

U.S. DOE



CHP  
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# Metro Wastewater Reclamation District

## 6-MW Renewable CHP System

### Site Description

Metro Wastewater Reclamation District (MWRD) serves 1.7 million people in metropolitan Denver and many of the surrounding suburbs, including 45 water and sanitation districts. Treating 140 million gallons per day, it is the largest wastewater treatment plant between the Mississippi River and the West Coast.

Twelve anaerobic digesters (2 million gallons each) treat the wastewater solids, generating methane as a by-product. The methane has a BTU value of about 50% of pipeline natural gas. The anaerobic digestion process also produces 38,000 tons of Class B biosolids per year that can be land-applied, thus enriching the soil and offsetting the greenhouse gases from producing synthetic fertilizer.

The CHP equipment is owned, operated, and maintained by Suez Energy North America, Colorado-Golden Energy Corporation, from a control room in Golden, Colorado.

### Quick Facts

**LOCATION:** Denver, Colorado

**MARKET SECTOR:** Wastewater treatment

**FACILITY SIZE:** 140 million gallons per day

**FACILITY PEAK LOAD:** 10 megawatts (MW)

**EQUIPMENT:** Two 3.1-MW Solar Centaur-40s

**FUEL:** Methane (biogas) from the wastewater

**USE OF THERMAL ENERGY:** 25 MMBTU/hr of heat for anaerobic digesters

**CHP IN OPERATION SINCE:** 1985

**ENVIRONMENTAL BENEFITS:** Renewable energy from a waste source, reduced need for fossil fuel generated electricity, reduced greenhouse gas emissions

### Reasons for CHP

Reasons for installing CHP at Metro Wastewater Reclamation District include:

- The fuel (methane) is a readily available byproduct of the water treatment process—although it does need to be pre-conditioned before use.
- Costs for self-generated electricity are cheaper and more stable than purchased electricity.
- Recovered heat is used to keep the digesters at the proper operating temperature and to support other processes.



Denver's Metro Wastewater Reclamation District, the largest wastewater treatment facility in the Rocky Mountain West

## CHP Equipment & Configuration

MWRD has had CHP in operation since 1985, first using reciprocating engines and now using gas turbines. The current system includes two 3.1-MW Solar Centaur-40 gas turbines configured to run on low BTU fuel (biogas). The biogas is compressed to 150 psi using three to four 200-hp compressors. The system supplies four to five MW in parallel and synchronized to the utility.

## CHP Operation

The generators are operational 24 x 7 with 97% availability. One generator runs at full capacity, while the second runs based on the amount of available biogas.

Like CHP systems at other wastewater treatment plants, the recovered heat is recycled back to help maintain the proper temperature of the digester. The thermal energy produced is up to 25 MMBTU/hr. The recovered heat raises the closed hot water loop temperature flowing through the digesters by 30°F. Heat is also used for space heating and other process support.

## Lessons Learned

- The site originally had four 1,200-kW reciprocating engines. With age, these units became expensive and inefficient to operate and maintain, and so two of the engines have been mothballed. However, the other two engines are operational and are used as back-up generators when either of the combustion turbines are offline.
- After the installation of two gas turbines and related infrastructure, Suez operates the plant with high reliability.
- Electric tariffs impact whether a utility-parallel CHP facility is financially viable. The users of a CHP facility must thoroughly understand the electrical tariffs and changes in the tariffs that may occur.
- Proper siloxane treatment is important. Siloxanes and silicon oxides can cause heat exchanger fouling, not only increasing maintenance but also reducing the quantity of recovered heat.



Above, some of the 12 anaerobic digesters.  
Below, the Solar Centaur-40 gas turbines that turn the biogas into electricity and useful heat.

## For More Information

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