



REPÚBLICA  
PORTUGUESA

# PORTUGAL NATIONAL HYDROGEN STRATEGY (EN-H<sub>2</sub>)

THE INDUSTRIAL H<sub>2</sub> PRODUCTION PROJECT IN SINES

25 de maio 2020



REPÚBLICA  
PORTUGUESA

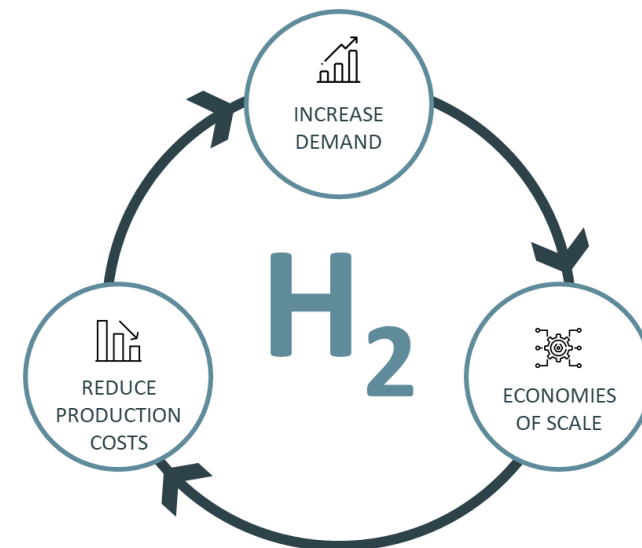
ENVIRONMENT AND  
CLIMATE ACTION



The Portuguese government is promoting an industrial policy around hydrogen and renewable gases, which is based on the definition of a set of public policies that guide, coordinate and mobilize public and private investment in projects in the areas of production, storage, transport and consumption of renewable gases in Portugal.

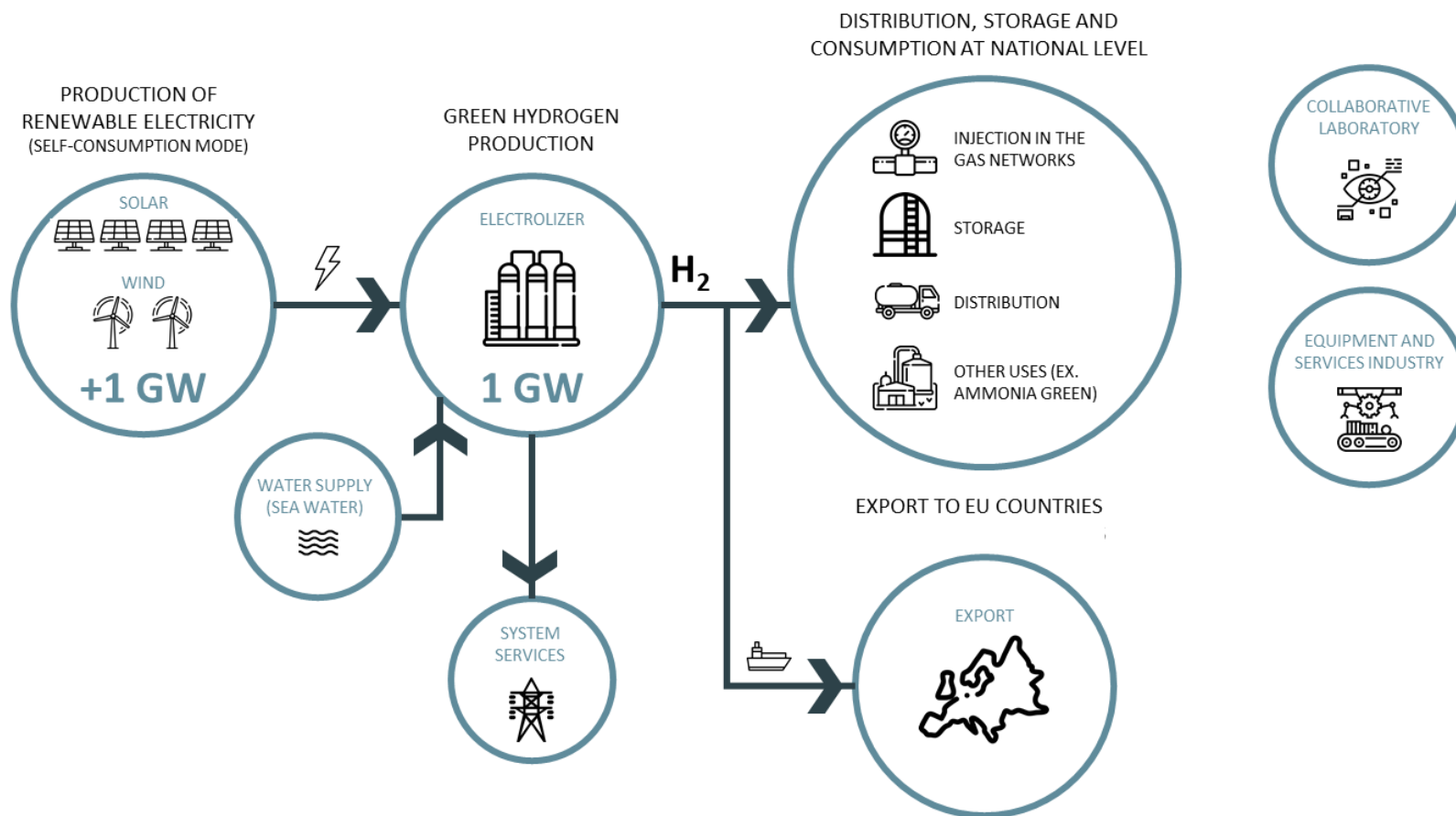
## PORTUGAL APPROVED THE DRAFT NATIONAL HYDROGEN STRATEGY (EN-H2)<sup>1</sup> THAT AIMS TO FACILITATE AND ACCELERATE THE ENERGY TRANSITION IN THE VARIOUS SECTORS:

- ✓ Introduce an element of incentive and stability for the energy sector, promoting the gradual introduction of hydrogen as a sustainable pillar and integrated in a more comprehensive strategy of transition to a decarbonized economy.
- ✓ Frames the role of hydrogen in the energy system and proposes a set of measures and targets for incorporating hydrogen in the various sectors of the economy.
- ✓ Gives a solid framework to all companies and promoters with hydrogen projects making possible to consolidate these projects into a broader and more coherent Strategy.
- ✓ Promotes an industrial policy around hydrogen, based on the definition of a set of public policies that guide, coordinate and mobilize public and private investment in projects of production, storage, transportation and consumption of renewable gases in Portugal.



(1) <https://participa.pt/pt/consulta/en-h2-estrategia-nacional-para-o-hidrogenio>

# A LARGE ANCHOR PROJECT ON AN INDUSTRIAL SCALE FOR THE PRODUCTION OF GREEN HYDROGEN IS ESSENTIAL TO CREATE A HYDROGEN ECONOMY IN PORTUGAL.



# THE PRODUCTION PROJECT IS FOCUSED ON LEVERING SOLAR ENERGY AS A FACTOR OF COMPETITIVENESS, INDUSTRIAL TRANSFORMATION AND OPPORTUNITY TO MEET EUROPE H<sub>2</sub> DEMAND



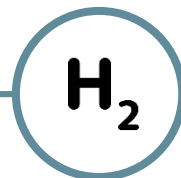
## 1 GW INDUSTRIAL SCALE PRODUCTION OF GREEN H<sub>2</sub>

- Position Portugal as an exporter of green H<sub>2</sub>, in particular to the Netherlands (Port of Rotterdam), but with potential for more countries
- Promote H<sub>2</sub> industry boosting its consumption.



## 2850 M€ ESTIMATED INVESTMENT

- 1 GW electrolyser capacity until 2030 (with foreseen scale-up potential);
- Solar and Wind for electricity production (self-consumption regime).
- Electrolyser Factory
- Collaborative Lab.



## TOTAL PRODUCTION OF 35 - 175 THOUSAND TONS H<sub>2</sub>/YEAR

- Production varies according to the profile of electricity generation (2000 - 8750 h/year);
- Consumption of 0,3 - 1,7 Mm<sup>3</sup> of water/year directly from the sea.



## SOCIAL & ECONOMIC GROWTH

- Job creation and requalification;
- Value and wealth creation;
- Promotion of new R&D areas and skills.



The Portuguese government is fully committed to the National and European hydrogen policy, to elevate hydrogen to a strategic priority, as well as contributing to a genuine international hydrogen market and to the definition of market rules that make hydrogen export a reality.

## PORTUGAL DUE TO ITS VERY FAVORABLE CONDITIONS FOR THE INSTALLATION OF A H<sub>2</sub> PRODUCTION INDUSTRY HAS POTENTIAL TO HELP MEET EU DEMAND FOR GREEN H<sub>2</sub>

### Advantages of H<sub>2</sub> production in Sines:

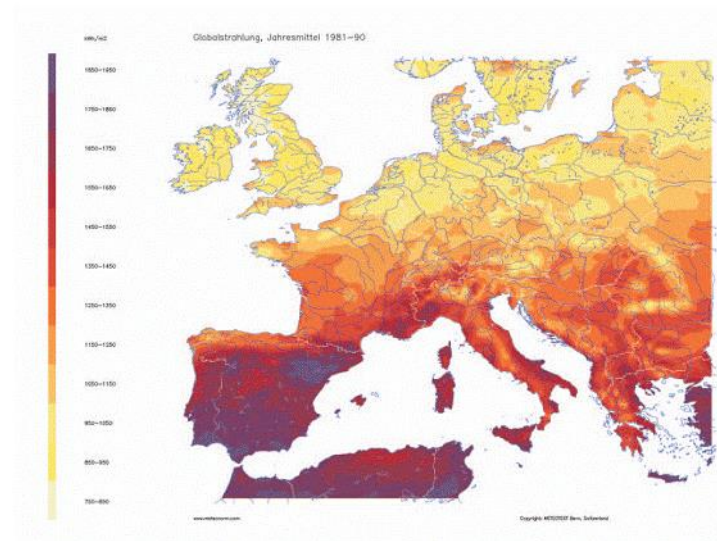
- Location on the Portuguese Atlantic coast (proximity to the sea and water supply);
- Deep sea port connected to an industrial park (allows exports);
- It has transport and storage infrastructures and connection to the natural gas network<sup>(1)</sup>;
- Associated to an industrial zone with H<sub>2</sub> consumption (Refinery) with the possibility of expansion to new industries;
- The state owns +4.000 hectares of land to set up the H<sub>2</sub> industrial complex.



(1) The national Natural Gas network is one of the most competitive for H<sub>2</sub> injection, due to its technical nature and the fact that it is one of the most recent at European level.

## THE COST OF ELECTRICITY PRODUCTION IN PORTUGAL IS THE COUNTRY'S MAIN “VISIT CARD” TO PROMOTE A GREEN H2 PRODUCTION INDUSTRY

- Hydrogen will be produced essentially via electrolysis using electricity;
- The cost of electricity represents most of the cost of producing Hydrogen, followed by the cost of capital;
- Hydrogen production is considered competitive with electricity prices of around 25 €/MWh;
- Portugal has a competitive advantage over the other countries because it has lower electricity production costs
- The auction held in July 2019 reached the lowest tariff ever recorded worldwide (14.76 €/MWh) and an average tariff of 20.33 €/MWh.



2019 PHOTOVOLTAIC SOLAR AUCTION

LOWEST TARIFF

**14.76 €/MWh**





The Green Hydrogen project in Portugal aims to secure Green Hydrogen production, transportation, distribution, demand, focused on leveraging Portugal's renewable energy as a factor of competitiveness with an export component. This initiative leverages on the existing deep sea port infrastructure at Sines and its strategic potential as an export hub of the Iberian peninsula, connected by maritime route to the Port of Rotterdam, but with potential for link to more countries.

## PORTUGAL'S COMPETITIVE ADVANTAGE IN GREEN H<sub>2</sub> PRODUCTION IS IN THE LOW COST OF ITS RENEWABLE ELECTRICITY PRODUCTION AND IN EU LARGE MARKET DEMAND



### CURRENT SITUATION IN WORLD H<sub>2</sub> MARKET

- Production exclusively from fossil fuels (coal & natural gas)
- H<sub>2</sub> production cost between 1-2 €/kg, not accounting for CO<sub>2</sub> emissions.



### GREEN H<sub>2</sub> PRODUCTION PROJECT IN LARGE SCALE IN NORTHERN NETHERLANDS

- 1 GW Electrolyser;
- 4 GW Offshore wind power;
- Aiming to achieve electricity prices between 20-25 €/MWh;
- H<sub>2</sub> production cost between 2-3 €/kg



### GREEN H<sub>2</sub> PRODUCTION PROJECT IN LARGE SCALE IN PORTUGAL

- 1 GW Electrolyser (2030 goal);
- +1 GW Solar PV + Wind;
- Very competitive electricity prices (~20 €/MWh);
- Objective to achieve H<sub>2</sub> production cost below 2 €/kg

(1) Study "Evaluation of H<sub>2</sub> potential in the national energy system" (2019)

## THE PORTUGUESE GOVERNMENT IS ALREADY WORKING TO CREATE THE NECESSARY CONDITIONS AND MECHANISMS THAT ALLOW TO RECOGNIZE AND VALUE HYDROGEN IN THE NATIONAL MARKET

1.

### PROMOTE THE PRODUCTION OF GREEN HYDROGEN

- Start the dialogue with investors and market players [\[ONGOING\]](#)
- Create the conditions for the installation of a green hydrogen industry [\[ONGOING\]](#)
- We expect the first electrolyser units to start operating in 2022/2023 and to deliver at least 1 GW of hydrogen production capacity by 2030.

2.

### ENSURE INTERNAL AND EXTERNAL DEMAND

- Create the conditions for the internal and external market for hydrogen [\[ONGOING\]](#)
- Partner with the Government of the Netherlands, and other Member States, to export green hydrogen [\[ONGOING\]](#)

3.

### IMPLEMENT POLICIES AND MECHANISMS

- Regulate the injection of renewable gases [\[ONGOING\]](#)
- National Hydrogen Strategy for Hydrogen in Portugal [\[ONGOING\]](#)
- System of guarantees of origin for renewable gases [\[ONGOING\]](#)
- Implement a mechanism to support the production of hydrogen [\[STARTING\]](#)

---

## PORTUGAL-NETHERLANDS LINK AIMS TO CONTRIBUTE IN A VERY SIGNIFICANT AND CONCRETE WAY TO AN EU ENVIRONMENTAL AND CLIMATE STRATEGY, COMBINING COMPETITIVENESS AND SUSTAINABILITY.

- The Netherlands has developed an advanced Hydrogen strategy, seeking to use both low carbon hydrogen and green hydrogen and to develop several ambitious projects in the short term (Northern Netherlands Hydrogen Economy and H-Vision);
- The challenge for Netherlands is related to the need to have Hydrogen production that is capable of meeting the high domestic demand (refineries, fertilizers and the chemical industry);
- The Netherlands intends to follow a diversified strategy, combining locally produced with imported green hydrogen;
- In addition, to meet the demand for green hydrogen from the chemical cluster in northern Europe (Holland, Belgium and Germany) it will be necessary to install 2x the electricity production capacity.
- The scope of the project allows other international partnerships. The openness for new partnerships is namely in the fields of electrolysis manufacture, transformation and transport.

STRENGTHENING REGIONAL COOPERATION WILL MAKE IT POSSIBLE TO REDUCE PRICES FOR ACCESS TO THE TRANSITION TO CLEAN ENERGY.



REPÚBLICA  
PORTUGUESA

ENVIRONMENT AND  
CLIMATE ACTION