WTE REDUCES GREENHOUSE GAS EMISSIONS

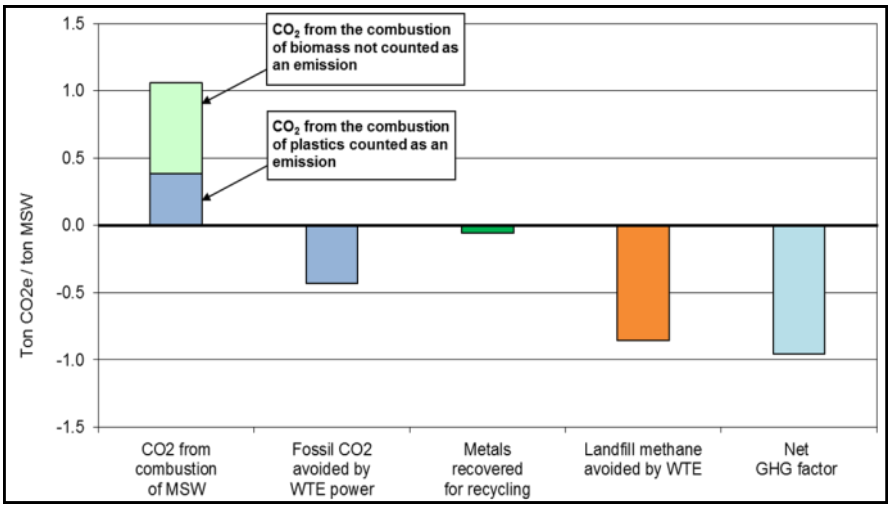
An Internationally-Recognized Source of GHG Emissions Mitigation

Numerous international governments, NGOs, and researches recognize the climate benefits of WTE, including the U.S. EPA,[1] U.S. EPA scientists,[2] the Intergovernmental Panel on Climate Change ("IPCC"),[3] the World Economic Forum,[4] the European Union,[5,] CalRecycle,[6] and the Center for American Progress,[7] Third Way,[8] and other researchers. WTE facilities generates carbon offsets credits under both the Clean Development Mechanism (CDM) of the Kyoto Protocol and voluntary carbon offset markets. Under CDM, more than 40 WTE projects have been registered, with a combined annual GHG reduction of 5 million metric tons of CO_2e per year. To date, three WTE expansions have been validated as carbon offset projects in North America. The Lee and Hillsborough County facilities, operated on behalf of municipal owners in Florida, have been selling carbon credits into the voluntary market for several years.

WTE contributes to GHGs reductions in three ways:

- it generates energy that otherwise would likely be generated by fossil-fueled facilities;
- it diverts solid waste from landfills where it would have emitted methane for generations; and
- it recovers metals for recycling, thereby saving the GHGs and energy associated with the production of products and materials from virgin inputs.

On average, the U.S. EPA has determined that WTE facilities reduce GHG emissions by one ton of CO2 equivalents (CO2e) for every ton of MSW diverted from landfill and processed.



[1]EPA Clean Power Plan, 40 CFR 60 Subpart UUUU
[2]Kaplan, P.O, J. DeCarolis, and S. Thorneloe, 2009, Is it better to burn or bury waste for clean electricity generation? *Environ. Sci. Technology* 43 (6) pp1711-1717. http://pubs.acs.org/doi/abs/10.1021/es802395e
[3]IPCC, "Climate Change 2007: Synthesis Report. Contribution of Work Groups I, II, and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change" [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland, 104 pp.
[4]World Economic Forum. *Green Investing: Towards a Clean Energy Infrastructure.* January 2009.
[5]European Environment Agency, *Greenhouse gas emission trends and projections in Europe 2009: Tracking progress towards Kyoto targets* http://www.eea.europa.eu/publications/eea_report_2009_9
[6]European Environmental Agency (2008) Better management of municipal waste will reduce greenhouse gas emissions. http://www.eea.europa.eu/publications/briefing_2008_1
[7]CalRecycle. 2012. CalRecycle Review of Waste-to-Energy and Avoided Landfill Methane Emissions. Available at: http://www.calrecycle.ca.gov/Actions/PublicNoticeDetail.aspx?id=735&aiid=689
[7]Center for American Progress (2013) Energy from Waste Can Help Curb Greenhouse Gas Emissions http://www.americanprogress.org/wp-content/uploads/2013/04/EnergyFromWaste-PDF1.pdf
[8]Third Way (2016) *Getting it Right: The Next Fifteen Years of Energy*. http://www.thirdway.org/report/getting-it-right-the-next-fifteen-years-of-energy

What the Authorities Say

EPA Clean Power Plan[1]

WTE facilities may generate tradable emission rate credits (ERCs) under a rate-based state plan to reduce GHG emissions from the power sector.

Is it Better to Bury or Burn?[2]

"WTE appears to be a better option than landfill gas to energy. If the goal is greenhouse gas reduction, then WTE should be considered as an option under U.S. renewable energy policies."

Intergovernmental Panel on Climate Change (IPCC)[3]

WTE is identified as a "key mitigation measure" in IPCC, "Climate Change 2007: Synthesis Report"

World Economic Forum[4]

WTE was recognized as a key emerging large-scale clean energy sector in a low-carbon economy along with onshore and offshore wind, solar, cellulosic ethanol and geothermal power.

Center for American Progress[7]

"In order to reduce greenhouse-gas emissions, garbage must be diverted from landfills and sent to EfW facilities after significant recycling and composting efforts are accomplished."

Third Way[8]

"A mass-based [Clean Power Plan] approach allows states to support a wider range of carbon reducing activities, [including] existing carbon negative waste-to-energy generation."

WTE IS A RENEWABLE RESOURCE

Waste-to-energy (WTE) meets the two basic criteria for establishing what a renewable energy resource is—its fuel source (trash) is *sustainable* and *indigenous*. Waste-to-energy facilities recover valuable energy from trash after efforts to "reduce, reuse, and recycle" have been implemented by households and local governments. Waste-to-energy facilities generate clean renewable energy and deserve the same treatment as any other renewable energy resource.

- **Trash Would Otherwise go to a Landfill.** Waste-to-energy facilities use no fuel sources other than the waste that would otherwise be sent to landfills.
- **State Renewable Statutes Already Include WTE.** 31 states, the District of Columbia, and two territories have defined waste-to-energy as renewable energy in various state statutes and regulations, including renewable portfolio standards.
- **Communities with WTE Have Higher Recycling Rates.** Studies have demonstrated that average recycling rate of communities served by waste-to-energy is higher than the national average.
- **WTE Has a Long History as Renewable**. Waste-to-energy has been recognized as renewable by the federal government for nearly thirty years under a variety of statutes, regulations, and policies. Many state have recognized as renewable under state statutes as well. The renewable status has enabled waste-to-energy plants to sell credits in renewable energy trading markets, as well as to the federal government through competitive bidding processes.
- **Renewable Designations Benefit Many Local Governments and Residents.** The sale of renewable energy credits creates revenue for local governments that own waste-to-energy facilities, helping to reduce a community's cost of processing waste. The U.S. Conference of Mayors has adopted several resolutions supporting waste-to-energy as a renewable resource.

Federal Statutes and Policies Establishing WTE as Renewable (as of 10/1/18)

EPA's Clean Power Plan

Balanced Budget Act of 2018

Consolidated Appropriations Act, 2016

Tax Increase Prevention Act of 2014

American Taxpayer Relief Act of 2012

American Recovery and Reinvestment Act of 2009

Emergency Economic Stabilization Act of 2008

Tax Relief and Healthcare Act of 2006

Energy Policy Act of 2005

American Jobs Creation Act of 2004

Biomass Research and Development Act of 2000

Public Utility Regulatory Policies Act (PURPA) of 1978

Federal Power Act

Pacific Northwest Power Planning and Conservation Act

Internal Revenue Code (Section 45)

Executive Orders 13123, 13423, 13514, and 13693

Presidential Memorandum on Federal Leadership on Energy Management (12/5/13)

Federal Energy Regulatory Commissions Regulations (18 CFR.Ch. I, 4/96 Edition, Sec. 292.204)

States Defining Waste-to-Energy as Renewable in State Law (as of 10/1/18)

Alabama	Maryland	Oregon
Arizona	Massachusetts	Pennsylvania
Arkansas	Michigan	Puerto Rico
Colorado	Minnesota	South Carolina
Connecticut	Missouri	South Dakota
Dist. of Columbia	Montana	Utah
Florida	Nevada	Virginia
Hawaii	New Jersey	Washington
Indiana	New York	West Virginia
Iowa	N. Mariana Islands	Wisconsin
Louisiana	Ohio	
Maine	Oklahoma	

WTE HAS A SUPERIOR EMISSIONS PROFILE

Waste-to-energy facilities are subject to standards that are among the most stringent in the world. Under the Clean Air Act, more than $1 billion was invested in upgrades to air quality control systems at America's waste-to-energy facilities. The results were so dramatic that the U.S. Environmental Protection Agency wrote that the "upgrading of the emissions control systems of large combustors to exceed the requirements of the Clean Air Act Section 129 standards is an impressive accomplishment."

In addition to combustion controls, waste-to-energy facilities employ sophisticated air quality control equipment, such as selective non-catalytic reduction" or "SNCR", scrubbers, activated carbon Injection, and fabric filter baghouses.

As a result of the controls employed at these plants, dramatic reductions in emissions have been achieved, leading EPA to conclude that the emissions performance of waste-to-energy "has been outstanding." (Stevenson, EPA, 2007)

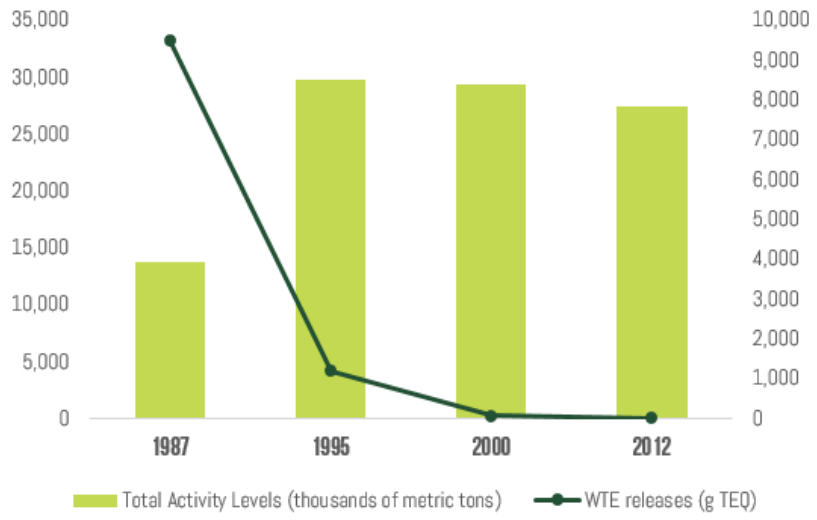
Columbia University Conducts Research on the Modern Day Dioxin Emissions

In 2006, the U.S. EPA published an inventory of dioxin emissions for the U.S. covering the period from 1987–2000. A peer-reviewed paper by Dwyer and Themelis* provides an updated inventory of all U.S. dioxin emissions to the atmosphere in the year 2012. The sources of emissions of "dioxins" were separated into two classes: controlled industrial and open burning sources. The 2012 dioxin emissions from 53 U.S. waste-to-energy (WTE) power plants were compiled on the basis of detailed data obtained from the two major U.S. WTE companies, representing 84% of the total MSW combusted (27.4 million metric tons).

The dioxin emissions of all U.S. WTE plants in 2012 were 3.4 g TEQ and represented 0.54% of the controlled industrial dioxin emissions, and 0.09% of all dioxin emissions from controlled and open burning sources.

*Dwyer, H., Themelis, N.J. Inventory of U.S. 2012 dioxin emissions to atmosphere. Waste Management (2015), http://dx.doi.org/10.1016/j.wasman.2015.08.009

WTE Throughput vs. Emissions (1987-2012)



	1987	1995	2000	2012
Total Activity Levels (thousands of metric tons)	13,700	29,800	29,400	27,400
WTE releases (g TEQ)	9510	1200	77	3.4

POLLUTANT	1990 EMISSIONS (TPY)	2005 EMISSIONS (TPY)	PERCENT REDUCTION
CDD/CDF, TEQ BASIS*	4,400	15	-99.7%
MERCURY	57	2	-96.0%
CADMIUM	10	0.4	-95.8%
LEAD	170	6	-96.8%
PARTICULATE MATTER	18,600	780	-95.8%
HCl	57,400	3,200	-94.4%
SO_2	38,300	4,600	-88.0%
NO_x	64,900	49,500	-23.7%