EUROPEAN SUPPLIERS OF WASTE-TO-ENERGY TECHNOLOGY

ESWET POSITION ON THE NET-ZERO INDUSTRY ACT

ESWET – the European Suppliers of Waste to Energy Technology – represents companies that have built and supplied over 95% of the Waste-to-Energy (WtE)1plants in operation in Europe. ESWET members are European manufacturers of technology which is indispensable to the EU's decarbonisation and de-pollution objectives. ESWET seeks to promote the technology that, within the frame of the Waste Hierarchy, recovers energy from waste that would otherwise end up in landfills.

ESWET welcomes the European proposal for a Net-Zero Industry Act, as this initiative aims to scale up the manufacturing of clean technologies in the EU thus accelerating the progress towards the EU's 2030 climate and energy targets.

ESWET's proposal:

ESWET agrees with the Commission's view on including electrolysers and fuel cells; sustainable biogas/biomethane technologies; and carbon capture and storage technologies as strategic Net-Zero technologies. WtE, in fact, presents a significant versatility as it may produce not only heat and electricity but also renewable and low-carbon hydrogen and fuels.

The Commission's recognition of CCS as a strategic net-zero technology is a prosperous achievement since the sector is already involved in CCS/BECCS projects. However, the **EC proposal does not include the related technologies pertaining to the transportation of the captured carbon to the storage sites.**

Therefore, ESWET advocates for the inclusion of the following technologies in the list of strategic net-zero technologies contributing to the European net-zero goals:

- **Heat recovery technologies;**
- **Material recovery technologies; and**
- **Carbon Capture and Utilisation technologies.**

The inclusion of these technologies will allow manufacturers to benefit from a simplified regulatory framework and be given the priority status to fully develop their potential projects.

Waste-to-Energy plants play a vital role in the circular economy and the renewable energy sector. These plants recover energy in the form of steam, electricity, or hot water, acting as a bridge between waste management and renewable energy generation. Waste-to-energy, therefore, contributes to the transition to a circular economy and maximises the circular economy's contribution to decarbonisation providing full respect for the waste hierarchy[2].

Technologies manufactured by ESWET members are the heart of most of the Waste-to-Energy plants in Europe and worldwide, allowing the recovery of energy and materials from non-recyclable waste. Considering the partly biogenic nature of emissions, the avoided CO_2 through electricity, heat, or fuel production, the waste diversion from landfills (avoiding methane emissions, whereby methane is 84 times more potent Green House

[1] Waste incineration with energy recovery
[2] Communication From The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions - The role of waste-to-energy in the circular economy - COM/2017/034 final, p. 10, available here: https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52017DC0034

Gas than CO_2 over a 20-year period according to the IPCC), and bottom ash recovery, **WtE plants act as carbon sinks.**

For ESWET, integrating innovative technologies, such as Carbon Capture and Storage, fuel cells and electrolysers, and technologies pertaining to biomethane and biogas production, into existing WtE plants can lead to additional environmental and climate benefits.

With regards to electrolysers and fuel cells, and biomethane and biogas production, WtE is involved in these technologies through **Waste-to-Hydrogen (WtH)[3] and Waste-to-Fuel (WtF)[4] technologies**. These fuels contribute to decarbonisation, particularly in energy-intensive industries and transportation. Waste-derived fuels reduce land competition, provide significant greenhouse gas savings, and have applications in public transport, industrial processes, and blending with natural gas. Waste-to-Hydrogen can help stabilize the energy grid, integrate variable renewable energy sources, and exemplify circular economy principles.

Hydrogen and fuels produced from waste are **partly bio-based fuels** (derived from the biogenic share of the energy from WtE). Waste-to-Hydrogen can be realised either by combining a combustion-based WtE plant with electrolysis or by certain processes based on gasification (for pre-treated waste). Waste-to-Fuel is characterised by the production of any synthetic fuel - liquid or gaseous - typically from a combination of captured carbon dioxide and Waste-to-Hydrogen. These synthetic fuels denote a form of carbon capture and utilisation (CCU). The produced fuels include methane (gas), methanol, and ethanol (both liquid), which all are formed through hydrogenation of carbon dioxide.

Concerning CCS, the integration of such technologies in WtE represents an **opportunity for bioenergy with carbon capture and storage (BECCS),** one of the few abatement technologies that can be carbon-negative. Furthermore, the sector is one of the cost-competitive options for CCUS[5] CCS projects that are now fairly advanced in Europe. For instance, the Klemetsrud plant, part of the Longship project supported by the Norwegian government, is being developed to capture up to 400,000 tons of CO_2 per year[6].

That is why, the association that represents the European suppliers of Waste-to-Energy technologies, is glad to welcome this proposal and the inclusion of these technologies as strategic net-zero technologies.

However, we regret to see the exclusion of **heat and material recovery technologies, as well as, Carbon Capture and Utilisation (CCU) technologies**. We believe that these technologies play a major role in strengthening the union's energy and climate strategy and in reducing Europe's reliance on imports from third countries.

KEY POINTS FOR ESWET:

Therefore, we call on the European Commission to reevaluate the proposal and include these technologies in the list of strategic net-zero technologies.

[3] WtH project example: http://www.awg.wuppertal.de/ueber-uns/aktuelles/artikel/muell-macht-mobil-wsw-busse-fahren-mit-wasserstoff-aus-dem-mhkw.html
[4] WtF project example: https://swisspower.ch/fr/courant/news/2022/vorzeigeprojekt-bei-limeco-in-dietikon-einweihung-der-ersten-industriellen-power-to-gas-anlage-der-schweiz/
[5] Eunomia (2021), CCUS Development pathway for the EfW sector, commissioned by Viridor, available here.
[6] Fortum Oslo Varme and our carbon capture project", article available here.

1) Heat Recovery: the gateway to energy efficiency

Energy security and efficiency represent an important topic and constitute one of the main economic, political, and environmental challenges in Europe. In light of the ongoing European energy crisis, **heat recovery technologies contribute to Europe's energy independence and stability.**

In fact, the energy produced from waste is resilient to supply setbacks and price fluctuations of raw materials and fuels, such as gas. As shown in studies[7], more than 50% of the energy output is renewable as it is of biogenic origin; the plants, therefore, generate partly renewable heat and electricity. Moreover, due to its complementary role to intermittent renewable energy sources (wind, solar), energy from waste is a secure baseload energy offering flexibility and stability to the existing energy grid.

In 2019, plants produced 43 billion kWh of electricity, which provided 20 million citizens with electricity and since more than 60% of WtE plants in Europe are combined heat and power plants, the facilities were able to supply almost 17 million Europeans with heat yearly[8].

The supply of affordable, efficient, and secure heat and power is, therefore, essential for key European industries and citizens. As recognised in the recast of the Energy Efficiency Directive (EED) (Directive 2012/27/EU), cogeneration is a crucial energy efficiency principle, already saving more than 33 bcm of primary energy across a range of energy sources, of which at least 15 bcm are directly linked to natural gas savings (equivalent to 10-20% of REPowerEU objective). If cogeneration was not utilised, it would be much more energy-intensive, polluting, and expensive to keep homes warm and maintain critical industrial operations during the winter.

Regarding energy from waste, around 10% of Europe's energy provided to **District Heating and Cooling (DHC)** networks comes from WtE. Below are some examples of European DHC networks currently running:

a) The district heating network in **Barcelona** avoids almost 30,000 tons of CO_2 per year with its connection to the local WtE plant. It also contributes to reducing the release of refrigerant gases into the atmosphere due to poorly controlled individual installations[9].

b) The district heating system of **Torino** is the largest system in Italy and one of the largest in Europe. The system is fed by three modern cogeneration plants, including a WtE plant that treats over 500,000 tons of waste per year. It covers several cities in the area such as Genoa or Parma, and saves 500,000 tons of CO_2 emissions[10].

c) The district heating network in **Paris** covers 12 municipalities in the area and is fed by 8 plants, 2 of them being cogeneration, and 3 WtE plants[11]. In total, they treat about 1.8 million tonnes of waste per year. The plants provide heat to approximately 300,000 homes, and to the main hospitals and museums of Paris, and avoid 900,000 tons of CO_2 emissions per year[12].

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[7] Frédéric GIOUSE, Elise RAVACHE et Léa MOUTTE. 2020. Détermination des contenus biogène et fossile des ordures ménagères résiduelles et d'un CSR. [ADEME - Cabinet Merlin – ENVEA. Détermination Des Contenus Biogène Et Fossile Des Ordures Ménagères Résiduelles Et D'un Csr, A Partir D'une Analyse 14c Du CO2 Des Gaz De Post-Combustion. Programme UIOM 14C – Campagne de mesures sur UIOM et chaufferie CSR.

[8] https://www.cewep.eu/wp-content/uploads/2022/06/CEWEP-WtE-Climate-Roadmap-2022.pdf.pdf

[9] Galindo Fernandez, M., Bacquet, A., Bensadi, S., Morisot, P. and Oger, A., Integrating renewable and waste heat and cold sources into district heating and cooling systems, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-29428-3, doi:10.2760/111509, JRC123771.

[10] https://trm.to.it/en/thermal-energy/

[11] https://www.vivis.de/wp-content/uploads/WM9/2019_WM_071-084_Hirtzberger.pdf

[12] https://www.cewep.eu/wp-content/uploads/2017/10/1322_hubert_de_chefdebien_presentation_on_wte_in_paris_v2_updated.pdf

Although WtE already significantly contributes to DHC networks in Europe as illustrated above, there is still a lot of untapped potential. The EU legislation has to recognise the role of waste heat recovery from WtE processes, as a pathway to enabling waste heat to be accounted towards the national renewable energy targets since the recovered heat can be utilised in district heating networks, heating and cooling buildings, offices, hospitals, and industrial processes, further reducing the reliance on fossil fuels and increasing energy sustainability.

ESWET's Proposal on Heat Recovery:

By recognising heat recovery technologies as strategic net zero in the NZIA, the EU legislators will be prioritising innovation and investments in the field, which can be indisputably crucial to the climate change mitigation efforts and objectives of Europe.

2) Material recovery technologies' contribution to the circular economy

Securing raw materials without over-relying on third countries has become a major environmental and geopolitical challenge for the EU. In this context, material recovery technologies have a significant role to play in the circular economy and decarbonisation by providing secondary raw materials and chemicals.

Incineration Bottom Ash (IBA) represents about 20 to 25% weight of the waste input to incineration and contains metals and minerals in various proportions that can substitute the energy-intensive extraction of virgin materials. On average, IBA is composed of 80 to 85% by weight of minerals, 10 to 12% by weight of ferrous metals (steel and iron), and 2 to 5% of non-ferrous metals (aluminium, copper, etc), and even precious metals, such as silver and gold[13].

The recovery of metals from plants is currently recognised as recycling at the EU level[14], and constitutes an additional source of revenue. However, the utilisation rate of materials from IBA differs significantly among Member States as there is no harmonisation at the EU level. It appears that the utilisation rate is rather a result of political commitment to IBA recycling[15].

The full recovery of metals represents a potential market of 2 billion EUR[16] in 2021 (so far 98% from non-ferrous metal). In general, material recovery from WtE processes prevents the energy-intensive extraction of raw materials. According to calculations by CEWEP - the Confederation of European WtE plants, **2,000 kg of CO_2 - equivalent emissions are saved for each tonne of metal recycled from bottom ash in incineration plants, while approximately 3.8 million tonnes of CO_2 eq. emissions are saved this way annually in Europe[17].**

Furthermore, the full volume of IBA potentially available for recovery with advanced technologies such as dry discharge systems in Europe is up to 0.7 million tons of aluminium[18] (which would represent up to 11% of all European imports). Iron is the main metal component in IBA, and represents a significant source of secondary raw materials. Moreover, recovering heavy metals from waste also substitutes the use of virgin materials in the chemical industry.

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[13] Muchova, Bakker & Rem (2009), Precious metals in municipal solid waste incineration bottom ash, Water Air Soil Pollution:Focus 9
[14] EC Implementing Decisions 2019/1004, WFD, metals separated and recycled after incineration are conside
[15] Blasenbauer et al. (2020), Legal situation and current practice of waste incineration bottom ash utilisation in Europe, Waste Management 102
[16] From internal calculation based on figures from Geschäftsbericht der ZAV Recycling AG (2020)
[17] https://www.cewep.eu/wp-content/uploads/2017/09/FINAL-Bottom-Ash-factsheet.pdf
[18] For reference, a tonne of aluminium is worth about 2 209 € (February 2023)

Even the material recovery of aggregates from IBA has a significant potential for CO_2 emissions avoidance. For instance, 100,000 tons of aggregates recovered from WtE processes that are used in the clinker production cycle replacing primary raw materials, can result in the avoidance of approximately 75,000 CO_2 -equivalent emissions, while in general recovered aggregates used in building materials and products can lead to the avoidance of approximately 2,200,000 tons of CO_2 -equivalent emissions over a 20-year period[19].

ESWET's Proposal on Material Recovery:

Material recovery technologies must be included in the list of strategic net-zero technologies as they are a crucial element to help reduce the union's reliance on foreign importation of raw materials.

3) CCU technologies: as tools to achieve carbon neutrality

Carbon capture, utilisation, and storage (CCUS) technologies are widely recognised as a necessity for decreasing GHG emissions[20]. As stated by the latest IPCC report, the implementation of CCUS for plants can "enable waste to be a net zero or even net negative emissions energy source", with the potential to capture "about 60 to 70 million tons of carbon dioxide annually" in Europe[21].

CCU technologies strengthen the resilience of the EU economy and industrial systems by storing CO_2 or solid carbon in materials over a long period and reusing the captured carbon as an alternative feedstock to produce fuels, chemicals, and materials in place of fossil equivalents. CCU contributes to the EU's independence from fossil resources (imports), significant emissions reductions (and even carbon elimination in some value chains and for some carbon sources and pathways), increased circular economy in production systems, and EU leadership in clean technologies.

In fact, among the possibilities of using CO_2, sending it to greenhouses is already applied in thermal waste treatment. In the Netherlands concretely, the AVR Duiven plant can capture up to 100,000 tonnes of CO_2 per year and the Twence plant in Hengelo is developing a larger scale unit to also reach this capture capacity[22]. Both facilities send the carbon to nearby greenhouses to promote plant growth23. Mineralisation is another possible route for carbon captured from WtE plants for building aggregates. Other uses include Fertiliser with lower environmental impact, Carbonated soft drinks, Methanol production, and E-fuels when coupled with hydrogen.

ESWET's Proposal on CCU:

CCU technologies will contribute to achieving the EU's hydrogen targets, and represent an essential outlet for CO_2 captured from all sources. Products and fuels derived from CCU technologies will replace fossil resources and reduce the EU's greenhouse gas emissions. Thus, CCU technologies should be included in the list of strategic net-zero technologies

[19] https://www.matrixoda.it/en/sustainability/
[20] As pointed out by the Global CCS Institute in their report Waste-to-Energy with CCS: A pathway to carbon-negative power Generation (2019).
[21] Intergovernmental Panel on Climate Change (IPCC). (2022). Climate Change 2022: Mitigation of Climate Change. Working Group III contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, p. 990.
[22] Newest-CCUS article (2022), "No time to waste: WtE operators in the Netherlands turn up the heat on decarbonisation", available here.
[23] Newest-CCUS article (2022), "No time to waste: WtE operators in the Netherlands turn up the heat on decarbonisation".

CONCLUSIONS

Waste-to-Energy is an essential feature of the EU waste management framework, as it treats non-recyclable waste that would otherwise be landfilled. ESWET deems that on top of the EC's proposed strategic net zero technologies - heat and material recovery technologies, as well as, Carbon Capture and Utilisation technologies are also important technologies necessary to mitigate climate change and progress towards the EU's 2030 climate and energy targets.

ESWET
European Suppliers of Waste-to-Energy Technology

For further information:
Charoula Melliou
Head of Policy
c.melliou@eswet.eu
Tel: +32.2.743.29.88

ESWET is a European association representing the European suppliers of Waste-to-Energy technologies, committed to fostering the development and dissemination of Waste-to-Energy at the European level. ESWET also seeks to raise awareness of the positive implications of the technology in terms of better waste management, energy, and for the environment.