CLEAN DEVELOPMENT MECHANISM

AM0124

Large-scale Methodology

Hydrogen production from electrolysis of water

Version 01.1

Sectoral scope(s): 01 and 05

United Nations
Framework Convention on
Climate Change

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1. Introduction

1. The following table describes the key elements of the methodology:

Table 1. Methodology key elements

Typical projects	**Production of hydrogen through electrolysis of water using electricity from a captive renewable power plant only, or from a mix of electricity predominantly from a captive renewable plant and residually from the electric grid. The hydrogen produced is supplied to an existing dedicated consumer.**
Type of GHG emissions mitigation action	• Fuel or feedstock switch • Renewable energy

2. Scope, applicability, and entry into force

2.1. Scope

2. The methodology applies to project activities where hydrogen is produced by electrolysis of water and is supplied to existing dedicated consumer(s). The electricity consumed by the electrolyser hydrogen production plant shall be sourced from a captive renewable power plant only, or from a mix of electricity predominantly from a captive renewable power plant and residually from the electric grid.

2.2. Applicability

3. This methodology is applicable to project activities that include the construction of a new captive renewable power plant and a new electrolyser hydrogen production plant. Retrofitting, rehabilitation (or refurbishment), replacement or capacity addition of an existing electrolyser hydrogen production plant or of an existing captive renewable power plant are not covered by this methodology.

4. The hydrogen produced by the project activity (hereinafter referred as 'project hydrogen') is supplied to (an) existing dedicated consumer(s) located in the host country and identified ex-ante in the project design document (PDD). Prior to the implementation of the project activity, the hydrogen supplied to the existing consumer(s) has been produced through gasification of coal, or steam reforming of natural gas or oil.

5. The captive renewable power plant shall be wind or solar. Purchase of renewable electricity via renewable electricity certificates are not covered by this methodology.

6. The project activity shall ensure that the ratio between the electricity consumed from the grid ($EC_{PJ,grid,y}$) and the electricity consumed from the captive renewable power plant ($EC_{PJ,captive,y}$) by the electrolyser hydrogen production plant is below 0.1 on an annual basis. The designated operation entity (DOE) shall confirm that this ratio requirement is met by comparing the data on the electricity consumed from the two sources annually.

7. The project participant shall demonstrate that double counting of emission reductions will not occur, e.g. via a contractual agreement with the dedicated consumer of the hydrogen

produced. The steps to be taken to avoid double counting shall be documented in the project design document.

8. The methodology is applicable only if the most plausible baseline scenarios identified after applying "TOOL02: Combined tool to identify the baseline scenario and demonstrate additionality" are "P4：Production of hydrogen from the steam reforming of syngas produced from the gasification of coal without capture and storage of CO_2", "P6: Production of hydrogen from the steam reforming of natural gas without capture and storage of CO_2" or "P8: Production of hydrogen from the steam reforming of syngas produced from the gasification of oil in general without capture and storage of CO_2".

9. The project shall use no more than 5 per cent of the drinking water available locally, to ensure that the water used in the electrolysis will not displace other uses. This check shall be made at validation and at each renewal of the crediting period using data from the project activity and from official sources.

10. The applicability conditions included in the tools referred to below also apply.

2.3. Entry into force

11. The date of entry into force is the date of the publication of the EB 119 meeting report on 27 September 2023.

2.4. Applicability of sectoral scopes

12. Designated operational entities validating and verifying clean development mechanism (CDM) project activities and programmes that use this methodology shall apply sectoral scopes 01 and 05.

3. Normative references

13. This baseline and monitoring methodology is based on the proposed new methodology NM0381 "Emission reduction by hydrogen production from renewable energy sources" by China Hydrogen Alliance Research Institute, HyOrigin Technology Co., Ltd., CHN Energy Hydrogen Technology Co., Ltd., and Shanghai Environment and Energy Exchange Co., Ltd.

14. This methodology also refers to the latest approved versions of the following tools:

    (a) "TOOLO1: Tool for the demonstration and assessment of additionality" (hereinafter referred to as TOOL01);

    (b) "TOOL02: Combined tool to identify the baseline scenario and demonstrate additionality" (hereinafter referred to as TOOL02);

    (c) "TOOL03: Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (hereinafter referred to as TOOL03);

    (d) "TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (hereinafter referred to as TOOL05);

    (e) "TOOL08: Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (hereinafter referred to as TOOL08);

(f) "TOOL10: Tool to determine the remaining lifetime of equipment" (hereinafter referred to as TOOL10);

(g) "TOOL12: Project and leakage emissions from transportation of freight" (hereinafter referred to as TOOL12).

15. For more information regarding the proposed new methodology and the tools, as well as their consideration by the CDM Executive Board, please refer to <https://cdm.unfccc.int/methodologies/PAmethodologies/pnm/pending> and <https://cdm.unfccc.int/Reference/tools/index.html>, respectively.

3.1. Selected approach from paragraph 48 of the CDM modalities and procedures

16. "Existing actual or historical emissions, as applicable"; or

17. "Emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment".

4. Definitions

18. The definitions contained in the Glossary of CDM terms shall apply.

19. For the purpose of this methodology, the following definitions apply:

(a) **Existing dedicated consumer:** an existing facility that has consumed hydrogen as a feedstock in a chemical process for at least three years prior to the implementation of the project activity, and switches to the project hydrogen under the project activity. Examples of facilities include, among others, ammonia plants and oil refineries;

(b) **Electrolyser hydrogen production plant:** a facility that produces hydrogen from the electrolysis of water. Under this methodology, the hydrogen production plant includes the desalted water station, electrolytic cell, hydrogen compressor, gas-liquid processor, hydrogen purification unit and other ancillary equipment;

(c) **Gasification of coal:** an industrial process where coal is converted into syngas through a process of gasification;

(d) **Steam reforming of syngas:** an industrial process where the syngas produced from the gasification of coal or oil reacts with steam in the presence of a catalyst to produce hydrogen, carbon monoxide and releases carbon dioxide as a by-product;

(e) **Steam reforming of natural gas:** an industrial process where natural gas reacts with steam in the presence of a catalyst to produce hydrogen, carbon monoxide and releases carbon dioxide as a by-product.

5. Baseline methodology

5.1. Project boundary

20. The spatial extent of the project boundary encompasses:

    (a) The electrolyser hydrogen production plant;

    (b) The captive renewable power plant;

    (c) All power plants/units connected physically to the electric grid to which the hydrogen production plant is connected; and

    (d) The existing dedicated consumer of the project hydrogen.

21. The greenhouse gases included in or excluded from the project boundary are shown in Table 2.

Table 2. Emission sources included in or excluded from the project boundary

Source		Gas	Included	Justification/Explanation
Baseline	Emissions from hydrogen production	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification
Project activity	Emissions from the electricity consumption by the electrolyser hydrogen production plant	CO_2	Yes	Might be an important emission source
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification
	Emissions from the consumption of fossil fuels by the electrolyser hydrogen production plant (e.g. by the desalination plant)	CO_2	Yes	Might be an important emission source
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification
	Emissions from the consumption of fossil fuels to transport the project hydrogen by road	CO_2	Yes	Might be an important emission source
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification
	Emissions from the consumption of electricity to transport the project hydrogen by pipeline	CO_2	Yes	Might be an important emission source
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification

5.2. Identification of the baseline scenario and demonstration of additionality

22. Project participants shall apply the latest approved version of TOOL02 to identify the baseline scenario among all reasonable potential alternative scenarios that could provide similar output/services as the proposed project activity and to demonstrate additionality.

23. In applying Step 1 of TOOL02, baseline alternatives for the production of hydrogen, the project participant shall take into consideration, inter alia, the following alternatives:

(a) P1: The proposed project activity undertaken without being registered as a CDM project activity;

(b) P2: Production of hydrogen through electrolysis of water using electricity from the grid only;

(c) P3: Production of hydrogen through electrolysis of water using electricity from a captive power plant that is neither solar nor wind;

(d) P4: Production of hydrogen from the steam reforming of syngas produced from the gasification of coal without capture and storage of CO_2;

(e) P5: Production of hydrogen from the steam reforming of syngas produced from the gasification of coal with capture and storage of CO_2;

(f) P6: Production of hydrogen from the steam reforming of natural gas without capture and storage of CO_2;

(g) P7: Production of hydrogen from the steam reforming of natural gas with capture and storage of CO_2;

(h) P8: Production of hydrogen from the steam reforming of syngas produced from the gasification of oil without capture and storage of CO_2;

(i) P9: Production of hydrogen from the steam reforming of syngas produced from the gasification of oil with capture and storage of CO_2;

(j) P10: Production of hydrogen as a by-product of industrial processes (e.g. as chlor alkali, coking, steel);

(k) P11: Production of hydrogen from chemical raw materials (e.g. methanol, ethanol, liquid ammonia cracking);

(l) P12: Production of hydrogen from the gasification of biomass;

(m) P13: Production of hydrogen from photochemical process.

5.3. Baseline emissions

24. The baseline emissions are calculated as the product between the quantity of project hydrogen produced and the emission factor of the existing baseline hydrogen production plant, as per the equation below.

$$BE_y = M_{H2,PJ,y} \times EF_{H2,BL};\ until\ DATE_{H2\ plant,BL} \qquad \text{Equation (1)}$$

Where:

BE_y	=	Baseline emissions in year *y* (tCO_2)
$M_{H2,PJ,y}$	=	Mass of pure hydrogen produced by project activity and consumed by existing dedicated consumers in year *y* (tH_2)

$EF_{H2,BL}$	=	Emission factor of the existing baseline hydrogen production plant (tCO_2e/tH_2)
$DATE_{H2\ plant,BL}$	=	Date when the existing baseline hydrogen production plant's lifetime will come to an end (date). Determined based on the TOOL10 in a conservative manner that is, if a range is identified, the earliest date should be chosen.

25. The baseline emission factor of the existing baseline hydrogen production plant ($EF_{H2,BL}$) shall be the minimum between (a) and (b) below:

(a) Use the following values derived from IEA (2023)[1]:

(i) 19 tCO_2e/tH_2 if the baseline scenario is the production of hydrogen from coal (scenario P4);

(ii) 9 tCO_2e/tH_2 if the baseline scenario is the production of hydrogen from natural gas (scenario P6) or from oil (scenario P8).

(b) The emission factor determined based on three years historical data of electricity and fossil fuel consumed and hydrogen produced by the existing baseline hydrogen production plant, following the equation below:

$$EF_{H2,BL} = \sum_{t-3}^{t-1} \frac{\left(EC_{H2,BL,t} \times EF_{EF,BL,t}\right) + \left(\sum_i FC_{i,BL,t} \times NCV_i \times EF_{CO2,i}\right)}{M_{H2,BL,t}}$$ Equation (2)

Where:

$EC_{H2,BL,t}$	=	Electricity consumed by the existing baseline hydrogen production plant in year *t* (MWh)
$EF_{EF,BL,t}$	=	Emission factor of the electricity source supplying electricity to the existing baseline hydrogen production plant in year *t* (tCO_2e/MWh)

[1] International Energy Agency (IEA). (2023). *Towards hydrogen definitions based on their emissions intensity.* Available at https://iea.blob.core.windows.net/assets/acc7a642-e42b-4972-8893-2f03bf0bfa03/Towardshydrogendefinitionsbasedontheiremissionsintensity.pdf, accessed on 05 July 2023. See pages 9 and 40. For hydrogen produced from oil, the emission factor was conservatively assumed to be equal to the emission factor from the use of natural gas. Upstream emissions related to fossil fuel production have been excluded in the estimation and the values were proposed as follows:

a) For the production of hydrogen through coal, IEA (2023) states that *'Hydrogen production from coal gasification without CCS results in total emissions of 22-26 $kgCO_2e/kg_{H2}$ (…)'*, and *'More than 80% of the emissions intensity of hydrogen production from coal is from direct emissions at the production plant and less than 20% is linked to coal mining, processing and transport.'* A value of 19 $kgCO_2e/kg_{H2}$ is proposed as the product of the share of direct emissions at the production plant (80%) and a median value of emissions from hydrogen produced from coal without CCS of 24 $kgCO_2e/kg_{H2}$;

b) For the production of hydrogen through natural gas, IEA (2023) states that *'Hydrogen production from unabated natural gas results in an emissions intensity in the range of 10-14 $kgCO_2e/kg_{H2}$, with upstream and midstream emissions of methane and CO2 in natural gas production being responsible for 1-5 $kgCO_2e/kg_{H2}$.'* A value of 9 $kgCO_2e/kg_{H2}$ is proposed as the difference of the median value of emissions from hydrogen produced from unabated natural gas (12 $kgCO_2e/kg_{H2}$) and the median value for upstream and midstream emissions of methane and CO_2 in natural gas production (3 $kgCO_2e/kg_{H2}$).

$FC_{i,BL,t}$	=	Fossil fuel type *i* consumed by the existing baseline hydrogen production plant in year *t* (mass or volume units)
NCV_i	=	Net calorific value of the fossil fuel *i* (GJ/mass or volume units)
$EF_{CO2,i}$	=	CO_2 emission factor of the fossil fuel *i* (tCO_2/GJ)
$M_{H2,BL,t}$	=	Mass of pure hydrogen produced by the existing baseline hydrogen production plant in year *t* (tH_2). Follow provisions and equations from paragraphs 26 and 27 below.
t	=	Calendar year of the start date of the project activity

26. If the project activity measures hydrogen production in volume units in standard temperature and pressure (STP), $M_{H2,y}$ is calculated according to the equation below:

$$M_{H2,PJ,y} = \sum_{t=1}^{y} V_{0,t} \times v_{H2,t} \times \frac{2}{22.4} \times 10^{-3}$$ Equation (3)

Where:

$V_{0,t}$	=	The volumetric flow of gas in STP in time interval *t* (Sm^3)
$v_{H2,t}$	=	Volumetric fraction of hydrogen in time interval *t* (m^3H_2/m^3_{gas})
t	=	The time-period of data reading (e.g. minute, hour, month)
22.4	=	Volume of gas in standard conditions (Sm^3/kmol)
2	=	Mass of one mole of hydrogen (kg/kmol)

27. If the project cannot directly monitor the volume of hydrogen under standard conditions, it can be converted through the following formula:

$$V_{0,t} = \frac{V_{H2,t} \times P_{H2,t} \times 273.15}{101{,}325 \times (273.15 + T_{H2,t})}$$ Equation (4)

Where:

$V_{H2,t}$	=	Volumetric flow of hydrogen at operational conditions in the time interval *t* (m^3)
$P_{H2,t}$	=	Pressure of compressed hydrogen in the time interval *t* (Pa)
$T_{H2,t}$	=	Temperature of compressed hydrogen in the time interval *t* (K)

5.4. Project emissions

28. Project emissions include the emissions from electricity consumption other than that from the captive renewable power plant, emissions from any fossil fuel consumed (e.g. by the desalination plant), emisisons from the incremental transportation of project hydrogen to

existing dedicated consumers and emissions due to physical leaks of hydrogen, and are calculated as follows:

$$PE_y = PE_{EC,y} + PE_{FC,y} + PE_{transport,y} + PE_{H2-leaks,y} \quad \text{Equation (5)}$$

Where:

PE_y	=	Project emissions in year *y* (tCO_2e)
$PE_{EC,y}$	=	Project emissions from the consumption of electricity from sources other than the captive renewable power plant to operate the electrolyser hydrogen production plant in year *y* (tCO_2e). Determined as per TOOL05 and applying value of 1.3 tCO_2/MWh for the emission factor of the electricity consumed from the grid based on Option A2 of the TOOL05 as a conservative approach[2].
$PE_{FC,y}$	=	Project emissions from the consumption of fossil fuels to operate the electrolyser hydrogen production plant in year *y* (tCO_2e). Determined as per TOOL03.
$PE_{transport,y}$	=	Project emissions due to incremental transportation of hydrogen to existing dedicated consumers in year *y* (tCO_2e)
$PE_{H2-leaks,y}$	=	Project emissions due to physical leaks of hydrogen in the project activity in year *y* (tCO_2e)

5.4.1. Project emissions due to incremental transportation of hydrogen

29. Project emissions due to incremental road and pipeline transportation of project hydrogen ($\boldsymbol{PE_{transport,y}}$) shall be calculated as follows only if the transportation distance between the baseline hydrogen production plant and the existing dedicated consumer within the host country is shorter than the distane between the project hydrogen production plant and the dedicated consumer:

$$PE_{transport,y} = PE_{road,y} + PE_{pipeline,y} \quad \text{Equation (6)}$$

Where:

$PE_{road,y}$	=	Project emissions due to incremental road transportation of hydrogen in year *y* (tCO_2e)
$PE_{pipeline,y}$	=	Project emissions due to transportation of hydrogen via pipelines in year *y* (tCO_2e)

30. In case the project hydrogen is transported via road, the project emissions shall be calculated based on the TOOL12, and the parameter $D_{f,m}$ in the tool shall correspond to the difference of the return trip distances between (i) the baseline hydrogen production

[2] This conservative grid emission factor is used because it is possible that the electricity is mainly used from the grid at times when solar or wind power is not available. During these times, the CO_2 intensity of power production in the electricity system may be higher than calculated with the combined margin emission factor. Any marginal increase in demand during these times only could affect the mostly GHG emission intensive power generation.

plant and the existing dedicated consumer and (ii) the electrolysis hydrogen production plant and the dedicated consumer.

31. In case the hydrogen is transported using pipelines, project emissions due to operation of pipelines to transport the hydrogen shall be calculated as follows.

$$PE_{pipeline,y} = EC_{H2,pipeline,y} \times EF_y$$ Equation (7)

Where:

$EC_{H2,pipeline,y}$	=	Electricity consumed for operating pipelines that transport the hydrogen in year *y* (MWh)
EF_y	=	Electricity emission factor in year *y* (tCO_2/MWh) determined as per TOOL05

5.4.2. Project emissions due to physical leaks of hydrogen

32. Project participant shall document in the project design document a plan to minimize physical leaks of hydrogen in its value chain including production, compression, storage, transportation and use. The monitoring report shall demonstrate the implementation of this plan, which should be verified by the designated operating entity through site visits and/or documentation review.

33. If the project participant failed to demonstrate full implementation of the plan to minimize physical leaks of hydrogen, then the project participant shall calculate the project emissions due to physical leaks of hydrogen from its value chain as follows:

$$PE_{H2-leaks} = M_{H2,PJ,y} \times PL_{H2} \times GWP_{H2}$$ Equation (8)

Where:

PL_{H2}	=	Physical leaks of hydrogen in hydrogen value chain as a percentage of the total production (%)
GWP_{H2}	=	Global warming potential of hydrogen (tCO_2e/t_{H2}).

5.5. Leakage

34. No Leakage is considered under this methodology.

5.6. Emission reductions

35. Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$ Equation (9)

Where:

ER_y	=	Emission reductions in year *y* (tCO_2e)
BE_y	=	Baseline emissions in year *y* (tCO_2e)
PE_y	=	Project emissions in year *y* (tCO_2e)

LE_y = Leakage emissions in year *y* (tCO_2e)

6. Monitoring methodology

6.1. Data and parameters not monitored

36. In addition to the parameters listed in the tables below, the~~The~~ provisions on data and parameters not monitored that are contained in the tools referred to in this methodology, and which are needed to calculate emission reductions, apply.

Data / Parameter table 1.

Data / Parameter:	$DATE_{H2\ plant,BL}$
Data unit:	Date
Description:	Date when the existing baseline hydrogen production plant's lifetime will come to an end
Source of data:	Information to be sourced from the existing baseline hydrogen production plant
Value to be applied	N/A
Any comment:	Determined based on the TOOL10 in a conservative manner that is, if a range is identified, the earliest date should be chosen.

Data / Parameter table 2.

Data / Parameter:	$EC_{H2,BL,t}$
Data unit:	MWh
Description:	Electricity consumed by the existing baseline hydrogen production plant in year *t*
Source of data:	Measured following the provisions of the parameter $EC_{BL,k,y}$ from the TOOL05
Value to be applied	-
Any comment:	Based on the provisions of the parameter $EC_{BL,k,y}$ from the TOOL05

Data / Parameter table 3.

Data / Parameter:	$EF_{EF,BL,t}$
Data unit:	tCO_2e/MWh
Description:	Emission factor of the electricity source supplying electricity to the existing baseline hydrogen production plant in year *t*
Source of data:	Determined following the provisions of the parameter $EF_{EF,k,y}$ from the TOOL05
Value to be applied	-
Any comment:	Based on the provisions of the parameter $EF_{EF,k,y}$ from the TOOL05

Data / Parameter table 4.

Data / Parameter:	$FC_{i,BL,t}$
Data unit:	Mass or volume units
Description:	Fossil fuel type *i* consumed by the existing baseline hydrogen production plant in year *t*
Source of data:	Measured following the provisions of the parameter $FC_{i,j,y}$ from the TOOL03.
Value to be applied	-
Any comment:	Based on the provisions of the parameter $FC_{i,j,y}$ from the TOOL03

Data / Parameter table 5.

Data / Parameter:	NCV_i
Data unit:	GJ/mass or volume units
Description:	Net calorific value of the fossil fuel *i*
Source of data:	Determined following the provisions of the parameter $NCV_{i,y}$ from the TOOL03
Value to be applied	-
Any comment:	Based on the provisions of the parameter $NCV_{i,y}$ from the TOOL03

Data / Parameter table 6.

Data / Parameter:	$EF_{CO2,i}$
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor of the fossil fuel *i*
Source of data:	Determined following the provisions of the parameter $EF_{CO2,i,y}$ from the TOOL03
Value to be applied	-
Any comment:	Based on the provisions of the parameter $EF_{CO2,i,y}$ from the TOOL03

Data / Parameter table 7.

Data / Parameter:	$M_{H2,BL,t}$
Data unit:	tH_2
Description:	Mass of pure hydrogen produced by the existing baseline hydrogen production plant in year *t*
Source of data:	Apply provisions and equations from paragraphs 26 and 27
Value to be applied	-
Any comment:	-

Data / Parameter table 8.

Data / Parameter:	PL_{H2}
Data unit:	%

Description:	Physical leaks of hydrogen in hydrogen value chain as a percentage of the total production
Source of data:	A study "Hydrogen emissions from the hydrogen value chain-emissions profile and impact to global warming" by Jasmin Cooper, Luke Dubey, Semra Bakkaloglu, Adam Hawkes, published at "Science of The Total Environment", by Elsevier B.V. on 15 July 2022.
Value to be applied	5
Any comment:	The project participants may propose another value through a request for revision of this methodology

Data / Parameter table 9.

Data / Parameter:	$\boldsymbol{GWP_{H2}}$
Data unit:	tCO_2e/t_{H2}
Description:	Global warming potential of hydrogen
Source of data:	IPCC AR4 WG1 as under chapeter 2.10.3.6
Value to be applied	5.8
Any comment:	The GWP value is calculated as an indirect 100-year GWP

6.2. Data and parameters monitored

37. All data collected as part of monitoring should be archived electronically and kept for at least two years after the end of the last crediting period. All of the data in the tables below should be monitored unless otherwise indicated. All measurements should be conducted with calibrated measurement equipment according to relevant industry standards.

38. In addition to the parameters listed in the tables below, the procedures contained in the tools referred to in this methodology also apply.

Data / Parameter table 10.

Data / Parameter:	$\boldsymbol{V_{0,t}}$
Data unit:	Sm^3
Description:	The volumetric flow of gas in STP in time interval *t*
Source of data:	As per the TOOL08
Measurement procedures (if any):	As per the TOOL08.
Monitoring frequency:	As per the TOOL08
QA/QC procedures:	As per the TOOL08
Any comment:	Project participants shall specify whether the flow is measured on wet or dry basis and follow the monitoring provisions of the parameters $V_{t,wb}$ or $V_{t,db}$ from TOOL08 accordingly

Data / Parameter table 11.

Data / Parameter:	$\boldsymbol{v_{H2,t}}$
Data unit:	m^3_{H2}/m^3_{gas}

Description:	Volumetric fraction of hydrogen in time interval *t*
Source of data:	As per TOOL08
Measurement procedures (if any):	As per TOOL08
Monitoring frequency:	As per TOOL08
QA/QC procedures:	As per TOOL08
Any comment:	Project participants shall specify whether the flow is measured on wet or dry basis and follow the monitoring provisions of the parameters $v_{t,i,wb}$ or $v_{t,i,db}$ from the TOOL08 accordingly

Data / Parameter table 12.

Data / Parameter:	$V_{H2,t}$
Data unit:	Volumetric flow of the hydrogen at operational conditions in the time interval *t*
Description:	m^3
Source of data:	As per TOOL08
Measurement procedures (if any):	As per TOOL08
Monitoring frequency:	As per TOOL08
QA/QC procedures:	As per TOOL08
Any comment:	Project participants shall specify whether the flow is measured on wet or dry basis and follow the monitoring provisions of the parameters $V_{t,wb}$ or $V_{t,db}$ from the TOOL08 accordingly

Data / Parameter table 13.

Data / Parameter:	$P_{H2,t}$
Data unit:	Pa
Description:	Pressure of the compressed hydrogen in time the interval *t*
Source of data:	As per TOOL08
Measurement procedures (if any):	As per TOOL08
Monitoring frequency:	As per TOOL08
QA/QC procedures:	As per TOOL08
Any comment:	As per TOOL08

Data / Parameter table 14.

Data / Parameter:	$T_{H2,t}$
Data unit:	K
Description:	Temperature of the compressed hydrogen in the time interval *t*
Source of data:	As per TOOL08
Measurement procedures (if any):	As per TOOL08
Monitoring frequency:	As per TOOL08

QA/QC procedures:	As per TOOL08
Any comment:	As per TOOL08

Data / Parameter table 15.

Data / Parameter:	$PE_{EC,y}$
Data unit:	tCO_2e/year
Description:	Project emissions from the consumption of electricity from sources other than the dedicated renewable power plant (grid electricity) to operate the electrolyser hydrogen production plant in year y
Source of data:	As per TOOL05
Measurement procedures (if any):	As per TOOL05
Monitoring frequency:	As per TOOL05
QA/QC procedures:	As per TOOL05
Any comment:	Apply a value of 1.3 tCO_2/MWh for the emission factor of the electricity consumed from the grid based on Option A2 of the TOOL05 as a conservative approach.

Data / Parameter table 16.

Data / Parameter:	$PE_{FC,y}$
Data unit:	tCO_2e/year
Description:	Project emissions from the consumption of fossil fuels to operate the electrolyser hydrogen production plant in year y
Source of data:	As per TOOL03
Measurement procedures (if any):	As per TOOL03
Monitoring frequency:	As per TOOL03
QA/QC procedures:	As per TOOL03
Any comment:	As per TOOL03

Data / Parameter table 17.

Data / Parameter:	$EC_{PJ,grid,y}$; $EC_{PJ,captive,y}$; $EC_{H2,pipeline,y}$
Data unit:	MWh
Description:	$EC_{PJ,grid,y}$: Electricity consumed by the hydrogen production plant from the grid in year *y* $EC_{PJ,captive,y}$: Electricity consumed by the hydrogen production plant from the captive renewable power plant in year *y* $EC_{H2,pipeline,y}$: Electricity consumed for operating pipelines that transport the hydrogen in year *y*
Source of data:	The monitoring of these parameters shall follow the monitoring of $EC_{PJ,j,y}$ from TOOL05
Measurement procedures (if any):	The monitoring of these parameters shall follow the monitoring of $EC_{PJ,j,y}$ from TOOL05

Monitoring frequency:	The monitoring of these parameters shall follow the monitoring of $EC_{PJ,j,y}$ from TOOL05
QA/QC procedures:	The monitoring of these parameters shall follow the monitoring of $EC_{PJ,j,y}$ from TOOL05
Any comment:	These parameters are used to check the compliance of the project with paragraph 6 of the methodology

Data / Parameter table 18.

Data / Parameter:	$\boldsymbol{PE_{road,y}}$
Data unit:	tCO_2e
Description:	Project emissions due to road transportation of hydrogen in year *y*
Source of data:	As per TOOL12
Measurement procedures (if any):	As per TOOL12
Monitoring frequency:	As per TOOL12
QA/QC procedures:	As per TOOL12
Any comment:	The parmeter $D_{f,m}$ in the tool shall correspond to the difference of the return trip distances between (i) the baseline hydrogen production plant and the existing dedicated consumer and (ii) the electrolysis hydrogen production plant and the dedicated consumer

Data / Parameter table 19.

Data / Parameter:	$\boldsymbol{EF_y}$
Data unit:	tCO_2/MWh
Description:	Electricity emission factor in year *y*
Source of data:	As per TOOL05
Measurement procedures (if any):	As per TOOL05
Monitoring frequency:	As per TOOL05
QA/QC procedures:	As per TOOL05
Any comment:	As per TOOL05

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Document information

Version	*Date*	*Description*
01.1	11 January 2024	Minor editorial revision to correct names of proponents of the proposed methodology.
01.0	27 September 2023	EB 119, Annex 7 Initial adoption.

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