Bilateral Cooperation Austria / People's Republic of China (MOST)

Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie
Abwicklung durch die Österreichische Forschungsförderungsgesellschaft FFG

ENGLISCH:
→ **Title of the project**

ReCMSI: Real-time Carbon Monitoring and Smart Incineration aiming at low carbon emissions and high energy efficiency in waste-to-energy plant: Technology development and demonstration

→ **Synopsis**
The goals of the project are:

1. *Accurate identification of carbon source and high-temporal-resolution monitoring of carbon emission from Waste-to-Energy plants (discrimination between fossil and biogenic based CO2 emissions).*
2. *Development of low-carbon and high-efficiency Waste-to-Energy technology based on well controlled waste mixing and feedback-based parameter optimization.*
3. *Cost-effective carbon capture coupled with conversion of carbon into value-added products.*

Project description / tasks:
→ **Status:** *ongoing (Nov 2022 – Oct 2025)*

→ **Summary**
A steadily increasing amount of waste is thermally utilized. Globally 350 million to/yr are combusted in Waste-to-Energy (WtE) plants, whereby three quarter of the overall waste incineration capacity is located in the EU and China.

The amount of energy recovered but also the emissions of WtE plants do not only depend on the combusted waste, but also on the operation mode of the plant. To maximize the energy output and minimize emissions, a constant operation in terms of steam production is mandatory. Findings by the applicants, however, show that the steam production in modern WtE plants is significantly below the maximum plant capacity at almost 40% of the operating time. The main reason for this is "unavoidable" **variations in the waste feed composition and the operation**, which is compensated via the utilization of auxiliary fuels and the supply of additional combustion air. Both lead to significant **energy losses** , **increased emissions** and **higher operating costs**.

Another challenge that WtE plants currently face is the monitoring of fossil CO_2 emissions. Due to the composition of the waste feed (variable shares of biogenic materials and plastics), only part of the emitted CO_2 is greenhouse relevant. There are currently no methods (especially in China where WtE plants will possibly be included in CO_2 emissions trading) to determine these CO_2 emissions cost-effectively and reliably.

In the long term, WtE plants aim to capture and and utilize CO_2, which ideally means that they can become a carbon sink, since biogenic CO_2 is also separated and withdrawn from the Carbon natural cycle. Here, too, there is currently a lack of proven technologies for WtE plants.

The aims of the proposed project are hence as follows:

a) Accurate identification of carbon source and high-temporal-resolution monitoring of carbon emission from Waste-to-Energy plants (discrimination between fossil and biogenic based CO_2 emissions).

b) Introduction of a of low-carbon and high-efficiency Waste-to-Energy technology by developing and implementing based on well controlled waste mixing and feedback-based parameter optimization.

c) Cost-effective carbon capture coupled with conversion of carbon into value-added products.

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The developed procedures/measurement methods can be used globally (in the first step they will be developed and tested for the Austrian and Chinese markets) and will contribute to a significant improvement in the environmental performance and resource efficiency of Waste-to-Energy plants.

→ **Project management**

- VIRWa GmbH (Vienna Institute for Resources and Waste)

→ **Project or cooperation partners**

- TU Wien – Institute for Water Quality and Resource Management
- Zhejiang University - Institute for Thermal Power Engineering
- Shanghai Jiao Tong University (Institute for Thermal Power Engineering

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Projektsteckbrief

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