

## 10<sup>th</sup> CEWEP Waste-to-Energy Congress, 14<sup>th</sup> - 16<sup>th</sup> June 2023 Berlin // Summary

### WtE's role in the EU Green Deal

#### Welcome and introduction by CEWEP, Paul De Bruycker, CEWEP President

Paul De Bruycker welcomed participants of the 10<sup>th</sup> CEWEP Congress and reiterated that Waste-to-Energy (WtE) feels at home in the circular economy. We want to turn non-recyclable waste to energy and secondary materials, he said.

Current projections envisage that more waste will be produced in the future. There is still a long way to go in reducing landfilling in some parts of Europe and that is only Europe. Outside Europe the situation is even worse – a lot of waste is put in open dumpsites (around 33%) or landfills (around 37%).

Our industry is already climate neutral, if we count avoided emissions and it strives to become carbon negative in the future. We are talking about energy substitution, bottom ash recovery, landfill diversion and Carbon Capture and Storage (CCUS) in the future.

We are working hard on innovation, there are 60 active projects in CCUS. This will only be possible with adequate policy support and a business model on the EU and national levels. As an industry we will not stop at being CO<sub>2</sub> neutral, we can reach CO<sub>2</sub> negative balance. Waste management has an important role in realising circular economy: efficient way of using resources, assuring high quality recycling and high-quality recovery. We need to close the loops without contamination.

Circular economy is the only direction to go and further investment is needed. We need to focus on high quality recycling and how to deal with the rejects of this activity. And we do not want to send rejects from recycling outside Europe where treatment standards are not high enough.

At the same time we need to make optimal use of the available WtE capacities. From an economic perspective the sector does not want to create overcapacity. Some additional capacity is needed in the southern European countries. And in general, we need more WtE capacity in Europe to deal with the residual waste.

Why is WtE not recognised under the taxonomy framework? Without the EU support investments in the countries that still need capacity are difficult.

#### Kick-off Speech: How to achieve climate neutrality worldwide? Prof. Franz Josef Radermacher, University of Ulm

Western countries do not grow anymore. However countries in development in 30 years will grow from 5 to 7 billion people, 2 additional billion people is more than four times the EU's population. Western countries present an attitude where they want to save the world, but their role and potential does not match. China adds 8 billion tonnes of CO<sub>2</sub> to our world budget per year. The world as a whole wants development. The development will stop the increase of the population. The situation will stabilise, hopefully with 10 billion people in 2050. What does this mean for CO<sub>2</sub> and our future in the climate sector?

So far projections on the world level have nothing to do with what is happening or has happened. Artificial Intelligence is not the ultimate solution, the real world is totally different from the digital one. It is possible and very easy to get efficiency gains in digital framework. But the physical world and our human body have limits and this is the problem. Key materials for humankind are cement, steel, plastic, and ammonia. So, the question is: how can we do it, go to "0" emissions if we still need material things?

The right solution should have two pillars: Renewable Energy Sources (RES) – climate-neutral but not reliable - complied with something reliable: nuclear or fossil energy with Carbon Capture (CC). CC is an absolute joker if you want a stable electricity system as 70% energy use today is fossil. CC should not only be used for

electricity, but it should also be applied as well to steel, cement, and ammonia – and of course in the waste sector. In the future there might be fights over who can reuse underground carbon. “All electricity” is not possible. We need a solution for the next 30 years. The number of cars and trucks in Africa is growing and trucks with batteries are too heavy. We need synthetic fuels. And the best synthetic fuel - HVO (Hydrogenated Vegetable Oil) comes from the waste sector.

**Keynote Speech, Dr Christoph Epping, Head of Resource Protection and Circular Economy, Ministry of Environment, Nature Protection and Nuclear Security, Germany**

Christoph Epping referred to the Waste Early Warning reports, published by the European Commission on 8<sup>th</sup> June 2023 which suggest that only 9 Member States are on track to meet the targets. He said that there is still a lot to do in Europe. The European Commission rightly points out that good waste management is the essential building block of a circular economy. It is important to stress that WtE is an indispensable pillar of sound waste management. Goals for the recycling of municipal waste will grow gradually from 50% in 2020 to 65% in 2035. There is a simultaneous change in the accounting of the recycling rate: from input to output. This will be challenging for countries like Germany as well. This is the right direction because this will show the amount of physical material which can be used.

A study published in 2020 by the European Environmental Agency showed that the share of recyclables in the residual waste has decreased significantly due to separate collection but it has to be further improved at source. The role of WtE will change as many coal and gas cogeneration plants will be taken off the grid in the next few years. Rightly the focus is still on safe disposal. However, heat recovered from waste incineration will be more important in the future. In Germany we are currently discussing climate neutral heat supply possibilities. Waste heat fed to local District Heating Networks by WtE is categorized as unavoidable waste heat.

At the European level we must advocate for waste incineration to be properly classified. Environmental Council meeting of 2020 under German Presidency highlighted minimising the need for incineration. There is a big difference between minimising the need for incineration and minimising capacity for incineration. If we just reduce the capacity of incineration it could result in increased landfilling.

Waste incineration sets a benchmark between high quality material recycling and landfilling of untreated waste. It is a better option when it comes to the safe disposal of polluted waste. It supplies public grids with heat and electricity. And ashes can be used as recycling material. In the foreseeable future we will need modern WtE plants as a component of the circular economy.

## **WtE's contribution to Climate Mitigation**

**CCS: Building the world's first full-scale WtE CCS plant, Markus Sebastian Hole, Public Affairs Manager, Hafslund Oslo Celsio, Norway**

Hafslund Oslo Celsio is committed to building the world's first full-scale WtE Carbon Capture and Storage (CCS) plant with a potential permanent geological CO<sub>2</sub> storage of up to 400,000 t/year in the North Sea. The project has already received funding from the Norwegian Longship project, the municipality, and other investors.

However, now the project is facing a one-year cost-reduction phase due to a significant cost increase. This is not related to the carbon capture project itself at the WtE plant but to some externalities such as a rapid inflation, higher energy prices and the NOK-EUR currency exchange. Other organisational and logistical issues complicated the project such as the area demand, the change of location for the intermediate CO<sub>2</sub> storage terminal at the port of Oslo, and the necessary expansion of the local electricity grid. Overall, the estimated cost increase is around 300 M EUR.

However, Hafslund Oslo Celsio remains fully committed to pursue this ambition project, also considering potential revenue streams achievable. This project in fact will be able to generate carbon removal certificates, considering that significant quantities of biogenic CO<sub>2</sub> will be captured and stored. There is also a collaboration opportunity of generating Net Zero Plastic certificates. Through these certificates plastic producers in the future would be able to generate carbon neutral plastic products since a corresponding amount of fossil carbon will be captured at the WtE plant.

WtE with carbon capture can be a multiple-win solution for Europe, but the right framework conditions to roll out the technology are needed. Such as a clear European framework for carbon removals, public authorities and private companies need to start tendering for carbon neutral waste handling services, and the future role of CCUS in the waste sector needs to be properly integrated into the EU's overarching strategies for the circular economy, sector integration, climate finance and the carbon removals certification scheme.

**CCU: CO<sub>2</sub> valorisation into synthetic fuels for the aviation sector, Karin Nikavar, Senior Regulatory Advisor, Vattenfall Värme, Sweden**

In Sweden, a reverse auction mechanism is in place to foster developments in BECCS technologies (Bio-Energy with Carbon Capture and Storage). This system works giving priority access to actors with the lowest bid until the budget limit is reached. The company initially applied for this mechanism, but the project could not compete with the full biomass ones. In order then to secure funding, the company finally opted for the Innovation Fund, joining the Hyskies project.

The Carbon Capture and Utilisation (CCU) project will take place at the WtE plant in Uppsala where approximately 200,000 tonnes of CO<sub>2</sub> per year are intended to be captured for re-use before 2030.

The captured CO<sub>2</sub> will be transported from the WtE plant to the nearby industrial site of Forsmark (80 km by truck), that will produce a bit more than 50,000 t/year of SAF (Sustainable Aviation Fuels). The availability of electricity in Forsmark can be also guaranteed by the nuclear power plant.

ReFuelEU Aviation proposal is important for this project since it sets quotas for the use of SAFs, and in particular of synthetic aviation fuels (e.g. Renewable Fuels of Non-Biological Origin - RFNBOs), to help defossilise the aviation sector. However, at the moment, the Delegated Acts of the Renewable Energy Directive recognise the use of fossil CO<sub>2</sub> from industrial processes to produce synthetic fuels only until 2040. Karin Nikavar stressed how this would not give the financial security for investments in this type of CCU technologies, which are very capital intensive.

**EU Innovation Fund and Certification of carbon removals, Dr Christian Holzleitner, Head of Unit, DG CLIMA, European Commission**

Carbon removals will be essential to reach climate neutrality by 2050. In addition to decarbonising its energy systems, the EU will also need to rethink its sourcing of carbon as feedstock for industrial processes by transforming CO<sub>2</sub> from waste to a resource, and use it to produce materials, chemicals and fuels. For example, biogenic CO<sub>2</sub> can be used to make methanol and consequently new bioplastics. According to the lifetime of these bioplastic products (for packaging, pipelines for building, etc.), different kinds of carbon removals can be generated according to how long the carbon would remain chemically bound, hence stored, in the product.

The proposal to define a framework for the certification of carbon removals in the EU is currently being discussed between the European Parliament and the Council. The final legislative text is expected for the beginning of 2024. In parallel, the EU Commission set up an Expert Group to start developing tailored certification methodologies on carbon farming and industrial removals.

More recently, with the Net Zero Industry Act (NZIA) the EU Commission set an EU-wide objective to achieve an annual CO<sub>2</sub> storage capacity of 50 million tonnes by 2030. This should reassure industry investors that their captured emissions can be stored in the EU (storage in combination with enhanced hydrocarbon recovery is excluded).

The Innovation Fund is the leading financing tool at EU level to help scaling-up of clean tech, low-carbon projects to commercial size. It can give support of up to 60% of additional costs related to innovative technologies. It is financed by the revenues of the EU Emissions Trading System, and it has an increasing budget each year (the 3<sup>rd</sup> call had a budget of 3 billion EUR). Up to now 70 projects were awarded, including the Hyskies project described previously by Karin Nikavar.

### **Panel Discussion: Waste-to-Energy - Ready for the Future?**

#### **Dr Helen Bray, Vice President Policy, Puro.earth**

Puro.earth is a Helsinki-based company which certifies suppliers of carbon net-negative processes or products. Removals are independently verified by a third party and CO<sub>2</sub> Removal Certificates are issued through the Puro Registry. On a policy level, it is essential to ensure first long-term plans with a clear role for durable carbon removal from National Governments. Learning from existing carbon crediting programmes would be also essential to develop new certification mechanisms. It must be ensured that suppliers know what they are selling, and buyers know what they are buying. Making the business case for investment can take a range of forms: tax incentives, contracts for difference, low-cost loans, integration of carbon removal units under compliance markets and a clear use of carbon removal units/credits to meet corporate claims.

#### **Dr Christian Holzleitner, Head of Unit, DG CLIMA, European Commission**

Member States will have to update their national energy plans by June this year and the EU Commission had been giving clear recommendations to introduce already Carbon Capture and Carbon Removals there.

On 8<sup>th</sup> June 2023, the European Commission launched a long-awaited consultation on the EU's upcoming industrial Carbon Management strategy. This will set the legal basis for the deployment of CCUS technologies and support efforts in hard-to-abate sectors towards the EU climate neutrality.

#### **Dr Anastasios Perimenis, Secretary General, CO2 Value Europe**

Both, CCU and CCS are necessary. They are not in competition but instead they are complementary solutions.

Reiterating what was mentioned by Karin Nikavar on the REDII Delegated Act for the methodology to calculate GHG emissions of synthetic fuels from captured CO<sub>2</sub>, it would become difficult to convince investors if the use of unavoidable CO<sub>2</sub> from industrial processes would only be possible until 2040. For CCU projects that have started before 2040, the captured unavoidable CO<sub>2</sub> should be allowed to be used throughout the project's lifetime. In parallel, strong investments in direct air capture as well including further sectors in the scope, like WtE, will provide the necessary long term security of supply of CO<sub>2</sub> for CCU products.

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.

#### **Jacob H. Simonsen, CEWEP Deputy-President/ CEO, ARC Amager Ressourcecenter, Denmark**

CO<sub>2</sub> capture will be a license to operate for WtE plants in the future. WtE plants are already committed to help Europe achieve net zero, but this will be possible only with governments' support. This also must come along with the full development of a CO<sub>2</sub> transport network, which goes beyond WtE boundaries.

Most likely in the short run CCS will be the prevailing solution, since CCU will have to grow with the full development and abundance of a green electricity infrastructure.

## The role of WtE in an Integrated Waste Management Infrastructure

**How the first WtE plant in Serbia was developed to foster Circular Economy in the Balkans, Philippe Thiel, Managing Director, Beo Čista Energija**

Developing the first waste treatment infrastructure PPP in Serbia, a EU pre accession country, was a real challenge. Vinca dumpsite was the biggest environmental black spot in the region. It is very close to the Danube River and all the leachate was going directly into the river. Main objectives of the project: remediate dumpsite, introduce energy recovery and recycling solutions, provide solution affordable to citizens (city waste tax was very low).

The project, financed by sponsors Veolia, Itochu and Marguerite and by IFIs (IFC, EBRD and OeEB), is developed as Private Public Partnership (PPP) with the city of Belgrade and includes engineered landfill and existing dumpsite remediation, construction and demolition waste recycling facility and WtE plant.

Environmental and social dimensions are integral components of the project. Resettlement Action Plan and Livelihood Restoration Plan for resettled families and workers from Roma community which were living at the dumpsite were provided.

The project has been recognised as a good practice at the European Bank for Reconstruction and Development (EBRD) 2023 Annual meeting. The project provides a modern waste treatment of municipal waste for 1,7 million inhabitants with GHG reduction - 210,000 t CO<sub>2</sub>eq/y - Carbon Credit certified.

**Strategy, investment plan and criticalities for WtE in Rome, Dr Paolo Aielli, General Manager of the Municipality of Rome**

The discussions surrounding the WtE plant in Rome were so difficult that because of that the national government of the Prime Minister Mario Draghi fell. In Italy there is uneven distribution of WtE plants between north and south. There are 37 WtE plants in the country treating around 6 million tonnes of waste per year, and the majority (26) are in the north.

In October 2013 Malagrotta landfill serving Rome was closed. In the period between 2014 and 2021 there was an emergency situation where waste (1,6 million tonnes per year) was sent to plants located either outside the city, the region or even the country. To deal with this extraordinary situation, in February 2022 the Mayor of Rome Roberto Gualtieri was appointed an Extraordinary Commissioner.

The December 2022 Rome Waste Management Plan includes a WtE plant (600,000 tonnes per year of residual waste) and two anaerobic digestion plants for the production of biomethane and compost (total treatment capacity of 200,000 tonnes per year).

In the context of the Rome Waste Management Plan, the WtE plant is fundamental, in combination with good practices such as waste sorting and substitution of landfill (waste hierarchy). According to the Life Cycle Analysis (LCA) conducted, the management of waste through these new plants will cause a drastic reduction of the environmental impact of waste.

Rome's mayor Roberto Gualtieri signed an ordinance launching an official expression of interest to the private sector for the construction of a WtE plant, through project financing. Now there is a selection of the contractor which will execute the project. The WtE plant will be built in the industrial area of S. Palomba (in the south of Rome). The construction will start in the summer of 2024 and will be finalised in 2026.

## **Panel Discussion: New WtE plants only outside the EU?**

### **Dr Tony Bonnici, Chief, Cooperation and Partnerships Section, UNECE PPP Secretariat**

In order to examine Public-Private Partnerships (PPPs) and highlight the challenges they face in contributing to the Sustainable Development Goals (SDGs) and the transition to a circular economy, the UNECE prepared guidelines on PPPs in Waste-to-Energy projects for non-recyclable waste.

If certain conditions are met there is a clear contribution by WtE to the circular economy. These conditions include avoiding landfills, focusing only on non-recyclable waste, focusing on the state-of-the-art technologies for pollution abatement and consulting the stakeholders.

Developing countries should first work towards an integrated waste management system and develop a strong legal framework. And only then decide to build WtE facilities.

The major issue in the developing countries is the informal sector (waste pickers) where the whole family's income depends on waste picking. It is a big challenge – how to involve the private sector which is regarded as taking precious waste away from the waste pickers. The informal sector must be included in any PPP arrangement.

### **Dr Aurel Ciobanu-Dordea, Director Circular Economy, DG Environment, European Commission**

It is not true that WtE investments cannot happen because of the EU policies in general (*referring to a slide question to the audience*). Rome's example in particular shows that EU policies are not a problem. Where there is a real need, the investment is possible, and the capacities find their opportunities.

If we look across the European Union, there are Member States which developed full capacities and even overcapacities in WtE. On the other hand we can see that in the Eastern Member States there are almost no capacities that have been built. And there is a need for capacity there but there is strong opposition. Not In My Backyard (NIMBY) is a powerful factor that needs to be taken into account in the explanation why it is not happening more.

The strategic overview on where the opportunities are, comes from the recently published Waste Early Warning Reports by the European Commission. They tackle the performance of the Member States in relation to the obligations in the area of waste management of the three important directives: Landfill Directive, Packaging and Packaging Waste Directive and Waste Framework Directive. Based on the overview of the performance of each Member State there is an opportunity for new WtE capacity in the Member States where the implementation gap is the biggest. There is a logical need to build WtE capacity with moderation in order not to create overcapacity, addressing the implementation gap.

Investments in WtE are economically viable and do not qualify to be supported by EU funds. EU funds are destined to help investments which need to take off, where there is no business case from the very beginning. This is not the case for WtE, which is a well-established technology with functioning business models.

### **Thomas Obermeier, Director and Head of Business Development, EEW Energy from Waste**

The greatest obstacle in the WtE development is the EU policy in general. The main reason is that we could have stopped landfilling in Europe a long time ago and this is the greatest mistake of the EU policy.

We should also discuss other waste streams, not only municipal waste. We will have EU ETS for WtE but not for landfills. Methane emissions from landfills are much more potent in terms of greenhouse gas effect than CO<sub>2</sub>. In the framework of emission trading all technologies should be included.

We need WtE for 20 to 30% of residual waste in Europe. Of course, we have to do more in recycling, in avoidance. Of course, we need to decouple economic growth from waste production. Not In My Backyard

(NIMBY) is not such a big issue. We should discuss it with the stakeholders and go to Please In My Backyard (PIMBY).

EEW is involved in the long-term contracts to deliver heat to the District Heating Networks. EEW has 17 plants and decided to have green bonds, not with taxonomy but with the international capital market association. EEW has developed ten or eleven projects for the green bonds. One of the difficulties is that you need to spend money in 36 months, if you have 500 billion green bonds you need a lot of projects. This is not easy.

WtE needs an ESG rating. You do not need taxonomy for the investment, but it sends a bad signal.

**Dr Julia Vogel, Research Associate, Environment Protection Agency, Germany**

According to the Waste Early Warning Reports Germany reaches the recycling target. So, whether there is WtE overcapacity in Germany or not this should not matter if the recycling target is fulfilled.

The waste hierarchy is not the problem for WtE. It is fine on the level on which it is. The main issue is that we have to go away from landfilling. Banning landfills is the success story which Germany can report. By banning landfilling and going on the route of WtE Germany is reducing GHG emissions. The biggest GHG emission reduction comes from banning landfilling of untreated waste. This is the direction to go to reduce GHG emissions. Therefore, it is a wrong signal to say in the taxonomy that increasing WtE is harmful. This is especially harmful for the Member States that do not have many facilities. The wording in the taxonomy should be changed. It should be the integrated waste management system approach, WtE should be a part of the package in the taxonomy.

Taxonomy sends the wrong signal. WtE needs to be recognised in this framework. It should not be unconditional; we need strict conditions. By doing this we could show the world how it should be done. It is good that residues treatment and CCUS are recognised but the WtE process should be recognised, not only downstream activities.

Responding to the discussion, **Aurel Ciobanu-Dordea** referred to the current legally binding regime in the EU which aims to reduce landfilling to 10% by 2035. This is a realistic solution for all Europe. The European Commission wants to fight landfilling in the existing legal framework.

In the context of WtE likely to be covered in the EU ETS, but not landfills, he stated that emissions trading for landfills is the right way forward.

Taxonomy does not represent an obstacle to the development of new WtE capacity. We need to make an economic case with the municipalities and public authorities where there are opportunities to support advanced and clean technologies. There is a misperception in many communities that WtE plants are polluting installations. It is not true. There is a need to explain.

European Commission will work on punctually clarifying the taxonomy (in the revision of the delegated act), in which conditions building WtE do not represent significant increase.

## Fake News is Good News?

### WtE's Social Media Experience

#### **Monika Michalska-Szulc, Polish Recycling Social Media Influencer**

In her Kick-off statement "THE POWER OF SOCIAL MEDIA - and how to use it", Monika Michalska shared some of her post insights and profile activities of "the waste lady".

She also shared a figure on the lifespan (half-life) of social media posts. A post on twitter for example lasts around 24 minutes, compared to 105 minutes in Facebook, the 20 hours on Instagram or the 24 hours on LinkedIn.

In terms of public exposure, Monika recommended that in different situations the best solution would be not to react when facing aggressive opposition. It can get difficult and frustrating. Honesty should always remain an essential value for communicators.

Regarding "keyboard warriors", Monika sees more general opposition on Facebook compared to other social media through her daily on-line activities on waste communication.

#### **Luke Walsh, Editor in Chief, ENDS Waste & Bioenergy**

Luke Walsh also suggested that sometimes it is just better to ignore the discussion that can be generated in social media. It could just prompt an endless ping-pong.

#### **Jarno Stet, Waste and Recycling Manager for Westminster City Council**

For Jarno Stet, the key is building trust. In his opinion, it is important to react using facts, explaining why a given statement on social media would not be correct.

Regarding a question, if WtE industry is not too defensive, Jarno Stet commented that in some cases it might be important to defend one's position but at the same time it is necessary to provide information which can help facilitate the communication. For example, in the industrial cluster at Teesside, in the UK, communication around developing new EFW plants is usually easier than in other regions because communities there are more supportive towards industry setting up in this region

#### **Jackie Keaney, Commercial Director, Indaver Ireland**

Social media is an effective tool but not the real solution, the best way remains meeting in person and openly addressing the concerns of the local communities. This has been the approach adopted by Indaver Ireland to promote their projects. Similarly, when facing journalists, Jackie suggested that it is always better to meet the author offline afterwards. Replying immediately online generally does not bring good results.

Jackie Keaney also commented that social media is not an effective platform to share technical information. It is best to discuss such topics within a technical forum or meetings where experts can provide both a technical and non-technical explanation of the information.



## Technical Seminar, 16<sup>th</sup> June 2023

### **Review of the EU Industrial Emissions Directive, Michael Suhr, Environmental Engineer, Environmental Protection Agency, Germany**

Michael Suhr gave an overview on how the Industrial Emissions Directive (IED) review fits in the Green Deal and can contribute to its objectives. The review should improve the effectiveness of IED by e.g. more stringent Emission Limit Values in permits, less room to grant derogations and a future implementing decision to harmonise compliance rules in permits. To better promote innovation, the review will provide additional tools to the IED such as:

- INCITE, the innovation centre for industrial transformation and emissions (a section of the European IPPC Bureau)
- Transformation plans (for energy-intensive industries first. The format and content of these transformation plans will be decided by an implementing act.

In order to contribute to the objectives of resource efficiency and sustainable use of chemicals, Environmental Management Systems will be required in all IED installations. Regarding the new activities included in the IED (mining, batteries, agriculture and landfill) a number of improvements could still be done to the landfill proposal. Trialogues will start at the end of July 2023 and are expected to last throughout the Spanish Presidency and finish under the Belgian presidency; publication is expected before the European elections.

### **Overview of CO<sub>2</sub> capture technologies for WtE: current perspective and future possibilities, Prof. Federico Viganò, Energy and Environment Laboratory Piacenza (LEAP)**

Prof. Viganò gave an overview of different techniques for CO<sub>2</sub> capture. Amongst them, solvent absorption is considered the technique that is closest to being market-ready among post-combustion technologies. Molten-carbonate fuel cells on the other hand are still extremely costly and show low tolerance against side pollutants like Hydrochloric acid, SO<sub>2</sub> and metals. Oxycombustion is promising but requires re-building of the installation. In general, CO<sub>2</sub> capture levels are more or less the same among the various technologies.

### **The role of chemical recycling of plastic waste Prof. Peter Quicker, RWTH Aachen**

In Germany and Austria there is a big hype surrounding chemical recycling technologies. On the European level, chemical recycling was also included by the Commission in the Taxonomy Delegated Act for Circular Economy.

The German UBA (Environment Agency) has a scientific project with a dedicated expert group that is addressing the possibilities and limitations of chemical recycling. Ironically, a WtE plant developing chemical recycling paths may produce a better input for chemical processes but is not regarded as an option for chemical recycling. In addition, Life Cycle Analysis show positive results in chemical recycling vs. WtE only with optimistic assumptions and when looking at CO<sub>2</sub> only.

In conclusion, there is a need for clarity on chemical recycling at a European level stipulating which processes are considered as such and how to calculate their contributions towards targets.

### **PFAS, a problem of waste incineration? Dr Julia Vogel/Markus Gleis, Environment Protection Agency, Germany**

Setting a definition of what is PFAS is already a challenge, but the most common classification used is the one developed by the OECD. Given their very useful properties, PFAS became very widely used. Only some of them are listed in the Stockholm Convention and in the EU POP regulation (e.g. PFOS and PFOA).

There is currently a great knowledge gap when it comes to assessing the impact of the PFAS compounds on the environment. Many projects are ongoing to show the positive contribution of WtE towards environmental protection when treating PFAS containing waste.

In Germany a measurement campaign was performed at BRENDA demonstration plant. In parallel the UBA is developing a study that aims to validate a sum parameter method for PFAS with a hotspot analysis. There is also an ongoing investigation for sewage sludge incineration to develop a good measuring method that can be afterwards applied to other incineration plants. The continuation of corresponding projects at French hazardous waste incineration plants in cooperation with the US EPA is planned for autumn 2023.

### **State of the art in metal extraction from Incineration Bottom Ash, Prof. Rainer Bunge, OST - Eastern Switzerland University of Applied Sciences**

In Switzerland, the extraction of metals from fly ash via acid washing is threatened by an acid supply shortage. This acid is currently obtained by the incineration of municipal waste, but incinerators cannot meet the future acid demand. As a solution, the addition of non-recyclable PVC-sorting residues to the waste is proposed to boost acid production. Proof of concept tests show an increased transfer of recoverable heavy metals from the bottom ash to the fly ash when PVC-sorting residues were mixed with the input waste. A follow-up project to investigate the mechanisms of this transfer and its optimisation is under development. The technology would meet the specifications for Chemical Recycling.

An audience member questioned if the technology may lead to increased corrosion in the incinerator's flue gas treatment train. This seems not to be the case if the correct temperature windows are established and maintained.

### **How are bioplastics affecting waste management, processing and WtE? Prof. Mario Grosso, Politecnico di Milano**

Prof. Grosso discussed what is the impact of introducing bioplastics on waste management, waste processing and WtE. The definition of bioplastics is divided by its origin (biogenic or fossil) and its characteristics (non-biodegradable or biodegradable). The preferable bioplastics are of biogenic origin and are biodegradable (e.g. PLA, PHA). Biodegradable and compostable bioplastics are already widely used on the Italian market (e.g. for food waste collection bags) and national legislation stipulated that biodegradable and compostable bioplastics must be conferred together with the organic waste.

Currently bioplastics are causing issues in the organic waste management system and plastic sorting systems. This means that biological processes, such as composting, anaerobic digestion, should be adapted to be more effective in dealing with bioplastics. When available, alternative materials that are more compatible with biological treatments should be considered instead of bioplastics (e.g. paper bags for food waste collection). Other options for the management of bioplastics waste should also be examined (e.g. incineration with energy recovery or material recovery), including an evaluation of the environmental aspects.