

Does Burning Garbage for Electricity Make Sense?

Nickolas J. Themelis of Columbia University says it has clear advantages; economist Jeffrey Morris says we should stick with landfills.



Garbage trucks deliver trash to a Florida waste-to-energy plant. Some European countries burn about half of their solid waste for energy, but in the U.S. the figure is much lower. *PHOTO: DANIEL ACKER/BLOOMBERG NEWS*
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The amount of garbage produced by the world's urban dwellers is growing at an astonishing clip. The World Bank has estimated that countries are generating 1.4 billion tons of municipal solid waste each year and forecasts that this number will double by 2025.

What is to be done with all of that stuff?

Governments and businesses have been working to change product packaging and consumer behavior to reduce the materials we throw away. In combination with recycling and composting efforts, these changes have helped significantly reduce garbage being buried in landfills.

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One option for dealing with the remaining trash—burning waste to generate electricity—has been adopted in several countries but has encountered stiff opposition in the U.S., where about 12% of municipal solid waste is burned for energy.

Supporters of waste-to-energy plants say such facilities reduce the need for land for dumps, lower the cost of moving trash around the country and provide an alternative source of power.

But for opponents, burning waste to produce energy is the least desirable way to deal with garbage. Such plants pollute the air, and their high capital costs can divert resources from waste-reduction and recycling efforts, the critics say.

Nickolas J. Themelis, director of the Earth Engineering Center at Columbia University, says burning waste for energy makes sense. Jeffrey Morris, an economist and president of Sound Resource Management Group in Olympia, Wash., counters that waste-to-energy is the worst of the possible options.

YES: It's Better Than Landfills

By Nickolas J. Themelis

Waste dumps are an age-old means of disposing of municipal solid waste that in developed nations in the past few decades have evolved into sanitary landfills. However, as cities run out of space for landfills, they have to transport their garbage to faraway sites—or find ways to produce less waste.

Many communities—in nearly 40 countries—have concluded that it makes sense to burn such waste, not only to reduce landfill space needs, but as a means of producing energy economically and with less harm to the environment than consigning garbage to landfills or burning fossil fuels.

Here are some of the reasons Germany and other nations in Europe and Asia have concluded that it makes sense to burn municipal solid waste instead of using landfills:

Land conservation: A waste-to-energy plant of one million tons capacity can be built on 20 acres and over a lifetime of 40 years or more help avoid conversion of 1,000 acres to landfills.

Preservation of nonrenewable resources: To generate 500 kilowatt-hours of electricity, the average waste-to-energy plant in the U.S. burns one ton of waste, while a coal-burning power plant must burn one-third of a ton of coal. The carbon emitted is roughly equal, but only a third of the carbon in the waste is fossil-based, so fewer nonrenewable resources are used. No one is arguing, by the way, that waste-to-energy plants should replace coal- or natural-gas-fired plants. But as power producers, they do offer benefits that landfills lack. Methane that

sanitary landfills capture for energy produces a theoretical 120 kilowatt-hours per ton. The average production of electricity from all U.S. landfills is only 50 kilowatt-hours per ton of solids landfilled.

Effect on recycling: Burning waste for energy doesn't discourage recycling, as some critics have claimed. Several studies have shown that states and [countries that recycle are also big users of waste-to-energy](#). Also, 90% of postrecycling waste in the U.S. is currently landfilled, presenting a good fuel supply.

Environmental quality: A recent Columbia University [study](#) showed that total dioxin emissions of U.S. waste-to-energy plants in 2012 were 0.09% of all dioxin emissions in the U.S. Spontaneous landfill fires in the U.S. in 2012 produced more than 400 times as much dioxins. It is true that waste-burning plants require sophisticated air-pollution controls, but landfills have no such controls on the gases they emit in the atmosphere.

Mitigation of climate change: [Studies by the Environmental Protection Agency](#) and academia have shown that diverting one ton of municipal solid waste from sanitary landfills to waste-burning plants reduces greenhouse-gas emissions by at least half a ton of carbon dioxide per ton of waste.

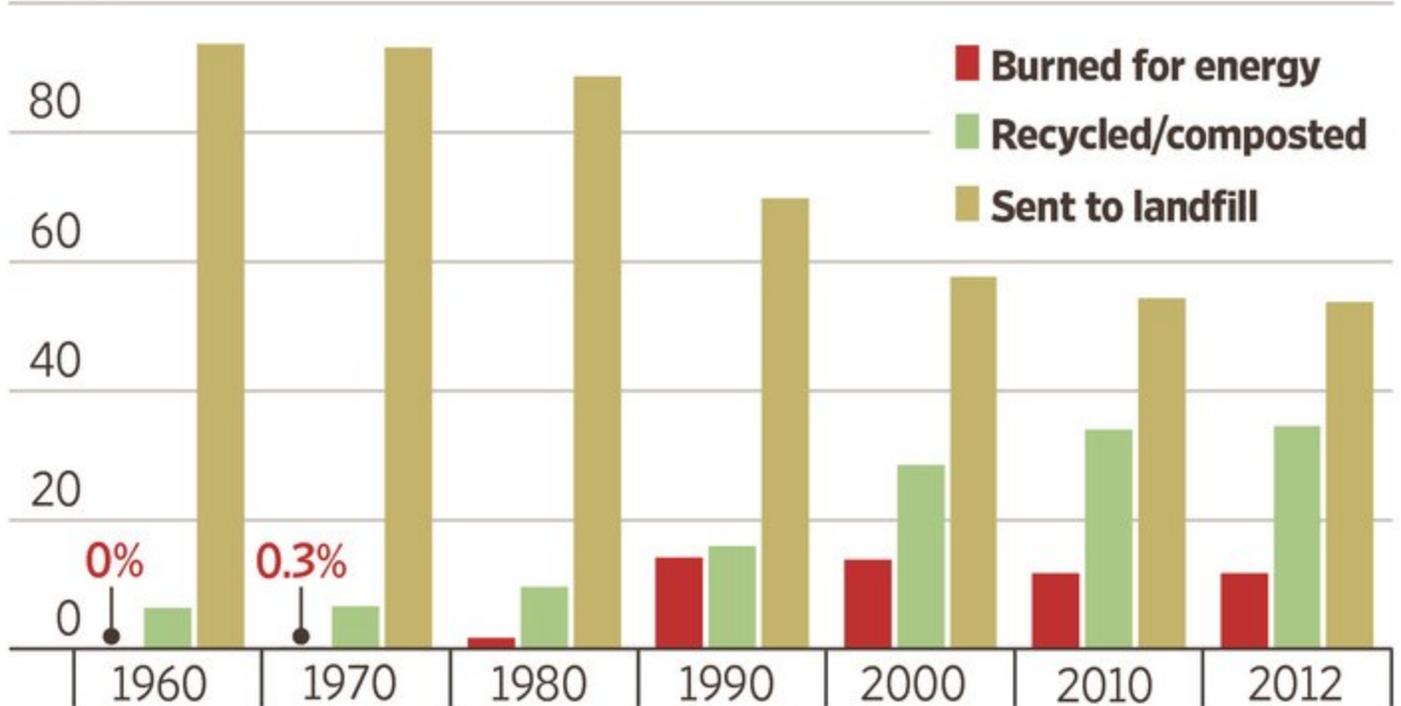
Fiscal advantage: Waste-to-energy plants require a large upfront capital investment. But most of the hundreds of U.S. municipalities that built them two and three decades ago have benefited financially. Such plants earn higher gate fees than landfills do, and they produce electricity.

Prof. Themelis is director of the Earth Engineering Center at Columbia University. Email him at reports@wsj.com.

Where Garbage Ends Up

The percentage of municipal solid waste in the U.S. that is:

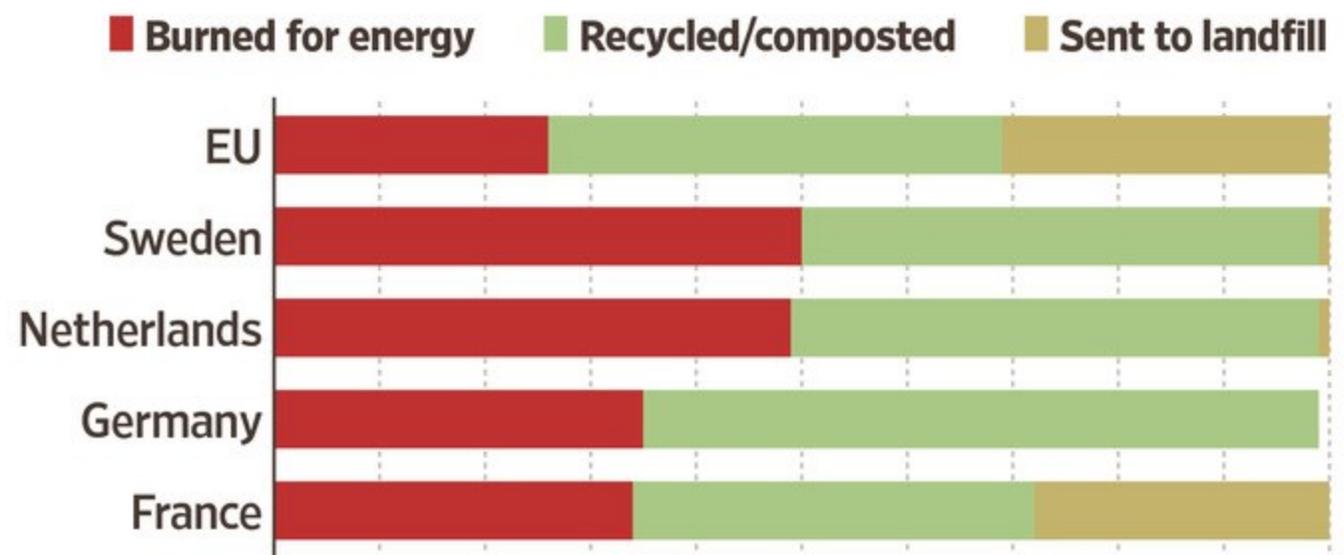
100%



Note: Percentages are based on weight.

Source: Environmental Protection Agency

The percentage of municipal solid waste in the European Union overall and selected EU countries that is:



NO: The Costs Are Too High

By Jeffrey Morris

Burning garbage to produce electricity is a terrible idea, for both economic and environmental reasons—including the harm it can do to a community's efforts to recycle and compost.

Here are the main reasons why we shouldn't burn garbage for power:

It is inefficient: Incineration converts less than 25% of material energy in garbage into marketed electricity, compared with about 35% for coal and as much as 45% for some natural-gas systems. Even landfill methane [burns with about 35% efficiency](#). Better still, recycling discarded items—reducing the need for manufacturing and packaging—saves three to five times as much energy as incinerating them generates.

It harms the environment: Burning garbage emits 1.5 times as much carbon dioxide per kilowatt-hour generated as coal and three times as much as natural gas. Waste-to-energy plants require costly air-pollution controls to reduce emissions of hazardous metals and chemicals. Even with such controls, garbage burning is more harmful to humans and the ecosystem than fossil fuels. Claims that waste-burning emissions contain only a small fraction of dioxins released by landfill fires are based on tests and data that are biased. Plant operators are warned well in advance of testing dates. And landfill-fire data include open, unlined dumps and landfills that do not capture explosive emissions, neither of which are representative of modern landfills.

It releases carbon, while landfills store it: Incineration spews virtually all of the carbon in burnable garbage materials into the atmosphere as carbon dioxide. [Landfills store](#) all of the carbon found in nonbiodegradable materials like plastics and glass, and some of the carbon in materials that break down over time: Amounts of carbon stored for biodegradable materials range from more than 80% for wood and newsprint to less than 20% for food scraps; leaves, other paper types, cardboard and grass are somewhere in between.

Modern landfills have smaller climate footprints: Studies which claim that waste-to-energy plants reduce greenhouse-gas emissions more than landfills typically don't count all of the carbon-dioxide such plants emit. They also base their comparisons, in part, on landfills that either [do not attempt to capture methane or do a poor job of it](#). Newer landfills, which grab and burn methane for electricity, release less carbon than incinerating the solid waste that generates it. Thus, communities that combine modern landfills with composting organics and recycling do less environmental harm than plants that burn solid waste for electricity.

It is more expensive than land-filling: Disposal costs for waste-to-energy plants—net of revenue from generated energy—are 35% to 50% higher than disposal costs for land-filling. Such facilities typically commit a community to throwing away a set amount of garbage each year to meet plant production requirements, thus inhibiting recycling and composting efforts.

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