



Paseo Real Wastewater Treatment Plant

500-kW Renewable CHP System

Site Description

The Paseo Real Wastewater Treatment Plant (WWTP) serves the New Mexico state capital city area, meeting the needs of over 80,000 people in the city of Santa Fe and Santa Fe county. The plant has a capacity of 9.2 million gallons per day (MGD) and uses an activated sludge process to achieve biological nutrient removal and anaerobic digestion for solids stabilization.

The facility has two photovoltaic (PV) systems that supply 1.4 kW. With the new addition of a digester gas cleaning system and two 250 kW CHP systems, the plant will produce over 95% of the site's power requirements and over 90% of the process heating needs.

Quick Facts

LOCATION: Santa Fe, NM

MARKET SECTOR: Wastewater treatment

FACILITY SIZE: 5 MGD design, 9.2 MGD capacity

FACILITY AVERAGE POWER USE: 6.9 MM kWh

EQUIPMENT: Two 250 kW MTU gensets

OPERATION: 60% of load to be supplied by biogas CHP, remainder from PV and grid

USE OF THERMAL ENERGY: Heating digesters

ENVIRONMENTAL BENEFITS: Use of a renewable fuel, reduced fossil fuel use, significant GHG emission reduction, high total energy efficiency

CHP IN OPERATION SINCE: 2020

Reasons for CHP

Combined heat and power (CHP) is a key part of the Paseo Real energy management program. The main reasons the plant installed CHP are:

- Making use of a renewable gas supply available on-site
- Support the City's sustainability goals
- Reduce power costs, which are a significant portion of the facility budget
- Ensure system resilience in case of grid power outage

With the addition of CHP, New Mexico has realized additional benefits beyond the initial reasons the WWTP pursued the project, including reduced GHG emissions and improved energy efficiency.



Image courtesy of City of Santa Fe, Wastewater Division

CHP Equipment and Configuration

Gas Supply

- From mesophilic digesters
- 60% methane, 35% CO₂, plus nitrogen, hydrogen, hydrogen sulfides, and misc.
- 600 BTU/scf
- Gas cleaning includes sulfide, moisture and siloxane removal

Paseo Real Facility

- Two MTU 12V400 GS CHP engines (biogas)
- Rated 250 kW each
- Total thermal output of 2.6 MMBTU/hr
- Fueled by digester gas
- Backup boilers run on biogas or natural gas

Emissions Reduction

- Removal of sulfide from biogas prior to combustion
- Reduce natural gas combustion by over 90% for process use
- Reduction of biogas flaring
- Reduction of GHG by over 3,000 MT/year

Optimizing the Economics

The local utility has a rate schedule for municipal utilities that varies from \$0.12 per kWh on-peak (Mon-Fri, 8 am to 8 pm) down to \$0.02 off-peak, resulting in a significant opportunity to reduce WWTP operating costs with energy supplied from the CHP plant during the on-peak periods. The lower cost CHP power supply is particularly beneficial during the coincident periods of peak power cost and peak wastewater flow, aeration requirements, and power demand.

The amount of CHP power generated is based on a calculation of when CHP power vs. grid power is most economical for the plant. The digesters are designed with biogas storage capacity, enabling storage of up to 6 hours of produced biogas. The plant then optimizes the use of the biogas as CHP fuel during on-peak times of the utility rate structure.

The CHP system provides up to 60% of the WWTP's power requirements. Two PV arrays provide up to 35% and utility grid power makes up the remainder as needed.

A significant component of the project is the gas cleaning system, provided by Unison. This system employs a mulch/iron "sulfide sponge" for H₂S removal, a compression/chiller condenser for moisture reduction, and activated carbon vessels for removal of siloxane from the biogas. This gas clean-up system will significantly reduce wear and, subsequently, maintenance costs for the CHP engines, as well as increase the lifespan of the plant.

Lessons Learned and Future Plans

Alan MacGregor, Paseo Real Anaerobic Digester Project Manager, Santa Fe, NM:

"This was a large project for Santa Fe. In addition to cogeneration, we replaced our 60-year old digesters with current technology, added two belt filter presses, and a SCADA system. The project took over 4 years to plan, design, and build. The gas cleaning and cogeneration processes are easily the most complex systems at the facility, and required close coordination between all parties to make it possible. The project was financed with the first green Climate Bonds¹ to be issued in New Mexico, and achieves a 55% reduction in GHG emissions."

For More Information

U.S. DOE SOUTHCENTRAL CHP TECHNICAL ASSISTANCE PARTNERSHIP

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PASEO REAL WASTEWATER TREATMENT PLANT

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MORE CHP PROJECT PROFILES:

www.sccchptap.org

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¹ <https://www.climatebonds.net/certification/city-santa-fe-new-mexico>