Question 17.4

Topic: Missing Data Load Ranges for Combustion Turbines

Question: For combustion turbines, how do you establish the missing data load ranges (load "bins") required under Section 2.2.1 of Appendix C?

Answer: Establish the load ranges in terms of percent of the maximum hourly gross load (MHGL) of the unit, as follows:

(1) For a simple-cycle turbine, the MHGL is the maximum electrical output (in megawatts) of the generator that serves the CT; or

(2) For a combined-cycle unit (with or without auxiliary firing), if a single generator serves both the CT and the HRSG, the MHGL is the maximum electrical output (megawatts) of this generator; or

(3) For a combined-cycle unit (with or without auxiliary firing), if separate generators serve the CT and HRSG, the MHGL is the sum of the maximum electrical outputs (megawatts) of these generators3; or

(4) If the HRSGs of two or more combined cycle units (CCUs) share a common steam turbine, then, for *each* CCU, the MHGL is the sum of the maximum electrical output (in megawatts) of the generator that serves the CT and the maximum electrical output obtainable from its HRSG; or

(5) For cogeneration facilities, where the HRSG is not used for electrical generation, the MHGL is the sum of the maximum output of the generator that serves the CT and the maximum output from the HRSG.

You may express these outputs either in megawatts or in klb/hr of steam, provided that the MHGL for the CCU is calculated on a consistent basis.

One acceptable way of converting the maximum heat input to the HRSG to an equivalent electrical load is to use the following equation:

$$L_{max} = K\, \eta_{hrsg} \left[(1 - \eta_t)(HI_{tm}) + HI_{am} \right]$$

Where:

L_{max} = Maximum equivalent electrical load for the HRSG (MW)

η_{hrsg} = Efficiency of the HRSG in converting heat input to electricity (Use either the actual, measured efficiency or a default value of 0.30)

η_t = Efficiency of the combustion turbine in converting heat input to electricity (Use either the actual, measured efficiency or a default value of 0.33)

HI_{tm} = Maximum heat input rate to the turbine (mmBtu/hr)

HI_{am} = Maximum heat input rate to the HRSG (if any) from an auxiliary combustion source, e.g., a duct burner (mmBtu/hr)

K = Conversion factor (0.293 MW-hr/mmBtu)

References: Appendix C, Section 2.2.1

History: First published in December 2000, Update #13; Revised in the October, 2003 Revised Manual