

Electricity conservation on **ONTARIO FARMS**



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European renewable energy technology generates Ontario electricity

Dairy farmer George Heinzle has turned a centuries-old technology (anaerobic digestion) commonly used in his native Austria into an electricity-generating reality in eastern Ontario.

The Ontario Power Authority visited Terryland Farms to learn first-hand from George and Linda Heinzle how their newly installed biogas digester produces electricity for the province's grid and meets the Heinzles' goal of protecting the agricultural environment.

Since August 2007, George and Linda's Terryland Farms have been producing about 750 kilowatt-hours (kWh) of electricity per day from a 1,000 cubic metre anaerobic digester. Biogas – containing about 60 percent methane and produced from organic materials (manure, crops and crop residues) enclosed in the digester – fuels a 180 kilowatt (kW) engine to generate the electricity. After the biogas has been removed, the solids are returned to the soil as nutrients.

The new biogas digester has not changed the farm operation. "The only difference is the manure from the barns is pumped into the biogas digester first, and the gas is burned for electricity before the digestate is moved to the field," explains George.

"We farm a complete circle. We take nutrients from the soil and return them to the soil. They are in a natural form. The digester changes the nutrients to a form that make the plant uptake easier."

The environmental benefits of an anaerobic digester include improving the air and water quality, reducing odour and pathogen levels in manure, reducing the need for chemical fertilizers and pesticides, and reducing food by-products.

The Heinzle farm operation and home consume about 400 kWh of electricity per day – the additional 350 kWh produced from the digester – is sold to the province's electricity grid under a Renewable Energy Standard Offer Contract (RESOP), administered by the Ontario Power Authority.

The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) recently established a \$9 million Ontario Biogas Systems Financial Assistance Program to provide up to \$400,000 to Ontario farms building biogas systems. Details about the program are available at www.omafra.gov.on.ca.

George has focused on building a biogas digester since he emigrated from Austria with his parents and siblings to Canada in 1982. "There was a digester in our neighbourhood over 30 years ago," George says. Since then,

Continued on page 2

(L. to r.) Linda and George Heinzle speak with the OPA's Terry Rothwell and Victoria Gagnon about their farm's 1,000 cubic metre biogas digester.



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Continued from page 1

the digester technology has improved significantly. The desulphurization process now used in the digesters prolongs generator engine life.

To expand its renewable energy resources, the German government introduced financial incentives to encourage farmers to build more anaerobic digesters. Since 2000, the number of German biogas plants has nearly tripled to 3,500. The German Biogas Association expects biogas will provide 17 percent of the country's electricity by 2020.

The Heinzles run a 300-cow herd with 130 milking cows. They grow corn, alfalfa and other crops as animal feed on about 430 acres of land.

Because of the large capital cost of a digester, it wasn't until recently that Linda and George could begin to seriously consider building one. "It was always something I wanted to do. But, we didn't have enough equity in our farm," George says.

"We believe that if we can make a comfortable living, why not try to preserve the environment for future generations. We want to leave the environment as we found it."

Three years ago, George and his brother Joseph, who operates an organic dairy and yoghurt factory adjacent to George's dairy farm – began planning the building of two biogas digesters – 1,000 cubic metres and 500 cubic metres capacity. Joseph's digester is smaller because his dairy herd has only 60 cows.

The total cost for the two digesters was about \$1 million. To help finance the building of the digesters, the Heinzle brothers received about \$300,000 from OMAFRA'S Rural Economic Development



The Heinzles show the OPA's Terry Rothwell and Victoria Gagnon the display panel for the biogas-fired electricity generating system. It measures the amount of renewable power delivered to the province's power grid.

HEINZLE SAYS THE NEW FUNDING FROM OMAFRA IS ESSENTIAL IF FARMERS ARE TO BUILD ANAEROBIC DIGESTERS.

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Program as part of a research project at nearby Alfred College to study the biogas digesters' effectiveness in Ontario agriculture. The Ontario Biogas Systems Financial Assistance Program was not yet available.

Heinzle says the new funding from OMAFRA is essential if farmers are to build anaerobic digesters. "Government incentives have to be there and farmers will build them," George says.

To expand the number of digesters in Ontario, the government might consider granting new farm building permits conditional on farmers building an anaerobic digester, George suggests.

The Heinzles expect their electricity generation to the province's electricity grid will increase significantly over the next few months when they begin to add grease trap waste from restaurants to the digester. "It acts like a booster."

He expects that with the addition of trap grease, the farm's electricity output will jump from 750 kWh a day to between 5,000 to 7,000 kWh when a second 180 kW biogas-fired engine is installed.

One cubic metre of trap grease generates 300 cubic metres of gas compared to one cubic metre of manure generating 25 cubic metres of gas.

The Heinzles have applied to OMAFRA for funding under the Ontario Biogas Systems Financial Assistance Program to add the second biogas engine.

"We're just getting going."

While the future economics of the biogas digester look more positive, the length of time and high connection costs required to get the digester installed and connected to the power grid still disappoints the Heinzles.

"The connection process with the power grid should move much faster and be less costly for the farmer. Generating power to the grid should be the same as drawing power. If we had not been a dairy farm with steady income, we could not have handled the long, long delays," says Linda.

"We were prepared to continue with the digester provided we don't lose any money. If we can break even today, then we expect we can make money tomorrow," adds George.

If the contract price for electricity increases, the original contract price should be increased so farmers who signed up early are not financially punished for 20 years. "We're looking for a grandfather clause so we're not punished because we had to sign to pay the cost."

Within 10 years, most livestock farms in Ontario as well as many cash crop producers will have biogas digesters, George predicts. In Germany, "we saw farms with no cattle – only corn silage – harvesting crops as a feedstock for their digesters." Biogas digesters will be an important part of our sustainable energy future, and Ontario farms such as Terryland will be at the centre of this economic transformation.

FINANCIAL ASSISTANCE FOR FARMERS FOR ANAEROBIC DIGESTERS

The \$9 million Ontario Biogas Systems Financial Assistance Program provides up to \$400,000 to farmers and rural businesses to conduct feasibility studies and partially fund the construction and implementation of biogas systems.

The funding from the Ontario Ministry of Agriculture, Food and Rural Affairs will help address Ontario's pressing need for more long-term electricity generation from renewable sources by providing significant financial opportunities for Ontario farmers in developing and building biogas (anaerobic digestion) systems.

In installing a biogas system, a number of factors need to be considered, including electricity grid connections, biogas safety, land use and local zoning requirements.

There are two phases of the Ontario Biogas Systems Financial Assistance Program. Phase 1 funding will cover up to 70 percent of the cost of a feasibility study to a maximum of \$35,000. Funding in Phase 2 will cover up to 40 percent of eligible construction and implementation costs. The total maximum feasibility and construction cost is \$400,000 for each anaerobic digester system.

Funding must meet the following requirements:

- the digester must use at least 75 percent agricultural products, agricultural by-products, food-based products or by-product products
- the digester must produce biogas for use in the production of electricity or heat or fossil fuel replacement
- the by-product or digestate must not be disposed of in a sanitary landfill or through sewage disposal. It must be land-applied as a crop nutrient or soil enhancement or must create a value-added nutrient product or be usable as livestock bedding material.

Applications for Phase 1 financial assistance and any supporting documents must be submitted by September 30, 2008, by e-mail, fax or regular post.

Applications for Phase 2 financial assistance and any supporting documents must be submitted by September 30, 2009, by e-mail, fax or regular post.

The program ends March 31, 2010.

Biogas systems produce biogas (methane and carbon dioxide) from microorganisms breaking down organic materials such as manure, crops, crop residues and food processing by-products in an enclosed container in the absence of oxygen.

The process removes most of the pathogens and odour from the waste. The anaerobic process also produces an effluent

(digestate) that contains all the water, all the minerals and about half of the carbon from the incoming organic materials.

This high-value product can be applied directly onto the land.

In Germany, one of the world's leading biogas producers, farmers generate \$500 million in revenue. In 2007, \$1 billion in new biogas construction was begun in Germany. In Ontario, several farm-based systems are already in production and a number are in their planning stages.

In Ontario, the cost of electricity produced by biogas can range from \$3,000 to \$7,000 per kilowatt of capacity. About a \$200,000 investment is required as a minimum start up, ranging up to \$2 million.

The biogas can be combusted to produce electricity and heat (co-generation), burned as fuel in a boiler or furnace or cleaned and used as a replacement for natural gas. The excess electricity can be sold to the province's electrical grid.

A biogas system that uses manure from 250 cows could result in 400 fewer tons of greenhouse gas production and 550 additional megawatt-hours of power production every year.

Under the Renewable Energy Standard Offer Program (RESOP), Ontario farmers generating electrical power from biogas through anaerobic digestion and delivered to the Ontario power grid can receive a fixed price of 11 cents per kilowatt-hour (kWh). The RESOP electricity contract guarantees payment for 20 years. The prices will be increased at a rate of 20 percent of the consumer price index annually.

There is an additional rate of 3.52 cents per kilowatt for electrical power produced during peak times. Most biogas systems will achieve this requirement. If the biogas-powered generator runs almost continuously (8,000 hours per year) the blend price paid will be about 11.9 cents per kWh.

More information about biogas systems, guidelines and applications for financial assistance are available from the following websites:

- Biogas program website www.omafra.gov.on.ca
- Ontario Power Authority Renewable Energy Standard Offer Program (RESOP) www.powerauthority.on.ca

