Climate project methodology № 0007

Grid-connected electricity generation from renewable sources (large-scale)

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TABLE OF CONTENTS **Page**

1. Terms and Definitions

1. The following definitions apply for the purpose of this methodology[1]:

(a) **Backup power supply -** supplying power to the electric grid loads for a specified length of time after it is disconnected from the power system/grid[2] [3];

(b) **Battery Energy Storage System (BESS) -** a stationary system for storing and converting electrical energy back into electricity that contains the components necessary for this function, in particular a battery, an energy conversion system, and an energy management system[4] [5];

(c) **Binary cycle geothermal power plant -** a power plant in which two cycles are used to generate electricity: the first cycle carries coolant from a source that heats the second cycle, through which the second coolant, which has a lower boiling point, is fed to the turbine[6] [7];

(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 besides the existing power plants; or (ii) the installation of new power plants, additional to the existing power plants; or (iii) construction of a new reservoir along with addition of new power plants in case of integrated hydro power projects. The existing power plants 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

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[1] When using the regulations and sets of rules referenced in this methodology, it is recommended to check the validity of reference documents in the public information system - on the official website of the federal executive body in the field of standardization on the Internet or according to the annual information index "National Standards".

[2] GOST R 58092.3.3-2023 Electric Energy Storage Systems. Planning and performance assessment of electrical energy storage systems

[3] Reference methodologies developed within the framework of the Clean Development Mechanism (ACM0002) use the following interpretation for this term: **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 site during emergency.

[4] GOST R MEK 62485-5-2021 Secondary batteries and battery installations. Safety requirements Part 5. Safe operation of stationary lithium-ion batteries

[5] Reference methodologies developed within the framework of the Clean Development Mechanism (ACM0002) use the following interpretation for this term: **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).

[6] GOST R 54531-2011 Non-conventional technologies. Recommended and alternative energy sources. Terminology and Definitions

[7] Reference methodologies developed within the framework of the Clean Development Mechanism (ACM0002) use the following interpretation for this term: **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.

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, rated power -** the power with which the electrical installation, equipment can operate for a long time under nominal parameters and/or normal conditions[8]. Expressed in watts or one of its multiples, for which the power unit has been designed to operate at nominal conditions. The structure of the installed capacity of power plants is a shared distribution of the total installed capacity of power plants by their types or by types of units[9] [10].

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

(k) **Power plant -** is a power plant designed for the production of electrical energy, containing a construction part, energy conversion equipment and necessary auxiliary equipment according to GOST 19431-84[11] [12].

(l) **Reconstruction -** is the reconstruction of existing fixed assets connected to the improvement of production and its technical and economic indicators and carried out under the project of reconstruction of fixed assets in order to increase production capacity, improve quality and change the nomenclature of production[13]. The reconstruction of existing energy enterprises includes the reconstruction of existing workshops and facilities for the main, auxiliary and maintenance purposes of power plants, thermal and electrical networks associated with the improvement of production, increasing the technical and economic level, changing the main technical and economic indicators. The objects of electrical networks are subject to reconstruction, as a rule, having an unsatisfactory condition of building structures and structures due to the

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[8] GOST R 57114-2016. Unified energy system and isolated power systems. Electric power systems. Operational dispatch management in the electric power industry and operational and technological management. Terms and definitions.

[9] GOST 19431-84. Energy and electrification. Terms and definitions.

[10] Reference methodologies developed within the framework of the Clean Development Mechanism (ACM0002) use the following interpretation for this term: **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.

[11] GOST 24291-90 Interstate standard. The electrical part of the power plant and the electrical network. Terms and definitions.

[12] Reference methodologies developed within the framework of the Clean Development Mechanism (ACM0002) use the following interpretation for this term: **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.

[13] For the terms "Technical re-equipment", "Modernization", "Reconstruction" and "Overhaul", the definition of a single terminology in the regulatory documents of the Russian Federation is not established and there may be discrepancies depending on the objects subject to these types of work. Terminology in reference methodologies also does not coincide in full (indicated for each specific term). The term "Technical re-equipment" in the sense of use in the methodology is close to the term "Modernization". However, the Russian legal field divides these concepts.

development of a standard service life, due to various natural disasters[14] that do not meet the requirements of sanitary standards and ecology.

(m) **Modernization (fixed asset completion, equipping, replacement[15])** - works caused by a change in the technological or service purpose of equipment, buildings, structures or other object of depreciable fixed assets, increased loads and (or) other new qualities[16], i.e. it is the replacement of outdated equipment with new due to functional wear. Modernization of the electric power industry includes not only decommissioning of old, physically and morally obsolete equipment, reconstruction of low-efficiency equipment and replacement of technologies with modern ones, but also the creation of fundamentally new equipment and energy technologies.

(n) **Reservoir** - an artificial reservoir formed by a water-retaining structure, filling a cavity or a collapsed area with water for the purpose of storing water and/or regulating runoff with special structures, creating a backup[17] [18].

(o) **Overhaul[19]** - repair in order to restore the usability (operability) of structures and equipment, as well as to maintain operational performance. During the retrofit of equipment, which is carried out to restore the usability and full or close to full resource of the object with the replacement or restoration of any of its parts, a complete disassembly of the unit, repair of basic and body parts and assemblies, replacement or restoration of all worn-out parts and assemblies to new and more modern, assembly, regulation and testing of the unit can be carried out. During the retrofit of the equipment, its functional purpose should not be changed. The purpose of the equipment retrofit is to restore its technical and economic characteristics to values close to the initial ones[20].

(p) **Crediting period** – the period in which verified and certified GHG emission reductions or increases in net anthropogenic GHG removals by sinks attributable to a climate project activity, as applicable, can result in the issuance of carbon units. The time period that applies to a crediting period for a climate project activity, and whether the crediting

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[14] Reference methodologies developed within the framework of the Clean Development Mechanism (ACM0002) use the following interpretation for this term: **Rehabilitation (or refurbishment)** - 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 or refurbishment 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.

[15] Reference methodologies developed within the framework of the Clean Development Mechanism (ACM0002) use the following interpretation for this term: **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.

[16] For the terms "Technical re-equipment", "Modernization", "Reconstruction" and "Overhaul", the definition of a single terminology in the regulatory documents of the Russian Federation is not established and there may be discrepancies depending on the objects subject to these types of work. Terminology in reference methodologies also does not coincide in full (indicated for each specific term). The term "Technical re-equipment" in the sense of use in the methodology is close to the term "Modernization". However, the Russian legal field divides these concepts.

[17] GOST R 70214-2022. Hydraulic engineering. Basic concepts. Terms and definitions.

[18] Reference methodologies developed within the framework of the Clean Development Mechanism (ACM0002) use the following interpretation for this term: **Reservoir** - a reservoir is a water body created in valleys to store water generally made by the construction of a dam.

[19] Reference methodologies developed within the framework of the Clean Development Mechanism (ACM0002) use the following interpretation for this term: **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.

[20] Order of the Ministry of Energy of the Russian Federation No. 1013 dated October 25, 2017 "On Approval of Requirements for Ensuring the Reliability of Electric Power Systems, Reliability and Safety of Electric Power Facilities and Power Receiving Installations "Rules for the Organization of Maintenance and Repair of Electric Power Facilities" (with amendments and additions).

period is renewable or fixed, is determined in accordance with Section 4. Project crediting period of this methodology.

(q) **Technical re-equipment**[21] - is a set of measures to improve the technical and economic indicators of fixed assets or their individual parts based on the introduction of advanced equipment and technology, mechanization and automation of production, modernization and replacement of obsolete and physically worn-out equipment with new, more efficient equipment[22].

(r) **Grid power plant** - a power plant that supplies electricity to an electricity grid and, if applicable, to specific consumers. This means that power plants supplying electricity to the grid and specific captive consumers at the project are considered as a grid power plant, while power plants that serve only captive consumers and do not supply electricity to the grid are not considered as a grid power plant;

(s) **Net electricity generation** - refers to the difference between the total quantity of electricity generated by the power plant and the auxiliary electricity consumption (also known as parasitic load) of the power plant (e.g. for pumps, fans, controlling etc.);

(t) **Project electricity system** - is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that are covered by either single or layered dispatch area;

(u) **Isolated grid system** - is an electricity system supplying electricity to household users, and if applicable, industries and commercial areas that is not connected to any other electrical network (e.g. national/regional or interconnected power system) and meet one of the following conditions:

(i) Any grid where 65 per cent of the power installed capacity is based on liquid fossil fuel sources;

(ii) Any grid with a maximum power installed capacity of 1000 MW and at least 80 per cent of the power installed capacity is based on fossil fuel sources - solid, liquid or gaseous.

(v) **Connected electricity system -** is an electricity system that is connected by transmission lines to the project electricity system.

2. Scope and applicability

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

[21] For the terms "Technical re-equipment", "Modernization", "Reconstruction" and "Overhaul", the definition of a single terminology in the regulatory documents of the Russian Federation is not established and there may be discrepancies depending on the objects subject to these types of work. Terminology in reference methodologies also does not coincide in full (indicated for each specific term). The term "Technical re-equipment" in the sense of use in the methodology is close to the term "Modernization". However, the Russian legal field divides these concepts.

[22] The Tax Code of the Russian Federation (Part Two) of 05.08.2000 No. 117-FZ (ed. of 18.03.2023) (with amendments and additions, intro. effective from 01.04.2023)

Table 1. Methodology key elements

Typical projects	Overhaul, reconstruction, modernization or capacity addition to an existing power plant or construction and operation of a new power plant that uses renewable energy sources and supplies electricity to the grid. 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 grid by more-GHG-intensive means

Given methodology is unaffected by applying to GHG programs. If a GHG program is applied, then the requirements of this program supplement the requirements of the methodology. This methodology is prepared based on the existing methodology developed under the Clean Development Mechanism of the Kyoto Protocol (ACM0002) and includes its adaptation to the current Russian regulations and standards.

2.1. Scope

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

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

   (b) Overhaul, reconstruction, modernization or capacity addition of an existing power plant.

4. 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.

2.2. Applicability

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

   (a) Install a Greenfield power plant;

   (b) Involve a capacity addition to (an) existing plant(s);

   (c) Involve a overhaul of (an) existing operating plant(s);

   (d) Involve a reconstruction of (an) existing plant(s); or

   (e) Involve a modernization of (an) existing plant(s).

6. 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 or wind power plant(s);

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

   (d) Integrate a BESS together with implementing a overhaul of (an) existing solar photovoltaic or wind power plant(s).

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

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

7. The methodology is applicable under the following conditions:

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

(b) In the case of capacity additions, overhauls, reconstructions or modernizations (except for wind, solar, wave or tidal power capacity addition projects) the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, overhaul, or reconstruction of the plant 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 6 (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 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 7.1.4 ниже. 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 certified emission reductions for the concerned periods of the monitoring period.

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

(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 (13), 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 (13), 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 (13), 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 (14), 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 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.

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

(a) Demonstrate that water flow from upstream power plants 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 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 project activity.

10. 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.

11. In the case of overhauls, reconstructions, modernizations, 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”.

12. In addition, the applicability conditions apply.

2.3. Project boundary

13. The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the project power plant is connected to.

14. 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

3. Baseline methodology

3.1. Identification of the baseline scenario

3.1.1. Baseline scenario for Greenfield power plant

15. If the project activity is the installation of a Greenfield power plant with or without a BESS as described under paragraph 5(a) or paragraph 6(a), 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.

3.1.2. 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

16. If the project activity is a capacity addition with or without a BESS to an existing grid-connected renewable energy power plant as described under paragraph 5(b) or paragraph 6(b) 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 6(c), 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 modernized or overhauled ($DATE_{BaselineOverhaul}$), 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.

3.1.3. Baseline scenario for overhaul or reconstruction or modernization of an existing power plant

17. If the project activity is overhaul or reconstruction or modernization of an existing plant as described under paragraph 5(c) or paragraph 5(d) or paragraph 5(e), the following step-wise procedure to identify the baseline scenario shall be applied.

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

18. Apply Step 1 of TOOL №1. The options considered should include:

(a) The project activity not implemented as a climate project;

(b) 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) 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 modernization, overhaul and/or reconstruction at the power plants. Only alternatives available to project participants should be taken into account.

3.1.3.2. Step 2: Barrier analysis of TOOL №1

3.1.3.3. Step 3: Investment analysis of TOOL №1

3.1.4. Baseline scenario for overhaul of an existing solar photovoltaic or wind power plant

19. If the project activity is overhaul to an existing solar photovoltaic or wind power plant as described under paragraph 6(d), 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 overhaul or reconstruction or modernization of an existing power plant, described above.

3.2. Baseline emissions

20. 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 existing grid-connected power plants and 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 (1)

Where:

BE_y	=	Baseline emissions in year *y* (t CO_2/yr)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year *y* (MWh/yr)
$EF_{grid,CM,y}$	=	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using Appendix 6. (t CO_2/MWh)

3.2.1. Calculation of quantity of net electricity generation

21. The calculation of $EG_{PJ,y}$ is different for Greenfield plants, capacity additions, overhauls, reconstructions, and modernizations. These cases are described as follows:

3.2.1.1. Greenfield power plants

22. If the project activity is the installation of a Greenfield power plant with or without the BESS, as described under paragraph 5(a) or paragraph 6(a) then:

$$EG_{PJ,y} = EG_{facility,y}$$ Equation (2)

Where:

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

3.2.1.2. Capacity addition to wind, solar, wave or tidal plant

23. In the case of wind, solar, wave or tidal power plants or solar, or wind power plants with the BESS as described under paragraph 5 (b) or paragraph 6 (b) or paragraph 6 (c), it is assumed that the addition of new capacity does not significantly affect the electricity generated by existing plants. In this case, the electricity fed into the grid by the added power plants shall be directly metered and used to determine $EG_{PJ,y}$.

$$EG_{PJ,y} = EG_{PJ\_Add,y} \quad \text{Equation (3)}$$

Where:

$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the 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 that has been added under the project activity (MWh/yr)

3.2.1.3. Capacity addition to hydro or geothermal power plant

24. In the case of hydro or geothermal power plants as described under paragraph 5 (b), the addition of new power plants may significantly affect the electricity generated by the existing plants. 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 3.2.1.4 below for overhaul or reconstruction or modernization projects shall be used for hydro power plants and geothermal power plants. $EG_{facility,y}$ corresponds to the net electricity generation supplied to a grid by the existing plants and the added plants together constituting "project plants". A separate metering of electricity supplied to a grid by the added plants is not necessary under this option.

3.2.1.4. Overhaul or reconstruction or modernization of an existing renewable energy power plant

25. If the project activity is the overhaul or reconstruction or modernization of an existing grid-connected renewable energy power plant as described under paragraph 5(c) or paragraph 5 (d) or paragraph (e), or overhaul of an existing solar or wind power plant with the BESS as described under paragraph 6(d), 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.

26. The power generation from renewable energy power projects 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.

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

$$EG_{PJ,y} = EG_{facility,y} - (EG_{historical} + \sigma_{historical});\ until\ DATE_{BaselineOverhaul} \quad \text{Equation (4)}$$

and

$$EG_{PJ,y} = 0; on/after\ DATE_{BaselineOverhaul} \quad \text{Equation (5)}$$

Where:

$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year *y* (MWh/yr)
$EG_{facility,y}$	=	Quantity of net electricity generation supplied by the project plants 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 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 that was operated at the project site prior to the implementation of the project activity (MWh/yr)
$DATE_{BaselineOverhaul}$	=	Point in time when the existing equipment would need to be replaced in the absence of the project activity (date). This only applies to overhaul or modernization projects

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

$$EG_{PJ,y} = 0 \quad \text{Equation (6)}$$

29. To determine $EG_{historical}$, project participants may choose between two historical periods. This allows some flexibility: 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.

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

(a) The five last 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;

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

(iii) If applicable: the last overhaul or reconstruction of the plant.

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

3.2.2. Calculation of $DATE_{BaselineOverhaul}$

32. In order to estimate the point in time when the existing equipment would need to be modernized/overhauled in the absence of the project activity ($DATE_{BaselineOverhaul}$), project participants may take into account the typical average technical lifetime of the type equipment, which shall be determined and documented as in Appendix 5.

33. The point in time when the existing equipment would need to be modernized/overhauled 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. Project crediting period

34. For emission reduction projects a crediting period is a maximum of 5 years renewable a maximum of twice, or a maximum of 10 years with no option of renewal, that is appropriate to the activity.

35. For validation, projects can be submitted to the validation and verification body, the implementation of which was started no earlier than 2 years before submission for validation.

36. The crediting period shall not start before the registration of the project in the Register of Carbon Units.

5. Additionality

37. For the additionality demonstration it is recommended to conduct the analysis and follow all the procedures indicated in Tool №1.

38. Implemented climate projects that are used for issuing carbon units within the territory of the Russian Federation must comply with Article 9 of the Federal Law (02.07.2021 №296-FZ) “On Limiting Greenhouse Gas Emissions”, as well as the criteria established in accordance with the Order of the Ministry of Economic Development of Russia (11.05.2022 № 248) "On approval of the criteria and procedure for classifying projects implemented by legal entities, individual entrepreneurs or individuals as climate projects, the form and procedure for submitting a report on the implementation of a climate project". In other cases, it is recommended to follow the CDM methodologies or other approved programs for the implementation of climate projects at the international level.

39. If the project activity is comprised of one or more technologies below, it is automatically additional.

5.1.1. Simplified procedure to demonstrate additionality

40. Project activities are deemed automatically additional if they exclusively apply the technologies listed under this section and demonstrate that they fulfil the related conditions specified in the same section.

5.1.2. Renewable energy technologies for large-scale grid-connected power generation

41. The following grid-connected electricity generation technologies are considered:

    (a) Solar thermal electricity generation including concentrating solar power;

    (b) Off-shore wind technologies;

    (c) Marine wave technologies;

    (d) Marine tidal technologies;

    (e) Ocean thermal technologies.

42. A specific technology listed in paragraph above is defined as automatically additional if at the time of PDD submission any of the following conditions is met:

    (a) The percentage share of total installed capacity of the specific technology in the total installed grid connected power generation capacity is equal to or less than two per cent; or

    (b) The total installed capacity of the technology is less than or equal to 50 MW.

5.1.3. Procedure to demonstrate additionality based on the TOOL №1

43. The additionality of the project activity shall be demonstrated and assessed using the TOOL №1.

44. In case of integrated hydro power project, the following shall be considered for the purpose of investment analysis:

(a) Investment associated with the CDM project activity i.e. construction of a new reservoir and new power plants; and

(b) Revenue due to net electricity generation ($EG_{PJ,y}$) as determined using equation (4).

45. In case of Greenfield power plant, or overhaul to an existing solar photovoltaic or wind power plant with a BESS, to assess the economic attractiveness of the project activity, the project participants shall use the highest possible tariff that they may receive by supplying the electricity to the grid. Only in exceptional cases, where project participants can justify showing data on the load/consumption and generation pattern of the project activity, may other tariffs be applied.

6. Monitoring plan requirements

46. 100% of the data should be monitored if not indicated otherwise in the table(s) in Appendix 3. Some parameters either need to be monitored continuously during the crediting period or need to be calculated only once for the crediting period, depending on the data. Detailed information about the monitoring parameters for baseline and project scenario is in Appendix 3.

47. All measurements should be conducted with calibrated measurement equipment according to relevant industry standards.

48. 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.

49. The calculation of the parameters and emission factors should be documented electronically that should be attached to the PDD. This should include all data used to calculate the emission factors and other parameters. The data should be presented in a manner that enables reproducing of the calculation.

50. Quality assurance/Quality control describe how to achieve good quality data, for example describe the procedures for conducting the data collection and/or field measurements including training of field personnel, provisions for maximizing response rates, documenting out-of-population cases, refusals and other sources of non-response, and related issues. An overall quality control and assurance strategy shall be documented in the plan. This shall include a procedure for defining outliers and under what circumstances outlier data/measurements may be excluded and/or replaced.

51. Data and parameters monitored and not monitored during the project activity are listed in Appendix 2 and 3.

7. Project Scenario

7.1. Project emissions

52. 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:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} + PE_{BESS,y} \qquad \text{Equation (7)}$$

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 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)

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

53. 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 ($PE_{FF,y}$).

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

55. $PE_{FF,y}$ shall be calculated as in Appendix 1.

7.1.2. Emissions from the operation of dry steam, flash steam[23] and binary[24] geothermal power plants due to non-condensable gases and/or working fluid ($PE_{GP,y}$)

56. For dry or flash steam geothermal project activities, project participants shall account emissions of CO_2 and CH_4 due to release of non-condensable gases from produced steam. Non-condensable gases in geothermal reservoirs usually consist mainly of CO_2 and H_2S. They also contain a small quantity of hydrocarbons, including 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.

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

$$PE_{GP,y} = PE_{dry\ or\ flash\ steam,y} + PE_{binary,y} \quad \text{Equation (8)}$$

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)

[23] 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.

[24] 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.

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

$$PE_{dry\ or\ flash\ steam,y} = \left(w_{steam,CO2,y} + w_{steam,CH4,y} \times GWP_{CH4}\right) \times M_{steam,y}$$ Equation (9)

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 valid for the relevant commitment period (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:

$$PE_{binary,y} = PE_{steam,y} + PE_{working\ fluid,y}$$ Equation (10)

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)

$$PE_{steam,y} = \left(M_{Inflow,y} - M_{outflow,y}\right) \times \left(w_{steam,CO2,y} + w_{steam,CH4,y} \times GWP_{CH4}\right)$$ Equation (11)

Where:

$M_{inflow,y}$	=	Quantity of steam entering the geothermal plant in year *y* (t steam/yr)
$M_{outflow,y}$	=	Quantity of steam leaving the geothermal plant in year *y* (t steam/yr)
$w_{steam,CO2,y}$	=	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 valid for the relevant commitment period (t CO2e/t CH_4)

$$PE_{working\ fluid,y} = M_{working\ fluid,y} \times GWP_{working\ fluid}$$ Equation (12)

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

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

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

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$ Equation (13)

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

59. 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:

(a) 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 (14)

Where:

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

(b) If the power density of the project activity using equation (13) or in case of integrated hydro power project using equation (14) 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 (15)

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 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:

$$PE_{HP,y} = 0 \quad \text{Equation (16)}$$

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

60. 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 ($EG_{BESS,y}$).

61. In cases where BESS is charged using grid electricity, the corresponding project emissions ($PE_{BESS,y}$) shall be calculated based on Appendix 6.

62. 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 Appendix 1.

63. In line with the requirement under paragraph 7(d), 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.

7.2. 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)

7.2.1. Estimation of emissions reductions prior to validation

65. Project participants shall prepare as part of the 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 grid emission factor ($EF_{CM,grid,y}$) is determined ex post during monitoring, project participants may use models or other tools to estimate the emission reductions prior to validation.

8. Leakage assessment

66. 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.

9. Non-permanence risk analysis

67. The section is not applicable to this methodology.

10. Methods to prevent double counting, negative impacts on the environment and society

68. Climate project should demonstrate its compliance with all legal requirements in the jurisdiction where it is located (including but not limited to the Reference list methodologies). Project proponent should question whether there is a risk that their project might result in negative impacts for local communities, biodiversity and the environment. Such projects should not cause an increase in atmosphere, soil, surface and ground water pollution as well as lead to any community conflicts, land tenure issues, forceful evictions, human rights violations, or worsened health and wellbeing due to restricted access to a forest or nature area.

69. Efforts should be made to avoid double counting between project areas (project boundaries), between company reporting and reporting on the project, between the reporting of different companies, between the subjects of the Russian Federation and different countries in the case of international transfer of carbon credits. In the latter case, it is necessary to demonstrate that the carbon credits transferred at the international level are excluded from the accounting of the quantitative goals of the defined at the national level contribution of the Russian Federation.

11. Update of the baseline at the renewal of the crediting period

70. The renewal of a crediting period shall be validated and approved following a technical assessment by a validation and verification body to determine necessary updates to the baseline, the additionality and the quantification of emission reductions.

71. The renewal of the crediting period of a registered project activity shall only be granted if The Project Developer can provide evidence that the original project baseline is still valid or has been updated taking account of new data where applicable.

72. Project developer shall update those sections of the project design document (PDD) relating to the baseline, estimated emission reductions and the monitoring plan using an approved baseline and monitoring methodology: the latest approved version of a baseline and monitoring methodology, applied in the original PDD of the registered project activity, shall be used whenever applicable.

73. The demonstration of the validity of the original baseline or its update does not require a reassessment of the baseline scenario, but rather an assessment of the emissions which would have resulted from that scenario.

74. If a review or update of the baseline of a registered project has been made, the Project developer must justify to the validation and verification body of the need to deviate from the approved methodology in order to extend the credit period.

75. Assessment the validity of the original/current baseline and to update the baseline at the renewal of a crediting period.

76. A stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period consists of two steps. The first step provides an approach to evaluate whether the current baseline is still valid for the next crediting period. The second step provides an approach to update the baseline in case that the current baseline is not valid anymore for the next crediting period. Further details on procedure to the validity of the original/current baseline at the renewal of the crediting period are in The Appendix 4.

12. Normative references

ACM0002. Large-scale Consolidated Methodology. Grid-connected electricity generation from renewable sources. Version 21.0. CDM Methodology

IPCC 2006. Guidelines for National Greenhouse Gas Inventories of the Intergovernmental Panel on Climate Change, 2006 / Edited by S. Iggleston, L. Buendia, K. Miwa, T. Ngara and K. Tanabe. // T.1-5. - IGES// Hayyam. 2006.

TOOL03 Methodological tool. Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion. Version 03.0. CDM Methodology

TOOL05 Methodological tool. Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation.Version 03.0. CDM Methodology

TOOL07 Methodological tool. Tool to calculate the emission factor for an electricity system. Version 07.0. CDM Methodology

TOOL32 Methodological tool. Positive lists of technologies. Version 04.0. CDM Methodology

Methodological Tool. Tool to determine the remaining lifetime of equipment. Version 01. CDM Methodology

Methodological Tool. Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period. Version 03.0.1. CDM Methodology

GOST R 58092.3.3-2023 Electric Energy Storage Systems. Planning and performance assessment of electrical energy storage systems

GOST R MEK 62485-5-2021 Secondary batteries and battery installations. Safety requirements Part 5. Safe operation of stationary lithium-ion batteries

GOST R 54531-2011 Non-conventional technologies. Recommended and alternative energy sources. Terminology and Definitions

GOST R 57114-2016. Unified energy system and isolated power systems. Electric power systems. Operational dispatch management in the electric power industry and operational and technological management. Terms and definitions.

GOST 19431-84. Energy and electrification. Terms and definitions.

GOST 24291-90 Interstate standard. The electrical part of the power plant and the electrical network. Terms and definitions.

GOST R 70214-2022. Hydraulic engineering. Basic concepts. Terms and definitions.

Order of the Ministry of Energy of the Russian Federation No. 1013 dated October 25, 2017 "On Approval of Requirements for Ensuring the Reliability of Electric Power Systems, Reliability and Safety of Electric Power Facilities and Power Receiving Installations "Rules for the Organization of Maintenance and Repair of Electric Power Facilities" (with amendments and additions).

The Tax Code of the Russian Federation (Part Two) of 05.08.2000 No. 117-FZ (ed. of 18.03.2023) (with amendments and additions, intro. effective from 01.04.2023)

Appendix 1. Calculation of CO2 emissions from fossil fuel combustion

1. This tool provides procedures to calculate project and/or leakage CO2 emissions from the combustion of fossil fuels. It can be used in cases where CO2 emissions from fossil fuel combustion are calculated based on the quantity of fuel combusted and its properties. Methodologies using this tool should specify to which combustion process *j* this tool is being applied.

2. CO2 emissions from fossil fuel combustion in process *j* are calculated based on the quantity of fuels combusted and the CO2 emission coefficient of those fuels, as follows:

$$PE_{FC,j,y} = \sum_{i} FC_{i,j,y} \times COEF_{i,y}$$

Where:

$PE_{FC,j,y}$	Are the CO2 emissions from fossil fuel combustion in process *j* during the year *y* (tCO2/yr)
$FC_{i,j,y}$	Is the quantity of fuel type *i* combusted in process *j* during the year *y* (mass or volume unit/yr)
$COEF_{i,y}$	CO_2 emission coefficient of fuel type *i* in year *y* (t CO_2/mass or volume unit)
i	Are the fuel types combusted in process *j* during the year *y*

3. The CO_2 emission coefficient $COEF_{i,y}$ can be calculated using one of the following two options. *Option A* should be the preferred approach if the necessary data is available.

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

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

$$COEF_{i,y} = w_{C,\mathrm{i},y} \times {}^{44}/_{12}$$

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

$$COEF_{i,y} = w_{C,\mathrm{i},y} \times \rho_{i,y} \times {}^{44}/_{12}$$

Where:

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

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

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

Where:

$COEF_{i,y}$	CO_2 emission coefficient of fuel type *i* in year *y* (t CO_2/mass or volume unit)
$NCV_{i,y}$	Is the weighted average net calorific value of the fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$	Is the weighted average CO2 emission factor of fuel type *i* in year *y* (tCO2/GJ)
i	Are the fuel types combusted in process *j* during the year *y*

Appendix 2. Data and parameters not monitored.

1. 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	Data unit	Description	Source of data	Value to be applied	Any comment
1.	GWP_{CH4}	t CO_2e/t CH_4	Global warming potential of methane valid for the relevant commitment period	IPCC	For the first commitment period: 21 t CO2e/t CH4 For the second commitment period: 25 t CO2e/t CH4	
2.	$EG_{historical}$	MWh/yr	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	Project activity site	Electricity meters	
3.	$\sigma_{historical}$	MWh/yr	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	Calculated from data used to establish $EG_{historical}$	Parameter to be calculated as the standard deviation of the annual generation data used to calculate $EG_{historical}$ for overhaul, or reconstruction or modernization project activities	
4.	$DATE_{BaselineOverhaul}$	date	Point in time when the existing equipment would need to be replaced in the absence of the project activity	Project activity site	As per provisions in the methodology above	
5.	$DATE_{hist}$	date	Point in time from which the time span of historical date for overhaul, reconstruction or modernization project activities may start	Project activity site	$DATE_{hist}$ is the latest point in time between: (a) The commercial commissioning of the plant; (b) If applicable: the last capacity addition to the plant; or (c) If applicable: the last overhaul or reconstruction of the plant	
6.	EF_{Res}	kgCO_2e/MWh	Default emission factor for emissions from reservoirs		90 kgCO_2e/MWh	

№	Data / Parameter	Data unit	Description	Source of data	Value to be applied	Any comment
7.	Cap_{BL}	W	Installed capacity of the hydro power plant before the implementation of the project activity. For new hydro power plants, this value is zero	Project site	Determine the installed capacity based on manufacturer's specifications or recognized standards	
8.	A_{BL}	m^2	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	Project site	Measured from topographical surveys, maps, satellite pictures, etc.	
9.	*The percentage share of total installed capacity of the specific technology*	%	The percentage share of total installed capacity of the specific technology in the total installed grid connected power generation capacity in the country	National statistics or other official data		
10.	*The total installed capacity of the technology*	%	the total installed capacity of the technology in the country	National statistics or other official data		
11.	$GWP_{working\ fluid}$	-	Global Warming Potential of the Working Fluid	IPCC 2006		

Appendix 3. Data and parameters monitored.

1. 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.

2. $EG_{facility,y}$, $EG_{PJ\_Add,y}$, $EG_{BESS,y}$, $EF_{grid,CM,y}$ and $PE_{FF,y}$ should be determined based on Appendix 1 and 5.

№	Data / Parameter	Data unit	Description	Source of data	Measurement procedures	Monitoring frequency	QA/QC procedures	Any comment
12.	$w_{steam,CO2,y}$	t CO_2/t steam	Average mass fraction of carbon dioxide in the produced steam in year *y*	Project activity site	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	At least every three months and more frequently, if necessary		Applicable to dry, flash steam and binary geothermal power projects
13.	$w_{steam,CH4,y}$	t CH_4/t steam	Average mass fraction of methane in the produced steam in year *y*	Project activity site	As per the procedures outlined for $w_{steam,CO2,y}$	As per the procedures outlined for $w_{steam,CO2,y}$		Applicable to dry, flash steam and binary geothermal power projects
14.	$M_{steam,y}$	t steam/year	Quantity of steam produced in year *y*	Project activity site	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	Daily		Applicable to dry or flash steam geothermal power projects
15.	TEG_y	MWh/year	Total electricity produced by the project activity, including	Project activity	Electricity meters	Continuous measurement and		Applicable to hydro power project activities with a power

№	Data / Parameter	Data unit	Description	Source of data	Measurement procedures	Monitoring frequency	QA/QC procedures	Any comment
			the electricity supplied to the grid and the electricity supplied to internal loads, in year *y*	site		at least monthly recording		density greater than 4 W/m^2 and less than or equal to 10 W/m^2
16.	Cap_{PJ}	W	Installed capacity of the hydro power plant after the implementation of the project activity	Project site	Determine the installed capacity based on manufacturer's specifications or commissioning data or recognized standards	Once at the beginning of each crediting period		
17.	A_{PJ}	m^2	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	Project site	Measured from topographical surveys, maps, satellite pictures, etc.	Once at the beginning of each crediting period		
18.	$M_{inflow,y}$	t steam/year	Quantity of steam entering the geothermal plant in year *y*	Project activity site	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	Continuous	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	
19.	$M_{outflow,y}$	t steam/year	Quantity of steam leaving the geothermal plant in year *y*	Project activity site	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	Continuous	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	
20.	$M_{working\ fluid,y}$	t working fluid/year	Quantity of working fluid leaked/reinjected in year *y*	Project site	Measured via log books and maintenance reports of the plant	Annually	Measured from the amount of working flow reinjected to the binary system of the geothermal plant. Cross check with the	

№	Data / Parameter	Data unit	Description	Source of data	Measurement procedures	Monitoring frequency	QA/QC procedures	Any comment
							purchase invoices	

Appendix 4. Assessment of the validity of the original/current baseline at the renewal of the crediting period

1. This appendix describes a procedure to the validity of the original/current baseline at the renewal of the crediting period.

2. Assessment of the validity of the original/current baseline at the renewal of the crediting period consists of two steps.

A. Assess the validity of the current baseline for the next crediting period.

1. Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies.

3. If the current baseline is not in compliance with the relevant mandatory national and/or sectoral policies or if it cannot be shown that the policies are systematically not enforced and that non-compliance with those policies is widespread in the country or region, then the current baseline needs to be updated for the subsequent crediting period.

2. Assess the impact of circumstances.

4. If the new circumstances make a continued validity of the current baseline not plausible, then the current baseline needs to be updated for the subsequent crediting period.

3. Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested.

5. If the baseline scenario of the project activity is the continuation of use of the current equipment(s) without any investment and the projects proponents or third party(ies) will undertake an investment later, but before the end of a crediting period, then the current baseline needs to be updated for that crediting period or the crediting of emission reductions should be limited to the period before the baseline equipment would cease its operation.

4. Assessment of the validity of the data and parameters.

6. If any of the data and parameters that were only determined at the start of the crediting period and not monitored during the crediting period are not valid anymore, the current baseline **needs to be updated** for the subsequent crediting period.

7. If the application of p.1, 2, 3 and 4 confirmed that the current baseline as well as data and parameters are still valid for the subsequent crediting period, then this baseline, data and parameters **can be used for the renewed crediting period**. Otherwise, proceed to Step B.

B. Update the current baseline and the data and parameters.

8. This step is only applicable if any of the p. 1, 2, 3 and/or 4 showed that the current baseline needs to be updated.

a. Update the current baseline

9. Update the current baseline emissions for the subsequent crediting period, without reassessing the baseline scenario, based on the latest approved version of the methodology applicable to the project activity. The procedure should be applied in the context of the sectoral policies and circumstances that are applicable at the time of request for renewal of the crediting period.

b. Update the data and parameters

10. If the application of p.4 showed that the data and/or parameter(s) that were only determined at the start of the crediting period and not monitored during the crediting period are not valid anymore, project developer should update all applicable data and parameters.

Appendix 5. Determination of the remaining lifetime of equipment

11. The tool provides guidance to determine the remaining lifetime of baseline or project equipment. The tool may, for example, be used for project activities which involve the replacement of existing equipment with new equipment or which overhaul existing equipment as part of energy efficiency improvement activities.

12. This tool provides procedures to determine the following parameter: **Remaining lifetime (RL).** The remaining lifetime of the equipment is the time for which the existing equipment can continue to operate before it has to be replaced/discarded for technical reasons, such as the age of the equipment, safety reasons, or deteriorated performance. The remaining lifetime is expressed in years or hours of operation.

13. For project activities that involve several equipment, project participants can either determine the remaining lifetime for each equipment or determine the remaining lifetime as the most conservative of the individual remaining lifetimes of the equipment by applying any one of the options (a) to (c).

14. If the remaining lifetime of existing equipment, which would continue to operate in the baseline, is extended due to the implementation of a project activity, the crediting of emission reductions should be limited to the shortest estimated remaining lifetime of the baseline equipment. In other words, the earliest point in time when any of the existing equipment would need to be replaced or overhauled in the absence of the project activity should be used, unless the methodology specifies otherwise. Small equipment accessories/components such as small pumps, motors, valves etc. that are generally replaced as part of regular maintenance activities do not need to be included in the scope of determination of the remaining lifetime.

Option (a): Use manufacturer’s information for the technical lifetime of equipment and compare to the date of first commissioning

15. In this option, the remaining lifetime is determined as a difference between the technical lifetime and the operational time.

16. This option can only be applied if:

    (a) Manufacturer’s information for the technical lifetime of the equipment is available;

    (b) The project participants can demonstrate that the equipment has been operated and maintained according to the recommendations of the equipment supplier to ensure that the technical lifetime specified by the manufacturer is not reduced; and

    (c) There are no periodic replacement schedules or scheduled replacement practices specific to the industrial facility, that require early replacement of equipment before the expiry of the technical lifetime;

    (d) The equipment has no design fault or defect and did not have any industrial accident due to which the equipment can not operate at rated performance levels.

17. Documentation supporting these conditions should be provided, for example information on the operational history of the equipment.

18. The operational time shall be determined based on the operational history of the equipment from the date of its first commissioning.

19. In cases where the equipment was overhauled prior to the implementation of the project activity or energy efficiency improvement measures were undertaken which increased the remaining lifetime, the technical lifetime provided by the equipment supplier may not be valid anymore. In this case, project participants should follow one of the following approaches:

(a) If the overhaul was undertaken by the equipment manufacturer, the equipment manufacturer may provide a revised estimation of the technical lifetime;

(b) Apply the original technical lifetime provided by the equipment manufacturer at the time of equipment installation, as long as assuming a shorter lifetime is conservative (e.g. in the case of baseline equipment which is replaced under the project activity); choose other options provided in this tool to determine the remaining lifetime.

20. In case of relocated equipment (equipment which was already in operation at another site and which is transferred to the site of the project activity where it continues to operate), the operation history at the previous site(s) should be considered when establishing the operational time.

Option (b): Obtain an expert evaluation

21. In this option, an independent expert having relevant experience in evaluating the remaining lifetime for the type of equipment can be requested to determine the remaining lifetime of the equipment. The information that could be evaluated includes an analysis of

(a) The operational history of the equipment to identify the past performance, equipment overhauls, failures/accidents, capacity upgrades/degradations, replacements etc.;

(b) The current operation and maintenance practices;

(c) Documented specific sectoral/industry practices for replacements;

(d) Conducting tests on the equipment, such as magnetic particle examinations, ultrasonic testing, metallurgical analysis, etc.

22. The expert should document his methods and conclusions and provide an expert evaluation stating the estimated remaining lifetime of the equipment. All the relevant documentation should be presented to the DOE for validation.

Option (c): Use default values

23. In this option, project participants may use the following default values for the technical lifetime and determine the remaining lifetime as the difference of the technical lifetime and the operational time.

24. This option can only be applied if:

(a) The project participants can demonstrate that the equipment has been operated and maintained according to the recommendations of the equipment supplier;

(b) There are no periodic replacement schedules or scheduled replacement practices specific to the industrial facility, that require early replacement of equipment before the expiry of the technical lifetime; and

(c) The equipment has no design fault or defect and did not have any industrial accident due to which the equipment can not operate at rated performance levels.

25. Documentation supporting these conditions should be provided, for example information on the operational history of the equipment.

26. The operational time shall be determined based on the operational history of the equipment from the date of its first commissioning. In case of relocated equipment (equipment which was already in operation at another site and which is transferred to the site of the project activity where it continues to operate), the operation history at the previous site(s) should be considered when establishing the operational time.

27. For the technical lifetime, the following default values apply:

Equipment	Default value for Technical lifetime
Boilers	25 years
Steam Turbines	25 years
Gas turbines, upto 50 MW capacity	150,000 hours
Gas turbines, above 50 MW capacity	200,000 hours
Hydro turbines	150,000 hours
Electric Generators, air cooled	25 years
Electric generators, hydrogen cooled or water cooled	30 years
Wind turbines, onshore	25 years
Wind turbines, offshore	20 years
Diesel/oil/gas fired generator sets	50,000 hours
Transformers	30 years
Heaters, chillers, pumps, etc. used in HVAC systems	15 years

Appendix 6. Recommended approach for calculation of grid emissions factor (emission factor for an electricity system)

1. Currently, there are no legislatively approved grid emission factors for greenhouse gases (GHG) in the Russian Federation.

2. If the initial data required to calculate the grid emission factor for the baseline and project scenarios is available, the climate project developer has the right to calculate it independently. In this case, it is recommended to use the Guidelines for the quantitative calculation of the volume of indirect energy emissions of greenhouse gases (Order of the Ministry of Natural Resources № 330 (29.06.2017)[25]) and the principles for calculating indirect energy emissions defined in GOST R ISO 14064-1-2021[26].

   To determine the grid emission factor, a regional method for calculation of indirect energy emissions is used, which reflects the average intensity of greenhouse gas emissions at facilities generating electrical and thermal energy consumed by the organization (Order of the Ministry of Natural Resources № 330).

   According to GOST R ISO 14064-1-2021, emissions from imported electricity must be calculated by the project developer using a location-based approach[27] by applying an emission factor that best characterizes the relevant electric power system, i.e. leased transmission line, local, regional or national grid average emission factor. The grid-averaged emission factors should refer to the emissions of the reporting year, if available, or otherwise the latest available year. Grid-averaged emission factors for imported electricity should be based on the average consumption pattern from the electric power system from which the electricity is consumed.

   Grid emission factors may also include other indirect emissions associated with electricity generation, such as transmission and distribution losses.

   The requirements and guidance described in ISO 14064-1-2021 for electricity also apply to consumed and transferred heat, steam, cooling air and compressed air.

   In case of energy from cogeneration facilities, it is necessary to use approaches to separate various forms of energy[28].

   Association "NP Market Council (Sovet Rynka)" and JSC "ATS" have developed a concept for calculating and publishing greenhouse gas emission factors for the energy system of the Russian Federation[29]. Based on the results of the peer review, independent international auditors issued an assurance certificate, and this concept received a validation report[30]. It is assumed that the

[25] Order of the Ministry of Natural Resources and Ecology of the Russian Federation (29.06.2017 № 330) "On approval of guidelines for quantifying the volume of indirect energy emissions of greenhouse gases".

[26] GOST R ISO 14064-1-2021. National Standard of the Russian Federation. Greenhouse gases. Part 1. Requirements and Guidance for Quantification and Reporting of Greenhouse Gas Emissions and Absorption at the Organization Level (approved and enacted by Rosstandart Order 30.09.2021 №1029-st)

[27] The location-based approach is a method for quantifying indirect energy emissions based on average emission factors from energy production for a given geographic location, including local, regional or national boundaries.

[28] For example, calculation of specific fuel consumption in accordance with the "Guidelines for the distribution of specific fuel consumption in the production of electrical and thermal energy within combined generation of electrical and thermal energy, used for the purpose of tariff regulation in the heat supply", legislatively approved by the Order of the Ministry of Energy of the Russian Federation (12.09.2016 №952)

[29] The concept of calculation and publication of greenhouse gas emission factors for the energy system of the Russian Federation URL: https://www.np-sr.ru/sites/default/files/koncepciya_kev.pdf

[30] As part of the validation procedure, a detailed verification of the Concept was carried out for its compliance with the requirements of the international standards in the field of accounting and reporting on greenhouse gas emissions (TÜV AUSTRIA). Based on the results of the audit, the Concept was recognized by international experts as complying with high international standards and best international practices for calculating energy system emission factors. URL: https://www.np-sr.ru/sites/default/files/zaklyuchenie_o_validacii_koncepcii.pdf

implementation of this concept will lead to the more accurate calculation and publication of grid emission factors. The approaches outlined in the concept can also be used by the project developer to calculate the emission factor of the electric power system.

3. If it is impossible to calculate the grid emission factor on its own, the project developer can use grid emission factors from the following sources:

Source 1. JSC "Administrator of the Trading System" in test mode in 2021 launched an Internet resource that publishes the grid CO2 emission factor for the first synchronous zone of the Russian Federation for various time periods (hour, day, month, year) [31].

Source 2. Emission factors of the International Energy Agency (IEA). The data is updated annually for the entire energy system of the regions (including the Russian Federation) and reflects the average carbon intensity of electricity and heat generation[32].

Source 3. Climate Transparency Global Partnership develops G20 climate indicators. The agency publishes annually reports from the G20[33] countries, including the average energy emission factor.

4. Methods and approaches applied to the calculation of the grid emission factor should be documented and specified in the PDD. It is necessary to justify the chosen calculation methodology, disclose information about the source of the initial data used, transparently and accurately document your own procedure for calculating the grid emission factor, or describe the properties of the selected and applied grid emission factor.

[31] URL: https://www.atsenergo.ru/results/co2

[32] URL: https://www.iea.org/data-and-statistics/data-product/emissions-factors-2021

[33] URL: https://www.climate-transparency.org/g20-climate-performance/g20report2021#1531904804037-423d5c88-a7a7