

## Waste-To-Energy: Clean, Reliable, Renewable Power

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Waste-to-energy facilities process nearly 30 million tons of trash each year and generate enough power to meet the needs of nearly 2.4 million homes. More than 37 million people in 31 states rely on the 102 waste-to-energy plants nationwide.

Waste-to-energy facilities generate about 2800 megawatts, or about one-quarter of total biomass generation. Biomass accounts for about 1.4% of the total electricity generated. Renewable energy totals slightly more than 2% of the electricity market.

New Clean Air Act Standards that the year 2000 facilities are among the cleanest sources of electricity in the nation. For example, EPA calculates that mercury emissions from waste-to-energy plants have dramatically declined by more than 90% over 1995 levels. Waste-to-energy now accounts for less than 3% of the U.S. inventory of mercury emissions stemming from industry.<sup>1</sup> EPA has acknowledged similar success in controlling dioxin emissions that have been reduced by at least 99% since 1995. Waste-to-energy represents less than 1% of the known sources of dioxin.<sup>2</sup>

Waste-to-energy prevent the release of greenhouse gases such as methane, carbon dioxide, nitrogen oxides, and volatile organic compounds.<sup>3</sup> Combined, waste-to-energy contributes to the reduction of more than 33 million tons of greenhouse gas equivalence.

- Waste-to-energy prevents the release of more than 10 million tons of carbon dioxide and more than a million tons of methane into our atmosphere.
- Waste-to-energy power as an alternative to coal prevents the release of nearly 25,000 tons of nitrogen oxides and 5,000 tons of volatile organic compounds.
- Waste-to-energy also depletes less of the Earth's natural resources than oil, coal or natural gas-powered electricity generation.

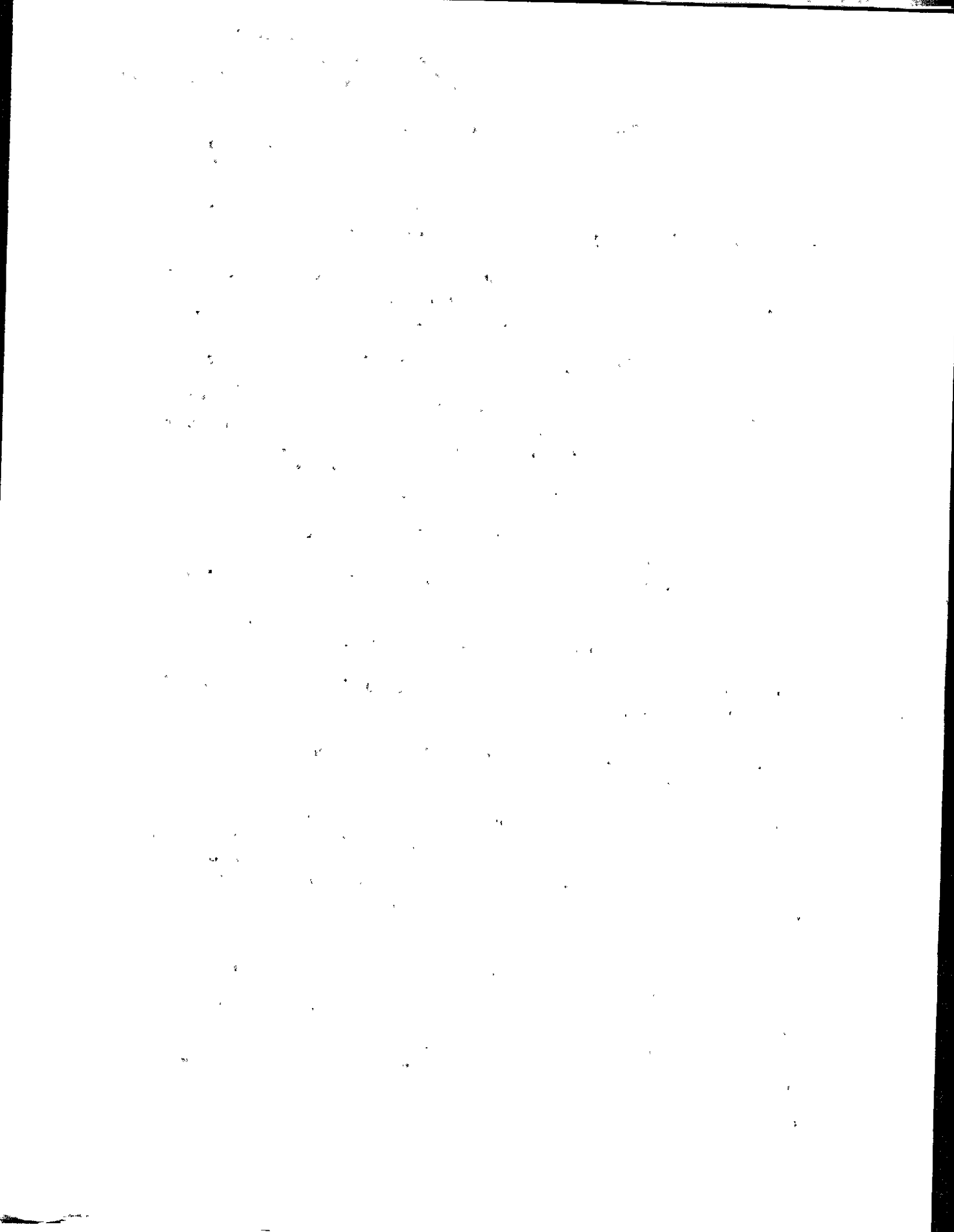
Communities with waste-to-energy plants recycle an average of 33% of their trash, five percent higher than the national average. Nearly 788,000 tons of steel is recovered for recycling each year at waste-to-energy plants. An additional 940,000 tons each year of non-ferrous metals, glass, plastics, white goods, batteries, paper, card board, yard waste, and ash is recycled on-site at waste-to-energy plants.

<sup>1</sup> U.S. Environmental Protection Agency, *Mercury Report to Congress*, December 1997.; U.S. EPA Fact Sheet, *Final Air Regulations for Municipal Waste Combustors*, (10/31/95)

<sup>2</sup> U.S. Environmental Protection Agency Fact Sheet *Final Air Regulation for Municipal Waste Combustors* (10/31/95); U.S. EPA Draft Dioxin Reassessment, 1994; EPA Memorandum, *Summary of the National Estimates for Municipal Waste Combustion Units*, (09/30/00).

<sup>3</sup> U.S. Department of Energy, Energy Information Agency, *Voluntary Reporting of Greenhouse Gases*, 1999.

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# Fact Sheet

## WASTE-TO-ENERGY: A RENEWABLE ENERGY SOURCE

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- The **Public Utility Regulatory Policy Act's** definition of small power plant production facility is as follows: "The term 'renewable energy' means electricity generated from **biomass, waste**, renewable resources to include wind and solar, geothermal resources, or any combination thereof."
- The **Federal Power Act Amendments of 1978** defines renewable electric energy as "electric energy produced by a renewable energy facility which produces electric energy solely by the use, as a primary energy source, of solar energy, wind energy, **waste resources, biomass resources**, geothermal resources, or any combination thereof."
- The **Federal Energy Regulatory Commission's Regulations** (18 CFR.Ch. I, 4/96 Edition, Sec. 292.204) defines **biomass energy** as "Any primary energy source which, on the basis of its energy content, is **50 percent** or more biomass shall be considered biomass."
- **EPA's Characterization of Municipal Solid Waste in the U.S.: 1998** calculates that the **biomass content of solid waste is more than 70%** on average.
- **DOE's National Renewable Energy Laboratory** contends that "renewable energy technologies are being developed to produce marketable energy by converting natural phenomena into useful energy forms."
- According to DOE "Biomass is a term that includes all energy materials that emanate from biological sources, whether they are wood or wood wastes, residue of wood processing industries, food industry waste products, or **municipal solid waste**. Unlike the burning of fossil fuels, combustion of biomass merely recycles the carbon fixed by photosynthesis in the growth phase."
- Waste-to-energy is the only renewable energy technology that provides communities with **dual environmental benefits: a clean source of electricity and clean trash disposal.**
- The fuel used in waste-to-energy plants to produce clean electricity is municipal solid waste. **Trash is both "sustainable" and "indigenous" - two basic criteria for establishing what is a renewable energy source.** Society will continue to generate waste and no one can reasonably claim that waste will ever be 100 percent eliminated.
- The **Clean Air Act Amendments of 1990** provides a special incentive for utilities that **use renewable fuels.** Under the Act, "the term 'qualified renewable energy' means energy derived from biomass, solar, geothermal, or wind as identified by the Administrator in consultation with the Secretary of Energy."

"The following listed measures are approved as 'qualified renewable energy generation' for purposes of the Conservation and Renewable Energy Reserve Program: **3.1 Biomass resources** - combustible energy-producing materials from biological sources which include: wood, plant residues, biological wastes, landfill gas, energy crops, and eligible components of municipal solid waste."



## SOURCES OF RENEWABLE ENERGY FOR ELECTRIC GENERATION

Sources	Total in Megawatts	% of Market
Geothermal	2,854	0.37
Biomass including waste-to-energy * <sup>1</sup>	10,702	1.38
Solar	334	0.04
Wind	1,620	0.21
<b>Total Renewable Energy</b> <sup>2</sup>	15,510	2.0
Nonrenewables	763,005	98.0
<b>Total</b>	778,515	
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* <u>Waste-To-Energy</u> <sup>3/4</sup>	2,769	0.35

*Source - Renewable Energy Annual 1998 - U.S. Department of Energy, Energy Information Administration*

<sup>1</sup>Waste-to-energy represents 26% of the biomass category.

<sup>2</sup>The Energy Information Administration includes hydroelectric power as a renewable energy source. Hydroelectric totals 79,795 megawatts, and, if included as a renewable source, would represent 10.2 percent of all electricity generated and 83 percent of all renewable sources.

<sup>3</sup>Waste-to-energy represents 18% of all renewable energy assuming hydroelectric power is not included in the renewable category.

<sup>4</sup>Waste-to-energy power generation increased to 2,816 megawatts in 1999.

# Fact Sheet

## NEW CLEAN AIR ACT RULES FOR WASTE-TO-ENERGY FACILITIES

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- Waste-to-energy facilities that burn municipal garbage to generate electricity and steam are subject to tougher federal emissions standards. Those standards ensure that **waste-to-energy is one of the cleanest sources of power in the world.**
- As part of the 1990 Clean Air Act mandates, EPA set new air pollution control standards for large units (furnaces) at municipal waste combustors, including waste-to-energy facilities. **The standards, coupled with EPA's strict enforcement policies, make the new rules among the toughest in the world for these power plants.**
- These Clean Air Act standards require facilities to use the "maximum achievable control technology," and therefore are referred to as the **MACT standards.**
- The MACT standards apply to facilities with large units (furnaces) that combust more than 250 tons each day of trash, representing nearly 90% of national waste-to-energy capacity. MACT standards for small units that combust 250 tons or less of trash each day will be promulgated in the year 2000.
- **America's 102 waste-to-energy plants operate cleaner than ever.** Waste-to-energy plants are now cleaner than the vast majority of the nation's other electricity sources including power plants fired by coal or oil. In most cases, a waste-to-energy plant improves air quality by replacing these fuels as a source of electricity generation.
- Some facilities were designed to meet the new emissions limits while others "**retrofit**" newer technology to their existing air pollution control equipment. Retrofit technology includes:
  - A "**bag house**" that works like a giant vacuum cleaner with hundreds of fabric filter bags which clean the air of soot, smoke, and metals.
  - A "**scrubber**" which sprays a slurry of lime into the hot exhaust. The lime neutralizes acid gases, just as a gardener uses lime to neutralize acidic soil. Scrubbing also can improve the capture of mercury in the exhaust.
  - "**Selective Non-Catalytic Reduction**" or "**SNCR**" that converts nitrogen oxides - a cause of urban smog -- to harmless nitrogen by spraying ammonia or urea into the hot furnace.
  - "**Carbon Injection**" systems that blow charcoal into the exhaust gas to absorb mercury. Carbon injection also controls organic emissions such as dioxins.

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## MACT RULES FOR EXISTING LARGE UNITS AT FACILITIES

Emission	Limit	Emission	Limit
<b>Dioxin/Furans</b>	(/dscm)	<b>SO<sub>2</sub></b>	
Large		Large	29 ppm or 75% removal
ESP-equipped units	60 ng		
All others	30 ng		
<b>Cd</b>	(/dscm)	<b>HCl</b>	
Large	0.04 mg	Large	29 ppm or 95% removal
<b>Pb</b>	(/dscm)	<b>Opacity</b>	10%
Large	0.44 mg	<b>Hg (/dscm)</b>	0.080 mg or 85% removal
<b>PM</b>		<b>Fugitives</b>	Visible less than 5% of the time
Large	27mg		
<b>NO<sub>x</sub>: Operator of large plants may select one of the two options</b>			
<i>Option A: Units must meet the following standards:</i>			
Mass Burn/Water Wall	205 ppmv	Fluidize Bed	180 ppmv
RDF	250 ppmv		
Mass Burn Rotary	250 ppmv		
<i>Option B: Plants may "bubble" units within the plant to meet the following standards:</i>			
Mass Burn/Water Wall	180 ppmv	Fluidize Bed	160 ppmv
RDF	230 ppmv		
Mass Burn Rotary	220 ppmv		
<b>CO</b>			
Modular	50 ppmv	Spreader Stoker Coal/RDF Mixed, RDF Stocker	200 ppmv
Mass Burn Rotary Refractories, Waterwall, Refractory, Fluidized Bed	100 ppmv	Mass Burn Rotary Waterwall	250 ppmv
Pulverized Coal, RDF Mixed	150 ppmv		

## NEW SOURCE RULES FOR NEW PLANTS

Emission	Limit	Emission	Limit
<b>Dioxin/Furans</b>	13 ng/dscm	<b>SO<sub>2</sub></b>	30 ppm or 80% removal
<b>Cd</b>	0.020 mg/dscm	<b>HCl</b>	25 ppm or 95% removal
<b>Pb</b>	0.20 mg/dscm	<b>Opacity</b>	10%
<b>PM</b>	24 mg	<b>Hg (/dscm)</b>	0.080 mg or 85% removal
<b>Fugitives</b>		<b>NO<sub>x</sub></b>	
Visible less than 5% of the time		First year	180 ppm
		After 1st year	150 ppm
<b>CO</b>		<b>Complete:</b>	
Modular/Mass Burn, Fluidized Bed	100 ppmv	• Siting Analysis	
RDF	150 ppmv	• Materials Separation Plan	
		• Public Meetings	

Large units are defined as those burning more than 250 tons each day of waste. The MACT rules apply to large units only. MACT standards for small units will be promulgated in the year 2000 by the EPA.

## WASTE-TO-ENERGY INDUSTRY

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Americans generate more than 225 million tons of trash annually. About one-third of the nation's trash is recycled or composted, leaving 150 million tons of trash to be managed. This remaining trash is managed in landfills, or used as fuel to generate electricity and steam power at waste-to-energy facilities.

Waste-to-energy is an effective method of trash management and volume reduction with the added benefit of generating clean energy. Waste-to-energy technology has proven to be safe, environmentally friendly and economical. Burning trash effectively destroys waste stream bacteria, pathogens and other harmful elements. The waste-to-energy process also reduces the incoming volume by *about 90%*. The remaining ash is either used as a road bed material or similar product or landfilled.

### *The Future of America's Trash Disposal Dilemma... Answered by Proven Waste-to-Energy Projects*

- There are 102 waste-to-energy plants, operating in 31 states, throughout the U.S.
  - these plants burn about .14% of the trash generated nationwide, or about 97,000 tons each day;
  - waste-to-energy generates more than 2,800 megawatts of electricity to meet the power needs of nearly 2.5 million homes;
  - the facilities serve the trash disposal needs of more than 37 million people.
- Waste-to-energy plants represent a national capital investment of more than \$10 billion.
- A recent survey, conducted in 70 cities nationwide and published in the *Solid Waste and Power Industry Sourcebook* indicates that almost three-quarters of the Americans polled believe waste-to-energy plants are vital components for the nation's environmental and economic future. Respondents also believe that waste-to-energy programs mean cleaner disposal of trash, less need for landfill space and cost effective, safe power generation.

### *The Environment and the Economy are Incentives to Use Waste-to-Energy Technology*

- Waste-to-energy plant employees receive total annual wages in excess of \$150 million. This translates into local economic benefits of more than \$300 million. The waste-to-energy industry provides more than 6,000 jobs for American workers.
- The value of energy produced annually at waste-to-energy plants in this country exceeds \$850 million. Waste-to-energy provides a reliable form of power because even after source reduction and recycling, the supply of fuel (trash) is dependable.

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## ***Waste-to-Energy Plants...Responsive to the Environment***

- New Clean Air Act rules ensure that waste-to-energy is one of the cleanest sources of power in the world. Energy can be produced from trash about as cleanly as from natural gas, reports a recent booklet jointly released by the U.S. Conference of Mayors, the American Society of Mechanical Engineers and others. Since the power from modern waste-to-energy plants usually replace older oil- or coal-burning technologies, they can actually *improve* the air quality in the communities where they operate.
- How clean are modern waste-to-energy facilities? Consider that Los Angeles District Sanitation Department officials concluded in 1993 that their local waste-to-energy facility created less pollution than the trucks used to haul trash to a nearby landfill.
- The U.S. Department of Energy has labeled waste-to-energy technology as a major part of a plan to reduce carbon dioxide emissions in the United States. By replacing fossil fuels, waste-to-energy reduces the buildup of carbon dioxide in the air. Combusting biomass -- materials such as paper, wood and food waste -- *does not* add to the buildup of greenhouse gases.
- A recent air emissions sampling at a waste-to-energy facility in Indianapolis showed that sulfur dioxide emissions were reduced by 52% over the levels produced by an old coal power generating plant.

## ***Safe Ash Management and Reuse***

- Ash landfill studies conducted over the past decade show that leachate is like salty water, with a metals content at about the same level as the standards set for drinking water. Ash is tested for safety from each waste-to-energy plant in accordance with federal and state laws.
- More than 300,000 tons of ash is used annually as daily and final cover in place of soil in landfills and in roadbed construction. Ash is used as a substitute for aggregate in road base materials, building construction and artificial offshore reefs.
- Waste-to-energy residue ash is safe for landfilling. The ash exhibits concrete-like properties causing it to harden once it is placed and compacted in a landfill. This reduces the potential for rainwater to leach contaminants from landfills into the ground.



## Waste-to-Energy:

**A tax credit for new, waste-to-energy facilities or new generating units at existing facilities continues the federal government's policy to encourage clean, renewable electricity, and promotes energy diversity while helping cities meet the challenge of trash disposal. Here's why the tax credit deserves your support.**

- Waste-to-energy facilities generate electricity and steam using municipal solid waste (garbage) as fuel. The garbage burns in specially designed boilers to ensure complete combustion, and new Clean Air Act standards require facilities to employ the most modern pollution control equipment available to scrub emissions. The result is clean, renewable energy.
- Nationwide, 85 waste-to-energy plants supply about 2400 megawatts of electricity to the grid. Plants operate 365-days-a-year, 24-hours a day. Facilities average greater than 90% availability of installed capacity. Waste-to-energy plants generally operate in or near an urban area, easing transmission to the customer.
- Facility revenues come from fees paid to dispose of the garbage and the price paid for electricity generated by waste-to-energy plants. New facilities or new generating units built at existing facilities require significant capital investment. The capital, and the operation and maintenance (O&M) costs at a facility equal about \$100 for each ton of garbage processed at a facility. On an energy revenue basis, about 20 cents per kWh would be required for capital and O&M. For example, a facility that processes 2000 tons of trash each day into 60 MW of electricity would require about \$200,000 in revenues daily, coming from either disposal fees or electricity revenues, or both.
- Waste-to-energy power must be sold as "base load" electricity and cannot be operated to supply "peak load" power simply because there is a constant need for trash disposal by combustion that keeps power generation steady and reliable.
- Similar to other alternative energy sources, waste-to-energy plants are qualified facilities (QFs) eligible under PURPA for mandatory power purchase at avoided cost. Most existing facilities have been financed based, in part, on long-term PURPA contracts that run commensurate with the facility debt.
- The biomass content of waste-to-energy's fuel, municipal solid waste, is about 75% on a Btu-output basis.
- Power purchasers no longer offer long-term PURPA contracts. Power generated by new waste-to-energy facilities or new units at existing facilities will be sold as base load, and the power price will fluctuate on a 24-hour basis at the market clearing price (i.e., waste-to-energy power will be bid at "0" cents and ride with the market.)
- The market price and disposal fee will, on average, not be sufficient to cover the cost of a new waste-to-energy unit. A tax credit is needed to encourage this form of clean, renewable electricity.

