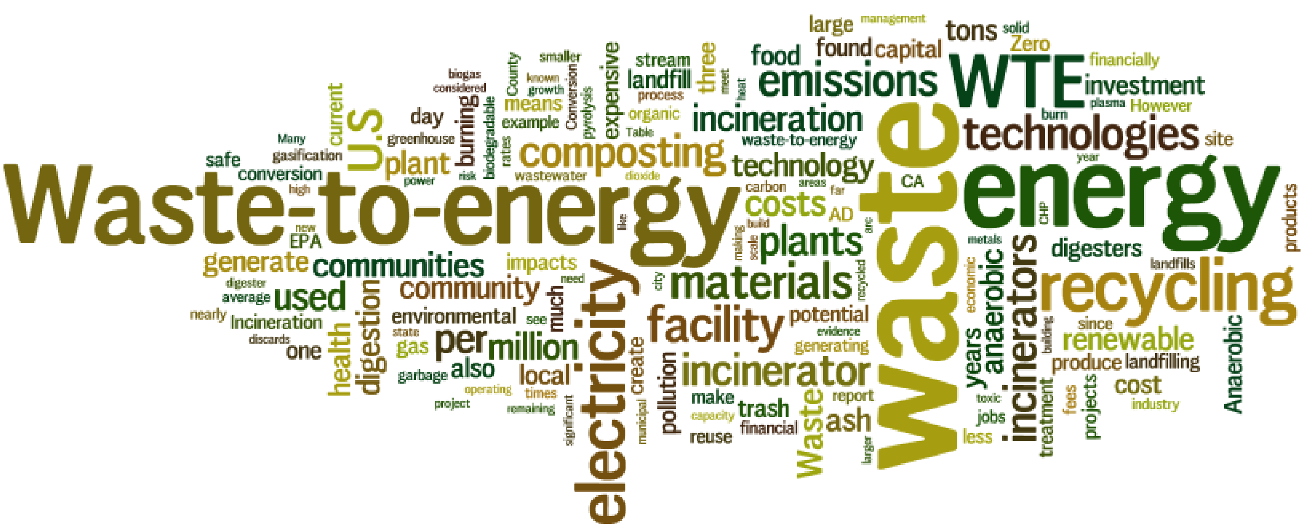
WASTE-OF-ENERGY

WHY INCINERATION IS BAD FOR OUR ECONOMY, ENVIRONMENT AND COMMUNITY



eco·cycle®

Working to Build Zero Waste Communities

SEPTEMBER 2011

www.ecocycle.org/zerowaste

EXECUTIVE SUMMARY

Eco-Cycle has been involved in the issue of what to do with society's discards if they aren't landfilled for 35 years. Our focus and expertise is in recycling, composting, reuse and waste reduction, but over the last ten years, we have been forced to become experts in another alternative—burning trash to make energy. While burning trash has always been considered as an alternative to landfilling, the industry received a tremendous jumpstart in the early 2000s when President George W. Bush and the EPA classified burning waste as a "renewable energy source," thus making waste-to-energy (WTE) projects eligible for all the tax breaks and perks intended for the solar and wind industries. Suddenly, the incinerator industry in America was alive again after a decade of no activity, and began seeking to acquire as much waste as they could in hopes of building new facilities around the country.

However, the financial reality of burning trash is that it is more expensive than both landfilling and recycling, not to mention the seriously negative environmental and social impacts of running a waste-to-energy facility. The cost, pollution and NIMBY issues in siting facilities were the issues that crippled the industry in the mid 1990s, and those three key concerns remain today. Despite the tax breaks and "renewable energy" status, the economic problems related to project scale and cost remain unresolved.

This report analyzes the three primary technologies commonly known as "waste-to-energy" (incineration, conversion technologies like pyrolysis and gasification, and anaerobic digestion) and their potential application in the U.S. **Our conclusions:**

1. Waste-to-energy is 50% more expensive than landfilling and poses an unjustified financial risk.

2. Waste-to-energy would only meet 1-3% of our electricity needs while stopping all future recycling and composting growth.

3. Waste-to-energy would produce myriad health and environmental risks that make a facility nearly impossible to site in any U.S. community.

4. Waste-to-energy is a waste *OF* energy because recycling conserves three to five times more energy than WTE generates because manufacturing new products from recycled materials uses much less energy than making products from virgin raw materials.

5. There is one waste-to-energy technology, anaerobic digestion, which does hold some potential for communities to produce energy from waste sustainably, safely and cost-effectively. In fact, anaerobic digestion is already used to create renewable energy at numerous municipal wastewater treatment plants. Communities should examine the feasibility of building an anaerobic digester to make energy from the source-separated organic (biowaste) portion of the waste stream and funding this project through renewable energy credits, carbon credits or other biogas incentives.

TABLE OF CONTENTS

What is Waste-to-Energy? 4

<u>Economic Issues</u> 5

- Waste-to-energy is not financially competitive.
- Waste-to-energy is a costly investment.
- Incineration is the most expensive method for generating electricity.
- Waste-to-energy is a risky investment.
- Conversion technologies—pyrolysis, gasification and plasma arc—are an unproven approach.

<u>Environmental Issues</u> 8

- Waste-to-energy is not safe or pollution-free.
- Waste-to-energy emissions and byproducts are neither benign nor insignificant.
- Waste-to-energy is a deterrent to recycling and composting.
- Waste-to-energy cannot co-exist with Zero Waste.
- Waste-to-energy is not climate-friendly.
- Waste-to-energy is not renewable energy.
- Waste-to-energy is a waste OF energy.

<u>Community Issues</u> 14

- Waste-to-energy will not generate significant electricity, nationally or locally.
- Waste-to-energy facilities are extremely difficult to site.
- Waste-to-energy facilities create far fewer jobs than recycling, reuse and composting.

Potential for Anaerobic Digestion 15

References 18

WHAT IS WASTE-TO-ENERGY?

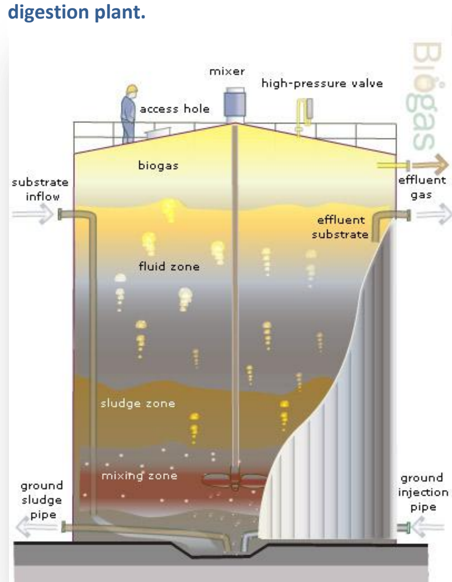
Waste-to-energy (WTE) describes a variety of technologies that convert garbage or municipal solid waste (MSW) into either heat or electricity.

Incineration: Incineration, also known as "mass burn," is by far the most common WTE technology. A waste incinerator is simply a high temperature furnace that burns garbage. The process creates heat, which is used to boil water and produce steam, which is then fed through a turbine to generate electricity.

Incineration is more efficient when used for combined heat and power (CHP), as is common in Western Europe. In a CHP plant, after the steam is used to create electricity, the hot steam is recaptured and pumped through pipelines to nearby facilities where it is used for heating. In Scandinavia, many communities have district heating pipelines laid throughout the town and are able to take advantage of CHP opportunities. CHP greatly improves both the efficiency and economics of waste incineration. However, district heating requires a very dense population and a large capital investment in pipelines and infrastructure. This is an exceptional situation globally and, due to the cost of creating district heating systems, will probably not be replicated in other locations. Co-locating CHP with a large industrial use such as a manufacturing plant is, however, a feasible future scenario and has been used in a few select situations in North America.

Conversion Technologies: Conversion technologies (CT) is a broad term covering a variety of thermal, chemical or mechanical methods to convert waste into energy or other feedstocks such as ethanol or natural gas. Gasification and pyrolysis are the most common conversion technologies, followed by plasma arc. ***There are no commercial-scale CT facilities in the U.S.***, even though these technologies have existed in the marketplace for over 20 years. The problem does not appear to be that these approaches don't "work," but rather that they fail to scale up to real world applications. Numerous plants have been built and closed because they were not economically viable or because they could not meet increasingly stringent air quality and emissions standards outside of the laboratory.

Figure 1. Cross section of typical anaerobic digestion plant.



Anaerobic Digestion: Anaerobic digesters use microorganisms to break down biodegradable materials in the absence of oxygen, and the resulting methane biogas is captured and used to generate energy. Anaerobic digesters are widely used by wastewater treatment plants to generate renewable energy from the treatment of sewage sludge, and farms are increasingly using digesters to manage and produce energy from manure.

Anaerobic digestion (AD) is categorized as waste-to-energy because it produces energy from waste. However, the similarities with other WTE technologies end there. AD is a lowtemperature thermal process where biodegradable wastes, such as food scraps, are inserted into a chamber and biodegrade over a number of days, creating a gas (methane) that is captured and used to make energy. Unlike incineration and conversion technologies, AD almost exclusively runs on a separated biodegradable portion of the waste stream, not mixed solid waste. It is more closely related to composting and managing organics than it is to a mixed solid waste disposal technology, and it is commonly analyzed separately from other WTE technologies, as it is in this report.

ECONOMIC ISSUES

1. Waste-to-energy is not financially competitive.
2. Waste-to-energy is a costly investment.
3. Incineration is the most expensive method for generating electricity.
4. Waste-to-energy is a risky investment.
5. Conversion technologies—pyrolysis, gasification and plasma arc—are an unproven approach.

Waste-to-energy is not financially competitive.

Tipping fees are the fees paid by haulers to dump large amounts of discarded materials (waste) in landfills or incinerators. Tip fees are also paid at composting facilities and can be paid at some recycling facilities, though most recycling facilities pay haulers for their materials. Tip fees at incinerators are consistently 50% higher than those at landfills. The average landfill tipping fee in the U.S. is $44 per ton while the average incinerator tipping fee is nearly $67 per ton. A recent survey of 121 communities in North America with progressive diversion programs also found incinerator tip fees were 50% more expensive than landfilling and double that of composting facilities (see Table 1).[i] Incinerator tip fees have been substantially higher than landfill tip fees since the late 1980s. This trend shows no signs of changing course, and may be one reason the amount of waste combusted in the U.S. has decreased almost 15% over the last decade.[ii]

Facility	Tip Fee per Ton
Incinerator	$92
Landfill	$61
Composting Facility	$44

Table 1. Average tip fees in North American communities with composting programs.

In some communities, the cost disparity is even more striking. For example, landfill rates on the Front Range of Colorado average $19/ton. This means waste-to-energy would cost at least four times more than current local landfilling rates.[iii] For most communities, an incinerator is simply a costly investment that raises the costs of discard management, impose financial risks and endanger the community and environmental health.

Other types of WTE facilities, such as conversion technologies, would probably face a similar economic disadvantage. Cost projections for these facilities typically fall around $57-67 per ton of waste handled, which puts them in the same price range as conventional waste incinerators. [iv] This means conversion technologies are also financially prohibitive for most areas.

Waste-to-energy is a costly investment.

The capital costs to build an incinerator average $200,000 per daily ton of capacity.[v] However, since no new plants have been constructed in the U.S. since 1995, it's hard to gauge the accuracy of this figure, so communities should look at other incinerator proposals for perspective. For example, the recently proposed incinerator in Frederick County, Maryland would cost $527 million for the 1,500 ton-per-day facility, nearly double the "average" cost.[vi]

It is commonly assumed that these upfront costs are recovered—and that this type of facility pays for itself—through the sale of electricity, but this is not the case. For Frederick County, the sale of electricity would only offset about half of the operating expenses. The remaining operating expenses would need to be covered by tipping fees or by the local government. For Frederick, the disposal fees would need to be an estimated $85 per ton to cover the remaining expenses, a sizeable increase over their current $58/ton landfill tip fee.[vii]

Many of the recently proposed incineration projects have been large-scale facilities, such as the 1,500-ton per day plant in Frederick and a 3,000-ton per day facility in Palm Beach, FL. With the growth of the "Zero Waste" approach to community discard management and the enormous capital needs of building these large incineration facilities, the idea of making smaller, cheaper WTE facilities is often discussed. Modular incineration facilities, on the scale of 5-50 tons per day, were at one time popular for commercial or industrial applications, and have been used in the past to serve smaller communities. However, these facilities have become less common because of concerns over the consistency and adequacy of air pollution controls.[viii] There are also economies of scale in building larger plants; while the capital costs are slightly lower for smaller facilities, the larger facilities average $10 per ton lower operating and maintenance costs.[ix]

While the large majority of projects proposed in North America are large-scale incinerators, there have been some proposals for smaller conversion technology projects:

- A plasma arc facility being considered in Marion, Iowa would have a capacity of 250 tons per day. The facility is estimated to cost between $104 and $172 million if constructed.
- A waste-to-biofuels plant with a capacity of 440 tons per day is under construction in Edmonton, Alberta with an estimated cost of $80 million. The facility has a contract with the city requiring Edmonton to supply 100,000 metric tons of waste per year over the next 25 years, essentially rejecting the notion that the community will do any additional recycling or composting for the next two to three decades.[x]

These small-scale (200-400 tons per day) conversion technology projects are less expensive than larger facilities but the technology has yet to prove itself in real world applications (see section on CTs), so they are viewed with skepticism. Conversion technology facilities of even smaller sizes (25-85 tons per day) are generally pilot-scale projects, built and designed as demonstrations for larger facilities. Eco-Cycle continues to monitor these projects and emerging technologies as an alternative to landfilling but has yet to find one that remains financially competitive and safe for the environment and community.

Waste-to-energy is the most expensive method for generating electricity.

Waste incinerators are hands-down the most expensive technology for generating electricity. In 2010, the U.S. Energy Information Administration (EIA) published a report showing that trash incinerators were more expensive to build and operate than nearly all other energy sources, including wind, solar, natural gas, coal and even nuclear power (see Table 2).[xi] The high cost of electricity generation and the vast upfront capital to construct a waste incinerator are nothing short of a high-risk economic gamble.

Technology	Capital Cost	Fixed O&M	Variable O&M
Conventional natural gas	$978	$14.39	$3.43
Wind (onshore)	$2,438	$28.07	$0
Conventional coal	$3,167	$35.97	$4.25
Photovoltaic (large scale)	$4,755	$16.70	$0
Nuclear	$5,335	$88.75	$2.04
Coal with carbon capture and sequestration	$5,348	$69.30	$8.04
Trash Incineration	$8,232	$373.76	$8.33

Table 2. Sample energy generation technologies with average capital and O&M costs.

Waste-to-energy is a risky investment.

No new "greenfield" (from scratch) WTE plants have been constructed in the U.S. since 1995, a telling testament to the free market skepticism of this technology, its risks and its costs.[xii] In addition, many existing plants have been shuttered due to the high costs of upgrading pollution control measures. Harrisburg, Pennsylvania is the poster child for the financial risks of a waste incinerator. The town is contemplating municipal bankruptcy and most of the blame has been placed on a single large incinerator project. Harrisburg owes $68 million in interest for its incinerator, an amount larger than the city's annual budget. The plant was shut down in 2003 because of excess pollution, but Harrisburg chose to retrofit the plant, absorbing more debt in the process to bring the current total to $282 million.[xiii] In another example, the Camden County Pollution Control Financing Authority in New Jersey did not have the cash to make its $26 million debt payment on its incinerator. In danger of defaulting, the county was saved when the state took unprecedented action by allowing the county to divert funds from other departments.[xiv] These examples show the high risk involved when absorbing the significant municipal debt required to build and operate WTE facilities.

Conversion technologies—pyrolysis, gasification and plasma arc—are an unproven approach.

There are no full-scale conversion technology (CT) facilities in the U.S. and very few in the world. Many of the zero-pollution and economic viability claims cited by these technologies are based on laboratory conditions or small-scale demonstration projects. These plants fail to meet expectations when scaled up in real world conditions. For example, the Thermoselect incinerator built in Karlsruhe, Germany—one of the world's largest trash gasification plants—was forced to close permanently in 2004 after only two years due to operational problems and more than $550 million in losses.[xv] U.S.communities that have rejected CT proposals when local authorities investigated deeper into "no pollution" or "no residue" claims include Chowchilla, CA; Alameda, CA; Romoland, CA; Hanford, CA; Sierra Vista, AZ; and Red Bluff, CA.[xvi]

A report for the state of Massachusetts found gasification and pyrolysis will not play a major role in solid waste management before 2020 for several reasons:

- the lack of experience in the U.S. with large-scale alternative technology facilities successfully processing mixed MSW and generating energy;
- the long lead times to plan, site, construct and permit such facilities;
- the significant capital costs required and the loss of solid waste management flexibility that is associated with the long-term contractual arrangements that such capital-intensive facilities require;
- and the relatively small benefit with respect to greenhouse gas emissions compared to diversion or landfilling.[xvii]

ENVIRONMENTAL ISSUES

1. Waste-to-energy is not safe or pollution-free.
2. Waste-to-energy emissions and byproducts are neither benign nor insignificant.
3. Waste-to-energy is a deterrent to recycling and composting.
4. Waste-to-energy cannot co-exist with Zero Waste.
5. Waste-to-energy is not climate-friendly.
6. Waste-to-energy is not renewable energy.
7. Waste-to-energy is a waste OF energy.

Waste-to-energy is not safe or pollution-free.

Incinerators and similar facilities emit particulate matter, volatile organic compounds (VOCs), heavy metals, dioxins, sulfur dioxide, carbon monoxide, mercury, carbon dioxide and furans. Many of these chemicals are known to be persistent (very resistant to degradation in the environment), bioaccumulative (build up in the tissues of living organisms) and toxic. These three properties make them arguably the most problematic chemicals to human health and the environment. Some of the emitted chemicals are carcinogenic (cancer-causing) and some are endocrine disruptors. Others, such as sulfur dioxide (SO_2) and nitrogen dioxide (NO_2), have been associated with adverse impacts on respiratory health.[xviii]

Several older studies demonstrate a correlation between people living near incineration facilities and higher concentrations of toxins. Increased rates of death from childhood cancer, all cancers, and cancer of the larynx, liver, stomach, rectum and lung were found in a series of studies. Elevated blood levels of PCBs, dioxins and VOCs in adolescent children were linked to delayed sexual maturation, delayed breast development in girls, and delayed genital development and reduced testicular volume among boys. Studies of workers at incineration facilities found increased death rates from cancer of the stomach, lungs and esophagus, and increased death rates from ischemic heart disease.[xix]

A National Academy of Sciences report published in 2000, “Waste Incineration & Public Health,” found there have been few studies on the health impacts of waste incinerators on local communities, and calls the existing data uncertain and inadequate. For example, stack emissions are tested only during best condition operating periods when emissions are expected to be at their lowest. Substantial data is missing from startup, shutdown and malfunctions when the greatest emissions are expected to occur. While the report does not find any clear negative health impacts from waste incinerators, it strongly questions the ability of current epidemiological methods to detect the health impacts of incinerators, given the problems isolating a definitive cause-and-effect relationship between potential environmental hazards and nearby populations.[xx]

A 2011 article published in the *Encyclopedia of Environmental Health* comes to a similar conclusion about the lack of definitive evidence—<u>the absence of evidence doesn’t mean the emissions are safe as much as it shows our epidemiological science is inadequate.</u> The article states:

> *Nevertheless, it must be stressed that the lack of consistent evidence of increased risk to health from exposure to the pollution of current waste incinerators only indicates that pollutants emitted from those well-run or punctually abnormally operated plants do not imply consistently detectable health effects by currently used methods. But absence of evidence is not evidence of absence and hence that does not necessarily mean that the very likely low-level exposures are safe…To identify and quantify potential health impacts of waste incinerators, it is therefore necessary to develop another type of study using more powerful tools that allow the identification of pollutants or their metabolites in the organism and the effects of these pollutants at levels as close as possible to the cellular or molecular.*[xxi]

While pollution levels from incineration have decreased in recent decades as the technologies have improved, our federal regulations are based upon best available industry practices and not upon eliminating negative human health impacts. This means regulatory compliance is not a guarantee of safety.[xxii] The EPA has acknowledged this juxtaposition in its regulatory role: ***"Since EPA could not clearly define a safe level of exposure to these cancer-causing pollutants, it became almost impossible to issue regulations."***[xxiii]

Incineration facilities, while claiming the safety of their practices, are frequently cited for pollution violations. Between late 2010 and early 2011, the state of Connecticut sued its WTE plant for repeated excessive dioxin emissions and the operator of three incinerators in Massachusetts settled claims of illegally treating and dumping ash, sewage sludge and wastewater.[xxiv]

As more toxic products such as electronics are increasingly found in the municipal waste stream, the challenges of managing the subsequent toxic emissions from burning these products are increasing. A chief example of an emerging threat is nanoparticle emissions from incinerators and other combustion technologies. These ultrafine particles are not captured through air pollution control measures and may contribute to between three and six percent of deaths in large urban areas in the E.U.[xxv]

Waste-to-energy emissions and byproducts are neither benign nor insignificant.

WTE facilities often claim to reduce the incoming waste down to only 10%, but this is a deceptive claim because it is measured by volume.[xxvi] The EPA states 25% of the processed waste by weight exits the facility as ash, meaning an incinerator does not eliminate the need for a landfill.[xxvii] A sizeable quantity of toxic ash will still need to be buried in a local landfill.

Waste incineration produces two types of ash, fly ash and bottom ash. Bottom ash is the remaining unburned materials and byproducts of incomplete combustion, much like the ash in a fireplace. Fly ash is the material trapped by the air pollution control measures, such as scrubbers, much like a fireplace chimney. The toxic emissions, such as heavy metals, dioxins and furans, are concentrated in fly ash and pose a conundrum—the cleaner the emissions, the more hazardous the ash. Both fly ash and bottom ash may be subject to hazardous waste regulations and require burial in a hazardous waste landfill, adding further to the environmental hazards of incineration.[xxviii]

Many communities are already paying to clean up polluted landfill sites that accepted hazardous waste and face a long-term financial obligation for remediation. The city of Boulder, CO is partially liable for the Superfund site at the former Marshall landfill and has paid 30% of the $13.9 million spent to capture and treat polluted groundwater on the site since 1992. The city also

25% of the processed waste (by weight) exits the facility as ash, meaning an incinerator does not eliminate the need for a landfill.

currently shares in the $105,000 annual monitoring, operations and maintenance costs.[xxix] How much this eventually costs taxpayers is a risky unknown since the EPA has directed Boulder to keep rainwater from entering the 160-acre landfill "in perpetuity." Taking on the liability for burying more hazardous materials created in the WTE process would be an unnecessary financial risk to the community and an environmental risk to local residents and ecosystems.

Waste-to-energy is a deterrent to recycling and composting.

WTE facilities need to burn energy-rich materials to generate electricity, which means the plants want certain types of waste and not others. *Paper and plastic* are best, whereas water-rich food scraps or non-combustible glass are not. These facilities directly compete with recycling markets for valuable paper and plastic materials.

While there is some screening of metals prior to combustion, WTE facilities as a rule ***do not sort out recyclables*** before sending the waste into the furnace. These plants burn everything that is delivered to the facility, including materials that could have been recycled. The limited screening for metals contributes marginally to local recycling rates, but this is done by WTE facilities because metals do not burn and are a contaminant in the furnace, not because of their commitment to recycling.

Incinerators require a minimum flow of garbage through the facility and almost always require a long-term (20-30 years) **"put or pay"** contract with local communities to guarantee a baseline tonnage. Under these contracts, if the community does not deliver enough waste, it is financially obligated to compensate the facility. This can put a local government in financial danger and diminish recycling efforts. This was experienced in 2009 by Lake County, Florida when the county found itself facing a trash shortfall because the economic downturn had decreased the amount of people wintering in Florida. County officials estimated the situation could cost millions of dollars and began soliciting trash from nearby counties. While the county did not burn sorted recyclables to make up for the shortfall, they admitted to not encouraging recycling: *"We don't want to turn off what we've turned on…But we're also not promoting recycling in a big way right now."*[xxx]

Figure 2. WTE competes against recycling for energy-rich paper.

The capital investment needed to develop WTE facilities also pulls funding away from Zero Waste infrastructure and programs. Because so much money is spent on WTE, the priority is to use these facilities to their fullest extent, and the focus on recovering materials through recycling and composting is pushed aside. A 2008 report for the state of Massachusetts on WTE facilities found the required capital investments would limit the state's ability to advance recycling and composting efforts.[xxxi]

Waste-to-energy cannot co-exist with Zero Waste.

The upfront capital investment in WTE facilities requires a steady stream of discards to pay back the bank—this means WTE plants, once built, cannot be scaled down as the amount of waste decreases. A Zero Waste community plans to recover, over time, more and more resources through recycling, reuse and composting. This means fewer tons every year for the incinerator, which is directly contrary to the economic interests of these facilities.[xxxii] WTE plants simply cannot survive with a dwindling supply of fuel, also known as the discarded resources that are the foundation for a Zero Waste economy.

Progressive communities throughout the U.S. and Canada are currently recovering nearly 70% of their discards and foremost Zero Waste planners all agree 70% recovery is an achievable goal today.[xxxiii] This leaves only 30% of the discard stream for disposal, and only the largest metropolitan areas generate enough trash to financially justify an incinerator for this remainder of the waste stream.

Waste-to-energy is not climate-friendly.

Waste incineration has attracted a lot of attention lately as a potential source of domestic energy and has been touted by some as a greenhouse gas reduction tool. This is because roughly half to two-thirds of the waste burned by an incinerator is from natural sources like paper, food and yard debris. The CO_2 emissions from burning these materials are considered "biogenic," or naturally occurring, and are not included under some greenhouse gas accounting protocols. This gives the false impression that waste incineration is good for our climate. However, the Intergovernmental Panel on Climate Change (IPCC) requires the reporting of both biogenic and non-biogenic greenhouse gas emissions when comparing electricity generation sources.[xxxiv] When all CO_2 emissions are counted, incinerators emit more CO_2 per unit of electricity generated than coal-fired or oil-fired power plants (see Figure 3).[xxxv]

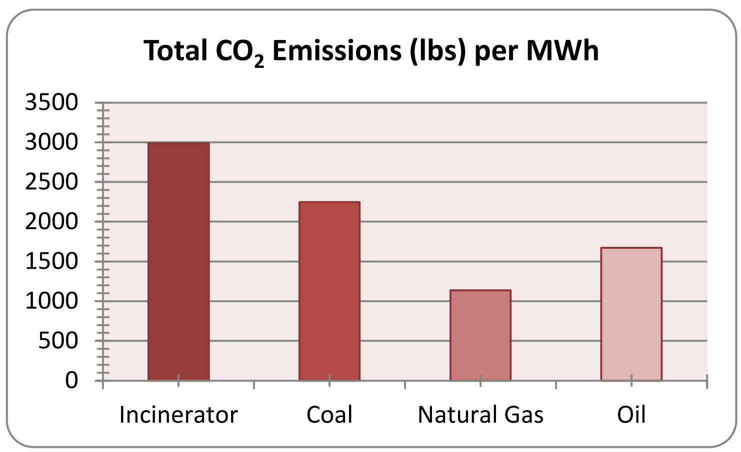


Figure 3: Total CO_2 emissions per MW-hour for select energy sources

There is a growing recognition that calculating biogenic and non-biogenic emissions separately may lead to poor decisions, like cutting down huge swathes of forests to burn as an energy source in the name of reducing climate change, and efforts are underway to address the issue.[xxxvi] Incinerators also emit indirect greenhouse gases such as carbon monoxide (CO), nitrogen oxide (NOx), non-methane volatile organic compounds (NMVOCs), and sulfur dioxide (SO_2).[xxxvii]

Waste-to-energy is not renewable energy.

Waste consists of a mix of products and packaging from both renewable and non-renewable resources including trees, minerals and fossil fuels. Burning non-renewable resources for fuel, whether they are fresh out of the ground or straight from our trash, violates the principles of renewable energy. If burning fossil fuels for energy is not considered renewable, then burning them in the form of petroleum-based plastic packaging should not be considered renewable either.

Waste-to-energy is a waste OF energy.

WTE facilities do produce energy from waste, but recycling is a far more effective form of recovering energy from our discarded products and packaging (see Figure 4). Recycling conserves an average of three to five times more energy than WTE generates because manufacturing new products from recycled materials uses much less energy than making products from virgin raw materials. Of the 25 most commonly recycled materials, recycling saves more energy than would be created by a waste incinerator for all but one material (wood).[xxxviii] This means waste incinerators are effectively burning three to five units of energy to make one unit, which is nothing short of a waste OF energy. [xxxix]

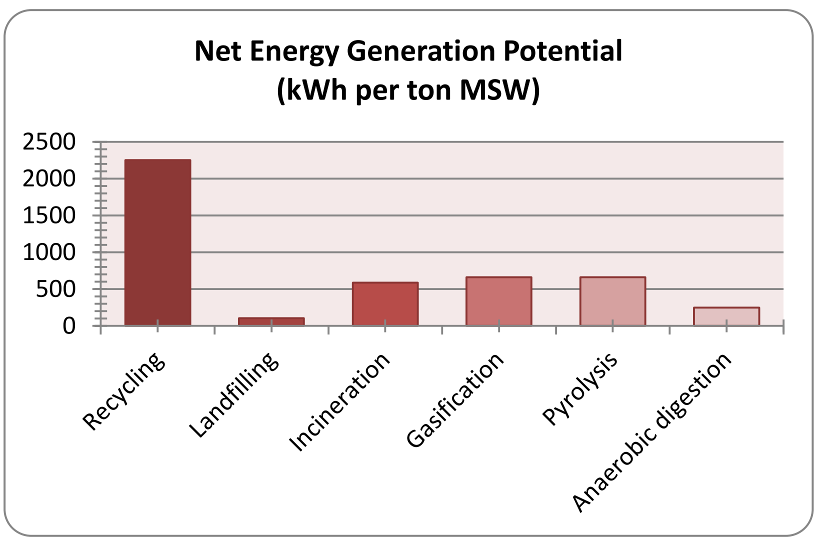


Figure 4. Recycling saves more than 3x as much energy as produced by incineration.

COMMUNITY ISSUES

1. Waste-to-energy will not generate significant electricity, nationally or locally.
2. Waste-to-energy facilities are extremely difficult to site.
3. Waste-to-energy facilities create far fewer jobs than recycling, reuse and composting.

WTE will not generate significant electricity, nationally or locally.

Despite all the commotion from the incineration industry, waste-to-energy would be a less than marginal contributor to our electricity grid, both nationally and locally. If the U.S. burned all its remaining discards (after current recycling and composting efforts), it could generate 14,000 MW. This would only add 1.3% to our current generation capacity of one million megawatts, hardly a blip on the radar.[xl]

Eco-Cycle also calculated the electricity potential from burning garbage in our local community. The 86,635 tons of trash sent to the landfill in 2009 from the city of Boulder could produce 523 kWh/ton, according to the EPA. This means the annual potential electricity production from Boulder's remaining waste stream is just over 45 million kWh, which would meet only 3% of Boulder's current electricity needs.[xli]

Discard Treatment Options	Jobs per 10,000 tons per year
Disposal:	
Landfill and Incineration	**1**
Recovery Processing Facilities:	
Conventional Material Recovery Facilities	10
Composting	4
Plastics Processing Facilities	18
Metal Reclaimers	26
C&D Processors	93
Product Reuse:	
Computer Reuse	296
Misc. Durables Reuse	62
Wooden Pallet Repair	28
Recycling-Based Manufacturers:	
Paper Mills	18
Glass Product Manufacturers	26
Plastic Product Manufacturers	93

Table 3: Job potential from select reuse, remanufacturing, recycling and disposal industries

Waste-to-energy facilities are extremely difficult to site.

It is safe to say no one wants a WTE plant in their backyard. Siting WTE facilities has been an enormous challenge over the past two decades and will only grow more challenging in the future. Many existing WTE plants were sited in low-income urban areas alongside other toxin-producing facilities, contributing to a great number of cases of environmental injustice.

Experiences in the EU and UK have shown the tendering, planning and permitting processes for thermal treatment facilities such as incinerators can take up to ten years. European experience has shown there is much less opposition to smaller, more flexible facilities, such as anaerobic digesters, which makes them quicker to build and operate.[xlii] Siting a WTE facility in most U.S. communities would be nothing short of a political impossibility.

Waste-to-energy facilities create far fewer jobs than recycling, reuse and composting.

While the construction of WTE facilities does create some short-term job growth, these facilities do not sustain a large workforce and pale in comparison to the job creation potential from recycling. Table 3 shows how recycling and composting create 4-10 times more jobs than landfills or incinerators, and that reuse and remanufacturing from recycled materials can create nearly 400 times more jobs than landfills and incinerators.[xliii] As an overall industry, recycling, reuse and remanufacturing account for more than 3.1 million jobs in the U.S.—one out of every three green jobs.[xliv]

THE POTENTIAL OF ANAEROBIC DIGESTION

Anaerobic digestion facilities produce energy from the decomposition of organic materials, and this technology has seen prolific growth throughout the EU in recent years (see Figure 3). The main driver behind this growth is EU regulations to keep organic materials out of landfills. The other influencing factors are the high costs of landfilling across Europe because of space constraints and requirements that utilities must purchase green energy from generators such as AD facilities (known as "feed-in tariffs" or TIFS).[xlv]

Anaerobic digestion has been successfully used in the U.S. at wastewater treatment facilities and for on-farm manure management for decades but not for managing a community's garbage. However, increasing interest in producing energy from waste, as well as keeping organic materials out of landfills, is driving the development of AD facilities in the U.S. in California, Portland, OR, and at the University of Wisconsin-Oshkosh. The EPA estimates that if 50% of the food waste generated each year in the U.S. was anaerobically digested, enough electricity would be generated to power over 2.5 million homes for a year.[xlvi]

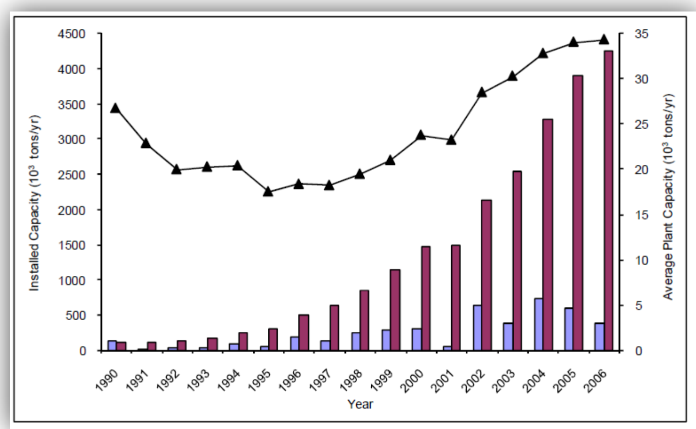


Figure 5: Rapid growth of AD facilities in EU. Pink bars are total capacity, purple bars are annual capacity and triangle lines are average plant size.

The East Bay Municipal Utility District in Oakland, CA was the first U.S. wastewater treatment plant to use some of its excess anaerobic digestion capacity to start processing food waste into energy. A study at the facility found anaerobically digesting 100 tons of food waste per day, five days a week, provides sufficient power for approximately 1,000 homes. The ongoing success of the project has led the EPA to create a Co-Digestion Financial Analysis Tool to help other communities determine if co-digestion would be right for them.

Anaerobic digestion is catching hold elsewhere in California too. San Jose is moving forward with an anaerobic digestion facility to convert source-separated food scraps to biogas, which it hopes to have fully operational by 2013, and the city of Los Angeles is in the final stages of contracting for an AD facility.[xlvii] Humboldt County studied treatment options for its food waste and found investing in an anaerobic digestion facility would save the region $12-16 million over 20 years by decreasing hauling and tipping fees (waste is currently long-hauled to landfills in central CA and southern OR), generating electricity, and reducing the region's greenhouse gas emissions. The feasibility study nicely summed up the benefits of AD: ***"There are relatively few opportunities that address so many needs while simultaneously generating revenues to offset the costs of construction and daily operations."***[xlviii]

The University of Wisconsin-Oshkosh hopes to have its commercial-scale anaerobic digester operational in 2011, making it the first commercial-scale plant in the U.S. The digester will process 8,000 tons of organic matter a year and meet 5-10% of the campus' electricity demand. These energy savings are expected to pay back the $3.5 million investment within 7-10 years. The campus is already a national leader in producing energy from digesters using cow manure.[xlix]

The first municipal-scale anaerobic digestion project will be under construction by summer 2011 in Portland, OR. The Portland plant will process about 300 tons per day of commercial and industrial source-separated solid and liquid food waste. The facility will produce 5 MW of electricity, the equivalent of the energy consumed by 4,000-5,000 area homes, and an agricultural-grade fertilizer. The proposed tipping fee for the facility is $50-60/ton, which is less than the area's current landfill tip fee of $85/ton. The plant is expected to employ 10 people.[l]

There are relatively few opportunities that address so many needs while simultaneously generating revenues to offset the costs of construction and daily operations.

Smaller modular AD facilities have been used in developing countries for many years, providing a cost-effective means of producing energy and typically a quality digestate used as an agricultural soil amendment. The tourist area of Kovalam in Kerala, India has used at least six biogas digesters since 2003 when the community rejected waste incineration as a solution to the mounds of garbage that threatened to destroy the area's tourism. The digesters consume the wet biodegradable discards from hotels and restaurants, and the resulting biogas is used either for heat in the kitchens, heat for buildings, or converted to electricity. The first digester, installed at the Institute of Hotel Management and Catering Technology, processes more than 650 pounds of biodegradable materials daily and saves the institute $120 per month.[li]

Anaerobic digesters qualify for U.S. federal tax credits and other state or federal subsidies as a renewable energy source. These facilities are also eligible for carbon credits, both of which can help lower startup or operating costs. Often modular or scalable in design, these facilities can be situated in industrial areas near urban centers. This greatly reduces hauling costs and environmental impacts compared to trucking organics to outlying composting facilities. Overall, there are several community benefits to an anaerobic digestion plant. For example, in our local Boulder, CO community, an anaerobic digester would:

- likely to be the easiest Zero Waste infrastructure to site within a community
- recover 17,000 tons of food waste and compostable paper from Boulder's waste stream
- increase our recovery rate nearly 20%
- generate 4.25 million kWh of electricity (based on 250 kWh/ton)[lii]
- produce fertilizer to sell to agricultural users
- result in no negative environmental or health impacts.[liii]

Anaerobic digestion is the most economically and environmentally feasible technology for communities to generate energy from waste. Communities should explore building anaerobic digesters, including additional digesters at their wastewater treatment plants, to generate energy from food scraps and other biodegradable waste.

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