

# BIODIESEL MAGAZINE

---

MAY 2007

www.BiodieselMagazine.com

## Electricity By the Gallons

The Houston area demands 3,000 more megawatts of electricity per hour than its local power plants can provide, and its nonattainment status won't allow for more plants to be built. Biofuels Power Corporation has a solution to Houston's power shortage, and it smells a lot like biodiesel.

By Anduin Kirkbride McElroy

**H**ouston has a problem. It's growing faster than the rest of the United States, but it lacks the production capacity to provide its population with power under the stringent pollution guidelines set by the federal Clean Air Act.

According to the Greater Houston Partnership, which oversees economic development in the Houston metropolitan area, the population grew 17.5 percent between the 2000 census and mid-2006. Local population growth was approximately 825,000 for the area, resulting in a total population of 5.5 million as of July 2006.

Meanwhile, Houston has had a serious air quality problem for years. It's been in competition with Los Angeles since 1999 to lead the nation in having the most polluted air, as defined by the number of days each city violates federal smog standards.

---

© Biodiesel Magazine, 2007

ARTICLE WAS PRINTED IN MAY 2007 ISSUE OF BIODIESEL MAGAZINE

Reprinted by Tirage Reprints with permission from *Biodiesel Magazine*. Call (416) 619-5397 for reprints, republications or other uses and permissions. May 2007.

## The power facility has the capacity to produce approximately 5 MW of electricity using three used diesel Caterpillar generators that act as a single source of power.

days each city violates federal smog standards.

In 1990, the eight counties that make up the Houston metropolitan area were classified as a nonattainment area—geographic regions that fail to meet the national ambient air quality standards (NAAQS) set by the U.S. EPA under the Clean Air Act. The region was classified as being a moderate nonattainment area for ground-level ozone under the eight-hour standard in 2005 and was given a maximum attainment date of June 15, 2010. According to the Texas Commission on Environmental Quality, attainment in the area is especially challenging due to the complex ozone formation chemistry and unique weather patterns in the area.

The city has implemented several measures to comply with its plan to reach attainment. Among these, it decommissioned three large power plants that resulted in taking more than 10,000 megawatts (MW) off the grid, according to Biofuels Power Corp. COO Ken Crimmins. To make up for its power deficit, Houston must import electricity from other areas. To provide power for one day in the summer, which is when demand is the highest, the city must import 3,000 MW per hour, he says. During nonpeak months, like January, it still imports 900 MW per hour.

Electricity consumption per capita is higher in Texas than in other areas of the United States, in part because of its intense use of air conditioners. Typically, 1 MW will service 1,000 homes on average, but in Texas the average is closer to 500 homes, according to Dottie Roark, communications manager

grid and manages the deregulated market for 75 percent of the state. On hot summer days, 1 MW may only power 200 homes, but in normal conditions it probably powers between 500 and 700 homes, she says.

Part of the solution for Houston may lie in local power generation from renewable sources. That's where Crimmins comes in. In mid-February, Biofuels Power Corp., which is registered with the Public Utilities Commission as a renewable energy source, first sent electricity into the grid from its biodiesel-powered generating plant in Oak Ridge North, a suburb of Houston. Its sister company, Safe Renewables Corp., provides all of the biodiesel used in the plant. Safe Renewables has the capacity to produce 18 MMgy of biodiesel from multiple feedstocks, such as soy oil, cottonseed oil, canola oil and animal fats. It is located just two miles from the Biofuels Power facility.

for the Electric Reliability Council of Texas Inc., which operates the electric

The power facility has the capacity to produce approximately 5 MW of electricity using three used diesel Caterpillar generators that act as a single source of power. At full load, they use 72 gallons of biodiesel per MW hour. An interesting feature is that waste heat from the generators is used to keep the fuel tank warm and prevent with: the biodiesel from gelling. The company is experimenting with various additives to decrease emissions and increase efficiency. "We hope to get down to 60 gallons per megawatt hour," Crimmins says.

He plans to run the engines all summer as long as the price is right. Because of the cost of biodiesel in relation to electricity, however, there is a point at which it isn't efficient to run the generators. "If you can sell [biodiesel] for \$2.90 on the open market, why would you convert it to electricity and sell it for less?" Crimmins says.

Diesel-based electric power has always been more expensive, says Bob Webb, general counsel for Biofuels Power. "Where you're able to compete is when the price of electricity is high," he says. "A few hot days per year could provide all the money you need for the whole year."

Electricity prices vary by the hour. It can't be stored or moved. Thus, Biofuels



Biofuels Power can produce up to 5 megawatts of electricity using these three Caterpillar generators that run exclusively on biodiesel produced by Safe Renewables.

**'If we can use B100, we could meet the more stringent air guidelines and be able to continue to use stationary diesel engines.'**

Power finds its market during peak hours, when the city demands all the electricity that can be made. "We only make power from 6 a.m. to 5 p.m. when the price is higher than our fuel costs," Crimmins says.

Selling biodiesel as electricity solves the distribution problem, Crimmins says. Many places are not equipped to sell biodiesel as a liquid fuel, but everybody can accept electricity.

However, there is one problematic aspect of using biodiesel in Houston, and that's the potential increase of nitrogen oxide (NOx) emissions, which are primarily responsible for the formation of ground-level ozone. Study results have not consistently proven that biodiesel increases NOx, but any increase in NOx is unacceptable in Houston. Therefore, Biofuels Power has invested significant time to research this subject. It partnered with the Houston Advanced Research Center (HARC) to form the Southwest Biofuels Initiative. Together, they have tested emissions and feedstocks. HARC provided an independent evaluation to support issuance of an air permit.



This substation, located outside of Biofuels Power, converts electricity produced by Biofuels Power from medium-to high-voltage so it can be connected to the electrical grid and distributed on a high-tension distribution voltage line.

## Finding a New Market

Biofuels Power has its roots in defense contracting, Webb says. Defense contractor Texoga Technology was interested in biodiesel for use as a military fuel because the fuel's high flashpoint makes it safer to use in combat situations. The company built a biodiesel plant and called it Safe Fuels Inc. The plant has since been expanded from 10 MMgy to 18 MMgy, and the name was changed to Safe Renewables Corp.

The company researched uses for biodiesel outside of motor vehicles, and electrical generation became an obvious choice. Crimmins says he has been working on this project for four years. "It wasn't all engineering hurdles," he says. "We had a prospectus floating for five months until we got anyone to fund it."

Webb says most diesel-powered stationary engines can't be used in the Houston area because of nonattainment issues, and the expense to remove all the pollutants from petroleum diesel is not cost effective. Thus, a lot of companies have switched to natural gas engines. "If we can use B100, we could meet the more stringent air guidelines and be able to continue to use stationary diesel engines," he says. "In Houston, there are roughly 500 megawatts of diesel-generating capacity. They all have trou-

ble meeting new clean air guidelines."

The beauty of this project is that the engines used to produce electricity have already been built—and built to last. "Diesel engines last forever," Webb says. He adds that the older engines, which are available and in working order, are better suited to use biodiesel because they are less complicated and adjust to the new fuel more easily. The deployment of biodiesel can put these generators back into commission in nonattainment areas. "We can eliminate through biodiesel most of the pollution," Webb says. "The one we can't eliminate—NOx—we can control."

For these reasons, Webb says expansion plans are concentrated on producing electricity in areas where there are significant air quality problems. Immediate expansion plans are already in the construction phase. The company purchased a used 10 mw General Electric turbine from Elgin Air Force Base in Florida. The turbine was shipped to the Safe Renewables plant by rail and at press time was being assembled within the biodiesel plant. Crimmins expects to have it hooked up to the grid by August.

The turbine, which Crimmins compared with a jet engine, was built to run on multiple fuels. The benefits of the turbine is that it was half the cost of the generators, is more reliable and offers more power from a smaller package. The only drawback is that it uses more fuel. Whereas the generators require 72 gallons per hour, the turbine uses 109 gallons per hour.

The turbine was also a good deal for Biofuels Power because its size allowed for a shorter permitting process. Permits for

most stationary power sources are issued at two levels in Texas. Because Biofuels Power's turbine would produce 10 MW or less and the pollution would be under statutory rates, the plant would fall under standard permit requirements within the jurisdiction of the state. If not, the process could take significantly more time.

Biofuels Power also plans to add a heat recovery unit at the Safe Renewables site. "After we find suitable heat use, we can use combined heat and power, and make additional electricity," Webb says. "We'll probably be using steam in the manufacture of

biodiesel. That will give us two different kinds of plants using biodiesel in two different markets." The 20 MW steam unit will be a base-load plant that can use anything that's renewable, Crimmins explains. "We'll make steam in the boiler and make electricity," he says.

The expansion doesn't stop there. Crimmins would like to expand the company's Houston operations even further. He also sees numerous opportunities for this technology as a supplement for windmills. Other states are also being considered; states like Alaska and Hawaii, where the electricity

comes primarily from diesel fuel, could benefit from switching their power supply to biodiesel.

Of course, much of the future plans are dependent on proven success and funding. "We're working with partners to show we can ramp up and get off the imported oil pipe," Crimmins says. ■

Anduin Kirkbride McElroy is a *Biodiesel Magazine* staff writer. Reach her at [amcelroy@bbibiofuels.com](mailto:amcelroy@bbibiofuels.com) or (701) 746-8385.