

Western's monthly energy efficiency and renewable energy newsletter dedicated to customer activities and sharing information on energy services.

## Nation's first biomass powerplant opens in Benson, Minn.

It may not be a slogan for a state license plate, but Benson, Minn., in the heart of a turkey-producing region, is proud to be the home of the nation's first poultry-litter biomass powerplant.

Fibrominn LLC flipped the switch this summer on a 55-megawatt facility that will burn 700,000 tons of waste annually to be supplied by more than 30 area turkey farmers. In addition to odor control for some of the nation's largest turkey growers, the plant will provide 30 primary-wage jobs and boost Benson's tax base by 20 to 30 percent.

Xcel signed a 21-year contract to buy the electricity from the Minnesota plant, and will apply the power to its state mandate to use 125 MW of renewable energy. The plant is connected to a new 115-kilovolt power line that runs approximately a quarter of a mile to a substation owned by Great River Energy.

Benson Public Utilities, a Western customer, will not be receiving any electricity from the Fibrominn facility, but it will be selling standby power



The Fibrominn biomass powerplant is located on a 77-acre industrial site near similar alternative energy businesses. (Photo by Fibrominn)

to the plant. "That's another benefit to the community," noted City Manager Rob Wolfington.

### Communities interested

With so much to be gained from the project, it is no wonder that Fibrowatt, Fibrominn's U.K.-based parent company, had more than 40 potential sites in Minnesota to choose from. "It wasn't exactly a competition," said Wolfington, "but the project generated a lot of interest from the beginning."

In December 2000, Fibrowatt selected the Benson site, a 77-acre industrial-zoned area northwest of town. "In reality, Benson chose Fibrowatt, not the other way around," Fibrowatt Executive Assistant Kasia Wieronski acknowledged. "The city and its business community invited

and welcomed the opportunity. It made for a well-matched relationship"

Benson didn't succeed on hospitality alone, however. "It helped that the city has 100 years' experience in the utility business," said Wolfington.

Offering a site served by 115-kv and 69-kv transmission and surrounded by similar alternative-energy and solid waste-recycling businesses didn't hurt the city's case. A helpful power wholesaler came in handy, too. On a contract with Missouri River Energy Services, Benson had recently finished expanding its standby self-generating plant. Missouri River also helped the city with backup service agreements and walked the European company through the new MISO agreements.

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# Powerplant *from page 1*

## Long road

Interest notwithstanding, it took years of discussions, public meetings, planning and permitting to make the innovative, utility-scale biomass powerplant a reality.

Like most animal waste-to-energy generators, the Fibrominn plant started as an odor-control solution. Most of the manure from turkey farms in west central Minnesota winds up on crops. However, stricter environmental regulations and encroaching suburbs are pushing growers to look for alternative means of waste disposal.

Greg Langmo, a turkey farmer in Lichtfield, Minn., found the answer he was looking for in Fibrowatt, LLC. The British company had developed and built three powerplants that burned poultry-litter in the U.K. Langmo attended a Fibrowatt presentation in 1998, and suggested that the company come to Minnesota. "The United States is the largest poultry producer in the world so there was clearly a market for our technology," said Wieronski.

The idea gained strong support from the Minnesota Turkey Growers Association, the Minnesota Building Trades Council, and many west

central Minnesota county boards and economic development groups. That support helped push a bill through the Minnesota House of Representatives in 2000 that added poultry litter to the state's 1994 biomass mandate.

## Open communication

The community was supportive from the beginning of the project, encouraged by Fibrowatt's openness, as well as by the promised benefits. The company, now doing business as Fibrominn in Minnesota, held an open house in Benson in October 2000 to explain the project to residents and give them the opportunity to ask questions.

The city also did its homework. A delegation of city council representatives went on a fact-finding mission to Fibrowatt's three U.K. facilities. Their independent reports answered some important questions for residents and officials. "People were concerned about the smell the plant might produce, and the delegation didn't find any," Wolfington said.

In April 2001, Benson and Fibrominn established a Citizens Advisory Panel to ensure communication throughout the project. The city selected panel members carefully to represent diverse occupations. Members include a barber, a science teacher and a local priest. "We looked for people who had a lot of interaction with the public," Wolfington said.

Fibrominn representatives worked with panel members to answer questions about truck traffic, odors, layout and air emissions. The panel continues to meet now that the plant is up and running, but Wolfington added, "In the U.K., residents stopped showing up to meetings because the plants worked so well."

## Permits granted

The open approach helped move the project forward through the usual funding and permitting hurdles powerplants face. During the public comment period, the Minnesota Pollution Control Agency received 135 letters, mostly in support of the plant. Opposition surfaced at the public meeting Fibrominn held in Benson, but, "most of it came from people from the Twin Cities, three hours away," Wolfington recalled.

The MCPA granted a permit to the project in October 2002, after more than a year of studying the environmental effects. It was the first project of its kind in the United States, so the state was cautious, said Wolfington. "The company had to provide a lot of explanation and demonstrations."

The permit included provisions for odor control and specific operating conditions to minimize the production of dioxins. The Minnesota Environmental Quality Board also waived the powerplant siting review process, finding that the project "will not create significant human or environmental impact."

## Operation a success

And so far, in four months of operation, said Wolfington, the city has not received a single complaint about the plant, or about the 100 trucks that daily transport litter through town. It helps, of course, that the truck drivers buy goods and services from local merchants.

But the main advantage in terms of odor control is that Fibrominn trucks haul the litter away all at once. Farmers don't have to pile it up outside their barns where it can draw flies and spread odors. At the plant, Fibrominn prevents odors from escap-

*See POWERPLANT, page 5*

### Energy Services Bulletin

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# Navajo FlexCrete builds homes, economy for tribe

**T**he Navajo Nation is redefining efficiency—getting a job done with the minimal amount of work and materials—as getting many jobs done with one material: a Flexcrete block from Navajo FlexCrete.

The Navajo Housing Authority isn't just using the lightweight, inexpensive, "green" building material to build affordable and energy-efficient homes across the reservation. Flexcrete is also a building block in the Navajo Nation's economic development, and in partnerships with Arizona State University, Washington State National Guard and the Santo Domingo Pueblo. If that wasn't enough, the plant is also making a useful product out of 300,000 tons of fly ash annually destined for the landfill.

## Business opportunity

Headwaters, Inc., Flexcrete's parent company, first approached the Navajo Nation Division of Economic Development several years ago with what seemed like just another business proposal. The plan called for using fly ash from Salt River Project's Navajo Generating Station to manufacture an aerated concrete product. The company proposed building a plant in Page, Ariz., just three miles from Navajo Station.

Fly ash makes up 60 to 70 percent of Flexcrete's content. "Up to that point, Salt River was disposing of the waste in its own landfill," said Rick Abasta, NHA public information officer.

Unlike traditional autoclaved aerated concrete, Flexcrete is cured at lower temperatures, so its production requires less energy. Locating the plant close to the source of Flexcrete's main component improves the mate-

rial's "green" profile from a lifecycle standpoint.

The project initially seemed like a good way to support the NHA's mission of providing affordable housing on the reservation. However, as the NHA learned more about Flexcrete technology, "The concept of green building really appealed to us," said Abasta. "We realized that a Navajo-owned factory could cut down the cost of standard stick construction and be an investment in the Nation's future."

Over four years, the proposal morphed into a major venture in which the NHA owns a 10-percent stake in the technology and financed construction of the plant. The NHA bought 10 acres in Page and built the plant, financing the project with a private loan. Opened in 2005, the plant currently provides 14 jobs for tribe members. In the land-rich, but job-poor area, Navajo FlexCrete expects to eventually employ 50 to 60 full-time workers. The additional employees will be added as the company develops the commercial market in Phoenix, Las Vegas and Salt Lake City.

## First Flexcrete home

Marketing opportunities notwithstanding, meeting the tribe's housing needs is the NHA's top priority. So far, the housing authority has built 13 homes on the reservation using Flexcrete from its own plant.

The first was a demonstration home for Mary and Kee Augustine, who had been on a waiting list for a new house for some time. Shortly after the opening of the Flexcrete factory, a group of Navajo architecture students asked to rebuild the elder couple's home for a project. One of the students, Christopher Billey, enlisted



**Navajo architecture students built the first house using Navajo Flexcrete blocks. Traditional features like this courtyard act with the block's insulating properties to keep out the desert heat. (Photo by Navajo Housing Authority)**

his employer, ASU's Stardust Center for Affordable Housing and Family to sponsor the project.

Navajo Flexcrete and the Stardust Center donated most of the materials, and the students designed and built the house modeled on the traditional hooghan. "That house was our 'guinea pig,' and the students made changes throughout the process," said Abasta. "The finished home is 80 percent more energy-efficient than a conventional house."

The energy-saving properties of Flexcrete contributed to that accomplishment. The tiny air pockets that make the material so much lighter than concrete give the 12-inch blocks used for the Augustine house an insulation value of R35. Originally, the Stardust Center planned to use straw

*See FLEXCRETE HOMES, page 5*

# Geothermal conference offers much for utilities

**G**eothermal energy, the underground renewable resource, finally seems to be getting its moment in the sun. If Western customers don't get the idea from two new geothermal guides and a two-day geothermal heat pump workshop in Bismarck, N.D., maybe the Geothermal Resources Council's 2007 Annual Meeting will send the message: geothermal energy can be a part of every utility's portfolio.

The meeting, taking place Sept. 30 to Oct. 3 in Reno, Nev., telegraphs that message in its theme—"Renewable Base-load Energy: Geothermal Heat Pumps to Engineered Reservoirs." Western Renewable Resource Manager Randy Manion shares some credit for an agenda that includes many sessions for utilities. He joined the GRC annual meeting planning committee three years ago with that goal in mind. "The conference initially targeted a highly specialized, technical audience," Manion recalled. "But it didn't offer much for the audience that makes up the market for the technology—power providers."

That won't be a problem at the 2007 GRC annual meeting, where the agenda shows plenty of diversity. All three forms of geothermal power—generation, direct use and heat pumps—are represented. The technical sessions have attracted 110 technical papers on a broad range of geothermal resource, exploration, characterization and development topics.



## Geothermal Resources Council

### Utility concerns

Manion recommends three events for utilities weighing the addition of geothermal resources. On Oct. 1, the GeoPowering the West/Utilities session looks at different geothermal options particularly suited to utility-scale implementation.

Transmission access, a utility concern for so many types of renewable energy, is the subject of a special panel session on Oct. 2. Transmission Challenges in the Western United States will cover electric transmission corridors, policy drivers, integration and management of renewable energy resources with traditional generation and much more. The panel will include speakers from Western Electricity Coordinating Council, Center for Energy Efficiency and Renewable Energy and California Energy Commission.

The Heat Pump session on Oct. 2 presents case studies of projects around the world. Geothermal heat pumps are the easiest way for utilities to tap into geothermal power, and the application is suitable for all parts of the country. "A utility doesn't have to be located near hot springs to take advantage of heat pump technology," said Nelson. "Heat pumps are a great business opportunity for utilities. That's a central message UGWG wants to communicate," he added.

### Exhibits, field trips

Nelson believes that the annual meeting will also prepare utilities to face development hurdles. "Sessions on exploration, drilling, powerplants and development will help professionals from the utility industry get a clear idea of the development process and timetables," he said.

Attendees will have the opportunity to thoroughly educate themselves at the 2007 poster session featuring more than 30 presentations. The Geothermal Energy Association Trade Show, running concurrently with the GRC meeting, will bring together 40 exhibitors to answer questions about geothermal projects, equipment, supplies and services.

Several planned field trips will allow conference-goers to see geothermal technology in action. An overnight field trip to the Long Valley Caldera geothermal and magmatic systems will highlight the volcanic history of the area and stop at new production wells. A half-day tour of the Upper Steamboat Hills power complex will take visitors through the recently-completed 10-MW Galena II binary plant. A third trip will bring visitors to the Blue Mountain geothermal field, site

*See GEOTHERMAL CONFERENCE, page 8*

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Visit [www.wapa.gov/es/pubs/esb/2007/sep/sep073.htm](http://www.wapa.gov/es/pubs/esb/2007/sep/sep073.htm)

## Powerplant *from page 2*

ing by drawing air from the storage building into the boiler. Another environmentally-friendly feature includes using gray water from Benson Municipal Water Treatment for some of the plant's cooling water requirements.

Most turkey producers with long-term contracts will get \$3 to \$5 per ton, about what they got selling it for fertilizer. Other

growers may find a market for their agricultural waste, too. Extensive testing indicates that the boiler can use ag-based biomass such as grain, straw, processing co-products and animal bedding. The plant's permit allows it to burn those wastes, which currently represent about one quarter of its fuel.

A renewable energy project that works out this well will spawn more like it. Fibrowatt LLC is planning similar plants in North Carolina, Arkansas, Maryland and Mississippi,

all major poultry states. Another developer, Earth Resources Inc., plans to break ground soon on a chicken litter-burning plant near Carnesville, Ga.

Benson may not be the only town in the United States with a utility-scale, biomass powerplant for long, but it will always have the title of being the first. And that distinction—along with the economic benefits—is something to be proud of. ⚡

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Visit [www.wapa.gov/es/pubs/esb/2007/sep/sep071.htm](http://www.wapa.gov/es/pubs/esb/2007/sep/sep071.htm)

## FlexCrete homes

*from page 3*

bales, until it was discovered that the heavier mass of Flexcrete is better protection against the high desert climate.

Other measures that add to the home's efficiency include passive solar heating, a traditional shade arbor for natural cooling and a roof that collects rainwater. A number of sensors were also built into the house so the Stardust Center could collect data on its performance. The data will be matched up to projections from the center's computer model. NHA will use the data for marketing Flexcrete, Abasta said.

### Others discover Flexcrete

The next Flexcrete construction project was a model housing development for low-income families near Crownpoint, N.M. "Those had the standard NHA floor plans,"

said Abasta. "Families can choose a three-, four- or five-bedroom home."

The NHA got help on construction from Seattle's 803rd Engineer Detachment. Guardsmen were in the area for Innovative Readiness Training, an annual program that offers engineers unusual training opportunities. In this case, it was the chance to learn how to build with Flexcrete.

Representatives from the Santo Domingo Pueblo visited the construction site of the next NHA housing development in Burnside, Ariz. They had heard about Flexcrete and wanted to know if the material would meet the pueblo's specific housing needs. "The pueblo is very old and new homes have to maintain the cultural aesthetic," explained Abasta. "They needed to know if Flexcrete could support the traditional adobe finish."

The tour answered those ques-

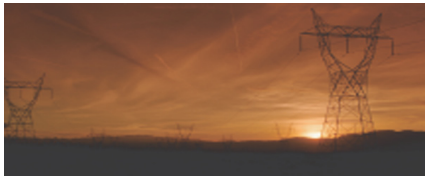
tions, and the Santo Domingo Pueblo ordered 10 houses worth of Flexcrete blocks.

The list of Flexcrete projects keeps growing. Construction is close to finished on a new NHA development of 20 houses in Low Mountain, Ariz. The first custom home to be privately built with Flexcrete blocks went on the market in July in Sedona, Ariz. The developer advertised it as the "greenest" home in the state.

Like the word efficient, green as applied to Flexcrete has many meanings. It means the building material was created with a low-energy process using recycled waste from a source close to the plant. It means homes built with Flexcrete need less energy for heating and cooling. For the Navajo Nation, "green" is a growing Navajo-owned business that promises affordable housing and economic growth. ⚡

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## TOPICS from the POWER LINE

### Hotel owner seeks to capture waste heat

*Editor's note: The Energy Services Bulletin features real answers to real questions posed to our staff at the Energy Services Power Line. We hope you find it useful.*

#### Question:

Our hotel and restaurant are currently heated with a 30-year-old, space-heating boiler we expect to replace soon. Also, we use a natural-gas water heater for both facilities. We were wondering if we could use waste soybean oil from the restaurant kitchen as fuel for the water heater and boiler. The restaurant generates about 500 gallons of waste oil annually. Also, we would like to recover the heat from the dishwasher's 130-degree wastewater.

#### Answer:

You are suggesting some innovative ideas for waste problems typical to the hospitality industry. Choosing a heating source is a complex process that must balance capital cost, expected operating cost, space, need for heat, operating life, environmental restrictions, efficiency, fuel and operating flexibility, reliability and availability and schedule. There are a few options you might consider, all of them compromises:

1. Replace your existing gas boiler with a newer, more energy-

efficient one. This is the simplest and probably the least expensive choice. Advances in technology over the last thirty years make these systems very economical.

2. Install one gas-powered unit boiler for both space- and water-heating systems. Depending on whether your existing boiler produces steam or hot water, a number of distribution system, steam trap, radiator or control measures to improve your heating-system efficiency may be possible.
3. Install a natural gas-powered generator with a cogeneration system that can produce electricity and preheat water for your facility.
4. Install a biodiesel generator for generating electricity. Jacket water used to cool the engine can be heated to 140° F or higher.
5. To heat water using vegetable oil fuel, install any kind of diesel or fuel oil boiler. Biodiesel specialists indicate that there are only a few small biodiesel-powered cogeneration systems in use in North America (for example, wind power and biodiesel generators).

#### Pros and cons

In theory, using waste vegetable oil as a fuel sounds like a good idea. Vegetable oil is an important

potential fuel because it comes from plants and is a renewable resource. As a waste product, it would appear to be a "free" fuel.

In practice, heating with waste vegetable oil is likely to be an expensive and complex project. First, used vegetable oil must be converted to biodiesel through a chemical process called transesterification. This requires space and special equipment, and there is always the danger of spills.

Although 500 gallons per year sounds like a lot, soybean oil's fuel value is lower than natural gas. Assuming a natural gas price at 32 to 50 cents per 100,000 Btu, using waste oil for heat would only save you \$204 to \$319 per year.

A small diesel generator set produces 20 kW, weighs over one ton, has an electrical efficiency of 27 percent, and probably costs \$20,000 installed. Such systems generally run on natural gas, and require a second fuel heating and injection system for liquid or dual-fuel operation. Your investment would only pay off if you had more than 10 times more waste oil and experienced frequent, extended power outages. As long as the cost of natural gas remains quite low, it remains a better value.

*See TOPICS, page 8*

Want to know more?  
Visit [www.wapa.gov/es/pubs/esb/2007/sep/sep074.htm](http://www.wapa.gov/es/pubs/esb/2007/sep/sep074.htm)

## Web site of the month:

# Energy Star Change a Light campaign

*Note: If there is an energy- or utility-related Web site that you find especially useful, let us know. Contact the editor with your suggestion for Web site of the Month.*

It is that time of year again—not back-to-school or time to get a jump on your Christmas shopping. It's time to Change a Light, Change the World, and to get your friends, family, customers and coworkers to join in.

Energy Star's 2007 campaign kicks off on October 3, Change a Light Day. Now in its eighth year, the national call-to-action encourages individuals to help change the world, one energy-saving step at a time.

### Opportunity for utilities

Utilities have lots of good reasons to get involved in the Change a Light campaign. A few compact fluorescent lights may not make a noticeable dent in lighting loads, but the change adds up. The more than 70,000 people who took the Change a Light pledge in 2005 have the potential to save more than 23 million kWh of energy and prevent more than 33 million lbs. of greenhouse gas emissions.

From an outreach standpoint, the campaign is a great way to get customers to think about steps they can take to control their electric bills. Customers appreciate it when their power provider helps them save money. Many utilities use the Change a Light campaign as a way to get out into the community. CFLs are a great item for giveaway promotions and fundraisers.



### Ready-made campaign

The campaign Web site offers many useful resources for both individuals and groups. Anyone can make or renew a pledge to replace one conventional light with a CFL. Visitors can also learn more about the energy-efficient lights and the campaign.

Those inspired to do more can start a campaign in their office or community by registering as a pledge driver. A pledge driver makes a commitment to ask 100 people or more to take the pledge. Registered pledge drivers receive a link to their organization's pledge page and a link to an online tracking tool to follow and compare their campaign's progress.

First-timers should visit the Pledge Driver Tool Kit to find a recommended timeline for campaign

planning. Sample newsletter articles and press release templates, Web icons and talking points found on this page will help pledge drivers create effective communications.

You don't have to be a pledge driver to use the Change a Light promotional materials. Energy Star offers a suite of customizable templates for posters, table tent cards, in-store retail materials and general newsletter articles.

### Spreading the word

Many Change a Light pledge drivers use activities to increase pledges and get people excited about the campaign. A searchable database provides ideas for student, employee and customer outreach; proclamations; Web outreach; in-store promotions and advertising campaigns. You can also register a successful idea for others to use.

The great thing about the Energy Star Change a Light, Change the World campaign is that it lasts all year long. Groups or individuals may participate at any point throughout the campaign year from October 2007 to October 2008.

Campaign resources are available year-round, and campaign updates are e-mailed to subscribers once or twice a month announcing the latest additions to online material, media developments and more. Subscribe today and become a part of the community that is changing the way we use energy, one light bulb at a time. ⚡

Want to know more?

Visit [www.wapa.gov/es/pubs/esb/2007/sep/sep075.htm](http://www.wapa.gov/es/pubs/esb/2007/sep/sep075.htm)

## Topics *from page 6*

### Wastewater Heat Recovery

Waste heat recovery may be a more cost-effective option than a biodiesel powered boiler. It takes advantage of a no-cost source of energy using simple, low-cost equipment that requires little energy for operation.

Businesses like restaurants and laundries spend a lot to heat water and most of that water gets discharged into the sewer while still very hot. Preheating incoming cold water with wastewater heat could recover as much as 60 percent of that energy. Under ideal conditions, recovering that heat can actually double the effective efficiency of a water heater. In addition, there may be environmental benefits from reducing the temperature of the wastewater stream to avoid possible thermal pollution.

Waste heat recovery water heating is typically uses recovered waste heat to heat incoming cold water. A conventional water heater supplies supplemental heat.

A water heat recovery device called GFX costs between \$89 and \$450, and increases the efficiency of a water heater by 70 percent by capturing waste heat from drain water and preheating incoming cold water. It saves 30 to 50 percent of total heating energy consumption and also effectively triples the heating capacity of the water heater.

If wastewater quantity and temperature are high, it could also be applied to showers. The cold water might need to be circulated through a warm-water sump. Depending on your shower needs, a hot water sump with a cold water circulation system could significantly reduce the electricity used for water heating in washing machines. ⚡

## Geothermal conference *from page 4*

of a successful well drilled last year with an estimated 7-MW net capacity.

### Registration open

With so much happening in such a short time, participants may wish to be in two or three places at once. GRC is easing that dilemma by providing all three-day registrants with a copy of the conference proceedings on CD. The CD will be a useful reference for utilities that decide to move forward with some form of geothermal acquisition, as Manion believes many will. "The GRC annual meeting is a good starting point for utilities to get acquainted with a base-load renewable resource that has lots of potential in the West and beyond," he said. ⚡



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