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Electricity Generation from Trash "Eliminating the Unwanted, While Creating the Needed"

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Abstract: A substantial increase in demand for the electricity has put forward the negative impact on the environment by using fossil fuels (Coal, Petroleum and Natural Gas).This paper elucidates transmitting the trash into electricity. As we know TRASH is prolific in India. We haven't been taking adequate advantage of them, we can burn coal in a clean way so as to improve the grid. The problem is that they are not optimally utilized.

Keywords: Fossil Fuels, Trash, Grid, Trash.

I. INTRODUCTION

Waste-to-energy or energy-from-waste is the technique of creating energy in the form of electricity and/or heat from the incineration of trash. Just think about a way of producing energy that can keep our surrounding clean as well. Yes, now researchers have developed ways through which we can produce electricity from trash or garbage at a very low cost. Getting energy from waste is a process under which energy in form of heat or electricity is generated from wasteful disposal of manure, feces, and various other organic materials. This waste is not just converted into these two forms of energy but besides this it can produce a combustible fuel commodity including methane, methanol, ethanol or synthetic fuels. Different principles are used to convert the organic waste into any usable form of energy.

In US per day generation of trash is 7pounds per person and approximately 390 million tons of trash per year. The waste that are accumulated in homes and businesses are collected by the Municipal Solid Waste (MSW) on the weekly basis and is usually sent straight to a landfill, where a hole is dug in the ground which is lined up with the man-made liner. When the hole is filled with trash, anaerobic reactions takes place breaking down the waste, thus producing METHANE gas. When the landfill is totally pack, it is covered to restrict the water from seeping into it.

Ways of converting waste to energy:

(A) Anaerobic digestion: Burning the waste and converting it into heat energy is the oldest way used, but it is not the best way as it damages air quality. To overcome this problem anaerobic digestion is used in which garbage is converted by making our bacteria friends do the dirty work for us into fuel.

(B) Gasification: Under this process trash is zapped and vaporized at 10,000 degrees Fahrenheit in converter to get synthetic gas that powers a turbine and creates steam to produce electricity.

(C) Thermal Hydrolysis: Under this process garbage is boiled to generate a biogas, which is used to produce electricity.

(D) Fermentation: This is one of the oldest technologies humans are using on this earth. Under this technology fermentation of biomass waste is done to create ethanol is the same process by which we make wine.

Pyrolysis: This is an extended kind of thermal technology under which trash is heated up in an oxygen-depleted environment to decompose waste and produce a gas that can be used as fuel.

II. HISTORY

The first incinerator or 'Destructor' was built in Nottingham UK in 1874 by Manlove, Alliott & Co. Ltd. to the design of Albert Fryer and The first US incinerator was built in 1885 on Governors Island in New York, NY.[1] The first waste incinerator in Denmark was built in 1903 in Frederiksberg and the first facility in Czech Republic was built in 1905 in Brno.

In the 1980s, Onondaga County developed a plan to deal with the community's mounting garbage crisis. They carefully analysed the environmental impacts of different trash disposal alternatives and determined that no single method of disposal would solve the trash dilemma. Ultimately, a comprehensive, finely balanced, and integrated solid waste management system was required to manage the County's waste.[2]

To manage this system, the County created a public authority – OCRRA (Onondaga County Resource Recovery Agency). OCRRA solid waste management system mirrors New York State's Solid Waste Management Plan priorities:

1. Waste reduction,
2. Recycling,

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3. Recovery of useful energy through solid waste combustion (i.e., modern waste-to-energy facilities), and
4. Use of permitted landfill facilities.

After a rigorous procurement process in 1988 and 1989, Ogden Martin Systems was selected to design, build, and operate the Waste-to-Energy Facility.

OCRRA entered into a service agreement with Ogden Martin Systems of Onondaga (currently Covanta Onondaga) in 1990.

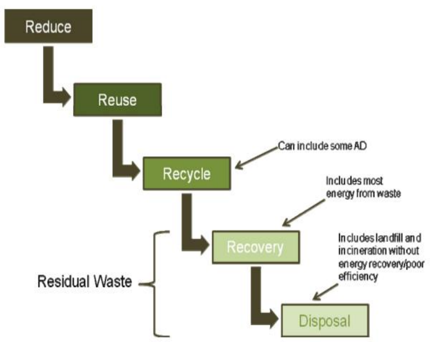
On December 18, 1992, with environmental permits in place and project revenue bonds totalling $178 million, formal groundbreaking ceremonies were held for the construction of the Waste-to-Energy Facility.

By late 1994 the Facility had its first official burn and by early 1995 the Facility was commercially operational.[3]

III. CURRENT SCENERIO

In an ideal world all waste would be prevented. However, in reality, for a range of social,economic and practical reasons, this does not happen.

Where waste does exist it isusually best to reuse it if possible, and if not, to recycle it. What can't be recycled, theresidual waste, could either go to energy recovery or as a last resort, landfill. This generalorder of preference is known as the waste hierarchy:



The waste hierarchy itself is not inflexible. Where a clearlybetter environmental outcomescan be shown, it is possible to depart from the hierarchy.

There is often concern that energy from waste discourages greater recycling.Government's goal is to move waste up the hierarchy.

Throughout Europe there areexamples where energy from waste coexists with high recycling, ultimately delivering lowlandfill.

Why not just recycle everything?

The waste hierarchy does not say everything should be recycled and not go to recovery regardless of cost or practicality.

If material is so contaminated that the resources required to clean and process it for recycling would outweigh the benefits of recycling then it may be better going to recovery.

However, if there is a cost effective, practical route for ensuring that material can be collected in a less contaminated state so that recycling is viable, the presence of a planned or operational energy from waste alternative should not impede doing so.

IV. HOW ENERGY FROM WASTE WORKS???

1.Municipal waste is delivered to our facilities and stored in a bunker.
2. The waste is transferred to a combustion chamber where self-sustaining combustion is maintained at extremely high temperatures. We maintain the building around the tipping and bunker area under negative pressure and use this air in the combustion process to control odor.
3. The heat from the combustion process boils water.
4. The steam from the boiling water is used directly, or more frequently, the steam drives a turbine that generates electricity.
5. Electricity is distributed to the local grid.
6. Ash from combustion is processed to extract metal for recycling. It is then combined with residue from the air pollution control process (see items 9 and 10).
7. The combined ash is either disposed of in a monofill (where only ash is stored) that receives only that waste, used as cover material at a conventional landfill, or landfilled with other waste.
8. All gases are collected, filtered and cleaned before being emitted into the atmosphere. We manage gas from the combustion process with state-of-the-art air pollution control technology that operates to state and federal standards.
9. We control emissions of particulate matter primarily through a baghouse (fabric filter).
10. We monitor criteria and other pollutants and operating parameters to ensure compliance with permit conditions.[4]

Disposing of waste in landfills is the most commonly used management technique in the United States, accounting for 69 percent of total garbage disposal. Some local governments, however, have begun to send their trash to EfW facilities, totaling 7 percent of total waste disposal.Instead of transporting trash to the landfill, garbage trucks deliver the waste to an EfW facility, and in some cases the trash is even loaded onto railcars for delivery, which eliminates both truck traffic and diesel pollution.Once the trash has been delivered to the EfW facility, it is dropped into a pit where a grapple will transfer the trash to a combustion chamber. Inside the combustion chamber, the trash is burned, causing water to boil, which will lead to the creation of steam. The steam then spins turbines to generate electricity. Throughout this process, filters are trapping fly ash, particulate matter, and

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metals from the trash that are not burned and are collected for recycling or even to be used in projects such as road construction and landfill-cover material.

Gases from the burned waste are collected, filtered, and cleaned before being emitted. The remaining quantities of residue are collected through the filters, stored, and then sent to landfills for disposal.

The electricity generated as a result of the spinning turbines goes to a switchyard and then gets transferred onto the grid for utilization and purchase.[5]

A typical EfW plant is able to generate about 550 kilowatt-hours per ton of waste while complying with all state and federal standards.

This process has led many to recognize EfW facilities as a form of renewable-energy technology. In fact, the Energy Policy Act of 2005, which authorized loan guarantees, tax credits, and energy bonds for technologies that avoid greenhouse-gas pollution, included it as a renewable-energy resource.

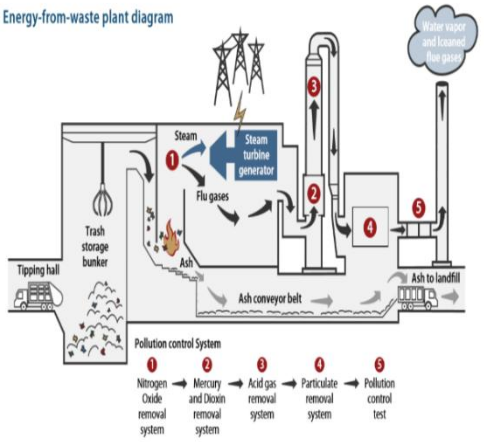
Under the Clean Air Act, EfW facilities must use the most modern air-pollution-control equipment available to ensure the smokestack emissions—carbon monoxide, nitrogen oxides, soot, and mercury—are safe for human health and the environment.

All facilities are specifically subject to regulations under the EPA's Maximum Achievable Control Technology Standards, which created emissions standards for industrial and commercial industries. Because of the high temperatures inside the combustion chambers, most pollutants do not escape through the smokestacks, but scrubbing devices are installed in all EfW facilities as another control system to limit dangerous emissions.[6]

EfW plants do involve large upfront expenditures, which can be a hurdle when building a new facility. A new EfW plant typically requires at least $100 million to finance construction costs, and this could be doubled or tripled depending on the size of the plant.

In order to finance the plant, facilities will require municipal revenue bonds, which are issued by local governments or agencies to secure revenue for essential serviceinfrastructure projects and are repaid with interest. Long-term contracts, however, are often developed between the facility and the county or city government that secure the facility-waste tipping fee, or the price charged for the trash received at a processing facility that is then used to pay back bonds and operating costs.

Contracts are also established with utilities to receive income from the electricity generated and sold to the grid. This money is then used to pay back the bonds with interest.



Furthermore, hauling trash to landfills isexpensive for large cities in America. New York City, for example, paid more than $300 million last year just to transport trash to out-ofstate landfills. In these cases, EfW facilities could be immediately beneficial by saving governments money while generating jobs and local revenue from an EfW facility. In 6 Center for American Progress | Energy from Waste Can Help Curb Greenhouse Gas Emissionsother regions of the United States, however, it can be cheaper to send trash to landfills when looking at a short-term economic analysis due to the amount of land available for trash disposal. Arkansas has an average landfill tipping fee of $35 per ton of garbage and has a reserve capacity of more than 600 years.[7] This is less than the U.S. average tipping fee of $45 per ton and also is below the average tipping fee at an EfW facility of $68 per ton. But on a long-term economic basis, EfW facilities cost less than disposing of waste in landfills due to returns from the electricity sold and even the sale of recovered metals. Indeed, Jeremy K. O'Brien, director of applied research for the solid-wastemanagement advocacy organization Solid Waste Association of North America, writes that, "Over the life of the [EfW] facility, which is now confidently projected to be in the range of 40 to 50 years, a community can expect to pay significantly less for MSW disposal at a [EfW] facility than at a regional MSW landfill."

V.ENERGY FROM WASTE REDUCES GREENHOUSE GAS EMISSIONS

What is the possibility for electricity generation using waste?

States can have both EfW and recycling strategies that are compatible. Indeed, communities using EfW technology have an aggregate recycling rate above the national average.[8]Reducing the amount of trash generated is the most preferred and cost-effective method, followed by recycling and composting practices.

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Currently, recycling and composting actions together decrease the United States' 390 million tons of MSW to 296 million tons, but a nationwide waste standard—mandatory levels of waste to be processed at EfW facilities and landfills—that incorporates recycling goals could reduce this number even further. Nevertheless, waste will always be generated, and instead of disposing of it in landfills, America should be sending it to energy-from-waste facilities.

According to the EPA, for every ton of garbage processed at an EfW facility, approximately one ton of emitted carbon-dioxide equivalent in the atmosphere is prevented.[9]This is because the trash burned at an EfW facility doesn't generate methane, as it would at a landfill; the metals that would have been sent to the landfill are recycled instead of thrown out; and the electricity generated offsets the greenhouse gases that would otherwise have been generated from coal and natural gas plants.

The European Environmental Agency, or EEA, notes that increasing rates of recycling and EfW will decrease the amount of greenhouse gases a country emits. After the EEA study was released, the European Union adopted proactive waste policies, including the promotion of recycling and EfW as alternative waste-management strategies. In fact, the European waste sector achieved a 34 percent greenhouse-gas-emissions reduction from 1990 to 2007, the largest pollution reduction of any industry in the European Union.[10]

VI. POSSIBLE SCOPE

Councils have a duty to cooperate to ensure that waste needs across their respectiveareas are handled properly and appropriately. They need to have regard for the proximityprinciple, which requires all waste for disposal and mixed municipal waste (i.e. waste from households) to be recovered in one of the nearest appropriate facilities. However, thisprinciple must not be over-interpreted. It does not require using the absolute closest facilityto the exclusion of all other considerations.There is nothing in the legislation or the proximity principle that says accepting waste fromanother council, city or region is a bad thing and indeed in many cases it may be the best economic and environmental solution and/or be the outcome most consistent with theproximity principle.[11]
The ability to source waste from a range of locations/organizations helps ensure existingcapacity is used effectively and efficiently, and importantly helps maintain local flexibility toincrease recycling without resulting in local overcapacity.
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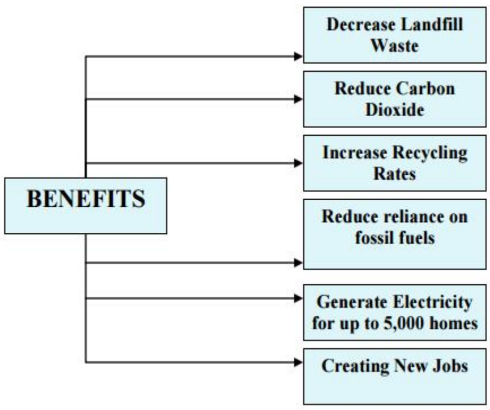
VII. ADVANTAGES

- The majority of waste that would normally go into landfill sites can be re-used.
- The fuel is obtainable cheaply.
- There will always be a reliable source of fuel as people will always have waste.[12]
- Current landfill sites can be mined out and the landfill material used as fuel.
- It is eco-friendly in nature.
- Recycling and recovery, both are possible.
- Reduction in carbon-di-oxide.
- Creation of new local jobs.

Benefits of Waste-to-Energy Plants



VIII.THE LOWDOWN

The overall process from waste management planning through to having an operationalenergy from waste facility is one which can take many years and in some cases a decadeor more. When trying to understand how this process works it is important that the decisions surrounding energy from waste are not considered in isolation but viewed aspart of a long, multifaceted and ongoing process.

Local waste plans

For local authorities the process begins with the development of waste strategies and localplans. We have a 'plan-led' planning system, which means a key deciding factor inwhether a proposal is approved will be whether or not it is consistent with local plans.[13] Thedevelopment and revision of local waste strategies and plans represents perhaps the mostimportant opportunity for the local community to be engaged in the process to determine

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ifenergy from waste should be part of their local waste solution, if this might require newinfrastructure, and where that might be.

IX.CONCLUSION

Both energy from waste and recycling and compositing efforts are a win-win-win for the US. Energy from Waste generates clean electricity, decreases greenhouse gases that would have been emitted from landfills and fossil-fuel power plants, and pairs well with increased recycling rates in states. Recycling and compositing reduces trash that is destined for the landfill that would have been used for the production of a virgin material, and decreases the need to mine for raw materials, which will preserve our natural resources. The India must begin developing national policies to deal with the waste-man-agement problem our country faces every day. Doing so will ultimately reduce emissions that cause climate change.

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