cewep Confederation of European Waste-to-Energy Plants

CEWEP Congress

15th June 2023
Berlin

Paul de Bruycker
CEWEP President

Welcome to bursting Berlin!

Welcome to our 10th conference and our 20-years celebration.

- discover the innovative world of the WtE sector
- discover our essential role within the Circular Economy

CEWEP – Confederation of European WtE Plants

CEWEP is the umbrella association of the operators and owners of Waste-to-Energy (WtE) Plants across Europe.

They thermally treat household and similar commercial & industrial waste that remains after waste prevention, reuse and recycling and generate energy and materials out of it.

CEWEP Members:

81 M tonnes/year

410 plants

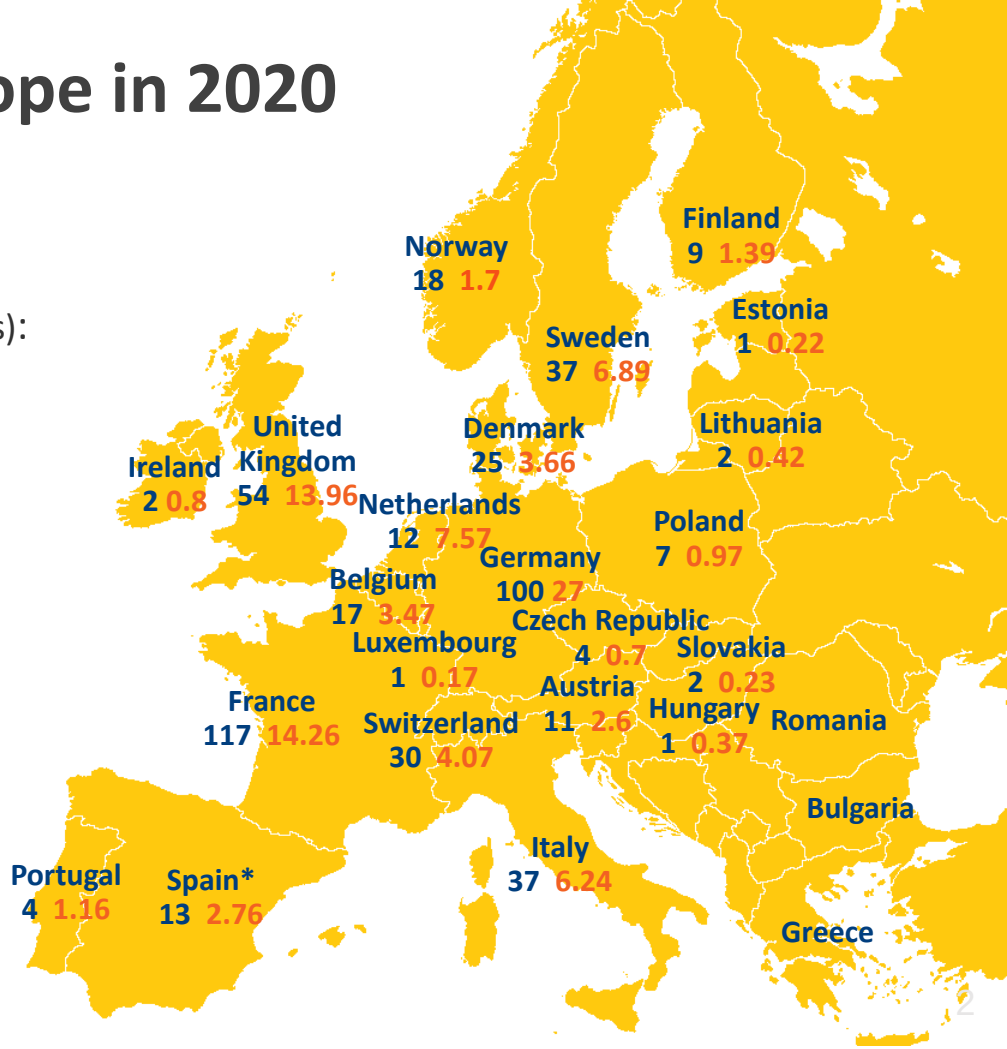
Waste-to-Energy in Europe in 2020

- **WtE Plants operating in Europe**
  (not including hazardous waste incineration plants):
  504

- **Residual waste thermally treated:**
  101 Million tonnes

Data supplied by CEWEP members
and national sources

*: Includes plant in Andorra and SAICA plant



CEWEP Confederation of European Waste-to-Energy Plants

WtE within the Circular Economy

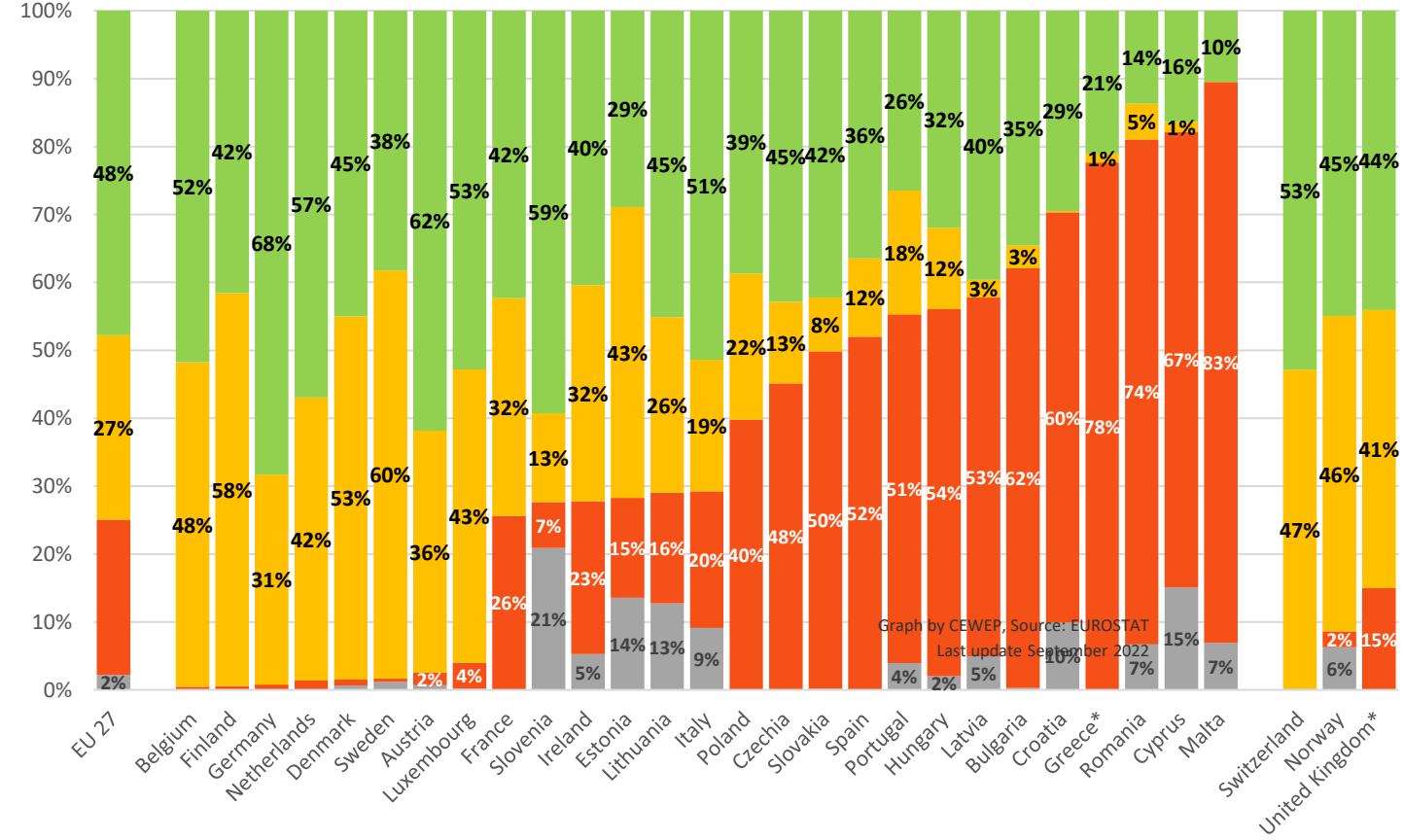
WtE has an important role to play in the Circular Economy of the future

- if in 2035 the ambitious targets of the **EU Circular Economy Package** would be reached (10% maximum cap for landfilling, minimum recycling target of 65% for municipal waste),
  residual waste will not have disappeared (still 132 M tonnes/year)

- even in 2050 our society will still produce residual waste which will be recovered.

Municipal waste treatment in 2020

EU 27 + Switzerland, Norway and the UK



Landfill

Waste-to-Energy

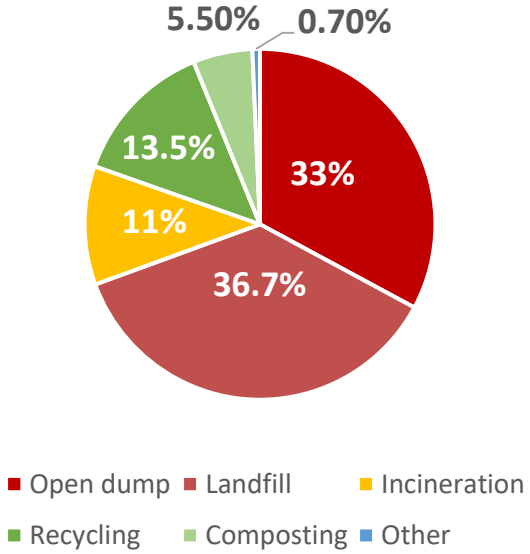
Recycling +Composting

Missing data

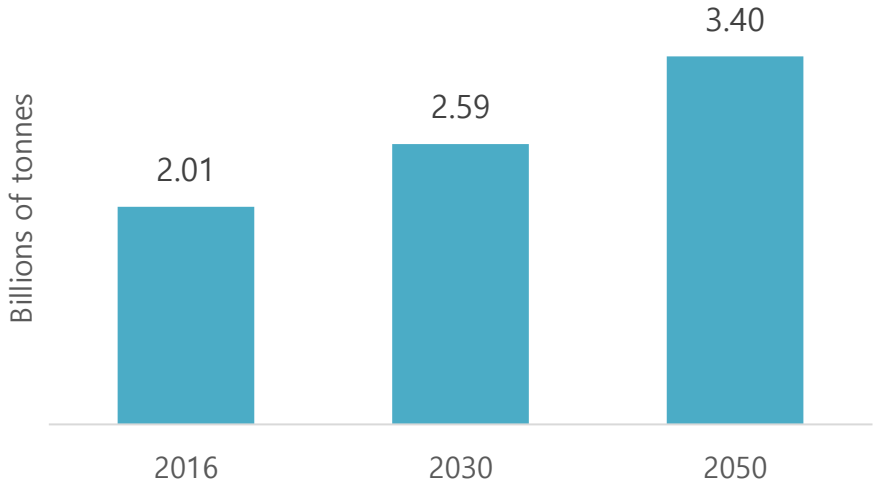
Percentages are calculated based on the municipal waste reported as generated in the country

*: last available data

Waste treatment and disposal worldwide



Projected waste generation: + 70% by 2050



Source: World Bank "What a waste" 2018

The Waste-to-Energy roadmaps in the European Green Deal

Making the Circular Economy happen today

Material and energy recovery are complementary solutions

→ **Waste-to-Energy Sustainability Roadmap 2019**

- Assessing future needs for the treatment of non-recyclable waste
- Stressing the double role WtE plays and will continue to play:
  - hygienic task: avoiding pollutants spreading into the environment;
  - recovering energy and materials from residual waste;

The Waste-to-Energy roadmaps in the European Green Deal

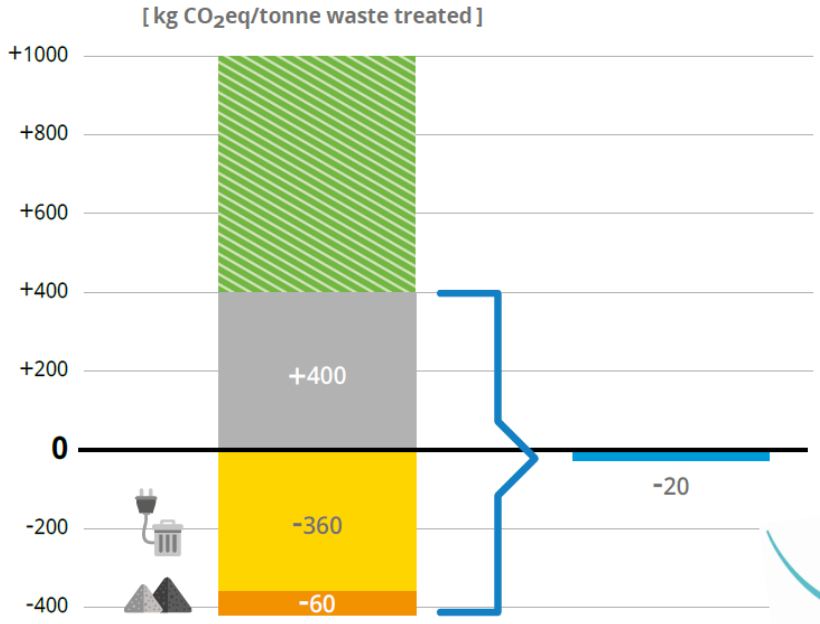
- **Our industry is preparing for the future and strives to become Carbon Negative in the future**

Energy substitution, bottom ash recovery, CCUS, landfill diversion, :

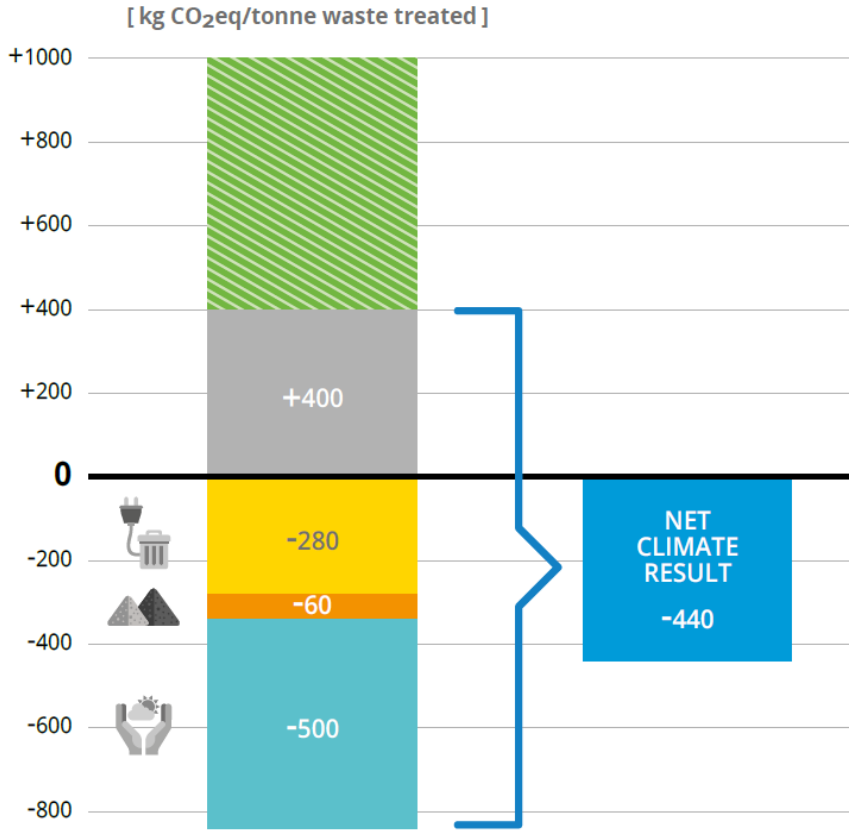
→ **Waste-to-Energy Climate Roadmap 2022**

CEWEP Climate Roadmap

From Carbon Neutral Today

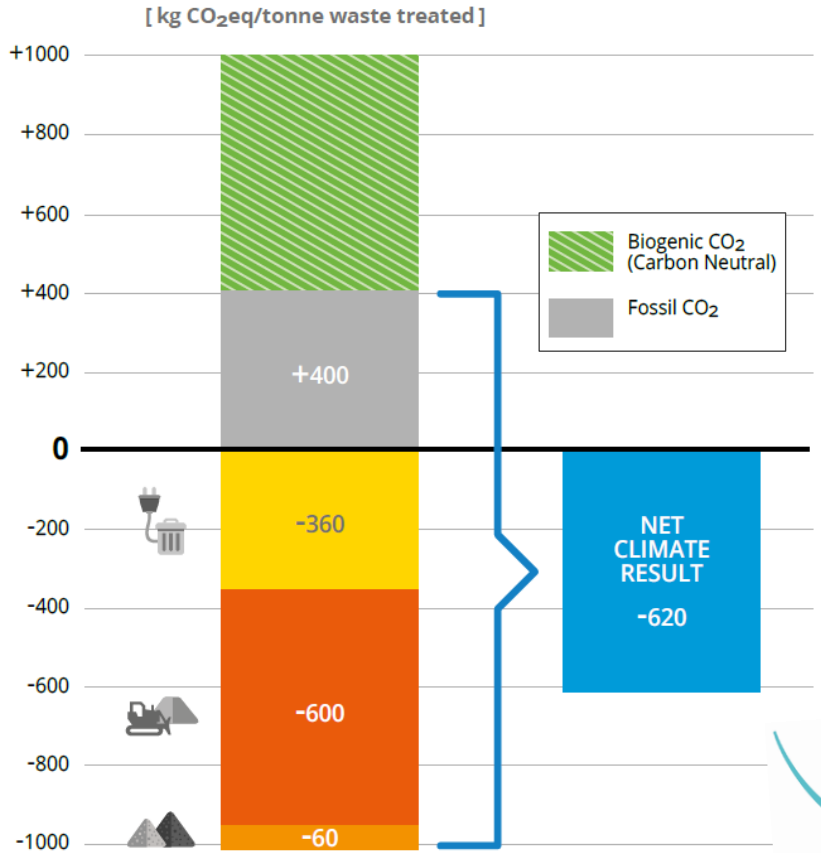


to Carbon Negative Tomorrow



Considering also **Landfill Diversion** the climate savings would be much higher!

How will the European WtE Sector Help to Achieve EU Net Zero?



ENERGY SUBSTITUTION
- local source of **baseload heat&power**
- less dependency on fossil fuel imports

LANDFILL DIVERSION:
- Methane emissions avoidance
  Methane GWP: 28x (100 years),
  86x (20 years) more potent than CO_2

BOTTOM ASH RECOVERY
- CO_2 eq savings from metals recycling

CURRENT CLIMATE BALANCE:
WtE offsets its direct, fossil CO_2 emissions

CCUS: Carbon Capture Utilisation and Storage

"The integration of WtE and carbon capture and storage (CCS) could enable waste to be a net zero or even net negative emissions energy source."

UN Intergovernmental Panel on Climate Change
IPCC Report, April 2022

Source and credits: AVR

Different CCUS projects in WtE kicked-off across Europe

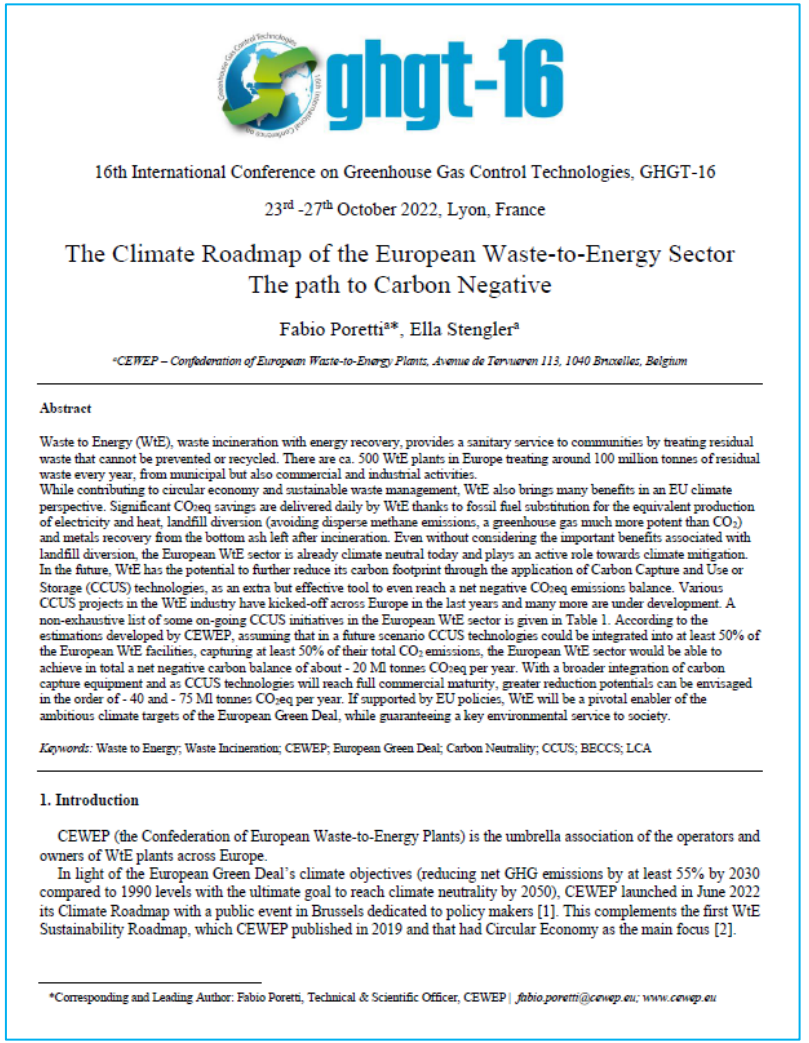
Belgium	Indaver Power-to-Methanol project (Antwerp@c, Port of Antwerp)
Denmark	CCS projects (ARC, Copenhagen), (Vestforbrænding, Glostrup), (ARGO, Roskilde) as part of the C4 - Carbon Capture Cluster Copenhagen
Finland	CCU Carbon2x pilot (Fortum, Riihimäki); EnergySampo CCU project (Westenergy, Mustasaari) + other CCU Power-to-Gas projects
France	CCU pilot project for CO2 use in algae production in the Paris area (SUEZ, Créteil), (Syctom, Saint-Ouen)
Germany	CCU projects for the production of synthetic methanol (EEW, Helmstedt); (ZASt, Zella-Mehlis)
Italy	Ravenna Hub CCS project (Herambiente, Ravenna); Hot Potassium Carbonate Test Installation (A2A, Corteolona)
Netherlands	Various CCUS projects (Twence, Hengelo), (AVR, Duiven), (AVR, Rozenburg), (AEB, Amsterdam), (HVC, Alkmaar); HyNetherlands CCU project for methanol production (EEW, Delfzijl); OSIRIS project for CO2 supply to two greenhouse clusters (PreZero, Roosendaal), etc.
Norway	CCS Longship Project (Hafslund Oslo Celsio, Klemetsrud); CCS Borg CO2 cluster (Frevar, Fredrikstad), (Kvitebjørn Bio-El, Fredrikstad), (Sarpsborg Avfallsenergi, Sarpsborg); other projects (Statkraft Varme, Trondheim), (Returkraft, Kristiansand), (BIR Ressurs, Bergen), etc.
Portugal	Power-to-Liquid project for the production of synthetic aviation fuels (LIPOR, Porto)
Sweden	HySkies CCU project for synthetic aviation fuels production (Vattenfall, Uppsala); CCS studies (Renova, Gothenburg), (SYSAV; Malmö);
Switzerland	CCS investigation study (KVA Linth, Niederurnen); All 29 Swiss WtE plants committed to CCS on the long-term
UK	CCS East Coast Cluster (SUEZ, Haverton Hill/Teesside); CCS Hynet North West project (Viridor, Runcorn), etc.

…and many more on-going feasibility studies, pilots projects, etc. across Europe

CCUS & WtE

About **60 active CCUS initiatives and projects** across WtE plants in Europe.

Poretti F., Stengler E., The Climate Roadmap of the European Waste-to-Energy Sector | The path to Carbon Negative, 16th Greenhouse Gas Control Technologies Conference (GHGT-16), Oct. 2022



16th International Conference on Greenhouse Gas Control Technologies, GHGT-16

23rd -27th October 2022, Lyon, France

The Climate Roadmap of the European Waste-to-Energy Sector
The path to Carbon Negative

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Abstract

Waste to Energy (WtE), waste incineration with energy recovery, provides a sanitary service to communities by treating residual waste that cannot be prevented or recycled. There are ca. 500 WtE plants in Europe treating around 100 million tonnes of residual waste every year, from municipal but also commercial and industrial activities.
While contributing to circular economy and sustainable waste management, WtE also brings many benefits in an EU climate perspective. Significant CO_2eq savings are delivered daily by WtE thanks to fossil fuel substitution for the equivalent production of electricity and heat, landfill diversion (avoiding disperse methane emissions, a greenhouse gas much more potent than CO_2) and metals recovery from the bottom ash left after incineration. Even without considering the important benefits associated with landfill diversion, the European WtE sector is already climate neutral today and plays an active role towards climate mitigation.
In the future, WtE has the potential to further reduce its carbon footprint through the application of Carbon Capture and Use or Storage (CCUS) technologies, as an extra but effective tool to even reach a net negative CO_2eq emissions balance. Various CCUS projects in the WtE industry have kicked-off across Europe in the last years and many more are under development. A non-exhaustive list of some on-going CCUS initiatives in the European WtE sector is given in Table 1. According to the estimations developed by CEWEP, assuming that in a future scenario CCUS technologies could be integrated into at least 50% of the European WtE facilities, capturing at least 50% of their total CO_2 emissions, the European WtE sector would be able to achieve in total a net negative carbon balance of about - 20 Mt tonnes CO_2eq per year. With a broader integration of carbon capture equipment and as CCUS technologies will reach full commercial maturity, greater reduction potentials can be envisaged in the order of - 40 and - 75 Mt tonnes CO_2eq per year. If supported by EU policies, WtE will be a pivotal enabler of the ambitious climate targets of the European Green Deal, while guaranteeing a key environmental service to society.

Keywords: Waste to Energy; Waste Incineration; CEWEP; European Green Deal; Carbon Neutrality; CCUS; BECCS; LCA

1. Introduction

CEWEP (the Confederation of European Waste-to-Energy Plants) is the umbrella association of the operators and owners of WtE plants across Europe.

In light of the European Green Deal's climate objectives (reducing net GHG emissions by at least 55% by 2030 compared to 1990 levels with the ultimate goal to reach climate neutrality by 2050), CEWEP launched in June 2022 its Climate Roadmap with a public event in Brussels dedicated to policy makers [1]. This complements the first WtE Sustainability Roadmap, which CEWEP published in 2019 and that had Circular Economy as the main focus [2].

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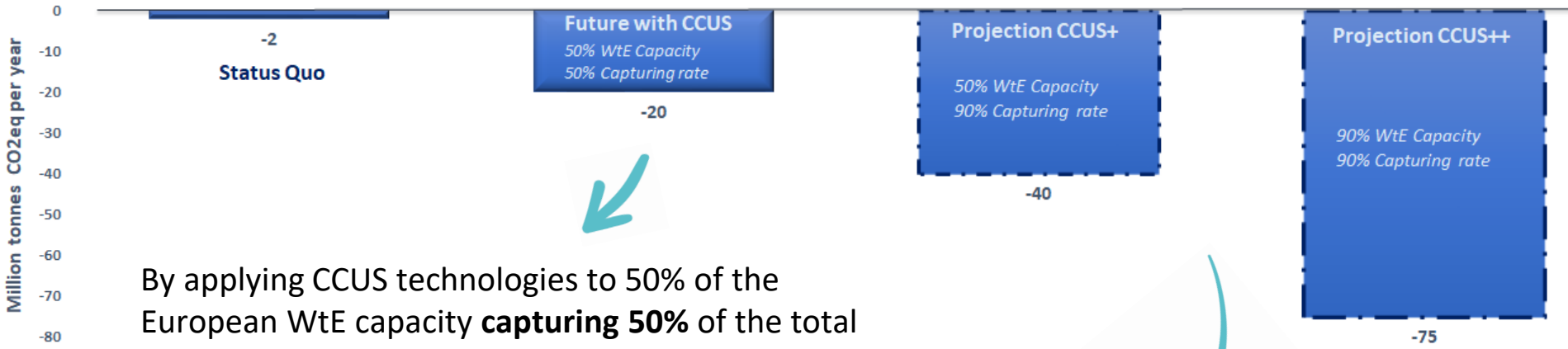
CO2eq Reduction Potentials

WtE saves every year ca. **2 million tonnes of CO2eq**

*Future projections will only be possible with **adequate policy support** and a **business model** on the EU and national levels*



By applying CCUS technologies to 50% of the European WtE capacity **capturing 50%** of the total CO2 emissions, **20 M tonnes of CO2eq** every year could be saved.

Increasing ambition: With a broader integration of carbon capture equipment, greater reduction potentials can be foreseen as CCUS technologies will reach **full commercial maturity**.

From Carbon Neutral to Carbon Negative

STATUS QUO

WtE is a climate neutral sector

BUILDING ON THE STATUS QUO

CCUS:
an extra but effective tool to reach a negative CO2 emission balance

Waste management within the Circular Economy

- **Prevention:** effective, efficient and safe use of raw materials and resources
- **High quality recycling:** closing loops without loss of quality and without a thread of contaminating food and product cycles
- **High quality recovery** of residual waste with the highest energy and material recovery rate, acting as a safe sink for unwanted organic components and CO_2

Thank you

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