Energy Gone to Waste: A Case for Promoting Waste-to-Energy Power Generation Over Landfills

By David Glanton

Waste is worse than loss. The time is coming when every person who lays claim to ability will keep the question of waste before him constantly.

Thomas Edison

The word which gives the key to the national vice is waste. And people who are wasteful are not wise . . . . In order to transmute energy to higher and more subtle levels one must first conserve it.

Henry Miller

“Solid wastes” are the discarded leftovers of our advanced consumer society. This growing mountain of garbage and trash represents not only an attitude of indifference toward valuable natural resources, but also a serious economic and public health problem.

Jimmy Carter

Prudent Americans have registered concern for years regarding the dangers of being a wasteful society. Wasteful habits impact both our supply of energy and the environment. These habits have resulted in an ever-increasing accumulation of trash. For example, the Fresh Kills landfill in New York City is one of only two man-made structures recognizable from space by the naked eye.

Consumption is a perpetual concern for any community. It implicates two responsibilities: (1) generating enough energy to support the community’s standard of living and (2) managing the waste that is a by-product of our consumer society. One solution that addresses both concerns is Waste-to-Energy power generation (“WTE”), by which municipal solid waste (“MSW”) is incinerated to produce electricity, via steam generators. Despite WTE’s ability to transform a growing waste problem into a renewable energy solution, no new plants have been built since 1995 and landfills remain the predominant system of waste management.

According to a 2008 study by Columbia University, Americans amass 389.5 million tons of MSW per year or 7.1 pounds per person per day. Over the course of a lifetime, the average American will generate approximately 102 tons of waste—enough to fill almost 40 thousand

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5. The other landmark is the Great Wall of China. Id. at 11–12.


9. Humes, supra note 4, at 144.

cubic feet\textsuperscript{11} or roughly twice the size of the average American home.\textsuperscript{12}

The majority of our collective waste—270 tons—is discarded in landfills every year.\textsuperscript{13} This practice is harmful to both human health and the environment. Large landfills produce significant amounts of greenhouse gases\textsuperscript{14} and may leak as much as 2 million gallons of hazardous sludge into the earth every day.\textsuperscript{15} The dangers posed by landfills, however, are not the only concerns—our waste graveyards are a forgotten resource, locking away abundant energy.

The environmental cost of relying on fossil fuels to meet energy needs is profound. In 2010, American energy consumption generated 5,916 million metric tons of carbon dioxide (CO\textsubscript{2}) emissions\textsuperscript{16} and all energy-related activities produced more than 85% of U.S. greenhouse gases in 2011.\textsuperscript{17} Fossil fuel combustion was the single largest contributor to these emissions, and coal mining the fourth largest.\textsuperscript{18}

Using WTE in place of landfills would generate 133 billion kWh of electricity per year.\textsuperscript{19} This new energy generation could reduce American reliance on coal by 8%.\textsuperscript{20} Furthermore, 3 million pounds of greenhouse gas emissions would be avoided for every kilowatt-hour generated by WTE instead of fossil fuels.\textsuperscript{21} Without WTE, greenhouse gas emissions will grow as energy demands increase on an annual basis.\textsuperscript{22}

WTE has not been promoted as the optimal solution to our waste management problems despite policy-makers’ concerns over the growth in energy consumption and waste generation.\textsuperscript{23} In recent years, controversy surrounding WTE projects has stilled new development.\textsuperscript{24} The three main concerns are that (1) WTE plants cause significant pollution through the emission of greenhouse gases, (2) WTE plants do not produce renewable energy and harm recycling efforts, and (3) WTE is too expensive, and therefore, not practical.\textsuperscript{25} As will be shown below, the first two concerns are unfounded, and the third, while sometimes valid, can be mitigated by federal incentives.

This Note dispels the misconceptions surrounding WTE and provides support for its use as a preferable means of waste disposal. Furthermore, this Note explores solutions to improve the economics of building new WTE plants. Specifically, this Note argues for the single classification of WTE as a first-tier renewable energy technology and proposes amendments to the Energy Policy Act of 2005 that would allow new WTE plants to be eligible for the same tax credits and loan guarantees as other renewable technologies. Part I provides background on the history of WTE, its regulation, and the current incentives for its development. Part II details the current waste management paradigm in the United States and why it is unlikely to change, absent concerted efforts to promote WTE. Part III provides the rationale for supporting WTE as both the optimal waste management solution and a practical source for renewable energy production. Part IV proposes that (a) the use of WTE be favored over the use of landfills, and (b) WTE be given equal legal status to other renewable energy sources for the purposes of promoting renewable energy. Part V addresses the concerns with WTE and the arguments against its adoption. Part VI concludes with a brief summary of the arguments in favor of WTE and the regulatory changes that would encourage greater WTE deployment.


\textsuperscript{12} In 2010, the average new home size in the United States was 2,392 square feet. U.S. Census Bureau, Median and Average Square Feet of Floor Area in New Single-Family Houses Completed by Location (2010), available at http://www.census.gov/const/c25/Ann/sfrmedavsgsf11.pdf. Assuming eight-foot ceilings, the volume of the average house would be 19,136 cubic feet.

\textsuperscript{13} See Rob van Haaren, Nickolas Thelemelis, & Nora Goldstein, BioCycle, The State of Garbage in America, at Table 1 (Oct. 2010).


\textsuperscript{18} Id.


\textsuperscript{20} Coal generated 1,734 kWh in 2011. U.S. Energy Info. Admin., supra note 16, at 224, Fig. 8.2a.

I. Background

A. History of WTE

The practice of burning trash is not new to America—New York opened the United States’ first trash incinerator in 1885.26 However, burning waste became disfavored over time due to air pollution caused by early incinerators. For example, Los Angeles city officials chose to abandon incineration after the city developed a notorious smog problem, due in part to backyard trash incineration, a common practice during the 1950s and 1960s.27 Today, the western region of the United States contains only eight of the eighty-six operational WTE projects nationwide, evidence of the long-lasting negative perception created by these earlier events.28

B. WTE Today

Currently, forty of the eighty-six WTE plants in the United States are located in the densely populated Northeast, where landfill space is limited.29 These plants operate by burning MSW in a combustion chamber, after sorting out hazardous waste and recyclables, to produce heat, which powers a steam turbine to generate electricity.30 Consequently, the MSW is reduced to ash, equal to 15–25% of its pre-incineration weight.31

Each year WTE delivers as much as 2.7 million kW of baseload32 electricity to the grid and processes more than 28 million tons of MSW.33 This production results in the avoidance of 28 million tons of greenhouse gas emissions per year, such that each ton of MSW burned in WTE plants avoids one ton of greenhouse gas emissions.34 Due to this mitigation, in 2010, a Florida power plant became the first WTE facility to earn carbon credits for its role in the reduction of greenhouse gas emissions.35

C. Cleaning Up With Regulation

Today’s WTE facilities feature significant improvements from those of years past.36 Much of the controversy surrounding the earlier WTE power plants related to the emission of dioxins,37 not CO2.38 In the short-term, dioxin emissions are likely more dangerous to human health than the climate change contributor CO2. Dioxins have been linked to cancer and a variety of respiratory diseases.39 Though concerns regarding the release of these hazardous particles are valid, they should not be associated with modern WTE plants, which are subject to regulations that limit emissions.

Pursuant to the 1990 amendments to the Clean Air Act, the Environmental Protection Agency (“EPA”) was required to promulgate stricter air toxins emissions standards for WTE facilities.40 Specifically, WTE facilities must conform to Maximum Achievable Control Technology (“MACT”) standards.41 Operators have retrofit WTE plants with advanced filtration technology to comply with increasingly strict emissions standards.42 Dixon emissions decreased 99% between 1990 and 2005 as a result of these filtration systems.43 EPA reported in a 2007 memorandum that the effect of the “MACT” retrofits has been outstanding,” resulting in only 15 grams of dioxin emissions nationwide in 2005.44 To put this statistic in perspective, far more dioxin is released from the use of home fireplaces and barbecues than is from WTE facilities.45

II. The Status Quo: A Land Filled With Garbage

A. The Hazards of Trash Put to Waste

Despite the improvements in WTE technology, nearly 70% of MSW is buried in landfills.46 It may not yet be economical to repurpose all of our waste, but burying a fortune in raw materials and potential energy is not the answer. Landfills impose significant costs on the environment. Despite regulation pursuant to the Resource Conservation and Recovery Act of 1976 (“RCRA”), landfills are far from being

27. Humes, supra note 4, at 47–52.
28. U.S. EPA, MSW Generation, Recycling, and Disposal, supra note 8, at Table 27.
29. Id.
30. Id.
31. Id.
32. A power source is defined as baseload only if its utilization rates are greater than 70%. Utilities purchase a majority of electricity from baseload sources in order to consistently meet consumer demands. See generally Part III.B.
34. One ton of greenhouse gas emissions are avoided for each ton of MSW processed by WTE as opposed to being buried in a landfill. U.S. EPA, Air Emissions From MSW Combustion Facilities, supra note 19; Kate Adams & Brian D. Israel, Breaking the Logjam: Environmental Reform for the New Congress and Administration, 17 N.Y.U. Envtl. L.J. 703, 716 (2008).
37. Dioxins are chemical compounds that are known to cause cancer. Salman Zafar, Negative Impacts of Incineration-Based Waste-to-Energy Technology, Alternative Energy (Sept. 25, 2008), http://www.alternative-energy-news.info/negative-impacts-waste-to-energy/
43. Id. at 1.
44. Id.
Under RCRA, landfills built after 1994 are required to use liners and implement a groundwater monitoring system to prevent water contamination. These regulations have not been entirely successful, however, and do not require liners for small or preexisting sites. Every day, landfills continue to leak leachate, a hazardous sludge that poisons freshwater sources.

Leachate is not the only harmful substance brewed in the depths of landfills. As MSW decomposes, greenhouse gases are produced. Landfill gas is composed of 25–50% CO₂ and 50–75% methane. Alarming, methane is considered to be at least twenty times more potent as a greenhouse gas than CO₂.

B. Choosing a Waste Management Solution

Landfills continue to be a cornerstone of waste management systems in the United States, despite their harmful nature. States have typically chosen to continue using landfills because building new WTE facilities is relatively expensive. Most plants cost at least $100 million. New landfills may be half as expensive as a WTE plant when considering the cost of construction, permitting, operating, and overhead.

Recognizing the dangers posed by landfills, some communities have discontinued using them within their borders, only to send MSW to landfills in distant states. New York City, for example, began exporting its waste to Virginia, Pennsylvania, and Ohio after the city shuttered its landfills but failed to implement WTE. New York is now paying more for trash removal than it would have were WTE adopted. Not all communities have to make 400-mile hauls (the distance from New York to Virginia), so the upfront cost of WTE may prove too much for municipalities that export waste at less cost. Unfortunately, as the situation in New York demonstrates, WTE suffers from a “not in my back yard” problem, premised on misconceptions about WTE. For this reason, some communities continue to choose landfills—at home or out of state—over WTE, even if at a premium.

C. Second-Class Treatment: WTE Misunderstood

Policymakers in the United States have not done enough to make WTE a more attractive investment for communities and private operators. Unfortunately, an incorrect public perception that waste incineration is worse for the environment than landfills has hampered government support and new development of WTE facilities. Federal- and state-level waste-management and energy policies are flawed because they do not favor WTE over landfills and they do not value WTE’s electricity-generating potential as equal to other renewable energy sources. Specifically, EPA’s Waste Hierarchy, the Energy Policy Act of 2005 (“EPACT-05”), and renewable energy portfolios implemented by the states, all give WTE a lesser status than is deserved.

1. Waste Hierarchy

The EPA Waste Hierarchy is a guideline that ranks waste management strategies in terms of their environmental impact. The primary concern with the EPA Waste Hierarchy is that WTE is not favored over the use of landfills. The Waste Hierarchy treats landfills that capture landfill gas for energy purposes and WTE as equivalent—both are defined as “Energy Recovery,” the third most-favored option for waste management. However, more than 20 years ago “a general consensus [had] developed among waste management profes-

50. 40 C.F.R. §258.1(e)–(d)(1), (f)(1) (July 1, 2011).
52. Landfills produce approximately 22% of methane emissions in the United States. Bennett, supra note 14, at 533.
53. Id. at 532.
58. Bennett, supra note 14, at 543.
59. See id. at 542.
sionals that a hierarchy of waste management options exists\textsuperscript{74} which places WTE above the use of landfills.\textsuperscript{68} Despite this consensus, many states have adopted waste hierarchies that substantially align with EPA’s, placing WTE and landfill gas recovery on the same level.\textsuperscript{69}

2. Renewable Portfolio Standards

WTE’s potential for energy generation is also undermined by the poor design of states’ renewable portfolio standards (“RPS”), which do not often promote waste incineration. Renewable Portfolio Standards serve as a state’s commitment to produce a specific percentage of its energy from qualified renewable sources by a given year.\textsuperscript{70} As such, RPS serve as a primary mechanism for states to drive investment in renewable energy.\textsuperscript{71} As of January 2012, a majority of states had enforceable RPS.\textsuperscript{72} States with enforceable standards have seen considerable gains in the production of renewable energy from qualified sources.\textsuperscript{73} A typical RPS includes wind, geothermal, and biomass as qualified renewable energy sources.\textsuperscript{74} However, few states have made WTE eligible as qualifying to meet RPS goals.\textsuperscript{75} Such policy decisions have significantly hindered investment in new WTE, as RPS are prime drivers for the development of new renewable energy generation.

States often use preferential treatment to distinguish among renewable technologies. For example, some RPS set distinct production goals for a given group of preferred energy sources.\textsuperscript{76} These groups are called tiers. Therefore, qualifying WTE as a renewable energy resource under state standards will not guarantee new investment unless WTE is placed in the top tier.


\textsuperscript{72} Today in Energy: Most States Have Renewable Portfolio Standards, supra note 70.


\textsuperscript{74} Today in Energy: Most States Have Renewable Portfolio Standards, supra note 70.

\textsuperscript{75} Paradoxically, some states have included landfill gas recovery as meeting the renewable standard. Braverman, supra note 73, at 15.


\textsuperscript{78} Conn. Gen. Stat. §16-1(a)(27).


\textsuperscript{80} Id.


\textsuperscript{83} Id. §1703, 1705 (codified as amended at 42 U.S.C. §16511–16).


\textsuperscript{86} Database PTC, supra note 84.

\textsuperscript{87} Department of Energy (“DOE”) loan guarantees also incentivize the development of new renewable energy projects on a competitive field with fossil fuels by subsidizing the cost of production. \textsuperscript{84} Electricity production that qualifies for PTCs earns credit against future taxes, calculated on a per kilowatt basis, using rates that vary by renewable energy source.\textsuperscript{85} Although WTE qualifies for the PTC incentive, it only earns 1.1c per kWh, whereas wind, closed-loop biomass, and geothermal energy earn 2.3c per kWh.\textsuperscript{86} Unfortunately, WTE is treated as equivalent to landfill gas recovery, which is also eligible to receive a 1.1c per kWh credit.\textsuperscript{87}

One characteristic that is common among tiered systems is that WTE falls at the bottom.\textsuperscript{77} In Connecticut for example—where WTE is a Tier II resource—20% of the State’s commercial electricity must be produced by Tier I renewable source by 2020, whereas only 3% must come from Tier II sources.\textsuperscript{79} Notably, Tier II sources like WTE can be avoided altogether if 23% of electricity comes from Tier I sources, allowing Connecticut to rely on fossil fuels for the remainder of their energy needs.\textsuperscript{80} Because classification can affect the demand for a particular renewable energy source, the Mayor of Hartford, one of Connecticut’s largest cities, has testified in support of reclassifying WTE as Tier I.\textsuperscript{81}
ects by expanding access to capital.\textsuperscript{88} Section 1705 of the EPAct-05 guaranteed loans for the rapid deployment of both innovative and commercial renewable energy and electric power transmission projects.\textsuperscript{89} WTE is included among the renewable technologies that qualify for this incentive,\textsuperscript{90} but in 2011, Congress failed to renew authorization for the section 1705 incentive.\textsuperscript{91}

In light of this background, one must consider if federal incentives encouraging the use of WTE are sufficiently meaningful. Capital for new WTE plants may be hard to secure without loan guarantees, and investors may choose to upgrade existing landfills over building WTE plants because they will receive the same incentive for what will likely be a smaller investment. No new WTE facilities have been built in more than a decade.\textsuperscript{92} The current system of incentives must be changed.

III. Benefits of Waste to Energy

WTE is an optimal solution for waste management and should be implemented for the following three reasons: (1) WTE facilities will reduce our reliance on the use of landfills; (2) WTE delivers baseload power and will reduce American reliance on coal; and (3) WTE is not dependent on geographical features like other renewable energy sources and can benefit communities in all regions of the United States.

A. Dumping the Landfills

Investing in WTE reduces reliance on landfills. In fact, states with the greatest number of WTE power plants have the fewest landfills.\textsuperscript{93} In the Northeast—where landfills are more costly because of high population density—there are six hundred fewer landfills and thirty more WTE power plants than in the more sparsely populated West.\textsuperscript{94} Connecticut will close down its last MSW landfill in 2015, making it the first state to completely abandon the practice.\textsuperscript{95} The state was able to achieve this goal, in part, because of its reliance on WTE. Approximately 68% of Connecticut’s MSW in 2010 was used for generating energy at the state’s six WTE power plants.\textsuperscript{96} Combined, these facilities generated approximately 1.27 million MWh of electricity,\textsuperscript{97} equivalent to 10% of the state’s electricity demand.\textsuperscript{98} More than 35 tons of metal was recovered from the MSW ash and the state maintained recycling levels above 24%.\textsuperscript{99}

B. Reliability and Baseload Power

Another key benefit of WTE is its ability to operate as a source of baseload power.\textsuperscript{100} Only plants that “can generate dependable power to consistently meet [minimum] demand” are considered baseload generating sources.\textsuperscript{101} Typically, these plants must be capable of 70% annual utilization rates,\textsuperscript{102} also known as a capacity rating. Whether an energy source can generate baseload power is significant because utilities buy at least 35–40% of their electricity from baseload sources.\textsuperscript{103}

Coal is currently the primary source of baseload power in the United States.\textsuperscript{104} As states reduce their carbon footprints by closing coal-fired power plants, the growth in public transportation and the use of electric vehicles will strain states’ abilities to meet baseload demand,\textsuperscript{105} if not replaced with electricity from baseload renewable sources. Fortunately, WTE can serve as this baseload power source that reduces American reliance on coal. WTE has a 90% capacity rating,\textsuperscript{106} far exceeding the 70% requirement for baseload power. This is unsurprising as there is a “constant need for trash disposal.”\textsuperscript{107} WTE, unlike other renewable electricity generation, is capable of operating 24 hours a day for practically every day of the year.\textsuperscript{108} The significance of this reliability is obvious when considering that WTE maintained power generation during devastating Florida hurricanes.\textsuperscript{109}

C. In Support of Local Communities

WTE is also favorable because of its geographical independence and ability to support local communities. A WTE facility does not take up significant space and can be built

\textsuperscript{89} 42 U.S.C. §16516.
\textsuperscript{91} The Department of Energy’s authority to enter into §1705 expired on September 30, 2011. 42 U.S.C. §16516(e).
\textsuperscript{92} See U.S. EPA, Energy Recovery From Waste, supra note 7 (noting that the last WTE facility was built in 1995).
\textsuperscript{93} U.S. EPA, MSW Generation, Recycling, and Disposal, supra note 8, at Tables 27 & 28.
\textsuperscript{94} See Rosenthal, supra note 45.
\textsuperscript{95} U.S. EPA, MSW Generation, Recycling, and Disposal, supra note 8, at Tables 26 & 27.
\textsuperscript{98} Id. at 8.
\textsuperscript{99} Humes, supra note 4, at 235.
\textsuperscript{100} Conn. Dep’t of Energy & Envtl. Prot., supra note 97, at 2.
\textsuperscript{101} Michaels, Waste Not, Want Not, supra note 21, at 7.
\textsuperscript{103} Martin Nicholson, The Power Makers’ Challenge: And the Need for Fission Energy 77 (2012).
\textsuperscript{104} Cordaro, supra note 102, at 3.
\textsuperscript{105} Id.
\textsuperscript{106} See id.
\textsuperscript{107} Michaels, Waste Not, Want Not, supra note 21, at 7.
\textsuperscript{108} Id.
\textsuperscript{109} Id. The utilization or capacity rating of wind and photovoltaic energy is necessarily limited by weather. As previously noted, traditional base-load sources, such as coal, are less favorable due to their environmental impact. See supra Part III.B.
\textsuperscript{110} Michaels, Waste Not, Want Not, supra note 21, at 7. At least three nuclear plants shut down in preparation for Hurricane Sandy.
anywhere. A typical facility in Lee County, Florida, operates on a parcel of land that is approximately 50 acres and generates 50 MW of electricity daily. To produce a corresponding megawatt output from solar facilities, in the best of conditions, at least 250 acres would be necessary. Likewise, for a wind farm to generate 50 MW, it would require more than 120 acres of land. Because WTE power plants require less land, facilities are typically built near large urban centers, which reduces the cost of waste disposal and power transmission.

Unlike wind and solar, which rely on economies of scale in order to be practical, WTE can be sized to fit the community it serves. For example, in 1991, Spokane, Washington built a small facility that only generates 16 MW per day while serving the waste disposal needs of the city’s 430,000 ratepayers. The facility cost $110 million, but the city has managed to cover operating expenses and pay off its debt service with a $98 per ton tipping fee. Spokane made the last payment on its bonds in 2011. Now that the facility is debt free, it can charge as little as $38 per ton and still break even. Unfortunately, few communities have decided that the high capital cost is worth the investment, and no new facilities have been built since 1995.

WTE tipping fees are typically lower than $98 per ton—the national average was approximately $67 per ton in 2009. In major cities, where tipping fees at landfills may be more expensive than $67 per ton, WTE should become the obvious choice for waste disposal. Unfortunately, $67 per ton is more than the national average at landfills, which is why Congress must take action to support the financing of new projects.

But even in smaller communities, where landfill use is typically cheaper up front, WTE has significant long-term financial benefits. Unlike exporting waste or importing energy, WTE creates local jobs, which stimulates the local economy. Local residents may also benefit from reduced heating costs as some WTE power plants pipe excess heat directly to nearby homes. Though these investments demand significant up-front capital, a number of these projects have paid off.

Where WTE projects have been successfully managed, local governments have used revenues from power generation to fund recycling programs. In Spokane, for example, since opening a WTE power plant, the city has increased its recycling rate to 50%, well above the national average of 26%. These additional benefits add up, and may be worth the cost imposed by a $98 per ton tipping fee.

IV. Driving Investment in WTE Through Federal and State Incentives

Given the benefits of WTE facilities and the overwhelming evidence that they are preferable to landfills, the United States must promote investment in new WTE power plants as the solution to its waste management crisis. To accomplish this goal, EPA must revise its waste hierarchy and states must amend their RPS so that WTE facilities are explicitly listed as preferable to landfills with energy recovery. Additionally, Congress should amend EPACT-05 to make the financing


113. Id., supra note 4, at 23.


116. Because regional power grids that make up our national system do not easily transfer power, it is impractical to limit power generation to any specific region of the country. For example, solar plants in the Southwest, which transmits over the Texas Interconnect, cannot power homes in the Northeast, falling within the Eastern Interconnect. Lynn M. Fountain, Johnny-Come-Lately: Practical Considerations of a National RPS, 42 CONN. L. REV. 1475, 1482 (July 2010).


119. Id.


121. Crawford, supra note 35, at 3.

122. In 2009, the net cost of operations, less the cost of debt, was $9.8 million. Considering the facility burns 720 tons of waste, 365 days a year, the cost of operations equals $37.29 per ton of MSW. See generally Waste to Energy Facility, Spokane Waste to Energy, http://spokanewasteenergy.com/WastetoEnergy.htm (last visited Sept. 23, 2013).


125. See Rosenthal, supra note 45 (noting that New York City’s exports its waste to distant landfills for costs significantly more than $65 per ton).


127. Id.


129. WTE that provides home heating is commonplace in Denmark and Germany, and has been accepted by many communities, in part, because of ratepayers reduced heating costs. See Rosenthal, supra note 45.

130. A number of bond-financed WTE facilities enjoy top ratings from the various investment ratings agencies. Also, news reports about facilities that are struggling financially point to the exception, not the rule. See generally Crawford, supra note 35, at 1–3.


132. See Crawford, supra note 35, at 3; Hours of Operations & Fees, supra note 120.

133. Only 26% of the MSW stream was recycled in 2010. U.S. EPA, MSW Generation, Recycling, and Disposal, supra note 8, at Table 29.

134. Hours of Operation & Fees, supra note 120.
of new WTE facilities more practical for municipalities and independent investors.

Part A details how EPA should update the waste hierarchy to promote WTE over landfills and why this action should cause states to consider doing the same. Part B suggests that states revise their existing RPS by making WTE a first-tier renewable energy source. Part C suggests making WTE eligible for PTCs equal to other renewable energy sources. Part D proposes reinstating the DOE section 1705 loan guarantee program. Taken together, these proposals will reduce the high cost of implementing WTE that has forestalled investment in years past and limit the future use of landfills.

A. Changing the Waste Hierarchy

EPA must revise its waste hierarchy to place WTE above landfills with energy recovery because WTE is a superior solution for both waste management and renewable energy generation. This step may seem symbolic, but many states take cues from EPA and follow similar hierarchies. Therefore, this proposal will have effects that trickle down to the waste management decisions made at the state and municipal levels.

New York City provides one example where adoption of EPA’s hierarchy has had a negative impact on the implementation of WTE. Beginning in the late 1980s New York went through a movement to rid the city of all landfills. Although New York prioritized WTE over landfills (without energy recovery) by statute, this was not the case in practice. Waste reduction and recycling were prioritized over WTE and landfills, and WTE would only be implemented if the cities recycling efforts were first successful. Because the recycling program did not meet its stated goals, use of WTE never came to fruition and the city was forced to export their waste to distant landfills. Had New York City implemented a hierarchy that required the use of WTE over landfills (in and out of state) regardless of recycling rates, it would not only have been free from the burden of exporting waste, but it also would have benefitted from increased electricity production from a renewable energy source.

The other problem plaguing New York City was the perception that WTE was a hazardous polluter. This perception is the reason the city has not built any WTE facilities. Widespread dissemination of positive WTE emissions data could play a significant role in making WTE a reality across America. If waste hierarchies were rewritten to reflect this data, public perceptions would likely change.

B. A Better Renewable Portfolio Standard

In addition to updating waste hierarchies, states must amend their RPS to make WTE a qualified first-tier renewable energy source. Regardless of any revisions to the waste hierarchy, states may face pressure to amend their RPS as WTE gains a more favorable public perception. Market choices will also influence whether states choose to further incentivize WTE under existing standards. If developers invest in WTE due to increased federal incentives or otherwise, states failing to make WTE Tier I may be forced to import renewable energy from other states, at a higher cost, in order to meet their renewable-consumption goals.

Connecticut and Maryland provide divergent examples of how states have used their RPS to encourage development in WTE. As previously discussed in Part III.A, Connecticut has long accepted WTE as a superior waste management solution to landfills. Recently, however, failure to amend the state’s RPS to reflect this preference has hindered the financial performance of the state’s existing WTE power plants. In support of reclassifying WTE as Tier I renewable energy source, the Mayor of Hartford argued that a reclassification would stabilize tipping fees and make electricity rates more predictable for ratepayers. Unfortunately, a bill amending the state’s RPS has yet to pass and Connecticut may be forced to import renewable energy to meet its RPS goals. Unlike Connecticut, Maryland has recently amended its RPS to make WTE a Tier I renewable energy source. As a result of this legislation, it is anticipated that electricity generation from WTE will more than double over the next decade.

As supported by the example above, when a state promotes WTE to Tier I status, new development will likely follow.

136. Behnke, supra note 15, at 112 (noting that New York DEC issued its plan in 1987 to close 258 of the state’s municipal landfills by 1997, leaving only 100).
137. Local Solid Waste Management Planning (LSWMP), N.Y. DEPT. OF ENV’T CONSERVATION, http://www.dec.ny.gov/chemical/47861.html (last visited Apr. 7, 2013), citing New York State Environmental Conservation Law 27-1061.1 (noting that the top solid waste management priority is to reduce the amount of solid waste generated; then second, to reuse material for the purpose for which it was originally intended or to recycle material that cannot be reused; third, to recover, in an environmentally acceptable manner, energy from solid waste that can not be economically and technically reused or recycled; and fourth, to dispose of solid waste that is not being reused, recycled or from which energy is not being recovered, by land burial or other methods approved by the department).
139. Id.
140. Id. at 108.
141. Id. at 140.
142. In Connecticut, where WTE is already commonplace despite a lack of federal incentives, the choice to designate WTE Tier II has forced the state to look to its neighbors for qualifying renewable energy. An Act Concerning the Reclassification of Trash to Energy Facilities as Class One Renewable Energy Sources: Hearing on H.B. 5118 Before the H. Comm. on the Environment, 2012 Leg., Sess. (Conn. 2012) (testimony of Mayor Pedro E. Segarra, City of Hartford).
143. CONN. DEPT. OF ENERGY & ENVTL. PROT., supra note 97.
144. An Act Concerning the Reclassification of Trash to Energy Facilities, supra note 142.
145. Id.
146. Id.
However, when WTE remains Tier II, states may be forced to import renewable energy at the expense of their existing power plants. For these reasons, states must amend their RPS to encourage the development of new WTE facilities.

C. Amending EPACT-05 to Increase the PTC

1. The Language of the Bill

Congress should amend EPACT-05 to make WTE eligible for PTCs equal to those available for new wind and photovoltaic energy projects. Congress should also amend EPACT-05 to extend the expiration of the PTC incentive. The amendment to Title 26 United States Code should read as follows:

Section 1. Renewable Energy Production Tax Credit

(a) In General.—Subsection (a)(4)(A) of Section 45 shall be amended by striking the existing language and replacing it with the following:

“(A) Credit Rate. There will be considered two tiers of qualified facilities for the purposes of this tax credit.—

“(i) The first tier is eligible to receive the full value of the tax credit, and includes: qualified wind, geothermal, closed- and open-loop biomass, certain municipal solid waste, and small irrigation power facilities as described in subsection (d).—

“(I) Waste to energy or trash facilities, as described in subsection (d), shall be qualified first tier.—

“(ii) The second tier may not receive more than half of the full value of the production tax credits.—

“(I) The second tier consists of the qualified facilities described in subsection (d) but not listed above in subsection (a)(4)(A)(i). —

“(II) Landfills with energy recovery shall be deemed second tier facilities for the purposes of this tax credit.—

These provisions will mitigate the challenges posed to financing a WTE facility and should encourage the development of new plants.

The goal of increased WTE utilization and reduced reliance on landfills should not be limited in time. Therefore, Congress should also extend the period of time for which new WTE facilities are eligible to receive the benefits of PTCs. The second section of the PTC amendment should read as follows:

Section 2. Expiration

(b) In General.—Subsection (d)(7) of Section 45 by striking the existing language and replacing it with the following:

“(7) In the case of a facility (other than landfill gas recovery) which uses municipal solid waste to produce electricity, the term “qualified facility” means any facility owned by the taxpayer which is originally placed in service after the date of the enactment of this paragraph and the construction of which begins before any year, in which any preceding year (since the year of enactment) saw more than ten percent of the United States’ MSW discarded in landfills. A qualified facility includes a new unit placed in service in connection with a facility placed in service on or before the date of the enactment of this paragraph, but only to the extent of the increased amount of electricity produced at the facility by reason of such new unit.

Provided that Congress adopts these amendments, development in WTE should increase until the point where the majority of our MSW is processed by incineration (or recycled) as opposed to being dumped in landfills.

2. PTCs Are a Proven Success

Growth in the wind power sector provides the strongest evidence that PTCs are effective. From 2005–2012, energy production from wind farms in the United States has grown on average 16% annually.149 This annual growth rate amounts to a 667% increase in total supply over the past decade.150 A driving force behind this rapid development is the 2.3¢ PTC.151 In the last decade, the tax credit has been scheduled to lapse numerous times.152 When expiration approaches, developers suggest that they will stop investing in wind power if Congress fails to grant an extension.153 Holding up their end of the bargain, the wind industry has staggered when the PTC has been allowed to sunset.154 But after investment dips, Congress has reauthorized the provision and the industry has boomed.155 In 2012, wind power became the top source of new generation after developers rushed to get projects online before the expiration scheduled in December of that year.156

3. An Increased Incentive Will Spur Development

WTE has not experienced the same highs associated with reauthorizations of the PTC. Ignoring the political opposition to WTE, the simplest explanation for the lack of new development is the cost.157 A large facility may require up to $350 million in capital and incur $28 million in annual


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150. See id.
155. Congress has authorized the extension of the PTC five times since 1992. Id.
157. COMBS, supra note 115, at 260.
operating expenses.158 Much of this cost can be recovered with revenue coming from both tipping fees and electricity generation.159 To fill the gap, however, further government incentives are necessary.160 The meaningful impact of PTCs for most developers does not come at the point of sale to the utilities, but when the facility is first developed.161 Project developers monetize PTCs by selling their future rights to the tax benefit, thereby providing another stream of financing for the upfront cost of building the power plant.162

Given the differences between the operation of a WTE facility and a wind farm, it is reasonable to ask whether increasing the PTC for WTE to $2.34 will have the same effect on the financing of new projects. The best metric to compare the relative price of energy production from different sources is a levelized cost, which accounts for factors such as the useful life of an operation, generating capacity, installed capital costs, and annual operating expense.163 Using this metric, on-shore wind costs approximately 7¢ per kWh.164 Considering that the PTC for wind is 2.34¢ per kWh,165 it should be obvious why this incentive has a significant impact. The levelized cost of WTE will vary depending on the size of the power plant, but 7¢ per kWh falls within the price range for a typical facility.166 The specific factors that determine the actual cost will be different for each local government, but given that the cost of the two technologies is in the same range, the impact of giving twice as many PTCs to one technology over another will certainly influence investment decisions.

If the PTC for WTE increases from 1.1¢ per kWh167 to 2.34¢ per kWh, new investment is likely to follow. An expiration tied to development goals will mitigate the volatility in development—like that seen with wind projects—because investors will be able to better forecast when the expiration expires, as compared to guessing whether Congress will or will not grant an extension. By tying the expiration to the percentage of MSW sent to landfills, new WTE facilities will ultimately replace landfills as the cornerstone of waste management.

D. Reviving DOE Loan Guarantees

1. The Amendment Reviving Loan Guarantees

Congress should also amend EPACT-05 to revive DOE’s 1705 loan guarantee program and extend the opportunity for WTE to compete on an equal basis with other qualifying technologies. Like the PTC amendment, this incentive should not have a predetermined expiration. The amendment to Title 26 of the United States Code should read as follows:

Section 3. Loan Guarantees

(a) In General.—Subsection (a)(1) of Section 16516 shall be amended by adding the following:

“(A) Expiration. Notwithstanding the September 2011 expiration of this program, new construction for qualified waste energy facilities, as described in Section 45(d), remain eligible to receive loan guarantees until the U.S. Energy Information Administration determines that less than ten percent of MSW was sent to landfills in any preceding year (following the enactment of this provision).

Loan guarantees have been described as “one of the financial engines powering clean energy investments across the United States.”169 PTCs will make financing and operating a WTE facility more competitive, but loan guarantees are the surest way to raise capital.

2. Why Loan Guarantee Are Necessary

Loan guarantees make financing easier because financial institutions are more willing to lend with the assurance of being backed by “creditor of last resort, the United States government.”169 PTCs, on the other hand, do not give an investor the same security. PTCs are most meaningful if they can be monetized at the time of financing a project.170 For this reason, the developer is subject to market demand. Large projects that generate a significant number of PTCs may have difficulty finding a single investor due to the risk associated with a lack of diversification.171 Additionally, if a project is controversial and therefore subject to delays, an investor may consider PTCs too speculative.172

Implementing WTE should not be a controversial decision, but given the misconceptions surrounding WTE, proposed plants may face stiff opposition.173 For this reason, loan guarantees will be necessary in at least some instances.

158. Id.
159. Id.
160. Id.
162. Id.
164. Id. at v.
167. Internal Revenue Service, supra note 151, at 20177.
170. See Ben-Moshe et al., supra note 161, at 516–17.
171. Id. at 515.
172. Cf. id. (noting that PTCs are inappropriate for nuclear energy because of a projects inherent risk).
173. In 2012 Baltimore citizens attempted to prevent a developer from finishing a new WTE facility because they believed it would “start spewing ash, particulates, [and] heavy metals” all across the surrounding neighborhoods. Shen, supra note 24.
Despite these risks, DOE loan guarantees have been wildly successful.174 In the context of solar development, four of the five largest solar farms would not exist without the support of 1705 loan guarantees.175

Though loan guarantees have proven successful in many instances, the reauthorization of 1705 loan guarantees will be an uphill battle. Prior to the expiration of the program, the House of Representatives passed a bill seeking to limit loan guarantees in the wake of the highly publicized bankruptcy of loan recipient Solyndra.176 This bankruptcy, however, does not discredit the program’s success. Out of $16.1 billion committed to new projects, loan recipients only defaulted on $300–$400 million.177 This equates to approximately 2% of the total guarantees. Like commercial lenders, the government budgeted for anticipated defaults.178 With a $2.47 billion loan guarantee reserve, a $300 million default leaves 85% of the reserve intact.179

Like an investment portfolio, a basket of loan guarantees cannot be judged on the success of any individual outcome, but must be gauged on the performance of the portfolio as a whole.180 Before it expired, DOE’s 1705 program was responsible for kick-starting enough clean energy projects to bring electricity to more than 2.5 million homes.181 Significantly, the program was also directly responsible for creating American jobs and indirectly responsible for “slowing severe job loss” during the economic recession.182

For the reasons stated above, loan guarantees should be seen as a resounding success that could be repeated with WTE. As previously noted with respect to PTCs,183 tying the expiration of eligibility for loan guarantees to the percentage of MSW sent to landfills will ultimately lead to WTE becoming a cornerstone of waste management.

V. Addressing the Counter Arguments

Benefits aside, WTE power plants do have some drawbacks. As such, it is important to address the arguments against WTE in greater detail.

A. Environmental Impact and Life-Cycle Emissions

While accepting that landfills are hazardous, proponents of the status quo may argue that communities should not adopt WTE because its environmental impacts are worse than the alternatives. This contention is false as it fails to consider the life-cycle impacts of both energy generation and waste management. As previously discussed,184 WTE is better than the alternatives for the following reasons: (1) one ton of greenhouse gas emissions are avoided for every ton of MSW processed by WTE as opposed to being dumped in a landfill;185 (2) high-efficiency filtration systems have reduced dioxin emissions by greater than 99%;186 and (3) three million pounds of greenhouse gas emissions are avoided for every kilowatt-hour of electricity generated by burning MSW as opposed to fossil fuels.187

Another way to consider the life-cycle impact of energy generation and waste management is by using EPA’s MSW—Decision Support Tool (“MSW-DST”).188 This software considers long-term impacts on (1) resource consumption, (2) environmental emissions, and (3) cost so that communities can consider the full impact of its waste management decisions.189

Using the MSW-DST, a 2007 study considered waste management options for a medium-sized community with a population of 750,000.190 The results showed that WTE had the least negative environmental impact out of the likely waste management scenarios under consideration.191 The results concerning carbon-equivalent emissions are the most compelling. Out of ten scenarios considered,192 the scenario using 70% WTE and 30% percent recycling resulted in the least environmental impact.193 In this scenario, life-cycle emissions of greenhouse gases were actually negative due to the avoidance of the production of 30,000 tons of CO₂ equivalents.194 In contrast, the scenario using 70% landfills and 30% recycling resulted in 30,000 tons of greenhouse gas emissions, a 60,000-ton variance from WTE.195 The results of this study indicate that WTE is far better for the environment than the use of landfills, even those with energy recovery.196

174. Tracey, supra note 168, at 364.
175. Id.
178. Id. at 20.
179. Id.
180. Id. at 22.
181. Id. at 21.
182. Id. at 27.
183. See supra note Part IV C.
184. See supra Part I.B & I.C.
186. U.S. EPA, Memorandum, supra note 42.
189. The use of full cost accounting and life-cycle inventory can offer the best guidance as to what are the true advantages or disadvantages of a particular waste management solution. Id. at 1006.
190. Id. at 1009.
191. Id. at 1019. Key assumptions included: (1) population of 750,000; (2) waste generation of 5.3 lbs per person per day; (3) use of WTE offset by decrease in the combustion of baseline coal; (4) use of landfill gas recovery offset by decrease in fuel oil or baseline coal depending on whether the gas is piped to a boiler or combusted on site; (5) once a week waste collection; (6) local landfill, compost, WTE, transfer, or MRF facilities located approximately 10 miles from collection; and (7) transport to out of state landfills cover approximately 500 miles. Id. at 1009, 1011–12, 1014.
192. The scenarios include a different mix of recycling, local landfills, exported waste, landfill gas recovery, and WTE. Id. at 1010–12.
193. Id. at 1019.
194. See id. at 1014, Fig. 9, 1019.
195. Id. at 1014, Fig. 9.
196. The scenario using landfill gas recovery for the purpose of energy generation also resulted in positive life-cycle greenhouse gas emissions. Id. 1014, Fig 9., 1018–19.
B. Recycling Compatibility

Critics of WTE may also posit that WTE is not compatible with recycling. These critics rely on statistics noting that over 90% of materials burned or buried can be reused, recycled, or composted. However, this statistic is fatally flawed. As shown by the 2007 MSW-DST study, a typical town may find that recycling is not economical at rates greater than 30%. As New York City experienced during its fiscal crisis, where the recycling goal was set at 25%, the market for recycled goods dried up as supply continued to increase. Most compelling, average recycling rates are higher in communities that use WTE. For this reason, the contention that WTE is not compatible with recycling does not hold water.

C. Upgrading Landfills to Recovery Energy

Because WTE plants are expensive, critics may instead suggest upgrading existing landfills to recover gas emissions for energy purposes. Although this suggestion is better than doing nothing, it is not the best solution. Landfill gas recovery is inefficient—as much as 40% of the methane created by landfills escapes into the atmosphere. In the long run, WTE provides returns more energy and profit for every ton of MSW. The average WTE facility will generate 550 kWh of electricity and up to $30 in revenue per ton of MSW, whereas landfill gas recovery generates no more than 84 kWh and less than $9 in revenue per ton of MSW. Therefore, from the same waste stream a community may either update an existing landfill to recover a nominal amount of its potential energy, or raise the capital to implement WTE and make up the cost by producing up to thirteen times as much energy.

D. Indefinite Expiration of the Incentive

Finally, critics may argue that it is unrealistic to limit landfill usage to less than 10% of the MSW stream. As demonstrated by Connecticut, however, this is not the case. In 2008, the state relied on landfills for approximately 11% of its MSW disposal. Likewise, a number of European countries have relied on WTE coupled with the promotion of recycling to reduce their use of landfills. Currently, Germany, the Netherlands, Sweden, Belgium, and Denmark all send at least 30% of their MSW to WTE facilities, and use landfills at rates less than 10%. Because it is possible to avoid harms of landfills altogether, tying the WTE incentives to a reduction in their use is the appropriate way to ensure that WTE facilities replaces landfills as the cornerstone of waste management.

VI. Conclusion

Consumption and the waste it creates is a concern that should be at the forefront of every American’s mind. Each year the United States generates waste at alarming rates, a majority of which winds up buried in the ground and results in eyesores like the Fresh Kills landfill, visible even from space. Such mountains of waste do more than harm the environment: they lock away valuable resources, which could otherwise provide renewable energy. With both an ongoing waste crisis and a growing energy deficit, the United States cannot afford to continue throwing away our future.

WTE presents the best solution for the United States growing waste management crisis. Aside from producing baseload energy, WTE mitigates greenhouse gas emissions from both landfill usage and the combustion of fossil fuels for energy production. Negative public perception and prohibitively high capital costs have hampered new WTE development. This should not be the case—public perception surrounding WTE has been misinformed and the cost of constructing new plants can be mitigated with federal and state action.

For the foregoing reasons, the following actions should be taken: (1) the EPA must revise its waste hierarchy to promote WTE above the use of landfills with energy recovery, (2) states must promote WTE to first-tier status under their existing RPS, and (3) Congress must increase the PTC incentive for WTE and reauthorize the 1705 DOE Loan Guarantee Program. If these actions are taken, we may no longer have the problem of figuring out where to haul our waste.

With WTE, our waste legacy will change from burying two homes’ worth of garbage per person to providing the fuel that generates the electricity used in our daily lives. Ultimately, waste reduction may be the final goal, but for the foreseeable future, the production of waste will continue at historic rates. WTE can replace landfills, reduce greenhouse gas emissions, generate base load electricity, and stimulate local economies. To ensure a brighter future, where waste is not put to waste, WTE power plants must become the cornerstone of an improved waste management paradigm.

197. Tan, GAIA, supra note 25.
198. Id.
199. See Thorneolocation, supra note 61, at 1013.
201. Id. at 124–25.
203. See Landfill Gas Basics, supra note 56, at 1–8.
205. P. Ozge Kaplan, Joseph Decorolos, & Susan Thorneolocation, Is It Better to Burn or Bury Waste for Clean Electricity Generation?, 43 ENVTL. SCI. & TECH. 1711, 1716 (2009). Electricity generated by landfill gas can earn between $0.06–$0.11 per kWh. RACHEL GOLDSTEIN, U.S. ENVTL. PROT. AGENCY, AN OVERVIEW OF LANDFILL GAS ENERGY IN THE UNITED STATES, slide 11 (Apr. 2009).
206. Ted Michæls, supra note 33.
207. Id. at 7.
208. Id.
209. HUMES, supra note 4, at 11–12.