USA Waste to Energy in Urbanized Cities

EGNRET-52

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U.S. DOE Office of Energy Efficiency and Renewable Energy's Bioenergy Technologies Office (BETO) leads USDOE's Waste to Energy Research*

- Wet waste, solid waste, and gaseous waste streams are potential high-impact resources for the domestic production of biogas, biofuels, bioproduct precursors, heat, and electricity.
- Wastes represent a significant and underutilized set of feedstocks for renewable fuel and product generation.
- These streams are available now without land-use change, and in many cases, their utilization helps to address the unique and local challenges of disposing of them.
- These resources are unlikely to diminish in volume in the near future, and as a result (in the short and medium term), they represent a potentially low-cost set of feedstocks that could help justify broader investment.

*https://www.energy.gov/eere/bioenergy/waste-energy

BETO's Waste steams of interest

- Commercial, institutional, and residential food wastes, particularly those currently disposed of in landfills
- Biosolids, organic-rich aqueous streams, and sludges from municipal wastewater-treatment processes
- Manure slurries from concentrated livestock operations
- Organic wastes from industrial operations, including but not limited to food and beverage manufacturing, biodiesel production, and integrated biorefineries, as well as potentially other industries such as pulp and paper, forest products, and pharmaceuticals
- Biogas derived from any of the above feedstock streams, including but not limited to landfill gas.

BETO Regularly hosts workshops to engage key stakeholders (1)

Engineered Carbon Reduction Listening Day: July 8, 2017

- This meeting had a strong pragmatic emphasis, with a focus on tangible challenges and potential solutions in facilitating cost-effective technologies in the waste-to-energy platform.
- Participants included feedstock providers, technology developers, potential customers, and relevant state actors.
- Participants told BETO that increased communication across federal and local levels was encouraging, because waste-to-energy research and development should not live in a vacuum without regional considerations.
- Participants explained that waste feedstock characteristics are regionally unique, and waste management decisions are driven by state and municipal policy.

BETO Regularly hosts workshops to engage key stakeholders (2)

- Biofuels and Bioproducts from Wet and Gaseous Waste Streams: Market Barriers and Opportunities Workshop: June 6–7, 2017
- This meeting had a strong pragmatic emphasis, with a focus on tangible challenges and potential solutions in facilitating cost-effective technologies in the waste-to-energy platform.
- Participants included feedstock providers, technology developers, potential customers, and relevant state actors. Participants told BETO that increased communication across federal and local levels was encouraging, because waste-to-energy research and development should not live in a vacuum without regional considerations.
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BETO Regularly hosts workshops to engage key stakeholders (3)

Waste-to-Energy Roadmap Review: June 22–23, 2016

- This meeting provided an opportunity for key stakeholders to provide focused input on future challenges, opportunities, and possible strategies regarding the conversion of wet and gaseous waste streams into drop-in biofuels and bioproducts.
- Participants received a preliminary draft of the "Challenges and Opportunities" report in advance in order to inform discussion.

Drawing on their workshops, BETO has estimated the overall production potential

Biofuels and Bioproducts from Wet and Gaseous Waste Streams: Challenges and Opportunities (January 2017)

- This report found that the United States has the potential to use 77 million dry tons of wet waste per year, which would generate about 1,079 trillion British thermal units (Btu) of energy.
- Also, gaseous feedstocks (which cannot be "dried" and therefore cannot be reported in dry tons) and other feedstocks assessed in the report could produce an additional 1,260 trillion Btu of energy, bringing the total to more than 2.3 quadrillion Btu annually.
- For perspective, in 2015, the United States' total primary energy consumption was about 97.7 quadrillion Btu.

Key BETO Waste to Energy Publications

- Biofuels and Bioproducts from Wet and Gaseous Waste Streams: Challenges and Opportunities
- Biogas Opportunities Roadmap Progress Report
- Energy-Positive Water Resource Recovery Workshop Report
- Hydrogen, Hydrocarbons, and Bioproduct Precursors from Wastewaters Workshop Report
- Waste-to-Energy Workshop Summary Report

U.S. EPA focuses on energy recover from the combustion of municipal solid waste (MSW)*

- Energy recovery from the combustion of municipal solid waste is a key part of the non-hazardous waste management hierarchy, which ranks various management strategies from most to least environmentally preferred.
- Energy recovery ranks below source reduction and recycling/reuse but above treatment and disposal.
- Confined and controlled burning, known as combustion, can not only decrease the volume of solid waste destined for landfills, but can also recover energy from the waste burning process.
- This generates a renewable energy source and reduces carbon emissions by offsetting the need for energy from fossil sources and

*https://www.epa.gov/smm/energy-recovery-combustion-municipal-solid-waste-msw reduces methane generation from landfills.

The History of Energy Recovery from Combustion*(1)

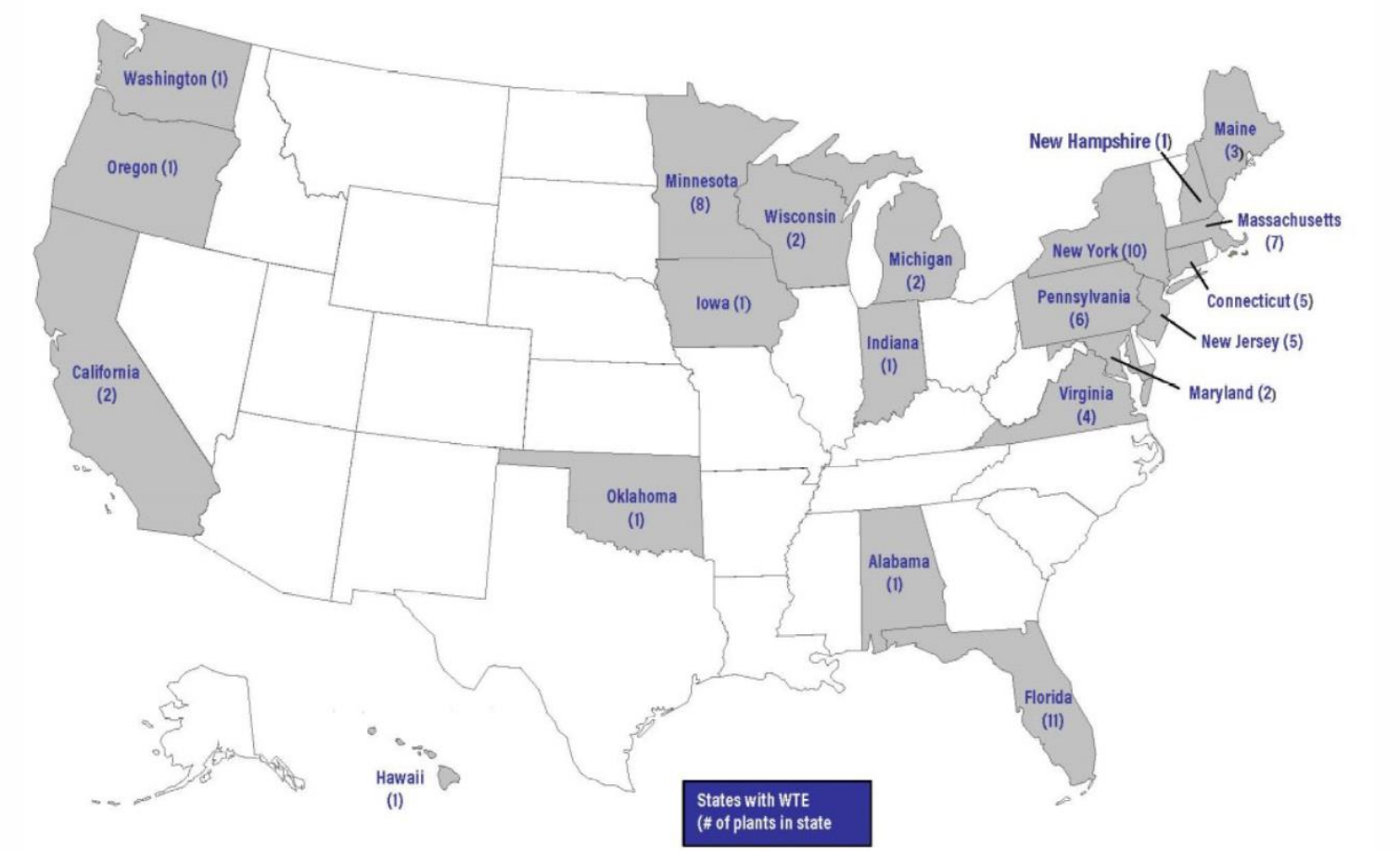
- The first incinerator in the United States was built in 1885 on Governors Island in New York, NY.
- By the mid-20th Century hundreds of incinerators were in operation in the United States, but little was known about the environmental impacts of the water discharges and air emissions from these incinerators until the 1960s.
- When the Clean Air Act (CAA) came into effect in 1970, existing incineration facilities faced new standards that banned the uncontrolled burning of MSW and placed restrictions on particulate emissions.
- The facilities that did not install the technology needed to meet the CAA requirements closed.

https://www.epa.gov/smm/energy-recovery-combustion-municipal-solid-waste-msw

The History of Energy Recovery from Combustion(2)

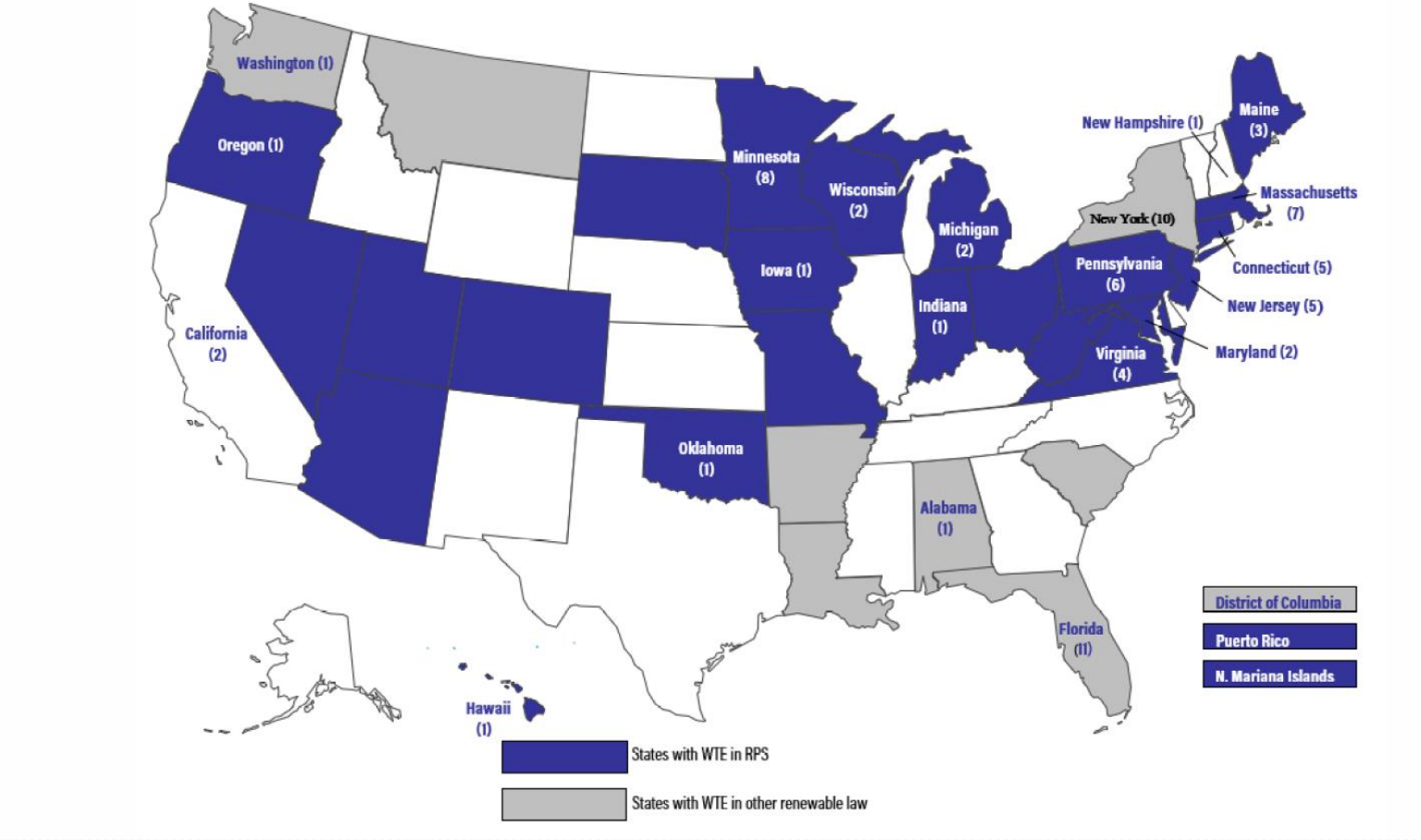
- Combustion of MSW grew in the 1980s. By the early 1990s, the United States combusted more than 15 percent of all MSW.
- The majority of non-hazardous waste incinerators were recovering energy by this time and had installed pollution control equipment.
- With the newly recognized threats posed by mercury and dioxin emissions, EPA enacted the Maximum Achievable Control Technology (MACT) regulations in the 1990s.
- As a result, most existing facilities had to be retrofitted with air pollution control systems or shut down.

There are 75 Waste-To-Energy Plants in 21 States*



*http://energyrecoverycouncil.org/wp-content/uploads/2019/01/ERC-2018-directory.pdf

States Defining WTE as Renewable*



*http://energyrecoverycouncil.org/wp-content/uploads/2019/01/ERC-2018-directory.pdf