



Maintenance and Operating Cost (VOM) Adder Review Guidelines

PJM Interconnection Version 2: 4/27/2023

For Public Use

The following checklist is an example of how VOM template is reviewed by PJM staff.

- Maintenance Adder Template - Contact Information (Name, phone number, email, unit information including ID and name)

Unit Name: _____ Unit ID #: _____
Market Seller: _____ Contact: _____

- Major Maintenance Adder Template - Section 1
 - All costs included are directly related to electric production. Verify M15 allowed major component
 - steam turbines generators boilers HRSGs
 - reactor engine gas turbine hydro turbines
 - Upgrades can only be included if they are a replacement of obsolete equipment¹
 - For Long Term Service Agreements (LTSA), only actual expended costs can be included (No future costs)
 - For LTSA, only variable fees (based on # of starts, # of hours, or # equivalent hours) can be included
 - LTSA must have support contract/agreement submitted
 - Costs not directly related to electric production may not be included (verify M15 un-allowed systems)
 - No straight-time labor – Overtime is allowed except for operators
 - FERC Accounts – Verify FERC accounts are 512, 513, or 553
- Major Maintenance Adder Template - Section 2
 - Verify current year dollars match Section 1 total dollars
 - Maintenance history – 10 or 20 years
 - Operating history – must be at least 10 years, only immature unit can have less than 10 years
 - Review maintenance history for outliers
 - Units in Equivalent Service Hours (ESH) – Verify Cyclic Starting and Peaking Factors documentation
- Major Maintenance Adder Template - Adder
 - Verify any changes to final number
 - Verify Handy Whitman Index is still locked and has not been changed
 - Compare value to previous year (if applicable)
 - If the unit is a black start using 1% of total maintenance cost verify maintenance adder has been reduced 1% and Minor Maintenance Adder template filled out

- Minor Maintenance Adder Template - Section 1
 - All costs included are directly related to electric production. Verify M15 allowed system
 - main steam feed water condensate condensers
 - cooling towers transformers fuel systems
 - Upgrades can only be included if they are a replacement of obsolete equipment
 - LTSA expenses cannot be included in minor maintenance template
 - Costs not directly related to electric production may not be included (verify M15 un-allowed systems)
 - No straight-time labor – Overtime is allowed except for operators
 - FERC Accounts – Verify FERC accounts are 512, 513, or 553
- Maintenance Adder Template - Section 2
 - Verify current year dollars match Section 1 total dollars
 - Maintenance history – 10 or 20 years
 - Only immature unit can have less than 10 years
 - Review maintenance history for outliers
 - Cannot use Equivalent Service Hours (ESH) for minor maintenance
- Maintenance Adder Template - Adder
 - Verify any changes to final number

¹ For the purposes of the Maintenance Adder review, obsolete shall mean any equipment that can no longer be purchased due to discontinuance.

- Verify Handy Whitman Index is still locked and has not been changed
- Compare value to previous year (if applicable)
- Cannot use 1% of total maintenance cost if no unit-specific template submitted

- Operating Cost Adder Template - Contact Information (Name, phone number, email, unit information including ID and name)

Unit Name: _____ Unit ID #: _____
Market Seller: _____ Contact: _____

- Operating Cost Adder Template – Section 1
 - Only M15 allowed consumable costs can be included
 - lubricants chemicals limestone trona
 - ammonia acids caustics water injection
 - activated carbon for mercury control demineralizers usage
 - Title V – only variable costs

- Operating Cost Adder Template – Section 2
 - Verify current year dollars match Section 1 total dollars
 - History is limited to 60 months
 - Escalation only if history is greater than 12 months

- Operating Cost Adder Template - Adder
 - Verify any changes to final number
 - Verify Handy Whitman Index is still locked and has not been changed
 - Compare to previous year (if applicable)

INTRODUCTION

This document is intended to provide general guidance for the review of Maintenance and Operating Cost Adders. The provisions in PJM's Operating Agreement, Schedule 2 allow Market Sellers to include Maintenance and Operating Cost Adders as components of the cost-based energy offer. Market Sellers must submit these adders to PJM, at least annually, for review and they must be changed if they are no longer accurate. Detailed descriptions of allowable costs are contained in Manual 15 "Cost Development Guidelines".

Maintenance Adders are expenses directly related to electric production and must be a function of starts and/or run hours. Allowable expenses may include repair, replacement, and major inspection, and overhaul expenses including variable long term service agreement expenses. Operating Costs are expenses related to consumable materials used during unit operation and include, but are not limited to, lubricants, chemicals, limestone, trona, ammonia, acids, caustics, water injection, activated carbon for mercury control, and demineralizers usage. Maintenance Adders and Operating Costs cannot include any costs that are included in the generation resource's Avoidable Cost Rate pursuant to Tariff, Attachment DD, Section 6.8(c).

The combination of Maintenance and Operating Cost Adders is often referred to as Variable Operating and Maintenance costs (VOM).

Market Sellers submit Maintenance and Operating Cost Adders to PJM for review using the templates posted at <https://www.pjm.com/markets-and-operations/energy/fuel-cost-policies.aspx>.

MAINTENANCE ADDER TEMPLATE

MAINTENANCE ADDER TEMPLATE – UNIT INFORMATION

Market Sellers shall provide the Market Seller's Company Name, Contact Name, Contact Email, Contact Phone Number and Market Unit ID and Name, ICAP MW, as requested.

Market Sellers shall provide Unit Technology Type (i.e. CT, CC, fossil steam, reciprocating engine, ect). The Market Seller can use one Maintenance Adder for multiple units at the same generating plant only when units are the same technology type, such as aero-derivative CT. And the Market Seller must include total operating history for all units (for example, total operating hours for unit 1 plus total operating hours for unit 2 plus total operating hours for unit 3).

Market Sellers can select 'Y' to Use 1% Maintenance Adder as VARIABLE BLACK START SERVICE COST. If selected 'Y', Market Sellers shall provide the number of black start units and number of total units of the template and the Maintenance Adder for black start units will be adjusted with 1% reduced. Market Sellers that are using the default minor maintenance adder for black start service units shall not use 1% of the total maintenance dollars as part of their black start service annual revenue requirement.

MAJOR MAINTENANCE ADDER TEMPLATE – SECTION 1

Allowable Expenses

Market Sellers should list all maintenance expenses from the previous year that are overhauls, repairs, or refurbishments that require disassembly to complete. This can include repair, replacement, inspection, and overhaul expenses, including Long Term Service Agreements (LTSA), related to the:

- steam turbines
- generators
- boilers
- HRSGs
- reactor
- gas/combustion turbine
- engine
- hydro turbine

Expenses should be listed by category, project, maintenance activity, and/or FERC account and include a short description of the maintenance activities included.

Examples of major maintenance include:

- turbine blade repair/replacement
- turbine diaphragm repair
- turbine casing repair/replacement
- turbine bearing repair/refurbishment
- turbine seal repair/replacement and generator refurbishment
- compressor blade repair/replacement
- hot gas path inspections, repairs, or replacements
- steam stop valve repairs
- steam throttle valve repairs
- steam nozzle block repairs
- steam intercept valve repairs
- generator stator or rotor rewind, refurbishment, or replacement
- scrubber refurbishment
- water wall panel replacement
- pendant or super heater replacement
- economizer replacement
- diesel/reciprocating engine overhaul
- reactor refueling
- steam generator overhaul/replacement

MINOR MAINTENANCE ADDER TEMPLATE – SECTION 1

Allowable Expenses

Market Sellers should list all maintenance expenses from the previous year that are repairs or refurbishments on equipment and components directly related to electric production and not otherwise classified as major maintenance. This can include repair, replacement, and inspection, related to the:

- main steam
- feed water
- condensate
- condensers
- cooling towers
- transformers
- fuel systems

Examples of minor maintenance include:

- heat transfer replacement and cleaning
- cooling tower fan motor and gearbox inspection
- cooling tower fill and drift eliminators replacement
- air filter replacement
- repair and replacement of valves and piping components
- repair and replacement of control equipment
- repair and replacement of pumps
- repair and replacement of motors
- repair and replacement of condenser components
- repair and replacement of transformers
- repair and replacement of cabling
- repair and replacement of breakers
- repair and replacement of motor control centers
- repair and replacement of switch gear
- repair and replacement of fuel and ash handling
- repair and replacement of selective catalytic reduction and scrubber emission control equipment and components
- repair and replacement of mills burners
- repair and replacement of boiler components
- repair and replacement of fan components
- repair and replacement of reactor recirculation components
- repair and replacement of hydraulic control rod drive system components
- repair and replacement of reactor components

Expenses should be listed by category, project, maintenance activity, and/or FERC account and include a short description of the maintenance activities included.

Un-allowable Expenses

Market Sellers cannot include any fixed costs that can be included in the unit's capacity offer or Avoidable Cost Rate (ACR). Examples including annual or time-based, preventative maintenance (vibration surveys, oil sampling, infrared surveys, conditioning monitoring, annual condenser cleaning, weekly filter changes, annual or monthly CT borescope inspection, etc.), buildings, HVAC, compressed air, closed cooling water, heat tracing/freeze protection, control room equipment and software, reactor safety system and plant water treatment systems. Typically, if the system is needed to remain in-service when the unit is not in operation, expenses related to it cannot be included in a unit's cost based offer.

Expenses for repairs and or replacements due to weather events also cannot be included in a unit's maintenance history, Items that have failed, for example, due to a lightning strike or external weather corrosion are not directly related to electric production.

Long Term Service Agreement (LTSA) costs

LTSA costs can be included if they are variable costs based on either operating hours or number of starts and the dollar value is set specifically in the LTSA.

LTSA costs can only be included in Major Maintenance Adder template. When LTSA costs are included, the Market Seller shall use the format of adder consistent with the variable maintenance payment criteria (i.e. \$/starts, \$/hours, etc.) specified in LTSA.

The adder format shall be consistent with the maintenance expense and is a function of units starts or run hours. For example, if the maintenance expenses are a function of starts, the Maintenance Adder shall be in \$/start.

Units that have LTSA or OEM documentation which specifies N-Ratio (i.e. run hours divided by number of starts) for maintenance payments will apply those in consistent manner in submitting Maintenance Adder. For example, a Market Seller allocates the dollars charged based on starts and divide by total starts to get a \$/start adder; and allocates the other dollars charge based on hours and divide by total hours to get a \$/hour adder.

LTSA's must be provided to PJM and the IMM in accordance with the Manual 15 Section 1.8 Cost Methodology and Approval Process. LTSA costs must be incurred before they can be included.

Labor Expenses

Market Sellers cannot include normal plant staffing labor in maintenance expenses, as these costs are included in the unit's capacity offer. Only staff overtime and/or contractor labor related to maintenance activities can be included.

FERC Accounts

Market Sellers can use FERC account expenses if they are directly related to electrical production. Market Sellers using FERC Accounts must remove straight-time labor expenses from the accounts as those costs are typically included in the unit's capacity offer. Some FERC accounts may include items that may not be included in the cost-based offer and these expenses must be removed in the Maintenance Adder

submission. Please note that FERC accounts do not define whether costs are includable in energy market cost-based offers.

Configuration Addition Maintenance Adder

Market Sellers that are using configuration addition maintenance adders should submit incremental costs and historical data as a separate sheet of the Multi-sheet Template.

Supporting Documentation

Market Sellers must submit supporting documentation for all year's costs. Acceptable supporting documentation includes work orders from the maintenance management system, maintenance records, invoices, time sheets, and or procurement card receipts. Supporting documentations for maintenance expenses shall include the work order and/or description of maintenance activities performed. Supporting documentations for operating costs shall include the amount of each consumable used while in operation, and the cost per unit of each consumable.

Operating Costs

Operating Costs have replaced Other Fuel Related Costs in Manual 15. Operating Costs should not be included in the maintenance adder calculation. Market Sellers should include these costs in the separate sheet labeled Operating Costs.

MAINTENANCE ADDER TEMPLATE – SECTION 2

Market Sellers must use either 10 years or 20 years of historical data when calculating a unit's maintenance adder. Any unit with fewer than 10 years of historical maintenance costs is considered an immature unit. Immature Units should select 10 years and input all available operating history data. Market Sellers providing more than 10 years of historical maintenance costs can select 10-year or 20-year as maintenance period. If 10-year is selected, only the most recent 10 years of historical maintenance costs shall be included in calculating the maintenance adder; if 20-year is selected, all provided historical maintenance costs shall be included in calculating the maintenance adder. Immature Units with less than one calendar year of operating history may use the default minor maintenance adder posted on PJM website.

Major Maintenance Adder template shall include a minimum of 10 years of operating history. The years that did not perform major maintenance shall be entered \$0 for maintenance annual dollars. New units with Major Maintenance expenses and less than 10 years of operating history will use all available operating history and submit a new template annually until they achieve the selected 10-year or 20 year maintenance period.

Maintenance History

Market Sellers should enter annual maintenance dollars for each year of the selected period under Maintenance History. All expenses included in the maintenance history shall conform to the requirements of Section 1 above. Market Sellers that wish to have multiple maintenance adders (i.e. \$/MWh and \$/start) must submit the multiple sheet template that is available from [Fuel Cost Policies page](#).

Market Sellers must only enter historical maintenance costs for years for which supporting documentations exist. If a Market Seller has years without supporting documentation, the historical maintenance costs for those years should not be included. For example, a unit transferred ownership and the new owner does not have supporting documentations prior to the transfer date for the unit, the new owner would not enter maintenance costs for years prior to the transfer of the unit. The new owner should include maintenance and operating costs for which supporting documentation is available. Operating history must reflect at least 10 (up to 20) years.

The 10 year or 20 year maintenance history should be reviewed for consistency. Spikes in the maintenance history should reflect major maintenance such as turbine, or boiler overhauls on a 6 to 10 year period for base load plants and 10 years or longer for peaking plants. Market Sellers should be questioned on historical years where the maintenance dollars and operating history seem to be significantly different from other years.

Operating History

Market Sellers should enter the appropriate operating history for each year that maintenance dollars are provided. Maintenance adders can be calculated on \$/MWh, \$/mmBTU, \$/hr, \$/ESH, or \$/start basis. If the maintenance adder is in \$/MWh, the Operating History must be entered as the annual positive generation (MWh) of the unit. Negative station service MWh when the unit is offline should be excluded². If

² Positive generation of the unit can be found in the historic Power Meter submittals for the unit. MSRS reports can be used to find these values.

the maintenance adder is in \$/mmBTU, the Operating History should be entered as the annual fuel consumption (mmBTU) of the unit. If the maintenance adder is in \$/hr, the Operating History should be entered as the annual operating hours (hrs). If the maintenance adder is in \$/start, the Operating History should be entered as the annual starts (starts) of the unit. If the maintenance adder is in \$/ESH, the Operating History should be entered in equivalent service hours (ESH) of the unit, Market Sellers must also provide the cyclic starting and peaking factors used. ESH can only be selected from Major Maintenance Adder template.

Cyclic Peaking and Cyclic Starting Factors

M15 Sections 5.6.3 and 6.6.3 allow combined cycle and combustion turbine units to use cyclic starting and cyclic peaking factors if they have submitted their maintenance history in units of \$/ESH. Cyclic starting and peaking factors convert starts and peak hours into base load operating hours. For example, if a cyclic starting factor is 10, one start is equivalent to 10 base load hours. Some OEMs use ESH to trigger when a major overhaul should be performed. These are typically found in OEM or LTSA documentation under “equivalent hours”, “equivalent starts”, “factored hours”, or “factored starts”.

Only OEM or LTSA-specified cyclic starting and peaking factors can be applied to the Maintenance Adder. Cyclic Fuel Factors can be used in the calculation of ESH if specified in the LTSA or OEM. Multiple cyclic peaking factors can be included in the calculation of ESH if specified in the LTSA or OEM.

In most cases, if the cyclic peaking or starting factors are not found in OEM or LTSA documentation it's because the unit does not have cyclic factors and therefore are equal to Zero. For example, most aero-derivative combustion turbines like Pratt & Whitney FT-4s do not have cyclic starting factors.

Multiple Maintenance Adders

Multiple Maintenance Adders cannot be used unless multiple variable maintenance payment criteria (specified in both starts and hours or starts/hours ratios, etc.) specified in LTSA. If multiple Maintenance Adders are used for the same unit(s), the total maintenance costs must be split into multiple Maintenance Adders to prevent double counting. For example, LTSA's guidance on overhauls for some of their combustion turbines specifies that overhauls should take place whenever the unit reaches either a set number of operating hours or a set number of starts. In some cases, it may be difficult for the Market Seller to determine which unit of measure to use. Market Sellers could split a \$2M maintenance history as \$1M in \$/hour and \$1M in \$/starts.

Note: Once a Market Seller submits a set of Maintenance Adders with specific units of measure for review, it must stay with those units until the next review period.

Handy Whitman

Historical maintenance costs are escalated by the Handy Whitman escalation factor to current year dollars (see M15 section 2.6.1). Market Sellers cannot change the Handy Whitman index provided in the template.

Units with Tolling Agreements

A Market Seller with tolling agreement must use zero for the default minor maintenance adder, but may include the variable tolling fees in the Maintenance Adder.

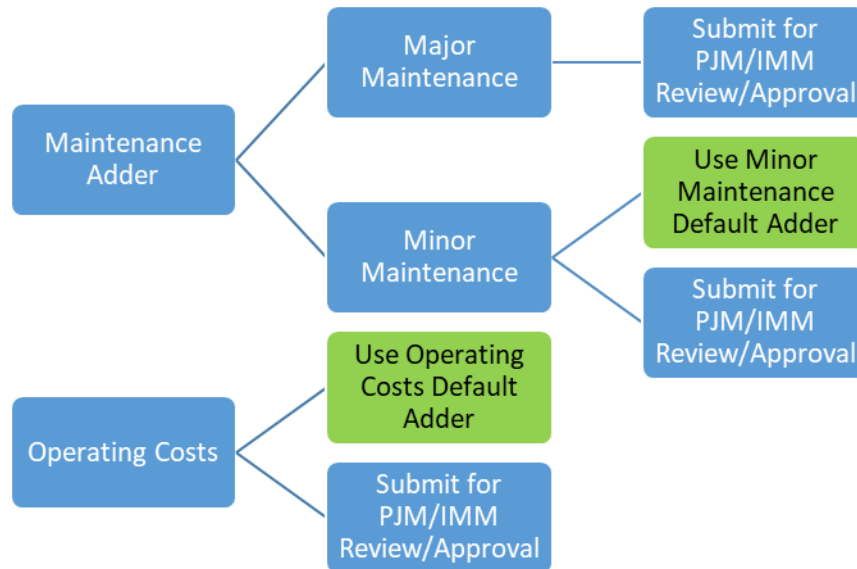
MAJOR MAINTENANCE ADDER TEMPLATE – MAINTENANCE ADDER

Market Sellers can only use the Major Maintenance Adder listed once it has been reviewed and accepted by PJM. Major Maintenance Adder template shall be submitted for PJM review whenever major maintenance costs are added to or removed from the maintenance period.

MINOR MAINTENANCE ADDER TEMPLATE – MAINTENANCE ADDER

The default minor maintenance adder may be included in the cost-based energy offer if available. Market Sellers that are using the default minor maintenance adder should not submit a Minor Maintenance Adder template.

A Market Seller may submit a Minor Maintenance Adder template if the unit does not have a default minor maintenance adder available for its technology type or the Market Seller elects not to use the default minor maintenance adder. Market Sellers can only use the Minor Maintenance Adder listed once it has been reviewed and accepted by PJM.



OPERATING COST TEMPLATE

OPEPRATING COST TEMPLATE – UNIT INFORMATION

Market Sellers shall provide the Market Seller's Company Name, Contact Name, Contact Email, Contact Phone Number and Market Unit ID and Name as requested.

OPERATING COST TEMPLATE – SECTION 1

Operating Costs have replaced Other Fuel Related Costs in Manual 15. Operating Costs may be calculated on a fixed or rolling average of values from one to five years in length, reviewed annually or a rolling average from twelve to sixty months in length, reviewed and updated if changed monthly.

Market Sellers shall provide an itemized breakdown of Operating Costs from the previous year. Operating Costs can include, lubricants, chemicals, limestone, trona, ammonia, acids, caustics, water injection, ash disposal, and waste disposal and demineralizer costs. Costs should be listed by category, maintenance activity, and/or FERC account, and include a short description of the items included.

OPERATING COST TEMPLATE – SECTION 2

Market Sellers may use up to the most recent 5 years of historical costs when calculating a unit's Operating Costs.

Operating Costs can only be calculated on \$/MWh or \$/mmBTU basis.

Market Sellers should enter annual Operating Costs for each year that has available Operating Cost History. If less than 1 year of data is available and entered, the length of time for which data is available should be entered as a note for the first year. All costs included in the history shall conform to the requirements of Section 1 above. When submitting an Operating History of MWh, only positive generation (MWh) of the unit should be included. Negative station service MWh when the unit is offline should be excluded.

Immature Units

Unit owners with less than one calendar year of operating history (either new or transferred units) may choose to use the default operating costs adder posted on PJM website for their unit's technology type and shall not be required to submit an Operating Costs template.

Handy Whitman

Operating Costs can be escalated by the Handy Whitman escalation factor when the term of the calculation exceeds twelve months. (See M15 section 2.3.3).

OPERATING COST TEMPLATE – OPERATING COST ADDER

If Market Sellers elect to submit an Operating Costs template for PJM review, Market Sellers can only use the Operating Costs adder listed once it has been reviewed and approved by PJM. Market Sellers elect to use the default operating costs adder should not submit an operating costs template.

SPECIAL CASES

The following paragraphs provide guidance for special cases encountered during the maintenance and operating cost adder review process.

Equipment Upgrades

Upgrades or replacement of existing equipment with capital upgrades/enhancements typically cannot be included in the calculation of a unit's maintenance adder. These are typically included in a unit's capacity offer via Avoidable Project Investment Recovery Rate (APIR).

Examples of upgrades that cannot be included are:

- 1) The addition of an SCR;
- 2) Replacement of steam turbine blades with the latest tilted twisted design;
- 3) Addition of emission control equipment; or
- 4) Addition of water sprays on a CT for power augmentation.

Note: If the equipment is being upgraded because the original equipment is obsolete and can no longer be procured, this expense is considered a replacement and can be included. The most common example of this is the replacement of a flow control actuator with a new design when the old design is no longer available.

Preventive Maintenance, Periodic Testing and Inspections

Preventive Maintenance costs such as oil analysis, vibration surveys, or time based replacements cannot be included in the calculation of the maintenance adder. Periodic testing or inspections if done on a time basis also cannot be included i.e. changed or performed monthly.

Title V Emission Costs

Title V emissions permits may contain a fixed and/or variable cost component. Only the variable portion may be included in the unit's operating cost. This is typically represented as a \$/MW, \$/start, or \$/hour cost.

Controls

Maintenance on control equipment located in the control room like computers, monitors, recorders, and software cannot be included. However control equipment on the includable systems listed above located in the field like control valves, actuators, temperature probes, pressure transmitters, and PLCs can be included on the maintenance template.

The completion of this review does not preclude any potential penalty that may be assessed in the event PJM later determines, with input from the Market Monitor, that the Maintenance Adder and Operating Cost includes charges that are not in compliance with Operating Agreement, Schedule 2.

Revision History

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Author: Roger Cao

Reviewer: Thomas Hauske

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Reviewer: Thomas Hauske

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