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RECOMMENDATIONS FOR GREEN HYDROGEN CERTIFICATION IN UKRAINE

FINAL EVENT OF THE “GERMAN-UKRAINIAN RESEARCH COOPERATION ON THE CERTIFICATION OF GREEN HYDROGEN” (GERUCCHY)

20.05.2026 | Conference session at the XXVII International Scientific and Practical Online Conference “Renewable Energy and Energy Efficiency of the XXI Century” | Hamburg Institut and Institute of Renewable Energy at the National Academy of Sciences of Ukraine (IRE)

WORKSHOP AGENDA

Time	Agenda
11:50	Introduction of the German-Ukrainian Research Cooperation on the Certification of Green Hydrogen | Jakob Schlandt, Head of Policy and Markets (Hamburg Institut)
12:00	Regulatory framework conditions for green hydrogen certification in the EU (Dr. Alexandra Styles, Hamburg Institut)
12:10	Framework conditions for green hydrogen production and trade in Ukraine (Timo Hoelzmann, Hamburg Institut)
12:20	Recommendations for designing a certification system for renewable hydrogen in Ukraine (Dr. Alexandra Styles, Hamburg Institut)
12:30	Extended sustainability criteria for renewable hydrogen in Ukraine (Timo Hoelzmann, Hamburg Institut)
12:40	Relevance of findings in the context of the implementation of a Hydrogen Strategy of Ukraine (Dr. Mykola Kuznietsov, Institute of Renewable Energy)
12:50	Questions and discussion with participants
13:10	Conclusion of the session

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INTRODUCTION OF THE GERMAN-UKRAINIAN RESEARCH COOPERATION ON THE CERTIFICATION OF GREEN HYDROGEN

20.05.2026 | Jakob Schlandt | Conference session
“Recommendations for green hydrogen certification in Ukraine”

INTRODUCTION: UKRAINE'S GREEN HYDROGEN OPPORTUNITY

- **European and German demand for imported renewable hydrogen** is forecast to be high, especially for hard to electrify sectors (heavy industry, aviation, maritime transport)
- EU regulation sets **rules for green hydrogen**:
  - Renewable Energy Directive (RED): targets for renewable fuels of non-biological origin (RFNBO) in industry and transport
  - EU Emissions Trading System (ETS) and Carbon Border Adjustment Mechanism (CBAM): renewable hydrogen is considered to have zero emissions
  - Detailed RFNBO criteria regarding renewable character of electricity inputs and required greenhouse gas (GHG) reductions
  - RED and Gas and Hydrogen Markets Directive: Disclosure rules for share of renewables in gas and hydrogen deliveries to consumers
  - Climate accounting standards for companies as complementary demand drivers on voluntary markets

- **Ukraine's green hydrogen opportunity:**
  - Potential to become a key trading partner for Europe
  - Current challenge: energy sector severely damaged by Russia's invasion, threatening energy security
  - Focus on renewable energy and green technologies as a strategic response
  - European demand and investment critical for developing Ukraine's green hydrogen economy
- Developing green hydrogen trade between Ukraine and Europe requires the **establishment of an internationally recognized verification and certification system:**
  - Crucial to ensuring the environmental integrity of hydrogen, supporting market development, and facilitating trade

ABOUT THE PROJECT

- The **“German-Ukrainian Research Cooperation on the Certification of Green Hydrogen (GerUCCHy)”** aims to provide science-based support for the development of a verification system for green hydrogen in Ukraine.
  - A cross-border, **internationally compatible hydrogen origin verification system** is an important link in the supply chain for certified green hydrogen between Ukraine and Germany and other EU countries
  - The project aims to build up the **necessary expertise** for the development and operation of such a system
- **Project duration:** August 2024 – July 2026
- **More information and project publications:** https://www.hamburg-institut.com/en/services/guarantees-of-origin/research-cooperation-gerucchy/

- The **research cooperation** is a partnership between two highly specialized, application-oriented research institutions:
  - **HIR Hamburg Institut Research gGmbH**
  - **Institute of Renewable Energy (IRE) at the National Academy of Sciences of Ukraine**
- Funding Agency: **Federal Ministry of Research, Technology and Space (BMFTR)** within the framework of the guideline for funding international projects on the topic of green hydrogen (Funding code: 01DK24007)

With funding from the:
Federal Ministry of Research, Technology and Space

PROJECT CONTENT AND DELIVERABLES

Basics of tracking approaches for renewable energy and hydrogen

Stocktaking of regulatory and market development of renewables and hydrogen in Ukraine, identification of main stakeholders

Analysis of the current electricity tracking system in Ukraine and adjustment needs for the certification of green hydrogen

Recommendations for designing a tracking system for renewable hydrogen in Ukraine

Examination of extended sustainability criteria for renewable hydrogen in Ukraine

Deliverables and milestones

- Report on certification basics and status quo of the Ukrainian renewable energy and hydrogen sector
- Report on design prerequisites for a hydrogen certification system, including recommendations for a further development of the electricity tracking system
- Interviews and survey with stakeholders in Ukraine and Germany/EU
- Exchange with stakeholders to disseminate and discuss project results
- Publications and presentations at specialized conferences

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REGULATORY FRAMEWORK CONDITIONS FOR GREEN HYDROGEN CERTIFICATION IN THE EU

20.05.2026 | Dr. Alexandra Styles | Conference session
“Recommendations for green hydrogen certification in Ukraine”

USE CASES FOR HYDROGEN CERTIFICATION ARE DIVERSE

Purposes of hydrogen tracking and certification:

Provide transparency on product attributes to customers (e.g. origin from renewable energy sources), exclude double counting, enhance credibility and trust, demonstrate adherence to policy requirements and market standards, facilitate trade

Energetic uses of hydrogen:

e.g. high-temperature processes in industry, peak load provision in electricity, fuel in road or maritime transport or aviation

Non-energy uses of hydrogen:

Raw material and process gas in chemical and basic materials industries

Both: Input for downstream products (e.g. green steel)

Target accounting:

- Accounting for **national contributions** to European renewable energy targets
- **Proof of renewable inputs** for European Emissions Trading System (EU ETS I/II), Carbon Border Adjustment Mechanism (CBAM) and national support schemes

Export and import:

European and international trade and transport of hydrogen and derivatives

Gas disclosure, voluntary market for green gas products:

Implementation of the Gas and Hydrogen Markets Directive (EU) 2024/1788 until 2026

Sustainability reporting

of companies, in compliance with regulatory and voluntary standards

TWO VERIFICATION SYSTEMS FOR GREEN GASES

	Gas disclosure (voluntary markets)	Target accounting (compliance markets)
Focus	**Disclosure of gas supply to consumers**	**Accounting of renewable fuels** (bio-based, renewable fuels of non-biological origin) **towards Union targets**
Basis	The RED and the EU Gas and Hydrogen Markets Directive require the use of **Guarantees of Origin (GOs)** to track and disclose renewable gases supplied via gas or hydrogen networks	The RED formulates requirements for the **sustainability** of biomass and renewable properties of RFNBO, as well as greenhouse gas emissions savings; certification of RED criteria also demanded by the Gas and Hydrogen Markets Directive
Type of proof	**Guarantees of origin (GOs)** with **information on energy attributes** at the time of production/grid feed-in	**Proof of Sustainability (PoS)**, plus any additional evidence required under national support schemes, as **proof of compliance with the criteria**
Chain of custody	**Book & Claim:** no coupling of attribute and energy commodity sales necessary; GOs cancelled for deliveries to end customers must correspond to the relevant grid characteristics	**Mass balancing:** certificates may only be traded together with the energy commodity; tracking of transactions and sustainability characteristics across the entire supply chain

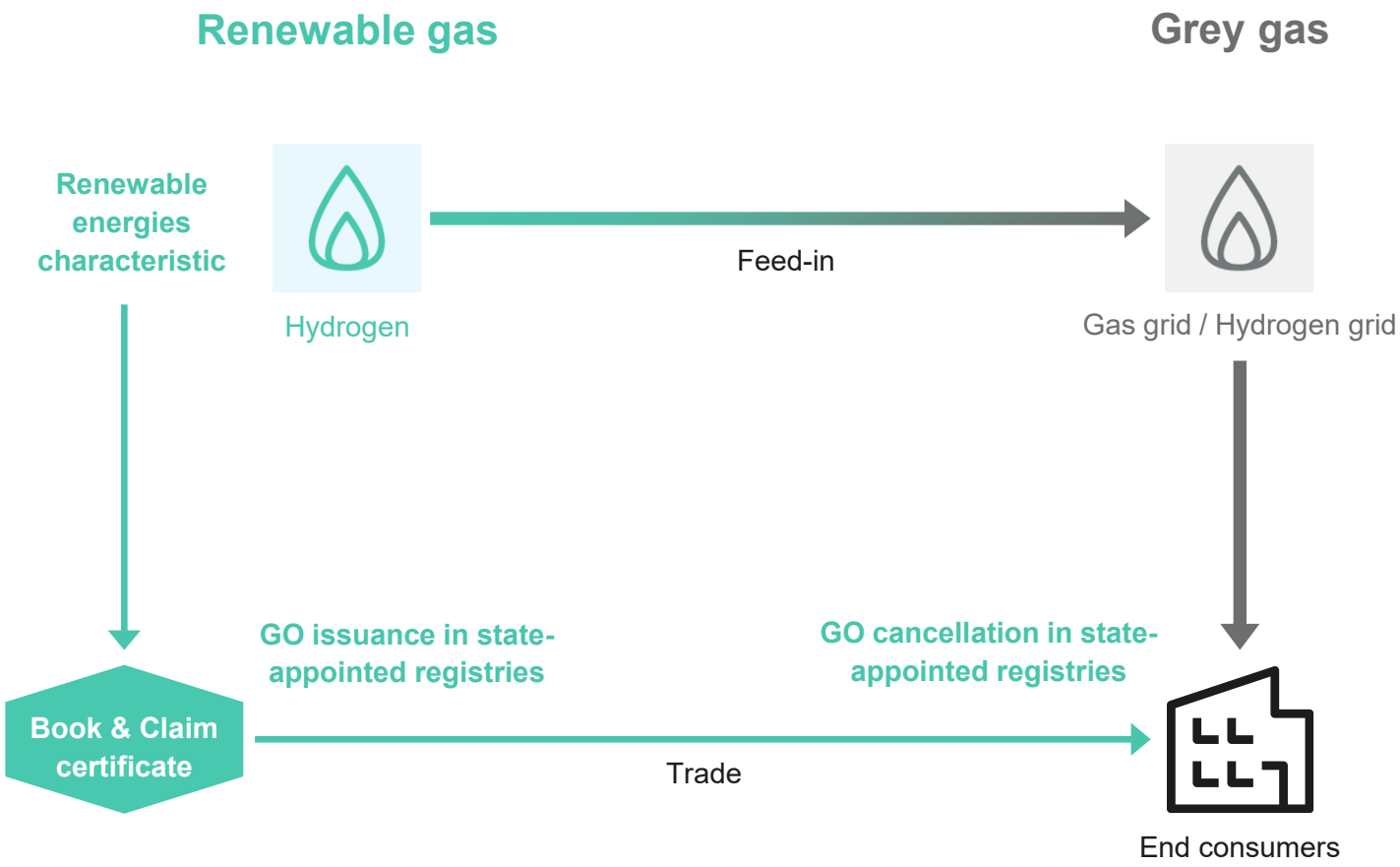
Future coupling of GOs and PoS for the same gas delivery in the EU‘s Union Database (UDB) to exclude double counting

CERTIFICATION REQUIREMENTS FOR GAS DISCLOSURE

- Introduction of **mandatory gas disclosure** through the Internal Gas and Hydrogen Markets Directive (EU) 2024/1788
  - Adopted on 13 June 2024
  - Transposition into national law mandatory for all Member States
  - Implementation deadline by mid-2026
- The **designation of renewable gases** must be substantiated with **Guarantees of Origin (GOs)** in accordance with the Renewable Energy Directive
- National implementation of **GO registries for gases** is currently underway

- **Obligation of gas suppliers** to disclose to customers:
  - Proportion of renewable gases in gas supply
  - Proportion of low-carbon gas in gas supply
  - Proportion of renewable hydrogen in hydrogen supply
  - Environmental impact of the gas supplied: at least CO_2 emissions
- Compliance with **RFNBO criteria** is **not mandatory for disclosure** of green hydrogen supply to consumers in voluntary markets
  - Renewable origin of electricity inputs can be proven by **electricity GO cancellation**
  - **GO standards** (EN 16325, European Energy Certificate System – EECS) provide rules for tracking **energy carrier conversion**

BOOK & CLAIM APPROACH TO GAS DISCLOSURE



Source: Hamburg Institut, based on Sabbagh Amirkhizi (2020)

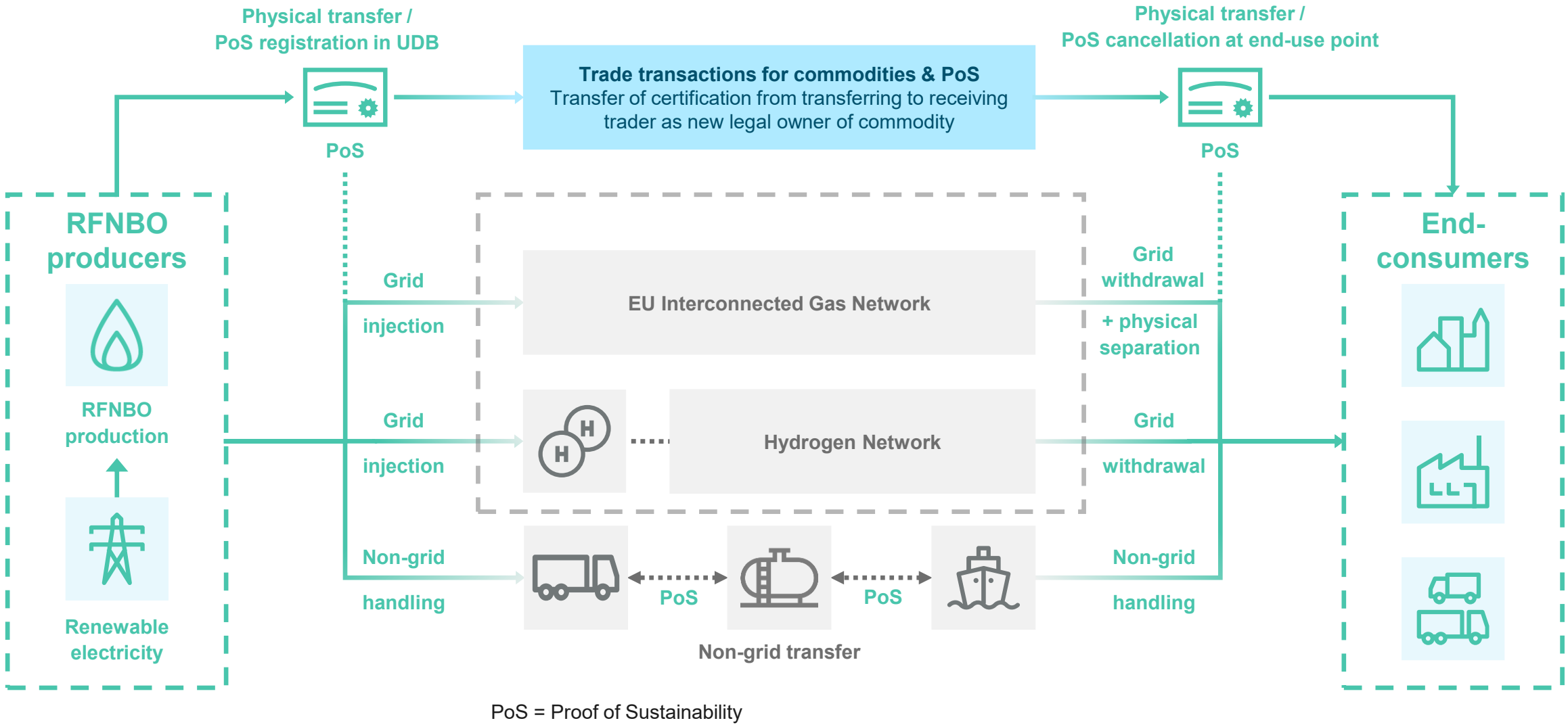
GOs cancelled for deliveries to end customers must correspond to the **relevant grid characteristics**:

- Consideration of blending limits in gas grids
- Distinction between gas grids with blending and pure hydrogen grids

CERTIFICATION REQUIREMENTS FOR TARGET ACCOUNTING

- **EU Renewable Energy Directive (RED)** 2018/2001 (RED II) and 2023/2413 (RED III) sets **renewable energy targets** for final energy consumption overall (at least 42,5 % in 2023) and by end-use sector (buildings, industry, heating/cooling, transport)
- **Technology-specific targets for RFNBO:**
  - **Industry target** (Article 22a RED III): By 2030, Member States must ensure that at least 42% of hydrogen used for final energy and non-energy purposes in industry comes from RFNBO; by 2035 this share must increase to 60%
  - **Transport-sector targets** (Article 25 RED III): By 2030, Member States must ensure either (i) a share of renewable energy in final energy consumption in transport of at least 29%, or (ii) a greenhouse gas intensity reduction of at least 14.5%.
  - The combined share of advanced biofuels and biogas plus RFNBO in the energy supplied to the transport sector must be ≥ 5.5% in 2030, of which at least 1 percentage point must come from RFNBO.
- **Criteria for RFNBO** to count towards renewable energy targets (RED, Delegated Acts 2023/1184 and 2023/1185):
  - Tracking through a **mass balance** system
  - **Electricity inputs** must be proven to be renewable (slides 26-28)
  - A life-cycle **greenhouse gas emission saving** of at least 70% compared to a fossil fuel-based comparator must be demonstrated
  - It must be ensured that each gaseous and liquid fuel delivery is **counted only once** in calculating RE shares per Member State and only in one final energy consumption sector
  - Criteria apply to **both domestic production and exports**
- RFNBO criteria also apply to RFNBO counted under **EU ETS / CBAM**
- **Certification requirements** for target accounting are **much stricter** than for disclosure – but higher price premiums are expected, making **compliance markets more attractive for exports** than voluntary markets

MASS BALANCING FOR TARGET ACCOUNTING OF RENEWABLE HYDROGEN



PoS = Proof of Sustainability

Source: Hamburg Institut, based on ISCC System (2025), Sabbagh Amirkhizi (2020) (with adaptations to the hydrogen case)

IMPLICATIONS FOR MULTI-PURPOSE CERTIFICATION SYSTEM DESIGN IN UKRAINE

- Hydrogen certification system has to provide **functionality for target accounting** (Proof of Sustainability for compliance with RFNBO criteria, mass balancing) **and disclosure** to end consumers (Guarantees of Origin, book & claim allowed)
- EU member states face the same issue in setting up new renewable gas GO registries and RFNBO PoS registries in coordination with existing PoS registries for biomethane; **search for efficient solutions is ongoing**
- When setting up GO and PoS systems for RFNBO in Ukraine, **it is recommendable to combine both functionalities in one registry from the outset**: reduces administrative costs and helps to protect against double counting
- First examples of **multi-purpose certificates** integrating GOs and PoS are being implemented (e.g. in Estonia and Czech Republic)

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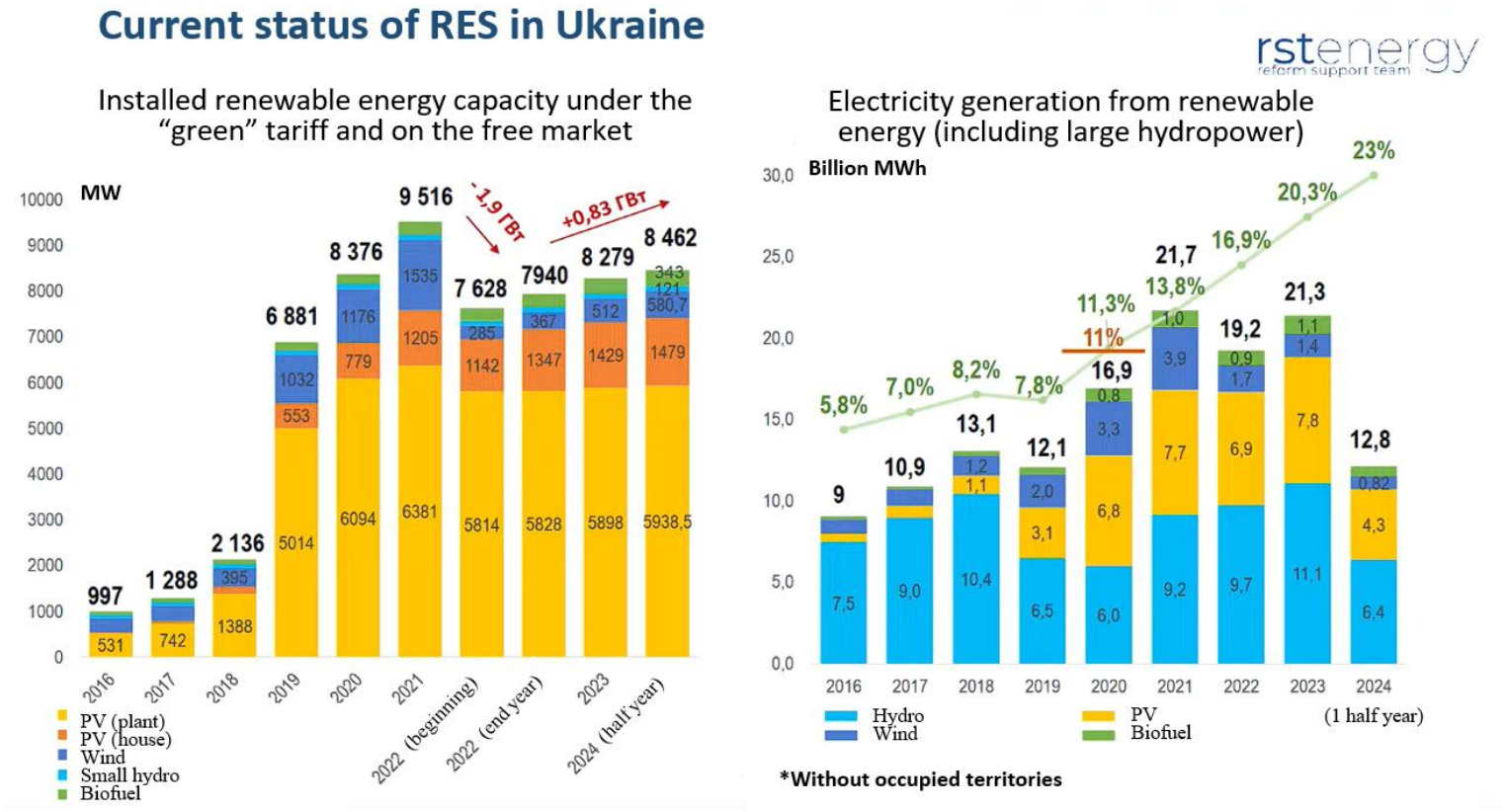
FRAMEWORK CONDITIONS FOR GREEN HYDROGEN PRODUCTION AND TRADE IN UKRAINE

20.05.2026 | Timo Hoelzmann | Conference session
“Recommendations for green hydrogen certification in Ukraine”

THE TRANSITION TO RENEWABLE ENERGY SOURCES HAS BECOME EVEN MORE URGENT

- Ukraine's energy system has been dependent on **fossil fuels** for many decades
- In recent years, the country has embarked on a **transition to renewable energy sources**
- This transition has become even more urgent since the start of the full-scale Russian invasion in 2022 which forced Ukraine to rethink its **energy priorities**
- Given the systematic attacks directed mainly at traditional power plants, **renewable energy sources** began to play a **more important role** in electricity generation

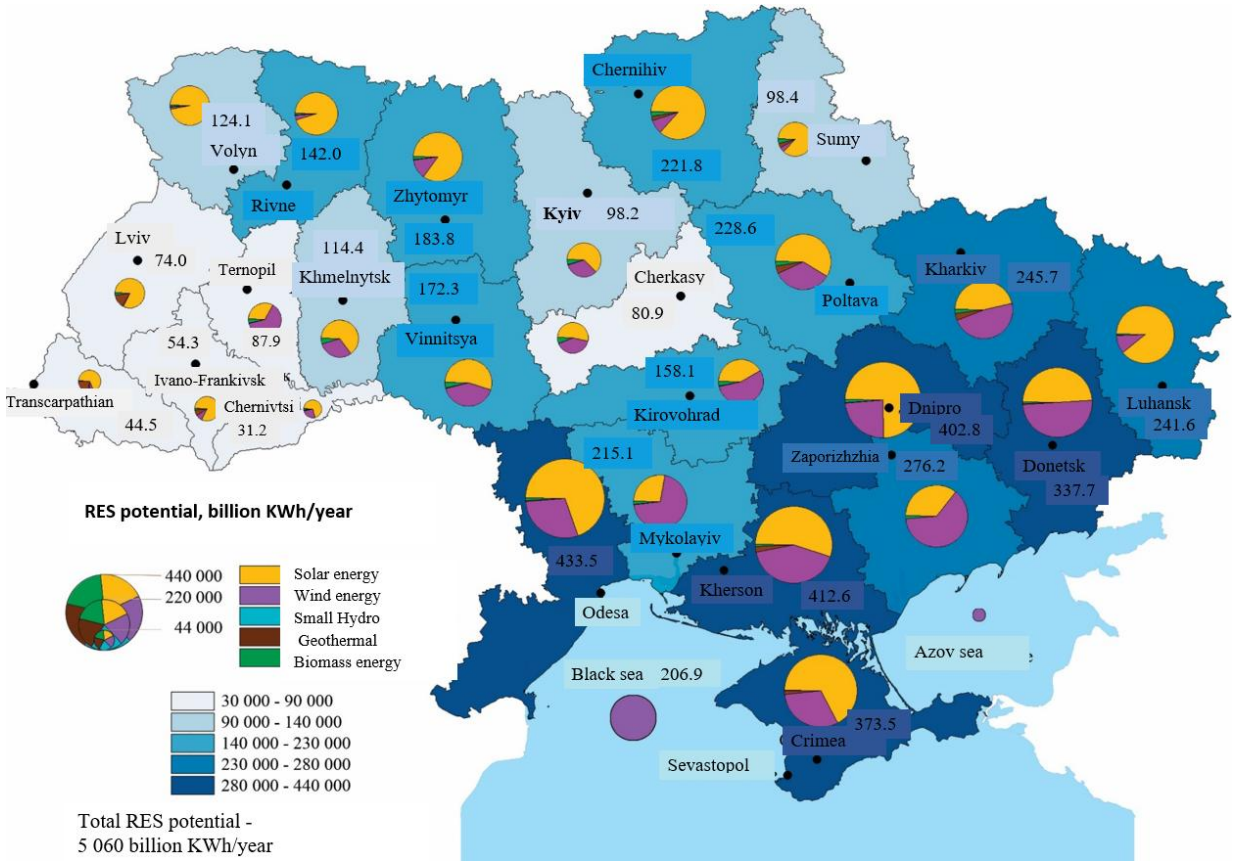
RES development of installed capacities and generation over 2016-2024



Source: Maksakov (2024)

THE RENEWABLE ENERGY SOURCES POTENTIAL IS RATHER UNEVEN ACROSS THE COUNTRY

Total renewable energy sources generation potential by region

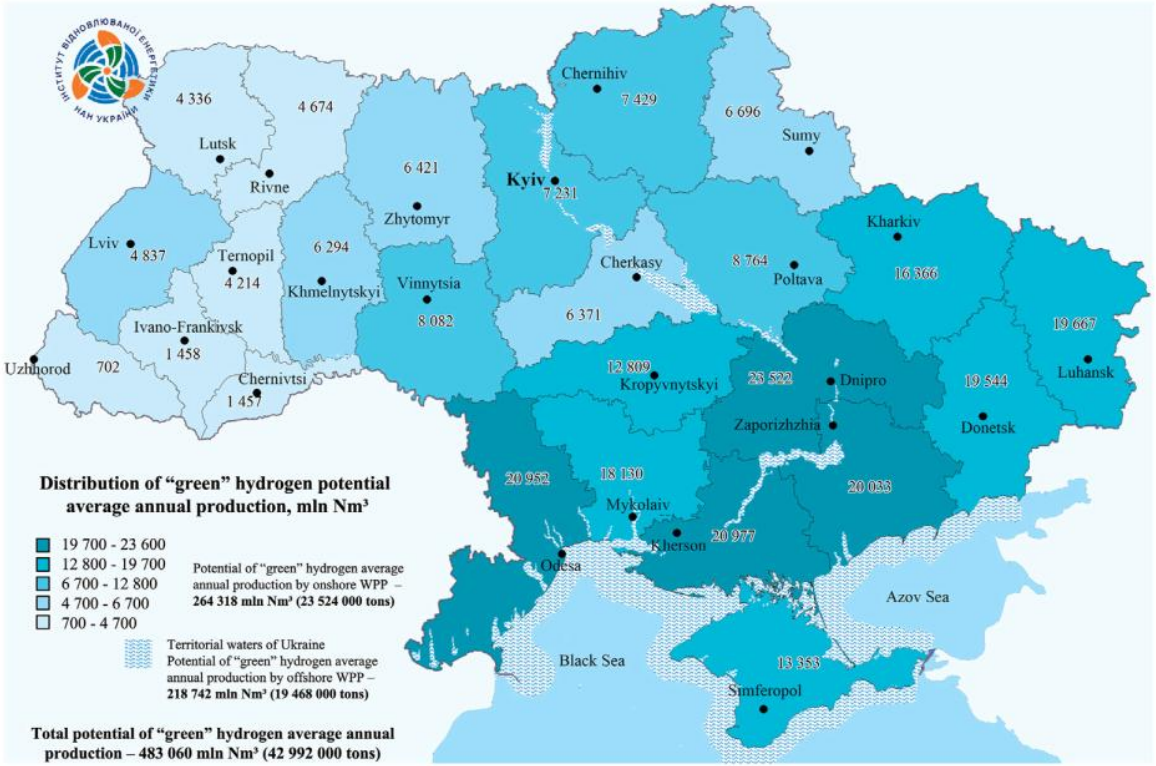


- After the invasion of 2022: around 25% of RES installations are located in occupied territories
- Particularly **difficult situation for wind power plants**: 75% of the capacity is located in occupied territories
- **Renewable energy** sector still **continued to develop**

Source: Institute of Renewable Energy at the National Academy of Sciences of Ukraine (2024)

DISTRIBUTION OF GREEN HYDROGEN POTENTIAL

- Identification of promising regions for large-scale renewable hydrogen production: optimal balance between **renewable energy potential** and accessible **water resources** for energy
- Experts from the Institute of Renewable Energy at the National Academy of Sciences of Ukraine (IRE) conducted an **assessment** of the available **wind and solar energy potential** across Ukraine as well as the **water resource availability**
- Greatest potential of green hydrogen production lies in the **southeastern regions** of Ukraine



Source: Kudria et al. (2021)

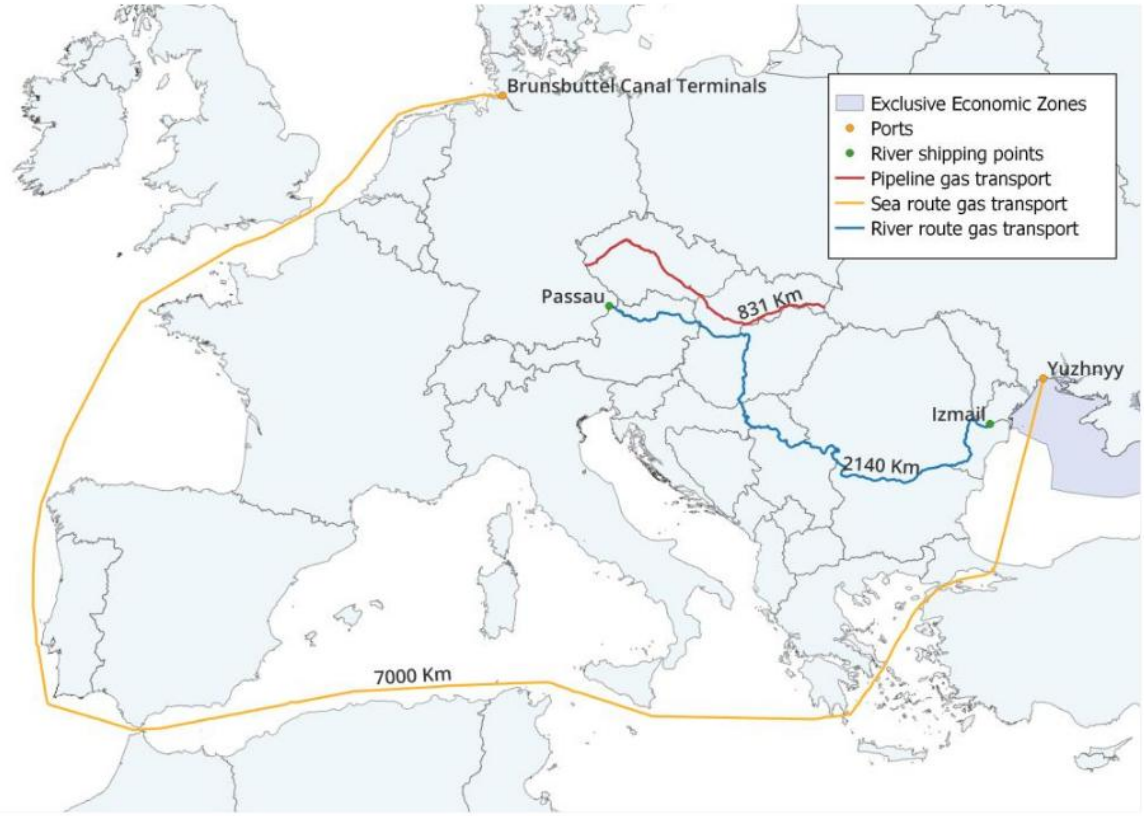
HYDROGEN POLICY – DRAFT HYDROGEN STRATEGY OF UKRAINE UNTIL 2050

- Draft strategy was **developed by a group of experts created by the Ministry of Energy** and submitted to the government in 2024 (still pending approval)
- **Aim of the strategy:** basic principles for the development of the hydrogen industry in Ukraine until 2050, defining main stages and strategic goals
- **Key aspects** of the strategy
  - Harmonization of the **certification procedure** in line with EU requirements for the import of hydrogen
  - Identification and removal of **administrative, technical and regulatory barriers** to the production, transport, storage and use of hydrogen
  - Creation of a **regulatory and administrative framework** for the development of hydrogen production and consumption in Ukraine
- **Roadmap for the implementation** of the objectives of the strategy
  - Phase I (**enabling**): creation of a regulatory framework, introduction of a certification system
  - Phase II (**industry formation**): pilot projects, starting of export
  - Phase III (**sustainable development**): 10 GW of electrolysis capacity by 2050

At present, Ukrainian legislation does not provide a legal, economic, or organizational framework for the production, transportation, storage, and use of hydrogen.

EXPORT STRATEGY AND TRANSPORTATION MODES

- Ukraine's **domestic hydrogen consumption has declined sharply** (primarily as a result of war-related disruptions in industrial activity)
- **Primary destination** for Ukrainian hydrogen exports is the **EU**
- Potential **transportation modes**
  - Existing Ukrainian gas transportation system (GTS)
  - Rivers and sea ways
  - Automobile road transport and railway
- Infrastructure of natural gas as a **potential storage facility**



Source: Sukurova et al. (2021)

INTEGRATION OF HYDROGEN INTO GAS NETWORKS

- Integration of hydrogen into **gas networks** currently the most **promising way of transportation**
- GTS comprises over 33.000 km of pipelines
- Parts of this infrastructure could be **repurposed or co-utilized** for hydrogen transport
- Comprehensive **modernization** of Ukraine's gas transmission infrastructure is required to enable transport of hydrogen
- **Central European Hydrogen Corridor**: project between Ukraine, Slovakia, Czech Republic, Austria and Germany (supported by the European Commission) aimed at the transformation of the Ukrainian GTS for transportation of hydrogen

Central European Hydrogen Corridor project

Source: UA Transmission System Operator (2021)

INTERNATIONAL COOPERATION

European Union

- **Memorandum of understanding** on cooperation in the energy sector (in 2005) and on strategic energy partnership (in 2016): basic documents of cooperation between Ukraine and EU covering **different energy areas**
- 2022: Ukrainian power system was fully synchronised with the power grid of continental Europe
- **Memorandum of understanding** (in 2023) on a **strategic partnership** in the field of biomethane, **hydrogen** and other synthetic gases
- Hydrogen Strategy for a Climate Neutral Europe (2020) names **Ukraine** as a **priority partner** in the **production of green hydrogen**

Germany

- 2019: Agreement on the establishment of a **strategic partnership in the energy sector** between Ukraine and Germany
- 2023: Joint statement of intent to expand areas of the German-Ukrainian Partnership as part of the **green recovery and reconstruction** of the Ukrainian energy sector
- 2023: Memorandum on partnership between the State Agency for Energy Efficiency and Energy Saving of Ukraine (SAEES) and the German Energy Agency (dena) for the introduction of the **biomethane registry** in Ukraine

STARTING SITUATION FOR CERTIFICATION OF GREEN HYDROGEN IN UKRAINE

Status of the hydrogen economy in Ukraine

- Ukraine's hydrogen economy is still in its **infancy** (significantly shaped by the broader challenges currently facing the country)
- Ukraine possesses several **key aspects** to become a future **exporter of hydrogen** to the EU: energy partnerships with the EU, existing gas pipeline and storage infrastructure, high renewable energy potential
- Development is held back by a number of **unresolved issues**: absence of guaranteed offtakers, lack of state support, high risk perception by investors, missing regulatory framework, uncertainties regarding the existing gas network, hydrogen projects in occupied territories, uncertain future domestic hydrogen demand
- Progress is experiencing **significant delays**, overall **timeline** for large-scale hydrogen deployment remains **uncertain**

Status of certification of electricity and hydrogen

- Significant progress on setting up a **Guarantees of Origin registry for electricity** from renewable energy sources and high-efficiency cogeneration units
  - Operated by **NEURC** and **SAEES** respectively
  - Ukraine has become a **member** of the Association of Issuing Bodies (**AIB**) and **applicant** of the European Energy Certificate System (**EECS**) Electricity Scheme
- **Biomethane registry** has become operational in February 2026, operated by the State Agency for Energy Efficiency and Energy Saving of Ukraine (**SAEES**); biomethane economic operators have access to the EU's **Union Database** (which however is not yet fully operational)
- Set-up of a **hydrogen verification and tracking** system is still at a conceptual stage, because the legal framework is missing (but at drafting stage)

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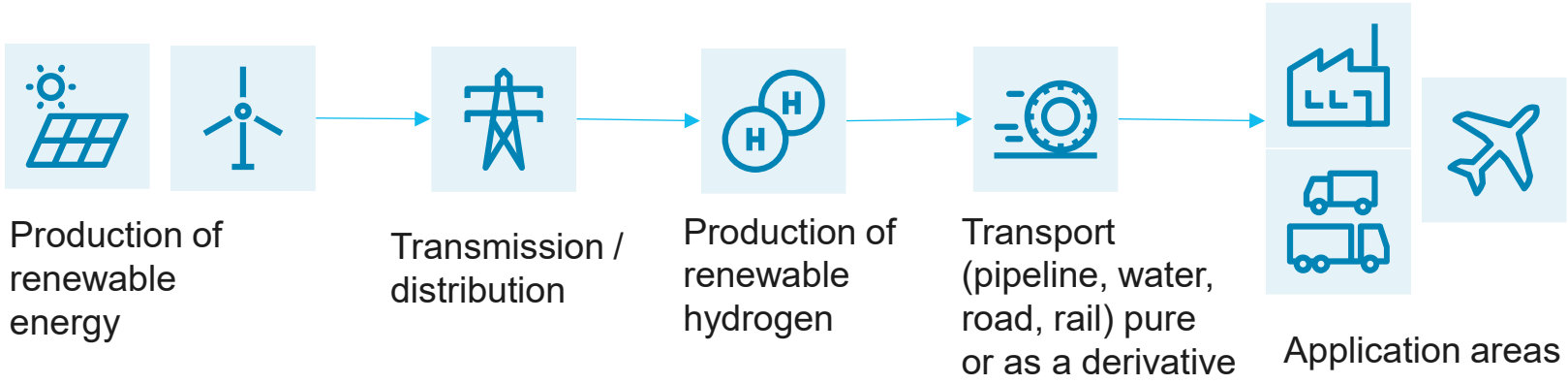
RECOMMENDATIONS FOR DESIGNING A CERTIFICATION SYSTEM FOR RENEWABLE HYDROGEN IN UKRAINE

20.05.2026 | Dr. Alexandra Styles| Conference session
“Recommendations for green hydrogen certification in Ukraine”

OVERVIEW OF DESIGN ELEMENTS ANALYSED IN THE PROJECT

The certification and tracking system needs to cover the whole hydrogen value chain:



Focus in this presentation: high-level recommendations

Verification of the renewable origin of electricity

- How to prove compliance with the EU's RFNBO criteria
- Tracking renewable attributes across different conversion stages (esp. power to gas)
  - Interaction between the Ukraine's electricity GO system and RFNBO certification
  - Interaction between electricity and hydrogen GO registries
- Interaction between registries for different energy carriers (electricity, biomethane, hydrogen)
- Data quality validation
- National disclosure rules for green electricity supply

Key building blocks of a hydrogen tracking system

- Scope and system boundaries
- Governance Structures
- Mutual recognition of certification systems in import and export countries
- Multi-purpose certification system design (PoS and GOs)
- Chain of custody
- Transport modes and conversion
- Attributes (information on GOs and PoS)
- Data quality validation
- RFNBO registry implementation options and role of the Union Database
- Gas disclosure rules
- Interactions with tracking systems in importing countries and climate accounting

EU REQUIREMENTS FOR RENEWABLE ELECTRICITY IN RFNBO PRODUCTION

For electricity to qualify as **fully renewable** (RFNBO), it must follow one of five approved input scenarios:

Scenario 1:

Electricity from direct connection.

Scenario 2:

Electricity from a grid with a renewable energy share exceeding 90%.

Scenario 3:

Electricity from a grid with an emission intensity lower than 18gCO_2eq/MJ with further requirements.

Scenario 4:

Electricity from the grid during an imbalance settlement period.

Scenario 5:

Electricity from the grid with further requirements (regarding additionality, temporal and geographical correlation).

Key scenarios for Ukraine: Scenario 1 and 5 are (currently) the most feasible options for domestic hydrogen production under current grid set-up and regulatory context

→ Compliance is verified through voluntary schemes, either directly in connection with the EU‘s Union Database (UDB) or with a national RFNBO registry

THE ROLE OF VOLUNTARY SCHEMES

- **Compliance with the RFNBO requirements** can be demonstrated by the use of recognised national or international voluntary schemes: Issuance of **Proof of Sustainability (PoS)** as formal confirmation
- Independent organizations provide and supervise **voluntary schemes**: they certify compliance with certain regulatory requirements, in cooperation with **auditors**
- **Formal recognition by the European Commission** as voluntary scheme for RFNBO is recommended (but not a pre-requisite for certification)
  - This currently applies to: CertifHy EU RFNBO Scheme, ISCC EU Scheme and REDcert-EU Scheme
- Voluntary schemes define **principles for RFNBO production** (e.g. rules for electricity input, GHG emission calculation methodology, traceability requirements)
- As part of compliance with RFNBO requirements, **voluntary schemes require cancellation of electricity GOs** to avoid double-counting renewable energy

RFNBO CRITERIA AND IMPLEMENTATION CHALLENGES

RFNBO criteria for grid-sourced renewable electricity (RE)

- **Additionality:** either RFNBO producer owns RE plant or has concluded a Power Purchase Agreement (PPA); RE plant must not receive operating or investment aid (with some exemptions); the RE plant must be commissioned or repowered < 36 months before the RFNBO plant. Applies for RFNBO plants going into operation from 2028 onwards.
- **Temporal correlation:** monthly correlation between RE consumption and RFNBO production until 2030, hourly from 2030
- **Geographical correlation:** RE plant and RFNBO plant must be located in the same bidding zone or a connected offshore bidding zone; in case of interconnected bidding zones, electricity price differentials between markets must indicate that the potential for grid congestion is low
- **Review announced** for June 2026 (AccelerateEU action plan)

Special challenges for Ukraine:

- **War-related damage to electricity infrastructure** disrupts reliable generation and transmission of RE
- **High geopolitical risk** discourages investors and blocks financing for expansion of renewable energy capacities
- **As a result:** despite promising potential for RE, the electricity mix is currently still largely determined by fossil energy sources
- Meeting the EU RFNBO criteria requires **well-developed institutional capacities** to implement complex requirements (e.g. PPA market, realisation of unsupported RE plants)
- **Lack of regulatory framework** on hydrogen further complicates the process of proving compliance with RFNBO criteria
- **Non-EU status** adds additional barriers: limited market access, challenges regarding mutual recognition and cross-border trade

IMPLICATIONS FOR RFNBO REGISTRY IMPLEMENTATION IN UKRAINE

There are several options available to Ukraine for demonstrating and verifying compliance with the RFNBO criteria:

Option 1: Establish a national RFNBO registry

- Independent national registry for RFNBO similar to Germany‘s model (37th BImSchV, implementation ongoing)
- Enables recording, tracking & documentation of the origin and use of electricity from renewable sources
- Provide the necessary interfaces to certification bodies and the EU‘s Union Database (UDB)
- Allows combining PoS (target accounting) + GOs (disclosure to end consumers) in one registry → reduces administrative costs and helps to avoid double counting

Option 2: Integrate RFNBO into existing national registries

- Integrate verification of RFNBO criteria into existing national registries
- Expand the scope of electricity GO registry (operated by NEURC) to include RFNBO
- Extend the biomethane registry (operated by SAEES) to cover RFNBO verification
- Makes use of synergies with existing structures and reduces administrative efforts

Option 3: Direct use of the Union Database (UDB)

- No national RFNBO registry
- Handle certification & verification entirely through the UDB (once fully operational) and international voluntary certification schemes
- EU Commission supports opening up the UDB to Ukraine, registration for biomethane economic operators already ongoing
- Attractive option for exports to the EU internal market

OVERVIEW OF THE FUTURE UKRAINIAN REGISTRY LANDSCAPE FOR RENEWABLE ENERGIES

Electricity GO registry (NEURC)

Issuance & Purpose

- **Guarantees of origin (GO)** for electricity from RES for disclosure purposes

Chain of custody

- **Book & claim**
  - no coupling of attribute and energy commodity sales necessary
  - exports beyond Ukraine depend on mutual recognition

Hydrogen registry (tbd)

Issuance & Purpose *(recommendation)*

- **Guarantees of origin (GO)** issuance for green hydrogen for disclosure purposes (incl. bio-based hydrogen production)
- **Proof of Sustainability (PoS)** tracking for RFNBO for target accounting purposes

Chain of custody

- **Book & claim** for disclosure purposes
- **Mass balancing** for target accounting
- Recommendation: **Linkage of GO and PoS in "multi-purpose certificate"**
  - Prevents GOs and PoS for the same hydrogen quantity from being traded independently, to avoid double counting
  - Mass balancing chain of custody has to be kept for GO and linked PoS to enable RFNBO quantity to count towards targets

Biomethane registry (SAEES)

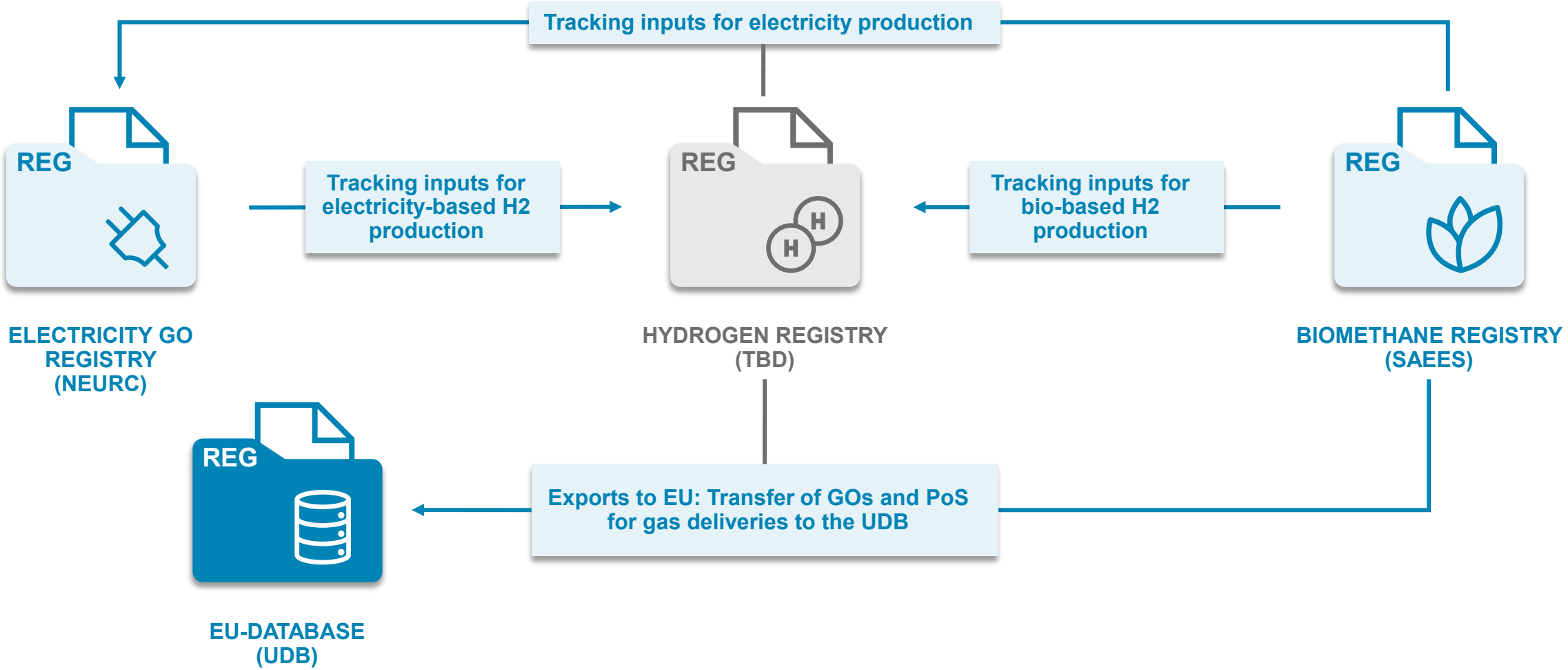
Issuance & Purpose

- **Guarantees of origin (GO)** issuance for disclosure purposes
- **Proof of Sustainability (PoS)** tracking for target accounting purposes
- PoS information used as a **basis for biomethane GO issuance**: producers must be audited under an international voluntary certification scheme concerning sustainability criteria to register in the Biomethane Registry

Chain of custody

- **Book & claim** for disclosure purposes
- **Mass balancing** for target accounting

COORDINATION NEEDS IN THE FUTURE UKRAINIAN REGISTRY LANDSCAPE FOR RENEWABLE ENERGIES



ROLE OF ELECTRICITY GOS IN RFNBO CERTIFICATION

Status quo: Cancellation of electricity GOs to avoid double counting

- **Voluntary certification schemes require GO cancellation** as proof of renewable electricity (RE) inputs, if electricity GO system exists

Potential: Using information on GOs to reduce administrative burden of RFNBO criteria verification

Already possible based on mandatory information on GOs
(according to EN 16325, EECS rules):

- **Additionality:** operation dates of RE installations and RFNBO installations; information on investment and/or production support for RE generation
- **Temporal correlation:** production month of electricity and RFNBO
- **Geographical correlation:** location of RE installations and RFNBO installations

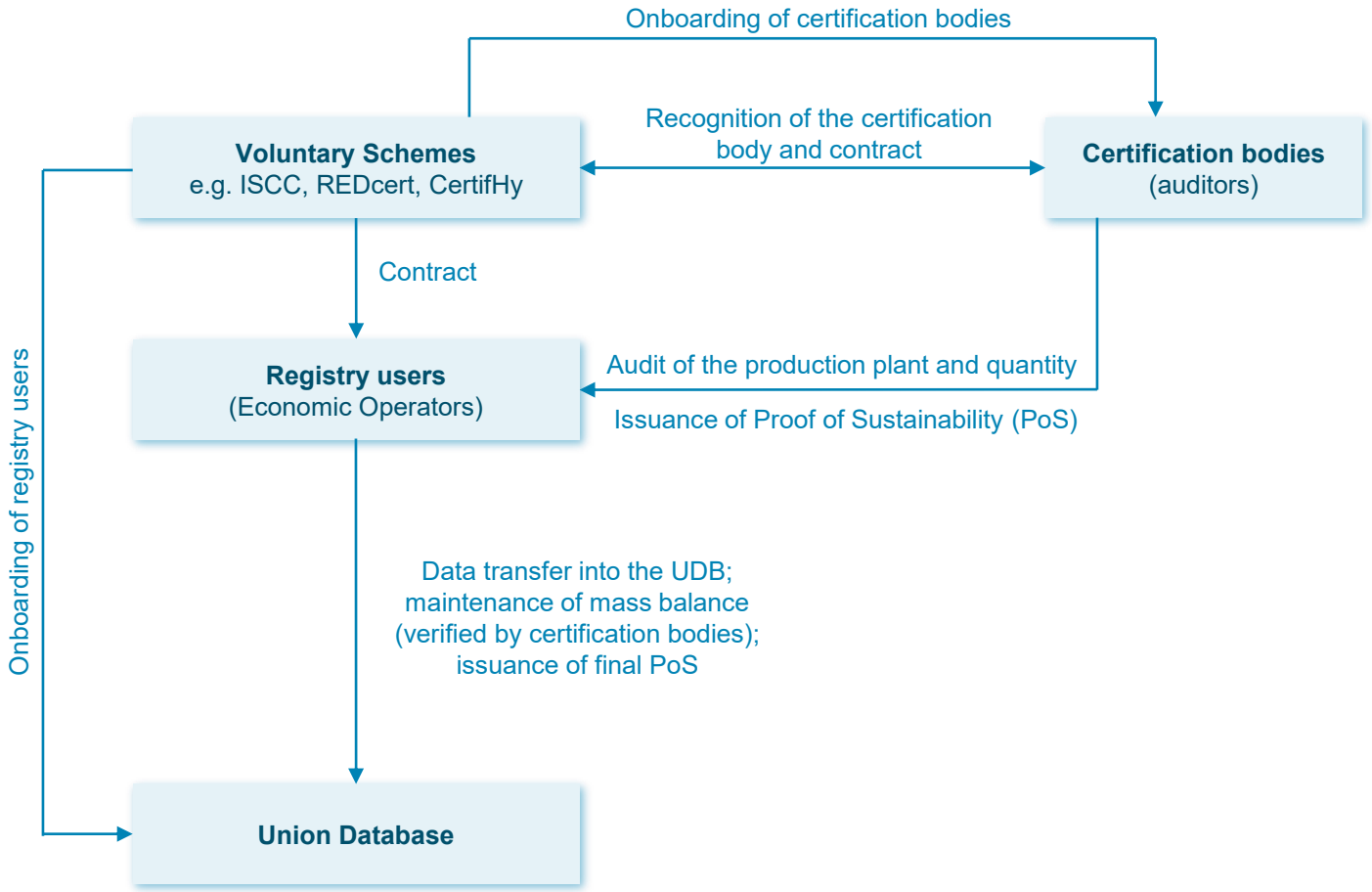
Possible based on optional information on GOs
(according to EECS rules, partly EN 16325):

- **Additionality:** Information on existence of PPA or ownership of RE and RFNBO plants
- **Temporal correlation:** production hour of electricity and RFNBO; inclusion of storage processes
- **Geographical correlation:** bidding zone of RE installations and RFNBO installations

Costs of electricity registry adjustments need to be weighed against **benefits of simplified RFNBO certification**:

- **Avoidance of double counting has priority**: registry should support timely electricity GO cancellation for inputs into RFNBO production
- Further development of electricity GO registry offers **optimisation potential in the longer run**

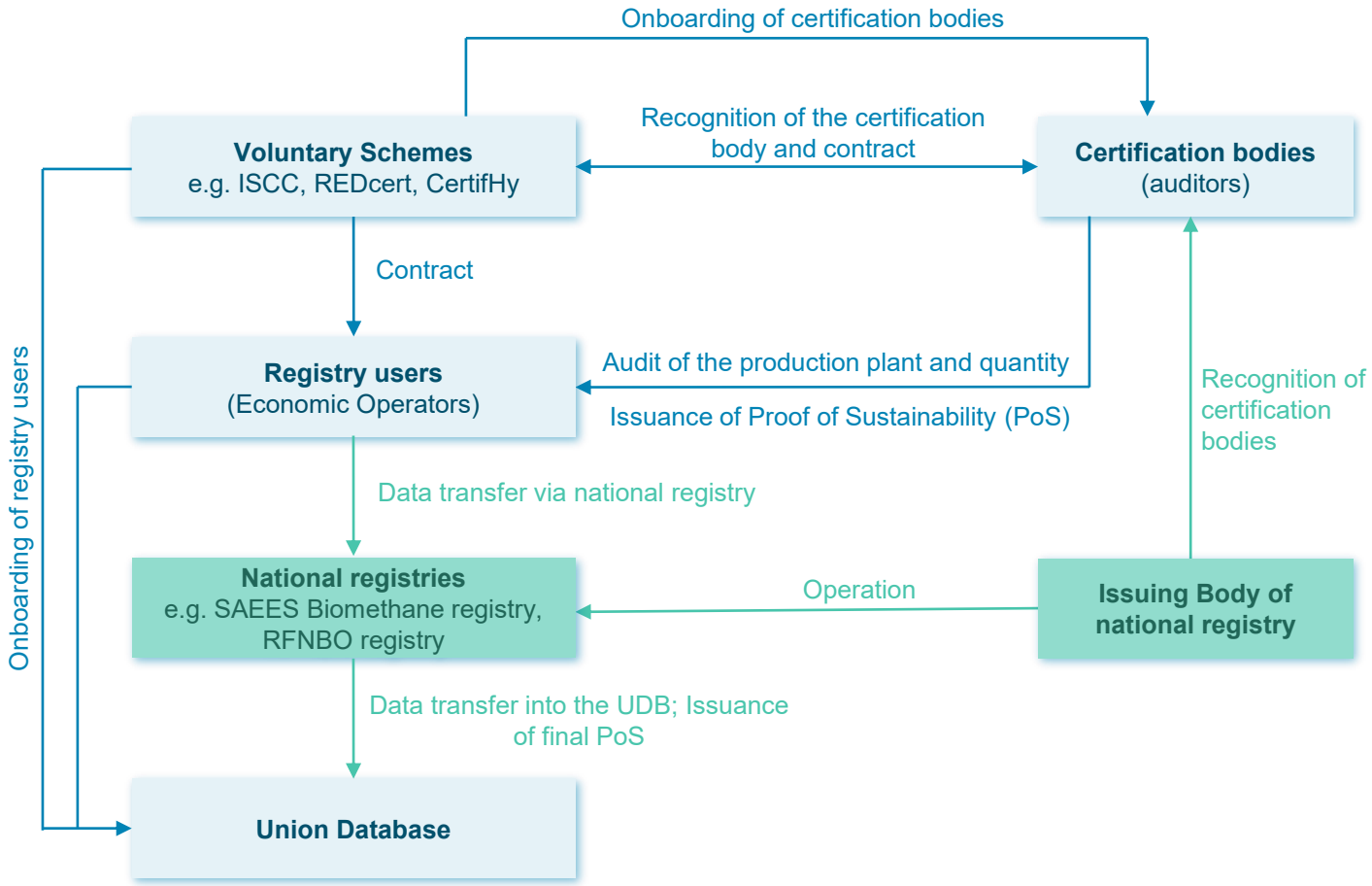
DIRECT USE OF THE UNION DATABASE (IMPLEMENTATION OPTION 3)



Source: own depiction, Hamburg Institut

- UDB records data on **transactions, sustainability characteristics, and GHG emissions** of fuels
- **Onboarding of economic operators** via voluntary schemes is ongoing (incl. from Ukraine for biomethane), but overall UDB tracking system is **not yet fully operational**
- **Chances of direct UDB use**: High compatibility of exports with EU regulation; can be implemented short-term with EU registry infrastructure (once UDB is fully operational) → low implementation costs
- **Limits of direct UDB use:** no coverage of domestic RFNBO use and exports to non-EU-regions; limited data sovereignty
- **Methodology for mass-balancing** of grid deliveries from non-EU countries needs to be further developed; recognition of Ukrainian grid-based mass balancing should be pursued in cooperation with voluntary certification schemes

NATIONAL RFNBO REGISTRY WITH UDB INTERFACE (IMPLEMENTATION OPTIONS 1 AND 2)



Source: own depiction, Hamburg Institut

- National registry records data on **transactions, sustainability characteristics, and GHG emissions** of fuels and transfers data to the UDB
- Verification in cooperation with **voluntary schemes**, as with UDB
- Requires **technical interface** of national registry with UDB: PoS and GOs associated with exports into the EU need to be transferred into UDB
- **Chances of national registry:** covers domestic use and exports to any region; better overview for national authorities of production and transaction data; direct oversight of verification processes
- **Challenges of national registry:** adds layer of complexity; close coordination with UDB required to exclude double counting; implementation in EU ongoing, few "good practices" available yet

RECOMMENDATION FOR IMPLEMENTING A GREEN HYDROGEN TRACKING SYSTEM IN UKRAINE

Short Term

Focus: Enable EU exports and start with pilot projects

- ✓ Prioritise direct use of the Union Database (UDB) as a transitional solution
- ✓ Cooperate with voluntary certification schemes to issue PoS
- ✓ Develop legal framework for hydrogen certification and disclosure (PoS/GOs)
- ✓ Coordinate between NEURC, SAEES and relevant ministries on responsibility for national hydrogen registry
- ✓ Gather practical experience while EU regulatory framework consolidates; capacity build-up and training

Medium to Long Term

Focus: Build-up of a national hydrogen registry

- ✓ Integrate PoS + hydrogen GOs into one multi-purpose certificate registry with interface to the UDB
- ✓ Enable national target accounting + disclosure of domestically used green hydrogen
- ✓ Leverage existing electricity GO registry or biomethane registry as starting point
- ✓ Further develop electricity GO registry to support conversion and efficient RFNBO verification

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EXTENDED SUSTAINABILITY CRITERIA FOR RENEWABLE HYDROGEN IN UKRAINE

20.05.2026 | Timo Hoelzmann | Conference session
“Recommendations for green hydrogen certification in Ukraine”

EU-REGULATION AND THE ROLE OF EXTENDED SUSTAINABILITY CRITERIA

EU regulation sets binding sustainability requirements for green hydrogen:

- Focus on renewable/low-carbon origin
- GHG emissions thresholds

→ EU compliance is essential for Ukraine to access the European market

Voluntary certification systems and standard initiatives go beyond EU requirements and formulate broader sustainability requirements

- Broader criteria foster positive outcomes such as reduced ecological footprints, improved social welfare, and strengthened local economies
- By voluntarily implementing such broader standards, producers can demonstrate a commitment to holistic sustainability

The following overview of existing extended sustainability criteria is based on a comparative assessment of different certification systems, sustainability standards and market mechanisms:

- *„ISCC 202 Sustainability Requirements“* issued by ISCC
- *„TÜV SÜD Standard CMS 70 Production of Green Hydrogen and Hydrogen Derivates“* issued by TÜV SÜD
- *„TN-H2 001 Criteria Catalogue for testing the production, transport and storage properties of hydrogen, hydrogen derivates and industrial gases“* issued by TÜV NORD CERT
- *„RSB Principles & Criteria“* issued by the Roundtable on Sustainable Biomaterials Association (RSB)
- *„Green Hydrogen Standard 2.0“* issued by the Green Hydrogen Organisation (GH2)
- *„Annex 9.1a Additional Sustainability Requirements“* as a part of a Hydrogen Purchase Agreement within the H2Global mechanism implemented by the H2Global Foundation and Hintco

OVERVIEW OF EXTENDED SUSTAINABILITY CRITERIA

Extended sustainability criteria are derived from selected standards and structured along four key dimensions:

- Biodiversity
- Water use
- Protection of soil and air
- Energy efficiency and waste management

Environmental Aspects

Social Aspects

- Labor standards and rights
- Land use rights
- Further human rights

- Economic viability and good management practices
- Local economic development

Economic Aspects

Governance Aspects

- Stakeholder engagement and complaint mechanisms
- Transparency, accountability, and anti-corruption

Central question: Which of these extended sustainability criteria should be prioritized when setting up a certification system for green hydrogen in Ukraine?

PRIORITIZATION OF EXTENDED SUSTAINABILITY CRITERIA

- Decision matrix: Use of a three-dimensional matrix to proritize extended sustainability criteria for the Ukrainian certification system beyond EU RFNBO requirements
- Scoring and evaluation: scoring from 1-10 across three dimensions

Dimension 1: Frequency of criteria across standards

Evaluation approach:
Analyzes the presence of criteria across relevant standards, initiatives, and mechanisms

Key findings:

- ***Score 10:*** *Water use* (universally covered)
- **Score 8 e.g.:** *Biodiversity; Energy efficiency and waste management; Land use rigths*

Dimension 2: Average ratings of workshop participants

Evaluation approach:
Average ratings of participants from polling during a project workshop that focused on relevance of extended sustainability criteria in the Ukrainian context

Key findings:

- **Score 9.2:** *Transparency, Accountability, and Anti-corruption*
- ***Score 7.0 – 8.0 e.g.:*** *Economic viability and good mangement practices; Local economic development; Water use; Energy efficiency and waste management; Land use rights*

Dimension 3: Local expert perspective by Institute of Renewable Energy (IRE)

Evaluation approach:
IRE assessment on the relevance of extended sustainability criteria in the Ukrainian context

Key findings:

- **Score 10:** *Local economic development; Land use rights; Transparency, accountability & anti-corruption*
- **Score 9:** *Water use; Economic viability and good management practices*

DECISION MATRIX: OVERVIEW OF RESULTS

Extended sustainability criteria	Representation in standards	Workshop participants	IRE evaluation	Arithmetic mean
Economic viability and good management practices	8	8.4	9	8.5
Local economic development	4	8.6	10	7.5
Biodiversity	8	6.7	7	7.2
Water use	10	8.2	9	9.1
Protection of soil and air	6	7.7	8	7.2
Energy efficiency and waste management	8	8.4	6	7.5
Labor standards and rights	8	7.5	7	7.5
Land use rights	8	7.2	10	8.4
Further human rights	6	6.3	5	5.8
Stakeholder engagement and complaint mechanisms	4	7.9	6	6.0
Transparency, accountability, and anti-corruption	4	9.2	10	7.7

RECOMMENDATIONS FOR UKRAINE REGARDING INTEGRATION OF EXTENDED SUSTAINABILITY CRITERIA INTO CERTIFICATION SYSTEM

Recommendation: **phased integration** of extended sustainability to not burden the market ramp-up, with three sustainability criteria to be prioritized

Water use

- Established as central pillar throughout all international standards and certification systems
- Highly relevant in the Ukrainian context: challenge of securing reliable water supply becomes more pressing each year
- Selection of sites for green hydrogen must be based on assessing the availability of water resources for each individual project
- Recommendation: introduce as mandatory requirement an examination of the consequences of the use of water resources (as part of an Environmental Impact Assessment or individual section of the project documentation)

Land use rights

- Consistently high scores within all three dimensions of decision matrix
- Highly relevant in the Ukrainian context: as a result of military actions, many agricultural land has been degraded and polluted
- When choosing production sites for green hydrogen, it is necessary to consider the interests of agricultural production
- Recommendation: introduce as mandatory requirement an examination of the consequences of the use of land resources (as part of the Environmental Impact Assessment or a separate section of the land management documentation)

Transparency, accountability, and anti-corruption

- Highest score from workshop participants with regard to Ukrainian context
- Development of hydrogen market will require large-scale investments
- Accountability and anti-corruption standards will ensure long-term sustainability of such development
- A few problem cases could derail the entire system and be very damaging to hydrogen exports from Ukraine
- Recommendation: Integration of transparency, accountability and anti-corruption as a criteria within the Ukrainian hydrogen certification should be prioritized

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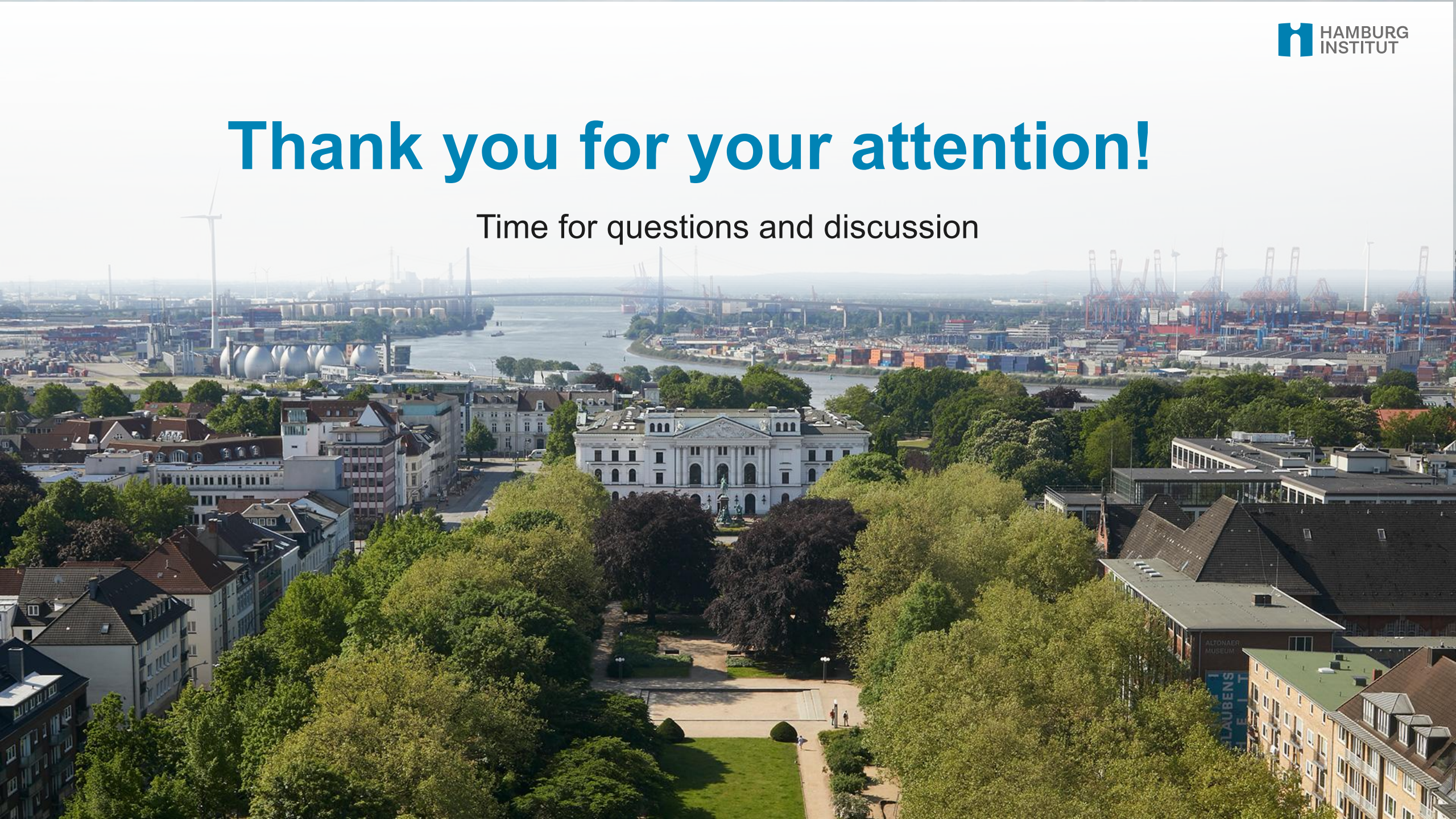
Thank you for your attention!

Time for questions and discussion



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