



New York State Energy Research and Development Authority

# Modern Landfill

## Engines Heat Hydroponic Greenhouse

DG/CHP Program

## Project Profile

Combined heat and power for  
Landfill Gas Recovery



### Overview

Modern Landfill, Incorporated, manages a 120 acre, non-hazardous solid waste landfill located in Model City, NY. Over 7 million tons of biodegradable waste has been deposited at the site. The facility has enough capacity to continue operating for 30 years.

Landfill gas collected from the decomposing waste is used as fuel for seven 800 kW engine-generator sets. Most of the electricity is exported to the grid. Heat is recovered from the engines as hot water which is used by an adjoining hydroponic grower to produce tomatoes year round.

### Quick Facts

**Location:**  
Model City, NY (National Grid)

**Installation Date:**  
April 2004

**Operating Experience:**  
23 months (as of March, 2006)

**CHP Equipment:**  
Seven Caterpillar 3516 Engine-Generator Sets

**Generating Capacity:**  
5,600 kW

**Heat Recovery Application:**  
Hot water to greenhouse (31,000 MBtu/h peak)

**Design CHP Efficiency:**  
70% HHV

**Type of Fuel:**  
Landfill Gas

**Annual Utility Savings:**  
\$567,000 per year (measured)

**Simple Payback:**  
1.3 years (measured)

### The Application

Anaerobic decomposition of the organic material in landfills produces methane (~50%), carbon dioxide (~45%) and other gases with a combined heating value less than 600 Btu/ft<sup>3</sup>. The gas is collected and usually flared to reduce odors and its greenhouse gas potential.

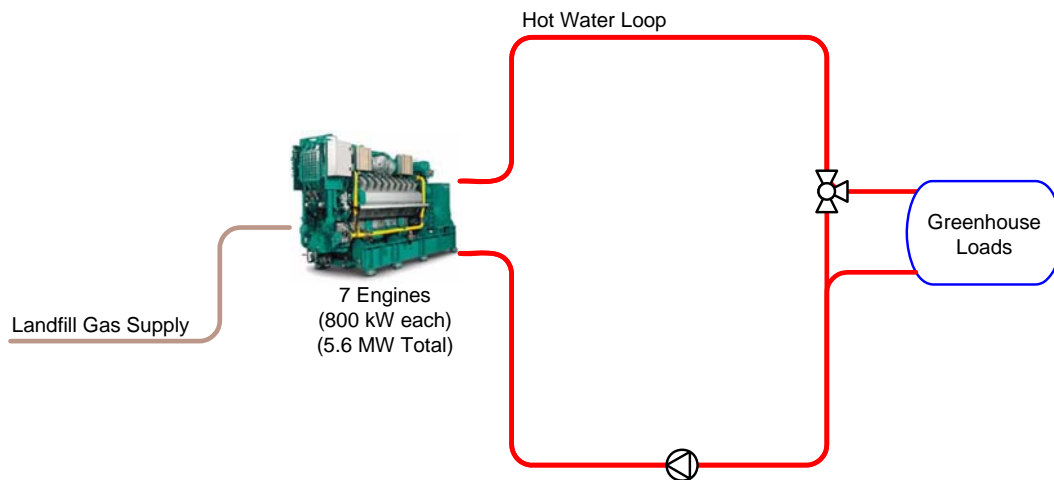
Modern Landfill worked with Innovative Energy Systems (IES) to develop a 5.6 MW generating plant rather than continuing to flare up to 2.6 million ft<sup>3</sup> of gas per day. Engines were used because of IES's experience at other sites. The installations are standardized to simplify operations and maintenance. Modern Landfill and IES jointly formed a third company, H2Gro, to hydroponically produce tomatoes using some of the waste heat (31 million Btu/h) recoverable from the engines to provide space conditioning in a 7.5 acre greenhouse.



Landfill Gas Fueled Engine-Generator Sets

## CHP System and Equipment

The combined heat and power system at Modern Landfill is configured on seven Caterpillar 3516 engine-generator sets. Waste heat from the engines is recovered as hot water that is circulated to the greenhouse to provide space heating. Excess heat can be rejected to atmosphere. The engines run continuously under automatic control with a minimum of daytime staffing provided. Except for minor site loads, all of the electricity produced is exported to the grid. Significant pretreatment of the gas is required to sustain engine performance. The gas is collected from the landfill under a vacuum, compressed to 3 psig, then cooled and forced through a glycol bath and filtering to remove particulates, moisture and other liquefied contaminants.



## Economics and Environmental Benefits

Electricity exported to the grid is sold at a price near \$0.05 per kWh. Annual sales have exceeded 30 million kWh in the last few years. The waste heat delivered to H2Gro reduces its fuel costs by 38%. Although the engines do not use catalytic converters because of siloxanes in the fuel, careful control of the air-fuel ratio has enabled IES to keep NO<sub>x</sub> emissions below regulated levels. Fugitive landfill gas emissions have been reduced by an estimated 85%. Monitored data from the site have been collected and are available on NYSERDA's DG/CHP website from December 2004.



*Aerial View of Greenhouse*



*Engine Radiators and Exhaust Systems*

## Summary of Benefits

- Renewable fuel source used to provide electricity and reduce greenhouse gases
- Waste heat used for economic development creating new employment
- Significant output of low cost electricity to grid

“The value of this project goes beyond the energy savings. Many jobs have been created with the possibility of even more to come.”  
- Anonymous

## Web Links and Further Information:

Innovative Energy Systems –  
Developer/Engineer

[www.innovativeenergysystems.com](http://www.innovativeenergysystems.com)

Engine  
Manufacturer

[www.cat.com](http://www.cat.com)

Other  
DG/CHP  
Resources

[chp.nyserd.org](http://chp.nyserd.org)

[www.moderncorporation.com](http://www.moderncorporation.com)

Prepared for NYSERDA by:  
CDH Energy Corp.  
Cazenovia, NY 13035  
315-655-1063  
[www.cdhenergy.com](http://www.cdhenergy.com)  
[dgchp\\_data@cdhenergy.com](mailto:dgchp_data@cdhenergy.com)