



# Glenbard Wastewater Authority

## 750 kW Biogas CHP System



### Project Overview

The Glenbard Wastewater Authority (GWA) was formed in 1977 via an intergovernmental agreement between the Villages of Glen Ellyn and Lombard, Illinois to protect public health and the environment through the proper collection and treatment of municipal wastewater. Today they provide these services to over 100,000 residents and businesses.

In February, 2015 the GWA initiated a project to design and construct a 750 kW Combined Heat and Power (CHP) system that would operate in conjunction with biogas produced by the anaerobic digesters at their wastewater facility. The facility, which is designed to process up to 47 million gallons per day (MGD) of waste water at peak load and a design average flow of 16 MGD at capacity, uses a high purity oxygen treatment system which includes anaerobic digestion to stabilize the bio-solids prior to land application.

The project also includes the addition of high strength waste (HSW) from local businesses to the anaerobic digesters, doubling the facility's biogas output to approximately 288,000 cubic feet per day. This level of 62% methane biogas production is sufficient to power two 375 kW internal combustion engine generator heat recovery units (CHP system) capable of supplying more than 60% of the facility's electric requirement. The CHP system recovers over 2.88 MM Btu/hr of thermal energy from the engines which is used to keep the digesters at their required temperature (98°F). Additional potential future uses for recovered heat include heating the facility buildings and/or sludge drying. The recovered heat can meet up to 96% of the facility's total heating requirements, offsetting the need to operate their two 1.5 MM Btu/hr dual fuel existing boilers.

### Project Drivers

The major driver for this CHP project is the strong interest and commitment of the GWA to find innovative ways to improve and expand its wastewater facility's operation. This CHP project provides the GWA the opportunity to:

- Move them closer to their operating goal of energy neutrality
- Become more of an Energy Resource Recovery Facility by utilizing its increased Biogas production to fuel a CHP system that makes their facility more operationally reliable and resilient.
- Educate their communities on the future of HSW as a renewable resource versus a costly hard to dispose of waste. The HSW consists of fats, oils and greases from local businesses as well as other industrial bi-products.
- Positively impact their communities by reducing the hauling and disposal costs associated with these high strength wastes.

### Quick Facts

**LOCATION:** Glen Ellyn, Illinois  
**MARKET SECTOR:** Wastewater Treatment  
**Plant Capacity:** 47 MGD Peak; 16 MGD Design  
Avg.; 10 to 12 MGD Typical  
**CHP GENERATION CAPACITY:** 750 kW  
**CHP HEAT RECOVERY RATE:** 2.88 MMBtu/hr  
**CHP FUEL SOURCE:** Biogas from municipal + high strength wastes  
**PRIME MOVERS:** Two - 375 kW IC Engines  
**PROJECT COST:** \$5.3M  
**PROJECT PAYBACK:** Best Case: 6.4 yrs. Most Likely Case: 8.8 yrs.  
**BEGAN OPERATION:** May, 2016  
**PROJECT AWARD:** 2017 National Engineering Award issued by the American Council of Engineering Companies (ACEC)

*"The CHP project provides our wastewater facility a significant increase in operational reliability and resiliency. The CHP system is capable of operating on either biogas from our digesters or natural gas supplied by our local utility. Electricity for the facility is provided by the CHP system with backup provided by the local electric utility, and the heat required by the digesters is supplied by the free recovered thermal energy from the CHP system with backup, if required from the 2 existing dual fueled boilers"*  
**Matt Streicher: Interim Executive Director, Glenbard Wastewater Authority**

## Project Economics

The GWA initiated the procurement for this project in February, 2015. They utilized a procurement approach known as a Progressive Design-Build Partnership that included the design company, the general contractor, the mechanical & electrical contractors, the equipment suppliers and the GWA. This procurement partnership approach resulted in project completion in just 16 months at a total cost of \$5.3 million. The project was commissioned and initiated operation in May, 2016. The cost to the GWA customers was reduced by a \$952,000 energy grant awarded by the State of Illinois Department of Commerce and Economic Opportunity (State Energy Office).

To secure funding approval from the GWA Executive Oversight Committee (EOC), the project team presented a payback analysis that factored in such variables as size of the CHP system, need for co-digestion, O&M and replacement costs with inflation, equipment and new facility costs, grant funding, and natural gas and electricity prices including inflation. The analysis considered a best case scenario (project goal), a middle case scenario (most likely) and a worst case scenario. The results showed the middle (most likely) scenario to have an 8.8 year payback with the best and worst case paybacks at 6.4 years and 15.6 years. The most likely case met the EOC's minimum criteria of a less than 10 year payback. The analysis calculates a net savings over the 20 year life of the equipment of over \$7.3 million, providing positive financial alternatives for future GWA strategic budgeting requirements.

<b>Project Costs (\$1,000s)</b>	
<b>CHP Equipment:</b>	\$930
– 2 engine/generator/heat recovery units	
<b>Biogas Treatment:</b>	\$850
– H <sub>2</sub> S, Moisture, & Siloxane Removal	
<b>Support Facility (new building):</b>	\$2,700
– Construction, electric & mechanical connections	
<b>HSW Receiving Station:</b>	\$400
<b>Engineering Support:</b>	\$425
<b>Total Cost</b>	<b>\$5,305</b>
<b>Incentive Payment</b>	<b>–\$952</b>
<b>Total Net Cost</b>	<b>\$4,253</b>

## Lessons Learned

Mr. Matt Streicher, who serves as the Interim Executive Director at the GWA, recently shared some comments, thoughts, and lessons learned after 17 months of operation of the CHP system:

- Overall, the CHP system has performed as expected. A few modifications were made to the heat recovery distribution system to optimize the timing and placement of the recovered thermal energy, substantially increasing the system performance and efficiency.
- The CHP system has demonstrated its ability to supply over 95% of the facility's electric requirements.



**UNISON Solutions: Biogas Treatment**

the facility's electric requirements.

This is due in part to better than expected biogas production and in part due to the implementation of several significant energy efficiency modifications and upgrades to the plant process. GWA is now in discussions with the local electric utility (ComEd) to allow the CHP system to export power to the utility grid.

- GWA learned that having the ability to tightly control the fats, oils, and greases entering the digesters is crucial. Consistency in the composition of the wastes entering the digesters is necessary to avoid digester upsets.



**NISSEN energy teknik: 375 kW CHP Module**

## For More Information

Several organizations are promoting the benefits and concepts of CHP in Illinois. For no cost technical assistance to investigate the technologies and economics of CHP at your facility, contact the US DOE Midwest CHP Technical Assistance Partnership (CHP TAP). For information on energy efficiency utility incentive rebates in the northern Illinois region totaling up to \$37.5K per feasibility study and up to \$2.5MM per installed CHP project, contact ComEd and Nicor Gas.

### ComEd Energy Efficiency Program

Phone: (855) 433-2700

[Comed.com/BizIncentives](http://Comed.com/BizIncentives)

### US DOE Midwest CHP Technical Assistance Partnership

(312) 996-4490

[www.MidwestCHPTAP.org](http://www.MidwestCHPTAP.org)

### energySMART, a Nicor Gas Program

(877) 886-4239

[www.nicorgasrebates.com/your-business](http://www.nicorgasrebates.com/your-business)