



California ISO

Variable Operations and Maintenance Cost Review

Working Group 4 – Hydro Resources

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Purpose of Working Groups

- Goal 1: Offer definitions for comment for:
 - Major Maintenance Costs
 - Variable Operations Costs
 - General and Administrative Costs
- Goal 2: Seek stakeholder feedback on how to differentiate cost components from one another on a technology-specific level

Both goals will aid in the CAISO's updates to Variable Operations and Maintenance cost adder values and may result in addition of new definitions in the CAISO Tariff or BPM

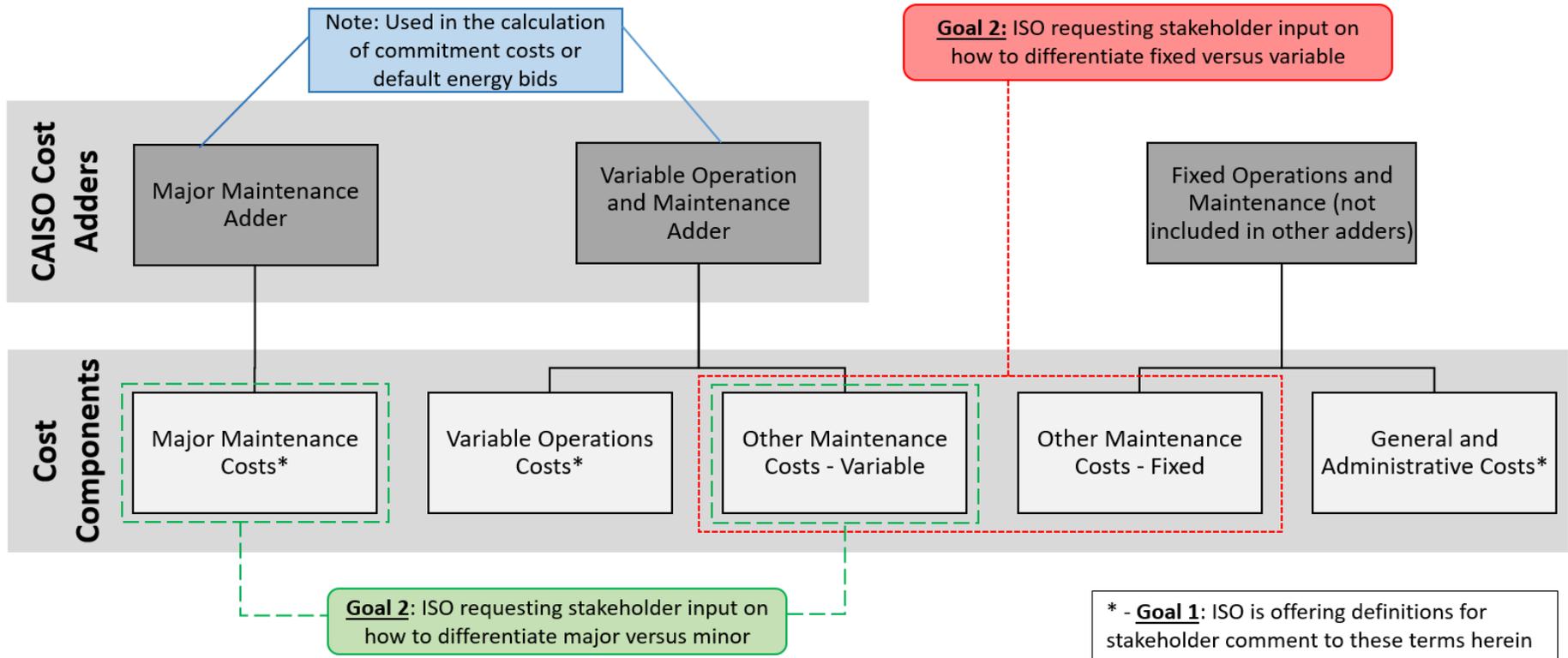
Background

- The CAISO has committed to revisit Variable O&M (VOM) adder values once every three years
- In December 2018, the CAISO and Nexant published a report proposing updates to VOM adder values that had been in place since 2012
- Stakeholders noted a lack of definitions for major maintenance and variable operations and maintenance in the CAISO Tariff and other issues with the values
 - Concerns were also raised about hydro resources being listed as “Plants without Variable Operations and Maintenance Costs”

Cost Components

- To aid in the discussion of the gray areas in the process of differentiating costs, CAISO is introducing some new cost component terms:
 - General and Administrative (G&A)
 - Variable Operations (VO)
 - Major Maintenance (MM)
 - Other Maintenance (OM)
 - Other Maintenance - Variable
 - Other Maintenance - Fixed

Cost Components and Cost Adders



The Low-Hanging Fruit

General & Administrative Costs

- General and Administrative costs are those costs incurred at a power plant that *do not vary with and/or relate to production.*
- These costs include:
 - Leasing or rental costs
 - Property taxes
 - Insurance
 - Industry-related fees and costs

The Low-Hanging Fruit

Variable Operations Costs

- Costs of consumables *associated directly with the electrical production* of a generating unit and *specifically exclude both maintenance and fuel costs.*
- These costs include:
 - Consumable materials and supplies

Major Maintenance Costs

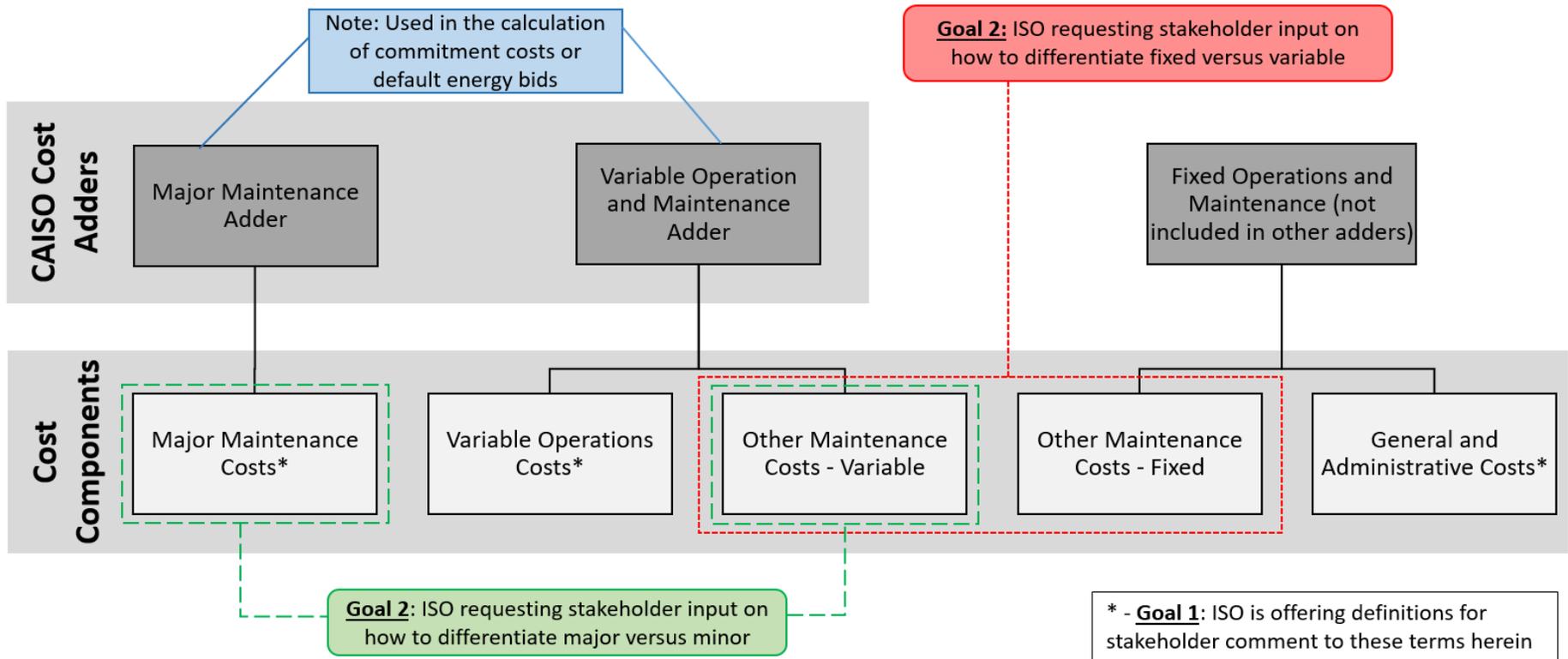
- Costs associated with *extensive maintenance of a generating unit* that cannot be done as part of routine maintenance. Major maintenance costs must be *associated with electrical production* of the generating unit such that the costs can be *related to run-hour production or the startup* of the generating unit.
- Major maintenance is an existing concept in the CAISO Tariff and an adder already exists for these costs

The Tricky Part

Other Maintenance Costs

- Other Maintenance costs are maintenance costs which *do not require the generator to undergo an extensive outage* and may be characterized as *fixed or variable*.
- Challenges:
 - Long-term Service and Power Purchase Agreements
 - Fixed \$ values covers all maintenance – variable and fixed
 - Predictive vs Corrective vs Preventative

Cost Components and Cost Adders



Previous VOM Adder Values

Currently used in CAISO markets

Generation Technology	Recommended VOM Cost Adder (\$/MWh)
Hydro	\$2.50

Proposed in December 2018

- Hydro and pumped storage units listed as “Plants without Variable Operations and Maintenance Costs” – i.e. a \$0/MWh adder value

Note: VOM adders are used in cost-based DEB and min load cost calculation. They are not used in Hydro DEB option (Fall 2019), which only accounts for opportunity costs for hydro resources with storage.

Maintenance Costs - Discussion

Inspections, Repairs and Overhauls, and Replacements:	
1) Bearings and Bushings	9) Main Turbines and Water Wheels
2) Communication Systems	10) Plant Electrical Systems
3) Distributed Control Systems	11) Runner Seals
4) Exciter Water Wheels and Turbines	12) Servomotors
5) Generator Cooling System	13) Shaft Sleeves and Seals
6) Generator Field Rewinds	14) Valves
7) Lubricating Systems	15) Wicket Gate Seals
8) Main Penstock Valves and Appurtenances	

Other	
16) Balance-of-Plant	

Materials	
17) Instruments	19) Shop Supplies
18) Safety Equipment	20) Tools

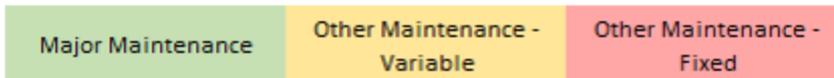


Maintenance Costs – Example Proposal

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Proposed Next Steps

After today's discussion, we'd like stakeholders to reflect on what was discussed and submit in writing:

- Maintenance activities missing that should be included in the future
- Which cost component the maintenance activities discussed should belong in
- Proposals for updates to definitions
- Feedback on structure of this stakeholder initiative and working groups

Send emails to initiativecomments@caiso.com by 8/2

Please note if you'd like your comments to be confidential