PROPOSED NEW BASELINE AND MONITORING METHODOLOGY OR METHODOLOGICAL TOOL FORM FOR EMISSION REDUCTIONS ACTIVITIES
(Version 02.0)

INFORMATION TO BE COMPLETED BY THE SECRETARIAT AND METHODOLOGIES EXPERT PANEL	
Type of standard	New baseline and monitoring methodology
Unique reference number and title of the proposed new methodology or new methodological tool	A6.4-PMM010
Date when this form was received at UNFCCC secretariat:	22/05/2026
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- Please clearly distinguish between proper methodology text, tables and equations and explanatory notes, using the following colour coding:
    - Methodology text shall be written in **black** fonts.
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[1] Format for footnotes.

SECTION A. Summary and applicability of the baseline and monitoring methodology or methodological tool

A.1. Title, submission date and version

Title: Partial substitution of fossil fuels by MSW in cement manufacture

Submission date: 22nd May 2026

Version: 1.0

A.2. If this methodology or methodological tool is based on a previous submission or an approved Article 6.4 mechanism methodology or methodological tool, please state the reference numbers here. Explain briefly the main differences and their rationale.

This methodology is not based on a previous submission or an approved Article 6.4 mechanism methodology.

This methodology follows the rationale and structure of the UNFCCC CDM large-scale methodology ACM0003 version 9.0

A.3. Summary description of the methodology or methodological tool, including major baseline and monitoring methodological steps.

This methodology involves replacing fossil fuels in existing clinker production with alternative fuels, such as municipal solid waste (MSW) managed formally by municipalities. The methodology applies on a global basis to any production facility or group of facilities that produce clinker.

The baseline scenario is produced using carbon-intensive fuels and/or the decay or uncontrolled burning of MSW, resulting in methane emissions.

In the project scenario, the clinker is produced using transformed MSW (partially or fully).

The most important parameters monitored in the application of the methodology are:

A. The quantity and net calorific value of alternative fuel used in the project facility,

B. The quantity of clinker produced.

The sectoral scopes correspond to fuel switch for energy demand or industrial manufacturing processes.

This methodology is only applicable to MSW. It does not include dedicated biomass sources.

SECTION B.	Proposed new baseline and monitoring methodology or methodological tool

1. Introduction

- The following table presents a summary of the key elements of a methodology:

Table 1. Methodology key elements

Type of GHG mitigation measure(s)	☒ Fuel/feedstock switch ☐ Technology switch ☐ GHG destruction ☒ GHG formation avoidance ☐ Engineered carbon dioxide removal ☐ Nature-based carbon dioxide removal
Types of mitigation outcomes achieved under this methodology	☒ Emission reductions ☐ Removals
Are the mitigation outcomes under this methodology at risk of reversal?	☐ Yes ☒ No
Typical projects eligible under the methodology	The methodology applies to the following typical projects. • Fuel switch to alternative fuels such as transformed municipal waste, as refuse-derived waste • Fuel switch to alternative fuels such as transformed municipal/industrial waste, such as blended refuse-derived waste

1. Scope and entry into force

1.1. Scope

Applicable Sectoral Scope:

Scope	Sectoral Area	Justification
3 Energy Demand	Energy for industries	The Clinker process is intensive in its energy input

1.2. Entry into force

[For the UNFCCC secretariat to complete - Leave blank]

1.3. Applicability of sectoral scopes

Designated operational entities validating and verifying Article 6.4 activities that use this methodology shall apply sectoral scope(s):

[For the UNFCCC secretariat to complete – leave blank]

2. Definitions

In addition to the definitions contained in the 'Article 6.4 mechanism Glossary of Terms', the following definitions apply for this methodology:

(a) **Activity participant:** A public or private entity that participates in an Article 6.4 activity.

(b) **Activity boundary**: The boundary that encompasses the greenhouse gas (GHG) sources, sinks and reservoirs that are controlled or related. The activity boundary may also include GHG sources, sinks or reservoirs that are otherwise affected by the activity.

(c) **Alternative fuels -** they include transformed municipal wastes, such as refuse-derived waste or blended refuse-derived waste. The transformation requires the implementation of dedicated inbound and outbound logistics, as well as the processing of waste (e.g., dryers, briquetting, cutting, handling, weighing, intermediate storage, hot feeding system, and monitoring). The final product has physically homogeneous properties.

(d) **Activity-specific combustion correction:** it is applied because the combustion of typically coarser biomass or other alternative fuels reduces heat transfer efficiency in the cement manufacturing process (affecting the radiation and conductivity mechanisms due to the fuel's physical form and deposition on the refractory). The use of alternative fuels will therefore require a greater heat input to produce the same quantity and quality of clinker. The chemical content and ease of absorption into clinker of all fuel ashes also differ, and this also contributes to the need for an activity-specific combustion correction

(e) **Clinker production** - The clinker production facility refers to the pyro-process, which may include an integrated system encompassing several in-line stages, comprising a multistage pre-heater, followed by an inline pre-calciner, kiln tube, and grate cooler, as indicated in Figure 1. The fuel for clinker production is fired in the pre-calciner and/or the kiln tube.

(f) **Controlled sources, sinks and reservoirs:** GHG sources, sinks and reservoirs that are under the direction and influence of the activity participant through financial, policy, management, or other instruments.

(g) **Leakage:** Changes in anthropogenic emissions and/or removals of GHGs that occur outside the activity boundary and that are attributable to the activity, including those resulting from changes in market demand or supply for associated outputs. Leakage may involve the following sub-forms:

- **Positive leakage:** Leakage where the implementation of an Article 6.4 activity results in a decrease in emissions and/or an increase in removals;

- **Negative leakage:** Leakage where the implementation of an Article 6.4 activity results in an increase in emissions and/or a decrease in removals

(h) **Level of service**: The quality, reliability and scale of an output provided by an Article 6.4 activity and/or in the baseline scenario.

(i) **Output**: Each good or service provided by the Article 6.4 activity and/or in the baseline scenario[2], as specified in the mechanism methodology;

(j) **Fossil fuel origin** - this refers to the location and type of reservoir(s) or mine(s) from which the fossil fuel originates. The type of reservoir differentiates key characteristics that influence upstream emissions. For natural gas-based fossil fuels, the types of reservoirs include sweet, sour, coalbed, shale, or associated gas. For coal-based fuels, the types of mines include underground or surface.

(k) **Freight** - Goods and materials (including waste materials) that are transported.

(l) **Gross vehicle mass (GVM)** - The maximum on-road mass of the fully loaded vehicle, consisting of its tare mass (i.e., vehicle mass) and the mass of the load (i.e., the freight) the vehicle is allowed to carry according to its design specifications.

(m) **Managed SWDS (Solid Waste Disposal Site)** - a SWDS that has controlled placement of waste (i.e. waste directed to specific deposition areas, a degree of control of scavenging and a degree of control of fires) and will include at least one of the following: (i) cover material; (ii) mechanical compacting in layers; or (iii) levelling of the waste. In this methodology, a SWDS that does not meet this definition is considered an unmanaged SWDS.

(n) **Municipal Solid Waste (MSW)** is a heterogeneous mix of different solid waste types, usually collected by municipalities or other local authorities. MSW includes household waste, garden/park waste, and commercial/institutional waste.

(o) **Project plant** - defined as the clinker/cement manufacturing facility where the project activity is implemented.

(p) **Project region** – area within a radius of 250km around the project activity.

(q) **Related sources, sinks and reservoirs:** GHG sources, sinks and reservoirs that have material or energy flows into, out of, or within the Article 6.4 activity**.**

(r) **Solid waste -** Material that is unwanted and insoluble (including gases or liquids in cans or containers). Hazardous waste is not included in the definition of solid waste. Solid waste may consist of residual waste**.**

(s) **Solid waste disposal site (SWDS)** - designated areas intended as the final storage place for solid waste. Stockpiles are considered a SWDS if: (a) their volume to surface area ratio is 1.5 or larger; and (b) a visual inspection by the DOE confirms that the material is exposed to anaerobic conditions (i.e., it has a low porosity and is moist).

(t) **Stockpile** - a pile of solid waste (not buried below ground). Anaerobic conditions are not assured in a stockpile with a low volume-to-surface area ratio (less than 1.5) because the waste may be exposed to higher aeration.

(u) **Upstream emissions** - GHG emissions associated with the production, processing, transmission, storage, and distribution of a fossil fuel, beginning with the extraction of raw materials from the fossil fuel origin and ending with the delivery of the fossil fuel to the site of use.

(v) **Upstream emissions stage** - the segmentation of upstream emissions into stages based on distinct activities occurring within a stage. Upstream emissions stages are interdependent and lead to one another, typically comprising production, processing, transmission, storage, and distribution. Upstream emissions stages may be broadly generalized by type of fossil fuel. However, only some of the upstream emission stages may apply to a particular fossil fuel due to location- and application-specific circumstances. For example, a specific natural gas may go directly from the production stage to the distribution stage, without going through any processing, transmission, or storage upstream emissions stages.

(w) **Vehicle** - A self-propelled machine powered by fossil fuels, biofuels, or blended fuels that is used for the transportation of freight by road. The vehicle should be designed for freight transportation, rather than passenger transportation. The vehicle is not required to transport freight associated with the project activity exclusively, but may also transport other freight.

(x) **Vehicle class** - This methodology defines two vehicle classes based on their gross vehicle mass: (i) Light vehicles - Vehicles with a GVM of less than or equal to 26 tonnes; (ii) Heavy vehicles - Vehicles with a GVM of more than 26 tonnes.

Further definitions from the Article 6.4 Glossary of Terms, once adopted by the Supervisory Body, shall also apply to this mechanism methodology.

3. Normative references

This mechanism methodology is based on elements from version 9.0 of the Clean Development Mechanism (CDM) Methodology “ACM0003: Partial substitution of fossil fuels in cement or quicklime manufacture”.

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

Sub-paragraph.

I. A6.4 – STAN-METH-003, standard for demonstration of additionality in mechanism methodologies.

   https://unfccc.int/process-and-meetings/bodies/constituted-bodies/article-64-supervisory-body/rules-and-regulations

II. A6.4 -STAN-METH-004, setting the baseline in mechanism methodologies.

   https://unfccc.int/process-and-meetings/bodies/constituted-bodies/article-64-supervisory-body/rules-and-regulations

III. A6.4 -STAN-METH-005, addressing leakage in mechanism methodologies.

https://unfccc.int/process-and-meetings/bodies/constituted-bodies/article-64-supervisory-body/rules-and-regulations

IV. A6.4 -AMT -001 Common practice analysis

https://unfccc.int/process-and-meetings/bodies/constituted-bodies/article-64-supervisory-body/rules-and-regulations

V. A6.4 -AMT -002 Investment analysis

https://unfccc.int/process-and-meetings/bodies/constituted-bodies/article-64-supervisory-body/rules-and-regulations

VI. A6.4 -AMT -003. Emissions from solid waste disposal sites.

https://unfccc.int/process-and-meetings/bodies/constituted-bodies/article-64-supervisory-body/rules-and-regulations

VII. A.6.4-AMT-007. Emissions from electricity generation and consumption

https://unfccc.int/process-and-meetings/bodies/constituted-bodies/article-64-supervisory-body/rules-and-regulations

This methodology is based on the following sources of information:

Sub-paragraph.

I. FICEM, Guidelines for Estimation of the Cost of Equity in the Cement Industry, 2025

https://www.ficem.org/publicacion

II. IPCC, 2006, Guidelines for National Greenhouse Gas inventories, volume 3, Industrial Processes and Product Use, Chapter 2. Mineral Industry Emissions

https://www.ipcc-nggip.iges.or.jp/public/2006gl/vol3.html

III. IPCC, 2006, Guidelines for National Greenhouse Gas inventories, volume 5, Waste, Chapter 2. Waste generation, composition, and management data.

https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf

IV. UNFCCC, 2006, CDM TOOL02: Combined tool to identify the baseline scenario and demonstrate additionality, version 0.7.0

https://cdm.unfccc.int/methodologies/PAmethodologies/approved

V. UNFCCC, 2017, CDM TOOL03: Tool to calculate project or leakage CO2 emissions from fossil fuel Combustion, version 03.0

https://cdm.unfccc.int/methodologies/PAmethodologies/approved

VI. UNFCCC, 2008, CDM TOOL04: Emissions from solid waste disposal sites, version 08.1

https://cdm.unfccc.int/methodologies/PAmethodologies/approved

VII. UNFCCC, 2017, CDM TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation, version 03.0

https://cdm.unfccc.int/methodologies/PAmethodologies/approved

VIII. UNFCCC, 2012, CDM TOOL12: Project and leakage emissions from transportation of freight, version 01.1.0

https://cdm.unfccc.int/methodologies/PAmethodologies/approved

IX. UNFCCC, 2014, CDM TOOL15: Upstream leakage emissions associated with fossil fuel use, version 02.0

https://cdm.unfccc.int/methodologies/PAmethodologies/approved

4. Applicability

The methodology is applicable under the following conditions:

- Type of Facility: The methodology applies to project activities in the cement industry where fossil fuel(s) are used in an existing clinker production facility and are partially replaced by alternative fuel(s).

The following specific operational conditions of the facility shall apply:

I. Capital expenditures (CAPEX) and additional operational expenses (OPEX) are required to enable the use of the alternative fuel(s), such as logistics, processing of waste, measurement, and feeding into the clinker kiln.

II. The use of alternative fuel is incremental to the existing use of it. The type of alternative fuel can be different from the current fuel.

III. There is at least one supplier of the new alternative fuel assured for the first crediting period of the A6.4 project.

IV. The methodology is applicable only for installed capacity (expressed in tonnes of clinker/year) that exists by the time of validation of the project activity.

V. The use of the MSW as an alternative fuel does not divert waste from other activities different from the cement manufacturing.

In addition, the following applicability conditions apply:

I. The waste is not chemically processed before combustion in the project activity. Still, it may be processed mechanically or dried on-site. Moreover, any preparation of the waste, occurring before use in the project activity, does not cause other significant GHG emissions (such as, for example, methane emissions from wastewater).

II. The waste used by the project facility is not stored for more than one year or is stored under aerobic conditions.

Finally, this methodology is only applicable if F2 (the continuation of the current fuel mix) or F3 (a different fossil fuel mix portfolio) results in the most plausible baseline scenario for the use of fuels in the cement plant and if one or several of the scenarios explained in B.5.5.1**,** resulting in the most plausible baseline scenario for the use of alternative fuels:

- For the fate of any wastes originating from fossil sources: scenarios W3, W4, and/or W7 of section 10.2.1

5. Avoidance of double-counting

The proponent of a mechanism methodology shall identify risks of potential double counting of the emission reductions or net removals and, where such risks are relevant and material, include provisions to avoid such double counting in the mechanism methodology. This shall include, but not be limited to:

(a) Double-counting due to overlapping claims between different crediting mechanism activities.

(b) Double-counting due to overlap with mandatory domestic mitigation schemes.

(c) Double-counting due to overlap with other frameworks or environmental markets.

The registration of the project and the reports of the validation and verification processes will be communicated in the corporate sustainability reports of the asset (e.g., GRI annual report) and the Designated National Authorities. Another source of consolidated data is the Global Cement and Concrete Association[2] (GCCA), which gathers key data on the industry's sustainability commitments, including CO2 reductions and the use of alternative fuels, on a global basis.

6. Demonstration of alignment with the policies, options and implementation plans with regard to the NDC and LT-LEDS of the host Party and the long-term temperature goal of the Paris Agreement and long-term goals of the Paris Agreement

Activity participants shall provide to the DOE responsible for performing the validation of the Article 6.4 project an assessment, undertaken by the DNA of the host Party, of the activity's consistency with Decision 3/CMA.3 paragraph 40 (c) and paragraph 27 (a) as part of the host Party's approval.

7. Activity Boundary

Stand-alone projects: The physical project boundary covers all production processes related to clinker production, at the activity level, including:

(a) The pre-heaters, if applicable, where the heat of exhaust gas is used to heat the inputs for clinker production.

(b) The pre-calciner, if applicable, where fuels are fired for the pre-calcination of the inputs for clinker production.

(c) The kiln tube, where fuels are fired and where the calcination process of the inputs for clinker production takes place.

(d) On-site storage, on-site transportation, and drying of alternative fuels (if alternative fuels are used in the project activity).

(e) The vehicles used for the incremental transportation of (alternative) fuels to the project site.

(f) Where waste residues are used, the project boundary includes the sites where the waste residues would be dumped, left to decay, or burned in the absence of the project activity.

The figure below shows a possible configuration of the pre-heaters, pre-calciner, and kiln tube for clinker production processes.

[2] See: GNR 2.0 - GCCA in Numbers : GCCA

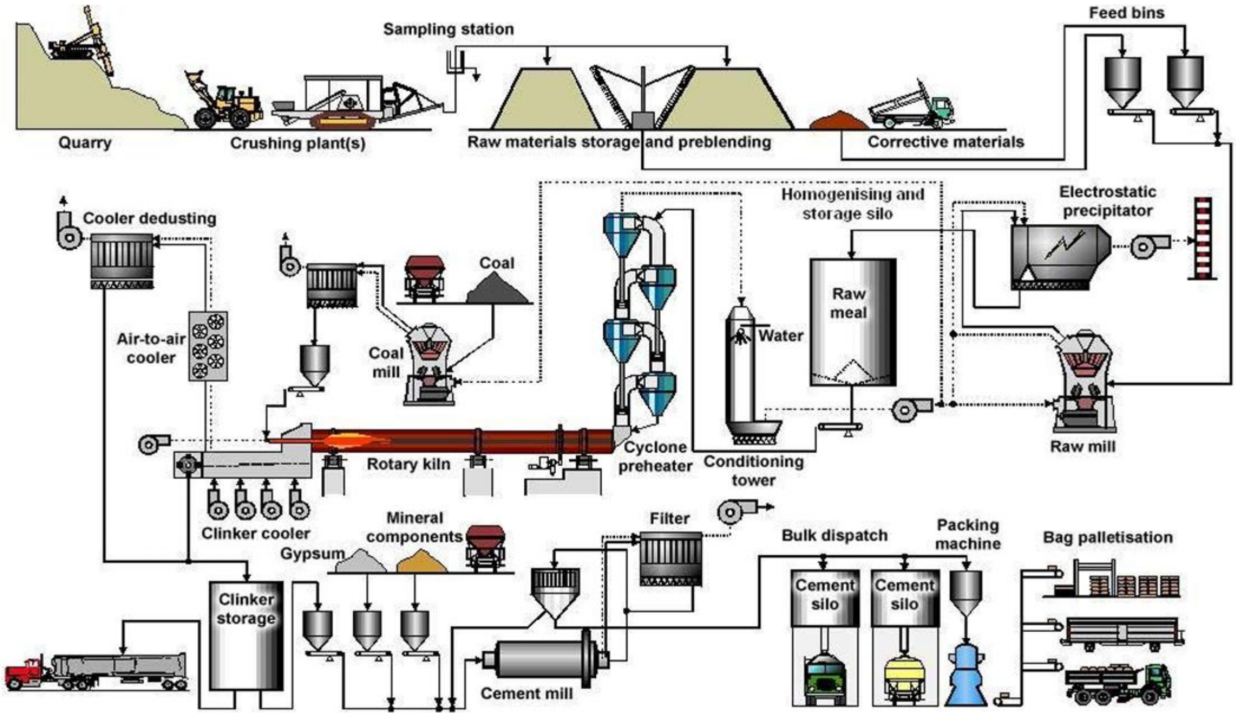

Figure 1. Value chain of cement production from quarry to outbound logistics
Source: The European Cement Association, 2013

POAs: The physical project boundary covers all production facilities in a country or a region, including:

(a) The production facilities (where pre-heaters, pre-calciner, and cement kilns, among other equipment and systems, are located).

(b) All on-site storage, on-site transportation, and drying of alternative fuels and raw materials (if alternative fuels are used in the project activity).

(c) All the vehicles/trains/ships used for the incremental transportation of (alternative) fuels to the project site.

(d) Where waste residues are used, the project boundary includes the sites where the waste residues would be dumped, left to decay, or burned in the absence of the project activity.

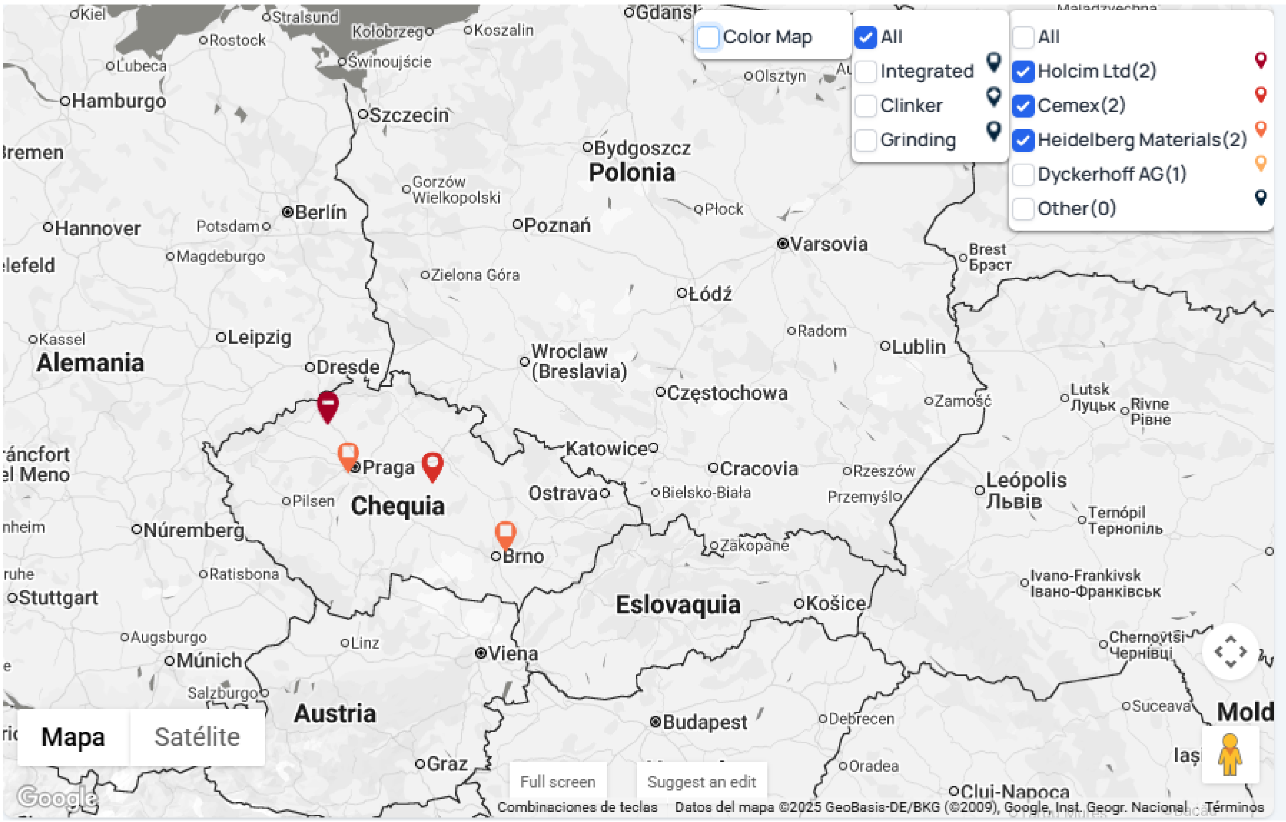

Figure 2. Example of boundaries, suppliers within the administrative borderline of the Czech Republic
Source: https://www.cemnet.com/global-cement-report/country/czech-republic

Table 2. Emissions sources and sinks included in or excluded from the activity boundary

Source		GHG			Justification / Explanation
BASELINE	Emissions from fossil fuels displaced in the project plant	CO_2	☒ Included ☐ Not included	☒ Controlled ☒ Related to ☐ Affected by	Main emission source
		CH_4	☐ Included ☒ Not included	☐ Controlled ☒ Related to ☐ Affected by	Minor source. Neglected for simplicity.
		N_2O	☐ Included ☒ Not included	☐ Controlled ☒ Related to ☐ Affected by	Minor source. Neglected for simplicity.
		-----	☐ Included ☐ Not included	☐ Controlled ☐ Related to ☐ Affected by	
BASELINE	Uncontrolled burning or decay of transformed waste	CO_2	☐ Included ☒ Not included	☐ Controlled ☒ Related to ☐ Affected by	Can be a significant emission source.
		CH_4	☒ Included ☐ Not included	☐ Controlled ☒ Related to ☐ Affected by	Included if W3, W4, or W7 has been identified as the most likely baseline scenario
		N_2O	☐ Included ☒ Not included	☐ Controlled ☒ Related to ☐ Affected by	Minor source. Neglected for simplicity
		-----	☐ Included ☐ Not included	☐ Controlled ☐ Related to ☐ Affected by	

	Source	GHG			Justification / Explanation
ACTIVITY	Emissions from the use of alternative fuels	CO_2	☒ Included ☐ Not included	☐ Controlled ☒ Related to ☐ Affected by	Main emission source
		CH_4	☐ Included ☒ Not included	☐ Controlled ☐ Related to ☐ Affected by	Minor source. Neglected for simplicity
		N_2O	☐ Included ☒ Not included	☐ Controlled ☐ Related to ☐ Affected by	Minor source. Neglected for simplicity
		-----	☐ Included ☐ Not included	☐ Controlled ☐ Related to ☐ Affected by	>>
ACTIVITY	Emissions from additional electricity and/or fossil fuel consumption as a result of the project activity	CO_2	☒ Included ☐ Not included	☐ Controlled ☒ Related to ☐ Affected by	Can be a significant emission source
		CH_4	☐ Included ☒ Not included	☐ Controlled ☐ Related to ☐ Affected by	Minor source. Neglected for simplicity
		N_2O	☐ Included ☒ Not included	☐ Controlled ☐ Related to ☐ Affected by	Minor source. Neglected for simplicity
		-----	☐ Included ☐ Not included	☐ Controlled ☐ Related to ☐ Affected by	>>
ACTIVITY	Emissions from the combustion of fossil fuels for the transportation of alternative fuels to the project plant	CO_2	☒ Included ☐ Not included	☐ Controlled ☒ Related to ☐ Affected by	Can be a significant emission source
		CH_4	☐ Included ☒ Not included	☐ Controlled ☐ Related to ☐ Affected by	Minor source. Neglected for simplicity
		N_2O	☐ Included ☒ Not included	☐ Controlled ☐ Related to ☐ Affected by	Minor source. Neglected for simplicity
		-----	☐ Included ☐ Not included	☐ Controlled ☐ Related to ☐ Affected by	>>
LEAKAGE	Leakage emissions from fossil fuel use	CO_2	☒ Included ☐ Not included	☐ Controlled ☒ Related to ☐ Affected by	Depend on the value chain of production of the fuel
		CH_4	☒ Included ☐ Not included	☐ Controlled ☐ Related to ☐ Affected by	Minor source. Neglected for simplicity
		N_2O	☒ Included ☐ Not included	☐ Controlled ☐ Related to ☐ Affected by	Minor source. Neglected for simplicity
		-----	☐ Included ☐ Not included	☐ Controlled ☐ Related to ☐ Affected by	

8. Demonstration of additionality

8.1. Regulatory analysis

Activity participants shall demonstrate and justify, based on legal requirements on environmental, energy transition, and waste management applicable to the host country and the proposed A6.4 activity, that the emission reductions resulting from the A6.4 activity would not occur as a result of any of these legal requirements (unless the law or regulation refers to or formally integrates the mechanism as an instrument for implementation in a specific sector) by confirming that these legal requirements:

- Explicitly require a partial use of alternative fuels to pet coke in cement manufacturing.
- Explicitly marks up a maximum carbon intensity of clinker that should be obtained with waste
- Explicitly mandates a progressive reduction of land use for landfilling with MSW and promotes recycling, composting, and production of RDF for industrial furnaces.
- Establish a support scheme for methane destruction/conversion in landfills through flaring or thermal destruction of waste.

If any of the legal requirement previously listed above applies to the A6.4 activity, then A6.4ERs cannot be claimed for emission reductions that are achieved in excess of legal requirements.

Activity developers shall update the regulatory analysis annually to reflect any changes in legal requirements and update the baseline.

During the validation process. Statutory documents such as the Environmental Impact Assessment, operating licenses, plant risk assessment, contracts with the MSW supplier, and other relevant terms and conditions.

8.2. Avoidance of locking-in the level of emissions

Locking-in emissions refers to project activities that commit a system to a high-emission pathway (e.g., fossil fuel infrastructure with long asset lifetimes), making future decarbonization harder. The use of alternative fuels for cement allows diverse low-carbon solutions to avoid lock-in. However, to rigorously demonstrate this, the following process may be applied:

A. Definition of Lock-In Emissions Criteria

Lock-in risks are identified by assessing whether the project:

1. Creates dependency on fossil fuels (e.g., contracts or energy security strategy)

2. Extends the lifespan of high-emission infrastructure (e.g., retrofits coal plants instead of replacing them). 3. Adopts technologies with no decarbonization pathway (e.g., irreversible design choices).

4. Triggers market/regulatory shifts favouring fossil fuels (e.g., crowding out renewables).

B. **Process to identify lock-in Emissions Risk:** the following steps must have low barriers for change

Step b.1: Identify long-term contractual obligations: Check if the operation has a long-term supply contract for carbon-intensive fuels (e.g., coal for decades) and assess its importance to the operation (e.g., national coal mining) from an energy security perspective.

Step b.2: Compare technical barriers to adapting new energy sources: Check the technical feasibility to implement other fuels such as biomass, (Refuse-Derived Fuel) RDFs, green hydrogen, e-fuels, and coal plus CCS.

Step b.3: Qualitative checklist: Confirm the project meets all criteria for lock-in avoidance:

- No long-term contracts or national dependency on coal.
- There is room and safe conditions to install new energy sources with lower emissions.
- Availability of reliable logistics for alternative fuels (e.g., pipeline, highways)
- Comply with national net-zero pathways (e.g., 2050 targets).

8.3. Investment analysis, Barrier analysis and Common practice analysis

The activity participant shall demonstrate additionality based on the additionality standard A6.4-STAN-METH-003 Demonstration of additionality in mechanism methodologies Version 01.2

8.3.1. Investment analysis

Provide an assessment on whether the project is financially additional using an investment analysis. The analysis should, in particular, demonstrate that the proposed activity would not have occurred in the absence of the incentives provided by the mechanism, using an investment analysis (default approach).

The assessment shall use the methodological tool A6.4-AMT-002: Investment Analysis, version 01.0

The following types of investment analyses may be used:

A. **Simple cost analysis**: Demonstration that the implementation of an Article 6.4 activity is associated with costs and does not generate any cost savings or revenues other than from A6.4 ERs.

   This type of intervention, using RDF, is usually corporate and for large-scale clinker furnace operations. So, the CAPEX analysis includes additional fiscal and financial variables that are more complex than accounting savings or A6.4 ERs and do not fully represent the economics of the sector and the legal entity responsible for the activity. This option is not adequate for the investment analysis.

B. **Benchmark analysis:** Comparison of the financial attractiveness of an Article 6.4 activity with a financial benchmark. The benchmark analysis may be undertaken where the only alternative scenario to the Article 6.4 activity is the continuation of the current situation without any alternative investment by the activity participants. The analysis shall:

- Set an assessment period according to the lifetime of the equipment or use 10 years plus a remaining lifetime with fiscal effects on the depreciation.
- Use a financial indicator of profitability such as IRR, Cost/Benefit in present value, or Present Value of all flows. All these indicators will have in common a discount factor based on the weighted average cost of Capital (WACC), which is composed of the cost of money from the financial system (cost of debt or lending rates from financial institutions or financial instruments in a period similar to the lifetime of the asset) and the expectation of return on corporate equity.

  By definition, the indicators are:

(a) Net present value (NPV): The NPV represents the total value of an investment, based on the present value of cash inflows and outflows during the assessment period;

(b) Project IRR: The project IRR is used to determine the viability of an activity to generate returns and service debt, based on all projected CAPEX and the series of cash flows throughout the assessment period.

(c) Equity IRR: The equity IRR is used to determine the final return on the initial equity investment for the proposed activity.

- To compute the cost of equity, on a corporate basis, use the guidance of the Cement Industry (FICEM, 2025), which includes a detailed methodology and computations adapted for the sector based on the CAPM model (Capital Asset Pricing Model) using stocks from corporations involved in cement production and the S&P 500 as reference market, plus a risk-free rate based on U.S. bonds. Compare this option with A6.4-AMT-002 default values and use the most conservative values.
- Include a justified estimation of inflation to build the cash flow in real terms and make it more realistic.
- Include a justified corporate benchmark based on a single legal entity or holding involved in the same manufacturing activity over a previous period of three years.

C. Investment comparison analysis: Comparison of the financial attractiveness of an investment. This technique demonstrates that the A6.4 Activity is not financially viable without the mechanism's incentives, and that those incentives enable the activity's implementation.

At the corporate level, for decision-making, specifically at the Board level, an analysis more oriented toward benchmarking is required. Consequently, this technique is not appropriate for the cement sector, which is managed by corporations worldwide, and almost all firms are publicly traded and have financial targets.

All parameters and assumptions used in the analysis shall be internally consistent. For example, cash flows shall be expressed in either real or nominal terms consistently and be determined consistently with the financial indicator used. The assumptions, data, and conclusions in the investment analysis shall be transparently documented, appropriately justified, and substantiated by evidence.

Sensitivity Analysis (benchmark analysis)

To ensure conservativeness, the benchmark analysis and investment comparison analysis shall include a sensitivity analysis in order to demonstrate that the outcome of the analysis is robust to reasonable variations in critical parameters.

A sensitivity analysis shall be carried out to assess potential scenarios in which the activity's financial indicator would reach the financial benchmark level and/or the proposed activity becomes the most financially attractive alternative.

The variation of assumptions and parameters in the sensitivity analysis shall:

(a) Require a variation of at least +/- 10% to the input values which constitute more than 20% of the total costs or total revenues, unless this is not deemed appropriate in the context of the specific circumstances of the type of mitigation activity;

(b) Provide an analysis of the impact of local currency versus A6.4 income in a possibly stronger currency or perform all the analysis in the strongest currency.

In cases where the applied variation results in the financial indicator reaching the level of the financial benchmark and/or the proposed Article 6.4 activity becoming the most financially attractive alternative, the proposed Article 6.4 activity shall not be deemed additional

8.3.2. Barrier analysis

The Activity participant shall demonstrate the barriers (such as first-of-its-kind, geographical, political, technological availability, suppressed demand, etc.) to establish additionality using this approach.

The barrier analysis shall:

(a) Identify and describe relevant barriers faced by the Article 6.4 activity.

(b) Demonstrate that the barriers prevent the Article 6.4 activity from being implemented without the incentives from the mechanism.

(c) Demonstrate that there are no other programs or incentives, such as subsidies, that would incentivize the Article 6.4 activity.

(d) Demonstrate that the incentives from the mechanism are the determining element in overcoming the identified barriers.

(e) Demonstrate that at least one plausible alternative to the Article 6.4 activity does not face significant barriers, including the barrier faced by the Article 6.4 activity.

The barrier analysis shall take into account:

(f) All relevant national and sub-national policies, including legislation.

(g) Current practices within the sector and geographic area.

(h) Indigenous Traditional Knowledge and customary laws, where applicable, and

(i) Relevant national circumstances, approaches, and pathways.

8.3.3. Common practice analysis

The activity participant shall demonstrate that alternative fuels projects in cement facilities are not a common practice.

This analysis shall use the methodological tool A6.4-AMT-001 or the common practice tool version 01.0. See the flow chart in Figure 3:

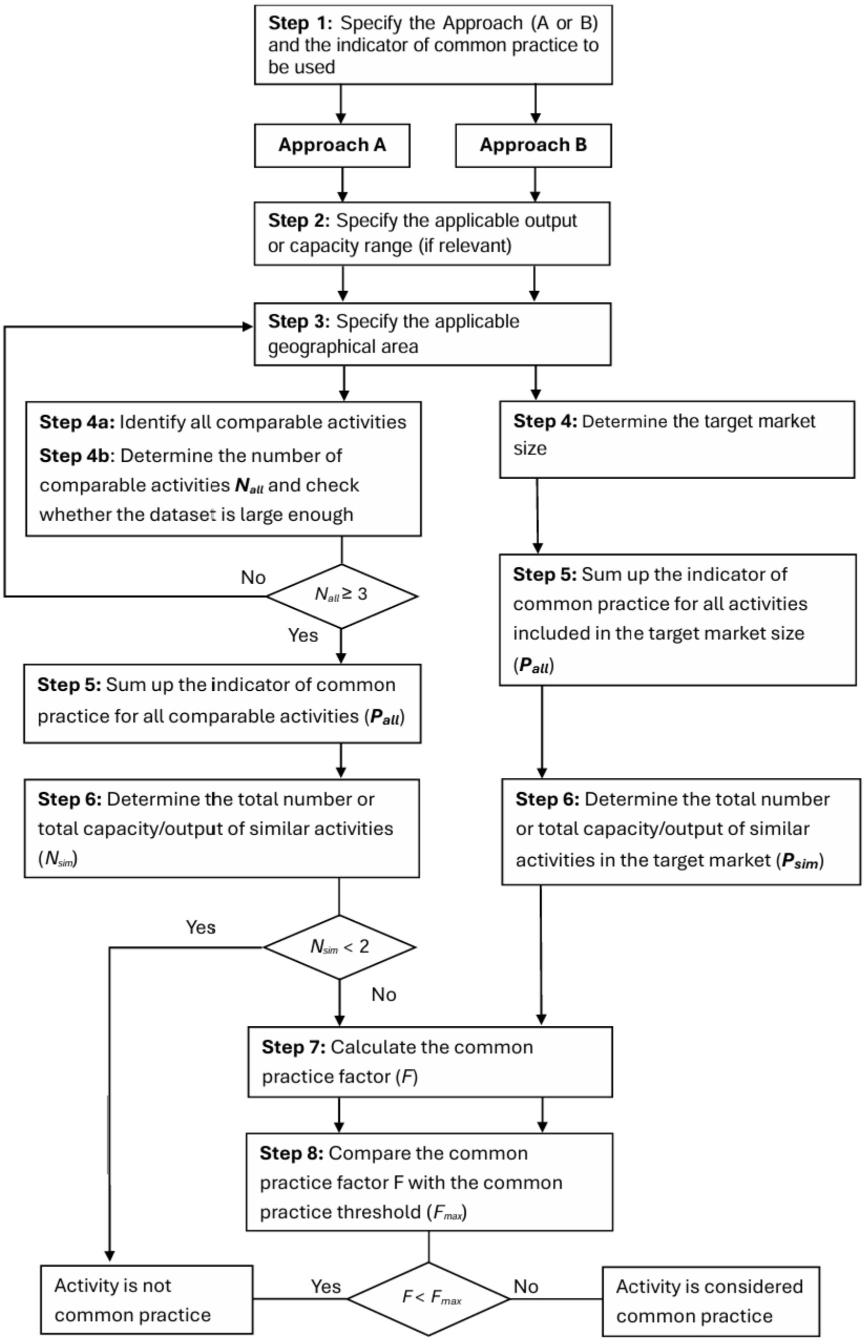

Figure 3. Flowchart of the common practice analysis steps
Source: UNFCCC, A6.4 AMT 001

Activity Participants shall assess the common practice following the flowchart and the following guidance:

- **Step 1.** Specification of the approach for common practice analysis**:** Approach A, which is based on the identification of existing 'comparable activities' and differentiation between 'similar' and 'different' activities, shall be used for the common practice analysis.

- **Step 2.** Specify the applicable output or capacity range. The capacity is set by the RDF processing unit, measured in tons/hour of RDF or equivalent.

- **Step 3.** Identification of the applicable geographical area: the applicable geographical area is the host country. If the applicable geographical area is different than the geographical reference area used to determine the baseline geographical reference area, this should be justified.
- **Step 4a.** Identify all comparable activities. These must be located in the host country with the same level of service (burning RDF, the same conversion process, same feedstock) and final use in a clinker plant.

  The timeline is important; the commercial operation should have begun before publication of the PDD for global consultation.
- **Step 4b.** Determine the total number of activities included in the common practice analysis (N_{all}). Check whether the dataset is large enough.
- **Step 5.** Sum up the specification of the indicator of common practice: a count-based indicator of common practice shall be used in the analysis of all comparable activities (P_{all}), based on, for example, the number of RDF compacting units or total capacity included in the common practice analysis.
- **Step 6**. Determine the total number or total capacity of similar activities ($P_{sim} = N_{sim}$). The differentiation between similar and different activities is based on the type of measure (RDF production or only pet coal) applied in the geographical area.

  If $N_{sim} < 2$, the activity is not common practice.
- **Step 7.** Calculate the common practice factor (F)

$$F = P_{sim}/P_{all} \qquad \textbf{Equation (1)}$$

- **Step 8.** Compare the common practice factor F with the common practice threshold (F_{max}). If $F < F_{max}$, the activity is not considered common practice.
- **Determining the common practice threshold (F_{max}):** the common practice factor thresholds to be applied under this mechanism methodology are 16 per cent[3] for Article 6.4 activities located in non-LDCs/SIDS, and 20 per cent for Article 6.4 activities located in LDCs/SIDS.

The Article 6.4 activity is only additional if it is demonstrated that:

1. Emission reductions or net removals resulting from an Article 6.4 activity would not occur as a result of the legal requirements, per section 9.1 above; and
2. The Article 6.4 activity is not financially viable, per section **Error! Reference source not found.**; and
3. The Article 6.4 activity is not common practice, per section 9.3.3 above.

[3] Value proposed based on the threshold of moving from early adopters to early majority as identified in the Roger diffusion curve (Rogers, 2003).

9. Baseline scenario

9.1. Selection of the baseline approaches from paragraph 36 of the rules, modalities and procedures

An approach based on existing actual or historical emissions, adjusted downwards, is selected.

- ☐ Best available technologies that represent an economically feasible and environmentally sound course of action, where appropriate.
- ☐ An ambitious benchmark approach where the baseline is set at least at the average emission level of the best performing comparable activities providing similar outputs and services in a defined scope in similar social, economic, environmental and technological circumstances.
- ☒ An approach based on existing actual or historical emissions, adjusted downwards to ensure alignment with paragraph 33 of the RMP.

The global cement industry has demonstrated a commitment to the PA milestone 2050. It is working to transform the sector through the modernization of its facilities, the introduction of cleaner energy sources, and pilots for the mineralization of CO_2. Most enterprises have decarbonization maps, and the following information from the European Cement Research Academy (ECRA, 2022) confirms the efforts:

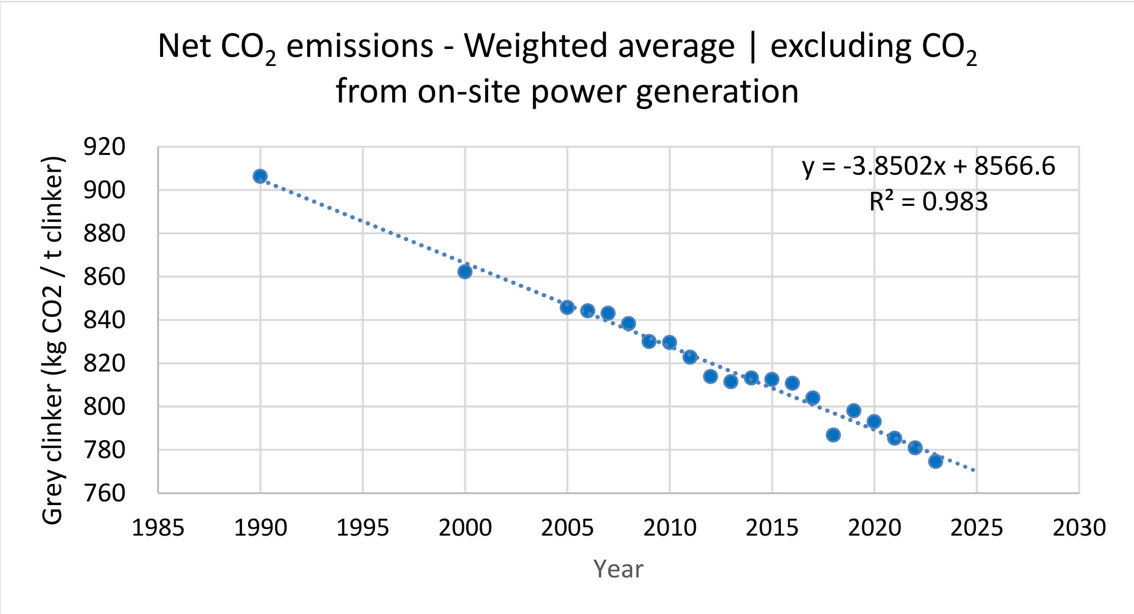

Figure 4. Global Net CO_2 emissions trend of the cement industry

Source: ECRA Technology Papers 2022

As shown in Figure 4, the last three decades have confirmed a 15% reduction in the global average emission factor per ton of clinker. Still, this information is based on a sampling of different facilities with varying capacities (ranging from 3,000 to 6,000 tons per day of Clinker production), which makes it challenging to have a homogeneous statistical sample that represents the whole universe of facilities.

Furthermore, the analysis of this emission benchmark versus the best available technologies (BAT) technologies used in the facilities makes it more challenging to have a perfect assessment of the BAT level, as the components have different lifetimes and efficiencies, and many critical factors determine the specific fuel consumption and later emissions intensity, such as:

- Chemical characteristics of the raw materials (rich or poor chemical composition)
- The moisture content of raw materials from mining, logistics, and feeding units (it differs for wet, semi-wet, and dry operations).
- Physical conditions of raw materials and fuels (burnability, humidity, ash content, sulphur content)
- Plant load factor during the year (campaign length vs refractory life)
- Diverse engineering schemes and equipment efficiencies in time due to financial capacity and the need to depreciate the assets, which makes it difficult to always have the latest state-of-the-art unit in place.
- Level of automation and kiln operation
- Size of the plant and the different thermal performance of parts

The future of the sector is being considered through new decarbonization paths, including cogeneration, carbon capture and storage, greener hydrogen, alternative raw materials with lower CO_2 emissions, and Bioenergy with Carbon Capture and Storage. However, the sector is highly capital-intensive, and these changes may extend beyond 2050; the lifetime of a cement plant is typically over 50 years.

Consequently, in the long term, it is challenging to envision two facilities with identical or similar equipment that can set a unique benchmark. Therefore, an approach based on actual or historical emissions, adjusted downward, is a more transparent option.

9.2. Application of the selected approach, prior to implementation of a downward adjustment

9.2.1. Procedure for the identification of the baseline scenario

The following stepwise approach serves to identify all the baseline scenarios for the proposed A6.4 activity that provide the same output (service or product). The stepwise approach is adapted from UNFCCC CDM Tools.[4]

Fuel Mix: the alternatives for the fuel mix for cement manufacturing may include, inter alia:

F1: The proposed project activity is not undertaken as a 6.4 project activity (i.e., use of alternative fuels and/or less carbon-intensive fossil fuels).

F2: Continuation of current practice, i.e., a scenario in which the company continues cement production using the existing technology, materials, and fuel mix.

F3: The continuation of using only fossil fuels and no alternative fuels, however, with a different fuel mix portfolio, taking into account the relative prices of fuels available. The scenario(s) may be based on one fuel or different mixes of fuels.

F4: The currently used fuels are partially substituted with alternative fuels and/or less carbon-intensive fossil fuels other than those used in the A6.4 project activity and/or any other fuel types, without using the A6.4 mechanism. If relevant, develop different scenarios with different mixes of alternative fuels or less carbon-intensive

[4] See reference: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf/history_view, and https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-16-v5.0.pdf/history_view

fuels and varying degrees of fuel-switching from traditional to alternative fuels or less carbon-intensive fuels.

F5: The construction and operation of a new cement plant.

For each of these scenarios, project participants shall quantify the amount of fossil fuel(s) and alternative fuels that are expected to be used for clinker production during the crediting period. If the project activity uses alternative fuels, project participants should determine what would happen to the alternative fuels in the absence of the A6.4 project activity.

Wastes: Where wastes originating from MSWD are used as an alternative fuel, the options to be analysed may include, inter alia:

W1: Incineration of the waste in a waste incinerator without utilizing the energy from the incineration.

W2: Incineration of the waste in a waste incinerator with the use of the energy (e.g., for heat and/or electricity generation).

W3: Disposal of the waste at a managed or unmanaged landfill. The waste is dumped or left to decay mainly under aerobic conditions.

W4: Disposal of the waste at a managed landfill. The waste is dumped or left to decay under clearly anaerobic conditions. This applies, for example, to landfills with cells that are deeper than five meters.

W5: The use of the waste at other facilities, for example, other cement plants or power plants, as a feedstock or for the generation of energy.

W6: The recycling or reutilization of the waste.

W7: The wastes are burnt in an uncontrolled manner without utilizing them for energy purposes.

W8: The proposed project activity, not undertaken as an A6.4 project activity, i.e., the use of the waste in the project plant.

Project participants should document transparently in the A6.4-PDD:

- The types and quantities of fuels have been used in the cement plant in the most recent three years prior to the start of the project activity.

For each waste type to be used in the project plant under the project activity, the type, source, and available quantities are provided.

9.2.2. Calculation of baseline emissions prior to downward adjustment

10.2.2.1 Baseline Emissions

The project reduces CO_2 emissions by using alternative fuels in the pre-calciner and/or the kiln for the production of clinker in cement manufacture. If applicable, the project may also reduce CH4 emissions from preventing the disposal or uncontrolled burning of waste. The unadjusted existing actual or historical net baseline emissions are calculated as follows:

$$BE_y = BE_{FF,y} + BE_{CH4,y}$$

Equation (2)

Where:

BE_y	=	Baseline emissions in year *y* (t CO_2)
$BE_{FF,y}$	=	Baseline emission from fossil fuels displaced by alternative fuels in year *y* (t CO_2)
$BE_{CH4,y}$	=	Baseline methane emissions avoided during the year *y* from preventing the disposal or uncontrolled burning of waste (t CO_2e)

10.2.2.2 Baseline emissions from the fossil fuels displaced by the alternative fuel(s)

Baseline emissions from the displacement of fossil fuels are calculated as follows:

$$BE_{FF,y} = \left[\sum_k \left(FC_{PJ,k,y} \times NCV_{k,y}\right) - FP_y\right] \times EF_{CO2,BL,y}$$ **Equation (3)**

Where:

$BE_{FF,y}$	=	Baseline emission from fossil fuels displaced by alternative fuels in year *y* (t CO_2)
$FC_{PJ,k,y}$	=	Quantity of alternative fuel type *k* used in the project plant in year *y* (t)
$NCV_{k,y}$	=	Net calorific value of the alternative fuel type *k* in year *y* (GJ/t)
FP_y	=	Fuel penalty in year *y* (GJ)
$EF_{CO2,BL,y}$	=	Emissions factor for the fossil fuels displaced by the use of alternative fuels in the project plant in year *y* (t CO_2/GJ)
k	=	Alternative fuel types used in the project plant in year *y*

The baseline emission factor ($EF_{CO2,BL,y}$) is estimated as the lowest of the following three CO_2 emission factors:

1. The weighted average CO_2 emission factor for the fossil fuel(s) consumed during the most recent three years before the start of the project activity, calculated as follows:

$$EF_{CO2,BL,y} = \frac{\sum_i \left(FC_{i,x-2} + FC_{i,x-1} + FC_{i,x}\right) \times NCV_i \times EF_{CO2,FF,i}}{\sum_i (\left(FC_{i,x-2} + FC_{i,x-1} + FC_{i,x}\right) \times NCV_i)}$$ **Equation (4)**

Where:

$EF_{CO2,BL,y}$	=	Emissions factor for the fossil fuels displaced by the use of alternative fuels in the project plant in year *y* (t CO_2/GJ)
$FC_{i,x}$	=	Quantity of fossil fuel type *i* used in the project plant in year *x* (t)
NCV_i	=	Net calorific value of the fossil fuel type *i* (GJ/t)
$EF_{CO2,FF,i}$	=	CO_2 emission factor for fossil fuel type *i* (t CO_2/GJ)
x	=	Year prior to the start of the project activity

i	=	Fossil fuel types used in the project plant in the last three years prior to the start of the project activity

2. The weighted average annual CO_2 emission factor of the fossil fuel(s) that are not less carbon-intensive fossil fuels and that are used in the project plant in year y, calculated as follows:

$$EF_{CO2,BL,y} = \frac{\sum_i FC_{PJ,i,y} \times NCV_{i,y} \times EF_{CO2,FF,i,y}}{\sum_i (FC_{PJ,i,y} \times NCV_{i,y})}$$ **Equation (5)**

Where:

$EF_{CO2,BL,y}$	=	Emissions factor for the fossil fuels displaced by the use of alternative fuels in the project plant in year *y* (t CO_2/GJ)
$FC_{PJ,i,y}$	=	Quantity of fossil fuel type *i* fired in the project plant in year *y* (t)
$NCV_{i,y}$	=	Net calorific value of the fossil fuel type *i* in year *y* (GJ/t)
$EF_{CO2,FF,i,y}$	=	Emission factor for fossil fuel type *i* in year *y* (t CO_2/GJ)
i	=	Fossil fuel types used in the project plant in year *y* that are not less carbon-intensive fossil fuel types

3. If option F3 has been determined as the most likely baseline scenario: the weighted average annual CO2 emission factor for the fossil fuel(s) that would have been consumed according to the fuel mix determined in the selection of the most plausible baseline scenario, as follows:

$$EF_{CO2,BL,y} = \frac{\sum_i FC_{BL,F3,i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{\sum_i (FC_{BL,F3,i,y} \times NCV_{i,y})}$$ **Equation (6)**

Where:

$EF_{CO2,BL,y}$	=	Emissions factor for the fossil fuels displaced by the use of alternative fuels in the project plant in year *y* (t CO_2/GJ)
$FC_{BL,F3,i,y}$	=	Quantity of fossil fuel type *i* that would in the absence of the project activity, be used in the project plant according to the selected baseline scenario F3 in year *y* (t)
$NCV_{i,y}$	=	Net calorific value of the fossil fuel type *i* in year *y* (GJ/t)
$EF_{CO2,i,y}$	=	Emission factor for fossil fuel type *i* in year *y* (t CO_2/GJ)
i	=	Fossil fuel types that are not less carbon-intensive fossil fuel types and that would, in the absence of the project activity, be used in the project plant according to the selected baseline scenario F3 in year *y*

10.2.2.3 Activity-specific combustion correction

An activity-specific combustion correction is applied because the combustion of typically coarser biomass or other alternative fuels reduces heat transfer efficiency in the cement manufacturing process (affecting the radiation and conductivity mechanisms due to the fuel's physical form and deposition on the refractory). The use of alternative fuels will therefore require a greater heat input to produce the same quantity and quality of clinker. The chemical content and ease of absorption into clinker of all fuel ashes also differ, and this also contributes to the need for an activity-specific combustion correction.

The activity-specific combustion correction ($ASCC_y$) shall be determined as follows:

$$ASCC_y = P_{clinker,y} \times MAX\left(0, SEC_{clinker,PJ,y} - SEC_{clinker,BL}\right)$$ **Equation (7)**

$$ASCC_y = P_{clinker,y} \times MAX\left(0, SEC_{clinker,PJ,y} - SEC_{clinker,BL}\right)$$

Where:

$ASCC_y$	=	Activity- specific combustion correction in year *y* (GJ)
$P_{clinker,y}$	=	Production of clinker in year *y* (t)
$SEC_{clinker,PJ,y}$	=	Specific energy consumption of the project plant in year *y* (GJ/t clinker)
$SEC_{clinker,BL}$	=	Specific energy consumption of the project plant in the absence of the project activity (GJ/t clinker)

The specific energy consumption in the project is calculated based on the quantity of all fuels used in the project plant and the quantity of clinker produced in year *y*, as follows:

$$SEC_{clinker,PJ,y} = \frac{\sum_i\left(FC_{PJ,i,y} \times NCV_{i,y}\right) + \sum_k\left(FC_{PJ,k,y} \times NCV_{k,y}\right)}{P_{clinker,y}}$$ **Equation (8)**

Where:

$SEC_{clinker,BL}$	=	Specific energy consumption of the project plant in year *y* (GJ/t clinker)
$FC_{PJ,i,y}$	=	Quantity of fossil fuel type *i* fired in the project plant in year *y* (t)
$NCV_{i,y}$	=	Net calorific value of the fossil fuel type *i* in year *y* (GJ/t)
$FC_{PJ,k,y}$	=	Quantity of alternative fuel type *k* used in the project plant in year *y* (t)
$NCV_{k,y}$	=	Net calorific value of the alternative fuel type *k* in year *y* (GJ/t)
$P_{clinker,y}$	=	Production of clinker in year *y* (t)
k	=	Alternative fuel types used in the project plant in year *y*
i	=	Fossil fuel types used in the project plant in year *y* that are not less carbon-intensive fossil fuel types

As a conservative approach, the specific energy consumption in the absence of the project activity is calculated as the average annual ratio of fuel input per clinker production of the most recent three years prior to the start of the project activity, as follows:

$$SEC_{\mathrm{clinker,BL}} = \frac{\frac{HG_x}{P_{clinker,x}} + \frac{HG_{x-1}}{P_{clinker,x-1}} + \frac{HG_{x-2}}{P_{clinker,x-2}}}{3}$$ **Equation (9)**

with

$$HG_x = \sum_i FC_{i,x} \times NCV_i$$ **Equation (10)**

Where:

$SEC_{clinker,BL}$	=	Specific energy consumption of the project plant in the absence of the project activity (GJ/t clinker)
HG_x	=	Heat generated from fuel combustion in the project plant in the historical year *x* (GJ)
$FC_{i,x}$	=	Quantity of fossil fuel type *i* used in the project plant in year *x* (t)
NCV_i	=	Net calorific value of the fossil fuel type *i* (GJ/t)
$P_{clinker,x}$	=	Production of clinker in year *x* (t)
x	=	Year prior to the start of the project activity
i	=	Fossil fuel types used in the project plant in the last three years prior to the start of the project activity

In cases where circumstances unrelated to the use of alternative fuels affect the specific energy consumption of the project plant in year(s) y, project participants may opt to undertake a measurement campaign of no less than two weeks to define $SEC_{clinker, BL,y}$ for that year(s) only, based on the use of the fossil fuels and under conditions that are representative of the new circumstances faced by the project plant, as follows:

$$SEC_{clinker,BL,y} = \frac{\sum_i \left(FC_{C,i,y} \times NCV_{i,y}\right)}{P_{clinker,C,y}}$$ **Equation (11)**

Where:

$SEC_{clinker,BL,y}$	=	Specific energy consumption of the baseline of the project plant in year *y* (GJ/t clinker)
$FC_{i,C,y}$	=	Quantity of fossil fuel type *i* fired in the project plant in baseline measurement campaign *C* in year *y* (t)
$NCV_{i,y}$	=	Net calorific value of the fossil fuel type *I* in year *y* (GJ/t)
$P_{clinker,C,y}$	=	Production of clinker in baseline measurement campaign *C* in year *y* (t)
i	=	Fossil fuel types used in the project plant in year *y* that are not less carbon-intensive fossil fuel types

10.2.2.4 Baseline emissions from decay, dumping, or burning of waste

The calculation of baseline methane emissions from waste residues dumped, left to decay, or burnt in an uncontrolled manner without utilizing them for energy purposes depends on the applicable baseline scenario (W3, W4, or W7). Baseline emissions from decay, dumping, or burning of waste are calculated as follows:

$$BE_{CH4,waste,y} = BE_{CH4,W3/W7,y} + BE_{CH4,W4,y} \quad \text{Equation (12)}$$

Where:

$BE_{CH4,waste,y}$	=	Baseline methane emissions avoided during the year *y* from preventing the disposal or uncontrolled burning of waste (t CO_2e)
$BE_{CH4,W3/W7,y}$	=	Baseline methane emissions avoided during the year *y* from aerobic decay and/or uncontrolled burning of waste (t CO_2e)
$BE_{CH4,W4,y}$	=	Baseline methane emissions avoided during the year *y* from anaerobic decay of waste residues at a solid waste disposal site (t CO_2e)

Scenarios W3 and W7: uncontrolled burning or aerobic decay of the waste

If the most likely baseline scenario for the use of a transformed waste type *k*, used as alternative fuel in the project plant, is that the waste would be dumped or left to decay under mainly aerobic conditions (W3) or burnt in an uncontrolled manner without utilizing them for energy purposes (W7). Then, baseline emissions are calculated assuming, for both scenarios, viz., natural decay and uncontrolled burning, that the waste would be burnt in an uncontrolled manner.

Baseline emissions avoided from aerobic decay and/or uncontrolled burning of waste are calculated as follows:

$$BE_{CH4,W3/W7,y} = GWP_{CH4} \times \sum_{k} FC_{PJ,k,y} \times NCV_{k,y} \times EF_{burning,CH4,k,y} \quad \text{Equation (13)}$$

Where:

$BE_{CH4,W3/W7,y}$	=	Baseline methane emissions avoided during the year *y* from aerobic decay and/or uncontrolled burning of waste (t CO_2e)
GWP_{CH4}	=	Global Warming Potential of methane valid for the commitment period (t CO_2e/t CH_4)
$FC_{PJ,k,y}$	=	Quantity of alternative fuel type *k* used in the project plant in year *y* (t)
$NCV_{k,y}$	=	Net calorific value of the alternative fuel type *k* in year *y* (GJ/t)
$EF_{burning,CH4,k,y}$	=	CH_4 emission factor for uncontrolled burning of the waste type *k* during the year *y* (t CH_4/GJ)
k	=	Types of waste residues used as alternative fuel in the project plant in year *y,* for which the identified baseline scenario is W3 or W7

To determine the CH_4 emission factor, project participants may undertake measurements or use referenced default values. In the absence of more accurate information, it is recommended to use 0.0027 t CH_4 per tonne of biomass as the default value for the product of NCV_k and $EF_{burning,CH4,k,y}$.[5]

The uncertainty of the CH_4 emission factor is relatively high in many cases. In order to reflect this and to provide conservative estimates of emission reductions, a conservativeness factor of 0.73 shall be applied, resulting in an emission factor of 0.001971 t CH_4/t biomass.

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[5] 2006 IPCC Guidelines, Volume 4, Table 2.5.

Scenario W4: anaerobic decay of the waste

If the most likely baseline scenario for the use of a biomass residue type *k*, used as an alternative fuel in the project plant, is that the waste would decay under clearly anaerobic conditions (case W4), project participants shall calculate baseline emissions using the 2006 IPCC guidelines, Volume 5, Waste, chapter 3, solid waste disposal.

Use a simplified approach to the First Decay Order (FOD) model with the following procedure:

The amount of methane generated from the disposal of waste at the SWDS is calculated based on an FOD model[6]. The model differentiates between the different types of waste j with respective constant decay rates (kj) and fractions of degradable organic carbon (DOCj).

The model calculates the methane generation occurring in year y (12 consecutive months) or month m based on the waste streams of waste types j (Wj,x or Wj,i) disposed in the SWDS over a specified time period (years or months).

In cases where, at the SWDS, methane is captured (e.g., due to safety regulations) and flared, combusted, or used in another manner that prevents methane emissions to the atmosphere, the emissions are adjusted for the fraction of methane captured (fy).

All data used to apply the equations should be documented transparently in A6.4-PDD or the monitoring reports. The A6.4-PDD should also clearly specify the time period (the consecutive years x or months i) in which waste disposal is considered in the calculation. For application A, this period may begin before the project activity starts, and typically begins when the SWDS starts receiving waste.

The emissions are calculated in two options, as follows, on a yearly basis:

$$BE_{CH4,W4,y} = \varphi_y \times (1 - f_y) \times GWP_{CH4} \times (1 - OX) \times \frac{16}{12} \times F \times DOC_{f,y} \times MCF_y \times \sum_{x=1}^{y} \sum_{j} \left(W_{j,x} \times DOC_j \times e^{-k_j \times (y-x)} \times (1 - e^{-k_j})\right)$$

Equation (14)

Where, for the yearly model:

$BE_{CH4,W4,y}$	=	Baseline, methane emissions occurring in year *y* generated from waste disposal at a SWDS during a time period ending in year *y* (t CO_2e/yr)
x	=	Years in the time period in which waste is disposed at the SWDS, extending from the first year in the time period (*x* = 1) to year *y* (*x* = *y)*
y	=	The year of the crediting period for which methane emissions are calculated (*y* is a consecutive period of 12 months)
$DOC_{f,y}$	=	Fraction of degradable organic carbon (DOC) that decomposes under the specific conditions occurring in the SWDS for year *y* (weight fraction)

[6] As an approximation, methane generation in the SWDS is described as a function of time according to a first-order decay process with rapid, moderate, and slow degrading organic fractions distinguished.

$W_{j,x}$	=	Amount of solid waste type *j* disposed or prevented from disposal in the SWDS in the year *x* (t)
φ_y	=	Model correction factor to account for model uncertainties for year *y*
f_y	=	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year *y*
GWP_{CH4}	=	Global Warming Potential of methane valid during the crediting period
OX	=	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste).
F	=	Fraction of methane in the SWDS gas (volume fraction)
MCF_y	=	Methane correction factor for year *y*
DOC_j	=	Fraction of degradable organic carbon in the waste type *j* (weight fraction)
k	=	Decay rate for the waste type *j* (1 / yr)
j	=	Type of residual waste or types of waste in the MSW

The calculations can use IPCC software, such as 19R_V5_Waste_Model, or follow the methodological tool A6.4-AMT-003 Emissions from solid waste disposal sites version 01.0

9.3. Calculation of the downward adjusted baseline

The activity participant shall select an approach based on existing actual or historical emissions, adjusted downwards to ensure alignment with paragraph 33 of the RMP.

The downward adjustment must take into account the long-term paths adopted by FICEM or similar international industry associations, the economic viability of mitigation technologies and/or practices, and market incentives for the adoption of new technologies and practices. In terms of technological changes and trends, the leading organization is the European Cement Research Academy GmbH[7], which publishes a "State of the Art Cement Manufacturing" research report every year, confirming the sector's commitment to increasing energy efficiency and reducing greenhouse gas emissions from global cement production.

Most studies present time series and a rationale using milestones aligned with PA and reasonable confidence levels of the values. If simulation techniques are required for a specific project, a complete description of the simulation model and its assumptions must be provided. The data must represent the situation at the national level and in the region where similar technologies are in operation.

Follow the following steps:

Step 1: Determine Historical Specific Emissions. These are based on actual or past emissions data from comparable cement plants that have commenced operation over a defined period (typically 3–5 years). A typical benchmark for traceable data includes the global performance of BAT technologies, as provided by industrial associations with at least 20 years of verifiable datasets.

[7] See: ECRA_Technology_Papers_2022.pdf

Step 2: Apply a downward adjustment. According to paragraph 33 of the RMP, the baseline must be adjusted downward to avoid over-crediting.

I. Determine the uncertainty at the lower bound of the uncertainty interval relative to the central estimate of the ex-ante quantified unadjusted net baseline emissions and/or removals at 95% confidence level during the first crediting period ($UNC_{BEact/\,hist,CP1}$).

The determination of the uncertainty shall consider all causes of uncertainty per A6.4-STAN-METH-004: Mechanism methodologies shall apply a conservative approach to ensure that the emission reductions or net removals from an Article 6.4 activity using the methodology are very unlikely to be overestimated, taking into account the overall uncertainty in quantifying the emission reductions or net removals. The implementation of conservativeness (e.g., through conservative assumptions, parameters, and discounts) in determining calculated emission reductions or net removals shall be based on the level of uncertainty (e.g., applying a larger deduction in cases of higher uncertainties). All causes of uncertainty shall be considered, including uncertainty in data (e.g., measurements), parameters (e.g., representativeness of default values), assumptions (e.g., the baseline scenario), and methods (e.g., models to quantify emission reductions).

II. Determine downward adjusted baseline emissions and/or removals based on uncertainty for the calendar year of the start date of the first crediting period ($BE_{ADJ,UNC,y}$), as follows;

$$BE_{ADJ,UNC,y} = BE_y * \left(1 - UNC_{BEact/\,hist,CP1}\right)$$ **Equation (15)**

Where:

$BE_{ADJ,UNC,y}$ = Downward adjusted baseline emissions based on uncertainty in year y.

BE_y = Unadjusted existing actual or historical net baseline emissions in year y.

$UNC_{BEact/\,hist,CP1}$ = Uncertainty at the lower bound of the uncertainty interval relative to the central estimate of the ex-ante quantified unadjusted net baseline emissions during the first crediting period (fraction).

y = Calendar year of the start date of the first crediting.

The $UNC_{BEact/\,hist,CP1}$ for the first crediting period. It can follow the global trend of the best operations that have a lower bound of uncertainty in the correlation of historical real values.

III. Determine the minimum downward adjusted baseline emissions and/or removals for the calendar year of the start date of the first crediting period ($BE_{ADJ,min,y}$), as follows:

$$BE_{ADJ,min,y} = BE_y - (BE_y + AE_y) * 0.1$$ **Equation (16)**

Where:

$BE_{ADJ,min,y}$ = Minimum downward adjusted baseline emissions and/or removals in year y.

BE_y = Unadjusted existing actual or historical net baseline emissions and/or removals in year y.

AE_y = Ex-ante estimated activity emissions and/or removals in the year y.

y = Calendar year of the start date of the first crediting period.

IV. Compare the downward adjusted baseline emissions and/or removals based on uncertainty ($BE_{ADJ,UNC,y}$) and the minimum downward adjusted baseline emissions and/or removals ($BE_{ADJ,min,y}$) and select the lower as the downward adjusted baseline.

$$BE_{ADJ,y} = \min(BE_{ADJ,min,y}\ , BE_{QADJ,UNC,y}) \qquad \text{Equation (17)}$$

Where:

$BE_{ADJ,y}$	= Downward adjusted baseline emissions and/or removals in year y
y	= Calendar year of the start date of the first crediting period

Step 3: Final Adjusted Baseline Emissions

Apply the downward adjustment to have a $BE_{ADJ,y}$

The downward adjustment applied in subsequent years shall increase over time to encourage ambition over time and ensure that the baseline is below BAU. The starting point for increasing the downward adjustment over time shall be the downward adjustment in the calendar year of the start date of the first crediting period.

The increase in the downward adjustments over time shall be operationalised either as an annual change or as stepwise change implemented not less frequently than every three years. An increase in the downward adjustment shall be applied starting on 1 January of a calendar year. The first increase shall be applied in the calendar year following the calendar year of the start date of the first crediting period.

9.4. Identification of the conservative BAU scenario

The Business-as-usual (BAU) scenario considers the most common clinker production practices in the host country/region over the last three years, accounting for sub-operational processes, energy sources (thermal and electric), and regulatory mandates. The BAU is identified as follows:

A. Definition of BAU subprocesses

Clinker production under BAU conditions is characterized by the predominant production schemes observed over the past three years. It typically includes:

- **Coal Production:** depending on the region’s or country's primary fossil fuel energy mix (local production or imported), and transported to the production facility by ship, truck, train, pneumatic duct, or belt conveyor.
- **Natural Gas supply:** Depending on the region’s primary fossil fuel mix, connecting the facility to a city gate or a hub for LNG imports. Natural gas could serve as an alternative partial fuel replacement if the predominant energy source is coal, or remain in a BAU status, and potentially be replaced by a cleaner mitigation option such as green hydrogen.
- **Oil products:** primarily used for preheating specific equipment, such as heavy bunker.

B. Data Collection for BAU Determination

The BAU scenario is derived from:

- **Technology Prevalence**: identification of the most widely deployed technology (e.g., mining, grinding, transportation, and injection into a furnace) based on national industry surveys, production reports, data of commissioning from key suppliers, or peer-reviewed studies.

- **Energy Source Dependency**: Analysis of the primary feedstock used and its share in the country's supply through a Sankey diagram or a similar type of balance to understand resource availability.
- **Regulatory compliance**: incorporation of legally enforced efficiency standards or national mandates that are binding during the three-year baseline period. Examples of these types of regulations include the Clean Air Act, minimum waste heat recovery requirements, and fuel component emission limits.

C. Adjustments for regulatory and efficiency law

The BAU scenario accounts for pre-existing regulations that influence production processes, such as:

- **Energy Efficiency Standards**: mandated minimum thermal efficiency levels (e.g., GJ/ton Clinker)
- **Air Pollution Limits**: caps on CO_2, NO_x, or SO_x emissions that affect the engineering of some equipment (e.g., pre-heaters or filtering)
- **Technology Requirements**: laws requiring specific equipment (e.g., waste heat recovery units or filtering media) in new or retrofitted plants.
- **Exclusion of Non-Compliant Practices**: processes failing to meet regulatory requirements during the baseline period are excluded from BAU (e.g., outdated plants shut down due to non-compliance)

D. Exclusion of Emerging Technologies

The BAU scenario excludes:

- Power-to-X options, unless they are economically competitive and account for over 10% of the national production capacity.

E. Conservativeness and Compliance

The BAU scenario is designed to be conservative and replicable:

- Temporal Scope: Based on the most recent three years of verifiable data (complete time series) to avoid speculative assumptions about future trends.
- Data Sources: Relies on auditable data (e.g., national industry reports, energy statistics, regulatory filings).
- Adjustment Safeguards: Downward adjustments are made only for **enforced regulations** (not voluntary initiatives) to prevent overestimation.

F. Methodological Steps to Determine BAU

Use the following sequence:

- STEP 1: Collect data on clinker production technologies, energy sources, and subprocess prevalence (last three years).
- STEP 2: Identify the dominant production pathway (e.g., FL Smith & Co A/S or Krupp Polysius AG)
- STEP 3: Adjust for binding regulations (e.g., efficiency standards) that could alter the baseline ratio of emissions/intensity.

- STEP 4: Exclude emerging technologies (e.g., in pilot stage or market share below 2.5%) not yet mainstream.
- STEP 5: Validate against national statistics and third-party industry research.

G. Key Output

A BAU emissions intensity (e.g., tCO_{2e}/ton of Clinker) reflecting:

- Dominant subprocesses.
- Energy source carbon intensity.
- Regulatory-compliant efficiency levels.

9.4.1. Calculation of the conservative BAU emissions

The BAU emissions formula estimates the total greenhouse gas (GHG) emissions from clinker production under standard conditions (before any decarbonization measures). $BAU_{Emission,y}$ emissions are calculated as follows:

$$BAU_{Emission,y} = (E_{Clinker,y}) * RAF$$ **Equation (18)**

Where:

$E_{Clinker,y}$	=	Emissions from clinker production in year y
RAF	=	Regulated Adjustment Factor to account for policy-mandated efficiency improvement (correction factor), a value in the range {0, 1}.

The equation for clinker production is as follows:

Equation (19)

$$E_{[clinker,y]} = \left[\sum_j \left(FC_{j,y} \times NCV_{j,y}\right)\right] \times EF_{CO2,BAU,y}$$

Where:

$E_{[clinker,y]}$	=	Emissions from carbon-intensive fossil fuels in year *y* (t CO_2)
$FC_{PJ,k,y}$	=	Quantity of carbon-intensive fossil fuel type *j* used in the project plant in year *y* (t)
$NCV_{k,y}$	=	Net calorific value of the carbon-intensive fuel type *j* in year *y* (GJ/t)
$EF_{CO2,BL,y}$	=	Emissions factor for the carbon-intensive fossil fuels in the project plant in year *y* (t CO_2/GJ)
j	=	Carbon-intensive fossil fuel types used in the project plant in year *y*

The weighted average CO_2 emission factor for the fossil fuel(s) consumed during the most recent three years before the start of the project activity, calculated as follows:

$$EF_{CO2,BAU,y} = \frac{\sum_j \left(FC_{j,x-2} + FC_{j,x-1} + FC_{j,x}\right) \times NCV_j \times EF_{CO2,FF,j}}{\sum_j (\left(FC_{j,x-2} + FC_{j,x-1} + FC_{j,x}\right) \times NCV_j)}$$ **Equation (20)**

Where:

$EF_{CO2,BAU,y}$	=	Emissions factor for the carbon-intensive fossil fuels in the project plant in year *y* (t CO_2/GJ)
$FC_{i,x}$	=	Quantity of fossil fuel type *i* used in the project plant in year *x* (t)
NCV_j	=	Net calorific value of the fossil fuel type *i* (GJ/t)
$EF_{CO2,FF,j}$	=	CO_2 emission factor for fossil fuel type *i* (t CO_2/GJ)
x	=	Year prior to the start of the project activity
j	=	Fossil fuel types used in the project plant in the last three years prior to the start of the project activity

The adjustment for efficiency gains is as follows

$$RAF\ = 1 - X\%$$ **Equation (21)**

Where:

RAF	=	Regulatory Adjustment Factor
X%	=	Mandatory efficiency improvement %

9.5. Comparison of the downward adjusted baseline and the conservative business-as-usual baseline

Activity participants shall calculate the difference between the baseline emissions or removals and BAU emissions as an annual and total amount concerning the crediting period:

$$\Delta_d = BAU_{Emissions,y} - BE_{ADJ,y}$$ **Equation (22)**

Where:

Δd	=	Difference between BAU and baseline emissions in year y (tCO_2/year)
$BAU_{Emissions,y}$	=	Business As Usual Emissions in year y (tCO_2/tClinker)
$BE_{ADJ,y}$	=	Final Adjusted Baseline Emissions based on the most conservative factor in yr y (tCO_2)

Confirm that the numerical value of the downward-adjusted baseline is lower than the numerical value of the conservative BAU baseline. If so, select the downward-adjusted baseline as the crediting baseline. If not, apply a further adjustment to ensure that the downward adjusted baseline is lower than the conservative BAU baseline.

10. Activity scenario

10.1. Calculation of activity emissions

Activity emissions refer to the total direct and indirect greenhouse gas (GHG) emissions resulting from the implementation of the partial alternative fuel project in a cement facility. These emissions must be compared with baseline emissions to determine the net mitigation impact.

Activity emissions include:

- Direct emissions from the combustion of alternative fuels and/or less carbon-intensive fossil fuels, and additional fossil fuels.
- Indirect emissions from electricity consumption, transportation of alternative fuels, and cultivation of biomass

Activity (project) emissions are calculated as follows:

$$AE_y = AE_{k,y} + AE_{FC,y} + AE_{EC,y} + AE_{T,y}$$ **Equation (23)**

Where:

AE_y	=	Activity emissions during the year *y* (t CO_2e)
$AE_{k,y}$	=	Activity emissions from combustion of alternative fuels and/or less carbon-intensive fossil fuels in the project plant in year *y* (t CO_2)
$AE_{FC,y}$	=	Activity emissions from additional fossil fuel combustion as a result of the project activity in year *y* (t CO_2)
$AE_{EC,y}$	=	Activity emissions from additional electricity consumption as a result of the project activity in year *y* (t CO_2)
$AE_{T,y}$	=	CO_2 emissions during the year *y* due to transport of alternative fuels to the project plant (t CO_2)

Activity emissions from the use of alternative fuels

Activity emissions from the use of alternative fuels in the project plant are calculated as follows:

$$AE_{k,y} = \sum_k FC_{PJ,k,y} \times NCV_{k,y} \times EF_{CO2,k,y}$$ **Equation (24)**

Where:

$AE_{k,y}$	=	Activity emissions from combustion of alternative fuels and/or less carbon-intensive fossil fuels in the project plant in year *y* (t CO_2)
$FC_{PJ,k,y}$	=	Quantity of alternative fuel or less carbon-intensive fossil fuel type *k* used in the project plant in year *y* (t)
$EF_{CO2,k,y}$	=	Emissions factor for alternative or less carbon-intensive fossil fuels type *k* in year *y* (t CO_2/GJ)

$NCV_{k,y}$	=	Net calorific value of the alternative or less carbon-intensive fossil fuel type *k* in year *y* (GJ/t)
k	=	Alternative fuel types and less carbon-intensive fossil fuel types used in the project plant in year *y*

Activity emissions from additional electricity and/or fossil fuel consumption as a result of the project activity

The use of alternative fuels may result in additional fossil fuel and/or electricity consumption at the project site or off-site. This may include, inter alia, the following emission sources:

a. Drying or mechanical treatment of the wastes.

b. On-site transportation of the transformed wastes.

c. Flue gas treatment is required as a result of the project activity.

Project participants should identify, in the A6.4-PDD, all relevant emission sources for additional fuel combustion and electricity generation and, if applicable, explain any changes in monitoring reports.

(a) Activity emissions from additional fossil fuel consumption

Emissions from on-site combustion of fossil fuels ($AE_{FC,y}$) shall be calculated for each fossil emission source *j*, and the fuel consumption of each fuel type *i* ($FC_{i,j,y}$) shall be monitored. CO_2 emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows:

$$AE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y}$$ **Equation (25)**

Where:

$AE_{FC,j,y}$	=	Are the CO_2 emissions from fossil fuel combustion in process *j* during the year *y* (tCO_2/yr)
$FC_{i,j,y}$	=	Is the quantity of fuel type *i* combusted in process *j* during the year *y* (mass or volume unit/yr)
$COEF_{i,y}$	=	Is the CO_2 emission coefficient of fuel type *i* in year *y* (tCO_2/mass or volume unit)
i	=	Are the fuel types combusted in process *j* during the year *y*

The CO_2 emission coefficient $COEF_{i,y}$ can be calculated using one of the following two Options, depending on the availability of data on the fossil fuel type i, as follows:

I. **Option A**: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on the chemical composition of the fossil fuel type *i*, using the following approach:

If $FC_{i,j,y}$ is measured in a mass unit:

$$COEF_{i,y} = w_{C,i,y} \times 44/12$$ **Equation (26)**

If $FC_{i,j,y}$ is measured in a volume unit:

$$COEF_{i,y} = w_{C,i,y} \times \rho_{i,y} \times 44/12 \qquad \textbf{Equation (27)}$$

Where:

$COEF_{i,y}$	=	Is the CO_2 emission coefficient of fuel type *i* (tCO_2/mass or volume unit);
$w_{C,i,y}$	=	Is the weighted average mass fraction of carbon in fuel type *i* in year *y* (tC/mass unit of the fuel)
$\rho_{i,y}$	=	Is the weighted average density of fuel type *i* in year *y* (mass unit/volume unit of the fuel)
i	=	Are the fuel types combusted in process *j* during the year *y*

II. **Option B**: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type *i*, as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y} \qquad \textbf{Equation (28)}$$

Where:

$COEF_{i,y}$	=	Is the CO_2 emission coefficient of fuel type *i* in year *y* (tCO_2/mass or volume unit)
$NCV_{i,y}$	=	Is the weighted average net calorific value of the fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$	=	Is the weighted average CO_2 emission factor of fuel type *i* in year *y* (tCO_2/GJ)
i	=	Are the fuel types combusted in process *j* during the year *y*

Option A should be the preferred approach if the necessary data is available.

(b) Activity emissions from additional electricity consumption

Emissions from electricity consumption include CO_2 emissions from the combustion of fossil fuels at any power plants at the site(s) of electricity consumption and, if applicable, at power plants connected physically to the electricity system (grid) from which electricity is consumed.

Project participants should document transparently in the A6.4-PDD and in monitoring reports which sources of electricity consumption are calculated using this methodology, and for each source, which scenario (A, B, or C, as described below) applies.

Next, a generic approach to calculating emissions from electricity consumption is introduced. This approach can be used in all applicable scenarios (A, B, or C) as described below. Then, guidance is provided on determining the emission factor for electricity generation.

Generic approach

In the generic approach, activity, baseline, and/or leakage emissions from the consumption of electricity are calculated based on the quantity of electricity consumed, an emission factor for electricity generation, and a factor to account for transmission losses, as follows:

$$AE_{EC,y} = \sum_{j} EC_{PJ,j,y} \times EF_{EF,j,y} \times (1 + TDL_{j,y})$$ Equation (29)

$$LE_{EC,y} = \sum_{l} EC_{LE,l,y} \times EF_{EF,l,y} \times (1 + TDL_{l,y})$$ Equation (30)

Where:

$AE_{EC,y}$	=	Activity emissions from electricity consumption in year *y* (t CO2 / yr)
$LE_{EC,y}$	=	Leakage emissions from electricity consumption in year *y* (t CO2 / yr)
$EC_{PJ,j,y}$	=	Quantity of electricity consumed by the project electricity consumption source *j* in year *y* (MWh/yr)
$EC_{LE,l,y}$	=	Net increase in electricity consumption of source *l* in year *y* as a result of leakage[8] (MWh/yr)
$EF_{EF,j,y}$	=	Emission factor for electricity generation for source *j* in year *y* (t CO2/MWh)
$EF_{EF,l,y}$	=	Emission factor for electricity generation for source *l* in year *y* (t CO2/MWh)
$TDL_{j,y}$	=	Average technical transmission and distribution losses for providing electricity to source *j* in year *y*
$TDL_{l,y}$	=	Average technical transmission and distribution losses for providing electricity to source *l* in year *y*
j	=	Sources of electricity consumption in the project
l	=	Leakage sources of electricity consumption

Determination of the emission factor for electricity generation ($EF_{EL,j/l,y}$)

For the determination of the emission factors for electricity generation ($EF_{EL,j/l,y}$) in the project scenar, use the methodological tool A6.4-AMT-007: Emissions from electricity generation and consumption.

Activity emissions from the combustion of fossil fuels for the transportation of alternative fuels to the project plant

The use of alternative fuels may lead to increased fossil fuel consumption due to additional transportation requirements. Project participants shall determine CO_2 emissions resulting from the incremental transportation of (alternative) fuels to the project plant. In many cases, transportation is undertaken by vehicles. Project participants may use two options to determine activity or leakage emissions from road transportation of freight: monitoring fuel consumption (Option A) or using conservative default values (Option B). This procedure is applicable when transportation is not the main activity and only determines CO_2, CH_4, and N_2O emissions, as they are small compared to CO_2 emissions.

[8] A net increase of electricity consumption outside the project boundary as a result of the A6.4 project activity should be reflected in a positive value for $EC_{LE,l,y}$. If electricity consumption decreases as a result of the A6.4 project activity, $EC_{LE,l,y}$ should be assumed as zero.

Option A: Monitoring fuel consumption

This option requires monitoring the fuel consumption of vehicles used for freight transportation under the activity. The monitored fuel consumption shall include fuel consumed by the vehicles on both outbound and return trips, regardless of whether the vehicles also transport freight not associated with the project activity. Use the following guidance to compute the project emissions:

I. The parameter $AE_{T,y}$ corresponds to the parameter $AE_{TR,m}$ or $LE_{TR,m}$ in equation 34.

II. Element process *j* corresponds to the combustion of fuels in vehicles.

III. If biofuels are used, then the corresponding CO_2 emission factor of the fossil fuels that would most likely be used in the absence of the use of biofuels should be used.[3] If biofuel blends are consumed, then the CO_2 emission factor of the fossil fuel used in the blend shall be used, as a conservative simplification.

The monitoring plan shall document the process for collecting and verifying data on fuel consumption. Additionally, for each transportation activity f, the monitoring reports should contain information on the origin and destination, as well as the number of trips conducted.

Option B: using conservative default values

This option relies on conservative default emission factors to estimate activity or leakage emissions from road transportation of freight. These default values are established for two vehicle classes: light vehicles and heavy vehicles.

Table 4. Default CO_2 emission factor for freight transportation activities
Source: IPCC 2006, guidelines, volume 2, chapter 3.

Vehicle class	Emission factor (g CO_2/t km)
Light vehicles	245
Heavy vehicles	129

Under this option, the following data shall be monitored separately for each freight transportation activity f to estimate the emissions:

(a) The quantity of freight transported ($FR_{f,m}$);

(b) The origin and destination of the freight transported and the road (or rail line) distance between the origin and the destination ($D_{f,m}$); and

(c) The vehicle class used, if the freight is transported by road.

The Project or leakage emissions are determined as follows:

$$AE_{TR,m} \text{ or } LE_{TR,m} = \sum_{f} D_{f,m} \times FR_{f,m} \times EF_{fCO2} \times 10^{-6} \qquad \textbf{Equation (31)}$$

Where:

$AE_{TR,m}$	=	Activity emissions from transportation of freight monitoring period *m* (t CO_2)
$LE_{TR,m}$	=	Leakage emissions from transportation of freight monitoring period *m* (t CO_2)

$D_{f,m}$	=	Return trip distance between the origin and destination of freight transportation activity *f* in monitoring period *m* (km)
$FR_{f,m}$	=	Total mass of freight transported in freight transportation activity *f* in monitoring period *m* (t)
$EF_{CO2,f}$	=	Default CO_2 emission factor for freight transportation activity *f* (g CO_2/t km)
f	=	Freight transportation activities conducted in the period *m*

11. Leakage

11.1. Identification of leakage emission sources

Per definition in A6.4-STAN-METH-005, a leakage is a change in anthropogenic emissions and/or removals of GHGs that occur outside the activity boundary and that are attributable to the activity, including those resulting from changes in market demand or supply for associated outputs.

The standard requires the assessment of the following potential sources of leakage:

- Baseline equipment transfer;
- Competition for resource use;
- Diversion of existing production processes or outputs;
- Increases in the release of GHGs from the environment as a result of Article 6.4 activity;

Additional leakage sources not covered by the leakage standard:

- Upstream emissions from the manufacturing of trucks, and the manufacturing of equipment used for RDF production and handling to the kiln.
- Upstream emissions from the generation of energy using fossil fuels, including emissions from the production, processing, and transportation of fossil fuels to the energy plant, manufacturing of the energy generation equipment, and construction of the energy generation plant.

The activity only uses MSW. No dedicated biomass flow is included as part of the alternative fuel.

Data Sources and Assumptions

Primary Data Sources (preferred)

- Monitoring market displacement or resource competition, especially for biomass or waste as RDF in different types. Use national or local registries, statistics, trade flow data, or estimations from industrial /municipal benchmarks.
- Monitoring specialized assessments from the Oil & Gas Industry, such as LCA reports or research reports on upstream emissions.

Secondary Data Sources

- IPCC or US EPA Emission Factors Database
- Society of Petroleum Engineers or American Petroleum Institute reports on global upstream emissions
- International Energy Agency (IEA) studies on the life cycle of fossil fuels.
- Any relevant peer-reviewed LCA study applicable to the fossil fuels used in the transportation of MSW for the activity.

Ensuring Data Conservativeness

In case more than one dataset is available, select the most conservative values (highest emissions)

Select information based on its technological relevance and market penetration.

11.2. Avoidance or minimization of leakage

12.2.1 Leakage from the transfer of baseline equipment

Leakage from the transfer of baseline equipment may happen if the equipment is replaced with new equipment and the old one is used in a project outside of the project boundary, with biomass that has emissions in its residues and cultivation. Any change to equipment seeking higher energy efficiency requires scrapping the old unit.

12.2.2 Diversion of existing production processes or outputs

Leakage from diversion of existing production of MSW may happen if solid waste used for other activities (e.g., composting) is diverted to the MSW conversion to alternative fuel. To avoid this leakage, an applicability condition (5.V) was introduced in this mechanism methodology, requiring activity participants to demonstrate that the Article 6.4 activity does not reduce the amount of organic waste that would otherwise be processed as alternative fuel in the absence of the Article 6.4 activity. This must be evidenced by contracts, legislative decrees, or public studies.

12.2.3 Upstream activity emissions from the manufacturing of trucks and processing units for MSW.

Leakage from the manufacturing of RDF units fed by MSW is a small quantity, and their upstream emissions are negligible. However, the project developer may recheck the value assuming that all the systems (compacting box, hydraulic systems, electrical unit, and conveyor) weight 100% as steel) by the CO_2 emission factor for the production of steel and apply the reference emission factor of 1.27 tCO_2e/t_{steel}, as per Appendix 3 of the approved CDM methodology AMS-III.BA.)

Leakage from the manufacturing of trucks for the transportation of MSW to the cement facility could be a small number, and their emissions are negligible. However, the project developer may recheck the available literature from the truck supplier or use reference data such as ICCT[9]. This institution has researched the LCA of a 40-ton articulated truck over a 20-year lifetime, resulting in a value of 130 tCO2e per truck.

12.2.4 Upstream emissions from fossil fuels used in the transportation of MSW.

The value chain of any fossil fuel is a significant source of emissions. The value must cover the emissions from the headwell, processing plants, transportation, refining and/or compression to city gates and distribution to final users. There are LCA datasets such as ICCT[10] (2014) specific for a region or set on a global basis.

11.3. Addressing leakage emissions

For MSW as the only alternative fuel, if leakages from the transfer of equipment, diversion of existing processes, and manufacturing of trucks and equipment are negligible, then the remaining significant leakage is upstream emissions from fossil fuels. If not, all leakages shall be included together with the fossil fuel upstream emissions.

$$LE_y = \mathrm{LE}_{\mathrm{FF,\ upstream},\,y} \qquad \textbf{Equation (32)}$$

Leakage emissions from fossil fuel use ($LE_{FF,upstream,y}$)

Where total net leakage effects from upstream emissions are negative ($LE_{FF,upstream,y} < 0$), activity participants should assume $LE_{FF,upstream,y} = 0$.

Leakage upstream emissions are calculated as follows:

$$LE_{\mathrm{FF,\ upstream},y} = \sum_{x} \mathrm{EF}_{\mathrm{FF,X,default}} \times (\mathrm{FC}_{\mathrm{PJ,x},y} - \mathrm{FC}_{\mathrm{BL,x},y}) \qquad \textbf{Equation (33)}$$

If $LE_{FF,upstream,y}$ is calculated as a value of less than 0, then a value of 0 shall be used instead, unless the methodology referencing this tool specifies that negative values for $LE_{US,y}$ are permitted.

Where:

$LE_{FF,\ upstream,y}$	=	Leakage upstream emissions in year *y* (t CO_{2e}/yr)
$FC_{PJ,x,y}$	=	Quantity of fossil fuel type *x* used in the project situation in year *y* (TJ/yr)
$FC_{BL,x,y}$	=	Quantity of fossil fuel type *x* used in the baseline situation in year *y* (TJ/yr)
$EF_{FF,x,default}$	=	Default emission factor for upstream emissions associated with consumption of fossil fuel type *x* (t CO_{2e}/TJ)

[9] International Council on Clean Transportation (ICCT). The life-cycle greenhouse gas emissions of European heavy-duty vehicles and fuels. 2023. White paper. Available at <https://theicct.org/wp-content/uploads/2023/02/Lifecycle-assessment-trucks-and-buses-emissions-Europe.pdf>, accessed on 10 August 2025.

[10] https://circabc.europa.eu/sd/a/6215286e-eb5f-4870-b92f-26acff386156/ICCT_Upstream-emissions-of-EU-crude_May2014.pdf

x	=	Fossil fuel types used in the project and/or baseline situation, and for which upstream emissions should be determined

Select $EF_{FF,x,default}$ from Table 5 for the corresponding fossil fuel type x. In this table, a simple default emission factor is provided for each fossil fuel type, not distinguishing factors for different fossil fuel origins except for coal-based fuels. For this fuel type, there are default emission factors provided if it is known that the coal-based fuel is wholly sourced from an underground mine or mines located in the host country of the project activity.

The default values are calculated by summing the emission factors for each of the upstream emission stages for fossil fuel type x. Natural gas, liquified natural gas (LNG), Oil, and Coal are commodities traded globally. The fuels produced in Annex I countries in various quantities, along with their emissions generated during the exploration, production, upgrading, refining, and transportation stages, are already accounted for in the national inventories of these countries. To avoid double-counting, each emission factor (for natural gas, liquefied natural gas, oil, and coal) is multiplied by a correction factor that accounts for the exporting activity from Annex I countries, applying data published by the U.S Energy Information Administration, International Energy Statistics, and BP Statistical Review of World Energy. The correction factors for natural gas-based fossil fuel types (except LNG), liquefied natural gas, oil-based fossil fuel types, and coal/lignite are, respectively, 0.26, 0.85, 0.76, and 0.48.

Table 5. Default emission factors for upstream emissions of fossil fuels ($EF_{FF,x,default}$)

Fossil fuel type		Default emission factor ($t\ CO_2e/TJ$)
Natural Gas (NG)		2.9
Natural Gas Liquids (NGL)		2.2
Liquefied Natural Gas (LNG)		16.2
Compressed Natural Gas (CNG)		10
Light Fuel Oil (Diesel)		16.7
Heavy Fuel Oil (Bunker or Marine Type)		9.4
Gasoline		13.5
Kerosene (household and aviation)		8.5
LPG (including butane and propane)		8.7
Coal/lignite (unknown mine location(s) or coal/lignite not 100 per cent sourced from within the host country)	Lignite	2.9
	Surface mine, or any other situation	2.8
	Underground (100 per cent source)	10.4
Coal/lignite (coal/lignite 100 per cent sourced from within the host country)	Lignite	6.0
	Surface mine, or any other situation	5.8
	Underground (100 per cent source)	21.4

12. Emission reductions

Emissions Reductions are calculated as follows:

$$ER_y = BE_{ADJ,y} - AE_y - LE_y \quad \text{Equation (34)}$$

13. Data and parameters not monitored

Data/parameter table 1

Data/parameter	***$FC_{i,x}$*, *$FC_{i,x-1}$* and *$FC_{i,x-2}$***
Description	Quantity of fossil fuel of type *i* used in the project plant in year *x*, *x-1* and *x-2* where *x* is the year prior to the start of the project activity and *i* are the fossil fuel types used in the project plant in the last three years prior to the start of the project activity.
Data unit	Mass or volume units
Equations referred	Equation (3)
Purpose of data	☒ Baseline emissions / removals ☐ Project emissions / removals ☐ Leakage emissions
Value(s) applied	Three years of data from fuel consumption data logs at the project site
Source of data	☒ Measured ☐ Other sources
Choice of data or measurement methods and procedures	Use mass or volume meters. The consistency of metered fuel consumption quantities should be cross-checked by an annual energy balance that is based on purchased quantities and stock changes. Where the purchased fuel invoices can be identified specifically for the A6.4 project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records
Treatment of uncertainty	To manage uncertainty in data from instruments or systems: ▪ If the time series has data gaps due to the malfunction of instruments or human error, the project participants will use a procedure developed for this purpose using statistical techniques (e.g., linear interpolation, k-nearest neighbour imputation, or regression-based imputation) to rebuild the data and maintain the same standard deviation. ▪ The registered data set should maintain a confidence level of 95% or lower. ▪ If modelling is used for getting a parameter, a small p-value (typically < 0.05) must be used. For time series, use indicators such as the Akaike criterion or equivalent to select the best models.
Additional comments	No comments

Data/parameter table 2

Data/parameter	***$FC_{BL,F3,i,y}$***
Description	Quantity of fossil fuel type *i* that would be used in the project plant in the absence of the project activity, according to the selected baseline scenario F3 in year *y*
Data unit	Mass or volume units

Equations referred	Equation (5)
Purpose of data	☒ Baseline emissions / removals ☐ Project emissions / removals ☐ Leakage emissions
Value(s) applied	
Source of data	☒ Measured ☐ Other sources
Choice of data or measurement methods and procedures	
Treatment of uncertainty	To manage uncertainty in data from instruments or systems: ▪ If the time series has data gaps due to the malfunction of instruments or human error, the project participants will use a procedure developed for this purpose using statistical techniques (e.g., linear interpolation, k-nearest neighbour imputation, or regression-based imputation) to rebuild the data and maintain the same standard deviation. ▪ The registered data set should maintain a confidence level of 95% or lower. ▪ If modelling is used for getting a parameter, a small p-value (typically < 0.05) must be used. For time series, use indicators such as the Akaike criterion or equivalent to select the best models.
Additional comments	Only applicable if F3 has been determined as the most likely baseline scenario

Data/parameter table 3

Data/parameter	$P_{clinker,x}$, $P_{clinker,x-1}$ and $P_{clinker,x-2}$
Description	Production of clinker in year *x*, *x-1*, and *x-2* where *x* is the year prior to the start of the project activity
Data unit	t (tons)
Equations referred	Equation (8)
Purpose of data	☒ Baseline emissions / removals ☐ Project emissions / removals ☐ Leakage emissions
Value(s) applied	Three years of data from production data logs at the project site
Source of data	☒ Measured ☐ Other sources
Choice of data or measurement methods and procedures	Use appropriate mass meters and/or weighing devices
Treatment of uncertainty	To manage uncertainty in data from instruments or systems: ▪ If the time series has data gaps due to the malfunction of instruments or human error, the project participants will use a procedure developed for this purpose using statistical techniques (e.g., linear interpolation, k-nearest neighbour imputation, or regression-based imputation) to rebuild the data and maintain the same standard deviation. ▪ The registered data set should maintain a confidence level of 95% or lower.

	▪ If modelling is used for getting a parameter, a small p-value (typically < 0.05) must be used. For time series, use indicators such as the Akaike criterion or equivalent to select the best models.
Additional comments	No comments

Data/parameter table 4

Data/parameter	***NCV$_i$***
Description	Net calorific value of the fossil fuel type *i*
Data unit	GJ/mass or volume units
Equations referred	Equations (2,3,4,5,7,10,19,20)
Purpose of data	☒ Baseline emissions / removals ☐ Project emissions / removals ☐ Leakage emissions
Value(s) applied	The following data sources may be used if the relevant conditions apply: <table><tr><th>Data source</th><th>Conditions for using the data source</th></tr><tr><td>(a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr><tr><td>(b) Measurements by the project participants</td><td>If (a) is not available</td></tr><tr><td>(c) Regional or national default values</td><td>If (a) is not available. These sources can only be used for liquid fuels and should be based on well documented, reliable sources (such as national energy balances)</td></tr><tr><td>(d) IPCC default values at the lower limit of the uncertainty at a 95 per cent confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If (a) is not available</td></tr></table>
Source of data	☐ Measured ☒ Other sources
Choice of data or measurement methods and procedures	For (a) and (b): measurements should be undertaken in line with national or international fuel standards
Treatment of uncertainty	To manage uncertainty in data from instruments or systems: ▪ If the time series has data gaps due to the malfunction of instruments or human error, the project participants will use a procedure developed for this purpose using statistical techniques (e.g., linear interpolation, k-nearest neighbour imputation, or regression-based imputation) to rebuild the data and maintain the same standard deviation. ▪ The registered data set should maintain a confidence level of 95% or lower.

	▪ If modelling is used for getting a parameter, a small p-value (typically < 0.05) must be used. For time series, use indicators such as the Akaike criterion or equivalent to select the best models.
Additional comments	Verify if the values under (a), (b), and (c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range, collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in (a), (b), or (c) should have ISO17025 accreditation or justify that they can comply with similar quality standards.

14. Data and parameters monitored

Data/parameter table 5

Data/parameter	**Regulated Adjustment Factor (RAF)**	
Description	A "downward adjustment factor" is applied to the BAU line to account for policy-mandated efficiency improvement.	
Data unit	Fraction of 1.0	
Equations referred	Equation (18, 21)	
Purpose of data	☒ Baseline emissions / removals ☐ Project emissions / removals ☐ Leakage emissions	
Measurement methods and procedures	The values must be aligned with Nationally Determined Contributions (NDCs) and Long-Term Low Emissions Development Strategies (LT-LEDS) to ensure compliance with enforced regulations and prevent overestimation. Voluntary initiatives are not included.	
Entity/person responsible for the measurement	Project developer	
Measuring instrument(s)	*Type of instrument*	Not applicable
	Accuracy class	Not applicable
	Calibration requirements	Not applicable
	Location	Not applicable
Measurement intervals	Not applicable	
QA/QC procedures		
Treatment of uncertainty	*Not Applicable*	
Additional comment	Comments may be provided if necessary.	

Data/parameter table 6

Data/parameter	$FC_{PJ,k,y}$, $FC_{PJ,i,y}$, $FC_{i,C,y}$
Description	Quantity of alternative fuel of type *k* ($FC_{PJ,k,y}$), fossil fuel of type *i* ($FC_{PJ,i,y}$) and ($FC_{i,C,y}$), used in the project plant in year *y*
Data unit	Mass or volume units
Equations referred	Equation (19, 20)
Purpose of data	☒ Baseline emissions / removals ☐ Project emissions / removals ☐ Leakage emissions
Measurement methods and procedures	Use mass or volume meters. The consistency of metered fuel consumption quantities should be cross-checked by an annual energy balance that is based on purchased quantities and stock changes.

	Where the purchased fuel invoices can be explicitly identified for the A6.4 project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records.	
Entity/person responsible for the measurement	Facility Operator	
Measuring instrument(s)	*Type of instrument*	Electronic meters certified to national or IEC standards, including a backup device and registries of data in a SCADA or equivalent.
	Accuracy class	Minimum accuracy grade: 0.2
	Calibration requirements	Ensure that the equipment is calibrated following the local/national standards or the manufacturer's specifications. If local/national standards or the manufacturer's specifications are not available, international standards may be used.
	Location	Primary meter at the substation level or before entering the process.
Measurement intervals	Recorded continuously and aggregated at least annually	
QA/QC procedures	According to ISO 9001 or a similar quality system The consistency of metered fuel consumption quantities should be cross-checked against an annual energy balance based on amounts purchased and stock changes. Where the purchased fuel invoices can be explicitly identified for the A6.4 project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records.	
Treatment of uncertainty	To manage uncertainty in data from instruments or systems: ▪ If the time series has data gaps due to the malfunction of instruments or human error, the project participants will use a procedure developed for this purpose using statistical techniques (e.g., linear interpolation, k-nearest neighbour imputation, or regression-based imputation) to rebuild the data and maintain the same standard deviation. ▪ The registered data set should maintain a confidence level of 95% or lower. ▪ If modelling is used for getting a parameter, a small p-value (typically < 0.05) must be used. For time series, use indicators such as the Akaike criterion or equivalent to select the best models.	
Additional comment	No comments	

Data/parameter table 7

Data/parameter	$EF_{CO2,k,y}$ **and** $EF_{CO2,FF,i,y}$
Description	Weighted average CO_2 emission factor for alternative fuels of type *k* ($EF_{CO2,k,y}$) and fossil fuel of type *i* ($EF_{CO2,FF,i}$) in year *y*
Data unit	t CO_2/GJ
Equations referred	Equation (2, 3, 4, 5,19,20)
Purpose of data	☒ Baseline emissions / removals ☐ Project emissions / removals ☐ Leakage emissions

<table>
<tr><td>Measurement methods and procedures</td><td colspan="2">For fossil fuels and for wastes originating from fossil sources for which W7 has been identified as the most likely baseline scenario, the following data sources should be used:
<table>
<tr><th>Data source</th><th>Conditions for using the data source</th></tr>
<tr><td>(a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr>
<tr><td>(b) Measurements by the project participants</td><td>If (a) is not available</td></tr>
<tr><td>(c) Regional or national default values</td><td>If (a) is not available.
These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances)</td></tr>
<tr><td>(d) IPCC default values at the upper/lower limit[11] of the uncertainty at a 95 per cent confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If (a) is not available</td></tr>
</table></td></tr>
<tr><td>Entity/person responsible for the measurement</td><td colspan="2">Facility Operator</td></tr>
<tr><td rowspan="4">Measuring instrument(s)</td><td>Type of instrument</td><td>Not applicable</td></tr>
<tr><td>Accuracy class</td><td>Not applicable</td></tr>
<tr><td>Calibration requirements</td><td>Not applicable</td></tr>
<tr><td>Location</td><td>Not applicable</td></tr>
<tr><td>Measurement intervals</td><td colspan="2">For (a) and (b): the CO_2 emission factor should be obtained for each fuel delivery, from which weighted average annual values should be calculated.
For (c): Review the appropriateness of the values annually.
For (d): any future revision of the IPCC Guidelines should be taken into account</td></tr>
<tr><td>QA/QC procedures</td><td colspan="2">According to ISO 9001 or a similar quality system</td></tr>
<tr><td>Treatment of uncertainty</td><td colspan="2">To manage uncertainty in data from instruments or systems:
If the time series has data gaps due to the malfunction of instruments or human error, the project participants will use a procedure developed for this purpose using statistical techniques (e.g., linear interpolation, k-nearest neighbour imputation, or regression-based imputation) to rebuild the data and maintain the same standard deviation.
The registered data set should maintain a confidence level of 95% or lower.</td></tr>
</table>

[11] To be conservative, choose the upper limit where project emissions are calculated and the lower limit where baseline emissions are calculated.

	▪ If modelling is used for getting a parameter, a small p-value (typically < 0.05) must be used. For time series, use indicators such as the Akaike criterion or equivalent to select the best models.
Additional comment	For (a): if the fuel supplier does provide the NCV value and the CO_2 emission factor on the invoice, and these two values are based on measurements for this specific fuel, this CO_2 factor should be used. If another source for the CO_2 emission factor is used or no CO_2 emission factor is provided, Options (b), (c), or (d) should be used.

Data/parameter table 8

<table>
<tr><td>Data/parameter</td><td colspan="2">NCV $NCV_{k,y}$,</td></tr>
<tr><td>Description</td><td colspan="2">Weighted average net calorific value of the alternative fuel types k ($NCV_{k,y}$), in year y</td></tr>
<tr><td>Data unit</td><td colspan="2">GJ/mass or volume units</td></tr>
<tr><td>Equations referred</td><td colspan="2">Equation (2, 3, 4, 5,19,20)</td></tr>
<tr><td>Purpose of data</td><td colspan="2">☒ Baseline emissions / removals ☐ Project emissions / removals ☐ Leakage emissions
Tick the applicable box(es).</td></tr>
<tr><td>Measurement methods and procedures</td><td colspan="2">The following data sources may be used if the relevant conditions apply:
<table>
<tr><td>Data source</td><td>Conditions for using the data source</td></tr>
<tr><td>(a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr>
<tr><td>(b) Measurements by the project participants</td><td>If (a) is not available</td></tr>
<tr><td>(c) Regional or national default values</td><td>If (a) is not available.
These sources can only be used for liquid fossil fuels and should be based on well-documented, reliable sources (such as national energy balances)</td></tr>
<tr><td>(d) IPCC default values at the upper limit of the uncertainty at a 95 per cent confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If (a) is not available.
This source may only be used for fossil fuels.</td></tr>
</table></td></tr>
<tr><td>Entity/person responsible for the measurement</td><td colspan="2">Facility operator</td></tr>
<tr><td rowspan="3">Measuring instrument(s)</td><td>Type of instrument</td><td>Not applicable</td></tr>
<tr><td>Accuracy class</td><td>Not applicable</td></tr>
<tr><td>Calibration requirements</td><td>Not applicable</td></tr>
</table>

	Location	Not applicable

Measurement intervals	For (a) and (b): the NCV should be obtained for each fuel delivery, from which weighted average annual values should be calculated.
	For (c): review appropriateness of the values annually.
	For (d): any future revision of the IPCC Guidelines should be taken into account	

QA/QC procedures	Verify if the values under (a), (b), and (c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range, collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in (a), (b), or (c) should have ISO17025 accreditation or justify that they can comply with similar quality standards	
Treatment of uncertainty	To manage uncertainty in data from instruments or systems: ▪ If the time series has data gaps due to the malfunction of instruments or human error, the project participants will use a procedure developed for this purpose using statistical techniques (e.g., linear interpolation, k-nearest neighbour imputation, or regression-based imputation) to rebuild the data and maintain the same standard deviation. ▪ The registered data set should maintain a confidence level of 95% or lower. ▪ If modelling is used for getting a parameter, a small p-value (typically < 0.05) must be used. For time series, use indicators such as the Akaike criterion or equivalent to select the best models.	
Additional comment	No comments	

Data/parameter table 9

Data/parameter	**$P_{clinker,y}$**	
Description	Production of clinker in year y	
Data unit	t (tons)	
Equations referred	Equations (6,7,8,10)	
Purpose of data	☒ Baseline emissions / removals ☐ Project emissions / removals ☐ Leakage emissions	
Measurement methods and procedures		
Entity/person responsible for the measurement	Facility operator	
Measuring instrument(s)	*Type of instrument*	weight scale for batch or continuous measurement (certified to national or IEC standards).
	Accuracy class	minimum accuracy class II.
	Calibration requirements	Ensure that the equipment is calibrated following the local/national standards or the manufacturer's specifications. If local/national standards or the manufacturer's specifications are not available, international standards may be used.
	Location	Conveyors, platform or tanks (silos).

Measurement intervals	Recorded/calculated, and reported monthly	
QA/QC procedures	According to ISO 9000 or similar quality systems	
Treatment of uncertainty	To manage uncertainty in data from instruments or systems: ▪ If the time series has data gaps due to the malfunction of instruments or human error, the project participants will use a procedure developed for this purpose using statistical techniques (e.g., linear interpolation, k-nearest neighbour imputation, or regression-based imputation) to rebuild the data and maintain the same standard deviation. ▪ The registered data set should maintain a confidence level of 95% or lower. ▪ If modelling is used for getting a parameter, a small p-value (typically < 0.05) must be used. For time series, use indicators such as the Akaike criterion or equivalent to select the best models.	
Additional comment	No comments	

Data/parameter table 10

Data/parameter	***$EF_{CO2,BL,y}$***	
Description	Emissions factor for the fossil fuels displaced by the use of alternative fuels in the project plant	
Data unit	t CO_2/GJ	
Equations referred	Equations (2)	
Purpose of data	☒ Baseline emissions / removals ☐ Project emissions / removals ☐ Leakage emissions	
Measurement methods and procedures	Calculated as follows, as the lowest of the following CO_2 emission factors: The weighted average annual CO_2 emission factor for the fossil fuel(s) consumed and monitored ex ante during the most recent three years before the start of the project activity. The weighted average annual CO_2 emission factor of the fossil fuel(s) consumed in the project plant in year y that are not less carbon-intensive fossil fuels. If F2 has been determined as the most likely baseline scenario: the weighted average annual CO_2 emission factor for the fossil fuel(s) that would have been consumed according to the fuel mix determined in the selection of the most plausible baseline scenario and demonstration of additionality.	
Entity/person responsible for the measurement	Facility Operator	
Measuring instrument(s)	*Type of instrument*	Not applicable
	Accuracy class	Not applicable
	Calibration requirements	Not applicable
	Location	Not applicable
Measurement intervals	Continuously, aggregated at least annually.	

QA/QC procedures	
Treatment of uncertainty	To manage uncertainty in data from instruments or systems: ▪ If the time series has data gaps due to the malfunction of instruments or human error, the project participants will use a procedure developed for this purpose using statistical techniques (e.g., linear interpolation, k-nearest neighbour imputation, or regression-based imputation) to rebuild the data and maintain the same standard deviation. ▪ The registered data set should maintain a confidence level of 95% or lower. ▪ If modelling is used for getting a parameter, a small p-value (typically < 0.05) must be used. For time series, use indicators such as the Akaike criterion or equivalent to select the best models.
Additional comment	No comments

Data/parameter table 11

Data/parameter	**$FC_{i,j,y}$**	
Description	Quantity of fuel type i combusted in process j during the year y	
Data unit	Mass or volume unit per year (e.g., ton/yr or m3/yr)	
Equations referred	Equation (3,4,5,7,10)	
Purpose of data	☐ Baseline emissions / removals ☒ Project emissions / removals ☐ Leakage emissions	
Measurement methods and procedures	• Use either mass or volume meters. In cases where fuel is supplied from small daily tanks, rulers can be used to determine mass or volume of the fuel consumed, with the following conditions: The ruler gauge must be part of the daily tank and calibrated at least once a year, and have a book of control for recording the measurements (daily or per shift) • Accessories such as transducers, sonar, and piezo electronic devices are accepted if they are properly calibrated with the ruler gauge and receive reasonable maintenance • In case of daily tanks with pre-heaters for heavy oil, the calibration will be made with the system at typical operational conditions	
Entity/person responsible for the measurement	Plant Operator	
Measuring instrument(s)	*Type of instrument*	Electronic meters certified to national or IEC standards, including a backup device and registries of data in a SCADA or equivalent.
	Accuracy class	Minimum accuracy grade: 0.2
	Calibration requirements	Ensure that the equipment is calibrated following the local/national standards or the manufacturer's specifications. If local/national standards or the manufacturer's specifications are not available, international standards may be used.
	Location	Located in the main fuel line or mechanical feeder that supplies energy input to a combustion process.

Measurement intervals	Continuously
QA/QC procedures	The consistency of metered fuel consumption quantities should be cross-checked by an annual energy balance that is based on purchased quantities and stock changes. Where the purchased fuel invoices can be identified specifically for the A6.4 project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records
Treatment of uncertainty	To manage uncertainty in data from instruments or systems: ▪ If the time series has data gaps due to the malfunction of instruments or human error, the project participants will use a procedure developed for this purpose using statistical techniques (e.g., linear interpolation, k-nearest neighbour imputation, or regression-based imputation) to rebuild the data and maintain the same standard deviation. ▪ The registered data set should maintain a confidence level of 95% or lower. ▪ If modelling is used for getting a parameter, a small p-value (typically < 0.05) must be used. For time series, use indicators such as the Akaike criterion or equivalent to select the best models.
Additional comment	No comments

Data/parameter table 12

Data/parameter	**$W_{C,i,y}$**	
Description	Weighted average mass fraction of carbon in fuel type i in year y	
Data unit	tC/mass unit of the fuel	
Equations referred	Equation (27)	
Purpose of data	☐ Baseline emissions / removals ☒ Project emissions / removals ☐ Leakage emissions	
Measurement methods and procedures	The following data sources may be used if the relevant conditions apply: (a) Values provided by the fuel supplier in invoices. This is the preferred source. (b) Measurements by the project participants, if (a) is not available Measurements should be undertaken in line with national or international fuel standards.	
Entity/person responsible for the measurement	Plant Operator	
Measuring instrument(s)	*Type of instrument*	Not applicable
	Accuracy class	Not applicable
	Calibration requirements	Not applicable
	Location	Not applicable
Measurement intervals	The mass fraction of carbon should be obtained for each fuel delivery, from which weighted average annual values should be calculated.	
QA/QC procedures	Verify if the values under (a) and (b) are within the uncertainty range of the product of the IPCC default values as provided in Table 1.2 and Table 1.3, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range, collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in (b) should have	

	ISO17025 accreditation or justify that they can comply with similar quality standards.
Treatment of uncertainty	To manage uncertainty in data from instruments or systems: ▪ If the time series has data gaps due to the malfunction of instruments or human error, the project participants will use a procedure developed for this purpose using statistical techniques (e.g., linear interpolation, k-nearest neighbour imputation, or regression-based imputation) to rebuild the data and maintain the same standard deviation. ▪ The registered data set should maintain a confidence level of 95% or lower. ▪ If modelling is used for getting a parameter, a small p-value (typically < 0.05) must be used. For time series, use indicators such as the Akaike criterion or equivalent to select the best models.
Additional comment	Applicable where Option A is used

Data/parameter table 13

Data/parameter	$\rho_{i,y}$	
Description	Weighted average density of fuel type i in year y	
Data unit	Mass unit/volume unit	
Equations referred	Equation (27)	
Purpose of data	☐ Baseline emissions / removals ☒ Project emissions / removals ☐ Leakage emissions	
Measurement methods and procedures	Measurements should be undertaken in line with national or international fuel standards.	
Entity/person responsible for the measurement	Plant Operator	
Measuring instrument(s)	*Type of instrument*	Not applicable
	Accuracy class	Not applicable
	Calibration requirements	Not applicable
	Location	Not applicable
Measurement intervals	The density of the fuel should be obtained for each fuel delivery, from which weighted average annual values should be calculated.	
QA/QC procedures		
Treatment of uncertainty	To manage uncertainty in data from instruments or systems: ▪ If the time series has data gaps due to the malfunction of instruments or human error, the project participants will use a procedure developed for this purpose using statistical techniques (e.g., linear interpolation, k-nearest neighbour imputation, or regression-based imputation) to rebuild the data and maintain the same standard deviation. ▪ The registered data set should maintain a confidence level of 95% or lower. ▪ If modelling is used for getting a parameter, a small p-value (typically < 0.05) must be used. For time series, use indicators such as the Akaike criterion or equivalent to select the best models.	

Additional comment	Applicable where Option A is used and where $FC_{i,j,y}$ is measured in a volume unit. Preferably, the same data source should be used for $W_{C,i,y}$ and $\rho_{i,y}$

Data/parameter table 14

Data/parameter	**$TDL_{j,y}$, $TDL_{k,y}$ and $TDL_{l,y}$**	
Description	Average technical transmission and distribution losses for providing electricity to source j, k, or l in year y	
Data unit	Dimensionless %	
Equations referred	Equation (29,30)	
Purpose of data	☐ Baseline emissions / removals ☒ Project emissions / removals ☐ Leakage emissions	
Measurement methods and procedures	In case of scenario B and scenario C, case C.II, assume *TDLj/k/l,y* = 0 as a simplification. In the case of other scenarios (scenario A and scenario C, cases C.I and C.III), choose one of the following options: 1. Use the annual average value based on the most recent data available within the host country. 2. Use as default values of 20% for: (a) project or leakage electricity consumption sources. (b) baseline electricity consumption sources if the electricity consumption by all projects and leakage electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies is larger than the electricity consumption of all baseline electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies. 3. Use as default values of 3% for: (a) baseline electricity consumption sources. Project and leakage electricity consumption sources if the electricity consumption by all project and leakage electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies is smaller than the electricity consumption of all baseline electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies.	
Entity/person responsible for the measurement	Plant Operator	
Measuring instrument(s)	*Type of instrument*	Not applicable
	Accuracy class	Not applicable
	Calibration requirements	Not applicable
	Location	Not applicable
Measurement intervals	For (a): $TDL_{j/k/l,y}$ should be estimated for the distribution and transmission networks of the electricity grid of the same voltage as the connection where the proposed A6.4 project activity is connected to. The technical distribution losses should not contain other types of grid losses (e.g., commercial losses/theft). The distribution losses can either be calculated by the project participants or be based on references from utilities, and network operators. Or other official documentation	
QA/QC procedures		

Treatment of uncertainty	To manage uncertainty in data from instruments or systems: ▪ If the time series has data gaps due to the malfunction of instruments or human error, the project participants will use a procedure developed for this purpose using statistical techniques (e.g., linear interpolation, k-nearest neighbour imputation, or regression-based imputation) to rebuild the data and maintain the same standard deviation. ▪ The registered data set should maintain a confidence level of 95% or lower. ▪ If modelling is used for getting a parameter, a small p-value (typically < 0.05) must be used. For time series, use indicators such as the Akaike criterion or equivalent to select the best models.
Additional comment	No comments

Data/parameter table 15

Data/parameter		**$FC_{n,i,t}$**
Description		Quantity of fossil fuel type i fired in the captive power plant n in the time period t
Data unit		Mass or volume unit at reference conditions per year (in m^3, ton, or l) The reference environmental conditions are: 0 oC (273.15 K, 32ºF) and 1 atm (101.325 kN/m2, 101.325 kPa,14.69 psia, 29.92 in Hg, 760 torr).
Equations referred		Equation (31)
Purpose of data		☐ Baseline emissions / removals ☒ Project emissions / removals ☐ Leakage emissions
Measurement methods and procedures		Annual data during the crediting period: On-site measurements Historical data: Historical records / onsite measurements Use either mass or volume meters. In cases where fuel is supplied from small daily tanks, rulers can be used to determine the mass or volume of the fuel consumed, with the following conditions: The ruler gauge must be part of the daily tank and calibrated at least once a year, and have a book of control for recording the measurements (daily or per shift). Accessories such as transducers, sonar, and piezo electronic devices are accepted if they are properly calibrated using the ruler gauge and receive regular maintenance in accordance with the supplier's specifications. For daily tanks with pre-heaters for heavy oil, calibration will be performed with the system at typical operational conditions.
Entity/person responsible for the measurement		Plant Operator
Measuring instrument(s)	*Type of instrument*	Electronic meters certified to national or IEC standards, including a backup device and registries of data in a SCADA or equivalent.
	Accuracy class	Minimum accuracy grade: 0.2
	Calibration requirements	Ensure that the equipment is calibrated following the local/national standards or the manufacturer's specifications. If local/national standards or the manufacturer's specifications are not available, international standards may be used.
	Location	Located in the main fuel line or mechanical feeder that supplies energy input to a combustion process.

Measurement intervals	Continuously, aggregated at least annually.
QA/QC procedures	The consistency of metered fuel consumption quantities should be cross-checked against an annual energy balance based on amounts purchased and stock changes.
Treatment of uncertainty	To manage uncertainty in data from instruments or systems: ▪ If the time series has data gaps due to the malfunction of instruments or human error, the project participants will use a procedure developed for this purpose using statistical techniques (e.g., linear interpolation, k-nearest neighbour imputation, or regression-based imputation) to rebuild the data and maintain the same standard deviation. ▪ The registered data set should maintain a confidence level of 95% or lower. ▪ If modelling is used for getting a parameter, a small p-value (typically < 0.05) must be used. For time series, use indicators such as the Akaike criterion or equivalent to select the best models.
Additional comment	Only applicable if option B1 is used.

Data/parameter table 16

<table>
<tr><td>Data/parameter</td><td colspan="2">EG_{n,t}</td></tr>
<tr><td>Description</td><td colspan="2">Quantity of electricity generated in the captive power plant n in the time period t</td></tr>
<tr><td>Data unit</td><td colspan="2">MWh</td></tr>
<tr><td>Equations referred</td><td colspan="2">Equation (32)</td></tr>
<tr><td>Purpose of data</td><td colspan="2">☐ Baseline emissions / removals ☒ Project emissions / removals ☐ Leakage emissions</td></tr>
<tr><td>Measurement methods and procedures</td><td colspan="2">Use electricity meters
Onsite measurements</td></tr>
<tr><td>Entity/person responsible for the measurement</td><td colspan="2">Plant Operator</td></tr>
<tr><td rowspan="4">Measuring instrument(s)</td><td>Type of instrument</td><td>Electronic meters certified to national or IEC standards, including a backup device and registries of data in a SCADA or equivalent.</td></tr>
<tr><td>Accuracy class</td><td>Minimum accuracy grade: 0.2</td></tr>
<tr><td>Calibration requirements</td><td>Ensure that the equipment is calibrated following the local/national standards or the manufacturer’s specifications. If local/national standards or the manufacturer’s specifications are not available, international standards may be used.</td></tr>
<tr><td>Location</td><td>Located in a substation before the delivery of electricity to consumers.</td></tr>
<tr><td>Measurement intervals</td><td colspan="2">Continuously, aggregated at least annually.</td></tr>
<tr><td>QA/QC procedures</td><td colspan="2">Cross-check measurement results with records for sold electricity, where relevant.</td></tr>
<tr><td>Treatment of uncertainty</td><td colspan="2">To manage uncertainty in data from instruments or systems:
▪ If the time series has data gaps due to the malfunction of instruments or human error, the project participants will use a procedure developed for this purpose using statistical techniques (e.g., linear interpolation, k-</td></tr>
</table>

	nearest neighbour imputation, or regression-based imputation) to rebuild the data and maintain the same standard deviation. ▪ The registered data set should maintain a confidence level of 95% or lower. ▪ If modelling is used for getting a parameter, a small p-value (typically < 0.05) must be used. For time series, use indicators such as the Akaike criterion or equivalent to select the best models.
Additional comment	Only applicable if option B1 is used.

Data/parameter table 17

Data/parameter		***$HG_{n,t}$***
Description		Quantity of heat co-generated in the captive power plant n in the period t
Data unit		GJ
Equations referred		Equation (32)
Purpose of data		☐ Baseline emissions / removals ☒ Project emissions / removals ☐ Leakage emissions
Measurement methods and procedures		Heat generation is determined as the difference between the enthalpy of the steam or hot water generated and the enthalpy of the feed water and any condensate return. The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures, and, in the case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure.
Entity/person responsible for the measurement		Plant Operator
Measuring instrument(s)	*Type of instrument*	Electronic meters certified to national or IEC standards, including a backup device and data registries in a SCADA or equivalent system, or arrangements with thermocouples and pressure gauges connected to a SCADA or PLC for computing enthalpies and energy (heat) through a program.
	Accuracy class	Minimum accuracy grade: 0.2
	Calibration requirements	Ensure that the equipment is calibrated following the local/national standards or the manufacturer's specifications. If local/national standards or the manufacturer's specifications are not available, international standards may be used.
	Location	Meters or instruments are inserted in the main pipelines.
Measurement intervals		Continuously, aggregated at least annually.
QA/QC procedures		Cross-check measurement results with records for sold heat and the other energy measurements, where relevant.
Treatment of uncertainty		To manage uncertainty in data from instruments or systems: ▪ If the time series has data gaps due to the malfunction of instruments or human error, the project participants will use a procedure developed for this purpose using statistical techniques (e.g., linear interpolation, k-nearest neighbour imputation, or regression-based imputation) to rebuild the data and maintain the same standard deviation.

	▪ The registered data set should maintain a confidence level of 95% or lower. ▪ If modelling is used for getting a parameter, a small p-value (typically < 0.05) must be used. For time series, use indicators such as the Akaike criterion or equivalent to select the best models.
Additional comment	Only applicable if option B1 is used and if heat generation is not ignored.

Data/parameter table 18

Data/parameter	***$EC_{PJ,j,y}$; $EC_{LE,l,y}$***	
Description	Quantity of electricity consumed by the project electricity consumption source j in year y Net increase in electricity consumption of source l in year y as a result of leakage1	
Data unit	MWh/yr	
Equations referred	Equation (29,30)	
Purpose of data	☐ Baseline emissions / removals ☐ Project emissions / removals ☐ Leakage emissions	
Measurement methods and procedures	Use electricity meters installed at the source of electricity consumption. Direct measurement or calculated based on measurements from more than one electricity meter.	
Entity/person responsible for the measurement	Plant Operator	
Measuring instrument(s)	*Type of instrument*	Electronic meters certified to national or IEC standards, including a backup device and registries of data in a SCADA or equivalent.
	Accuracy class	Minimum accuracy grade: 0.2
	Calibration requirements	Ensure that the equipment is calibrated following the local/national standards or the manufacturer's specifications. If local/national standards or the manufacturer's specifications are not available, international standards may be used.
	Location	Located in a substation before the delivery of electricity to consumers.
Measurement intervals	Continuous measurement and at least monthly recording	
QA/QC procedures	In cases where electricity meters are regulated (e.g., the electricity is supplied by the electric grid – scenario A), the electricity meter will be subject to regular maintenance and testing following the stipulation of the meter supplier and/or as per the requirements set by the grid operators or national requirements. The calibration of meters, including the frequency of calibration, should be done in accordance with national standards or requirements set by the meter supplier or requirements set by the grid operators. The accuracy of the meters should be in accordance with the stipulation of the meter supplier and/or as per the requirements set by the grid operators or national requirements. In cases where electricity meters are not regulated (e.g. the electricity is supplied by captive power plants – Scenario B), the electricity meter will be subject to regular maintenance and testing in accordance with the stipulation of the meter supplier or national requirements. The calibration of meters, including the frequency of calibration, should be done in accordance with national standards or requirements set by the meter supplier. The accuracy	

	class of the meters should be in accordance with the stipulation of the meter supplier or national requirements. If these standards are not available, and the meter supplier does not specify, calibrate the meters every 3 years and use the meters with at least a 0.5 accuracy class (e.g., a meter with a 0.2 accuracy class is more accurate and thus it is accepted).
Treatment of uncertainty	To manage uncertainty in data from instruments or systems: ▪ If the time series has data gaps due to the malfunction of instruments or human error, the project participants will use a procedure developed for this purpose using statistical techniques (e.g., linear interpolation, k-nearest neighbour imputation, or regression-based imputation) to rebuild the data and maintain the same standard deviation. ▪ The registered data set should maintain a confidence level of 95% or lower. ▪ If modelling is used for getting a parameter, a small p-value (typically < 0.05) must be used. For time series, use indicators such as the Akaike criterion or equivalent to select the best models.
Additional comment	No comments

14.1. Frequency of submission of monitoring reports

For activities involving removals and for emission reduction activities with risks of reversals:

The maximum permissible interval between the start date of the first crediting period and the submission of the first monitoring report is ___years

Not Applicable.

The maximum permissible interval between the submission of two consecutive monitoring reports after the first monitoring report is ___years

Not Applicable.

15. Methodologies principles

15.1. Encouraging ambition over time

In determining the baseline scenario, the host party's ambition is clearly reflected and aligned with the 2050 targets, using the most conservative approach. The potential alternative fuel options and their technologies behind are encouraged, and BAU and locking-in emissions are quantified.

The use of alternative fuel derived from processed waste is an option that requires significant effort to ensure the source of waste, develop the necessary engineering, establish a reliable supply chain for a 24-hour operation like a cement kiln, and manage multiple engineering parameters to prevent lower quality and efficiency. The scale of the proposal reflects the project developer's ambition. It presents a replicable solution with high global potential, capable of impacting global change by reducing methane emissions— a GHG more valuable than CO_2 due to its short lifetime.

15.2. Contributing to the equitable sharing of mitigation benefits between participating Parties

Per paragraph 33 of the RMP:

Mechanism methodologies shall contain provisions for contributing to the equitable sharing of mitigation benefits between participating Parties, including the application of conditions specified by the Designated National Authorities (DNAs) of the host Party. These may also include one or more of the provisions below:

a) Conditions to ensure that the total length of the crediting period(s) of activities is shorter than the lifetime of the technology implemented, including any replacements undertaken during the crediting period, where there is very high confidence that emission reductions from the technology continue to be achieved beyond the end of the crediting period(s).

b) Other approaches to fulfil the demonstration of equitable sharing of mitigation benefits.

In this methodology, the conservative approach is below that of BAU, and that is a contribution to the host party NDCs and beyond. Furthermore, the lifetime of this type of project is typically over 25 years, which is twice the length of the crediting period. So, the host party will likely share emission reductions beyond BAU.

15.3. Encouraging broad participation

This methodology will be applicable in all the geographies at all scales of production

15.4. Attributability of emission reductions or net removals to the Article 6.4 activity

This project is not possible without the development of many contracts, the construction of new facilities to process waste, transport the processed waste, and inject the new alternative into the kiln while maintaining a safe operation with the same level of service. The amount of work is not equivalent to or potentially possible by an exogenous factor that would generate reductions without an MRV.

15.5. Potential perverse incentives

All the value chain of supply of alternative fuel has well-known costs, ownership, and it is challenging to find a free source of materials or indirect incentives to inflate the emission reductions. Moreover, the developers are a private firm, with most of its members in corporate structures, which have numerous due diligence procedures in place for environmental controls and undergo diverse levels of local and international audits to ensure the financial and non-financial outcomes for the Board and shareholders.

15.6. Rebound effects

The production of clinker depends on macro-economic variables, and the alternative fuel will not change the level of service of the output and its marginal cost to final customers. Therefore, it is difficult to determine a change in demand solely from the labelling of lower-CO_2 clinker. In the case of waste, production is dependent on exogenous conditions. The municipality or landfill operator will have a fixed capacity, as specified in a contract with conditions, to avoid potential conflicts with other materials and prevent a rebound effect.

Appendix 1. [Name of the appendix]

- A paragraph

[Use one or more appendixes to add complementary information to the main part of the methodology which could make the main part of the methodology too long, such as providing additional details, supporting evidence or examples to comply with specific requirements.]

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Document information

Version	*Date*	*Description*
0.2.0	19 August 2025	Revision to incorporate new sections and sub-sections in line with current standards; provide completion instructions, realign their sequence, and allow inclusion of explanatory notes.
01.0	18 December 2024	Initial publication of form template.

Decision Class: Regulatory
Document Type: Form
Business Function: Methodology
Keywords: A6.4 mechanism, developing methodologies and tools