Combine Cycle Plant and Combustion Turbine Unit Incremental Maintenance Discussion

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The Issue: Maintenance Costs and Cost Curves

• Rule changes in PJM starting in 2015 that eliminate certain maintenance costs from Cost Bid Curves for CTs and CC plants

• Emerging perspective from a number of resource owners is that at least some of these maintenance costs are variable in nature, and should be permitted in cost curve

• Example: CCGT’s
  – “Major Maintenance” events are driven by equivalent hours of run time – unit “majors” are required every ~every 40K of equivalent hours.
  – Costs are not “cash” (unless owner/operator has an LTSA), but costs are real and variable in nature
    • “Fired Hour Charge” used in dispatch economics – essentially reflecting the cost of advancing towards a major maintenance event by running
    • Note: some LTSA’s actually charge based on a “fired hour charge”; in these cases this would be a variable cash cost

• Issue is especially acute on certain combined cycle units, which have more output tiers of varying maintenance costs than other combined cycles
  – Fogging and peaking tiers require an “equivalent hours” multiplier – essentially counting as a multiple of a normal hour – driving a material cost difference in running these tiers vs baseload (Example on following page)
  – Without inclusion of maintenance costs (or multiplier) on peaking or fogging tiers, the units would likely be dispatched into peak firing most of the time, dramatically increasing the frequency of major maintenance cycles and events

• Removal of these costs, and related multiplier, could lead to suboptimal dispatch decisions on CC’s across PJM, and lead to dramatic increase in maintenance costs and frequency

[LTSA – Long Term Service Agreement]
Combined Cycle Maintenance Costs Example (I) – Baseload Cost Build Up (Indicative Numbers – not for a Specific Plant)

Fired Hour Charge (Accumulated Maintenance)
- $200 / fired hr / turbine
- At 3x1 base load, output 450 MW
- 3 turbines x $200 = $600 / fired hour
- $600 / 450 MWh = $1.33 / MWh

Cash O&M
- Approximately $0.15 / MWh for water and chemicals

Total Maint Baseload Cost = $0.15 + $1.33 = $1.48 / MWh
Combined Cycle Maintenance Costs Example (II) – Maintenance Cost Multipliers (Indicative Numbers – not for a Specific Plant)

- Fogging, Pagging, and Peak firing are used to increase output on peak days; however, they accelerate maintenance adding a significant amount of variable maintenance cost related with achieving the incremental MW’s.

- CC manufacturers provide maintenance multipliers for CC’s to calculate Equivalent Operating Hours
  - Peaking Range: 6.0 - 8.0
  - NOTE: Peak output operation affects maintenance requirements for the whole plant, not just the peaking increments.
Arguments for Status Quo in 2015

• Affected units can still offer appropriate prices in their price schedules
  – This does not cover units when they must operate on cost schedules due to TPS test

• Affected units can make peaking MW available at ME only to minimize over-dispatch at peak
  – Plant operators are willing to operate at these higher output levels at the appropriate LMP, based on actual costs

• The rule has already been changed – it affects RPM
  – The original discussion apparently did not include all considerations. This error should be remedied, not propagated
Potential Solutions

• Restore engine overhaul costs to incremental maintenance for CC and CT plants (best)
  – Divide costs appropriately between RPM and operations

• Restore engine overhaul costs to incremental maintenance for peaking increments only
  – Decrease the potential for over-dispatch of peaking increments due to under-recognition of actual incremental maintenance impact

• Note: Existing maintenance multipliers should be retained in any case.