METHODOLOGY

BM EN01.001

Grid-connected electricity generation from renewable sources

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Sectoral scope(s): Energy

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1. Introduction

1. This methodology is adopted and refers to the latest approved version of the UNFCCC Clean Development Mechanism Methodology ACM0002 (as valid from 31 May 2024).

2. It shall be the responsibility of the non-obligated entity and Accredited Carbon Verification Agency (ACVA) to note of any subsequent changes or revisions in the above-mentioned methodology while developing projects and performing validation and/or verification activity respectively.

3. The following table describes the key elements of the methodology.

Table 1. Methodology key elements

Typical projects	Retrofit, rehabilitation, replacement or capacity addition to an existing power plant or construction and operation of a new power plant/unit that uses renewable energy sources and supplies electricity to the grid. Battery energy storage system can be integrated under certain conditions. Pumped storage projects operating in coordination with a renewable energy plant under certain conditions.
Type of GHG emissions mitigation action	Renewable energy: Displacement of electricity that would be provided to the grid by more-GHG-intensive means

2. Definitions

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

(a) **Backup generator** - a generator that is used in the event of an emergency, such as power supply outage due to either main generator failure, captive failure or tripping of generator units, to meet electricity demand of the equipment at power plants/units site during emergency;

(b) **Battery Energy Storage System (BESS)** - a rechargeable energy storage system consisting of batteries, battery chargers, controls, power conditioning systems and associated electrical equipment designed to store the electricity generated from the renewable energy plant(s);

(c) **Binary geothermal power plant** - a geothermal technology that utilizes an organic Rankine cycle (ORC) or a Kalina cycle and typically operates with temperatures varying from as low as 73°C to 180°C. In these plants, heat is recovered from the geothermal fluid using heat exchangers to vaporise an organic fluid with a low boiling point (e.g. butane or pentane in the ORC cycle and an ammonia-water mixture in the Kalina cycle) and drive a turbine. Binary geothermal plants are categorised as closed cycle technology;

(d) **Capacity addition** - a capacity addition is an investment to increase the installed power generation capacity of existing power plants through: (i) the installation of a new power plants/units besides the existing power plants/units; or (ii) the installation of new power plants/units, additional to the existing power plants/units; or (iii) construction of a new reservoir along with addition of new power plants/units in case of integrated hydro power projects. The existing power plants/units in the case of capacity addition continue to operate after the implementation of the project activity;

(e) **Dry steam geothermal power plant -** a geothermal technology that directly utilises dry steam that is piped from production wells to the plant and then to the turbine. Dry steam geothermal plants are categorised as open cycle technology;

(f) **Existing reservoir** - a reservoir is to be considered as an "existing reservoir" if it has been in operation for at least three years before the implementation of the project activity;

(g) **Flash steam geothermal power plant -** a geothermal technology that is used where water-dominated reservoirs have temperatures above 180°C. In these high-temperature reservoirs, the liquid water component boils, or "flashes", as pressure drops. Separated steam is piped to a turbine to generate electricity and the remaining hot water may be flashed again twice (double flash plant) or three times (triple flash) at progressively lower pressures and temperatures, to obtain more steam. Flash steam geothermal plants are categorised as open cycle technology;

(h) **Greenfield power plant** - a new renewable energy power plant that is constructed and operated at a site where no renewable energy power plant was operated prior to the implementation of the project activity;

(i) **Installed power generation capacity (or installed capacity or nameplate capacity)** - the installed power generation capacity of a power unit is the capacity, expressed in Watts or one of its multiples, for which the power unit has been designed to operate at nominal conditions. The installed power generation capacity of a power plant is the sum of the installed power generation capacities of its power units; In case of solar power projects, the installed capacity would refer to the sum of the DC capacity of all the solar panels installed in the project;

(j) **Integrated hydro power project** - integration of multiple hydro power plants/units with single or multiple reservoirs designed to work together;

(k) **Pumped Storage Project** - a type of hydroelectric energy storage that includes two water reservoirs at different elevations that can generate power as water moves down from one to the other reservoir, passing through a turbine. The system also requires power as it pumps water back into the upper reservoir.

(l) **Power plant/unit** - a power plant/unit is a facility that generates electric power. Several power units at one site 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. Where several identical power units (i.e. with the same capacity, age and efficiency) are installed at one site, they may be considered as one single power unit;

(m) **Rehabilitation** - is an investment to restore the existing power plants/units that was severely damaged or destroyed due to foundation failure, excessive seepage, earthquake, liquefaction, or flood. The primary objective of rehabilitation is to restore the performances of the facilities. Rehabilitation may also lead to increase in efficiency, performance or power generation capacity of the power plants/units with/without adding new power plants/units;

(n) **Replacement** - is an investment in new power plants/units that replaces one or several existing units at the existing power plant. The new power plants/units have the same or a higher power generation capacity than the plants/units that were replaced;

(o) **Reservoir** - a reservoir is a water body created in valleys to store water generally made by the construction of a dam;

(p) **Retrofit** - is an investment to repair or modify existing operating power plants/units, with the purpose to increase the efficiency, performance or power generation capacity of the plants/units, without adding new power plants/units. A retrofit restores the installed power generation capacity to or above its original level. Retrofits shall only include measures that involve capital investments and not regular maintenance or housekeeping measures.

5. In addition, definition of Renewable Energy and OTEC as recognized by Central Government will be applied.

3. Scope & Applicability

3.1. Scope

6. This methodology applies to grid-connected renewable energy generation project activities that include:

(a) Construction and operation of a Greenfield power plant; or

(b) Retrofitting, rehabilitation, replacement or capacity addition of an existing power plant.

7. Further, the methodology applies to grid-connected renewable energy generation project activities which integrate Battery Energy Storage System (BESS) to a Greenfield power plant or to an existing solar photovoltaic or wind power plant.

8. Furthermore, the methodology applies to a grid-connected Greenfield pumped storage project (PSP) which is connected to a Greenfield renewable energy plant through a dedicated line and/or through the grid. A greenfield PSP connected to an existing renewable energy plant is not eligible to apply this methodology.

3.2. Applicability

9. This methodology is applicable to grid-connected renewable energy power generation project activities that:

   (a) Install a Greenfield power plant (excluding standalone grid-connected wind and solar power plants);

   (b) Involve a capacity addition to (an) existing plant(s) (excluding standalone grid-connected wind and solar power plants);

   (c) Involve a retrofit of (an) existing operating plant(s)/unit(s) (excluding standalone grid-connected wind and solar power plants);

   (d) Involve a rehabilitation of (an) existing plant(s)/unit(s) (excluding standalone grid-connected wind and solar power plants); or

   (e) Involve a replacement of (an) existing plant(s)/unit(s) (excluding standalone grid-connected wind and solar power plants); or

   (f) Install a Greenfield power plant together with a grid-connected Greenfield pumped storage power plant. The greenfield power plant may be directly connected to the PSP or connected to the PSP through the grid.

   (g) Hybrid systems, where a combination of renewable energy technologies are used with BESS or PSP. In case technologies other than standalone wind and solar are used, these shall be eligible without BESS or PSP as well.

10. In case the project activity involves the integration of a BESS, the methodology is applicable to grid-connected renewable energy power generation project activities that:

   (a) Integrate BESS with a Greenfield power plant;

   (b) Integrate a BESS together with implementing a capacity addition to (an) existing solar photovoltaic[1] or wind power plant(s)/unit(s);

   (c) Integrate a BESS to (an) existing solar photovoltaic or wind power plant(s)/unit(s) without implementing any other changes to the existing plant(s);

   (d) Integrate a BESS together with implementing a retrofit of (an) existing solar photovoltaic or wind power plant(s)/unit(s);

   (e) Integrate a BESS together with a Greenfield power plant that is operating in coordination with a PSP. The BESS is located at site of the greenfield renewable power plant.

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[1] In case of retrofit or capacity addition for concentrated solar power projects, stakeholders may submit a request for revision to this methodology, providing an apportioning approach to calculate the project emissions due to any fossil fuel consumption attributed to the increased electricity generation from the BESS.

Table 2. Combinations of renewable energy technologies and mode of BESS applicable for integration

Renewable Energy Technology[2] / Mode of installation of BESS	Solar photovoltaic or wind	Other renewable technologies
BESS + (a) Greenfield plant(s)	Eligible	Eligible
BESS+ capacity addition to existing plant(s)	Eligible	Not eligible
BESS with no other changes to the existing plant(s)	Eligible	Not eligible
BESS + retrofit to existing plant(s)	Eligible	Not eligible

11. The methodology is applicable under the following conditions:

(a) Hydro power plant/unit with or without reservoir, offshore wind power plant/unit, geothermal power plant/unit, wave power plant/unit or tidal power plant/unit;

(b) In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, wave or tidal power capacity addition projects) the existing plant/unit must have started commercial operation prior to the start of a minimum historical reference period of five years. The reference period is used for the calculation of baseline emissions and defined in the baseline emission section. Furthermore, no capacity expansion, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;

(c) In case of Greenfield project activities applicable under paragraph 10(a) above, the project participants shall demonstrate that the BESS was an integral part of the design of the renewable energy project activity (e.g., by referring to feasibility studies or investment decision documents);

(d) The BESS should be charged with electricity generated from the associated renewable energy power plant(s). Only during exigencies[3] may the BESS be charged with electricity from the grid or a fossil fuel electricity generator. In such cases, the corresponding GHG emissions shall be accounted for as project emissions following the requirements under section 4.4.4 below. The charging using the grid or using fossil fuel electricity generator should not amount to more than 2 per cent of the electricity generated by the project renewable energy plant during a monitoring period. During the time periods (e.g., week(s), months(s)) when the BESS consumes more than 2 per cent of the electricity for charging, the project participant shall not be entitled to issuance of the Carbon Credit Certificates (CCC) for the concerned periods of the monitoring period.

(e) In case the project activity involves PSP, the PSP shall utilize the electricity generated from the renewable energy power plant(s) that is operating in coordination with the PSP during pumping mode.

12. In case of hydro power plants, one of the following conditions shall apply:

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[2] This may include a combination of renewable energy technologies combined with BESS.

[3] For example, upon deep discharge of the batteries.

(a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or

(b) The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density, calculated using equation (7), is greater than 4 W/m^2; or

(c) The project activity results in new single or multiple reservoirs and the power density, calculated using equation (7), is greater than 4 W/m^2; or

(d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (7), is lower than or equal to 4 W/m^2, and all of the following conditions shall apply:

(i) The power density calculated using the total installed capacity of the integrated project, as per equation (8), is greater than 4 W/m^2;

(ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity;

(iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m^2 are:

a. Lower than or equal to 15 MW; and

b. Less than 10 per cent of the total installed capacity of integrated hydro power project.

13. In the case of integrated hydro power projects, project participants shall:

(a) Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or

(b) Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under ICM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore, this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum of five years prior to the implementation of the ICM project activity.

14. In the case of PSP, the project participants shall demonstrate in the PDD that the project is not using water which would have been used to generate electricity in the baseline.

15. The methodology is not applicable to:

(a) Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;

(b) Biomass fired power plants/units.

16. In the case of retrofits, rehabilitations, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is “the continuation of the current situation, that is to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance”.

17. In addition, the applicability conditions included in the tools referred to below apply.

3.3. Methodology Approval Date

18. The date of adoption of this document shall be effective from 27 March 2025.

3.4. Applicability of sectoral scopes

19. For validation and verification of ICM projects and programme of activities by a designated ACVA using this methodology, application of sectoral scope “*01: Energy”* is mandatory.

3.5. Applicability of approved adopted tools

20. This methodology also refers to the latest approved versions of the following adopted ICM tools:

    (a) “BM-T-001: Combined tool to identify the baseline scenario and demonstrate additionality” (hereinafter referred to as BM-T-001);

    (b) “BM-T-002: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion” (hereinafter referred to as BM-T-002);

    (c) “BM-T-003: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (hereinafter referred to as BM-T-003);

    (d) “BM-T-012: Positive lists of technologies” (hereinafter referred to as BM-T-012);

4. Methodology: Baseline Component

4.1. Project boundary

21. The spatial extent of the project boundary includes the project power plant/unit and all power plants/units connected physically to the electricity system that the ICM project power plant is connected to.

22. The greenhouse gases and emission sources included in or excluded from the project boundary are shown in Table 3.

Table 3. Emission sources included in or excluded from the project boundary

Source		Gas	Included	Justification/explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project activity	For dry or flash steam geothermal power plants, emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam	CO_2	Yes	Main emission source
		CH_4	Yes	Main emission source
		N_2O	No	Minor emission source
	For binary geothermal power plants, fugitive emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam	CO_2	Yes	Main emission source
		CH_4	Yes	Main emission source
		N_2O	No	Minor emission source
	For binary geothermal power plants, fugitive emissions of hydrocarbons such as n-butane and isopentane (working fluid) contained in the heat exchangers	Low GWP hydrocarbon/refrigerant	Yes	Main emission source
	CO_2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	Minor emission source
		CH_4	Yes	Main emission source
		N_2O	No	Minor emission source
	Charging of BESS using electricity from the grid or from fossil fuel electricity generators.	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
	Utilization of electricity from grid or from fossil fuel generators by PSP for pumped mode.	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
	For PSP, emissions of CH_4 from the reservoir	CO_2	No	Minor emission source
		CH_4	Yes	Main emission source
		N_2O	No	Minor emission source

4.2. Identification of the baseline scenario

4.2.1. Baseline scenario for Greenfield power plant

23. If the project activity is the installation of a Greenfield power plant with or without a BESS as described under paragraph 9(a) or paragraph 10(a) or paragraph 10(e) above, the baseline scenario is electricity delivered to the grid by the project activity that would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources.

4.2.2. Baseline scenario for capacity addition to an existing renewable energy power plant or integration of a BESS to an existing solar photovoltaic or wind power plant/unit

24. If the project activity is a capacity addition with or without a BESS as described under paragraph 9(b) or paragraph 10(b) above or is an integration of a BESS to (an) existing solar photovoltaic or wind power plant(s)/unit(s) without implementing any other changes to the existing plant(s) as described under paragraph 10(c) above, the baseline scenario is the existing facility that would continue to supply electricity to the grid at historical levels, until the time at which the generation facility would likely be replaced or retrofitted ($DATE_{BaselineRetrofit}$), and electricity delivered to the grid by the added capacity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources. From that point of time onwards, the baseline scenario is assumed to correspond to the project activity, and no emission reductions are assumed to occur.

4.2.3. Baseline scenario for retrofit or rehabilitation or replacement of an existing power plant

25. If the project activity is retrofit or rehabilitation or replacement of an existing plant as described under paragraph 9(c) or paragraph 9(d) or paragraph 9(e) above, the following step-wise procedure to identify the baseline scenario shall be applied.

4.2.4. Baseline scenario for retrofit of an existing solar photovoltaic or wind power plant/unit with the integration of BESS

26. If the project activity is retrofit to an existing solar photovoltaic or wind power plant/unit as described under paragraph 10(d) above, the project activity provides the possibility of supplying additional electricity to the grid using the same existing power generation capacity. This allows for a higher power plant load factor over the year, enabling more electricity supply to the grid from project activity renewable power plant as compared to the situation prior to the installation of the BESS. This potentially displaces an equivalent amount of electricity generation in the grid, which may comprise many fossil fuel plants. The baseline scenario shall be determined following the same procedure as in the case of a retrofit or rehabilitation or replacement of an existing power plant, described above.

4.2.5. Baseline scenario for pumped storage projects operating in coordination with the renewable energy plants

27. If the project activity is as described under paragraph 9(f) above, the project participant shall demonstrate that the baseline scenario is neither the installation of the project Greenfield renewable power plant without PSP nor the installation of the PSP without the Greenfield renewable power plant. If the project participant failed to demonstrate the

baseline scenario is not Greenfield renewable energy plant without PSP or the PSP without the Greenfield renewable power plant, the methodology is not applicable.

4.3. Additionality

4.3.1. Simplified procedure to demonstrate additionality

28. For the simplified procedure to demonstrate additionality the non-obligated entities shall refer to the methodological tool BM-T-012 to identify if the activity is listed under the positive list. If not, the following procedures shall be followed.

4.3.2. Demonstrate additionality based on the BM-T-001.

4.3.2.1. Step 1: Identify realistic and credible alternative baseline scenarios for power generation

29. Apply Step 1 of BM-T-001. The options considered should include:

    (a) P1: The project activity not implemented as a ICM project;

    (b) P2: The continuation of the current situation, that is to use all power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance. The additional power generated under the project would be generated in existing and new grid-connected power plants in the electricity system; and

    (c) P3: All other plausible and credible alternatives to the project activity that provide an increase in the power generated at the site, which are technically feasible to implement. This includes, inter alia, different levels of replacement, retrofit and/or rehabilitation at the power plants/units. Only alternatives available to project participants should be taken into account.

4.3.2.2. Step 2: Barrier analysis

30. Apply Step 2 of BM-T-001.

4.3.2.3. Step 3: Investment analysis

31. If this option is used, apply one of the following:

    (a) Apply an investment comparison analysis, as per Step 3 of BM-T-001, if more than one alternative is remaining after Step 2 and if the remaining alternatives include scenarios P1 and P3;

    (b) Apply a benchmark analysis, as per BM-T-001, if more than one alternative is remaining after Step 2 and if the remaining alternatives include scenarios P1 and P2.

    (c) Hydro-power or pumped storage projects shall be deemed additional.

4.4. Project emissions

32. For most renewable energy power generation project activities, PE_y = 0. However, some project activities may involve project emissions that can be significant. These emissions shall be accounted for as project emissions by using the following equation:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} + PE_{BESS,y} + PE_{PSP,y}$$ Equation (1)

Where:

PE_y	=	Project emissions in year *y* (t CO_2e/yr)
$PE_{FF,y}$	=	Project emissions from fossil fuel consumption in year *y* (t CO_2/yr)
$PE_{GP,y}$	=	Project emissions from the operation of dry, flash steam or binary geothermal power plants in year *y* (t CO_2e/yr)
$PE_{HP,y}$	=	Project emissions from water reservoirs of hydro power plants amd pumped storage plants in year *y* (t CO_2e/yr)
$PE_{BESS,y}$	=	Project emissions from charging of a BESS using electricity from the grid or from fossil fuel electricity generators (t CO_2e/yr)
$PE_{PSP,y}$	=	Project emissions from utilizing electricity from the grid for pumping operation of PSP in excess to the production of the renewable power plant operating in coordination with the PSP (t CO_2e/yr)

4.4.1. Emissions from fossil fuel combustion ($PE_{FF,y}$)

33. For geothermal or solar thermal projects which also use fossil fuels for electricity generation, CO_2 emissions from the combustion of fossil fuels shall be accounted for as project emissions ($PE_{FF,y}$).

34. For all renewable energy power generation project activities, emissions due to the use of fossil fuels for the backup generator can be neglected.

35. $PE_{FF,y}$ shall be calculated as per BM-T-002.

4.4.2. Emissions from the operation of dry steam, flash steam[4] and binary[5] geothermal power plants due to non-condensable gases and/or working fluid ($PE_{GP,y}$)

36. For dry or flash steam geothermal project activities, project participants shall account for emissions of CO_2 and CH_4 due to release of non-condensable gases from produced

[4] In open cycle geothermal technologies, the underground geothermal fluid would come in touch with the atmosphere during the heat exchange process. In such process, non-condensable and other gases within the geothermal fluid are partially released to the atmosphere.

[5] In binary geothermal technologies, the underground fluid is re-injected back to the heat source without any exposure to the atmosphere. In this case, non-condensable and other gases within the geothermal fluid are kept within the outgoing geothermal fluid and sent back into the heat source. However, there may be some physical leakage from closed cycle pipes and wells.

steam.[6] Non-condensable gases in geothermal reservoirs usually consisting mainly of CO_2 and H_2S. They also contain a small quantity of hydrocarbons, predominantly CH_4. In dry or flash steam geothermal power projects, non-condensable gases flow with the steam into the power plant. A small proportion of the CO_2 is converted to carbonate/bicarbonate in the cooling water circuit. In addition, parts of the non-condensable gases are re-injected into the geothermal reservoir. However, as a conservative approach, this methodology assumes that all non-condensable gases entering the power plant in dry or flash steam geothermal technologies are discharged to atmosphere via the cooling tower. Fugitive CO_2 and CH_4 emissions due to well testing and well bleeding are not considered, as they are negligible.

37. $PE_{GP,y}$ is calculated as follows:

$$PE_{GP,y} = PE_{dry\ or\ flash\ steam,\ y} + PE_{binary,y} \quad \text{Equation (2)}$$

Where:

$PE_{GP,y}$	=	Project emissions from the operation of dry steam, flash steam and/or binary geothermal power plants in year *y* (t CO_2e/yr)
$PE_{dry\ or\ flash\ steam,\ y}$	=	Project emissions from the operation of dry steam or flash steam geothermal power plants due to release of non-condensable gases in year *y* (t CO_2e/yr)
$PE_{binary,y}$	=	Project emissions from the operation of binary geothermal power plants due to physical leakage of non-condensable gases and working fluid in year *y* (t CO_2e/yr)

(a) Project emissions from dry or flash steam geothermal power plants:

$$PE_{dry\ or\ flash\ steam,\ y} = \left(w_{steam,CO2,y} + w_{steam,CH4,y} \times GWP_{CH4}\right) \times M_{steam,y} \quad \text{Equation (3)}$$

Where:

$w_{steam,CO2,y}$	=	Average mass fraction of CO_2 in the produced steam in year *y* (t CO_2/t steam)
$w_{steam,CH4,y}$	=	Average mass fraction of CH_4 in the produced steam in year *y* (t CH_4/t steam)
GWP_{CH4}	=	Global warming potential of CH_4 (t CO_2e/t CH_4)
$M_{steam,y}$	=	Quantity of steam produced in year *y* (t steam/yr)

(b) Project emissions from binary geothermal power plants:

$$PE_{binary,y} = PE_{steam,y} + PE_{working\ fluid,y} \quad \text{Equation (4)}$$

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[6] In the case of retrofit, rehabilitation or replacement projects at geothermal plants, this methodology does not account for baseline emissions from release of non-condensable gases from produced steam or fossil fuel combustion. Project participants are welcome to propose revisions to this methodology to account for these baseline emissions.

Where:

$PE_{steam,y}$	=	Project emissions from the operation of binary geothermal power plants due to physical leakage of non-condensable gases in year *y* (t CO_2e/yr). In case the difference between steam inflow and outflow to the power plant is less than 1%, then the project participants are not required to account these project emissions
$PE_{working\ fluid,\ y}$	=	Project emissions from the operation of binary geothermal power plants due to physical leakage of working fluid contained in heat exchangers in year *y* (t CO2e/yr)

$$PE_{steam,y} = \left(M_{Inflow,y} - M_{outflow,y}\right) \times \left(w_{steam,CO2,y} + w_{steam,CH4,y} \times GWP_{CH4}\right) \quad \text{Equation (5)}$$

Where:

$\mathrm{M}_{inflow,y}$	=	Quantity of steam entering the geothermal plant in year *y* (t steam/yr)
$M_{outlow,y}$	=	Quantity of steam leaving the geothermal plant in year *y* (t steam/yr)
$\mathrm{w}_{steam,CO2,y}$	=	Average mass fraction of CO_2 in the produced steam in year *y* (t CO_2/t steam)
$w_{steam,CH4,y}$	=	Average mass fraction of CH_4 in the produced steam in year *y* (t CH_4/t steam)
GWP_{CH4}	=	Global warming potential of CH_4 (t CO2e/t CH_4)

$$PE_{working\ fluid,y} = M_{working\ fluid,y} \times GWP_{working\ fluid} \quad \text{Equation (6)}$$

Where:

$M_{working\ fluid,y}$	=	Quantity of working fluid leaked/reinjected in year *y* (t working fluid/yr)
$GWP_{working\ fluid}$	=	Global Warming Potential for the working fluid used in the binary geothermal power plant

4.4.3. Emissions from water reservoirs of hydro power plants and pumped storage projects ($PE_{HP,y}$)

38. The power density (*PD*) of the project activity is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \quad \text{Equation (7)}$$

Where:

PD	=	Power density of the project activity (W/m^2)
Cap_{PJ}	=	Installed capacity of the hydro power plant or PSP after the implementation of the project activity (W)
Cap_{BL}	=	Installed capacity of the hydro power plant or PSP before the implementation of the project activity (W). For new hydro power plants or PSP, this value is zero

A_{PJ}	=	Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2)
A_{BL}	=	Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero

39. For hydro power project or PSP activities that result in new single or multiple reservoirs and hydro power project or PSP activities that result in the increase of single or multiple existing reservoirs, project participants shall account for CH_4 and CO_2 emissions from the reservoirs, estimated as follows:

(a) For integrated hydro power project or PSP, PD of the entire project is calculated as follows:

$$PD = \frac{\sum Cap_{PJ,i}}{\sum A_{PJ,j}} \quad \text{Equation (8)}$$

Where:

i	=	Individual power plants included in integrated hydro power project/ PSP
j	=	Individual reservoirs included in integrated hydro power project/ PSP

(b) If the power density of the project activity using equation (7) or in case of integrated hydro power project using equation (8) is greater than 4 W/m^2 and less than or equal to 10 W/m^2:

$$PE_{HP,y} = \frac{EF_{Res} \times TEG_y}{1000} \quad \text{Equation (9)}$$

Where:

$PE_{HP,y}$	=	Project emissions from water reservoirs (t CO2e/yr)
EF_{Res}	=	Default emission factor for emissions from reservoirs of hydro power plants/ PSP (kg CO2e/MWh)
TEG_y	=	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y* (MWh)

(c) If the power density of the project activity is greater than 10 W/m^2:

$$PE_{HP,y} = 0 \quad \text{Equation (10)}$$

4.4.4. Emissions from charging of a BESS using electricity from the grid or from fossil fuel electricity generators (*$PE_{BESS,y}$*)

40. Under normal conditions, BESS should be charged with the electricity generated by the associated renewable power plant. In a few instances, the BESS may be charged using grid electricity or electricity from fossil fuel generators (*$EC_{BESS,y}$*).

41. In cases where BESS is charged using grid electricity, the corresponding project emissions ($PE_{BESS,y}$) shall be calculated according to the procedure described in BM-T-003.

42. In cases where BESS is charged using electricity from fossil fuel generators, the corresponding project emissions ($PE_{BESS,y}$) shall be calculated according to the procedure described in BM-T-002.

43. In line with the requirement under paragraph 11(d) above, the charging using the grid or using fossil fuel electricity generator should not amount to more than 2 per cent of the electricity generated by the project renewable energy plant during a monitoring period. During the periods where the BESS consumes more than 2 per cent of the electricity for charging, the project participant shall not be entitled to issuance of the CCC for the concerned period. Furthermore, the project participant(s) should compensate in full, any negative emissions reductions which may arise from power consumption from the grid by the BESS, including for monitoring periods for which no emission reductions can be claimed.

4.4.5. Emissions from utilizing grid electricity by pumped hydro plants ($PE_{PSP,y}$)

44. Under normal conditions, PSP should utilize the electricity generated by the associated renewable power plant. Exceptionally, the PSP may utilize grid electricity in excess to the electricity supplied by the renewable power plant ($EC_{PSP,y}$).

45. In cases where PSP utilizes grid electricity in excess to the production of the renewable power plant, the corresponding project emissions ($PE_{PSP,y}$) shall be calculated according to the procedure described in BM-T-003.

46. In line with the requirement under paragraph 11(e) above, utilization of electricity from grid in excess of the electricity generated by the project renewable energy plant shall only be used during exigencies[7] and shall not amount to more than 2 per cent of the electricity in excess of the electricity generated by the project renewable energy plant during a monitoring period.

47. During the monitoring periods where the PSP consumes more than 2 per cent of the electricity in excess of the electricity generated by the project renewable energy plant, the project participant shall not be entitled to issuance of the CCC for the concerned monitoring period.

48. Furthermore, the project participant(s) should compensate in full any negative emissions reductions which may arise from power consumption from the grid by the PSP, including for monitoring periods for which no emission reductions can be claimed. These will be adjusted from subsequent issuances.

4.5. Baseline emissions

49. Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by

[7] For example, when the electricity from the renewable energy plant is not available for the internal consumption of the pumped storage plant.

existing grid-connected power plants and/or the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$$ Equation (11)

Where:

BE_y	=	Baseline emissions in year *y* (t CO_2/yr)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and supplied to the grid as a result of the implementation of the ICM project activity in year *y* (MWh/yr)
$EF_{grid,CM,y}$	=	Grid Emission Factor (for net effective injection into grid) for grid connected power generation in year *y,* as published by the CEA[8]

4.5.1. Calculation of quantity of net electricity generation

50. The calculation of $EG_{PJ,y}$ is different for Greenfield plants, capacity additions, retrofits, rehabilitations, and replacements. These cases are described as follows:

4.5.1.1. Greenfield power plants

51. If the project activity is the installation of a Greenfield power plant with or without the BESS or PSPs operating in coordination with a Greenfield power plant, as described under paragraph 9(a) or paragraph 10(a) above $EG_{PJ,y}$ shall be calculated as follows :

$$EG_{PJ,y} = EG_{facility,y}$$ Equation (12)

Where:

$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and supplied to the grid as a result of the implementation of the ICM project activity in year *y* (MWh/yr).
$EG_{facility,y}$	=	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)

4.5.1.2. Capacity addition to offshore wind, wave or tidal plants/units

52. In the case of capacity additions referred to in paragraphs 5(b) and 6(b), different approaches apply according to renewable energy technologies. In the case of offshore wind, wave or tidal power plants/units, it is assumed that the addition of new capacity does not significantly affect the electricity generated by existing plants/units.[9] In this case, the electricity supplied to the grid by the added power plants/units shall be directly metered and used to determine $EG_{PJ,y}$.

$$EG_{PJ,y} = EG_{PJ\_Add,y}$$ Equation (13)

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[8] https://cea.nic.in/?lang=en

[9] In this case of capacity additions to wind power plants/units, some shadow effects can occur, but are not accounted under this methodology.

Where:

$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and supplied to the grid as a result of the implementation of the ICM project activity in year *y* (MWh/yr)
$EG_{PJ\_Add,y}$	=	Quantity of net electricity generation supplied to the grid in year *y* by the project plant/unit that has been added under the project activity (MWh/yr)

4.5.1.3. Capacity addition to hydro or geothermal power plants/units

53. In the case of hydro or geothermal power plants/units, the addition of new power plants/units under paragraph 5(b) may significantly affect the electricity generated by the existing plants/units. For example, a new hydro turbine installed at an existing dam may affect the power generation by the existing turbines. Therefore, the approach as in section 4.5.1.4 below for retrofit or rehabilitation or replacement projects shall be used. . $EG_{facility,y}$ corresponds to the net electricity generation supplied to a grid by the existing plants/units and the added plants/units together constituting "project plants/units". A separate metering of electricity supplied to a grid by the added plants/units is not necessary under this option.

4.5.1.4. Retrofit or rehabilitation or replacement of an existing renewable energy power plant

54. If the project activity is the retrofit or rehabilitation or replacement of an existing grid-connected renewable energy power plant as described under paragraphs 9(c), 9(d) 9(e) above, or retrofit of an existing power plant/unit with the BESS as described under paragraph 10(d) above, the methodology uses historical electricity generation data to determine the electricity generation by the existing plant in the baseline scenario, assuming that the historical situation observed prior to the implementation of the project activity would continue.

55. The power generation from renewable energy generation project activities can vary significantly from year to year, due to natural variations in the availability of the renewable source (e.g. varying rainfall, wind speed or solar radiation). The use of few historical years to establish the baseline electricity generation can therefore involve a significant uncertainty. The methodology addresses this uncertainty by adjusting the historical electricity generation by its standard deviation. This ensures that the baseline electricity generation is established in a conservative manner and that the calculated emission reductions are attributable to the project activity. Without this adjustment, the calculated emission reductions could mainly depend on the natural variability observed during the historical period rather than the effects of the project activity.[10]

56. $EG_{PJ,y}$ is calculated as follows:

$$EG_{PJ,y} = EG_{facility,y} - (EG_{historical} + \sigma_{historical}); until\ DATE_{BaselineRetrofit} \quad \text{Equation (14)}$$

[10] As an alternative approach for hydropower plants, the baseline electricity generation could be established as a function of the water availability. In this case, the baseline electricity generation would be established ex post based on the water availability monitored during the crediting period. Project participants are encouraged to consider such approaches and submit the related request for a revision to this methodology.

and

$$EG_{PJ,y} = 0; on/after\ DATE_{BaselineRetrofit} \quad \text{Equation (15)}$$

Where:

$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and supplied to the grid as a result of the implementation of the ICM project activity in year *y* (MWh/yr)
$EG_{facility,y}$	=	Quantity of net electricity generation supplied by the project plants/units to the grid in year *y* (MWh/yr)
$EG_{historical}$	=	Annual average historical net electricity generation delivered to the grid by the existing renewable energy power plants/units that was operated at the project site prior to the implementation of the project activity (MWh/yr)
$\sigma_{historical}$	=	Standard deviation of the annual average historical net electricity generation delivered to the grid by the existing renewable energy power plants/units that was operated at the project site prior to the implementation of the project activity (MWh/yr)
$DATE_{BaselineRetrofit}$	=	Point in time when the existing equipment would need to be replaced in the absence of the project activity (date). This only applies to retrofit or replacement projects

57. In case $EG_{facility,y} < (EG_{historical} + \sigma_{historical})$ in a year *y* then:

$$EG_{PJ,y} = 0 \quad \text{Equation (16)}$$

58. To determine $EG_{historical}$, project participants may choose between two historical periods as shown in the following paragraph. This allows some flexibility of application in that the use of the longer time period may result in a lower standard deviation and the use of the shorter period may allow a better reflection of the (technical) circumstances observed during the more recent years.

59. Project participants may choose among the following two-time spans of historical data to determine $EG_{historical}$:

    (a) The last five calendar years prior to the implementation of the project activity; or

    (b) The time period from the calendar year following $DATE_{hist}$, up to the last calendar year prior to the implementation of the project, as long as this time span includes at least five calendar years, where $DATE_{hist}$ is latest point in time between:

        (i) The commissioning of the plant/unit;

        (ii) If applicable: the last capacity addition to the plant/unit; or

        (iii) If applicable: the last retrofit or rehabilitation of the plant/unit.

60. In case of rehabilitation where the power plant/unit did not operate for the last five calendar years before the rehabilitation starts, $EG_{historical}$ is equal to zero.

4.5.2. Calculation of $DATE_{BaselineRetrofit}$

61. In order to estimate the point in time when the existing equipment would need to be replaced/retrofitted in the absence of the project activity ($DATE_{BaselineRetrofit}$), project participants may take into account the typical average technical lifetime of the equipment, which shall be determined and documented

62. The point in time when the existing equipment would need to be replaced/retrofitted in the absence of the project activity should be chosen in a conservative manner that is, if a range is identified, the earliest date should be chosen.

4.6. Leakage

63. No other leakage emissions are considered. The emissions potentially arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g., extraction, processing, transport etc.) are neglected.

4.7. Emission reductions

64. Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \quad \text{Equation (17)}$$

Where:

ER_y	=	Emission reductions in year *y* (t CO_2e/yr)
BE_y	=	Baseline emissions in year *y* (t CO_2/yr)
PE_y	=	Project emissions in year *y* (t CO_2e/yr)

4.7.1. Estimation of emission reductions prior to validation

65. Project participants shall prepare as part of the ICM-PDD an estimate of likely emission reductions from the proposed project activity during the crediting period.

66. Where the grid emission factor ($EF_{CM,grid,y}$) is determined ex-post during monitoring, non-obligated entities may use the annual grid emission factor, corresponding to the time period of the data being used for calculating emission reductions, as published by the Central Electricity Authority (CEA) under 'CO2 Baseline Database' under Annual Reports[11]. The choice between ex-ante and ex-post vintage for calculation of the build margin and the operating margin should be specified in the PDD and cannot be changed during the crediting period.

4.8. Data and parameters not monitored

67. In addition to the parameters listed in the tables below, the provisions on data and parameters not monitored in the tools referred to in this methodology apply.

[11] https://cea.nic.in/?lang=en

Data / Parameter table 1.

Data / Parameter:	GWP_{CH4}
Data unit:	t CO_2e/t CH_4
Description:	Global warming potential of methane
Source of data:	IPCC Sixth Assessment Report (AR6)
Value to be applied:	Value: 29.8 t CO_2e/t CH_4
Any comment:	The GWP value will be updated in line with the latest available IPCC Assessment Reports.

Data / Parameter table 2.

Data / Parameter:	$EG_{historical}$
Data unit:	MWh/yr
Description:	Annual average historical net electricity generation delivered to the grid by the existing renewable energy power plant that was operated at the project site prior to the implementation of the project activity
Source of data:	Project activity site
Value to be applied:	Electricity meters
Any comment:	–

Data / Parameter table 3.

Data / Parameter:	$\sigma_{historical}$
Data unit:	MWh/yr
Description:	Standard deviation of the annual average historical net electricity generation delivered to the grid by the existing renewable energy power plant that was operated at the project site prior to the implementation of the project activity
Source of data:	Calculated from data used to establish $EG_{historical}$
Value to be applied:	Parameter to be calculated as the standard deviation of the annual generation data used to calculate $EG_{historical}$ for retrofit, or rehabilitation or replacement project activities
Any comment:	–

Data / Parameter table 4.

Data / Parameter:	$DATE_{BaselineRetrofit}$
Data unit:	date
Description:	Point in time when the existing equipment would need to be replaced in the absence of the project activity
Source of data:	Project activity site
Value to be applied:	As per provisions in the methodology above
Any comment:	–

Data / Parameter table 5.

Data / Parameter:	***$DATE_{hist}$***
Data unit:	date
Description:	Point in time from which the time span of historical date for retrofit, rehabilitation or replacement project activities may start
Source of data:	Project activity site
Value to be applied:	$DATE_{hist}$ is the latest point in time between: (a) The commercial commissioning of the plant/unit; (b) If applicable: the last capacity addition to the plant/unit; or (c) If applicable: the last retrofit or rehabilitation of the plant/unit
Any comment:	–

Data / Parameter table 6.

Data / Parameter:	***EF_{Res}***
Data unit:	$kgCO_2e/MWh$
Description:	Default emission factor for emissions from reservoirs
Source of data:	Decision at CDM EB 23, UNFCCC
Value to be applied:	90 $kgCO_2e/MWh$
Any comment:	

Data / Parameter table 7.

Data / Parameter:	***Cap_{BL}***
Data unit:	W
Description:	Installed capacity of the hydro power plant before the implementation of the project activity. For new hydro power plants, this value is zero
Source of data:	Project site
Value to be applied:	Determine the installed capacity based on manufacturer's specifications or recognized standards
Any comment:	–

Data / Parameter table 8.

Data / Parameter:	***A_{BL}***
Data unit:	m^2
Description:	Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero
Source of data:	Project site
Value to be applied:	Measured from topographical surveys, maps, satellite pictures, etc.
Any comment:	–

Data / Parameter table 9.

Data / Parameter:	$GWP_{working\ fluid}$
Data unit:	–
Description:	Global Warming Potential for the Working Fluid used in the binary geothermal plant
Source of data:	IPCC
Value to be applied:	–
Any comment:	–

5. Methodology: Monitoring Component

68. All data collected as part of monitoring should be archived electronically and be kept at least for two years after the end of the last crediting period. One hundred per cent of the data should be monitored if not indicated otherwise in the tables below. All measurements should be conducted with calibrated measurement equipment according to relevant industry standards.

69. In addition, the monitoring provisions in the tools referred to in this methodology apply. Accordingly, $EG_{facility,y}$, $EG_{PJ\_Add,y}$, , $EC_{BESS,y}$, and $EC_{PSP,y}$ should be determined as per BM-T-003, and $PE_{FF,y}$ should be determined as per BM-T-002.

5.1. Data and parameters monitored

Data / Parameter table 10.

Data / Parameter:	$w_{steam,CO2,y}$
Data unit:	t CO_2/t steam
Description:	Average mass fraction of carbon dioxide in the produced steam in year *y*
Source of data:	Project activity site
Measurement procedures (if any):	Non-condensable gases sampling should be carried out in production wells and/or at the steam field-power plant interface using ASTM Standard Practice E1675 for Sampling 2-Phase Geothermal Fluid for Purposes of Chemical Analysis (as applicable to sampling single phase steam only). The CO_2 and CH_4 sampling and analysis procedure consists of collecting non-condensable gases samples from the main steam line with glass flasks, filled with sodium hydroxide solution and additional chemicals to prevent oxidation. H_2S and CO_2 dissolve in the solvent while the residual compounds remain in their gaseous phase. The gas portion is then analyzed using gas chromatography to determine the content of the residuals including CH_4. All alkanes concentrations are reported in terms of methane.
Monitoring frequency:	At least every three months and more frequently, if necessary
QA/QC procedures:	–
Any comment:	Applicable to dry, flash steam and binary geothermal power projects

Data / Parameter table 11.

Data / Parameter:	$w_{steam,CH4,y}$
Data unit:	t CH_4/t steam
Description:	Average mass fraction of methane in the produced steam in year *y*
Source of data:	Project activity site
Measurement procedures (if any):	As per the procedures outlined for $w_{steam,CO2,y}$
QA/QC procedures:	–
Any comment:	Applicable to dry, flash steam and binary geothermal power projects

Data / Parameter table 12.

Data / Parameter:	$M_{steam,y}$
Data unit:	t steam/year
Description:	Quantity of steam produced in year *y*
Source of data:	Project activity site
Measurement procedures (if any):	The steam quantity discharged from the geothermal wells should be measured with a Venturi flow meter (or other equipment with at least the same accuracy). Measurement of temperature and pressure upstream of the Venturi meter is required to define the steam properties. The calculation of steam quantities should be conducted on a continuous basis and should be based on national or international standards. The measurement results should be summarized transparently in regular production reports
Monitoring frequency:	Daily
QA/QC procedures:	–
Any comment:	Applicable to dry or flash steam geothermal power projects

Data / Parameter table 13.

Data / Parameter:	TEG_y
Data unit:	MWh/year
Description:	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y*
Source of data:	Project activity site
Measurement procedures (if any):	Electricity meters
Monitoring frequency:	Continuous measurement and at least monthly recording
QA/QC procedures:	Calibration records of the electricity meters to be maintained and archived
Any comment:	Applicable to hydro power project activities with a power density greater than 4 W/m^2 and less than or equal to 10 W/m^2

Data / Parameter table 14.

Data / Parameter:	$EG_{PJ,y}$
Data unit:	MWh/year
Description:	Quantity of net electricity generation that is produced and supplied to the grid as a result of the implementation of the ICM project activity in year *y*
Source of data:	Project activity site
Measurement procedures (if any):	Electricity meters or Calculated as follows: $EG_{PJ,y} = TEG_y - Aux_y$
Monitoring frequency:	Continuous measurement and at least monthly recording
QA/QC procedures:	Calibration records of the electricity meters to be maintained and archived
Any comment:	In case the on site electricity meter provides direct values for $EG_{PJ,y}$, the same can be used and calculations are not required.

Data / Parameter table 15.

Data / Parameter:	$Aux_{,y}$
Data unit:	MWh/year
Description:	Quantity of electricity that is consumed from the grid or from the electricity generation plant under the ICM project activity in year *y*
Source of data:	Project activity site
Measurement procedures (if any):	Electricity meters
Monitoring frequency:	Continuous measurement and at least monthly recording
QA/QC procedures:	Calibration records of the electricity meters to be maintained and archived
Any comment:	

Data / Parameter table 16.

Data / Parameter:	Cap_{PJ}
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data:	Project site
Measurement procedures (if any):	Determine the installed capacity based on manufacturer's specifications or commissioning data or recognized standards
Monitoring frequency:	Once at the beginning of each crediting period
QA/QC procedures:	–
Any comment:	–

Data / Parameter table 17.

Data / Parameter:	A_{PJ}
Data unit:	m^2
Description:	Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data:	Project site
Measurement procedures (if any):	Measured from topographical surveys, maps, satellite pictures, etc.
Monitoring frequency:	Once at the beginning of each crediting period
QA/QC procedures:	–
Any comment:	–

Data / Parameter table 18.

Data / Parameter:	$M_{inflow,y}$
Data unit:	t steam/year
Description:	Quantity of steam entering the geothermal plant in year *y*
Source of data:	Project activity site
Measurement procedures (if any):	The steam quantity entering the power plant should be measured with a Venturi flow meter (or other equipment with at least the same accuracy). Measurement of temperature and pressure upstream of the Venturi meter is required to define the steam properties. The calculation of steam quantities should be conducted on a continuous basis and should be based on national or international standards. The measurement results should be summarized transparently in regular production reports
Monitoring frequency:	Continuous
QA/QC procedures:	The flow meter must be calibrated according to the national, international, or manufacturer's instructions. The recorded data must be stored daily in a central database with backup
Any comment:	–

Data / Parameter table 19.

Data / Parameter:	$M_{outflow,y}$
Data unit:	t steam/year
Description:	Quantity of steam leaving the geothermal plant in year *y*
Source of data:	Project activity site
Measurement procedures (if any):	The steam quantity entering the power plant should be measured with a Venturi flow meter (or other equipment with at least the same accuracy). Measurement of temperature and pressure upstream of the Venturi meter is required to define the steam properties. The calculation of steam quantities should be conducted on a continuous basis and should be based on national or international standards.
Monitoring frequency:	Continuous

QA/QC procedures:	The flow meter must be calibrated according to the national, international, or manufacturer's instructions. The recorded data must be stored daily in a central database with backup
Any comment:	–

Data / Parameter table 20.

Data / Parameter:	$M_{working\ fluid,y}$
Data unit:	t working fluid/year
Description:	Quantity of working fluid leaked/reinjected in year *y*
Source of data:	Project site
Measurement procedures (if any):	Measured via log books and maintenance reports of the plant
Monitoring frequency:	Annually
QA/QC procedures:	Measured from the amount of working flow reinjected to the binary system of the geothermal plant. Cross check with the purchase invoices
Any comment:	–

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Revision/Changes in the Document

Version	*Date*	*Description*
1.0	27 March 2025	Initial Adoption