

Cost-Based Offer Education

CDS

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Competitive Markets

- **Competitive market outcomes in the PJM markets in the presence of market power require market power mitigation of supply offers to a competitive level.**
- **Short run marginal costs are the only costs relevant to the energy market. The competitive offer level in the energy market is the short run marginal cost of production.**
- **The current PJM Market Rules include fuel, consumables, emission allowances, maintenance, opportunity costs, and taxes or subsidies charged based on energy output, as short run marginal costs.**

Cost-Based Offers

- **In PJM, unit owners have to submit cost-based offers and may submit price-based offers.**
- **Cost-based offers are used by PJM to mitigate the exercise of market power by market sellers that fail the three pivotal supplier test.**
- **Market sellers are responsible for the development of cost-based offers.**

Cost-Based Offer Parts

- **Schedule 2 of the PJM Operating Agreement defines the components of cost-based offers. Units in PJM are allowed to submit cost-based offers in three parts.**
 - **Incremental energy cost curve**
 - **No load cost**
 - **Start cost**

Cost Components

- **Cost-based offer components include:**
 - **Fuel costs:** Include commodity costs, delivery costs (such as variable transportation costs), fuel supplier fees and taxes.
 - **Operating costs:** Include water purchases, water or waste water treatment control reagents, emission control reagents, equipment lubricants, electricity byproducts disposal, electricity consumed during starts.



Cost Components

- **Cost-based offer components include:**
 - **Maintenance costs:** expenses of maintaining equipment and facilities in satisfactory operating condition.¹
 - **Emission allowance costs:** Include costs of emission allowances and any regulatory fees that vary directly with energy output.
 - **Energy market opportunity costs (including federal/state subsidies).**
 - **Ten percent adder / FMU adder ²**

¹ Not a short run marginal cost.

² Tariff defined components of costs.



Fuel Costs

- In PJM, the IMM does not calculate cost-based offers for market sellers. Market sellers calculate cost-based offers based on their approved fuel cost policies, Operating Agreement, Schedule 2 and the Cost Development Guidelines (PJM Manual 15).
- Fuel Cost Policy is the document that describes the “method used to price fuel for calculation of the Market Seller’s cost-based offers for a generation resource.”

Cost-Based Offer Calculations

- **Incremental Cost**

$$C'(MW) = H'(MW) \times [FC(MW) + VOM_{fuel}(MW) + EC(MW)] + VOM_{output}(MW) + OC(MW)$$

where:

$C'(MW)$ represents the short run marginal cost curve for the unit, varying with the MW output of the unit, in \$/MWh.

$H'(MW)$ is the incremental heat rate curve at MW , in MMBtu/MWh.

FC is the fuel cost at MW , in \$/MMBtu.

$VOM(MW)$ is the sum of the variable operating cost and the maintenance adder at MW , in \$/MMBtu. VOM can be included either in \$/MMBtu (VOM_{fuel}) or in \$/MWh (VOM_{output}).

$EC(MW)$ is the cost of emission credit allowances at MW , in \$/MMBtu.

$OC(MW)$ is the opportunity cost at MW , as defined in Section 12 of Manual 15, in \$/MWh.

Cost-Based Offer Calculations

- **No Load Cost**

$$NL = H(0) \times (FC + VOM(0) + EC(0)) + VOM_{hour}$$

where:

NL is the no load cost in \$/hour.

$H(0)$ is the no load heat input, the intercept of the heat input curve, in MMBtu.

FC is the fuel cost at MW output of zero, in \$/MMBtu. For units that use a different starting fuel (e.g. coal units), the fuel in the no load cost calculation cannot be the fuel used during startup and synchronization, but must be the fuel used during normal operation.

$VOM(0)$ is the sum of the variable operating cost and maintenance adder at zero MW, in \$/MMBtu.

VOM_{hour} is the sum of the variable operating cost and maintenance adder at zero MW, in \$/hour.

$EC(0)$ is the cost of emission credit allowances at zero MW, in \$/MMBtu.

Cost-Based Offer Calculations

- **Start Cost**

$$SC(T) = \left[\sum_f SH_f(T) \times (FC_f + VOM_f + EC_f) \right] + SP(T) \times SSR + SMA$$

where:

$SC(T)$ is the start cost in \$/start as a function of the unit's temperature state, T .

f indexes the number of fuel types required to start.

$SH_f(T)$ is the start heat requirement for fuel f given for temperature state T in MMBtu.

FC_f is the fuel cost for fuel f in \$/MMBtu.

VOM is the sum of the variable operating cost and maintenance adder for fuel f in \$/MMBtu.

EC_f is the emissions allowance cost incurred while burning fuel f in \$/MMBtu.

$SP(T)$ is the station service power load during starts for temperature state T in MWh.

SSR is the station service rate in \$/MWh.

SMA is the start maintenance adder in \$/start.

T is the boiler temperature state. Hot, intermediate or cold.

Components Definition

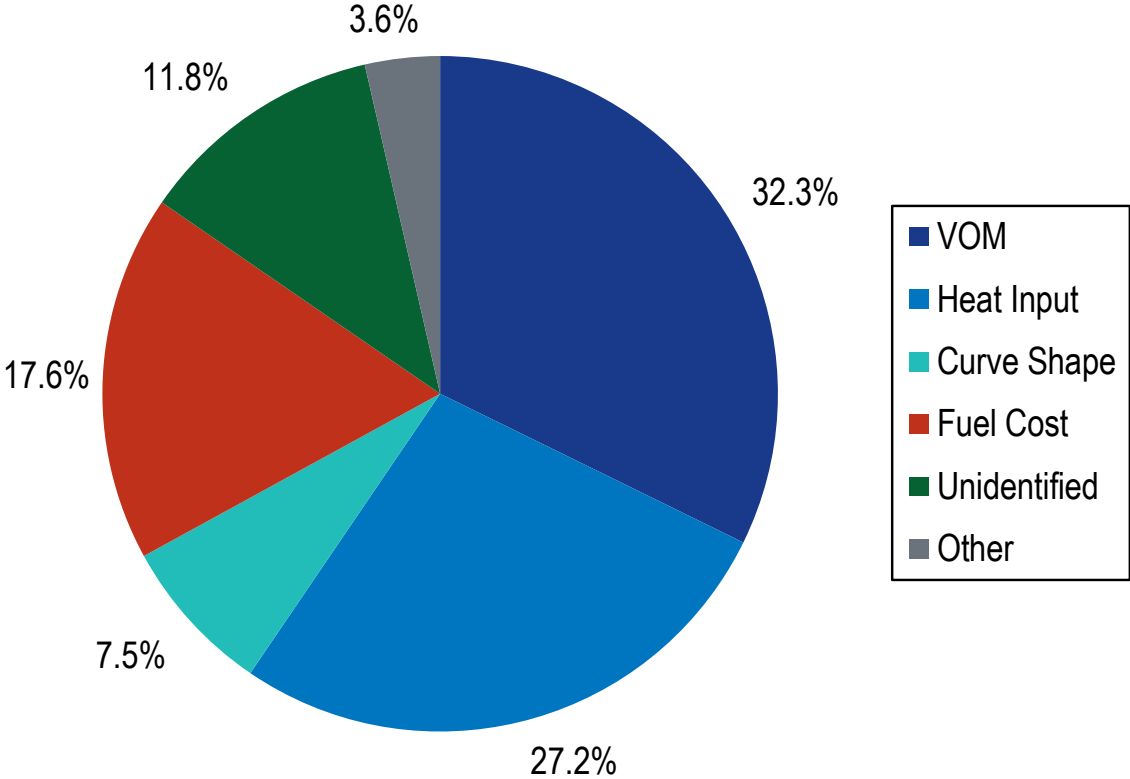
- **Inputs required in cost-based offer calculations:**
 - **Fuel cost per fuel cost policy**
 - **Heat rate or heat input curves**
 - **Start heat input**
 - **Maintenance adders**
 - **Operating costs**
 - **Emission rates**
 - **Emission allowance costs**
 - **Station power**
 - **Station service rate**
 - **OC adder**



IMM Identified Penalties

- **The IMM estimates generators' offers using data collected from:**
 - MIRA (e.g. heat inputs, VOM, fuel index).
 - Independent fuel price sources (e.g. Platts and ICE).
 - PJM (e.g. schedule IDs, schedule fuel types, MW segments).
- **The IMM uses these estimates as the basis for asking questions to the Market Seller.**
- **The Market Seller's responses make it clear when there are errors in offers.**

Causes of Penalties



Causes of Errors in Offers

- **Most penalties have not resulted from overstated fuel cost (fuel cost policy noncompliance).**
- **Most penalties (67 percent) have resulted from overstatement of VOM and incorrect heat input assumptions.**
 - **Common VOM issues: Incorrect application of a VOM adder approved by PJM or use of a VOM adder not approved by PJM.**
 - **Common heat input issues: Overstatement of actual inputs (e.g. start heat/no load heat) or incorrect calculation of incremental heat rates using correct inputs.**

Common Issues

- **VOM:**
 - **Market Sellers need to be more careful in determining relevant VOM costs.**
 - **More clarity from PJM regarding includable VOM costs is needed to avoid future penalties.**
- **Heat Input**
 - **Errors in heat input curves could be eliminated.**
 - **The cost development guidelines (M15) are deficient in providing guidelines for the calculation of correct heat input curves and incremental heat rate curves.**

Validation

- **There are two general types of errors in cost-based offers:**
 - **Errors that result from misunderstanding the math of cost-based offers.**
 - **Errors that result from incorrect input data.**
- **The IMM is available to provide detailed education on the construction of cost offers.**
- **The IMM is prepared to propose a new version of Manual 15 that is clear, internally consistent and easy to follow.**



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