



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
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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?**

- 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.**

As noted in PGE’s comments on gas and hydro resources, maintenance activity costs are most easily classified as costs related to “wear-and-tear” from dispatch (i.e., repair money only spent if the unit is started up and/or operated) and “other” costs that ensure stand-by dispatchability (i.e.,

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money spent regardless of whether it operates 0 days or 1 month, 3 months or 12 months). PGE maintains that the first classification would be considered “variable” and the second would be considered “fixed.” It should be noted, however, that there will always be specific exceptions or hybrids to these classifications. PGE could classify some of the items listed as “variable” and “fixed” because it depends on the type of unit and the accounting of the operating profile of the asset in question, the age of the asset, the asset management strategy, and whether there is a service agreement in place with a maintenance provider.

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.

PGE agrees with the Variable Operations Cost and General and Administrative Cost definitions presented in this process. However, PGE is concerned with CAISO’s attempt to divide “Major Maintenance” and “Other Maintenance” costs based on how large the scale of the costs are and the frequency of spending. Separating “Major Maintenance” and “Other Maintenance” is difficult to defend because the frequency with which a generator owner performs repairs related to wear-and-tear is highly dependent. Factors influencing frequency include the asset age, the operating profile, equipment type, risk tolerance for reliability, and vendor agreements (if applicable).

Wear and tear for rotating/mechanical equipment is a variable (not fixed) operating expense in that it is only incurred in the production of power. This supports the idea of non-zero variable maintenance costs for both wind and PV with tracking systems. Presuming a zero VOM for these resources overlooks an asset management strategy that does preventative maintenance using production values (rather than time) as the driver for work.

First, wear and tear that drives major drivetrain component replacements (main bearing, gearbox, generator) is a function of torque and shaft RPM, which increases with turbine load. Often, operators will derate a turbine to prolong component life until it can be replaced during low wind periods. This inherently supports the idea that the VOM for wind resources can be production based (i.e., \$/MWh) and should not be assumed to be zero. Moreover, this variability in cost is further reflected in various sections of the National Renewable Energy Laboratory (NREL) Report that Nexant references on Page 6 of their December 2018 Report:

The parts that are considered candidates for replacement, including mechanical, electrical, and hydraulic components, are those that wear or deteriorate during use. Mechanical parts that experience any form of friction, contact, or flexure (e.g., bearings, seals, gears, diaphragms, brake and yaw pads) are all candidates, although, the failure rate can vary dramatically depending on the design life and duty cycle.¹

¹ <https://www.nrel.gov/docs/fy08osti/40581.pdf> (Page 14)

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The duty cycle for the contactors in a wind turbine varies widely depending on the device it is driving and the site conditions. Machines that come on and off line frequently, or with highly variable wind direction, will have a higher duty cycle and can expect contactors to wear faster.²

Second, variable operation costs for wind facilities can include royalties, that is the payments made to owners of the leased land that the wind facilities are sited on. These royalties can be production based, meaning that the appropriate place for inclusion would be in the Variable Operation and Maintenance Adder.

PGE similarly supports the inclusion of VOM costs for Solar PV resources. Consistent with PGE's comments regarding Storage Resources, PGE encourages the CAISO to preserve the option to represent wear and tear costs in a default VOM cost adder rather than to force a market participant to represent variable operations and maintenance via the utilization of the major maintenance or negotiated DEB process.

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)?

PGE recommends simplifying to the highest standard within reason. CAISO has a negotiated DEB option for those market participants seeking more specificity in their cost representation. However, at minimum, PGE supports the VOM cost adders proposed in the December 2018 report for Solar Thermal Power Plants with and without storage. PGE also recommends that CAISO include default cost adders for Solar PV Power Plants with and without tracking. Additionally, PGE strongly recommends that CAISO retain a VOM cost adder for wind generation (consistent with PGE's comments above).

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

PGE appreciates the opportunity to provide comments on the ISO's efforts to review the VOM cost adders and recognizes the challenges associated with identifying those maintenance activities that are directly linked to variable costs.

² <https://www.nrel.gov/docs/fy08osti/40581.pdf> (Appendix C, C-4)

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	
2) Battery System	
3) Bearings	
4) Clutches and Gears	
5) Communication Systems	
6) Device Calibrations	
7) Distributed Control Systems	
8) Generator Field Rewinds	
9) Panels, Inverters, and Trackers	
10) Plant Electrical Systems	
11) Transformer	
12) Turbine Blades	
13) Vibration Analysis Monitoring	

Other	
14) Balance-of-Plant	
15) Spare Parts	

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