नवीन एवं
नवीकरणीय ऊर्जा मंत्रालय
MINISTRY OF
NEW AND
RENEWABLE ENERGY

सत्यमेव जयते

Green Hydrogen Certification Scheme of India

April 2025

National Green Hydrogen Mission
Ministry of New and Renewable Energy
Government of India

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Report by:
National Green Hydrogen Mission Secretariat
Ministry of New and Renewable Energy
Government of India

प्रल्हाद जोशी
PRALHAD JOSHI
ಪ್ರಲ್ಹಾದ ಜೋಶಿ

सत्यमेव जयते

उपभोक्ता मामले, खाद्य और सार्वजनिक वितरण तथा
नवीन और नवीकरणीय ऊर्जा मंत्री
भारत सरकार

MINISTER OF CONSUMER AFFAIRS
FOOD & PUBLIC DISTRIBUTION AND
MINISTER OF NEW & RENEWABLE ENERGY
GOVERNMENT OF INDIA

Message

India is spearheading the clean energy revolution with Green Hydrogen as a key element for sustainability. The Green Hydrogen Certification Scheme of India (GHCI) creates a transparent framework to certify Green Hydrogen, enhancing investor confidence and industry engagement.

I commend all stakeholders and encourage continued collaboration for a greener, self-reliant Bharat.

(Pralhad Joshi)

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श्रीपाद नाईक
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नवीन और नवीकरणीय ऊर्जा एवं विद्युत
भारत सरकार

सत्यमेव जयते

SHRIPAD NAIK
Minister of State for
New and Renewable Energy & Power
Government of India

MESSAGE

"As we embrace the clean energy transition, Green Hydrogen stands as a pivotal solution for a sustainable future. The launch of the Green Hydrogen Certification Scheme of India (GHCI) will ensure the credibility of green hydrogen, fostering investor trust and industry growth. I urge all stakeholders to collaborate for a resilient and eco-friendly India."

(Shripad Naik)

Date: 25th April, 2025

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संतोष सारंगी, भा.प्र.से.
सचिव
Santosh Sarangi, IAS
Secretary

सत्यमेव जयते

International Year of Cooperatives 2025
Cooperatives Build a Better World

भारत सरकार
नवीन और नवीकरणीय ऊर्जा मंत्रालय
Government of India
Ministry of New and Renewable Energy

FOREWORD

As the world stands at the cusp of a clean energy transition, Green Hydrogen has emerged as a transformative solution to address the dual challenge of decarbonization and energy security. Recognizing its strategic importance, the Government of India launched the National Green Hydrogen Mission (NGHM) in January 2023.

This document presents an important initiative as part of National Green Hydrogen Mission in India. With the launch of the Certification Scheme, the country has taken a significant step towards standardizing and verifying the origin and carbon intensity of hydrogen. These efforts will be crucial in establishing Green Hydrogen produced in India as a globally tradable and trusted commodity.

This document not only demystifies the certification processes but also brings together key elements, from policy and standards to verification practices, making it a timely and practical resource for all stakeholders in the value chain.

I am confident that this certification mechanism will form the backbone of a transparent and accountable hydrogen economy enabling market access, attracting investment, and reinforcing environmental credibility.

I commend the authors and contributors for bringing out this instrument which is critical enabler of a sustainable hydrogen future.

(Santosh Sarangi)

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सत्यमेव जयते

अभय बाकरे
ABHAY BAKRE

ITUWTSA
NEW DELHI 2024

मिशन डायरेक्टर
नैशनल ग्रीन हाइड्रोजन मिशन
भारत सरकार
नवीन और नवीकरणीय ऊर्जा मंत्रालय

Mission Director
National Green Hydrogen Mission
Government of India
Ministry of New and Renewable Energy

PREFACE

The Ministry of New & Renewable Energy (MNRE) is implementing the National Green Hydrogen Mission (NGHM) with an objective to make India a global hub for the production, usage, and export of Green Hydrogen (GH2) and its derivatives. One of the foundational pillars to achieving this vision is the establishment of a robust, transparent, and credible certification framework. The Green Hydrogen Certification Scheme of India (GHCI) has been developed to serve this purpose. It offers a comprehensive methodology to assess and verify the Greenhouse Gas (GHG) emission intensity of hydrogen production, thereby ensuring that genuinely "Green" Hydrogen is certified and promoted.

This document provides detailed insights into the GHCI — from the standard's definition and certification procedures to monitoring, verification, and governance mechanisms. It lays out the technical criteria, institutional framework, and operational guidelines necessary for the implementation of scheme. By fostering consistency, transparency, and trust, the GHCI is set to be a cornerstone in shaping India's hydrogen ecosystem.

The integration of global standards like ISO 19870:2023, which provides a consistent framework for GHG assessment in hydrogen production, ensures interoperability and enables international acceptance. At the same time, the involvement of Accredited Carbon Verification (ACVs) agencies adds a much-needed layer of integrity by independently validating emissions data and certification claims.

We hope this document serves as a useful guide for stakeholders, and all those contributing to India's clean energy transition. Through collaborative efforts and steadfast commitment, the Certification Scheme will not only support national climate goals but also set a global benchmark for sustainable hydrogen production.

Abhay Bakre 29/4

(Abhay Bakre)

New Delhi
Dated: 29/04/2025

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Contents

Abbreviations

ACV	Accredited Carbon Verifier
BEE	Bureau of Energy Efficiency
CEA	Central Electricity Authority
CCTS	Carbon Credit Trading Scheme
CO2	Carbon dioxide
FEED	Front-End Engineering Design
GHCI	Certification Scheme of India
GO	Guarantee of Origin
GEF	Grid Emission Factor
GHG	Greenhouse Gas
H2	Hydrogen
IA	Implementing Agency
ISO	International Organization for Standardization
MNRE	Ministry of New and Renewable Energy
MoP	Ministry of Power
MoPNG	Ministry of Petroleum and Natural Gas
MRV	Monitoring, Reporting, Verification
SMC	Scheme Monitoring Committee

1. Introduction

The National Green Hydrogen Mission, hereafter referred as 'Mission', was launched on 04th January 2023 by the Government having an outlay of Rs. 19,744 Crore, with an objective to make India a global hub for the production, usage, and export of (GH2) and its derivatives. The Mission will contribute to India's goal to become Atmanirbhar (self-reliant) through clean energy adoption and serve as an inspiration for the global clean energy transition. The Mission will lead to significant decarbonization of the economy, reduced dependence on fossil fuel imports, and enable India to assume technology and market leadership in . Under the Mission, along with other initiatives, the Ministry of New & Renewable Energy (MNRE) proposes to implement pilot projects for replacing fossil fuels and fossil fuel-based feedstock with and its derivatives.

The Ministry of New and Renewable Energy, through OM No 353/35/2022-NT dated 18 August 2023, has defined standard, establishing specific criteria for its production. The standard stipulates a threshold for greenhouse gas emissions (non-biogenic) at 2.0 kgCO2eq/kg H2 for system boundaries as defined in section 6. The threshold is measured as an average over the last 12 months.

The Ministry has aimed to develop detailed methodology for the measurement, monitoring, reporting, onsite verification, and certification of Green Hydrogen . MNRE will designate an Implementing Agency (IA) as the nodal authority responsible for monitoring, and certification of projects based on the verification reports from accredited agencies.

In line with these requirements, the Ministry of New and Renewable Energy (MNRE) is now specifying a certification scheme under the National Green Hydrogen Mission (NGHM). The scheme shall be called Green Hydrogen Certification Scheme of India (GHCI).

2. Summary

The Green Hydrogen Certification Scheme in India (GHCI) aims to promote the production and use of Green Hydrogen , which is generated from renewable energy sources. The summary of key objectives of this scheme are as under:

Objective: The scheme is designed to facilitate the development of a market in India, ensuring that hydrogen produced is genuinely green and contributes to reducing carbon emissions.

Certification Process: Producers of must undergo a certification process to verify that their hydrogen is produced using renewable energy sources and the emission intensity in the production process does not exceed the standard. This will be verified by a BEE Accredited Carbon Verification (ACV) Agency.

Standards and Guidelines: The scheme outlines comprehensive standards and guidelines for the monitoring, reporting, verification (MRV) and emission calculation methodology for certification.

Transparency: The Green Hydrogen certification would build confidence with investors through transparency in emissions throughout production. The producers will also be eligible to claim carbon credits through this certification.

Market Development: By establishing a certification framework, the scheme aims to create a transparent and trustworthy market for , encouraging industries to adopt this cleaner alternative.

Alignment with NGHM Mission: The initiative aligns with India's broader goals of achieving energy security, reducing dependence on fossil fuels, and meeting international climate commitments.

3. Key Features of GHCI

The GHCI includes following key features:

i. To outline governance structure of the certification mechanism and further define roles and responsibilities of various stakeholders involved in the certification process.

ii. Technical Committee, to be chaired by the Mission Director, National Green Hydrogen Mission, shall provide oversight and strategic direction for the certification scheme.

iii. Maintain the transparency and authenticity in the origin and production process of green hydrogen.

iv. To define eligibility criteria for the final certificate.

v. To define the monitoring requirements & ensuring continuous assessment and improvement.

vi. Provide clear and transparent guidelines for calculating GHG emission intensity during Green Hydrogen production process.

vii. The GHCI adopts a boundary which encompasses all direct emission sources and includes indirect emissions from the electricity and/or fuel used during the Green Hydrogen production as defined in this scheme.

viii. The Green Hydrogen Producers, aiming to claim the credential, shall engage an ACV agency for verification of GHG emissions and compliance with the certification scheme requirements.

ix. Upon completion of the verification with reasonable assurance, the ACV agency shall submit the verification report through the Portal.

x. Two (02) types of certificates shall be issued for the 'Facility' under GHCI namely, "Concept Certificate" and "Facility Level Certificate".

xi. Two (02) types of certificates shall be issued for Green Hydrogen production under GHCI namely, Provisional Certificate and Final Certificate.

xii. MNRE or its designated agency shall withdraw the certificate issued to Green Hydrogen producer/ Green Hydrogen production facility under two (02) cases as mentioned below.

- Production Facility has been issued provisional certificates but the annual emissions post, the verification, is above the emission threshold.
- Provisional certificate has been issued but Green Hydrogen producer did not apply for final certificate before the deadline.

xiii. The final certificate shall contain a unique identification for each 100Kg of hydrogen produced, specifying project details, production year, and emission intensity values.

xiv. The Green Hydrogen certificate shall be mandatory for Green Hydrogen facility/producers is following cases; where

- Green Hydrogen Production Facility/ Green Hydrogen Producer is receiving any incentive/subsidy from Central Government (including awardees under the "Strategic Interventions for Transition" scheme) or State Government for production of .

- Green Hydrogen Production Facility/ Green Hydrogen Producer intends to sell/use Green Hydrogen in India.

- Green Hydrogen Production Facility/ green Hydrogen Producer is receiving any type of exemption/concession from Central/State government.

- Green Hydrogen Production Facility/ Green Hydrogen Producer has a consumer in India for partial quantity and the balance quantity is used for export purpose.

xv. Notwithstanding anything contrary to this scheme, Green Hydrogen production facilities with an annual production capacity of 10 tons or less may not be required to seek green hydrogen Certificate. Though such facilities can apply for the certificate on a voluntary basis.

xvi. Green Hydrogen producer with 100% export capacity who do not avail any incentives or concessions from the central or state government is not required to apply for the final certificate as per the GHCI. However, they must report the quantity and emissions of the hydrogen produced in accordance with the standards of the Green Hyrogen importing country.

4. Scheme Guidelines

1. Definitions

1.1 **"Accredited Carbon Verification (ACV) Agency"** means an agency accredited by the Bureau of Energy Efficiency (BEE) to carry out validation and verification activities under the carbon credit trading scheme (offset ACV Agency).

1.2 **'Conversion of Biomass'** includes gasification, pyrolysis, dark fermentation, and photobiological hydrogen production.

1.3 **'Combustion GHG Emissions'** means emissions of greenhouse gases (GHG) resulting from the chemical reaction of solid, liquid, or gaseous fuel with oxygen, typically involving the release of carbon dioxide (CO2) and other greenhouse gases.

1.4 **'Data control'** activities involve implementing policies and procedures to effectively manage and govern processes, ensuring they meet objectives, mitigate risks, and provide safeguards for maintaining data integrity.

1.5 **'Evaluation cycle'** is a time period of one financial year to be considered for hydrogen production for which the quantified figure for the GHG emissions is representative. For the first year of operation, the period shall be from the date of commencement of operations to the end of that financial year.

1.6 **'Electrolysis'** is a process that uses direct current to split chemical compounds, producing hydrogen as output. It also includes other methods such as photocatalytic and photoelectrochemical processes.

1.7 **'Functional unit'** is defined as the quantified performance of a product system for use as a reference unit and in case of hydrogen is one kilogram of hydrogen.

1.8 **'Force Majeure Events':**

a) Act of God, including, but not limited to lightning, drought, fire and explosion (to the extent originating from a source external to the site), earthquake, volcanic eruption, landslide, flood, cyclone, typhoon or tornado if and only if it is declared / notified by the competent state / central authority / agency (as applicable);

b) any act of war (whether declared or undeclared), invasion, armed conflict or act of foreign enemy, blockade, embargo, revolution, riot, insurrection, terrorist or military action if and only if it is declared / notified by the competent state / central authority / agency (as applicable);
c) radioactive contamination or ionising radiation originating from a source in India or resulting from another Force Majeure Event mentioned above excluding circumstances where the source or cause of contamination or radiation is brought or has been brought into or near the plant by the affected party or those employed or engaged by the affected Party.

1.9 **"Greenhouse Gas (GHG)'** refers to gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, atmosphere, and clouds. GHCI currently includes Carbon Dioxide (CO2), Methane (CH4), Nitrous Oxide(N2O). Other GHGs shall not be included.

1.10 **'Green Hydrogen**' as defined by MNRE vide OM no. 353/35/2022-NT dated 18th August 2023 and its subsequent amendments, if any.

1.11 '**Indirect GHG emissions**' means GHG emissions that are a consequence of the activities of the Green Hydrogen producer but occurred at sources outside the Green Hydrogen project includes emissions from electricity and heat imported for hydrogen production.

1.12 **"Monitoring plan'** is a comprehensive document outlining the details of Green Hydrogen project's boundary, activity data, and other relevant information necessary for the transparent monitoring and calculation of GHG emissions relating to hydrogen production.

1.13 **'System boundary'** means processes for Green Hydrogen production which are covered in the GHG emission intensity calculation.

1.14 **'Verification'** activity is an independent process conducted by an ACV agency appointed by respective hydrogen producers for assessment of greenhouse gas emission intensity during the evaluation cycle.

1.15 **'Water Treatment'** is defined as a process of purifying and conditioning water to meet the specific quality standards required for electrolysis.

2. Objectives of Certification Scheme

2.1 The objectives of certification scheme are as follows:

2.1.1 To outline the governance structure of the certification mechanism and further define roles and responsibilities for various stakeholders involved in the certification process.

2.1.2 To provide details of the scope and system boundaries for Green Hydrogen certification procedure.

2.1.3 To provide clear and transparent guidelines for calculating GHG emission intensity during Green Hydrogen production.

2.1.4 Define the monitoring requirements for Green Hydrogen production and its emissions, ensuring continuous assessment and improvement, and further specifying parameters and methodologies for ongoing monitoring to maintain transparency and compliance with Green Hydrogen standards.

2.1.5 Establish a robust verification approach for projects and designate nodal authority for issuing certification for Green Hydrogen as per the standard notified by the Government.

2.1.6 Develop a mechanism for reporting Green Hydrogen production and implement a system for continuous tracking of data (chain of custody) to ensure transparency and accountability in Green Hydrogen production and end use.

2.1.7 To establish the Green Hydrogen Certification procedure as a 'Guarantee of Origin' (GO), ensuring transparency and authenticity in the origin and production process of Green Hydrogen.

2.2 By addressing the above objectives, the GHCI aims to provide a holistic framework for the measurement, monitoring, and certification of Green Hydrogen production in India. It emphasizes transparency, accountability, aligning with national energy transition and climate goals, contributing to the overall success of the National Mission.

2.3 The scheme contains following key elements
(i) Governance and Roles & Responsibilities of Stakeholders
(ii) Certification Scope
(iii) Eligible Pathways
(iv) System Boundary
(v) Materiality Threshold
(vi) Renewable Energy Consideration
(vii) Evaluation Cycle
(viii) GHG emission Quantification
(ix) Data monitoring
(x) Verification procedure
(xi) Certification Process
(xii) Non-Compliance of Standard
(xiii) Certification Details

3. Governance and Roles & Responsibilities of Stakeholders

3.1 The governance structure for the certification scheme involves Ministry of New and Renewable Energy (MNRE) as the nodal ministry for overall supervision and monitoring. MNRE may designate an implementing agency (IA) to implement the provisions of this scheme. A Technical Committee shall provide strategic direction and approval to issue Green Hydrogen certificates. The implementing agency will be responsible for evaluating compliance to standard for Green Hydrogen production based on the periodic verification reports, prepared by Accredited Carbon Verification (ACV) agency. The ACV agency shall be mandated to conduct verification processes and furnish report.

3.2 The following are the roles and responsibilities of key stakeholders:

3.2.1 The Implementing Agency (IA) for the scheme, shall lead the implementation and operationalization of the certification scheme, ensuring its effectiveness. MNRE shall provide policy guidance, directives, and necessary support for the scheme's execution. MNRE shall also facilitate coordination among stakeholders and address any challenges that may arise during the scheme's implementation.

3.2.2 Technical Committee, to be chaired by the Mission Director, National Green Hydrogen Mission, shall provide oversight and strategic direction for the certification scheme. The concerned officer from the IA shall be the convenor of the technical committee. The committee shall hold consultations with stakeholders including Ministry

of Power, Ministry of Petroleum and Natural Gas, BEE, technical bodies, experts, and industry associations to seek policy recommendations. The committee shall conduct periodic reviews to ensure that the scheme aligns with latest industry standards and government priorities.

3.2.3 Green Hydrogen producers (covered under para 1.5) shall follow the scheme guidelines and adhere to key aspects related to the calculation, monitoring, reporting and verification of emissions. Such Green Hydrogen producers shall undertake annual verification or with lesser duration by an ACV agency for demonstrating their claim for Green Hydrogen . The producers shall also register on the designated Green Hydrogen Certification Portal (GHCP) and provide necessary information as per the MRV framework to ensure compliance with the certification scheme.

3.2.4 ACV Agency shall conduct the verification of Green Hydrogen produced, in order to evaluate its compliance with the Green Hydrogen standards and scheme. Agencies shall submit a detailed verification report to IA (through Green Hydrogen Certification Portal) pertaining to the emissions calculation, monitoring, reporting and compliance status of the hydrogen producers.

4. Certification Scope

4.1 The GHCI shall operate at the project level of Green Hydrogen production, encompassing all stages up to the compression, purification and onsite storage of hydrogen for transport. However, processes such as transport and storage of hydrogen outside plant boundaries, conversion into hydrogen carriers, reconversions, and utilization are excluded from the Green Hydrogen certification scope.

4.2 The reporting metric/functional unit for GHG emission intensity shall be kg CO2eq/kg H2.

4.3 For eligibility under the GHCI, Green Hydrogen Producers shall comply with all national and local regulations, including environmental and safety requirements, ensuring responsible and lawful project installations and operations.

4.4 The Hydrogen producer may voluntarily report emissions from the value chain that extend beyond the defined system boundary, based on the verification report submitted by accredited ACVs. These emissions can be reported additionally in the provisional and final certificate, if requested by the producer.

5. Eligible Pathways

5.1 The following Eligible Hydrogen Production Pathways are currently considered within scope of this scheme, and therefore eligible to apply:

5.1.1 Electrolysis
5.1.2 Conversion of Biomass

5.2 Above listed Eligible Hydrogen Production Pathways have the potential to produce hydrogen which complies with the GHCI. Inclusion on this list does not, however, guarantee the hydrogen produced shall comply with the scheme. Each Green Hydrogen Production Facility shall be designed, installed and operated in an appropriate way, so as to ensure the compliance is achieved in practice and on continual basis.

5.3 Stakeholders may propose new pathways to the above list and are required to submit an application along with the relevant evidence to MNRE. The Technical committee shall assess and review the application for consideration of the proposed pathway(s) for inclusion in the list of eligible pathways.

6. System Boundary

6.1 The GHCI adopts a boundary which encompasses all direct emission sources and includes indirect emissions from the electricity and/or fuel used during the Green Hydrogen production process as defined in this scheme.

6.2 For Green Hydrogen produced through electrolysis, the non-biogenic greenhouse gas emissions arising from water treatment, electrolysis, gas purification, drying & compression and onsite storage of hydrogen shall be included.

6.3 For Green Hydrogen produced through conversion of biomass (such as biogas reforming and biomass gasification) the non-biogenic greenhouse gas emissions arising from biomass processing, heat/steam generation, conversion of biomass to hydrogen, along with onsite gas purification, drying & compression and onsite storage of hydrogen shall be included. Provided that separate guidelines shall be issued where carbon capture and storage (CCS) is deployed for such a plant producing Green Hydrogen through conversion of biomass.

6.4 The emission from onsite water treatment of raw water (such as ground water, river, sea water etc), shall be counted. For the water treatment plant out of the control of the

project developer, default value of the emission factor for water supply may be prescribed. The GHG emission related to drawal of water from the natural source shall not be counted. MNRE shall issue separate detailed guidelines for emission calculation from offsite water treatment.

6.5 The emissions from the construction, manufacturing, and decommissioning of the capital goods (including hydrogen production device, etc.), business travel, employee commuting, shall not be included in Green Hydrogen production boundary. The emissions owing to generation and transmission of renewable electricity shall also not be included.

6.6 GHG emissions arising within project boundary from the conversion/use of input materials onsite shall be included in the emission intensity calculations. The purpose of input materials may not be necessarily to provide energy to the process, for example, water, oxygen, salts, catalysts, solvents, and acids. Only materials generated offsite and brought into the System Boundary into the Hydrogen Production Facility shall be accounted for this Emission Category. Implementing Agency (IA) shall consider specifying such emissions for each potential input material for consideration by ACV. All other flows that cross the System Boundary to generate any materials on site shall be accounted for, within their corresponding Emission Categories.

6.7 The system boundary shall include all the production stages till the purification and compression and onsite storage of hydrogen. Producers are required to provide the final composition of the hydrogen produced, as well as the pressure at which it has been produced. The composition and pressure level of the hydrogen shall be documented on the certificate.

7. Materiality Threshold

7.1 The Materiality Threshold for an Emission Source shall be 1% of the Total Emission Threshold as stipulated in Green Hydrogen Standard of India. Further, no more than a total of 5% of the Total Emission Threshold shall be excluded as being Immaterial Emission Sources.

7.1.1 Accordingly, if a single Emission Source contributes <1% of the Total Emission Threshold (2.0 kgCO2eq/kg H2 for system boundaries) and in total, all the Immaterial Emission Sources contribute <5% of the Total Emission Threshold, the single Emission Source in question may be considered as an Immaterial Emission Source and may be excluded from the GHG Emission Intensity Calculation.

7.1.2 Where a single Emission Source is <1% of the Total Emission Threshold but deeming it to be an Immaterial Emission Source would lead to >5% of the Total Emission Threshold being considered as Immaterial Emission Sources, this specific Emission Source shall be considered as a Material Emission Source and would be included in the GHG Emission Intensity Calculation.

7.2 Emissions from similar Emission Sources shall be considered together to avoid Production Facilities making multiple claims of Immaterial Emission Sources, which if aggregated would result in Material Emission Sources.

8. Renewable Energy (RE) Consideration

8.1 The Green Hydrogen standard by MNRE
specifies the applicability of renewable energy for certification purposes. The definition of renewable energy includes electricity generated from renewable sources, which is either stored in an energy storage system or banked with the grid as per the policy directive/regulations.

8.2 Renewable energy supply for Green Hydrogen production may be sourced from a renewable energy project and transmitted either through a dedicated or common transmission line.

8.3 Claims of energy as renewable, based on renewable energy certificates, or carbon credits, shall not be considered under this scheme. However, claims of energy as renewable from green tariffs mechanisms and power exchange (such as: G-DAM) shall be considered

8.4 Green Hydrogen producers may count electricity as fully renewable if the producer has concluded one (or more) power purchase agreements (PPAs) with operators producing renewable electricity in one (or more) installations, generating renewable electricity for an amount that is at least equivalent to the amount of electricity that is claimed as fully renewable (including T&D losses), and demonstrated that the electricity claimed is effectively produced in these renewable energy installations. The Green Hydrogen producer has to provide necessary evidence such as load dispatch certificates issued by the appropriate Load Dispatch Centre.
For illustration,
Electricity Generation - Transmission & Distribution Losses = Electricity Consumption

8.5 If energy from any source other than RE has been consumed during the course of operation of the plant, GHG emissions resulting from the use of such energy consumption shall be included in the overall GHG emission intensity calculation.

8.6 The obligation to prove the renewable nature of source and quantum of energy used rests solely on Green Hydrogen producer.

9. Evaluation Cycle

9.1 The evaluation cycle for GHG emission intensity calculation for Green Hydrogen production under the GHCI shall be each financial year. However, the hydrogen producers may apply for provisional certificate by considering evaluation not less than monthly interval.

9.2 In no circumstances shall the period of evaluation extend more than 12 months.

10. GHG Emission Quantification

10.1 Hydrogen producers participating in the Green Hydrogen Certification Scheme in India shall estimate the GHG emissions intensity for hydrogen production. The process shall follow the Green Hydrogen Emission Calculation Methodology (refer to annexure).If The methodology for determining the greenhouse gas emissions associated with the production, conditioning and transport of hydrogen to consumption gate for which the emission calculation methodology is not mentioned in the Annexure, the Indian standards and ISO Standards such as IS/ISO 14064-1,2,3 and ISO 19870: 2023 may be applicable.

10.2 The calculated emission intensity shall be based on the following points for rounding-off.

10.2.1 The total emission intensity shall be rounded-off to the nearest whole number up to one decimal place.

10.2.2 The value shall be rounded off to respective significant figures, as per IS 2:2022. For e.g.: Emission Intensity of 1.949 kg CO2eq/kg H2 shall be considered as 1.9 kg CO2eq/kg H2 and the emission Intensity from 1.950 kg CO2eq/kg H2 up to 2.049 kg CO2eq/kg H2 shall be considered as 2.0 kg CO2eq/kg H2.

10.3 The Green Hydrogen producers shall put in place a monitoring plan for GHG emission quantification and monitoring. To be called as MRV framework the monitoring plan shall include – details on emission source streams, activity data monitoring, monitoring instruments, written procedure on data control, procedure on calibration of monitoring instruments, frequency of data monitoring and recording, emission factor details and other relevant information required for transparent and effective monitoring of production and GHG emissions. All critical monitoring instruments should be calibrated and certified by certifying agencies.

10.4 The scope and boundary for emissions calculation have been defined in the scheme, ensuring a standardized and comprehensive assessment.

10.5 The hydrogen producers shall estimate both emissions and emission intensity associated with hydrogen production.

10.6 In the case of electricity which has not been certified as fully renewable, appropriate losses from transmission and distribution shall be accounted for the purpose of emission intensity calculation. Such emissions shall be estimated using the Weighted Average Grid Emission Factor (GEF) as published by CEA for the financial year. In case the GEF is not available for the year at the time of certification, the latest available GEF shall be used.

10.7 As regards to the transmission and distribution losses of electricity which has not been certified as fully renewable, the latest corresponding central-level T&D losses data as published by Central Electricity Authority shall be used.

10.8 Hydrogen production may result in co-products. The allocation of emissions to the co-product shall be based upon the Energy Content Allocation Method as per Green Hydrogen Emission Calculation Methodology (refer to annexure).

10.9 If the production process takes heat from another existing process outside the control of the applicant, in such a case, the emissions attributed to the heat input shall be the increase in the emissions of the other process associated with the heat export. Thus, if the heat is truly "waste heat", no emissions shall be attributable to the same. However, if extra fuel needs to be burnt to replace the heat in the existing process, the emissions from burning that extra fuel shall be included in the emission intensity calculation.

10.10 The Certificate shall contain a Product Carbon Footprint as calculated by Green Hydrogen Emission Calculation Methodology (refer to annexure).

11. Data Monitoring

11.1 The Green Hydrogen producers shall maintain detailed records of the hydrogen production (covering sale up to first purchaser) for at least five evaluation cycles or from the date of commencement of operations if the date of commencement of Green Hydrogen Production Facility is less than five years.

11.2 This includes adherence to the Green Hydrogen MRV framework ensuring a consistent and reliable approach to emission intensity calculation.

11.3 In accordance with the Green Hydrogen MRV framework, the Green Hydrogen producer shall meet and maintain specific data quality requirements to enhance the accuracy and reliability of the emissions intensity calculation.

11.4 The records shall be subject to verification by ACV agency. These comprehensive records would contribute to a thorough understanding of the environmental impact and resource usage associated with Hydrogen production.

11.5 To ensure transparency and clarity regarding the entire lifecycle of Hydrogen production and utilization, Green Hydrogen producers shall also keep records up to the stage of captive use or sale to first purchaser of Hydrogen produced and may also specify whether the hydrogen is further converted into a Hydrogen carrier for sale to first purchaser. However, this data is meant only for record keeping. It shall not have any impact on the issuance of the certificate. Any sensitive commercial data shall not be disclosed in the certificate. The ACV agency shall not insist on reporting of sensitive commercial data such as information related to offtake contracts.

11.6 The Hydrogen producers shall maintain daily records of hydrogen production, its parameters (physical and chemical) and energy consumption from various sources, both aggregated and disaggregated figures. In addition to fuel and electricity consumption, Hydrogen producers shall keep detailed records of water consumption, feedstock consumption, losses, and other relevant information pertaining to the production process.

12. Verification

12.1 The Green Hydrogen Producers, aiming to claim the Green Hydrogen credential, shall engage an ACV agency (accredited by BEE) for verification of GHG emissions and compliance with the certification scheme requirements within one month of completion of evaluation cycle.

12.2 The ACV agency shall follow the verification process as per the Green Hydrogen MRV framework.

12.3 Upon completion of the verification with reasonable assurance, the ACV agency shall submit the verification report and verification statement through the Green Hydrogen Certification Portal. The verification statement, reflecting emissions, emission intensity, and compliance with scheme requirements, shall be prepared by the ACV agency.

13. Certification Process for Production Facility

13.1 Under the scheme, certificates may be issued in two stages for each of the Hydrogen production facilities, namely, concept certificate (initial stage) and facility level certificate (commissioning stage). Details of the two stages of certificates have been given in clauses 13.2 to 13.3.

13.2 Concept Certificate

13.2.1 Concept Certificate is a voluntary certificate. Concept Certificate certifies that the design of Green Hydrogen production facility has met the pre-requisite requirements as specified in MRV framework to enable them to produce according to Standard.

13.2.2 The Green Hydrogen producer may apply for the concept certificate any time after the design/concept/FEED (front-end engineering design) approval.

13.2.3 In case the Green Hydrogen facility is built in multiple phases at a single location, the Green Hydrogen producer may apply for multiple concept certificates.

13.2.4 The Green Hydrogen producer shall prepare all the documents and data as specified in Green Hydrogen MRV Framework verified by an ACV agency. Post verification, the producer shall submit the application along with all required documents on the Green Hydrogen portal. The IA and technical committee shall review the

documents and the certificate shall be issued during the subsequent month in which the application has been submitted.

13.2.5 In case of any discrepancies in the submitted application, the IA shall seek clarifications by the last date of the subsequent month in which the application has been submitted.

13.2.6 The Green Hydrogen producer shall resubmit the application by the last date of the subsequent month in which the clarification has been requested.

13.2.7 Post re-submission of application, the IA and technical committee shall review the resubmitted application and the certificate shall be issued during the subsequent month in which the application has been re-submitted.

13.3 Facility Level Certificate

13.3.1 Facility-level certificate is mandatory for Green Hydrogen production facilities to apply for a provisional or final certificate. Facility-Level Certificate certifies that the Green Hydrogen production facility has met the pre-requisite requirements as specified in Green Hydrogen MRV framework to produce Green Hydrogen according to Green Hydrogen Standard.

13.3.2 The Green Hydrogen producers may apply for the facility-level certificate any time after obtaining the "consent to operate" for the Green Hydrogen production facility.

13.3.3 In case the Green Hydrogen facility is built in multiple phases at a single location, the Green Hydrogen producer shall apply for multiple facility level certificates.

13.3.4 The Green Hydrogen producer shall offer the facility to undergo on-site verification by an ACV agency. Post verification, the producer shall submit the application along with all required documents on the Green Hydrogen Certification portal. The IA and technical committee shall review the documents and the certificate shall be issued by the last date of the subsequent month in which the application has been submitted.

13.3.5 In case of any discrepancies in the submitted application, the IA shall seek clarifications by the last date of the subsequent month in which the application has been submitted.

13.3.5 In case of any discrepancies in the submitted application, the IA shall seek clarifications by the last date of the subsequent month in which the application has been submitted.

13.3.6 The Green Hydrogen producer shall resubmit the application by the last date of the subsequent month in which the clarification has been requested.

13.3.7 Post re-submission of application, the IA and technical committee shall review the resubmitted application and the certificate shall be issued by the last date of the subsequent month in which the application has been re-submitted.

13.4 Under certification scheme for Green Hydrogen , two (2) types of certificates shall be issued for the quantity of Green Hydrogen produced namely, provisional certificate and final certificate. Details of the 2 certificates have been given in clauses 13.5 to 13.6.

13.5 Provisional Certificate

13.5.1 This is an auto-generated voluntary certificate, and Green Hydrogen producers may apply for it through the Green Hydrogen Certification portal by submitting actual production details related to the hydrogen production as specified in the Green Hydrogen MRV Framework.

13.5.2 This provisional certificate guarantees that the hydrogen produced during the specified period is in compliance to Green Hydrogen standard based on the data provided by the Green Hydrogen producer. The guarantee of the provisional certificate for Green Hydrogen production is subject to the issuance of the final certificate to be issued after due verification by the ACVs.

13.5.3 The minimum duration for which a producer may apply for a provisional certificate is one calendar month. Applications for a given calendar month shall be submitted by the end of the next calendar month. The number of months for which the provisional certificate can be applied has to be greater than or equal to one and less than or equal to eleven.

13.5.4 For the first month of operations, the provisional certificate shall be issued from the date of commencement of operations to the end of that calendar month.

13.5.5 For example, a producer may apply for a provisional certificate for the month of June (i.e. from 1st June to 30th June) anytime between 1st July to 31st July. However, if the operations of the facility started on 15th June, provisional certificate may be applied for the period 15th June to 30th June anytime between 1st July to 31st July.

13.5.6 In cases where a Green Hydrogen production facility has received facility-level certificate after the commencement of operations, the provisional certificate shall be issued from the date of receipt of "consent to operate" to the end of that calendar month for the first month of issuance of facility-level certificate.

13.5.7 In cases where a Green Hydrogen production facility has received facility-level certificate after the commencement of operations, the provisional certificate shall not be issued for the period before the issuance of facility-level certificate.

13.5.8 In cases where a Green Hydrogen production facility has been issued a provisional certificate, the next provisional certificate in the same evaluation cycle may be applied for any month/period (as specified in 14.5.3) after the period of the latest provisional certificate in that evaluation cycle, but not for any period before.

13.5.9 For instance, if the previous provisional certificate has been issued for the period from 1st May to 30th May, the next provisional certificate may be applied for a period starting from 1st June but not before in the same evaluation cycle.

13.5.10 A producer may apply for a maximum eleven months of provisional certificates in the evaluation cycle.

13.6 Final Certificate

13.6.1 Applicability: The final certificate is mandatory for any Green Hydrogen Production Facility/ Green Hydrogen Producer in following cases;

I. Green Hydrogen Production Facility/ Green Hydrogen Producer is receiving any incentive/subsidy from Central Government (including awardees under the "Strategic Interventions for Transition" scheme) or State Government.

II. Green Hydrogen Production Facility/ Green Hydrogen Producer intends to sell/use Green Hydrogen in India.

III. Green Hydrogen Production Facility/ Green Hydrogen Producer is receiving any type of exemption/concession from Central/State Government.

IV. Green Hydrogen Production Facility/ Green Hydrogen Producer has a consumer in India for partial quantity and the balance quantity is used for export purpose.

Notwithstanding anything contrary to this scheme, Green Hydrogen production facilities with an annual production capacity of 10 tons or less may not be required to seek Green Hydrogen Certificate. Though such facilities can apply for the certificate on a voluntary basis.

Green Hydrogen producer with 100% export capacity who do not avail any incentives or concessions from the central or state government is not required to apply for the final certificate as per the GHCI. However, they must report the quantity and emissions of the hydrogen produced in accordance with the standards of the Green Hydrogen importing country.

13.6.2 The final certificate guarantees that the hydrogen produced during the specified evaluation cycle is Green as per GHCI.

13.6.3 The developer shall appoint the ACV by the month of March for the respective evaluation cycle.

13.6.4. The final certificate shall mention the Product Carbon Footprint during the production of Green Hydrogen .

13.6.5. The final certificate shall be issued every year, after the end of financial year. The Green Hydrogen producer shall submit all the relevant evidence, documentation, and data post verification by ACV agency by 30th June of the subsequent evaluation cycle on the Green Hydrogen portal.

13.6.6. Post submission of data, the technical committee shall review the application, and the certificate shall be issued by the 31st July.

13.6.7. In case of any discrepancies in the submitted application, the technical committee shall request clarifications by 31st July and the Green Hydrogen producer shall resubmit the application by 31st August.

13.6.8. Post re-submission of data, the technical committee shall review the resubmitted application and the certificate shall be issued by the 30th September. In case technical committee does not accept the application after re-submission of data, the specific data can be verified by other ACV and after reviewing the same, the decision of technical committee shall be final.

13.7. This certification shall not constitute any statutory clearance for establishing a Green Hydrogen plant.

13.8. In certain cases, MNRE or its designated agency may conduct random or sample audit during or after the evaluation year.

14. Non-Compliance of Standard

14.1 MNRE or its designated agency shall withdraw the certificate issued to producer/ production facility under two (02) cases as mentioned below:

14.1.1 If the Green Hydrogen Producer/ Production Facility has been issued provisional certificate in any one evaluation cycle and the actual emissions for that evaluation cycle post the verification by ACV/ review by the technical committee for the final certificate is above the emission threshold.

14.1.2 If the Green Hydrogen Producer/ Green Hydrogen production facility has been issued at least one provisional certificate and fails to apply for the final certificate before the deadline.

14.2 In respect of clause no. 14.1.2 up to one month extension shall be given by payment of late fee for the final certification. The developer has to apply for the final certificate by 31st July of the subsequent evaluation cycle on the portal without fail. A late fee equal to the final certification fee shall be levied for delay in application.

14.2.1 For clause no. 14.1.2 post submission of data, the technical committee shall review the application and the certificate shall be issued by the 31st August.

14.2.2 For clause no. 14.1.2 In case of any discrepancies in the submitted application, the technical committee shall request clarifications by 31st August and the Green Hydrogen producer shall resubmit the application by 30th September.

14.2.3 Post re-submission of data, the technical committee shall review the resubmitted application and the certificate shall be issued by the 31st October. In case the technical committee does not accept the application after re-submission of data, the specific data can be verified by other ACV and after review, the decision of technical committee shall be final.

14.3 Consequence of Non-Compliance of Standard.

14.3.1 For the first occurrence of any event mentioned under clause(s) 14.1.1 to 14.1.2, any provisional certificate already issued for that evaluation cycle shall be withdrawn.

14.3.2 For the Second occurrence of any event mentioned under clause(s) 14.1.1. to 14.1.2. within 3 years from the first occurrence, the Green Hydrogen Producer/ Green Hydrogen Production Facility shall not be eligible to apply for provisional certificate for the next one evaluation cycle. Any provisional certificate already issued for these evaluation cycles shall be cancelled and the Green Hydrogen producer shall apply for the facility certificate again.

14.4 In the event of third or more occurrence of Clause 14.1.1 and 14.1.2, MNRE reserves the right to take additional actions beyond the withdrawal of the certificate, including but not limited to, barring the applicant from applying for the provisional/final certificate for a specific period. MNRE may issue a separate executive order to address such cases.

15. Certificate Details

15.1 The issued certificate shall contain a unique identification for each 100 Kg of hydrogen produced, specifying project details, production year, and emission intensity values. The certification shall be conditional upon the average emission intensity being equal or below 2.0 kgCO2eq/kg H2 within defined scheme conditions and system boundaries. In case any production facility exceeds the limit of 2.0 kg CO2eq/kg H2, taken as an average in a particular financial year, then no Hydrogen produced during the year from that facility shall be certified as 'Green'.

15.2 The Green Hydrogen certificate serves as a label which guarantees the origin (GO) of the Green Hydrogen production as well as chain of custody. To maintain and track the chain of custody, the certificate shall be transferable as per procedure laid down by MNRE.

15.3 The certificate can be used for the purpose of claiming carbon credit under Carbon Credit Trading Scheme (CCTS) of India. However, the developer has to comply with additional requirements specified under the CCTS, if any.

15.4 A certification fee on the final certificate of Rs. 5 per 100 kg (or part thereof) of certified shall be charged by MNRE or its designated agency. No other fee shall be charged for concept certificate, facility certificate & provisional certificate. The fee for final certificate may be revised periodically. The certificate will be issued for quantity in multiples of 100 Kg of Hydrogen.

15.5 In case of force majeure events no action shall be taken as per clause no.14.

16. Monitoring

A scheme monitoring committee (SMC) under the chairmanship of Secretary, MNRE, and comprising representatives from MNRE, MOP, MoPNG and experts from other organizations as may be required for the purpose, shall periodically review the status of implementation of the scheme. The committee will facilitate/ recommend measures to resolve difficulties, if any, which have been observed during the implementation of the scheme.

17. The provision of this scheme may be modified at any later date with the approval of Minister of New & Renewable Energy, Government of India.

Annexure : Emission Calculation Methodology

1. The Green Hydrogen Production Facility outlines the methodology for calculating greenhouse gas (GHG) emissions associated with the production of as per GHCI. Green Hydrogen producers shall adopt this methodology to apply for the certification under GHCI.

2. Electrolysis Pathway

2.1 GHG Emission Intensity Calculation

Following the System Boundary, Green Hydrogen Production Facilities shall apply following Equation 1 for the purpose of calculating total GHG emissions.

Equation1

$$E_{Total,electrolysis} = E_{Feedstock\ Supply} + E_{Electricity\ Supply} + E_{Input\ Materials} - EA_{Co-product}$$

Where, ETotal,electrolysis = the total GHG emissions in kg CO2eq/kg H2 and each term on the right-hand side of Equation 1 represents an Emission Category within the scope of the GHCI.

2.2 Feedstock Supply

Feedstock Supply emissions shall be calculated with Equation 2:

Equation2

$$E_{Feedstock\ Supply} = \frac{[(Q_{Feedstock,1} * EF_{Feedstock,1}) + (Q_{Feedstock,2} * EF_{Feedstock}}{P_{Hydrogen} * 10}$$

Where, EFeedstock Supply = the total GHG emissions from feedstock used in the process in kg CO2eq/kg H2.

QFeedstock,i = the total quantity of feedstock used in tons.

EFFeedstock,i = the emission factor of feedstock used in Kg CO2eq/Kg[1].

PHydrogen = the total hydrogen produced in tons.

For the electrolysis pathway, water and steam should be considered as feedstock.

2.3 Electricity Supply

Electricity Supply emissions shall be calculated with Equation 3:

Equation 3

$$E_{Electricity\ Supply} = E_{Grid\ Electricity} + E_{N}$$

Where, Electricity Supply = the total GHG emissions from electricity used in the process in kg CO2eq/kg H2

EGrid Electricity = the total GHG emissions from grid electricity used in the process in kg CO2eq/kg H2

ENon-RE Captive Power Plant = the total GHG emissions from electricity from captive power plant (non-renewable) used in the process in kg CO2eq/kg H2.

Equation 4

$$E_{Grid\ Electricity} = \frac{Q_{Grid\ Electricity} * [EF_{Grid\ Electricity}/(1 - T\&D\ Losses)]}{P_{Hydrogen} * 1000}$$

Where,

°Grid Electricity = the total amount of grid electricity used in kWh

EFGrid Electricity = the emission factor of grid electricity used in Kg CO2eq/kWh[2]

T&D Losses = Transmission and Distribution losses of the state in which the plant has been setup[3]

Equation 5

$$E_{Non-RE\ Captive\ Power\ Plant} = \frac{[(Q_{Fuel,1} * EF_{Fuel,1}) + (Q_{Fuel,2} * EF_{Fuel,2}) + \ldots + (Q_{Fuel,n} * EF_{Fuel,n})] * 1000}{P_{Hydrogen} * 1000}$$

Where,

°Fuel,i = the total quantity of fuel used in tons

EFFuel,i = the emission factor of fuel used in Kg CO2eq/Kg[4]

2.4 Fuel Supply

Fuel Supply emissions shall be calculated with Equation 6:

Equation 6

$$E_{Fuel\ Supply} = \frac{[(Q_{Fuel,1} * EF_{Fuel,1}) + (Q_{Fuel,2} * EF_{Fuel,2}) + \ldots + (Q_{Fuel,n} * EF_{Fuel,n})] * 1000}{P_{Hydrogen} * 1000}$$

Where,

EFuel Supply = the total GHG emissions from fuel used in the process in kg CO2eq/kg H2

°Fuel,i = the total quantity of fuel used in tons

EFFuel,i = the emission factor of fuel used in Kg CO2eq/Kg[5]

2.5 Steam Supply

Steam Supply emissions shall be calculated with Equation 7:

Equation 7

$$E_{Steam\ Supply} = \frac{[(Q_{Fuel,1} * EF_{Fuel,1}) + (Q_F}$$

Where,

ESteam Supply = the total GHG emissions from steam used in the process in kgCO2eq/kg H2

°Fuel,i = the total quantity of fuel used in tons

EFFuel,i = the emission factor of fuel used in Kg CO2eq/Kg[6]

2.6 Other Input Materials

Other Input Materials emissions shall be calculated with Equation 8:

Equation 8

$$E_{Other\ Input\ Materials} = \frac{[(Q_{Input\ Material,1} * EF_{Input\ Material,1}) + (Q_{Input\ Material,2} * EF_{Input\ Material,2}) + \ldots +}{P_{Hydrogen} * 1000}$$

where

EOther Input Materials = the total GHG emissions from input materials used in the process in kgCO2eq/kgH2

°Input Material,i = the total quantity of input material used in tons

EFInput Material,i = the emission factor of input material used in Kg CO2eq/Kg[7]

Any Input Material with a negative GHG Emission Intensity shall be recorded as having a nil GHG Emission Intensity.

2.7 Co-Product

Equation 9

Total Energy Output= MCO-1×ECCO-1+ MCO-2×ECCO-2+ MCO-3×ECCO-3+…… MCO-n X ECCO-n

Allocation ratio= (MCO ×ECCO) / Total Energy Output

EACO = Total emissions × Allocation ratio

Where,

EACo-product = the total GHG emissions allocated to co-product produced during the production process in kg CO2eq/kg H2.

MCO= Mass of co-product in Kg
ECCO= Energy Content of co-product in MJ/Kg
Total Emission = Total emission in production.
Any co-product which has **no calorific value shall not be assigned any emissions**

3.0 Biomass Pathway

3.1 GHG Emission Intensity Calculation

Following the System Boundary, Production Facilities shall apply the following Equation 10 for the purpose of calculating the total GHG emissions

Equation 10

$$E_{Total,biomass} = E_{Upstream\ Process} + E_{Pr}$$

Where
ETotal = the total GHG emissions in kg CO2eq/kg H2 and each term on the right-hand side of Equation 10 represents an Emission Category within the scope of the GHCI.

3.2 Upstream Process

Upstream Process emissions shall be calculated with Equation 11:
EUpstream Process= Ebiomass Pre-Treatment
Where,
EUpstream Process = the total GHG emissions from the upstream process in kg CO2eq/kg H2
EBiomass Pre-Treatment/Treatment = the total GHG emissions from the Biomass Pre-Treatment and Treatment process in kg CO2eq/kg H2

3.3 H2Biomass Pre-Treatment/Treatment

Biomass Pre-Treatment/Treatment emissions shall be calculated with Equation 12:

Equation 12

$$E_{Biomass\ Pre-Treatment/Treatment} = E_{Electricity\ Supply} + E_{Fuel\ Su}$$

Calculation Methodology for right-hand side of the equation 12 is given in equation 3 to equation 8.

3.4 Production Process

Production Process emissions shall be calculated with Equation 13:

Equation 13

$$E_{Production\ Process} = E_{Feedstock\ Supply} + E_{Electricity\ Suppl} + E_{Input\ Materials}$$

Where,

EProduction Process = the total GHG emissions from the production process in kg CO2eq/kg H2 Calculation Methodology for right-hand side of the equation 13 is given in equation 3 to equation 8.

3.5 Co-Product

Emission Allocation to Co-product shall be calculated with Equation 14:

Equation 14

Total Energy Output= MCO-1×ECCO-1+ MCO-2×ECCO-2+ MCO-3×ECCO-3+…… MCO-n X ECCO-n

Allocation ratio= (MCO ×ECCO) / Total Energy Output

EACO = Total emissions × Allocation ratio

Where,

EACo-product = the total GHG emissions allocated to co-product produced during the production process in kg CO2eq/kg H2.

MCO= Mass of co-product in Kg

ECCO= Energy Content of co-product in MJ/Kg

Total Emission = Total emission in production.

Any co-product which has no calorific value shall not be assigned any emissions

[1] UK Low Carbon Hydrogen Standard
[2] All India Weighted Average CEA Grid Emission Factor
[3] CEA T&D Losses Data
[4] IPCC Emission Factor
[5] IPCC Emission Factor
[6] IPCC Emission Factor
[7] UK Low Carbon Hydrogen Standard

5. Role of ISO 19870:2023 in GHG Assessment

1. The ISO 19870:2023 provides a methodology for estimating the GHG emissions associated with the production, conditioning and transport of hydrogen, i.e., from raw material extraction till consumption.

2. **Need :** On the basis of type of Hydrogen to be deployed and the thresholds of GHG emissions intensity , various geographies introduced different policy measures and defined varying thresholds of GHG emissions intensity.

3. The standard provides a common methodology to assess the GHG emissions for various pathways of hydrogen production and through use of different technologies in its production.

4. The framework provides a better and easier way to compare the different production pathways as well as technologies of producing hydrogen.

5. It also assists the process of policy formulation through a standard framework.

6. Some of the **key benefits** of ISO 19870:2023 in GHG assessment – Easier comparison; supports certification process and policy formulation and ensures comprehensive assessment of environmental impact of hydrogen.

7. It considers the life cycle of hydrogen from resource extraction to consumption.

8. The two approached considered for assessing the environmental impact are – attributional and consequential.

9. The attributional approach considers the environmental impact of specific hydrogen products or systems.

10. The consequential approach considers the environmental impact of the supply chain of H2 on associated products or systems.

11. Role for investors :

(i) The standard helps building trust among global investors in hydrogen.

(ii) It can also help in comparison of different technologies and pathways of hydrogen production and promote competition.

(iii) It helps in building trust among consumers

(iv) It can also ensure transparency for investors globally.

12 Role in supporting certification schemes for hydrogen :

(a) The standard can support the certification schemes for hydrogen through reference to its methodologies of assessment of GHG emissions.

(b) It also provides a global benchmark to compare different national and regional methodologies.

6. Accreditation of ACVs by BEE

As part of India's Carbon Credit Trading Scheme (CCTS), the offset mechanism is a key component that allows non-obligated entities to register GHG emission reduction projects and become eligible for the issuance of carbon credits. These credits can then be traded in the carbon market, contributing to national decarbonization goals. Accredited Carbon Verification (ACV) agencies, recognized by the Bureau of Energy Efficiency (BEE), play a crucial role in this process by independently verifying the emissions reductions claimed by these projects.

Key functions of ACVs

1. Verification

The ACVs through independent audits verify that the carbon emissions claimed are accurate and genuine and meet the standards.

2. Promote Transparency

The ACVs verify that the entities accurately measure and report the emissions and thereby promotes transparency.

3. Adherence to the standards

They ensure that the entities adhere to the established standards.

4. Third party verification

By acting as a third party, they ensure that the verification is impartial and avoid the conflict of interest.

5. Ensuring credibility

ACVs play a crucial role in ensuring the credibility of Certificate.

6. Support Climate Action

By verification of effectiveness, they help in achieving the goal of mitigating the climate change.

Role of ACVs in Certification

As Green Hydrogen production is energy-intensive, verifying its carbon intensity is essential for determining its eligibility for carbon credits. ACVs, accredited by the Bureau of Energy Efficiency (BEE), serve as independent third parties to measure the emissions and verify that the hydrogen produced meets the required emission intensity thresholds.

ACVs help ensure that only genuinely Green Hydrogen qualifies for certification. This would not only strengthen market credibility and stakeholder confidence in Green Hydrogen but also aligns with India's broader decarbonization and clean energy goals.

7. FAQs

1. What is the Certification Scheme of India (GHCI) ?

- The GHCI aims to provide a holistic framework for the measurement, monitoring, and certification of Green Hydrogen production in India, emphasizing transparency, accountability, and alignment with national energy transition and climate goals.

2. What are the key elements of the GHCI?

- The scheme includes Governance and Roles & Responsibilities of Stakeholders, Certification Scope, Eligible Pathways, System Boundary, Materiality Threshold, Renewable Energy Consideration, Evaluation cycle, GHG emission quantification, Data monitoring, Verification, Certification process, Penalty clause, and Certification details.

3. Can the Green Hydrogen certificate be used for emission reduction credits/carbon credits?

- Yes, the certificate can be used for the purpose of claiming carbon credits under Carbon Credit Trading Scheme (CCTS) of India. However, the developer has to comply with additional requirements specified under the CCTS if any.

4. What types of certificates are issued under GHCI?

- There are four stages of certification under GHCI:

- **Concept Certificate** - Green Hydrogen producer may apply for the concept certificate" any time after the design/concept/FEED (front-end engineering design) approval.
- **Facility-level certificate** - It is mandatory for Green Hydrogen production facilities to apply for a provisional or final certificate. The Green Hydrogen producers may apply for the facility-level certificate any time after obtaining the **"consent to operate"** for the production facility.

Provisional certificate - This is an auto-generated voluntary certificate, and producers may apply for it through the Green Hydrogen Certification portal by submitting actual production details related to the hydrogen production.

Final Certificate - The final certificate is mandatory for any Green Hydrogen Production Facility/ Green Hydrogen Producer. The Green Hydrogen Producers can claim it after the verification of GHG emission intensity by the appointed ACV.

5. What is the certification fee?

- A certification fee on the final certificate of Rs. 5 per 100 kg of Green Hydrogen certified shall be charged by MNRE or its designated agency. The certificate will be issued for quantity in multiples of 100 Kg of Hydrogen.

6. What are the eligible pathways for Hydrogen Production under GHCI?

- Eligible Hydrogen Production Pathways include Electrolysis and Conversion of Biomass. However, Stakeholders may propose new pathway(s) and submit an application along with the relevant evidence to MNRE. The Technical committee shall assess and review the application for consideration of the proposed pathway(s).

7. Which are the cases of GHCI non-compliance and its consequences?

MNRE or its designated agency shall withdraw the certificate issued under two cases –

- If the Green Hydrogen Producer/ Green Hydrogen Production Facility has been issued provisional certificates in any one evaluation cycle and the actual emissions for that evaluation cycle post the verification by ACV/ review by the technical committee for the final certificate is above the emission threshold.
- If the Green Hydrogen Producer/ Green Hydrogen Production Facility has been issued at least one provisional certificate and fails to apply for the final certificate before the deadline.

Consequences of non-compliance:

- Any provisional certificate already issued for the evaluation cycle shall be withdrawn.
- Within 3 years from the first occurrence, the Green Hydrogen Producer/ Production Facility shall not be eligible to apply for provisional certificate for the next one evaluation cycle.
- MNRE reserves the right to take additional actions beyond the withdrawal of the certificate, including but not limited to, barring the applicant from applying for the provisional/final certificate for a specific period. MNRE may issue a separate executive order to address such cases.

8. What is the Green Hydrogen standard defined by MNRE?

- MNRE has defined standard, establishing specific criteria for its production, incorporating a threshold for greenhouse gas emissions (non-biogenic) at 2 kgCO2eq/kg H2 for system boundaries.

9. What is the reporting metric for GHG emission intensity?

- The reporting metric/functional unit for GHG emission intensity shall be kg CO2eq/kg H2.

10. What is the evaluation cycle for GHG emission intensity calculation?

- The evaluation cycle for GHG emission intensity calculation for Green Hydrogen production for final certificate shall be one financial year.

11 How is Renewable Energy considered in production?

- Renewable energy, for the purpose of Green Hydrogen production, includes electricity generated from renewable sources such as solar, wind, hydro, etc. This energy may be:
  - Stored in an energy storage system (e.g., battery or pumped hydro),
  - Banked with the grid, in accordance with applicable policy directives or regulatory provisions, or
  - Directly sourced from a renewable energy project and transmitted via either a dedicated or common transmission line.

12 What is the Green Hydrogen MRV Framework?

- The Green Hydrogen MRV Framework specifies the monitoring, reporting, and verification requirements for production and its emissions.

13 How long should producers maintain records?

- The Green Hydrogen producers shall maintain detailed records of the hydrogen production (covering sale upto first purchaser) for at least five evaluation cycles or from the date of commencement of operations if the date of commencement of Green Hydrogen Production Facility is less than five years.

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