



MIDWEST  
**CHP**  
APPLICATION  
CENTER

In Partnership with  
the US DOE

combined heat & power in government facilities

# Winnebago County Sheriff's Office

## 1.06 MW CHP Application

### Project Profile

#### Quick Facts

**Location:**  
Oshkosh, Wisconsin

**Facility Size:**  
209,020 square feet

**CHP Electric Capacity:**  
1.06 Megawatts

**CHP Thermal Capacity:**  
4,700 MBtu per hour at 194°F

**Prime Mover Type:**  
GE Jenbacher JMC320

**Heat Recovery Type:**  
Cain Exhaust Heat Recovery Unit

**Fuel Type:**  
Landfill Gas

**CHP Efficiency:**

- ▶ 36.9% Electric Efficiency
- ▶ 47.8% Thermal Efficiency
- ▶ 84.6% Overall Efficiency

**Installation Costs:**  
\$1.2 Million

**Annual Revenue/Savings:**  
\$400,000 to \$500,000

**Simple Payback:**  
Less than 3 Years

**Began Operation:**  
April 2007

#### Project Overview

In April 2007, Winnebago County Solid Waste Management Board began the operation of a 1.06 megawatt combined heat and power (CHP) system located at the Winnebago County Sheriff's Office in Oshkosh, Wisconsin. At the core of the CHP system is a single GE Jenbacher JMC320 engine generator with Cain exhaust heat recovery equipment. The electrical power generated by the CHP system is sold directly to the Wisconsin Public Service Corporation while the recovered heat from the engine generator supplements both heating and domestic hot water systems at the sheriff's office. The total project cost of the CHP system was approximately \$1.2 million with a projected simple payback of less than three years.



Winnebago County Sheriff's Office – Oshkosh, WI

#### Background

The CHP system at the Winnebago County Sheriff's Office is not the first LFGE (landfill-gas-to-energy) project for Winnebago County. Over \$12 million has been invested on a gas collection system and electrical power generation equipment at its two landfill facilities. Since December 1999, the county has operated three 1MW distributed generators at its Snell Road Landfill. Therefore, generating electrical power at the sheriff's office would not be a new concept for Winnebago County.

In 2006, county officials, working with local engineering firm EarthTech and engine distributor Inland Power Group, made the decision to increase the county's landfill gas utilization by pumping gas from the Sunnyview Landfill to a newly built sheriff's office on the east side of the landfill. Jim Morris, Landfill Manager for Winnebago County Gas Recovery, states "our landfill gas supply was rising; we needed to decide how to use it efficiently. Waste-heat recovery seemed like a good idea. We figured out the rough costs of doing this, and we liked what we saw." Construction and installation of the 1.06 MW CHP plant commenced in November 2006 and the system was commissioned in April 2007.

The CHP installation provides some control over volatile energy costs. According to Morris, the sheriff's office can save anywhere from \$50,000 to \$100,000 annually in energy bills, depending on the price of natural gas. The county also performs their own operation and maintenance of the CHP plant and gas cleanup system.

## Landfill Gas Cleanup

One of the prerequisites for a successful LFGE project is to ensure the landfill gas is cleaned properly. Fortunately, the gas cleanup process at Winnebago County is a relatively simple process. Saturated gas is filtered and pre-cooled before being sent to an evaporator that chills it to about 35°F. This temperature drop causes condensation, removing the liquids from the gas. The gas is then reheated to 80°F with a dew point of 40°F.

The containments found in landfill gas (LFG) cannot be ignored either which include siloxanes, chemical compounds of silicone, oxygen, and carbon and hydrogen. In most applications, a comprehensive and costly gas-cleaning system is installed to remove containments from landfill gas. On the contrary, Winnebago County officials decided to increase the maintenance intervals at their gas cleanup plants rather than install an expensive gas-cleaning system, proving to be a more cost-effective solution for their operations.

## Emissions Reduction

According to the US EPA's Landfill Methane Outreach Program (LMOP), the 1.06 MW CHP plant reduces annual emissions, on a direct (reduction of methane emitted directly by the landfill) and avoided (offset of carbon dioxide from the avoided use of fossil fuels) equivalent by:

- ▶ 0.0457 million metric tons of carbon dioxide equivalents (MMTCO<sub>2</sub>)
- ▶ 2,112 tons of methane (CH<sub>4</sub>)
- ▶ 6,038 tons of carbon dioxide (CO<sub>2</sub>)

These annual emissions reductions are equivalent to any one of the following benefits:

- ▶ Removing emissions equivalent to 8,839 road vehicles
- ▶ Planting 12,595 acres of forest
- ▶ Offsetting the use of 226 railcars of coal
- ▶ Averting electricity usage of 82,592 light bulbs



GE Jenbacher Container with Heat Recovery Equipment



GE Jenbacher J320 Engine Generator

## Key to LFG CHP Projects

Today, the CHP plant at the Winnebago County Sheriff's Office is only one of 14 CHP projects across the nation that is fueled by landfill gas. The small number of projects is attributed neither to the effectiveness or economic benefits of these types of applications, but rather to location. The location of both the landfill and end user is critical for the feasibility of a landfill gas-fueled CHP project. According to Jon Going, Sales Director with Inland Power Group, "these CHP projects are rare in the landfill industry not because they don't make sense or that they're not good projects. They're rare for the main reason that typically a customer is not located right near a landfill that can utilize the heat. That is the main reason why these projects are still so rare."

For further information  
contact:

*Midwest CHP Application Center  
851 S. Morgan Street  
Chicago, IL 60607-7054*

*Phone: (312) 413-3835  
Fax: (312) 996-5620  
[www.CHPCenterMW.org](http://www.CHPCenterMW.org)*

\$400,000  
To \$500,000  
Annual  
Revenue/Savings

Projected Simple  
Payback Less  
than 3 years

"This is an extremely efficient use of our landfill gas. The county is glad to hear that we are creating revenue and saving money in heating costs."

**Jim Morris**  
*Landfill Manager for  
Winnebago County Gas  
Recovery*

