GREEN HYDROGEN PRODUCTION FROM RENEWABLE ENERGY SURPLUS

MOTIVATION

- The Climate crisis has driven governments to set more demanding targets for renewable energy production.
- RNC2050 establishes an expansion of installed renewable energy capacity from 13 GW to 50 GW in 2050, 80 % from WT and PV.
- The intermittence of renewable energy is a real challenge to guarantee the stability of the national electricity grid.
- H_2 production by electrolysis of water using excess production of renewable energy is a promising solution.
- There are no studies on the Portuguese capacity for green H_2 production and its connection with the country's energy strategy.

OBJECTIVES

- Assess the potential of H_2 production from renewables surplus, using climate models.
- Modelling and optimization of Power-to-Gas systems and their integration with the national electricity production.
- Study strategies for hydrogen storage and transportation.

Team:

CERENA (PI + 6 Researchers)
INESC-ID (Co-PI)
IPMA (1 Researcher)

PITCH by Catarina Braz

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RESEARCH PLAN

02

Electricity demand and renewable generation forecast

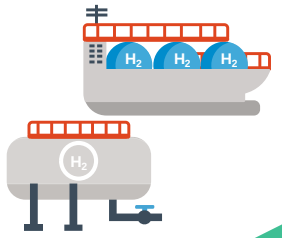
Development of regional load demand forecasting models based on temporal WT/PV power density maps.

04

Hydrogen storage and transport

Geotechnical characterization and cost model of underground H_2 storage (UHS) in Carriço's salt dome.

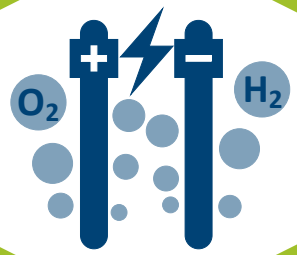
Comparison of liquid organic hydrogen carriers systems for H_2 storage.



Geostatistical modelling of climate variables

Development of statistical-based models of the spatiotemporal distribution of climate variables relevant to generating wind and solar power.

01



03

05

Decision Support tool

Development of a Power Planning System software with 3D geomechanical simulations of salt caverns as UHS, interactive maps of climate variables forecasts, and temporal WT/PV power density maps up to 2050.

Assessment of hydrogen production systems

Modelling and optimization of electrolyser systems and their integration in Green H_2/electricity production.

Optimal sizing and scheduling of Power-to-Gas systems.

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EXPECTED RESULTS

01

Climate scenarios up to 2050

Temporal WT/PV power density map forecasting models

02

Detailed individual models of optimized electrolyser plants.

Size and scheduling of optimal Power-to-Gas systems

03

Identification of viable salt caverns for UHS

Identification of viable systems for transport (LOHC)

WEB-BASED POWER PLANNING SYSTEM DECISION SUPORT TOOL

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