PROJECT DESIGN DOCUMENT (PDD) FORM FOR ARTICLE 6.4 PROJECTS

(Version 01.0)

BASIC INFORMATION

Project title:	UGF- Uberaba Green Fertilizer Project		
UNFCCC project reference number:	>>		
Host Party:	Brazil		
Other participating Parties:	Choose a Party.		
Activity participant(s): (add rows if needed)	**Type of Party**	**Name of activity participant(s)**	**Party that is to provide authorization**
	Host Party	Atlas Agro Brasil Fertilizantes LTDA	Brazil
	Choose a type of Party.	>>	Choose a Party.
	Choose a type of Party.	>>	Choose a Party.
PDD version number:	V2.0		
PDD completion date:	01/12/2025		
Applied methodologies and standardised baselines, and their versions:	Proposed new baseline and monitoring methodology “Fertilizer production with renewables-based ammonia”		
Sectoral scope(s):	5. Chemical industries		
Type of the project:	☒ Emission reductions activity ☐ Removals activity ☐ Combined emission reductions and removals activity		
Estimated annual emission reductions or net removals over the crediting period (tCO_2e/year):	>>245,791		

SECTION A. Project description

A.1. Project purpose and general description

The proposed activity is designed as a greenfield, state-of-the-art renewables-based ammonia-based fertilizer production facility located in Uberaba, Minas Gerais, Brazil. The facility is planned with an annual ammonia production capacity of approx. 225,000 t/a focused on producing a range of ammonium nitrate-based fertilizers, including Calcium Ammonium Nitrate ("CAN27") and "AN33.5" through a sustainable, low-carbon process.

Unlike conventional ammonia production, which typically relies on fossil fuels as feedstock and where the hydrogen for ammonia is produced via steam methane reforming generating significant CO_2 emissions ("grey ammonia"), this facility will utilize green hydrogen produced on-site through water electrolysis powered by renewable electricity via the grid. By integrating renewable energy and green hydrogen into the production process, the activity will substantially reduce greenhouse gas (GHG) emissions, advancing both environmental sustainability and energy efficiency in fertilizer production.

Project Overview

The project will be built on four main process components, which form the foundation of the design:

Renewable Electricity Supply

The facility will be powered entirely by electricity sourced from the grid via power purchase agreements (PPAs), with 100% of the electricity derived from renewable energy sources purposely build as part of the project activity (i.e. solar and wind). A total capacity of about 300 MW will be signed in form of PPAs. This renewable electricity will power the electrolyzers, compressors, and other electrically operated auxiliary systems, ensuring the complete exclusion of fossil-based hydrogen and ammonia.

Hydrogen Production (Electrolyzers)

Hydrogen will be produced on-site via water electrolysis using renewable electricity. The electrolyzer system produces high-purity hydrogen (99.99%) at a daily capacity of 115 TPD (tonnes per day), corresponding to an annual capacity of approximately **40,250 t/a** with oxygen co-produced at 920 TPD (322,000 t/a). The process relies on demineralized water derived from raw water, purified through a dedicated water treatment unit. Water consumption is approximately 9 liters per kilogram of hydrogen produced, in line with electrolysis requirements. The electric capacity required for operation of the electrolysers will be 245 MW beginning of life and 270 MW end of life resulting in an average annual electricity consumption of 2,247,000 MWh/a.

Nitrogen Production (Air Separation Unit, ASU)

High-purity nitrogen is generated via cryogenic rectification of air in the ASU. The daily production capacity is 525 TPD for nitrogen (183,750 t/a) and 140 TPD (49,000 t/a) for oxygen. Nitrogen is used for ammonia synthesis and inerting, while oxygen can be utilized in other plant operations as needed.

Ammonia Synthesis

Renewables-based ammonia is synthesized from green hydrogen and nitrogen via the Haber-Bosch process. The ammonia synthesis process comprises an ammonia converter and a refrigeration section to achieve 99.9% purity of ammonia.

The produced ammonia is used as feedstock for all downstream fertilizer production. The fertilizer production is integrated into the same facility avoiding any long transport distance for the produced ammonia.

Project Scope and Planned Phases

The activity involves the installation of a renewables-based ammonia production plant and downstream fertilizer production units. The planned production capacity of the ammonia plant is 635 TPD, which corresponds to an annual production of approximately 222,250 t/a, assuming a minimum of 350 operating days per year.

The facility is designed for continuous operation, with an on-stream factor of 24 hours per day to ensure reliable production. The plant is also expected to operate with a turn-down capacity of approximately 30%, subject to market demand or maintenance requirements.

Project Spatial Boundary:

The spatial boundary includes all facility location where direct emissions occur due to the activity, as well as areas relevant for unavoidable leakage, in line with baseline and leakage standards. This encompasses the renewable energy consumption via grid, electrolysis and ammonia synthesis facilities and supporting infrastructure. All renewables-based ammonia produced will be utilized on-site for fertilizer production, with no transport offsite. As such, all direct activity emissions and the GHG reductions achieved through the replacement of grey ammonia are fully captured.

Baseline Scenario

The baseline scenario assumes that all ammonia-based fertilizers continue to be produced with grey ammonia, which is produced primarily via steam methane reforming of natural gas and other fossil fuel feedstock. The CO_2 emissions associated with this grey ammonia are represented using a common global baseline emission factor, reflecting the average greenhouse gas intensity of conventional ammonia production worldwide.

Project Activity

The project activity introduces a renewables-based ammonia facility, powered by renewable energy sources via grid , producing hydrogen via electrolysis and synthesizing ammonia with nitrogen separated from ambient air. The project activity includes direct emissions from electricity consumption within the project activity, hydrogen leakage , land clearing for construction of the ammonia plant and its immediate supporting infrastructure .By replacing grey ammonia with locally produced renewables-based ammonia, the project achieves significant GHG reductions relative to the baseline scenario, while all direct activity emissions and leakage are fully accounted for within the defined spatial boundary as per the methodology.

Estimated annual average and total GHG emission reduction:

During the 10 year crediting period, the project activity is expected to achieve annual GHG emission reductions of 245,791 tCO_2e/a resulting in a cumulative reduction of 2,457,907 tCO_2e.

A.2. Confirmation that the project aligns with the A6.4 activity types indicated by the host Party

As of 20 March 2025, Brazil has outlined its approach to Article 6.4 activities, specifying eligible project types such as renewable energy. Green hydrogen and ammonia production, which is entirely powered by renewable electricity, falls under this category. Accordingly, this renewables-based ammonia project, producing ammonia for on-site fertilizer production, aligns with Brazil's Article 6.4 framework and supports the country's long-term decarbonization objectives as outlined in Brazil's NDC[1], which emphasizes the expansion of renewable energy, low-carbon industrial processes, and sustainable development and is aligned with the country's economy-wide goal of achieving carbon neutrality by 2050. [2]

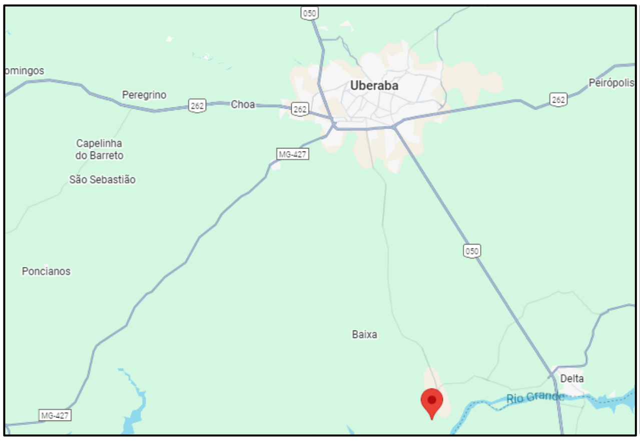
A.3. Demonstration that the project, does not constrain, but aligns with the policies, options and implementation plans of the host Party

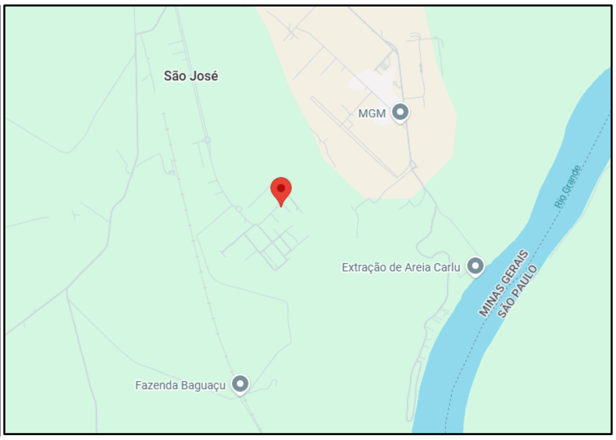
As described above under A.2. the project fully aligns with Brazil's policies and as such does not constrain any implementation plans of the host Party.

A.4. Project location

[1] https://unfccc.int/sites/default/files/2024-11/Brazil_Second%20Nationally%20Determined%20Contribution%20(NDC)_November2024.pdf
[2] https://unfccc.int/sites/default/files/resource/A6.4_Host_Party_Participation_Brazil.pdf

Host Party	Brazil
Region(s)/State(s)/Province(s)	Minas Gerais
Cities/towns/communities	Uberaba
Geographic coordinates	-20.00284006442935, -47.89087809216611
Map of project location	





A.5. Technology/measures

A.5.1. Existing technologies/measures prior to project implementation

The project is a greenfield activity; no existing technologies or installations were in place prior to its implementation.

All ammonia used in this region was previously produced as conventional “grey” ammonia, which is mainly produced by steam reforming of hydrocarbons with natural gas being the most common feedstock. By way of these processes the feedstock is reformed with steam in a heated primary reformer and subsequently with air in a secondary reformer, in order to produce synthesis gas (N_2, H_2), which also contains CO, CO_2 and H_2O. After removal of H2O (condensation), CO (methanation) and CO_2 (chemical or physical absorption), the synthesis gas is compressed and synthesis of ammonia takes place on an iron catalyst.

Key environmental factors in conventional ammonia production include the amount of raw materials (feedstock) used and the energy needed to heat the primary reformer. Emissions from the plant mainly come from the gases released during production, including carbon dioxide (CO_2), nitrogen oxides (NOx), ammonia (NH_3), sulfur dioxide (SO_2), and dust. Additional emissions come from removing CO_2, methane (CH_4), and carbon monoxide (CO) from the synthesis gas, as well as from purge gases that are separated from the main ammonia production loop. Purge gases are often sent to an older ammonia plant where they are reused as feedstock to make more ammonia.

A.5.2. Technologies/measures implemented/deployed by the project

The project activity is structured around three main process steps and their supporting systems: Hydrogen Plant (Electrolyzers), Nitrogen Plant (ASU), Ammonia Plant, and associated utilities. The project boundary covers the production of **renewables-based ammonia**, while downstream fertilizer production and distribution are outside the scope. However, fertilizer production is directly integrated into the overall production facility avoiding long transport distances.

Hydrogen Plant
Hydrogen will be produced on-site via water electrolysis powered entirely by 100% renewable energy, ensuring that the hydrogen produced is classified as renewables-based. The plant consists of:

- One electrolyzer system (Electrolyzer Package)

- Purification facilities to achieve hydrogen purity of 99.99% for ammonia synthesis

Production Capacity:

- H_2 Daily Capacity: 115 MTPD
- Oxygen co-produced: 920 MTPD
- Alkaline electrolyzers have been considered

Product Specification:

- Hydrogen purity: 99.99%
- Pressure: Preliminary 30 bar (to be confirmed as per downstream requirements)
- Impurities: Reference 10 ppm maximum of oxygenated compounds

Nitrogen Plant (Air Separation Unit, ASU)

Nitrogen required for ammonia synthesis will be extracted from air using cryogenic rectification.Nitrogen Production Capacity

Production Capacity:

- N_2 Daily Capacity: 525 MTPD
- O_2 Daily Capacity: 140 MTPD (to be confirmed with vendor)

Product Specification:

- Preliminary N_2 pressure: 28 bar a
- Preliminary N_2 temperature: 30°C

Ammonia Plant

The renewables-based ammonia plant synthesizes ammonia from green hydrogen and nitrogen as feedstock; the former is produced by electrolysis and the latter is separated from air in an air separation unit. Ammonia synthesis mainly comprises an ammonia converter and a refrigeration section

Production Capacity:

- NH_3 Daily Capacity: 635 MTPD
- Turn-down capacity: 30% (to be confirmed by technology provider)
- Operating days per year: Minimum 350 d/y
- On-stream factor: 24 hours per day

Product Specification:

- Phase: Liquid
- Temperature at battery limit: -33°C
- Pressure at battery limit: 3.9 barg
- Appearance: Colorless

Ammonia product quality		
Parameter	Unit	Value
Ammonia, minimum	wt %	99.9
Water, min	wt %	0.1
Oil, max	ppm	5
Chloride, maxPpm w/w1	Ppm w/w	1
Iron, max	ppm w/w	1
Hydrogen, max	ppm w/w	1

A.5.3. Declaration related to the existence of a former project in the same geographical location

The project is a greenfield project activity and there is no former project existing in the same geographical location.

A.6. Parties and activity participants

(Add/remove rows as necessary)

Type of Party	Name of the Party	Activity participant(s)
Host Party	Brazil	Atlas Agro Brasil Fertilizantes LTDA

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines

Applied methodology: Proposed new baseline and monitoring methodology "Fertilizer production with renewables-based ammonia", version 01.0

B.2. Applicability of methodologies and standardized baselines

Applicability conditions of the proposed mechanism methodology:

Title: "Fertilizer production with renewables-based ammonia"

Methodological tools:

"A6.4-AMT-001: Common practice analysis" (hereinafter referred as "common practice tool");

"A6.4-AMT-002: Investment analysis" (hereinafter referred as "investment analysis tool").

Applicability condition in the methodological regulatory document or the methodological requirement specified by the host Party	Compliance of the project with the applicability condition in the methodological regulatory document or the methodological requirement specified by the host Party
a) The activity produces renewables-based ammonia for fertilizer production. This shall be verified at validation and at each verification of emission reductions.	The activity will produce fertilizers using ammonia derived entirely from renewable energy source via dedicated renewable energy facilities and a related PPA, complying with the applicability condition.
b) No fossil fuels are used as feedstock in the production of hydrogen and ammonia. This shall be verified at the initial validation and at each verification of emission reductions.	No fossil fuels will be used in the production of hydrogen or ammonia; all hydrogen and nitrogen production processes rely on renewable electricity, complying with the applicability condition.
c) Hydrogen under the activity is produced from electrolysis and the entire production of hydrogen is used for the renewables-based ammonia production. This shall be verified at the initial validation and at each verification of emission reductions.	Hydrogen is planned to produce through Alkaline electrolysis complying with the applicability condition. All hydrogen production is planned to be used for the ammonia synthesis.
d) Nitrogen is produced from air separation. This shall be verified at the initial validation and at each verification of emission reductions.	Nitrogen will be generated through an Air Separation Unit (ASU) cryogenic rectification, complying with the applicability condition.
e) Electricity used to produce hydrogen, nitrogen and ammonia is either sourced from one or a combination of the following sources taking into consideration the provisions as defined in Appendix 1 of the methodology: This shall be verified at the initial validation and at the start of each crediting period:	Electricity is planned to be sourced from dedicated renewable energy sources connected via the electricity grid to the production facility, complying with the applicability condition (ii).

(i) from dedicated renewable energy sources connected via the electricity grid to the ammonia production facility; (ii) from the grid, where the grid emission factor (i.e. the combined margin) is equal or less than 0.2 tCO_2e/MWh and it can be demonstrated that the share in total electricity production was expanded over the last 5 years prior to the start date of the activity. (Only to be assessed once at the initial validation of the PDD or, where the information is not yet available, at the first verification of emission reductions); (iii) From the grid, where the grid emission factor (i.e. the combined margin) is above 0.2 tCO_2e/MWh and it can be demonstrated that the share in total electricity consumption from the grid is below 15%.	
For (the share of) electricity that is provided to the activity from a dedicated renewable energy source facility via the public/national electricity grid and where all of the following conditions are fulfilled: a. The renewable energy facility started operation no more than 3 years before the project start date of the activity; b. The renewable energy facility is located in the same country as the activity; c. The capacity of the renewable energy facility used exceeds any jurisdictional renewable portfolio requirements or is otherwise excluded from those requirements if existing; d. A power purchase agreement (PPA) is established and complies with all of the following conditions: i. The PPA is mutually executed by both the project proponent (or project proponent's representative) and the renewable energy facility before the start of construction of the renewable energy facility (or phase); ii. The PPA forbids the project proponent and the PPA counterparties from generating, transferring, or selling renewable energy credits (RECs) or other instruments representing the low-carbon benefits of the energy to others for the quantity of energy supplied to the project through the agreement. e. The production of electricity at the renewable energy facility and the consumption of electricity at the activity	Brazil offers a regulatory framework called the self-producer model, which allows large industrial consumers to secure dedicated renewable electricity through the national grid. Under this model, a Special Purpose Entity (SPE) can be appointed to develop, operate, and manage a renewable energy facility dedicated to the project. The electricity produced is delivered via the grid, and all transactions are reported and settled through the Brazilian Electric Energy Commercialization Chamber (CCEE), ensuring full compliance with national regulations and all relevant applicability conditions for renewable electricity use. a) The SPE and the project will ensure that the renewable energy facility is constructed and operational at or shortly before the project start date, satisfying the condition that the facility is no more than 3 years old relative to project commencement. b) The renewable energy facility will be located in the same country and bidding zone as the project, as required under the self-producer framework. c) The renewable energy facility under the self-producer model will be sized to fully meet the ammonia plant's electricity demand. This ensures that its capacity exceeds any jurisdictional renewable portfolio requirements. i) The PPA will be mutually executed by both the project proponent and the renewable energy facility before the start of construction, with the SPE responsible for managing this process. ii) No renewable energy credits (RECs) or other low-carbon instruments will be sold or

site takes place during the same period on an hourly basis.	transferred; all environmental attributes of the electricity will be dedicated to the ammonia project. iii) Hourly matching of electricity production and consumption is feasible under the framework and will be implemented as required to ensure full compliance. All measures will be in place before the project start date, guaranteeing that the ammonia plant operates entirely on renewable electricity and that all Appendix 1 conditions are satisfied.
g) Ammonia is produced by the Haber-Bosch process using the hydrogen and nitrogen produced as per the previously described conditions. This shall be verified at initial validation and at each verification of emission reductions.	Ammonia is planned to be produced using renewable hydrogen and nitrogen in a Haber–Bosch process, complying with the applicability condition.
h) Only the share of ammonia used for fertilizer production within the host country of the activity is applicable for generating emission reductions. The produced fertilizer may be used in the host country or exported. This shall be verified at each verification of emission reductions.	The produced renewables-based ammonia will be used to produce fertilizers such as Ammonium Nitrate, and Calcium Ammonium Nitrate at an integrated facility. Fertilizer is used within the host country, complying with the applicability condition.
i) The activity shall use no more than 5 % 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 verification of emission reductions using data from the project activity and from official sources. This shall be verified at initial validation and at each verification of emission reductions	The electrolysis process will not use any locally available drinking water. All water required for hydrogen production will be sourced as raw water from the Rio Grande and transported to the facility via a dedicated pipeline. Since the project does not draw from potable water supplies, its consumption represents **0% of local drinking water availability**, ensuring no displacement of drinking, domestic, or other essential uses
j) Activities must demonstrate minimal impact on water needed for drinking, agriculture, livelihood and ecosystems as per Appendix II. This shall be verified at initial validation and at each verification of emission reductions Activities have to ensure that negative impacts to fresh or drinking water resources are minimised by the following requirements. Development of a water risk assessment showing that the overall risk to fresh or drinking water resources is not exceeding “low-medium” levels following the WRI Aqueduct methodology on global water risk indicators or adequate methodologies for the following indicators: a. Water stress; b. Water depletion; c. Interannual variability;	The electrolysis process will use raw water sourced locally from the Rio Grande, transported approximately 2 km via pipeline to the facility. This water is not drawn from potable supplies or irrigation allocations, ensuring that project needs do not compete with drinking water, agriculture, or other critical livelihoods. On-site demineralization treatment will make the water suitable for electrolysis, avoiding any impact on municipal or agricultural water networks. This approach minimizes effects on local water availability and livelihoods and fully complies with the applicability conditions. 6.Water Risk Assessment: The project will conduct a water risk assessment at validation and for each crediting period renewal, following WRI Aqueduct global water risk indicators or equivalent methodologies. Based on the limited intake relative to the river flow, the overall risk to fresh or drinking water resources is expected to be “low-medium”, covering indicators such as: • Water stress

d. Seasonal variability; e. Groundwater table decline; f. Drought risk; g. Unimproved/No Drinking Water The water risk assessment shall be done once at validation and for each renewal of the crediting period.	• Water depletion • Interannual and seasonal variability • Groundwater table decline • Drought risk • Access to unimproved or no drinking water This ensures that the project's water use does not negatively impact local water availability or communities
Development and implementation of a water management and monitoring plan including a description of a. the operational practices that will be implemented to maintain or enhance water quality; b. the operational practices that will be implemented to use water efficiently and to avoid the depletion of surface or groundwater resources beyond replenishment capacities; c. how an increase in the risk of negative impacts will be detected; d. the corrective measures to be implemented if risk of negative impacts is observed to be significantly increasing compared to the water risk assessment described above.	7.Water Management and Monitoring Plan: The project will implement a comprehensive water management and monitoring plan to minimize potential impacts: • Water will be treated on-site via a dedicated demineralization unit, preventing any contamination of local water sources. • Process water use will be optimized, and consumption will not exceed the replenishment capacity of the Rio Grande. • Continuous monitoring of water intake, local river levels, and seasonal flow variability will detect any increase in risk to water resources. • If risks increase significantly, mitigation measures such as reducing withdrawal, implementing water recycling, or adjusting operations will be applied. This approach ensures that the project minimizes impacts on freshwater resources and fully complies with Appendix II requirements.
k) Activities must demonstrate that water utilization will not have an impact on ecosystems resulting in an increase of emissions (e.g. loss in biomass or soil carbon stocks). This shall be verified at initial validation and at each verification of emission reductions.	All water required for the project will be sourced from raw water and delivered via dedicated pipelines to the production facilities. The controlled delivery will ensure that there is no disturbance to vegetation, soil, or aquatic habitats. As a result, the project will not cause any changes in carbon stocks or risk of emissions from ecosystem degradation, fully complying with the applicability conditions.
l) This methodology is applicable to activities implemented in existing ammonia and fertilizer production facilities replacing fossil-fuel-based hydrogen and ammonia production (brownfield) or to the construction of new hydrogen and ammonia production facilities (greenfield activities). This shall be verified at the initial validation.	The project involves the construction of entirely new hydrogen and ammonia production facilities. No existing fossil-fuel-based ammonia or hydrogen production infrastructure is being replaced. Therefore, the project qualifies as a greenfield activity under the methodology and brownfield-specific conditions do not apply.
m) For brownfield activities, it must be possible to distinguish all production steps, related energy inputs and emission sources between the existing production pathway and the activity production pathway. This may be demonstrated based on the entire production facility or on the level of entire	Not applicable.

production lines. This shall be verified at initial validation and at each verification of emission reductions	
n) For brownfield activities, it must be demonstrated that replaced equipment and production facilities are scrapped and not used elsewhere. (Only to be assessed once at the initial validation of the PDD or, where the information is not yet available, at the first verification of emission reductions). This shall be verified at the initial validation. If the required information is not available at validation, it shall be assessed at the first verification of emission reductions.	Not applicable.
Providing evidence, in each monitoring report, that the outcomes from the Article 6.4 activity (e.g., renewable energy consumed, green fertilizer produced) for which they intend to request issuance of A6.4ERs are not also claimed in other environmental markets or accounting frameworks (e.g., renewable energy certificates, guarantees of origin, green hydrogen schemes, low-carbon fuel standards), except for outcomes not related to GHG emissions. Demonstrating that the reported GHG emission reductions for which they intend to request issuance of A6.4ERs do not overlap with mandatory domestic mitigation schemes (e.g., emissions trading systems), or that measures are in place to ensure that any relevant impacts of the activity (e.g., the GHG emission reductions achieved or the kilowatt-hours of renewable electricity used for hydrogen production) are not counted towards the achievement of targets or obligations under the mandatory domestic mitigation scheme (e.g., by cancelling allowances from the emissions trading system before issuing carbon credits) if the overlap exists[3], by: i. Declaring and providing evidence in each monitoring report that the Article 6.4 activity and the activities displaced in the baseline scenario (e.g., fossil-fuel-based hydrogen or ammonia production) do not fall within the scope of any mandatory domestic mitigation scheme; or ii. Where the Article 6.4 activity or the activities displaced in the baseline scenario fall within the scope of a	The Green Ammonia project ensures that all emission reductions are claimed solely under Article 6.4. The electricity used in hydrogen and ammonia production comes from 100% renewable sources via grid-connected PPAs, and all associated environmental benefits (e.g., RECs or certificates) are dedicated exclusively to the project . This arrangement is being implemented and will be verified in each monitoring report to ensure that no other party claims the same reductions, thereby preventing double counting. This status will be declared and documented in each monitoring report. The project recognizes that Brazil has established a regulated emissions trading system (SBCE), which applies cap-and-trade obligations to major emitting sectors. The Green Ammonia activity—including green hydrogen production via electrolysis, renewable electricity generation, and ammonia synthesis—comprises newly constructed facilities that are not currently designated as covered installations under existing SBCE regulations or allocation plans. Likewise, baseline activities represent performance from facilities either hypothetical or not subject to SBCE obligations at this period. This no-overlap status will be explicitly declared and evidenced in each monitoring report. Should components later enter SBCE scope, allowances will be cancelled or emissions excluded to prevent double counting. If the project exceeds regulatory thresholds in the future or if SBCE rules are updated to include these facilities as covered entities, the project will take appropriate measures—such as cancelling allowances or excluding relevant emissions from crediting—to prevent double counting, with all actions transparently reported in subsequent monitoring documentation. Brazil's SBCE (Law 15.042/2024) formally integrates Article 6.4 as an implementation instrument by allowing UNFCCC-certified A6.4ERs to be used as CRVEs (Certificates of Verified Emission Reduction or Removal) for compliance by covered entities[4] .

[3] When full or partial impact of the activity is covered under mandatory domestic mitigation scheme and counted towards the achievement of targets and obligations under mandatory domestic mitigation scheme, the relevant share of the impact shall be deducted by the activity participants from the amount requested for issuance.

[4] https://icapcarbonaction.com/en/news/brazil-adopts-cap-and-trade-system

mandatory domestic mitigation scheme, activity participants may: a. Provide evidence in each monitoring report that the mitigation outcomes of the Article 6.4 activity are not counted in the mandatory mitigation scheme to reduce the obligations by the entities covered by the scheme. For example, in the case of an emissions trading system covering electricity generation, a confirmation from the operator of the emissions trading system may be sought that a number of allowances equal to the A6.4 ERs being requested for issuance for the electricity generation component were cancelled before the issuance of the A6.4 ERs; or b. Demonstrate that project participants are not requesting the issuance of A6.4ERs for any emission reductions resulting from a component of the Article 6.4 activity that falls within the scope of the mandatory domestic scheme. For example, in the case of an emissions trading system covering electricity generation, the activity participant could elect to not include baseline emissions from electricity generation in the calculation of the total emission reductions and thereby demonstrate that no double-counting has occurred. Notwithstanding above-mentioned guidance, where the policy for establishing the framework or environmental market or for establishing the mandatory domestic mitigation scheme refers to or formally integrates the mechanism as an instrument for implementation, participation in such a framework or environmental market or domestic mitigation scheme does not result in double counting.	Subject to SBCE approval of the project methodology and registration in the SBCE Central Registry, these A6.4ERs could be used domestically by covered entities to meet SBCE obligations or transferred internationally in compliance with UNFCCC requirements. In such cases, the project will ensure that the credits are properly transferred, retired, and correspondingly adjusted, preventing double counting. This will be declared and documented in each monitoring report. The Green Ammonia project will ensure that all emission reductions are claimed only by the project participants through legally binding contracts. Any external users of the produced ammonia, hydrogen, or electricity will not be entitled to claim A6.4ERs or carbon credits under any other carbon crediting program, because ownership of emission reductions will be contractually restricted to the activity participant. These contractual arrangements, together with monitoring and documentation, will ensure that all A6.4ERs are uniquely attributed to the project, preventing double counting or overlapping claims. This will be declared and documented in each monitoring report.

2. Activities that involve third parties for green fertilizer production shall ensure that A6.4ERs can only be claimed by the activity participants and signed contracts shall be employed ensuring the same. These contracts must explicitly indicate that A6.4ERs can only be claimed by the activity participants and that the third parties involved shall not claim A6.4ERs or carbon credits from any other carbon crediting programme.	
By fulfilling all applicability conditions, including using renewable electricity, building new facilities (greenfield), and using raw water has water source, the project ensures very low emissions. The only emissions that may occur are from hydrogen leakage and transportation, which are planned to be measured and accounted for according to the methodology. Since no fossil fuels will be used anywhere in the project, there is no expected risk of carbon lock-in.	

B.3. Project boundary, sources, sinks and greenhouse gases

The project boundary includes all physical sites, equipment, and processes involved in the production of renewables-based hydrogen and ammonia. This covers:

1. The renewable energy generation
2. Water supply and treatment, including demineralization and pipelines to the electrolysis and ammonia production facilities.
3. Electrolysis units for hydrogen production.
4. Air separation units for nitrogen production.
5. Ammonia synthesis units (Haber-Bosch process).
6. Handover of ammonia to downstream fertilizer production at the project site.

The project boundary is limited to the premises of the production facilities of renewables-based ammonia and the sources of renewable energy supplying them. Emissions and mitigation outcomes within this boundary are included for monitoring and accounting purposes

B.3.1. Baseline emissions/removals

Source/reservoir/pool	GHG		Justification/Explanation
Nitrogen production	CO_2	☒ Included ☐ Not included	CO_2 emissions from the use of electricity and energy are the main emission source
	CH_4	☐ Included ☒ Not included	CH_4 emissions are considered negligible for this emission source
	N_2O	☐ Included ☒ Not included	N_2O emissions are considered negligible for this emission source
	-----	☐ Included ☒ Not included	No other GHG are expected from the process
Hydrogen production	CO_2	☒ Included ☐ Not included	CO_2 emissions from the use of fossil fuels as feedstock in the process are the main emission source. Furthermore, CO_2 emissions from the use of electricity and energy are the main emission source

	CH_4	☐ Included ☒ Not included	CH_4 emissions (upstream) from the use of fossil fuels in the steam reforming process are a significant emission source
	N_2O	☐ Included ☒ Not included	N_2O emissions are considered negligible for this emission source
	-----	☐ Included ☒ Not included	No other GHG are considered from the process, which is conservative
Ammonia production	CO_2	☒ Included ☐ Not included	CO_2 emissions from the use of electricity and energy are the main emission source
	CH_4	☐ Included ☒ Not included	CH_4 emissions are considered negligible for this emission source
	N_2O	☐ Included ☒ Not included	N_2O emissions are considered negligible for this emission source
	-----	☐ Included ☒ Not included	No other GHG are considered from the process, which is conservative

B.3.2. Project emissions/removals

Source/reservoir/pool	GHG		Justification/Explanation
Nitrogen production	CO_2	☒ Included ☐ Not included	CO_2 emissions from the use of electricity and energy are the main emission source
	CH_4	☐ Included ☒ Not included	CH_4 emissions are considered negligible for this emission source
	N_2O	☐ Included ☒ Not included	N_2O emissions are considered negligible for this emission source
	-----	☐ Included ☒ Not included	Other GHG emissions are considered negligible for this emission source
Hydrogen production	CO_2	☒ Included ☐ Not included	CO_2 emissions from the use of electricity and energy are the main emission source
	CH_4	☐ Included ☒ Not included	CH_4 emissions are considered negligible for this emission source
	N_2O	☐ Included ☒ Not included	N_2O emissions are considered negligible for this emission source
	H_2	☒ Included ☐ Not included	H_2 emissions are considered as emission source as the switch in H_2 production may increase related emissions
Ammonia production	CO_2	☒ Included ☐ Not included	CO_2 emissions from the use of electricity and energy are the main emission source
	CH_4	☐ Included ☒ Not included	CH_4 emissions are considered negligible for this emission source
	N_2O	☐ Included ☒ Not included	N_2O emissions are considered negligible for this emission source
	-----	☐ Included ☒ Not included	Other GHG emissions are considered negligible for this emission source
Transport within the production steps and transport of ammonia to	CO_2	☒ Included ☐ Not included	CO_2 emissions from the use of electricity and energy are the main emission source
	CH_4	☐ Included ☒ Not included	CH_4 emissions are considered negligible for this emission source

the fertilizer production within the host country	N_2O	☐ Included ☒ Not included	N_2O emissions are considered negligible for this emission source
	-----	☐ Included ☒ Not included	Other GHG emissions are considered negligible for this emission source
Clearing of land	CO_2	☒ Included ☐ Not included	Main emission source.
	CH_4	☐ Included ☒ Not included	CH_4 emissions are considered negligible for this emission source
	N_2O	☐ Included ☒ Not included	N_2O emissions are considered negligible for this emission source
	-----	☐ Included ☒ Not included	Other GHG emissions are considered negligible for this emission source

B.4. Establishment and description of baseline scenario

B.4.1. Identification of the baseline scenario

As per the methodology and as per the type of activity (i.e. greenfield), the BAT approach is the default approach and is applied to set the baseline for the project.

Under this approach, the baseline scenario represents conventional ammonia production using hydrogen from fossil fuel feedstock via steam reforming or coal gasification process. Since this is a greenfield project, the BAT emission factor of 2.16 tCO_2e per ton of ammonia produced is applied, as specified in the methodology. No country-specific values are used, and no historical emissions are considered, consistent with the greenfield nature of the project.

B.4.2. Identification of the BAU scenario or reference benchmark

The BAU scenario, as described in the applied methodology, represents conventional ammonia production using hydrogen from natural gas-based SMR/Coal gasification process. The project applies the global BAU emission factor of 3.84 tCO_2e per ton of ammonia as the reference to check the appropriateness of the above mentioned baseline benchmark to for calculating GHG emission reductions.

B.5. Demonstration of additionality

B.5.1. Regulatory analysis

The proposed greenfield renewables-based ammonia project in Brazil is not mandated by any existing law or regulation:

Existing relevant policies and programs provide enabling conditions or incentives but do not impose binding requirements on ammonia producers:

-**Law No 14.948/2024 – Hydrogen Legal Framework (Marco Legal do Hidrogênio)**: Establishes the National Hydrogen Policy and official categories of “low-carbon hydrogen,” including hydrogen for low-carbon ammonia. While it creates a framework for certification and potential incentives, it does not mandate the production or use of renewable hydrogen or green ammonia.

-**Law No 14.902/2024 – Mercado Brasileiro de Redução de Emissões (MBRE / SBCE)**: Creates a regulated carbon market. Although the chemical and fertilizer industries are expected to be covered under future compliance caps, there are currently no binding emission reduction requirements specific to ammonia production in Brazil today.

-**BNDES and Finep financing programs (2022–2025)**: Provide credit lines for industrial decarbonization and energy transition projects, which may include hydrogen or ammonia initiatives. However, these are voluntary financial incentives rather than regulatory mandates.

The current project activity in Brazil goes beyond existing legal and regulatory requirements as follows:

- Brazil does not have legal requirements to reduce CO_2 emissions from ammonia production.

- There are no national or regional policies that require the use of renewable hydrogen or renewables-based ammonia production.
- The project has no economic incentives to take any CO_2 reduction measures because this entails significant capital and operating costs but no financial benefits.

Therefore, the project is deemed **additional** with regard to the regulatory check according to the methodology provisions.

B.5.2. Avoidance of lock-in

The project demonstrates compliance with all relevant requirements of the methodology as follows:

Hydrogen for ammonia production is generated exclusively via electrolysis powered by renewable electricity sourced from dedicated renewable energy facilities connected via the electricity grid. Diesel generator facilities of smaller capacity are only used for emergency purposes, with operations strictly limited to a dedicated testing protocol not exceeding 100 hours per year. This backup system does not create any fossil fuel lock-in, as it is not used for regular operations and the facility relies entirely on renewable electricity for hydrogen and ammonia production.

B.5.3. Financial additionality or performance-based approach

☒ Financial additionality ☐ Performance-based approach

(Select one option)

The financial additionality has been tested applying the benchmark analysis, comparing the financial attractiveness of the proposed activity against a financial benchmark. The IRR has been selected to identify the benchmark, as it is one of the most common metrics used to evaluate investments' financial attractiveness.

The following inputs parameters have been used to perform the investment test related to the entire integrated facility including, hydrogen, nitrogen, ammonia and fertilizer production units.

Item	Value	Unit	Comments:
Total CAPEX	1,045,000 - 1,265,000	US$ '000	In addition to the initial outlay 2% of CAPEX is assumed as annual repair plus 42,900 every 8 years for electrolysis stack replacement.
Total OPEX	99,750 - 120,750	US$ '000	
Total revenues from sales	238,000 - 294,000	US$ '000	
Benchmark IRR used in test	13	%	Conservative benchmark relecting the non-mature / emerging technology solution of renewables-based ammonia production.
Lifetime considered for the investment test	25	Years	Typical period of investment assessment period in the sector

The median values of the ranges showed above have been applied for the investment test.

Result of the benchmark analysis show that the proposed activity reaches (without the revenues from carbon credits) an IRR of 10.2 %which is lower than the benchmark, set at 13%.

The results of the benchmark analysis are corroborated by the sensitivity test. The sensitivity has been performed on key parameters, i.e. total CAPEX, total OPEX and total revenues. These parameters drive the IRR results and thus are variated +/-10% each to test robustness of the investment test and of its results also when main input parameters vary. The 10% variation has been selected to take into account uncertainty related to the input parameters. The results of the sensitivity analysis are presented in the following table.

Sensitivity Results				
		-10%	0	+10%
Total CAPEX	**IRR**	11.66%	10.20%	8.97%

Total OPEX	**IRR**	11.32%	10.20%	9.05%
Total Revenues	**IRR**	7.35%	10.20%	12.86%

As shown, the activity's IRR does not cross the benchmark when CAPEX and OPEX are decreased by 10%. A reduction in either CAPEX or OPEX is not expected in short term, as these inputs parameters tend to constantly increase due over time. An increase in the revenues generated by the activity is considered plausible, depending on the actual market conditions: however, even in this case, a 10% increase in the revenues would not result in the IRR crossing the 13% benchmark.

The activity is thus deemed **additional as confirmed by the investment test and by the sensitivity analysis.**

B.5.4. Common practice analysis

The common practice analysis follows the methodology requirements and thus applies Approach B as described in the Methodological tool: Common practice analysis. The geographical scope is set at the entire country, i.e. Brazil. While several producers have announced the interest in renewables-based ammonia production, as of today, no commercial renewables-based ammonia production is observed in Brazil. As such, the activity is deemed not to be common practice in line with the proposed methodology.

B.6. Addressing non-permanence and risks of reversals

B.6.1. Identification of risk of reversal

This project activity doesn't involve removals and emission reduction with reversal risks

B.6.2. Reversals risk assessment

This project activity doesn't involve removals and emission reduction with reversal risks

B.6.3. Reversals risk mitigation plan

This project activity doesn't involve removals and emission reduction with reversal risks

B.6.4. Remediation of reversals

This project activity doesn't involve removals and emission reduction with reversal risks

B.7. Calculation of emission reductions or net removals

B.7.1. Calculation of BAU emissions/removals and baseline emissions/removals

The Business-As-Usual (BAU) emissions for the project have been calculated based on data from GS4GG A6 M400-01 SI, table 11 and table 16 taking into consideration direct and upstream emissions and the estimated production volumes for the global BAU. In the absence of a specific geographical reference for the baseline scenario, the global BAU value of 3.84 has been applied, consistent with baseline conditions in similar social, economic, environmental, and technological circumstances, and producing outputs comparable to the project activity.

For this project, which involves renewables-based ammonia production, the global BAU value is applied along with an uncertainty adjustment factor of 0.94 as a conservative measure outlined in methodology, in line with the Baseline standard.

Regulatory Adjustment:

Where applicable, the global BAU value is adjusted to account for regulatory policies, following the approach specified in the baseline standard. Currently, the proposed activity is not subject to any mandatory regulatory policies requiring adjustment based on an assessment of existing policies and regulations in Brazil.

Thus, BAU emissions after applying the regulatory adjustment are:

$$BAU_y = 3.6 \frac{tCO2e}{tNH3} \times 222{,}250\ tNH3 = 853{,}440\, tCO2e$$

B.7.1.1. Calculation of BAU emissions/removals

The BAU emissions for the project are determined using the step-wise procedure outlined in the Baseline Standard.

Step i: Determine uncertainty of the BAU:
The ex-ante quantified unadjusted net BAU emission intensity (BAU) for the project is estimated as 3.84 tCO_2e per tNH_3, based on data from .

Step ii: Apply uncertainty adjustment:
Following the methodology, a conservative uncertainty adjustment factor of 0.94 is applied to account for uncertainties follows.

The downward adjusted baseline emissions based on uncertainty are calculated as:

$$BE_{Cons,UNC,y} = BAU_y * (1 - UNC_{BAU,CP1,y})$$
$$BE_{Cons,UNC,y} = 3.84\ tCO2e/tNH3 \times (1 - 0.06)$$
$$BE_{Cons,UNC,y} = 3.6\ tCO2e/tNH3$$

Applying the actual production value for Year 1:

$$BE_{Cons,UNC,y} = 3.6\ \frac{tCO2e}{tNH3} * 222{,}250\ tNH3$$

$$BE_{Cons,UNC,y} = 801{,}000\ tCO2_e$$

$UNC_{BAU,CP1,y}$	=	Uncertainty at the lower bound of the uncertainty interval relative to the central estimate of the ex-ante quantified most likely net BAU baseline emissions and/or removals during the first crediting period year y (fraction)
$BE_{Cons,UNC,y}$	=	Conservative BAU baseline emissions and/or removals based on uncertainty in year y
$BAU_{,y}$	=	Most likely net BAU baseline emissions and/or removals in year y
y	=	Calendar year of the start date of the first crediting period

Step iii. **Determine the minimum downward adjusted BAU baseline emissions**

As per the Baseline Standard, the minimum conservative BAU baseline is determined as:

$$BE_{Cons,miny} = BAU_y - (BAU_y - AE_y) \times 0.1$$

$BE_{Cons,min,y}$	=	Minimum conservative BAU baseline emissions and/or removals in year y
AE_y	=	Ex-ante estimated activity emissions in year y

Applying project emission from section B.7.2 as follows:

$$BE_{Cons,min,y} = 853{,}440tCO2e - (853{,}440tCO2e - 0tCO2e) \times 0.1$$
$$BE_{Cons,UNC,y} = 768{,}096tCO2e$$

Step iv: Selection of the conservative baseline

The final conservative BAU baseline is taken as the lower of the two values calculated in Steps ii and iii:

$$BE_{cons,y} = min(BE_{cons,UNC,y}, BE_{cons,min,y})$$

$BE_{cons,y}$	=	Conservative BAU baseline emissions and/or removals in year y
y	=	Calendar year of the start date of the first crediting period

Accordingly, the **conservative BAU baseline selected** is the **lowest of the two values**, i.e.:

$$BE_{cons,y} = min(801{,}000\ tCO2_e, 768{,}096tCO2e)$$
$$BE_{cons,y} = 768{,}096tCO2e$$

The same applies for following years.

B.7.1.2. Calculation of baseline emissions/removals

The baseline emissions for the activity are calculated using the **ambitious benchmark approach**, as specified in the proposed methodology. The baseline scenario represents conventional ammonia production using fossil fuel feedstock **(SMR/Coal gasification).**

Baseline emissions prior to downward adjustment

The baseline emissions for renewables-based ammonia project in year 1 before applying any downward adjustment are calculated using equation as follows:

$$BE_{prior,y} = P_{NH3,Act,y} \times BE_{baseline}$$

Where:		
$BE_{prior,y}$	=	Baseline emissions in year y prior to downward adjustment (tCO_2e)
$P_{NH3,Act,y}$	=	Production of renewables-based ammonia in year y (tNH_3)
$BE_{baseline}$	=	Emission benchmark for ammonia production (tCO_2e/tNH_3)

The project activity produces 222,250 tNH_3/year in the year 1. Using the emission benchmark of 2.16 tCO_2e/tNH_3, which already incorporates the conservative adjustment, the baseline emissions prior to any further downward adjustments are calculated as:

$$\boldsymbol{BE_{prior,y} = 222,250\ tNH_3 \times 2.16 tCO_2e/tNH_3 = 480,062 tCO_2e}$$

Calculation of the downward adjusted baseline

Since an ambitious benchmark approach is default baseline approach, no downward adjustment is applied in the first year of the project.

For subsequent years, a downward adjustment factor (DAF) is applied to reflect the host country's long-term decarbonization pathways as per the Baseline Standard and methodology. According to Option (c) – consideration of established long-term pathways, the downward adjustment accounts for national targets.

For Brazil, the NDC sets a target of achieving net zero by 2050, using 2025 as the reference year, which corresponds to a 4% annual reduction applied each year for the downward adjustment, as per the equation below.

$$DAF_{Yn} = 1 - (Y_n - 2021) \times max\left(\frac{1}{(Y_{netzero} - Y_{reference})}, 0.01\right)$$

$$= 1 - (2030 - 2021) \times max\left(\frac{1}{(2050 - 2025)}, 0.01\right)$$

$$= 1 - 9 \times max(0.04, 0.01)$$

$$= 0.64$$

The downward adjustment baseline shall be calculated as per equation below:

$$BE_{adj,Yn} = BE_{adj,y1} \times DAF_{Yn}$$

Where:		
$BE_{adj,y}$	=	Downward adjusted baseline in year y
y_{first}	=	Calendar year of the start date of the first crediting period

The downward adjusted baseline in the first year is therefore equal to the baseline prior to adjustment:

$$BE_{adj,Year\ 1} = 480{,}062tCO2e$$

By applying a DAF for the subsequent years, the downward adjusted baseline is calculated as follows:

$$BE_{adj,year\ 2} = 480{,}062tCO2e \times 0{,}64$$

$$BE_{adj,year\ 2} = 307{,}238tCO2e$$

For the entire crediting period, the baseline for each year is calculated by applying a 4% reduction from the previous year using the same formula.

B.7.1.3. Calculation of the annual difference between baseline and BAU emissions/removals

As per the baseline standard and the proposed methodology, the activity must compare the downward adjusted baseline and the conservative BAU baseline to ensure that the crediting baseline remains conservative.

According to the calculations in the following it can be confirmed that the downward adjusted baseline $BAU_{adj,y}$ is lower than the conservative BAU baseline $BE_{Cons,min,y}$ for all years of the crediting period.

Year 1

The downward adjusted baseline is already lower than the conservative BAU baseline:

$$BE_{BAU,year1} > BE_{adj,year1}$$

$$768{,}096\ tCO2e > 480{,}060\ tCO2e$$

Year 2

Similarly, for Year 2, the downward adjusted baseline remains lower than the conservative BAU baseline:

The downward adjusted baseline is already lower than the conservative BAU baseline, so no adjustment is needed in Year 2

$$BE_{BAU,\text{year2}} > BE_{adj,\text{year2}}$$

$$768{,}096\ tCO2e > 307{,}238\ tCO2e$$

The comparison is performed annually to ensure that the downward adjusted baseline remains below the conservative BAU baseline throughout the entire crediting period. Where BAU emissions are lower than the baseline emissions, the lower values are used as crediting baseline.

Year	Baseline emissions (tCO_2e)	BAU (tCO_2e)	Selected crediting baseline (min of Baseline and BAU)
Year 1	480,060	768,096	480,060
Year 2	307,238	691,286	307,238
Year 3	288,036	614,477	288,036
Year 4	268,834	537,667	268,834
Year 5	249,631	460,858	249,631
Year 6	230,429	384,048	230,429
Year 7	211,226	307,238	211,226
Year 8	192,024	230,429	192,024
Year 9	172,822	153,619	153,619
Year 10	153,619	76,810	76,810

B.7.1.4. Factors or quantitative methods for downward adjustment of baseline

Default baseline emission factor according to the ambitious benchmark approach is calculated as per the applied proposed methodology.

The annual increase in the downward adjustment corresponds to 4% of the baseline emissions in the calendar year based on Brazil NDC According to Option (c) – consideration of established long-term pathways, the downward adjustment accounts for national targets and as outlined in the methodology.

B.7.2. Calculation of project emissions/removals

As per the methodology, activity emissions include all GHG emissions resulting from the operation of the project activity. These emissions are calculated for each source using the following approach:

These overall emissions are calculated as by applying all emission from the above to this equation as per methodology

$$AE_y = AE_{H2,y} + AE_{EC,y} + AE_{FC,y} + AE_{T,y} + AE_{LC}$$

:

Where:		
AE_y	=	Activity emissions in year y (tCO_2e)
$AE_{H2,y}$	=	Activity emissions as a result of physical leakage of hydrogen in year y
$AE_{EC,y}$	=	Activity emissions as a result of electricity consumption in year y (tCO2e). Where the conditions of Appendix 1 of the applied methodology are fulfilled, the emission factor for electricity can be assumed to be zero.
$AE_{FC,y}$	=	Activity emissions as a result of fossil fuel consumption in year y (tCO_2e).
$AE_{T,y}$	=	Activity emissions as a result of transportation in year y (tCO_2e).

AE_{LUC}	=	Activity emissions as a result of land clearing for construction (only applicable in the first year of the crediting period (tCO_2e)

1) Hydrogen leakage

The physical leakage of hydrogen is calculated using the following equation as per the methodology.

$$AE_{H2,y} = LK_{H2,y} \times GWP_{H2}$$

$LK_{H2,y}$	=	Quantity of hydrogen leaks in year y (tH_2)
GWP_{H2}	=	Global warming potential of hydrogen (tCO_2e/tH_2)

For the activity, **no hydrogen leakage is expected to occur** during the crediting period as a result of appropriate leak detection. In the event of any leakage detection, the related hydrogen emissions will be quantified as per the proposed new methodology. Therefore, the associated emissions are:

$$AE_{H2,y} = 0\ tCO2e$$

2) Electricity Consumption

In accordance with the methodology, the emission factor for electricity may be considered zero if the conditions specified in Appendix 1 of the applied methodology are met.

The proposed activity, electricity is sourced entirely from renewable energy through a long-term Power Purchase Agreement (PPA), ensuring that 100% of the electricity consumed originates from renewable sources. As such, project emissions from electricity consumption are calculated using the following equation:

$$AE_{EC,y} = \sum_{l} EC_{AE,\mathrm{j,y}} \times\ EF_{AE,\mathrm{j,y}} \times (1 + TDL_{j,\mathrm{y}})$$

Where:		
$AE_{EC,y}$	=	Activity emissions from electricity consumption in year y (tCO_2e)
$EC_{AE,\mathrm{j,y}}$	=	Quantity of electricity consumed by the activity from source j in year y (MWh)
$EF_{AE,\mathrm{j,y}}$	=	Emission factor for electricity generation for source j in year y (tCO_2e/MWh)
$TDL_{j,\mathrm{y}}$	=	Average technical transmission and distribution losses for providing electricity to source j in year y

The activity consumes 2,247,000 MWh of electricity annually. Since the emission factor $EF_{AE,\mathrm{j,y}}$ can be assumed to be zero and the used renewable energy sources are wind power and PV, the resulting project emissions are:

$$AE_{EC,y} =\ 0\ tCO2e$$

3) Fossil fuel consumption

The project does not use fossil fuels as a feedstock for hydrogen and ammonia production. A diesel generator is only used for emergency backup, associated emissions are deemed negligible at this stage but will be quantified as per real fuel consumption observed.

4) Transportation Emission

As per the methodology, emissions associated with transportation of renewables-based ammonia to end user $AE_{T,y}$ are considered. The produced renewables-based ammonia is entirely utilized on-site for the integrated fertilizer production. As such, no transportation-related emissions are applicable.

$$AE_{T,y} = 0\ tCO2e$$

5) Land clearing emissions

Emissions from land clearing are quantified as follows:

$$\Delta C_{LUC} = \sum_i \left(\left(C_{BL} - C_{Activity} \right) \times A_i \times \frac{44}{12} \right)$$

C_{BL}	=	Total carbon stock per unit area before land clearing (tC/ha)
$C_{Activity}$	=	Total carbon stock per unit area after land clearing (tC/ha)
A_i	=	Area i where land clearing was observed (ha)

The project site covers **108 hectares** within an existing industrial area. As the land was already developed and not previously forest, grassland, or cropland, **no land-use change occurs** as a result of the project. Therefore, there is **no change in carbon stocks** attributable to land conversion.

$$\Delta C_{LUC} = 0\ tCO2e$$

The total activity emissions for the project in year *1* are calculated by summing all sources:

$$AE_y = AE_{H2,y} + AE_{EC,y} + AE_{FC,y} + AE_{T,y} + AE_{LC}$$

Thus, the Total activity emissions in year 1 is 0 $tCO2e$. The same approach will be followed for all subsequent years of the activity.

B.7.3. Addressing of leakage

B.7.3.1. Sources of leakage

According to the leakage standard, potential leakage sources in renewables-based ammonia production include:

1. Transfer of baseline equipment
2. Competition for resource use
3. Diversion of existing production or outputs
4. Environmental GHG release

As per the applicable methodology, emissions from international transport of fertilizers exported from the host country need to be quantified as leakage emissions for greenfield activities.

B.7.3.2. Description of how leakage is avoided, minimized or addressed

- **Option (a) Baseline equipment transfer:** Not applicable, as this is a greenfield development. No existing equipment is replaced, so no leakage from reuse of equipment occurs.
- **Option (b) Use of competing resources:** Electricity is the main potentially competing resource. The project procures 100% of its electricity via a renewable PPA, avoiding diversion from other uses. In addition, Brazil's grid already has a **92% renewable share** which further demonstrates that any incremental electricity demand is highly likely to be supplied from renewable rather than fossil-based generation
- **Option (c) Diversion of existing production processes or services:** Not applicable, since the project represents new capacity and does not displace or reduce existing ammonia production elsewhere.
- **Option (d) Environmental GHG release:** Land clearing emissions are already accounted for within the project boundary in section 7.2 as per the methodology and therefore related leakage is considered zero.

As per the methodology, international transport emissions could be accounted as leakage if the renewables-based ammonia is exported. However, the renewables-based ammonia is consumed on-site for fertilizer production and fertilizer is assumed to be consumed in Brazil. Therefore, no leakage from international transport occurs in the project activity.

B.7.3.3. Calculation of leakage emissions

The project poses minimal leakage risks as it is a greenfield activity with no transfer of baseline equipment, diversion of existing production, or significant competition for resources. These aspects are reinforced by the project conditions, which consume 100% renewable electricity and no export of renewables-based ammonia is foreseen.

Therefore,

$$LE_y = 0tCO2e$$

B.7.4. Calculation of emission reductions or net removals

Emission reductions are calculated as the difference between baseline emissions, activity emissions, and leakage emissions:

$$ER_y = BE_y - AE_y - LE_y$$

For the renewables-based ammonia project in Year 1:

$$ER_{y=1} = 480{,}060\ tCO2e - 0\ tCO2e - 0\ tCO2e$$

$$ER_{y=1} = 480{,}060\ tCO2e$$

B.7.5. Data and parameters fixed ex ante

Data/parameter	$BE_{baseline}$
Description	Baseline emissions for ammonia production, expressed as the combined direct and upstream emission intensity per tonne of ammonia produced.
Data unit	tCO_2e/tNH_3
Equations referred	*Equation (3) of the proposed methodology*
Purpose of data	☒ Baseline emissions ☐ Project emissions ☐ Leakage emissions

Value(s) applied	<table><tr><th>Country or region</th><th>Direct emission intensity (tCO_2e/tNH_3)</th><th>Upstream emission intensity (tCO_2e/tNH_3)</th><th>Default Benchmark Emission Intensity (tCO_2e/tNH_3)</th></tr><tr><td>Global</td><td>1.6</td><td>0.6</td><td>2.16</td></tr></table>
Source of data	☐ Measured ☒ Other sources *Tick the applicable box. 'Other sources' include official statistics, expert judgment, proprietary data, IPCC, commercial and scientific literature, etc.*
Choice of data or measurement methods and procedures	Based on data from GS4GG A6 M400-01 SI, table 16 and taking into consideration direct and upstream emissions and a conservative factor of 0.98 from Annex 3 of FCCC/SBSTA/2003/10/Add.2 for the default benchmark to address uncertainty.
Additional comments	

Data/parameter	$BAU_{,y}$
Description	BAU emission intensity values for ammonia production in tCO_2e/tNH_3, including direct and upstream emissions. Used to determine the conservative BAU scenario for ex-ante baseline comparison.
Data unit	tCO_2e/tNH_3
Equations referred	*Equation (6) and Equation (7) of the proposed methodology*
Purpose of data	☒ Baseline emissions ☐ Project emissions ☐ Leakage emissions
Value(s) applied	<table><tr><th>Country or region</th><th>Direct emission intensity (tCO_2e/tNH_3)</th><th>Upstream emission intensity (tCO_2e/tNH_3)</th><th>Default BAU Emission intensity (tCO_2e/tNH_3)</th></tr><tr><td>Global</td><td>2.97</td><td>0.6</td><td>3.84</td></tr></table>
Source of data	☐ Measured ☒ Other sources *Tick the applicable box. 'Other sources' include official statistics, expert judgment, proprietary data, IPCC, commercial and scientific literature, etc.*
Choice of data or measurement methods and procedures	Default BAU values are based on data from GS4GG A6 M400-01 SI, table 11 and table 16 taking into consideration direct and upstream emissions and the estimated production volumes for the global BAU.
Additional comments	

Data/parameter	$UNC_{BAU,CP1,y}$
Description	Uncertainty applied to ex-ante BAU emissions in year *y* to ensure conservativeness, accounting for uncertainties in data, parameters, assumptions, and methods
Data unit	Dimensionless
Equations referred	*Equation (6) of the proposed methodology*

Purpose of data	☒ Baseline emissions ☐ Project emissions ☐ Leakage emissions
Value(s) applied	*0.06*
Source of data	☐ Measured ☒ Other sources *Tick the applicable box. 'Other sources' include official statistics, expert judgment, proprietary data, IPCC, commercial and scientific literature, etc.*
Choice of data or measurement methods and procedures	A default value of 0.06 can be applied based on a conservative factor of 0.94 from Annex 3 of FCCC/SBSTA/2003/10/Add.2.
Additional comments	

Data/parameter	GWP_{H2}
Description	Global Warming Potential of hydrogen (H_2
Data unit	tCO_2e/tH_2
Equations referred	*Equation (10) of the proposed methodology*
Purpose of data	☐ Baseline emissions ☒ Project emissions ☐ Leakage emissions
Value(s) applied	5.8 tCO_2e/tH_2
Source of data	☐ Measured ☒ Other sources *Tick the applicable box. 'Other sources' include official statistics, expert judgment, proprietary data, IPCC, commercial and scientific literature, etc.*
Choice of data or measurement methods and procedures	IPCC AR4 WG1 as under chapter 2.10.3.6
Additional comments	

Data/parameter	C_{BL}
Description	Total carbon stock per unit area before land clearing (tC/ha). Includes above-ground biomass, below-ground biomass, dead wood, litter, and soil organic carbon remaining following land conversion.
Data unit	tC/ha
Equations referred	*Equation (12) of the proposed methodology*
Purpose of data	☐ Baseline emissions ☒ Project emissions ☐ Leakage emissions
Value(s) applied	0 tC/ha
Source of data	☐ Measured ☒ Other sources *Tick the applicable box. 'Other sources' include official statistics, expert judgment, proprietary data, IPCC, commercial and scientific literature, etc.*
Choice of data or measurement methods and procedures	For conversion to "Settlements" (i.e., an industrial facility like a solar farm or ammonia plant), the IPCC assumes all living biomass is lost. Therefore, a default value of 0 for biomass pools can be used.

Additional comments	

Data/parameter	$C_{Activity}$
Description	Total carbon stock per unit area after land clearing (tC/ha). Includes above-ground biomass, below-ground biomass, dead wood, litter, and soil organic carbon remaining following land conversion.
Data unit	tC/ha
Equations referred	*Equation (12) of the proposed methodology*
Purpose of data	☐ Baseline emissions ☒ Project emissions ☐ Leakage emissions
Value(s) applied	0 tC/ha
Source of data	☐ Measured ☒ Other sources *Tick the applicable box. 'Other sources' include official statistics, expert judgment, proprietary data, IPCC, commercial and scientific literature, etc.*
Choice of data or measurement methods and procedures	For conversion to "Settlements" (i.e., an industrial facility like a solar farm or ammonia plant), the IPCC assumes all living biomass is lost. Therefore, a default value of 0 for biomass pools can be used.
Additional comments	

Data/parameter	A_i
Description	Total area of project facilities including dedicated renewable energy facilities as applicable.
Data unit	ha
Equations referred	*Equation (12) of the proposed methodology*
Purpose of data	☐ Baseline emissions ☒ Project emissions ☐ Leakage emissions
Value(s) applied	108 ha
Source of data	☐ Measured ☒ Other sources *Tick the applicable box. 'Other sources' include official statistics, expert judgment, proprietary data, IPCC, commercial and scientific literature, etc.*
Choice of data or measurement methods and procedures	Based on activity design and local map.
Additional comments	

B.7.6. Summary of ex ante estimates of emission reductions/net removals

Year	Baseline emissions (tCO_2e)	Project emissions (tCO_2e)	Leakage emissions (tCO_2e)	Emission reductions (tCO_2e)
Year 1	480,060	0	0	480,060

Year 2	307,238	0	0	307,238
Year 3	288,036	0	0	288,036
Year 4	268,834	0	0	268,834
Year 5	249,631	0	0	249,631
Year 6	230,429	0	0	230,429
Year 7	211,226	0	0	211,226
Year 8	192,024	0	0	192,024
Year 9	153,619	0	0	153,619
Year 10	76,810	0	0	76,810
Total	**2,457,907**	**0**	**0**	**2,457,907**
Annual average over the crediting period	**245,791**	**0**	**0**	**245,791**

B.8. Monitoring Plan

B.8.1. Data and parameters to be monitored

Data/parameter	$P_{NH3,Act,y}$	
Description	Annual production of renewable ammonia from the activity.	
Data unit	tNH_3	
Equations referred	*Equation (3) of the proposed methodology*	
Purpose of data	☒ Baseline emissions ☐ Project emissions ☐ Leakage emissions	
Value Applied	2,225,000 tonnes/year	
Measurement and updating frequency	Measured continuously by flow meters/weighbridge and recorded in daily logs; aggregated monthly and reported annually.	
Measurement methods and procedures	Renewables-based ammonia production and export will be determined based on continuous readings from calibrated flow meters at the ammonia synthesis outlet or weighbridge records (for bulk transfers). These measurements will be cross-checked with production records, dispatch notes, and stock balances.	
Entity/person responsible for the measurement	Plant operator / project activity manager.	
Measuring instrument(s)	*Type of instrument*	Calibrated flow meter (continuous measurement) / weighbridge (batch-wise transfer), verified against production logs.
	Accuracy class	Minimum ±1% of measured value.
	Calibration requirements	1. Calibration procedures: As per manufacturer's specifications / national standards. 2. Calibration frequency: At least once every year or as per manufacturer's recommendation, whichever is earlier. 3. Responsible entity: Accredited third-party calibration agency / internal QA team.
	Location	At project site, downstream of ammonia synthesis unit / dispatch point.
QA/QC procedures	• Cross-check measured production data with dispatch notes, invoices, and stock records. • Internal reconciliation of production, dispatch, and inventory data on a monthly basis. • Annual third-party verification of records and calibration certificates. • Electronic data backed up and hard copies of invoices/records archived securely.	
Additional comment		

Data/parameter	$LK_{H2,y}$
Description	Quantity of hydrogen physically leaked during the project activity in year *y*
Data unit	tH2
Equations referred	*Equation as per the proposed methodology*
Purpose of data	☐ Baseline emissions ☒ Project emissions ☐ Leakage emissions
Value Applied	0

Measurement and updating frequency	Estimated based on volumes of pipes and equipment. The activity proponent will determine the quantity of leaked hydrogen by transient flow rate calculations for compressible fluids appropriate for the expected evolving conditions in the pipeline or component based on the approximate geometry of the escaping flow and pipelines/components connected to the leak. Appropriate leak detection equipment must be in place that would detect hydrogen leakage and result in an emergency shutdown of the production process.	
Measurement methods and procedures	Measured using calibrated hydrogen gas analysers / leakage sensor	
Entity/person responsible for the measurement	Plant operator / project activity manager.	
Measuring instrument(s)	*Type of instrument*	NA, as Option 2 is followed
	Accuracy class	NA, as Option 2 is followed
	Calibration requirements	NA, as Option 2 is followed
	Location	At project site, downstream of electrolysis unit / dispatch point.
QA/QC procedures	Quantification will be done conservatively to ensure all potential emissions from hydrogen leakage are included.	
Additional comment		

Data/parameter	$EC_{GRID,j,y}$		
Description	Quantity of electricity consumed by the activity from source j in year y		
Data unit	MWh		
Equations referred	*Equation as per the proposed methodology*		
Purpose of data	☐ Baseline emissions	☒ Project emissions	☐ Leakage emissions
Value Applied	2,247,000 MWh		
Measurement and updating frequency	Measured continuously by flow meters/weighbridge and recorded in daily logs; aggregated monthly and reported annually.		
Measurement methods and procedures	Renewables-based ammonia production and export will be determined based on continuous readings from calibrated flow meters at the ammonia synthesis outlet or weighbridge records (for bulk transfers). These measurements will be cross-checked with production records, dispatch notes, and stock balances.		
Entity/person responsible for the measurement	Plant operator / project activity manager.		
Measuring instrument(s)	*Type of instrument*	Calibrated electricity meters (continuous measurement), verified against PPA documentations.	
	Accuracy class	Minimum ±1% of measured value.	

	Calibration requirements	1. Calibration procedures: As per manufacturer's specifications / national standards. 2. Calibration frequency: At least once every year or as per manufacturer's recommendation, whichever is earlier. 3. Responsible entity: Accredited third-party calibration agency / internal QA team.
	Location	At project site and site of dedicated renewable energy facilities
QA/QC procedures	• Cross-check measured production data with dispatch notes and invoices. • Internal reconciliation of production, dispatch, and inventory data on a monthly basis. • Annual third-party verification of records and calibration certificates. • Electronic data backed up and hard copies of invoices/records archived securely.	
Additional comment		

Data/parameter	$EF_{AE,j,y}$		
Description	Emission factor for electricity generation for source j in year y		
Data unit	tCO_2e/MWh		
Equations referred	*Equation as per the proposed methodology*		
Purpose of data	☐ Baseline emissions	☒ Project emissions	☐ Leakage emissions
Value Applied	0 tCO_2e/MWh		
Measurement and updating frequency	Not applicable as default value as per proposed methodology is used		
Measurement methods and procedures	Not applicable as default value as per proposed methodology is used		
Entity/person responsible for the measurement	Not applicable as default value as per proposed methodology is used		
Measuring instrument(s)	*Type of instrument*	Not applicable as default value as per proposed methodology is used	
	Accuracy class	Not applicable as default value as per proposed methodology is used	
	Calibration requirements	Not applicable as default value as per proposed methodology is used	
	Location	Not applicable as default value as per proposed methodology is used	
QA/QC procedures	Not applicable as default value as per proposed methodology is used		
Additional comment			

Data/parameter	$TDL_{j,y}$
Description	Average technical transmission and distribution losses for providing electricity to source j in year y

Data unit	%	
Equations referred	*Equation as per the proposed methodology*	
Purpose of data	☐ Baseline emissions ☒ Project emissions ☐ Leakage emissions	
Value Applied	1.25	
Measurement and updating frequency	Not applicable	
Measurement methods and procedures	Not applicable	
Entity/person responsible for the measurement	Not applicable	
Measuring instrument(s)	*Type of instrument*	Not applicable
	Accuracy class	Not applicable
	Calibration requirements	Not applicable
	Location	Not applicable
QA/QC procedures	Not applicable as default value *as per the proposed methodology*	
Additional comment		

B.8.2. Sampling plan

The planned renewables-based ammonia facility represents a fully integrated, ultra-low carbon fertilizer production system with rigorous monitoring, and adherence to international standards (ISO 14040/44, ISO 50001, ISO 8000). The project's design prioritizes renewable energy allocation, emission abatement, and continuous traceability, ensuring that future carbon credits are accurate, verifiable, and aligned with MRV frameworks.

Key Sampling Components:

Electricity Consumption:

- The plant receives all incoming power through a single grid connection, measured at the main transformer meter (total plant) and submeters at unit-level (H_2, NH_3 synthesis, downstream units).

-Electricity consumption is tracked by source:

- Renewable Power: Pre-allocated via PPAs with time-stamped certificates as applicable.
- Grid Power: Residual power, with related emissions quantified as per the grid carbon intensity (only for emergency)

Hydrogen Production (Electrolysis)

- Real-time hydrogen output (kg/h) will be measured via flow/mass meters at the ammonia plant inlet.

- Electricity supplied to the electrolyzers will be continuously recorded by rectifiers in kWh.

Nitrogen Production (ASU)

-Nitrogen production (kg/h) will be measured using flow meters at the ASU outlet.

-Energy consumption per ton of N_2 will be recorded via a dedicated submeter.

Ammonia Production

-Ammonia output (kg/h) will be measured via flow meters connected to the Distributed control system (DCS).

-Total electricity consumed for ammonia synthesis will be tracked via unit-level submeters.

B.8.3. Monitoring management system

The facility will use an Energy Management System (EMS) to allocate electricity dynamically and track production in real time.

-Renewable and low-carbon electricity will be prioritized for hydrogen electrolysis.

-Any surplus renewable electricity will be allocated to nitrogen production and ammonia synthesis.

-Remaining grid power will supply downstream processes, including nitric acid and ammonium nitrate units.

B.8.4. Post-crediting period monitoring plan

Not applicable for the proposed activity.

SECTION C. Start date, crediting period type and duration

C.1. Project start date

01-01-2030

C.2. Expected operational lifetime of the project

25 years

C.3. Project crediting period

C.3.1. Type of crediting period approved by the host Party

☐ Renewable ☒ Fixed

C.3.2. Start date of the crediting period

01-01-2030

C.3.3. Duration of the crediting period

10 years (01-01-2030 to 31-12-2039)

SECTION D. Environmental impacts, social impacts and sustainable development impacts

D.1. Environmental and social impacts and sustainable development impacts as per the Article 6.4 sustainable development tool

D.1.1. Summary of the environmental and social risk assessment and applicable mitigation measures

>>

D.1.2. Summary of the sustainable development impacts assessment

>>

D.1.3. Monitoring plan of activity-level environmental and social indicators and activity-level SD indicators

>>

D.2. Environmental and social impacts as per the host Party regulations

D.2.1. Summary of host Party requirements

>>

D.2.2. Summary and conclusion of the assessment

>>

SECTION E. Local stakeholder consultation

E.1. Scope of the consultation

>>

E.2. Stakeholders invited

>>

E.3. Modalities for the consultation

>>

E.4. Summary of comments received

>>

E.5. Consideration of comments received

>>

SECTION F. Confirmation of avoidance of double or revived registration

A 6.4 mechanism	☒	**The proposed A6.4 project has not been already registered as an A6.4 project.**
	☒	**The proposed A6.4 project has not been already included as a component project (CP) in a registered Article 6.4 mechanism programme of activities (A6.4 PoA).**
	☒	**The proposed A6.4 project has not been previously deregistered from the Article 6.4 mechanism.**

	>> *Tick all the three boxes above as a confirmation of compliance with mandatory requirements.* ☐ **The proposed A6.4 project has not been excluded from a registered A6.4 PoA.** >>*Tick the box if applicable.*
Other	☐ **The proposed A6.4 project is not currently registered or being pursued for registration, or covered by a programme, under any other international, regional, national, subnational or sector-wide GHG mitigation crediting scheme.** ☐ **The proposed A6.4 project was previously registered under or covered by a programme under any other international, regional, national, or subnational or sector-wide GHG mitigation crediting scheme but deregistered or excluded from the other crediting scheme before fully consuming the crediting period under the other crediting scheme.** ☐ **The proposed A6.4 project is currently registered or covered by other international, regional, national, subnational or sector-wide GHG mitigation crediting scheme.** >> *Tick only one applicable box.*

Appendix 1. Contact information of activity participants

(Copy this table for each activity participant)

Organization name	Atlas Agro Brasil Fertilizantes LTDA
Country	Brazil
Address	201 Selma Parada Avenue, Tower 3 - Room 35 Zip Code: 13091-904 Jardim Madalena Campinas, SP - Brazil
Telephone	
Mobile	+55 11 9 5292 9936
E-mail	https://www.atlasagro.ag/
Website	Elisa Figueiredo (Head of Carbon) / Gabriel Araujo (Finance Manager)
Contact person	elisa.figueiredo@atlasagro.ag / gabriel.araujo@atlasagro.ag

Appendix 2. Applicability of methodologies and standardized baselines

>>

Appendix 3. Further background information on ex ante calculation of emission reductions or net removals

>>

Appendix 4. Summary of post-registration changes

>>

Appendix 5. Further background information on monitoring plan

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Appendix 6. A6.4 Environmental and Social Safeguards Risk Assessment Form (A6.4-FORM-AC-015)

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Appendix 7. A6.4 Environmental and Social Management Plan Form (A6.4-FORM-AC-016)

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Appendix 8. A6.4 Sustainable Development Impact Form (A6.4-FORM-AC-017)

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Document information

Version	*Date*	*Description*
01.0	11 December 2024	Initial publication of form template.

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Document Type: Form
Business Function: A6.4 activity cycle
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