



City of Portland Green Purchasing Case Study

On-Site Renewable Energy: Biogas

Purchasing Green

The Columbia Boulevard Wastewater Treatment Plant (CBWTP) produces about 1.5 million cubic feet of anaerobic digester gas (comprised of 50 to 60 percent methane) every day as a byproduct of the sewage treatment process. The plant has tested several technologies over the years to reclaim this “biogas” for electrical power generation, including fuel cells, microturbines and co-generation engines. The plant also sells excess biogas to Malarkey Roofing Company, a nearby roofing materials manufacturer.

In 2008, CBWTP installed two 850 kilowatt GE/Jenbacher reciprocating engine-generators with a total generating capacity of 1.7 megawatts. A gas pretreatment system removes hydrogen sulfide, siloxane, and moisture to prepare the biogas to be used as fuel. In addition, the plant recovers heat from the engine jacket water and engine exhaust to heat its anaerobic digesters. The engine-generators supply about 40 percent of the plant’s electricity needs

Benefits

Wastewater treatment plants typically flare (burn) excess biogas. Redirecting this biogas to generate power provides the CBWTP with a free, renewable energy source, displacing electricity generation at power plants that use fossil fuels.

Cost

The reciprocating engine project cost about \$8.9 million, but the CBWTP received a \$362,000 cash incentive from the Energy Trust of Oregon. In addition, the CBWTP utilized the Oregon Department of Energy Business Tax Credit program to offset 33.5 percent of the total cost. With an approximate 40 percent energy savings rate, they should recover their investment in 12 to 15 years. The electricity generated by the reciprocating engines saves the CBWTP approximately \$665,000 in electricity costs every year. In addition to the electricity savings from the generation of on-site power, the CBWTP currently receives about \$300,000 a year from sales of excess biogas to Malarkey Roofing.

Performance

The biogas treatment system is operating as intended and the heat recovery is meeting the demand for digester heating. There have been some challenges with recovering sufficient heat to heat the digesters during cold weather events. The engine generators currently use about 45 percent of the biogas produced by the plant.



These engine generators use biogas to produce about 40 percent of the CBWTP’s electricity needs.

At a glance –

Who –

- Columbia Boulevard Wastewater Treatment Plant

Product –

- Biogas-fueled engine generators

Cost –

- \$8.9 million
- Generates electricity savings
- Surplus biogas generates revenue

Benefits –

- Uses waste biogas as fuel source
- Reduces use of fossil fuels
- Offsets energy use

“The Bureau of Environmental Services is at the forefront of exploring opportunities to work with both public and private partners to expand renewable energy use. These efforts benefit the environment by reducing reliance on fossil fuels and Portland sewer ratepayers by containing our sewage treatment costs.”

Dean Marriott, Director
Bureau of Environmental Services

Lessons Learned

Before installing the co-generation engines, the CBWTP piloted both fuel cell and microturbine technology to generate power using biogas. Although both technologies saved CBWTP nearly \$60,000 a year in electricity costs, ongoing maintenance issues with the fuel cells and biogas pretreatment issues with the microturbines led the CBWTP to discontinue their use. However, the CBWTP was able to take the lessons learned from the fuel cell and microturbine projects and apply them to the installation of the new reciprocating engines.

The CBWTP's ability to pioneer these promising technologies for reclaiming biogas from the wastewater treatment process was possible in large part due to financial partnerships. By pursuing grants, credits, and rebates from federal, state, and local sources, the CBWTP was able to offset initial installation costs. Exploring opportunities to partner with both public and private entities has been instrumental in the CBWTP's success in increasing renewable energy use.

Current Projects at the CBWTP

The CBWTP still flares about 20 percent of the total digester gas produced on-site. The Bureau of Environmental Services is evaluating alternatives for the most beneficial use of the remaining biogas. A recommended alternative is expected in the coming months.

■ December 2013 (v4)

About the Columbia Boulevard Wastewater Treatment Plant

The Bureau of Environmental Services (BES) operates the Columbia Boulevard Wastewater Treatment Plant (CBWTP), the largest wastewater treatment plant in Oregon. The plant serves nearly 600,000 people and treats wastewater conveyed by Portland's 2,500 miles of sewer pipes and 96 sewage pump stations. The facility cleans more than 25 billion gallons of wastewater annually.

For more information: Linc Mann, Public Information Officer,
Bureau of Environmental Services, 503-823-5328.
