



Collaborative actions to bring novel **BIO**fuels **THE**rmochemical
ROutes into industrial **S**cale

WORKSHOP: “ALTERNATIVE AND RENEWABLE FUELS”

Introduction - BioTheRoS Overview

Dr. Dimitris Kourkoumpas (CERTH)

Motor Oil (Hellas) Corinth Refineries S.A | 23rd October, 2025



The BioTheRoS Project has received funding from the European Union's Horizon Europe research and innovation programme under Grant Agreement No. 101122212.

Agenda



Technical Expert Workshop

Alternative and Renewable Fuels

CET

- 9:20 Introduction - BioTheRoS Overview
Dimitrios Kourkoumpas, CERTH
- 9:30 Presentation of BioTheRoS logistics
Sebastian Zapata Habas, CIRCE
- 9:45 Presentation of BioTheRoS pyrolysis technology
Patrick Reumerman, BTG
- 10:00 Presentation of BioTheRoS gasification technology
Theresa Köffler, BEST
- 10:15 Coffee break**
- 10:30 Innovative Tools for Sustainable Decision-Making in Biofuels
Angeliki Sagani, CERTH
- 10:45 Green Hydrogen Project: The path towards a Hydrogen Hub in East Med
Stella Giannisi, Motor Oil
- 11:00 IRIS: Developing an Integrated CCUS Project In Corinth Refinery
George Daskalakis, Motor Oil
- 11:15 Producing biodiesel from advanced and waste feedstock
Haris Andrianos, VERD
- 11:30 UCO Logistics: Urban Challenges, Smart Planning, Service Excellence
George Svolimis, Prasino Ladi
- 11:45 Transforming Biowaste into Renewable Fuels through Sustainable Management Practices
Ioannis Brikis, Thalix ES
- 12:00 Biofuels in Maritime Sector: Technological & Economic Dimensions and Applications
George Rizos & Nikolaos Christopoulos, HYDRUS
- 12:15 Discussion & round table
- 12:40 End of the meeting



23 OCTOBER 2025



ONLINE



Join the workshop!



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*** No photos or videos are allowed within the industrial complex of Motor Oil**

About CERTH

The **Centre for Research and Technology Hellas** (CERTH) is a non-profit organization, established in 2000 with the goal of benefitting society through **innovative research**.

CERTH is a frontrunner in **basic, applied and technological research**.

Research fields:

- Sustainability
- Zero CO₂ Emission Technologies
- Artificial Intelligence
- Internet of Things
- Industry 4.0



>1600

5

9

Researchers & Associates

Institutes

Cities

60 M€

80%

13%

7%

Funds Secured
Annually

From
Research Projects

From Bilateral
Contracts with the
Industry

From State
Funds

15th

1st

23

In H2020 Net EU
Contribution in the EU

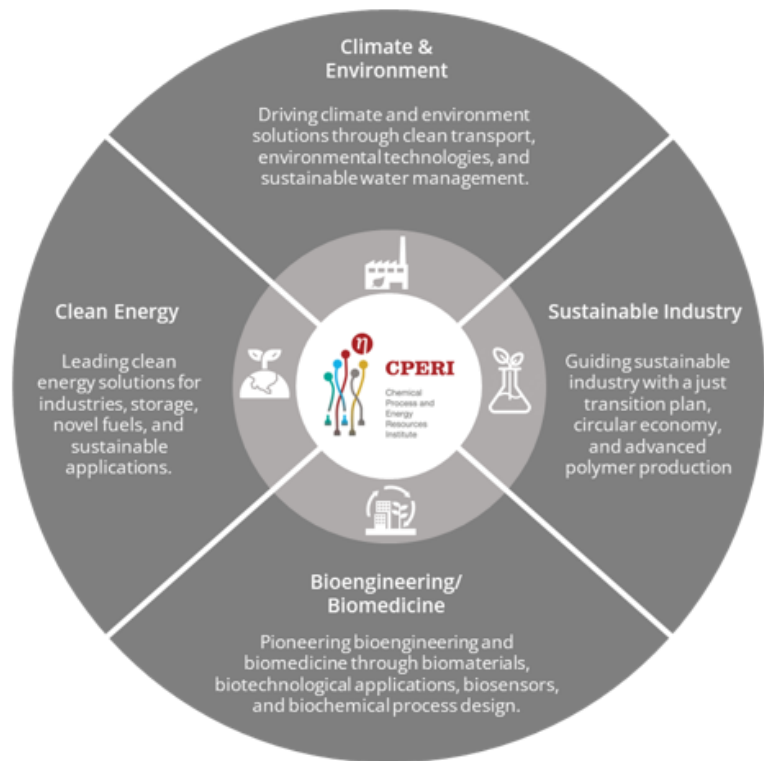
In H2020 Net EU
Contribution in Greece

Spin-offs

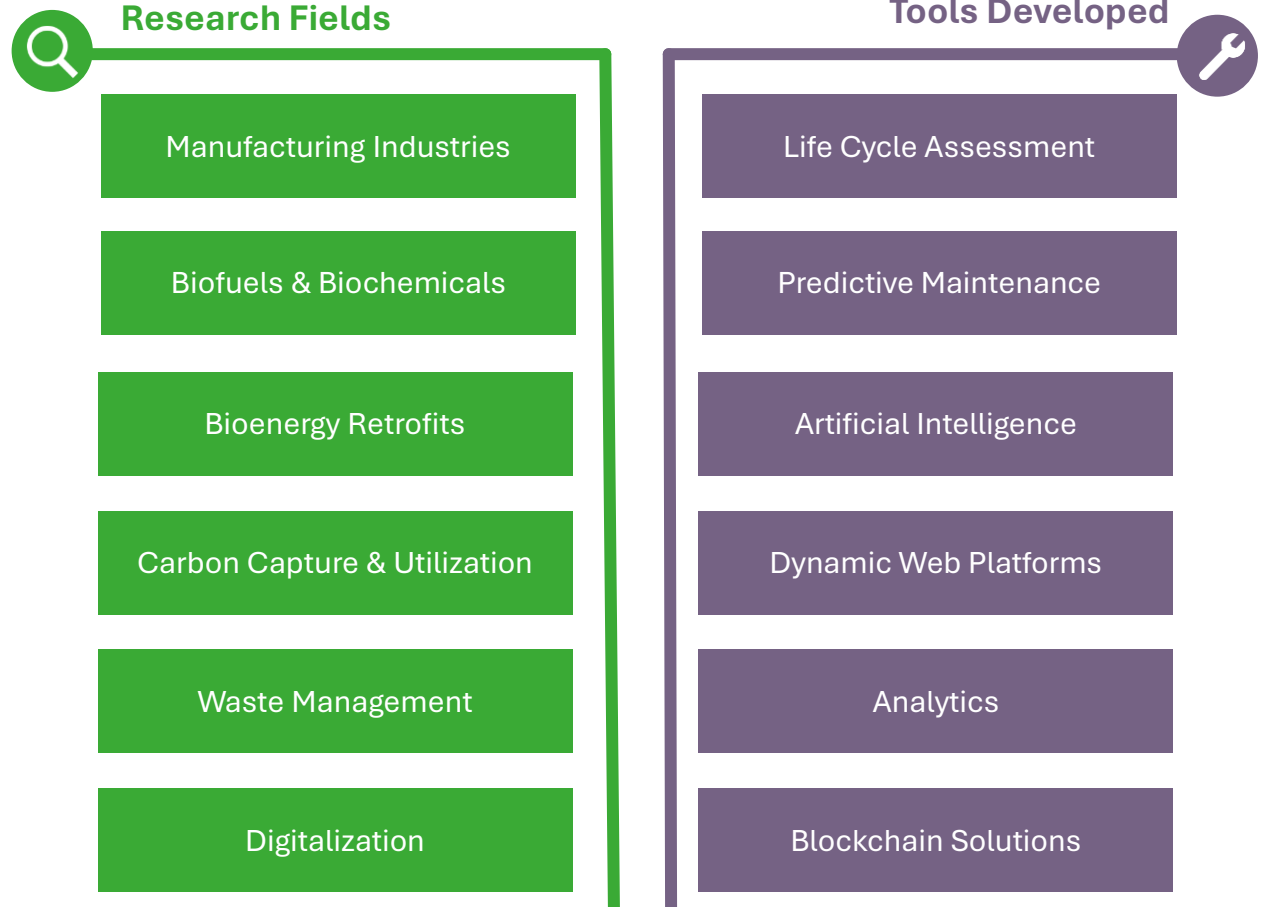
About CPERI

Established in 2000 as part of the Centre for Research and Technology-Hellas (CERTH)

CPERI'S RESEARCH DIRECTIONS



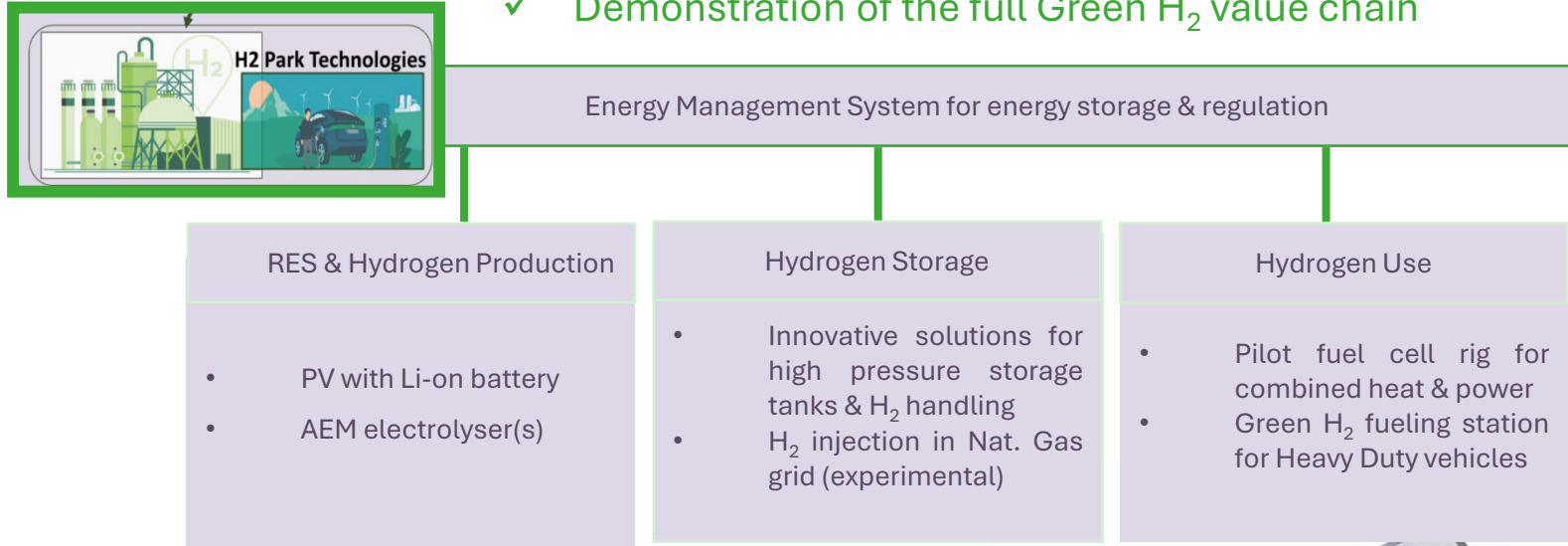
TEAM EXPERTISE



Emblematic Project H2-HUB

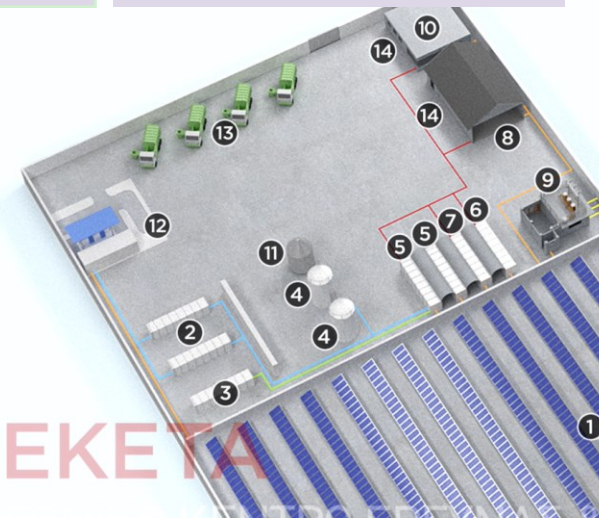
Objectives of H2-HUB

- ✓ Demonstration of the full Green H₂ value chain



- ✓ Testing facilities, sizing, certifying and supporting services

H2HUB is the flagship research program for Hydrogen Production, Storage and Applications, implemented by CERTH's branch in Western Macedonia.



1. PV park of 1MW
2. H₂ storage tank
3. O₂ storage tank
4. H₂O storage tank
5. **Electrolyzers of 900 kW (AEM)**
6. Battery storage of 370 kWh
7. **Fuel cells of 100 kW and 40 kW (PEM HT)**
8. Test bench of H₂ equipment
9. Electric substation
10. Offices + Control room (ISO Box)
11. Hot water buffer
12. **H₂ refueling station + Compressors**
13. Garbage trucks
14. Parking Lots

BioTheRoS Overview

Project Details

BioTheRoS is an EU Horizon Programme under Grant Agreement No 101122212 running from 2023

Consortium Members



CERTH
CENTRE FOR
RESEARCH & TECHNOLOGY
HELLAS



Demonstration Cases

Application in pyrolysis and upgrading units in Netherlands & gasification unit in Austria

BioTheRoS Objectives

BioTheRoS develops **innovative** & cost-competitive **Fast Pyrolysis-to-biofuels** and **Gasification-FT-Synthesis value chains**, combining **Carbon Capture Utilization (CCU)** and **fuel upgrading** for accelerating the scale-up of sustainable biofuels.

BioTheRoS Goal: Transfer biomass into an opportunity



1. Development of **cost-effective & sustainable technologies** for thermochemical conversion of biomass to produce biofuels to TRL5



2. Selection and assessment of **several biomass feedstocks** suitable for scaled-up sustainable pyrolysis & gasification biofuel value chains employing **predictive biomass demand AI models**



3. Development of **scale-up rules** of biofuels production based on advanced modelling techniques and lab/pilot-scale trials.



4. Development of an **LCSA framework**, integrating technical, environmental, economic & social parameters via **multi-criteria decision analysis** techniques



5. Identification of **concrete measures** to improve the sustainability of thermochemical conversion of biomass to biofuels via pyrolysis and gasification



6. Provide clarity into the **market dynamics** of scaled-up pyrolysis and gasification biofuel value chains

Demo sites & related technologies



The Netherlands – Pyrolysis and Upgrading units

Pyrolysis Units:

- Bench-scale unit: 2–5 kg/h
- Pilot plant: 80–200 kg/h

Upgrading Unit (for pyrolysis oil to fuels):

- Continuous operation
- Capacity: 0.8–1.5 kg/day



Austria – Gasification Unit



Gasification Units:

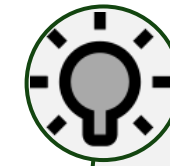
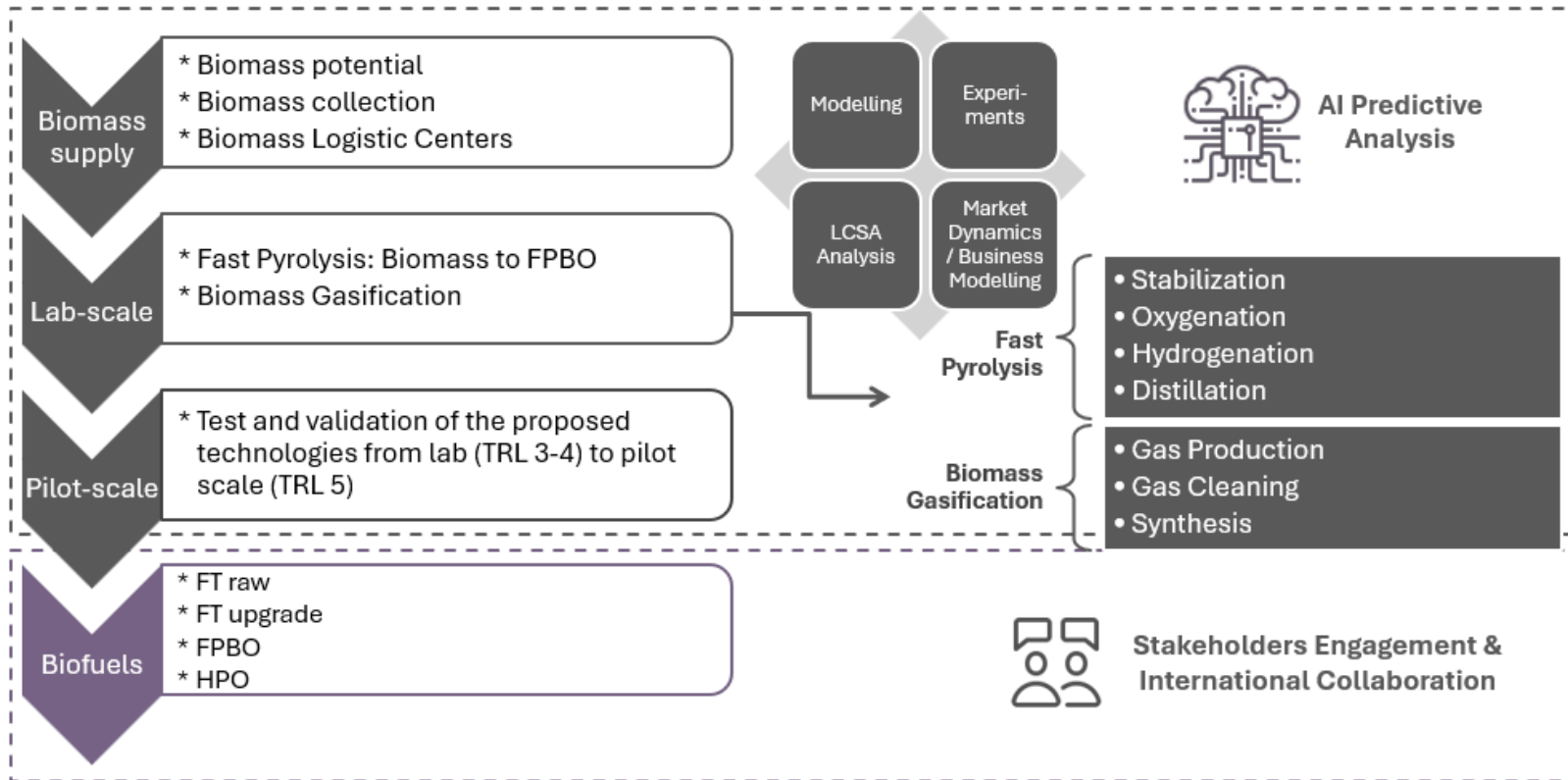
- 1 MW DFB reactor: ~200 kg/h feed rate
- 250 kW Fischer-Tropsch pilot unit: produces 15-20 L of FT raw product

Upgrading Unit (for FT waxes to fuels):

- Hydrocracking pilot plant located in Greece

BioTheRoS Methodology

Core Focus: Pyrolysis & gasification-based advanced biofuel value chains



**Multidisciplinary,
stepwise methodology**

- Feedstock selection
- Pilot-scale validation
- Scale-up simulation & modelling
- Environmental, techno-economic & social assessments

BioTheRoS Reached Outcomes

1. Biomass-to-Biofuel Optimization Process

- Quantified and categorized agricultural and forestry biomass to optimize value chains and prioritize biofuel feedstocks.
- Successfully developed an initial AI-driven optimization model for processing plant siting.

2. Validation of TEC value Chains

- **Pyrolysis Value Chain:** Achieved targeted FPBO production: 22.3 L from forestry residues and 23.5 L from barley straw. About 5 litter of barley straw derived HPO is available.
- **Gasification Value Chain:** Syngas from both forestry residues and softwood met Fischer-Tropsch specifications, with effective nitrogen removal from forestry residues.

3. Holistic Sustainability Framework

- Established a novel MCDA approach that merges efficiency assessment with multi-criteria ranking to identify optimal production routes for advanced biofuels.
- Developed an integrated Life Cycle Sustainability Assessment (LCSA) framework combining LCA, LCC, and sLCA to enable comprehensive evaluation of biofuel scale-up pathways.

4. Market Insights

- Advanced biofuel demand quantified, providing a robust analytical basis for future production targets.
- Completed assessment of RED III Annex IX-A feedstocks currently utilized in advanced biofuel production, supporting informed policy and investment decisions.

5. Building knowledge for upscaling

- Developed BioTheRoS Knowledge Hub and Tech State Navigator, connecting 50+ research groups & stakeholders

Potential Synergies



Government & Regulatory Bodies

BioTheRoS shares lessons learned and regulatory insights at EU and regional levels

Fuel Producers and Suppliers

BioTheRoS highlights the environmental and economic benefits of biofuel production & use

Biomass Providers

BioTheRoS provides economic benefits for engaging in the biofuel supply chain

Research Stakeholders

BioTheRoS shares technical results, innovations, progress, and project challenges

Airlines & Shipping Companies

BioTheRoS raises awareness of the potential for biofuel use

General Public / Citizens

BioTheRoS shares insights on EU competitiveness, external dependency, environmental and societal impacts.

Take-Home Messages



Feedstock Supply & Cost Competitiveness:

Ensuring a **sustainable, cost-effective feedstock supply** is essential for the growth of future biorefineries. Investment incentives are needed to offset biomass's price disadvantage relative to fossil fuels.



Supply Chain Risk Management:

Effective biomass supply chain management is critical to securing long-term sustainability and consistent fuel availability.



Circular Economy Integration:

Holistic, circular economy-driven guidelines are required across the entire advanced biofuel supply chain to stimulate aviation and maritime fuel markets.



Technology Pathways & Scale-Up:

Constraints and opportunities for scaling up pyrolysis and gasification pathways must be clearly identified.



Sustainability & LCA Focus:

Growing attention to GHG impacts in aviation and maritime sectors underscores the need for **LCSA** and integration of **economic, environmental, and social dimensions** for a balanced sustainability approach.

Thank you!

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Special Issue
Life Cycle Thinking in the Era
of Digitalization and Artificial
Intelligence: Implications for
Green Energy and
Sustainability

 *clean technologies*

Guest Editor
Dr. Dimitrios Sotirios
Kourkoumpas

Deadline
30 June 2026



IMPACT
FACTOR
4.7

CITESCORE
8.3



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