Green Hydrogen Organisation

HHP Law Firm

Indonesia Good Green Hydrogen Contracting and Legislation for People and the Planet

PRINCIPLES AND POLICY IMPLEMENTATION OPTIONS ON CERTIFICATION AND CATEGORISATION

March 2025

About the Green Hydrogen Organisation (GH2)

The Green Hydrogen Organisation (GH2) is a not profit foundation under Swiss law.

The mission of GH2 is to dramatically accelerate the production and utilisation of green hydrogen across a range of sectors globally. It will push to rapidly decarbonise industries like steel, cement, fertilisers, shipping and aviation that have so far made limited progress reducing their emissions.

GH2 welcomes comments and feedback on the guidance to be sent to Rifan Bachtiar (rifan.bachtiar@gh2.org).

Acknowledgement

This guidance is part of a series of four guidebooks developed under the Indonesia Good Green Hydrogen Contracting and Legislation for People and the Planet initiative. Its purpose is to provide essential guidance to the Indonesian government in streamlining contracting practices, making them more robust, efficient, and cost-effective. Furthermore, the project aims to support project developers and local communities in achieving equitable agreements while maximizing the development potential of green hydrogen projects.

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INDONESIA GREEN HYDROGEN CONTRACTING AND LEGISLATION – PRINCIPLES AND POLICY IMPLEMENTATION OPTIONS ON CERTIFICATION AND CATEGORIZATION OF HYDROGEN WITH SPECIFIC CRITERIA BASED ON EMISSION LEVELS, SOURCES AND PRODUCTION PROCESSES

1. Introduction

Hydrogen is emerging as a potential low-carbon energy carrier as an alternative to fossil fuels. Hydrogen also plays a role in reducing carbon emissions in several sectors. As Indonesia is currently aiming to achieve its Nationally Determined Contributions, it needs to develop potential clean energy sources, including hydrogen. The quality of hydrogen is determined by standards, certification and categorization processes.

While categorization serves as a basis for regulators to determine the types of hydrogen they seek to produce, incentivize or import, certification serves to demonstrate adherence to regulatory requirements and potential incentives within national or legislative frameworks related to hydrogen and its derivatives. Accordingly, both certification and categorization of hydrogen are crucial to enhance the growth of the hydrogen economy, to ensure that hydrogen is produced and utilized in a manner that meets safety, quality and environmental standards.

Even though there are some existing national classifications and certifications, there is growing criticism that the existing classifications overlook the entire value chain when calculating carbon footprint as they only concentrate on the method of hydrogen production. Therefore, in developing the categorization and certification scheme for hydrogen, relevant best practices and their applicability need to be taken into account.

With respect to certification, key points to be considered include: (i) clarity on what is being certified; (ii) measures to avoid double counting; (iii) transparency and adaptability of scheme; and (iv) the openness for mutual recognition. While for categorization, the key three main points to be further discussed are how categorization can (i) accommodate the entire value chain of the hydrogen, (ii) align with international standards and (iii) be flexible enough to adapt to technological developments.

Hydrogen certification and categorization play pivotal roles in the development and development of hydrogen as a clean energy source. By establishing a robust certification and categorization legal framework, stakeholders can drive the production and adoption of hydrogen as a sustainable and reliable energy solution.

2. Certification vs. Categorization of Hydrogen: Key Differences

Certification and categorization are commonly considered as the same thing. However, both are essentially different, as illustrated in the table below.

	Standards	Certification	Categorization
Definition	Criteria and standards on quality and safety of hydrogen	A formal verification process to assess and validate the hydrogen against certain standards and criteria to ensure the hydrogen meets the quality, safety and environmental standards	A classification of hydrogen based on its production methods, purity levels or origins
Purpose	• To set out the quality, safety and environmental standards for certification purpose	• To provide an endorsement that hydrogen meets the quality, safety and environmental standards • To assure stakeholders that the produced hydrogen complies with the regulatory benchmark	• To label hydrogen into distinct groups • To be able to trace the production process and the environmental footprint based on the labelling • To be able to compare different hydrogen types for various uses and applications
Output	Foundation to differentiate categories	A hydrogen certificate issued by a certification body	Labels for each type of hydrogen
Applicability	Standards are used as the basis for certification	Certification usually becomes part of the requirements of a supply or offtake contract and is subject to mutual recognition.	The label must provide the information on GHG footprint and may include other relevant parameters, such as, for example, the origin of the hydrogen (e.g. whether gas, or renewable energy).
Example	ISO/TS 19870:2023	CertifHy, TÜV SÜD	• Color classification (e.g., green hydrogen, blue

			hydrogen, black hydrogen)[1] ● Production-based classification (e.g., renewable hydrogen, clean hydrogen, fossil-based hydrogen) ● Carbon intensity (e.g., high-carbon hydrogen, low-carbon hydrogen)

Why is certification needed?

Hydrogen certification is needed to prove and verify that hydrogen was produced in a sustainable way. It demonstrates that there has been adherence to regulatory requirements and, potentially, compliance with national or legislative incentives frameworks related to hydrogen and its derivatives, as regulators may utilize certification as a requirement for market participants to access any such incentives.

Additionally, certification may also be a tool to show compliance with voluntary reporting and disclosure obligations. For example, market participants may use certificates for voluntary disclosure to support the project's bankability. In a contractual relationship, for example in a supply or offtake agreement, a hydrogen certificate constitutes evidence of standardized and sustainably-produced hydrogen as a clean energy source.

Similar with carbon credits, hydrogen certificates can also be traded. Non-hydrogen users/consumers may buy these hydrogen certificates and claim that they have supported green hydrogen production by purchasing such certificates.

For a proper hydrogen certificate to be issued, the hydrogen would need to be tested, inspected and verified by an accredited organization. Once a hydrogen certificate is duly issued by an accredited organization, it can be used as evidence to demonstrate compliance with clean energy standards or regulatory benchmarks.

While Indonesia does not have any mandatory certification body yet, there are several voluntary certification bodies across the world that carry out this function. Several examples of certification bodies are as follows.

- **CertifHy**

  CertifHy has developed a hydrogen certification scheme which addresses consumer disclosure (from well to gate) and compliance with the EU's Renewable Energy Directive ("**RED**") II[2] targets (from well to wheel) to provide transparent information about the origin and environmental attributes of hydrogen.

[1] See page 6 for a definition of these various categorizations.

[2] The RED is the legal framework for the development of clean energy across all sectors of the EU economy, supporting cooperation between EU countries towards this goal. The RED I entered into force

There are two types of certification system provided by CertifHy: (i) CertifHy Non-Government Certificate (NGC) Scheme and (ii) CertifHy European Union Renewable Fuels of Non-Biological Origin (EU RFNBO). CertifHy covers the European Union plus the European Economic Area plus Switzerland.

Additionally, CertifHy categorizes hydrogen based on its carbon intensity into two types: (i) green hydrogen, which is produced from renewable energy sources like wind and solar, and (ii) low carbon hydrogen, which is generated from non-renewable low carbon energy sources such as nuclear power and fossil fuels with carbon capture and storage.

- **TÜV SÜD**

  Similar with CertifHy, TÜV SÜD also provides green hydrogen certification. To be certified by TÜV SÜD, the hydrogen must meet the certificate holder requirements and basic requirements. Certificate holder requirements include applicable terms and required documents for the certificate holder as set out in the TÜV SÜD Standard.[3] Basic requirements are national regulations existing in the respective country or association of countries. If the national regulation is unavailable, the TÜV SÜD will apply a standard which is based on European legislation and several ISOs.

- **The Green Hydrogen Standard**

  The Green Hydrogen Standard[4] is a voluntary standard that establishes a global definition of green hydrogen. Green hydrogen is hydrogen produced through the electrolysis of water with 100% or near 100% renewable energy with close to zero greenhouse gas emissions. The environmental, social, and governance impacts of green hydrogen production must be comprehensively assessed. Additionally, the potential development opportunities and effects of producing and using green hydrogen must be fully taken into account. Projects that comply with the Green Hydrogen Standard will be authorized to use the "GH2 Green Hydrogen" label and will be eligible to acquire and trade GH2 certificates of origin for green hydrogen and its derivatives, such as green ammonia..

- **ISO/TS 19870:2023**

  The ISO does not set a specific threshold for classifying hydrogen as "clean", "sustainable" or "low carbon" and only generate a global standard of hydrogen certification. This standard includes a life-cycle analysis covering the production, treatment and transport of hydrogen to the consumption gate which can be used by any country for their certification scheme.

  Specific certification schemes adopted by a certification body or a country might not be appropriate for other countries. For example, some people argue that Australia should adopt a modified version of an existing certification scheme, such as the EU's CertifHy scheme. However, the Australian Government has said that

in December 2018 and was revised by the RED II in 2023. The RED II entered into force on 20 November 2023.

[3] See the following link for reference: TÜV SÜD Standard CMS 70.

[4] https://greenhydrogenstandard.org/

the CertifHy scheme is not appropriate for Australian certification requirements as it was developed to allow comparison between lifecycle emissions from hydrogen and other alternative transport fuels, but was not designed to facilitate commodity trade beyond EU member countries.

Therefore, for Indonesia, a further assessment might be needed to establish an appropriate yet robust certification mechanism to ensure consistent development of hydrogen. We suggest that factors to consider should include:

- The degree to which such certification will facilitate in-country development and use of hydrogen (e.g., because it can easily accommodate itself to carbon credit certification schemes, or because it can be used to support the greening of Indonesia's mineral ore down-streaming policies);

- Just as importantly, given Indonesia's ability to generate green hydrogen, to facilitate the export of hydrogen, as a commodity;

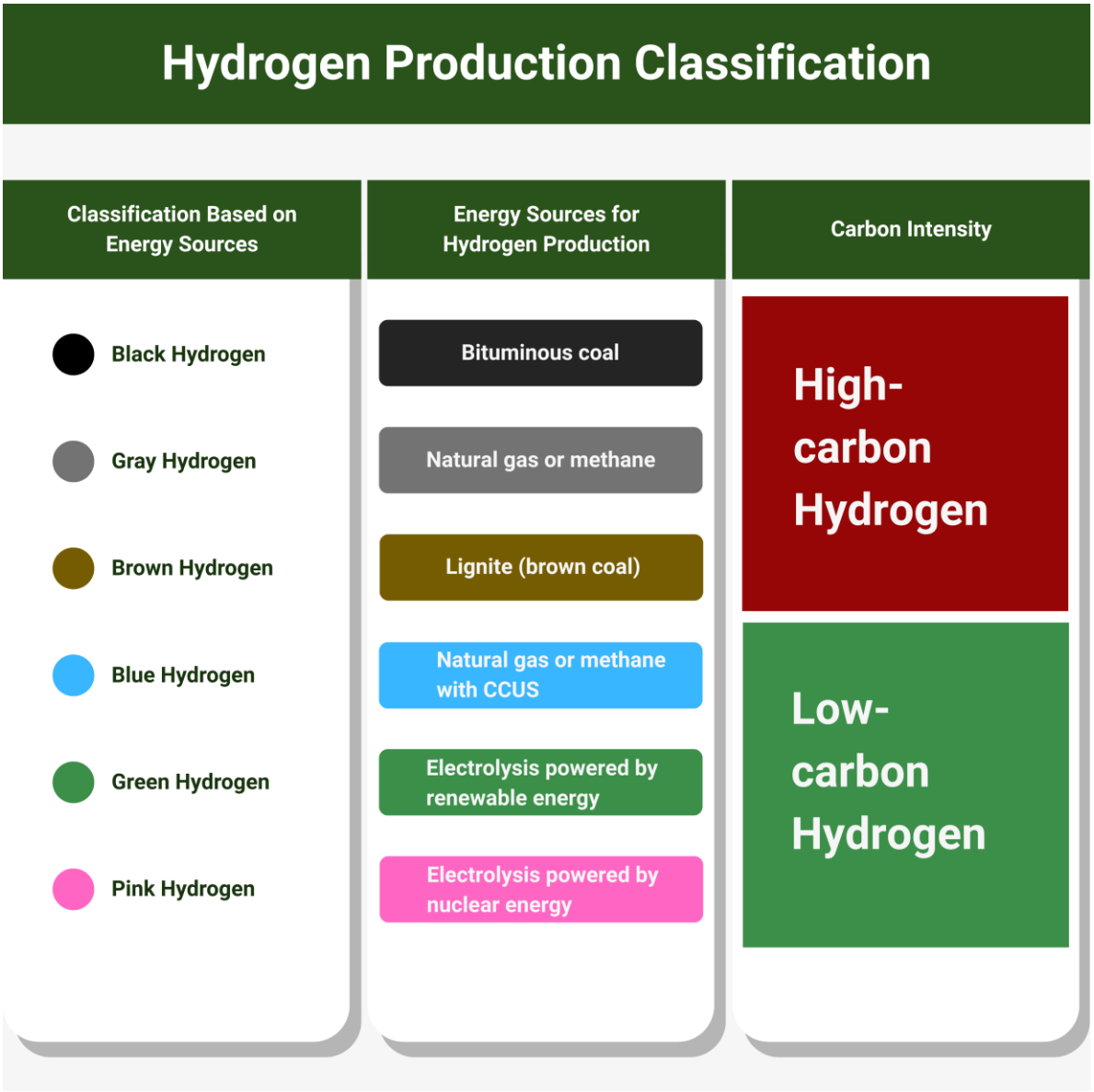
- Indonesia's focus and preference for the categorization of hydrogen.

Why is categorization needed?

Hydrogen must be produced from other energy resources. Therefore, it is considered an energy carrier rather than an energy source. Once produced, hydrogen can be stored, transported or used in other applications.

Physically, hydrogen is a colorless, odorless and clean-burning gas. Therefore, it needs to be classified based on the carbon emission intensity of the full production cycle for different production methods to be able to determine whether the produced hydrogen is high-carbon or low-carbon hydrogen.

The most common classification of hydrogen uses colors based on energy source and carbon intensity.



However, please note that there is no universal standard that defines the different colors of hydrogen.

In light of these points, we believe that adopting a carbon-intensity based classification is the most effective approach for Indonesia to promote the green hydrogen market.

3. Key issues and considerations

To date, there is no internationally established certification and categorization of hydrogen. However, some countries have implemented their own national certification and categorization. In Indonesia, certification and categorization are not yet regulated under the existing regulatory framework. Under Law No. 30 of 2007 on Energy, hydrogen is included only as an example of new energy sources, while new energy sources are defined as energy sources that can be generated by new technologies both from renewable energy sources and non-renewable energy sources. The draft law on new energy and renewable energy reflects the same.

We note that the Directorate General of New Renewable Energy and Energy Conservation of Ministry of Energy and Mineral Resources ("**MEMR**") has released the National Hydrogen Strategy which serves as a guideline for hydrogen development in Indonesia. Through such strategy, the MEMR has acknowledged that a certification scheme needs to be regulated.

Certification

While certification is critical to the development and utilization of hydrogen in Indonesia, it faces several key issues and challenges.

- **Absence of regulatory framework**

  A proper regulatory framework is needed. To date, there is no regulation that governs the certification of hydrogen. Accordingly, Indonesia is unable to trace the amount and quality of the hydrogen produced in Indonesia. Another concern is the need to harmonize the hydrogen certification mechanism with the existing recording mechanism for climate adaptation and mitigation actions governed under the applicable laws and regulations in Indonesia.

  Carbon trading has been regulated under Presidential Regulation No. 98 of 2021 on the implementation of Carbon Economic Value to Achieve Contribution Target Set Nationally and to Control Green House Gases in National Development. To date, the relevant ministry has issued several implementing regulations to accommodate the implementation of carbon trading. Further, the Indonesian Financial Services Authority (Otoritas Jasa Keuangan or "**OJK**") has issued OJK Regulation no. 14 of 2023 on Carbon Trading Through Carbon Exchange and established carbon exchange to further accommodate carbon trading activities.

  In general, carbon trading is a market-based mechanism to reduce Greenhouse Gasses ("**GHG**") emissions through the sale and purchase of carbon units. The same regulation classifies 2 (two) types of carbon trading, being: (a) GHG emission offset and (b) emission trading. Firstly, emissions offset is generally defined as a reduction in GHG emissions that is carried out using the results of mitigation actions from other businesses and/or activities, in order to compensate for the emissions of business actors created elsewhere. Secondly, for emission trading, there is a cap and trade scheme, which applies to businesses and/or activities with a GHG emission upper limit. Each ministry is required to set emissions caps for its respective sectors (*persetujuan teknis batas atas emisi* or PTBAE) and will then issue technical approvals to business actors to comply with those caps (*persetujuan teknis batas atas emisi pelaku usaha* or PTBAE-PU).

  Since the government of Indonesia seeks to categorize hydrogen by emissions intensities, there might be some overlapping issues between the hydrogen certification mechanism and carbon credit mechanism.

- **Harmonization with international standards**

  Aside from establishing a domestic hydrogen certification mechanism, the relevant regulatory framework should also seek to align with international certification processes and standards to facilitate the sale and trade of hydrogen globally.

- **Limited certification knowledge, infrastructure and expertise**

  As Indonesia is still in the early stages of developing hydrogen, it does not yet have sufficient skilled technical experts in this field to be able to implement the certification processes. Further, it needs to develop the infrastructure required to test, verify and certify hydrogen products. The lack of these creates a 'Catch-22' situation: until the production and use of hydrogen in Indonesia develops further, such competencies and infrastructure may be in short supply; until such competencies and infrastructure are developed, the production and use of hydrogen will be delayed.

- **High costs and limited funding and investment**

  Indonesia might need to incur significant expenses unless it chooses to implement an available certification process to establish and maintain a reliable hydrogen certification processes. Query how willing the Government will be to make this a priority.

- **Lack of awareness and readiness**

  Crucial to the development of Indonesia's nascent hydrogen industry is the adoption of robust certification and standards. There is a need to spread awareness and increase training for the stakeholders on the importance, benefits, standards and mechanism of hydrogen certification.

To achieve this, Indonesia will need to work on the following aspects:

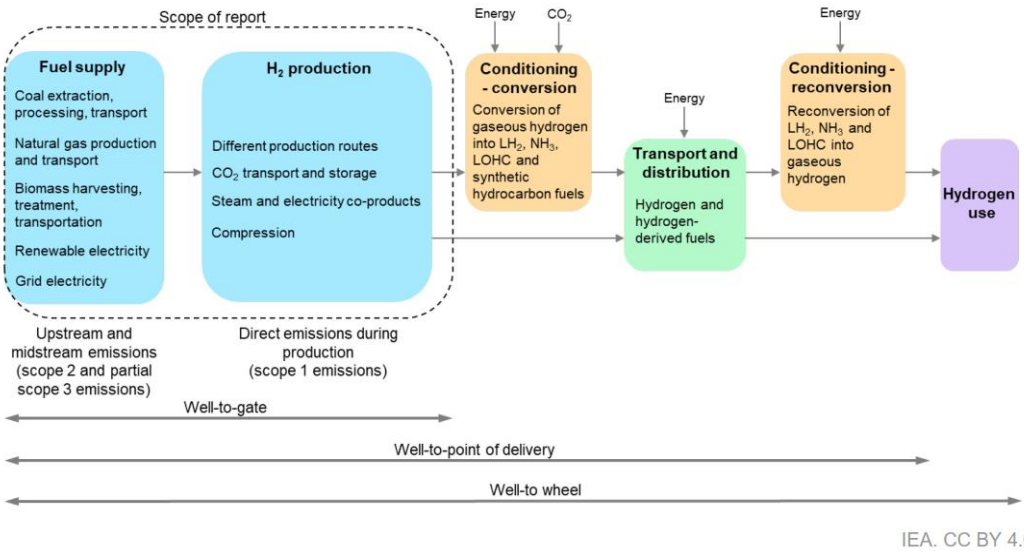
- **Clarity with regard to the certified object**

  As set out above, there is no internationally established classification for hydrogen. Therefore, Indonesia needs to work on criteria and standards for hydrogen certification. These criteria and standards must also align with international standards and norms to support hydrogen producers from Indonesia in the global market.

  To determine the certified object, Indonesia needs to establish definitive criteria for the proposed certification system:

  (a) *System boundaries*

  Based on the existing and upcoming certification systems, there are three supply chain steps that are usually covered - see explanations below and Fig. 1 for further reference.



Notes: LH_2 = liquefied hydrogen; NH_3 = ammonia; LOHC = liquid organic hydrogen carrier.

Source: IEA 2023.

(1) *Well-to-gate*

Certifications following this chain ensure the supply of fuels used in the production process. CertifiHy operates within this well-established system boundary.

(2) *Well-to-point of delivery or well-to-tank*

Certifications following this chain encompass the supply of fuels used in the production process, as well as the transport, potential conversion, and reconversion of hydrogen into other carriers. H2Global employs this system boundary, having regard as well to the transport of emissions to designated delivery points in Europe.

(3) *Well-to-wheel*

Certifications following this chain not only include the supply of fuels used in the production process, transportation, conversion, and reconversion, but also account for emissions associated with the use of hydrogen. This system boundary is part of the definition of renewable hydrogen in the EU RED II.

(b) *Scope*

During the certification process, two types of emissions need to be considered: (i) direct emissions and (ii) indirect emissions, which are linked to the generation of electricity, heating/cooling, or steam purchased for own use. At present, nearly all existing and proposed certifications address both types of emissions.

(c) *Production pathways*

Certification systems might restrict the variety of technologies and fuel options for hydrogen production. For instance, the Green Hydrogen Standard mandates the use of electrolysis with renewable electricity, whereas the French certification scheme, currently in development, does not impose any restrictions on the choice of technology for hydrogen production.

(d) *Chain of custody model*

There are two types of chain of custody models that are commonly used in the existing certifications systems, namely the book-and-claim model and the mass balancing model. Please below our further explanations on each model.

(1) *Identity preserved model*

In this model, materials or products originated from a single source. It does not allow the certified product from a certified site to mix with other certified sources. Accordingly, it requires the tracking of actual molecules of the materials as they move through the supply chain.

(2) *Segregated model*

Segregated model requires the certified product from certified site to be kept separately from non-certified sources. Accordingly, materials from different certified sources can be mixed if they share the same defined standard. However, they cannot be mixed with materials with different characteristics and/or grades.

(3) *Controlled blending model*

In this model, certified and non-certified materials are handled separately in the supply chain until the final manufacturing step, where they are mixed, allows for a known proportion of certified material in the final product.

(4) *Book-and-claim model*

Generally, if the certification system uses the book-and-claim model, the hydrogen certificate may be sold independently from the produced hydrogen.

Under this model, the producer supplies a product that meets specific environmental standards, such as hydrogen with emissions below a certain threshold, to the market. Simultaneously, they record an equivalent amount on a certification system platform. The buyer can eventually obtain a certificate, allowing them to claim that the purchased product meets the environmental criteria. This model provides flexibility and does not require the physical tracking of the product.

(5) *Mass balancing model*

This model aims to monitor the overall quantity of sustainable content throughout the production process and guarantee its proper distribution in the final products. It permits the blending of sustainable and non-sustainable materials. However, the precise amount of sustainable material must be verified and tracked along the supply chain, ensuring that the proportion of sustainable material in the finished product is accurately reflected.

Taking into account the above, Indonesia may choose between the two models to be applied in its national hydrogen certification system. The mass balancing model is applied by EU RED II and CertifHy. Indonesia may also choose to take the same approach as France, where the government provides two types of certificates (i.e., Guarantees of Traceability that apply the book-and-claim model and Guarantees of Origin that apply the mass balancing model) with a note that one batch of hydrogen is not allowed to be certified with both types of certificates.

(e) *Emissions intensity levels*

Some certification systems mandate that the GHG emissions per unit of hydrogen must be below specific thresholds to qualify for a label, whereas others certify the emissions intensity without setting any threshold levels.

(f) *Additional sustainability criteria*

Several certification systems, including TÜV SÜD, have incorporated additional sustainability criteria beyond greenhouse gas emissions. These criteria encompass the energy source used for hydrogen production, land or water usage, and socio-economic factors such as working conditions, living standards, and food security.

- **Mutual recognition to avoid double counting**

Since there are several hydrogen certification schemes across the world, double counting is prone to happen.[5] The risk increases in the implementation of offshore trades. This may be avoided by conducting mutual recognition partnerships with other countries.

- **Transparency of scheme**

To ensure impartiality and consistency in the implementation of the certification scheme, the certification rules must be clear and transparent. The certification body must also demonstrate its competencies and capacities in conducting the certification. For this purpose, it is important that the Government sets standards for the accreditation or recognition of hydrogen certification bodies.

[5]Double counting is relevant in the case that the hydrogen is classified based on the carbon concentration. This will further affect the calculation of the NDC.

- **Adaptability of scheme**

  The development of the hydrogen market is moving rapidly. Therefore, the certification scheme must be able to adapt to new trends / developments, for example other methods of hydrogen production. For this purpose, periodic evaluation of the certification scheme might be required.

- **Incentives and government support**

  Developing hydrogen as a clean energy source is technically challenging and expensive. Without further incentives, stakeholders may focus their attentions on other, more cost and time efficient projects.

Categorization

As set out above, the categorization of hydrogen is important to identify the impact of the production of each type of hydrogen on the environment. Consequently, the categorization serves as a basis for regulators to determine the types of hydrogen they seek to produce, incentivize or import.

For categorization, even though some existing national categorizations are available (e.g., color classification), there is growing criticism that the existing categorizations overlook the entire value chain when calculating carbon footprint as they only concentrate on the method of hydrogen production. There are often other production facilities that cannot be assigned a type of categorization.

Currently, the government of Indonesia is leaning towards a categorization type which takes into account emissions intensity and environmental, social and governance aspects. Therefore, it seems that the hydrogen will only be classified into two categories, i.e., green hydrogen and non-green hydrogen.

In developing the categorization scheme for hydrogen, relevant best practices and their applicability need to be taken into account. Based on the existing practices, below are some key points to be further considered by the regulators.

- **Accommodation of the entire value chain**

  The color classification is deemed to only focus on the method of hydrogen production and not take into account the entire value chain. This is because the color classification only focuses on the source of hydrogen and does not take into account emissions generated from chains other than production (e.g., emissions generated from the transportation of hydrogen). Therefore, in classifying hydrogen, other determining factors must be assessed, such as the GHG emission footprint during the production, conditioning and transportation processes.

- **Alignment with the international standards**

  Even though there is no internationally established categorization of hydrogen, there are several hydrogen classifications developed by public and private sector actors. Therefore, the hydrogen categorization must be developed with reference

to existing classifications to ensure the acceptability of the categorization by the relevant stakeholders.

- **Flexibility of the categorization**

  One of the concerns over the color classification is the inability to accommodate types of hydrogen produced from other production facilities that have not been covered by the existing classifications. Reflecting such concern, the categorization of hydrogen should be able to accommodate new technologies and the different carbon intensities resulting from such new technologies.

Governance of Green Hydrogen Certification

The governance of green hydrogen certification is a complex, multi-stakeholder process involving various players who ensure the credibility, transparency, and functionality of certification schemes. Each stakeholder has a distinct role to play, from setting the rules to implementing and supervising the schemes. IPHE have identified common 10 actors below:

Governments and Legislators
Governments and legislators establish the legal framework and requirements for operating certification schemes, particularly those used for regulatory compliance, such as meeting emission reduction targets or renewable energy quotas. They are also responsible for consumer protection and implementing safeguards to prevent fraud or double counting. As the ultimate authority, they have the power to inspect compliance, impose fines, and take enforcement actions as necessary.

Producers
Producers rely on certification schemes to verify that their hydrogen products meet either voluntary or mandatory sustainability and compliance standards. Certification helps producers demonstrate that their operations align with environmental and regulatory benchmarks.

Traders, Suppliers, and End-Consumers
These stakeholders use certificates for various purposes. For instance, they may disclose information voluntarily to investors, customers, or other stakeholders, showing that the hydrogen product and its associated processes (e.g., production, transportation, and storage) adhere to specific sustainability criteria. Alternatively, certificates may be used to meet mandatory requirements, such as sourcing hydrogen with a low carbon footprint under regulatory frameworks like the EU's Renewable Energy Directive.

Certification Scheme Owners
Certification scheme owners, also referred to as scheme holders, design and oversee the operation of certification schemes. These entities can be public or private organizations. For compliance-focused schemes, governments often play a supervisory role to ensure credibility and accountability.

Certification Bodies (CB) / Conformity Assessment Bodies (CAB)
These independent organizations assess whether a product, facility, or process meets the requirements of a certification scheme. Certification bodies verify compliance with a specific methodology, while conformity assessment bodies

evaluate alignment with voluntary technical standards. Both types of bodies may be governmental or non-governmental and often employ auditors and laboratories to conduct assessments. Their role is critical for ensuring that scheme participants adhere to the prescribed standards, and they must be accredited and approved by the scheme owner to operate under the certification framework.

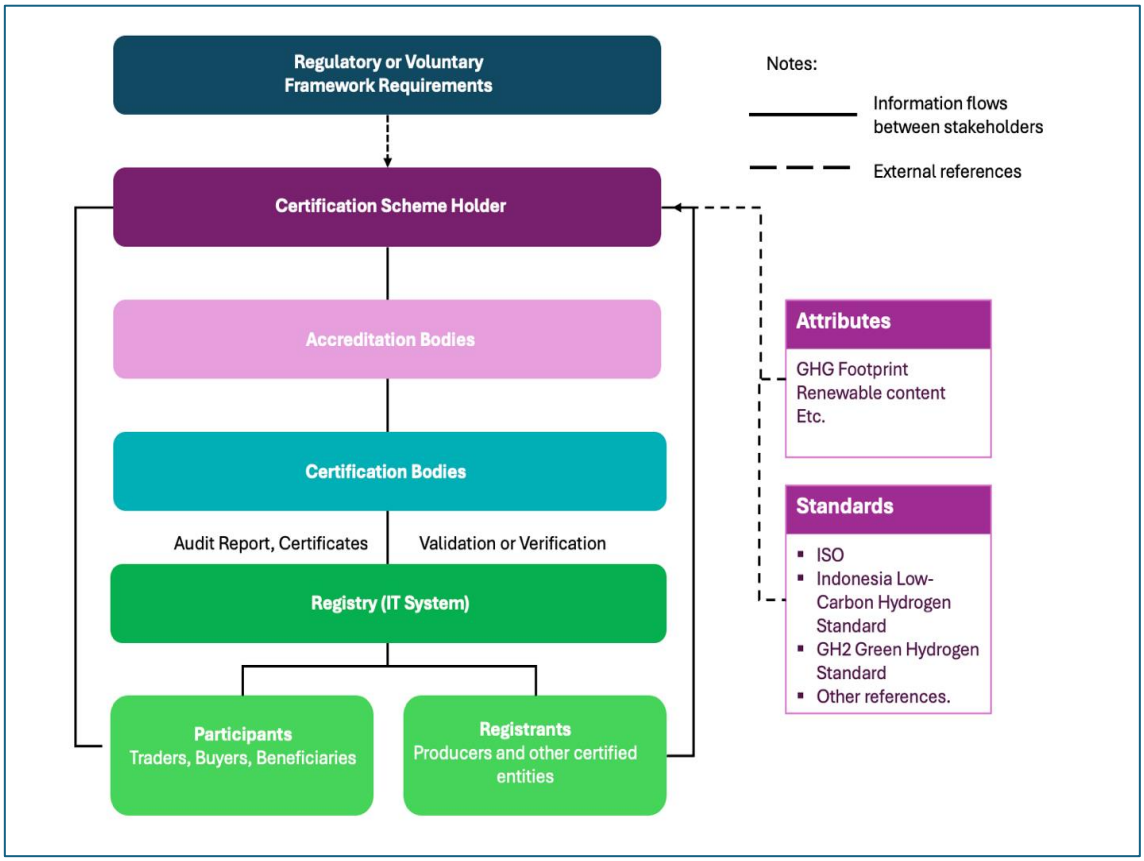
Issuing Bodies
Issuing bodies are responsible for ensuring that certificates accurately reflect compliance with scheme requirements. After validating the information provided through certification bodies, they issue the certificates. In some cases, certification bodies may also function as issuing bodies.

Accreditation Bodies
These entities evaluate and monitor the technical competence, reliability, and independence of certification bodies. Acting in the public interest, they ensure that certification bodies maintain high standards and comply with national and international regulations. National accreditation bodies may also serve as regulatory authorities when authorized by the government.

Scheme Participants
Scheme participants are individuals or organizations that adhere to the requirements and procedures of a certification scheme. While they operate under the scheme, they are not involved in its development or approval processes.

Certification Scheme Registry
A certification scheme registry is a digital platform that records and stores all relevant data on certificates issued under a specific scheme. It also facilitates the tracking and tracing of product movements along the supply chain to ensure compliance with chain-of-custody requirements.

Supervisory Authorities of Certification Schemes
Supervisory authorities oversee the operation of certification schemes, ensuring that they meet imposed requirements and hold certification bodies accountable for any non-compliance. Their primary aim is to uphold the credibility and trustworthiness of certification schemes and the overall system through continuous monitoring and enforcement.



Governance of a Certification Process (Source: IPHE 2024, modified)

4. Comparison of practices and trends

- **South Korea**

In South Korea, the Minister of Trade, Industry and Energy ("**MTIE**") may certify hydrogen or hydrogen compounds meeting the certification standards prescribed by the Enforcement Decree of the Hydrogen Economy Promotion Hydrogen Safety Management Act ("**Presidential Decree**"), such as carbon dioxide emissions emitted in the course of production, importation, etc., as clean hydrogen by grade. Several key points from South Korea's regulatory framework are as follows:

(a) The MTIE may designate an institution, an organization, or a corporation related to hydrogen business which meets the standards prescribed by Presidential Decree, such as facilities necessary for certification, as a clean hydrogen certification agency.

(b) The MTIE may provide administrative or financial support to persons who produce or use clean hydrogen. In such cases, such support may be provided differentially based on each grade of clean hydrogen.

(c) The MTIE may revoke the certification or order the producer or importer not to use a certification mark or to make an improvement within a reasonable period of time in the following cases:

(i) where the producer of importer obtains certification by fraud or other improper means;
(ii) where clean hydrogen ceases to meet the certification standards;
(iii) where a person who engages in the business of the production, importation, etc. of clean hydrogen fails to commence such business activities within a year of obtaining such certification or fails to perform such business activities for at least twelve consecutive months, without good cause;
(iv) where the producer or importer refuses, obstructs, or evades an inspection;
(v) where the producer or importer fails to file a report on the sale and use of clean hydrogen;
(vi) where the producer or importer who is issued an order not to use a certification mark or who is required to implement improvements relating to subparagraphs (ii) through (v) fails to comply with such order.

Based on the Presidential Decree, the certification standards are defined as the certification standards publicly notified by the MTIE in consultation with the heads of the relevant central administrative agencies in relation to carbon dioxide emissions, etc. emitted directly or indirectly, not only from extracting raw materials, but also from producing or importing hydrogen or hydrogen compounds (including domestic and international transport processes), based on the existence or non-existence of greenhouse gases and their emissions. In such cases, the MTIE may take into account the methods of producing clean hydrogen, technologies, etc. applicable to such production.

Until the date of this report, the MTIE has not published the official notification regarding the certification standards. From the publicly information, the standards are expected to be issued this year.

The proposed notification applies the "4kgCO2eq/kgH2"[6] greenhouse gas emissions standard for clean hydrogen based on the actual amount of greenhouse gas emissions as follows, with Grade 1 signifying the most green hydrogen and Grade 4 signifying the least green hydrogen.

Classification	**Grade 1**	**Grade 2**	**Grade 3**	**Grade 4**
Certification Standards (Emissions) (Unit: kgCO2eq/kgH2)	0.–0 - 0.10	0.–1 - 1.00	1.–1 - 2.00	2.–1 - 4.00

Further, under the Hydrogen Economy Promotion Hydrogen Safety Management Act which came into force on 5 February 2021, clean hydrogen is defined as hydrogen or a hydrogen compound that has been certified as any of the following:

(a) **Zero-carbon hydrogen:** hydrogen that does not generate any greenhouse gases in the course of production, importation, etc.

[6] This means that there are CO2 emissions of 4kgCO2 per kg of hydrogen produced.

(b) **Low-carbon hydrogen:** hydrogen that generates greenhouse gases at or below the level prescribed by Presidential Decree in the course of production, importation, etc.
(c) **Low-carbon hydrogen compound:** hydrogen compound that is produced for the transportation, etc. of hydrogen and that generates greenhouse gases at or below the level prescribed by Presidential Decree in the course of production, importation, etc.

- **Japan – Basic Hydrogen Strategy**

  Through the strategy issued by The Ministerial Council on Renewable Energy, Hydrogen and Related Issues, the government of Japan has defined low-carbon hydrogen as hydrogen that meets the carbon intensity target that was set at 3.4 kg-CO2 or less of carbon emissions from 1 kg of hydrogen production from the well to the production gate for hydrogen. Such definitions will be revised further as technology develops.

  The hydrogen categorization is set out under the Hydrogen Society Promotion Act. This act defines low-carbon hydrogen as hydrogen and its derivative products (to be further defined in the relevant ministerial orders) which meet the following requirements:
  (a) The amount of carbon dioxide ("CO2") emitted from its production is not more than a certain amount
  (b) The level of contribution to reducing CO2 emissions is recognized in light of the relevant internationally approved standards
  (c) Other requirements as may be set by the ministerial orders

- **France**

  The regulatory framework for hydrogen in France is governed under Ordinance 2021-167 ("**Ordinance**").

  The Ordinance divides hydrogen into three types as follows:
  (a) Renewable hydrogen: hydrogen produced either by electrolysis using electricity from renewable energy sources, or by any other technology using exclusively one or more of these same renewable energy sources and not conflicting with other uses allowing their direct recovery. In all cases, its production process emits, per kilogram of hydrogen produced, a quantity of carbon dioxide equivalents less than or equal to a threshold.

  (b) Low-carbon hydrogen is hydrogen whose production process generates emissions that are less than or equal to the threshold used to qualify it as renewable hydrogen, without being able to qualify as renewable because it does not meet the other criteria.

  (c) Carbon hydrogen is defined as hydrogen that is neither renewable nor low-carbon.

  In relation to certification, there are two mechanisms introduced in the Ordinance: Guarantees of Origin ("**GO**") and Guarantees of Traceability ("**GT**"). GTs are the only certificates that will allow a consumer to prove his actual consumption of

renewable or low-carbon hydrogen[7], while the GOs will only serve to certify his support for this type of production.

- **EU – A hydrogen strategy for a climate-neutral Europe**

  On 10 February 2023, in line with the requirements of the Renewable Energy Directive, the Commission adopted two delegated regulations, i.e., (i) rules on renewable hydrogen production and criteria for renewable electricity and (ii) methodology to calculate lifecycle greenhouse gas emissions. On 28 March 2023, the Committee on Industry, Research and Energy did not raise any objection to the delegated regulations. In short:

  (a) The delegated regulation on additionality provides that electricity taken from the grid may be recognised as fully renewable if it meets the criteria of:

    (i) additionality (where the production of hydrogen matches the production of renewable electricity)

    (ii) geographical correlation (where the additional renewables are located in the area where hydrogen is produced)

    (iii) temporal correlation (where the renewable electricity generation and hydrogen production coincide temporally).

  (b) The delegated regulation on greenhouse gas emissions savings establishes a method to calculate the lifestyle greenhouse gas emissions savings achieved, not taking into account manufacture of machinery and equipment.

  Renewable hydrogen is defined as hydrogen produced through the electrolysis of water powered by electricity from renewable sources or through reforming of biogas or biochemical conversion of biomass. In EU legislation, renewable hydrogen and hydrogen derived fuels produced without the use of biomass are referred to as renewable fuels of non-biological origin (RFNBO)

  EU has moved away from colour-based scheme and classifies hydrogen based on the definitions for renewable and low-carbon hydrogen. The table below shows the comparison between the definitions and the colour-based classification.

Hydrogen by definition	Hydrogen by colour	
Renewable hydrogen (or clean hydrogen)	Green hydrogen (renewable electricity through electrolysis)	Electricity from grid (electrolysis)
Low-carbon hydrogen	Blue hydrogen (natural gas with carbon capture and storage)	
Fossil-based hydrogen	Grey hydrogen (natural gas), brown hydrogen (brown coal), black hydrogen (black coal)	

[7]The certificate can be traded, similar to carbon trading scheme.

Whereby:

(a) Renewable hydrogen refers to hydrogen that is produced through the electrolysis of water (in an electrolyser, powered by electricity), and with the electricity stemming from renewable sources. The full life-cycle greenhouse gas emissions of the production of renewable hydrogen are close to zero.

(b) Low-carbon hydrogen refers to fossil-based hydrogen with carbon capture and electricity-based hydrogen, with significantly reduced full life-cycle greenhouse gas emissions compared to existing hydrogen production.

(c) Fossil-based hydrogen refers to hydrogen that is produced through a variety of processes using fossil fuels as feedstock, mainly the reforming of natural gas or the gasification of coal.

(d) The electricity from the grid may fall into all categories depending on the electricity mix.

5. Model legislation

Indonesia might consider including the following provisions for certification and categorization of hydrogen under the draft government regulation on green hydrogen production; these provisions are necessarily general at this stage, and will require further technical input into the adoption of relevant ministerial regulations. We believe for the purpose of this regulation, the most suitable ministry to manage the implementation and development of hydrogen is the ministry of energy and mineral resources, given its supervisory role over some of the sources of hydrogen (hydrocarbons), the transportation, use and export of energy and given perhaps, too, its familiarity with the issues raised by Article 33(3) of the Indonesian Constitution[8]. Therefore, for the purpose of this chapter, 'Ministry' refers to the ministry of energy and mineral resources.

Hydrogen certification

Part One
General

Article [*]

(1) To ensure an accurate, consistent, transparent, sustainable and accountable production and use of hydrogen, the following shall be carried out:
  (a) Testing and Measurement
  (b) Verification and Reporting
  (c) Certification
  (d) Recording in a hydrogen registry system

[8]Art. 33(3) of the Indonesian Constitution provides that the earth and water and the natural resources contained in it are controlled by the state and used for the greatest prosperity of the people.

(2) The testing, verification, certification and recording of hydrogen shall be carried out in an integrated manner.[9]

Part Two
Testing and Measurement

Article [*]

(1) Testing and measurement of hydrogen is carried out to identify:
  (a) the carbon intensity of the produced hydrogen and its derivatives;
  (b) the origin of the hydrogen production;
  (c) other requirements as may be governed in the ministerial regulation.
(2) Testing and measurement of hydrogen shall be carried out by a professional and skilled expert accredited by the Minister to identify the origin and environmental attributes of hydrogen.
(3) The detailed process and mechanism for the testing and measurement of hydrogen shall be further governed under a ministerial regulation.

Note to draft: This must be further consulted with persons with technical background to obtain accurate details and requirements for testing and measurement.

Part Three
Verification and Reporting

Article [*]

(1) Quality control and assurance of the results of hydrogen testing and measurement is carried out through a verification process.
(2) The verification process can be carried out by an independent verifier.
(3) The verification result shall be reported to the Minister.
(4) Further provisions on verification procedures and competency standards for independent verifiers shall be further governed under a ministerial regulation.

Note to draft: The government may run a test or collect data to identify the appropriate threshold for the verification of hydrogen production. For reference, the EU rules for renewable green hydrogen and blue hydrogen require a 70% reduction (3.4kg CO2e/kg H2) including transport of the hydrogen up to the point of use, and the UK's low carbon hydrogen standard requires a 78% reduction (2.4kg CO2e/kg H2) up to the point of production. If the government needs more time to identify the appropriate threshold, it is recommended to mention that the threshold will be further governed under the ministerial regulations level.

Part Three
Certification

Article [*]

(1) Hydrogen certification is intended to evidence:
  (a) the low-carbon intensity energy production;
  (b) the fulfilment of quality, safety and environmental standards; and
  (c) the compliance with the benchmark determined under the laws and the regulations.
(2) A hydrogen certificate can be obtained through the following stages:

[9]This means that the application, MRV process, issuance and recording are to be carried out in one registry.

(a) registration of account in the registry system;
(b) testing and measurement of the produced hydrogen by a professional and skilled expert
(c) verification by an independent verifier; and
(d) report of the verification result to the Minister, which shall become the basis for the issuance of the hydrogen certificate.

(3) The Minister will establish a national certification body that will be responsible for issuing the hydrogen certificate.
(4) Further provisions on the hydrogen certification mechanisms shall be governed under a ministerial regulation.

Note to draft: The government may consider mandating two types of hydrogen certificate for different purposes via ministerial regulation. The first is Guarantee of Origin, which is to track and verify the production emissions intensity of hydrogen. (In this connction, the Guarantee of Origin may be further divided into two categories, i.e., for product-based emissions accounting and for renewable electricity generations, which can be further linked to the carbon emissions reduction framework in Indonesia). The second is a Guarantee of Traceability, which is to ensure the linkage of hydrogen molecules and its attributes from production to consumption. The applicability and feasibility in Indonesia will need to be further assessed.

Article [*]

(1) In the event that a business actor uses another hydrogen certification scheme, such scheme must fulfil the following requirements:
(a) such scheme is in accordance with the principles, procedures and provisions of international standards and/or the relevant Indonesian National Standard; and
(b) the body implementing such scheme is accredited by the National Accreditation Committee.
(2) The acknowledgment of other hydrogen certification schemes referred to in paragraph (1) shall be carried out by the Minister.

Article [*]

(1) The hydrogen certificate can be used by its holder:
(a) to evidence its compliance with the regulatory threshold;
(b) to become the basis of hydrogen categorization based on the standards and certification scheme;
(c) to become the basis for providing information to customers, supply chains and sustainability reports; and
(d) to become the basis for submission of green funding access or sustainability funding.
(2) The use of hydrogen certification as referred to in paragraph (1) shall comply with the laws and regulations.
(3) In the event of a violation of the prohibition referred to in paragraph (2), the Minister shall impose the following administrative sanctions:
(a) written warning; and/or
(b) revocation of the hydrogen certificate.
(4) The Minister may revoke the hydrogen certificate if the hydrogen certificate holder fails to rectify its breach of the laws and regulations after the third warning letter.

Article [*]

(1) The Minister shall conduct mutual recognition of hydrogen certification.
(2) The mutual recognition as referred to in paragraph (1) shall be carried out through:
    (a) mutual disclosure of information on the use of verification standards;
    (b) carrying out an assessment of the conformity of such certification with international standards and/or Indonesian National Standards;
    (c) issuing a statement of the results of the assessment of conformity with international standards and/or Indonesian National Standards;
    (d) creation and implementation of mutual recognition cooperation mechanism; and
    (e) registration of the hydrogen certificate recognized by both parties in the registry system of both parties.
(3) Mutual recognition as referred to in paragraph (1) is supported by increasing the capacity for verification, publication and promotion of cooperation.
(4) Further provisions on mutual recognition procedures shall be further governed under a ministerial regulation.

Hydrogen categorization

Article [*]

(1) A hydrogen categorization system provides information on carbon intensity and energy sourced for hydrogen production.
(2) The hydrogen categorization will be used in the hydrogen certification process as referred to in Article [*].
(3) The implementation of the hydrogen categorization system aims to:
    (a) meets market demands;
    (b) increase market demands; and
    (c) strengthen the image of being environmental friendly.
(4) Further provisions on hydrogen categorization will be further governed under a ministerial regulation.

6. Sample clauses in relation to hydrogen certification and categorization

We set out below some sample clauses that may be referred to in preparing a contract containing provisions related to certification and categorization of hydrogen.

Certification

A. Obligation of the Supplier

(1) The Supplier must provide hydrogen that meets the specifications set out in Appendix [*] of this Agreement and complies with all Applicable Laws and standards. *[Note: A detailed specifications appendix is commonly attached to H2 offtake agreement]*
(2) The Supplier must obtain and maintain all necessary certifications required for the production, handling and delivery of hydrogen.

(3) The Supplier shall deliver to the Buyer upon request, copies of all relevant certification documents, including but not limited to certificates of analysis, guarantee of origin, conformity certificates and any other documentation verifying that the hydrogen supplied met the agreed specifications set out in Appendix [*] of this Agreement and the Applicable Laws.
(4) If the Supplier fails to perform its obligation as referred to in paragraph (1), the Supplier will provide notice (an "**Off-Spec Hydrogen Notice**") to Buyer as soon as reasonably practicable if Supplier becomes aware of any existing or anticipated delivery of off-spec hydrogen, giving the projected specifications for such off-spec hydrogen. The Buyer will inform the Supplier in writing not later than one (1) Business Day after receipt of a notice of off-spec hydrogen of whether Buyer will purchase such off-spec hydrogen.
(5) Supplier's failure to provide an Off-Spec Hydrogen Notice shall constitute a default under this Agreement.
(6) Buyer’s failure to respond to the Off-Spec Hydrogen Notice within the time set forth in paragraph (4) shall not constitute a default under this Agreement, but such failure shall be deemed to constitute Buyer’s consent to receive the off-spec hydrogen, until such time as the Buyer provides an Off-Spec Hydrogen Notice.

B. Certification Standards

(1) The supplied hydrogen must be certified in accordance with [*insert applicable standards or regulatory bodies, e.g., ISO 14687 or ASTM D7606*].
(2) The Supplier shall promptly notify the Buyer in writing if there is any deviation from these standards. Such notice shall set out reasonably comprehensive details of the reasons for such deviation and the corrective actions being undertaken by the Supplier, and shall be provided within [5 (five)] Business Days of its awareness of such deviation.

C. Inspection and Testing

(1) The Buyer is entitled to inspect and test the hydrogen to ensure compliance with the relevant certification requirements.
(2) Prior to carrying out the inspection and testing of hydrogen of the Supplier as referred to in paragraph (1), the Buyer shall give a prior written notification of no less than [5 (five)] Business Days prior to the hydrogen inspection and testing date.
(3) The Supplier shall provide access to the Supplier's facilities, records and personnel, as reasonably required, for the purposes of carrying out such inspection and testing.
(4) The hydrogen inspection and testing costs shall be borne by the Buyer.

Note to draft: The breach of this provision may be tied to the event of default clause and the corresponding remedy for this. We also recommend including representations, warranties and undertakings pursuant to which the supplier has, and shall at all times maintain, such certification in accordance with applicable laws and international standards. This may be adjusted based on mutual agreement of the supplier and the buyer.

Categorization

A. Hydrogen Categorization

(1) The Supplier shall supply hydrogen in accordance with the following classifications:

(a) *[to insert the specifications, purity level, intended use, etc.]*
(b) *[to insert the specifications, purity level, intended use, etc.]*

(2) [Each of]the hydrogen categorization[s] referred to in paragraph (1) must meet the specifications set out in Appendix [*] of this Agreement and be certified in accordance with the clause [*] of this Agreement.

Relevant resources

1. *Law No. 30 of 2007 on Energy*
2. *Draft law on new energy and renewable energy*
3. *Strategi Hidrogen Nasional (unece.org/sites/default/files/2024-03/ECE_ENERGY_151.pdf)*
4. *Towards a Hydrogen Economy in the UNECE Region (unece.org/sites/default/files/2024-03/ECE_ENERGY_151.pdf)*
5. *Hydrogen Certification 101 (Hydrogen Certification 101 | Hydrogen Council)*
6. *European Commission - A hydrogen strategy for a climate-neutral Europe (IMMC.COM%282020%29301%20final.ENG.xhtml.1_EN_ACT_part1_v10.docx (europa.eu))*
7. *Japan – Basic Hydrogen Strategy (20230606_5.pdf (meti.go.jp))*
8. *Australia – National Hydrogen Strategy (Australia's National Hydrogen Strategy - DCCEEW)*
9. *South Korea - Hydrogen Economy Promotion Hydrogen Safety Management Act (https://elaw.klri.re.kr/eng_mobile/viewer.do?hseq=60917&type=sogan&key=13#:~:text=The%20purpose%20of%20this%20Act,to%20the%20safety%20management%20of)*
10. *South Korea - Enforcement Decree of the Hydrogen Economy Promotion Hydrogen Safety Management Act (https://elaw.klri.re.kr/eng_mobile/viewer.do?hseq=66594&type=sogan&key=13#:~:text=ENFORCEMENT%20DECREE%20OF%20THE%20HYDROGEN%20ECONOMY%20PROMOTION%20AND%20HYDROGEN%20SAFETY%20MANAGEMENT%20ACT&text=The%20purpose%20of%20this%20Decree,necessary%20for%20the%20enforcement%20thereof)*
11. *Consultancy Services for Technical Assistance Activity: Recommendations for a Green Hydrogen Certification Scheme in Chile that is Compatible with National and International Carbon Markets (PowerPoint Presentation (worldbank.org)*
12. *Hydrogen standards should only lend credibility to truly emissions-busting projects (https://gh2.org/blog/hydrogen-standards-should-only-lend-credibility-truly-emissions-busting-projects)*
13. *Australian Hydrogen Council – Position Statement: Hydrogen Certification (https://h2council.com.au/wp-content/uploads/2022/10/AHC0001_Hydrogen_Cert-V2.pdf)*
14. *Towards hydrogen definitions based on their emissions intensity (Towards hydrogen definitions based on their emissions intensity – Analysis - IEA)*