

Refinery combined heat and power information brief

March 2012

Context

We have installed a new combined heat and power (CHP) system at our copper Refinery. The purpose of the CHP unit at the Refinery is to produce steam to meet the needs of the facility (about 70,000 pounds per hour) while efficiently co-producing 6 megawatts of electricity, which is equivalent to the electrical needs of about 6,000 average-size homes.

Refinery CHP system

The Refinery CHP system became operational in December 2010. It displaces 6 megawatts of electricity that would otherwise be sourced from more conventional processes (like coal). The Refinery CHP unit has been sized to meet the steam needs of the facility and co-produce approximately 50% of the electrical needs of the facility.

Summary of Kennecott's alternative electricity production

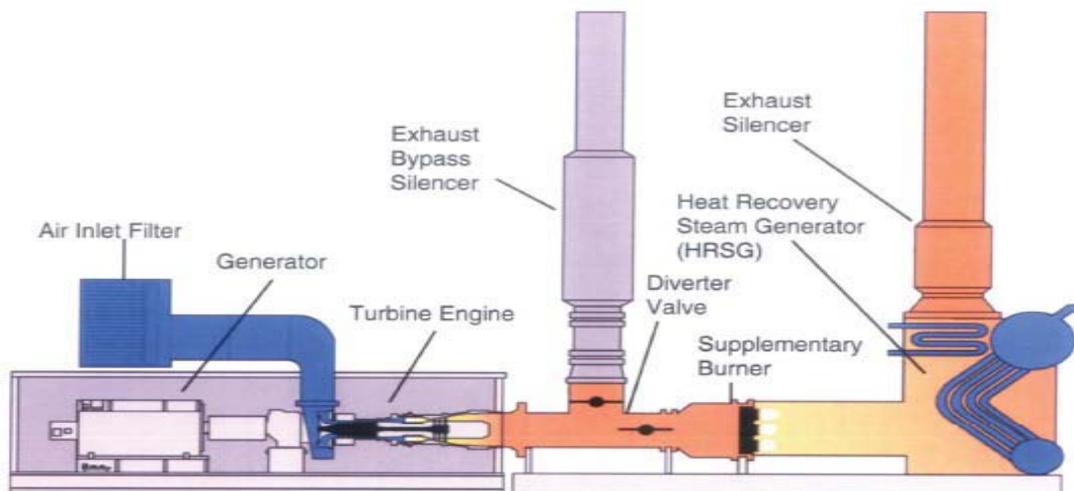
The Refinery CHP system, along with another CHP system, generates about 15% of our total electricity requirements using renewable and/or alternative technologies. Other systems where renewable and alternative electricity systems are or will be installed include the following:

- A similar-sized CHP system at our MAP facility will co-produce approximately 6 MW of electricity and 60,000 pounds per hour of steam.
- A waste-heat power generation system at our smelter that captures waste heat from the two furnaces (the flash-smelting and converting furnaces) at the smelter's acid plant (which captures 99.9% of sulfur dioxide emissions and converts it into sulfuric acid). The waste heat generates about 20 MW of electricity (about two-thirds of the smelter's electrical power demand.)
- A solar photovoltaic system at our Reverse Osmosis Plant generates enough electricity for 65% of the building's lighting needs. (System size 32.5 kilowatts.)

Overview of CHP systems

According to the EPA, CHP, also known as cogeneration, is an efficient, clean, and reliable approach to generating power and thermal energy from a single natural gas fuel source. By installing a CHP system designed to meet the thermal and electrical base loads of a facility, CHP can greatly increase the facility's operational efficiency and decrease energy costs. At the same time, CHP reduces the emission of greenhouse gases, which contribute to global climate change. The system uses a natural gas fired turbine-generator combined with a heat recovery steam boiler to capture heat from hot turbine exhaust for efficient production of process steam at the facility. (Source: <http://www.epa.gov/chp>)

Below is a simple graphic of a CHP system:



Benefits of CHP

Transmission losses are avoided and system reliability is improved by co-producing steam and electricity onsite where it is needed and consumed. Combined heat and power systems generate at efficiencies of 80 to 84 percent, compared to about 50 percent efficiency for traditional power plants.

Other key benefits of the combined heat and power systems include the following:

- Uses technology more environmentally friendly than traditional power options.
- Provides distributed onsite steam and power production at individual facilities.
- Meets short-term rising demand for energy with highly-efficient technologies.
- Diversifies our energy generation portfolio and reduces the risk of power outages.