Clean Hydrogen Partnership

Topics in the call 2024

Renewable Hydrogen Production

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Renewable Hydrogen Production Overview

Main Focus

- Electrolysers:
  - Improving PCCEL and AEMEL
  - Revisiting monitoring & diagnostic tools for electrolysers
- Circular Hydrogen production
  - Optimal integration of hydrogen production in industry

What is new

- Direct sea water electrolysis

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Renewable Hydrogen Overview

Topic	Type of Action	Ind. Budg (M€)
HORIZON-JTI-CLEANH2-2024-**01-01**: Innovative proton conducting ceramic electrolysis cells and stacks for intermediate temperature hydrogen production	RIA	3
HORIZON-JTI-CLEANH2-2024-**01-02**: Advanced anion exchange membrane electrolysers for low-cost hydrogen production for high power range applications	RIA	4
HORIZON-JTI-CLEANH2-2024-**01-03**: Development of innovative technologies for direct seawater electrolysis	RIA	4
HORIZON-JTI-CLEANH2-2024-**01-04**: Development and implementation of online monitoring and diagnostic tools for electrolysers	RIA	4
HORIZON-JTI-CLEANH2-2024-**01-05**: Hydrogen production and integration in energy-intensive or specialty chemical industries in a circular approach to maximise total process efficiency and substance utilisation	IA	10

Renewable Hydrogen - Topics

HORIZON-JTI-CLEANH2-2024-01-01: Innovative proton conducting ceramic electrolysis cells and stacks for intermediate temperature hydrogen production

Aim for intermediate temperature operation to replace CRM with steel-based materials & increase lifetime (TRL 2 → 4)

- Novel cells and stacks designed for < 600°C and Faradaic η > 90%
- Current density > 0.75 A/cm^2 @ thermoneutral voltage
- Scalable manufacturing; development of testing protocols & AST
- Demonstrate 5 SRU; stack > 250 cm^2; testing >2,000h; degradation < 0.5% / 1,000h

HORIZON-JTI-CLEANH2-2024-01-02: Advanced anion exchange membrane electrolysers for low-cost hydrogen production for high power range applications

Increasing capacity and operating pressure of AEMEL stacks; suitable for industrial end-users (TRL 3 → 5)

- 50kW stack ; 500 cm^2 active area cells ; 50 bar ; >1 A/cm^2 ; < 90°C
- < 50 kWh/kg with < 1mole/l KOH ; CRM < 0.1 mg/W
- Testing > 3,000h ; degradation < 0.7%/1,000h with emphasis on corrosion / degradation of anode & cathode catalysts using EU harmonized testing protocols

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Renewable Hydrogen - Topics

HORIZON-JTI-CLEANH2-2024-01-03: Development of innovative technologies for direct seawater electrolysis

Electrolyse sea water for environmentally friendly H_2 production in remote near/off-shore locations (TRL 2 → 4)

- Material development (catalysts, membranes, PTLs, bipolar plates, sealings) & design options
- Optimise CRM use in HER and OER electrocatalysts with high tolerance to poisoning by seawater contaminants
- Use experiments and numerical modelling techniques
- 5-cell stack, > 20g H_2/h operating > 2,000h and 1,500 cycles; assess degradation (< 5%/500h) for 2 types of salinity
- Explore synergies with EIC Pathfinder Challenge & EURAMET programmes

HORIZON-JTI-CLEANH2-2024-01-04: Development and implementation of online monitoring and diagnostic tools for electrolysers

Monitoring tools/sensors/systems for industrial scale (>100kW) electrolysers (TRL 4 → 6)

- Develop a generic open-access monitoring and diagnostic platform & identify monitoring parameters
- Develop diagnostic algorithms and suitable hardware for implementation of these tools
- Validate in lab on at least two technologies (PEMEL, AEL, AEMEL or SOEL)
- Demonstrate in real conditions (>100kW) on at least one technology (PEM, AEL or SOEL)
- Explore synergies with the metrology research programme run under the EURAMET

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Renewable Hydrogen - Topics

HORIZON-JTI-CLEANH2-2024-01-05: Hydrogen production and integration in energy-intensive or specialty chemical industries in a circular approach to maximise total process efficiency and substance utilisation

Production of clean hydrogen and its integration into Energy Intensive and Specialty Chemical Industries, within a circular approach. (TRL 5 → 7)

- Open to any production technology or combination of production technologies, as long as they operate from renewable input – full scale demo @ 100kg/h for 2 years / > 5,000 h
- Demonstration into a sector not yet covered by on-going initiatives or an innovative demonstration of clean hydrogen production technology
- Integration of clean hydrogen production aiming for circularity and sustainability (feedstock, heat and power generation, synthetic fuels production) plus transformation of at least one by-product into a feedstock
- Development and validation of a comprehensive Energy Management System utilising advanced control methodologies like predictive approaches and real-time optimisation
- Tecno-economic and life cycle assessment
- Water management; use of AI for optimization and safety;
- Hydrogen production plant, BoP, storage costs can be declared as full capitalized costs

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Questions?
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