Establishing a National Hydrogen Standard (the EU experience)

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Why are standards & certification important for H2?

- Ability to comply w/ national requirements (targets) for low-carbon / green H2.
- For the uptake of the green H2 / renewable gas market (domestic & international).
- Give confidence to gas producers and consumers.
- Facilitate the development of a production and supply chain with quality products.
- Ability to export to different international markets, depending on their specific requirements/standards.

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Purposes of H2 certification schemes: regulatory vs. voluntary

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International Sustainability & Carbon Certification

- **Mandatory certification:**
  - Must mirror the regulatory framework
  - Purpose: target/quota compliance
  - Example: RED II (DAs Art. 27 & 28)

- **Voluntary certification:**
  - Could mirror the regulatory framework
  - Purpose: marketing and voluntary reporting (e.g. consumer disclosure)
  - A market-based / voluntary standard can be used
  - Example: TÜV SÜD CMS 70 Standard, TÜV Rheinland H2.21 Renewable & Low-Carbon Standard, ISCC Plus

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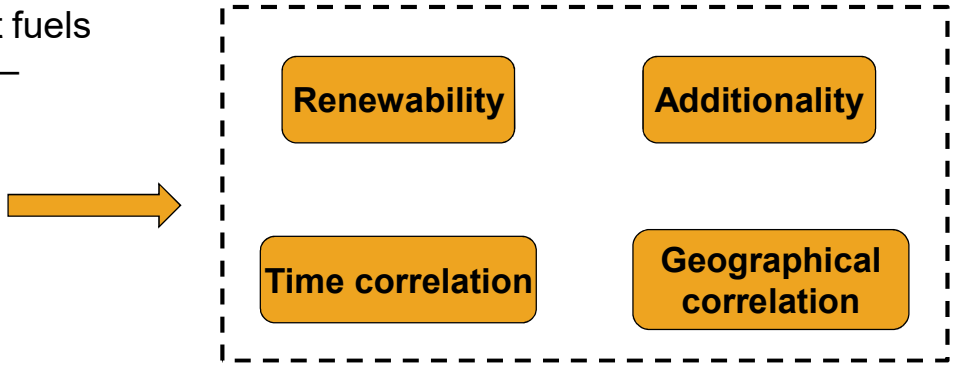
Background

RED II and its delegated acts (Art. 27 and 28)

Article 27 RED II and its delegated act (DA)

- **Article 27:** calculation rules with regard to the minimum shares of renewable energy in the transport sector.

- **DA:** establishes **detailed rules** for the **production** of renewable transport fuels of non-biological origin (**RFNBOs**) – liquid or gaseous.
- Specifies the renewable electricity criteria for RFNBOs



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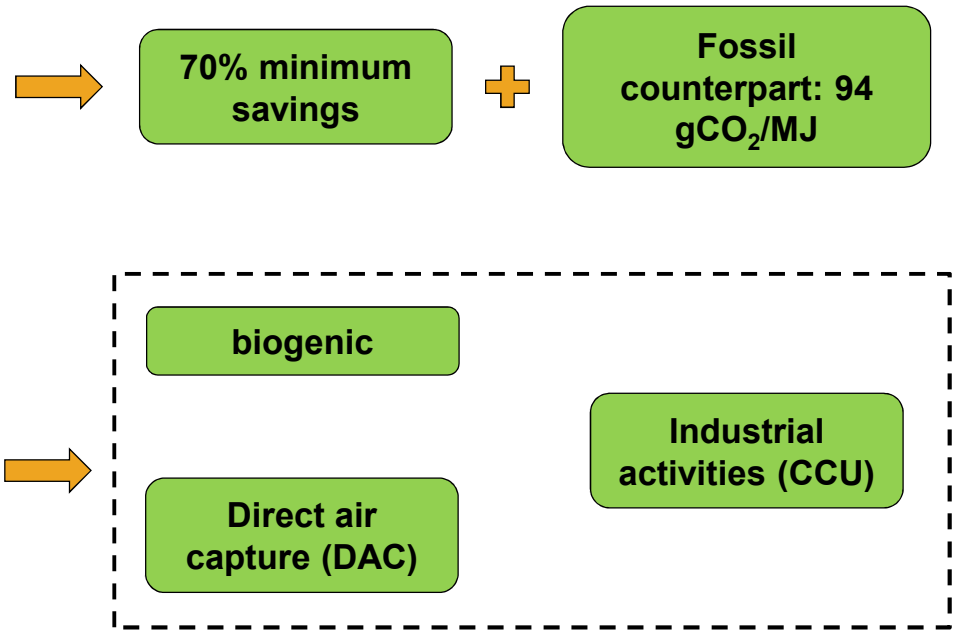
Background

RED II and its delegated acts (Art. 27 and 28)

- Article 28 RED II and its DA
  - **Article 28:** provisions on GHG emissions savings and life-cycle GHG emissions of biofuels and RFNBOs
  - **DA:** **methodology** for assessing **GHG emissions savings** from RFNBOs and recycled carbon fuels.
  - Defines the eligible carbon sources for H2 derivatives.



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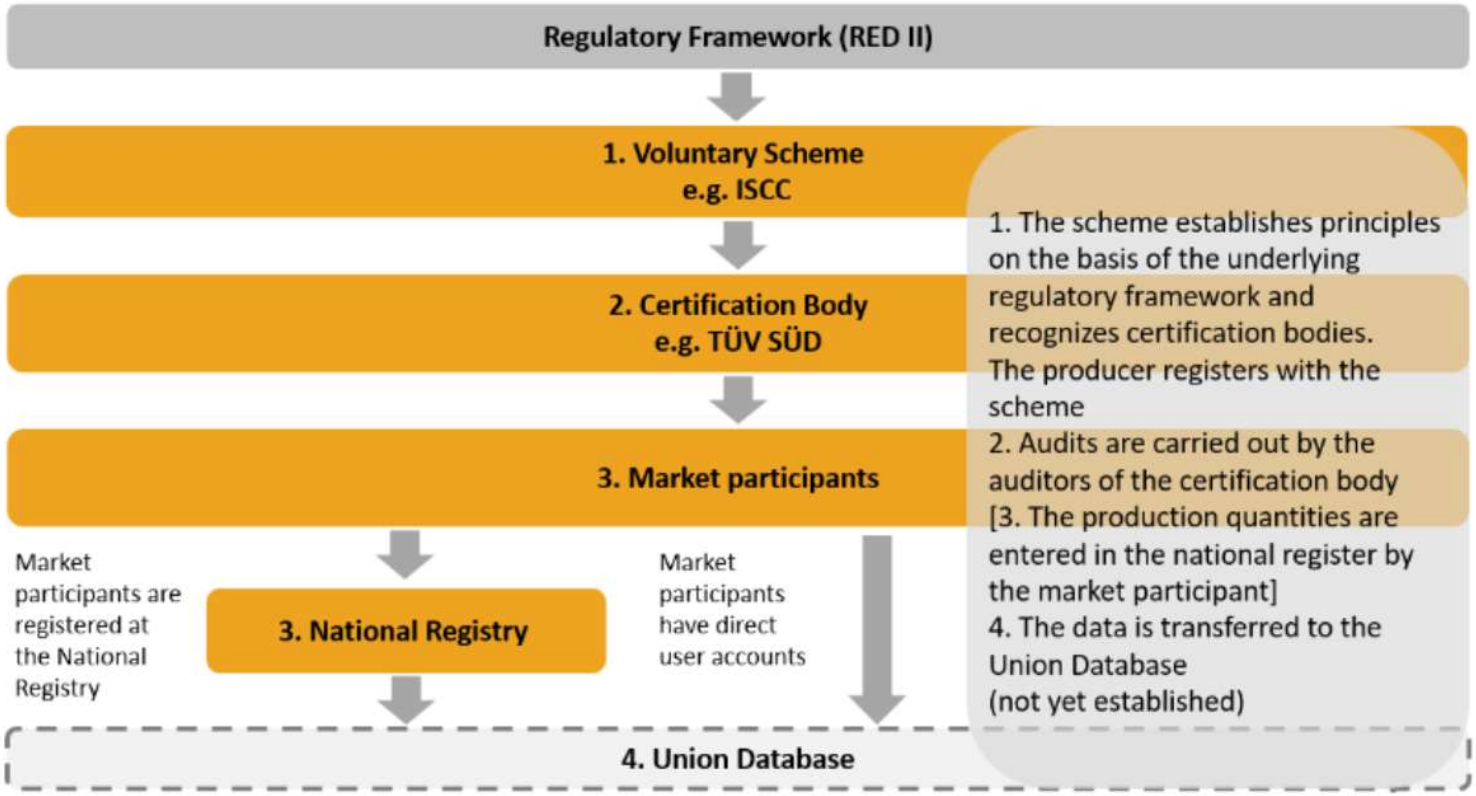
EU governance for the certification of green H2



Definitions

Voluntary scheme, certification bodies… ???

Voluntary Scheme or Certification Scheme

- Private entity **officially recognized by the EU Commission** for issuing certification based on the **regulatory framework** (target compliance)
- Certification schemes →"**voluntary schemes**" once they have obtained the recognition from the EU Commission.
- **NOT** to be confused with a "**voluntary standard**"
- Example:

ISCC
International Sustainability & Carbon Certification

Certification Body

- Private entity capable of **auditing installations and products** according to the requirements of the certification schemes.
- Example: TÜV SÜD, TÜV Reihnland, REDCert, etc.

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Definitions

Union Database (UDB)

- Electronic repository storing the Proofs of Sustainability (PoS) for RFNBOs.
- Pilot version already working.
- Currently assessing the feedback (ended Dec. 2022) received from the focus groups.
- Foresees VS or CB entering the data into the UDB on behalf of the RFNBO producer.

- Aim:

Cover the value chain of RFNBOs: production to end use

+

Prevent multiple counting when PoS are traded across borders of MS or sectors

- Renewable electricity criteria (renewability, additionality, temporal & geographical correlations):

→ **Must be proven through a sustainability certificate of a VS for a PoS to be issued for the RFNBO.**

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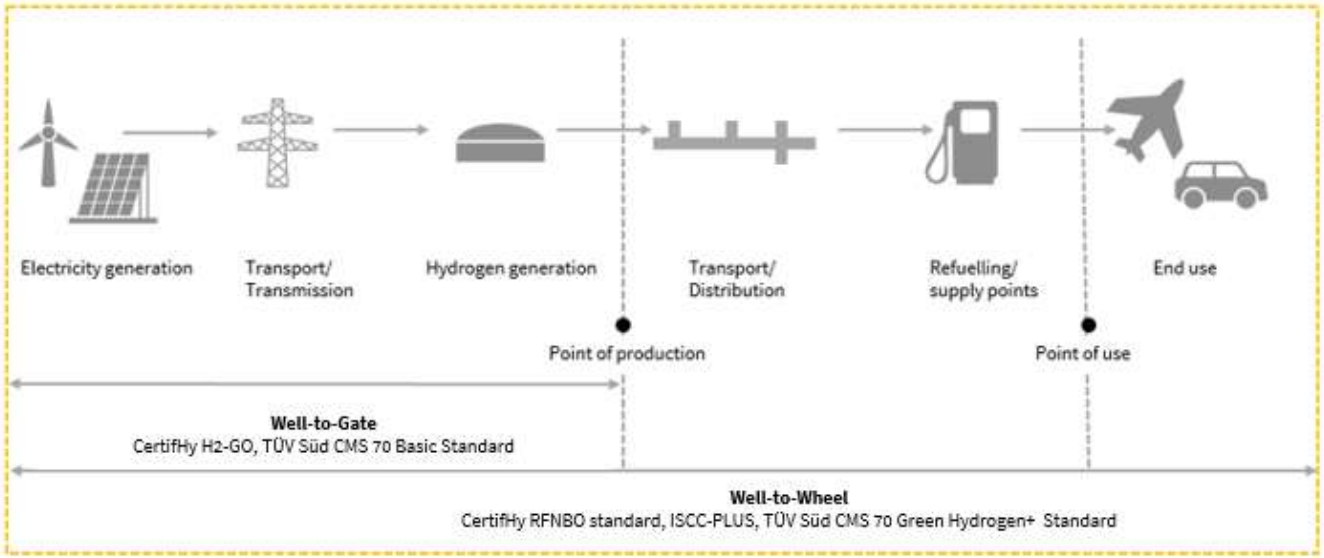
Definitions

UDB



Cancelled electricity certificate: If electricity is consumed via the electricity grid and already holds an electricity certificate (e.g. GO), proof must be provided that the respective electricity certificate was cancelled before a PoS gets issued for the RFNBO volume in order to avoid double/multiple counting.

Sustainability Certification via Voluntary Scheme

Union Database: PoS issuing

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Definitions

Tracking principle: book & claim, mass balancing

Book & Claim

- The green property of the gas is separated from the physical volume.
- Green certificate and physical volume are traded separately.
- United after consumption upon buying the certificate for the same energy consumed (1 MWh certificate = 1 MWh gas)
- Article 19 RED II: “**guarantees of origin**” are issued on a **book & claim** basis and only for **consumer disclosure.**
- **NOT** for target compliance!!!

Mass balancing

- The chain of custody for the gas volume is closely followed from the point of production to the point of final consumption.
- The **green property** of the gas and the **physical volume** are **not separated**.
- Required for complying with the RED II provisions regarding RFNBOs: **issuance of a Proof of Sustainability**

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Definitions

Guarantee of Origin vs. Proof of Sustainability

	Guarantee of Origin (G)	Proof of Sustainability (PoS)
Relevant RED II Article	19	25-30
Geographical scope	EU	Global
Beneficiary	Energy consumer	Economic operators seeking production support or meeting obligations
Purpose	Consumer disclosure (sustainability requirements are voluntary)	Compliance w/ RED II Art. 3 (32% of RE in final consumption by 2030), sustainability criteria & GHG reduction potential.
Area of application	All RES (RED II Art.2): wind, solar, geothermal, ambient, tidal, wave, hdyro, biomass, landfill gas, sewage treatment plant gas, biogas.	Biofuels, bioliquids and biomass fuels, RFNBOs
Expiry	12 months (transfer & cancellation) + 6 months (only cancellation)	none
Trade principle / tracking method	Book & claim	Mass balancing

Definitions

Renewable electricity criteria for RFNBOs

Renewability	Requirement for the renewable share of electricity as a production input.
Additionality	Set by the EC for prioritizing the use of renewable electricity for direct applications. The additional installed capacity shall be used for the production of RFNBOs. Requires the absence of subsidies.
Geographical correlation	The power plant and the electrolyzer must be in a determined geographical area.
Temporal correlation	Relates to the time difference between electricity and RFNBO production.

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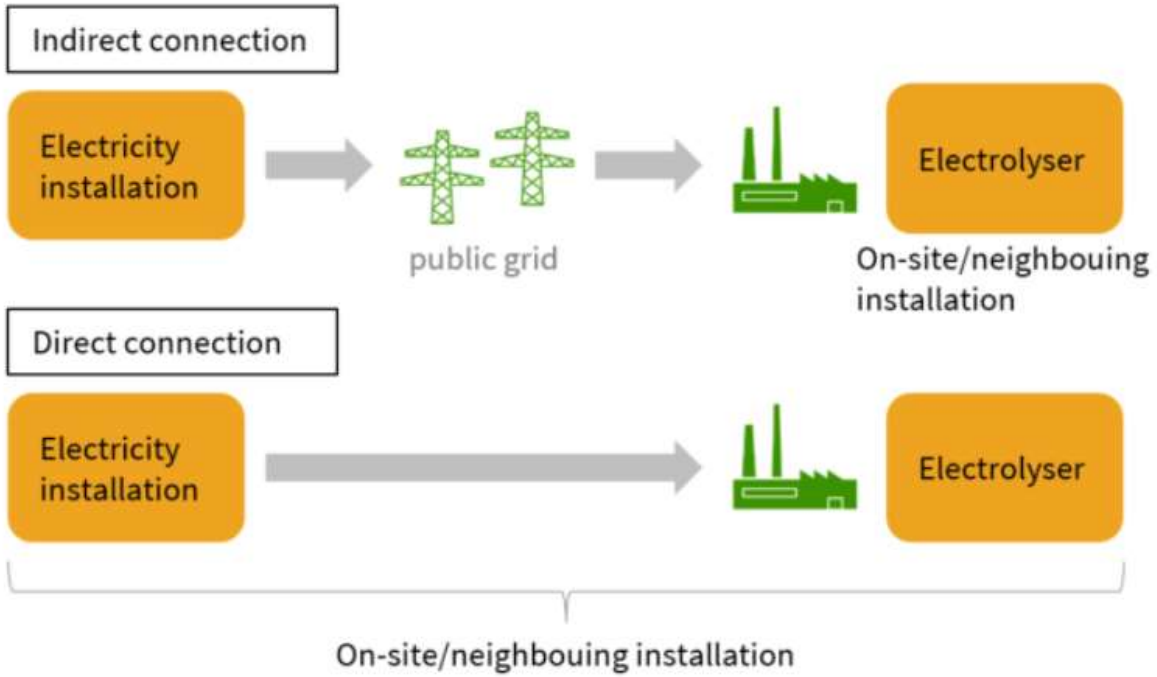
Definitions

Renewable electricity criteria for RFNBOs

- RE criteria are to be fulfilled depending on the connection between the RE power plant and the electrolyzer (RED II Art. 27 Delegated Act)



Case 1: direct connection

Criterion	Fulfillment options
Renewability & geographical correlation	• **Option 1:** proof of direct connection to the electrolyzer. • **Option 2:** electricity generation and electrolysis take place in the same plant.
Additionality	• Power plant commissioning max. 36 months before electrolyzer. • Additional electrolysis capacities added max. 36 months after first commissioning.
Purchase of R-electricity exclusively	• Power plant is not connected to the grid; or • Power plant is connected to the grid, but a smart meter is used to demonstrate that no electricity from the grid was used in the electrolyzer.

Case 2: indirect connection (90% case)

Criterion	Fulfillment options
Renewability & geographical correlation	• No PPA needed. • Electrolyzer is located in a bidding zone w/ over 90% average RE share in the grid during the previous year. • Average RE share in grid = gross power generation + import - export • If for year *x*, average RE electricity share > 90%, then average RE share > 90% for the next 5 years
Additionality, temporal correlation	Not to be fulfilled

Case 3: indirect connection (18 gCO_2eq/MJ case)

- This case refers to a carbon intensity of the electricity grid mix of maximum 18 gCO_2eq/MJ.
- Facilitates compliance w/ the renewable attribute for countries meeting this criterion (e.g., Sweden, with 4.1 gCO_2eq/MJ)

Criterion	Fulfillment options (RED II Art. 27 DA)
Renewability, geographical and temporal correlations	• PPAs signed with the operator of the RE power plant(s) must be provided. • Electrolyzer is located in a bidding zone w/ an emission intensify factor (EIF) of max. 18 gCO_2/MJ • One or more PPAs equivalent to the amount of electricity consumed for RFNBO production. • Temporal correlation according to Art. 6 (RED II Art. 27 DA) and geographical correlation according to Art. 7 (RED II Art. 27 DA) are met. Both to be explained with the PPA case. • If EIF < 18 gCO_2eq/MJ in a calendar year, it will be considered as such for the next 5 calendar years.
Additionality	Not to be fulfilled

Case 4: indirect connection (system-friendly case)

- This case aims to balance fluctuations in the power grid: high electricity generation w/ low demand and insufficient transmission & distribution infrastructure → generation curtailment
- Hydrogen is produced with the surplus electricity

Criterion	Fulfillment options (RED II Art. 27 DA)
Renewability & geographical correlation	• Grid electricity consumed during an imbalance settlement. • Electrolyzer is in the same bidding zone as the imbalance settlement. • Proof from a national TSO that the RES power plants would have been curtailed/redispatched. • The electricity consumed for the production of RFNBOs reduced the need for curtailment/redispatching.
Additionality, temporal correlation	Not to be fulfilled
Additional constraints	Limited by low full load hours of the electrolyzer (preliminary test results in DEU: max. 2,500 h)

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Case 5: indirect connection (PPA)

- Expected to be the most relevant case for a power plant w/ indirect connection: not too many bidding zones with an electricity grid mix of 90% RE or a carbon intensity of 18 gCO_2eq/MJ
- EIF in DEU: 99.3 gCO_2eq/MJ

Criterion	Fulfillment options (RED II Art. 27 DA)
Renewability	• PPAs signed with the operator of the RE power plant(s) must be provided. • Energy in the PPAs must equal the amount of energy used for RFNO production.
Additionality	• Will enter into force on 1 Jan. 2028 and does not apply to installations commissioned before 31 Dec. 2038. • Electrolyzer starts operating max. 36 months after the power plant. The commissioning date of the latter corresponds to the most recent PPA. • Additional electrolysis capacities were added max. 36 months after the initial commissioning. • No investment and operation subsidies (excluding the ones prior to repowering).

Case 5: indirect connection (PPA)

Criterion	Fulfillment options (RED II Art. 27 DA)
Temporal correlation	• **Option 1:** RFNBO is produced during the same 1-hour period as the renewable electricity, or • **Option 2:** RFNBO produced from R-electricity from a storage asset located behind the same network connection point as the electrolyzer and charged during the same 1-hour period. • **Option 3:** during a 1-hour period where the electricity clearing price from the day-ahead market is ≤ 20 EUR/MWh or < 0.36 times the price of an allowance from the EU-ETS.
Geographical correlation	• **Option 1:** RES power plant under the PPA is located (or was located when it came into operation) in the same bidding zone as the electrolyzer. • **Option 2:** RES power plant is located in an interconnected bidding zone and the electricity prices for the relevant time period of the day-ahead market is ≥ the price in the bidding zone where the RFNBO is produced. • **Option 3:** RES power plant under the PPA is located in an offshore biding zone interconnected w/ the bidding zone where the electrolyzer is connected.

Lessons learned

What is there to learn from the EU experience?

- Certification of RFNBOs can be a complicated task.
- Complicated as much as the regulatory framework wants to.
- Main elements for developing a functional national standard:

Regulatory framework

Accredited certification bodies

Electronic databases to avoid multiple counting

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International

Transport of RFNBOs into the DEU from overseas

By ship and truck

- Export certificate and the import license (requirements from the German Customs Office).
- For verification purposes:
  - Delivery slip from the transport company to verify the goods were actually transported.
  - Country of origin
  - Final delivery point
  - Information about contractor, carrier & vehicle
  - Number of units of goods, including parameters.
- Certification by a Certification Body according to a Voluntary Scheme: green H2 / RFNBO

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International

International standards for green hydrogen

Ultimate goals of an international standard

- Global definition of renewable/low-carbon H2.
- Facilitate deployment of new technologies & international trade.
- Make H2 production consistent & comparable.
- Ensure that the produced H2 lowers carbon emissions.
- Increase flexibility to sell a product to several markets due to market changing conditions.
- Reduce the effort & cost of multiple certification depending on the market.

Reality

- No harmonized international standard for certifying H2 yet.
- Different initiatives:
  - TÜV SÜD CMS70 Standard
  - TÜV Reinhland H2.21 Renewable & Low-Carbon Hydrogen Fuels Standard
  - CertifHy H2-GO & CertifHy RFNBO
  - ISCC Plus & ISCC EU (for EU target compliance)

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Obrigado pela atenção!

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