Natural Gas Combined Heat & Power (CHP) Guidelines

Eligibility

- Minimum Efficiency – Systems must meet or exceed a Fuel Chargeable to Power (FCP) heat rate of 6,120 Btu/kWh. This translates to a 56% FCP efficiency. The calculation of FCP heat rate can include a credit for the efficiency of the boiler that the heat recovery is offsetting. The Higher Heating Value (HHV) energy content of gas should be used for the FCP calculation. FCP is calculated as follows.

$$FCP = \frac{Gas\ Input\ (Btu) - \frac{Heat\ Recovered\ (Btu)}{Offsetting\ Boiler\ Efficiency}}{Net\ Electricity\ Generated\ (kWh)}$$

- Cost Effectiveness – All projects must pass Energy Trust of Oregon's cost effectiveness screening.
- Selling power offsite – Only CHP systems that use the power and heat on site, behind the meter, are considered conservation and eligible to participate.
    - Systems that are intended to occasionally sell power to the grid may be eligible, however, Energy Trust of Oregon will only fund the portion of total electric generation that is used on site.
- Serving Utility – Eligible customers must be Pacific Power or PGE customers in Oregon.
- Fuel Source – The primary fuel source for the prime mover of the CHP must be natural gas.

Incentives

- Projects are processed as Custom projects, and follow all the normal program caps and guidelines, such as:
    - Incentives > $500k require Board approval and must provide energy savings at a significantly better than average cost to Oregon ratepayers. Incentives will typically be negotiated at a lower rate than standard incentives detailed below.
    - Program-specific annual site incentive caps apply.
- Incentive Rates – Incentives will be provided at a rate of $0.08/kWh, capped at 50% of eligible project costs.
    - Self-direct entities are eligible for incentives consistent with Energy Trust of Oregon's most current self-direct policy, 4.10.000-P.
- Incentive Calculation – Incentives will be calculated based on net performance incremental to that of modern central power plants. For this calculation, the baseline heat rate is 6,800 Btu/kWh. Once FCP is determined, the savings can be calculated using the following equation.

$$Savings_{kWh} = \left(1 - \frac{FCP}{6800}\right) \times kWh_{CHP}$$

Determining the annual electric generation (kWh_{CHP}) and heat recovered requires an in-depth technical analysis (refer to CHP Technical Assessment section).

Preliminary Scoping

In order to procure technical resource assistance, or to begin a 3rd party review by Energy Trust of Oregon, the Energy Trust contractor must conduct a preliminary scoping meeting and site visit with the eligible end-use customer. In addition to providing standard information and format as per scoping for any custom project, a CHP Scoping Report should address the following questions:

- Is there access to natural gas or nearby low or no-cost renewable fuels (ex. landfill gas, farm manure, sawdust and other wood waste, food processing waste, etc.)?
- Does the facility operate for more than 5,000 hours per year?
- Does the facility have a large and relatively stable need for heat and electricity as is common in institutions such as hospitals or universities and industries such as pulp and paper, lumber and wood products, metal finishing, plastics, and food processing facilities?
- What is the proposed CHP system size and thermal application? Does the site have the ability to utilize most or all of the waste heat produced by a CHP system? (An ideal system is sized to the base thermal load to minimize wasted thermal energy.)
- Is there an existing central heating/cooling plant and distribution system in place?
- Does the customer have plans to replace major equipment or expand production or facility operations that will require added electric or thermal capacity?
- Is the customer concerned about power quality and/or reliability from the grid?
- Has the customer successfully implemented other energy efficiency measures and is motivated to reduce energy costs further?

CHP Technical Assessment

Following the preliminary scoping, a custom technical assessment study must be performed prior to an incentive offer. Energy Trust of Oregon will provide a technical assessment to the end use customer free of charge, through an Allied Technical Assistance Contractor (ATAC) chosen and managed by the Program. Alternatively, a facility or project developer can perform their own CHP study, without Energy Trust funding, and may submit that study to the Program for review and approval.

Technical assessments must quantify CHP performance to a high degree of accuracy and defensibility to serve as the basis for determination of an incentive. Below is an outline of major items to address in a CHP technical assessment.

1. Executive Summary
    a. Facility Overview – Description of buildings, processes, annual hours of operation, seasonality, etc. This should identify and summarize key data of major equipment such as central plants, large process loads, HVAC equipment, etc.
    b. Energy Usage – Existing facilities should provide three years of historic electric and gas usage data. New facilities should demonstrate, through engineering analysis, estimates

of annual electric and gas usage. Data should be as granular as possible and in no greater intervals than monthly.

c. Proposed CHP Overview – Provide a high level summary of the system.
d. Economic Summary

2. CHP Details
   a. Include preliminary equipment selection data including type and efficiency rating of prime mover, (i.e. gas turbine, reciprocating engine, etc.) and equipment specifications.
   b. Describe the annual use for heat and electric output from the CHP.
   c. Provide floor plan to specify the location of the CHP.
   d. Identify any required facility upgrades to accommodate the electric and heat output, rejected waste heat, etc.
3. Energy Analysis
   a. Describe analytical approach, provide submetering data, analytical files, etc.
   b. Load profiles for heat and electric loads must be established in hourly intervals for a representative, full year. Interval metering and/or submetering is preferred to support load profile analysis.
   c. Identify periods where CHP capacity may exceed the facilities ability to use electric or heat available from the CHP.
   d. Perform hourly energy balance for one year period including CHP electric and heat output, parasitic loads, use of heat and electric and heat rejection.
   e. Account for estimated downtime including planned maintenance and unplanned outages.
   f. Document heating efficiency of heating load offset by heat recovery.
   g. Calculate FCP accounting for offsetting boiler efficiency according to the formula below. The Higher Heating Value (HHV) of gas should be used in this calculation.

$$FCP = \frac{Gas\ Input\ (Btu) - \dfrac{Heat\ Recovered\ (Btu)}{Offsetting\ Boiler\ Efficiency}}{Net\ Electricity\ Generated\ (kWh)}$$

   h. Calculate annual electric generation (kWh_{CHP}) using established annual load profiles and net system output.
   i. Calculate performance incremental to central power plants according to the formula below.

$$Savings_{kWh} = \left(1 - \frac{FCP}{6800}\right) \times kWh_{CHP}$$

   j. If applicable, determine appropriate incentive rate in accordance with Energy Trust of Oregon's most current self-direct policy, 4.10.000-P.
   k. Calculate incentive based on savings incremental to central power plants.
4. Cost Details
   a. Provide detailed cost estimates that itemize equipment and installation costs.
   b. Identify and price any required structural or building improvements required.
   c. Include any required electrical upgrades and interconnect expenses.
   d. Include design, permitting, rigging, commissioning and any other expenses.

   e. Identify required CHP system maintenance and include estimated costs.
   f. Provide any quantifiable non-energy benefits, such as avoided maintenance costs.
   g. All costs should be supported by additional detail included in the appendix.
5. Commissioning Plan
   a. Include all relevant operating criteria to ensure operation of the system as designed.
   b. Include CHP controls including sequence of operations and integration with existing controls, if applicable.
   c. Include a verification checklist of all equipment and operating parameters that should be verified by Energy Trust of Oregon to ensure complete installation and optimized operation.