

## **Electric Utilities Hook up To Biogas**

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Published: March 2002 ***Pennsylvania Power & Light, Alliant Energy, Wisconsin Electric and Portland General Electric are some utilities that are plugging into anaerobic digestion projects.***

AT the October, 2001 BioCycle conference on "Renewable Energy from Organics Recycling," the director of the Iowa Energy Center, Floyd Barwig, pointed out that the possibility of separating the United States from Middle East oil politics "takes on much greater meaning. ... A heightened need for security can become another driver of an energy revolution." Right now, small steps are being taken by a number of electric power utilities throughout the nation that could someday add up to significant production of renewable energy. These power companies are making use of recovered methane in their electric grid systems from such feedstocks as manure, wastewater treatment sludge, municipal solid waste and food processing residuals. (At the same time as noted in the accompanying sidebar, other utilities are making it difficult for these developments to take place.)

Last month, a nationally syndicated newspaper columnist wrote: "The most obvious bold national project that President Bush could launch now would be a program for energy independence, based on developing renewable resources, domestic production and energy efficiency. Every school kid in America would be excited by such a project. ... I don't want to be dependent on Mideast oil anymore. Countries in that region haven't had a good century in 700 years. ... Oil has prevented them from developing innovative economies that make things instead of just take things from the ground."

### **PENNSYLVANIA POWER & LIGHT USES MICROTURBINES AT CITY PLANT**

Since August, 2001, the Pennsylvania Power & Light Company (PPL Spectrum) has been making electricity from the biogas generated at the Allentown, Pennsylvania wastewater treatment plant. The plant's biogas is collected from two primary digesters and one secondary digester. According to John Steckel of PPL Spectrum, "the bottom line is that the system is working and — as with any cutting edge project, we are tweaking the process to boost production and solve some problems with gas composition." PPL is also involved with creating power from methane gas recovered at landfills.

The Allentown project is using microturbines manufactured by Capstone Turbine Corporation of Chatsworth, California. The 12 microturbines are each capable of converting biogas into 30 kW of electric power. The microturbines, explains Steckel, operate in a "grid connect mode," that is, only when utility power is available. In an article in a trade journal, *Water World*, Steckel wrote that the 12 microturbines would use about 191,500 cubic feet of gas per day at full capacity.

The system would be capable of producing hot water to meet about 96 percent of the plant's thermal requirements. Designers expect heat output from the microturbines will exceed plant needs the vast majority of the time. Allentown's use of Performance Contracting with PPL Spectrum provided the means to address such issues and allow the project to move forward.

Under the performance contract, PPL Spectrum will assume all performance risks to the new equipment and guarantee savings from the project. The reduction in utility costs provides money for the payment and net savings in the city's operating budget.

Founded in 1988 by two engineers, Capstone Turbine Corporation received major investments from individuals associated with high-profile Silicone Valley computer companies. Applications of its microturbines are at a wide variety of sites — from landfills for methane recovery to a dairy waste processing plant in Japan. "In resource recovery operations," sums up Capstone President and CEO Ake Almgren, "the microturbines enables conversion of biomass waste gases into electricity, using fuel that is otherwise wasted and essentially 'free.'"

As further indication of how gas use applications are steadily emerging, Kurt Roos — AgStar program manager — points out that one of the program's partner farms, Colorado Pork, has a 50 kW Capstone microturbine operating on biogas generated from a 5,000 sow heated mixed digester. "This is the first farm-scale application of this kind," Roos notes. A 120 kW reciprocating engine operates in series with this system.

## **ALLIANT ENERGY PROJECTS**

With offices throughout the Midwest in places like Cedar Rapids, Iowa and Portage, Wisconsin, Alliant Energy has arranged biogas recovery projects with Iowa swine farms (Top Deck), Seneca Foods in Minnesota, and others. "Innovative On-Site Technology Puts You In Control" headlines an Alliant Energy brochure adding this information on the services the company offers to encourage methane recovery:

Identify digester opportunities; Determine type of digester; and Develop preliminary costs. "After the preliminary work is complete," sums up the brochure, "Alliant Energy will work with you to design and construct the digester and install the electric generator and associated equipment. You can own the power generated or we will own, operate and maintain the digester generator for you. It can also provide a backup supply of electricity to your operation."

## **PILOT PROJECTS LAUNCHED BY PORTLAND GENERAL ELECTRIC**

Portland General Electric (PGE) of Portland, Oregon has teamed up with Cal-Gon Farms of Salem, Oregon to construct an anaerobic digester system to produce methane gas for use by the utility. According to Jeff Cole, biogas program manager for PGE, the digester began loading

in mid-December. Cole supplies this background information on the combination pilot project/R&D site:

PGE began investigating biogas opportunities as a green resource during the summer of 1999. “We were looking for a moderate size dairy (Cal Gon is permitted for 500 cows) at a site served by PGE. As an R&D project, we have made some design decisions and added some systems and features that might not be included in subsequent projects,” notes Cole.

PGE is also working with Threemile Canyon Farm in Boardman, Oregon, where the digestion facility will consist of two complete reactors. PGE hopes to work with additional farms on biogas recovery projects and is currently in early stages of additional feasibility studies. “We are being cautious about moving forward too aggressively,” Cole notes. “We would like to evaluate both design and operating practices.” (A recent report noted that PGE had been purchased several years ago by Enron, which is now trying to sell the utility — adding a bit of uncertainty to future developments of its biogas projects.) According to an article in Dairy Today, the Cal-Gon Farms digester will generate 100 kilowatts of power from up to 500 cows, enough for 65 homes. Effluent from the digester will be processed through a solids separator, with the solids to be composted for commercial nursery use. The remaining liquid will be pumped to the farm’s two existing lagoons and later used to fertilizer cropland.

#### **HOW A UTILITY WORKS WITH A DAIRY FARM**

According to an October, 2001 article in the Portland Oregonian, the digester at Cal-Gon is fairly low-tech, relying on the dairy herd and colonies of bacteria and other microorganism to do most of the work. Officials estimate the cost of a facility capable of handling manure from 500 cows to be about \$300,000. Regarding costs of generating energy by burning biogas, estimates have ranged from 5.5 cents to six cents a kilowatt hour (competitive in the region with wind-generated energy) to nine cents a kilowatt hour. “With prices for natural gas and other fuels rising, and utilities interested in becoming partners with farmers,” noted the Oregonian article, “biogas is becoming a more realistic alternative.” According to a dairy specialist with Oregon State University, who supplied the pricing data, there are 98,000 dairy cattle in Oregon — enough potential energy to supply nearly 10,000 homes.

Adds a biochemical engineer with the U.S. Department of Energy’s National Renewable Energy Laboratory: “No one should expect biogas to become a dominant energy resource, akin to oil and coal. But as the nation works toward attaining a sustainable energy supply, power produced from biogas will be part of the mix.”

#### **WISCONSIN ELECTRIC/WISCONSIN GAS AND EAST CENTRAL ENERGY OF MINNESOTA**

As part of the grand opening of a manure-to-energy digester at Tinedale Farms in Wrightstown, Wisconsin in June, 2001, the president and CEO of Wisconsin Electric/Wisconsin Gas, Dick Grigg, delivered these remarks: "I've helped design, construct and operate power plants in Wisconsin for more than 30 years, and this is definitely a first. This facility represents the creativity and innovation our state needs to care for our environment and secure our energy future."

Added Carl Theunis of Tinedale Farms: "Farming and caring for the environment go hand in hand. I'm very proud that we've developed a way to turn our waste into renewable energy and protect the land for future generations. This project also demonstrates how important the link is between our urban and rural areas. The electricity we generate here on the farm will flow to businesses and people's homes." Tinedale Farms milks about 1,800 cows. The generating unit at Tinedale Farms produces 750 kW; enough to provide electricity for about 250 homes. (See the article about Tinedale Farms by John Katers in this section on anaerobic digestion developments.)

In Minnesota, East Central Energy (ECE) — the state's oldest customer owned electric cooperative — distributes energy to more than 40,000 homes, farms and businesses throughout East Central Minnesota.

ECE is a partner in a digester operation at the Dennis and Marsha Haubenschild 760-cow dairy farm in Princeton, Minnesota. According to published reports, for a period last winter, the dairy cows were earning the farm 40 cents a day from their milk and 30 cents a day from their electricity. Biogas captured in a digester tank generates 3,000 kW of electricity daily, enough to power the Haubenschild farm plus 78 average size homes. ECE pays the farm 7.25 cents per kW hour, the full retail rate. Farm sales of electricity average \$900 per week.

