



# Delivering the EU Green Deal:

## Hydrogen Projects supported under the Green Deal topic

EUROPEAN CLIMATE,  
INFRASTRUCTURE AND  
ENVIRONMENT  
EXECUTIVE AGENCY



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# About CINEA



- **CINEA - the Climate, Infrastructure and Environment Executive Agency** started its operations on 1 April 2021
- Combining programmes, legacies, projects and staff from two previous EC's executive agencies - INEA and EASME
- Adding new 2021-2027 programmes

**CINEA is the EU focal point for green and infrastructure projects**

# European Climate, Infrastructure and Environment Executive Agency



> **58 billion** for the period  
**2021-2027**



> **500 staff** by 2027



from 2800+ projects  
managed in October 2021  
to > **4500 projects** by 2027

- **Policy feedback** to the European Commission as an essential part on project and programme implementation results
- **Expertise** at the service of **beneficiaries** in managing the complete lifecycle of projects
- Exploitation of **synergies** and dynamic ways to work **across programmes**

# Key contribution to the European Green Deal



- Implementing CINEA's portfolio supports the **European Green Deal** - the roadmap for making the EU's economy **sustainable**
- Aiming to boost the efficient use of resources by moving to a clean circular economy, restore biodiversity, cut pollution, and achieve **climate neutrality by 2050**

# The H2020 Green Deal call

## LC-GD-2-2-2020:

Develop and demonstrate a 100 MW electrolyser upscaling the link between renewables and commercial/industrial applications

**Objective:** demonstrate energy system integration through hydrogen: produce hydrogen from RES and use it in a commercial/industrial application

### **Added value & challenge:**

- To help achieve the climate neutrality objective, hydrogen needs to be produced at large scale, mainly through electrolysis powered by RES.
- Today the technology is only available at multi-MW
- In order to reach the GW scale, the development and demonstration of a 100MW electrolyser is key. It will help create economies of scale, thus leading to further cost reductions

# The call on 100 MW electrolyser: expected activities

1. **Develop larger modules** with reduced balance of plant, managing efficiently the input power, the output hydrogen and oxygen streams and the heat flows, while ensuring the reliability of the system and reducing the footprint
2. **Assemble the modules into a 100MW electrolyser system**, test and demonstrate it in real life conditions, operating flexibly to harvest maximum renewable power and provide grid-balancing services, and supplying renewable hydrogen to a commercial/industrial application
3. **Demonstration of the future economic viability** of the technology depending on cost of electricity and hours of operation of the electrolyser
4. **Assess the performance and the durability** of the electrolyser operating dynamically and address potential safety issues
5. **Evaluation of the environmental performance** of the system and of other ecological and **societal benefits** along the **EU value chain**

# Supported projects:



**GreenHySCALE**  
(Skive – Denmark)

**GREENH2ATLANTIC**

**GREENH2ATLANTIC**  
(Sines – Portugal)



**REFHYNE II**  
(Cologne – Germany)

Alkaline electrolyser

PEM electrolyser

# GreenHySCALE

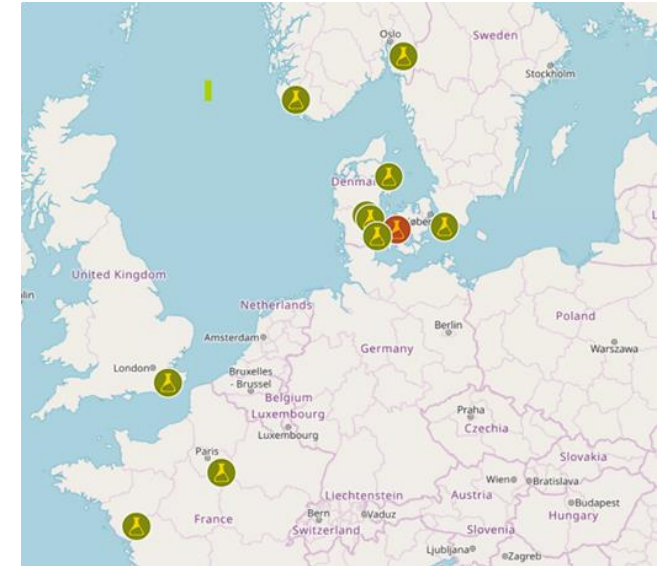
100 MW Green hydrogen production in a replicable and scalable industrial hosting environment

## Aim:

- develop a novel **multi-MW alkaline electrolyser** platform with **factory assembled and pre-tested modules**, reaching a CAPEX below 400 EUR/kW by the end of the project.
- A 6 MW module will be demonstrated as the first step, and leading to 100 MW electrolysis plant (**Skive, DK**)
- Generate green hydrogen for 2 years from 80 MW directly connected renewables in combination with certified green electricity from a TSO grid connection.

## Ambition:

- reaching an overall energy efficiency above 90% and to become the world's largest electrolyser system qualified as a TSO balancing services provider,
- reducing the cost of hydrogen to below 2.85 EUR/kg for an electricity cost of 40 EUR/MWh.



- Starting: **1 October 2021**
- Duration: 60 months
- Grant Amount: €30,000,000.00
- 11 participants (Denmark, France, Norway, United Kingdom)
- Coordinated by GREENLAB SKIVE AS (DK)



# GREENH2ATLANTIC

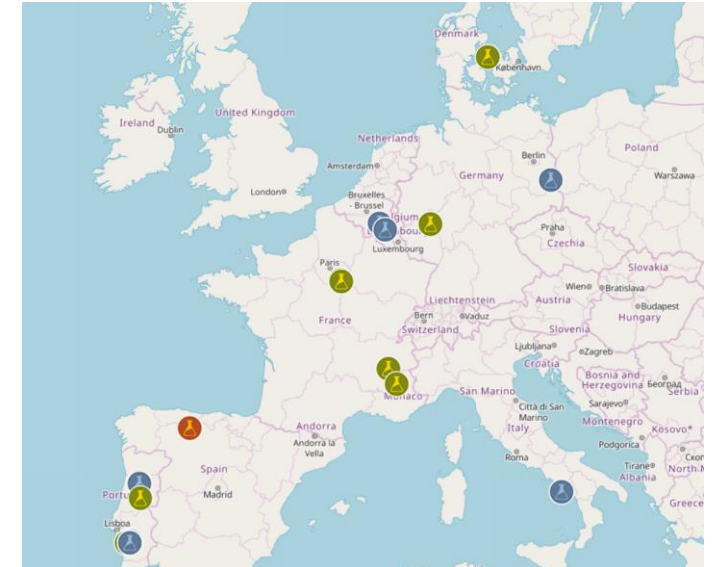
A 100 MW Flexible Green Hydrogen Production Process Sourcing Hybrid Renewable Energy and Supplying Green Hydrogen to Multiple End-uses

## Aim:

- demonstrating a first-of-a-kind 100 MW **alkaline electrolyser (Sines, PT)** leveraging scale-up, standardization and manufacturing automation,
- composed of innovative, scalable and fast-cycling 8 MW modules
- innovative interface system composed of advanced power electronics will allow for the direct coupling of the electrolyser with local, dedicated hybrid (solar and wind) renewable energy
- innovative, AI-enhanced Advanced Hydrogen Management System will allow for the optimization of OPEX, load factor, real-time H<sub>2</sub> production management

## Ambition:

- reduce the LCOH to 2.87EUR/kg of green H<sub>2</sub>
- overcome bottlenecks related to CAPEX (...)
- reduce greenhouse gas emissions by 82.16 ktCO<sub>2</sub>-eq/year
- input for EU harmonization and regulations



- Starting: **1 December 2021**
- Duration: 72 months
- Grant Amount: €30,000,000.00
- 13 participants (Portugal, France, Germany, Denmark)
- Coordinated by EDP RENOVAVEIS

# REFHYNE II

## Clean Refinery Hydrogen for Europe II

### Aim:

- ➔ Install 100MW **PEM electrolyser** to be sited at Rheinland refinery in Cologne, Germany using 5MW electrolyser modules
- ➔ The electrolyser will be powered from renewable energy (on and offshore wind farms and solar electricity)
- ➔ The team has already installed a 10MW PEM electrolyser at the same site (REFHYNE I)

### Ambition:

- ➔ demonstrate the potential of 100MW electrolysers to decarbonise the operations of refineries and other industrial sites
- ➔ propose viable business case for large-scale electrolysis at refineries by valorising the hydrogen and oxygen streams in the refinery
- ➔ explore the upgrading of waste heat to higher temperatures for use in the refinery, to further improve the business case



- Starting: **1 October 2021**
- Duration: 60 months
- Grant Amount: 32,431,618.00
- 8 participants (Portugal, France, Germany, Denmark)
- Coordinated by SINTEF, NO

# Thank you