ZERO WASTE EUROPE

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The impact of Waste-to-Energy incineration on climate

Policy Briefing

September 2019 – Zero Waste Europe

Summary

Waste-to-energy incineration is sometimes promoted as a low-carbon source of energy, justifying increasing quantities of waste for use in electricity generation. The evidence, however, suggests that the carbon intensity of energy produced through incineration is around 2 times greater than the carbon intensity of the current EU average electricity grid intensity and has significantly more adverse climate impacts than conventional electricity generation from fossil fuels such as gas. Moreover, a number of reports indicate that much of what is currently used as incinerator feedstock could instead be recycled or composted, resulting in carbon savings and other environmental benefits. What's clear is that waste incineration is therefore not a low-carbon source of energy, in fact, strategies promoting waste to energy could seriously undermine the EU's efforts to reach net-zero climate change emissions by 2050.

Introduction

In the EU 28, an increasing quantity and proportion of MSW (Municipal Solid Waste) is being incinerated for energy generation. Yet, a number of recent reports and policy strategies warn about the impact of incineration on climate[1].

The latest available data from Eurostat shows that approximately **70 million tonnes[2] of MSW were incinerated in 2017, 118% more than in 1995**. This increasing level of incineration makes it necessary to consider the impact of waste incineration on climate change as well as its fit within the EU's climate targets. This paper takes a look at the greenhouse gas emissions emitted by a typical waste to energy incinerator, the carbon intensity of electricity produced by such an incinerator and critically addresses how it compares to the carbon intensity of electricity produced through conventional use of fossil fuels such as gas.

CO2 emitted by waste incinerators in the EU 28

Waste incineration of 1 tonne of municipal waste (MSW) is associated with the release of about 0.7 to 1.7 tonnes of carbon dioxide (CO2)[3]. Although, this carbon dioxide is directly released into the atmosphere and thus makes a real contribution to the greenhouse effect, only **the CO2 emissions from fossil sources are considered for the purposes of a global analysis**.

The level of fossil CO2 emitted by burning of 1 tonne of waste depends on what is burned. Since plastics – derived from fossil sources - make up a significant proportion of the material burned at municipal waste incinerators, the fossil CO2 level is estimated to be around 580g CO2 per tonne of

[1] For instance, the European Strategy for Plastics in a Circular Economy estimated that plastics production and the incineration of plastic waste give rise globally to approximately 400 million tonnes of CO2 a year. Available from www.ec.europa.eu/environment/circular-economy/pdf/plastics-strategy-brochure.pdf
Plastic & Climate: The Hidden Costs of a Plastic Planet www.ciel.org/plasticandclimate/
Material Economics; The Circular Economy - a Powerful Force for Climate Mitigation www.materialeconomics.com/publications/the-circular-economy-a-powerful-force-for-climate-mitigation-1

[2] Municipal waste statistics, available from https://ec.europa.eu/eurostat/statistics-explained/index.php/Municipal_waste_statistics

[3] Pollution inventory reporting – incineration activities guidance note, available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/759647/Pollution-inventory-reporting-incineration-activities-guidance-note.pdf

waste combusted[4]. This means that the electricity generated by waste incineration has significantly higher greenhouse emissions than electricity generated through conventional means, such as fossil gas (340g CO_2eq per kWh)[5] - **it is clearly therefore, not a climate friendly alternative**.

In 2017, approximately 70 million tonnes of MSW was incinerated across the EU 28 countries[6]. This equates to more than 40 million tonnes of fossil CO2 released by EU incinerators in 2017. Note that this figure only relates to direct emissions of CO2 from incineration of MSW and does not take into account other greenhouse gases emitted by incinerators (e.g. methane and nitrous oxide).

Furthermore, it excludes greenhouse gas emissions emitted by burning of other types of waste such as commercial and industrial wastes that constitute about half of all waste incinerated[7].

Climate impact of electricity generated by waste incineration

The average carbon intensity of the EU28 (2018) electricity grid has constantly been falling thanks to the increasing uptake of renewables, and stands currently at 296g CO2eq/KWh. This means that the carbon intensity of energy produced through waste incineration (580g CO2eq/kWh) is already about two-times greater than the current EU average electricity grid carbon intensity.

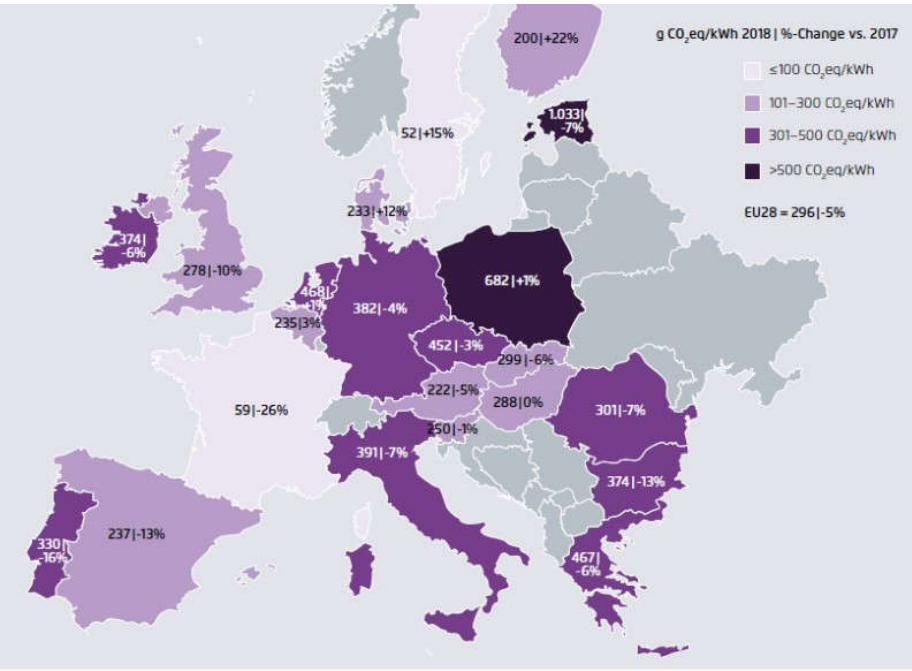

Figure 1 - CO2-intensity of electricity consumption
Source: The European Power Sector in 2018, Sandbag, available from: www.sandbag.org.uk/project/power-2018/

[4] A Changing Climate for Energy from Waste?, available from: www.friendsoftheearth.uk/sites/default/files/downloads/changing_climate.pdf
[5] Page 5 of Valuation of Energy Use and Greenhouse Gas Emissions – Background documentation (January 2018), available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/37048/1940-nps-renewable-energy-en3.pdf
[6] Municipal waste statistics, available from https://ec.europa.eu/eurostat/statistics-explained/index.php/Municipal_waste_statistics
[7] According to Eurostat, in 2016 as much as 123 million tonnes of non-hazardous waste was incinerated https://ec.europa.eu/eurostat/web/waste/waste-generation-and-management/management/incineration

Due to the progressive decarbonisation of the electricity supply (Figure 2) the electricity generated by incinerators will have an increasing negative impact on climate change impacts in the future.

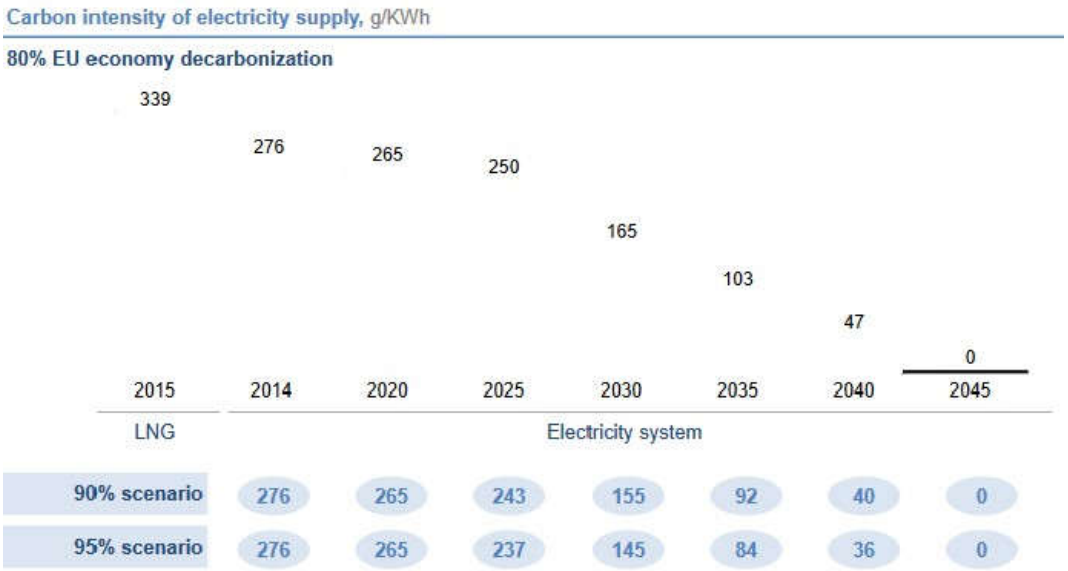

Figure 2 - CO2-intensity of electricity consumption
Source: Decarbonisation pathways, Eurelectric, avaialble from :
https://cdn.eurelectric.org/media/3558/decarbonisation-pathways-all-slideslinks-29112018-h-4484BB0C.pdf

Other sustainability issues

A number of reports have highlighted the high proportion of recyclables in residual waste[8] that could be either recycled or composted - having a positive reduction on carbon emissions while having other environmental benefits (Figure 3)[9]. Also, several reports[10] highlight the fact that incinerators require a constant flow of waste to burn which makes the case for maintaining, or even increasing residual waste flows rather than reducing them, which will contribute to lock societies into a linear economy that justifies a throw-away culture.

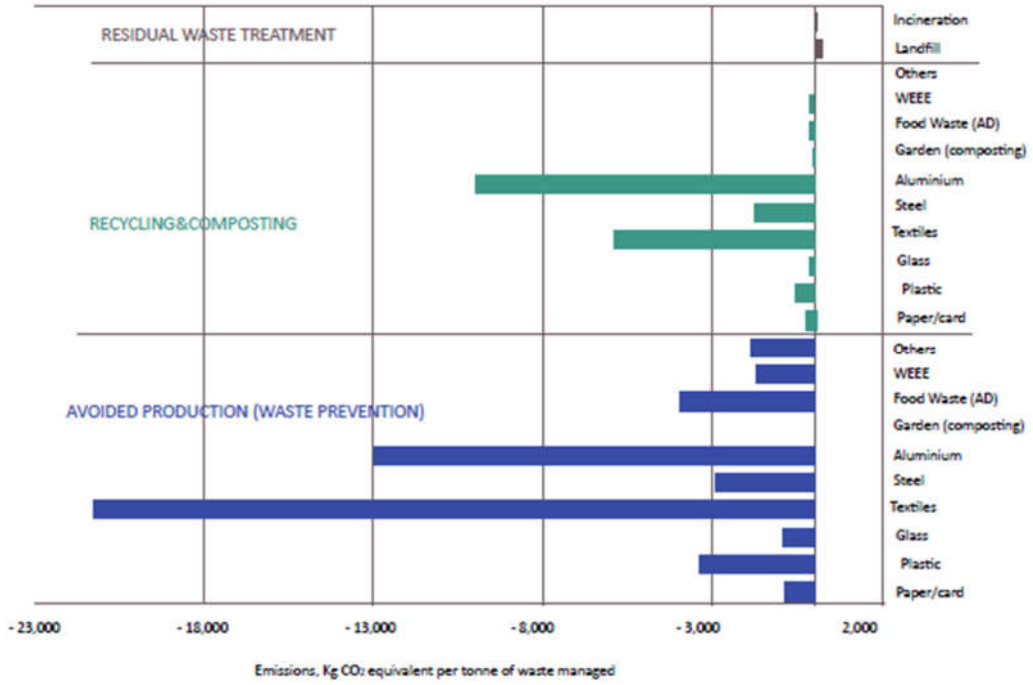

Figure 3- Indicative Climate Change Impacts of Key Waste Management Activities (excl. CO2 from biogenic sources), available from: www.zerowasteeurope.eu/downloads/the-potential-contribution-of-waste-management-to-a-low-carbon-economy/

[8] See for example, report on Integration of environmental concerns in Cohesion Policy Funds (ERDF, ESF, CF), available from www.publications.europa.eu/en/publication-detail/-/publication/73061c4e-7aaa-11e9-9f05-01aa75ed71a1 or The EIB Circular Economy Guide, available from www.eib.org/attachments/thematic/circular_economy_guide_en.pdf

[9] The Potential Contribution of Waste Management to a Low-Carbon Economy, available from www.zerowasteeurope.eu/downloads/the-potential-contribution-of-waste-management-to-a-low-carbon-economy/

[10] Technical report Taxonomy, available from https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/190618-sustainable-finance-teg-report-taxonomy_en.pdf

Conclusion

European incinerators generate a significant amount of direct CO2 emissions (580g CO2eq/kWh), which is twice the current EU28 average electricity grid intensity (298g CO2eq per kWh) and significantly greater than energy produced through conventional fossil fuel sources such as gas. Since these infrastructures are meant to last for about 20-30 years, they are delaying a much needed and urgent transition to less carbon intensive power generation infrastructure such as wind and solar renewable energy.

It would be environmentally irresponsible to continue to promote waste to energy infrastructures that are already largely outperformed by the EU average and even worse, by conventional fossil fuel energy generation such as gas. Promoting waste to energy electricity would make it impossible to facilitate ambitious emissions reduction in the energy sector that align with the Paris Agreement and genuinely seek to limit global average temperature increase to below 1.5°C.

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Zero Waste Europe is the European network of communities, local leaders, businesses, experts, and change agents working towards the same vision: phasing out waste from our society. We empower communities to redesign their relationship with resources, to adopt smarter lifestyles and sustainable consumption patterns, and to think circular.
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Zero Waste Europe gratefully acknowledges financial assistance from the European Union. The sole responsibility for the content of this event materials lies with Zero Waste Europe. It does not necessarily reflect the opinion of the funder mentioned above. The funder cannot be held responsible for any use that may be made of the information contained therein.