

Energy Offer Calculation Education (Start Cost)

CDS

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Energy Offer

- **Energy offers are submitted in PJM in up to three parts:**
 - **Incremental Energy Cost Curve**
 - **No Load Cost**
 - **Start Cost**



Tariff Definitions

- **Start Cost** shall mean the unit costs to bring the boiler, turbine and generator from shutdown conditions to the point after breaker closure which is typically indicated by telemetered or aggregated state estimator megawatts greater than zero and is determined based on the cost of start fuel, total fuel-related cost, performance factor, electrical costs (station service), start maintenance adder, and additional labor cost if required above normal station manning. Start-Up Costs can vary with the unit offline time being categorized in three unit temperature conditions: hot, intermediate and cold.



Start Cost Components

- **Station Power:** Energy consumed during the start. Priced at the station service rate calculated by PJM.
- **Start Fuel:** Fuel consumed from first fire to breaker close plus any fuel consumed after shutdown.
- **Maintenance Adder.**
- **Additional Labor.**



Start Cost Equation

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

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.

SAL is the start additional labor in \$/start



CC Start Cost

- **The combined cycle start cost definition differs from other unit types:**
 - **The start fuel includes the fuel consumed by the first CT from first fire to breaker close of the ST, plus the fuel consumed by each additional CT from first fire to HRSG/ST pressure match.**
 - **The station power includes the energy consumed during the start, priced at the station service rate minus the net generation produced, priced at the actual cost of the unit.**



Recommendations

- **Include clear guidelines for the calculation of start fuel and station power.**
- **Make the guidelines consistent with the notification and start times parameter limits.**
- **Make CC start cost consistent with all other unit types.**
 - **Soak costs should be modeled separately for CCs and other units (e.g. steam units).**
- **Remove start additional labor costs (not SRMC).**

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