EUROPEAN SUPPLIERS OF WASTE-TO-ENERGY TECHNOLOGY

ESWET POSITION FOR THE PROPOSED REVISION OF THE RENEWABLE ENERGY DIRECTIVE

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ESWET – the European Suppliers of Waste to Energy Technology – represents companies that have built and supplied **over 95% of the Waste-to-Energy plants** in operation in Europe. It seeks to promote the technology which, within the frame of the Waste Hierarchy, recovers energy from waste that would otherwise end up in landfills.

ESWET welcomes the European Commission's proposal for the revision of the **Renewable Energy Directive (RED)** (Directive (EU) 2018/2001), as it accurately addresses the urgency of up-taking every renewable energy source available, including the electricity, steam, heating and cooling generated from non-recyclable waste.

Indeed, **around 50% of the energy output of Waste-to-Energy plants is renewable** as it comes from the biodegradable fraction of waste.

KEY POINTS FOR ESWET:

1) Emerging Waste-to-Energy applications can help reach the **increased targets of the RED**, which require the uptake of more renewable energy and fuels.

2) The revised RED should continue to recognise the partly **renewable feature of the energy from Waste-to-Energy plants** and to count it towards the EU renewable energy targets based on the percentage of biogenic waste (calculation method provided by MS legislation). This energy from waste, which can be recovered as heat or electricity, should not be subject to RED sustainability criteria.

3) The definition of biomass should continue to include "**the biodegradable fraction of waste**", which should continue to be considered a source of renewable energy.

4) The **exception for biofuels, bioliquids, and biomass fuels** produced from waste and residues, as granted by Article 29 paragraph 1 sub-paragraph 2 should remain. However, amending the sustainability criteria for biofuels in Art 29 (10) could prove counter-productive as the current ones are still under implementation by the Member States.

5) **Recycled carbon fuels** for fuels produced from the fossil part of waste should continue to count towards meeting the transport targets.

6) Any relevant **sustainability criteria for fuels from waste** should take into account avoided greenhouse gas (GHG) emissions from landfill diversion and captured GHG emissions from CCUS implementation.

Waste-to-Energy – an integral part of circular economy

Waste-to-Energy is an essential part of the European waste management and contributes to the decarbonisation of the sector, as it diverts non-recyclable waste from landfills and recovers energy and secondary raw materials, thus providing reliable renewable energy and preventing GHG emissions.

Waste-to-energy plays a role in the transition to a circular economy and can maximise the circular economy's contribution to decarbonisation **provided full respect of the waste hierarchy**[1], which is what Art 3(3)(a)(ii) of the proposed revision of the RED depicts: "*Member States shall grant no support for the production of renewable energy produced from the incineration of waste if the separate collection obligations laid down in Directive 2008/98/EC have not been complied with*."

In order to achieve a circular economy, each type of waste must be treated according to the Waste Hierarchy (Directive 2008/98). Residual waste is the fraction of waste that cannot be recycled following collection and sorting, or that is rejected from recycling facilities.

The only viable solution for residual waste as per the waste hierarchy and the circular economy is the recovery of its energy content of in **advanced Waste-to-Energy facilities with a high energy efficiency and low emissions**[2].

Biomass from waste – a renewable source of energy

The proposed revision of the RED reiterates that **the biodegradable fraction of municipal and industrial waste is considered biomass**, which is a renewable energy source (Art 2 point 24).

Biomass has the potential of replacing fossil energy carriers and feedstocks in energy-intensive industries. Waste-to-Energy activities are involved in biomass applications for energy uses. It is estimated that the renewable energy output from Waste-to-Energy plants is more than 50%[3], contributing substantially to decarbonising the energy systems in Europe, in particular by substituting fossil fuels in the heating and transport sector.

The advantage of using biomass in energy applications in energy-intensive industries is that when it is combined with Carbon Capture and Storage (CCS), the industry can provide a net removal of CO_2 from the atmosphere, resulting in negative emissions.

Waste-to-Energy – A stable source of renewable energy

Under the current Renewable Energy Directive, at least half of the energy recovered in Waste-to-Energy plants is renewable, as it comes from biogenic waste. Moreover, contrary to intermittent renewable sources (such as wind or solar energy), renewable energy from Waste-to-Energy can be provided 24/7, and is thus plannable and reliable, which increases the flexibility of electricity generation of the entire electric grid.

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1 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

2 Paragraph 104 of the EP Resolution on the new Circular Economy Action Plan, 10 February 2021: https://www.europarl.europa.eu/doceo/document/TA-9-2021-0040_EN.html

3 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.] Available at: https://bit.ly/3D8SN7b

Moreover, Waste-to-Energy contributes to the European Green Deal objective of securing affordable renewable energy in Europe and it has potential to further substitute fossil fuels while reducing related GHG emissions.

Waste-to-Energy – A key actor in energy and material recovery and in meeting the targets for renewable energy, heating and cooling, and district heating and cooling.

Waste-to-Energy is the link between circular economy and renewable energy: it ensures that the residues of recycling processes and other non-recyclable waste are used as a resource by recovering energy and material from it. This recovered energy is turned into electricity, heat, or renewable and low-carbon fuels, to the benefit of communities and industries.

It is estimated that Waste-to-Energy plants in Europe account for 2.4% of the EU's total energy supply[4]. I**n 2018 in Europe, Waste-to-Energy plants exported around 40 billion kWh electricity and 90 billion kWh heat, which provided 18 million citizens with electricity and 15.2 million citizens with heat**[5]. **As an example, Waste-to-Energy plants provide more than 30% of the overall heat production in the district heating networks supplying Copenhagen and 16 neighbouring municipalities.**

ESWET supports the increased collective target of 40%, from the current target of 32% (Art 3(1)), for the minimum share of renewable energy of the EU's final energy consumption, and the increased targets on heating and cooling (Art 23(1)) and on district heating and cooling (Art 24 (4)). Energy efficient district heating and cooling systems using waste, as input fuel can certainly make a positive contribution to environmental protection.

For district cooling in particular, the way it works is that the heat from a WtE plant is used to provide chilled water for air conditioning and other cooling applications. It is worth adding that a district cooling system replaces many individual smaller cooling units, so there are environmental benefits from reduced leakage of refrigerant gases. "A large system will typically only emit 1% of refrigerant gases, whereas a small installation may emit around 10- 20%"[6].

In order to make full use out of this energy, the revised RED should support the efficient integration of Waste-to-Energy plants into local heat and power grids, provided the respect of the waste hierarchy. Pursuant to the above, it is important that electricity, heating and cooling produced from municipal solid waste are not subject to any greenhouse gas emissions saving criteria (Art 29(1) sub-paragraph 3). Waste-to-Energy emits CO_2 which is partly fossil and partly biogenic. Biogenic CO_2 from WtE plants depends on a fluctuant input of biowaste.

Any GHG emissions saving criteria should take into account the biogenic emissions, since these count towards the renewable energy targets. Given the specific features of WtE input, precise continuous assessment of biogenic emissions would be a technical challenge.

Moreover, Waste-to-Energy technology is the safest waste treatment option for residual non-

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4 International Energy Agency (IEA) Renewables Information: Overview: https://www.iea.org/reports/renewables-information-overview

5 CEWEP - What is Waste-to-Energy? https://www.cewep.eu/what-is-waste-to-energy/

6 Saveyn, H., Eder, P., Ramsay, M., Thonier, G., Warren, K. and Hestin, M., Towards a better exploitation of the technical potential of waste-to-energy , EUR 28230 EN, Publications Office of the European Union, Luxembourg, 2016, ISBN 978-92-79-63778-0 (online),978-92-79-74180-7 (ePub), doi:10.2791/870953 (online),10.2791/269648 (ePub), JRC104013 , page 150, citing: Swedish Ministry of the Environment and Energy, July 2016: http://publications.jrc.ec.europa.eu/repository/bitstream/JRC104013/wte%20report%20full%2020161212.pdf

recyclable waste, which would otherwise be landfilled and thus lost as a resource. It is also an effective alternative energy option to prevent the use of fossil fuels and the consequent CO_2 emissions from traditional power plants producing the same amount of energy[7].

Though material recovery performed in many Waste-to-Energy plants, it is a source of metals and aggregates sent back into the European economy and consequently does not need to be exploited from virgin raw materials or imported from outside Europe. In the EU, Waste-to-Energy plants save 3.8 million tonnes of CO_2 equivalent every year through metal recovery[8].

Waste-to-Energy – A solution for reliable renewable and low-carbon fuel

Waste-to-Energy covers a wide range of different technologies, including the production of biogas from biogenic waste, with proven advantages to the European energy mix. Energy from waste presents a significant versatility as it produces not only heat and power, but also useful products.

Waste-to-Energy can produce renewable and low-carbon fuels and hydrogen, whereby the combustion of municipal solid waste can provide some or all of the energy required for the generation of hydrogen through electrolysis or certain types of gasification. This Waste-to-Hydrogen represents a significant alternative to fossil fuels in powering fuel cell buses in cities, or refuse trucks collecting municipal waste.

Several hundreds of refurbished or new plants treating municipal waste throughout Europe would thus have potential to become as many local sources of green hydrogen.

Already, promising pilot demonstrations and projects at various stages of development are now taking off in Europe. **A successful example is found in the modern Waste-to-Energy plant of Wuppertal (Germany)**, where the electricity generated during the thermal treatment of residual waste is used for the production of hydrogen which supplies the city buses with zero-carbon fuel[9].

Renewable and low-carbon hydrogen are considered key to the climate objectives, especially in energy-intensive industries and transport. Waste-to-Hydrogen solutions offered by Waste-to-Energy increase the contribution of the sector to the decarbonisation of Europe.

The benefits of waste-derived fuels include the contribution to climate change mitigation, and to the reduction of land competition between energy and food crops. Besides, the JRC 2016 report on WtE writes that: "*Life-cycle CO_2 costs are lower than for fossil fuels or crop-based biofuels*"[10], and it continues by highlighting that *"In many parts of Europe where municipal solid waste is still predominantly landfilled, its conversion to biofuels would provide significant GHG savings. The displacement of GHG emissions for ethanol from municipal solid waste is estimated at -225g CO_2e/MJ*[11]".

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7 Depending on the fuel that is replaced (gas, oil, hard coal, lignite), it is estimated that 10 – 49 million tonnes of fossil fuels emitting 24 – 49 million tonnes of CO_2, would not need to be used by conventional power plants to produce this amount of energy: https://www.cewep.eu/what-is-waste-to-energy/

8 CEWEP's Bottom Ash Factsheet: https://www.cewep.eu/bottom-ash-factsheet/

9 Garbage makes you mobile: WSW buses run on hydrogen from the MHKW: https://awg-wuppertal.de/ueber-uns/aktuelles/artikel/muell-macht-mobil-wsw-busse-fahren-mit-wasserstoff-aus-dem-mhkw.html

10 Saveyn, H., et al., JRC104013, page 240 and 242, citing: Recreate: Policy Brief No. 2, November 2015, Producing Bioethanol from residues and wastes: http://publications.jrc.ec.europa.eu/repository/bitstream/JRC104013/wte%20report%20full%2020161212.pdf

11 Ibid, citing: Wasted: Europe's Untapped Resource – An Assessment of Advanced Biofuels from Waste & Residues: http://publications.jrc.ec.europa.eu/repository/bitstream/JRC104013/wte%20report%20full%2020161212.pdf

Some conversion processes can convert over 40% of the waste input energy into biofuel. Where heat use is not possible, this is a potential route to also increase the energy efficiency of WtE.

Under the RED, since energy from WtE is considered partly renewable, the produced fuel of WtE is also seen as partly renewable, meaning partly as recycled carbon fuel and partly as biofuel (combination of Art 2 points 24 and 35, and Art 7 (2) (Subpar. 2).

In other words, the biofuel content of the fuel produced is based on the biogenic content of the MSW input. Pursuant to that, any fuel produced from mixed waste is considered as partly biofuel and partly recycled carbon fuel depending on the biogenic and fossil content of the fuel.

In that sense, waste-to-fuel is featured in the RED in two different contexts:

a) fuels derived from biomass (Art 2 point 24, and Art 29 (1) and (10)), and
b) recycled carbon fuels (Art 2 point 35, Art 25 Art 29a).

While biofuels count towards meeting the renewable energy targets referred to in Articles 3(1) (binding overall Union target for 2030) ,15a(1) (buildings), 22a(1) (industry), 23(1) (heating and cooling), 24(4) (district heating and cooling), and 25(1) (transport sector) of the proposed REDIII, recycled carbon fuels count only towards meeting the targets of renewable energy in transport.

Regarding the GHG emissions saving criteria for biofuels, ESWET approves that the exception for biofuels, bioliquids and biomass fuels produced from waste and residues, as granted by Article 29 paragraph 1 sub-paragraph 2, remains in the proposed revision of the Directive. However, amending the sustainability criteria for biofuels in Art 29 (10) could prove counter-productive as the current ones are still under implementation by the Member States.

In addition, ESWET supports that recycled carbon fuels[12] **continue to count towards meeting the transport targets (Art 25), under the proposed revision of RED**. However, our association reserves its judgement on the new proposed Article 29a setting up greenhouse gas emissions saving criteria for renewable fuels of non-biological origin and recycled carbon fuels until the proposal of the relevant delegated acts. In any case, these criteria should take into account the avoided GHG emissions from landfill diversion of waste and the use of CCUS technologies, as analysed below.

Waste-to-Energy – Essential in avoiding methane release from landfills

In addition to all the above, Waste-to-Energy also prevents non-recyclable waste from ending up in landfills, which are a toxic legacy for generations to come. There, this waste is not only lost as a resource but its organic fraction will decompose and emit methane, a greenhouse gas 84 times more potent than CO_2 over a 20-year period[13].

Almost half of the European Member States still send to landfills more than 40% of their municipal waste[14]. In 2018 only, methane emissions from landfills in the EU27 Member States plus UK generated around 100 million tonnes CO_2 equivalent, and they counted for more than

12 Art 2 point 35 of Directive 2009/28/EC (RED): ""recycled carbon fuels" means liquid and gaseous fuels that are produced from liquid or solid waste streams of non-renewable origin which are not suitable for material recovery in accordance with Article 4 of Directive 2008/98/EC, or from waste processing gas and exhaust gas of non-renewable origin which are produced as an unavoidable and unintentional consequence of the production process in industrial installations;"

13 IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp. https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full.pdf

14 EUROSTAT - EU Waste Statistics: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Waste_statistics#Waste_treatment

20% of the total European methane emissions[15]. At the same time, the landfill issue is not likely to disappear, as conservative estimates still foresee a gap in non-recyclable waste treatment capacity in the coming decades[16].

The avoided emissions resulting for diverting waste from landfills should be considered in the calculation of GHG emissions savings[17], so they can be reflected in the RED' sustainability criteria for biomass, biofuels, and recycled carbon fuels. If the relevant sustainability criteria are not met, then biomass, biofuels, or recycled carbon fuels cannot count towards the renewable energy targets as provided for in the RED.

If, however, those criteria for energy and fuel from municipal solid waste take into account the offset of avoided emissions from landfilling of that waste, then the fuel (either biofuel or recycled carbon fuel) produced from waste could meet them.

The revised RED should consider carbon capture technologies

The revised RED and any following delegated acts should take into account the use of Carbon Capture for Utilisation or Storage (CCU or CCS) technologies when providing support to electricity, heating, and cooling production from biomass and in setting up sustainability and GHG emissions saving criteria for biomass, biofuels, and recycled carbon fuels.

Using CCS in the waste-to-energy industry presents a particular opportunity for bioenergy with carbon capture and storage (BECCS); one of the few abatement technologies that can be carbon negative (i.e., removal of CO2 from the atmosphere). BECCS involves the utilisation of biomass as an energy source and the capture and permanent storage of the CO2 produced.

The Intergovernmental Panel on Climate Change (IPCC) SR15 report (2018, p. 34) acknowledges that Carbon Dioxide Removal (CDR), including BECCS, is necessary to limit warming to 1.5°C[18]. The Waste-to-Energy sector has already had successful applications of this technology, for example, in Oslo, Norway, where removing emissions is required to meet the city's goal of 95% emissions reduction (in essence, climate-neutrality) by 2030[19].

Furthermore, carbon capture technologies should be made economically viable on all processes that have unpreventable CO_2 emissions, including the Waste-to-Energy sector, and for which climate neutrality cannot be achieved without CCS. Creating incentives and support for investments in research, innovation, and implementation in CCS technology will definitely assist many industry sectors in their transition to a circular and carbon-neutral model.

Important and early greenhouse gas reductions can be realised by a rapid use of CCS for those applications, allowing for some extra time to develop low- and zero-carbon alternatives, while ensuring the development of renewable generation capacity.

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15 EEA's GHG viewer : https://www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer

16 CEWEP Circular Economy Calculation Tool : https://www.cewep.eu/circular-economy-calculations-2/

17 E.g. See the tool to support the calculation of GHG emission avoidance from renewable electricity, renewable cooling and renewable heating projects under the Innovation Fund (v2.0 - 24.03.2021), available at: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/innovfund/other/ghg-calculator-renewable-electricity-heating_innovfund-lsc_en.xlsx

18 Waste-to-Energy with CCS: A pathway to carbon-negative power generation: https://www.globalccsinstitute.com/wp-content/uploads/2019/10/Waste-to-Energy-Perspective_October-2019-5.pdf

19 A full-scale carbon capture and storage (CCS) project initiated in Norway: https://www.fortum.com/media/2018/11/full-scale-carbon-capture-and-storage-ccs-project-initiated-norway; Sustainable waste management for a carbon neutral Europe: https://www.klimaoslo.no/2021/02/26/the-klemetsrud-carbon-capture-project/

CONCLUSIONS

Waste-to-Energy is a key actor in the treatment of non-recyclable waste and at the same time it constitutes a reliable source of continuous energy, partially renewable, as a complement to intermittent renewable energy sources.

It relies on waste directly available in Europe which participates to the European Green Deal objective of securing affordable renewable energy within the European Union.

In this respect, energy and fuels produced from Waste-to-Energy activities should continue to be promoted by the RED and count towards the renewable energy targets set out in the Directive.

Any relevant sustainability criteria should take into account avoided GHG emissions from landfill diversion and captured GHG emissions from CCUS implementation. For the latter, financial support is needed to accelerate the decarbonisation of the sector, which otherwise is hard to abate emissions.

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