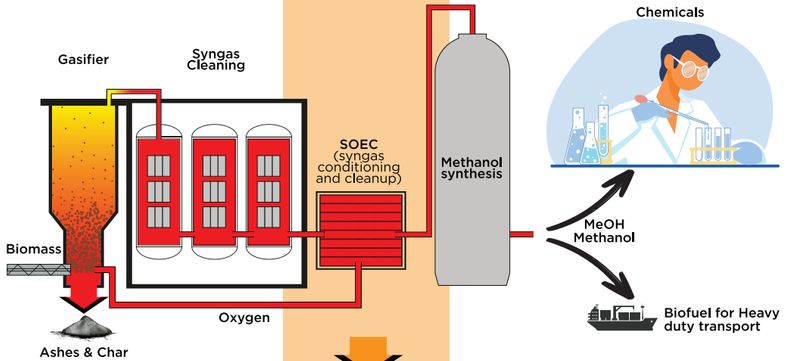
Current challenges and BeBOP solution

Low carbon efficiency in conventional biomass-to-methanol systems due to carbon losses and limited oxygen management.

TRL6: 20 kW biomass-scale pilot plant

BeBOP INNOVATION: Integration of SOEC into the syngas line to remove excess oxygen electrochemically, improving methanol synthesis efficiency.



(+) avoid the emission of more than 30 Mt of CO_2 per year (3% of CO_2 emissions in chemical industry)

Chemicals

(+) fertiliser
(+) heavy metals recovery

Self-sustaining energy: possibility of switching part of the cell modules into fuel cells (SOFC), to self-produce electricity in periods with low renewable production.

(+) cleaner and more efficient hard-to-electrify mobility

Why should I be interested in BeBOP?

I am a policy maker! It would be great to know how this system could be integrated in the energy transition and what are the gaps that we have to fill in!

Hello!! I'm a scientist and I'm always interested in new technologies to reinforce the current knowledge on biomass to methanol production

I am a farmer!!!! It would be fantastic to know which kind of wood discard could be used as a by-product to produce energy!!

Hello!! I'm an investor and as someone who is interested in investing in green technologies with high returns and low risks, I believe this is an excellent opportunity!

Hi, I'm the owner of a methanol plant, and it would be great to know how to reduce GHG emissions while decreasing our overall costs

I am a high school teacher and I'm very interested in raising awareness on a sustainable way to produce biofuels and green chemicals from biomass in order to inspire and educate the new generation!

Project partners

Meet us!

Find out more about the project

Biomass to bio/E-methanol by Breakthrough SOEC-based Process: the BeBOP innovation

Funded by the European Union

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BeBOP is a Horizon Europe project aimed at demonstrating a highly efficient and circular biomass-to-e-methanol system. The project integrates a Solid Oxide Electrolysis Cell (SOEC) with a biomass gasifier and a methanol synthesis unit, creating a low-emission, flexible and scalable Power-Biomass-to-X (PBtX) configuration.

Start Date
October 1st, 2024

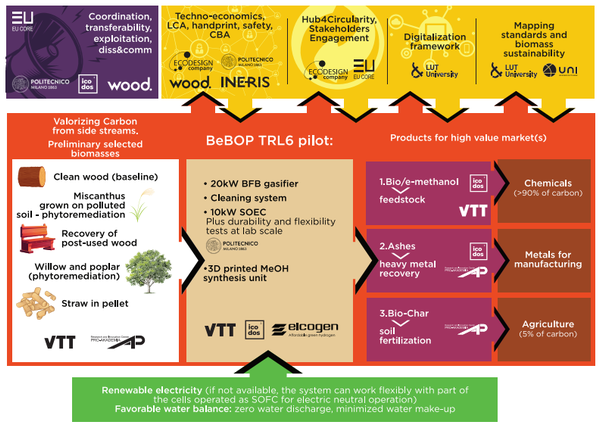
Budget/EU Contribution
€ 11.166.415,71

Number of Partners
12

Project duration
48 months

Coordinator
EuCore Consulting S.r.l

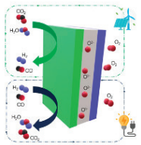
TRL6



Project Structure

01 • Gasification system and BeBOP integration

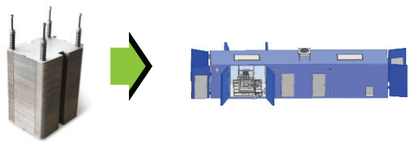
02 • BeBOP SOEC system-laboratory and industrial application



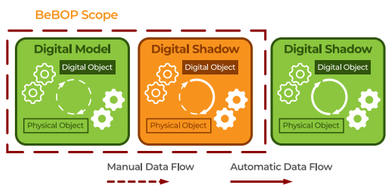
Durability tests and the characterization analysis at lab scale on squared single cells up to 25 cm² area, in **both electrolysis and fuel cell conditions**, at atmospheric pressure, up to 900°C.

03 • Design and planned implementation of SOE and syngas compression unit

The SOEC stack will be incorporated in an advanced fully automated hot box at VTT.



04 • The Digitalization framework of the BeBOP system



Digital twins for gasification island, rSOC system and methanol synthesis key unit processes will be created for simulation, optimization, and aid techno-economic analysis-based decision-making.

05 • The BeBOP 3D-Printed Methanol Reactor and Synthesis Integration

The 3D-printed heat exchange reactor

- compact
- efficient heat exchange
- homogeneous flow distribution
- small thermal mass
- >70% efficiency,
- low pressure drop
- isothermal operation
- dynamic operation
- fast cold-start possible

06 • Leaching and Recovery of solid resources from gasification

07 • Circularity of the BeBOP system

1 • **Zero-water** discharge process, by recovering waste water

2 • Recovery of Biochar (e.g. for soil amendment) and heavy metals from the gasifier ashes (e.g. zinc)

3 • Other co-product use cases: waste heat for district heating, oxygen for gasification.

08 • BeBOP system analysis

Several analysis will be performed in order to ensure safety and sustainability in the process:

- Risk analysis (health + safety): to identify hazards from materials and processes
- LCA: to estimate environmental impacts of the scale-up and perform a carbon handprint assessment
- CBA: to estimate the overall impact of the BeBOP technology including: environmental & social, health & safety, economic
- TEA: to calculate and evaluate technical and economic KPIs for the BeBOP plant, integrated with renewable power systems across Europe

09 • Standardizing framework for BeBOP System

10 • Exploiting, Communicating, and Disseminating the BeBOP Innovation