



San Francisco State University

2.125 MW CHP System

Site Description

San Francisco State University (SFSU) was founded in 1899 and is a public university located in the western part of San Francisco. It is part of the 23-campus California State University system. The SFSU campus consists of 142 acres and has approximately 30,000 students, of which 82% are undergraduate and 18% are graduate students.

Project Profile

SFSU has operated a combined heat and power (CHP) plant since 1982. This originally consisted of a 725 kW Waukesha engine that was housed in a campus building. The building was damaged in the 1989 Loma Prieta earthquake and the engine was moved to its current location at the campus' central plant. In 1998, a second larger engine – a 1.4 MW Fairbanks Morse Engine unit – was installed at the central plant as well. The Waukesha engine operates on natural gas and the Fairbanks Morse engine is capable of dual fuel operation, or operation on diesel fuel only for emergency backup purposes. When operating in dual fuel mode, the engine burns one gallon per hour of diesel fuel along with natural gas, compared with 160 gallons per hour if operating on diesel fuel alone. Waste heat from the system is used to supplant boiler usage for hot water for campus needs, where one of two 25 million BTU per hour Johnson Boiler Company units can often be left off when the CHP plant is producing waste heat.

Quick Facts

LOCATION: San Francisco, California
MARKET SECTOR: College Campus
TOTAL PROJECT COST: \$27 Million
PAYBACK PERIOD: 15 Years
ANNUAL ENERGY BILL SAVINGS: \$0.5–0.6 Million
EQUIPMENT: 2.125 MW (725 kW Waukesha engine plus 1.4 MW Fairbanks Morse Engine unit)
FUEL: Natural gas (dual fuel with diesel for the Fairbanks Morse Engine unit)
USE OF THERMAL ENERGY: Hot water
FACILITY SIZE: 142 acres
FACILITY PEAK LOAD: 5,692 kW
FACILITY AVERAGE LOAD: 5,114 kW
CHP IN OPERATION SINCE: 1982

Emergency Backup for the Campus

Using a 20,000 gallon diesel storage tank, the 1.4 MW Fairbanks Morse engine can provide approximately 125 hours of backup runtime for key campus loads. This capability is estimated to have added approximately \$400 per kW to the system capital cost, but provides important emergency backup service to the campus health center and residential buildings.

SFSU's well performing CHP plant saves the campus \$500,000–600,000 annually on energy costs, at a time when cost containment to minimize needed student fee increases is of great importance. The system also provides critical backup power capability for the campus.



725 kW Original Waukesha Engine – 28 years of runtime!



SFSU Central Plant Switchgear for CHP System

Future Plans – A PG&E Owned Fuel Cell Power Plant

SFSU plans to extend its CHP system with the addition of a 1.4MW DFC1500 fuel cell system from FuelCell Energy. The system has been ordered by Pacific Gas and Electric Company, and will be owned by the utility. Even with the ~2 MW CHP plant, the campus still purchases approximately 30 million kWh per year of electricity and operates at least one gas-fired boiler at all times, suggesting the potential for additional CHP capacity. The waste heat from the fuel cell system will be used to help supply heat to campus buildings. The campus plans to incorporate information about fuel cell systems into its curriculum and to teach students and the public about the potential benefits of fuel cell-based CHP systems.

California Self Generation Incentive Program

CPUC/PG&E's Self-Generation Incentive Program (SGIP) provides financial incentives to help support the costs of on-site electric generating systems utilizing wind, fuel cell, microturbine or internal combustion engine cogeneration systems. Program participants are eligible to receive incentives under this program for installing distributed generation technologies based on system type, size, fuel source and out-of-pocket costs. Only commercially available and factory new equipment is eligible to receive incentives under this program. Furthermore, The tiered incentive rate varies depending on the capacity of the system. For example the incentive rate for a 0-1 MW system is 100%, while it is 50% for a 1-2 MW system and 25% for a 2-3 MW system. See link below for further SGIP details.

For More Information

San Francisco State University:

<http://www.sfsu.edu>

Waukesha Engines:

<http://www.dresserwaukesha.com/>

Self-Generation Incentive Program:

<http://www.cpuc.ca.gov/EFILE/RULINGS/124214.pdf>

Additional CHP Pacific Projects Profiles:

<http://www.pacificcleanenergy.org>

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