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Cleaner Energy is Here

Why We Need to Invest in Waste to Energy (WTE) Power Plants

Global Renewable Energy Initiative (GREI)

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Abstract

Waste is a byproduct of human society. On average, every American generates 4.4 lbs of municipal solid waste (MSW) daily. According to EPA estimates, of the more than 258 Million Tons of MSW produced in the US in 2014, roughly 136 Million Tons (52.6%) of that flowed downstream, ending up in a landfill (EPA, 2016), left to pollute our earth and upset the ecosystem.

Responding to the burgeoning waste collecting in the landfills, the waste hierarchy of the 3 "Rs", was created. By consciously **reducing** the amount of waste generated, **reusing** goods for other purposes, and **recycling** materials whenever possible. However, it is impossible to completely eliminate the generation of MSW through these methods alone. These efforts must be coupled with energy **recovery**.

Waste to Energy (WTE), is the process of recovering transient latent energy found in MSW. Viable methods to recover energy from waste include mass-burn, pyrolysis, and anaerobic digestion. The benefits of WTE are less waste flowing into landfills, generating renewable, clean energy, and higher-paying jobs for the local population.

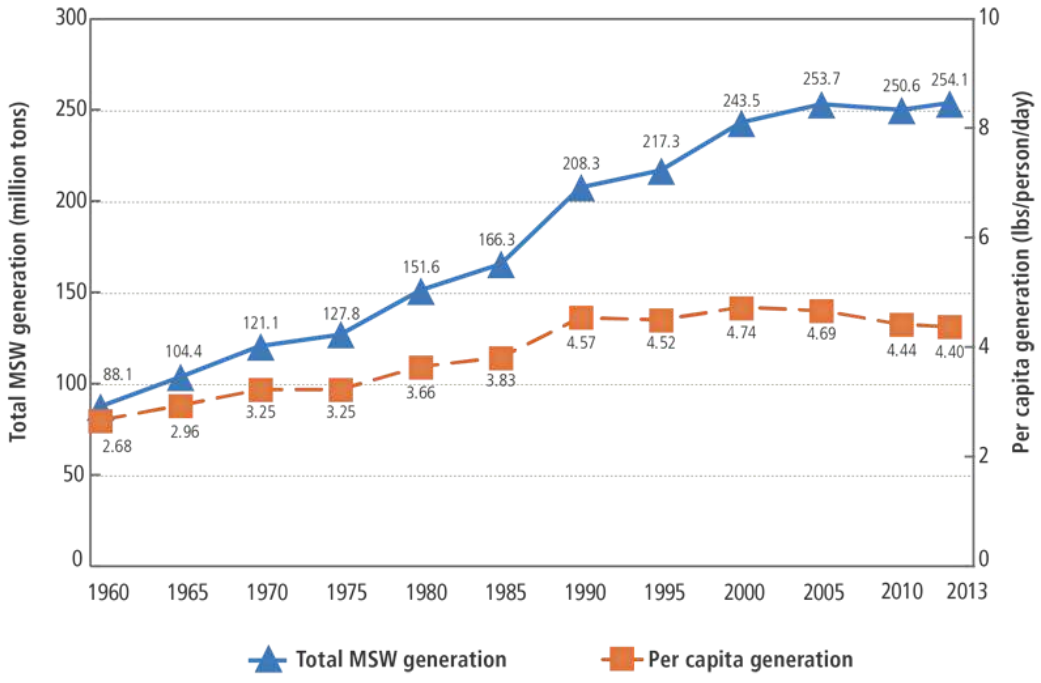

Figure One. MSW Generation Rates 1960-2013, Source: EPA 2014 Fact Sheet

Project Narrative

Achieving a green, carbon-neutral future means humans have to find a solution for our waste. According to a 2010 study conducted by the Global Methane Initiative, landfills are the third-largest anthropogenic source of methane accounting for approximately 6.82 billion tons (Waste Management World, 2012) of CO2 emissions. That same year, US landfills alone contributed roughly 16.2% of global methane emissions.

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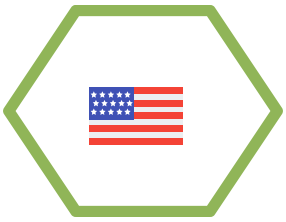

16.2%

US landfill makeup of global methane emissions

Why does this matter? The potential for methane to trap heat within the atmosphere is 21 times greater than that of CO2 (BBC, 2014). The methane and greenhouse gas (GHG) emissions from landfills are predicted to increase over time proportionally with human population (see Figure one). But methane and GHG emissions aren't the only environmental concerns.

21X

Potential methane heat capture 21X > CO2

Landfills are exposed to the elements and moisture from precipitation accumulates in them forming a "garbage stew" known as leachate. As the leachate collects, it eventually seeps deep into the ground and contaminates the groundwater, affecting local ecosystems, flora and fauna, as well as an accumulation of toxins and heavy metals. Landfills are only a temporary solution until we run out of space.

Project Narrative (continued)

Prior to the 1970s, landfills were largely unregulated. The majority of solid waste was deposited in unlined pits. Although federal and state regulations in the 1980s started requiring landfills to use liners and leachate collection systems to mitigate seepage of leachate into the groundwater, the US EPA concluded that all landfills will eventually fail and leak into the environment (EPA, 2020).

Because of this, the EPA mandates all landfills that cease operations must be certified by a professional engineer so that post-closure care requirements are properly conducted. The landfill site must be closely monitored for at least 30 years and cannot be used for any other purpose (EPA, 2016).

30 years

Engineer-supervised post-closure care required. Land cannot be used for any other purpose

Furthermore, the US has fallen behind Asia and Europe in terms of rewarding environmentally mindful business practices. It has begun to create Renewable Portfolio Standards (RPS) and more rigorous EPA standards. However, there are currently no RPS or clean energy policies in place on a federal level (NCSL, 2017). Some states have started with state-level policies and although basic, these include tax incentives for energy companies that work with renewable energies like biomass, geothermal, and wind.

However, as shown on the map (next page), some states remain without incentives. In the rural south, infrastructure development has lagged behind that of northern neighbors. These smaller communities are often trapped in a continuous cycle of not having enough budget for infrastructure projects, having to reduce engineering hours or critical components due to budget constraints, and receiving fines for environmental violations.

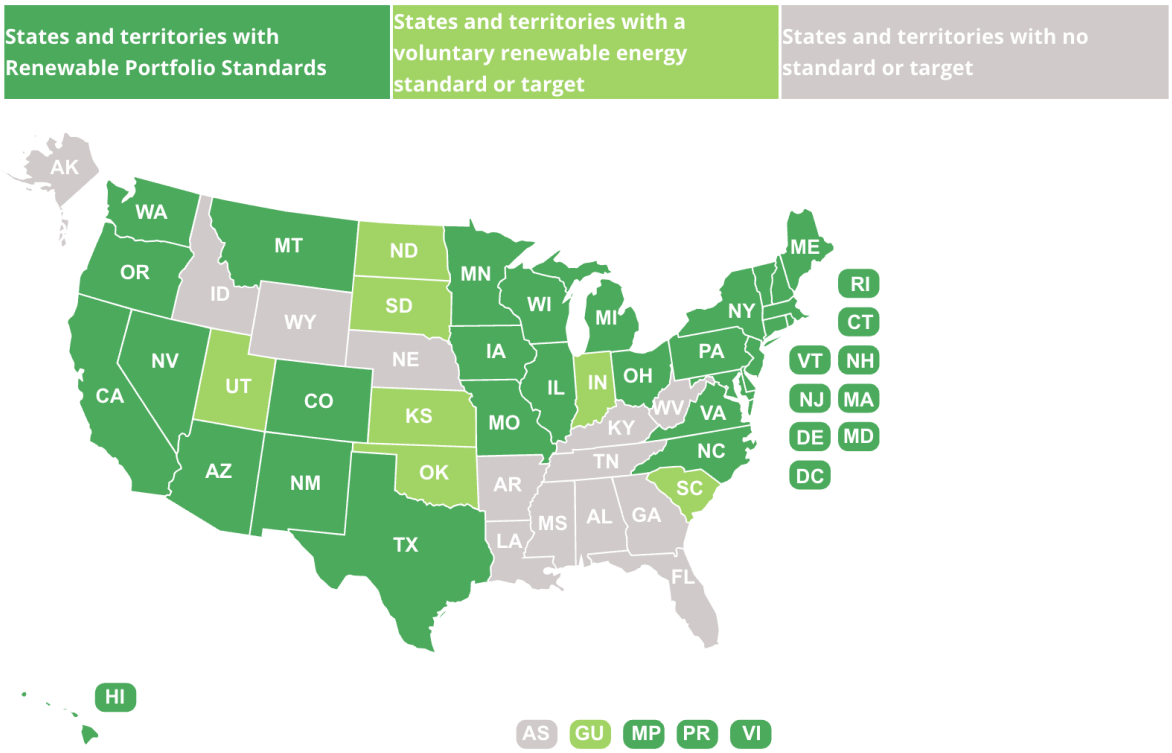

Table: Renewable Portfolio Standards or Voluntary Targets

Figure 2. https://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx

Scope

Rural communities in Mississippi and Alabama are severely lacking in municipal infrastructure. Several counties in the Mississippi Delta are still using lagoons for wastewater treatment in addition to unlined landfills. Abundant precipitation during the wet seasons in the Mississippi Delta causes leachate to collect at the bottom of these unlined landfills (Geological Survey of Alabama, 2016).

Further constraints include high water tables causing groundwater contamination, detrimentally affecting local farmers and rural communities that rely on groundwater for drinking. With rising budgets and a decreasing tax base, communities often resort to allocating as little budget as possible to avoid penalties. This often leads to short-term solutions that only address immediate issues.

Scope (continued)

This is why Global Renewable Energy Initiative (GREI) has been working with local energy companies and municipal corporations through a public-private partnership. GREI intends to build WTE power plants in the Mississippi Delta and Alabama: to create facilities that not only process the growing amount of MSW that ends up in landfills but also generate heat and power for the region.

Mass-burn facilities can produce a net positive reduction of greenhouse gases when compared to traditional landfills (Power, 2016). The WTE facility would also provide high-paying jobs for the local population, thereby increasing the tax base and revenue for rural communities. Better community infrastructure would foster further economic development in the region.

Means

Since the introduction of US mass-burn WTE facilities in the late 1980s, the air quality and emissions control standards have tightened. Emission control technology has improved in parallel. In order to process such a large volume of waste, GREI will use stoker grate mass-burn boilers with best achievable air quality control systems. Pyrolysis (heated decomposition of organic materials without oxygen) and gasification technologies (conversion of carbon-based materials like coal into fuel gas) will be used to process hazardous waste streams.

Additionally, our facilities will use a three-stage emission control process consisting of spray dry absorber (SDA) for acid gas absorption, selective catalytic reduction (SCR) to reduce nitrogen oxide (NOx) levels, and pulse jet fabric filter baghouses to capture and reduce particulates, and remaining hazardous air pollutants in vapor or metal form. Reduction in total volume of hazardous waste and extension of the lifetime of supersites are the long-term goals.

Potential Expansion

The Mississippi WTE Plant will have the capacity to process 500 tons of MSW per day. The Alabama WTE Plant will have the capacity to process 1000 tons of MSW per day. Both plants will be designed to be modular for future expansion. If the MSW waste streams grow with population, both plants can be scaled up.

Conclusion

It is clear that the U.S needs to do better.

- Develop free programs to educate the population about renewable energy.
- Provide grants and tax incentives for new environmentally-friendly energy corporations.
- Establish a foothold in the global energy market.

Over the course of more than three years of due diligence and research, GREI has earned support from community leaders from local, state, and national levels. Working to bring new levels of sustainable and lucrative energy jobs to their respective regions, GREI endeavors to reduce the overall amount of MSW being sent to the landfills and bolster economic development in the region. These new WTE plants will be a positive icon of their respective communities, setting the stage for future infrastructure and economic development.

References

BBC, 2014, Weather Centre - Climate Change - Methane. http://www.bbc.co.uk/climate/evidence/methane.shtml#:~:text=The%20importance%20of%20methane%20in,the%20'enhanced%20greenhouse%20effect'

Christenson S.C and Cozzarelli I.M., 2003, U.S. Geological Survey: The Norman Landfill Environmental Research Site: What Happens to the Waste in Landfills? https://pubs.usgs.gov/fs/fs-040-03/

Geological Survey of Alabama, 2016, Groundwater Assessment Program. http://www2.gsa.state.al.us/gsa/water/water_information.html

Gies, E., 2016, ENSIA, Landfills have a huge greenhouse gas problem. Here's what we can do about it. https://ensia.com/features/methane-landfills/

Global Methane Initiative, 2011, Landfill Methane: Reducing Emissions, Advancing Recovery and Use Opportunities. https://www.globalmethane.org/documents/landfill_fs_eng.pdf

National Conference of State Legislatures (NCSL), 2017, State Renewable Portfolio Standards and Goals https://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx

PowerMag.com, 2016, Energy from Waste: Greenhouse Gas Winner or Pollution Loser? https://www.powermag.com/energy-waste-greenhouse-gas-winner-pollution-loser/

U.S. Environmental Protection Agency, 2016, Advancing Sustainable Materials. Management: 2014 Fact Sheet. https://www.epa.gov/sites/production/files/2016-11/documents/2014_smmfactsheet_508.pdf

U.S. Environmental Protection Agency, 2016, Closure/Post Closure Care | Municipal Solid Waste Landfills. https://archive.epa.gov/epawaste/nonhaz/municipal/web/html/mswclose.html

U.S. Environmental Protection Agency, 2020, Closure and Post-Closure Care Requirements for Hazardous Waste Treatment, Storage and Disposal Facilities. https://www.epa.gov/hwpermitting/closure-and-post-closure-care-requirements-hazardous-waste-treatment-storage-and

U.S. Environmental Protection Agency, 2020, Energy Recovery from the Combustion of Municipal Solid Waste (MSW). https://www.epa.gov/smm/energy-recovery-combustion-municipal-solid-waste-msw

U.S. Environmental Protection Agency, 2016, Municipal Solid Waste. https://archive.epa.gov/epawaste/nonhaz/municipal/web/html/

Waste Management World, 2012, Carbon Emissions from Waste Measured in EPA Greenhouse Gas Inventory. https://waste-management-world.com/a/carbon-emissions-from-waste-measured-in-epa-greenhouse-gas-inventoryå