



CHP
TECHNICAL ASSISTANCE
PARTNERSHIPS

Gresham Wastewater Treatment Plant

Net Zero Energy Use with CHP

790-kW CHP System



FOG Receiving Station. The Gresham WWTP Doubled Biogas Production by Collecting about 12,000 gallons/day of Fats, Oils, and Grease (FOG)

Site Description

The Gresham Wastewater Treatment Plant (WWTP) treats about 13 million gallons per day (MGD) while serving about 114,000 customers in the cities of Gresham, Fairview, and Wood Village, Oregon. The secondary treatment process produces activated sludge which is anaerobically digested to produce biogas. The scrubbed biogas is then combusted in two 395 kW reciprocating engines.

Quick Facts

LOCATION: Gresham, Oregon
 MARKET SECTOR: Wastewater Treatment
 FACILITY SIZE: 20 MGD capacity (Average flow of 13 MGD plus Fats, Oils, and Grease Collection)
 FACILITY PEAK LOAD: NA
 EQUIPMENT: two 395 kW biogas-fueled Caterpillar reciprocating engines
 FUEL: Treated biogas
 USE OF THERMAL ENERGY: Digester heating
 CHP Output: 5.8 million kWh/year (2017)
 ENVIRONMENTAL BENEFITS: First energy net-zero WWTP in Pacific Northwest
 TOTAL PROJECT COST: \$9.1 million
 YEARLY ENERGY SAVINGS: \$500,000
 PAYBACK: N/A, staged project
 CHP IN OPERATION SINCE: Phase 1 (2005), Phase 2 (2015)

The Journey to Net Zero

The path to Net-Zero for Gresham's WWTP was initiated in 2010 when the City established an Energy Management Team, set a goal for the plant to be Net-Zero by 2015 and identified potential efficiency and renewable generation opportunities to support that goal. A 395 kW biogas-fueled Caterpillar reciprocating engine had been installed in 2005 and met almost half of the WWTP annual electrical load. Additional renewable energy generation was made available when a 420 kW ground-mounted solar array was installed with grant funding at no cost to the city. The solar project was followed by a conservation project which reduced electrical loads through the provision of new high efficiency turbo-blowers and aeration basin fine bubble diffusers.

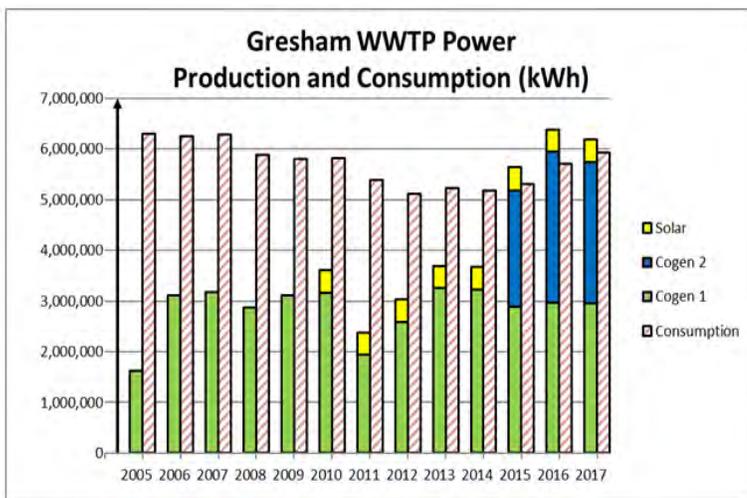
A Fats, Oils, and Grease (FOG) receiving station was later added to increase biogas production, while also generating tipping fee revenue. FOG collection allows for increased urban waste grease collection from food service establishments, which offers an added benefit as it keeps grease from clogging the sewer collection system. Co-digestion of FOG doubled biogas production, allowing for a second 395 kW CHP project to be added. An engine-generator identical to the first was purchased to facilitate ease of maintenance and to support an on-site inventory of spare parts. Engine repair and maintenance was contracted out to a local Caterpillar dealer and, with 48-hour spare parts availability, a 95% availability factor is maintained.

Since 2015, the Gresham wastewater treatment plant has been a *net positive* electrical energy producer, making this the first treatment plant in the Northwest to achieve energy net zero status.

Fats, Oils, and Grease (FOG) storage tanks: The city earns about \$350,000 annually in tipping fees as haulers deliver about 12,000 gallons per day of FOG from local restaurants. FOGs are stored in tanks, then metered directly into the digesters for co-digestion with sewage sludge to obtain a doubling of biogas production. It is estimated that each gallon of grease produces about 13 cubic feet of digester gas. A biogas treatment system is included to reduce H₂S concentrations in the biogas to less than 100 ppm with undetectable levels of siloxanes. Siloxane testing costs (at \$2,000/test) are minimized through replacing filter media at recommended intervals. A biogas chiller is also included to reduce moisture.



CHPs Role in Achieving Net Zero Energy Use



2005-2017 WWTP Consumption/Production Summary:

- The original 395 kW CHP project produced about 3 million kWh/year by 2006; roughly half of the WWTP load requirements (see red and green bars).
- Adding a 420 kW solar increased generation by 475,000 kWh/year, or about 8% of the facility load (yellow bars).
- Consumption at the WWTP declined by about 17% following installation of multiple energy efficiency projects during this same period.
- Net Zero operation was achieved by 2015 after a second 395 kW CHP unit commenced operation (blue bars).

Lessons Learned

The Gresham WWTP is one of a select few net-zero treatment plants in the country and the first energy net-zero treatment plant in the Pacific Northwest. Gresham staff indicate that energy champions are essential for project success and that forming an energy committee and meeting regularly are also important. They endorse doing efficiency first and taking deliberate steps to achieve energy net-zero. They also identified and applied for available financial incentives. The city believes that energy management, like treating wastewater, should be a core responsibility of WWTPs.

The Mayor of Gresham notes that the WWTP CHP projects are great for the bottom line while producing green energy and green financial returns for the city. The City of Gresham received over \$3.6 million in incentives from the Oregon Energy Trust and Oregon Department of Energy for the WWTP energy projects while investing about \$6.0 million of their own funds. The mayor also notes that the Gresham process of turning waste streams into treasure can be replicated at many of the WWTPs across the country.

For More Information

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“Traditionally, the WWTP was the biggest energy hog for the city. In less than ten years it is now producing all of its own energy on-site.”

- Shane Bemis, Mayor, City of Gresham