EffiTorch

Efficient valorisation of CO2 and bio-waste for long-term energy storage using a microwave plasma torch and quenching using the reverse Boudouard reaction

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Project Background

EffiTorch - Efficient valorisation of CO2 and bio-waste for long-term energy storage using a microwave plasma torch and quenching using the reverse Boudouard reaction.

The EffiTorch project is focused on developing a breakthrough technology for long-term energy storage by utilising ultra-high temperature thermal plasma to directly split CO2, while simultaneously valorising low-value bio-waste to produce syngas. Aiming for carbon efficiencies greater than 90% and energy efficiencies exceeding 60%, EffiTorch seeks to surpass current energy storage solutions. The project will demonstrate this innovative approach at a pilot scale, targeting continuous operation for over 10 hours. EffiTorch will also create robust process balancing techniques to thoroughly analyse carbon utilization and energy flow, ensuring scalability and industrial applicability. This project not only addresses the urgent need for efficient energy storage but also supports the circular economy by reclaiming value from waste and minimizing environmental impact.

Project Objectives

DEVELOP an innovative microwave plasma process to convert CO2 and bio-waste into syngas using electrodeless torches and rapid quenching through RBR, boosting carbon and energy efficiency.

INTEGRATE the continuous processing of bio-waste (particularly sewage sludge) with CO2 to generate syngas, enabling the production of synthetic fuels and chemicals, and advancing a circular economy.

DESIGN a high-temperature reactor with plasma confinement and ultrasonic atomization of bio-oil to improve the conversion of bio-waste into syngas, using advanced reactor technology.

IMPROVE the process to exceed 90% carbon efficiency and 60% energy efficiency, providing a viable alternative to electrolysis-based hydrogen production, reducing reliance on expensive electrolysers.

DEMONSTRATE the feasibility and industrial scalability of the EffiTorch technology, addressing key challenges in renewable energy storage and waste valorisation, while contributing to climate goals.

BOOST the dissemination of EffiTorch's innovations through targeted communication, engaging key stakeholders, including policy makers and industry leaders, to facilitate the adoption of EffiTorch solutions.

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PROJECT FACTS

Duration
10/2024 to 09/2028

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Horizon Europe
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HORIZON Research and Innovation Actions

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Coordinator
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