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RENEWABLE ENERGY FROM WASTE

“The Role of Waste-to-Energy in a Renewable and Carbon-Conscious Environment”

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President
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Governments (COG) Recycling
Committee Meeting

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Outline

- Industry Overview
- WTE Process Overview
- Life Cycle Analysis
- Policy Recognition
- Cap & Trade / Offsets
- Voluntary Carbon Standard
- Summary



Energy Recovery Council & Industry Overview

- ERC represents companies and local governments engaged in the nation's waste-to-energy sector.
- There are 86 waste-to-energy facilities in the United States which produce clean, renewable energy through the combustion of municipal solid waste in specially designed power plants equipped with the most modern pollution control equipment to clean emissions.
- Trash volume is reduced by 90% and the remaining residue is safely reused or disposed in landfills.
- The 86 waste-to-energy plants in the nation have a baseload electric generation capacity of approximately 2,700 megawatts and can process more than 28 million tons of trash per year.



What is Waste-to-Energy?

Waste-to-Energy is a specially designed energy generation facility that uses household waste as fuel and helps solve some of society's big challenges

Municipal Solid Waste 1
ton

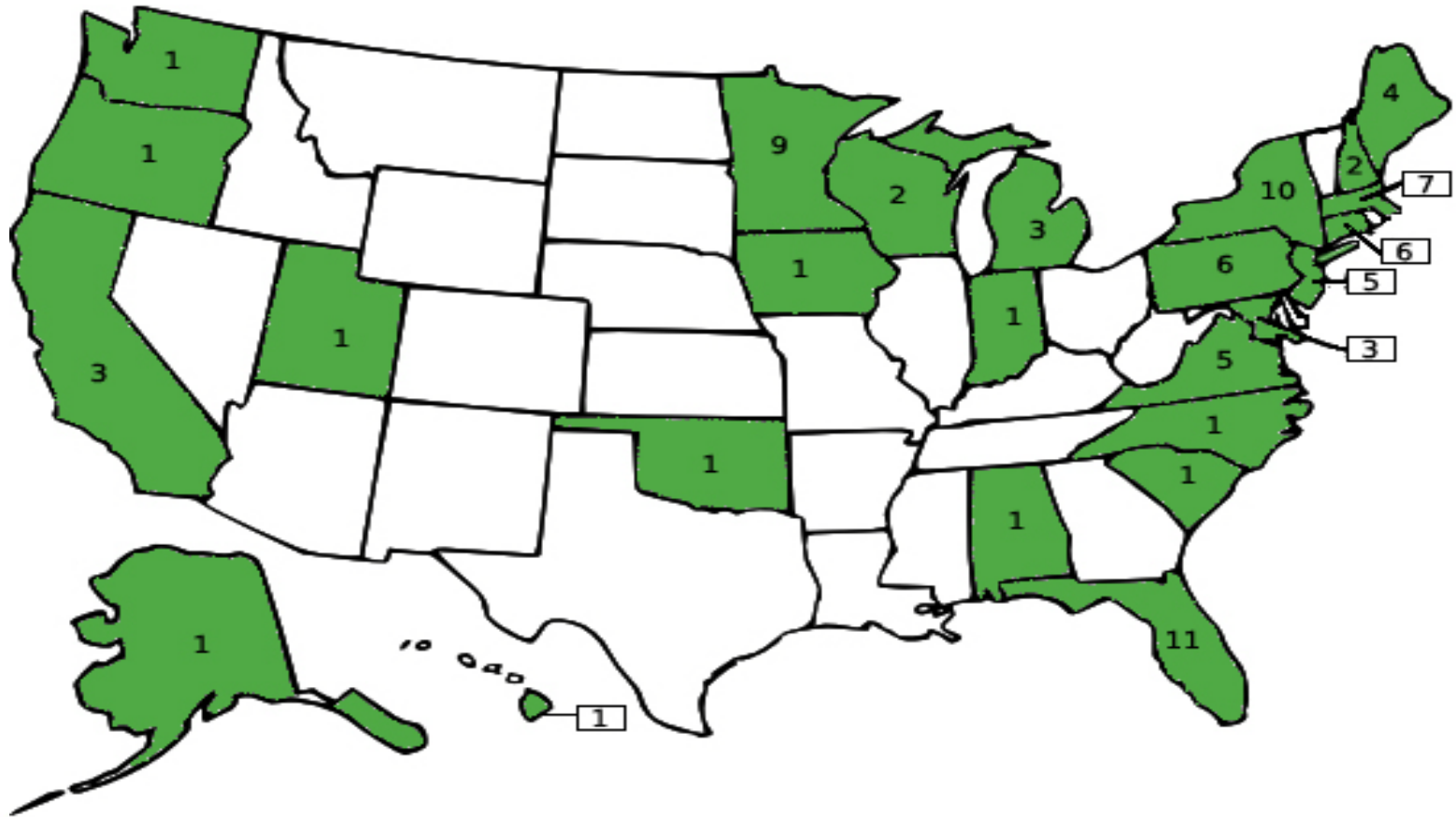


- Power: up to 750 kWh
- Metal: 50 lbs
- Ash: 10% of original volume



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Waste-to-Energy Playing a Significant Role



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Waste-to-Energy Facility

Reducing the Volume of Waste & Saving Space in the Landfill while
Generating Clean, Renewable Energy



100 cubic yards
of waste

10 cubic yards
of (inert) ash

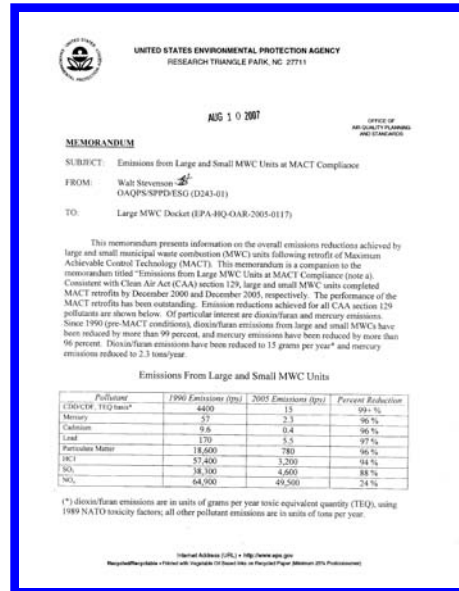
Clean, Renewable Energy

- U.S. EPA has stated that Waste-to-Energy “produces electricity with less environmental impact than almost any other source”
- 26 States, the District of Columbia, Puerto Rico, the Northern Marianna Islands, and the federal government define Waste-to-Energy as renewable
- Waste-to-Energy produces up to 750kWh per ton while landfill gas produces 65 kWh per ton
- Waste-to-Energy complements other renewable sources
 - 24 hours per day, 7 days per week
- A new 1,500 ton/day facility = 50 MW electricity



Environmental Performance Waste-to-Energy

U.S. EPA: “The performance of the MACT retrofit has been outstanding.”
8/10/2007



Pollutant	1990-2005% reduction
Dioxin	99
Mercury	96
Cadmium	96
Lead	97
Particulate Matter	96
HCl	94
SO ₂	88
NO _x	24



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WTE & Greenhouse Gas Avoidance

Waste-to-energy plants are tremendously valuable contributors in the fight against global warming. According to the U.S. EPA MSW Decision Support Tool nearly one ton of CO₂ equivalent emissions are avoided for every ton of municipal solid waste handled by a waste-to-energy plant due to the following:

- **Avoided methane emissions from landfills.** When a ton of solid waste is delivered to a waste-to-energy facility, the methane that would have been generated if it were sent to a landfill is avoided. While some of this methane could be collected and used to generate electricity, some would not be captured and would be emitted to the atmosphere.
- **Avoided CO₂ emissions from fossil fuel combustion.** When a megawatt of electricity is generated by a waste-to-energy facility, an increase in carbon dioxide emissions that would have been generated by a fossil-fuel fired power plant is avoided.
- **Avoided CO₂ emissions from metal recycling.** Waste-to-energy plants recover more than 700,000 tons of ferrous metal for recycling annually. Recycling metals saves energy and avoids CO₂ emissions that would have been emitted if virgin materials were mine and new metals were manufactured, such as steel.



EPA's MSW Decision Support Tool

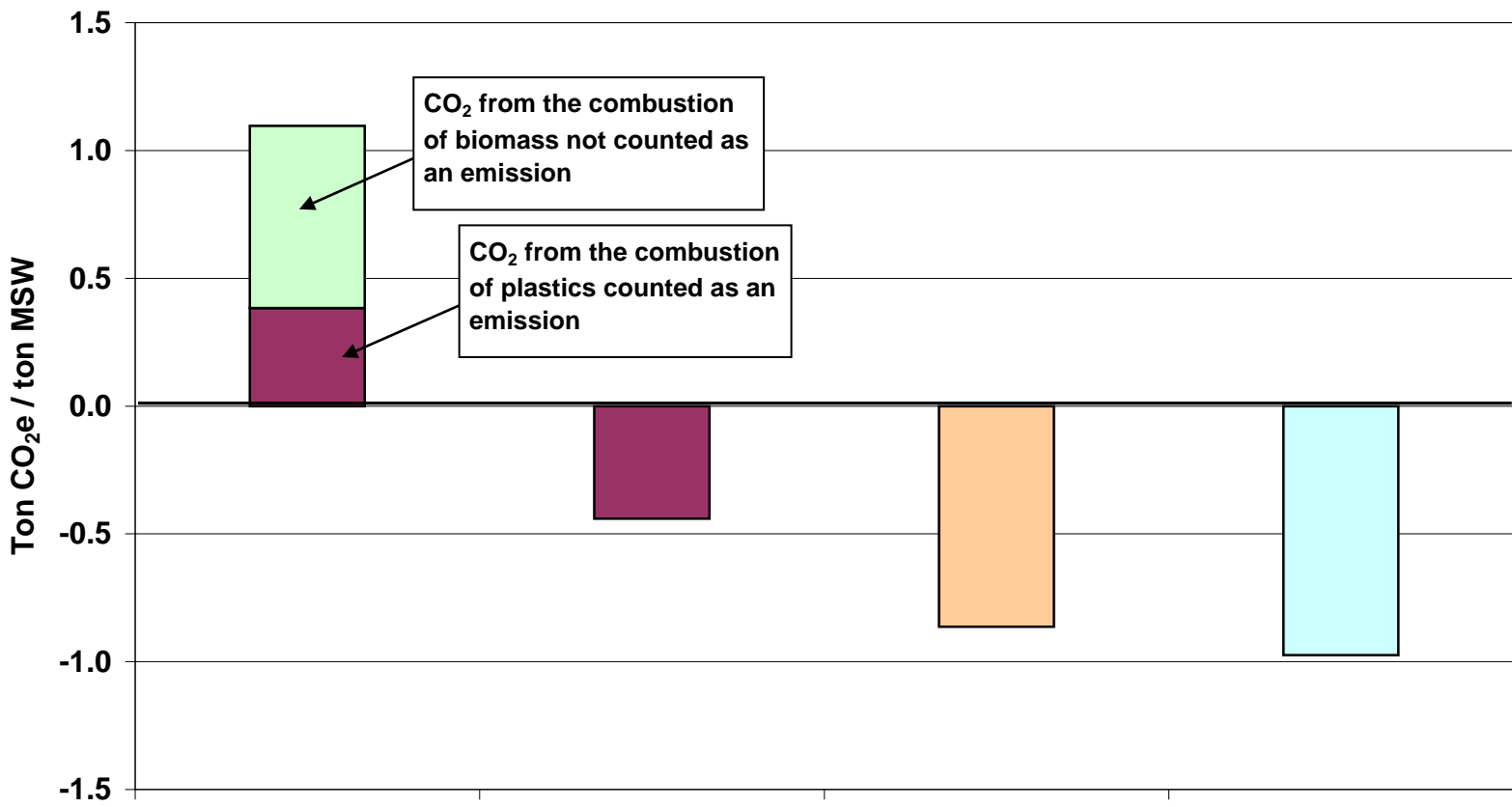
- The Decision Support Tool is a peer-reviewed tool[1] that enables the user to directly compare the energy and environmental consequences of various management options for a specific or general situation. Technical papers authored by EPA[2] report on the use of the Decision Support Tool to study municipal solid waste management options.

[1] Available through US EPA and its contractor RTI International.

[2] “Moving From Solid Waste Disposal to Management in the United States,” Thorneloe (EPA) and Weitz (RTI) October, 2005, and “Application of the U.S. Decision Support Tool for Materials and Waste Management,” Thorneloe (EPA), Weitz (RTI), Jambeck (UNH), 2006



Environmental Performance of Waste-to-Energy Climate Change



CO₂ from combustion of MSW Fossil CO₂ avoided by WTE power Methane avoided by WTE Net GHG factor

WTE Life Cycle Unit Operations



Biogenic vs. Anthropogenic CO₂ emissions

- There are two types of carbon dioxide emissions: biogenic and anthropogenic.
- The combustion of biomass generates biogenic carbon dioxide. Although waste-to-energy facilities do emit carbon dioxide from their stacks, the biomass-derived portion is considered to be part of the Earth's natural carbon cycle.
- Anthropogenic carbon dioxide is emitted when man-made substances in the trash are burned, such as plastic and synthetic rubber.
- Testing of stack gas from waste-to-energy plants using ASTM Standards D-6866 can determine precisely the percentage of carbon dioxide emissions attributable to anthropogenic and biomass sources. Long-term measurements of biogenic CO₂ from waste-to-energy plants measure consistently at approximately sixty-seven percent.

Air Emissions of Waste-To-Energy and Fossil Fuel Power Plants (Pounds per Megawatt Hour)		
Fuel Type	Direct CO ₂ ¹	Life Cycle CO ₂ E ²
Coal	2,138	2,196
Residual Fuel Oil	1,496	1,501
Natural Gas	1,176	1,276
Waste-to-Energy ³	1,294	-3,636

¹Based on 2007 EPA eGRID data except WTE which is a nationwide average using 34% anthropogenic CO₂.

²Life Cycle CO₂E for fossil fuels limited to indirect methane emissions using EPA GHG inventory and EIA power generation data. Life Cycle value would be larger if indirect CO₂ was included.

³Life Cycle CO₂E for WTE based on nominal nationwide avoidance ratio of 1 ton CO₂E per ton of MSW using the Municipal Solid Waste Decision Support Tool, which includes avoided methane and avoided CO₂.

Biogenic vs. Anthropogenic CO2 emissions

There is significant international and domestic precedent for the exclusion of biogenic CO2 emissions:

- CO2 emissions from the combustion of biomass are not included in national and international inventories, including the EPA GHG inventory, in accordance with the IPCC Guidelines for National Greenhouse Gas Inventories.
- Biomass emissions from combustion or non-combustion sources have not been capped under the current draft of the California cap and trade system, the Kyoto Protocol, the European Union Emission Trading Scheme (EU-ETS), or the Regional Greenhouse Gas Initiative.
- The Clean Development Mechanism of the Kyoto Protocol does not include CO2 from biogenic sources as an emission. Biogenic emissions are not counted in the applicability determination for the EPA's Greenhouse Gas Reporting Program.



Life Cycle Analysis of WTE & GHG

“Discarded MSW is a viable energy source for electricity generation in a carbon constrained world. One notable difference between LFGTE and WTE is that the latter is capable of producing an order of magnitude more electricity from the same mass of waste. In addition, as demonstrated in this paper, there are significant differences in emissions on a mass per unit energy basis from LFGTE and WTE. On the basis of the assumptions in this paper, WTE appears to be a better option than LFGTE. If the goal is greenhouse gas reduction, then WTE should be considered as an option under U.S. renewable energy policies.”

Is It Better To Burn or Bury Waste for Clean Electricity Generation?

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Domestic Recognition of WTE as a Greenhouse Gas Reducer



THE UNITED STATES CONFERENCE OF MAYORS
CLIMATE PROTECTION CENTER



- The ability of waste-to-energy to reduce greenhouse gas emissions has been embraced by the U.S. Conference of Mayors.
- The USCM adopted a resolution in 2004 recognizing the greenhouse gas reduction benefits of waste-to-energy, while supporting a 7 percent reduction in greenhouse gases from 1990 levels by 2012.
- The Agreement recognizes waste-to-energy technology as a means to achieve that goal. As of today, 1,049 mayors have signed the agreement.



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International Recognition of Waste-to-Energy as a Greenhouse Gas Reducer

The World Economic Forum in its 2009 report, “Green Investing: Towards a Clean Energy Infrastructure,” identifies waste-to-energy as one of eight technologies likely to make a meaningful contribution to a future low-carbon energy system.

The Eight Emerging Large-Scale Clean Energy Sectors include

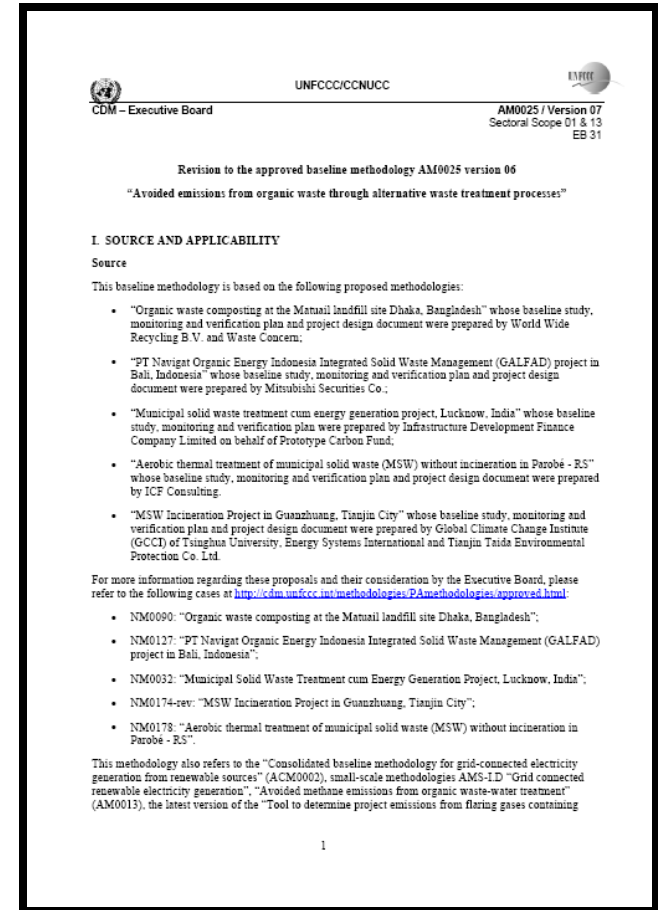
1. Onshore Wind
2. Offshore Wind
3. Solar Photovoltaic (PV)
4. Solar Thermal Electricity Generation (STEG)
5. Municipal Solid Waste-to-Energy (MSW)
6. Sugar-based Ethanol
7. Cellulosic and Next Generation Biofuels
8. Geothermal Power



WTE treatment under the Kyoto Protocol

- Under the Kyoto Protocol, by displacing fossil fuel-fired electricity generation and eliminating methane production from landfills, waste-to-energy plants can generate tradable credits (Certified Emission Reductions [CERs^[1]]) through approved Clean Development Mechanism protocols. This allows waste-to-energy facilities constructed in developing nations to sell carbon credits.

[1] CDM protocol (AM0025 v7) and associated memorandum, “Avoided emissions from organic waste through alternative waste treatment processes.”



Federal Legislation

Current laws and legislative proposals provide recognize waste-to-energy as renewable and climate-friendly.

TAX CREDITS

- The American Recovery and Reinvestment Act of 2009 signed into law by President Obama extended the Section 45 renewable energy production tax credit (PTC), which includes WTE, until 12/31/2013. (ITC and Sec. 1603 grants also options)

RENEWABLE (or CLEAN) ENERGY STANDARD

- Last year, bills in both the House and the Senate proposed establishment of a renewable energy standard (RES or RPS) which define waste-to-energy facilities as generators of renewable energy and make them eligible to generate and sell renewable energy credits. (Waxman-Markey; Bingaman; Bingaman-Brownback; Klobuchar; Lugar). The 112th Congress has yet to take action.

CAP-AND-TRADE (111th Congress)

Would not require WTE facilities to be regulated under a cap-and-trade system if fuel source was more than 95% MSW on a heat-input basis.



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Credits on the Voluntary Market

Voluntary Carbon Standard

The VCS Registry System is a custodial system for Voluntary Carbon Units (VCUs), the carbon offsets generated under the VCS Program. The VCS Registry System enables the tracking of all VCUs, from issuance to retirement, and is a key part of the VCS Program which ensures that all VCUs are real, measurable, additional, permanent, independently verified, unique and traceable.

Lee County, Florida

Lee County, Florida's waste-to-energy facility is the first waste-to-energy facility in the United States to be approved under a national voluntary standard to sell offsets.

Renewable Energy Credits

Waste-to-energy facilities have sold renewable energy credits to the Federal Government through solicitation and to private parties who voluntarily acquire renewable energy.



Summary

- Municipal solid waste is a homegrown renewable energy source that can contribute significantly to a renewable and climate-conscious future.
- All levels of government, foreign and domestic, have recognized the benefits waste-to-energy and are shaping policies to promote.
- Increased cost of compliance for fossil fuel electricity sources will make WTE more attractive in the marketplace.
- The political attractiveness of developing GHG-mitigation power sources will make it easier for communities to develop WTE facilities.
- The United States has a long way to go to catch up with policies in Europe that promote renewables and WTE, but momentum is building.





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