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WASTE TO ENERGY POWER

REPORT

April, 2011

Paul R. LePage
Governor
State of Maine

Kenneth C. Fletcher
Director
Governor's Office of Energy
Independence and Security

STATE OF MAINE
OFFICE OF THE GOVERNOR
22 STATE HOUSE STATION
AUGUSTA, MAINE
04333-0001

PAUL R. LEPAGE
GOVERNOR

KENNETH C. FLETCHER
DIRECTOR
OFFICE OF ENERGY
INDEPENDENCE AND SECURITY

April 2011

Senator Michael D. Thibodeau, Senate Chair
Representative Stacey Allen Fitts, House Chair
Joint Standing Committee on Energy, Utilities and Technology
115 State House Station
Augusta, ME 04333

Dear Senator Thibodeau and Representative Fitts:

Pursuant to Resolve Chapter 163 (LD 1720), the Governor's Office of Energy Independence and Security (OEIS) is required to examine the issue of qualifying certain waste-to-energy power for renewable energy credits and renewable resource portfolio requirements. The OEIS is submitting this report of its findings and recommendations to the Joint Standing Committee on Energy, Utilities and Technology with particular emphasis on:

1. Relevant legislative proposals and actions in the United States Congress and in other states, with particular attention to other states within New England;
2. Appropriate qualifying criteria and technologies, including but not limited to advanced pyrolysis technology;
3. Potential implications of allowing certain waste-to-energy power to qualify for renewable energy credits and renewable resource portfolio requirements, including but not limited to impacts on the market for renewable energy credits and the environment; and
4. Consideration of the renewable resource portfolio requirements specified in the Maine Revised Statutes, Title 35A, section 3210 and the solid waste management hierarchy specified in Title 38, section 2101.

Please let us know if you have any questions concerning the report. Thank you!

Sincerely,

Kenneth C. Fletcher

Kenneth C. Fletcher
Director
Governor's Office of Energy Independence and Security

Acknowledgements

Jeffrey Marks, Deputy Director of the Governor's Office of Energy Independence and Security (OEIS) served as the primary author of this report and coordinated and communicated with interested parties and stakeholders.

Special thanks to John Kerry, former Director of the OEIS, for his oversight role.

Tyler Adkins deserves special recognition for his extensive research, attentive editing and thoughtful ideas that pulled the various components of this report together.

I would like to particularly thank the following for their participation, information sharing, and expert input for this report.

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- Eric Kennedy – Maine Department of Environmental Protection
- Greg Lounder – Eastern Maine Development Corporation
- George MacDonald – State Planning Office
- Rick McCarthy – Maine Tomorrow
- Ted Michaels – Energy Recovery Council
- Elizabeth Neptune – Indian Township Tribal Government
- Ken Robbins – Maine Energy Recovery Company
- Kevin Roche – EcoMaine
- Bryce Sproul – Maine Department of Environmental Protection
- Rep. Donald Soctomah – Passamaquoddy Tribe
- Mitchell Tannenbaum – Maine Public Utilities Commission
- Daniel Walker – Preti Flaherty
- George Wood – Oak Point Energy Associates, LLC

Jon Doucette, Woodard & Curran, designed the cover.

Kenneth C. Fletcher
Director
Governor's Office of Energy Independence and Security

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GOVERNOR'S OFFICE OF ENERGY INDEPENDENCE AND SECURITY

KENNETH C. FLETCHER - DIRECTOR

Table of Contents

Executive Summary

Waste-to-energy (WTE) is recognized as a renewable resource at the global, national and state levels. In order to fully develop and use renewable energy as one tool in a diverse portfolio of energy solutions, the State of Maine should examine the financial, regulatory and policy options available for WTE technologies and systems to replace the use of fossil fuels, address electricity costs and reduce environmental impacts.

The Governor's Office of Energy Independence and Security (OEIS) has reviewed international, federal and state WTE regulatory requirements, initiatives and programs; energy, environmental and economic benefits; and the status of WTE in the U.S. and Maine solid waste management hierarchies. Based on its examination and the critical need to create jobs and promote economic development while reducing greenhouse gas emissions, air and waste pollution, and enhancing Maine's energy security and long-term economic viability, the OEIS supports utilization of WTE as a base-load source of electricity generation from a renewable energy resource.

The OEIS recommends potential creation of a new class of Renewable Energy Certificates (often referred to as "credits") (RECs) for WTE as part of Maine's Renewable Portfolio Standard. Development of a separate class must take into account the impact on the REC market and prices and the costs to electricity consumers. Based on the OEIS study of international, national and state WTE policies and systems; discussions with four existing WTE facilities operating in Maine; review of third-party studies and reports; and responses to OEIS inquiries regarding this option, adoption of such a new WTE Class must also consider:

- The status of existing, and potential opportunities for future WTE facilities;
- The amount of electricity generated;
- Compliance with State of Maine air, water and waste standards and permits;
- Volume of waste received and reduction of waste volume to be land filled; and
- Levels of recycling/removal of waste for other beneficial purposes.

Approximately 75 percent of Maine's municipal solid waste is handled via WTE. Qualification of WTE for Class I or separate class RECs must not incentivize the production and importation of waste itself in Maine and it must not raise costs for electricity ratepayers.

By establishing WTE as a separate class, it may avoid an impact on other renewable resources currently eligible for Class I such as wind, solar, geothermal, biomass, combined heat and power and landfill gas. Areas of further study include whether out-of-state WTE should qualify and additional barriers to developing and using WTE systems in Maine. Some believe that new investment in WTE would be more likely if the State's renewable portfolio requirements were more ambitious and continue to grow beyond

2017, but this is a subject beyond the scope of this report but one of particular relevance for the Maine Legislature to consider.

Introduction

The Role of Waste-to-Energy in Maine's Energy Plan

Maine is exceedingly dependent on imported sources of energy to heat and power its homes, businesses and factories. The State of Maine Comprehensive Energy Action Plan (Maine Energy Plan) provides the strategic roadmap to achieve Maine's goals of energy independence and security with clean, reliable, affordable, sustainable, indigenous and renewable resources. The Governor's Office of Energy Independence and Security (OEIS) developed the Maine Energy Plan to promote and advance projects and technologies that meet the objectives of energy security, economic development and environmental quality.

While we must cultivate renewable resources such as on- and off-shore wind, solar, biomass and biofuels, geothermal and tidal energy, as well as consider nuclear and natural gas infrastructure, we should also carefully examine the role of waste-to-energy (WTE) power in Maine's immediate and future energy plans. The OEIS recognizes the importance of diversifying its energy resources and WTE is an important part of the State's energy mix. In order to successfully and cost-effectively employ this resource to provide competitively-priced electricity at the lowest cost, we must consider the eligibility of WTE for expanded renewable energy certificates, or credits (RECs).

According to the U.S. Environmental Protection Agency (EPA), waste-to-energy is a "clean, reliable, renewable source of energy." In addition, the *Energy Policy Act of 2005*, the *Federal Power Act*, the *Public Utility Regulatory Policies Act*, the *Biomass Research and Development Act of 2000*, Federal Energy Regulatory Commission regulations, and twenty-four states all recognize waste-to-energy power as "renewable."[1] The United States has 86 waste-to-energy plants across the country that dispose of more than 97,000 tons of trash each day while generating enough clean energy to supply electricity to about 2.3 million homes nationwide.[2] WTE already supplies electricity to 30 million Americans, mainly along the East coast.[3]

The Maine State Planning Office (SPO) estimates that nearly 33.3 percent of Maine's garbage was incinerated in 2009 at four waste-to-energy facilities. These four facilities are EcoMaine in Portland, Maine Energy Recovery Company (MERC) in Biddeford, Penobscot Energy Recovery Company (PERC) in Orrington, and Mid-Maine Waste

[1] www.wte.org/faq
[2] American Council on Renewable Energy (ACORE), 2010
[3] Psomopoulos, 2009, p. 1718

Action Corporation (MMWAC) in Auburn. The combined daily processing capacity of these four energy facilities is about 2,750 tons of waste per day.[4]

Maine residents and businesses generate about 900,000 tons of post-recycled non-bulky MSW annually. Of that total, 660,000 tons are processed through Maine's four WTE facilities, 170,000 tons are land filled in Maine and approximately 70,000 tons are exported. The four WTE facilities manage about 80 percent of the annual post-recycled non-bulky MSW processed and disposed within Maine.

The U.S. regional breakdown of land filling, recycling and WTE rates (2004) is depicted in Figure 1.

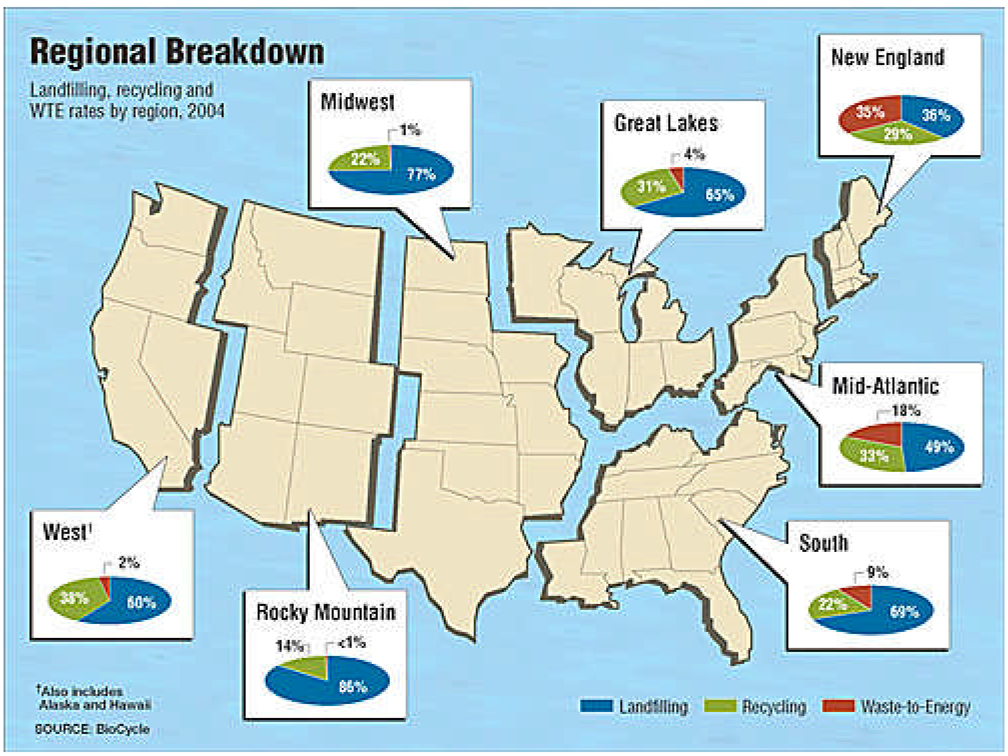

Figure 1 - Land filling, Recycling & WTE Rates by Region, 2004 (Source: BioCycle)

According to the American Council of Renewable Energy (ACORE)[5], WTE:

- Recovers for recycling more than 700,000 tons of ferrous metals on-site;

[4] State Planning Office, 2010
[5] ACORE, 2010

- Annually recycles more than 3 million tons of glass, metal, plastics, batteries, ash and yard waste with more than one-third of all ash reused as an aggregate material in roads and as landfill cover;
- Prevents the emissions of eleven million metric tons of greenhouse gases (methane and carbon dioxide) that would otherwise be released into the atmosphere annually;
- Meets some of the most stringent environmental standards in the world and employs the best available emissions control equipment available;
- Serves as an alternative to land disposal and power generation from fossil fuels;
- Reduces the volume of trash by about 90%, resulting in a 90% decrease in the amount of land required for garbage disposal.

According to the Energy Recovery Council publication, "The 2010 ERC Directory of Waste-to-Energy Plants:"

- WTE facilities processed 26 million tons of municipal solid waste (MSW) in 2008;
- Public policy incentives for WTE could create an average of 58 full-time jobs per facility for the next forty to fifty years;
- In 2010, 86 WTE plants were operating in 24 states with a capacity to process more than 97,000 tons of MSW per day;
- The nation's WTE facilities have the capacity to generate the energy equivalent of 2,790 megawatt hours of electricity.

Debate over waste consumption levels aside, to the extent that MSW can be reframed as a potentially valuable resource, rather than a social ill and negative byproduct of modern society, WTE can serve a productive and meaningful role in the transition away from a carbon intensive, foreign fossil fuel dependent economy, and facilitate an independent and self-sustaining future for the State of Maine.

In order to increase the generation of renewable power in Maine's electricity portfolio, and maintain the systems already in place, we must examine a diverse selection of energy sources and carefully evaluate the costs and benefits of providing incentives to waste-to-energy and other traditional and alternative energy technologies.

Purpose and Scope of Report

L.D. 1720 (Resolve, Regarding Waste-to-Energy Power)

Under Maine's current renewable portfolio standard (RPS), electric power generated from waste-to-energy (WTE) in conjunction with recycling qualifies for Class 2 renewable energy certificates or credits (RECs). Pursuant to *Resolve Chapter 163 (LD 1720) – Regarding Waste-to-Energy Power,* the Governor's Office of Energy Independence and Security (OEIS) is required to examine "qualifying certain waste-to-energy power for renewable energy credits and renewable resource portfolio requirements." The full Resolve reads as follows:

RESOLVE Chapter 163 LD 1720, item 1, 124th Maine State Legislature
Resolve, Regarding Waste-to-energy Power

Resolve, Regarding Waste-to-energy Power

Sec. 1 Waste-to-energy power; examination. Resolved: *That the Executive Department, Governor's Office of Energy Independence and Security shall examine the issue of qualifying certain waste-to-energy power for renewable energy credits and renewable resource portfolio requirements. The examination must include, but is not limited to:*

1. *Relevant legislative proposals and actions in the United States Congress and in other states, with particular attention to other states within New England;*
2. *Appropriate qualifying criteria and technologies, including but not limited to advanced pyrolysis technology;*
3. *Potential implications of allowing certain waste-to-energy power to qualify for renewable energy credits and renewable resource portfolio requirements, including but not limited to impacts on the market for renewable energy credits and the environment; and*
4. *Consideration of the renewable resource portfolio requirements specified in the Maine Revised Statutes, Title 35A, section 3210 and the solid waste management hierarchy specified in Title 38, section 2101.*

In carrying out the examination under this section, the Governor's Office of Energy Independence and Security shall, at a minimum, consult with the Passamaquoddy Tribe, the Department of Environmental Protection, the Public Utilities Commission and the Efficiency Maine Trust; and be it further

Sec. 2 Report; legislation. Resolved: *That, by February 15, 2011, the Executive Department, Governor's Office of Energy Independence and Security shall submit a report of its findings and recommendations under section 1, together with any necessary implementing legislation, to the joint standing committee of the Legislature having jurisdiction over utilities and energy matters. After its review of the report, the joint standing committee may submit a bill to the First Regular Session of the 125th Legislature relating to the report.*

Development of Report

In order to respond to LD 1720, the OEIS sought information, data, advice and suggestions from Maine's WTE facility operators, landfill gas operators, government agencies, policymakers, municipalities, electric utilities, non-governmental organizations and industry representatives. As required by LD 1720, the OEIS also consulted with the Passamaquoddy, the Department of Environmental Protection, the Public Utilities Commission and the Efficiency Maine Trust. The OEIS posed a set of questions to all stakeholders for their input regarding WTE, its qualification for RECs, its inclusion in Maine's RPS and resulting implications on the market for RECs and on the environment. Those questions can be found in Appendix A.

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Regulatory Context

Renewable Portfolio Standards

A Renewable Portfolio Standard (RPS) is intended to "increase renewable energy generation using a cost-effective, market-based approach."[6] An RPS requires electricity providers (*i.e.,* "competitive energy suppliers" in Maine) to obtain a specified minimum percentage of their power from eligible renewable energy sources by a certain date. According to the U.S. Environmental Protection Agency (EPA), the goal of an RPS is to "stimulate market and technology development so that, ultimately, renewable energy will be economically competitive with conventional forms of electric power and achieve energy, environmental, and economic benefits in conjunction with energy efficiency and other clean energy alternatives."[7]

While RPS requirements differ among states, there are generally four ways that electricity suppliers can comply with the RPS[8]:

- Owning a renewable energy facility and its output generation;
- Purchasing Renewable Energy Certificates or credits (RECs);
- Purchasing electricity from a renewable facility inclusive of all renewable attributes (sometimes called "bundled renewable electricity"); or
- In the case of Maine's Class I New Renewable Resource Requirement, payment of the Alternative Compliance Payment.[9]

A RPS can provide various benefits[10]:

- Environmental improvements: reduced air pollution, greenhouse gas emissions, reduction of landfill waste and increased natural resource conservation;
- Energy improvements: increased diversity and supply of energy resources;

[6] EPA, 2009, CHP Partnership
[7] ibid
[8] ibid
[9] Tannenbaum, 2011
[10] EPA, 2009, CHP Partnership

- Economic improvements: jobs and revenue from new renewable capacity, reduced volatility of power prices, clarity for investors and developers in the renewable energy market through clear and long-term regulatory targets.

RPS requirements or goals have been established in 33 states plus the District of Columbia. See Figure 2.

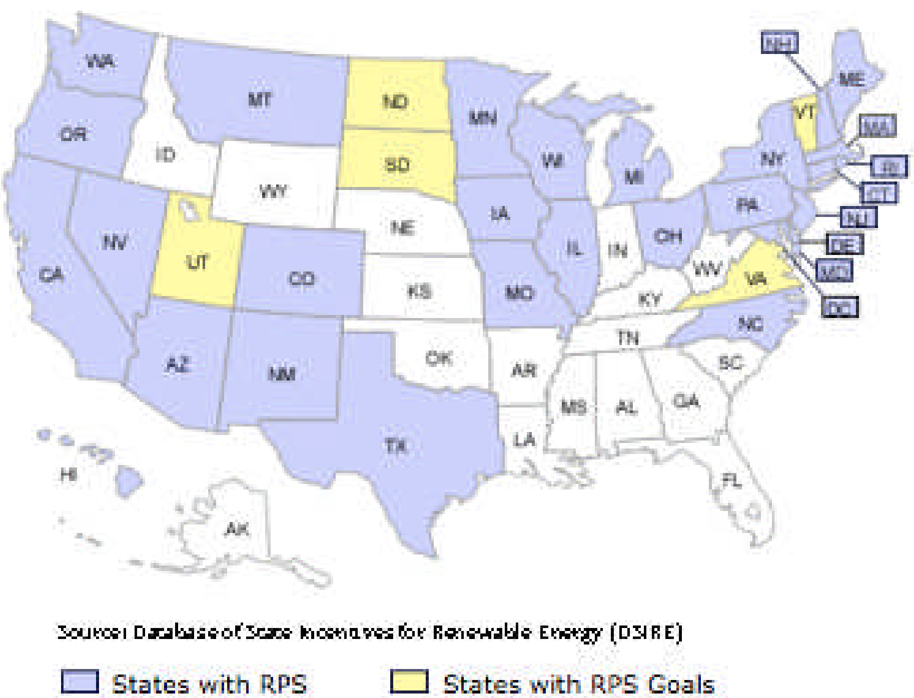

Figure 2 - States with RPS Requirements (Source: DSIRE)

Significant diversity exists among these states with respect to the minimum requirements of renewable energy, implementation timing, and eligible technologies and resources. See Table 1. The New England states are generally recognized as having some of the more successful RPS programs.

Table 1 - State RPS Requirements (Source: DSIRE) ** States with RPS Goals, not mandatory requirements*

State	Target (% of electricity sales)
AZ	15% by 2025
CA	20% by 2010
CO	IOUs 20% by 2020; electric cooperatives and municipal utilities 10% by 2020
CT	27% by 2020
DC	20% by 2020
DE	20% by 2019
HI	20% by 2020
IA	105 MW by 2025
IL	25% by 2025
MA	Class I: 4% by 2009 (+1%/year after); Class II: 3.6% renewable, 3.5% waste energy by 2009; APS: 5% by 2020 increasing by 0.25% each year after.
MD	20% by 2022
ME	30% by 2000; 10% new by 2017
MI	10% by 2015
MN	Xcel Energy (utility) 30% by 2020; other utilities 25% by 2025
MO	15% by 2021
MT	15% by 2015
ND*	10% by 2015
NH	23.8% by 2025 - 16.3% new
NJ	22.5% by 2021
NM	IOUs: 20% by 2020; rural electric cooperatives 10% by 2020
NV	20% by 2015
NY	24% by 2013
OH	25% by 2025 (12.5% renewable energy)
OR	Large utilities (>3% state's total electricity sales) 25% by 2025
PA	18% by May 31, 2021 (8% renewable energy)

RI 16% by 2020

SD* 10% by 2015

TX 5,880 MW by 2015

UT* 20% by 2025

VA* 12% of 2007 sales by 2022

VT* 20% by 2017; Total incremental energy growth between 2005-2012 to be met with new renewables (10% cap)

WA 15% by 2020

WI 10% by December 31, 2015

Defining which energy resources and technologies qualify is a complex process and takes into account available fuel sources and technologies and the states' commitments to foster indigenous, clean energy within their borders.[11] See Table 2.

Table 2 - Eligible Technologies Under State RPS Requirements (Source: DSIRE)

Energy Source	AZ	CA	CO	CT	DE	DC	HI	IA	IL	MA	MD	ME	MI	MN	MO[a]	MT	NC	ND[a]	NH	NJ	NM	NV	NY	OH	OR	PA	RI	SD	TX	UT	VA[a]	VT[a]	WA	WI
Biofuels	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Biomass	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
CHP & Waste Heat	●[b]		●	●			●			●			●				●	●				●		●		●		●		●			●	
Energy Efficiency				●			●		●				●				●					●		●		●							●	
Fuel Cells				●								●		●					●	●			●	●	●	●								
Geo-thermal	●	●	●		●	●	●			●	●	●	●		●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●		●	●
Hydro	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Landfill Gas	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
WTE		●		●		●	●	●		●	●		●	●						●		●		●	●	●		●		●	●	●		●
Ocean Thermal		●		●	●	●	●			●	●								●				●	●	●		●	●	●	●	●		●	
Photovoltaic	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Solar Thermal Electric	●	●		●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●		●	●	●	●	●	●	●
Tidal		●		●	●	●	●			●	●	●	●				●		●	●			●	●	●		●	●	●	●	●		●	●

[11] EPA, 2009, CHP Partnership

Energy Source	AZ	CA	CO	CT	DE	DC	HI	IA	IL	MA	MD	ME	MI	MN	MO[a]	MT	NC	ND[a]	NH	NJ	NM	NV	NY	OH	OR	PA	RI	SD	TX	UT	VA[a]	VT[a]	WA	WI
Waste Tire																						•			•		•							
Wave		•		•	•	•	•			•	•	•	•				•		•	•			•	•	•		•	•	•	•	•		•	•
Wind	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

[a] States with RPS goals not mandatory requirements.

[b] Renewable CHP systems are eligible; fossil-fueled CHP systems are not eligible.

In Maine, the RPS has developed and been refined over time. In 1999, the Maine Public Utilities Commission (MPUC) adopted rules for its Renewable Resource Portfolio Requirement, pursuant to the state's 1997 electric-utility restructuring law. The rules required each competitive electricity provider, including standard offer providers, to supply at least 30 percent of their total retail electric sales in Maine using electricity generated by eligible renewable resources and certain energy-efficiency resources. Under the original RPS, electricity must be generated by a facility no greater than 100 megawatts (MW) in capacity that uses fuel cells, tidal power, solar arrays and installations, wind power, geothermal power, hydropower, biomass power *or generators fueled by municipal solid waste in conjunction with recycling.* Electricity generated by efficient combined heat and power (CHP) facilities and other systems that qualify as "small power production facilities" under the federal *Public Utility Regulatory Policies Act of 1978* (PURPA) also were eligible.[12]

To provide context, before restructuring, Maine's electricity was almost 50 percent renewable.[13]

In 2007, the Maine Legislature enacted an *Act to Stimulate Demand for Renewable Energy,*[14] adding a mandate that specified percentages of electricity that supply Maine's consumers come from "new" renewable resources. Generally, new renewable resources are renewable facilities that have an in-service date, resumed operation or were refurbished after September 1, 2005. The percentage requirement began at one percent in 2008 and increase by one percent annually, to ten percent in 2017. The implementing rules designated the "new" renewable resource requirement as "Class I" (the requirement is similar to portfolio requirements in other New England states that are referred to as "Class I." Maine's pre-existing "eligible" resource portfolio requirement is designated as Class II) and incorporated the resource type, capacity limit and the vintage requirements as specified in the 2007 Act. The rules stated that a new renewable resource used to satisfy the Class I portfolio requirement must be of the following types[15]:

[12] DSIRE, 2010, Maine Incentives
[13] MPUC, 2010, Report on the New Renewable Portfolio Requirement, p.5
[14] P.L. 2007, ch. 403 (codified at 35-A M.R.S.A. § 3210(3-A)
[15] MPUC, 2010, Report on the New Renewable Portfolio Requirement pp. 7-8

- Fuel cells;
- Tidal power;
- Solar arrays and installations;
- Wind power installations;
- Geothermal installations;
- Hydroelectric generators that meet all state and federal fish passage requirements; or
- Biomass generators, *including generators fueled by landfill gas*.

This list of renewable resources is the same as those that qualify for the original requirement, *except that municipal solid waste is excluded.*

In addition, except for wind power installations, the generating resource must not have a nameplate capacity that exceeds 100 MW. Finally, the resource must satisfy one of four vintage requirements. These are[16]:

1) Renewable capacity with an in-service date after September 1, 2005;

2) Renewable capacity that has been added to an existing facility after September 1, 2005;

3) Renewable capacity that has not operated for two years or was not recognized as a capacity resource by ISO New England or the Northern Maine Independent System Administrator (NMISA) and has resumed operation or has been recognized by the ISO-NE or NMISA after September 1, 2005; or

4) Renewable capacity that has been refurbished after September 1, 2005 and is operating beyond its useful life or employing an alternate technology that significantly increases the efficiency of the generation process.

Under current rules, "new" renewable generators do not need to be located in Maine or New England as long as the energy is delivered into New England. The MPUC publishes the criteria for qualified renewable generation, reviews the applications and issues orders approving or denying certification of generation resources as eligible for Class I new renewable resource status.

Currently, New England states do not include WTE in Class I but Massachusetts has allowed WTE in as a separate class and this will be discussed later.

[16] MPUC, 2010, Report on the New Renewable Portfolio Requirement, pp. 8-9

The Pew Center on Global Climate Change provides current state-by-state updates and details regarding "Renewable and Alternative Energy Portfolio Standards" at: http://www.pewclimate.org/what_s_being_done/in_the_states/rps.cfm.

Renewable Energy Certificates

Renewable electricity generators produce both electricity and renewable energy certificates (RECs). RECs are the "currency" of renewable electricity and green power markets – they can be bought and sold based on the generation resource (*e.g.*, wind, solar, geothermal), when generation occurred, and location of the renewable generator. RECs are created at the point of electricity generation and are typically measured in single megawatt-hour increments. States allow utilities to use RECs to meet their RPS by serving as the means to deliver environmental and non-power attributes of renewable electricity generation to buyers separate from the physical electricity. RECs are monitored and verified and individual, business and other organization buyers can purchase them knowing that the electricity generated on their behalf was done so with renewable energy sources.[17]

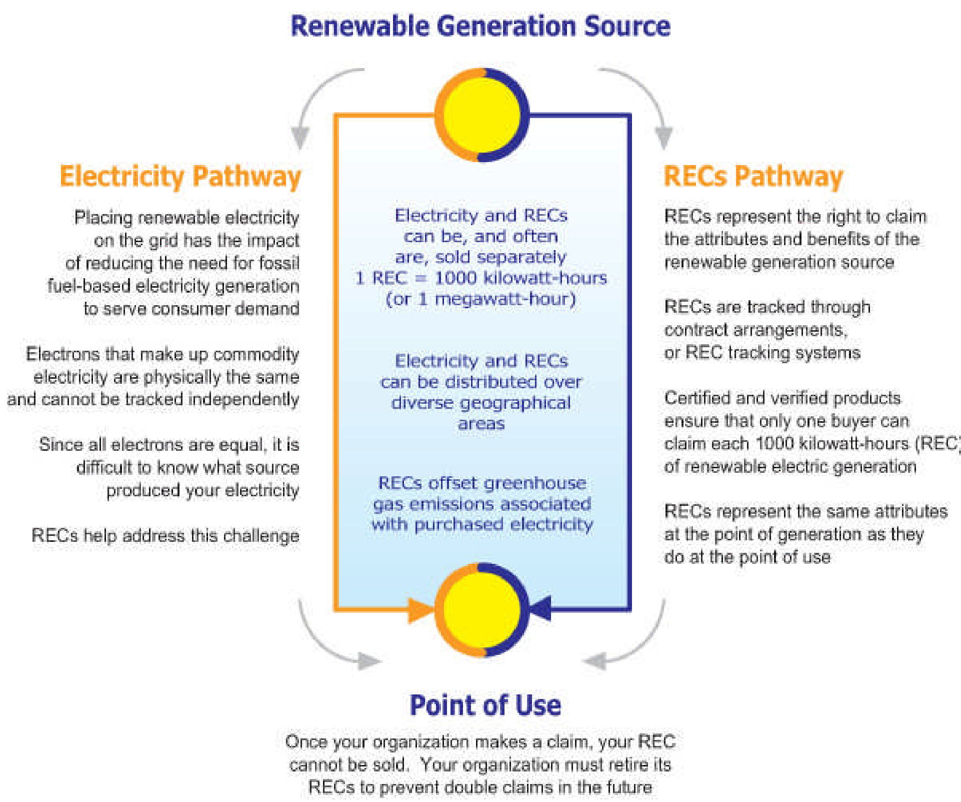

Figure 3 - REC Process & Attributes (Source: EPA)

[17] EPA, 2010, Green Power Partnership

As discussed above, an RPS requires a set percentage of delivered power to come from state certified renewable resources. The majority of states with RPS requirements permit the trading of RECs for compliance purposes. The RPS regulation defines what constitutes a REC, delineates the parameters for REC trading and sets the standards for REC production. Entities that must comply with a RPS may purchase RECs as a cost-effective alternative to developing their own sources of renewable energy generation. The price for RECs can vary dramatically depending on eligible resources under the RPS and the overall demand and supply status at the time of a REC purchase. In any case, RECs are intended to increase flexibility and boost compliance with RPS mandates.

The Maine Public Utilities Commission (MPUC) has approved the use of NEPOOL Generation Information System (GIS) certificates, which are renewable energy certificates, to satisfy the RPS requirement. GIS certificates used to meet the Class I standard may not also be used to satisfy the Class II standard. Legislation[18] enacted in June 2009 provides a 1.5 credit multiplier for eligible community-based renewable energy projects. For more information on the NEPOOL GIS system, visit www.nepoolgis.com. The MPUC sets an alternative compliance payment (ACP) that utilities may pay instead of satisfying the standard by procuring GIS certificates. The MPUC set the ACP base rate for the Class I standard at $57.12 per megawatt-hour (MWh) in 2007; this rate is adjusted annually for inflation beginning in 2008. The 2010 ACP rate is $60.93. Revenues from ACPs are directed to the state's Renewable Resource Fund.[19]

According to the MPUC, RECs from seven facilities were used by suppliers to comply with the 2008 “new” renewable resource requirement – two biomass, four wind and one landfill gas facility. Five were located in Maine and two in New Hampshire. Of the approximately 36.5 million RECs purchased to meet Maine’s RPS, 83 percent came from facilities located in Maine while none were located outside of New England. During 2008, the costs of eligible RECs ranged from approximately $27.00 per MWh to $51.00 per MWh with an average cost of $37.19 per MWh.[20] However, Maine Class I REC prices started 2010 at approximately $25 per MWh. While the price may gradually rise during 2011, it is extremely difficult to predict REC prices with any precision.[21] The total cost to ratepayers during 2008 was $2,046,678, or 0.02 cents per kWh. Additional costs for consumers could depend on the structure of the new class for WTE. Overall, the MPUC found that Maine’s renewable resources portfolio requirement promotes regional resource diversity and has resulted in REC prices representing a significant premium over wholesale prices, promoting renewable energy resources in Maine.[22]

[18] L.D. 1075, P.L. Chpt. 329
[19] DSIRE, 2010, Maine Incentives
[20] MPUC, 2010, Report on the New Renewable Portfolio Requirement pp. 13-14
[21] Tannenbaum, 2011
[22] MPUC, 2010, Report on the New Renewable Portfolio Requirement pp. 13-14

Addressing the role of the renewable resource portfolio requirement in energy policy considerations, the MPUC states[23] that the purpose is to "promote resource diversity and reduce greenhouse gas emissions." Concordantly, the MPUC argues that larger markets for RECs are preferable due to the increased competition resulting in a scenario where the State can fulfill its energy policy goals at the lowest cost to Maine's electricity consumers. While some believe that inclusion of WTE in the full RECs market will not induce a price drop in the market for RECs or dissuade investment in other qualifying renewables, others feel that it would reduce Class I REC prices. A new class for WTE, rather than inclusion in Class I, may avoid the risk that an expanded class will reduce incentives for new Class I renewables.

The MPUC reasons[24] that the proper response to policymakers' concerns that REC prices may be too low is to consider increasing the required percentages of renewables required rather than limiting competition through restriction of particular technologies. In the cited MPUC report, Ed Holt & Associates suggests[25] increasing the renewable energy targets to provide the renewable energy industry with a more aggressive target to meet and prevent a reduction for investment as current targets are met. The OEIS believes this is worth considering, but a recommendation regarding increased renewable targets is beyond the scope of this report.

While the MPUC addresses the issue regarding sources qualifying for Maine RECs located in other states, it remains unclear what benefit, if any, would be obtained by specifically excluding WTE facilities from out-of-state. If the point of qualifying WTE for RECs is to reduce the environmental impact of electricity generation, WTE facilities in other states may need to qualify as well. If out-of-state WTE facilities meet the criteria developed in a Maine law creating a separate class of RECs, they should qualify for the RECs. Excluding out-of-state WTE facilities from the Maine RPS may also raise U.S. Constitutional Commerce Clause implications. On the other hand, since Maine WTE facilities accept out-of-state waste, allowing RECs for WTE plants in other New England states could introduce new competition for waste fuel and make operations of existing plants more costly. Increasing the amount of WTE RECs could reduce the overall price of RECs, which could, in turn, reduce incentives for WTE over land filling. It could be argued that existing, in-state facilities should be given preferential treatment through exclusive or higher-priced RECs over and above any proposed, but not-yet-built facilities.

[23] ibid, p. 10
[24] MPUC, 2010, Report on the New Renewable Portfolio Requirement, p. 11
[25] ibid, p. 12

Regional Greenhouse Gas Initiative

The Regional Greenhouse Gas Initiative (RGGI) is a cooperative effort by ten Northeastern and Mid-Atlantic states to reduce regional carbon dioxide (CO_2) emissions that are contributing to global climate change. See Figure 4.

Figure 4 - States Participating in the Regional Greenhouse Gas Initiative (Source: Maine DEP)

RGGI has established a goal of reducing carbon emissions from large fossil fuel-fired power plants (25 MW or greater) in the RGGI region by 10 percent below 2009 levels by the year 2018. These power plants comprise about 7 percent of the power sector emissions in the entire country. RGGI is the first market-based cap-and-trade regulation program to reduce greenhouse gas emissions in the United States.[26]

A cap-and-trade program, as its name suggests, "caps" the volume of greenhouse gas emissions and lets the market determine the appropriate price level. Under RGGI, states are also allowed to use offsets from other sectors to achieve compliance. An offset represents project-based greenhouse gas emissions reductions or carbon sequestration achieved outside of the capped electricity sector. Participating states currently allow regulated power plants to use qualifying offsets to meet up to 3.3 percent of their compliance obligations. To be eligible, offsets must be "real, surplus, verifiable,

[26] Maine DEP, 2010, Regional Greenhouse Gas Initiative

permanent and enforceable."[27] Offset projects must be in an RGGI-participating state, but do not need to be in the state where the emissions are originating.[28]

Carbon dioxide offset categories include landfill gas collection and destruction at small landfills. Methane emitted from landfills is a significant source of greenhouse gases. Although emitted in smaller quantities, its Global Warming Potential is twenty one times stronger than carbon dioxide.[29] Therefore, methane gas that would normally be emitted by landfills can be burned and used as an energy source – an allowable offset under the RGGI system. The methane reduction could be sold to someone looking for an offset allowance to meet their compliance requirements.

Maine's RGGI statute, P.L. 2007, Chapter 317, requires RGGI proceeds from emission allowance auctions to be administered through the Energy and Savings Carbon Trust (Efficiency Maine Trust) and used for specific purposes. No less than 85 percent of the funds must be used on measures that reduce electricity use and no more than 15 percent on measures that reduce consumption of fossil fuels. The proceeds from the auctions enhance energy efficiency and renewable energy projects that should reduce demand for electricity leading to lower electricity costs for Maine's electricity consumers. Maine currently has six covered RGGI sources.

The increasing attention on reducing greenhouse gases through programs like RGGI is expected to increase the demand for renewable energy. With an expanding population and growing waste disposal needs, communities may have greater incentives to consider waste-to-energy as an integral component of their waste and energy strategies. Supporters of waste-to-energy facilities claim that avoided greenhouse gas releases attributable to the use of WTE should be recognized and WTE providers may be assigned credits for those offsets, which can be sold to facilities under a cap-and-trade system. Many believe that the analysis of greenhouse gases using a life-cycle analysis should lead policymakers to conclude that WTE is part of the solution.

Maine has received about $24 million in RGGI auction revenues since it first started trading in 2008. These funds have been almost exclusively used for energy efficiency programs. Since March 2009, the auction prices have dropped from a high of $3.51/ton of greenhouse gas emissions to January 2011 prices of around $1.89/ton.

[27] Bogdonoff, 2007, p.5
[28] ibid
[29] Columbia, Part B Summary

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Municipal Solid Waste

Generation and Disposal

A successful society runs on a base of strong economic development, but modern societies also generate unsustainably large amounts of solid waste that end up in landfills. Breaking the correlation between increased wealth and increased waste generation remains a great challenge. Waste can be reduced in a number of ways, including improved product design, or re-use, such as conversion to energy. Municipal solid waste (MSW) represents the second largest mass of solids generated in the United States[30] and consists of discards from human activities – food and other organic wastes, papers, plastics, fabrics, leather, metals, glass and other inorganic materials. See Figure 5.

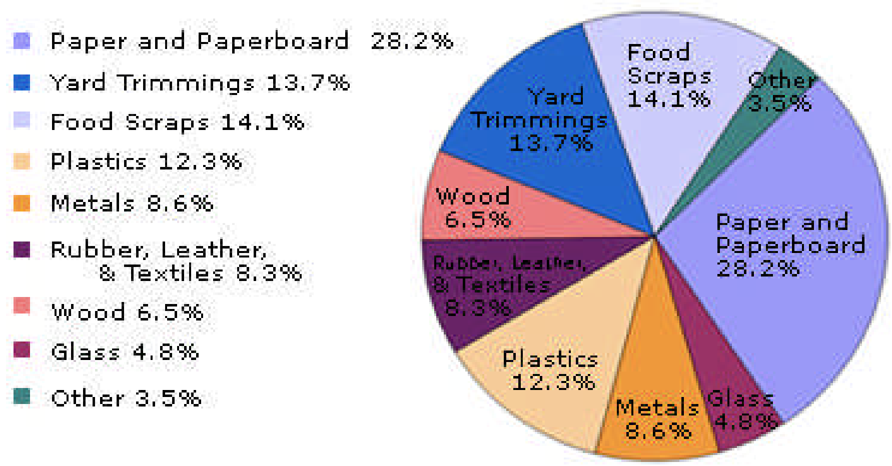


Figure 5 – 2009 Total U.S. MSW Generation by Material, 243 Million Tons Before Recycling (Source: EPA)

The waste management hierarchy, which will be explained in more detail below, is[31]:

1. Reduce volume and/or toxicity;
2. Reuse;
3. Recycle;
4. Compost;
5. Energy recovery (WTE);
6. Landfill.

[30] Fagan, 2008
[31] 38 MRSA § 2101

MSW landfills are the second-largest source of human activity-related methane emissions in the United States, accounting for approximately 22 percent of such emissions in 2008[32]. But, MSW is responsible for less than 5 percent of global greenhouse gas emissions with landfill methane as the largest component[33]. Existing waste management practices provide some effective emission mitigation techniques and a wide range of mature technologies are ready to be employed – with public health, environmental protection and clean development co-benefits. These technologies include landfill gas recovery where the gas is either flared or piped to utilities to produce electricity; wastewater management; controlled waste reduction of the volume and/or toxicity of waste; reuse of products; composting of organic waste; recycling; and state-of-the-art incineration processes. Commercial recovery of landfill methane as a source of renewable energy has been practiced for more than three decades.[34]

As mentioned above, a direct correlation exists between increases in gross domestic product (GDP) and waste generation – more people and wealth equals more waste. Any waste management strategy, including WTE, must seek to avoid the creation of waste in the first place. Percentages of recycled, composted, incinerated or land filled waste must also be factored into the utility of WTE, as local economics, regulatory restrictions, public perceptions and infrastructure requirements differ among municipalities. Data show that municipal solid waste is currently 1.3 tons per person, per year, and growing in the United States at a rate of 2.5 percent per year, the highest in the world.[35] See Figure 6 for trends in MSW generation.

[32] Fagan, 2008
[33] Bogner, 2007, p. 597
[34] ibid, pp. 597-598
[35] Themelis, 2006, p.1

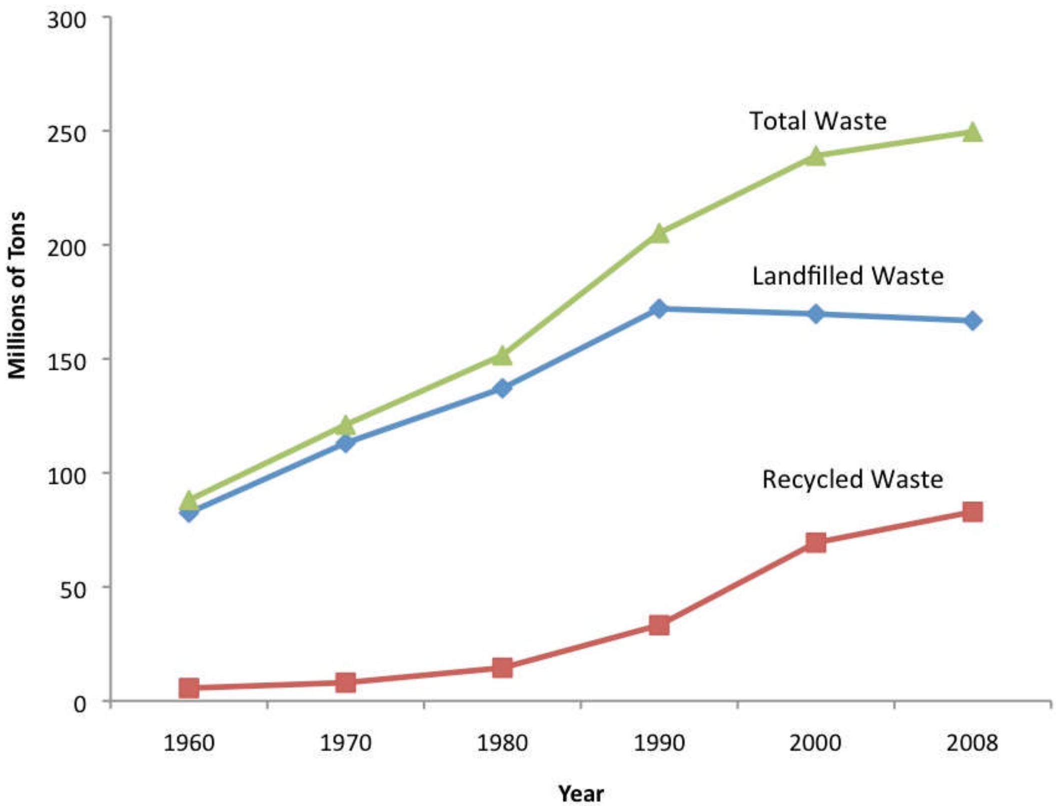


Figure 6 - U.S. MSW Generation, 1960 – 2008 (Source: EPA)

Consideration of WTE incentives for renewable electricity applications should not incentivize the production of waste itself. In other words, policies and priorities should incentivize incineration over land filling, but not at the expense of waste reduction in the first place. According to the EPA[36], MSW combustion for energy recovery has remained fairly constant since 1990.

For additional facts and figures on municipal solid waste in the United States, visit http://www.epa.gov/epawaste/nonhaz/municipal/msw99.htm.

[36] 2009, MSW Generation, Recycling and Disposal in the U.S., p. 1

Municipal Solid Waste Management Hierarchy

According to the U.S. Environmental Protection Agency (EPA), U.S. residents, businesses, and institutions produced about 250 million tons of MSW, which is approximately 4.5 pounds of waste per person per day, in 2008.

The EPA has ranked the most environmentally sound strategies for MSW. Source reduction, including reuse, is the most preferred method, followed by recycling and composting, waste processing (including combustion) then, lastly, disposal in landfills. See Figure 7. Currently, in the United States, approximately 33.2 percent is recovered and recycled or composted, 12.6 percent is burned at combustion facilities, and the remaining 54 percent is disposed of in landfills.[37]

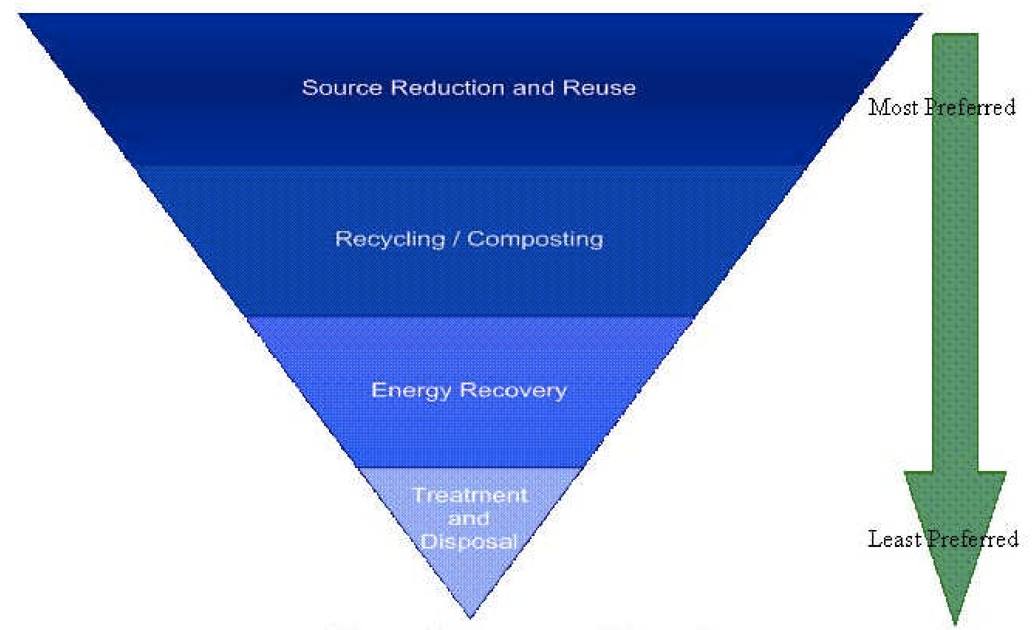


Figure 7 - EPA Solid Waste Management Hierarchy (Source: EPA)

Source reduction prevents the emission of many greenhouse gases and pollutants, saves energy, conserves resources, and reduces the need for new landfills and combustors. Recycling, including composting, diverted 83 million tons of material away from disposal in 2008, up from 15 million tons in 1980, when the recycle rate was just 10 percent.[38] Recycling prevents the emission of many greenhouse gases and water

[37] EPA, 2010, Municipal Solid Waste
[38] ibid

pollutants, saves energy, supplies valuable raw materials to industry, creates jobs, stimulates the development of greener technologies, conserves resources, and reduces the need for new landfills and combustors. In 2008, the national recycling rate of 33.2 percent (83 million tons) prevented the release of approximately 182 million metric tons of carbon dioxide equivalent into the air--roughly the amount emitted annually by 33 million cars, or 1.3 quadrillion BTUs, saving an energy equivalent to 10.2 billion gallons of gasoline. Burning MSW in WTE plants can generate energy while reducing the amount of waste by up to 90 percent in volume and 75 percent in weight.[39]

The State of Maine solid waste management hierarchy follows the EPA model. The Waste Management and Recycling Program in the Maine State Planning Office (SPO):

- Collects, synthesizes and reports on solid waste programs and data;
- Assists Maine residents, businesses and municipalities in their efforts to reduce the amount of waste produced, develop reuse options and improve recycling and composting performance; and
- Ensures sufficient, environmentally-secure disposal capacity for Maine's MSW.

The SPO program tracks the amount and sources of input to Maine's four existing WTE plants, the four throughput streams and the two waste streams that are land filled in Maine. As directed by State law and policy, the program supports WTE over direct land filling of MSW but recognizes that Maine WTE facilities are dependent upon landfills for disposal of residual ash and non combustible materials and require:

- Reasonable access to landfills either through direct ownership, as is the case for EcoMaine;
- Close community ties, such as exist between the MMWAC facility in Auburn and the city-owned Lewiston landfill;
- Vertical integration that allows MERC to send its waste streams to the landfill owned by the State of Maine and operated by Casella Waste Systems operations; or
- Long-term contracts, as has been the practice at PERC.

[39] ibid

A close relationship with waste management operators across state lines exists, as in 2008, 28.6 percent of the MSW delivered to Maine's WTE facilities was generated out of state.[40]

The Maine solid waste management hierarchy is as follows under Title 38, § 2101:

> **§2101. Solid waste management hierarchy**
>
> 1. Priorities. It is the policy of the State to plan for and implement an integrated approach to solid waste management for solid waste generated in this State and solid waste imported into this State, which must be based on the following order of priority:
>
> A. Reduction of waste generated at the source, including both amount and toxicity of the waste; [1989, c. 585, Pt. A, §7 (NEW).]
> B. Reuse of waste; [1989, c. 585, Pt. A, §7 (NEW).]
> C. Recycling of waste; [1989, c. 585, Pt. A, §7 (NEW).]
> D. Composting of biodegradable waste; [1989, c. 585, Pt. A, §7 (NEW).]
> E. Waste processing that reduces the volume of waste needing land disposal, including incineration; and [2007, c. 583, §7 (AMD).]
> F. Land disposal of waste. [1989, c. 585, Pt. A, §7 (NEW).]
>
> It is the policy of the State to use the order of priority in this subsection as a guiding principle in making decisions related to solid waste management. [2007, c. 583, §7 (AMD) .]
>
> 2. Waste reduction and diversion. It is the policy of the State to actively promote and encourage waste reduction measures from all sources and maximize waste diversion efforts by encouraging new and expanded uses of solid waste generated in this State as a resource.

With landfill gas collection and combustion to produce electricity included in Class I, it effectively prioritizes land disposal of waste over waste processing that reduces the volume of waste needing land disposal. Depending on how the waste is sorted prior to land filling, current policy and pricing mechanisms may prioritize land filling over composting, recycling and even reduction and reuse of waste. At the same time, the Maine Legislature has found that, as a matter of public policy, new technologies and industrial development are making recycling and reuse of waste an increasingly viable and economically attractive option with minimal risk to the State and the environment and increased conservation of Maine's limited disposal capacity.

[40] State Planning Office, 2009, Waste Generation & Capacity Report

Solid Waste Disposal Facilities in Maine

Landfill Operators

Maine land filled about 25 percent of its waste in 2009. Maine's solid waste disposal facilities include:

- Juniper Ridge Landfill in Old Town is owned by the State of Maine and is operated by Casella Waste Systems, Inc.;
- Six municipally-owned landfills primarily used for disposal of garbage generated within the community or the region: Bath, Brunswick, Augusta (Hatch Hill), Greenville, Presque Isle and Fort Fairfield (TriCommunity);
- Two municipally-owned landfills operated by regional entities used primarily for the disposal of ash/residue from waste-to-energy plants: Mid-Maine Waste Action Corporation to the Lewiston Landfill and EcoMaine to its own landfill located in Scarborough;
- One commercial landfill: Waste Management, Inc. owns and operates the Crossroads Landfill in Norridgewock.

A full list of active landfills may be found at http://www.maine.gov/dep/rwm/solidwaste/index.htm.

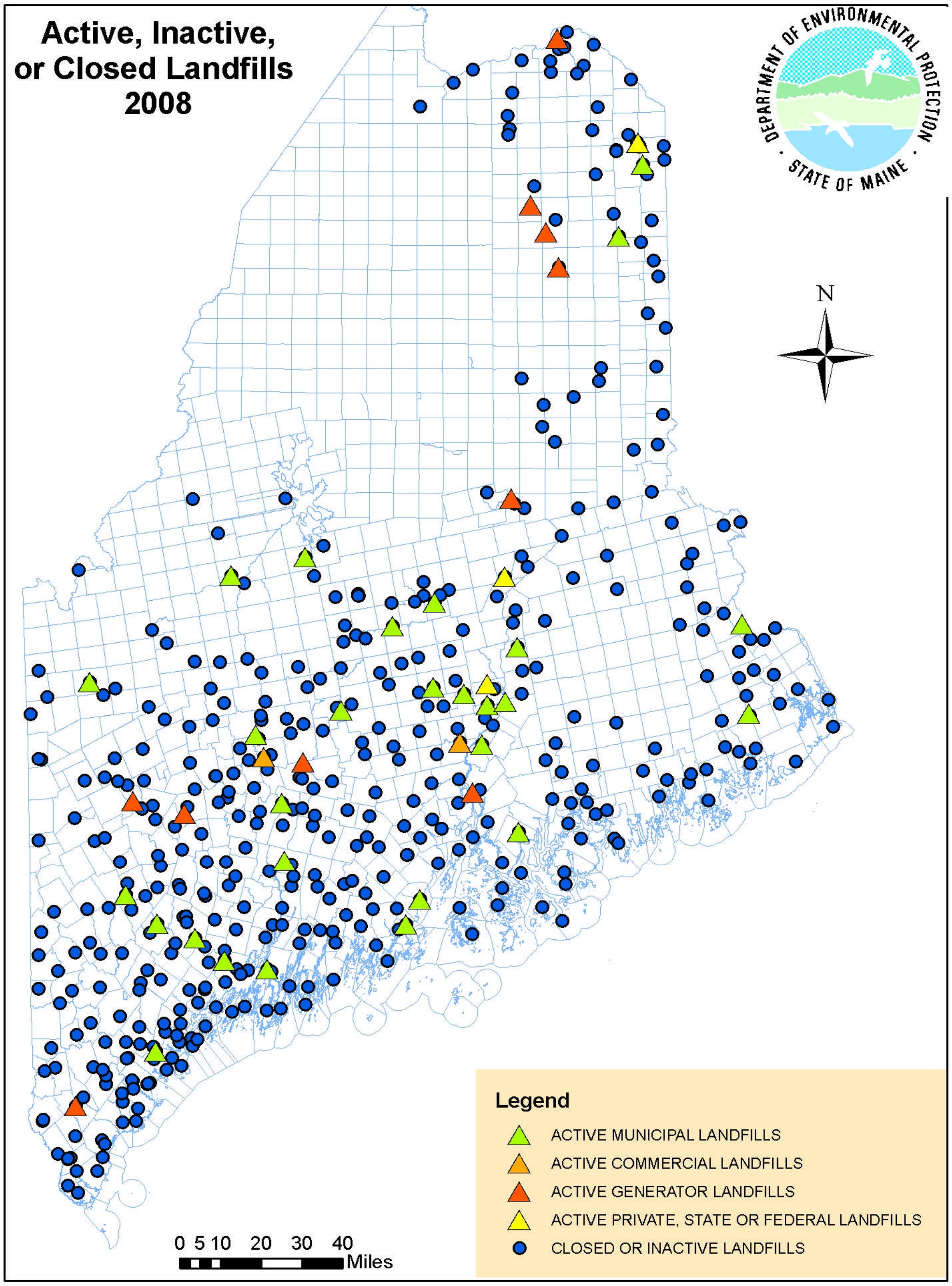


Figure 8 - Maine Landfills, 2008 (Source: Maine DEP)

Landfill Gas Operators

Maine's existing landfill gas operators include:

- Pine Tree Landfill – 3 MW in Hampden; and
- WM Renewable Energy, LLC; Crossroads Landfill – 3.2 MW in Norridgewock.

See the SPO report at http://www.maine.gov/spo/recycle/docs/final%20plan%20Wastecover01-26-09.pdf for additional information.

Waste-to-Energy Operators

Maine has four waste-to-energy operators with a combined capacity of approximately 2,800 tons per day and a combined 65.3 megawatts nameplate generation capacity. They serve large regions of Maine and accept some out-of-state generated waste. Two of the facilities are cooperatively-owned and managed by municipalities. WTE facilities in Maine annually spend $15 million in wages and payroll taxes for more than 220 full-time-equivalent, highly-skilled employees with competitive wages and benefits. WTE facilities also pay $21 million to local businesses for maintenance and operational expenses every year, providing tax revenue to state and local governments. The WTE facilities in Maine are:

1. EcoMaine;
2. Maine Energy Recovery Company (MERC);
3. Mid-Maine Waste Action Corporation (MMWAC);
4. Penobscot Energy Recovery Company (PERC).

EcoMaine (Greater Portland Resource Recovery Facility)

- Location – Portland, Maine
- Trash Capacity – 2 units @ 250 tons per day (tpd) (500 tpd total)
- Energy Capacity – 14.7 megawatts (MW)
- Project Startup – 1988
- Technology – Mass burn
- Continuous Emissions Monitors (CEMS) & Air Pollution Control Systems
- Owner & Operator – EcoMaine

Maine Energy Recovery Company (MERC)

- Location – Biddeford, Maine
- Trash Capacity – 2 units @ 300 tpd (600 tpd total)
- Energy Capacity – 22 MW
- Project Startup – 1987
- Technology – Refuse-derived fuel facility
- Continuous Emissions Monitors (CEMS) & Air Pollution Control Systems
- Owner – Casella Waste Systems
- Operator – Casella

Mid-Maine Waste Action Corporation

- Location – Auburn, Maine
- Trash Capacity – 2 units @ 100 tpd (200 tpd total)
- Energy Capacity – 3.6 megawatts
- Project Startup – 1992
- Technology – Rotary water wall combustor – mass burn
- Continuous Emissions Monitors (CEMS) & Air Pollution Control Systems
- Owner & Operator – Mid-Maine Waste Action Corp.

Penobscot Energy Recovery Corporation

- Location – Orrington, Maine
- Trash Capacity – 2 units @ 750 tpd (1,500 tpd)
- Energy Capacity – 25 megawatts
- Project Startup – 1988
- Technology – Refuse-derived fuel
- Continuous Emissions Monitors & Air Pollution Control System
- Owner – USA Energy Group, LLC; PERC Holdings, LLC; Communities
- Operator – ESOCO Orrington, LLC

Please see Appendix B for a full fact sheet on Maine WTE facilities, including number of municipalities served; population of regions served; waste processed per year; number of employees; total payroll; expenses; nameplate capacity; electricity generated and sent to the grid; date of commercial operation; and contact information.

Waste-to-Energy

Types of Waste-to-Energy Systems

In 2008, about 32 million tons of material, or 12.7 percent of MSW, were combusted for energy recovery in the United States. These waste-to-energy (WTE) facilities fall generally into two main categories[41]:

- Mass-burn plants generate electricity and/or steam by feeding municipal solid waste into large furnaces dedicated solely to burning trash and producing power;

- Refuse-derived fuel (RDF) plants shred the municipal solid waste, recover some recyclable materials and combust the homogenized fuel in a combustion chamber.

These two types of facilities represent more than 80 percent of the total capacity of WTE in the United States.[42]

In a mass-burn plant, "trucks carrying MSW empty their load in a large enclosed chamber. A crane scoops material and deposits it at the feed end of a moving metal grate, or set of slowly rotating cylinders, that slowly conveys the waste materials through the combustion chamber. After loading directly into the furnaces, the MSW is combusted to produce heat and/or power. Many favor this process as it does not require pre-processing of the feed and is relatively simple. The main drawback is that the large size of the items moving through the combustion chamber generates slow rates of heat, mass transfer and combustion. The temperatures generated in the combustion chamber are close to 900 degrees Celsius."[43]

[41] Themelis, 2006, p.2
[42] Psomopoulos, 2009, p. 1718
[43] Columbia, 2001, B-20

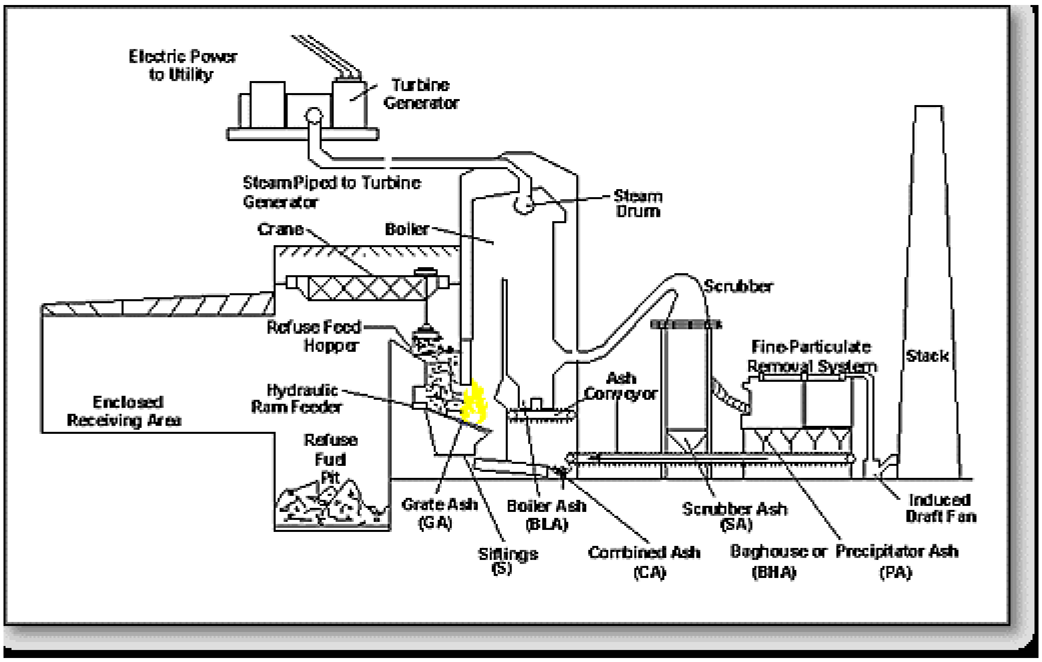


Figure 9 - Mass Burn WTE Facility (Source: FHADOT)

In a refuse-derived plant, the process entails separation of inert materials, size reduction and densifying (*i.e.,* pelletizing or producing flakes), allowing for the removal of both recyclable and hazardous materials. The processed and shredded materials are more easily transported, stored and combusted than raw MSW. The fuel can be produced on a small scale at several locations and transported and used in a large WTE plant where efficiencies of scale lead to effective emissions control. The difficulties of processing highly non-homogenous materials, and the requirements for modern gas control equipment when RDF is used as a coal substitute, have hampered widespread adoption of RDF.[44]

In either type of WTE plant, MSW consists of products produced by the residential, commercial and public services sectors. These wastes are typically collected by local authorities for disposal in a central location. The fuel can be wet or dry, and it varies in energy content. Air for the combustion process in the furnaces is drawn from within the receiving building so that air is always flowing into the building from the outside, creating a "negative pressure" within the building that prevents dust and odors from escaping the building. The plant's high temperature combustion furnace completely destroys viruses, bacteria, rotting food and other organic compounds found in household garbage that could potentially impact human health. The heat from the burning garbage boils water flowing inside the boiler tubes and turns the water into steam. The steam can

[44] ibid

be used directly in a heating system or a factory but it is usually used to turn a turbine-generator to make electricity. After any incombustible residue (*i.e.*, ash) cools, magnets and other mechanical devices pull metals from the ash for recycling. WTE facilities recover over 700,000 tons of ferrous and non-ferrous metals annually.[45]

In February 2, 2010 testimony on LD 1720 before the Maine Legislature Joint Standing Committee on Utilities and Energy, Rep. Donald Soctomah described Recycling and Advanced Pyrolytic Plant (RAPP) technology as a way to create an economic and energy resource for the Passamaquoddy Tribe while ensuring a clean environment. Pyrolysis involves exposing waste materials to very high temperatures in the absence of oxygen, reducing the waste to either a carbon char or synthetic gas, which is then directed to a thermal oxidizer, cleaned by a scrubber system and sent to a boiler to capture thermal energy and convert to high temperature steam. The steam supplies energy to turbine generators, which in turn produce electricity.[46] Rep. Soctomah's concept legislation stimulated the discussion regarding the role of WTE in Maine and formed the basis for the OEIS examination of WTE in the context of RECs and the RPS.

According to Rep. Soctomah's testimony, a RAPP facility produces clean, renewable energy with an efficiency of 95 percent of the waste processed, converted to energy and other saleable by-products. The waste is gasified to produce a synthetic gas, which is then conditioned with a scrubber system before reaching a turbine generator. The RAPP system is an alternative to incineration and land filling, producing very low emissions and generating an ash that can be used in concrete and other products. Pyrolysis has been in use in Europe for decades and the technology has existed for over a century. The RAPP allows for the use of the synthetic gas to run a gas turbine-generator for producing electricity on a continuous basis and uses a commercially viable pyrolytic conversion system that is efficient, reliable, continuous, and environmentally safe.

Rep. Soctomah testified[47] that the RAPP system could be a long-term solution for disposing of residential, commercial, and industrial wastes and allows for stabilization of disposal fees, which will be passed on to the customers. "At the same time, the facility will provide jobs and long-term income. It will also provide the surrounding communities with a source of alternative energy, while reducing greenhouse gas emissions and reducing our need for fossil fuels. All materials will be suitable for other beneficial use with less than 1 percent needing to be placed in a landfill."

[45] ACORE, 2010
[46] Nixon, 2010
[47] Soctomah, 2010

Waste-to-Energy – Costs and Benefits

Waste-to-energy (WTE) plants can produce heat or electricity and have been widely deployed in many European countries.[48] WTE is not a pollution-free waste management and electricity generation source, but it is significantly better than many of the alternatives. It is clear that they have environmental, energy and economic benefits.

Air Quality and Climate Change

Burning MSW produces nitrogen oxides and sulfur dioxide as well as trace amounts of toxic pollutants, such as mercury compounds and dioxins. Although WTE plants do emit carbon dioxide, emissions from the biomass-derived portion (77 percent) are considered to be part of the Earth's natural carbon cycle. The plants and trees that make up the paper, food, and other biogenic waste remove carbon dioxide from the air while they are growing, which is returned to the air when this material is burned. In contrast, when fossil fuels, or products derived from them such as plastics, are burned (23 percent of MSW), they release carbon dioxide that has not been part of the Earth's atmosphere for millions of years. Like fossil fuel power plants, WTE facilities discharge used water. Water pollutants and the higher temperature of the discharged water can negatively affect water quality and aquatic life upon its release. This discharge usually requires a permit and is monitored.[49]

However, WTE facilities produce electricity with "less environmental impact than almost any other source of electricity," according to the U.S. Environmental Protection Agency[50]. America's WTE facilities today meet some of the most stringent environmental standards in the world and employ the most advanced emissions control equipment available, including scrubbers to control acid gas, fabric filters to control particulate, selective non-catalytic reduction to control nitrogen oxides, and carbon injection to control mercury and organic emissions. It is estimated that WTE facilities have spent $1 billion to retrofit pollution control equipment to achieve the strictest federal standards. Throughout the 1980s and 1990s, poor environmental performance and high emissions led to public backlash against waste incineration, in favor of land filling. However, recent improvements in technology, performance, and increased emissions regulations have driven innovation, resulting in a new generation of WTE facilities that operate safely and efficiently, emitting only a small fraction of the pollutants experienced previously.

[48] Bogner, 2007, p. 601
[49] EPA, 2010
[50] 2003

Table 3 shows the significant reduction of air pollutants since regulations were enacted for large municipal waste combustors in 1990.

Table 3 - Dramatic Reductions Achieved After Regulation of MSW (Source: Valdez, 2009)

Pollutant	Total			Percent Reduction
	1990	2005	Reductions	
Dioxins, total mass, kg/yr	226	0.706	226.0	99.7%
Dioxins TEQ, kg/yr	4.42	0.0138	4.4	99.7%
Hg, tons/yr	56.7	3.72	53.0	93.4%
PM, tons/yr	18,630	1,066	17,564.0	94.3%
SO_2, tons/yr	38,270	6,118	32,152.0	84.0%
NO_X, tons/yr	64,900	49,500	15,400.0	23.7%
Cd, tons/yr	9.61	0.550	9.1	94.3%
Pb, tons/yr	172	8.70	163.0	94.9%
HCl, tons/yr	57,400	2,538	54,862.0	95.6%

Modern WTE facilities meet or exceed the EPA's Maximum Achievable Control Technology (MACT) standards. "The performance of the MACT retrofits has been outstanding," according to the EPA. "Upgrading of the emissions control system of large combustors to exceed the requirements of the Clean Air Act Section 129 standards is an impressive accomplishment." Also, strong recycling programs that keep older mercury-containing products out of WTE facilities, combined with the MACT standards, decreased the mercury emissions of WTE facilities from 89 tons of mercury in 1989 to less than one ton today. Dioxins have been dramatically reduced as well.[51]

Life cycle studies have shown that WTE reduces carbon dioxide emissions by 1.1 – 1.3 tons per ton of MSW combusted rather than land filled, resulting in greenhouse gas emission reductions of about 40 million tons.[52] The Maine DEP *Third Biennial Report on Progress* suggests that, "the vast majority of GHG emissions in Maine are the result of energy consumption, largely produced by combustion of petroleum products [and] the largest contributing sector is transportation",[53] suggesting that possible synergies between the energy production and transportation sectors should be maximized to reduce

[51] EPA, 2009
[52] Themelis, 2006, p. 3; Columbia, 2001, Part B Summary
[53] 2010, p. 1

emissions. WTE can play a limited, but important role. A larger discussion should take place regarding the effectiveness of RECs and WTE to reduce GHG emissions in a broader and more indirect sense. In the report mentioned above,[54] emissions from a variety of sources are calculated, including agriculture, fossil fuel combustion, industrial processes, mobile combustion, natural gas, solid waste, stationary combustion, and wastewater, all of which are interrelated with WTE at some point along the materials chain.

Materials Recovery

An estimated 10 million tons of metals are buried annually in U.S. landfills.[55] WTE power plants recover 600-700,000 tons of non-ferrous and ferrous metals annually in the United States that would otherwise be buried in landfills.[56] WTE has the potential to serve as a foundation for more advanced materials recovery facilities that include recovery for reuse, recycling, organic waste separation for biotreatment and bioconversion to compost and biogas that can either be used in biogas cars or be upgraded and injected into the natural gas grid. Furthermore, waste heat from electricity generation can be used for district heating.

Waste Disposal and Recycling

Literature on recycling rates in WTE communities has shown that such communities tend to exceed the national average for recycling and while the extent to which they exceed the averages is less conclusive, the myth that WTE comes at the expense of higher recycling rates has been debunked.[57] Recycling rates are higher in U.S. communities with WTE and other energy recovery systems and European Union member states show the same pattern.[58] In fact, the current municipal recycling rate in the United States is 28 percent; by comparison, 57 percent of WTE communities achieved a higher recycling rate of 33 percent. Said another way, WTE communities have a 17.8 percent higher recycling rate than the US average.[59] According to one study, recycling rates in WTE communities track closely the statewide recycling rates, meaning state policies and programs, not a reliance on WTE as a disposal option, are key determinants of recycling

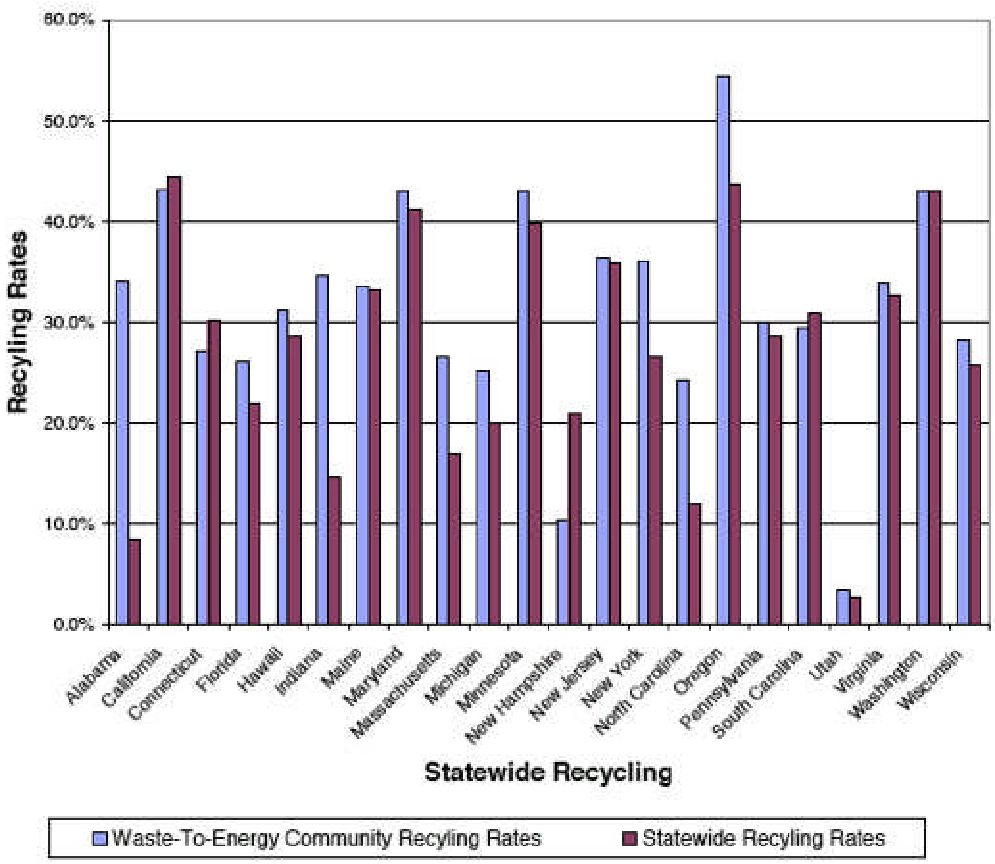
[54] Maine DEP, 2010, p. 3
[55] Themelis, 2006, p. 8
[56] Psomopoulos, 2009, p. 1718
[57] Berenyi, 2009
[58] Brandes, nd
[59] Psomopoulos,2009, p. 1724

rates.[60] In fact, many of these WTE plants have materials-recovery facilities co-located with the plant or owned by the public entity responsible for the plant.[61]

Table 4 - Annual Benefits from MSW Energy Recovery After Assuming a Recycling Rate of 50% (Source: Brandes)

50% Recycling Rate	Material Available (millions of tons per year)	Energy Content (billions of BTU/year)	Electrical Power (billion kilowatt hours)	Equivalent Number of Homes Powered	Lifecycle GHG Savings (million tons CO2E)
	178	1,826,300	91	8,300,000	178

Figure 10 - Recycling Rates in Communities with WTE Facilities Compared to Statewide Rates (Source: Berenyi, 2009)



[60] Berenyi, 2009
[61] ibid

One study of recycling rates in more than 500 communities with WTE facilities showed that these communities had an aggregate recycling rate at least 5 percentage points above the national average.[62] Recycling and WTE are compatible activities as shown by the EcoMaine facility in Portland, Maine. Currently, over 30 percent of MSW generated in the United States is recycled annually. While not producing this waste in the first place is the preferred management strategy for this material, recycling is preferred over any method of disposal. The majority of MSW that is not recycled is typically sent to landfills after it is collected. As an alternative, MSW can be directly combusted in waste-to-energy facilities to generate electricity.

Land Use Requirements

WTE facilities, much like fossil fuel power plants, require land for equipment and fuel storage. MSW combustion creates a waste ash, which can contain any of the elements that were originally present in the waste. The non-hazardous ash residue from the burning of MSW is typically deposited in landfills. However, a properly maintained WTE facility has a life span of more than 30 years and does not normally need more land than initially required unless expanded to process additional MSW.[63] The combustion of MSW can reduce waste streams, slowing the creation of new landfills. MSW power plants reduce the need for landfill capacity because disposal of MSW ash requires less land area than does unprocessed MSW. However, because ash and other residues from MSW operations may contain toxic materials, the power plant's waste must be tested regularly to assure that the waste is safely disposed of to prevent toxic substances from migrating into ground-water supplies. Under current regulations, MSW ash must be sampled and analyzed regularly to determine whether it is hazardous or not. Hazardous ash must be managed and disposed of as hazardous waste and non-hazardous ash may be disposed of in a MSW landfill or recycled for use in roads, parking lots, or daily covering for sanitary landfills.[64] Currently, Maine does not permit WTE ash to be utilized; it must be land filled.

Co-location of plants with waste sources may reduce the need to transport waste significant distances. And, the baseload power produced can be generated near population centers, reducing the need for additional transmission and distribution infrastructure construction as is common with other renewable resources. However, critics of WTE facilities' location near population centers cite the multitude of trucks delivering odorous waste through their communities as an unintended consequence of siting these plants too close to residential and business areas.

[62] Michaels, 2010
[63] Psomopoulos, 2009, p. 1721
[64] EPA, 2010

Health & Safety

Modern waste-to-energy facilities are subject to comprehensive health risk assessments that repeatedly show that waste-to-energy is safe and effective. The National Research Council wrote in a study that today's WTE facilities are designed and operated to produce nearly complete combustion of waste and emit low levels of pollutants. WTE destroys pathogens, organics, and other disease-bearing material in trash. Trash coming into a WTE facility is handled in enclosed tipping halls that are maintained under negative pressure to pull air directly into the boilers and destroy any odors. Ash residue from WTE facilities is tested in accordance with strict state and federal leaching tests and is consistently shown to be safe for land disposal and reuse. WTE reduces the volume of trash by about 90 percent, resulting in a 90 percent decrease in the amount of land required for garbage disposal. Ash also exhibits concrete-like properties causing it to harden once it is placed and compacted in a landfill, reducing the potential for rainwater to leach contaminants from ash landfills into the ground.[65]

Electricity Generation and Energy Security

According to the U.S. EPA, waste-to-energy is a "clean, reliable, renewable source of energy." In addition, the *American Recovery and Reinvestment Act*, the *Energy Policy Act of 2005*, the *Federal Power Act*, the *Public Utility Regulatory Policies Act*, the *Biomass Research and Development Act of 2000*, the Federal Energy Regulatory Commission's regulations, 24 states and the District of Columbia all recognize waste-to-energy power as renewable.

Renewable energy tends to be intermittent and not co-located with the source of demand, but WTE is, or can be, and requires little land, compared to landfills. For instance, a 1,000,000 ton/year WTE plant would require less than 25 acres, but a 30,000,000 ton landfill would require over 740 acres. In addition, after 30 years, a WTE plant can be refurbished and continue operations, or be torn down and replaced with something else, but a landfill is likely unsuitable for further development.[66] With continuous, incremental improvements, WTE facilities could achieve efficiencies close to those of conventional power plants.[67]

The United States has 86 WTE plans in 24 states, combusting 26-28 million tons per year and serving a population of more than 30 million people. They have a generating capacity of 2700 MW of electricity.[68] In 2004, 28.9 million tons of municipal solid waste was combusted in United States WTE plants, generating a net 13.5 billion kW/h of

[65] Energy Recovery Council, 2010
[66] Psomopoulos, 2009, p. 1721
[67] ibid, 1715
[68] ibid, 1718

electricity, equal to geothermal energy and greater than all other renewable sources with the exception of hydroelectric. For comparison purposes, wind generated 5.3 billion kW/h and solar 0.87 billion kW/h of electricity in the same year.[69] Municipal solid waste to generate electricity through landfill gas and WTE projects represents nearly 14 percent of U.S. non-hydro renewable electricity generation in the United States.[70] Power generation from WTE is an order of magnitude higher than landfill gas (470-930 kWh/ton v. 41-84 kWh/ton).[71]

It is estimated that one ton of MSW in a modern WTE plant generates a net of 550 kWh of electricity, avoiding mining a quarter of a ton of coal or importing one barrel of oil.[72] At its current capacity, WTE can eliminate the need for 1.6 billion gallons, or 38 million barrels, of oil and potentially replace 4.5 percent of the 313,000 MW of current coal-fired generation capacity.[73]

Economic Development and Jobs

In contrast to conventional power plants, WTE facilities have two sources of income: the sale of generated electricity and the "tipping" (disposal) fees paid by municipalities and trash haulers to dispose of their waste.[74] WTE plants typically do not need to buy their fuel or transport it long distances. The economy of generating both electricity and steam is also economically attractive.

Electricity from WTE can be produced at 3-10 cents/kilowatt hour (kWh) but prices in Maine may differ.[75] According to the World Economic Forum, "electricity generation from renewable energy [like WTE] very often has little to no variable cost, instead front loading the vast bulk of the lifetime cost in the upfront capital expenditures. As opposed to natural gas generation, where the bulk of the lifetime cost is embedded in the variable fuel costs, capital-heavy generation is very dependent on the price of financing."[76] The capital-intensive nature of projects requiring significant and sustained financing up-front, low tipping fees and land prices that effectively prioritize land filling over incineration serve as significant barriers.

However, even the initial capital cost may be managed and costs controlled if a substantial amount of capital investment is financed. In the case of Coventa's SEMASS

[69] Themelis, 2006, p. 3
[70] Kaplan, 2009, p. 1711
[71] ibid
[72] Themelis, 2006, p. 1
[73] Kaplan, 2009, p. 1714
[74] Columbia, 2001, B-19
[75] World Economic Forum, 2009
[76] ibid, p. 30

facility in Rochester, Massachusetts, the new WTE plant resulted from the commitment of many municipalities to send their MSW to the plant for a specific number of years, in addition to the tipping fees. The plan would be privately financed, owned and operated with a long-term contract for the sale of electricity.[77] When viewing disposal costs over the life of a landfill or WTE facility, WTE can be cost competitive.

Job creation and preservation are also key components to consider in a sound WTE policy.[78]

Costs and Benefits

Proponents and opponents of WTE will present the following arguments for and against eligibility of WTE for RPS inclusion and REC eligibility.[79] However, the OEIS believes that the energy, economic and environmental benefits outweigh the opponents' claims.

The Proponents' Arguments

- Energy recovery from combustion of MSW is producing significant amounts of clean power for an energy hungry world – and more is available.
- Avoids land filling of raw MSW and reduces toxic releases.
- Lifecycle greenhouse gas emission reductions benefit the fight against climate change, including the avoidance of methane emissions.
- WTE reduces the volume of MSW by 90 percent, thereby reducing the amount of landfill space needed for disposal.
- WTE recovers materials otherwise lost, such as metals.
- MSW could provide 2-4 percent of nation's electrical energy demand and already serves 10 percent of the population.
- WTE is already considered a renewable generation source in Maine.
- WTE assists municipalities to manage locally-generated waste.
- WTE is an example of "distributed generation" that serves nearby load generally located close to population centers.
- Proceeds from the sale of RECs may reduce the cost of MSW disposal and the related burdens on property taxes.
- WTE complements recycling programs and WTE communities regularly outperform non-WTE communities in recycling with rates that are typically at least 5 percent about the national average.
- Maine's solid waste hierarchy prioritizes WTE over landfill gas, as does the EPA policy.

77 Columbia, 2001
78 Navigant, 2010
79 Brandes

The Opponents' Arguments

- Incineration is "disposal," or "wasting" rather than "waste reduction."
- Prohibits a "zero waste" policy from being initiated by reducing the more beneficial option of increased recycling and composting. This "Feed the Beast" syndrome ruins potential for "zero waste" national policy.
- Adversely impacts greenhouse gas reduction efforts by directly releasing massive amounts of CO_2 and NOx while reducing future carbon emissions reductions from increased recycling.

Waste-to-Energy Policy – New England & Other States

State governments throughout New England and the rest of the United States are calling for increased renewable energy, including waste-to-energy, to encourage homegrown resources, establish energy security and reduce greenhouse gas emissions. Eighty-six WTE energy plants operating in 24 states currently dispose of approximately 26 million tons of municipal solid waste per year while generating about 17 million kilowatt hours of clean, renewable electricity per year – enough to supply an estimated 2 million homes. According to the Energy Recovery Council, the following twenty-six states, the District of Columbia and Puerto Rico, define WTE as "renewable energy" under various statutes and regulations:

Alaska	Maine	Oklahoma
Arkansas	Maryland	Oregon
California	Massachusetts	Pennsylvania
Connecticut	Michigan	Puerto Rico
District of Columbia	Minnesota	South Carolina
Florida	Nevada	South Dakota
Hawaii	New Hampshire	Virginia
Iowa	New Jersey	Washington
Indiana	New York	Wisconsin

Massachusetts[80]

Massachusetts established two separate renewable standards -- a standard for "Class I" renewables, and a standard for "Class II" renewables. Under the Class I RPS, all retail electricity suppliers must provide a minimum percentage of kilowatt-hours (kWh) sales to end-use customers in Massachusetts from eligible renewable energy resources installed *after* December 31, 1997 of 15 percent by December 31, 2020 and an additional 1% of sales each year thereafter, with no stated expiration date. Eligible Class I resources include landfill gas

[80] DSIRE, 2010

among other renewable resources. The Class II RPS requires all retail electricity suppliers to provide annually 3.6% of kWh sales to end-use customers in Massachusetts from Class II renewables, starting in 2009. Eligible Class II renewables include systems operating *before* December 31, 1997, that generate electricity using the same resources stated for Class I.

In addition, there is a separate Class II Waste Energy Minimum Standard that requires all retail electricity suppliers to provide annually 3.5% of kWh sales to end-use customers in Massachusetts from waste energy starting in 2009. Waste energy is defined as the electrical energy created from combustion of municipal solid waste. Eligible waste energy generation units must have and maintain a state approved recycling program, must comply with Massachusetts Department of Environmental Protection's air pollution and solid waste management regulations, and must allocate at least 50 percent of any revenue received from the sale of renewable energy certificates generated to its recycling programs.

Retail suppliers may pay the alternative compliance payment (ACP) if they are unable to procure enough renewable energy attributes.

Like Maine, the respective RECs are issued by the New England Power Pool Generation Information System (NEPOOL-GIS) and are technically called GIS Certificates. Massachusetts' law currently recognizes WTE as a renewable resource and provides incentives for WTE in the form of RECs. Half of all revenues derived from the sale of WTE RECs are returned to the Massachusetts Department of Environmental Protection for recycling programs throughout the Commonwealth. Historically, Massachusetts has done a good job of using WTE to manage trash within its borders and generate clean, renewable energy from its seven WTE facilities.

Waste-to-Energy Policy – Federal Law and Initiatives

The U.S. Department of Energy classifies WTE as a type of biomass, which is further defined as "any plant- or animal-derived organic matter available on a renewable basis, including…municipal wastes…"[81] Waste-to-energy facilities recover valuable energy from trash after efforts to "reduce, reuse, and recycle" have been implemented by households and local governments. The renewable electricity produced at these facilities is so valuable that Congress included waste-to-energy in the Section 45 Production Tax Credit to encourage development of waste-to-energy and other renewable technologies.

Waste-to-energy has been recognized as renewable in federal law more than 30 years. Statutes that define waste-to-energy as renewable include:

- *American Recovery and Reinvestment Act of 2009 (Stimulus Bill)*

[81] Psomopoulos, 2009

- *Energy Policy Act of 2005*
- *Public Utility Regulatory Policy Act (PURPA) of 1978*
- *Biomass Research and Development Act of 2000*
- *Pacific Northwest Power Planning and Conservation Act*
- *Federal Power Act*
- *Internal Revenue Code*
- *Laws of 24 States, the District of Columbia, and Puerto Rico*

For example, Section 203 of EPAct 2005 includes the following definition surrounding the purchasing and use of renewable energy by Federal agencies:

> *Defines "renewable energy" as electric energy generated from solar, wind, biomass, landfill gas, ocean (including tidal, wave, current, and thermal), geothermal, municipal solid waste, or new hydroelectric generation capacity achieved from increased efficiency or additions of new capacity at an existing hydroelectric project.*

The Davos Report, produced by the World Economic Forum in 2009, cited waste-to-energy among eight emerging "green" technologies that can help reduce greenhouse gases and change the world's energy consumption patterns.

In June 2009, the U.S. House of Representatives passed energy legislation that recognizes waste-to-energy as a climate-friendly, renewable energy source. The *American Clean Energy and Security Act of 2009* (H.R. 2454) amends the *Public Utility Regulatory Policies Act of 1978* (PURPA) to establish the Combined Efficiency and Renewable Electricity Standard, a portfolio standard that requires each certain electricity suppliers to meet an increasing percentage of its demand per year (20 percent by 2020) from a combination of electricity savings (i.e., efficiency), and renewable energy resources. The renewable energy standard defines waste-to-energy as renewable and establishes a greenhouse gas cap-and-trade system which recognizes the net greenhouse gas reductions associated with waste-to-energy. The major provisions of the legislation approved with respect to waste-to-energy include:

> *Renewable electricity standard (RES)*: The bill includes waste-to-energy as a renewable electricity generator eligible to generate and sell renewable energy credits subject to certain limitations and conditions. Waste-to-energy facilities will only generate credits for the percentage of electricity generated from the biomass (non-fossil) components of municipal solid waste and if the lifecycle greenhouse gas emissions of waste-to-energy are less than those of the likely alternative disposal option (as determined by FERC with the concurrence of EPA). In addition, in order to generate RECs in a given year, waste-to-energy facilities must: 1) demonstrate compliance with state and federal environmental permits, 2) must meet the MACT

standards for new facilities (both existing and new facilities), and 3) demonstrate that the communities from which the facility accepts waste offer recycling services.

Section 101 of the bill defines "renewable energy resource" to include…'other qualifying energy resources.' In turn, "other qualifying energy resources" is defined to include…'qualified waste-to-energy.' "Qualified waste to energy" is further defined as:

> "Energy from the combustion of municipal solid waste or construction, demolition, or disaster debris, or from gasification or pyrolization of such waste or debris and the combustion of the resulting gas at the same facility, provided that…(A) such term shall include only the energy derived form the non-fossil biogenic portion of such waste or debris; (B) …the total lifecycle greenhouse gas emission attributable to the generation of electricity from such waste or debris are lower than those attributable to the likely alternative method of disposing of such waste or debris; and (C) the owner or operator of the facility generating electricity form such energy provides to the Commission on an annual basis…in the case of combustion, pyrolization, or gasification of municipal solid waste, a certification that each local government unit from which such waste originates, operates, participates in the operation of, contracts for, or otherwise provides for, recycling services for its residents;"

Greenhouse gas cap: The bill would not regulate waste-to-energy facilities under the greenhouse gas cap if more than 95 percent of the fuel combusted was municipal solid waste on a heat-input basis;

Federal Agency RES. The bill increases the amount of electricity that federal agencies must purchase from renewable sources, consistent with the levels being mandated for non-Federal entities. Waste-to-energy continues to be an eligible source of renewable electricity that federal agencies can use to satisfy their mandate; and

RECs. The Federal Energy Regulatory Commission (FERC) is required to provide for the issuance, tracking, verification and identification of renewable electricity credits (RECs).

As of the time of release of this report, the 112^{th} Congress has not moved on similar energy or climate change legislation, but the inclusion of WTE in the 2009 legislation gave the industry a boost by including it as a "renewable" energy source along with wind, solar and other traditional renewables.

Waste-to-Energy – International Activities

The European Union requires its member countries to reduce MSW in landfills by 75 percent by 2015.[82] This has led to increased WTE and recycling initiatives. Germany bans all land filling of biodegradable waste.[83]

Sweden is considered the global leader in WTE technologies and systems. More than 2 million tons of household waste are processed in Swedish WTE plants per year, with a similar amount originating from industrial sources. WTE provides heat to more than 800,000 homes and electricity to about a quarter of a million homes. Just under 50 percent of household waste is recycled, a slightly smaller percentage goes to WTE and only four percent is sent to landfills. The waste management sector reduced greenhouse gas emissions 34 percent between 1990 and 2006 and estimates that emissions will decrease 76 percent by 2020.[84]

In Sweden, a variety of policy tools, including green certificates for heating and cooling produced via WTE, have directed waste away from landfills and toward incineration. The European Union waste hierarchy control measures for biological treatment, a ban on organic waste in landfills, high tipping fees (>65 USD, before taxes), energy and environmental taxes, combined heat and power (CHP) development, and green tax reform have contributed to WTE becoming a cost effective policy option, less in need of direct subsidization.[85] The district heating network has provided the market to tackle the high investment and capital costs of WTE.[86]

In Denmark, national legislation prohibits waste suitable for incineration from being land filled. Most waste management is organized on the municipal level and nearly all WTE facilities are owned and operated by the municipalities themselves or consortia of municipalities. Operations are based on a cost-coverage principle that seeks to minimize costs for households. Almost all WTE plants in Denmark are CHP plants.[87] Multiple policy components and legislative action has prioritized incineration and the use of heat and power from waste over other fuels. The *Environmental Protection Act* bans the land filling of material suitable for incineration, thus ensuring a supply of fuel for WTE plants. The *Heat Supply Act* promotes development of district heating and prioritizes WTE as a source of heat, increasing the efficiency of WTE plants and making them more economically viable. The *Power Supply Act* promotes distributed generation and includes surcharges for renewable generation, WTE included, and CHP plants.

[82] EU Landfill Directive, 1999
[83] Gohike, 2007
[84] Avfall Sverige, 2010
[85] EU Waste Framework Directive, 2008
[86] Avfall Sverige, 2010
[87] RenoSam and Rambøll, 2006

Electricity from WTE is allowed a surcharge between 2.1 cents/kWh and 63 cents/kWh, depending on the market price, along with a 1.4 cent/kWh subsidy. The three pieces of legislation combine to make for a much more attractive market for WTE development.[88]

In Austria, waste utilized with high biomass content for CHP is entitled to the feed-in tariff system if it has an efficiency rate of more than 60 percent. Support levels currently range from 15.8 – 22.0 cents/kWh with an entitlement of 10 years at that rate and two further years at a reduced rate.[89]

Waste-to-Energy – The Maine Experience

According to the Maine Department of Environmental Protection (DEP), the experience with Maine's existing WTE facilities has been primarily positive. The DEP Air Bureau regulates the air emissions from WTE facilities and issues air emission licenses to the facilities designed to ensure compliance with emission and ambient air quality standards. WTE plants reduce the amount of waste going to landfills, recover the energy contained in waste and reduce the amount of energy that would need to come from other energy generation sources such as fossil-fuel fired sources of electricity. WTE facilities do emit pollutants into the air, including criteria pollutants (particulate matter, sulfur dioxide, nitrogen oxides, carbon monoxide, and volatile organic compounds) as well as some air toxics; however, these emissions are controlled to meet applicable emission standards and ambient air quality standards. These facilities also generate wastewater and solid waste, but again, these discharges are treated and disposed of in accordance with Maine's regulatory requirements. The bottom line from an environmental perspective is that these WTE facilities are able to treat and reduce much of the solid waste that Maine residences, businesses and municipalities produce while generating a useful commodity – electricity.[90] And, WTE facilities must still comply with all government regulations.

From a state level perspective, at present there is little incentive or opportunity for siting a new facility in Maine regardless of the technology employed for two basic reasons: all technologies require a constant flow of waste to be financially viable and they require, for their lifetime, access to land disposal at some level.

Because Maine is a very small market for disposal facilities, existing facilities must compete with each other for share of the supply of MSW, and often must import high percentages of wastes from out of state to meet fuel needs. Over 33 percent of Maine MSW is already contracted to WTE while about 38 percent is recycled or composted. This leaves roughly 24 percent that is directly land filled. Most of that tonnage is

[88] RenoSam and Rambøll, 2006
[89] EREC, 2007
[90] Kennedy, Maine DEP, 2010

committed to regional municipally owned and operated landfills that are financially dependent upon the tipping fees. Thus, the only portion that is available for a new facility would be the amount that is contracted to the state's single remaining commercial landfill. New technologies may be able to take advantage of the relatively small amount of the combustible fraction of the construction and demolition debris waste stream that is currently being land filled, but it would compete with existing facilities in Maine and Canada. Any new facilities would have to compete for that same waste stream and the supply is trending down, further reducing the amount of MSW available for 'redirection' to another facility.[91]

Though Maine would like to move away from the land filling of MSW, WTE plants require government incentives and support for the continued existence of in-state landfills for disposal of their residual ash. State law would require any new disposal facility to be publicly owned, either by the state or a public entity such as a municipality or group of municipalities.

A Note on Landfill Gas-to-Energy

The distinction between the efficacy and utility of waste-to-energy versus landfill gas-to-energy (LFG) is not the subject of this report. The scope of this study is to examine whether the State of Maine should qualify certain waste-to-energy power for renewable energy credits and renewable resource portfolio requirements and place WTE on a level regulatory playing field with other renewable sources of energy, including LFG. However, because of the relation between WTE and LFG and their relative placement in the MSW hierarchy, we feel it is important to recognize LFG as an energy resource and briefly describe it in this section in the context of the U.S. Environmental Protection Agency Landfill Methane Outreach Program (LMOP).

The LMOP provides technical support, tools and resources to facilitate landfill gas projects on the domestic and international levels. LMOP is a voluntary assistance program that helps to reduce methane emissions from landfills by encouraging the recovery and use of LFG as an energy resource. LMOP forms partnerships with communities, landfill owners, utilities, power marketers, states, project developers, tribes, and nonprofit organizations to overcome barriers to project development by helping them assess project feasibility, find financing, and market the benefits of project development to the community.

The following section provides a summary of LFG based on information provided by the EPA LMOP at http://www.epa.gov/lmop/index.html as of December 2010.

[91] MacDonald, Maine State Planning Office, 2010

The two main strategies in the United States to reduce landfill gas emissions are implementation of landfill methane (CH_4) recovery standards and reduction in biodegradable waste that is land filled. The Clean Air Act requires capture and control of landfill gas from large landfills within five years of waste placement. Clean Air Act maximum available control technology (MACT) regulations also require all WTE facilities to have the latest air pollution control equipment.[92] Landfill gas emissions are generally stabilizing in the developed world and declining in the European Union due to increased rates of methane recovery and decreased rates of land filling.

As of October 2010, there are approximately 526 operational LFG energy projects in the United States and 515 landfills that are good candidates for projects. Of the 2,300 or so currently operating or recently closed MSW landfills in the United States, more than 490 have LFG utilization projects. The EPA estimates that approximately 515 additional MSW landfills could turn their gas into energy, producing enough electricity to power more than 665,000 homes.

MSW landfills are the second-largest human-generated source of methane emissions in the United States, releasing an estimated 30 million metric tons of carbon equivalent to the atmosphere in 2008 alone. Methane is a very potent greenhouse gas that is a key contributor to global climate change (over 21 times stronger than CO_2). Methane also has a short atmospheric life of about 10 years. LFG is created as solid waste decomposes in a landfill. Instead of escaping into the air, LFG can be captured, converted, and used as an energy source to generate electricity, used to replace fossil fuels in industrial and manufacturing operations, or upgraded to pipeline–quality gas where it may be used directly or processed into an alternative vehicle fuel. Because methane is both potent and short-lived, methane emissions from landfills represent a lost opportunity to capture and use a significant energy resource.

The generation of electricity from LFG makes up about two–thirds of the currently operational projects in the United States. Electricity for on–site use or sale to the grid can be generated using a variety of different technologies, including internal combustion engines, turbines, microturbines, and fuel cells. Directly using LFG to offset the use of another fuel (e.g., natural gas, coal, fuel oil) is occurring in about one–third of the currently operational projects. Industries using LFG include auto manufacturing, chemical production, food processing, pharmaceuticals, cement and brick manufacturing, wastewater treatment, consumer electronics and products, paper and steel production, and prisons and hospitals.

Cogeneration, also known as combined heat and power or CHP, projects using LFG generate both electricity and thermal energy, usually in the form of steam or hot water.

[92] Kaplan, 2009, p. 1711

Several cogeneration projects have been installed at industrial operations, using both engines and turbines. The efficiency gains of capturing the thermal energy in addition to electricity generation can make these projects very attractive.

Using both LFG and WTE for energy is an opportunity to involve citizens, nonprofit organizations, local governments, and industry in sustainable community planning and create partnerships. These resources foster renewable energy, economic development, improved public welfare and safety, and reductions in greenhouse (global warming) gases and offset the use of non-renewable resources such as coal, natural gas and oil to produce the same amount of energy. WTE and LFG from waste is a reliable and renewable fuel option that remains largely untapped across the United States, despite the benefits.

Both WTE and LFG energy projects can generate revenue and jobs associated with the design, construction, and operation of energy recovery systems. WTE and LFG energy projects involve engineers, construction firms, equipment vendors, and utilities or end–users of the power produced. Much of this cost is spent locally for construction, recovery and operational personnel, helping communities to realize economic benefits from increased employment and local sales. Businesses and residents can also realize the cost savings associated with using WTE and LFG as replacements for more expensive fossil fuels, such as petroleum and natural gas.

Conclusion and Recommendations

Conclusion

According to the EPA, no current national policy on energy recovery from secondary materials exists, although there are various incentives.[93] With the majority of America's energy currently being produced by fossil fuel-fired power plants, the steam and renewable electricity generated by the nation's 86 waste-to-energy plants are valuable commodities. These waste-to-energy facilities have a power generating capacity of nearly 2,700 megawatts of clean electricity. Unlike other types of renewable resources, waste-to-energy is considered base load power that operates 24 hours per day, 365 days per year and can be co-located with population centers, reducing the need for additional infrastructure. As a result, these facilities reliably generate approximately 17 billion kilowatt hours of electricity per year—enough power for approximately 2 million American homes. This accounts for nearly 20 percent of all renewable electricity generation in the United States.

Maine's four waste-to-energy operators process approximately 2,800 tons of municipal solid waste per day and have 65.3 megawatts of generation capacity while providing millions of dollars in their local regions and full-time jobs with competitive wages and benefits. Today's waste-to-energy plants are highly efficient and utilize municipal solid waste as their fuel rather than coal, oil or natural gas. Far better than expending energy to explore, recover, process and transport the fuel from some distant source, waste-to-energy plants in Maine turn garbage into a valuable resource. These plants recover the thermal energy contained in the trash in highly efficient boilers that generate steam that can then be sold directly to industrial customers, used on-site to drive turbines for electricity production, or distributed to the electricity grid.

Recommendations

Recognition of WTE as a Renewable Resource

The Governor's Office of Energy Independence and Security (OEIS) recommends that its office work collaboratively with the Maine Legislature, the State Planning Office, Maine Public Utilities Commission, and the Department of Environmental Protection to actively consider financial, regulatory and policy options for WTE as a renewable resource. Based on its examination of WTE resources and the critical need to create jobs, enhance competitive markets, promote economic development and enhance Maine's energy

[93] Brandes

security and long-term economic viability, the OEIS supports utilization of WTE as a renewable energy resource.

A New Class for Waste-to-Energy

More specifically, the OEIS recommends consideration of establishing a new WTE Class for purposes of the Renewable Portfolio Standard and Renewable Energy Certificates provided that electricity costs for Maine consumers do not increase. Maine's four existing WTE facilities operating in Maine (EcoMaine, Maine Energy, Mid Maine Waste, and PERC) have suggested possible criteria to qualify for such a new WTE Class to include:

- A source of electrical generation, including pyrolytic waste systems;
- Fueled by municipal solid waste in conjunction with recycling or materials recovery facilities;
- Production of electricity by generators whose nameplate capacity does not exceed maximum megawatt size. WTE operators have suggested a 35 MW limit while the current RPS (except for wind power installations) mandates that the generating resource must not have a nameplate capacity that exceeds 100 MW;
- Licensed to comply with DEP air emission standards;
- Licensed to meet DEP performance standards and siting criteria, including standards prohibiting contamination of ground water;
- Support of the State of Maine and EPA MSW hierarchies.

Particular criteria of relevance include meeting and exceeding all relevant regulatory limits at the state and federal levels. WTE has the capacity to deliver an energy product with low emissions and environmental impact compared to alternatives, but it is important that the criteria for RECs are comprehensive and set appropriate standards so as not to undermine the REC system or increase electricity costs to consumers. Technologies, control equipment requirements and emission limits would all be reviewed and determined during the licensing process and would need to meet Best Available Control Technology (BACT) determinations. At the same time, existing facilities should qualify for RECs and not be punished or excluded based on their first-mover status.

Creating a dedicated class for specific fuel sources is not without precedent in New England (See Table below).

Table 5 - New England RPS Class II, III, IV Summary (Source: Maine WTE Working Group)

Key Criteria	NH Class III – existing biomass & landfill gas	NH Class IV – existing hydro	MA Class II – Renewables – all existing renewables	MA Class II – Waste to Energy	RI "existing" class	CT Class II (existing biomass & WTE & hydro)	CT Class III (CHP, energy savings & waste heat recovery)	ME Class II (all Class I fuels plus WTE)
Commercial Operation Date	Before 1/1/2006	Before 1/1/2006	Before 12/1997	Before 12/1997	Before 12/31/1997	Bio/WTE before 7/98; Hydro before 7/03	CHP & efficiency after 1/06; WHR after 1/07	Allow before 9/2005
2010 Percent of Statewide Load	5.5%	1.0%	3.6%	3.5%	none	3.0%	4.0%	30%
Size of Generator (MW)	Under 25 MW	Under 5 MW at station	Limits only on hydro at 5 MW	No limits	Biomass under 30 MW	None	None mentioned	Under 100 MW (FERC regs)
Alternative Compliance Payment 2010 ($/MWh)	$29.87	$29.87	$25.00	$10.00	None found	$55.00	$31.00	None; Penalty imposed by MPUC
First Year of Activity	2008	2008	2009	2009	1997	2004	1998	2008
Exemptions to RPS	Public Power	Public Power	Public Power	Public Power	Public Power	Public Power	Public Power	Public Power
WTE Allowed	NO	NO	NO	Yes	No	Yes	No	Yes
WTE defined	N/A	N/A	N/A	"1" See text below table	No WTE classes	None offered	N/A	"2" See text below table
WTE recycling	N/A	N/A	N/A	Required	No WTE classes	None offered	N/A	Required
WTC State Regulations	N/A	N/A	N/A	Must meet	No WTE classes	None offered	N/A	Yes
NOx	Under 0.075 lbs/MMBtu	N/A	Under 0.075 lbs/MMBtu	Meet MA state codes	Meet state regulations	Under 0.2 lbs/MMBtu	Meet state code	Meet state code
Particulate	Under 0.02 lbs/MMBtu	N/A	Under 0.02 lbs/MMBtu	Meet MA state codes	Meet state regulations	N/A	Meet state code	Meet state code
Combined Heat & Power Efficiency	N/A	N/A	N/A	N/A	N/A	N/A	50%	N/A

1 - MA WTE defined: "Waste Energy [is] electrical energy generated from the combustion of municipal solid waste" "Waste Energy Generation Unit a Generation Unit that utilizes conventional municipal solid waste plant technology in commercial use to generate Waste Energy"
2 - Maine WTE defined: Power production that relies on "...generators fueled by municipal solid waste in conjunction with recycling.

According to the Maine Waste-to-Energy Working Group, the advantages of a separate class for WTE include avoiding conflict with Class I facilities, allowing the MPUC to narrowly target WTE facilities and preventing adverse effects on the prices in other classes.

The OEIS recommends that in order to develop broad support for a new WTE class with top-level support from the Governor and the Legislature, the OEIS, or MPUC should hold facilitated discussions among key stakeholders regarding appropriate design of a separate class, including Members of the Legislature, state agencies, electric utilities, WTE and LFG facility operators, developers of WTE systems, local government officials, environmental organizations, ratepayer advocates and community groups, among others. The goal is to work together to determine incentives designed to promote the best combination of waste management practices and WTE technologies that can be implemented to improve or replace current practices with alternative methods that are socially, economically and environmentally acceptable.

The consideration of a separate class for WTE RECs should take into account the following issues, many of which have been examined in this report but could use additional expert analysis during the legislative process:

- Careful analysis of the expected impact of establishing a separate class for WTE, including potential implications for the market for RECs and the prices for RECs if WTE qualifies as a separate WTE class;
- Relevant criteria for WTE to qualify for RECs (*e.g.*, initial date of commercial operation, nameplate capacity, regulatory limits, types of technologies, processes, permits, etc.);
- Timeline for incorporation of the new WTE class into the RPS;
- Environmental considerations;
- Whether out-of-state WTE should qualify;
- Effects on other renewable resources (*e.g.*, wind, solar, geothermal, biomass), alternative energy systems (e.g., combined heat and power), recycling, landfill gas;
- Additional barriers to developing and using WTE systems in Maine;

It is not entirely clear whether qualifying WTE for Class I RECs would stimulate new investment in WTE on its own, perhaps with the exception of expanding existing facilities, before the 2017 deadline for meeting 10 percent of Maine's electricity needs with renewable sources. Bringing new investment online may be more likely if the portfolio requirements were more ambitious and continue to grow beyond 2017, a subject for policymakers to consider. There are many factors involved in new investment in WTE, including availability of fuel, siting issues, and potential opposition from landfills and WTE plants now in operation. RECs are only one incentive among many to be considered to spur any new investment of this type. However, the four operating WTE facilities in Maine are adamant that they would "definitely invest additional funds in our operations if there was additional funds made available from a new REC class."[94] And, it appears that at least one entity, through the efforts of Rep. Soctomah and the Passamaquoddy Tribe, is considering a new facility.

Analyze and Estimate REC Price and Market Impact Under Draft WTE Legislation

Renewable energy certificates can be a key financial and regulatory instrument to support the development of renewable energy resources in Maine and will continue to grow in importance as the generation of wind, solar, geothermal, hydropower, biomass and other renewable resources increase. A number of factors influence the price of RECs, including the date of first commercial operation of the renewable generation plant, the resource used to generate the megawatt hour, and the demand for the renewable resource within the REC market. If a national renewable portfolio standard is enacted, the demand for RECs is likely to increase. However, REC prices are difficult to predict under any circumstances and carve-outs and separate classes for specific renewable technologies, such as WTE, can create another layer of uncertainty.

During the consideration of legislation to create a separate REC class for WTE, the OEIS recommends that the MPUC, Maine Waste to Energy Working Group and/or other third party experts conduct a thorough analysis of potential REC prices and impacts on the renewable energy market in Maine should a separate class be ultimately established. While such a study need not be excessively rigorous, the OEIS does feel that the Energy, Utilities and Technology Committee should receive as much information, data analysis and background regarding draft legislation offered by the Maine WTE companies that seeks to:

- Amend the definition of "renewable capacity resource" to add generators fueled by municipal solid waste in conjunction with recycling;

[94] Maine WTE Working Group, 2010, Personal Correspondence

- Limit inclusion to facilities with a total power capacity not to exceed 35 megawatts;
- Establish a 3.5% or similar portfolio requirement for electricity from WTE resources; and
- Allow electricity providers to meet the requirements for WTE through the use of RECs or alternative compliance payments.

The four WTE facilities in Maine range from around 5 MW to 25 MW, so the "35MW" capacity maximum would allow for all four to qualify. Also, the production of the four plants is approximately equal to 3.5 percent of the total electricity usage in the State. The total electricity use in Maine is about 11,200,000 MWhs and the generation of the four facilities is around 400,000 MWhs. Prior to incorporating these specific requirements into legislative or regulatory initiatives, justification would need to be made and assurances given that incentives would exist for the development of new WTE energy facilities and/or participation from WTE plants from outside the state (if out-of-state WTE facilities are allowed to qualify). Otherwise, the four current WTE facilities could have the ability to set the price at close to the alternative compliance payment amount.

As the OEIS examination finds, WTE power should be afforded serious consideration for an elevated status under the Maine renewable standard and RECs system. But, the OEIS believes that further analysis is needed to fully inform the Maine Legislature of the potential benefits and costs to a renewable energy market that is complex, multifaceted and facing an uncertain but promising national regulatory future.

Areas for Further Study and Discussion

Other considerations for new WTE facilities to qualify for generating a separate class of RECs in Maine include:

- Volume of waste received and reduction of waste volume to be land filled;
- Level of recycling/removal of waste for other beneficial purposes;
- Initial date of commercial operation.

The OEIS recommends further examination of the use of residual heat from WTE facilities to heat buildings or other uses of waste heat. While none of the four Maine WTE plants are engaged in the cogeneration or sale of waste heat to third parties, the concept of electric power generation units at or near customer facilities to supply on-site heating makes sense from economic, energy and environmental standpoints. Cogeneration is an efficient, clean and reliable "systems" approach to generating power and thermal energy from a single fuel source and can significantly increase a facility's operational efficiency, decrease energy costs and reduce greenhouse gas emissions.

An important criterion for considering in qualifying WTE for a separate class is whether this qualification would incentivize the production of waste itself in Maine. The OEIS does not currently believe this to be the case, but careful attention must be afforded the question. Maine's longstanding solid waste policy framework has discouraged this practice. Following this policy framework, Maine's four WTE facilities began operations between 1987 and 1992. The operation of these four facilities has greatly reduced the volume of Maine solid waste requiring land disposal (by roughly 12,000,000 tons over 20 years; by 85 to 90 percent). Due to some quantities of solid waste disposed in Maine still not being processed by WTE prior to landfill disposal, the OEIS believes the qualification of WTE for RECs further strengthens the continuance of Maine's solid waste policy framework described above while also providing incentive for further advancement and innovation in future WTE processing technologies.

Occasionally, there is insufficient waste produced in Maine to maintain the operation of any one or more of the existing WTE facilities, hence there is a need to import waste from out of state. An important distinction must be made between importing waste for incineration for electricity and importing waste for land filling. Supporters for a separate class for WTE argue that imports of waste would decline if MSW generated in Maine was not being land filled at its current rate. According to the State Planning Office, in-state generated MSW in Maine amounted to 1,833,634 tons in 2008. Deliveries to WTE facilities in the same year were 850,860 tons – 243,397 tons from out of state and the balance of 607,463 generated in state. This was more than enough for WTE electricity generation with current capacities.

WTE faces many of the same challenges as other electricity generation projects in that siting issues and the "winners" and "losers" associated with site selection are not avoided. Special consideration should be given to issues of fairness and equity and communities where future projects may be developed should be actively involved in the siting process.

In summary, the OEIS suggests that the creation of a separate class for qualifying WTE facilities could offer numerous benefits to the State of Maine, including:

- Reduced dependence on foreign sources of energy;
- Decreased overall emissions from the treatment of waste;
- Expanded Maine jobs and expenditures; and
- Additional investment in existing facilities and creation of incentives for new facilities.

One ton of combusted MSW produces approximately 550 kWh of electricity, the same amount as a barrel of oil or ¼ ton of coal. The State of Maine Comprehensive Energy Action Plan calls for energy from "clean, reliable, affordable, sustainable, and indigenous renewable resources" and WTE meets all of these criteria. However, any justification for WTE should ensure that electricity is reasonably priced and is part of a cost-competitive, market oriented price structure.

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Appendix A – Waste-to-Energy Stakeholder Questions

1. *What is your organization's role in Maine WTE?*
2. *What are the potential implications for the market for renewable energy credits (RECs) and the prices for RECs if waste-to-energy (WTE) qualifies as Class I or as a separate WTE class?*
3. *What do you consider relevant criteria for WTE to qualify for RECs (concerning initial date of commercial operation, nameplate capacity, regulatory limits, technologies, processes, etc.)?*
4. *What are the environmental/economic/social/energy security/local property tax implications of WTE, both positive and negative?*
5. *If WTE qualified for Class I RECs or a new WTE Class, what implications would it have for renewable energy development in other New England states? Should out-of-state WTE qualify for Maine Class 1 or a separate WTE class?*
6. *How have WTE technologies in other states/countries been incorporated into Renewable Portfolio Standards or RECs?*
7. *What does WTE offer for potential synergies with other renewable resources, for example, increased recycling, landfill airspace utilization, waste heat and/or steam hosts, biogas production or co-firing in coal plants?*
8. *What are the barriers (legislative, regulatory, economic, etc.) to developing and installing WTE technologies/systems in Maine?*
9. *What are the current incentives for WTE in Maine and the United States, and what are your recommendations to promote WTE?*
10. *What are the energy benefits (or costs) of WTE? Include price, cost, environmental, energy efficiency, jobs data/information?*
11. *Which WTE technologies are most adept to the case of Maine?*
12. *Do existing policies reflect the role of WTE in Maine's solid waste management hierarchy: 1) reduce, 2) reuse, 3) recycle/compost, 4) incinerate, and 5) landfill?*
13. *What is the annual electric output of existing WTE in Maine and New England?*
14. *If WTE qualifies for Maine Class 1 or a separate WTE class, would it stimulate new investment in WTE?*

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Appendix B – Maine Waste-to-Energy Facilities Fact Sheet (January 2011)

Facility	EcoMaine	Maine Energy Recovery Company (MERC)	Mid-Maine Waste Action Corporation (MMWAC)	Penobscot Energy Recovery Company (PERC)	Totals (where applicable)
Town	Portland	Biddeford	Auburn	Orrington	n/a
Municipalities Served (#)	39	37	29	188	293
Population of Service Territory (estimate)	250,000	270,000	141,500	300,000	961,500
Waste Processed per year (tons)	165,000	280,000	70,000	315,000	830,000
Full Time Employees (#)	42	79	28	74	223
Total Payroll ($)	$2.5 million	$5.0 million	$1.9 million	$5.6 million	$15 million
Expenses of Outside Services ($/yr)	$8.0 million	$10.0 million	$2.4 million	$16.4 million	$36.8 million
Nameplate Capacity of Generator (MW)	14.7	22.0	5.0	30	71.7
Total Electricity Production (est. MWhs/yr)	93,000	160,000	24,000	197,700	474,700
Total	80,000	130,000	17,000	162,400	389,400

Electricity Sent to the Grid (MWhs/yr)					
Date of Commercial Operation	1988	1987	1992	1988	1987 thru 1992
General Manager	Kevin Roche	Ken Robbins	Joe Kazar	Peter Prata	n/a
Phone Number of General Manager	207-773-1738	207-282-4127 x111	207-783-8805	207-825-4566 X16	n/a

Appendix C – L.D. 425

The following bill has been introduced in the 125th Legislature. The bill is being offered here as an example of how WTE legislative language may be presented. The OEIS has not endorsed this version at the time of publication of this report.

SP0129, LD 425, item 1, 125th Maine State Legislature
An Act To Stimulate Demand for Renewable Resources

An Act To Stimulate Demand for Renewable Resources

Be it enacted by the People of the State of Maine as follows:

Sec. 1. 35-A MRSA §3210, sub-§2, ¶B-3, as enacted by PL 2009, c. 542, §3, is amended to read:

B-3. "Renewable capacity resource" means a source of electrical generation:

(1) Whose total power production capacity does not exceed 100 megawatts and relies on one or more of the following:

(a) Fuel cells;

(b) Tidal power;

(c) Solar arrays and installations;

(d) Geothermal installations;

(e) Hydroelectric generators that meet all state and federal fish passage requirements applicable to the generator; ~~or~~

(f) Biomass generators that are fueled by wood or wood waste, landfill gas or anaerobic digestion of agricultural products, by-products or wastes; or

(g) Waste energy resources; or

(2) That relies on wind power installations.

Sec. 2. 35-A MRSA §3210, sub-§2, ¶D is enacted to read:

D. "Waste energy resource" means a source of electrical generation, which may include pyrolytic waste systems:

(1) That is fueled by municipal solid waste in conjunction with recycling;

(2) Whose total power production capacity does not exceed 35 megawatts;

(3) That is licensed to comply with the air emission requirement levels for resource recovery facilities established pursuant to Title 38, section 585, including, but not limited to, standards for mercury established pursuant to Title 38, section 585-B, subsection 5;

(4) That complies with all applicable licensing requirements for solid waste facilities as established pursuant to Title 38, section 1310-N; and

(5) Whose residuals are transported to a landfill that is licensed to meet at least the performance standards and siting criteria established by rules adopted pursuant to Title 38, section 1304, subsection 1B, including, but not limited to, standards prohibiting contamination of groundwater outside the solid waste boundary of landfills.

Sec. 3. 35-A MRSA §3210, sub-§3-B is enacted to read:

3-B. Portfolio requirements; waste energy resources. Portfolio requirements for waste energy resources are governed by this subsection.

A. Beginning July 1, 2012, as a condition of licensing pursuant to section 3203, a competitive electricity provider in this State must demonstrate in a manner satisfactory to the commission that no less than 3.5% of its portfolio of supply sources for retail electricity sales in this State is accounted for by waste energy resources. Waste energy resources used to satisfy the requirements of this paragraph may not be used to satisfy the requirements of subsection 3.

B. Retail electricity sales pursuant to a supply contract or standard-offer service arrangement executed by a competitive electricity provider that is in effect on the effective date of this subsection are exempt from the requirements of this subsection until the end date of the current term of the supply contract or standard-offer service arrangement.

The commission shall adopt rules to implement this subsection. Rules adopted pursuant to this subsection are routine technical rules as defined in Title 5, chapter 375, subchapter 2A.

Sec. 4. 35-A MRSA §3210, sub-§10 is enacted to read:

10. Alternative compliance payment; portfolio requirements for waste energy resources. The commission shall allow competitive electricity providers to satisfy the portfolio requirements for waste energy resources under subsection 3-B through an alternative compliance payment mechanism in accordance with this subsection.

A. The commission shall set the alternative compliance payment rate by rule and shall publish the alternative compliance payment rate by January 31st of each year. In setting the rate, the commission shall take into account prevailing market prices, standard-offer service prices for electricity and reliance on alternative compliance payments to meet the requirements of subsection 3-B.

B. The commission shall collect alternative compliance payments made by competitive electricity providers and shall deposit all funds collected under this paragraph in the Renewable Resource Fund established under section 10121, subsection 2 to be used to fund research, development and demonstration projects relating to renewable energy technologies.

The commission shall adopt rules to implement this subsection. Rules adopted pursuant to this subsection are routine technical rules as defined in Title 5, chapter 375, subchapter 2-A.

SUMMARY

Current law establishes as a policy of the State the encouragement of the generation of electricity from renewable and efficient resources by requiring that each competitive electricity provider in this State demonstrate that no less than 30% of its portfolio of supply sources for retail electricity sales in this State is accounted for by eligible resources. This bill implements that policy by stimulating demand for electricity from generators fueled by municipal solid waste in conjunction with recycling.

This bill amends the law in the following ways.

1. It amends the definition of "renewable capacity resource" to add waste energy resources.

2. It defines "waste energy resource" as a source of electrical generation that is fueled by municipal solid waste in conjunction with recycling and whose total

power capacity does not exceed 35 megawatts. In addition, the waste energy resource would have to meet Maine's air emissions standards for resource recovery facilities and licensing standards for solid waste facilities and ensure that residuals from the waste energy resource are disposed of at a landfill meeting Maine's licensing standards.

3. It establishes a 3.5% portfolio requirement for electricity from waste energy resources.

4. It allows competitive electricity providers to meet the portfolio requirements for waste energy resources through the use of renewable energy credits or an alternative compliance payment to be set by the Public Utilities Commission.