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for the Global Goals

METHODOLOGY

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SDG 13

JOINED-UP SUSTAINABLE TRANSITION (JUST) – COAL DECOMMISSIONING

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SUMMARY

This methodology supports a Just Transition through the paired actions of the early closure of coal-fired power plants and the installation of renewable energy power plants in a way which does not hinder access to energy and is fair and inclusive for all stakeholders.

Key Methodological Components

- **Integrated Transition:** The activity shall structurally link the permanent decommissioning of a CFPP with the investment in and construction of a specific, grid-connected REP.
- **Dynamic & Conservative Baselines:** To prevent over-crediting, baseline emissions are determined using an Ambitious Performance Benchmark (replacing historical inefficiencies with Best Available Technology) and are adjusted annually using a Downward Adjustment Factor (DAF) aligned with the host country's Net Zero trajectory.
- **Comprehensive Leakage Accounting:** The methodology accounts for system-wide impacts, including Gap Leakage (emissions from the grid if REP generation falls short) and Market Leakage (emissions from the displacement of coal fuel to other users).
- **Just Transition Compliance:** Central to the activity is the mandatory implementation of a Just Transition Plan, developed in accordance with GS4GG requirements. This ensures that the financial benefits of carbon finance directly

support affected workers and communities through retraining, severance, and redevelopment initiatives.

- **Financial Additionality:** Activities shall undergo an investment analysis to prove that the early closure and renewable replacement would not be financially viable without the revenue from carbon credits.
- **Applicability:** This methodology is applicable to grid-connected activities globally, provided the activity developers adhere to strict eligibility criteria, including a prohibition on new global coal investments to prevent carbon leakage by substitution.

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1| KEY INFORMATION

1.1.1 | The following table describes the key information for the application of the methodology.

Table 1. Key information

Activity summary	The activity involves the early closure and decommissioning of an operating Coal Fired Power Plant (CFPP) and its replacement with a paired grid connected green-field renewable energy plant (REP). The activity shall be implemented in accordance with Gold Standard for Global Goals (GS4GG): Just Transition Requirements .
Mitigation type	<input checked="" type="checkbox"/> Emission reductions <input type="checkbox"/> Emission removal
Applicable activity scale	<input checked="" type="checkbox"/> Micro scale (e.g., ≤10,000 tCO ₂ e per year) <input checked="" type="checkbox"/> Small scale (e.g., ≤15 MW installed capacity) <input checked="" type="checkbox"/> Large scale (e.g., >15 MW installed capacity)
Sectoral Scope	1. Energy industries (renewable / non-renewable sources)
Activity Requirement	<input checked="" type="checkbox"/> Renewable Energy Activity Requirements
Activity start date	The earliest date on which the activity developer has committed to expenditures related to the implementation of the project activity.
Crediting Period start date	The start date of the Crediting Period is the date of the start of operations of the REP or a maximum of two years prior to the date of Design Certification, whichever occurs later.
Crediting period length	Five years, renewable twice or the Remaining Lifetime (RLT) of the CFPP, whichever is shorter
Applicable Gold Standard for Global Goals (GS4GG) products	<input checked="" type="checkbox"/> Gold Standard Verified Emissions Reduction (GSVERs) <input checked="" type="checkbox"/> Certified impact statement
Geographical applicability	Global.
Additional requirements	Activities applying this methodology shall also comply with the GS4GG: Just Transition Requirements .

2| DEFINITIONS

2.1.1 | In addition to the definitions provided in the [GS4GG Glossary](#) and the referenced standards and tools, the following definitions shall apply in the context of this methodology:

Table 2. Terms and definitions

TERM	DEFINITION
Applicable Geographical Area	The spatial boundary used for the assessment of additionality (e.g., common practice analysis) and the identification of the baseline scenario. It is defined as the host country by default. The applicable geographical area may also be defined as the relevant electricity system or grid to which the CFPP and REP are connected. A broader region or a narrower sub-national region may be defined if robust justification is provided demonstrating that the defined area represents the most relevant context for the assessments.
Captive Generation	An electricity generation facility used by an industrial, commercial, or institutional consumer primarily for its own consumption. Captive generation systems may be grid-connected, provided that the grid is used solely for supplementary power or backup during outages, and the baseline generation system was the primary source of electricity for the consumer.
Coal Fired Power Plant (CFPP)	A grid connected electricity generation facility that produces power through the combustion of coal as the primary fuel. A CFPP may comprise one or more generating units operating independently at the same site
Decommissioning (or Permanent Phase-out)	The process of permanently retiring the CFPP from service, ensuring it is dismantled or rendered permanently inoperative with no scope of operational revival (including repurposing for any type of fossil fuel-fired power generation).
Dispatchable Capacity	Generation capacity that can be dispatched (turned on or adjusted) at the request of power grid operators according to market needs.
Historical Reference Period	The period used to determine the historical performance parameters of the CFPP, defined as the most recent five consecutive years of uninterrupted commercial operation prior to the activity start date.
Just Transition (JT)	A framework of principles and practices aimed at ensuring that the transition to a low-carbon economy is fair, inclusive, and equitable for all stakeholders, particularly affected workers and communities, in accordance with the GS4GG Just Transition Requirements .
Just Transition (JT) Plan	A comprehensive document developed in consultation with stakeholders outlining the specific measures, timelines, responsibilities, and resources dedicated to achieving a Just Transition in the context of the activity.

Remaining Lifetime (RLT)	The duration (in years) for which the existing equipment can continue to operate before it needs to be replaced or discarded for technical reasons, such as age, safety reasons, or deteriorated performance. The RLT is expressed in years or hours of operation. The RLT shall be assessed in line with the latest version of A6.4-AMT-006: Determination of the technical lifetime of equipment .
Renewable Energy Plant (REP)	A grid-connected electricity generation facility which uses a renewable source of energy (electricity) with or without battery energy storage systems (BESS) e.g., on shore and/or offshore wind power, solar power, wave power, or tidal power. An REP may comprise one or more generating units operating at the same site

3| APPLICABILITY CRITERIA

3.1 | Project Activity Scope

3.1.1 | The methodology is applicable to an activity that involves the permanent and accelerated phase-out of an operational Coal-Fired Power Plant (CFPP), in conjunction with the integrated displacement by a new, grid-connected Renewable Energy Plant (REP), structured explicitly in accordance with the principles of a Just Transition.

3.2 | General Activity Requirements

3.2.1 | The activity shall involve the installation of a grid-connected greenfield REP that is implemented specifically to displace the generation of the baseline CFPP¹. Objective evidence shall be provided demonstrating the direct linkage between the decision to decommission the CFPP and the investment decision for the REP (e.g., integrated financial agreements, regulatory filings, or board resolutions linking the two actions).

3.2.2 | **Capacity Adequacy:** The activity shall demonstrate that the replacement configuration ensures equivalent energy generation and maintains capacity adequacy with grid stability. This requires:

- The expected annual net electricity generation of the REP configuration (including associated energy storage, if applicable) shall

¹ Demonstrating Causality (Example): A project activity is permitted if the utility Board Resolution explicitly links the closure of CFPP-X to the issuance of a Request for Proposals (RFP) for REP-Y capacity. A Project Activity is not permitted if the REP-Y investment decision was made independently (e.g., due to a generic government renewable energy auction) and the CFPP-X closure was subsequently added to the project with no justifiable and verifiable inter-dependency of the two events.

be equal to or greater than the historical annual generation of the CFPP (EG_{BAU}).

- b. A demonstration that the REP configuration contributes to *equivalent capacity adequacy*, ensuring the reliable supply of electricity previously served by the dispatchable capacity (MW) of the CFPP. This shall be demonstrated by one of the following:
 - i. Analysis that shows the REP configuration can reliably meet the demand profile previously served by the CFPP; OR
 - ii. A formal confirmation from the grid operator or relevant regulatory authority that the REP configuration is sufficient to replace the capacity and ancillary services previously provided by the CFPP without adversely impacting grid reliability.

3.2.3 | **Just Transition Compliance:** The activity developer shall comply with the latest version of the [GS4GG: Just Transition Requirements](#). A comprehensive Just Transition (JT) Plan shall be developed and implemented. The continued progress of the JT Plan implementation shall be monitored throughout the crediting period and shall continue until all planned activities are fully completed, even if this extends beyond the crediting period.

3.2.4 | **Prohibition of New Coal Investment:** The CFPP owner and all other entities formally defined as activity participants shall have no commitments to invest globally in new CFPP(s) or extend the capacity of existing CFPP(s) beyond plants that reached financial closure or final investment decisions prior to 31 December 2021.

3.2.5 | **Activity Developer Eligibility:** The activity participant(s) may comprise one or a combination of the CFPP asset owners, the REP developer(s), or a third party. If multiple entities are involved, details regarding the identity of all activity participants, project ownership, implementation arrangements, and ownership of issued carbon credits/statements shall be disclosed in the Project Design Document (PDD).

3.3 | Baseline Coal-Fired Power Plant (CFPP) Criteria

3.3.1 | The baseline CFPP shall meet the following criteria:

A. Operational Status:

3.3.2 | The CFPP shall be:

- a. Operated using coal as the primary fuel (other fossil fuels may be used only as secondary/support fuels).
- b. Connected to the electricity grid².

3.3.3 | Where the CFPP comprises multiple units generating power at the same site, this criterion shall apply to the units included in boundary.

² Captive or off-grid CFPPs are not eligible under the methodology.

B. Regulatory Surplus:

- 3.3.4 | The CFPP shall be free of any pre-existing legal mandate for early closure. The activity developer shall demonstrate that the CFPP operates in compliance with all existing applicable laws and regulations at the start of the activity. The activity developer shall monitor the applicable regulatory framework continuously and shall confirm at each verification event that no new legal mandate requiring the early closure of the CFPP has been enacted or enforced.

C. Lifetime and History:

- 3.3.5 | The CFPP shall have:
- A history of uninterrupted commercial operation of at least five consecutive years immediately prior to the activity start date³.
 - A remaining technical/operating lifetime of at least five years, determined according to [Section 7.4](#).
 - Availability of verifiable historical operational data required for the assessment of additionality and calculation of baseline emissions (See [Section 7](#)).

D. Permanent Phase-out Requirement:

- 3.3.6 | The CFPP shall be permanently phased out. This is defined as being dismantled, decommissioned, or rendered permanently inoperative with no scope of operational revival (including partial or full repurposing for any type of fossil fuel-fired power generation) in the future.

E. Final Phase-out Timelines:

- 3.3.7 | The CFPP phase-out (defined here as the physical decommissioning and dismantling) may be spread over a period of five years date of cessation of electricity generation and shall be completed by the following deadlines, considering the host country's development priorities:

Table 3. CFPP Phaseout Timeline

Host country category⁴	Phase-out completion deadline
All other countries (Non-LDC & Non-SIDS)	31/12/2035
Least Developed Economies (LDCs) & Small Island Developing States (SIDS)	31/12/2040

³ Historical operational data will be used to establish the required capacity of the REP (1:1 MWh replacement ratio).

⁴ The classification of a country as an LDC or SIDS shall be based on the official lists maintained by the United Nations Committee for Development Policy (CDP) and the United Nations Department of Economic and Social Affairs (UNDESA) respectively. "Developed & Emerging Economies" are defined as all remaining countries not listed as LDCs or SIDS.

3.4 | Renewable Energy Plant (REP) Criteria

3.4.1 | The REP shall meet the following criteria:

A. Technology eligibility:

3.4.2 | The REP shall utilize one or a combination of the following renewable energy technologies: Wind (on-shore/offshore), Solar (PV or CSP), Wave, or tidal power)⁵. Associated energy storage systems (e.g., BESS) may be included as part of the REP configuration.

3.4.3 | The REP shall be a newly constructed facility (Greenfield). Expansions or retrofits of existing renewable energy facilities are not eligible.

3.4.4 | The REP shall be located within the host country⁶ where the CFPP of the baseline existed and feed into the same grid system.

B. Capacity and Timing:

3.4.5 | **Implementation and Commissioning Timeline:** The following two core conditions shall be met within five years of the start of CFPP phase-out (i.e., cessation of electricity generation):

a. **Mandatory Completion:** Confirmation of the full equivalent matching capacity and all necessary commercial arrangements (e.g., PPAs, financing agreements) shall be secured, and the REP shall be fully implemented and made fully operational.

b. **Extension Exception:** A verifiable justification by the activity developer is required if the implementation period for the REP shall be extended beyond five years due to force majeure or demonstrable administrative delays beyond the control of the activity developer.

3.4.6 | **Consequence of Non-Compliance:** Failure to meet the Mandatory Completion requirement by the deadline, or the extended deadline approved by the Gold Standard Secretariat, shall result in the immediate suspension of all further carbon credit issuance for the activity.

C. Excluded Technologies:

3.4.7 | The REP shall not be:

a. Captive or off-grid.

⁵ Other types of renewable energy sources unless listed under excluded technologies may be considered eligible for this methodology, with prior approval.

⁶ A cross-country arrangement, where the CFPP and REP are in different countries but on the same grid system, may be allowed only with prior written approval from the Gold Standard Secretariat, contingent upon the submission of a legally binding agreement between the governments of the involved countries or the entities formally authorized by them detailing, including but not limited to, the mutual recognition of the mitigation activity, allocation of mitigation benefits (emission reductions, associated revenues, or other financial or non-financial consideration), and clear commercial arrangements for the displaced electricity..

- b. Hydro power, biomass-fired power, waste-to-energy (WtE) or an activity generating energy from agriculture residues.

3.5 | Credit Issuance Eligibility:

- 3.5.1 | The activity shall become eligible for the issuance of carbon credits only when the REP starts supplying at least 50% of the baseline annual electricity generation (MWh) provided by the CFPP prior to its phase-out (on an annual average basis).

3.6 | Energy Attribute Certificates (EACs) Management

- 3.6.1 | In cases where Energy Attribute Certificates (EACs) such as Renewable Energy Certificates (RECs) are automatically issued by (sub)national governments for energy generated by the REP(s), the activity developer may only claim GS-VERs if the following measures are taken to prevent double counting (e.g., ensure the same MWh isn't claimed for both RECs and GS-VERs):
 - a. **Disclosure:** The developer shall disclose and detail the relevant regulations and/or compliance schemes, the quantity of EACs that will be issued, and the process of converting the EACs to GS-VERs in the PDD. The process of converting the EACs to GS-VERs.
 - b. **Proof of No Double Counting:** The developer shall provide verifiable evidence, such as the cancellation of RECs upon issuance, to ensure that the same MWh of electricity generation is not claimed for both EACs and GS-VERs.

3.7 | Mandatory Compliance and Safeguards

- 3.7.1 | The Project Activity shall adhere to the following principles and requirements:
 - a. **Gold Standard Requirements:** The activity shall adhere to the [Principles & Requirements](#), [Safeguarding Principles & Requirements](#), the [Renewable Energy Activity Requirements](#), and the [Just Transition Requirements](#).
 - b. **Contractual Obligation:** The activity developer shall, by means of direct ownership, contractual agreement, or other such arrangement between the activity developer and the relevant project and non-project participants, establish access to all required monitoring data and supporting documentation set forth in this methodology and related GS4GG requirements e.g., [Principles & Requirements](#), [GHG Emissions Reduction & Sequestration Product Requirements](#), and the [Renewable Energy Activity Requirements](#).
 - c. **Double Counting Mitigation:** To mitigate the risk of double issuance and claims, the activity developer shall conform with the requirements and apply the procedures set forth in the [GHG Emissions Reduction & Sequestration Product Requirements](#).

d. Health, Safety, and Pollution:

- i. Activities shall comply with health and safety requirements at both the organization level in line with Principle 3 of the [Safeguarding Principles & Requirements](#).
- ii. A risk assessment shall be conducted for all hazardous and potentially hazardous materials that are used for the activity (e.g., solvents and sorbents).
- iii. It shall be demonstrated that any pollutants (solids, liquids and gases) associated with the activity are addressed in line with Principle 9.4 of the [Safeguarding Principles & Requirements](#).

4| SOURCES AND REFERENCES

4.1.1 | The following standards, tools, and guidelines are normative references for the application of this methodology. Activity developers shall apply the latest valid version of these documents available at the time of validation.

a. GS4GG Methodology/ TOOL/ Resources

- i. [GS4GG: Just Transition Requirements](#)
- ii. [Methodological Tool 01: Project or Leakage Emissions from Fossil Fuel Combustion](#);
- iii. [Methodological Tool 02: Project or Leakage Emissions from Transportation](#);
- iv. [Methodology Tool 05: Downward Adjustment Factor Determination](#);

b. Article 6.4 Mechanism and CDM Tools/Standards: References to CDM tools are valid until equivalent tools are published under Article 6.4 Mechanism (A6.4). Upon publication of an A6.4 tool, it shall supersede the corresponding CDM tool.

- i. [A6.4-AMT-002: Investment analysis](#);
- ii. [A6.4-amt-006-Determination of the technical lifetime of equipment](#);
- iii. [A6.4-AMT-007: Emissions from electricity generation and consumption](#);
- iv. Clean Development Mechanism (CDM) Tool 09: [Determining the baseline efficiency of thermal or electric energy generation systems](#)

c. Other References:

- i. [2006 IPCC Guidelines for National Greenhouse Gas Inventories, Table 1.4, Chapter 1, Volume 2 \(Energy\)](#)
- ii. 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
- iii. ISO 14040: Environmental management — Life cycle assessment — Principles and framework

- iv. ISO 14044: Environmental management — Life cycle assessment — Requirements and guidelines

5| ACTIVITY BOUNDARY AND GHGS SOURCES/SINKS

5.1 | Activity scope

- 5.1.1 | This methodology applies to activities that achieve greenhouse gas (GHG) emission reductions through an integrated approach to energy transition. The scope of the activity encompasses the following interconnected components: ⁷
 - a. Accelerated Phase-out of Coal: The early and permanent decommissioning of an existing, grid-connected CFPP.
 - b. Renewable Energy Deployment: The installation and operation of a new (greenfield) grid-connected REP to replace the CFPP generation and capacity (may include storage).
 - c. Just Transition Implementation: Execution of a GS4GG-compliant Just Transition Plan to address the socio-economic impacts of the CFPP closure.
- 5.1.2 | The mitigation result is the net GHG reduction achieved by the REP electricity displacing power that would have been generated by the CFPP in the baseline scenario and the grid, after accounting for activity emissions and leakage.

5.2 | Activity boundary

- 5.2.1 | The activity boundary encompasses all anthropogenic emissions by sources of GHGs that are under the control of the activity developer, are related to the activity, or are significantly affected by the activity.

A. Physical and Geographical Boundary

- 5.2.2 | The spatial extent of the activity boundary includes the physical infrastructure and sites directly involved in the activity, as well as the upstream processes and market boundaries relevant for assessing the activity's baseline, activity and leakage emissions.

⁷ The target application of the methodology is for early phase-out of CFPPs. However, a similar approach may be applied to other use cases. Hence, this methodology will be reviewed before January 1st, 2028, to assess the potential for scope expansion to include other fossil fuels for power generation and other use cases beyond power generation. In the meantime, an activity developer intending to retire other types of TPPs may apply for revision in the methodology.

Table 4: Delineation of the Physical and Geographical Boundary

Component	Included?	Description/Justification
Physical Infrastructure and Sites		
CFPP Site	Yes	The physical site of the CFPP. Emissions related to operation (baseline emissions) and on-site decommissioning activities (activity emissions) occur within this boundary.
REP Site(s)	Yes	The physical site(s) of the REP and associated infrastructure (e.g., BESS). Emissions related to installation & maintenance (activity emissions) and operation occur within this boundary.
Electricity Grid	Yes	The electricity transmission and distribution system connecting the CFPP and the REP. Relevant for determining the grid emission factor used in calculation of baseline emissions and leakage emissions (supply demand gap).
Processes and Activities		
CFPP Operation (Baseline)	Yes	The continued operation of the CFPP in the absence of project activity.
CFPP Decommissioning and Disposal	Yes	Activities related to the dismantling of the CFPP and the transport/disposal of materials.
REP Manufacturing (Upstream)	Yes	The extraction of raw materials and manufacturing processes (cradle-to-gate) for the REP infrastructure. Included for calculating embodied emissions.
REP Installation and O&M	Yes	Construction, installation, operation, and maintenance activities of the REP, including associated transport.
Market Boundaries (for Leakage Assessment)		
Coal Market	Yes	The domestic and international markets for the coal previously consumed by the CFPP. The applicable market boundary shall be determined based on the source of the coal (domestic or imported), the specific quality/grade, transportation infrastructure, and market dynamics (tradability and substitutability). Included for the assessment of market leakage.

5.3 | GHG Sources

5.3.1 | The following tables identify the relevant GHG sources for the baseline scenario, the activity scenario, and leakage, specifying whether they are included in the quantification of emission reductions.

A. Materiality Thresholds for Inclusion:

5.3.2 | **Baseline Emissions (CH₄/N₂O):** CH₄ and N₂O from the CFPP operation (Component A) may be excluded only if their combined contribution is demonstrated to be less than 1% of the total Component A baseline emissions (in tCO₂e).

5.3.3 | **Activity Emissions:** Embodied emissions ($AE_{em,y}$) and emissions from land use change ($AE_{LUC,y}$) shall always be included. For other activity emission sources, individual sources representing <2% of the total estimated activity emissions may be omitted, provided that the sum of all omitted sources does not exceed 5% of the total activity emissions.

B. Baseline Emissions (BE_y)

5.3.4 | The following table details the GHGs included in, or excluded from, the baseline scenario(s):

Table 5: Sources of Baseline Emissions

Source	Description	Gas	Included?	Justification / Conditions
Component A: CFPP Operation				
Fuel Combustion (Coal and secondary fuels)	Emissions in combustion of fuels at the CFPP for electricity generation, including main boilers and auxiliary systems.	CO ₂	Yes	Major source of baseline emissions.
		CH ₄	Conditional	Included if found material (≥1% combined for CH ₄ and N ₂ O).
		N ₂ O	Conditional	Included if found material (≥1% combined for CH ₄ and N ₂ O).
Fugitive Emissions	Fugitive emissions from coal handling and storage at the CFPP site.	CH ₄	Conditional	Included if found material. Fugitive methane emissions from coal handling and storage.
	Emissions in electricity generation by other	CO ₂	Yes	Major source of emissions.

Grid Electricity Generation	grid-connected power plants that would have occurred in the absence of the REP generation (beyond Component A).	CH ₄	Yes	Calculated using the grid emission factor (EF_{Grid}).
		N ₂ O	Yes	

C. Activity emissions (AE_y)

5.3.5 | The following table details the GHGs included in, or excluded from the activity scenario(s):

Table 6: Sources of Activity Emissions

Source	Description	Gas	Included?	Justification / Conditions
Process Operations ($AE_{op,y}$)				
Electricity Consumption	Emissions in generation of Grid electricity consumed during CFPP decommissioning, REP installation, and specific maintenance activities.	CO ₂	Yes	Included if found material (2%/5% rule).
		CH ₄		
		N ₂ O		
Fuel Combustion	Emissions in combustion of fossil fuels consumed in on-site electricity generation, by machinery, vehicles, and on-site power generation (e.g., backup generators) during CFPP decommissioning, REP installation, and O&M.	CO ₂	Yes	Included if found material (2%/5% rule).
		CH ₄		
		N ₂ O		
Transport Activities ($AE_{tr,y}$)				
Electricity Consumption and Fuel Combustion	Emissions in combustion of fuel and electricity consumption used for the transportation of decommissioned CFPP materials and REP infrastructure.	CO ₂	Yes	Included if found material (2%/5% rule).
		CH ₄		
		N ₂ O		
Embodied Emissions ($AE_{em,y}$)				
REP Manufacturing	Cradle-to-gate emissions from the manufacturing of REP components (e.g., turbines, PV panels, BESS).	Various GHGs (CO ₂ e)	Yes	Major source of lifecycle emissions. These shall be amortized

					over the 1 st crediting period.
Other Emissions ($AE_{other,y}$)					
Fugitive Emissions	Leakage of GHGs from equipment (e.g., SF6 from switchgear).	SF ₆ , HFCs	Yes	Included if found material (2%/5% rule).	
Waste Disposal	Emissions due to associated with the disposal of non-recyclable CFPP materials, waste generated during REP operation, and emissions from recycling processes.	CH ₄ , CO ₂	Yes	Included if found material (2%/5% rule).	

D. Leakage emissions

5.3.6 | The following table details the GHG emissions included in, or excluded from, the leakage scenario:

Table 7: Sources of Leakage Emissions

Source	Description	Gas	Included?	Justification / Conditions
Physical Displacement ($LE_{physical,y}$)				
Reuse of CFPP Equipment	Emissions due to relocation and reuse of the CFPP infrastructure for power generation outside the boundary.	CO ₂ , CH ₄ , N ₂ O	No	Deemed zero due to applicability criteria (Section 2) mandating permanent decommissioning and dismantling.
Supply-Demand Gap ($LE_{gap,y}$)				
Compensatory Grid Generation	Emissions in electricity generation by the grid to compensate for the generation gap during the transition phase (when $EG_{REP,y} < EG_{BAU}$).	CO ₂ , CH ₄ , N ₂ O	Yes	Ensures accounting for emissions during the transition phase.
Market Leakage ($LE_{market,y}$)				
Displacement of Coal	Emissions in consumption of the displaced coal (by	CO ₂ , CH ₄ , N ₂ O	Yes	Major source of emissions.

	other users (domestically or internationally) displaced from the baseline CFPP.			
Land Use Change (LUC)	Changes in biomass and soil carbon stocks due to land clearing for the REP installation and significant changes at the decommissioned CFPP site (e.g., degradation of previously maintained green belts)	CO ₂	Yes	Major source of emissions. These shall be amortized over the crediting period.

6 | DEMONSTRATION OF ADDITIONALITY

6.1 | Requirements

- 6.1.1 | The activity developer shall demonstrate that the activity—comprising the early decommissioning of the CFPP, the installation and operation of the REP, and the implementation of the JT plan—would not have occurred in the absence of the incentives provided by the carbon revenues.
- 6.1.2 | The demonstration of additionality shall be conducted in accordance with the [GS4GG Requirements for Additionality Demonstration](#). As this methodology is primarily intended for large-scale activities, the use of Investment Analysis ([Section 6.4](#)) is mandatory.
- 6.1.3 | The assessment shall robustly establish that:
 - a. The baseline scenario (continued operation of the CFPP, as identified in [Section 7.3](#)) is the most plausible and economically attractive scenario; and
 - b. The proposed activity is economically less attractive than the baseline scenario without the revenues from carbon credits.
- 6.1.4 | The additionality assessment shall follow the stepwise approach detailed below:
 - Step 1: Regulatory Analysis ([Section 6.2](#))
 - Step 2: Avoidance of Lock-in Risk Analysis ([Section 6.3](#))
 - Step 3: Investment Analysis ([Section 6.4](#))
 - Step 4: Common Practice Analysis ([Section 6.5](#))

6.2 | Regulatory analysis

6.2.1 | The activity developer shall demonstrate that the emission reductions achieved by the activity are regulatory surplus, meaning they are not required by any existing laws, regulations, or mandates (legal requirements) within the host Party's jurisdiction at the time of the activity start date. The activity developer shall monitor compliance with this requirement throughout the crediting period.

A. Host Country Eligibility:

6.2.2 | The activity type shall not be excluded or declared ineligible by the host country (e.g., via a negative list of activities, technologies, or measures for the issuance of carbon credits).

B. Legal Mandates:

6.2.3 | It shall be demonstrated that neither the early phase-out of the CFPP, nor the REP replacement is not mandated by any existing legal requirement. The activity developer shall provide verifiable evidence demonstrating that:

- a. There is no legal obligation to cease the operation of the CFPP prior to the end of its Remaining Lifetime.
- b. The CFPP is compliant with all existing environmental and operational regulations, or there is a technically and economically viable plan to achieve compliance without necessitating the closure of the plant.

6.2.4 | The activity developer shall confirm at each verification that no new legal mandates requiring the early closure of the CFPP or REP replacement have been enacted. If such a mandate is enacted, the crediting of baseline emissions from the CFPP (Component A) shall cease from the effective date of the mandate.

6.3 | Lock In Risk Analysis

6.3.1 | The activity developer shall assess the risk that the activity may lead to a lock-in of the level of GHG emissions, technologies, or practices that may not be consistent with the achievement of the host Party's NDC or the long-term goals of the Paris Agreement.

6.3.2 | The activity involves the replacement of a high-emission, carbon-intensive technology (i.e., CFPP) with zero-emission technologies (i.e., REP). The baseline scenario represents the lock-in of high emissions for the duration of the CFPP's remaining lifetime. The project activity directly avoids this carbon lock-in by accelerating the transition to renewable energy.

6.3.3 | Therefore, the activity inherently avoids the risk of locking in high levels of GHG emissions. A specific lock-in risk analysis is not required for activities applying this methodology, provided the REP technologies utilized are aligned with the host country's NDC and LT-LEDS.

6.4 | Investment analysis

- 6.4.1 | The activity developer shall conduct an investment analysis in accordance with the latest version of [A6.4-AMT-002: Investment analysis](#) to demonstrate that the implementation of the proposed activity is economically less attractive compared to the baseline scenario without the revenues from carbon credits.

Step 1 - Selection of Financial Indicator and Analysis Method

- 6.4.2 | The analysis shall use standard financial indicators e.g., Net Present Value (NPV) or the Internal Rate of Return (IRR), and follow the specific guidance provided in [A6.4-AMT-002](#) for the calculation of these indicators, including requirements for the identification of the most appropriate benchmark (hurdle rate). The chosen indicator and the methodology for its calculation (including the discount rate/hurdle rate) shall be clearly documented and justified in the PDD, using recognized financial principles. The analysis shall be conducted using an Investment Comparison Analysis, as the activity and baseline scenarios are mutually exclusive. The analysis shall be conducted in nominal or real terms and where conversion is required, inflation shall be applied in accordance with A6.4-AMT-002

Step 2 - Assessment of the Baseline Scenario (Continued CFPP Operation)

- 6.4.3 | To validate the baseline scenario identified in Section 7.3, it shall be demonstrated that the continued operation of the CFPP is financially sustainable and commercially competitive on a standalone basis. This assessment shall include:
- a. **Historical Profitability:** Evidence that the CFPP has generated positive net income historically (e.g., audited financial statements for the historical reference period defined in Section 7.4.1).
 - b. **Future Cash Flow Analysis ($NPV_{baseline}$):** A forward-looking projection of the Net Present Value of the future operations of the CFPP ($NPV_{baseline}$) covering the duration of the first crediting period or the RLT, whichever is shorter. The analysis shall use realistic and verifiable assumptions for:
 - i. Electricity prices (based on existing Power Purchase Agreements (PPAs), regulated tariffs or conservative market forecasts).
 - ii. Fuel costs (based on supply agreements or market forecasts).
 - iii. Operational expenditures (OPEX), including any required Capital Expenditures (CAPEX) for maintenance, compliance retrofits, or refurbishment.

It shall be demonstrated that $NPV_{baseline}$ is positive.

- c. **LCOE Competitiveness (if applicable):** If the CFPP operates in a merchant market, a Levelized Cost of Electricity (LCOE) analysis demonstrating that the CFPP's LCOE is competitive relative to the forecasted wholesale market price in the region, ensuring its continued dispatch.

Step 3 -Assessment of the Activity Scenario (CFPP Phase-out, REP, and JT)

- 6.4.4 | The financial indicator (e.g., $NPV_{activity}$) shall be calculated for the activity scenario, excluding any revenues from the sale of carbon credits. The analysis shall use realistic, documented, and conservative assumptions for all relevant costs and revenues of the integrated activity:
 - a. Capital Costs (CAPEX):
 - i. Decommissioning costs of the CFPP (dismantling, site remediation).
 - ii. Investment costs for the REP infrastructure (including BESS, grid connection upgrades, if applicable).
 - iii. Contractual penalties associated with the early termination of existing PPAs or fuel supply agreements for the CFPP.
 - b. Just Transition (JT) Costs:
 - i. All costs associated with the implementation of the comprehensive JT plan (e.g., severance packages, retraining programs, social support, community redevelopment initiatives) that are financially covered by the activity developer shall be included as CAPEX or OPEX, as appropriate.
 - c. Operational Costs (OPEX):
 - i. Operational and maintenance costs of the REP.
 - d. Revenues:
 - i. Projected revenues from the sale of electricity generated by the REP (based on new PPAs, regulated tariffs or conservative market forecasts).
 - e. Salvage Value:
 - i. Potential salvage value of the decommissioned CFPP assets.

Step 4- Comparative Analysis and Demonstration of Unattractiveness

- 6.4.5 | Demonstrate that the activity scenario without carbon revenues is economically less favorable than the baseline scenario.
 - a. Comparison with Baseline:
 - i. If using NPV: $NPV_{activity} < NPV_{baseline}$.
 - ii. If using IRR: $IRR_{activity} < IRR_{baseline}$.
 - b. Comparison with Benchmark (if using IRR):

- i. It shall also be demonstrated that $IRR_{activity} < \text{Benchmark Hurdle Rate}$. The hurdle rate shall represent the standard return required for investments of similar risk in the power sector and region, supported by verifiable evidence (e.g., regulatory determinations of the Weighted Average Cost of Capital (WACC), central bank data, or reputable local financial institution benchmarks).
- 6.4.6 | It shall then be demonstrated that the inclusion of carbon revenues improves the financial viability of the activity, enabling the investment decision. A conservative assumption for the carbon price shall be used in this demonstration.

Step 5- Sensitivity Analysis

- 6.4.7 | A sensitivity analysis shall be performed to assess the robustness of the conclusion of financial additionality, strictly adhering to the procedures for sensitivity analysis outlined in A6.4-AMT-002. The analysis shall examine the impact of reasonable variations (e.g., +/- 10%, or a more appropriate range if justified) in key parameters, including:
- a. Electricity prices (Baseline and Activity scenarios).
 - b. Fuel costs (Baseline scenario).
 - c. CAPEX of the REP.
 - d. Decommissioning and Just Transition costs.
 - e. Discount rate/Hurdle rate.
- 6.4.8 | It shall be demonstrated that the conclusion (that the activity is not financially attractive without carbon revenues) holds true even under favorable variations of these parameters for the activity scenario.

6.5 | Common practice analysis

- 6.5.1 | The activity developer shall conduct a common practice analysis in accordance with the latest version of the *GS4GG Methodological Tool: Common Practice Analysis (GS4GG PAA MT400-06)*.
- 6.5.2 | **Technology Classification and Exemptions:** This methodology formally pre-classifies the integrated activity (early CFPP phase-out, paired greenfield REP replacement, and Just Transition Plan implementation) as a Technology Maturity Category 1 (TMC-1: Innovator/Nascent). Due to the nascent nature of this transition mechanism globally, the following exemptions apply:
- 6.5.2.1 | **First-of-its-Kind Exemption:** The first three (3) project activities globally to successfully apply this methodology and submit for validation are deemed to have satisfied the common practice requirement and are exempt from further analysis under this section.
 - 6.5.2.2 | **Deemed Additionality for Small/Micro Scale:** In accordance with Section 5.4 of the Tool, activities meeting the GS4GG definition of Small-Scale (e.g., ≤ 15 MW installed capacity) or Micro-Scale are deemed additional. These activities are exempt from common practice analyses.

6.5.3 | **Stepwise Market Penetration Analysis:** For large-scale activities not exempted under Section 6.5.1, the developer shall determine the Common Practice Factor (F) using the stepwise approach defined in Section 6 of the Tool, applying the following mandatory parameters:

- a. **Assessment Approach & Indicator (P):** A Stock-Based Approach using a capacity-based metric (Installed MW).
- b. **Applicable Geographical Area (AGA):** The Host Country.
- c. **Target Market Size (P_{all}):** The total cumulative installed capacity (MW) of all operational, grid-connected CFPPs within the AGA.
- d. **Similar Activities (P_{sim}):** The total cumulative capacity (MW) of activities within the AGA meeting all criteria in the Attribute Matrix below. (Note: Activities supported by carbon finance or dedicated international climate ODA shall be excluded).

Table 8: Attribute Matrix for Similar Activities

Attribute	Description of Objective Technical Characteristics	Required
1. CFPP Phase-out	Permanent decommissioning and physical dismantling of a grid-connected CFPP prior to the end of its remaining technical lifetime.	Yes
2. Replacement	Integrated replacement of the decommissioned CFPP capacity with a newly constructed (greenfield) Renewable Energy Plant (REP).	Yes
3. Just Transition	Execution and full funding of a formalized Just Transition (JT) Plan for affected workers and communities.	Yes
4. Scale / Economics	Specific MW capacity size, investment cost, or socioeconomic target segment.	No

6.5.4 | **Calculation and Threshold (F_{max}):**

6.5.4.1 | The developer shall calculate the market penetration ratio using the formula:

$$F = \frac{P_{sim}}{P_{all}}$$

6.5.4.2 | Based on the TMC-1 classification and the Stock-Based Approach, the following fixed Common Practice Thresholds (F_{max}) apply (per Table 3 of the Tool):

- $F_{max} = 5.0\%$ for Least Developed Countries (LDCs) and Small Island Developing States (SIDS).
- $F_{max} = 2.5\%$ for all Other Countries.

6.5.5 | If $F < F_{max}$, the proposed activity is considered "not common practice." All data sources and calculations shall be transparently documented in the PDD.

6.6 | Ongoing Financial Needs Assessment:

- 6.6.1 | At the time of crediting period renewal, the activity developer shall conduct an Ongoing Financial Need assessment to demonstrate continued compliance with:
 - a. Regulatory surplus (mandatory), AND
 - b. Investment analysis.
- 6.6.2 | The OFN assessment shall consider the prevailing technological costs, market conditions, policy context, and the remaining financial commitments related to the Just Transition plan at the time of renewal.

7 | BASELINE SCENARIO

7.1 | Selection of baseline approaches

- 7.1.1 | In accordance with the GS4GG methodological standard "Requirements for Methodology Development", the baseline scenario shall be determined using one or more of the following approaches:
 - a. Best available technologies that represent an economically feasible and environmentally sound course of action, where appropriate.
 - b. 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.
 - c. An approach based on existing actual or historical emissions, adjusted downwards (for example, using a baseline contraction factor).
- 7.1.2 | This methodology utilizes approach (c), based on existing actual or historical emissions, adjusted downwards. It integrates elements of approach (b) by applying an ambitious performance benchmark.
- 7.1.3 | The baseline scenario accounts for two components of electricity generation displaced by the Renewable Energy Plant (REP). The application of the selected approach is detailed below:

Table 9: Baseline Approach

Component	Baseline Approach Application
Component A: Displacement of the Coal-Fired Power Plant (CFPP) generation (during the CFPP's remaining lifetime).	(c) Existing actual or historical emissions, adjusted downwards via (b) an ambitious performance benchmark and the DAF.
Component B: Displacement of the grid generation (for generation exceeding the CFPP historical annual generation during	(c) Existing actual or historical emissions (Grid Emission Factor), adjusted

its lifetime, or all generation after the CFPP lifetime).

downwards via the Downward adjustment Factor (DAF).

7.2 | Justification for the Baseline approach

7.2.1 | The selection of approach (c) "Existing actual or historical emissions, adjusted downwards," integrated with approach (b), is justified as the most appropriate for this methodology for the following reasons:

A. Appropriateness to Activity Context (Approach c):

7.2.2 | The core of the activity is the early retirement of an existing, operational CFPP. The emissions associated with the continued operation of a specific CFPP are highly dependent on site-specific factors, including the plant's technology vintage, fuel source characteristics, maintenance history, and historical capacity utilization. Historical operational data provides the most accurate and verifiable basis for estimating the emissions that would occur in the counterfactual scenario (continued operation). A generalized BAT approach (a) would not accurately reflect the specific conditions of the asset being retired.

B. Ensuring Conservativeness and Ambition (Integration of Approach b):

7.2.3 | To ensure conservativeness, the historical efficiency of the CFPP is adjusted upward to meet an ambitious performance benchmark. This aligns with the principles of approach (b) by ensuring the baseline reflects the performance of the best comparable activities prevents the rewarding of historical inefficiency.

C. Encouraging Ambition Over Time (Approach c):

7.2.4 | To align with the principles of the Paris Agreement, the baseline is dynamically adjusted downwards over time using the Downward Adjustment Factor (DAF), consistent with the host country's long-term climate strategies (e.g., Net-Zero targets).

7.3 | Identification of the baseline scenario

7.3.1 | The baseline scenario represents the most likely scenario that would occur in the absence of the activity. The activity developer shall determine the baseline scenario using the following stepwise approach:

Step 1 – Identification of the baseline geographical reference area

7.3.2 | The baseline geographical reference area is the host country by default.

7.3.3 | The activity developer may limit the reference area to a narrower specific geographical area (e.g., subnational region, electricity grid boundary) if it can be demonstrated that significant differences in regulatory frameworks, fuel availability, or electricity market dynamics exist between the specified area and the remainder of the host country, and that these differences

materially impact the identification of plausible alternatives. Where the CFPP supplies an interconnected electricity system with cross-border dispatch, the reference area shall be defined with the relevant electricity system boundary used for the GEF

Step 2 – Identification of plausible alternative scenarios

- 7.3.4 | The activity developer shall identify all realistic and credible alternative scenarios available within the baseline geographical reference area concerning the fate of the existing CFPP and the provision of equivalent electricity services. This includes, but is not limited to:
- **A.1:** The continuation of the operation of the existing CFPP until the end of its remaining lifetime (Business-as-Usual).
 - **A.2:** The early closure of the CFPP and replacement with the proposed REP (the project activity implemented without carbon finance).
 - **A.3:** The early closure of the CFPP and replacement with alternative low-carbon generation technologies available in the region.
 - **A.4:** The early closure of the CFPP and replacement with other fossil fuel generation technologies (e.g., Natural Gas Combined Cycle).
 - **A.5:** The lifetime extension or significant refurbishment of the existing CFPP.

Step 3 – Assessment of compliance with legal and regulatory requirements

- 7.3.5 | The activity developer shall assess whether the alternative scenarios identified in Step 2 are in compliance with all applicable legal and regulatory requirements in the baseline geographical reference area. Scenarios that do not comply with existing mandates shall be excluded from further consideration, unless it is demonstrated that such regulations are systematically not enforced. This assessment shall be consistent with the Regulatory Analysis conducted in Section 6.2.

Step 4 – Assessment of financial viability and barriers

- 7.3.6 | The activity developer shall assess the financial viability of the remaining scenarios and the barriers they face, utilizing the analysis conducted under the Demonstration of Additionality (Section 6).
- a. **Technical Viability and Barriers:** Scenarios involving the continued operation or life extension of the CFPP (A1, A5) shall be technically viable, as determined by the Remaining Lifetime (RLT) assessment (Section 7.4.4). Scenarios facing insurmountable technical, regulatory, or institutional barriers shall be excluded.
 - b. **Financial Attractiveness:** Based on the Investment Analysis (Section 6.4), the financial attractiveness of the alternatives shall be compared. The project activity without carbon revenues (A2) and other alternatives (A3-A5) are excluded as the baseline if they are demonstrated to be financially less attractive than A1.

Step 5 - Identification of the representative baseline scenario

- 7.3.7 | The representative baseline scenario is the alternative scenario that remains after the assessments in Steps 3 and 4, and which represents the most economically attractive and technically viable course of action. This methodology is only applicable if the continuation of the operation of the existing CFPP (A1) is identified as the representative baseline scenario.
- 7.3.8 | Provided the applicability criteria are met and the additionality demonstration (Section 6) confirms that early closure and replacement (A2, A3) are not viable without carbon revenues, the activity developer shall select the continuation of the operation of the existing CFPP (A1) as the representative baseline scenario.

7.4 | Calculation of the Baseline Emissions Prior to Downward Adjustment ($BE_{Unadj,y}$)

- 7.4.1 | This section details the procedures for calculating the unadjusted baseline emissions ($BE_{Unadj,y}$), incorporating the historical parameters. Parameters determined in this section shall be fixed ex-ante for the duration of the crediting period.

A. Determination of Historical Parameters

- 7.4.2 | Historical parameters shall be determined based on the average of the most recent five consecutive years of uninterrupted commercial operation prior to the activity start date (the historical reference period).
- 7.4.3 | **Historical Electricity Generation (EG_{BAU}):** EG_{BAU} is the average annual net electricity supplied to the grid by the CFPP during the historical reference period (MWh/year).
- 7.4.4 | **Historical Fuel Consumption and Emission Factor of the Fuel Mix ($EF_{fuelmix}$):** The emission factor of the fuel mix ($EF_{fuelmix}$) (tCO₂/GJ) shall be calculated as a weighted average of the fuels consumed during the historical reference period:

$$EF_{fuelmix} = \frac{(\sum_i (FC_{BAU,i} \times NCV_i \times EF_{CO2i}))}{(\sum_i (FC_{BAU,i} \times NCV_i))} \quad (\text{eq. 1})$$

Where:

$EF_{fuelmix}$ = Weighted average CO₂ emission factor of the fuel mix (tCO₂/GJ). Fixed ex-ante.

$FC_{BAU,i}$ = Average annual quantity of fuel type i consumed during the historical reference period (mass or volume unit). Fixed ex-ante.

NCV_i = Net calorific value of fuel type i (GJ/mass or volume unit)

EF_{CO2i} = CO₂ emission factor of fuel type i (tCO₂/GJ).

7.4.5 | **Historical Efficiency and Heat Rate (η_{BAU} , HR_{BAU})**

7.4.5.1 | The historical net efficiency (η_{BAU}) shall be determined using the latest version of *CDM Tool 09* (or equivalent PACM tool), applying "Option E".

$$\eta_{BAU} = \frac{(EG_{BAU} \times 3.6)}{(\sum_i (FC_{BAU,i} \times NCV_i))} \quad (\text{eq. 2})$$

7.4.5.2 | The corresponding historical Heat Rate (HR_{BAU}) (GJ/MWh) is calculated as:

$$HR_{BAU} = 3.6 / \eta_{BAU} \quad (\text{eq. 3})$$

B. Application of the Ambitious Performance Benchmark

7.4.6 | The historical efficiency shall be adjusted upward to an ambitious benchmark.

Step 1: Determination of the Efficiency Benchmark (η_{bench})

7.4.7 | An ambitious efficiency benchmark (η_{bench}) shall be established specific to the technology type, capacity range, fuel quality, and vintage of the CFPP.

Step 2: Determination of the Baseline Efficiency (η_{BL}) and Heat Rate (HR_{BL})

7.4.8 | The Baseline Efficiency (η_{BL}) shall be the higher value between the historical efficiency and the benchmark.

$$\eta_{BL} = \text{MAX}(\eta_{BAU}, \eta_{bench}) \quad (\text{eq. 4})$$

7.4.9 | The corresponding Baseline Heat Rate (HR_{BL}) (GJ/MWh) is calculated as:

$$HR_{BL} = 3.6 / \eta_{BL} \quad (\text{eq. 5})$$

Step 3: Determination of the Baseline Emission Factor (EF_{BL})

7.4.10 | The Baseline Emission Factor (EF_{BL}) (tCO₂e/MWh) used for Component A is calculated using the adjusted Baseline Heat Rate (HR_{BL}) and the fixed $EF_{fuelmix}$. The EF_{BL} is fixed ex-ante.

$$EF_{BL} = HR_{BL} \times EF_{fuelmix} \quad (\text{eq. 6})$$

C. Determination of the Grid Emission Factor (EF_{grid})

7.4.11 | The grid emission factor for Component B shall be the emission factor (EF_{grid}), calculated in accordance with the latest version of [A6.4-AMT-007](#). EF_{grid} shall be determined ex-ante for the duration of the crediting period or updated annually as specified for the option selected to determine the emission factor as per tool.

D. Calculation of Unadjusted Baseline Emissions ($BE_{Unadj,y}$)

7.4.12 | The Remaining Lifetime (RLT) of the CFPP shall be determined ex-ante using the latest version of [A6.4-AMT-006](#).

7.4.13 | The unadjusted baseline emissions ($BE_{Unadj,y}$) are the sum of Component A and Component B emissions.

$$BE_{Unadj,y} = BE_{A,y} + BE_{B,y} \quad (\text{eq. 7})$$

a. Component A Emissions ($BE_{A,y}$) Applies only for the remaining lifetime ($y \leq \text{RLT}$).

i. If $y \leq \text{RLT}$:

$$BE_{A,y} = \text{MIN}(EG_{REP,y}, EG_{BAU}) \times EF_{BL} \quad (\text{eq. 8})$$

ii. If $y > \text{RLT}$:

$$BE_{A,y} = 0 \quad (\text{eq. 9})$$

b. Component B Emissions ($BE_{B,y}$)

Step 1: Determine the relevant electricity generation ($EG_{B,y}$)

i. If $y \leq \text{RLT}$:

$$EG_{B,y} = \text{MAX}(0, EG_{REP,y} - EG_{BAU}) \quad (\text{eq. 10})$$

ii. If $y > \text{RLT}$:

$$EG_{B,y} = EG_{REP,y} \quad (\text{eq. 11})$$

Step 2: Calculate Component B Baseline Emissions

$$BE_{B,y} = EG_{B,y} \times EF_{grid} \quad (\text{eq. 12})$$

Where:

$EG_{REP,y}$ = Net electricity delivered by the REP in monitoring period y (MWh).

RLT = Remaining Lifetime of the CFPP (years). Fixed ex-ante.

7.5 | Application of downward adjustment

7.5.1 | The baseline emissions shall be adjusted downward to ensure conservativeness and encourage ambition over time.

Step 1 – Uncertainty accounting

7.5.2 | Uncertainty is addressed through the application of conservative principles:

a. **Conservativeness in Parameter Determination:** Key parameters are determined using conservative approaches mandated by this

methodology and the referenced tools. This includes the use of conservative options and default factors within referenced tools (e.g., A6.4 Tools, CDM Tool 09, IPCC defaults as specified in Section 14.1).

- b. **Parameter-Specific Uncertainty Assessment:** The activity developer shall identify and quantify the uncertainty associated with key monitored parameters (e.g., fuel properties, electricity generation metering) as specified in Section 13.
 - i. If the uncertainty level for a specific parameter exceeds the required threshold (e.g., as defined by the relevant tool or international standards for metering accuracy), the monitored value shall be adjusted conservatively.
 - ii. The approach for quantifying uncertainty and applying adjustments shall be documented in the PDD and is subject to validation.

Step 2 - Application of the Downward Adjustment Factor (DAF)

- 7.5.3 | The Downward Adjustment Factor (DAF) shall be applied using the default values provided in the latest version of the GS4GG Methodology Tool 05: [Downward Adjustment Factor Determination](#) (hereinafter referred to as the DAF Tool). The activity developer is required to apply the relevant default value sourced from the tool.
- 7.5.4 | The DAF Tool establishes an annual linear reduction rate based on national or sectoral Net-Zero targets. The activity developer shall source the applicable default $DAF_{NetZero}$ value for the host country.
- 7.5.5 | The DAF Tool provides $DAF_{NetZero}$ values for specific calendar application periods (e.g., 1st Jan 2026 to 31st Dec 2030). The DAF values are updated periodically (e.g., every five years).
 - a. **Application:** The activity developer shall ensure that the $DAF_{NetZero}$ value corresponding to the calendar year of the monitoring period ($Year_y$) is applied.
 - b. **Period Transitions:** If a monitoring period (y) spans the transition between two different DAF application periods (e.g., a monitoring period covering parts of 2030 and 2031, where the $DAF_{NetZero}$ value changes), the calculation of Adjusted Baseline Emissions (BE_y) shall be prorated. The unadjusted baseline emissions corresponding to the days falling within the first period shall be adjusted using the $DAF_{NetZero}$ value of the first period, and the emissions corresponding to the days falling within the second period shall be adjusted using the updated $DAF_{NetZero}$ value specified for the second period.

Step 3 - Calculation of Adjusted Baseline Emissions (BE_y)

- 7.5.6 | The final Adjusted Baseline Emissions (BE_y) are calculated by applying the downward adjustment to the unadjusted baseline emissions ($BE_{Unadj,y}$)

$$BE_y = BE_{Unadj,y} \times (1 - DAF_{NetZero,y}) \quad (\text{eq. 13})$$

7.6 | Identification and Calculation of the Conservative BAU scenario

7.6.1 | The Business-as-Usual (BAU) scenario is the continuation of the CFPF operation at historical performance levels. BAU emissions (BAU_y) are calculated using historical performance parameters without the application of the ambitious performance benchmark or the DAF. This calculation is required for transparency.

7.6.2 | The historical emission factor (EF_{BAU}) is calculated as:

$$EF_{BAU} = HR_{BAU} \times EF_{fuelmix} \quad (\text{eq. 14})$$

7.6.3 | BAU emissions (BAU_y) are calculated using the unadjusted historical parameters:

$$BAU_y = (MIN(EG_{REP,y}, EG_{BAU}) \times EF_{BAU}) + (EG_{B,y} \times EF_{grid}) \quad (\text{eq. 15})$$

7.7 | Difference between BAU and baseline emissions

7.7.1 | The difference between the crediting baseline and BAU emissions in monitoring period y ($\Delta_{BAU,BE,y}$) shall be calculated as follows:

$$\Delta_{BAU, BE,y} = BE_{BAU} - BE_y \quad (\text{eq. 16})$$

7.7.2 | Annual values obtained from the equation above can be summed to determine the total quantity in line with the crediting period. This is reported for transparency and methodology application and is not used in the final calculation.

8 | ACTIVITY EMISSIONS

8.1 | Calculation of total activity emissions

8.1.1 | Activity emissions are all anthropogenic emissions of GHGs occurring within the activity boundary that are attributable to the activity.

8.1.2 | The total activity emissions in the monitoring period y (AE_y) shall be determined by summing the emissions from electricity/ fuel consumption for operations ($AE_{op,y}$), from transport activities ($AE_{tr,y}$), embodied emissions of the REP infrastructure, ($AE_{em,y}$), and other relevant sources, including land use change and fugitive emissions ($AE_{othe,y}$).

$$AE_y = AE_{op,y} + AE_{tr,y} + AE_{em,y} + AE_{other,y} \quad (\text{eq. 17})$$

Where:

AE_y = Total activity emissions in monitoring period y (tCO₂e)

$AE_{op,y}$	=	Activity emissions from process operations (electricity and fuel consumption) in monitoring period y (tCO ₂ e)
$AE_{tr,y}$	=	Activity emissions from transport activities in monitoring period y (tCO ₂ e)
$AE_{em,y}$	=	Embodied activity emissions of the REP infrastructure, amortized over in monitoring period y (tCO ₂ e)
$AE_{other,y}$	=	Other activity emissions (e.g., fugitive emissions, EOL of CFPP) in monitoring period y (tCO ₂ e)

8.1.3 | Materiality:

- Embodied emissions ($AE_{em,y}$) and emissions from land use change ($AE_{luc,y}$) shall always be included.
- For others ($AE_{op,y}$, $AE_{tr,y}$, and remaining $AE_{other,y}$), individual sources representing <2% of the total estimated activity emissions may be omitted, provided that the sum of all omitted sources does not exceed 5% of the total activity emissions. Evidence that the sources fit within this materiality threshold shall be detailed in the PDD and shall be subject to validation and verification.

8.2 | Activity emissions from operations ($AE_{op,y}$)

8.2.1 | Activity emissions from process operations include the consumption of electricity and fossil fuels during the decommissioning of the CFPP and the installation and maintenance of the REP:

$$AE_{op,y} = AE_{op,elec,y} + AE_{op,fuel,y} \quad (\text{eq. 18})$$

Where:

$AE_{op,elec,y}$ = Activity emissions associated with electricity consumption for process operations in monitoring period y (tCO₂e).

$AE_{op,fuel,y}$ = Activity emissions associated with fuel consumption for process operations in monitoring period y (tCO₂e).

A. Emissions from electricity consumption

8.2.2 | Emissions associated with electricity consumption ($AE_{op,elec,y}$) shall be calculated as follows:

$$AE_{op,elec,y} = AE_{elec,CFPP\,decom,y} + AE_{elec,REP\,install,y} + AE_{elec,REP\,maint,y} \quad (\text{eq. 19})$$

Where:

$AE_{elec,CFPP\,decom,y}$ = Emissions from electricity consumption for decommissioning/dismantling the CFPP in monitoring period y (tCO₂e).

$AE_{elec,REP,install,y}$ = Emissions associated with electricity consumption for installing the REP in monitoring period y (tCO₂e).

$AE_{elec,REP,maint,y}$ = Emissions from grid electricity consumption specifically for maintenance of the REP in monitoring period y (tCO₂e).

8.2.3 | For each parameter associated with electricity consumption, emissions shall be calculated according to [A6.4-AMT-007](#).

B. Emissions from fuel consumption

8.2.4 | Activity emissions associated with fuel consumption ($AE_{op,fuel,y}$) shall be calculated as follows:

$$AE_{op,fuel,y} = AE_{fuel,CFPP,decom,y} + AE_{fuel,REP,install,y} + AE_{fuel,REP,O\&M,y} \text{ (eq. 20)}$$

Where:

$AE_{fuel,CFPP,decom,y}$ = Emissions from fuel consumption (e.g., diesel for heavy machinery) for decommissioning/dismantling the CFPP in monitoring period y (tCO₂e).

$AE_{fuel,REP,install,y}$ = Emissions from fuel consumption for installing the REP in monitoring period y (tCO₂e).

$AE_{fuel,REP,O\&M,y}$ = Emissions from fuel consumption for O&M (e.g., maintenance vehicles, backup generators) of the REP in monitoring period y (tCO₂e).

8.2.5 | For each component, emissions shall be calculated according to the GS4GG [Methodological Tool 01: Emissions from Fossil Fuel Combustion](#)

8.2.6 | Use of Defaults and Simplified Approaches:

- a. **Fuel Properties:** When applying [GS4GG Methodological Tool 01](#), if reliable local or national data for Net Calorific Values (NCV) or CO₂ Emission Factors (EF_{CO_2}) are unavailable, the tool mandates the use of default values provided in the latest IPCC Guidelines for National Greenhouse Gas Inventories (Volume 2, Energy). The most conservative values shall be applied as per the tool's requirements.
- b. **Fuel Quantities:** If direct measurement of fuel quantities (e.g., through fuel meters or purchase records) is not feasible, particularly for activities involving subcontractors, fuel consumption may be estimated based on equipment operating hours, rated capacity, and manufacturer-specified or standardized efficiency values. This approach shall be clearly documented and justified in the PDD.

8.3 | Activity emissions from for transport activities ($AE_{tr,y}$)

8.3.1 | Activity emissions associated with the transportation of materials and equipment ($AE_{tr,y}$) shall be calculated as follows:

$$AE_{tr,y} = AE_{tr,CFPP,y} + AE_{tr,REP,y} \quad (\text{eq. 21})$$

Where:

$AE_{tr,CFPP,y}$ = Emissions associated with the transportation of decommissioned CFPP infrastructure and materials to the final site of disposal or recycling in monitoring period y (tCO₂e).

$AE_{tr,REP,y}$ = Emissions associated with the transportation of REP infrastructure to the installation site, and transport for ongoing O&M, in monitoring period y (tCO₂e).

- 8.3.2 | Emissions shall be calculated according to the [GS4GG Methodological Tool 02: Emissions from Transportation](#). If electric vehicles (EVs) are used, the associated electricity consumption shall be monitored, and emissions calculated using the relevant grid emission factor.

8.4 | Embodied emissions ($AE_{em,y}$)

- 8.4.1 | Embodied emissions associated with the manufacturing and production of the REP infrastructure shall be accounted for. The scope shall cover 'cradle-to-gate' emissions. This shall include, at a minimum: Wind turbines (towers, nacelles, blades); or Photovoltaic (PV) modules, inverters, and mounting structures; and Battery Energy Storage Systems (BESS) (if applicable).
- 8.4.2 | The total embodied emissions⁸ for the activity ($AE_{em,total}$) shall be calculated based on the installed capacity of the equipment and corresponding Life Cycle Assessment (LCA) emission factors ($EF_{LCA,k}$).

$$AE_{em,total} = \sum_k (Q_k \times EF_{LCA,k}) \quad (\text{eq. 22})$$

Where:

$AE_{em,total}$ = Total embodied emissions of the REP infrastructure (tCO₂e).

Q_k = Installed capacity of technology component k (e.g., MWp for Solar PV, MW for Wind, MWh storage capacity for BESS).

$EF_{LCA,k}$ = LCA-based emission factor for technology component k (tCO₂e per unit of Q_k).

k = Index for technology component.

- 8.4.3 | Data Sources and Default Factors for $EF_{LCA,k}$:

a. Project-Specific EPDs: Manufacturer-specific, third-party verified Environmental Product Declarations (EPDs) (compliant with ISO 14025/14040/14044) for the exact equipment models used.

⁸ Greenhouse gas emissions released during the production, transportation, and disposal of goods, including construction materials.

- b. Peer-Reviewed LCA Studies and Databases:** Recent (within the last 5 years) peer-reviewed LCA studies or internationally recognized databases (e.g., Ecoinvent) specific to the technology type and the region of manufacture. If using this option, the upper quartile (75th percentile) of the identified range shall be used to ensure conservativeness.
- c. Conservative Default Factors (Standardized Option):** If options 1 or 2 are not applied, the standardized conservative default factors in Table 10 below may be used.

Table 10: Conservative Default Factors for Embodied Emissions (Cradle-to-Gate)

Technology Component (k)	Default ($EF_{LCA,k}$)	Unit
Solar PV (Utility-scale, crystalline silicon)	2,500	tCO ₂ e/MWp
Wind (Onshore and Offshore)	1,500	tCO ₂ e/MW
Battery Energy Storage System (BESS - Li-ion based)	200	tCO ₂ e/MWh storage capacity

These factors are derived based on conservative interpretations of LCA meta-analyses and internationally recognized reports (e.g., IPCC AR6, IEA, NREL LCA Harmonization), accounting for typical lifetimes and capacity factors.

8.4.4 | **Amortization:** The total embodied emissions ($AE_{em,total}$) shall be amortized linearly over the duration of the 1st registered crediting period (CP_{1st} e.g., 5 or RLT, whichever is shorter) of the activity.

$$AE_{em,y} = \frac{AE_{em,total}}{CP_{1st}} \quad (\text{eq. 23})$$

8.4.5 | If components are replaced during the crediting period, the embodied emissions of the new components shall be calculated (using the hierarchy above) and amortized over the remaining duration of the crediting period along with the previous components.

8.5 | Other emissions ($AE_{other,y}$)

8.5.1 | Other emissions for the activity ($AE_{other,y}$) include emissions from fugitive emissions from REP operation, and emissions from the disposal of CFPP infrastructure.

$$AE_{oth ,y} = AE_{fugitive,y} + AE_{EOL,CFPP,y} \quad (\text{eq. 24})$$

Where:

$AE_{fugitive,y}$ = Fugitive emissions from the REP infrastructure (e.g., SF₆ leakage) in monitoring period y.

$AE_{EOL,CFPP,y}$ = Emissions from the end-of-life (EOL) disposal of CFPP infrastructure (tCO_{2e})

A. Fugitive Emissions ($AE_{fugitive,y}$)

8.5.2 | If the REP utilizes equipment containing greenhouse gases, such as Sulphur Hexafluoride (SF₆) in switchgear, the emissions from potential leakage shall be calculated.

$$AE_{fugitive,y} = \sum_g (Leak Rate_g \times \Delta Stock_g \times GWP_g) \quad (\text{eq. 25})$$

Where:

$Leak Rate_g$ = Annual leakage rate for GHG g (fraction). Based on manufacturer specifications or IPCC default factors (e.g., Tier 1 approach from 2006 IPCC Guidelines).

$\Delta Stock_g$ = Stock difference of GHG g in equipment installed in year y (tGHG)

GWP_g = Global Warming Potential of GHG g (tCO_{2e}/tGHG).

B. Emissions from CFPP Disposal ($AE_{EOL,CFPP,y}$)

8.5.3 | Emissions resulting from the final disposal (e.g., landfilling) from the decommissioned CFPP shall be estimated if found significant under the materiality assessment. This may include emissions from the degradation of waste materials. Relevant methodological tools for waste handling and disposal or IPCC guidelines shall be applied.

9 | LEAKAGE EMISSIONS

9.1 | Identification and assessment of leakage sources

9.1.1 | The following potential sources of leakage shall be assessed in alignment with the latest version of the [GS4GG Requirements for Addressing Leakage in Methodologies](#).

A. Leakage from physical displacement of equipment (Activity-shifting)

9.1.2 | The applicability criteria of this methodology (Section 3) require that the baseline CFPP is dismantled, decommissioned, or rendered permanently inoperative with no scope of operational revival. Therefore, leakage emissions relating to the reuse of the CFPP infrastructure and equipment for power generation beyond the project boundary are considered zero ($LE_{physical,y} = 0$). The reuse of equipment for non-power generation applications is permitted. A detailed inventory of dismantled equipment and its final destination (disposal, recycling, or non-power reuse site) shall be maintained and verified to ensure compliance.

B. Leakage from the supply-demand gap during transition ($LE_{gap,y}$)

- 9.1.3 | During a transition phase, where the CFPP has ceased or reduced electricity generation and the REP has not yet reached the equivalent baseline generation level, a supply-demand gap may occur. This gap necessitates electricity generation from other sources connected to the grid. The emissions associated with this generation are attributable to the activity and shall be accounted for as leakage ($LE_{gap,y}$).
- 9.1.4 | This leakage shall be monitored and calculated during any period where the net electricity delivered by the REP ($EG_{REP,y}$) is less than the baseline electricity generation level (EG_{BAU}).

C. Market leakage (Displacement of feedstock) ($LE_{market,y}$)

- 9.1.5 | The cessation of coal consumption by the baseline CFPP releases that quantity of coal into the market. The subsequent consumption of this displaced coal by other users, either domestically or internationally, results in market leakage ($LE_{market,y}$). As thermal coal is generally considered an internationally traded commodity, this leakage shall be assessed according to the procedures outlined in Section 9.3.

D. Leakage from Indirect Environmental Emissions ($LE_{LUC,y}$)

- 9.1.6 | If the installation of the REP may involve direct land use change (e.g., deforestation, conversion of grassland), the resulting emissions from changes in biomass and soil carbon stocks shall be calculated. Compensatory plantation or other offsetting activities shall not be included in the calculation of $LE_{LUC,y}$.
- 9.1.7 | The total emissions from land use change ($LE_{LUC,total}$) shall be calculated ex-ante. The $LE_{LUC,total}$ emissions are calculated as the difference between the carbon stocks of the land before conversion and after conversion, summed over all land parcels i affected by the activity.

$$LE_{LUC,total} = \sum_i \left((C_{BSL,i} - C_{proj,i}) \times A_i \times \left(\frac{44}{12} \right) \right) \quad (\text{eq. 26})$$

Where:

$C_{BSL,i}$ = Total carbon stock per unit area for the land use type of parcel i before conversion (tonnes C/ha).

$C_{proj,i}$ = Total carbon stock per unit area for the land use type of parcel i after conversion (tonnes C/ha).

A_i = Area of land parcel i undergoing conversion (ha).

$\frac{44}{12}$ = Conversion factor from tonnes of carbon (C) to tonnes of carbon dioxide (CO₂).

- 9.1.8 | The total carbon stock (C) for a given land use type is the sum of carbon in five pools, as defined by the IPCC: Above-Ground Biomass (AGB), Below-

Ground Biomass (BGB), Dead Wood (DW), Litter (LI), and Soil Organic Carbon (SOC).

$$C = C_{AGB} + C_{BGB} + C_{DW} + C_{LI} + C_{SOC} \quad (\text{eq. 27})$$

9.1.9 | Activity developers shall use a tiered approach consistent with IPCC guidelines to determine carbon stock values. Tier 1 involves using the global default values provided in this methodology. Higher tiers may be used if verifiable, region-specific data or direct measurements are available.

9.1.10 | **Amortization:** The total landuse change leakage emissions ($LE_{LUC,total}$) shall be amortized linearly over the duration of applicable period (20 years) of the activity.

$$LE_{LUC,y} = \frac{LE_{LUC,total}}{\text{Period}} \quad (\text{eq. 28})$$

Where:

- $LE_{LUC,y}$ = Leakage emissions from land use change in year y (tCO₂e/yr).
- $LE_{LUC,total}$ = Total carbon stock change due to land use conversion (tCO₂e).
- $Period$ = Amortization period for LUC emissions, fixed at 20 years as per IPCC good practice guidance to ensure the total climate impact is accounted for in a standardized manner, even if this period extends beyond the activity's 15-year crediting period or applicable crediting period

9.2 | Calculation of leakage from the supply-demand gap ($LE_{gap,y}$)

9.2.1 | If the electricity supplied to the grid by other source(s) during the transition period is (are) less GHG intensive than the baseline CFPP, then there is no leakage. However, if the GHG emission-intensity of the other source(s) is (are) higher than that of the baseline CFPP then leakage emissions shall be considered as follows:

$$LE_{gap,y} = \text{Max}(0, (EG_{BL,y} - EG_{REP,y}) \times EF_{LE,gap,y}) \quad (\text{eq. 29})$$

Where:

- $LE_{gap,y}$ = Leakage emissions due to the supply-demand gap during the monitoring period y (tCO₂e). If no gap exists, this value is zero
- $EG_{BL,y}$ = Quantity of electricity that would have been generated by the CFPP in the baseline scenario (MWh).

$EG_{REP,y}$ = Net electricity delivered by the REP in monitoring period y (MWh)

$EF_{LE,Gap,y}$ = Emission factor of electricity supplied to the grid by the most GHG intensive plant in monitoring period y , tCO₂/MWh

9.2.2 | If data for the most GHG intensive power plant in the connected grid is not available for the transition period, then a default factor of 1.3 tCO₂/MWh as per A6.4: Emissions from electricity generation and/or consumption shall be applied to determine at the leakage emissions.

9.3 | Assessment and calculation of market leakage ($LE_{market,y}$)

9.3.1 | Market leakage shall be quantified using the following hierarchical approach:

Option 1: Demonstration of insignificant leakage or mitigation

9.3.2 | Market leakage may be considered zero ($LE_{market,y} = 0$) only where the activity developer provides verifiable evidence that the displaced coal demand is not be consumed elsewhere. This shall be demonstrated by fulfilling one of the following conditions:

a. **Coal procured from captive mines (Concurrent Mine Closure):**

Verifiable evidence (e.g., regulatory filings, independent audits) demonstrating the permanent closure of the specific mine(s) that supplied the baseline CFPP, provided that the mine closure is directly attributable to the cessation of demand from the CFPP activity, and that the associated coal reserves will not be exploited.

b. **Coal procured from open markets:**

- i. **Commercially Unviable Feedstock:** The activity developer shall provide an independent, third-party technical and economic assessment demonstrating that the specific grade and quality of coal used by the baseline CFPP are not commercially viable for international trade or any other domestic industrial or power generation application. The activity developer shall robustly demonstrate that the CFPP itself remained financially viable using this specific feedstock (as per Section 6.4) despite its lack of viability in the broader market. Market conditions shall be monitored annually.
- ii. **Insignificant Market Impact (De Minimis):** If the annual coal consumption (in energy terms) of the baseline CFPP is less than 1% of the total consumption in the applicable market, market leakage may be deemed negligible.

Option 2: Quantification using Integrated Market Analysis

9.3.3 | If Option 1 cannot be substantiated, the activity developer shall quantify market leakage using an Integrated Market Analysis. The developer may choose one of the following:

- a. **Apply a Jurisdictional Default Factor:** The developer may apply the standardized Default Leakage Rate ($LR_{default}$) provided in [Annex 01](#) for the relevant host country, if available.
- b. **Calculate a Project-Specific Factor:** The developer may calculate a project-specific Leakage Rate ($LR_{project}$) by following the 5-Step Integrated Market Analysis outlined below. The derivation shall be transparently documented in the PDD and is subject to validation by the VVB.

9.3.4 | **Integrated Market Analysis:** The analysis shall follow these sequential steps to ensure robustness, transparency, and conservativeness.

Step 1: Define Model Applicability and Hierarchy

9.3.5 | The developer shall select the appropriate economic model based on the activity and data availability. As this methodology involves the replacement of a CFPP with a REP, the interaction between the upstream (coal) and downstream (electricity) markets shall be considered.

- i. **Dual-Market Equilibrium Model (Preferred):** This model structure captures the stabilizing effect of the REP on the electricity market and explicitly accounts for intersectoral leakage (Ye et al., 2020; Bi et al., 2023). This option shall be used unless data constraints are prohibitive. The Leakage Rate (LR) is calculated using established formulas from peer-reviewed literature, such as:

$$LR = 1 + \frac{E_c^s \times [E_e^d - (1 - \omega) \times E_e^{Srew} - \omega E_c^{de}]}{D_1 + D_2} \quad (\text{eq. 30})$$

Where D1 - captures the interaction between the coal supply and the non-power sectors (industries):

$$D_1 = [\omega E_c^{de} + (1 - \omega) E_e^{Srew} - E_e^d] \times [E_c^s - (1 - \varphi) E_c^{dotr}] \quad (\text{eq. 31})$$

Where D2 captures the interaction between the power sector's demand for coal and the renewable energy supply response

$$D_2 = \varphi E_c^{dc} \times [E_e^d - (1 - \omega) E_e^{Srew}] \quad (\text{eq. 32})$$

Where:

ω = Share of coal-fired generation in electricity supply market (%).

φ = Share of coal-fired generation in coal demand market (%)

E_c^s = Price elasticity of coal supply (how much coal mining drops when price drops).

E_e^d = Price elasticity of electricity demand.

E_e^{Srew} = Price elasticity of renewable energy supply

- E_c^{de} = Cross-price elasticity: how coal demand changes when electricity price changes.
- E_c^{dc} = Own-price elasticity: how coal demand from power plants changes when coal price changes.
- E_c^{dotr} = Price elasticity of coal demand from other industries (e.g., cement, steel). This variable captures the risk that cheap coal will be bought by factories.
- LR = Leakage Rate (fraction)

- ii. **Simple Partial Equilibrium Model (Fallback):** If robust data for the electricity market for **Dual-Market Equilibrium Model** is demonstrably unavailable, the simple model may be used:

$$LR = \frac{E_s}{|E_d| + E_s} \quad (\text{eq. 33})$$

Where:

- E_s = Price elasticity of supply (a positive value).
- E_d = Absolute value of the price elasticity of demand (a positive value)

The developer shall rigorously demonstrate that the E_d value used represents the *aggregate* demand across all relevant domestic sectors and the international market.

Step 2: Rigorous Data Filtering and Collection

- 9.3.6 | The developer shall conduct a systematic literature review to identify plausible ranges for all required input parameters. Data sources shall be rigorously filtered based on:
- Recency:** Prioritize studies published within the last 10 years.
 - Relevance:** Ensure data matches the specific geography, market boundary, and coal type.
 - Quality:** Use only peer-reviewed academic literature or reports from reputable international institutions.

Step 3: Multi-Parameter Uncertainty Analysis (Monte Carlo Simulation)

- 9.3.7 | To manage the inherent uncertainty in the input parameters, a Monte Carlo simulation shall be performed.
- Define Distributions:** The plausible ranges identified in Step 2 shall be used to define probability distributions for each input parameter (e.g., uniform distribution if the true distribution is unknown).
 - Simulation:** A simulation (minimum 10,000 iterations) shall be run by repeatedly sampling from these distributions and calculating the Leakage Rate using the selected model.

- c. **Analyze Results:** The simulation results shall be used to generate a probability distribution of the potential Leakage Rate.

Step 4: Apply Statistical Conservatism

- 9.3.8 | To ensure environmental integrity, the applied Leakage Rate ($LR_{applied}$) shall not be the central tendency (mean or median). The developer shall apply the Leakage Rate corresponding to the 90th percentile of the Monte Carlo simulation results.

Step 5: Documentation and Intersectoral Safeguards

- 9.3.9 | The PDD shall transparently document the model selection, literature review, data sources, justification for the selected ranges, simulation methodology, and the final results (including the mean and the 90th percentile).
- 9.3.10 | The developer shall assess the risk of intersectoral leakage. The PDD shall demonstrate how the selected model and input parameters (specifically E_c^{dotr} , if using Dual-Market Equilibrium Model) adequately capture this risk, particularly if domestic policies favor industrial coal consumption.

9.4 | Calculation of Market Leakage Emissions

- 9.4.1 | The market leakage is then calculated as:

$$LE_{market,y} = BE_{A,y} \times LR_{applied} \quad (\text{eq. 34})$$

Where $LR_{applied}$ is $LR_{default}$ or $LR_{project}$ calculated as per Option 2.

9.5 | Calculation of Total Leakage Emissions (LE_y)

- 9.5.1 | The total leakage emissions in monitoring period y (LE_y) shall be calculated as follows:

$$LE_y = LE_{physical,y} + LE_{gap,y} + LE_{market,y} + LE_{LUC,y} \quad (\text{eq. 35})$$

10 | NET GHG EMISSION REDUCTIONS

10.1 | Calculation of net GHG emission reductions

- 10.1.1 | The net GHG emission reductions in monitoring period y (ER_y) shall be calculated as the difference between the total Adjusted Baseline Emissions (BE_y), the total Activity Emissions (AE_y), and the total Leakage Emissions (LE_y). The Adjusted Baseline Emissions (BE_y) incorporate the ambitious performance benchmark and the Downward Adjustment Factor (DAF), as calculated in Section 7.

$$ER_y = BE_y - AE_y - LE_y \quad (\text{eq. 36})$$

Where:

ER_y = Net emission reductions during the monitoring period y (tCO₂e).

BE_y = Total Adjusted Baseline Emissions in the monitoring period y (tCO₂e).

AE_y = Total Activity Emissions in the monitoring period y (tCO₂e).

LE_y = Total Leakage Emissions in the monitoring period y (tCO₂e).

11 | MEETING METHODOLOGICAL PRINCIPLES

11.1 | Encouraging ambition over time

11.1.1 | The methodology incorporates several mechanisms to ensure that the baseline encourages ambition over time and aligns with long-term climate goals:

- a. **Ambitious Performance Benchmark:** The baseline scenario (Section 8.) mandates the application of an ambitious efficiency benchmark (η_{benc}). This ensures the baseline emissions are set at least at the level of the best performing comparable activities. If the historical efficiency of the CFPP is lower than the benchmark, the baseline emissions are adjusted downwards, preventing the rewarding of inefficiency.
- b. **Dynamic Downward Adjustment (DAF):** The methodology mandates the application of the Downward Adjustment Factor (DAF) (Section 7.5), which applies a linear annual reduction to the baseline emissions.
- c. **Crediting Period Renewal:** At the renewal of the crediting period, all key baseline parameters, including the Grid Emission Factor (EF_{Grid}) and the applicable DAF value, shall be reassessed and updated based on the prevailing circumstances and the latest data. This ensures the baseline reflects the evolving technological and policy landscape.

11.2 | Equitable sharing of mitigation benefits

11.2.1 | The methodology actively promotes the equitable sharing of mitigation benefits and supports a Just Transition through the following mandatory requirements:

- a. **Just Transition (JT) Plan:** The applicability criteria (Section 2) mandate the development and implementation of a comprehensive JT plan. This ensures that the transition away from coal is managed in a manner that is fair and inclusive to affected workers, communities, and other stakeholders.

- b. **Inclusion of JT Costs in Additionality:** The Investment Analysis (Section 6.4) explicitly requires the inclusion of all costs associated with the JT plan implementation when assessing the financial viability of the activity. This recognizes the financial burden of ensuring an equitable transition and allows carbon revenues to directly support these critical social and economic measures.
- c. **Safeguarding Principles:** Activities shall comply with the GS4GG Safeguarding Principles and Requirements (Section 2), ensuring that the activity respects human rights, promotes gender equality, and avoids negative social and economic impacts through robust stakeholder consultation.

11.3 | Avoidance of double counting

11.3.1 | The methodology includes rigorous provisions to prevent the double counting of emission reductions, including double issuance and double claiming.

- a. **Permanent Decommissioning:** The methodology requires that the baseline CFPP is dismantled, decommissioned, or rendered permanently inoperative with no scope of operational revival (Section 2). This ensures that the emissions source is permanently eliminated and cannot be claimed by another entity or scheme.
- b. **Energy Attribute Certificates (EACs):** If the REP generates EACs (e.g., RECs), the methodology mandates specific procedures to ensure no double counting occurs between the EACs and the carbon credits (Section 2). This includes the cancellation of EACs corresponding to the electricity generation for which carbon credits are claimed.
- c. **GS4GG Product Requirements:** The activity developer shall conform to the requirements and apply the procedures in the *GS4GG GHG Emissions Reduction & Sequestration Product Requirements* to mitigate the risk of double issuance and claims.

11.4 | Aligning with NDC and LT-LEDS

11.4.1 | The methodology ensures alignment with the host Party's Nationally Determined Contribution (NDC) and Long-Term Low-Emission Development Strategies (LT-LEDS).

- a. **Activity Type:** The core activity—accelerating the phase-out of coal-fired power generation and replacing it with renewable energy—is fundamentally aligned with the decarbonization pathways required to meet national and international climate goals.
- b. **DAF Alignment:** The Downward Adjustment Factor (DAF) is explicitly linked to the host country's Net-Zero targets, ensuring the baseline trajectory is consistent with national long-term strategies (Section 8.5).

- c. Avoidance of Lock-in:** The methodology ensures the avoidance of carbon lock-in (Section 6.3) by replacing high-emission infrastructure (CFPP) with zero-emission technology (REP).

11.5 | Encouraging broad participation

11.5.1 | The methodology is designed to be globally applicable across diverse jurisdictions (Developed & Emerging Economies, LDCs, and SIDS), while recognizing different national circumstances by providing differentiated timelines for the completion of the CFPP phase-out (Section 2). The standardized procedures for baseline setting and monitoring facilitate broad participation by providing clarity and predictability for project developers. The methodology also allows for flexible ownership and implementation arrangements (Section 2).

11.6 | Including data sources, accounting for uncertainty and monitoring

- 11.6.1 | The methodology ensures robustness and transparency in data usage, uncertainty management, and monitoring.
- a. Data Sources:** The methodology specifies clear hierarchies for data sources used in calculations (e.g., for fuel properties, LCA factors, efficiency benchmarks), prioritizing project-specific measurements and recognized international standards (e.g., IPCC, IEA) (Section 14.2). It also mandates the use of standardized tools (e.g., relevant CDM/A6.4 tools).
 - b. Accounting for Uncertainty:** Uncertainty is addressed through the mandatory use of conservative assumptions and parameters throughout the methodology. Furthermore, Section 7.5.1 details the approach to parameter-specific uncertainty assessment, requiring conservative adjustments if uncertainty levels exceed defined thresholds.
 - c. Monitoring:** A comprehensive monitoring methodology is provided (Section 14), detailing the parameters to be monitored, frequency, QA/QC procedures, and data management requirements, ensuring the verifiability of the emission reductions and the implementation of the Just Transition plan.

11.7 | Taking into account policies, measures and relevant circumstances

11.7.1 | The methodology contains provisions to consider relevant circumstances, including national, regional, or local, social, economic, environmental and technological, based on robust data and verifiable information. The type of data and information that would be necessary to demonstrate eligibility conditions, set the baseline, and demonstrate additionality is specified in the methodology.

12 | REVERSALS

12.1 | Assessment of Reversal Risks

- 12.1.1 | This methodology covers emission reduction activities based on the permanent decommissioning of a GHG-emitting infrastructure (CFPP) and its replacement with zero-emission infrastructure (REP). The mitigation outcome is the avoidance of emissions that would have occurred from the CFPP.
- 12.1.2 | Provided the activity adheres to the applicability criteria requiring the baseline CFPP to be dismantled or rendered permanently inoperative with no scope of operational revival (Section 2), the emission reductions achieved are permanent and irreversible.

12.2 | Addressing Reversals

- 12.2.1 | As the risk of reversal is non-existent for activities applying this methodology, specific measures to address reversals, such as the establishment of a buffer pool or monitoring for reversals, are not required.
- 12.2.2 | The activity developer shall provide verifiable evidence (e.g., decommissioning reports, photographic evidence and independent audits) during the monitoring period demonstrating the permanent cessation of operations and the dismantling of the CFPP infrastructure.

13 | QUANTIFICATION OF UNCERTAINTY

A. Identification of Uncertainty Sources

- 13.1.1 | The activity developer shall systematically identify and document all relevant sources of uncertainty associated with the determination of the baseline scenario, baseline emissions, activity emissions, and leakage emissions. These sources include, but are not limited to:
 - a. **Measurement Uncertainty:** Uncertainty related to the accuracy and precision of measurement equipment (e.g., electricity meters, fuel flow meters).
 - b. **Estimation Uncertainty:** Uncertainty associated with the use of estimation methods or models where direct measurement is not feasible.
 - c. **Parameter Uncertainty:** Uncertainty associated with the selection of input parameters, particularly when using default factors or data sourced from literature (e.g., NCV , EF_{CO_2} , LCA factors).

B. Addressing Uncertainty

- 13.1.2 | Uncertainty shall be addressed through the following approaches:

a. Conservativeness in Parameter Selection

- 13.1.3 | For parameters determined ex-ante, the methodology mandates the use of conservative values when selecting from a range of plausible options or defaults. This includes:
- a. Using the upper quartile (75th percentile) or the upper end of the range for LCA emission factors ($EF_{LCA,k}$) when sourced from databases or literature.
 - b. Using conservative IPCC default factors if local data is unavailable.

b. Measurement Accuracy and Calibration

- 13.1.4 | The activity developer shall ensure that all measurement equipment complies with the required accuracy levels specified in the relevant methodological tools or international standards. A rigorous QA/QC regime, including regular calibration, shall be implemented as required in Section 14.3.

c. Parameter-Specific Uncertainty Adjustment

- 13.1.5 | If the uncertainty level associated with a specific monitored parameter (Section 14.3) exceeds the required threshold defined by the relevant standard or tool, the monitored value shall be adjusted conservatively.
- a. Quantification of Uncertainty: The uncertainty of the parameter shall be quantified at a 95% confidence level.
 - b. Conservative Adjustment:
 - i. For parameters contributing to the calculation of Baseline Emissions (e.g., $EG_{REP,y}$), the lower bound of the 95% confidence interval shall be used.
 - ii. For parameters contributing to the calculation of Activity Emissions or Leakage Emissions (e.g., $FC_{op,j,y}$, $EC_{op,y}$), the upper bound of the 95% confidence interval shall be used.
- 13.1.6 | The procedures used for quantifying uncertainty and applying these adjustments shall be transparently documented in the PDD and the Monitoring Report.

14 | MONITORING METHODOLOGY

14.1 | Requirements

- 14.1.1 | This section outlines the requirements for the collection and management of data necessary for the quantification of baseline emissions, activity emissions, leakage emissions, and the monitoring of the JT plan implementation.
- 14.1.2 | The activity developer shall develop and implement a Monitoring Plan, which shall be included in the PDD. The Monitoring Plan shall detail the monitoring tasks, responsibilities, data collection methods, frequency, Quality

Assurance (QA) and Quality Control (QC) procedures, and data archiving protocols.

14.2 | Data and parameters not monitored

- 14.2.1 | The following data and parameters are determined prior to or at the start of the activity and remain fixed for the duration of the crediting period.
- 14.2.2 | **Hierarchy of Data Sources:** For parameters where multiple data sources are utilized (e.g., NCV , EF_{CO_2} , η_{benc} , $EF_{LCA,k}$), the hierarchy specified within the respective sections (e.g., Section 7.4, 7.4, 10.4) shall be strictly followed. The choice of data source shall prioritize accuracy and conservativeness and shall be justified and documented in the PDD.

A. CFPP Historical Data (BAU Parameters)

Parameter ID	1
Data/parameter:	EG_{BAU}
Description:	Average annual net electricity supplied to the grid by the CFPP during the historical reference period (5 years).
Data unit:	MWh/year
Purpose of data:	<input checked="" type="checkbox"/> Baseline emissions <input type="checkbox"/> Activity emissions <input type="checkbox"/> Leakage emissions
Value(s) applied:	To be determined at the activity level.
Source of data:	<input checked="" type="checkbox"/> Measured Audited operational records of the CFPP; Grid dispatch records.
Choice of data or measurement methods and procedures:	Determined by averaging the annual net electricity generation over the most recent 5 consecutive years of uninterrupted commercial operation. Data shall be cross-verified with audited financial statements or grid operator records.
Comments:	N/A

Parameter ID	2
Data/parameter:	$FC_{BAU,i}$
Description:	Average annual quantity of fuel type i consumed by the CFPP during the historical reference period.
Data unit:	Mass or Volume unit/year
Purpose of data:	<input checked="" type="checkbox"/> Baseline emissions <input type="checkbox"/> Activity emissions <input type="checkbox"/> Leakage emissions
Value(s) applied:	To be determined at the activity level.
Source of data:	<input checked="" type="checkbox"/> Measured Audited operational records of the CFPP; Fuel purchase invoices.

Choice of data or measurement methods and procedures:	Determined by averaging the annual consumption of each fuel type i over the historical reference period. Quantities shall be based on direct measurements as recorded in operational logs and verified by purchase records.
Comments:	N/A

Parameter ID	3
Data/parameter:	NCV_i
Description:	Net Calorific Value of fuel type i .
Data unit:	GJ/mass or volume unit
Purpose of data:	<input checked="" type="checkbox"/> Baseline emissions <input type="checkbox"/> Activity emissions <input type="checkbox"/> Leakage emissions
Value(s) applied:	To be determined at the activity level.
Source of data:	<input checked="" type="checkbox"/> Measured <input checked="" type="checkbox"/> Other source Hierarchy: 1. Plant-specific measurements; 2. National defaults; 3. IPCC defaults.
Choice of data or measurement methods and procedures:	If plant-specific: Determined based on periodic laboratory analysis of fuel samples during the historical reference period, following international standards (e.g., ASTM, ISO). If defaults are used, the source shall be clearly documented, and the most conservative value applied.
Comments:	N/A

Parameter ID	4
Data/parameter:	EF_{CO_2i}
Description:	CO ₂ Emission Factor of fuel type i .
Data unit:	tCO ₂ /GJ
Purpose of data:	<input checked="" type="checkbox"/> Baseline emissions <input type="checkbox"/> Activity emissions <input type="checkbox"/> Leakage emissions
Value(s) applied:	To be determined at the activity level.
Source of data:	<input checked="" type="checkbox"/> Measured <input checked="" type="checkbox"/> Other source Hierarchy: 1. Plant-specific measurements; 2. National defaults; 3. IPCC defaults.
Choice of data or measurement methods and procedures:	If plant-specific: Determined based on laboratory analysis of fuel composition during the historical reference period. If defaults are used, the source shall be clearly documented, and the most conservative value applied.
Comments:	N/A

Parameter ID	5
Data/parameter:	$EF_{fuelmix}$
Description:	Weighted average CO ₂ e emission factor of the fuel mix consumed by the CFPP.
Data unit:	tCO ₂ /GJ
Purpose of data:	<input checked="" type="checkbox"/> Baseline emissions <input type="checkbox"/> Activity emissions <input type="checkbox"/> Leakage emissions
Value(s) applied:	To be determined at the activity level.
Source of data:	Calculated (Eq. 1).
Choice of data or measurement methods and procedures:	Calculated as the weighted average emission factor of the fuel mix based on parameters 2, 3, and 4.
Comments:	N/A

Parameter ID	6
Data/parameter:	η_{BAU}
Description:	Historical net efficiency of the CFPP.
Data unit:	Fraction
Purpose of data:	<input checked="" type="checkbox"/> Baseline emissions <input type="checkbox"/> Activity emissions <input type="checkbox"/> Leakage emissions
Value(s) applied:	To be determined at the activity level.
Source of data:	Calculated (Eq. 2).
Choice of data or measurement methods and procedures:	Determined in accordance with CDM Tool 09 (Option E), based on parameters 1, 2, and 3.
Comments:	N/A

Parameter ID	7
Data/parameter:	HR_{BAU}
Description:	Historical Heat Rate of the CFPP.
Data unit:	GJ/MWh
Purpose of data:	<input checked="" type="checkbox"/> Baseline emissions <input type="checkbox"/> Activity emissions <input type="checkbox"/> Leakage emissions
Value(s) applied:	To be determined at the activity level.

Source of data:	Calculated (Eq. 3).
Choice of data or measurement methods and procedures:	Calculated based on the historical net efficiency (parameter 6).
Comments:	N/A

Parameter ID	8
Data/parameter:	EF_{BAU}
Description:	Historical Emission Factor of the CFPP.
Data unit:	tCO ₂ e/MWh
Purpose of data:	<input checked="" type="checkbox"/> Baseline emissions <input type="checkbox"/> Activity emissions <input type="checkbox"/> Leakage emissions
Value(s) applied:	To be determined at the activity level.
Source of data:	Calculated (Eq. 14).
Choice of data or measurement methods and procedures:	Calculated based on the historical heat rate (parameter 7) and the emission factor of the fuel mix (parameter 5).
Comments:	N/A

B. Baseline Adjustments and Factors

Parameter ID	9
Data/parameter:	RLT
Description:	Remaining Lifetime of the CFPP.
Data unit:	Years
Purpose of data:	<input checked="" type="checkbox"/> Baseline emissions <input type="checkbox"/> Activity emissions <input type="checkbox"/> Leakage emissions
Value(s) applied:	To be determined at the activity level.
Source of data:	Technical assessments; Manufacturer specifications; Regulatory permits; Industry norms.
Choice of data or measurement methods and procedures:	Determined in accordance with the procedures in the latest version of <i>A6.4: Methodology Tool - Determination of the technical lifetime of equipment</i> of equipment. All evidence and assessments shall be documented.
Comments:	N/A

Parameter ID	10
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Data/parameter:	η_{bench}
Description:	Ambitious Efficiency Benchmark for the CFPP technology and vintage.
Data unit:	Fraction
Purpose of data:	<input checked="" type="checkbox"/> Baseline emissions <input type="checkbox"/> Activity emissions <input type="checkbox"/> Leakage emissions
Value(s) applied:	To be determined at the activity level.
Source of data:	Hierarchy: 1. National/Regional regulatory data (75th percentile); 2. International BAT data (e.g., IEA); 3. NDC targets.
Choice of data or measurement methods and procedures:	Determined based on a systematic review of data sources in the specified hierarchy. The benchmark shall be specific to the CFPP's technology, size, vintage, and fuel quality. Data sources and selection process shall be transparently documented.
Comments:	N/A

Parameter ID 11	
Data/parameter:	η_{BL}
Description:	Baseline Efficiency of the CFPP.
Data unit:	Fraction
Purpose of data:	<input checked="" type="checkbox"/> Baseline emissions <input type="checkbox"/> Activity emissions <input type="checkbox"/> Leakage emissions
Value(s) applied:	To be determined at the activity level.
Source of data:	Calculated (Eq. 4).
Choice of data or measurement methods and procedures:	Determined as the maximum value between the historical efficiency (parameter 6) and the ambitious benchmark (parameter 10).
Comments:	N/A

Parameter ID 12	
Data/parameter:	HR_{BL}
Description:	Baseline Heat Rate of the CFPP.
Data unit:	GJ/MWh
Purpose of data:	<input checked="" type="checkbox"/> Baseline emissions <input type="checkbox"/> Activity emissions <input type="checkbox"/> Leakage emissions
Value(s) applied:	To be determined at the activity level.
Source of data:	Calculated (Eq. 5).
Choice of data or	Calculated based on the baseline efficiency (parameter 11).

measurement methods and procedures:	
Comments:	N/A

Parameter ID	13
Data/parameter	EF_{BL}
Description:	Baseline Emission Factor of the CFPP (Component A).
Data unit:	tCO ₂ e/MWh
Purpose of data:	<input checked="" type="checkbox"/> Baseline emissions <input type="checkbox"/> Activity emissions <input type="checkbox"/> Leakage emissions
Value(s) applied:	To be determined at the activity level.
Source of data:	Calculated (Eq. 6).
Choice of data or measurement methods and procedures:	Calculated based on the baseline heat rate (parameter 12) and the emission factor of the fuel mix (parameter 5).
Comments:	N/A

Parameter ID	14
Data/parameter:	EF_{grid}
Description:	Grid Emission Factor (Component B).
Data unit:	tCO ₂ e/MWh
Purpose of data	<input checked="" type="checkbox"/> Baseline emissions <input type="checkbox"/> Activity emissions <input type="checkbox"/> Leakage emissions
Value(s) applied:	To be determined at the activity level.
Source of data:	Official grid data (generation, fuel consumption); National statistics; Regulatory bodies.
Choice of data or measurement methods and procedures:	Calculated strictly in accordance with the latest version of A6.4: Emissions from electricity generation and/or consumption. Based on the most recent data available at the time of validation.
Comments:	N/A

C. Downward Adjustment Factor (DAF) Parameters

Parameter ID	15
Data/parameter:	$DAF_{NetZero}$

Description:	Annual Downward Adjustment Factor for the host country and application period.
Data unit:	Fraction
Purpose of data:	<input checked="" type="checkbox"/> Baseline emissions <input type="checkbox"/> Activity emissions <input type="checkbox"/> Leakage emissions
Value(s) applied:	To be determined at the activity level.
Source of data:	GS4GG Methodology Tool: Downward Adjustment Factor (DAF) Determination.
Choice of data or measurement methods and procedures:	Sourced directly from the relevant Annex of the DAF Tool corresponding to the host country and the applicable calendar period (e.g., 2026-2030).
Comments:	N/A

D. Activity Emissions Parameters (Fixed Components)

Parameter ID	16
Data/parameter:	Q_k
Description:	Installed capacity of REP technology component k (Solar PV, Wind, BESS).
Data unit:	MWp, MW, or MWh storage capacity
Purpose of data:	<input type="checkbox"/> Baseline emissions <input checked="" type="checkbox"/> Activity emissions <input type="checkbox"/> Leakage emissions
Value(s) applied:	To be determined at the activity level.
Source of data:	REP design specifications; Commissioning reports; Nameplate data.
Choice of data or measurement methods and procedures:	Determined based on the final installed capacity as verified in the commissioning reports.
Comments:	N/A

Parameter ID	17
Data/parameter:	$EF_{LCA,k}$
Description:	LCA-based emission factor for technology component k (Cradle-to-Gate).
Data unit:	tCO ₂ e/unit of Q_k
Purpose of data:	<input type="checkbox"/> Baseline emissions <input checked="" type="checkbox"/> Activity emissions <input type="checkbox"/> Leakage emissions
Value(s) applied:	To be determined at the activity level.

Source of data:	Hierarchy: 1. Manufacturer EPDs; 2. Peer-reviewed LCA/Databases (75 th percentile); 3. Default Factors (Table 10).
Choice of data or measurement methods and procedures:	Determined by applying the hierarchy of data sources. If EPDs or LCA databases are used, compliance with relevant ISO standards (e.g., ISO 14040/14044) shall be demonstrated.
Comments:	N/A

Parameter ID	18
Data/parameter:	$AE_{em,total}$
Description:	Total embodied emissions of the REP infrastructure.
Data unit:	tCO ₂ e
Purpose of data:	<input type="checkbox"/> Baseline emissions <input checked="" type="checkbox"/> Activity emissions <input type="checkbox"/> Leakage emissions
Value(s) applied:	To be determined at the activity level.
Source of data:	Calculated.
Choice of data or measurement methods and procedures:	Calculated as the sum of the installed capacity (parameter 16) multiplied by the LCA emission factor (parameter 17) for all components k.
Comments:	N/A

Parameter ID	19
Data/parameter:	CP_{1st}
Description:	Total duration of the 1 st crediting period (e.g., 5 years).
Data unit:	Years
Purpose of data:	<input type="checkbox"/> Baseline emissions <input checked="" type="checkbox"/> Activity emissions <input type="checkbox"/> Leakage emissions
Value(s) applied:	To be determined at the activity level.
Source of data:	Methodology requirement (Section 1).
Choice of data or measurement methods and procedures:	Fixed based on the methodology specification. Used for the linear amortization of embodied and LUC emissions.
Comments:	N/A

Parameter ID	20
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Data/parameter:	$AE_{LUC,total}$
Description:	Total emissions from Land Use Change for REP installation (if applicable).
Data unit:	tCO ₂ e
Purpose of data:	<input type="checkbox"/> Baseline emissions <input checked="" type="checkbox"/> Activity emissions <input type="checkbox"/> Leakage emissions
Value(s) applied:	To be determined at the activity level.
Source of data:	Site surveys; Satellite imagery; IPCC Guidelines (Vol 4, AFOLU) or relevant CDM A/R tools.
Choice of data or measurement methods and procedures:	Calculated based on changes in biomass and soil carbon stocks resulting from direct land use change. Procedures shall follow the relevant tools/guidelines (e.g., IPCC Tier 1, 2, or 3).
Comments:	N/A

E. Leakage Assessment Parameters (If fixed options applied)

Parameter ID	21
Data/parameter:	LF
Description:	Standardized Leakage Factor for market leakage (if Option 2 is applied).
Data unit:	Fraction
Purpose of data:	<input type="checkbox"/> Baseline emissions <input type="checkbox"/> Activity emissions <input checked="" type="checkbox"/> Leakage emissions
Value(s) applied:	To be determined at the activity level.
Source of data:	
Choice of data or measurement methods and procedures:	Sourced from methodology default values as outlined in Table AX in Annex 01
Comments:	N/A

Parameter ID	22
Data/parameter:	E_s, E_d
Description:	Price elasticities of supply (E_s) and demand (E_d) (if Option 3 is applied).
Data unit:	Fraction
Purpose of data:	<input type="checkbox"/> Baseline emissions <input type="checkbox"/> Activity emissions <input checked="" type="checkbox"/> Leakage emissions
Value(s) applied:	To be determined at the activity level.

Source of data:	Internationally recognized, recent, peer-reviewed studies/databases.
Choice of data or measurement methods and procedures:	Determined based on a systematic literature review for the specific coal type and relevant market. Data sources and applicability shall be robustly justified.
Comments:	-

Parameter ID	23
Data/parameter:	<i>LR</i>
Description:	Project-specific Leakage Rate (if Option 3 is applied).
Data unit:	Fraction
Purpose of data:	<input type="checkbox"/> Baseline emissions <input type="checkbox"/> Activity emissions <input checked="" type="checkbox"/> Leakage emissions
Value(s) applied:	To be determined at the activity level.
Source of data:	Calculated (Eq. Table A03).
Choice of data or measurement methods and procedures:	
Comments:	-

14.3 | Data and parameters monitored

14.3.1 | The following data and parameters shall be monitored during the crediting period.

A. Electricity Generation (Baseline and Leakage Calculation)

Parameter ID	M.1
Data/parameter:	$EG_{REP,y}$
Description:	Net electricity delivered by the REP in monitoring period <i>y</i> .
Data unit:	MWh.
Purpose of data:	<input type="checkbox"/> Baseline removals <input checked="" type="checkbox"/> Leakage emissions <input type="checkbox"/> Activity emissions
Measurement methods and procedures:	Direct measurement (Electricity meters). Continuous measurement, aggregated monthly/annually.
Entity/person responsible for the	Activity developer, plant operator.

measurement:		
Measuring instrument(s):	Type of instrument	Electricity meters.
	Calibration requirements	Calibration shall be undertaken in line with equipment manufacturer instructions and shall be in line with national standards or, if these are not available, international standards (e.g., IEC, ISO). The meters used for measurement shall be tested and/or calibrated at a frequency as mandated by local regulations or as prescribed by the manufacturer.
	Location	Electricity meters installed at the activity site (REP).
QA/QC procedures:	Meters shall comply with international/ national standards (e.g., IEC) and be calibrated according to manufacturer specifications or national standards. Cross-checked with grid dispatch data/invoices.	
Comments:	N/A	

B. Activity Emissions

Parameter ID	M.2	
Data/parameter:	$EC_{OP,y}$	
Description:	Electricity consumption for CFPP decommissioning, REP installation, and REP maintenance.	
Data unit:	MWh.	
Purpose of data:	<input type="checkbox"/> Baseline removals <input type="checkbox"/> Leakage emissions <input checked="" type="checkbox"/> Activity emissions	
Measurement methods and procedures:	Direct measurement (Meters) or purchase invoices, Monitored during relevant activities, aggregated annually.	
Entity/person responsible for the measurement	Activity developer, plant operator.	
Measuring instrument(s):	Type of instrument	Electricity meters, where used
	Calibration requirements	Calibration shall be undertaken in line with equipment manufacturer instructions and shall be in line with national standards or, if these are not available, international standards (e.g., IEC, ISO). The meters used for measurement shall be tested and/or calibrated at a frequency as mandated by

		local regulations or as prescribed by the manufacturer.
	Location	Electricity meters installed at the activity site (REP).
QA/QC procedures:	Calibration of meters. Verification of purchase records.	
Comments:	N/A	

Parameter ID	M.3	
Data/parameter:	$FC_{OP,j,y}$	
Description:	Consumption of fuel type j for CFPP decommissioning, REP installation, and REP O&M.	
Data unit:	Mass or Volume unit	
Purpose of data:	<input type="checkbox"/> Baseline removals <input type="checkbox"/> Leakage emissions <input checked="" type="checkbox"/> Activity emissions	
Measurement methods and procedures:	Fuel meters, purchase records, or equipment logs, Monitored during relevant activities, aggregated annually.	
Entity/person responsible for the measurement:	Activity developer, plant operator.	
Measuring instrument(s):	Type of instrument	Electricity meters, where used
	Calibration requirements	Calibration shall be undertaken in line with equipment manufacturer instructions and shall be in line with national standards or, if these are not available, international standards (e.g., IEC, ISO). The meters used for measurement shall be tested and/or calibrated at a frequency as mandated by local regulations or as prescribed by the manufacturer.
	Location	Electricity meters installed at the activity site (REP).
QA/QC procedures:	Verification of invoices and logs. Calibration of meters if used. If estimated (Section 10.2.2), operating logs shall be maintained.	
Comments:	-	

Parameter ID	M.4	
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Data/parameter:	<i>Transport Data</i>	
Description:	Data required to calculate emissions from transport ($AE_{tr,y}$) for CFPP disposal and REP installation/O&M.	
Data unit:	Various (e.g., km, tkm, fuel consumption)	
Purpose of data:	<input type="checkbox"/> Baseline removals <input type="checkbox"/> Leakage emissions <input checked="" type="checkbox"/> Activity emissions	
Measurement methods and procedures:	Transport logs, invoices, GPS tracking, Monitored during relevant activities, aggregated annually..	
Entity/person responsible for the measurement:	Activity developer, plant operator.	
Measuring instrument(s):	Type of instrument	-
	Calibration requirements	-
	Location	-
QA/QC procedures:	Verification of logs and invoices. As required by GS4GG Methodological Tool 02.	
Comments:	-	

Parameter ID	M.5	
Data/parameter:	<i>Stock_{g,y}</i>	
Description:	Total stock of GHG g (e.g., SF ₆) contained in operating equipment in year y.	
Data unit:	tGHG	
Purpose of data:	<input type="checkbox"/> Baseline removals <input type="checkbox"/> Leakage emissions <input checked="" type="checkbox"/> Activity emissions	
Measurement methods and procedures:	Equipment nameplates, maintenance records. Annual inventory check.	
Entity/person responsible for the measurement:	Activity developer, plant operator.	
Measuring instrument(s):	Type of instrument	-

	Calibration requirements	-
	Location	-
QA/QC procedures:	Verification of equipment inventory and maintenance/refilling logs.	
Comments:	-	

C. Leakage Emissions

Parameter ID	M.6	
Data/parameter:	$EF_{grid,y}$	
Description	Emission factor of electricity supplied by the grid in monitoring period y.	
Data unit:	tCO ₂ /MWh	
Purpose of data:	<input type="checkbox"/> Baseline removals <input checked="" type="checkbox"/> Leakage emissions <input type="checkbox"/> Activity emissions	
Measurement methods and procedures:	Calculated as per the latest version of A6.4: Emissions from electricity generation and/or consumption.	
Entity/person responsible for the measurement:	Activity developer.	
Measuring instrument(s):	Type of instrument	This shall be guided by the choice of emission factor as defined in latest version A6.4: Emissions from electricity generation and/or consumption
	Accuracy class	As above.
	Calibration requirements	As above.
	Location	As above.
Measurement intervals:	As above.	
QA/QC procedures:	As above.	
Comments:	-	

Parameter ID	M.7	
Data/parameter:	<i>Mine Status</i>	

Description	Operational status of the dedicated mine(s) (if Option 1 for Market Leakage is applied).	
Data unit:	Status	
Purpose of data:	<input type="checkbox"/> Baseline removals <input checked="" type="checkbox"/> Leakage emissions <input type="checkbox"/> Activity emissions	
Measurement methods and procedures:	Regulatory filings, independent audits, site inspections.	
Entity/person responsible for the measurement:	Activity developer.	
Measuring instrument(s):	Type of instrument	-
	Accuracy class	-
	Calibration requirements	-
	Location	-
Measurement intervals:	Annually.	
QA/QC procedures:	Verification of permanent closure and cessation of coal extraction activities.	
Comments:	-	

D. Just Transition (JT) Monitoring

Parameter ID	M.8
Data/parameter:	<i>JT_KPI_Workers</i>
Description	KPIs related to the workforce transition (e.g., % of workers retrained, job placement rate, adherence to severance agreements).
Data unit:	Various (e.g., Number, %)
Purpose of data:	<input type="checkbox"/> Baseline removals <input type="checkbox"/> Leakage emissions <input type="checkbox"/> Activity emissions
Measurement methods and procedures:	JT implementation reports, HR records, surveys of affected workers.
Entity/person responsible for the	Activity developer.

measurement:		
Measuring instrument(s):	Type of instrument	-
	Accuracy class	-
	Calibration requirements	-
	Location	-
Measurement intervals:	Annually (or as defined in the JT Plan).	
QA/QC procedures:	Independent audits of JT implementation reports. Confidentiality of personal data shall be maintained.	
Comments:	-	

Parameter ID	M.9	
Data/parameter:	<i>JT_KPI_Community</i>	
Description:	KPIs related to community support and redevelopment (e.g., delivery of social support programs, progress of community infrastructure projects).	
Data unit:	Various	
Purpose of data:	<input type="checkbox"/> Baseline removals <input type="checkbox"/> Leakage emissions <input type="checkbox"/> Activity emissions	
Measurement methods and procedures:	JT implementation reports, community meeting minutes, project progress reports.	
Entity/person responsible for the measurement:	Activity developer.	
Measuring instrument(s):	Type of instrument	-
	Accuracy class	-
	Calibration requirements	-
	Location	-
Measurement intervals:	Annually (or as defined in the JT Plan).	

QA/QC procedures:	Stakeholder consultations and independent audits.
Comments:	-

E. Compliance Monitoring

Parameter ID	M.10	
Data/parameter:	<i>CFPP Operational Status</i>	
Description:	Status of the baseline CFPP decommissioning and dismantling.	
Data unit:	Operational / Decommissioned	
Purpose of data:	<input type="checkbox"/> Baseline removals <input type="checkbox"/> Leakage emissions <input type="checkbox"/> Activity emissions	
Measurement methods and procedures:	Site inspections, decommissioning reports, regulatory filings.	
Entity/person responsible for the measurement:	Activity developer.	
Measuring instrument(s):	Type of instrument	-
	Accuracy class	-
	Calibration requirements	-
	Location	-
Measurement intervals:	Annually until full decommissioning is verified.	
QA/QC procedures:	Independent verification of the permanent cessation of operations and dismantling of key infrastructure.	
Comments:	The reuse of equipment for non-power generation applications is permitted. A detailed inventory of dismantled equipment and its final destination (disposal, recycling, or non-power reuse site) shall be maintained and verified to ensure compliance.	

Parameter ID	M.11	
Data/parameter:	<i>Regulatory Context</i>	
Description	Confirmation that no new mandates for early closure have been enacted.	
Data unit:	Status	

Purpose of data:	<input type="checkbox"/> Baseline removals <input type="checkbox"/> Leakage emissions <input type="checkbox"/> Activity emissions	
Measurement methods and procedures:	Review of official legislative updates and regulatory announcements.	
Entity/person responsible for the measurement:	Activity developer.	
Measuring instrument(s):	Type of instrument	-
	Accuracy class	-
	Calibration requirements	-
	Location	-
Measurement intervals:	Annually.	
QA/QC procedures:	Documentation of the review process and findings.	
Comments:	The activity developer shall confirm that the CFPP remains free of any legal mandate for early closure as per the eligibility criteria in Section 2.3. If a mandate is enacted, the crediting of baseline emissions from the CFPP (Component A) shall cease from the effective date of that mandate.	

14.4 | QA/QC and Data Management

A. Calibration and Measurement Accuracy

- 14.4.1 | All measurement equipment (e.g., electricity meters, fuel flow meters, weighbridges) shall be maintained and calibrated regularly according to the manufacturer’s specifications or relevant national/international standards (e.g., IEC, ISO), whichever is most stringent. Calibration records shall be maintained and made available for verification.
- 14.4.2 | The accuracy of the measurements shall comply with the requirements specified in the referenced methodological tools. If the required accuracy levels are not met, the procedures for conservative adjustment of parameters due to uncertainty (Section 7.5.1) shall be applied.

B. Data Management and Archiving

- 14.4.3 | All data collected as part of the monitoring process, including raw measurements, calculations, assumptions, calibration records, and evidence related to the JT plan implementation, shall be archived electronically. Data

shall be kept for the duration of the crediting period and for at least five years after the end of the last crediting period or the last issuance of credits, whichever is later. The data management system shall ensure the integrity, traceability, and security of the data.

C. Quality Control (QC)

- 14.4.4 | The activity developer shall implement QC procedures, including regular cross-checks between different data sources (e.g., comparing metered electricity generation (M1) with grid operator statements or sales invoices; comparing fuel consumption records (M4) with purchase invoices) to identify and correct errors or inconsistencies. Roles and responsibilities for data collection and quality control shall be clearly defined in the Monitoring Plan.

14.5 | Sampling requirements

A. GHG Quantification

- 14.5.1 | The quantification of the primary emission sources and the net electricity generation ($EG_{REP,y}$) shall be based on direct measurement of the entire parameter population (census). Sampling approaches are generally not applicable for these parameters.
- 14.5.2 | If sampling is proposed for the monitoring of secondary parameters (e.g., estimation of fuel consumption for distributed maintenance activities), the sampling plan shall adhere to the requirements of the methodological tools. The sampling plan shall be detailed in the PDD, ensure a 95% confidence level and a precision of $\pm 10\%$ (or stricter if required by the tool), and is subject to validation.

B. Just Transition Monitoring

- 14.5.3 | If surveys or interviews are used to monitor specific KPIs of the Just Transition plan (M11, M12) or other KPIs and monitoring parameter, a statistically robust sampling approach shall be applied. The sampling design, sample size determination, and data collection procedures shall be detailed in the Monitoring Plan and ensure representativeness of the affected stakeholder groups. The design shall ensure a 90% confidence level and a margin of error of no more than 10% (90/10 rule).

15 | MONITORING REQUIREMENTS FOR ACTIVITIES WITH REVERSAL RISKS

- 15.1.1 | As established in Section 15 (Reversals), this methodology covers emission reduction activities based on the permanent decommissioning of GHG-emitting infrastructure (CFPP). The mitigation outcomes are permanent and irreversible, provided the applicability criteria are met. This methodology does not cover activities involving GHG removals or sequestration.

Therefore, monitoring requirements for activities with reversal risks are not applicable.

- 15.1.2 | The activity developer is required to monitor and verify the permanent cessation of operations and the dismantling of the CFPP infrastructure, as detailed in parameter M10 (Section 14.3).

16 | APPLICATION TO PROGRAMME OF ACTIVITIES

16.1 | General requirements

- 16.1.1 | This methodology is applicable to a Programme of Activities (PoA). A PoA may coordinate the implementation of multiple VPAs, where each VPA involves the early decommissioning of one or more CFPPs and the installation of associated REPs, adhering to the requirements of this methodology.
- 16.1.2 | The implementation of the PoA shall comply with the latest version of the GS4GG Standard on Programme of Activities.

16.2 | Baseline and Additionality Demonstration

- 16.2.1 | **Baseline Scenario:** The baseline scenario shall be determined independently for each VPA, following the procedures in Section 7, based on the specific historical data and circumstances of the CFPP included in that VPA.
- 16.2.2 | **Additionality:** Additionality shall be demonstrated independently for each VPA, following the procedures in Section 6. The Investment Analysis shall reflect the specific costs, revenues, and financial conditions relevant to the VPA, including the VPA-specific Just Transition costs.

16.3 | Monitoring and Quantification

- 16.3.1 | Emission reductions shall be quantified independently for each VPA based on the monitored data of the respective REP and the ex-ante baseline parameters of the respective CFPP.
- 16.3.2 | The CME shall establish a system to ensure that each CFPP and REP is uniquely identified and included in only one VPA, preventing double counting of emission reductions.
- 16.3.3 | Sampling approaches for monitoring may be applied across the PoA only for parameters where it is explicitly permitted by Section 14.3 and the relevant methodological tools, provided that the VPAs are sufficiently homogeneous. Sampling is not permitted for the measurement of net electricity generation ($EG_{REP,y}$).

16.4 | Just Transition and Safeguards

- 16.4.1 | **Safeguards:** Safeguarding assessments shall be conducted for each VPA, reflecting the local context.
- 16.4.2 | **Just Transition:** A specific Just Transition Plan shall be developed and implemented for each VPA, addressing the specific impacts on the workers and communities associated with the CFPP included in that VPA. Monitoring of the JT KPIs shall be conducted at the VPA level.

17 | RENEWAL OF CREDITING PERIOD

17.1 | Crediting period length

- 17.1.1 | The crediting period for the Activity is 5 years, renewable twice (total 15 years). However, the crediting of baseline emissions from the CFPP (Component A) is limited to the Remaining Lifetime (RLT) of the CFPP. If the RLT ends before the crediting period, Component A shall clearly be set to zero for the remainder of the period.
- 17.1.2 | The renewal of the crediting period is subject to the procedures outlined in the *GS4GG Principles and Requirements* and the specific requirements detailed below.
- 17.1.3 | At the time of renewal, the activity developer shall conduct a comprehensive reassessment of the baseline scenario, additionality, and relevant parameters to ensure they remain valid, conservative, and reflect the prevailing circumstances.
- 17.1.4 | The latest version of the methodology shall be applied at the time of crediting period renewal.

17.2 | Reassessment of the Baseline Scenario

- 17.2.1 | The activity developer shall re-evaluate the baseline scenario (Section 7) to confirm its continued validity.

17.3 | Update of Baseline Parameters

- 17.3.1 | The following key parameters shall be updated at the renewal of the crediting period:
 - a. Grid Emission Factor (EF_{Grid}): The Grid Emission Factor used for Component B shall be recalculated using the latest available data and the most recent version of A6.4: Emissions from electricity generation and/or consumption.
 - b. Downward Adjustment Factor ($DAF_{NetZero}$): The applicable $DAF_{NetZero}$ value shall be updated based on the latest version of the GS4GG DAF Tool and the relevant application period corresponding to the new crediting period

- c. Other Parameters: Any other parameters that rely on data subject to change over time shall be reviewed and updated if necessary.

17.3.2 | The parameters related to the historical performance of the decommissioned CFPP (e.g., EG_{BAU} , EF_{BL}) remain fixed, provided the RLT assessment remains valid.

17.4 | Reassessment of Additionality

17.4.1 | The activity developer shall conduct the Ongoing Financial Need (OFN) assessment as detailed in Section 6.6. This includes:

- a. **Regulatory Analysis:** Reconfirming that the activity remains regulatory surplus.
- b. **Financial Viability:** Demonstrating the continued financial need for carbon revenues, considering the updated economic conditions, operational performance of the REP, and the remaining financial commitments for the implementation of the Just Transition plan.

17.4.2 | The crediting period shall only be renewed if the OFN assessment confirms the continued additionality of the activity.

ANNEX 01 - DEFAULT MARKET LEAKAGE FACTORS

1| INTRODUCTION

1.1.1 | This Annex provides standardized Jurisdictional Default Leakage Factors ($LR_{default}$) for activities located in Indonesia, Malaysia, Philippines, Thailand, and Vietnam. These factors have been derived following the 5-Step Integrated Market Analysis methodology (Section 9.3).

2| DEFAULT FACTORS AND APPLICABILITY

2.1.1 | The following default factors may be used by activity developers applying this methodology in the respective countries.

Table AX: Default Market Leakage Factor

Host Country	Default Market Leakage Factor ($LR_{default}$)
Indonesia	34.1%
Malaysia	33.9%
Philippines	33.4%
Thailand	34.4%
Vietnam	33.6%

2.1.2 | **Applicability:** The default factors are applicable for project utilizing standard thermal coal.

2.1.3 | **Validity:** These factors are valid for the first crediting period of the activity.

2.1.4 | **Developer Choice:** Activity developers retain the option to calculate a project-specific leakage factor by applying the methodology in Section 9 or presenting an alternative approach via methodology revision route.

3| DERIVATION METHODOLOGY AND DATA SOURCES

3.1.1 | The derivation followed the 5-Step Integrated Market Analysis.

Step 1: Model Selection

3.1.2 | Option - Dual-Market Equilibrium Model was selected as the preferred approach, utilizing the formula structure outlined in the methodology (derived from Ye et al., 2020). This approach captures interactions between the electricity and coal markets and explicitly accounts for intersectoral leakage risks (Bi et al., 2023).

Step 2: Data Filtering and Collection

3.1.3 | Plausible ranges for the eight input parameters were established through a literature review, utilizing standardized regional elasticity parameters and country-specific market shares.

Table A01: Input Parameters, Ranges, and Sources

Parameter	Description	Common Elasticity Ranges (All Countries)	Justification and Indicative Sources (Elasticities)
Elasticities			
E_e^d	Electricity Demand	[-1.2, -0.5]	Ranges reflect findings for emerging Asian economies (ERIA, 2014; Labandeira et al., 2017).
E_c^s	Coal Supply (Domestic/Regional)	[0.5, 1.5]	Reflects the long-run supply elasticity range used in structural equilibrium models of the international steam coal market (e.g., COALMOD-World, EWI Model), accounting for capacity expansion over time. (Trüby & Paulus (2012); Haftendorn & Holz (2010)).
E_e^{Srew}	Renewable Energy Supply	[0.1, 0.5]	Reflects responsiveness of renewable supply; range informed by studies on similar markets (Ye et al., 2020).
E_c^{dc}	Coal Demand from Power	[-0.5, -0.1]	Reflects the power sector's responsiveness to coal prices (Ye et al., 2020; ERIA, 2014).
E_c^{dotr}	Coal Demand from Other Industries	[-0.5, -0.1]	Accounts for intersectoral leakage risk (Bi et al., 2023; Labandeira et al., 2017).
E_c^{de}	Coal Demand from Power (Cross-Price)	[0.05, 0.3]	Reflects the responsiveness of coal demand to changes in electricity prices (Ye et al., 2020).

Table A02: Market Share

Description	Parameter	
	ω (Omega)	ϕ (Phi)
	Coal share in Electricity Supply	Power sector share in Coal Demand
Indonesia	[0.65, 0.70]	[0.55, 0.75]
Malaysia	[0.35, 0.45]	[0.60, 0.75]
Philippines	[0.55, 0.65]	[0.65, 0.80]
Thailand	[0.15, 0.20]	[0.50, 0.65]

Vietnam	[0.45, 0.55]	[0.50, 0.70]
Source (Market Shares)	Based on recent national energy statistics (IEA, 2023; Ember, 2023; National statistics).	Reflects the balance of power sector and industrial coal consumption (IEA, 2023).

Step 3 & 4: Uncertainty Analysis and Statistical Conservatism

3.1.4 | A Monte Carlo simulation (10,000 iterations) was performed for each country using the ranges in Table A01, assuming uniform distributions for all parameters. To ensure conservatism, the 90th percentile of the resulting distribution was adopted as $LR_{default}$.

Table A03: Simulation Results

Country	Mean Leakage Rate	90th Percentile (Adopted as $LR_{default}$)
Indonesia	23.3%	34.1%
Malaysia	23.1%	33.9%
Philippines	22.6%	33.4%
Thailand	23.6%	34.4%
Vietnam	23.0%	33.6%

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