



East Bay Municipal Utility District

600 kW microturbine CHP/chiller system

Project Profile

combined heat & power in an administration building

Quick Facts

- Location:**
Oakland, California
- Capacity:**
600 kW (ten Capstone C60 microturbines)
- Fuel:** Natural gas
- Noise Level:** 70dB at 30 feet
- Planning and Construction Time:**
23 months
- System Online:** July 2003
- Total Project Cost:**
\$2,510,000 (administration building only)
- Energy Cost Savings:**
\$200,000 – \$300,000/year
- Expected Payback Time:**
6 to 8 years (with SGIP rebate)
- Maximum On-Site Plant Efficiency with Heat Utilization:** 74%
- Funding Sources:**
California Public Utilities Commission/Pacific Gas & Electric
California Energy Commission

Project Overview

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.

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.

Costs & Financial Incentives for the Administration Building

- 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 has 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).

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.



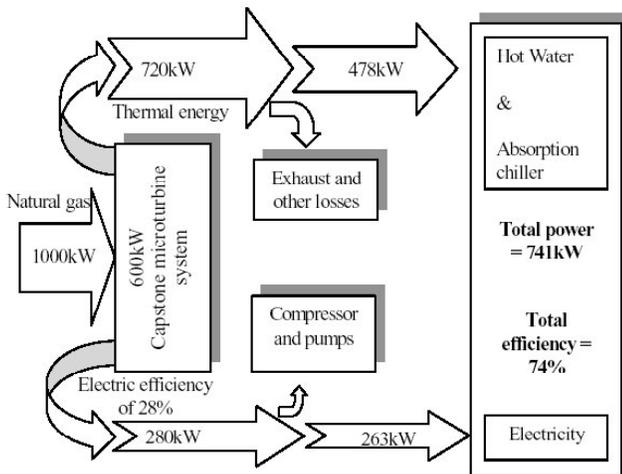
Natural gas compressors located on the roof of the EBMUD admin. building.

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 electrical demand. It is designed to first meet the building thermal load and then to contribute to electricity supply.

The system produces NO_x emissions of 0.21lb/MWh_{elec}. This is roughly 7% of the NO_x emissions released by conventional US electricity production.

Maximum 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.

Further information can be found at

- EBMUD: www.ebmud.com
- Microturbines: www.capstoneturbine.com
- Self-Generation Incentive program (SGIP): www.pge.com/suppliers_purchasing/new_generator/incentive/index.html
- PRAC: www.chpcenterpr.org

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