

Using Waste, Swedish City Cuts Its Fossil Fuel Use

By ELISABETH ROSENTHAL, December 10, 2010

KRISTIANSTAD, Sweden — When this city vowed a decade ago to wean itself from fossil fuels, it was a lofty aspiration, like zero deaths from traffic accidents or the elimination of childhood obesity.

But Kristianstad has already crossed a crucial threshold: the city and surrounding county, with a population of 80,000, essentially use no oil, natural gas or coal to heat homes and businesses, even during the long frigid winters. It is a complete reversal from 20 years ago, when all of their heat came from fossil fuels.

But this area in southern Sweden, best known as the home of Absolut vodka, has not generally substituted solar panels or wind turbines for the traditional fuels it has forsaken. Instead, as befits a region that is an epicenter of farming and food processing, it generates energy from a motley assortment of ingredients like potato peels, manure, used cooking oil, stale cookies and pig intestines.

A hulking 10-year-old plant on the outskirts of Kristianstad uses a biological process to transform the detritus into biogas, a form of methane. That gas is burned to create heat and electricity, or is refined as a fuel for cars.

Once the city fathers got into the habit of harnessing power locally, they saw fuel everywhere: Kristianstad also burns gas emanating from an old landfill and sewage ponds, as well as wood waste from flooring factories and tree prunings.

Over the last five years, many European countries have increased their reliance on renewable energy, from wind farms to hydroelectric dams, because fossil fuels are expensive on the Continent and their overuse is, effectively, taxed by the European Union's emissions trading system.

But for many agricultural regions, a crucial component of the renewable energy mix has become gas extracted from biomass like farm and food waste. In Germany alone, about 5,000 biogas systems generate power, in many cases on individual farms.

Kristianstad has gone further, harnessing biogas for an across-the-board regional energy makeover that has halved its fossil fuel use and reduced the city's carbon dioxide emissions by one-quarter in the last decade.

"It's a much more secure energy supply — we didn't want to buy oil anymore from the Middle East or Norway," said Lennart Erfors, the engineer who is overseeing the transition in this colorful city of 18th-century row houses. "And it has created jobs in the energy sector."

In the United States, biogas systems are rare. There are now 151 biomass digesters in the country, most of them small and using only manure, according to the Environmental Protection Agency. The E.P.A. estimated that installing such plants would be feasible at about 8,000 farms.

So far in the United States, such projects have been limited by high initial costs, scant government financing and the lack of a business model. There is no supply network for moving manure to a centralized plant and no outlet to sell the biogas generated.

Still, a number of states and companies are considering new investment.

Last month, two California utilities, Southern California Gas and San Diego Gas & Electric, filed for permission with the state's Public Utilities Commission to build plants in California to turn organic waste from farms and gas from water treatment plants into biogas that would feed into the state's natural-gas pipelines after purification.

Using biogas would help the utilities meet requirements in California and many other states to generate a portion of their power using renewable energy within the coming decade.

Both natural gas and biogas create emissions when burned, but far less than coal and oil do. And unlike natural gas, which is pumped from deep underground, biogas counts as a renewable energy source: it is made from biological waste that in many cases would otherwise decompose in farm fields or landfills and yield no benefit at all, releasing heat-trapping methane into the atmosphere and contributing to global warming.

This fall, emissaries from Wisconsin's Bioenergy Initiative toured German biogas programs to help formulate a plan to develop the industry. "Biogas is Wisconsin's opportunity fuel," said Gary Radloff, the initiative's Midwest policy director.

Like Kristianstad, California and Wisconsin produce a bounty of waste from food processing and dairy farms but an inadequate supply of fossil fuel to meet their needs. Another plus is that biogas plants can devour vast quantities of manure that would otherwise pollute the air and could affect water supplies.

In Kristianstad, old fossil fuel technologies coexist awkwardly alongside their biomass replacements. The type of tanker truck that used to deliver heating oil now delivers wood pellets, the major heating fuel in the city's more remote areas. Across from a bustling Statoil gas station is a modest new commercial biogas pumping station owned by the renewables company Eon Energy.

The start-up costs, covered by the city and through Swedish government grants, have been considerable: the centralized biomass heating system cost \$144 million, including constructing a new incineration plant, laying networks of pipes, replacing furnaces and installing generators.

But officials say the payback has already been significant: Kristianstad now spends about \$3.2 million each year to heat its municipal buildings rather than the \$7 million it would spend if it still relied on oil and electricity. It fuels its municipal cars, buses and trucks with biogas fuel, avoiding the need to purchase nearly half a million gallons of diesel or gas each year.

The operations at the biogas and heating plants bring in cash, because farms and factories pay fees to dispose of their waste and the plants sell the heat, electricity and car fuel they generate.

Kristianstad's energy makeover is rooted in oil price shocks of the 1980s, when the city could barely afford to heat its schools and hospitals. To save on fuel consumption, the city began laying heating pipes to form an underground heating grid — so-called district heating.

Such systems use one or more central furnaces to heat water or produce steam that is fed into the network. It is far more efficient to pump heat into a system that can warm an entire city than to heat buildings individually with boilers.

District heating systems can generate heat from any fuel source, and like New York City's, Kristianstad's initially relied on fossil fuel. But after Sweden became the first country to impose a tax on carbon dioxide emissions from fossil fuels, in 1991, Kristianstad started looking for substitutes.

By 1993, it was taking in and burning local wood wastes, and in 1999, it began relying on heat generated from the new biogas plant. Some buildings that are too remote to be connected to the district heating system have been fitted with individual furnaces that use tiny pellets that are also made from wood waste.

Burning wood in this form is more efficient and produces less carbon dioxide than burning logs does; such heating has given birth to a booming pellet industry in northern Europe. Government subsidies underwrite purchases of pellet furnaces by homeowners and businesses; pellet-fueled heat costs half as much as oil, said Mr. Erfors, the engineer.

Having dispensed with fossil fuels for heating, Kristianstad is moving on to other challenges. City planners hope that by 2020 total local emissions will be 40 percent lower than they were in 1990, and that running the city will require no fossil fuel and produce no emissions at all.

Transportation now accounts for 60 percent of fossil fuel use, so city planners want drivers to use cars that run on local biogas, which municipal vehicles already do. That will require increasing production of the fuel.

Kristianstad is looking into building satellite biogas plants for outlying areas and expanding its network of underground biogas pipes to allow the construction of more filling stations. At the moment, this is something of a chicken-and-egg problem: even though biogas fuel costs about 20 percent less than gasoline, consumers are reluctant to spend \$32,000 (about \$4,000 more than for a conventional car) on a biogas or dual-fuel car until they are certain that the network will keep growing.

"A tank is enough to get you around the region for the day, but do you have to plan ahead," Martin Risberg, a county engineer, said as he filled a biogas Volvo.