PROJECT PROFILE

NORTHWEST CHP TECHNICAL ASSISTANC PARTNERSHIPS

New University of Alaska Coal-Fueled CHP Plant Fairbanks, Alaska

17 MW 'Best-in-Class' Replacement

The New University of Alaska Fairbanks Coal-fueled CHP power plant

Quick Facts

LOCATION: Fairbanks, Alaska
MARKET SECTOR: Higher Education
COMMUNITY SIZE: More than 10,000 Students, faculty and staff
FACILITY: Coal-fueled university power, heating, and cooling plant
EQUIPMENT: 240,000 lb/hr, 600 psig steam boiler with 17 MW extraction steam turbine
FUEL: Subbituminous Coal
USE OF THERMAL ENERGY: Steam district heating and cooling system serving 3.1 million sq. ft. of campus buildings
CHP TOTAL EFFICIENCY: Average 75% - Can meet 100% of electrical and thermal loads
YEARLY ENERGY SAVINGS: 21% coal reduction compared to previous coal CHP plant, providing the same services
CHP IN OPERATION SINCE: September, 2018

Site Description

The University of Alaska at Fairbanks (UAF) is a Land, Sea and Space Grant college founded in 1917 and is Alaska's primary research university. Located in Fairbanks, 155 miles south of the Arctic Circle, the campus has 3.1 million square feet of conditioned space and over 10,000 students, faculty and staff. Average Fairbanks winter temperatures in winter months are below zero, while extended temperatures below -20 degrees F are common. With heating and electricity being essential in the winter, commercial facility fuel options are limited; both the city and university are dependent primarily on coal for heat and power. Fairbanks does not have a piped natural gas supply from a gas field, and electrical power is supplied by a limited power transmission system that serves central Alaska from a power plant located at a coal mine 100 miles to the south.

Reasons for CHP

The new UAF CHP plant was built to replace the university's pre-existing Heat and Power Plant, constructed in 1964. After forty-seven years, that plant had been through one near-catastrophic failure in 1998 and was requiring continuous high maintenance costs to stay operational, with increasing risk of a total failure. The university researched all options for supplying the campus with both heat and power reliably, efficiently and with minimum environmental impacts. CHP was the obvious choice for efficiency and operating costs, as it had been previously. Far more challenging than the choice of CHP was what fuel to use in the new plant. All available options were considered carefully (gas, oil and biomass), but in the final analysis only coal offered the combination of availability and reasonable sustained price. A significant requirement of the project was to ensure that the facility could provide steam and electricity to the campus to act as a community shelter in the event of a disaster—including the possibility of a regional transmission outage—so the plant is designed to operate as an islanded system.

CHP Equipment & Configuration

Major project elements include an entirely new power plant building containing the boiler, a 17 MW Shin Nippon steam turbine, switchgear, dry-tower condenser and control rooms, plus fuel loading facility and supporting balance of plant. The boiler and plant are optimized for the large thermal loads, but the flexible extraction/condensing turbine allows for a range of heating vs. power generation options, depending on season and needs.

The 17 MW Extraction/Condensina Steam Turbine

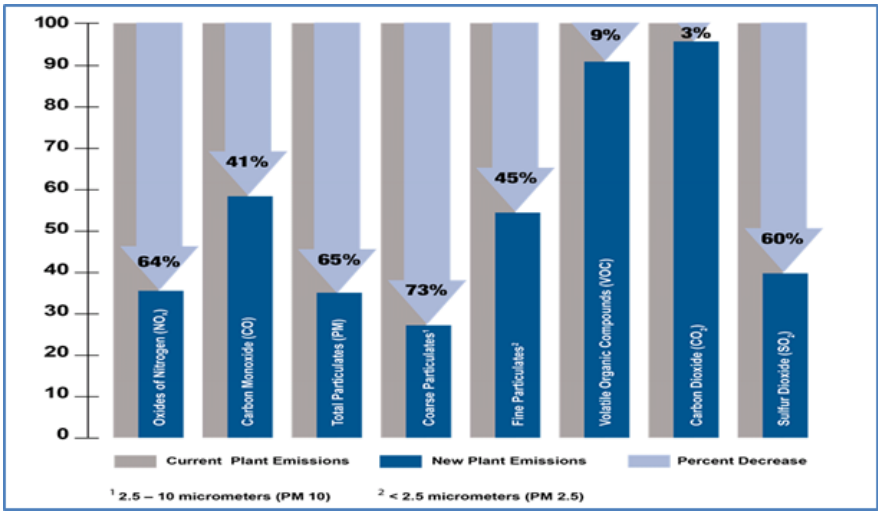
The plant uses a state of the art Babcox and Wilcox circulating fluidized bed combustor (CFB) designed for the highest practical efficiency and lowest emissions. Up to 15% biomass fuel is an option. The CFB allows for low combustion temperatures with resultant lower nitrogen oxides emissions, limestone injection for in-situ sulfur oxides absorption, and high heat transfer to boiler tubes. Combined with multi-clone and baghouse scrubbing, the result is minimum emissions.

CHP Design, Installation, and Operation

Engineering design was provided by Stanley Consultants, and the contractor, Haskell Davis JV, constructed the project using "Construction Manager at Risk" contracting. Commissioning of the equipment and its systems began late 2018, with first fire on coal at the end of 2018. Tuning of the CFB boiler and equipment has continued into the fall of 2019. Emissions test results have shown that the unit is capable of meeting NOx and SO2 emissions permit limits throughout its load range. Performance and state testing are planed for November of 2019 followed by a 30-day reliability run. Ultimately, the university will operate and maintain the plant.

CHP Project Benefits

The new plant effectively doubles the campus electrical generation capacity, using 21% less coal per pound of steam compared to the old plant. According to the developer, the UAF plant has the lowest PM 2.5 particulates emissions ever guaranteed for any coal-fired boiler—specified to produce only 0.012 lb./ MMBtu of PM2.5—and other emissions are commensurately lower. Compared to the pre-existing UAF CHP plant—also powered with coal—the net emissions reductions as a result of this project are large, as seen in the graphic on the right.



For More Information

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"That lowest PM 2.5 guaranteed for a coal boiler is a really big deal in this community… pollution here [around Fairbanks—a non-attainment area] is mostly caused by wood smoke. It's really good that we're not contributing to that [as compared to our old plant]…"
Mike Ruckhaus – UAF Senior Project Manager