CLEAN DEVELOPMENT MECHANISM

CDM-MP91-A02

Draft Large-scale Methodology

AM00XX: Renewable energy generation for captive use

Version 01.0

Sectoral scope(s): 01

United Nations
Framework Convention on
Climate Change

COVER NOTE

1. Procedural background

1. The Executive Board of the clean development mechanism (hereinafter referred to as the Board) considered the recommendation of the Methodologies Panel (MP) to approve the clarification prepared in response to the request for clarification “AM_CLA_0297: Clarification regarding application of ACM0002 for captive purpose” and decided to request the MP to review the recommendation. In this regard, the Board requested the MP to revise "ACM0002: Grid-connected electricity generation from renewable sources" (hereinafter referred to as ACM0002), or develop a new methodology to clarify the applicability and requirements in relation to wheeling and banking of renewable electricity fed into the grid by the project activity before its use, and submit the revised methodology or new methodology, together with the revised response to the request for clarification AM_CLA_0297, for consideration by the Board at a future meeting.

2. Further, a stakeholder submitted AM_REV_0262: Request to revision of ACM0002 to integrate battery energy storage system (BESS) to renewable energy projects supplying electricity to the captive user and or sale through open access (hereinafter referred to as AM_REV_0262). The proposal requests to revise ACM0002 to expand its applicability to include renewable energy supply to the captive consumer.

3. The MP noted that AM_REV_0262 has an overlap with the current mandate from EB113 as in paragraph 1 above, in terms of scope of development of new methodology for renewable energy generation for captive use. Therefore, the MP agreed to work together on these agenda items.

2. Purpose

4. The purpose of this new methodology is to address the mandate received from the Board as mentioned in paragraph 1 above.

3. Key issues and proposed solutions

3.1. Renewable energy technologies to be considered

5. The secretariat conducted an analysis of projects registered applying ACM0002 and noted that project design documents of 30 project activities stated that the electricity generated from these project activities will be supplied to an identified customer via: (i) a grid interface either through a wheeling or other similar arrangements under systems that allow under open access mechanism or (ii) as a stand-alone or an independent power plant/unit.

6. Out these 30 projects, 26 projects will sell the electricity to an identified captive consumer by a power purchase agreement through a wheeling and banking arrangement with the respective national grid, and the remaining 4 projects will sell the electricity to a third party via open access mechanism.

7. Also, it is noted that 26 out of these 30 projects implemented wind energy technology while 2 each implemented hydro and solar PV technology.

8. Further, all these 30 projects involved construction and operation of a greenfield project activity.

9. Noting the above-mentioned analysis, the MP at its ninetieth meeting (MP90) agreed:

   (a) To limit the proposed methodology to project activities implementing greenfield renewable energy power projects based on solar, wind and/or hydro technologies with or without Battery Energy Storage System (BESS) and supplying renewable electricity to the captive consumer. However, the methodology allows a leeway for project activities allowing to supply up to 10 per cent of the electricity generated to the grid a yearly basis; and

   (b) The renewable energy power plant would not have existed in the baseline; and

   (c) In the pre-project scenario, the captive consumer does not source electricity from a renewable energy source.

10. In case a stakeholder wishes to add other technologies or types such as capacity addition, retrofit, rehabilitation or refurbishment to an existing power plant/unit, this can be done through a request for revision.

3.2. Baseline determination and additionality demonstration

11. The MP agreed to prepare a draft methodology for supply of renewable energy to the captive consumer, wherein the renewable energy plant is connected to the user with or without a grid interface and where the renewable energy producer and captive consumption facility are owned by the same project participant.

12. Limiting to this case will ensure avoiding issues such as whether the baseline determination and additionality demonstration should be for consumer or renewable energy producer.

13. The MP conducted a review of approaches used to determine the baseline scenario and to demonstrate additionality in existing CDM methodologies that address similar producer-consumer relationship. such as “AM0058: Introduction of a district heating system”, “AM0117: Introduction of a new district cooling system”, “ACM0012: Waste energy recovery” and “ACM0025: Construction of a new natural gas power plant ”.

14. It is noted that all the above-mentioned methodologies determine the baseline and demonstrate the additionality following the investment comparison analysis as per the requirements provided in “TOOL02: Combined tool to identify the baseline scenario and additionality demonstration”. Therefore, the MP agreed to use the same approach for the proposed draft methodology.

15. Further, the baseline emission factor shall be dependent on the baseline scenario. If the project participant demonstrates that their baseline scenario is receiving electricity from a dedicated fossil-fuel plant then the baseline emission factor should be calculated following the requirements of the "TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation". If in the baseline scenario the captive consumer receives electricity from the grid, then baseline emission factor should be calculated following the requirements of the "TOOL07: Tool to calculate the emission factor for an electricity system", whichever is applicable depending on the baseline scenario determined for the project activity.

16. The draft methodology also considers a case wherein the project activity results in supplying surplus electricity to the grid. However, the maximum portion of the electricity supplied to the grid shall be fixed ex-ante in the project design document and it shall not be more than 10 per cent of that value in a calendar year.

3.3. Consideration of wheeling and banking

17. Based on the literature review[1] the MP agreed to define wheeling as a direct relationship between producer and consumer, where electricity generated will be consumed without any time delay. In case of banking, the situation is different, where the electricity, if not consumed by the consumer without any time delay, is virtually banked for the consumption by the consumer at a later time. Banking does not lead to a physical energy storage but rather electricity is virtually banked (up to a few months) through accounting methods. In physical terms the amount of electricity that is banked will be supplied to the consumer at a later time from the grid through the operation of other grid-connected plants and the impact of the electricity generated and banked will be on the grid-connected plants.

3.4. Pending issues to be addressed

18. The MP agreed to continue working on the following issues:

    (a) How the baseline scenario should be determined in the following cases;

        (i) The renewable energy producing facility and the captive consuming facility are not owned by the same project participant, specifically noting that the baseline should be determined for a renewable energy producer as well as for the captive consumer;

        (ii) The renewable energy producer is not a greenfield producer, but it switches the supply of generated energy from one captive consumer to other, in which case the first captive consumer may switch to use of electricity generated by a fossil fuel source;

    (b) How to address the rigidity (or fluidity) of the contractual agreement between the producer and consumer(s) at the time of the investment decision, and whether the termination of the contract during a given crediting period should disqualify the project; and

    (c) How to consider inclusion/exclusion of a group of individual households as consumers, which may impose obstacles in determining baseline and demonstration of additionality .

4. Impacts

19. The new methodology provides a framework to calculate emission reductions for the project activities that supply renewable electricity to the captive consumer replacing more GHG intensive electricity.

5. Subsequent work and timelines

20. The draft methodology is recommended by the MP for consideration by the Board at its 119th meeting. The proposed draft addresses the mandate and issues raised in the request for revision AM_REV_0262 and satisfies the requirements from the stakeholder.

21. In addition, the MP agreed to further work on the open issues as mentioned under section 3.4 above and will submit revised version of this methodology for the Board's consideration at a future meeting.

6. Recommendations to the Board

22. The MP recommends that the Board adopt this draft methodology, to be made effective at the time of the Board's approval.

[1] Refer to: (i) Technical report by NREL "Wheeling and Banking Strategies for Optimal Renewable Energy Deployment: International Experiences", NREL/TP-6A20-65660, March 2016; (ii) Factsheet by ESKOM available at https://www.eskom.co.za/distribution/wp-content/uploads/2022/07/20220721-Wheeling-concept_Introduction.final_.pdf; and (iii) India's electricity act passed in 2003 available at https://cercind.gov.in/Act-with-amendment.pdf

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1. Introduction

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

Table 1. Methodology key elements

Typical projects	Construction and operation of a greenfield power plant/unit that uses renewable energy sources and supplies electricity to a captive consumer belonging to the same project participant. Battery energy storage system can be integrated under certain conditions.
Type of GHG emissions mitigation action	Renewable energy: Displacement of electricity that would be provided to the captive consumer by more-GHG-intensive means

2. Scope, applicability, and entry into force

2.1. Scope

2. This methodology applies to a greenfield renewable energy power generation project activities supplying electricity to the captive consumer.

3. Further, the methodology applies to project activities that integrate battery energy storage systems (BESS) to a greenfield power plant.

2.2. Applicability

4. This methodology is applicable to renewable energy power generation project activities that install a greenfield power plant supplying electricity to the captive consumer via:

   (a) A grid interface through a wheeling or other similar arrangements that are allowed under an open access mechanism; or

   (b) A stand-alone power plant/unit using a dedicated electricity transmission and distribution line.

5. In case the project activity integrates a BESS, the methodology is applicable only to project activities that integrate greenfield BESS with a greenfield renewable energy power plant.

6. The methodology is applicable under the following conditions:

   (a) In the pre-project scenario, the captive consumer does not source electricity from a renewable energy source;

   (b) The renewable energy producer and captive consumption facility shall be owned by the same project participant;

   (c) The project activity may include renewable energy power plant/unit of one of the following types: solar power plant/unit, wind power plant/unit, hydro power plant/unit with or without a reservoir.

(d) A greenfield power plant at the time of the start date of the project activity should be contractually bound to supply electricity to a captive consumer at least for the entire duration of the first crediting period.

(e) The renewable energy plants shall not export more than 10 per cent on a yearly basis of its generation to a grid. This condition shall be met over the crediting period;

(f) In case of integration of BESS as per paragraph 5 above, the project participants shall demonstrate that the BESS was an integral part of the design of the project activity (e.g., by referring to feasibility studies or investment decision documents);

(g) The BESS should be charged with electricity generated from the associated renewable energy power plant(s). Only during exigencies[2] 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 5.4.3 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., days(s), 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 certified emission reductions for the concerned periods of the monitoring period.

7. In case of hydro power plants, one of the following conditions shall apply:[3]

(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 (2), 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 (2), 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 (2), is lower than or equal to 4 W/m^2, all of the following conditions shall apply:

(i) The power density calculated using the total installed capacity of the integrated project, as per equation (3), 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;

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

[3] Project participants wishing to undertake a hydroelectric project activity that results in a new reservoir or an increase in the volume of an existing reservoir, in particular where reservoirs have no significant vegetative biomass in the catchments area, may request a revision to the approved consolidated methodology.

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

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.

8. 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 CDM 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 CDM project activity.

9. The project participant shall demonstrate that double counting of emission reductions will not occur[4]. The steps undertaken to avoid double-counting shall be documented in the project design document.

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

2.3. Entry into force

11. The date of entry into force is the date of the publication of the EB ### meeting report on ## Month 202#.

2.4. Applicability of sectoral scopes

12. For validation and verification of CDM projects and programme of activities by a designated operational entity (DOE) using this methodology, application of sectoral scope 01 is mandatory.

3. Normative references

13. This methodology also refers to the latest approved versions of the following tools:[5]

(a) "TOOL01: Tool for the demonstration and assessment of additionality" (hereinafter referred to as TOOL01);

[4] For example, via a contractual agreement with each relevant counterparty for example, with the renewable energy generating company and the captive customer(s).

[5] Available on the UNFCCC CDM website.

(b) "TOOL02: Combined tool to identify the baseline scenario and demonstrate additionality" (hereinafter referred to as TOOL02);

(c) "TOOL03: Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (hereinafter referred to as TOOL03);

(d) "TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (hereinafter referred to as TOOL05);

(e) "TOOL07: Tool to calculate the emission factor for an electricity system" (hereinafter referred to as TOOL07);

(f) "TOOL11: Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" (hereinafter referred to as TOOL011).

14. For more information regarding the proposed new methodologies and the tools as well as their consideration by the Executive Board (hereinafter referred to as the Board) of the clean development mechanism (CDM) please refer to <http://cdm.unfccc.int/goto/MPappmeth>.

3.1. Selected approach from paragraph 48 of the CDM modalities and procedures

15. "Existing actual or historical emissions, as applicable"; or

16. "Emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment".

4. Definitions

17. The definitions contained in the Glossary of CDM terms shall apply.

18. 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 or captive failure or tripping of generator units, to meet electricity demand of the equipment at power plants/units site during emergency;

(b) **Banking** - is a financial and accounting mechanism under which a renewable energy producer earns credit for excess renewable energy supplied to the grid.

(c) **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);

(d) **Captive consumer** – a facility that receives electricity generated from the project activity with an aim to meet its entire or partial electricity demand;

(e) **Captive power plant** – a facility that provides electricity to a captive consumer to meet its entire or partial electricity demand. The captive power plant may or may not be operated in a grid-connected mode;

(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) **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;

(h) **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;

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

(j) **Open access mechanism** – a non-discriminatory provision to allow use of transmission and distribution system and or associated facilities and services by allowing a buyer and seller to choose their supplier of electricity. Such usage is as specified by the local regulation. The objective of such mechanism is normally to promote competition and increase efficiency. Generally, a buyer and seller enter into a power purchase agreement. The transmission operator levies certain charges. These include transmission charges, wheeling charges, cross subsidy charges, etc.

(k) **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;

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

(m) **Wheeling** - is a transmission service that enables the delivery of renewable energy to a captive consumer under a power purchase agreement.

19. In addition, the definitions in the TOOL05 and TOOL07 apply.

5. Baseline methodology

5.1. Project boundary

20. The spatial extent of the project boundary includes the project power plant/unit and or all power plants/units connected physically to the electricity system that the CDM project power plant is connected to, the captive consumer that receives electricity generated by the project activity via wheeling or other similar arrangements that are allowed under an open access mechanism, or through a dedicated electricity transmission and distribution line.

21. The greenhouse gases and emission sources included in or excluded from the project boundary are shown in Table 2.

Table 2. 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	CO_2 emissions from combustion of fossil fuels for electricity generation in solar thermal 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

5.2. Identification of the baseline scenario

22. The following procedure shall be applied to identify the baseline scenario.

5.2.1. Identify realistic and credible baseline scenarios

23. Apply Step 1 of TOOL02. In application of this step only the alternatives available to project participants shall be taken into account. The options considered should include:

(a) S1: No investment is undertaken by the project participant to meet the electricity demand of the captive consumer, and electricity delivered to the captive consumer would have been generated by the operation of grid-connected power plants and by the addition of new generation sources;

(b) S2: The project participant makes an investment to meet the electricity demand of the captive consumer through the construction of captive power plant using fossil fuels;

(c) S3: The project participant makes an investment to meet the electricity demand of a captive consumer through the construction of captive power plant using renewable power generation technologies, i.e., the proposed project activity is undertaken without being registered as a CDM project activity;

(d) S4: All other plausible and credible alternatives to the project activity that would meet the requirement from the captive consumer;

(e) S5: The "proposed project activity undertaken without being registered as a CDM project activity" to be implemented at a later point in time (e.g., due to existing regulations, end-of-life of existing equipment, financing aspects).

24. Identify the baseline scenario as the economically most attractive alternative scenario, using an investment comparison analysis as per Step 3 of TOOL02.

25. In case of integrated hydro power project only the incremental investment associated with the CDM project activity i.e., construction of a new reservoir and new power plants/units should be considered as the capital investment.

5.3. Additionality

26. The additionality of the project activity shall be demonstrated and assessed using requirements under TOOL02.

5.4. Project emissions

27. 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:

$$PE_y = PE_{FF,y} + PE_{HP,y} + PE_{BESS,y} \quad \text{Equation (1)}$$

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)
$PE_{HP,y}$	=	Project emissions from water reservoirs of hydro power plants in year *y* (t CO_2e/yr)
$PE_{BESS,y}$		Project emissions from charging of BESS using electricity from the grid or from fossil fuel electricity generators (t CO_2e/yr)

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

28. For 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 ($PE_{FF,y}$).

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

30. $PE_{FF,y}$ shall be calculated as per TOOL03.

5.4.2. Emissions from water reservoirs of hydro power plants ($PE_{HP,y}$)

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

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$ Equation (2)

Where:

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

32. For hydro power project activities that result in new single or multiple reservoirs and hydro power project 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:

33. For integrated hydro power project PD of the entire project is calculated as follows:

$$PD = \frac{\sum Cap_{PJ,i}}{\sum A_{PJ,j}}$$ Equation (3)

Where:

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

34. If the power density of the project activity using equation (2) or in case of integrated hydro power project using equation (3) is greater than 4 W/m^2 and less than or equal to 10 W/m^2:

$$PE_{HP,y} = \frac{EF_{Res} \times TEG_y}{1000}$$ Equation (4)

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 (kg CO2e/MWh)
TEG_y	=	Total electricity produced by the project activity, including the electricity supplied to the captive consumer and the electricity supplied to internal loads, in year *y* (MWh)

35. If the power density of the project activity is greater than 10 W/m^2:

$$PE_{HP,y} = 0$$ Equation (5)

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

36. Under normal conditions, BESS should be charged with the electricity generated by the associated renewable power plant. Exceptionally, the BESS may be charged using grid electricity or electricity from fossil fuel generators ($EG_{BESS,y}$).

37. 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 TOOL05.

38. 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 TOOL03.

39. In line with the requirement under paragraph 6(g), 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 certified emission reductions for the concerned period.

5.5. Baseline emissions

40. Baseline emissions include only CO_2 emissions from electricity generation either in grid-connected and or captive fossil fuel fired power plants that are displaced due to the project activity. The baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{CO2,y} + EG_{PJsurplus,y} \times EF_{grid,y}$$ Equation (6)

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 a captive consumer as a result of the implementation of the CDM project activity in year *y* (MWh/yr)
$EG_{PJsurplus,y}$	=	Quantity of the surplus electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)
$EF_{CO2,y}$	=	The electricity emission factor (t CO_2/MWh) of the baseline electricity source (i) In cases where the baseline is use of electricity from the grid (baseline scenario S1), follow the procedures described in TOOL07 to calculate the electricity emission factor; (ii) In cases where the baseline is use of electricity from an existing and/or new captive power plants using fossil fuels (baseline scenario S2 or S4), follow the procedures described in TOOL05 to calculate the electricity emission factor

$EF_{grid,y}$ = The emission factor of the grid (t CO_2/MWh) following the procedures described in TOOL07

5.5.1. Calculation of quantity of net electricity generation

41. The calculation of $EG_{PJ,y}$ is calculated as follows:

$$EG_{PJ,y} = EG_{facility,y} \quad \text{Equation (7)}$$

Where:

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and supplied to a captive consumer as a result of the implementation of the CDM project activity in year *y* (MWh/yr)

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the captive consumer in year *y* (MWh/yr)

5.6. Leakage

42. No 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.

5.7. Emission reductions

43. Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \quad \text{Equation (8)}$$

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)

5.7.1. Estimation of emissions reductions prior to validation

44. Project participants shall prepare as part of the CDM-PDD an estimate of likely emission reductions from the proposed project activity during the crediting period. This estimate should, in principle, employ the same methodology as selected above. Where the electricity emission factor ($EF_{CO2,y}$) is determined ex post during monitoring, project participants may use models or other tools to estimate the emission reductions prior to validation.

5.8. Changes required for methodology implementation in 2nd and 3rd crediting periods

45. Project participants shall refer to TOOL11.

5.9. Data and parameters not monitored

46. 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.

Data / Parameter table 1.

Data / Parameter:	***GWP_{CH4}***
Data unit:	t CO_2e/t CH_4
Description:	Global warming potential of methane valid for the relevant commitment period
Source of data:	IPCC
Value to be applied:	For the first commitment period: 21 t CO_2e/t CH_4 For the second commitment period: 25 t CO_2e/t CH_4
Any comment:	-

Data / Parameter table 2.

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

Data / Parameter table 3.

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 4.

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:	-

6. Monitoring methodology

47. 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 shall be monitored if not indicated otherwise in the tables below. All measurements shall be conducted with calibrated measurement equipment according to relevant industry standards.

48. In addition, the monitoring provisions in the tools referred to in this methodology apply. Accordingly, $EG_{facility,y}$, and $EG_{BESS,y}$ shall be determined as per TOOL05, when applying the tool, requirement for the $EG_{PJ,facility,l,y}$ should apply to parameters $EG_{facility,y}$, and $EF_{CO2,y}$ shall be determined either as per TOOL07 or TOOL05 depending on the baseline determination for the project activity, and $PE_{FF,y}$ shall be determined as per TOOL03.

6.1. Data and parameters monitored

Data / Parameter table 5.

Data / Parameter:	TEG_y
Data unit:	MWh/year
Description:	Total electricity produced by the project activity, including the electricity supplied to a captive consumer 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:	-
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 6.

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 7.

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 8.

Data / Parameter:	$EG_{PJsurplus,y}$
Data unit:	MWh/year
Description:	Quantity of the surplus electricity supplied to the grid as a result of the implementation of the CDM 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:	-
Any comment:	Applicable to renewable energy plants suppling surplus electricity to the grid. The maximum amount of electricity supplied to the grid is capped at 10 per cent on a yearly basis. This condition shall be met over the crediting period.

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