

VCS Methodology

VM0052

ACCELERATED RETIREMENT OF COAL- FIRED POWER PLANTS USING A JUST TRANSITION

Version 1.1

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Sectoral Scope 1: Energy Supply

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1 SUMMARY DESCRIPTION

Project Category	Renewable energy generation and fuel switch
Project Activity Type	Energy transition
Additionality	Project method
Crediting Baseline	Project method
Mitigation Outcome	Reductions

This methodology determines net greenhouse gas (GHG) emission reductions resulting from the accelerated retirement of grid-connected coal-fired power plants (CFPPs) paired with the addition of renewable electricity to partially or fully replace the lost electricity capacity.

Project proponents must use this methodology in conjunction with VCS module *VMD0061 Just Transition Requirements for Accelerated Retirement of Coal-fired Power Plants* to ensure that projects are accompanied by a comprehensive, just transition plan and implementation. The just transition mitigates negative impacts of accelerated retirement of CFPPs such as loss of livelihoods of workers, their households, contractors, and communities. This methodology is globally applicable.

2 SOURCES

This methodology uses the following VCS modules and tools:

- *VMD0060 Combined Baseline and Additionality Assessment for Accelerated Retirement of Coal-fired Power Plants*
- *VMD0061 Just Transition Requirements for Accelerated Retirement of Coal-fired Power Plants*
- *VT0011 Electricity System Emission Factors*
- *VMR0017 Grid-connected Electricity Generation from Renewable Sources*

This methodology uses the following CDM methodologies and tools:

- *ACM0001 Flaring or Use of Landfill Gas*

- *ACM0006 Electricity and Heat Generation from Biomass*
- *ACM0014 Treatment of Wastewater*
- *ACM0022 Alternative Waste Treatment Processes*
- *TOOL15 Upstream Leakage Emissions Associated With Fossil Fuel Use*

This methodology is based on the following sources:

- *CDM AM0019 Renewable Energy Projects Replacing Part of the Electricity Production of One Single Fossil Fuel Fired Power Plant That Stands Alone or Supplies to a Grid, Excluding Biomass Projects, Version 2.0*
- *RMI. 2022. Guidelines for Financing a Credible Coal Transition*

3 DEFINITIONS

In addition to the definitions set out in the *VCS Program Definitions*, the following definitions apply to this methodology.

Accelerated retirement

The ceasing of operations, decommissioning of equipment, and remediation of a coal-fired power plant earlier than would have occurred in the absence of the project activity

Accelerated retirement date

The date on which the coal-fired power plant relevant to the project ceases operation because of the project activities.

Baseline retirement date

The date on which the coal-fired power plant relevant to the project would have been retired due to technical, regulatory, or economic drivers, in the absence of the project activity

Coal-fired power plant (CFPP)

An installation that generates electric power from coal combustion. Several power units at one site may comprise one power plant, whereas a power unit is characterized by the fact that it can operate independently from other power units at the same site. A single unit of the power plant may also be referred to as a coal-fired power plant (CFPP). Plants operating as combined heat and power plants and plants with mixed fuels (e.g., biomass, waste) are not included.

Commitment date

The date on which the project proponent commits to retire the coal-fired power plant that is relevant to the project. Listed in descending order of preference, this is based on the date on which the project proponent terminates:

- long-term power purchase agreements (PPAs) or electricity supply agreements with the utility,
- long-term coal supply contracts, or
- operating agreements with the plant operator.

Deregulated electricity market

An electricity market in which market participants (independent power producers) other than the system operator own power plants. In a deregulated market, the independent power producers sell electricity to the wholesale market, typically to an off-taker or retail energy supplier that provides electricity to end customers. Such markets allow for price competition and choice of electricity supplier.

Grid

In this methodology, the electricity system that connects the project coal-fired power plant to other power plants and consumers through transmission and distribution lines in the host country. The grid extent is limited to the smaller of that which is managed by a single balancing pool operator, system operator, or the national jurisdictional border within which the project activity occurs.

Independent power producer (IPP)

A legal entity or instrumentality that owns facilities for the generation of electricity and sells electricity to an electric utility under a power purchase agreement. In this methodology, an IPP is understood to include all members of an IPP consortium, including their parent or holding companies, and when an IPP is, or when an IPP consortium has among its members, a state-owned company such as in a public-private partnership, the host country.

Just transition (JT)

A set of principles, processes, and practices that aim to ensure that no people, workers, places, sectors, countries, or regions are left behind in the transition from a high-carbon to a low-carbon economy.¹

Just transition plan

A set of criteria and procedures developed using VCS module VMD0061 *Just Transition Requirements for Accelerated Retirement of Coal-fired Power Plants* that ensure stakeholder inclusion, fair representation, transparency, and mitigation of negative impacts on livelihoods and the environment, in the implementation of accelerated retirement of coal-fired power plants

¹ Taken from Intergovernmental Panel on Climate Change (IPCC). (2022). *Climate Change 2022: Mitigation of Climate Change*. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. <https://www.ipcc.ch/report/ar6/wg3/>

Mine-mouth power plant

A coal-fired power plant that is constructed and operates near a coal mine, where the coal-fired power plant is the anchor buyer of the coal from the mine and the coal is transported directly to the coal-fired power plant (e.g., via a conveyor belt).

Mothballed power plant

A coal-fired power plant that has been deactivated or put into an inactive state and could return to operation.

Off-taker

An entity that has a power purchase agreement with the independent power producer for all or part of the electricity produced, for self-consumption or sale to another consumer. In the case of a regulated market, only the system operator acts as the off-taker.

Paired renewable electricity

Electricity generated by a grid-connected renewable energy power plant that is newly operationalized or operationalized earlier than planned, as a result of the accelerated retirement and to replace lost generation capacity, and that is paired with the project using an applicable pairing pathway.

Power purchase agreement (PPA)

A contract between an independent power producer and an off-taker. In this methodology, power purchase agreements:

- refer to agreements in which the off-taker is a utility or electricity system operator or a distribution company or power trader.
- are considered long-term where the term of the PPA is at least 20 years.

Regulated electricity market

An electricity market with an integrated utility company that is the system operator, owns the power system transmission and distribution (including all associated infrastructure), and generates and/or purchases wholesale electricity from independent power producers to sell to customers. The market is overseen by a public regulator with the authority and mandate to ensure consumers have access to reliable electricity at a reasonable cost.

Regulated utility

An integrated utility company that is the system operator, owns the power system transmission and distribution (including all associated infrastructure), and may generate or purchase wholesale electricity from independent power producers to sell to customers. A regulated utility is overseen by a public regulator with rate-making authority, mandated to provide consumers with access to reliable electricity at a reasonable cost.

Regulatory-determined reserve margin target

The minimum reserve margin (expressed as a percentage) mandated by the regulatory authority responsible for the grid, to meet a specific grid reliability target or simply to ensure grid reliability

Reserve margin

The unused and available generation capacity of an electric power system at peak load as a percentage of the electric power system's total supply capacity.² When availability of capacity varies or some generation capacity is not available during hours of expected peak load, a weighted average may be used.

System operator

Entity responsible for day-to-day electricity grid management and operations, including scheduling and dispatching electricity from power plants while coordinating use of the transmission system. Irrespective of the nature and structure of the electricity market, the system operator typically remains independent. In a regulated market, the system operator acts as the single buyer (off-taker) of electricity from independent power producers and provides electricity to different consumers. In a deregulated market, the system operator ensures non-discriminatory access to the transmission system for independent power producers to provide electricity to their respective off-takers and consumers.

4 APPLICABILITY CONDITIONS

This methodology is applicable to project activities that reduce GHG emissions through the accelerated retirement of grid-connected CFPPs paired with renewable electricity.

4.1 Just Transition

This methodology is applicable under the following conditions related to just transition:

- 1) A just transition plan developed in accordance with VMD0061 is available at the time of validation of the project description.
- 2) The plan in Section 4.1(1) is fully funded through sources other than the revenues generated from the sale of Verified Carbon Units (VCUs).

4.2 CFPP Retirement

This methodology is applicable under the following conditions related to CFPP retirement:

² Adapted from US Energy Information Administration.
[https://www.eia.gov/tools/glossary/index.php?id=reserve_margin#:~:text=Reserve%20margin%20\(operating\)%3A%20The,a%20percentage%20of%20total%20capability](https://www.eia.gov/tools/glossary/index.php?id=reserve_margin#:~:text=Reserve%20margin%20(operating)%3A%20The,a%20percentage%20of%20total%20capability)

- 3) CFPP construction began prior to 31 December 2021.³
- 4) Where in a regulated electricity market, the CFPP is owned by either a regulated utility or an independent power producer (IPP).
- 5) The CFPP has a single long-term (at least 20 years) power purchase agreement (PPA) fully executed prior to 31 December 2023:
 - a) in a regulated electricity market, with a system operator or a regulated utility off-taker.
 - b) in a deregulated electricity market, with an eligible counterparty with obligations as a load-serving entity, such as a distribution company, power trader, government agency, or power retailer.
- 6) At validation and at the accelerated retirement date, the CFPP has positive annual net income after tax over the three (3) most recent years and positive fair value, determined using a methodology that meets International Financial Reporting Standards for accounting (e.g., *IFRS 13 Fair Value Measurement*).
- 7) At validation and prior to its accelerated retirement, the CFPP has demonstrated use (i.e., positive capacity factor) for the five (5) most recent years.
- 8) At validation, where the CFPP is owned by a state-owned utility company, both the utility and the host country have a publicly available commitment to not build new CFPPs and to not increase existing CFPP capacity in their jurisdiction.
- 9) At validation, where the CFPP is owned by an IPP, the IPP has a publicly available commitment to not build new CFPPs, and to not increase existing CFPP capacity under their control.
- 10) For all projects, the system operator has issued a letter that includes:
 - a) Confirmation that the renewable electricity pairing plan of the project will avoid material negative effects on consumer prices, access to electricity, and grid stability.
 - b) The analysis that underlies the confirmation of the pairing plan, including but not limited to a rate impact analysis and a reliability assessment that follows:

³ This date coincides with the adoption of the Glasgow Climate Pact at the 26th United Nations Framework Convention on Climate Change Conference of the Parties (UNFCCC COP 26), which includes the phaseout and phase-down of fossil fuel. This threshold is set to prevent the eligibility of new CFPPs that were developed with the expectation that carbon finance would be available in the future to enable their retirement (i.e., preventing perverse incentives). The COP26 outcome is available here: https://unfccc.int/sites/default/files/resource/cma2021_10_add1_adv.pdf

- i) an existing assessment process of the system operator, or where none is in place,
 - ii) a reliability standard relevant to the jurisdiction in which the grid is located, or where none exists,
 - iii) an international standard.
- c) A description of KPIs, how they are monitored, and a commitment to make available the data required for the project proponent to implement the monitoring plan in Section 10.3.5 of this methodology.

In cases where a utility is the project proponent, the letter must be issued by an independent system operator.

11) At validation, the host country's most recent Nationally Determined Contribution (NDC) includes at least one (1) of the following:⁴

- a) Power sector-wide decarbonization targets, either as absolute targets or intensity-based targets.
- b) An increased share of renewable energy in the total electricity mix, either as an absolute increase in renewable energy capacity or as a percentage of renewable energy in the grid.

12) At validation, the host country has either:

- a) submitted a long-term low greenhouse gas emission development strategy (LT-LEDS)⁵ to the UNFCCC, or
- b) published a power sector, energy transition, or economy-wide decarbonization strategy or policy that supports the transition towards a less carbon-intensive economy.

This methodology is not applicable under the following conditions:

- 13) The CFPP is deactivated or repurposed to continue to combust fossil fuels, including co-firing biomass with coal or gas.

4.3 Paired Renewable Electricity

This methodology is applicable under the following conditions related to paired renewable electricity:

⁵ LT-LEDS can be accessed here: <https://unfccc.int/process/the-paris-agreement/long-term-strategies>

- 14) The project proponent has committed to a renewable electricity pairing plan under which new renewable electricity facilities:
- a) Export electricity to the grid, and
 - b) Collectively provide annual electricity generation, determined on a P90 basis, equivalent to either:
 - i. 100% of the retired CFPP annual energy generation by the end of the total crediting period, or
 - ii. The quantity required by the system operator.
- 15) The renewable electricity pairing plan referred to in applicability condition (14) must:
- a) Identify each paired facility by name, type, capacity, location, P90 annual net energy generation, and pairing pathway as listed in applicability condition (17);
 - b) Define a schedule of milestones sufficient to assess progress towards renewable generation requirements and safeguard against negative impacts on the grid as described in applicability condition (10)a). The schedule must, at minimum, include annual development milestones, the facility commissioning date, and annual generation milestones; and
 - c) Provide the results of an assessment of actual or potential conflicts of interest between the system operator and the project proponent, including the measures in place to manage and mitigate any identified conflicts.
- 16) The paired renewable electricity is generated by one (1) or a combination of the following sources:
- a) Solar power plant with or without battery energy storage systems (BESS)
 - b) On-shore and/or offshore wind power plant with or without BESS
 - c) Hydropower plant (run-of-river or individual plant net output capacity limited to 15 MW)
 - d) Geothermal power plant
 - e) Tidal/wave power plant
 - f) Landfill gas power plant
 - g) Biogas power plant, including biogas from wastewater treatment
 - h) The organic fraction of industrial or municipal wastes, biomass from waste, or a biomass feedstock that meets the requirements of Appendix 1 in VCS module VMD0059 *CO₂ Capture from Bioenergy* or the VCS tool that supersedes VMD0059 at one of the following:
 - i) Waste-to-energy (WtE) power plant
 - ii) Biomass-fired power plant

17) Pairing of renewable electricity is publicly acknowledged (i.e., published), included in an agreement between the proponent and the renewable electricity developer, and is done through one (1) of the following pairing pathways:

- a) Contractual pairing: A new or revised coal-fired power plant (CFPP) power purchase agreement (PPA) covers new renewable electricity generation capacity.
- b) Financial pairing: The conditions for refinancing a CFPP for retirement require new renewable electricity generation capacity.
- c) On-site pairing: New renewable electricity generation capacity is developed at the CFPP site and uses existing grid connection or balance of plant components.
- d) Regulatory pairing: A regulator approves new renewable electricity generation capacity (that was not part of the counterfactual plans) as an explicit replacement for retired CFPP generation capacity.

18) Agreements between renewable electricity developers and the project proponent for paired electricity must include assurances from the power plant operator that they will not register the renewable power plant with the VCS, another GHG program, or otherwise seek to generate credit, or other forms of environmental attributes, for the quantity of renewable energy supplied under the agreement.

Note – Changes to the project description to include new renewable electricity power plants are acceptable and subject to the requirements of the applicable version of the VCS Standard at the time the changes are submitted. However, changes in technology (e.g., solar photovoltaic instead of wind) at previously identified plants are not permitted.

5 PROJECT IMPLEMENTATION

5.1 Project Start Date

The project start date must be established in accordance with the applicable versions of the *VCS Standard* and *VCS Program Definitions*.

When determining the project start date, the following types of actions must be considered, as applicable:

- 1) Signing contracts for goods and services related to the shutdown and/or decommissioning of the CFPP
- 2) Signing agreements for paired renewable electricity described in Section 4.3

5.2 Initial Crediting Period Start Date

The initial crediting period start date is the accelerated retirement date, i.e., the date on which the coal-fired power plant relevant to the project ceases operation because of the project activities.

5.3 Crediting Period Renewal

Project proponents must follow the procedures for renewal of the crediting period in accordance with the applicable version of the VCS Program rules.

When demonstrating the validity of the original baseline scenario or updating the baseline scenario, the baseline retirement date must be reassessed in accordance with the criteria and procedures of the baseline and additionality assessment module for the type of power plant relevant to the project listed in Section 2.

The baseline retirement date for the CFPP is the earliest date of the following scenarios:

- a) Scenarios that must be reassessed and updated at crediting period renewal:
 - i) Regulatory CFPP phaseout date
 - ii) Committed coal transition mechanism (CTM)
 - iii) Financially attractive retirement
- b) Scenarios that are determined at validation and not reassessed at crediting period renewal:
 - i) End of technical life
 - ii) End of long-term PPA

The updated baseline retirement date for the CFPP applicable for the next crediting period will depend on the results of the reassessment of the applicable scenarios:

- Where the baseline retirement date reassessment does not result in a different date, the baseline retirement date remains the same as in the previous crediting period.
- Where the baseline retirement date reassessment results in a later date (e.g., due to a delay in regulatory phaseout or CTM commitments), the baseline retirement date remains the same as in the previous crediting period.
- Where the baseline retirement date reassessment results in an earlier date (e.g., because the regulatory commitment has advanced), the baseline retirement date for the next crediting period is the earlier date. In this case, the duration of the crediting period must be updated, and the crediting period will terminate at the new baseline retirement date or at the maximum crediting period permitted under the applicable version of the VCS *Standard*, whichever is earlier.

5.3.1 Crediting period

The crediting period is the shorter of the following:

- a) The default crediting period in accordance with the applicable version of the VCS *Standard*
- b) The period between the CFPP's accelerated retirement date (i.e., date by which the CFPP has been decommissioned) and the baseline retirement date

Example 1: The initial crediting period is five (5) years, and the difference between the accelerated retirement date and the baseline retirement date is three (3) years. In such a scenario, the project is eligible to be issued VCUs for three (3) years and not five (5) years.

Example 2: The total crediting period for this project type is 15 years (five (5) years, renewable twice), and the difference between the accelerated retirement date and the baseline retirement date is 25 years. In such a scenario, the project is eligible to be issued VCUs for 15 years provided it complies with all rules and requirements applicable at each renewal of the crediting period.

5.4 Methodology Transition

Projects that transition from other methodologies to VM0052 must apply this methodology in full and follow the VCS *Program* rules.

6 PROJECT BOUNDARY

The spatial extent of the project boundary encompasses the CFPP to be retired and, where applicable, the emissions from the operation of paired renewable electricity sources.

Sources of leakage that must be quantified are all the power plants/units connected to the grid that would compensate for electricity generation that is not produced by the retired CFPP and is not covered by paired renewable electricity capacity. Other leakage emissions are associated with certain paired renewable electricity sources.

The GHG sources included in or excluded from the project boundary are shown in Table 1.

Table 1. GHG sources associated with baseline, project, and leakage emissions

Source		Type	Gas	Included?	Justification/Explanation
Baseline	CFPP electricity generation	Source	CO ₂	Yes	Major source
			CH ₄	No	Conservative to exclude
			N ₂ O	No	Conservative to exclude
			Other	No	N/A

	Source	Type	Gas	Included?	Justification/Explanation
	CFPP decommissioning	Source	CO ₂	No	The CFPP is decommissioned in the baseline and in the project, with the only difference being the timing of that event and therefore the emissions are equivalent.
			CH ₄		
			N ₂ O		
			Other		
	Construction of renewable electricity power plant(s)	Source	CO ₂	No	Embodied emissions associated with construction of paired renewable electricity facilities are accounted for as leakage in Section 9.3.4 and are therefore not quantified separately as baseline emissions.
			CH ₄		
			N ₂ O		
			Other		
Project	CFPP decommissioning	Source	CO ₂	No	The CFPP is decommissioned in the baseline and in the project, with the only difference being the timing of that event and therefore the emissions are equivalent.
			CH ₄		
			N ₂ O		
			Other		
	Construction of renewable electricity power plant(s)	Source	CO ₂	No	Emissions from the construction of paired renewable electricity facilities are accounted for as leakage in Section 9.3.4 and are therefore not quantified separately as project emissions.
			CH ₄		
			N ₂ O		
			Other		
	Electricity production by new renewable sources	Source	CO ₂	Yes	Must be considered for landfill gas, geothermal, hydro, biomass thermal, wastewater, and waste-to-energy plants. Not considered for other eligible renewable electricity sources.
			CH ₄	Yes/No	Depending on the renewable electricity technology and the relevant CDM methodology referenced in Section 9.2.
			N ₂ O	No	De minimis
			Other	No	N/A
Leakage	Electricity sourced from the grid	Source	CO ₂	Yes	Major source
			CH ₄	Yes	Upstream methane emissions considered for gas-fired power

Source		Type	Gas	Included?	Justification/Explanation
					plants where incremental gas is burned to compensate for retired CFPP electricity generation
			N ₂ O	No	De minimis
			Other	No	De minimis
	Paired renewable electricity sources	Source	CO ₂	Yes/No	Depending on the renewable electricity technology and the relevant CDM methodology referenced in Section 9.3.4.
			CH ₄	Yes/No	Depending on the renewable electricity technology and the relevant CDM methodology referenced in Section 9.3.4.
			N ₂ O	No	De minimis
			Other	No	De minimis

7 BASELINE SCENARIO

This methodology uses the project method to determine the baseline scenario. Project proponents must apply the baseline and additionality assessment module for the type of power plant relevant to the project, as listed in Section 2, to determine the baseline scenario and baseline retirement date of the CFPP.

The end of the baseline scenario is the earliest of the following:

- 1) The baseline retirement date, as determined by the relevant baseline and additionality assessment module
- 2) Where the CFPP is owned by a utility, the date on which the jurisdiction reneges on its no new coal commitment, either explicitly through an announcement or implicitly through the permitting of a new CFPP
- 3) Where the CFPP is owned by an IPP, the date on which the IPP reneges on its no new coal commitment, either explicitly through an announcement or implicitly through application for permits for a new CFPP anywhere globally

8 ADDITIONALITY

Additionality is demonstrated using the project method outlined in the baseline and additionality assessment module for the type of power plant relevant to the project, as listed in Section 2 of this methodology.

9 QUANTIFICATION OF REDUCTIONS AND REMOVALS

9.1 Baseline Emissions

The baseline emissions are the GHG emissions from the operation of the CFPP between the accelerated retirement date and the baseline retirement date. They are calculated for each year y of the crediting period (see Appendix 1 for information on project start date and crediting period) as follows:

$$BE_y = EG_{BL\ CFPP_y} \times EF_{BL_y} \quad (1)$$

Where:

BE_y	=	Baseline emissions in year y (t CO ₂)
$EG_{BL\ CFPP_y}$	=	Baseline net electricity generated by the CFPP and supplied to the grid in year y (MWh)
EF_{BL_y}	=	Baseline emission factor for the CFPP in year y (t CO ₂ /MWh)

Baseline net electricity generated and supplied in year y ($EG_{BL\ CFPP_y}$) must be determined as follows:

$$EG_{BL\ CFPP_y} = CAP_{CFPP} \times CUF_{BL} \times 8760 \quad (2)$$

Where:

$EG_{BL\ CFPP_y}$	=	Baseline net electricity generated by the CFPP and supplied to the grid in year y (MWh)
CAP_{CFPP}	=	Net installed generation capacity of the CFPP being retired (MW)
CUF_{BL}	=	Historical capacity utilization factor of the CFPP (dimensionless)
8760	=	Number of hours in one year

The capacity utilization factor is determined as follows:

$$CUF_{BL} = \min \left(\left(\frac{EG_{3y Val}}{CAP_{CFPP} \times T}, \frac{EG_{3y AR}}{CAP_{CFPP} \times T}, \frac{EG_{5y Val}}{CAP_{CFPP} \times T}, \frac{EG_{5y AR}}{CAP_{CFPP} \times T} \right), CUF_{ref} \right) \quad (3)$$

Where:

CUF_{BL}	=	Historical capacity utilization factor of the CFPP (dimensionless)
$EG_{3y Val}$	=	Net electricity delivered to the grid by the CFPP in the three-year period preceding validation (MWh)
$EG_{3y AR}$	=	Net electricity delivered to the grid by the CFPP in the three-year period preceding the accelerated retirement date (MWh)
$EG_{5y Val}$	=	Net electricity delivered to the grid by the CFPP in the five-year period preceding validation (MWh)
$EG_{5y AR}$	=	Net electricity delivered to the grid by the CFPP in the five-year period preceding the accelerated retirement date (MWh)
CAP_{CFPP}	=	Net installed generation capacity of the CFPP being retired (MW)
CUF_{ref}	=	Average capacity utilization factor of at least two (2) reference CFPPs (dimensionless)
T	=	Hours in the period selected in the numerator (net electricity generation period); equal to 26 280 for three (3) years and 43 800 for five (5) years (hours)

The average capacity utilization factor must be determined using the following equation:

$$CUF_{ref} = \frac{EG_{ref}}{CAP_{ref} \times 8760} \quad (4)$$

Where:

CUF_{ref}	=	Average capacity utilization factor of at least two (2) reference CFPPs (dimensionless)
EG_{ref}	=	Average net electricity generation of at least two (2) reference CFPPs (MWh)
CAP_{ref}	=	Net installed generation capacity of the reference plants (MW)
8760	=	Number of hours in one year

The baseline emission factor (EF_{BL-y}) is determined using the equation below:

$$EF_{BL,y} = (FC_c \times NCV_c \times EF_{CO2,c}) / EG_{CFPP} \quad (5)$$

Where:

$EF_{BL,y}$	=	Baseline emission factor for the CFPP in year y (t CO ₂ /MWh)
FC_c	=	Quantity of coal fired in the CFPP (mass unit)
NCV_c	=	Weighted average net calorific value of coal used in the CFPP (GJ/mass unit)
$EF_{CO2,c}$	=	CO ₂ emission factor of coal used in the CFPP (t CO ₂ /GJ)
EG_{CFPP}	=	Historical quantity of electricity generated and supplied to the grid by the CFPP (MWh)

9.2 Project Emissions

Project emissions are those that are emitted from renewable electricity capacity that is demonstrated to be paired with the accelerated retirement of the CFPP. Project emissions are calculated as follows:

$$PE_y = \sum_i PE_{RE_{i,y}} \quad (6)$$

Where:

PE_y	=	Project emissions in year y (t CO ₂ e)
$PE_{RE_{i,y}}$	=	Project emissions from operation of paired renewable electricity power plant i in year y (t CO ₂ e)

Generation of electricity from solar photovoltaic, wind (on-shore/offshore), tidal, and wave sources does not emit GHGs during the project. Other renewable electricity types emit GHGs and these must be quantified as applicable, using the following methodologies:

- Project emissions from electricity generation from landfill gas: *ACM0001 Flaring or Use of Landfill Gas*
- Project emissions from geothermal and hydropower: *VMR0017 Grid-connected Electricity Generation From Renewable Sources*
- Project emissions from biomass-fired power plant: *ACM0006 Electricity and Heat Generation From Biomass*
- Project emissions from wastewater treatment: *ACM0014 Treatment of Wastewater*
- Project emissions from waste-to-energy power plant: *ACM0022 Alternative Waste Treatment Processes*

9.3 Leakage Emissions

Leakage emissions are calculated as follows:

$$LE_y = \left\{ \text{MAX} \left[0, (EG_{BL\ CFPP,y} - EG_{MB,y} - \sum_i EG_{RE_{i,y}}) \right] \times EF_{OM,y} \right\} + (EG_{MB,y} \times EF_{MB,y}) + LE_{RE_{i,y}} \quad (7)$$

Where:

- LE_y = Leakage emissions in year y (tCO₂e)
- $EG_{BL\ CFPP,y}$ = Baseline net electricity generated by the CFPP and supplied to the grid in year y (MWh)
- $EG_{MB,y}$ = Electricity generated by coal-fired power plants that were mothballed prior to the project activity, and operated in year y (MWh)
- $EG_{RE_{i,y}}$ = Net electricity generated and supplied to the grid by paired renewable electricity power plant i in year y (MWh)
- $EF_{OM,y}$ = Operating margin emission factor in year y (tCO₂e/MWh)
- $EF_{MB,y}$ = Emission factor for coal-fired power plants that were mothballed prior to the project activity, and operated in year y ; use sub-critical coal-fired power emission factor (tCO₂e/MWh)
- $LE_{RE_{i,y}}$ = Leakage emissions from paired renewable electricity power plant i in year y (tCO₂e)

9.3.1 Paired Renewable Electricity Generation ($EG_{RE_{i,y}}$)

For a renewable electricity power plant that meets the applicable pairing requirements and is operationalized earlier than planned as a result of the accelerated retirement, only net electricity generated and supplied to the grid from its actual operational start date up to, but excluding, its baseline scenario operational start date may be included in $EG_{RE_{i,y}}$.

The baseline scenario operational start date must be demonstrated using the relevant baseline and additionality assessment module under this methodology. Generation on or after that date must not be included in $EG_{RE_{i,y}}$.

9.3.2 Operating Margin Emission Factor ($EF_{OM,y}$)

The operating margin emission factor is determined as the higher of the values⁶ obtained using the following two (2) approaches:

⁶ Choosing the higher value from these two (2) approaches helps ensure conservative estimation in cases where carbon-intensive fossil fuel-fired power plants in the reserve margin generate disproportionately more during the project activity than the baseline.

- 1) Approach 1: the simple generation-weighted average for each year using VCS tool *VT0011 Electricity System Emission Factors*
- 2) Approach 2: the capacity-weighted average for all plants that generated electricity during the year, using the annual average emission factor for each respective plant as determined in Approach 1

Under both approaches, the emission factor must be determined using all power plants connected to the grid, excluding low-cost/must-run (LCMR) electricity sources. LCMR electricity sources include renewables and nuclear. All fossil fuel power plants that generated electricity for the grid, including CFPPs, must be included in the operating margin calculation.

9.3.3 Inclusion of Upstream Methane Leakage in Gas-Fired Power Plants

The operating margin emission factor ($EF_{OM,y}$) must account for upstream methane leakage emissions associated with power generation at gas-fired power plants, determined using CDM *TOOL15 Upstream Leakage Emissions Associated With Fossil Fuel Use*. Upstream methane leakage emissions must be determined per GJ of gas consumed at the relevant gas-fired power plants and added to the CO₂-equivalent emission factor of each such plant before determining $EF_{OM,y}$ under Approach 1 and Approach 2 in Section 9.3.2.

9.3.4 Leakage Emissions from Paired Renewable Electricity ($LE_{RE,i,y}$)

Emissions must be quantified as applicable according to the following equation:

$$LE_{RE,i,y} = LE_{RE-OP,i,y} + LE_{RE-EM,i,y} + LE_{HP,i,y} \quad (8)$$

Where:

$LE_{RE,i,y}$	=	Leakage emissions from paired renewable electricity power plant i in year y (t CO ₂ e)
$LE_{RE-OP,i,y}$	=	Leakage emissions from operating paired renewable electricity power plant i in year y (t CO ₂ e)
$LE_{RE-EM,i,y}$	=	Leakage emissions from embodied emissions due to renewable electricity power plant i in year y (t CO ₂ e)
$LE_{HP,i,y}$	=	Leakage emissions from water reservoirs of hydro power plants and pumped storage projects determined using section 47 of ACM0002: <i>Grid-connected electricity generation from renewable sources</i> , in conjunction with updated reservoir emission factors (EF_{RES}) in VMR0017.

Proponents must determine $LE_{RE-OP,i,y}$ for the following renewable electricity sources using the following CDM methodologies:

- Leakage emissions from biomass-fired power plant: *ACM0006 Electricity and Heat Generation From Biomass*

- Leakage emissions from wastewater treatment: *ACM0014 Treatment of Wastewater*
- Leakage emissions from waste-to-energy power plant: *ACM0022 Alternative Waste Treatment Processes*

For other renewable electricity sources, $LE_{RE-OP,i,y}$ may be assumed to be zero (0).

Leakage from embodied emissions includes emissions related to construction, off-site operations, and decommissioning of the power plant. Studies have shown these emissions most prominently relate to transport of equipment, people, and expendables to the project site or to upstream manufacturing facilities. These emissions are spread over the construction, operating life, and decommissioning phases of the renewable power plant, and can be parameterized using net generation output of a renewable plant as an estimation technique.

Embodied emissions are determined using Equation (9):

$$LE_{RE-EM,i,y} = EG_{RE,i,y} \times EF_{embodied} \times 10^{-3} \quad (9)$$

Where:

$LE_{RE-EM,i,y}$	= Leakage emissions from embodied emissions due to renewable electricity power plant i in year y (tCO ₂ e)
$EG_{RE,i,y}$	= Net electricity generated and supplied to the grid by paired renewable electricity power plant i in year y (MWh)
$EF_{embodied}$	= Emission factor of the embodied emissions of the renewable energy generation plant (gCO ₂ e/kWh)

9.4 Net Reductions and Removals

The net GHG emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \quad (10)$$

Where:

ER_y	= GHG emission reductions in year y (t CO ₂ e)
BE_y	= Baseline emissions in year y (t CO ₂)
PE_y	= Project emissions in year y (t CO ₂ e)
LE_y	= Leakage emissions in year y (t CO ₂ e)

9.5 Uncertainty Assessment

The primary sources of uncertainty arise from the quantification of electricity that would have been supplied to the grid by the CFPP and the emission factors of electricity production, both from the CFPP and the incremental output from grid-connected power plants.

The baseline electricity production uncertainty is addressed through conservative underestimation. This is done by incorporating two reference CFPPs that dynamically represent comparable coal operations in the country and setting the value as the minimum between dynamic CFPPs and the historical generation of the retired power plant.

The emission factor of the CFPP is based on historical data on fuel consumption and electricity generation. Both have very low uncertainty given the typical measurement methods in industry and because they serve commercial transactions. The net calorific value and fuel emission factor also have low uncertainty. The effective heat rate (fuel consumed per MWh produced) of the CFPP is determined at validation (set through FC_c) and remains constant, which is conservative given the expected decrease in efficiency as the plant would have aged.

The emission factor of the incremental output from grid-connected power plants is conservative given the inclusion of potential mothballed coal-fired power plants, the requirement to apply simple operating margin (which is always higher than simple adjusted or average), and the requirement to account for upstream methane leakage emissions associated with power generation.

Uncertainty associated with the paired renewable electricity power plants is estimated to be less than 1% given the accuracy of the meters and commercial transactions involved.

Project and leakage emissions are expected to be zero (0) or low depending on the technology. While some of the parameters may have individual uncertainty (e.g., those related to methane emissions), the overall impact in absolute terms would be minor.

The overall uncertainty is estimated to be less than 10%, and no discount for quantification of uncertainty is necessary. An assessment of uncertainty in the baseline retirement date is included in VCS module *VMD0060 Combined Baseline and Additionality Assessment for Accelerated Retirement of Coal-fired Power Plants*.

10 MONITORING

In addition to the parameters in Sections 10.1 and 10.2, all relevant parameters from the applicable methodologies, modules, and tools used in conjunction with this methodology must be included.

10.1 Data and Parameters Available at Validation

Data/Parameter	CAP_{CFPP} CAP_{ref}
Data unit	MW

Description	Net installed generation capacity of the CFPP being retired Net installed generation capacity of the reference plants
Equations	(2), (3) (4)
Source of data	Project proponent records or those of the grid administrator or operation if different than the project proponent
Value applied	As per project proponent and CFPP records
Justification of choice of data or description of measurement methods and procedures applied	Project proponent (IPP or utility) will have the relevant data.
Purpose of data	Calculation of baseline emissions
Comments	This is the maximum electrical output capacity available for grid supply at the plant's connection to the transmission system, excluding any losses or reductions from turbines, plant output, or other stages. Other factors that limit the CFPP's capacity, such as regulatory caps, must also be considered.

Data/Parameter	$EG_{3y Val}$ $EG_{5y Val}$ $EG_{3y AR}$ $EG_{5y AR}$
Data unit	MWh
Description	Net electricity delivered to the grid by the CFPP in the three-year period preceding validation Net electricity delivered to the grid by the CFPP in the five-year period preceding validation Net electricity delivered to the grid by the CFPP in the three-year period preceding the accelerated retirement date Net electricity delivered to the grid by the CFPP in the five-year period preceding the accelerated retirement date
Equations	(3)
Source of data	Direct measurements using electricity meter at the grid interface, project proponent records
Value applied	Net annual average generation supplied to the grid over the monitoring period

Justification of choice of data or description of measurement methods and procedures applied	<p>Use electricity meters installed at the grid interface for electricity exported to the grid. The electricity meter must have been subject to regular maintenance and testing in accordance with the stipulation of the meter supplier and/or as per the requirements set by the system operators or national requirements.</p> <p>Meters must be calibrated in accordance with national standards or requirements set by the meter supplier or requirements set by the system operator.</p> <p>Meter accuracy class must be in accordance with requirements set by the grid operator or national bodies.</p>
Purpose of data	Calculation of baseline emissions
Comments	None

Data/Parameter	FC_c
Data unit	mass unit (e.g., tonne, kg)
Description	Quantity of coal fired in the CFPP
Equations	(5)
Source of data	On-site records
Value applied	Combined five (5) years of coal usage during the five-year period preceding validation, or the five-year period preceding the accelerated retirement date, whichever occurs earlier
Justification of choice of data or description of measurement methods and procedures applied	<p>On-site records are the most appropriate source of data.</p> <p>Monthly (or more frequent) values must be cross-checked with coal purchase invoices for the same period.</p>
Purpose of data	Calculation of baseline emissions
Comments	None

Data/Parameter	$EF_{CO_2,c}$
Data unit	t CO ₂ /GJ
Description	CO ₂ emission factor of coal used in the CFPP

Equations	(5)
Source of data	<p>The following data sources must be used, where available, listed in descending order of priority:</p> <ol style="list-style-type: none"> 1) Values provided by coal supplier 2) Measurement by project proponent 3) Regional or national default values 4) IPCC default values as provided in Table 1.4 of Chapter 1, Vol. 2, <i>2006 IPCC Guidelines for National Greenhouse Gas Inventories</i>, or any more recent refinements as published periodically by IPCC (no refinement in 2019 applies to these values) converted to the appropriate data units listed in this table.
Value applied	As per “Source of data”
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of data	Calculation of baseline emissions
Comments	None

Data/Parameter	NCV _c
Data unit	GJ/mass unit
Description	Weighted average net calorific value of coal used in the CFPP
Equations	(5)
Source of data	<p>The following data sources must be used, where available, listed in descending order of priority:</p> <ol style="list-style-type: none"> 1) Values provided by coal supplier 2) Measurement by project proponent 3) Regional or national default values 4) IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1, Vol. 2 of the <i>2006 IPCC Guidelines for National Greenhouse Gas Inventories</i>, or any more recent refinements as published periodically by IPCC (no refinement in 2019 applies to these values)
Value applied	As per “Source of data”

Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of data	Calculation of baseline emissions
Comments	<p>For (1) and (2), the value of NCV_c must be obtained for each fuel delivery over the five-year period, from which weighted average values must be calculated.</p> <p>Check whether the NCV values under (1), (2), and (3) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the <i>2006 IPCC Guidelines for National Greenhouse Gas Inventories</i>. Where the values are above this range, collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in (1), (2), and (3) should have ISO 17025 accreditation or justify that they can comply with similar quality standards.</p>

Data/Parameter	EG_{CFPP}
Data unit	MWh
Description	Historical quantity of electricity generated and supplied to the grid by the CFPP
Equations	(5)
Source of data	Use the net electricity delivered to the grid by the CFPP in the five-year period preceding validation ($EG_{5yr Val}$), or preceding the accelerated retirement date ($EG_{5yr AR}$), whichever occurs earlier.
Value applied	As per "Source of data"
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of data	Calculation of baseline emissions
Comments	None

Data/Parameter	$EF_{MB,y}$
Data unit	tCO ₂ e/MWh

Description	Emission factor for coal-fired power plants that were mothballed prior to the project activity, and operated in year y ; use sub-critical coal-fired power emission factor
Equations	(7)
Source of data	<p>The following data sources must be used, where available, listed in descending order of priority:</p> <ol style="list-style-type: none"> 1) Values provided by coal supplier 2) Measurement by project proponent 3) Regional or national default values 4) IPCC default values as provided in Table 1.4 of Chapter 1, Vol. 2, <i>2006 IPCC Guidelines for National Greenhouse Gas Inventories</i>, or any more recent refinements as published periodically by IPCC (no refinement in 2019 applies to these values) converted to the appropriate data units listed in this table.
Value applied	As per “Source of data”
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of data	Calculation of baseline emissions
Comments	None

Data/Parameter	$EF_{embodied}$
Data unit	gCO ₂ e/kWh
Description	Emission factor of the embodied emissions of the renewable energy generation plant
Equations	(9)
Source of data	Life Cycle Greenhouse Gas Emissions from Electricity Generation: Update (September 2021) published by NREL ⁷

⁷ Available at: <https://perma.cc/BQ23-EDVB>

Value applied	The value is based on the renewable energy technology type and must be determined as follows:	
	Renewable energy generation technology	Emission factor for embodied emissions (g CO ₂ e/kWh)
	Solar photovoltaic	43
	Wind (onshore and offshore)	13
	Biomass	52
	Geothermal	37
	Hydropower	21
	Ocean energy	8
	Concentration solar power (tower and trough)	28
Justification of choice of data or description of measurement methods and procedures applied	N/A	
Purpose of data	Calculation of leakage emissions	
Comments	For renewable energy generation technologies not included in the table above, the project proponent may use values for credible and reputable sources/literature. The project proponent must justify the chosen value and clearly document its source in the project documents.	

10.2 Data and Parameters Monitored

Data/Parameter	$EG_{ref,y}$ $EG_{MB,y}$
Data unit	MWh
Description	Average net electricity generation of at least two reference CFFPs in year y Electricity generated by coal-fired power plants that were mothballed prior to the project activity, and operated in year y
Equations	(4) (7)
Source of data	System administrator or operator records

Description of measurement methods and procedures to be applied	<p>Reference CFPPs used to determine average value must meet all of the following criteria:</p> <ol style="list-style-type: none"> 1) Unabated CFPP combusting at least 90% coal on a thermal input basis 2) Not a combined heat and power plant 3) No contracted power offtake outside of the system operator 4) Equal or greater nameplate capacity than the CFPP being retired 5) Equal or greater long-run marginal cost than the CFPP being retired, defined as the sum of fuel costs, fixed and variable operating and maintenance costs, and carbon costs (where applicable) per unit of electricity produced. A reference plant may be selected based on the following criteria where the data needed to determine the long-run marginal cost are not available: <ol style="list-style-type: none"> a) The reference CFPP has a similar or lower efficiency technology than the CFPP being retired (technologies are subcritical, supercritical, and ultra-supercritical, listed from least to most efficient). Where no other suitable CFPPs are connected to the grid, a subcritical CFPP must be used as the reference CFPP. b) The reference CFPP uses a similar or lower grade of coal as the CFPP being retired (lignite, subbituminous, bituminous, anthracite, listed from lowest to highest grade). <p>Where there are no CFPPs that meet the above criteria, CUF_{ref} is assumed to decline linearly to 30% at the end of the technical life of the CFPP. Where the project CFPP had a historical capacity factor of less than 30%, in absence of reference CFPPs, it is assumed that the CFPP would run at the same capacity factor (e.g., for seasonally operated plants).</p> <p>All mothballed power plants must be included in $EG_{MB,y}$.</p>
Frequency of monitoring/recording	Annual
QA/QC procedures to be applied	<p>Average of values from the selected reference CFPPs considered and all mothballed CFPPs, to ensure appropriateness and conservativeness</p> <p>Three (3) years of historical reference data from each reference plant selected must be analyzed for electricity market distortions. Distortion events must include at least the following:</p> <ul style="list-style-type: none"> • atypical weather events affecting generation mix (e.g., aberrant rainfall in grid regions with significant hydropower) • significant (more than 10% difference) changes in overall electricity demand from changing economic situation (e.g., recession) • military conflict in the region served by the grid <p>When market distortions have been identified in the historical reference data, a comparison between the reference plant and target retirement plant's performance must be provided. This comparison must highlight any contravariant responses from the plants and in the case where a reference plant's generation during a distortion would lead to over-</p>

	estimation of EG_ref, this plant must be omitted from the calculation of EG-ref during comparable market distortion events during the project.
Purpose of data	Calculation of baseline and leakage emissions
Calculation method	The average is calculated via adding the electricity generation of all the reference CFPPs in year y, divided by the number of CFPPs selected as the reference CFPPs. Simple aggregation is used for generation of mothballed power plants.
Comments	None

Data/Parameter	$EG_{RE,i,y}$
Data unit	MWh
Description	Net electricity generated and supplied to the grid by paired renewable electricity power plant i in year y
Equations	(7)
Source of data	Measurements using electricity meters at the grid interface of the paired renewable electricity generating plant
Description of measurement methods and procedures to be applied	Use calibrated electricity meters from the grid supplier.
Frequency of monitoring/recording	Data must be monitored continuously and recorded at least monthly or with the frequency applicable according to the grid supplier.
QA/QC procedures to be applied	<p>The consistency of metered electricity generation must be cross-checked with receipts from grid operator/utility where applicable.</p> <p>The meters must be calibrated as per manufacturer specifications or industrial specifications.</p> <p>Check contracts or other legally binding agreements such as PPAs to ensure that renewable electricity is paired and generated earlier than it would have been in the baseline scenario.</p>
Purpose of data	Calculation of leakage emissions
Calculation method	<p>For each paired renewable electricity source, this parameter must be either monitored using a bi-directional energy meter or calculated as the difference between:</p> <ol style="list-style-type: none"> 1) the quantity of electricity supplied by the project plant/unit to the grid; and 2) the quantity of electricity used by the project plant/unit from the grid. <p>Where calculated, the following parameters must be measured:</p> <ol style="list-style-type: none"> a) Quantity of electricity supplied by the project plant/unit to the grid b) Quantity of electricity delivered to the project plant/unit from the grid

Comments	<p>To be reported from the date on which the CFPP is retired until the earliest of the following dates:</p> <ul style="list-style-type: none"> i) The baseline scenario CFPP retirement date ii) Date on which the renewable electricity generated would no longer be considered to be paired with the CFPP retirement (i.e., date from which it is assumed that the renewable electricity would have been generated even in the absence of the project)
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Data/Parameter	$EF_{OM,y}$						
Data unit	tCO ₂ e/MWh						
Description	Operating margin emission factor in year y						
Equations	(7)						
Source of data	<p>Where a subcritical coal default emission factor is applied, use the following sources:</p> <table border="1"> <thead> <tr> <th>Data source</th><th>Condition</th></tr> </thead> <tbody> <tr> <td>1) Regional or national default values</td><td>Preferred option where values are well documented and available from reputable sources</td></tr> <tr> <td>2) Global average default</td><td>Use where (1) is not available. Use reputable sources such as International Energy Agency (IEA), IPCC, UNFCCC.</td></tr> </tbody> </table> <p>Where simple operating margin is applied, it must be calculated as per VT0011.</p>	Data source	Condition	1) Regional or national default values	Preferred option where values are well documented and available from reputable sources	2) Global average default	Use where (1) is not available. Use reputable sources such as International Energy Agency (IEA), IPCC, UNFCCC.
Data source	Condition						
1) Regional or national default values	Preferred option where values are well documented and available from reputable sources						
2) Global average default	Use where (1) is not available. Use reputable sources such as International Energy Agency (IEA), IPCC, UNFCCC.						
Description of measurement methods and procedures to be applied	N/A						
Frequency of monitoring/recording	Where simple operating margin is applied, it must be estimated ex ante and thereafter calculated annually.						
QA/QC procedures to be applied	N/A						
Purpose of data	Calculation of leakage emissions						
Calculation method	<p>Simple operating margin is calculated as per VT0011.</p> <p>Where the simple operating margin is applied, the value for crediting year y is the greater of the ex-ante simple operating margin and the simple operating margin in year y.</p> <p>Where there are other coal-to-clean/power sector crediting projects, the operating margin calculation must include those CFPPs, assuming the same generation projected in the baseline retirement case.</p>						

Comments

Upstream methane leakage from gas-fired power plants to be determined where simple operating margin is applied as per criteria and procedures established under Section 9.3.3.

Separate upstream methane leakage from gas-fired power plants is not considered where the operating margin value applied is the subcritical coal default emission factor, as this is already conservative.

10.3 Description of the Monitoring Plan

The project proponent must design and implement a comprehensive and robust monitoring plan. The monitoring plan must contain the following information:

- 1) Types of data and information to be reported
- 2) Units of measurement
- 3) Source of data
- 4) Monitoring methods (e.g., estimation, modeling, measurement, calculation)
- 5) Type of equipment used
- 6) Monitoring times and frequencies
- 7) Procedures related to the just transition plan developed using *VMD0061*, including at least:
 - a) continual updates to:
 - i) communication pertaining to the just transition
 - ii) consensus building among identified stakeholders and project proponents
 - iii) identified policies, programs, and grants relevant to the just transition plan and their use
 - b) implementation of and updates to provisions to mitigate loss of work and ensure continued livelihood
 - c) continual updates for financial transactions associated with just transition plan implementation
 - d) updates and changes to the operational and management system
- 8) Quality assurance and quality control (QA/QC) procedures
- 9) Monitoring roles and responsibilities, including experience and training requirements

- 10) GHG information management systems, including the location, backup, and retention of stored data
- 11) Roles and responsibilities of the team and whether parts of monitoring are being outsourced
- 12) Mechanism to ensure compliance with criteria and procedures of monitoring

Where measurement and monitoring equipment is used, the project proponent must ensure that the equipment is calibrated according to current good practice (e.g., relevant industry standards, manufacturer specifications).

The QA/QC procedures must include at least the following:

- 1) Data gathering, input, and handling measures
- 2) Input data checked for typical errors, including inconsistent physical units and unit conversion errors
- 3) Typographical errors caused by data transcription from one document to another, and missing data for specific time periods or physical units
- 4) Input time series data checked for unexpected variations (e.g., orders of magnitude) that could indicate input errors
- 5) Use of version control for all electronic files to ensure consistency
- 6) Physical protection of monitoring equipment
- 7) Physical protection of records of monitored data (e.g., hard copy and electronic records)
- 8) Input data units checked and documented
- 9) All sources of data, assumptions, and emission factors documented

All necessary documents must be collected and centrally stored by the project proponent and be available for verification at any time. Documents and records must be stored in a secure and retrievable manner for at least two (2) years after the end of the project crediting period. The monitoring plan must include procedures to ensure competence of teams and team members engaged in technical tasks such as monitoring of data, transmission of renewable electricity, and implementation of the just transition plan. This may be via appropriate and adequate education, demonstrated experience, trainings, or other measures.

10.3.1 No New Coal Commitments

The monitoring plan must include monitoring of the following commitments that are included as applicability conditions (see Section 4), and must be maintained throughout the total project crediting period:

- 1) Where the CFPP is owned by a state-owned utility company, both the utility and the host country have not built new CFPPs, not increased existing CFPP capacity, and have no new CFPPs or CFPP capacity expansions under development or construction.
- 2) Where the CFPP is owned by an IPP, the owners have not built new CFPPs, not increased existing CFPP capacity, and have no new CFPPs or CFPP capacity expansions under development or construction that are under their control.

If any of these criteria are not fulfilled, the project activity is not eligible for crediting in the current monitoring period nor for the remainder of the crediting period.

10.3.2 Regulatory CFPP Phaseout

Project proponents must monitor whether a regulatory coal phaseout date earlier than was considered when determining the baseline retirement date has been imposed.

If an earlier regulatory coal phaseout is found to exist, the project must reassess the project baseline retirement date as per Section 6 of the relevant baseline and additionality module listed in Section 2 of this methodology, considering that new date. Project activities are not eligible for crediting after the new phaseout date.

Where a new scheduled phaseout over time is included in the net zero transition plan of the jurisdiction where the project is located, the project proponent must reassess the baseline to reflect the implications of the scheduled phaseout.

10.3.3 Decommissioning

The monitoring plan must include procedures to monitor and demonstrate by the first verification that major equipment at the CFPP has undergone adequate disposal. Adequate disposal of major equipment prevents its reuse to build a new CFPP or extend the life of existing CFPPs. Major equipment includes, for example, coal pulverizers and other equipment specifically designed for CFPP operations.

At the first verification, site reclamation and remediation must have started, including evaluating for any toxic chemicals like asbestos or heavy metals, and the cleanup and proper disposal of coal ash. Proper disposal of coal ash includes its removal from the site and disposal in designated landfills that adhere to relevant host country standards or to relevant available technical standards, such as the US EPA under Subtitle D of the Resource Conservation and Recovery Act (RCRA).

10.3.4 Progress to renewable energy generation requirements

The project proponent must monitor progress towards each milestone included in the renewable electricity pairing plan required by Section 4.3 (15) and forecast the likelihood of missing milestones two years into the future.

Where meeting a milestone is determined to be at risk or has been missed, the project proponents must:

- 1) notify the system operator and Verra of the situation within 60 days,
- 2) conduct a root cause analysis to identify the underlying cause of the problem, and
- 3) prepare a corrective-action plan developed in consultation with the system operator describing the measures and schedule for returning to the pairing plan and include it in the monitoring report.

In cases where a milestone is missed, crediting will be paused during the period between the milestone date and the date that milestone is restored. Credits can be retroactively issued for this period.

In cases where a milestone is missed and a deterioration in any of the KPIs underlying the analysis described in section 4.2 10(b) is identified or projected, or where a milestone has been missed without previously being identified as being at risk, regardless of impact to the KPIs, no credits will be issued between the milestone date and the date that milestone is restored (for clarity, with no retroactivity on issuance).

10.3.5 Double counting of renewable energy after commissioning

Project proponents must monitor whether, after commissioning, the renewable energy power plant is registered with a GHG program other than the VCS Program and generates credit, renewable energy certificates, or other forms of environmental attributes under that program or any other program for the supply of renewable energy. Where this occurs, the project proponent must demonstrate that the quantity of energy generating credit in the other GHG program is not counted towards the project under VM0052.

11 REFERENCES

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APPENDIX 1: COMPATIBILITY WITH TRANSITION TO NET ZERO

As per the *VCS Methodology Requirements, v5.0*, this methodology only credits project activities that are aligned with the transition to net zero and do not result in carbon lock-in.

A1.1 Risk of Carbon Lock-In

Supply Side

VM0052 credits activities that lead to the decarbonization of electricity grids through the replacement of CFPPs with renewable generation. For projects where this replacement is not complete and grid electricity is used to back-fill lost electricity generation, emissions associated with grid electricity are accounted for as leakage. As such, the methodology accelerates the transition away from fossil fuel powered electricity generation at the project level and is compatible with net zero.

Alternative technologies that might be supported by VM0052 include mothballed coal-fired generation, new coal-fired generation, and gas-fired generation. Operators of these technologies may be incentivized to start construction where they otherwise would not have, locking in those emissions for longer than the coal plant would have otherwise. To mitigate the risk of carbon lock-in, as per the *VCS Methodology Requirements, v5.0*, the methodology avoids incentivizing:

- mothballed power plants and gas-fired generation by imposing leakage emissions discounts when mothballed power plants restart and for lost electricity generation capacity that is not paired.
- new coal-fired generation by requiring “no new coal” commitments by project proponents and the host country.

Demand Side

Electricity consumers fall into two (2) general categories based on consumption – small residential/business consumers, and large industrial or commercial consumers. Small consumers are typically disconnected from the supply chain, agnostic about the source of their power, and concerned mainly with reliability. Larger consumers may have more direct access to power producers depending on the structure of the market and typically make decisions based on minimizing cost, or in rare cases based on environmental, social, and governance goals.

As established above, VM0052 does not offer credit for the use of fossil-derived electricity and therefore does not improve competitiveness of coal-generated electricity for consumers from either category to start using, use more, or prolong their use into the future just because natural gas processing incorporates carbon capture and storage, especially considering that this would increase costs. As such, VM0052 does not contribute to carbon lock-in.

A1.2 Activities Not Compatible with Jurisdictional Net Zero Objectives

As per the *VCS Methodology Requirements, v5.0*, VM0052 requires that:

- public-facing transition plans be in place in the host country.
- “no new coal” commitments be made by project proponents (including the host country where they are a project proponent through state-owned enterprises).
- the project activity not increase the risk of energy poverty.
- the project activity not decrease grid reliability.

VM0052 therefore excludes activities not compatible with a jurisdiction’s transition away from fossil fuel powered electricity at the economy or jurisdictional level and is compatible with net zero.

DOCUMENT HISTORY

Version	Date	Comment
v1.0	6 May 2025	Initial version
v1.1	30 Oct 2026	<p>The following updates are included:</p> <ul style="list-style-type: none">• Section 2 - <i>VMR0017</i> replaces <i>CDM ACM0002</i>, and <i>VT0010</i> was removed.• Section 3 – definitions of “Paired renewable electricity” and “Accelerated retirement date” revised for clarity• Section 4 – expanded requirements under Applicability Condition 10; revised requirements for pairing levels and the content of the pairing plan; replaced reference to <i>ACM006</i> with <i>VMD0059</i>.• Section 5 – added new sections on the project start date, the start date of the first crediting period (the accelerated retirement date), crediting period renewal and methodology transition; updated requirements for reassessment at crediting period renewal• Section 7 – revised direction on additionality assessment• Section 9 – revised treatment of leakage from the grid and from renewables• Section 10 – parameters tables revised for clarity and correctness; added new requirements of the monitoring plan