

# Agenda

- 1 Round of introduction of participants
- 2 Background and context for the EU hydrogen certification rules and procedures
- 3 How do certification systems certify environmental qualities?

## Coffee break

- 4 Under which conditions the EU considers hydrogen as “of renewable origin”
- 5 EU methodology for assessing GHG emissions savings from H<sub>2</sub>-based fuels and from recycled carbon fuels

Disclaimer: No liability can be accepted for the accuracy of the information within this presentation. The contents of the presentation do not constitute a legal interpretation of the Delegated Acts.

# Under which conditions the EU considers hydrogen as “of renewable origin”

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# Agenda

- 1 Main contents of the EU rules to produce renewable hydrogen – Delegated Act Art. 27 REDII
- 2 Short comparison with the rules of the H2Global Instrument
- 3 Short comparison with the rules of the IPHE methodology

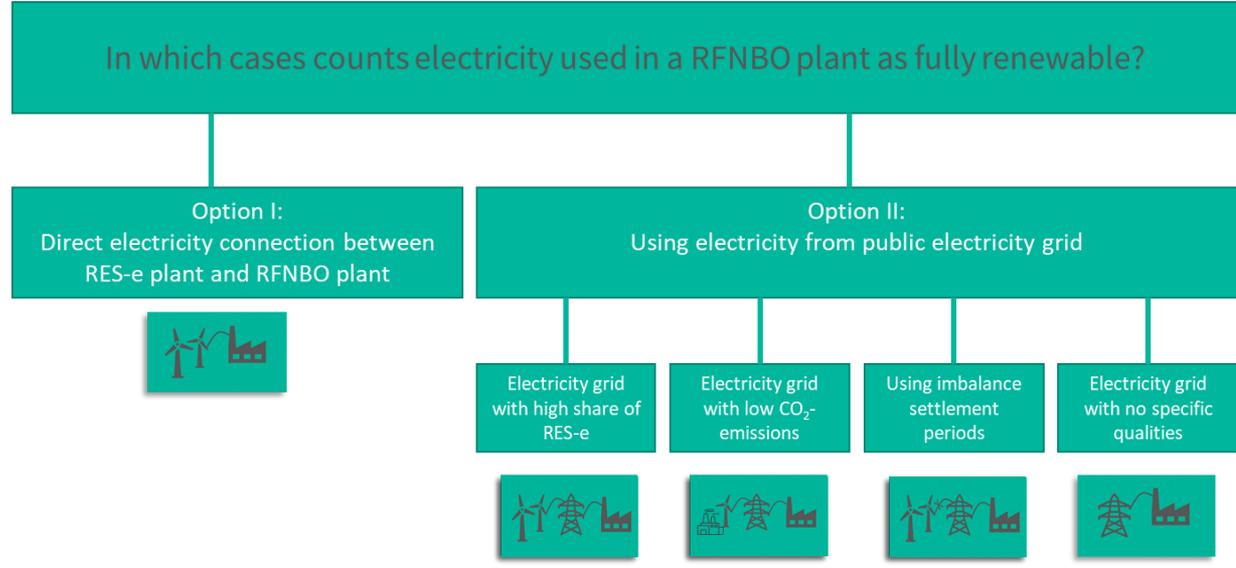
# EU regulatory definition of hydrogen of renewable origin

## Delegated Act | Article 27 of Renewable Energy Directive (REDII) Published by the European Commission on 10 February 2023

- Lays down detailed rules for determining when electricity used to produce RNFBOs (used in the transport sector) can be **considered fully renewable** [DA – Article (1)]
- Rules apply for production **inside and outside the European Union**
  - i.e. are also applicable for imports of H<sub>2</sub> and PtX products
  - Rules of Delegated Act could be blueprint for other sectors



# 5 Which options does the Delegated Act declare? *An overview*

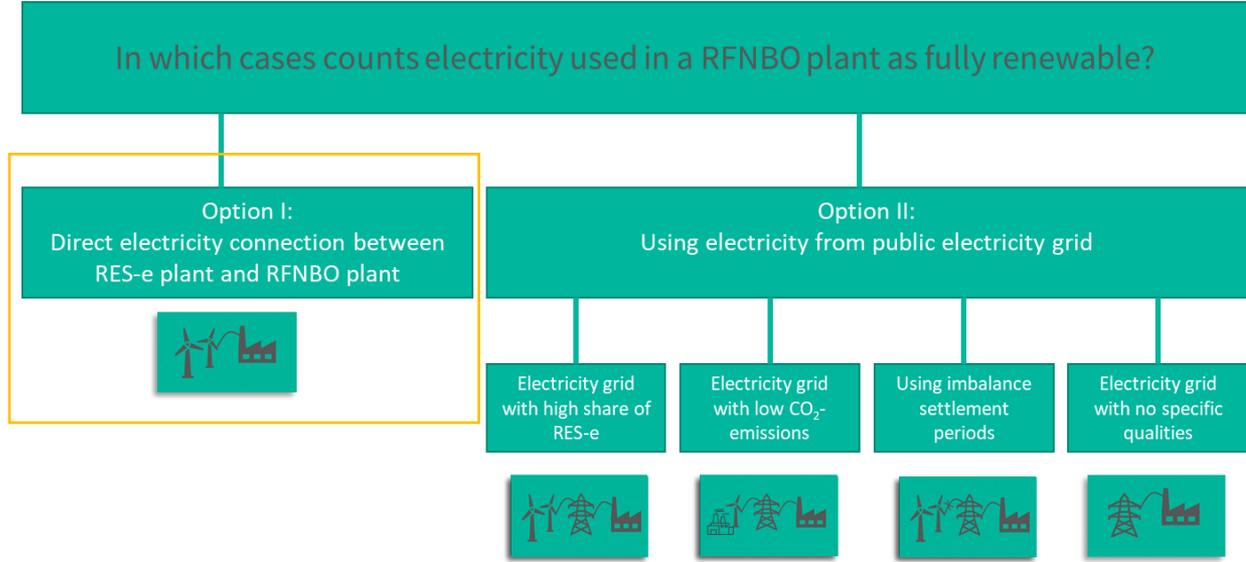


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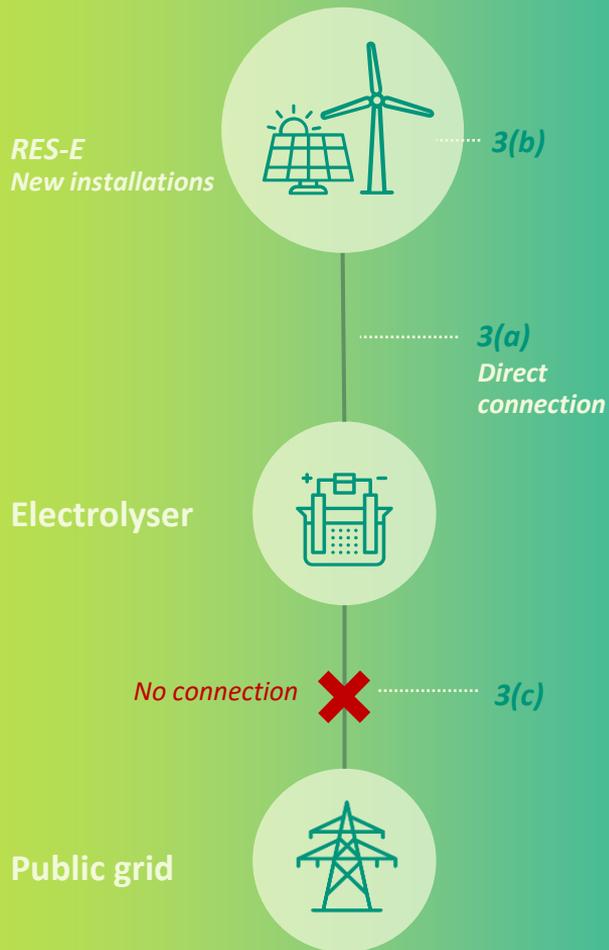
# 6 Which options does the Delegated Act declare? *An overview*



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## Electricity produced off-grid (Article 3)

**3(a):** RES-E plants must be connected to the electrolyser

- *via* direct line **OR** located in the same installation

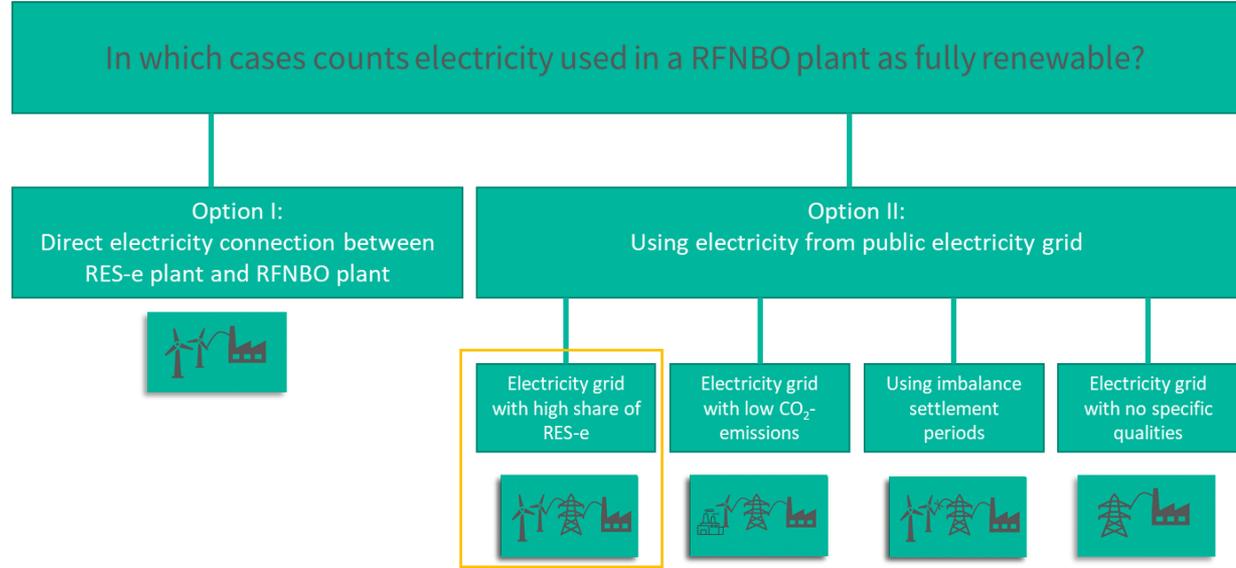
**3(b):** RES-E plants must be new

- RES-E plant started operating no earlier than 36 months before the electrolyser

**3(c):** RES-e plants must not be connected to the grid

- **Option:** Electrolyser is connected to the grid, but a smart metering system is implemented which proves that no electricity is taken from grid

# 8 Which options does the Delegated Act declare? *An overview*



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## Main grid

share of RES-E > 90%  
in the previous year



4(1)



## Electricity sourced from the grid (Article 4) Renewable grid electricity

Electricity taken from the grid counts as **fully renewable**

**4(1)** ... if the average RES-E share  $x$  in the bidding zone  
**exceeds 90%** in the previous year\*

**AND** fuel production does not exceed  $[x\% \text{ RES-E} * 8760] \text{ h}$   
in the bidding zone where  $H_2$  is produced

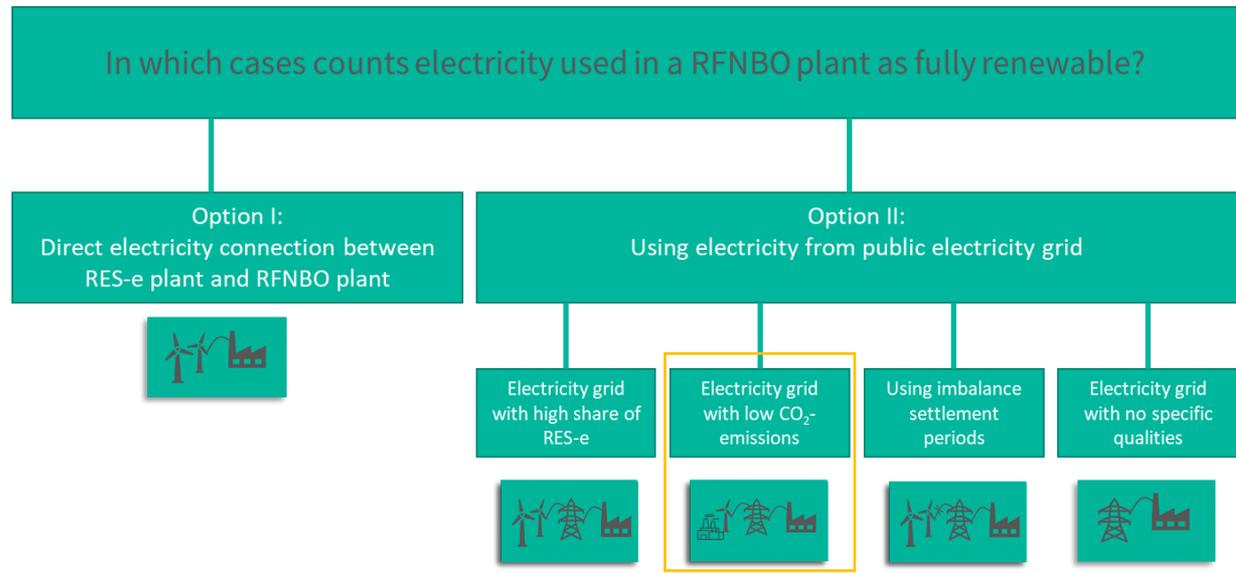
**4(1)** Fuel production  $\leq$  .....  
 $[x\% \text{ RES-E} * 8760] \text{ h}$

## Electrolyser



\*Once this share has been provenly attained, it is assumed that this condition will also hold true in the subsequent five calendar years.

# 10 Which options does the Delegated Act declare? *An overview*

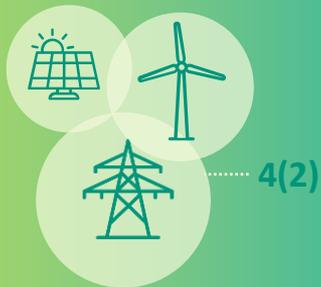


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Main grid  
GHG emission intensity  
< 18 g CO<sub>2</sub>eq/MJ



4(2)

4(2b) Conditions of  
temporal &  
geographical  
correlation are met

4(2a) Electricity is  
sourced  
via PPAs

Electrolyser



## Electricity sourced from the grid (Article 4) Low-carbon grid electricity

Electricity taken from the grid counts as **fully renewable**

4(2) ... if the GHG intensity of the bidding zone is  
< 18 g CO<sub>2</sub>eq/MJ\* (equals 64,8 g CO<sub>2</sub>eq/kWh)

AND

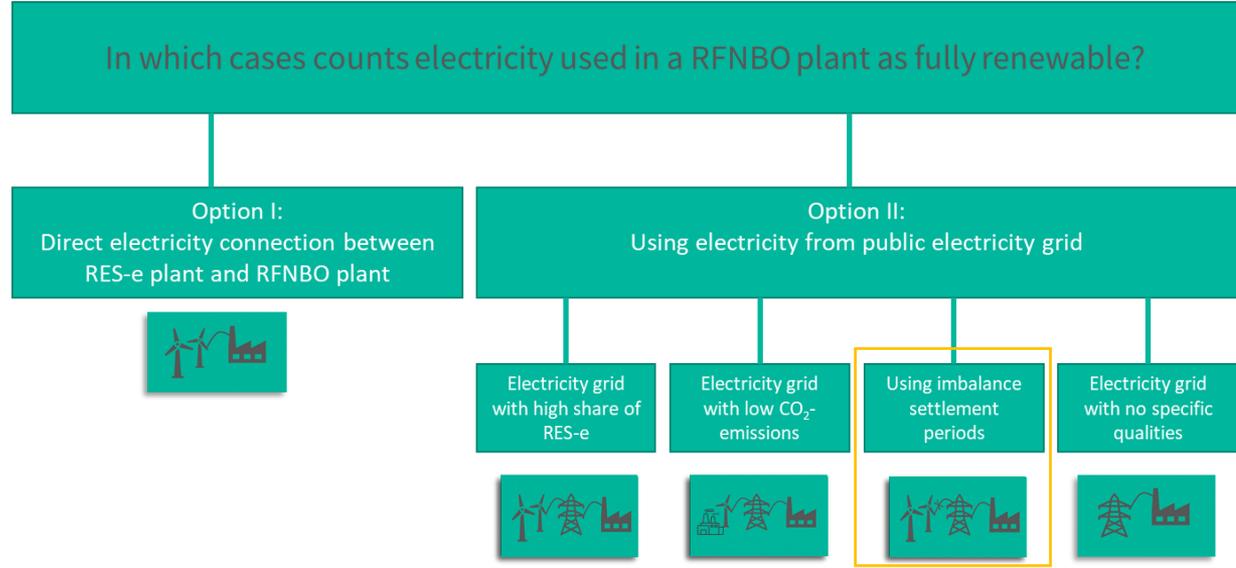
4(2a): ...if the fuel producers have concluded one or more  
renewables power purchase agreements (PPAs)  
→ These supply an amount of RES-E ≥ the amount  
of RES-E claimed & used for H<sub>2</sub> production

AND

4(2b): ...if conditions of temporal & geographical correlation are  
met (see later slide on more detail)

\*Once this share has been provenly attained, it is assumed that this  
condition will also hold true in the subsequent five calendar years.

# 12 Which options does the Delegated Act declare? An overview



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4(3a) Proof of curtailment of RES-e installations



Main grid

Imbalance settlement period occurs



4(3)

4(3b) Proof that consumed electricity reduces the need for redispatch



Electrolyser



## Electricity taken from the grid Imbalance settlement period

Electricity taken from the grid counts as **fully renewable**

**4(3)** ... if there is proof\* that H<sub>2</sub> production helps to **reduce temporal grid imbalances**

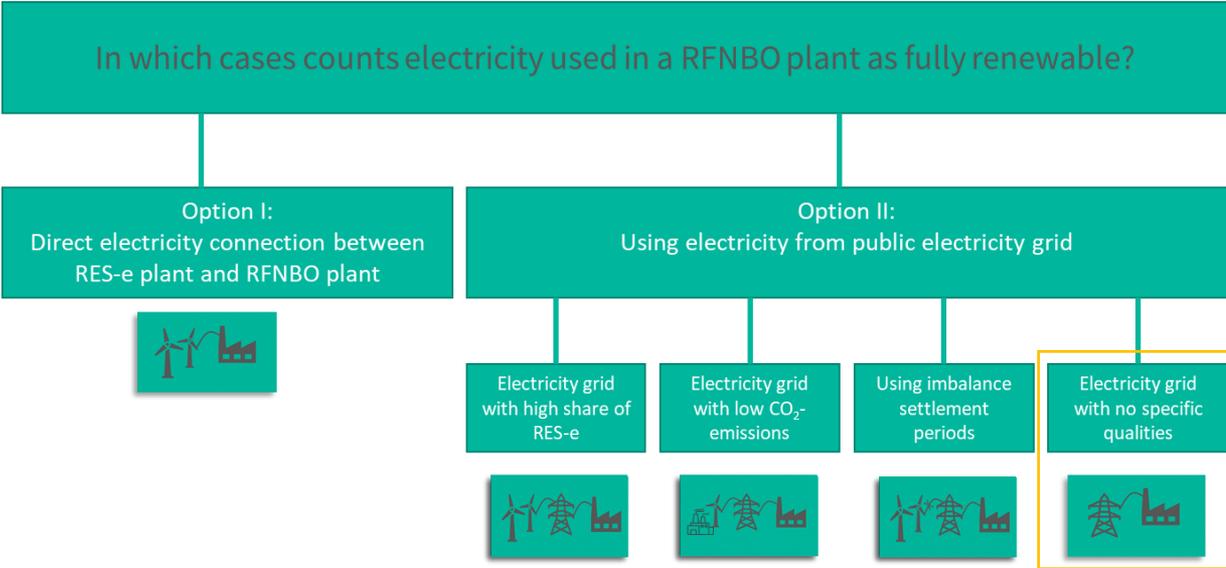
**4(3a):** Electricity sourced for H<sub>2</sub> production is consumed during a time period in which RES-e installations were redispatched downwards (curtailment)

**AND**

**4(3b):** The electricity consumed reduced the need for redispatching by a corresponding amount

\*The fuel producer must show evidence from the national transmission system operator on the stated conditions.

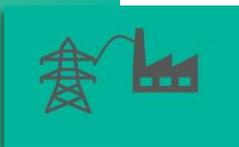
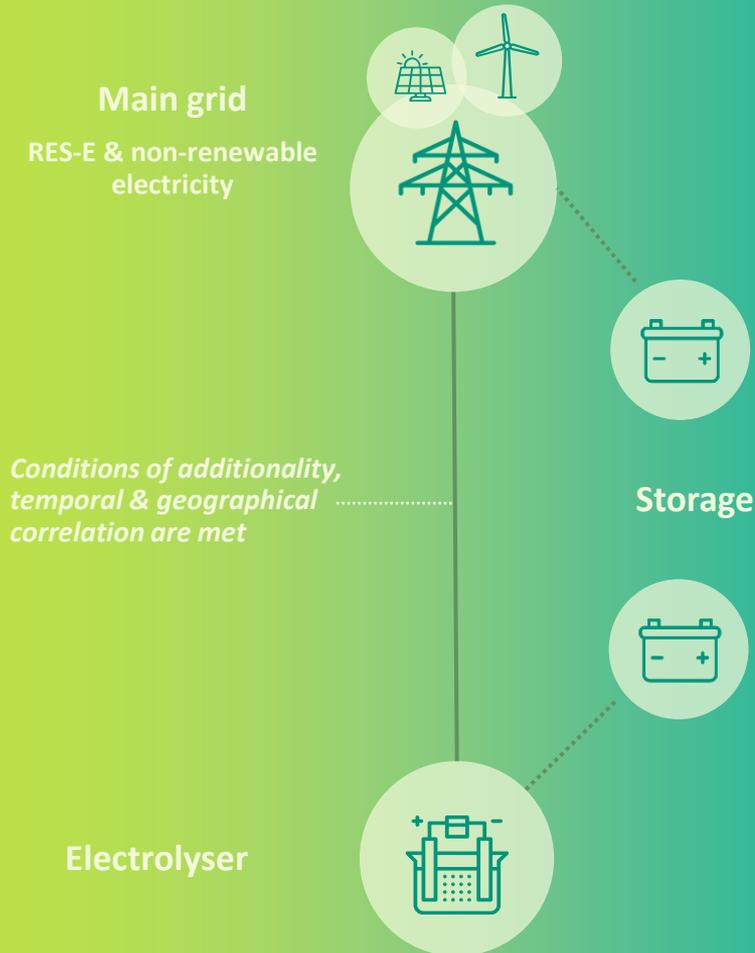
# 14 Which options does the Delegated Act declare? An overview



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## Electricity taken from the grid electricity grid with no specific qualities

Electricity taken from the grid counts as **fully renewable**

**4(4):** ... if requirements of additionality, temporal & geographical correlation are met

- **5 Additionality**  
PPAs | New | Unsupported
- **6 Temporal correlation**  
Matching of RES-e generation and H<sub>2</sub> production on a monthly – (or later) hourly scale
- **7 Geographical correlation**  
Geographical proximity of H<sub>2</sub> production site and RES-e generation installations

→ Next slide will show the details

## Additionality (Article 5)



## Temporal correlation (Article 6)



## Geographical correlation\* (Article 7)

### RES-E used for H<sub>2</sub> production is

- Sourced *via* renewables PPAs
- **OR** generated in the same installation

### 5(a) RES-E plants must be new\*

Started operating no more than 36 months prior to the installation

### 5(b) RES-E plants must be unsupported\*

Have not received operating or investment support

\*For installations which started operating before January 2028 this requirement only applies from January 2038 on.

### H<sub>2</sub> production takes place

- In the same calendar month as the sourced RES-E generation (*until Dec 2029*)
- In the same hour as sourced RES-E generation (*from Jan 2030 on*)

OR

### Storage option

- Electricity is sourced from a storage facility with the same grid connection point than the electrolyser or RES-E plants
- Storage facility is charged at the time of generation of the contracted RES-E plants

OR

### H<sub>2</sub> production takes place

- during a one-hour period where the day-ahead price of the concerned bidding zone
- Is < 20 €/MWh
- **OR** Is < than 0.36 times the price for a certificate of 1 ton of CO<sub>2</sub> equivalent

Electrolyser and RES-E plants are located in the same bidding zone

OR

Electrolyser and RES-E plants are located in interconnected bidding zones

Electricity prices of the day-ahead market in RE's zone are  $\geq$  the prices in the electrolyser's bidding zone

OR

RES-E generating plants are located in an offshore bidding zone interconnected to the electrolyser's bidding zone

\*Further criteria can be imposed on a national law basis (6(2)).

# Open issues

for application of the  
*Delegated Act* on an  
international level

## Definition of a 'bidding zone'



What can be declared as an equivalent concept to a 'bidding zone'?

Which institution can attest this 'equivalent concept'?

## Temporal correlation condition



Option: Day-Ahead price is 0.36 times the price for a certificate of 1 ton CO<sub>2</sub> equivalent

Is this option only applicable within the EU Emission Trading System (ETS)?



Is the definition of an 'imbalance settlement period' convertible to concepts in countries outside the EU?

What are equivalent concepts?

Which institution can attest this 'equivalent concept'?

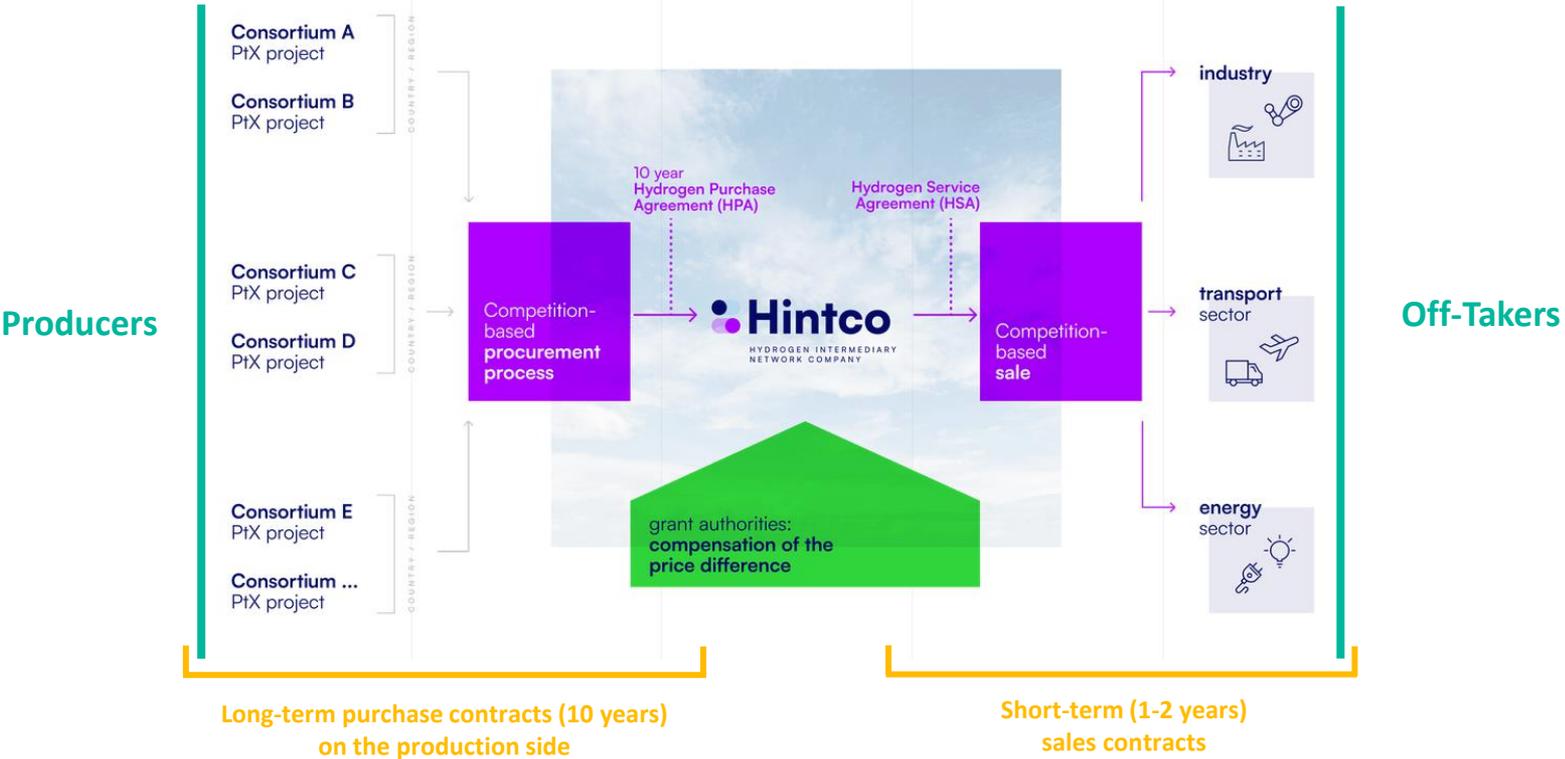
# H2Global Funding instrument

## What is H2Global? *And why is it relevant?*

- A global funding instrument for renewable molecule production outside EU and import to Germany
  - Established by the German-based H2Global Foundation
  - Financially backed by the German Federal State
- Aim:
  - Creating high investment security for H2-producers worldwide
  - Securing hydrogen supply at competitive prices for off-takers in Germany
- Similar instrument now on EU level in development: EU Hydrogen Bank

# The H2Global Instrument and its mechanism

23.06.2023



In collaboration with:



Source: <https://www.h2-global.de/project/h2g-mechanism>

## Sustainability-based 'funding windows'

Producers who want to qualify for H2Global funding must fulfill a comprehensive set of criteria

- GHG emissions and electricity supply
  - Environmental aspects (water & land-use)
  - Socio-economic dimensions
- If you fulfil the H2Global criteria set, you also fulfil the criteria set by the EU Delegated Act 27

## First call(s) for tenders

Backed by a funding of EUR 900 million from the German Federal State (BMWK)

- First call launched in December 2022 for the procurement of green ammonia to import into Germany
- First deliveries of green hydrogen derivatives to Germany and Europe planned for the end of 2024

Sources: <https://www.h2-global.de/project/h2g-mechanism>; <https://www.h2global-stiftung.com/post/900-million-eur-market-ramp-up-green-hydrogen>

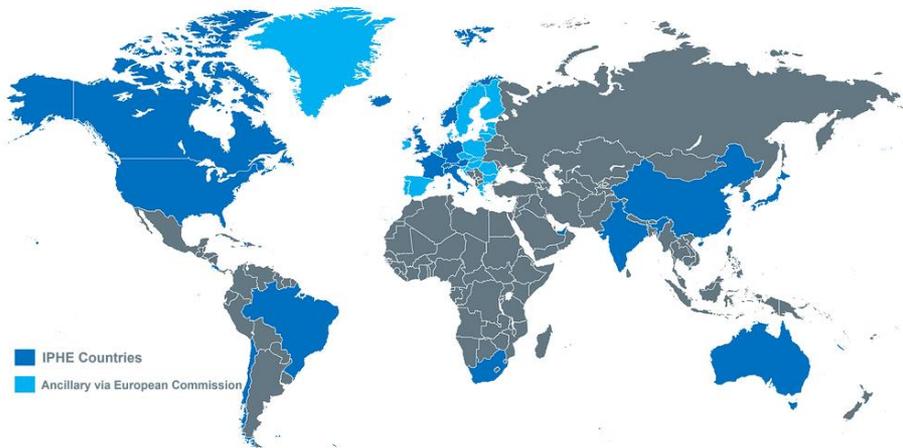


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# IPHE Methodology



## What is IPHE and its methodology? *And why is it relevant?*

### International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE)

International collaborative initiative working towards a global ramp-up of hydrogen

### IPHE Methodology

- Goal: Recognized standard to determine the GHG Emissions associated with the production of hydrogen and PtX products
- Covers both low-carbon and renewable hydrogen
- Aims to facilitate the market valuation and international trade in 'clean' hydrogen (IPHE 2023)
- Is in the process of being established as an International Organization for Standardization (ISO) standard (IRENA & RMI 2023)

# IPHE Options for sourcing renewable electricity, compared to Delegated Act

23.06.2023

|                                 | Off-grid hydrogen production<br>production of hydrogen directly connected to RES-E production  | Sourcing electricity from grid  |
|---------------------------------|--|---|
| <b>Additionality</b>            |  ... no requirements on age or possible financial support of RES-E plants |  ... no requirements for RES-E plants used for PPAs or certificates              |
| <b>Temporal Correlation</b>     |   |  ... no temporal correlation between H2-production and RES-E generation required |
| <b>Geographical Correlation</b> |   |  ... no regulation on location of RES-E plants                                   |

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# Which production pathways are covered in the IPHE methodology?

## Four production pathways covered

- Electrolysis
- Steam methane reforming with carbon capture and storage (CCS)
- Coal gasification with CCS
- Industrial by-product hydrogen

2021

1<sup>st</sup> version

## Two additional production pathways

- Hydrogen from biomass with CCS
- Autothermal Reforming with CCS

## Also covers conditioning of hydrogen in different carriers

- Ammonia as hydrogen carrier
- Liquid hydrogen
- Liquid Organic Hydrogen Carriers (LOHCs)

2022

2<sup>nd</sup> version

## Plans to extend the system boundaries

- Targeted boundary: well-to-tank
- i.e. including GHG emissions from the transportation of hydrogen and/or hydrogen carriers

tbd

3<sup>rd</sup> version

Sources: IRENA & RMI (2023): Creating a global hydrogen market: Certification to enable trade, p. 17; IPHE (2023): <https://www.iphe.net/iphe-wp-methodology-doc-nov-2022>

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## Comparison of RED II, IPHE & H2Global – What criteria need to be fulfilled to qualify?

| Framework                             | GHG thresholds  | Electricity supply  | Land-use & Biodiversity  | Water use   | Socio-economic aspects  | Other   |
|---------------------------------------|---|---|--|---|---|---|
| RED II                                |  |          |  |   |   |   |
| IPHE                                  |  |          |  |   |   |   |
| H2Global                              |  |          |                   |  |    |  |
| <b>Specific criteria for H2Global</b> | GHG emissions threshold of 28.2 g CO <sub>2</sub> eq/MJ                           | Supply of RES-E; Conditions of additionality, temporal and geographical correlation apply | Restrictions of water use in arid areas; For desalination: reporting how brine disposal is handled | Exclusion of protected areas for project development                                | International Labour Organisation (ILO) standards apply; Proof of local participation | e.g. Use of CO <sub>2</sub> from fossil fueled power plants not allowed             |

Source: Heinemann et al. (2022): Comparing the sustainability of RES-e and methane-based hydrogen. Sustainability dimensions, blind spots in current regulation and certification, and potential solutions for hydrogen imports to Europe, pp. 24-30.

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