



Energy

SUMMER 2005

The Earth Institute Newsletter for Cross-Cutting Research

Making Energy from Waste

If waste-to-energy (WTE) power plants are considered a relatively more expensive energy option than coal-fired and other power generation plants, why has China—a developing nation of 1.3 billion people known to spend frugally on its public infrastructure—built 39 of them? “The Chinese are looking at their long-term interests,” notes Earth and Environmental Engineering Professor Nickolas Themelis, director of the Earth Engineering Center (EEC) at the Earth Institute and a leading innovator of waste-to-energy technologies. “They see the value in recovering energy from waste, and increasing the utilization of energy while reducing green-house gas emissions and the acreage required for landfill.”

According to the Waste-to-Energy Research and Technology Council, founded by EEC and the only research arm of companies and municipalities operating WTE facilities, WTE plants have significant environmental benefits, including:

- Conserving fossil fuels by generating electricity and heat: One ton of combusted municipal solid waste (MSW) reduces oil use by about 45 gallons, and coal use by about 0.28 tons.
- Reducing greenhouse gas emissions: One ton of MSW combusted rather than landfilled reduces greenhouse gas emissions by 1.2 tons of carbon dioxide.
- Recovering ferrous and non-ferrous metals.



According to the Integrated Waste Services Association, there are 89 waste-to-energy plants operating in the U.S. managing about 13 percent of the country's trash.

- Reducing the space required by landfills by about 90 percent.

In addition, these plants do not have the aqueous emissions that may be produced by landfills.

New ways of intensifying the WTE process are leading to more cost-effective plant designs. “Whereas the United States has 90 large WTE plants usually at some distance away from cities, Denmark has built over 30 smaller facilities to serve its population of 3 million, so that each plant is within a town or city and provides district heating as well as electricity,” says Themelis. “We are interested in learning more about the costs and benefits of developing WTE plants in this manner, as it may have implications for urban centers in developing countries with growing energy needs.”

Graduate students at Columbia, under the direction of Professor Marco Castaldi, are conducting research on the reaction phenomena of rubber and plastics gasification; others are working on several projects related to integrated waste management and the advancement of the WTE alternative to landfilling.