

U.S. DOE

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East Bay Municipal Utility District

600 kW Microturbine CHP/Chiller System

Site Description

The East Bay Municipal Utility District (EBMUD) is a publicly owned utility that provides water service to portions of two counties in the San Francisco Bay Area. Its water supply system covers 325 square miles (841 km²) and serves some 1.3 million customers. One of EBMUD's largest electrical demands is its own headquarters. In 2001 EBMUD decided to install a distributed generation (DG) system at its downtown Oakland administration building.

Project Profile

The motivation for the project was to reduce energy costs and ultimately increase reliability while the electric utility industry experienced financial and technical turbulence. The DG system consists of ten 60-kW Capstone microturbines and a ~180 refrigeration ton (RT) (~633-kW) York absorption chiller. EBMUD has also installed two 60-kW microturbines at its Adeline Maintenance Center, along with a 30 kW solar PV system. The selection of microturbines was driven by the air quality restrictions in downtown Oakland.

Fuel cells were also considered. Apart from their higher capital costs they were rejected because they proved to be too heavy for the roof. It is estimated that the DER system will produce enough residual heat to power the adsorption chiller to meet 60% of the existing cooling load that is currently met by two 880-kW (250 RT) centrifugal chillers.

Cost & Financial Incentives

System costs include:

- System design: \$125,000
- 10 Capstone microturbines: \$1,100,000
- Installation of turbines: \$410,000
- Absorption chiller: \$360,000
- Electrical and gas connections: \$130,000
- Service contract: \$100,000
- Air permit: \$30,000
- Other costs: \$255,000

Total cost: \$2,510,000

To assist with project costs EBMUD received a \$2,000,000 low interest (3%) loan (payable within 11 years) from the California Energy Commission (CEC) and a \$900,000 rebate from the California Public Utilities Commission (CPUC) and Pacific Gas and Electric Co. (PG&E) under California's Self-Generation program (SGIP).

Quick Facts

LOCATION: Oakland, California

MARKET SECTOR: Municipal Utility

TOTAL PROJECT COST: \$2,510,000 (admin. building only)

PAYBACK PERIOD: 6 to 8 years (with SGIP rebate)

ANNUAL ENERGY BILL SAVINGS: \$200,000 - \$300,00/year

EQUIPMENT: 600 kW (ten Capstone C60 microturbine)

FUEL: Natural gas

USE OF THERMAL ENERGY: Thermal load and electricity

FACILITY SIZE: No Data

FACILITY PEAK LOAD: No Data

FACILITY AVERAGE LOAD: No Data

CHP IN OPERATION SINCE: July 2003

EBMUD does not sell electricity back to the grid. Under agreement with the local utility it uses the system for onsite cogeneration only.

The system operation is controlled by waste heat needs and not by electric demand. It is designed to first meet the building thermal load and then to contribute to electric supply.

The system produces NO_x emissions of 0.2lb/ MWh_{elec}. This is roughly 7% of the NO_x emissions released by conventional US electricity production.

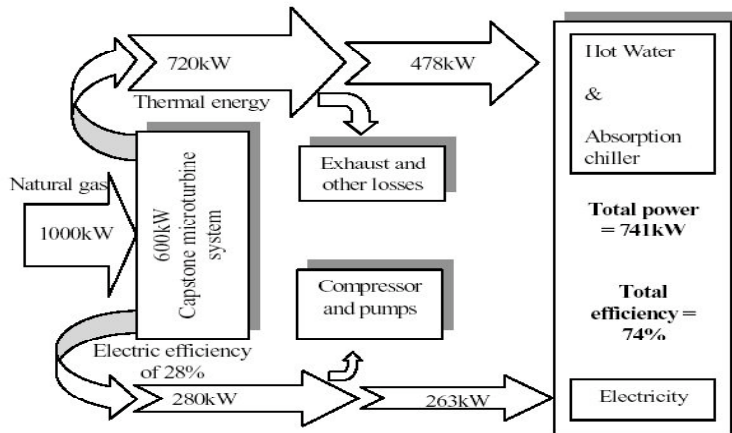


A main reason for the installation of micro-turbines is their small footprint and weight—each turbine is placed in a space only 30 in. (76 cm) wide and 77 in. (196 cm) long

Natural gas compressors located on the roof of the EBMUD administration building



Maximizing On-Site Plant Efficiency



The efficiency of serving the entire heating and cooling loads was critical to obtaining the required 42.5% overall FERC energy efficiency rating. This energy efficiency level is necessary to receive state funding as part of the California Public Utilities Commission SGIP program.

EBMUD operates the individual microturbines only when there is sufficient heating or cooling load to meet this level of efficiency on an annual basis. The microturbines will occasionally be shut down if there is insufficient thermal load, regardless of electrical load requirements.

For More Information

EBMUD: <http://www.ebmud.com>

Microturbines: <http://www.capstoneturbine.com>

Self-Generation Incentive Program (SGIP):
<http://www.cpuc.ca.gov/EFILE/RULINGS/124214.pdf>

Additional CHP Pacific Projects Profiles:
<http://www.pacificcleanenergy.org>

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