

Aspects of Green Hydrogen Certification

in the frame of

Promoting the development of a hydrogen economy for South Africa

Webconference

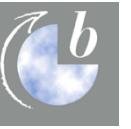
Date 11 August 2022

Matthias Altmann, Ludwig-Bölkow-Systemtechnik GmbH (LBST), Germany

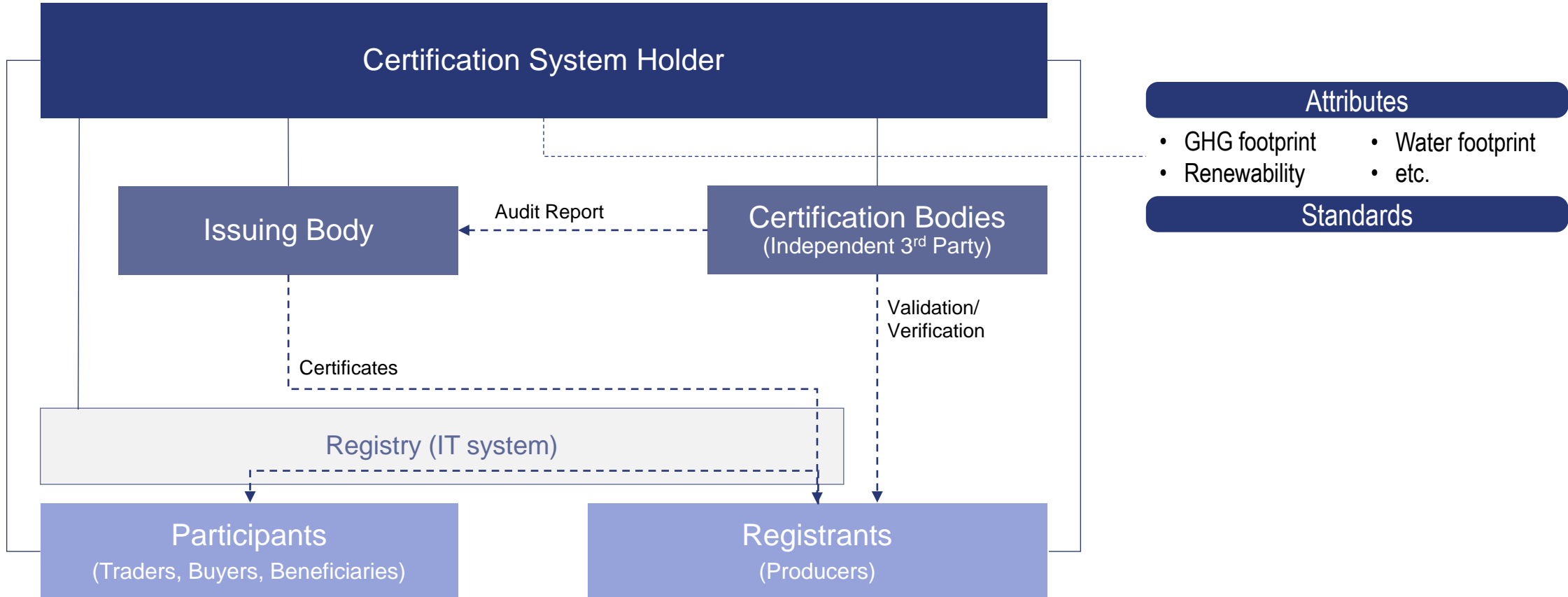
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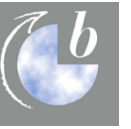
Certification System structure (typical)



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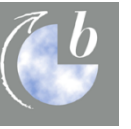
Certification purposes: differences and similarities in US and EU



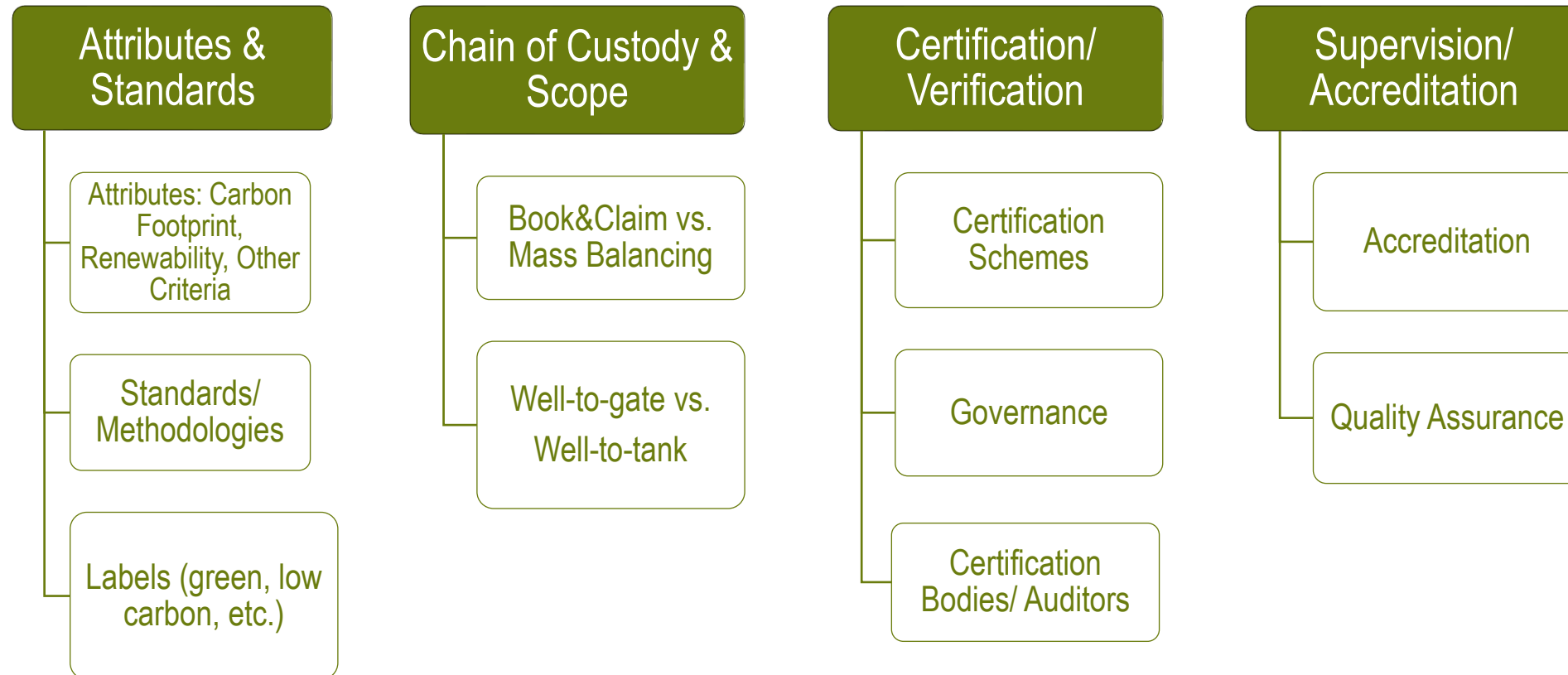
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Purpose	US Instruments	EU Instruments
<p>Legal Compliance</p>	<p>LCFS (California): Credits and deficits Suppliers of transportation fuels are obligated to reduce the carbon intensity goes down every year. All types of fuels can contribute if their GHG intensity is lower than the LCFS benchmark Mass balancing GHG intensity along the supply chain (well-to-tank). LCA methodology follows ISO 14xxx family Certification by 'Verification Bodies' recognized by CARB</p>	<p>RED II: Proof of Sustainability Suppliers of transportation fuels are obligated to increase the share of renewable energies in transport until 2030 Biofuels, Renewable Fuels of Non-Biological Origin (RFNBOs), renewable electricity can contribute Mass balancing GHG intensity along the supply chain (well-to-tank) LCA methodology defined in RED II Certification by 'Voluntary Schemes' recognized by EC</p>
<p>Consumer Information & Corporate Reporting</p>	<p>EACs (Environmental Attribute Certificates) for renewable electricity which are non-governmental / non-regulated instruments: e.g. no law in place to avoid double counting various Issuing Bodies exist in parallel no (reliable) residual mix is calculated</p>	<p>RED II: Guarantee of Origin (GO) GOs are issued at the point of production, traded and cancelled after consumption. Book & Claim is applied where GOs are traded independently of the physical product. Avoiding double counting is fundamental legal requirement GOs are issued by national Issuing Bodies The residual mix needs to be calculated and applied for products not using GOs</p>

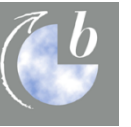
Major elements of hydrogen certification



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Coverage of attributes internationally: examples



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System	California	China	Europe	EU RED II		Germany	Global	Biofuels: EU voluntary schemes			EU	Further Systems
	LCFS		CertifyHy	GO	RFNBO	H2Global	GBEP	RSB	ISCC	REDcert	Taxonomy	
GHG balance	x	x	x		x	x	x	x	x	x	x	
Renewable origin		(x)	x	x	x	x		x	x	x		
Input					x							
Additionality					x							
Temp. Correlation					x							
Geogr. Correlation					x							
CO ₂ Sources					tbd	x						
Biodiversity Conservation												
Biodiversity					?	x	x	x	x	x		
Natural Habitats, ecosystems					?	x	x	x	x	x		
High conservation value areas					?		x	x	x	x		
Soil conservation												
Soil protection					x		x	x	x	x		
Residues, wastes							x	x	x	x		
Waste management						x	x	x	x	x		
Sustainable Water												
Water rights							x	x	x	x		
Water quality					x		x	x	x	x	x	
Water management, conservation							x	x	x	x	x	
Efficient use of water						x	x	x			x	
Air quality												
Air pollution					x		x	x	x	x		
Community Development												
Local Infrastructure and services development							x	x				
Increase in energy access							x	x				
Local Economic development and employment						x	x	x	x			
Local Professional skills training and education								x	x			
Social aspects												
Social Impact Assessment						x	x	x	x			
Indigenous peoples' rights							x	x	x			
Land right issues							x	x	x			
Gender issues						x						
Labor conditions												
Working conditions / ILO conventions						x	x	x	x	x		
Contracts								x	x	x		
Health and Safety								x	x	x		

Taking up RED II criteria soon

Attributes and requirements defined by certification systems world-wide vary considerably

Based on: LBST, ILF: Requirements for the production and export of green-sustainable hydrogen; for GIZ/ Energy Partnership Chile-Alemania; December 2021

Allocation may make a major difference!

ISO 14044 and ISO 14067: attributional approach, hierarchy of possible approaches for allocation

→ Several options with prioritization: Should be avoided through system expansion; if not possible, physical relationships (mass or energy) based on nature of system; if not possible, other relationships (e.g. economic value) can be used

GHG Protocol: (Product Life Cycle Accounting and Reporting Standard): “Companies shall avoid allocation wherever possible by using process subdivision, redefining the functional unit, or using system expansion”

→ Several options accepted building on ISO 14044; priority: 1. Avoid allocation, 2. Physical allocation, 3. Economic allocation, 4. other

RED II Delegated Act (draft of 20 May 2022): allocation by the economic value of the co-products

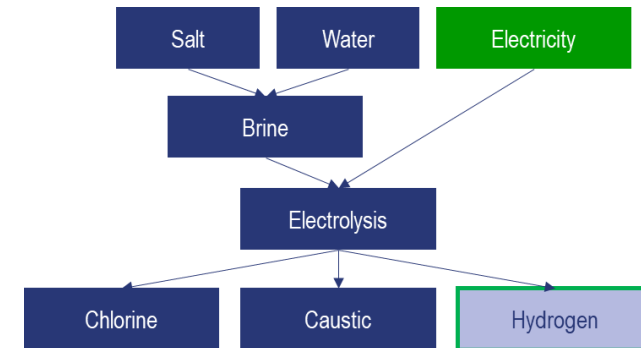
→ average factory-gate value of the products over the last three years

CertifHy: value-based allocation (revision towards ODC process foreseen)

→ Carbon footprint changes over time and regionally even if energy inputs remain identical

IPHE: system expansion recommended, building on ISO 14044; priority: 1. Avoid allocation, 2. Physical allocation, 3. Economic allocation, 4. other

→ The carbon footprint is based on an allocation method that is identical for all plants

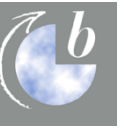


Process diagram of hydrogen production as by-product from chlor-alkali process

Allocation Method	Share of emissions to be allocated to hydrogen	Hydrogen emissions intensity (g CO ₂ e/MJ LHV H ₂)	Sources
Enthalpy-Based	53%	282	CertifHy (2015)
Mass-Based	1%	7	Own calculation
Market Value-Based	9-11%	34-59	Scherpbier and Eerens (2020) and CertifHy (2015)
Based on the energy savings provided by the ODC process	21%	134	CertifHy (2015) Jung.(2014) and Bechtel (2018)
Substitution	-	57	Own calculation
Molar-Based	25%	134	Own calculation

Source: IPHE, *Methodology for Determining the Greenhouse Gas Emissions Associated With the Production of Hydrogen*, 2021.

GO-type certificates: Book&Claim

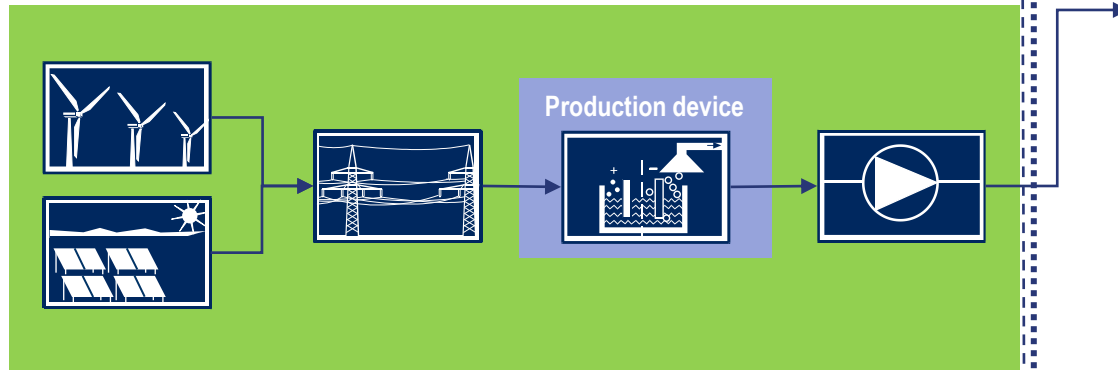


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CertifHy™ GO-type scope

Renewable electricity



Plant gate

**Separate
flow of fuel
and
certificates**

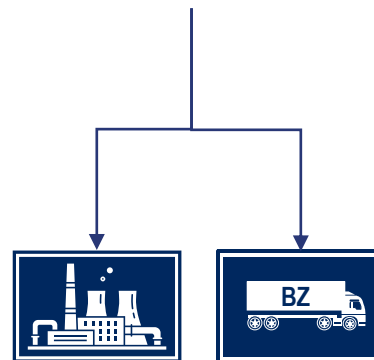
Out of scope



Construction material (e.g. steel)



Manufacture



Sustainability certification of RFNBOs (RED II, EU)



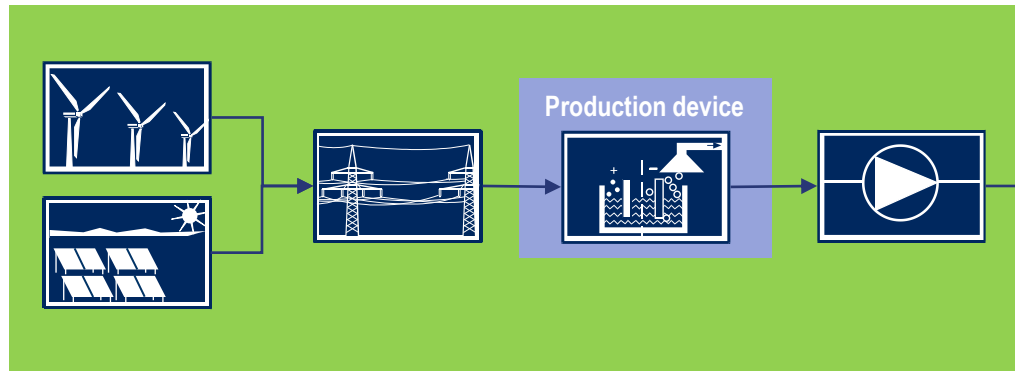
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CertifHy™ H₂/RFNBO scope

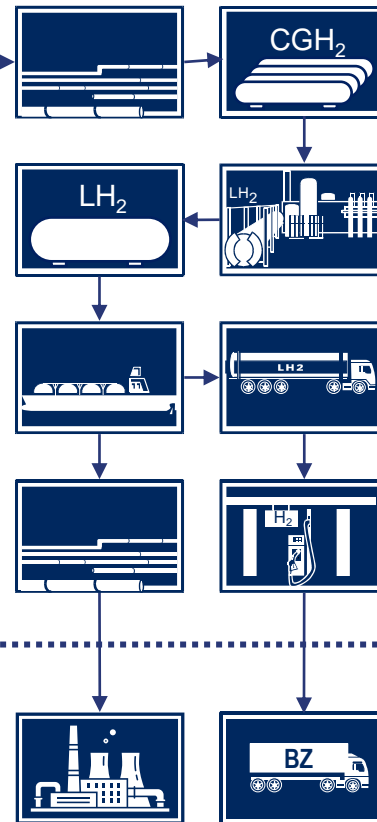
CertifHy™ GO-type scope

Renewable electricity criteria:
 Additionality, temporal & geographic correlation



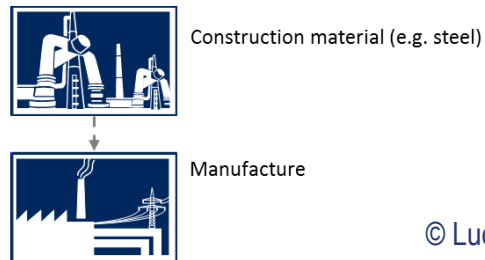
Plant gate

+ mass balance

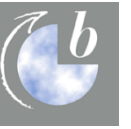


Combined flow of fuel and certificates

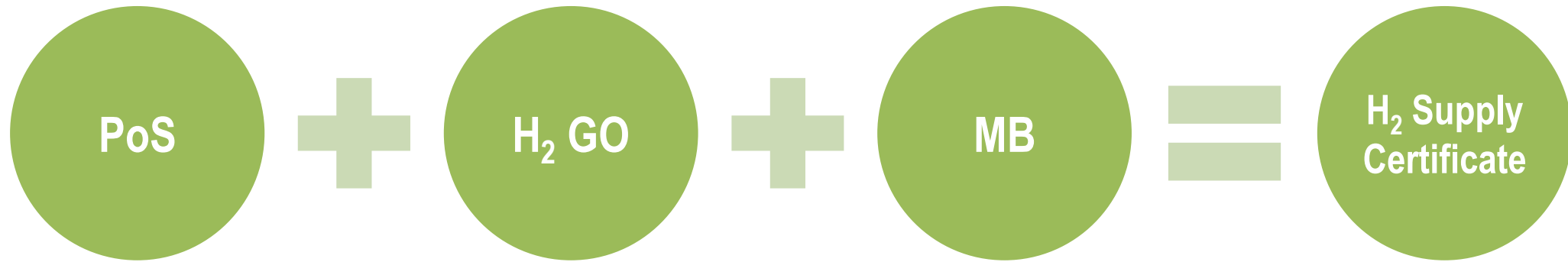
Out of scope



Hydrogen Supply Certificate

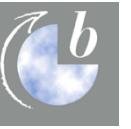


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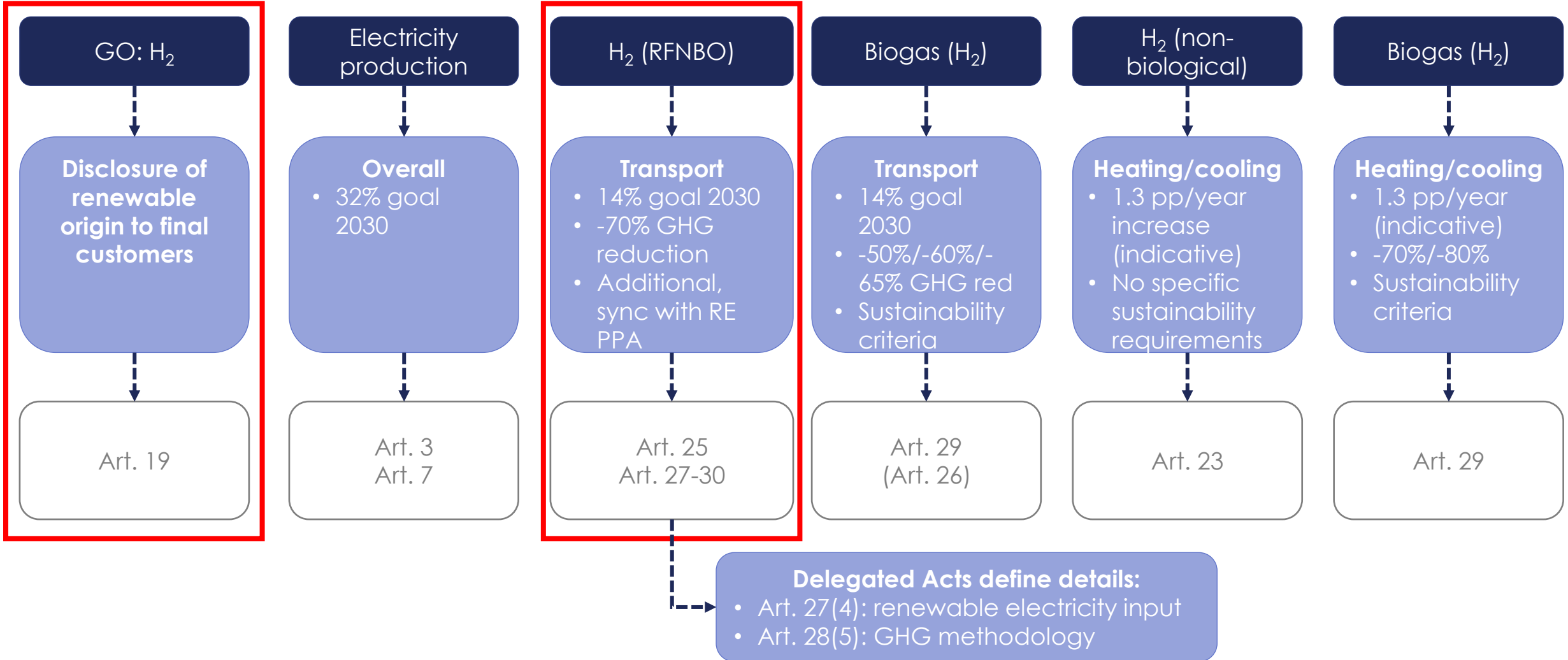


Proof of Sustainability + Guarantee of Origin + Mass Balancing = H₂ Supply Certificate

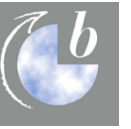
EU: H₂ in Renewable Energy Directive recast (RED II)



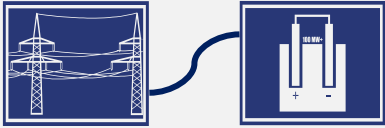
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EU RED II: Electricity supply cases



Delegated Act to Art. 27(3)

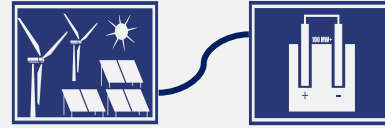


Case 1 : Grid Mix

Partial renewable hydrogen

- Renewable share of grid

- -70% rel. to 94 g_{CO2eq}/MJ
- GHG emissions: grid mix

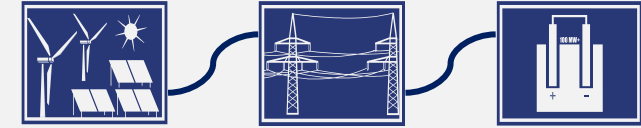


Case 2 : Direct connection

100% renewable hydrogen

- New renewable installation

- -70% rel. to 94 g_{CO2eq}/MJ



Case 3 : PPA

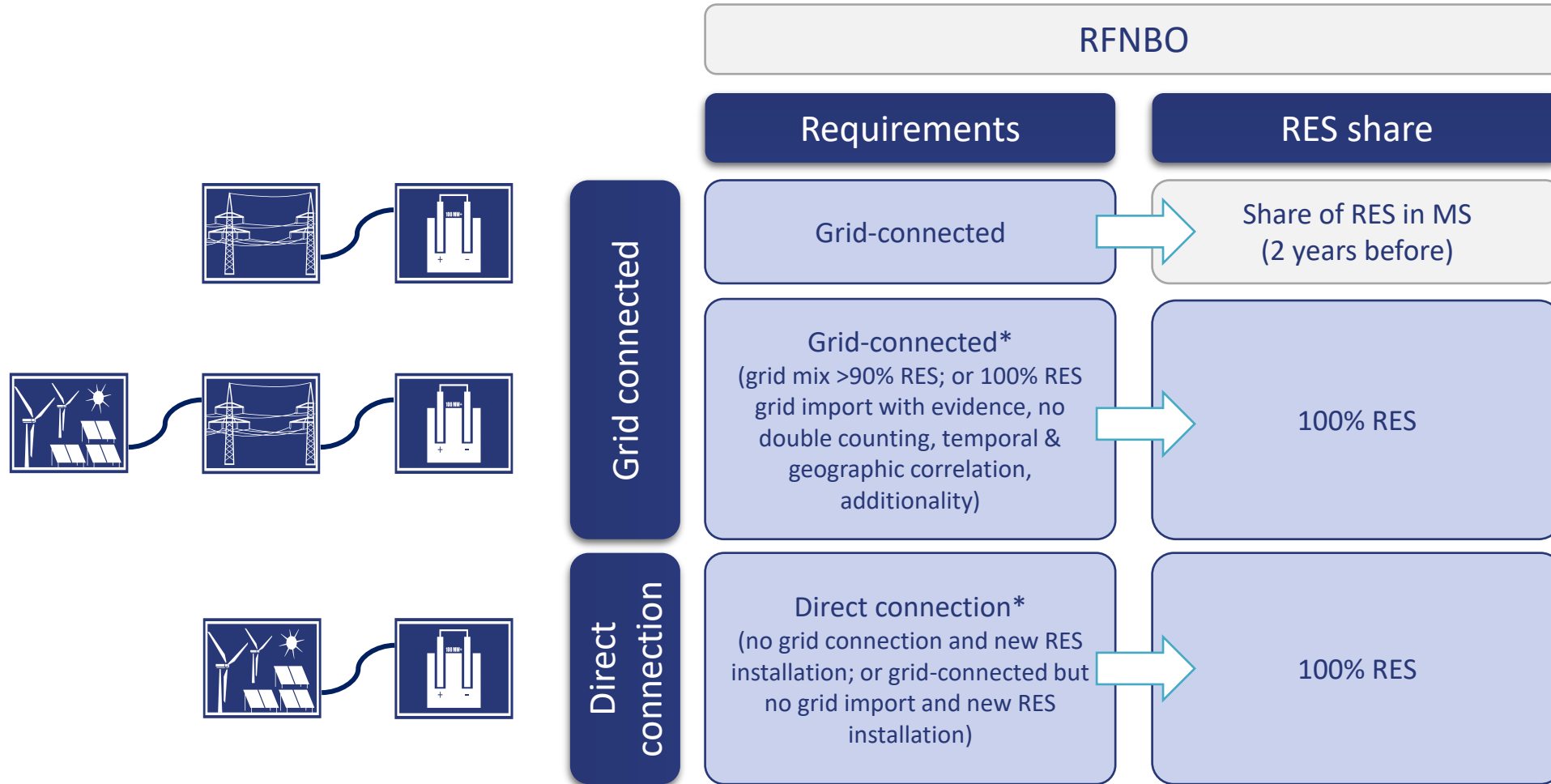
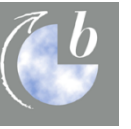
100% renewable hydrogen

- New renewable installation
- No aid to renewable installation
- Temporal correlation
- Geographic correlation

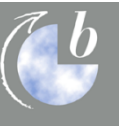
- -70% rel. to 94 g_{CO2eq}/MJ

Delegated Act to Art. 28(5)

EU RED II: Renewable share of hydrogen produced



* Details defined in draft delegated act, 20 May 2022



EU: draft Delegated Acts according to RED II

- Drafts published for public consultation on 20 May; consultation open for feedback until 17 June

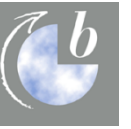
- DA on **renewable electricity input:**

<https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/7046068-Production-of-renewable-transport-fuels-share-of-renewable-electricity-requirements- en>

For RES electricity supplied over the grid; major criteria:

- **Additionality:** 36 months (new RES electricity installation); applies from 1.1.2027 (grandfathering)
- **No funding:** applies from 1.1.2027 (grandfathering)
- **Temporal correlation:** same hour, storage allowed, option: day-ahead price < 20 €/MWh; applies from 1.1.2027 (no grandfathering), before: same month
- **Geographic correlation:** same bidding zone, neighbouring bidding zone if prices RES zone ≥ EL zone, off-shore bidding zone
- DA on **GHG methodology**
<https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12713-Renewable-energy-method-for-assessing-greenhouse-gas-emission-savings-for-certain-fuels en>
 - **Scope:** All upstream emissions, no CAPEX emissions, emissions of existing use or fate included, avoidance through CCS
 - **Savings** of 70% compared to 94 gCO_{2eq}/MJ
 - **Allocation:** detailed provisions
 - Etc.

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National/ regulatory standards and certification schemes

EU: H₂ Guarantees of Origin

- Legal basis: RED II art. 19; adopted 2018, national transposition 2021
- National H₂ GO systems under development in some Member States
- CertifHy established EU-wide; compatibility to be achieved in 2022

EU: Voluntary Schemes

- Legal basis: RED II art. 25-30; adopted 2018, national transposition 2021
- RFNBOs (H₂, derivatives); incl. imports
- Voluntary schemes to be recognized by European Commission
- CertifHy to become Voluntary Scheme

California: LCFS

- Established in 2011
- Hydrogen included since 2015
- Including imports
- Etc.

Japan: Guideline

- Published in May 2022
- Focus on blue H₂

China: H₂ standard

- Established in 2020
- First certification in 2022

Australia: H₂ Guarantees of Origin

- Under development since 2020

UK: Low carbon H₂ standard

- Draft version of 2022

Korea: H₂ standard

- Announced for 2024/25

Independent standards and certification schemes



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TÜV SÜD: CMS70

- Established in 2011
- Renewable H₂

CertifHy

- Established in 2019
- Renewable & low carbon H₂
- Limited to Europe for the time being

IPHE Working Paper

- Published 2021
- Renewable & low carbon H₂

TÜV Rheinland

- Published in May 2022
- Renewable & low carbon H₂

Bureau Veritas

- Published in May 2022
- Renewable & low carbon H₂

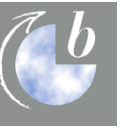
Green Hydrogen Standard

- Published in June 2022
- Renewable H₂

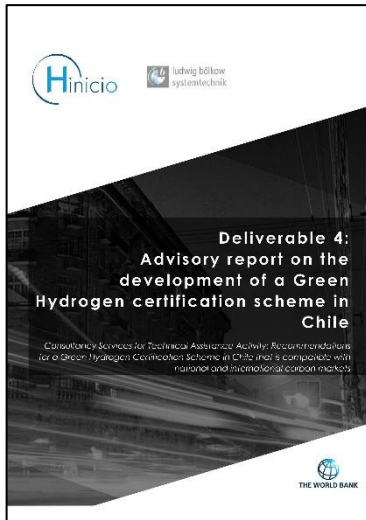
I-REC: H₂ code

- Alpha version to be published

Further reading



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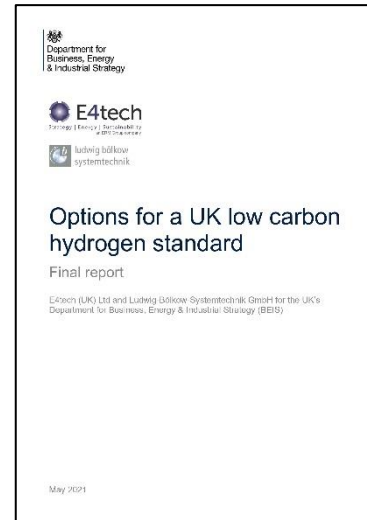


The study provides analysis, comparison and benchmarking of international green and low-carbon hydrogen certification schemes in order to support the development of a green hydrogen certification scheme in Chile

Available at

https://energia.gob.cl/sites/default/files/documentos/green_hydrogen_certification_-_international_benchmark.pdf

11 August 2022



The study helped defining a low carbon hydrogen standard allowing the UK government to incentivise and support low carbon hydrogen production for supply across the energy system. To this end, options for such a standard were identified and compared.

Available at <https://www.gov.uk/government/publications/options-for-a-uk-low-carbon-hydrogen-standard-report>

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The study established a basis of sustainability criteria for the processes involved in the production and exportation of H2 and/or its derivatives from Chile to Europe

Available at

https://www.energypartnership.cl/fileadmin/user_upload/chile/media_elements/Studies/EP_CHL_Production_of_green_sustainable_hydrogen_final_ISBN.pdf

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Thank you for your attention!



Matthias Altmann

Ludwig-Bölkow-Systemtechnik GmbH
Senior Consultant
T: +49 89 608 110 38
Matthias.altmann@lbst.de



Leo Diehl

Ludwig-Bölkow-Systemtechnik GmbH
Project Manager
T: +49 89 608 110 42
Leo.Diehl@lbst.de



Dr. Uwe Albrecht

Ludwig-Bölkow-Systemtechnik GmbH
Managing Director
T: +49 89 608 110 31
uwe.albrecht@lbst.de

LBST · Ludwig-Bölkow-Systemtechnik GmbH

Daimlerstr. 15 · 85521 München/Ottobrunn · Germany
www.LBST.de