



CERTH
CENTRE FOR
RESEARCH & TECHNOLOGY
HELLAS

The role of renewable gases in the energy sector: CERTH activities

Dr Panagiotis Grammelis

Biomethaverse, Workshop, 20 June 2024



CPERI

Chemical
Process and
Energy
Resources
Institute



CERTH

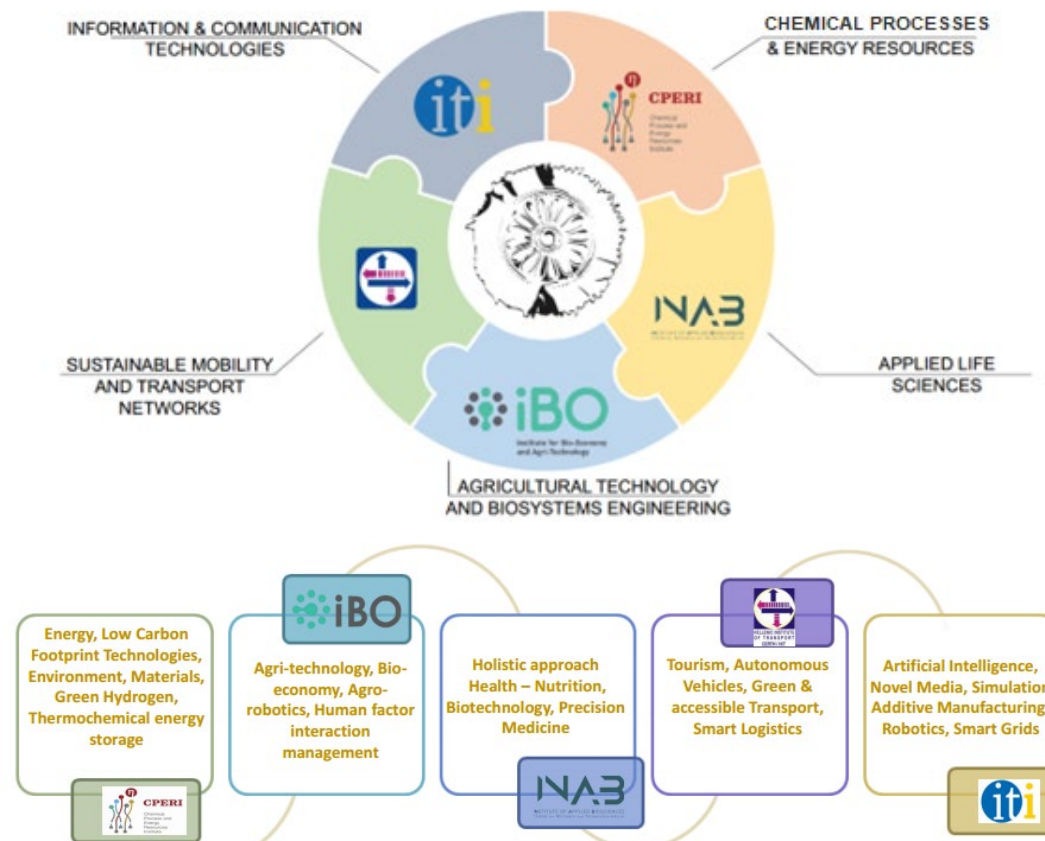
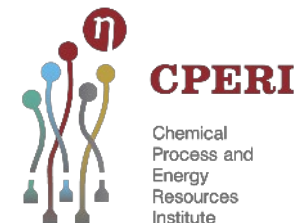
CERTH at a glance

- Foundation: 2000
- Legal form: Legal entity governed by private law under the auspices of the General Secretariat for Research & Innovation of the Ministry of Development & Investment
- Personnel: > 1500
- Annual Revenues: > 50 M€ (3-year average)
 - 77% from competitive research projects through open call for proposals
 - 13% from bilateral industrial research contracts
 - 10% from government institutional funding
- Numerous distinctions & awards (Descartes Prize, ERC Advanced Grant, Trading Agent Competition Award, etc.)

Our mission:

- Promotion of the threefold framework: Research-Development Innovation;
- High Quality Scientific Research;
- Development of Innovative Products and Services;
- Strong partnerships with the National and International Industry;
- Strong collaboration with Research Centers and Universities in Greece & Abroad

Five Institutes





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HISTORY TIMELINE



AEVAL



3rd PHASE


C section/nZEB



Establishment and operation of non profit legal person under the name "Center for Technology and Solid Fuel Applications" (KTESK)

Conversion of KTESK into "Institute of Solid Fuel Technology and Applications" (ITESK) of CERTH

Erection of own buildings in Ptolemais



Conclusion of 1st phase
Budget: 1.59 M€
Funding: Region of Western Macedonia

K and ITXHD
ical Process
resources
f CERTH

Conclusion of 2nd phase

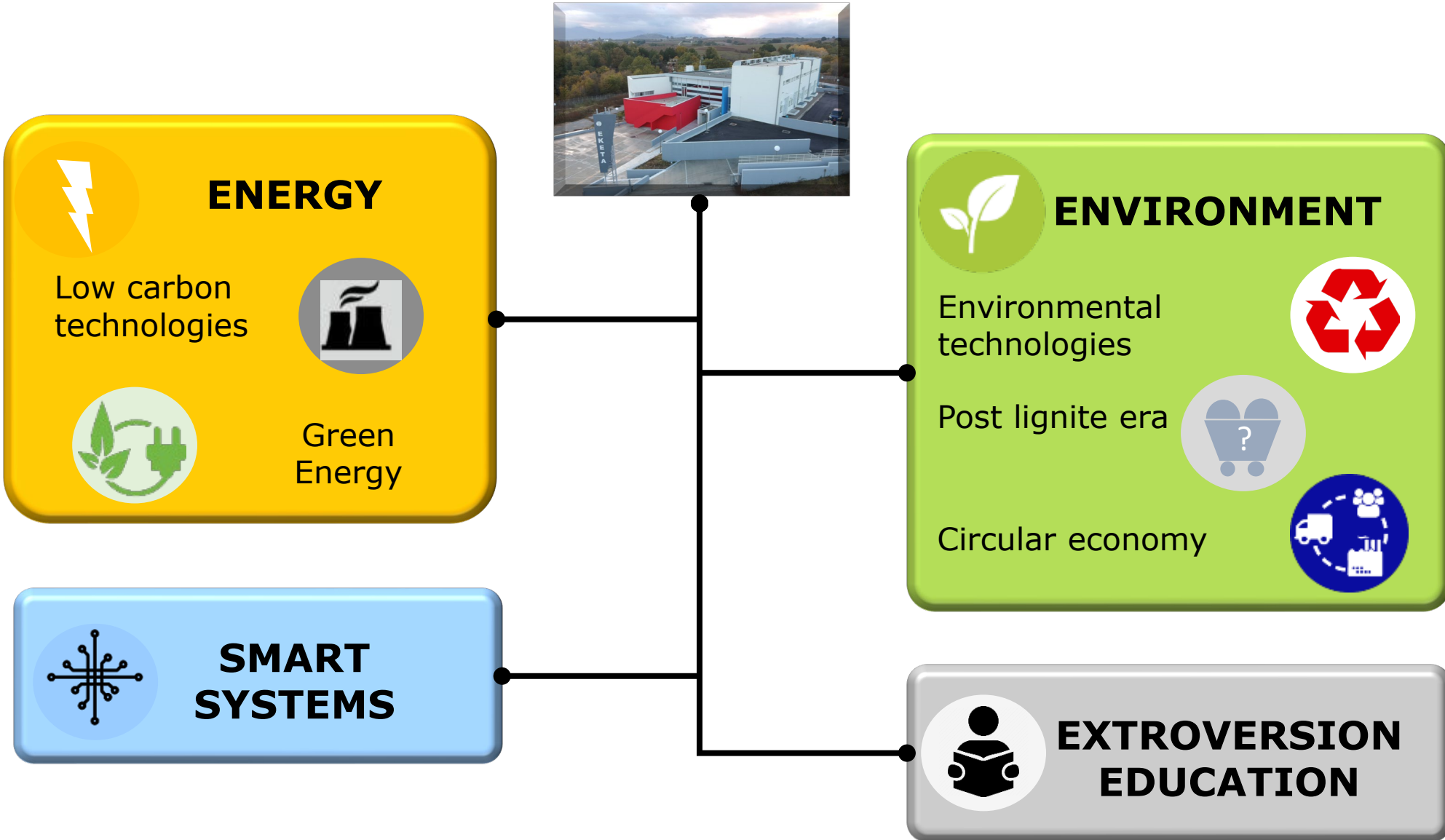


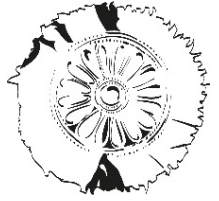
Extension of current building (2nd phase) is funded from Region of Western Macedonia.

Initial budget: 3.915 M€



Main Thematic Areas





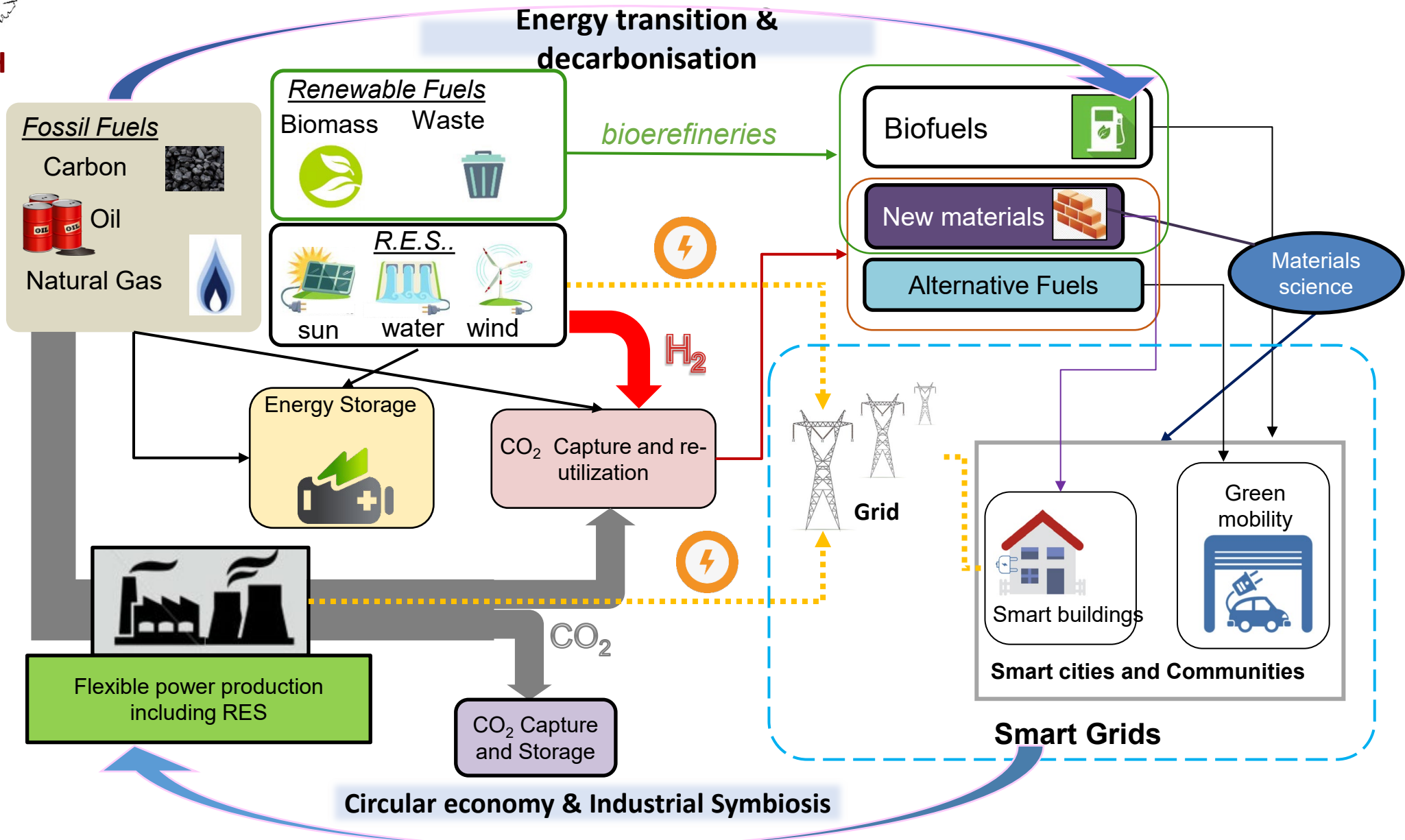
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Vision for Energy transition and Environment



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Fuel Analysis



Calorimeter



TGA



S, Cl definition



TGA/DSC, high accuracy

Accreditation (biomass, carbon, SRF) (ELOT EN ISO/IEC 17025)



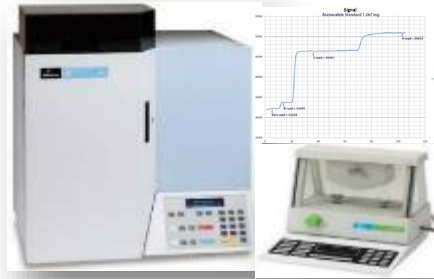
TOC



HPLC



Pellet DU (durability)



(C, H, N, S) analyser

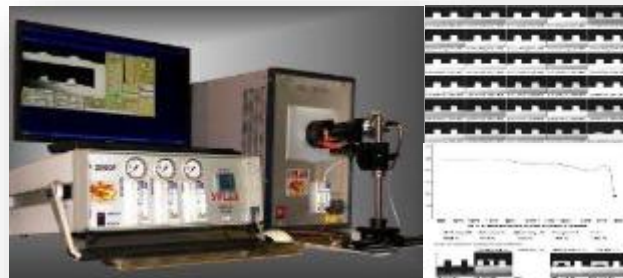
Ash analysis



Atomic adsorption

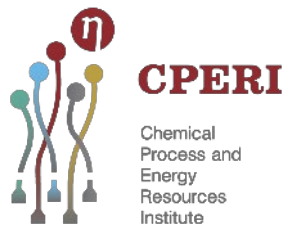


XRD



Ash melting behaviour

Laboratory Equipment



Waste analysis



BMP (biomethane measurement)

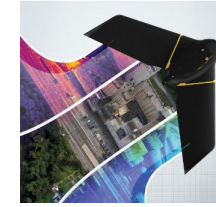


MicroGC-Biogas analyzer



XRF

Mobile equipment



Drones



online particles distribution



Thermal analysis of buildings



Flue gas analysis

Meteo stations



Measurement of 21 parameters





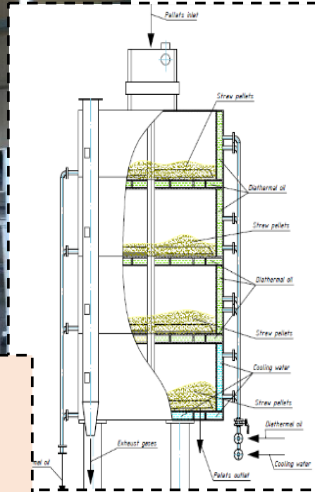
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Pilot units

Torrefaction



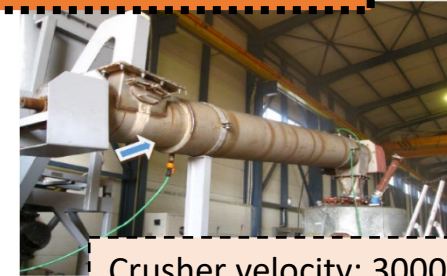
Capacity: 100 Kg/h
Biomass boiler: 250 kWth
Indicative fuels: agropellets and prunings



Pellet unit



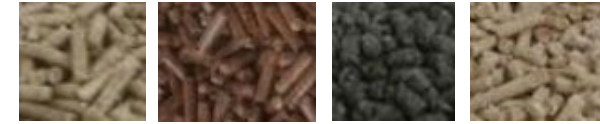
Drying unit



Crusher velocity: 3000 rpm/min
Power: 11 kW

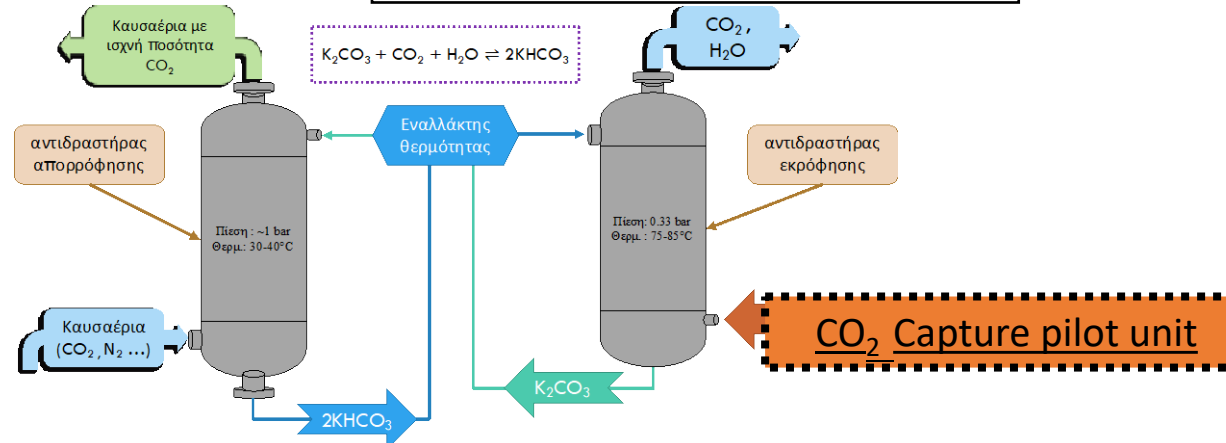
Pellet unit

Pellets produced from:



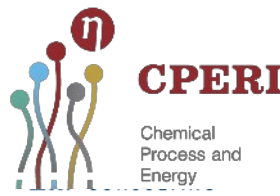
Straw Olive prunings Sunflower Sawdust

Biogas pilot unit (30 lt)



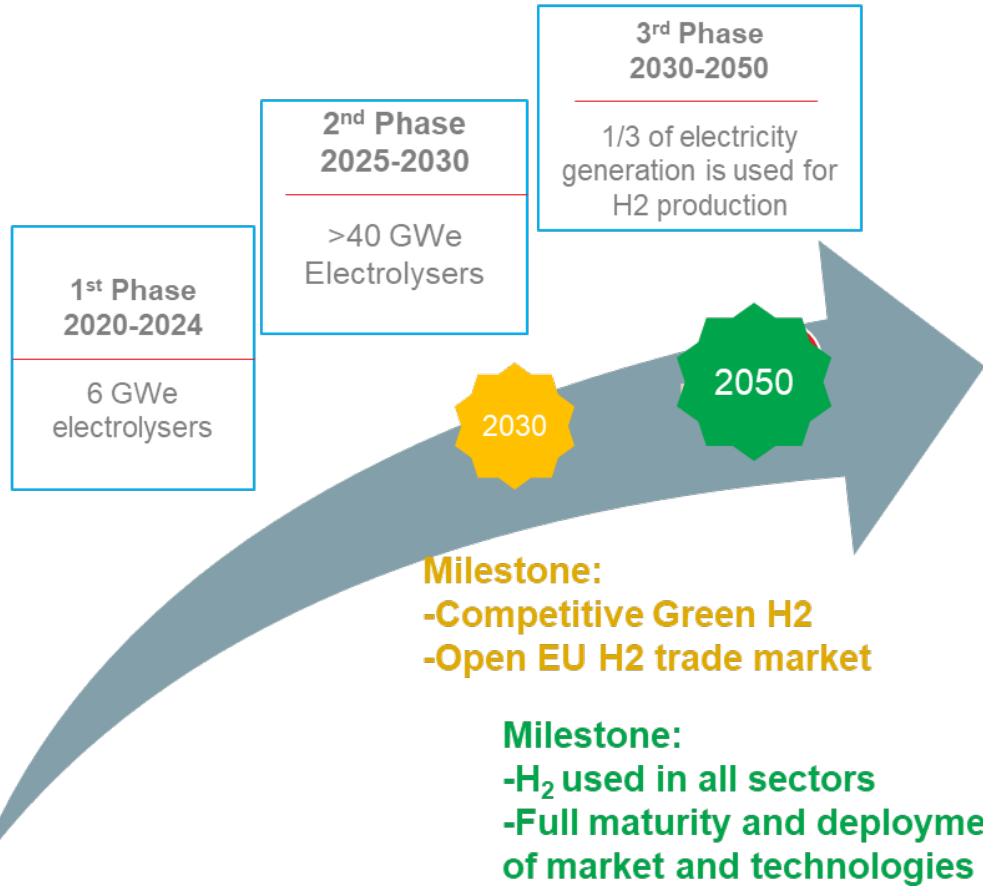


Hydrogen Strategy and Investments in Europe

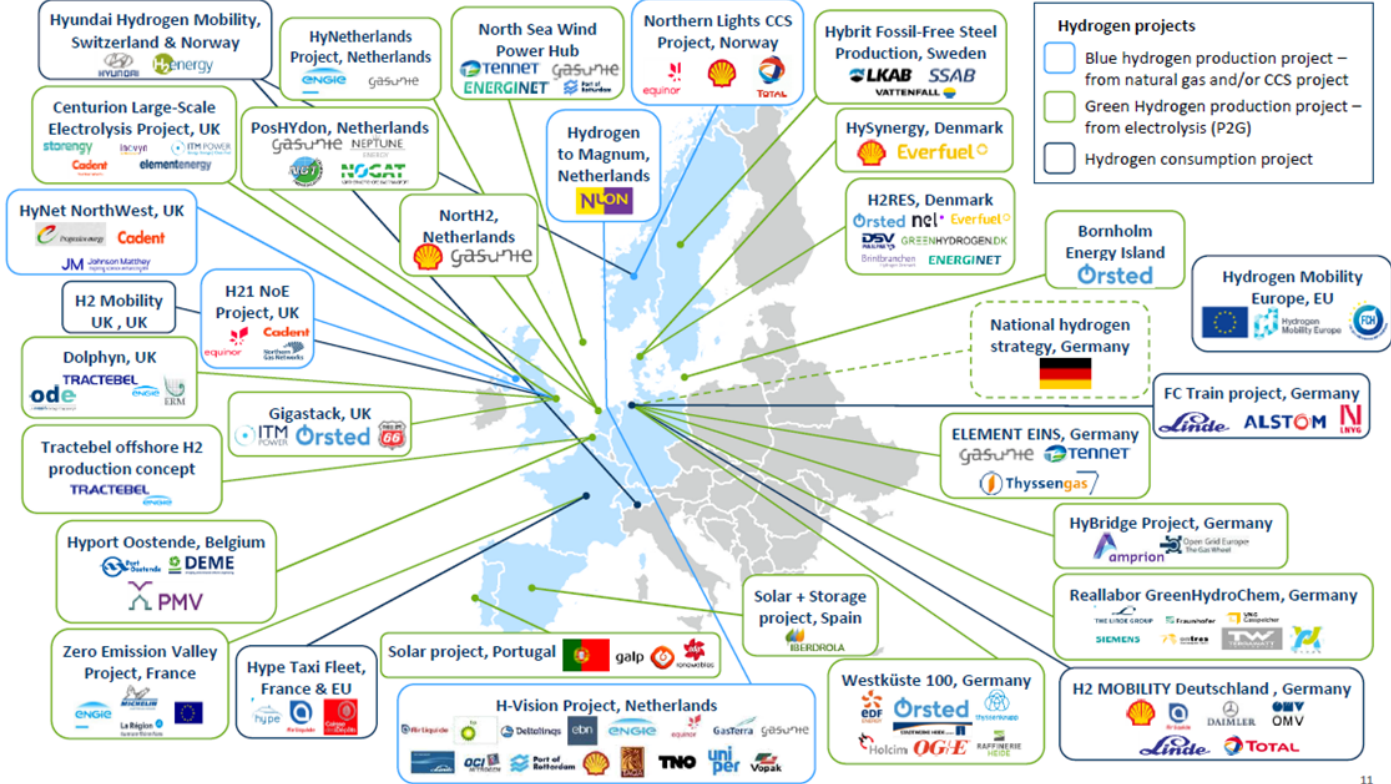


European Hydrogen Strategy

(EC, COM(2020)301 final)



Significant investment in large-scale clean hydrogen projects has been concentrated in Europe



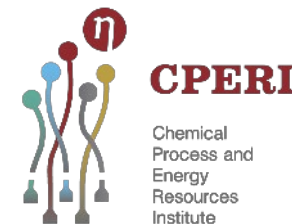
Source: FTI Analysis

- FIDs expected from 2024 onwards
- Regulatory framework needed
- CfDs, CO₂ pricing and market conform support mechanisms



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How will Greece meet its 2030 energy storage needs?



0.7 GW

- 4 storage plants.
- 2 open-loop pumped-hydro storage (PHS) stations.
- 2 small hybrid RES-storage stations .



700 MW



3 MW

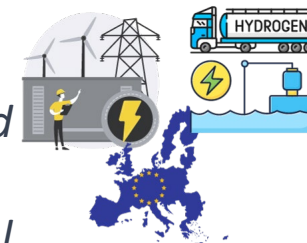
The Challenges

- *Legal framework*
- *Facilitate licensing & financing related to technology / infrastructure*



Potentials for Western Macedonia

- *Utilisation of extensive HV power grid infrastructure and existing labour knowledge*
- *Storage integration to planned PV parks in former coal mining areas*



Energy Storage Future looks bright, but...

- *Technical challenges need to be addressed → substantial support on innovations, research, further development and market uptake*
- *Grid integration and efficiency optimization remain significant obstacles to overcome*



7 GW ~~2.7 GW~~



3.1 GW



2.2 GW



1.7 GW

Source: NECP 2023



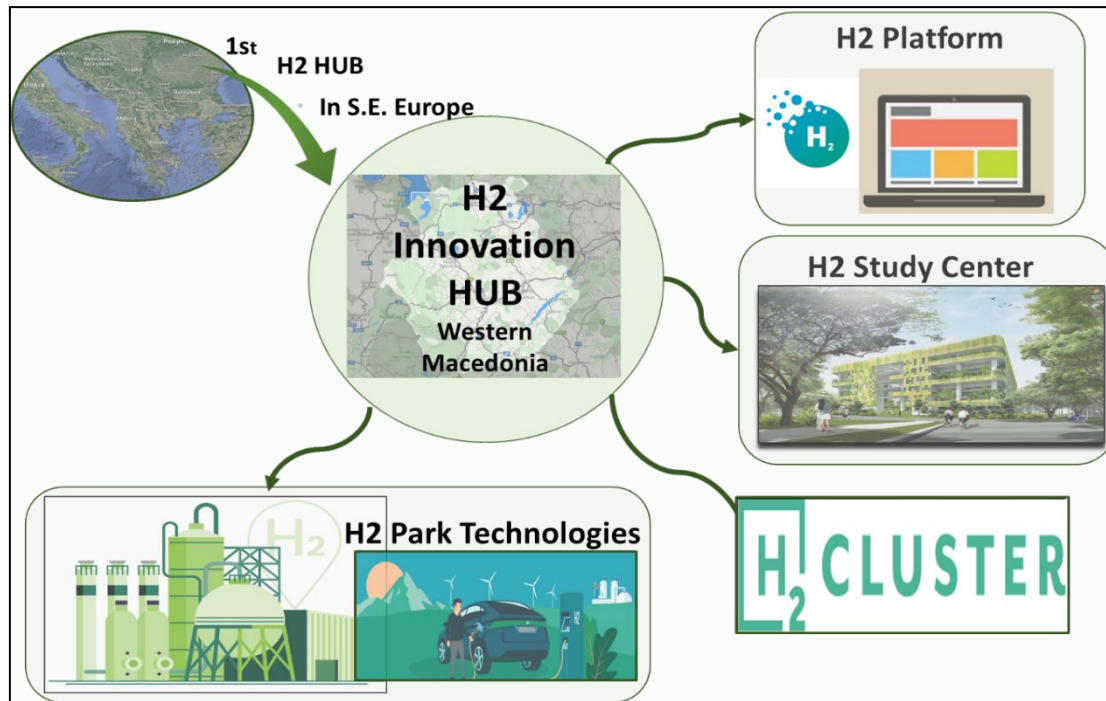
2022

Energy Storage

Greek National energy and climate plan (NECP)

2030

Emblematic Project H2-HUB



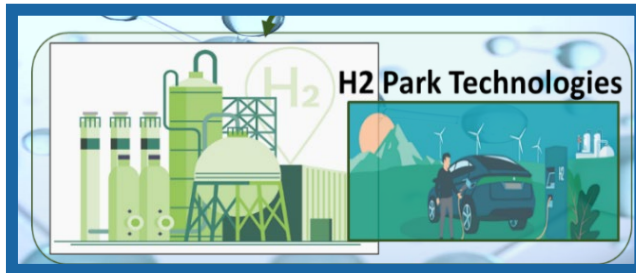
- Approved budget of H2 Technology Park 19,8 mi.€

VISION: "Become the number one hub connecting science, industry, politics and other partners in the Greek hydrogen economy by 2025 and onwards, establishing a green hydrogen technology park, offering top-quality services, promoting innovation and know how transfer"



- Location in AEVAL on a plot of ~20 acres (within the industrial park)
- Free concession of use by the Municipality of Eordaia

✓ Demonstration of the full Green H₂ value chain



Energy Management System for energy storage & regulation

RES & Hydrogen Production

- PV with Li-on battery
- Alkaline electrolysers

Hydrogen Storage

- Innovative solutions for high pressure storage tanks & H₂ handling

Hydrogen Use

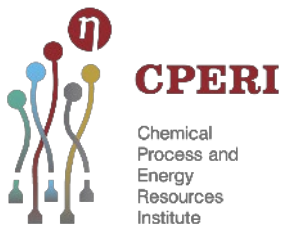
- Pilot fuel cell rig for combined heat & power
- Green H₂ fueling station for Heavy Duty vehicles

✓ Testing facilities, sizing, certifying and supporting services

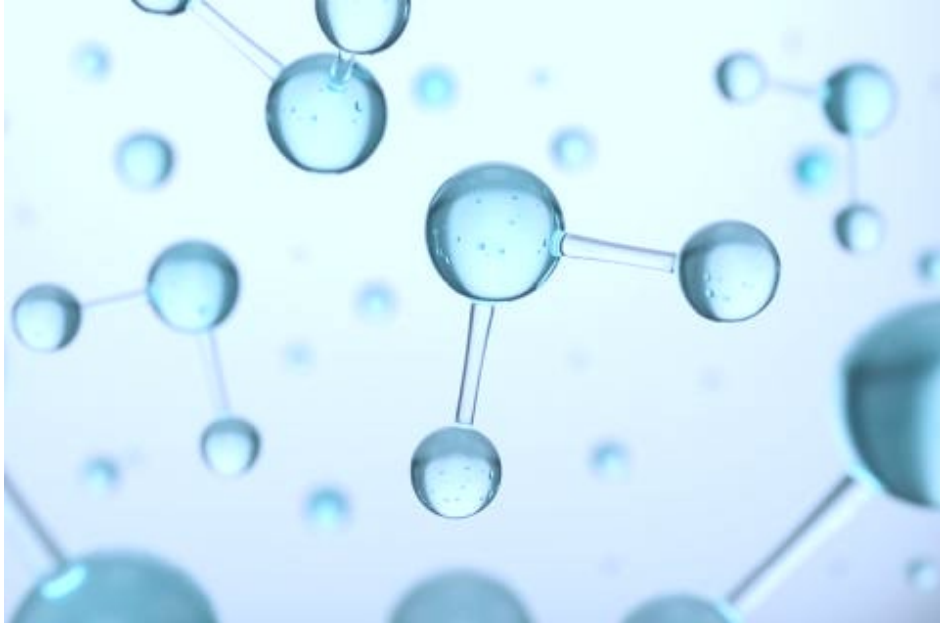


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Hydrogen Cluster, Center and AppPlatform



H₂ Innovation Hub:



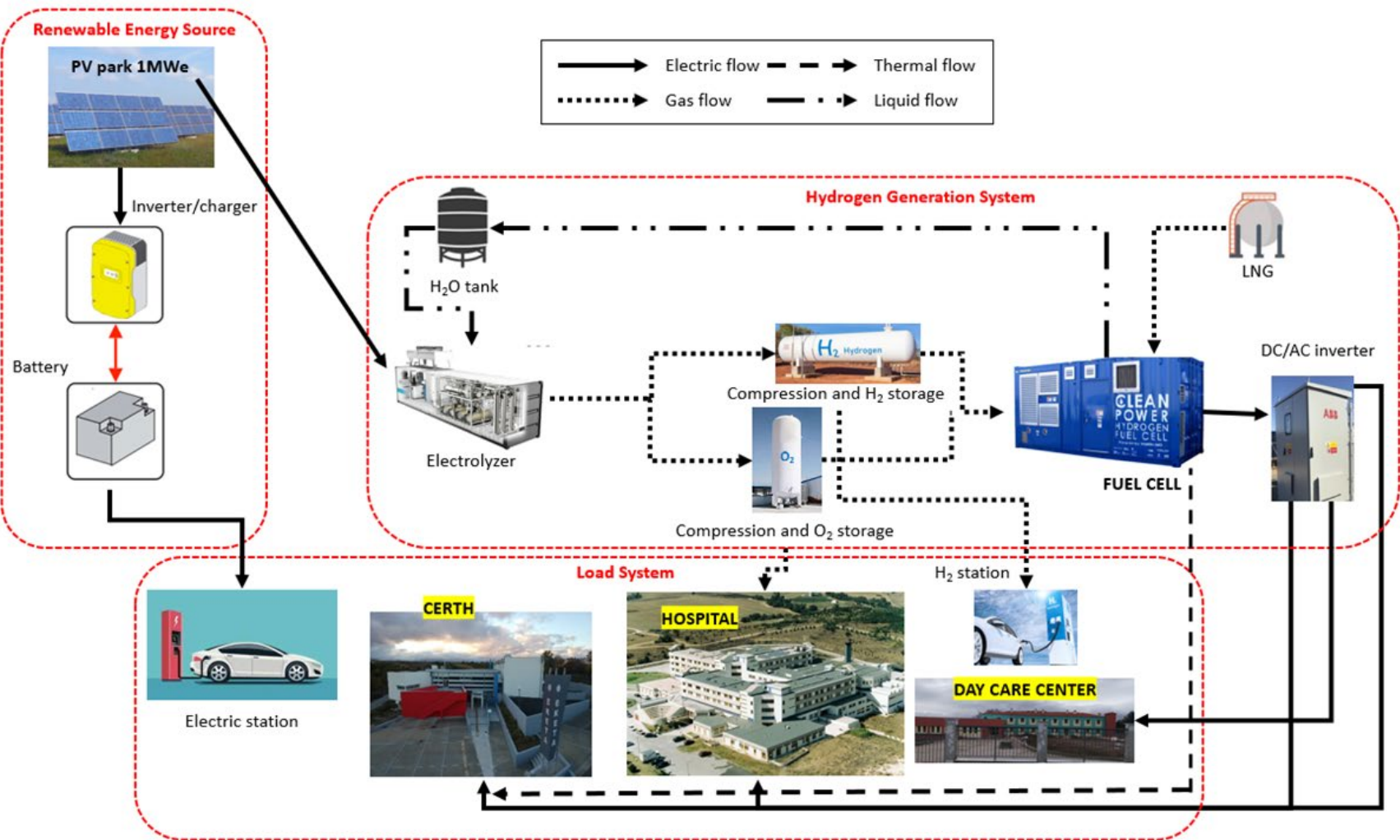
*Development study in progress –
Initial budget allocation ~20 Mil. EUR*

- **1) H2 CLUSTER** 
 - International Hydrogen Network for R&D and joint investments
 - Co-development of large projects and consulting services
 - Market and Policy analysis in Greece & South-Eastern Europe
 - Research facility for industrial scale applications and certification

- **2) HYDROGEN VOCATIONAL CENTER** 
 - Establishment of a competence center for hydrogen technologies (reskilling and upskilling for technical and managerial business-oriented staff)
 - Courses, Seminars and Conference events focused on dissemination

- **3) H2AppPLATFORM** 
 - Connection and communication of associated entities for the promotion and development of hydrogen technologies
 - “Data Warehouse” and Analytics

Interventions at District/Neighborhood Level



- Installation of CHP pilot unit with RES and green H₂ for covering part of electric loads of
1. CPERI premises Ptolemais
 2. MPODOSAKEIO Hospital
 3. Day care center of EORDAIA



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Indicative projects



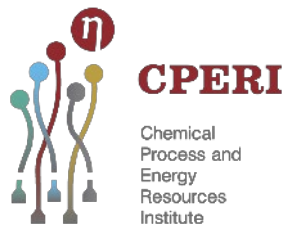
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FLEXSNG





C E R T H
Thank you for your attention



Website

<https://www.cperi.certh.gr/el/research-areas-2/solid-fuel-techonology-application-sector-2>