenance or Other Maintenance – Variable. For example, maintenance on the hydraulic pump or motor should be considered Major Maintenance. Replacement of yaw drives should be considered Other Maintenance – Variable.
27) Towers	This work should be considered Fixed Maintenance.
28) Underground Electrical Collection / Fiberoptic Data Lines	This work should be considered Major Maintenance.
29) Power Converter System (in tower)	This work should be considered Variable Maintenance - Other.
30) Oil Changes	This work should be considered Major Maintenance given the expense and lengthy outage required.