

HARNESSING THE ENERGY OF TRASH

by Alyssa A. Lappen

inFocus

Fall 2009

Among the greatest ironies of President Barack Obama's environmental policies is his federal budget proposal to "cap-and-trade" greenhouse gas emissions. The plan would roughly double electricity rates nationwide. It would weigh heavily on businesses during the worst recession since World War II. The irony stems from Obama's oft-repeated promise on the campaign trail not to raise taxes on American families earning less than \$250,000 annually. Indeed, "cap-and-trade" might be better termed "cap-and-tax" for the crushing tax impact it will have on Americans.

The American Recovery and Reinvestment Act (ARRA) and the proposed 2010 federal budget promote many potential "clean" and "renewable energy" projects. However, they ignore one of the most economical and environmentally friendly ways of improving energy efficiency and cutting carbon emissions: harnessing the potential energy of trash.

Waste-to-Energy

In 2006, the state of California enacted a "Roadmap for the Development of Biomass" to increase wind, solar, and biomass projects—and to eventually extract 22 percent of its energy feeds from urban waste. The same year, the Los Angeles City Council unanimously voted to replace citywide garbage disposal with waste-to-energy (WTE) by 2016. The goal is to improve energy efficiency and eliminate the high costs and pollution from trash transports.

The federal government, the District of Columbia, and at least 11 states now include waste-to-energy on their lists of viable, renewable energy resources, according to Ted Michaels of Washington, D.C.'s Energy Resource Council. Yet, the United States lags the rest of the world in WTE development. Of more than 600 state-of-the-art WTE plants worldwide, only 90 operate in the U.S. Waste-to-energy plants like those in Cape Cod, MA, Palm Beach, FL, and Hempstead and Onondaga County, NY, prove that municipal and solid wastes can serve as significant and effective biomass energy sources, generating clean electrical energy.

In total, American WTE plants generate 2,800 megawatts of electricity annually, saving 1.4 billion gallons of fuel oil. That's equivalent to current U.S. geothermal energy production, and far more than wind and solar energy, according to Columbia University Professor Nicholas Themelis.

Untapped Potential

The U.S. could recover much more energy from trash. Some 300 million Americans generate nearly 1.4 billion pounds of municipal solid waste daily, more than 500 billion pounds annually. From that supply of residential waste alone, the U.S. could more than septuple its waste-produced energy to 21,000 megawatts of electricity per year. That could save nearly 14 billion gallons of fuel oil. Add industrial and agricultural wastes, and total U.S. energy gains could skyrocket.

So far, Europe is far ahead. By late 2005, European WTE plants generated sufficient energy to supply 27 million people a year with electricity—or to heat 13 million homes, reports Dr. Ella Stengler, Managing Director of the Brussels-based Confederation of European Waste-to-Energy Plants.

By 2006, Holland generated 14.3 percent of its renewable energy from waste, Belgium 13.3 percent, Denmark 12.5 percent, and Germany 7.5 percent. Germany has since further enhanced its WTE program to include agricultural and industrial waste. In fact, Germany now recycles 60 percent of its municipal solid waste at 72 plants despite having cut overall waste production by more than one fifth since 2002.

Unexpected Enemies

Surprisingly, a huge roadblock to WTE in the U.S. stems from opposition from local, state, national, and global environmental organizations like the New York Public Interest Research Group (NYPIRG), the Sierra Club, and the Global Alliance for Incinerator Alternatives (GAIA). Even some government officials reportedly oppose WTE, including New York deputy environmental secretary Judith Enck, a former NYPIRG activist and a potential presidential pick to serve as a regional administrator for the Environmental Protection Agency (EPA).

These and other opponents believe that WTE plants could eliminate incentives to recycle. Citing obsolete data, they also erroneously assert that WTE can cause harmful emissions. Ultimately, their opposition may stem from an unrealistic goal of creating a utopian society that generates zero waste.

This, according to Columbia University's Jack D. Lauber, is an idealistic impossibility. While zero waste is a pipe dream, working toward zero waste disposal would significantly increase recycling in the U.S., which would thrive as long as it offers profit potential. It would also substantially cut trash transport expenses nationwide, not to mention the transports' annual release of hundreds of tons of atmospheric gaseous and particulate toxins. Indeed, a 2002 Australian study found that diesel trucks spew five times more atmospheric particulates than municipal waste plants.

Unexpected Allies

While the ideologues try to achieve the unachievable, WTE has attracted allies from some unexpected quarters, including a wildlife pathologist from New York's Department of Environmental Conservation, Ward Stone, who in September will receive a Sierra Club lifetime achievement award for his scientific work.

"WTE is a smart way to go," Stone says. While "some people have made careers of fighting waste incineration," as a scientist, Stone well understands "we won't have dioxin emissions."

Stone refers to the fact that new-generation, multi-stage WTE plants have virtually eliminated emissions. In fact, according to the EPA, the plants have cut dioxin and other toxic emissions upwards of 99 percent. Total combined waste-to-energy plant emissions in the U.S. are only 12 grams of dioxin annually, less than 0.5 percent of all dioxins produced nationwide. Moreover, the residue produced can be recycled into road building, and construction materials, as well as valuable metals.

There is no getting around the fact that these plants incinerate waste. The very word "incineration" can evoke an image of unregulated back yard burning, sending curls of black smoke into the air. However, modern mechanical and chemical engineers worldwide (U.S., Japan, Germany, and elsewhere) have devised remarkably innovative toxin extraction methods. Multiple-burn technology, for example, re-circulates dioxins into high temperature combustion zones, cutting their concentrations and all but eliminating them. In another extraction technique, introducing lime directly into refuse-derived fuel causes calcium to react with toxins to form removable particulates.

Thus, even though WTE involves incineration, Stone considers it a potential boon to the energy resource and recycling industries. "It is better to eliminate unnecessary use or waste of anything," he says.

Stone also notes that multiple-burn WTE technology allows for technological and economic flexibility. During recessionary periods like the current one—when "trash crashes," and plastic and paper prices decline deeply, rendering recycling costly and unprofitable—WTE plants can burn increased material loads. The high-tech incinerators simply pick up the economic slack, and generate more electricity until raw material prices recover sufficiently to again warrant sales to factories and other recyclers.

Urban Mining

The idea of utilizing WTE technology becomes particularly appealing when considering that the alternative is landfills. One ton of municipal solid waste in a landfill produces 200 normal cubic meters (Nm³) of methane. According to the National Oceanic and Atmospheric Administration, methane is a greenhouse gas that is 25 times more potent than carbon dioxide. Even the operating landfills that reclaim methane emit far more greenhouse gas than WTE plants.

Emissions are not the only problem. New York City, for example, buried over 150 million tons of municipal solid waste in Staten Island —without liners—before closing the Fresh Kills dump in March 2001. Without further intervention, toxins will pollute the adjacent wetlands and air throughout the 21st century. This is why Europe largely bans municipal solid waste landfills.

New York is now spending millions on "remediation" and building public parks on top of Fresh Kills. Instead, it could be mining these landfills, and turning waste to energy.

Other countries have already engaged in "urban mining." Japan's private and government sectors have partnered to mine 20th century "landfill mountains" for their wealth in recyclable and precious metals, as well as plastic, newspaper, combustible materials, and methane.

Using WTE technology, treasure can be found beneath the trash in Fresh Kills—at least \$50 per ton via municipal waste-to-energy electricity generation. Multiply that buried treasure times thousands of U.S. municipal and state landfills, and one can understand the vast potential in WTE. This does not include the value to be captured in recovering paper, plastic, metals, combustibles, and gas.

Will Washington Embrace Waste?

Despite its promises to embrace all forms of renewable energy, the Obama Administration may not have a taste for waste. Indeed, for Congress to even consider a switch to WTE technology would likely require the "cap-and-tax" scheme to wither on the vine, as a growing chorus of analysts now suggest might happen.

However, the battle would not end there. The waste disposal industry would then need to navigate around ideologically-charged environmental activists, such as Enck, who put politics before the planet.

In the end, however, if Washington is to embrace WTE, it will likely stem from popular demand. Indeed, when the broader public learns of WTE's multiple benefits, the American people will insist that government put this available technology to work on a broader scale.

Alyssa A. Lappen, a former senior editor at Institutional Investor magazine and former associate editor at Forbes, is a U.S.-based investigative journalist.