Variable Operations and Maintenance (VOM) Costs Education

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Operating Agreement Schedule 2 – Components of Cost

Market Sellers can include the following incremental costs in a generator's cost-based energy offer:

- Incremental Fuel Cost
- Incremental Maintenance Cost
- No-Load cost during periods of operation
- Incremental labor cost
- Emission allowances/adders
- Variable operations and maintenance adders
- Ten percent adder
- Other incremental operating cost

Operating Agreement Schedule 2 – Maintenance Adders

Maintenance Adders cannot include any costs that are included in a generation resource's Avoidable Cost Rate

Section 2.6

- "*Variable Maintenance Cost is the parts and labor expenses of maintaining equipment and facilities in satisfactory operating condition.*"
- *"Only expenses incurred as a result of electric production qualify for inclusion."*
- *The Maintenance Adder should be reviewed (and updated if changed) at least annually.*

Sections 5.6.2 & 6.6.2

- *CC/CT Plant major inspection and overhaul expenses after being previously evaluated and approved, may be included until June 1, 2015 in variable maintenance expenses.*

(a) Avoidable Cost Rate = [Adjustment Factor * (AOML + AAE + AFAE +AME + AVE + ATFI + ACC + ACLE) + ARPIR + APIR + CPQR]

- Adjustment Factor = 1.1 to provide margin of error for understatement of costs
- AOML is Avoidable Operations and Maintenance Labor
- AAE is Avoidable Administrative Expenses
- AFAE is Avoidable Fuel Availability Expenses
- AME is Avoidable Maintenance Expenses

Avoidable Cost Rate – Attachment DD Section 6.8

- AVE is Avoidable Variable Expenses
- ATFI is Avoidable Taxes, Fees and Insurance
- ACC is Avoidable Carrying Charges
- ACLE is Avoidable Corporate Level Expenses
- ARPIR is Avoidable Refunds of Project Investment Reimbursements
- APIR is Avoidable Project Investment Recovery Rate
- CPQR is Capacity Performance Quantifiable Risk

Avoidable Cost Rate – Attachment DD Section 6.8

(b) For the purpose of determining an Avoidable Cost Rate, avoidable expenses are incremental expenses directly required to operate a Generation Capacity Resource that a Generation Owner would not incur if such generating unit did not operate in the Delivery Year or meet Availability criteria during Peak-Hour Periods during the Delivery Year.

Avoidable Cost Rate – Attachment DD Section 6.8

(c) For the purposes of determining an Avoidable Cost Rate, avoidable expenses shall exclude variable costs recoverable under cost-based offers to sell energy from operating capacity on the PJM Interchange Energy Market under the Operating Agreement.

Avoidable Cost Rate – Attachment DD Section 6.8

(d) Projected PJM Market Revenues for any Generation Capacity Resource to which the Avoidable Cost Rate is applied shall include all actual unit-specific revenues from PJM energy markets, ancillary services, and unit-specific bilateral contracts from such Generation Capacity Resource, net of *energy and ancillary services market offers for such resource. Net energy market revenues shall be based on the non-zero market-based offers of the Capacity Market Seller of such Generation Capacity Resource unless one of the following conditions is met, in which case the cost-based offer shall be used …*

Avoidable Operations and Maintenance Labor

AOML consists of the avoidable labor expenses related directly to operations and maintenance of the generating unit for the twelve months preceding the month in which the data must be provided. The categories of expenses included in AOML are those incurred for: (a) on-site based labor engaged in operations and maintenance activities; (b) off-site based labor engaged in on-site operations and maintenance activities directly related to the generating unit; and (c) off-site based labor engaged in off-site operations and maintenance activities directly related to generating unit equipment removed from the generating unit site.

Avoidable Administrative Expenses

AME consists of the avoidable administrative expenses related directly to employees at the generating unit for twelve months preceding the month in which the data must be provided. The categories of expenses included in AAE are those incurred for: (a) employee expenses (except employee expenses included in AOML); (b) environmental fees; (c) safety and operator training; (d) office supplies; (e) communications; and (f) annual plant test, inspection and analysis.

Avoidable Maintenance Expenses

AME consists of avoidable maintenance expenses (other than expenses included in AOML) related directly to the generating unit for the twelve months preceding the month in which the data must be provided. The categories of expenses included in AME are those incurred for: (a) chemical and materials consumed during maintenance of the generating unit; and (b) rented maintenance equipment used to maintain the generating unit.

Avoidable Variable Expenses

AVE consists of avoidable variable expenses related directly to the generating unit incurred in the twelve months preceding the month in which the data must be provided. The categories of expenses included in AVE are those incurred for: (a) water treatment chemicals and lubricants; (b) water, gas, and electric service (not for power generation); and (c) waste water treatment.

Maintenance Cost included in Cost of New Entry (CONE)

- From 2014 Brattle “Cost of New Entry Estimates for Combustion Turbine and Combined Cycle Plants in PJM”
  - Fixed O&M included (labor, materials, contract services for routine O&M, and administrative and general costs
  - Variable O&M costs are not used in calculating CONE
    - the largest component of variable O&M is the allowance for major maintenance expenses

Maintenance Costs

NOT RUN

ACR

Avoidable Cost Rates

FIXED
Avoidable costs

- Plant Staff
- Taxes
- Fees
- Insurance
- Carrying Charges
- Fuel Availability

RUN

VOM-M15

Variable Operations and Maintenance – Manual 15

TWO TO TEN YEARS
Major overhauls and inspections

- CT Hot Gas Path Inspections
- Turbine Overhaul
- Boiler Overhaul
- CT and CC Excluded June 15, 2015

ANNUAL
Annual repairs from operating

- Pump/Valve Repair
- Boiler Tube Leak Repair
- CT Air Filter Replacement

OPERATING DAY
Short run marginal cost

- Short Run Marginal Cost
- Water
- Chemicals
- Consumables

Manual 15: Maintenance Adder Calculation

- Maintenance Adders are calculated by:
  - determining annual maintenance cost for each year of the selected maintenance period
  - using escalation indexes for normalizing annual maintenance cost for previous years
  - calculating Equivalent Hourly Maintenance Cost

M15: Total Maintenance Cost

$$\text{Total Maintenance Cost}_{\text{next year}} =$$

$$\left(\text{Annual Maintenance Cost} * \frac{\text{Escalation Index}^{\text{next year}}}{\text{Escalation Index}^{\text{current year}}}\right) +$$

$$\left(\text{Annual Maintenance Cost} * \frac{\text{Escalation Index}^{\text{next year}}}{\text{Escalation Index}^{\text{last year}}}\right) +$$

$$\left(\text{Annual Maintenance Cost} * \frac{\text{Escalation Index}^{\text{next year}}}{\text{Escalation Index}^{\text{last year}-1}}\right) +$$

$$\ldots + \left(\text{Annual Maintenance Cost} * \frac{\text{Escalation Factor}^{\text{next year}}}{\text{Escalation Index}^{\text{last year}-(\text{maintenance period}-1)}}\right)$$

Escalation index derived from July 1 Handy – Whitman Index Table E-1, Line 6, “construction cost electrical plant”

- A unit must choose a rolling historical period based on calendar year.
- A unit may choose a 10-year or 20-year period for maintenance cost.
- A unit can only change this period after a significant unit configuration change.

Manual 15: Equivalent Hourly Maintenance Cost

Equivalent Hourly Maintenance Cost is the total maintenance dollars divided by equivalent service hours or total fuel, depending on the unit type.

$$\text{Equivalent Hourly Maintenance Cost (\$/Hour)} = \frac{\text{Total Maintenance Dollars}}{\text{Equivalent Service Hours}}$$

Or

$$\text{Equivalent Hourly Maintenance Cost (\$/mmbtu)} = \frac{\text{Total Maintenance Dollars}}{\text{Total Fuel}}$$

Immature Units – Units with neither 10 years of operation nor 50,000 Operating Hours

- Immature Units should use a blend of actual, calculated, or forecasted costs. The weighted blend should be based on the ratio of historical operating hours to projected hours to meet 50,000 hours or achieving ten years of operation whichever comes first.

- FERC Accounts are referenced for maintenance adders for nuclear, fossil, combined cycle, and combustion turbine/diesel units.
- FERC Accounts may no longer be applicable due to rule changes for RPM/ACR.
  - Market Sellers using FERC Accounts must verify that costs were not also included in the unit's ACR.

VOM Reference Documents

- Open Access Transmission Tariff
  - Attachment DD Section 6.8
- Operating Agreement
  - Schedule 2
- Manuals
  - M15 Cost Development Guidelines
    - Section 2.6(all), 3.6(nuclear), 4.6(fossil), 5.6(CC), 6.6(CT/diesel), 7.6(hydro), & 9.6(wind)