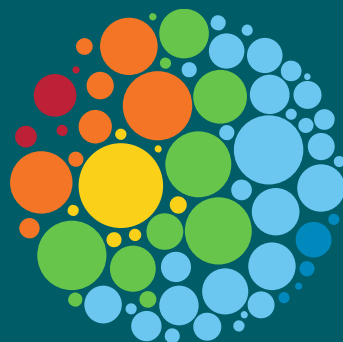




**Pedro Amaral Jorge**

[pajorge@apren.pt](mailto:pajorge@apren.pt)

+351913780120



**APREN**

Associação Portuguesa de Energias Renováveis

**EUFORES 2020**

**Renewable Energy in Portugal – Opportunities and Challenges ahead**



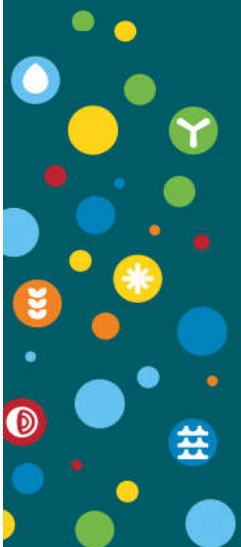
• 15.12.2020



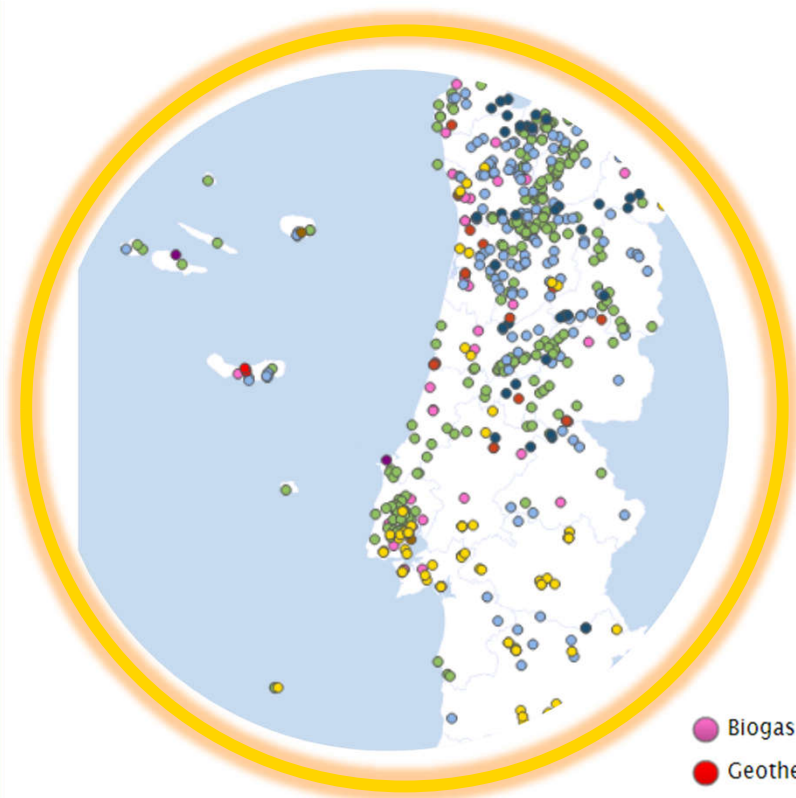
EUFORES 2020

Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead



## APREN



- Biogas
- Biomass
- CSP
- Geothermal
- Large Hydropower
- MSW
- Photovoltaic
- SHP
- Wave and Tidal
- Wind

Technology	Share
Wind	97 %
Hydro	99 %
Solar PV	25 %
Biomass	28 %
Geothermal	100 %
<b>Overall Renewables</b>	<b>92 %</b>



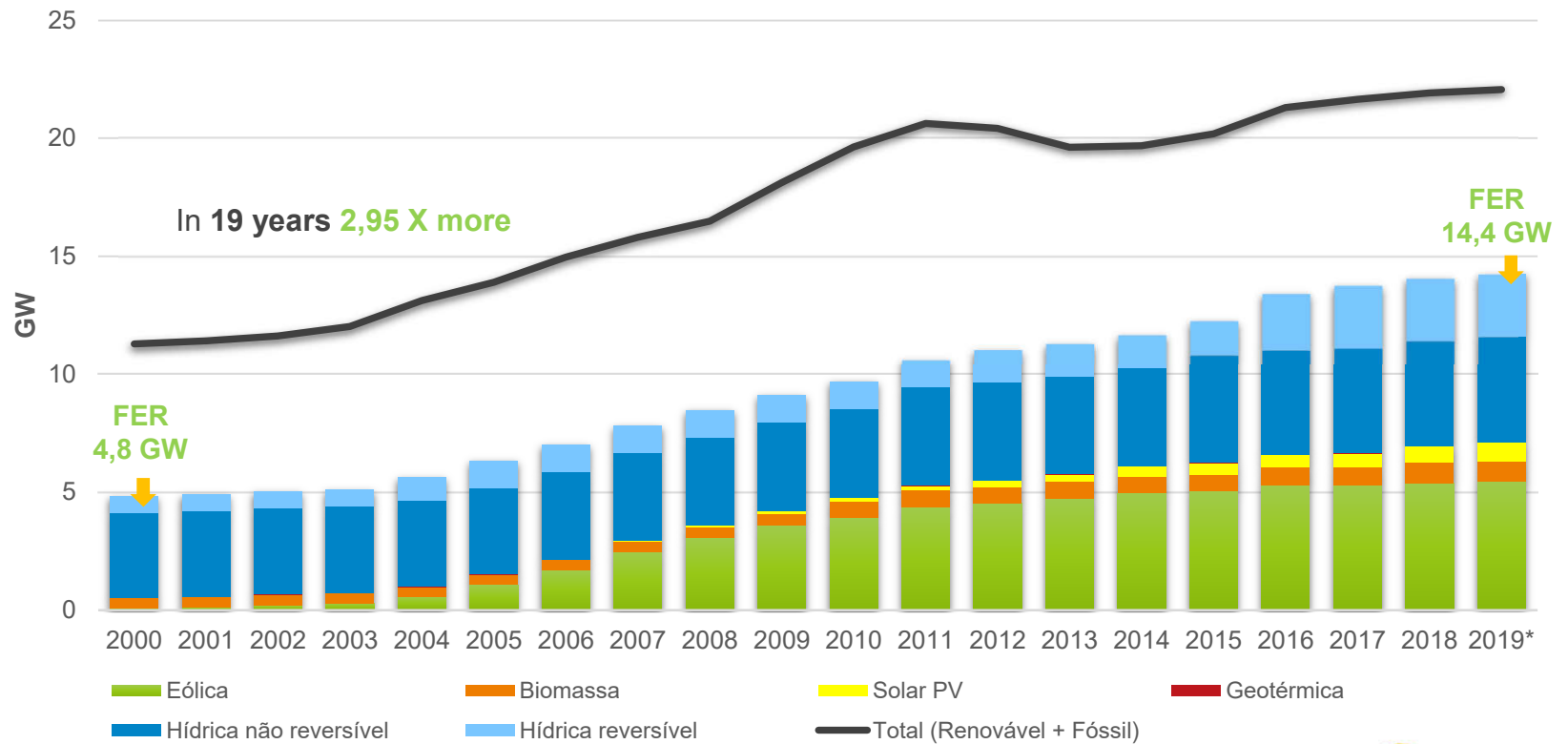
EUFORES 2020

Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead

## Power mix from renewables

### Installed Renewable Capacity Breakdown In Portugal 2000 - 2019



Source: DGEG, Análise APREN



EUFORES 2020

Renewable Energy  
in Portugal

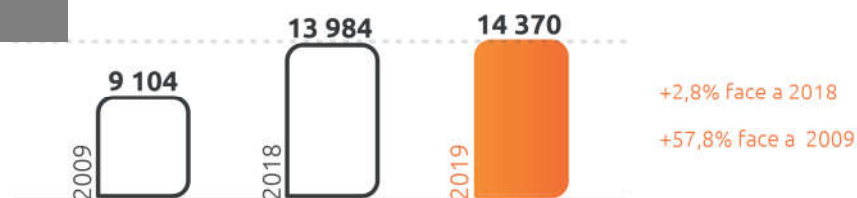
Opportunities and  
Challenges ahead

## Power mix from renewables

### Installed Capacity (MW)



### Renewable (MW)



### Non Renewable (MW)





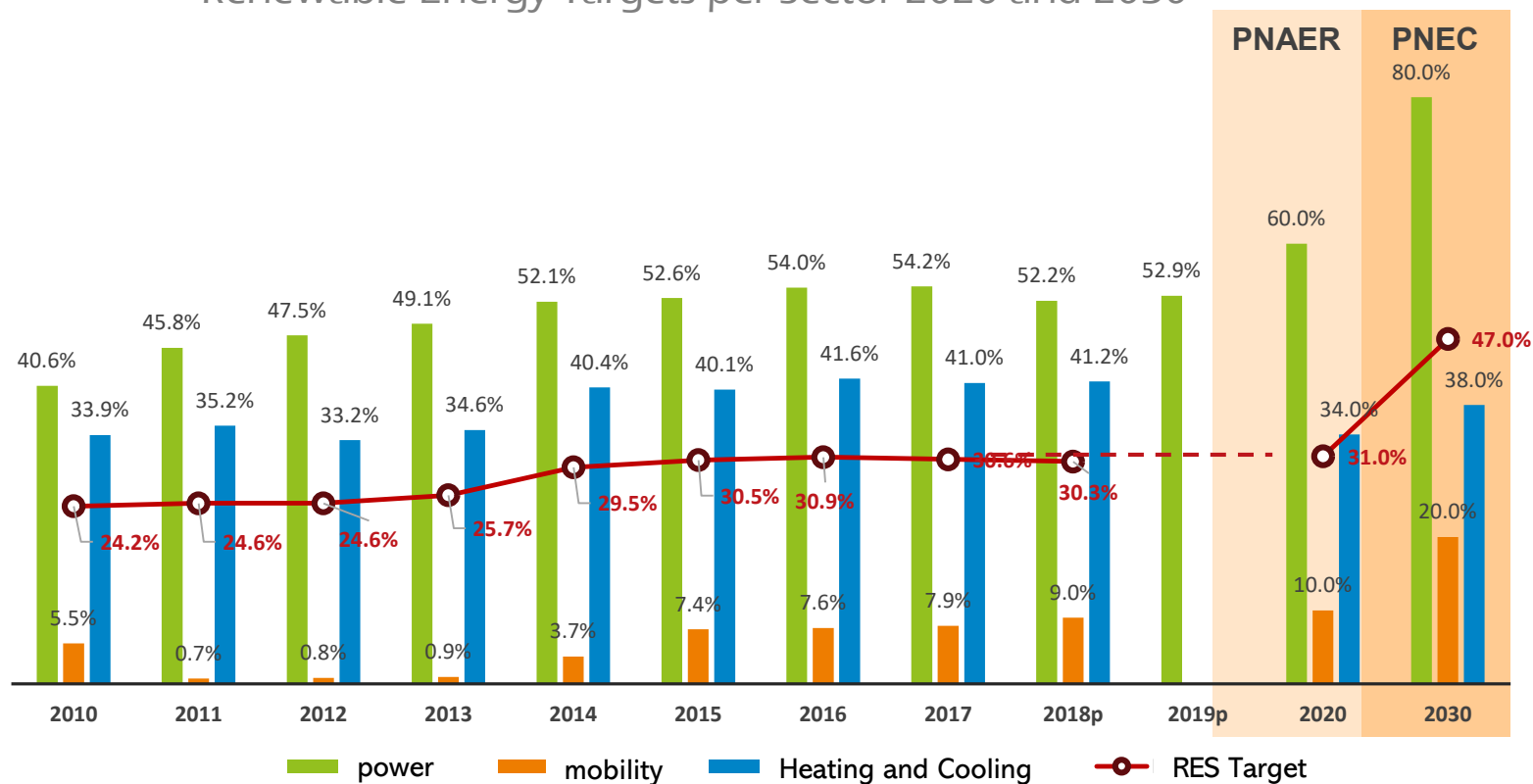
EUFORES 2020

Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead

## Energy usage mix from renewables

### Renewable Energy Targets per Sector 2020 and 2030



Fonte: Análise APREN, PNAER, PNEC, DGEG, 2019






EUFORES 2020

Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead



## Portugal in numbers

	2019	1st Semester 2020
 GENERATION	48.8 TWh	23.3 TWh
RENEWABLE GENERATION	56%	69.8%
 PT MIBEL PRICE	47.9 €/MWh	29.1 €/MWh
 CO <sub>2</sub> PRICE	24.8 €/tCO <sub>2</sub>	21.9 €/tCO <sub>2</sub>

Source: OMIE, REN, SendCO2, APREN's analysis



EUFORES 2020

Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead



## 2030 TARGETS



**-45% a -55%**

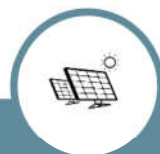
**EMISSIONS**

(sem LULUCF, em relação a 2005)



**35%**

**ENERGY  
EFFICIENCY**



**47%**

**RENEWABLES**

IN FINAL ENERGY CONSUMPTION



**20%**

**RENEWABLES IN  
TRANSPORT**



**15%**

**ELECTRIC  
INTERCONNECTIONS**

**80%**  
**RES IN ELECTRICITY**



EUFORES 2020

Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead



## 2030 TARGETS

### 2030 National Targets

	2020 Target	2030 Target
GHG Emissions	- 18% to -23%	-45% to -55%
Energy Efficiency	25%	35%
Renewable Energy	31%	47%
Electricity	59.6%	80%
Heating & Cooling	34%	38%
Transports	10%	20%
Interconnections	10%	15%

Source: PNEC 2030

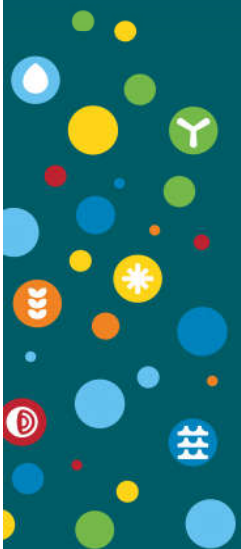




EUFORES 2020

Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead



## 2030 TARGETS

### Renewable Electricity until 2030

	2020	2030
Demand	56 TWh	~65 TWh
Renewable Electricity	53.7 % <sup>1</sup>	80 %
RES Installed Capacity	14.8 GW	27.4 – 27.9 GW
Hydro	7.0 GW	8.2 – 8.7 GW
Wind	5.4 GW	9.3 GW
Solar	2.0 GW	9.0 GW
Centralized	1.5 GW	7.0 GW
Distributed	0.5 GW	2.0 GW
Other RES <sup>2</sup>	0.4 GW	0.9 GW

1 - DGEG, Estatísticas Rápidas – Renováveis, Dec. 2019

2 – Includes Waves, Geothermal, Concentrated Solar thermal and Biomass (excluding cogeneration)

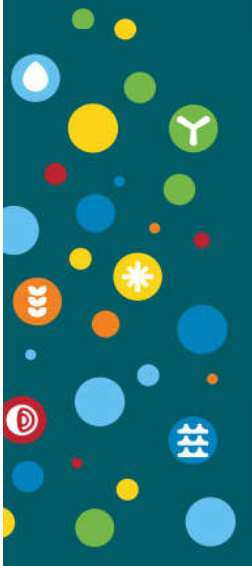
Source: PNEC 2030



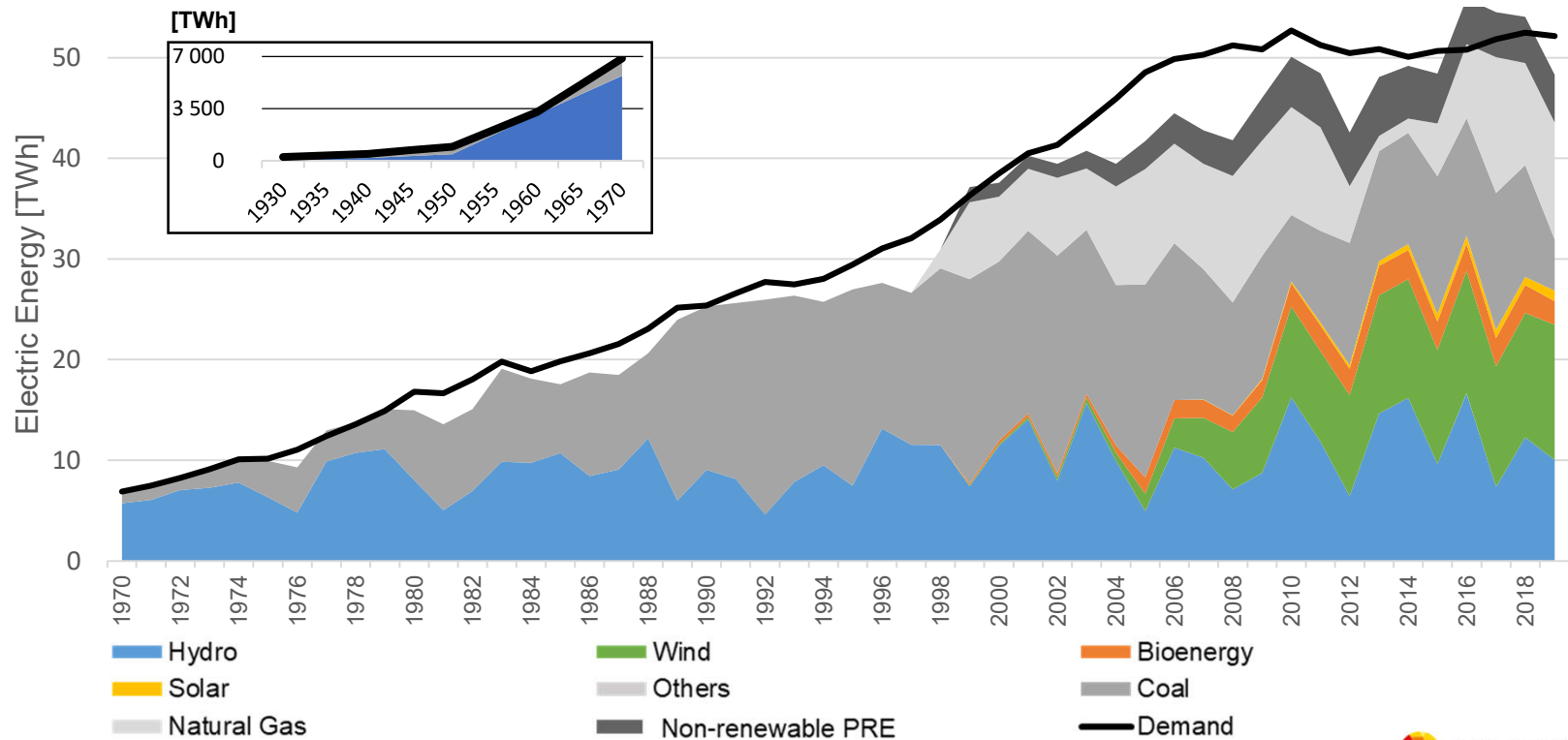
EUFORES 2020

Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead



## Electricity production mix in Mainland Portugal 1970 - 2019



Source: REN, EDP, APREN's analysis



EUFORES 2020

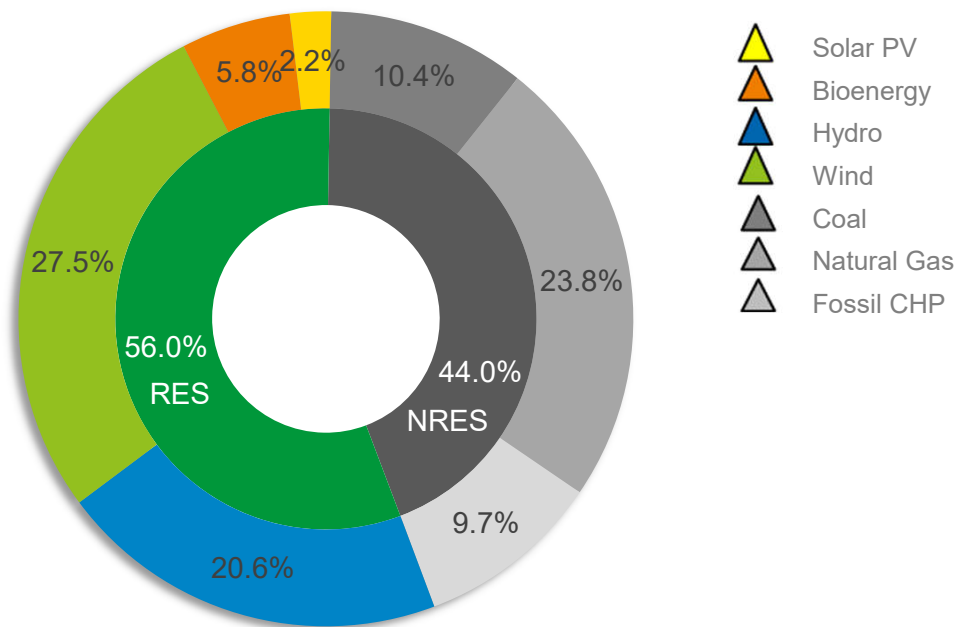
Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead



## Current situation in Portugal electricity market

### Portuguese Electricity Generation, 2019



**15 Mt  
CO<sub>2</sub>  
avoided  
emissions**

- In 2019, **renewable electricity represented 56.0% (27.315 GWh)** of the total electricity produced in mainland Portugal (48.759 GWh).

Source: REN, APREN's analysis



EUFORES 2020

Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead



# Current situation in Portugal electricity market

## Electricity Generation in Portugal | | June 2020

# 69.8 %

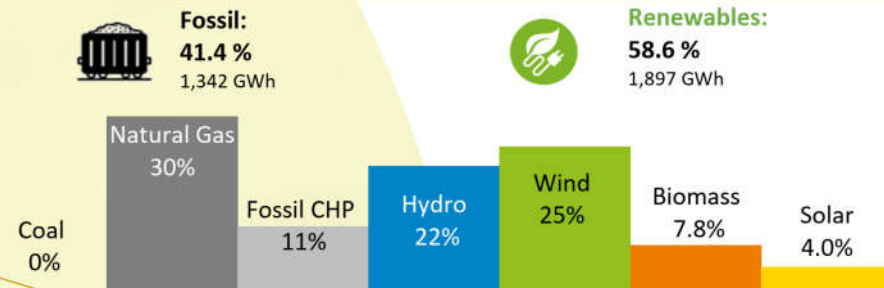
### Renewable electricity generation

(January to June 2020)

### CUMULATIVE ON JUNE 2020 (JAN-JUN)



### JUNE 2020





EUFORES 2020

Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead



## Current situation in Portugal electricity market

### POWER SECTOR EMISSIONS

The table aside identifies the savings achieved between January 1<sup>st</sup> and June 30<sup>th</sup> of 2020 on fossil fuel imports, CO<sub>2</sub> emissions and CO<sub>2</sub> emission allowances, as result of the renewable electricity generation.

During this period, the European market for CO<sub>2</sub> allowances (EU-ETS) registered an average price of 21.9 €/tCO<sub>2</sub>.

June recorded an average price for CO<sub>2</sub> emission allowances of 23.3 €/tCO<sub>2</sub>, a 7.5 % reduction compared to June 2019, contrary to the trend on increasing allowances prices that has been observed. This is a result of the COVID-19 pandemic impact on the carbon market. The main impacts of the pandemic are presented in the section [COVID-19: IMPACT ON THE ELECTRICITY SECTOR.](#)

Source: SendeCO2

#### THIS YEAR RENEWABLES AVOIDED...

Fossil fuel imports

**291 M€**

Jan-Jun



CO<sub>2</sub> emissions

**9.2 MtCO<sub>2</sub>**

Jan-Jun



CO<sub>2</sub> allowances

**201 M€**

Jan-Jun



Source: REN, SendeCO2, WorldBank, DGEG, ERSE, APREN analysis  
Note: Coal prices were considered until November 2019, due to data unavailability.



EUFORES 2020

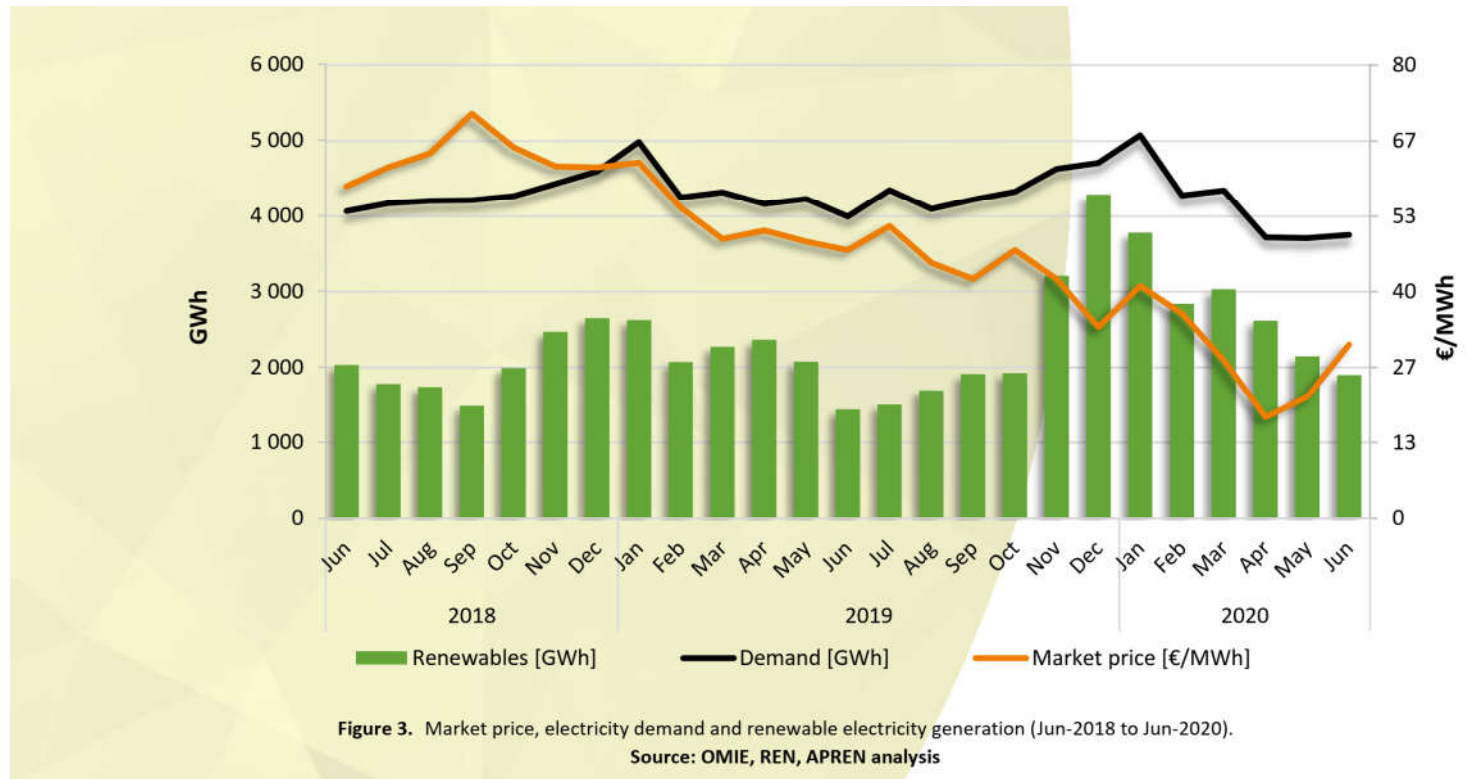
Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead



# 1. Current situation in Portugal electricity market

## ELECTRICITY MARKET



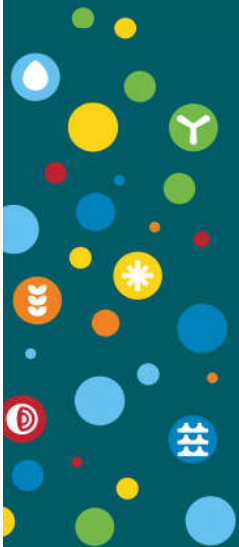




EUFORES 2020

Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead



## 1. Current situation in Portugal electricity market

### ELECTRICITY MARKET

Between January 1<sup>st</sup> and June 30<sup>th</sup> of 2020 there was an average electricity market price within the Iberian Electricity Market (MIBEL) in Portugal of 29.1 €/MWh<sup>2</sup>, a significant reduction of 44 % in comparison to the same period of 2019.

Also, it was recorded 340 non-consecutive hours in which renewable electricity generation was sufficient to meet the demand in Mainland Portugal, being characterized by an average MIBEL price of 25.7 €/MWh.

June registered an average hourly price of 30.6 €/MWh, a decrease of 35 % compared to the same period of 2019 (June 2019 - 47.2 €/MWh). This scenario reflects the impacts of the COVID-19 pandemic, for which a summary of the main impacts is presented in the section [COVID-19: IMPACT ON THE ELECTRICITY SECTOR](#).

<sup>2</sup>Arithmetic average of the hourly prices

Source: OMIE, APREN Analysis

### AND ON THE REST OF EUROPE?

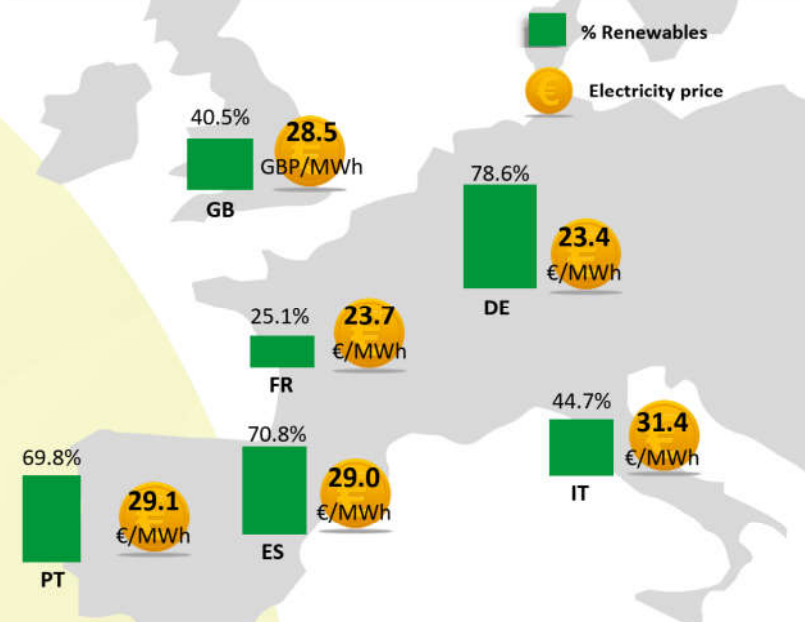


Figure 2. Renewable electricity generation share and average hourly electricity market price, between January and June 2020. Source: REN, Fraunhofer, REE, Terna, National Grid, ENTSO-E, APREN analysis

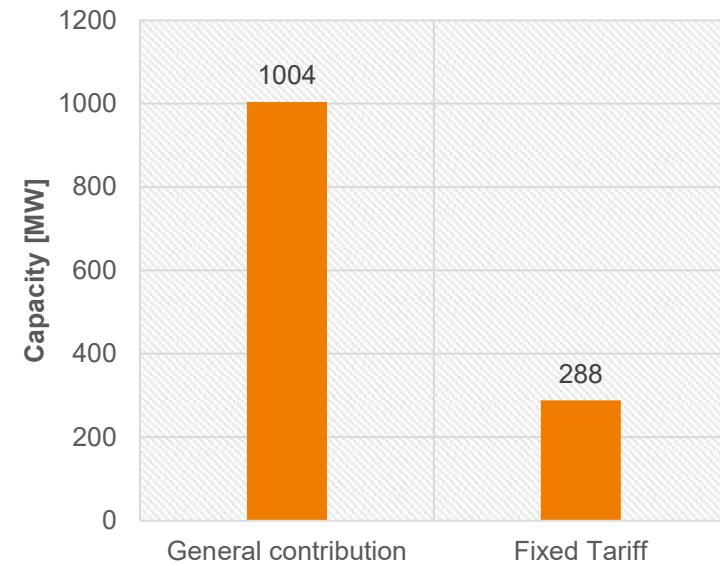
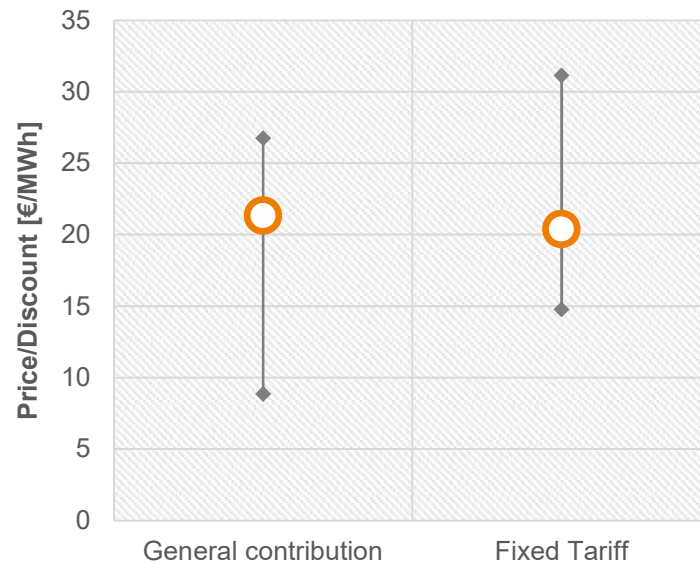


EUFORES 2020

Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead

## Results of 2019 Solar Auction



Record tariff on the fixed remuneration: 14,76€

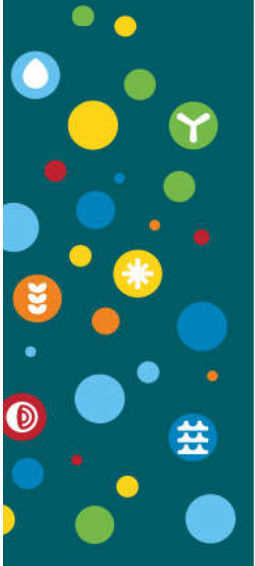




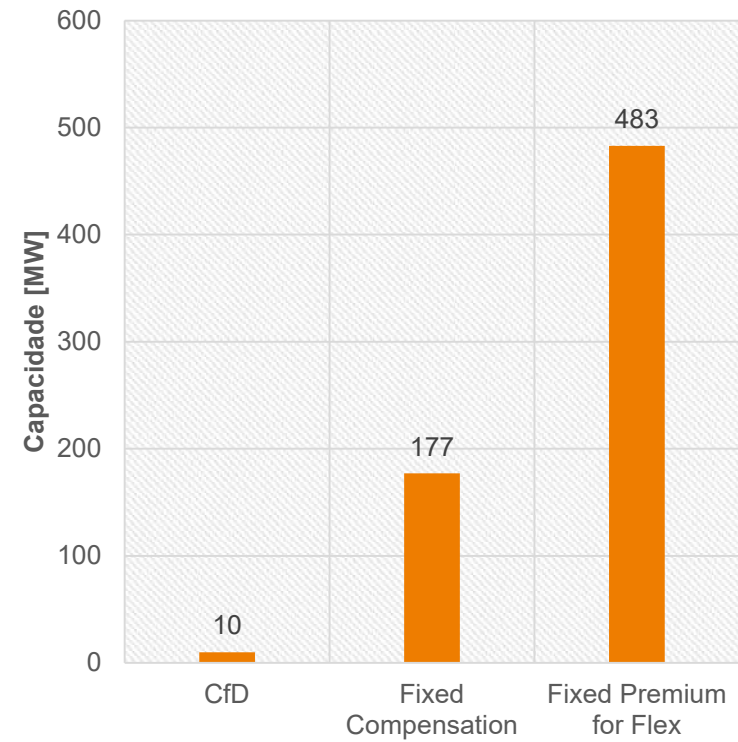
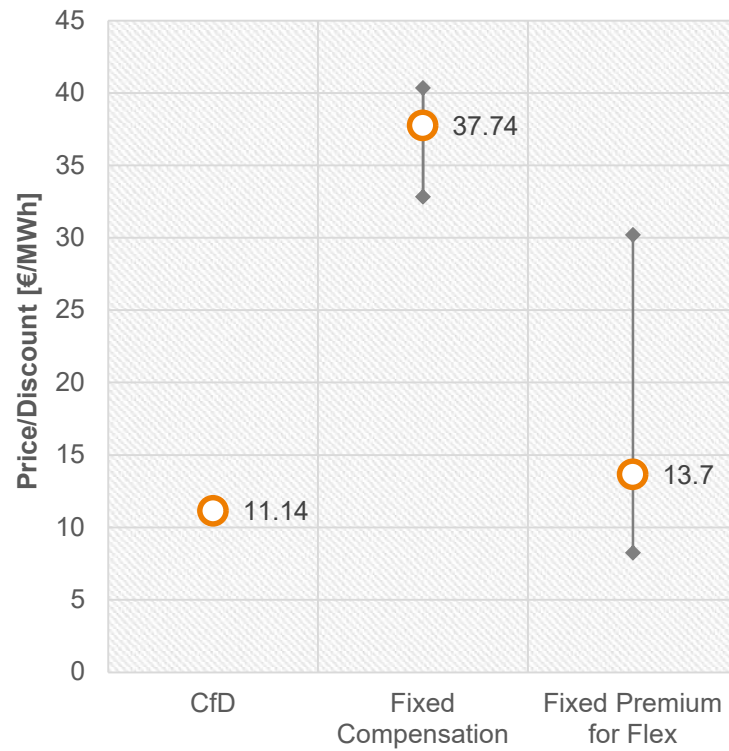
EUFORES 2020

Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead



## Results of 2020 Solar Auction





EUFORES 2020

Renewable Energy  
in Portugal

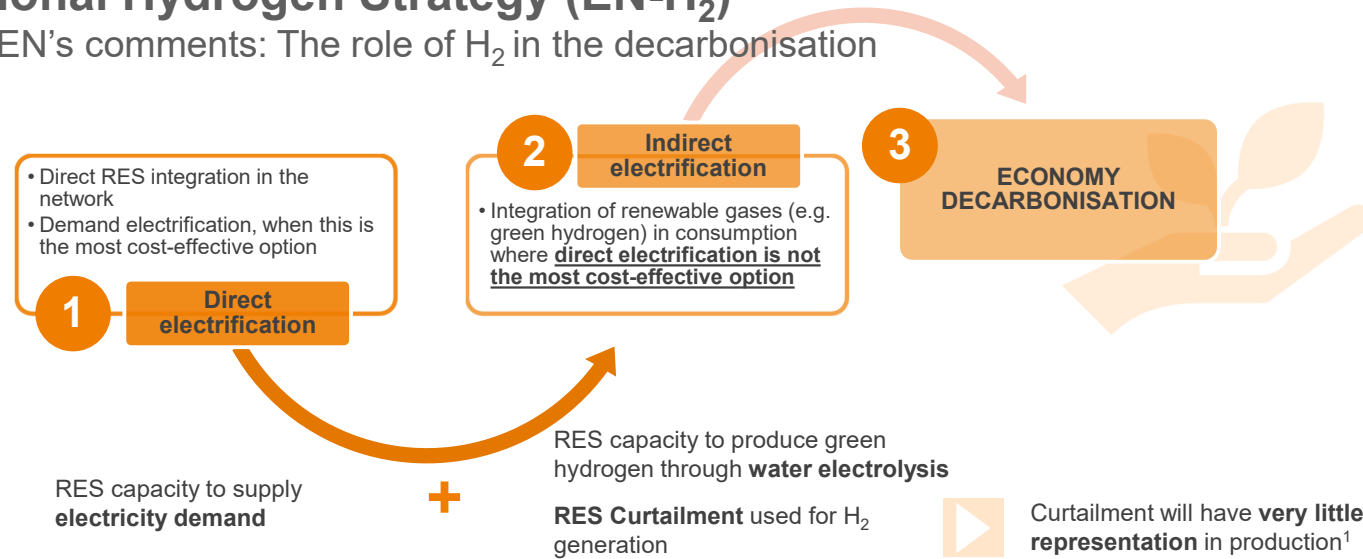
Opportunities and  
Challenges ahead



## Portugal Hydrogen Strategy

### National Hydrogen Strategy (EN-H<sub>2</sub>)

APREN's comments: The role of H<sub>2</sub> in the decarbonisation



“ It should also be noted that this Strategy does not define new goals for global or sectorial decarbonisation that are more ambitious than those defined in the NECP 2030. Rather, part of the targets for incorporating renewables into the gross final energy consumption and for emissions reduction defined in the NECP 2030 and with which the country is already committed, allowing these goals to be achieved, also, through the incorporation of renewable gases, in particular hydrogen. Excerpt of EN-H<sub>2</sub> ”



**However,** it is imperative that the installed capacity targets are revised!

<sup>1</sup>According to the study "Portuguese Market Outlook up to 2040", Poyry 2018, representativeness will be below 2% in 2040.



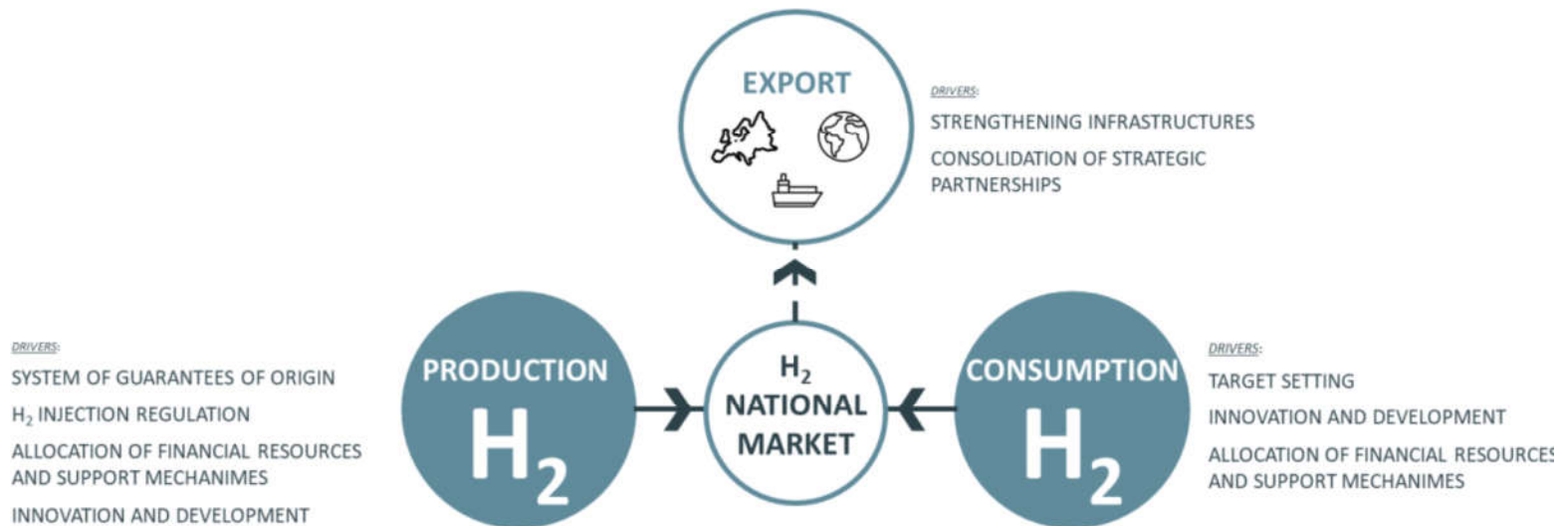
EUFORES 2020

Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead



# Portugal Hydrogen Strategy





EUFORES 2020

Renewable Energy  
in Portugal

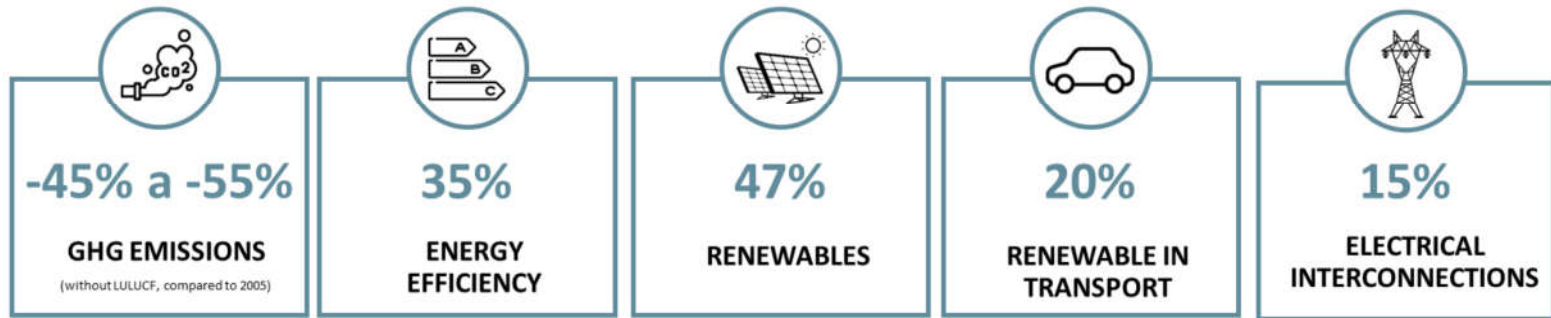
Opportunities and  
Challenges ahead



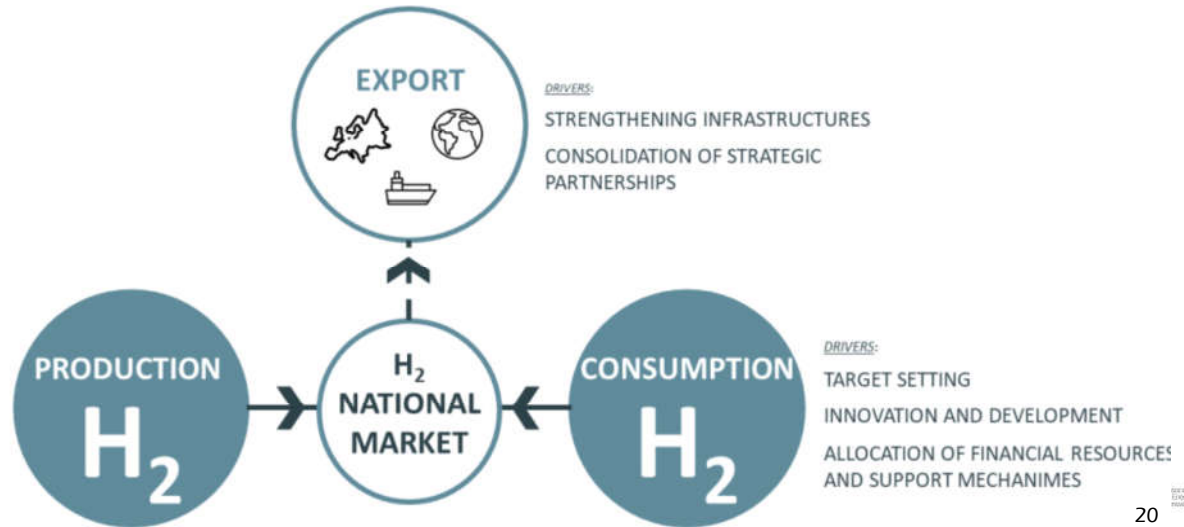
Source: EN-H2

# Portugal Hydrogen Strategy

## Renewable Gases in Portugal / Green Hydrogen



**DRIVERS:**  
 SYSTEM OF GUARANTEES OF ORIGIN  
 H<sub>2</sub> INJECTION REGULATION  
 ALLOCATION OF FINANCIAL RESOURCES AND SUPPORT MECHANIMES  
 INNOVATION AND DEVELOPMENT





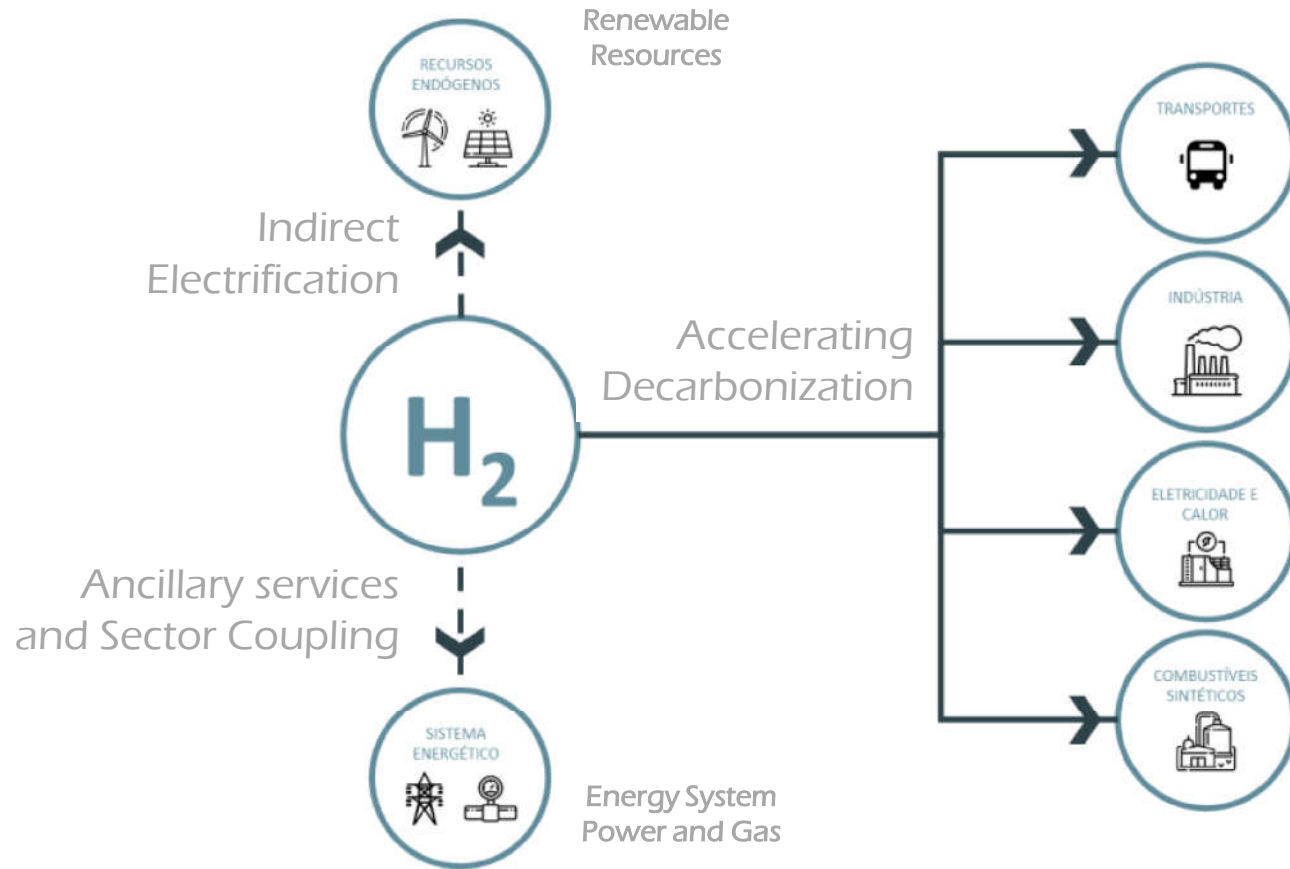
EUFORES 2020

Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead



# Portugal Hydrogen Strategy



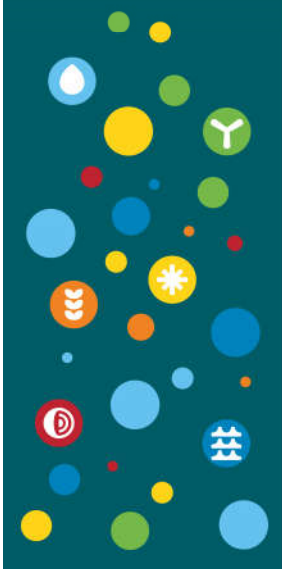
Source: EN-H2



EUFORES 2020

Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead



# Portugal Hydrogen Strategy

## 2030 Targets



5%

Final Energy  
Consumption



5%

Heavy Duty  
Transport



5%

Industrial  
Sector



8.500 to 12.000  
New Jobs



8 Mton CO2  
Emissions Avoided

180 M €  
Ammonia  
Import  
Reductions



15%

Injected the  
Natural Gas Grid



50-100

Green H2  
Fuelling Stations



2 GW

Electrolysers  
Installed capacity 2.5 GW

Water Usage  
from Wastewater Re-use from Municipal WWTP  
1% of all available wastewater



7 000 M €

Private Investment in  
Green H2 Manufacturing



300-600 M €

Natural Gas Imports  
Avoided



900 M €

Governmental Support  
Mechanism to Green  
H2 Production

400 - 450 M €  
Investment (CAPEX) Support  
from European Union Funds  
  
500 - 550 M €  
Green H3 Manufacturing Process Support  
From Portugal Environmental Fund

through a Competitive Bidding Open Process

Source: EN-H2





EUFORES 2020

Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead



## Portugal Hydrogen Strategy

### Portugal Competitive Advantages Renewable Gases in Portugal / Green Hydrogen



#### Sustainable Water Usage, Water availability

- WWTP to supply raw water to electrolyzers
- No water from rivers, aquifers, springs, etc, will be required



#### Competitive LCOEs

- Wind, PV, FPV, Hydro
- Hybrid Projects



#### Support Mechanism to Green H2 Generation

- H2 "tariff" do be discussed and presented by the Government in 2021
- CAPEX support for Green H2 Generation Projects



EUFORES 2020

Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead



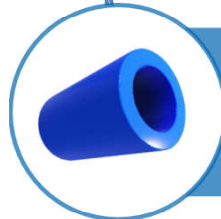
## Portugal Hydrogen Strategy

### Portugal Competitive Advantages Renewable Gases in Portugal / Green Hydrogen



#### Renewable Energy in the Generation Mix

- 2020 – 60%
- 2030 – 80%



#### Natural Gas Grid

- Recent Infrastructure, will support at the TSO level minimum 15% of Gren H2
- PE HD piping at the DSO's level, will support more than 15% of Gren H2



#### Ports

- Sines
- Leixões





EUFORES 2020

Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead



## Portugal Hydrogen Strategy

### Portugal Competitive Advantages Renewable Gases in Portugal / Green Hydrogen



#### Guarantees of Origen for Power and Green H2 / Renewable Fuels

- 2020 – 60%
- 2030 – 80%



#### Political Stability

- Stable Government
- Representative Institutions



#### Defined Regulatory Framework

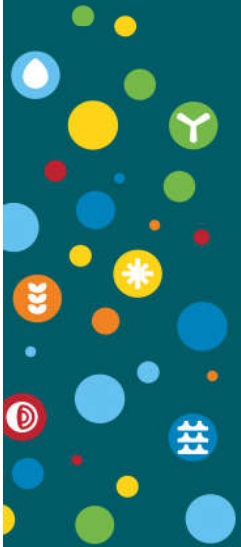
- Green Fiscal Policy trend
- Electricity Generation and Storage
- Green H2 Production



EUFORES 2020

Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead



## Main Challenges



### NECP 2030 & EN-H2 IMPLEMENTATION

- Directives transposition
- Preparation of studies to support the energy transition
- Promote population literacy



### REGULATORY AND FINANCIAL STABILITY

- Process for the attribution of production permits (capacity)
- Capacity auctions design
- Regulation for PPAs
- Energy Taxation measures



### SIMPLIFICATION PERMITTING PROCESS

- “One-stop-shop”
- Interaction with the different involved parties
- Environmental requirements and protection of fire-risk zones
- Response times



### MARKET AGGREGATOR

- Obligation for the creation of a market aggregator
- Defense of individual small Producers
- Responsibilities and balancing market



### GRID EXPANSION AND ADEQUACY

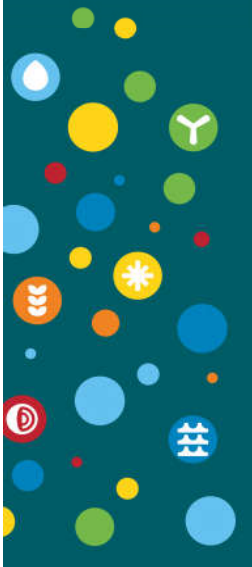
- Review of Grid Investment and Development Plans in accordance with higher connection capacity needs
- Review of the adequacy rules for the RES integration



EUFORES 2020

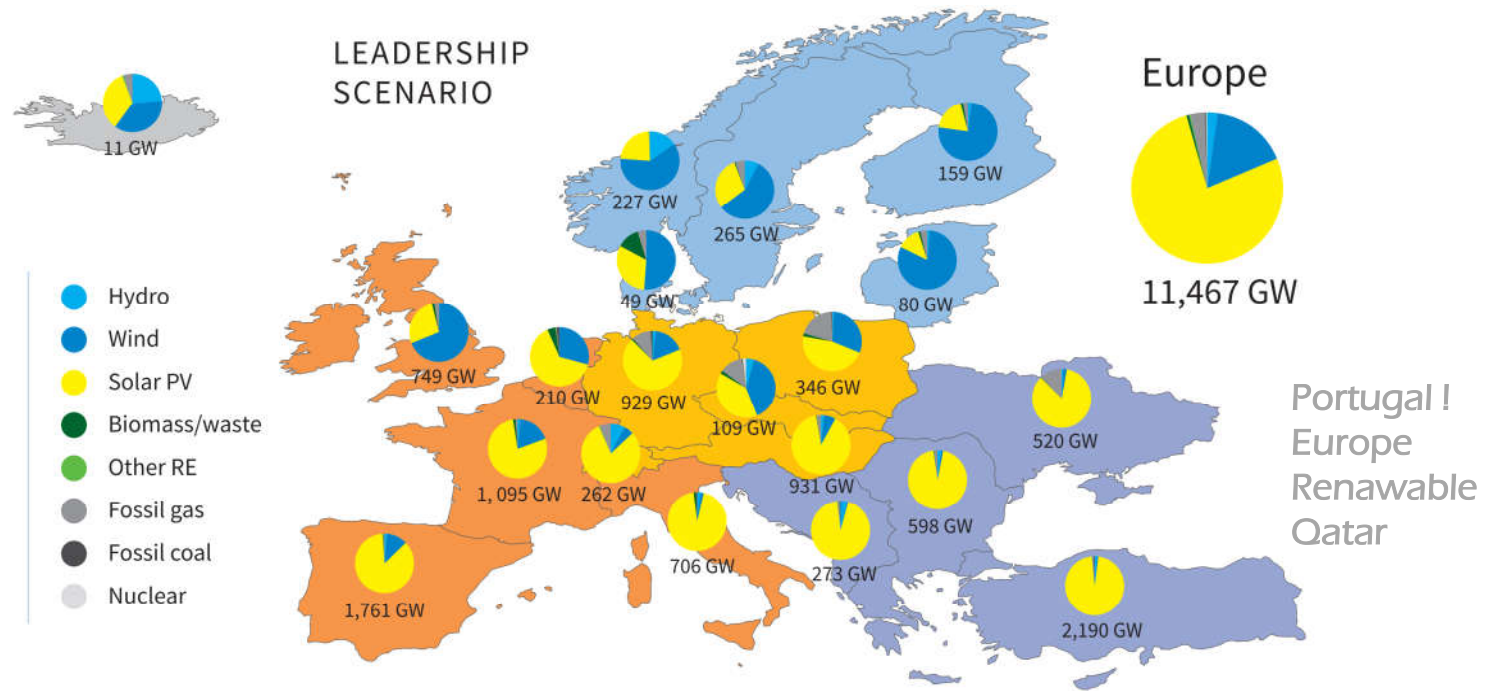
Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead



## Portugal Opportunities

### Portugal Competitive Advantages Renewable Gases in Portugal / Green Hydrogen



Renewable Resource in Portugal | Capacity





EUFORES 2020

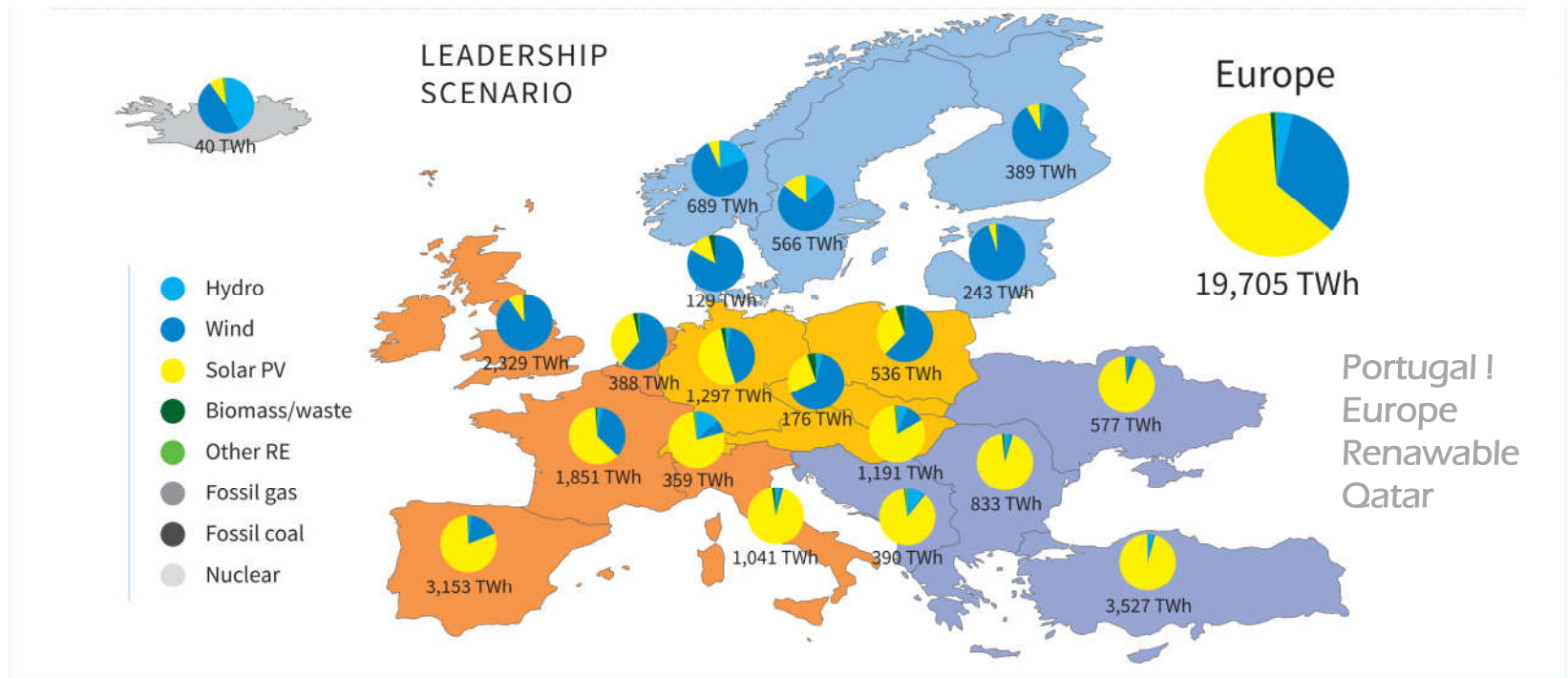
Renewable Energy  
in Portugal

Opportunities and  
Challenges ahead



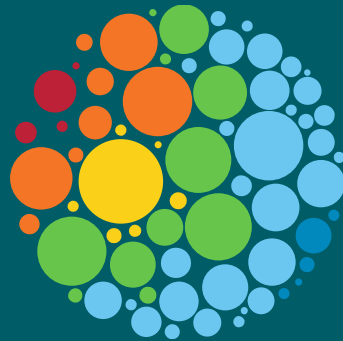
# Portugal Opportunities

## Portugal Competitive Advantages Renewable Gases in Portugal / Green Hydrogen



Renewable Resource in Portugal | Generation





**Thank You**

**Pedro Amaral Jorge**

[pajorge@apren.pt](mailto:pajorge@apren.pt)

**+351913780120**



[\*\*www.apren.pt\*\*](http://www.apren.pt)