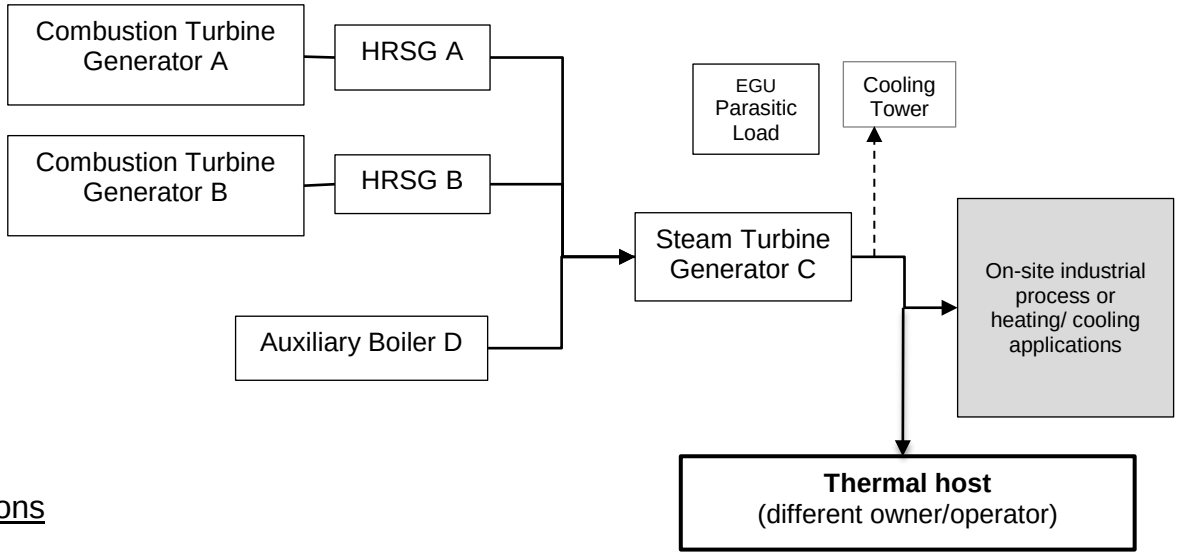
Course 1.4: Handout 1.4.1 Energy Disposition

This example shows a cogeneration facility that includes two combustion turbine generators with HRSGs and a boiler that produces steam to power a steam turbine generator. Steam is used on-site and sold to a thermal host.



Questions

1. (a) Draw the energy (fuel, electricity, and steam) flows and the system boundary such that all integrated units associated with energy production are included in the same box. (b) What type of electricity generating facility is this (section 95112(c))?

   Answer: (a) See diagram on next page. (b) This example is an industrial/institutional/commercial facility with electricity generation capacity.

2. Which electricity pathways represent gross generation?

   Answer: All electricity from the cogeneration system including EGU parasitic load. E_A+E_B+E_C

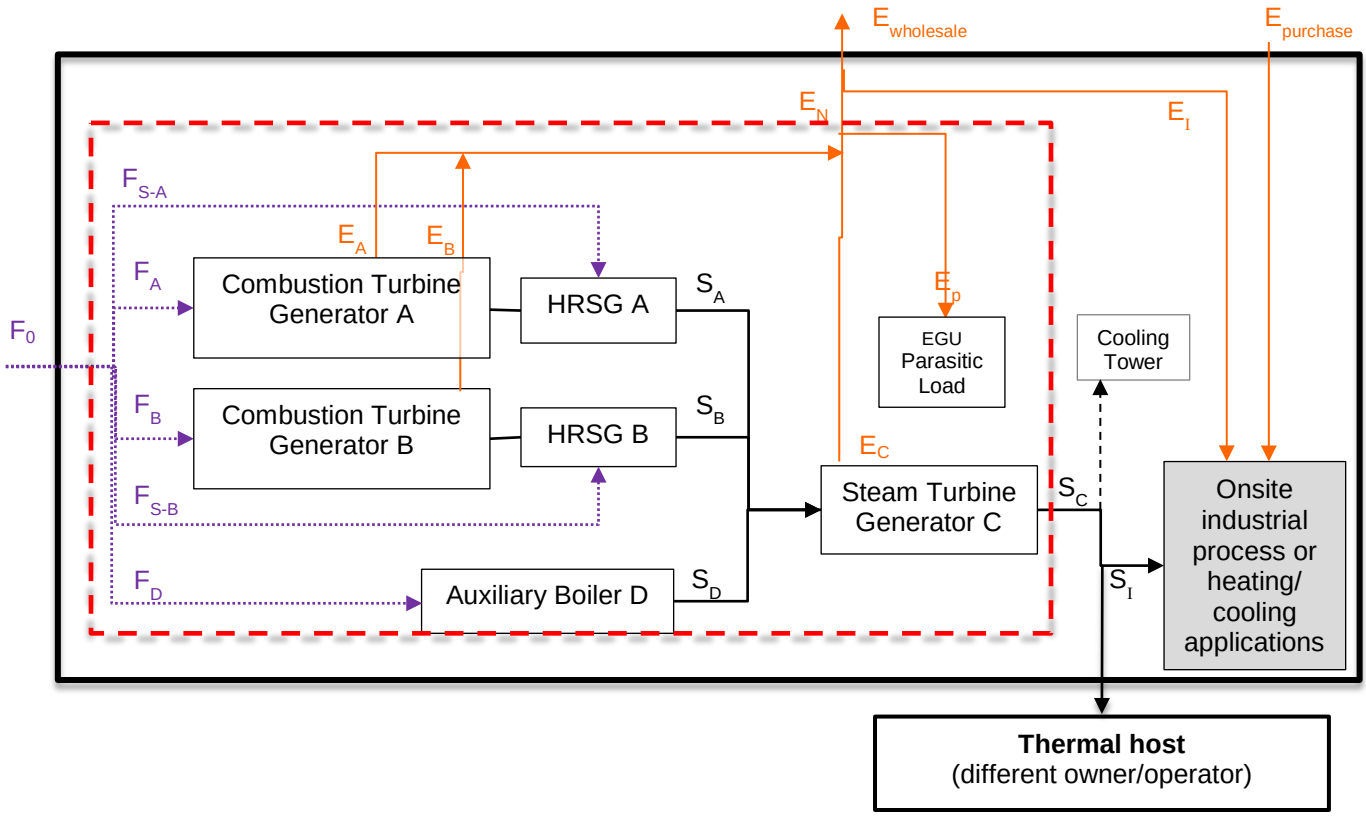
3. Which variables represent total thermal output (not just useful thermal output)?

   Answer: Total thermal output = S_C. The other variables S_A, S_B, and S_D are within the system boundary and are used for additional power production in the STG before exiting the system as total thermal output (S_C).

4. Which emissions are reportable by the operator of the cogeneration facility?

   Answer: Cogeneration emissions are reported by the operator regardless of whether the thermal energy is used on-site or sold to a thermal host. If the thermal host is independently owned and operated, additional emission sources (not shown here) would be reported separately from the cogeneration operator's emissions data report.

Reference: Electricity Generation and Cogeneration: Regulatory requirements and detailed examples for reporting. (2013) *Reporting Guidance for Electricity Generating Units*
http://www.arb.ca.gov/cc/reporting/ghg-rep/guidance/guidance-docs.htm



The cooling tower is being shown outside of the red dashed line for the electricity generation boundary, so the thermal energy related to the cooling tower would be reported as thermal energy in support of power production.

The operator instead may have shown the cooling tower inside the electricity generation boundary. In this case, the thermal energy related to the cooling tower would not be separately reported as thermal energy in support of power production because it is inside the boundary. The choice is dependent on the metering at the facility.

[Example of how the math works for each scenario]

Cooling Tower (CT) Outside Boundary
Total thermal output (TTO) = CT + steam sold + steam used on-site
(ignoring wasted energy)
100 = 10 + 40 + 50

Cooling Tower Inside Boundary (ignoring wasted energy)
TTO = sold + used
(100 - 10) = 40 + 50