Clean Hydrogen Partnership

Topics in the call 2023

Renewable Hydrogen Production

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Renewable Hydrogen Production Overview

Main Focus

- Cost reduction and efficiency increase for renewable hydrogen production routes:
  - Going low in TRL for LT & HT electrolyser concepts
  - Ringfencing support to AEL
  - Revisiting PEC & PC devices

What is new

- Waste to H_2
- Valorising O_2 and heat from electrolysis

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Renewable Hydrogen Overview

Topic	Type of Action	Ind. Budg (M€)
HORIZON-JTI-CLEANH2-2023-**01-01**: Innovative electrolysis cells for hydrogen production	RIA	2 x 3
HORIZON-JTI-CLEANH2-2023-**01-02**: Innovative Solid Oxide electrolysis cells for intermediate temperature hydrogen production	RIA	3
HORIZON-JTI-CLEANH2-2023-**01-03**: Advances in alkaline electrolysis technology	RIA	2.5
HORIZON-JTI-CLEANH2-2023**-01-04**: Photoelectrochemical (PEC) and/or Photocatalytic (PC) production of hydrogen	RIA	2.5
HORIZON-JTI-CLEANH2-2023-**01-05**: Waste to Hydrogen demonstration plant	IA	10
HORIZON-JTI-CLEANH2-2023-**01-06**: Valorisation of by-product O2 and/or heat from electrolysis	IA	10
HORIZON-JTI-CLEANH2-2023-**01-07**: Hydrogen use by an industrial cluster via a local pipeline network	IA	15

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Renewable Hydrogen - Topics

HORIZON-JTI-CLEANH2-2023-01-01: Innovative electrolysis cells for hydrogen production

Thinking outside the box for disruptive components and cell concepts in LT electrolysers (TRL 2 → 4)

- Improve efficiency (<48kWh/kg) and life time, reduce CRMs
- Innovative cells using multi disciplinary approach: material science, nano-engineering, bio-hybrid catalysts
- Diaphragms, membranes/membrane-less electrolysers that can operate down to 5% of nominal load @ < 0.4% H_2 in O_2
- 8 potential innovations listed, more than one to be explored

HORIZON-JTI-CLEANH2-2023-01-02: Innovative Solid Oxide electrolysis cells for intermediate temperature hydrogen production

550- 700ºC aiming for dynamic operation of SOEL (TRL 2 → 4)

- Hot start up in 4min, cold start-up in 6h; current density of 1.2A/cm^2
- New cell & stack designs replacing costly ceramics, reducing CRMs; CFD & multi-physics modelling
- 5 cells of > 25cm^2; > 1,000h

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Renewable Hydrogen - Topics

HORIZON-JTI-CLEANH2-2023-01-03: Advances in alkaline electrolysis technology

Improvements in performance, reduction in cost from materials to BoP components, control, systems (TRL 3 → 5)

- Improve at least one KPI, maintaining the others at present levels
    1. Current density > 1.2 A/cm^2 @ <2V per cell; efficiency increase <48 kWh/kg @ <2V
    2. CAPEX < 150€/kW; OPEX< 35€/(kg/d)/y
    3. Deg <0.1%/1,000h
    4. Avoid PGMs and other CRMs

HORIZON-JTI-CLEANH2-2023-01-04: Photoelectrochemical (PEC) and/or Photocatalytic (PC) production of hydrogen

Prove the potential of PEC&PC to cheap H2 in centralised/decetralised systems (TRL 2/3 → 5)

- Single component for solar harvesting and catalytic reaction – no PV cells and electrolyser cells connection
- PEC: 15% solar / PC 5% to H_2 conversion eff @ >500 cm^2
- Demo for 500h with stable STH efficiencies

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Renewable Hydrogen - Topics

HORIZON-JTI-CLEANH2-2023-01-05: Waste to Hydrogen demonstration plant

Develop a pilot plant to demonstrate waste to H2 conversion (TRL 5 → 7)

- Wastes without any recycling potential – mainly organic; range of moisture (<50%) and calorific value (2-5kWh/kg)
- various conversion techs are possible
- 3MW reactor; 4,000h/a operation; 180,000kg/a @ location with H_2 end user
- Funding plan to be provided

HORIZON-JTI-CLEANH2-2023-01-06: Valorisation of by-product O2 and/or heat from electrolysis

Utilise O2 and heat in non-energy intensive industries (TRL 7 → 8)

- Innovative EL; BoP integration with industrial process
- Optimal & dynamic operation to balance H_2, O_2 and heat demand – impact on durability
- 15MW, 1 year, 4,000h operation
- Go-no go decision; detailed funding plan

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Renewable Hydrogen - Topics

HORIZON-JTI-CLEANH2-2023-01-07: Hydrogen use by an industrial cluster via a local pipeline network

Install a large electrolyser and a new or repurposed 100% hydrogen pipeline network to fully or partially decarbonise at least two industrial processes of a single industrial zone (TRL → 8)

- Demonstrate operation of a number of processes from a small H2 pipeline
- Electrolyser > 10MW, pipeline of sufficient capacity
- Pipeline: capital investment 1 M€ /km, transmission pressure 100 bar, H2 leakage 0%
- Synergies with existing projects of the Horizon Europe Process4Planet or Clean Steel partnerships are encouraged – Funding plan

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Questions?
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