Climate project methodology No. 0013

FUEL SWITCHING FROM COAL AND/OR PETROLEUM FUELS TO NATURAL GAS IN EXISTING POWER PLANTS

Developer: Yu. A. Izrael Institute of Global Climate and Ecology

Version 1.0

14 July 2023

Table of contents

1.Terms and definitions

1.1. The definitions and terms contained in Russian regulatory documents and national standards shall apply.

1.2. The climate project developer is encouraged to use the terms and definitions used in this methodology:

1.2.1. **Power plant** is a complex of buildings, structures, equipment and devices combined into an industrial facility that generates electricity.

1.2.2. **Project activity power plant (PAPP) is** an existing power plant where the fuel switch project activity is implemented.

1.2.3. **Combined heat and power (CHP) plant** is a thermal power plant that simultaneously generates and releases both electrical energy and heat to consumers (operation in cogeneration mode).

1.2.4. **Condensation power plant** is a thermal power plant that generates and releases only electricity to consumers.

1.2.5. **Captive consumer** is defined as a consumer or multiple consumers that are supplied with electricity from the PAPP alone and that are either located directly at the site of the PAPP or are connected through (a) dedicated electricity line(s) with the PAPP but not via the electricity grid.

1.2.6. **Electricity grid** is an electricity supply system to which many consumers and many power plants are connected. The power plants connected to the electricity supply system are dispatched by a dispatch center. Localized grids[1], i.e. grids in which a limited number of power plants not dispatched by a dispatch center are connected, are excluded from this definition.

1.2.7. **Installed power, rated power** is the power with which the electrical installation or equipment can operate for a long time under nominal parameters and/or normal conditions[2]. 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[3].

1.2.8. **Crediting period** is 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 period is renewable or fixed, is determined in accordance with Section 4 of this methodology.

1.2.9. **Project Design Document (PDD)** is the principal document used by project developers to demonstrate and describe information about the proposed climate project for submission to the validation/verification authorities and the carbon units register.

---

[1] There are local communities in Russia that are not connected to the Unified National Electric Grid. Most of these communities are located in remote areas of the Far North with undeveloped road and energy infrastructure.

[2] 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.

[3] GOST 19431-84. Energy and Electrification. Terms and Definitions.

2.Scope and applicability

2.1. This methodology has been prepared on the basis of the existing methodology developed within the framework of the Clean Development Mechanism (ACM0011) and includes its adaptation to the current Russian regulations and standards.

2.2. This methodology is applicable to project activities that switch from coal and/or petroleum fuels to natural gas in an existing power plant for electricity generation.

2.3. In case of changes in the GHG regulatory legal framework of the Russian Federation, this methodology is subject to revision in order to take into account the relevant changes.

2.4. Furthermore, the following conditions shall be applied to project activities:

2.4.1 The project activity power plant (PAPP) either supplies electricity only to the electricity grid or only to a captive consumer.

2.4.2 Under the project activity, only natural gas is used in the PAPP except for auxiliary fuel consumption (e.g. for start-ups, emergency fuel) which shall not exceed one per cent of the total fuel consumption in the PAPP (measured on an energy basis).

2.4.3 Prior to the implementation of the project activity, only coal and/or petroleum fuels (but not natural gas) were used in the PAPP to generate electricity.

2.4.4 If the project activity relates to the conversion to natural gas of part of the boilers located on the territory of the power plant, the boundaries of accounting for GHG emissions should be limited to these boilers.

2.4.5 The main type of fuel and/or local type of fuel in the region is coal/petroleum fuel (the baseline fuel).

2.4.6 The captive consumer or electricity grid, to which the electricity generated by the PAPP is sold, if applicable, is not restrained by regulations/law to purchase (transmit) electricity generated from different types of baseline fuels (coal/petroleum fuel), i.e. it is not prohibited to purchase electricity generated using a higher greenhouse gas (GHG) intensity fuel during the crediting period of the project activity.

2.4.7 The project activity does not result in a significant change in the power generation capacity, i.e. not more than +/- five per cent of the actual installed power generation capacity before the implementation of the project activity. The installed capacity of the PAPP before and after the fuel switch activity shall be tested using an internationally approved standard or equivalent national standards[4].

2.5. If the technical lifetime of the existing power plant (or boilers) is not prolonged as a result of the project activity, the application of procedure 2.4.1-2.4.3 is not necessary. In this case, project participants should provide appropriate explanations and documentation in the PDD.

2.5.1 If the lifetime of the PAPP is prolonged as a result of the project activity, the remaining lifetime of the existing power plant in the absence of the project activity should be determined. One of the following approaches shall be used:

(a) The typical average technical lifetime of the type of the power plant may be determined taking into account common practices in the sector and country (e.g. based on industry surveys, statistics, technical literature, etc.);

[4] In accordance with the requirements of the regulations of the System Operator.

(b) The practices of the responsible company regarding replacement schedules may be evaluated and documented (e.g. based on historical replacement records for similar equipment).

2.5.2 The time of decommissioning of an existing power plant (or the park resource of boilers) in the absence of the project activity should be chosen in a conservative manner, i.e. the earliest point in time should be chosen in cases where only a time frame can be estimated, and should be documented in PDD.

2.5.3 If the remaining lifetime of the power plant is increased due to the project activity, the crediting period has to be limited to the estimated remaining lifetime of the power plant, i.e. the time when the existing power plant would have been decommissioned in the absence of the project activity.

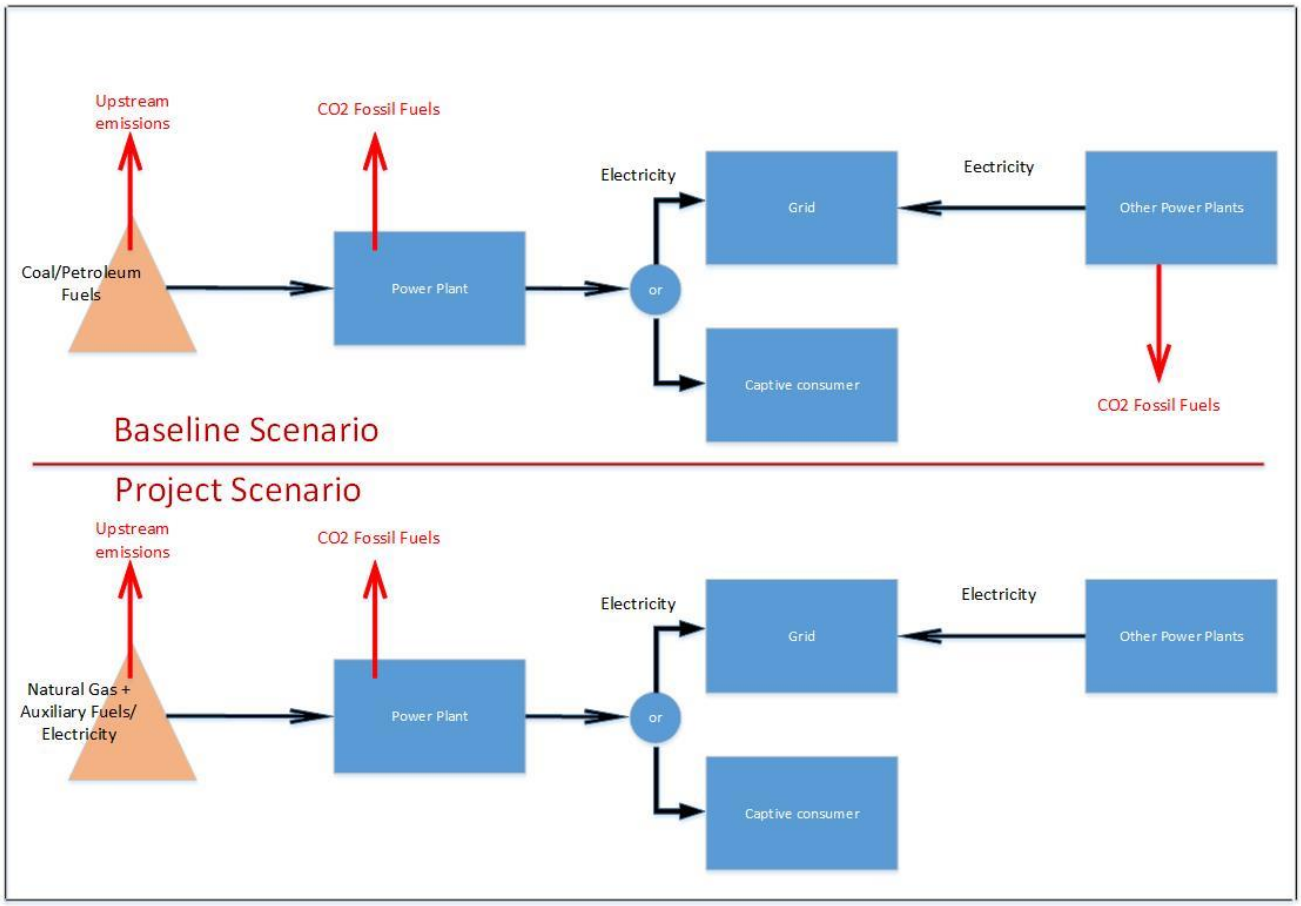
2.6. The project boundary encompasses the PAPP that supplies electricity either to the grid or to captive consumers. If the power plant supplies electricity to the electrical grid and purchases electricity for its own consumption (for example, to cover own losses), such volumes should be taken into account. Summary of emissions sources and GHGs are listed in Table 1 and the project boundary is described in Figure 1.

Table 1. Emission sources included in or excluded from the project boundary

Source		Gas	Included	Justification/Explanation
Baseline	Emissions due to the combustion of the baseline fuel (coal and/or petroleum fuels) for electricity production in the PAPP	CO_2	Yes	Main emission source
		CH_4	No	Minor source. Accounting is not required
		N_2O	No	Minor source. Accounting is not required
	Emissions due to the combustion of fossil fuels in grid connected power plants	CO_2	Yes	Main emission source
		CH_4	No	Minor source. Accounting is not required
		N_2O	No	Minor source. Accounting is not required
Project activity	Emissions due to the combustion of natural gas for electricity production in the PAPP	CO_2	Yes	Main emission source
		CH_4	No	Minor source. Accounting is not required
		N_2O	No	Minor source. Accounting is not required
		CO_2	Yes	Main emission source

Source		Gas	Included	Justification/Explanation
	Emissions due to the use of energy (auxiliary fuel, purchased electricity etc) for the operation of the PAPP	CH_4	No	Minor source. Accounting is not required
		N_2O	No	Minor source. Accounting is not required

Figure 1. Project boundary



3.Baseline methodology

3.1. The baseline[5] for the established baseline scenario (continuation of the use of coal or petroleum fuel) is set conservatively[6] for a business-as-usual activity, taking into account all existing policies and measures, but not considering additional project activities (Business-as-usual model[7]). The project developer may use one of the following approaches (paragraphs 3.1.1-3.1.3) to determine the baseline with justification for the appropriateness of the choices[8]:

3.1.1. Best available technologies that represent an economically feasible and environmentally sound course of action.

3.1.2. An ambitious benchmark approach where the baseline is set at least at the average emission level of the 20% best performing comparable activities providing similar outputs and services in a defined scope in similar social, economic, environmental and technological circumstances.

3.1.3. An approach based on existing actual or historical emissions, adjusted downwards by at least 5%, unless otherwise specified in the project methodology.

3.2. The approaches above provide a framework for general understanding of the ways in which baselines can be defined. A general description of the baseline definition for each of the approaches is provided below. For this type of project, the approach based on existing actual or historical emissions should be used (see paragraph 3.7).

3.3. For the approach defined by the project developer, the calculation of baseline emissions corresponds to the general equation:

$$BE_y = A_{baseline,y} \times EF_{CO2,baseline} \ (1)$$

Where:

BE_y - Baseline emissions during the year *y* in t CO2;

$A_{baseline,y}$ - Data on any activity of the installation for the year *y*;

$EF_{CO2,baseline}$- CO2 emission factor;

3.4. For each of the approaches described in paragraphs 3.1.1-3.1.3, activity data (A) and emission factors (EF) are determined in accordance with the required conditions. For example, for existing actual emission approach, activity data (A) is the quantity of gross electricity generated by the PAPP in year *y* (MWh/yr), and (EF) is the emission factor of the PAPP (CO2 emissions per electricity generation) in year *y* (t CO2/MWh).

3.5. For ambitious benchmark approach, activity data (A) is the amount of products produced at industrial installation(s)\power plants (downstream products/TJ/ Gcal/MWh) in year y, (EF) -

[5] Greenhouse gas baseline, GHG baseline - quantitative reference(s) of GHG emissions and/or GHG removals that would have occurred in the absence of a GHG project and provides the baseline scenario for comparison with project GHG emissions and/or GHG removals (ISO 14064-2:2019 Greenhouse gases - Part 2).

[6] Calculation of the baseline is considered conservative if the final estimate of emission reductions resulting from project activities will not be overestimated. If there is any doubt, the project developer should better understate the baseline projection.

[7] Business-as-Usual assumes that few or no steps are taken to limit greenhouse gas emissions.

[8] Approaches to determining baselines are given in Action taken by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement at its third session (FCCC/PA/CMA/2021/10/Add.1, Article 6, paragraph 4, p. 34, para. 36). URL: https://unfccc.int/sites/default/files/resource/cma2021_10a01E.pdf. Currently, the use of approaches based on the best available technologies and ambitious benchmark to determine baselines is limited by the lack of appropriate procedures and regulations.

average GHG emissions intensity of the 20% most efficient installations (power plants) according to the national benchmark or industry standards[9] in year *y* (t CO2/MWh).

3.6. For best available technologies, emission factor (EF) is determined in accordance with Best Available Techniques Reference Documents[10] for industrial installation, operating in corresponding industry/sector[11]. Activity data (A) of industrial installation(s) must comply with the applicable dimension of the EF.

3.7. This methodology provides a detailed calculation of baseline emissions for approach 3.1.3 (existing actual or historical emissions). For an approach based on existing actual or historical emissions, the project developer should use paragraphs 3.8-3.20 of this methodology to calculate baseline emissions.

3.8. For an approach based on historical emissions, the calculation of baseline emissions therefore depends on:

a) whether the PAPP supplies[12] electricity to captive consumer(s) or to the grid; and

b) whether the amount of electricity generated by PAPP will increase beyond historical levels (previous 3 years) as a result of project activities. **The item is taken into account only in the case of electricity supply to the grid.**

3.9. If the PAPP provides electricity to captive consumer(s), baseline emissions are calculated as follows:

$$BE_y = MIN\left(EG_{PJ,y}; EG_{AVR}\right) \times EF_{BL,plant,y} \quad (2)$$

Where:

BE_y - Baseline emissions in year *y* (t CO_2/yr);

$EG_{PJ,y}$ - The amount of gross electricity generated by the power plant in year *y* (MWh/yr);

EG_{AVR} - Average annual quantity of gross electricity generated by the PAPP during the three most recent historical years prior to the implementation of the project activity (MWh/yr);

$EF_{BL,plant,y}$ - Baseline emission factor of the PAPP in year *y*, i.e. the CO_2 emissions per electricity generation if coal and/or petroleum fuels would be used as fuel in the project activity power plant (t CO_2/MWh);

MIN – the minimum value is selected from the considered ones.

3.10. If the PAPP provides electricity to the grid, the following cases are differentiated[13]:

---

[9] For example, the National Standard of the Russian Federation GOST R 113.00.11-2022 "Benchmarking criteria of greenhouse gas emissions by industries", approved by Order No. 178-st of the Federal Agency for Technical Regulation and Metrology dated March 30, 2022, URL: https://www.consultant.ru/cons/cgi/online.cgi?req=doc&base=OTN&n=32887#Fq2VvkTUPOG1aZT11

[10] Information and technical reference books on the best available technologies (BAT), URL: https://www.rst.gov.ru/portal/gost/home/activity/NDT

[11] If the relevant regulatory documents (BAT) have been developed, put into effect and include relevant indicators.

[12] In this case, "supply" means the volume of generated electricity released to third parties (the grid). The condition is accepted that the entire generated resource (gross electricity generation) is sent to the unified power supply system. Further, in the guidelines, to simplify terminology, the supply of electricity will be referred to as gross generation (output).

[13] If electricity generation in the project activity power plant is increased beyond historical levels after the implementation of the project activity, it is difficult to clearly attribute whether such an increase is the result of the project activity or would have occurred anyhow. If the increase is a result of the project activity, the project activity displaces grid electricity. If it is

a) Case (a) - the quantity of electricity generated in the PAPP $EG_{PJ,y}$ exceeds the maximum annual quantity of electricity that the PAPP could have produced prior to the implementation of the project activity EG_{max} . Baseline emissions are calculated as:

$$BE_y = EG_{AVR} \times EF_{BL,plant,y} + (EG_{MAX} - EG_{AVR}) \times min\left(EF_{BL,plant,y}; EF_{grid,y}\right) + \left(EG_{PJ,y} - EG_{MAX}\right) \times EF_{grid,y} \quad (3)$$

b) Case (b) - the quantity of electricity generated in the project activity power plant $EG_{PJ,y}$ exceeds the historic average annual generation level EG_{AVR}but is lower than the maximum annual quantity of electricity that the PAPP could have produced prior to the implementation of the project activityEG_{max} . Baseline emissions are calculated as:

$$BE_y = EG_{AVR} \times EF_{BL,plant,y} + \left(EG_{PJ,y} - EG_{AVR}\right) \times min\left(EF_{BL,plant,y}; EF_{grid,y}\right) \quad (4)$$

c) Case (c) - the quantity of electricity generated in the project activity power plant $EG_{PJ,y}$ is lower or the same than the historic average annual generation level EG_{AVR} . Baseline emissions are calculated as:

$$BE_y = EG_{PJ,y} \times EF_{BL,plant,y} \quad (5)$$

Where:

BE_y - Baseline emissions in year *y* (t CO_2/yr);

$EG_{PJ,y}$ - Quantity of gross electricity generated by the PAPP in year *y* (MWh/yr);

EG_{AVR} - Average annual quantity of electricity generated by the during the three most recent historical years prior to the implementation of the project activity (MWh/yr);

EG_{MAX} - Maximum annual quantity of electricity that could have been generated by the PAPP prior to the implementation of the project activity (MWh/yr);

$EF_{BL,plant,y}$ - Baseline emission factor of the PAPP in year y, i.e. the CO2 emissions per electricity generation if coal and/or petroleum fuels would be used as fuel in the project activity power plant (t CO2/MWh);

$EF_{grid,y}$ - Emission factor of the electricity grid to which the PAPP is connected (t CO2/MWh);

MIN – the minimum value is selected from the considered ones.

3.11. The maximum annual amount of electricity that could have been generated (for the supply of electricity to the grid or captive consumer) by the PAPP prior to the implementation of the project activity is calculated as:

$$EG_{MAX} = CAP_{max} \times T_{max} \quad (6)$$

not a result a of the project activity, the use of coal or petroleum fuel in the project activity power plant is displaced. To deal with this uncertainty, in this methodology the lower emission factor between the project activity power plant fired with the baseline fuel and the grid emission factor is used, as a conservative approach

Where:

EG_{MAX} - Maximum annual quantity of electricity that could have been generated by the PAPP prior to the implementation of the project activity (MWh/yr);

CAP_{max} - Maximum power generation capacity of the PAPP prior to the implementation of the project activity (MW);

T_{max} - Maximum amount of time in which the PAPP could have operated at full load prior to the implementation of the project activity (hours);

3.12. The Average annual quantity of electricity generated by the during the three most recent historical years prior to the implementation of the project activity is calculated as follows:

$$EG_{AVR} = \frac{\sum_{x=1}^{3} EG_{PAPP,x}}{3} \quad (7)$$

Where:

EG_{AVR} - Average annual quantity of electricity generated by the during the three most recent historical years prior to the implementation of the project activity (MWh/yr);

$EG_{PAPP,x}$ - Quantity of electricity generated by the PAPP t in year x (MWh/yr);

x - Three most recent historical years prior to the implementation of the project activity;

3.13. The emission factor for the PAPP prior to the implementation of project activity is calculated as:

$$EF_{BL,plant,y} = \frac{1000}{3.6} \times \frac{EF_{FF,BL}}{\eta_{PAPP}} \quad (8)$$

Where:

$EF_{BL,plant,y}$ - Baseline emission factor of the PAPP in year y, i.e. the CO2 emissions per electricity generation if coal and/or petroleum fuels would be used as fuel in the PAPP (t CO2/MWh);

$EF_{FF,BL}$ - CO2 emission factor of the coal or petroleum fuel used in the PAPP prior to the implementation of the project activity (t CO2/TJ). The emission factor must be calculated in accordance with the guidelines approved by Order No. 371 of the Ministry of Natural Resources and Environment of the Russian Federation (Guidelines No. 371).

η_{PAPP} - Efficiency of the project activity power plant;

$\frac{1000}{3.6}$ - Conversion factor for TJ conversion into MW*h.

3.14. Note that the most plausible baseline scenario may be that several fuel types would be used in the PAPP in the absence of the project activity. Where the use of several fuel types is the most plausible baseline scenario, project participants should for estimating baseline emission factor $EF_{BL,plant,y}$, as a conservative approach, select the fuel type with the lowest CO2 emission factor from the fuels used in the power plant during the most recent three years prior to the implementation of the project activity. For example, cases of using brown coal and hard coal in an industrial installation(s).

3.15. Baseline emission factor of the PAPP $EF_{BL,plant,y}$ should be calculated as the ratio between the emissions produced at the power plant (calculated according to the category "stationary fuel combustion" as per Guidelines No. 371) and the gross electricity generated by the PAPP in year y.

3.16. The energy efficiency of the project activity power plant η_{PAPP} should be determined for each year y as the higher value between:

a) The efficiency of the project activity power plant prior to the implementation of the project activity $\eta_{PAPP,hist}$, which may be determined using one of the following options:

i) Use the manufacturer's specification of efficiency at optimum load (if no retrofit has been undertaken that results in an increased efficiency);

ii) Measurement of efficiency at optimal load using national or international standards;

iii) Determine the average historical efficiency during the most recent three years prior to the implementation of the project activity, based on fuel consumption and electricity generation data, as follows:

$$\eta_{PAPP,hist} = \frac{1000}{3.6} \times \frac{\sum_{x=1}^{3} EG_{PAPP,x}}{\sum_{x=1}^{3} \sum_{i} FC_{i,x} \times NCV_{i,x}} \quad (9)$$

Where:

$\eta_{PAPP,hist}$ - Efficiency of the project activity power plant prior to the implementation of the project activity;

$FC_{i,x}$ - Quantity of type *i* fossil fuel combusted in the project activity power plant in year *x* (mass or volume unit/year);

$NCV_{i,x}$ - Net calorific value of type *i* fossil fuel in year *x* (TJ/mass or volume unit);

$EG_{PAPP,x}$ - Quantity of electricity generated by the PAPP in year *x* (MWh/yr);

x - Three most recent historical years prior to the implementation of the project activity;

i - Fossil fuel types used in the project activity power plant in year *x*;

b) The efficiency of the PAPP in year *y* $\eta_{PAPP,y}$, calculated as follows:

$$\eta_{PAPP,y} = \frac{1000}{3.6} \times \frac{EG_{PJ,y}}{\sum_{i} FC_{PAPP,i,y} \times NCV_{i,y}} \quad (10)$$

Where:

$\eta_{PAPP,y}$ - Efficiency of the project activity power plant in year *y*;

$FC_{PAPP,i,y}$ - Quantity of type *i* fossil fuel combusted in the project activity power plant in year *y* (mass or volume unit/yr);

$NCV_{i,y}$ - Net calorific value of type *i* fossil fuel in year *y* (TJ/mass or volume unit);

$EG_{PJ,y}$ - Quantity of electricity generated by the PAPP in year *y* (MWh/yr);

3.17. The value determined for $\eta_{PAPP,hist}$, the measurement procedure, the underlying data and the assumptions used (e.g. on a representative load) should be documented and justified in the PDD. The $\eta_{PAPP,hist}$ value shall remain fixed throughout the crediting period. $\eta_{PAPP,y}$ shall be calculated for PAPP each year throughout the crediting period.

3.18. If the PAPP is a combined heat and power plant (CHP), the distribution of fuel consumption for electric and thermal energy produced in the cogeneration mode should be carried out according to one of the methods: physical, proportional, etc. The project developer can independently determine the method of fuel consumption distribution. The project developer can be guided by the following documents: "Methodological Guidelines for Preparation of

Reports of Power Plants and Energy Utility and Electrification Joint-Stock Companies on the Thermal Efficiency of Equipment" RD 34.08.552-95[14]; or "Methodological Guidelines for the Distribution of the Specific Consumption of Reference Fuel in the Production of Electric and Thermal Energy in the Cogeneration Mode Used for Tariff Regulation in the Field of Heat Supply", approved by Order No. 952 of the Ministry of Energy of the Russian Federation dated 12 September 2016[15].

3.19. **The chosen method for the distribution of fuel consumption must not change during the entire crediting period of the climate project.**

3.20. When distributing fuel consumption, it is necessary that the parameters $FC_{PAPP,i,y}$ and $FC_{i,x}$ be adjusted to take this approach into account.

4.Project crediting period

4.1. The starting date of project activities is not regulated. A crediting period for emission reduction projects is a maximum of 5 years with a maximum of two renewable periods of 5 years each, or a maximum of 10 years with no option of renewal. The crediting period begins no earlier than 5 years prior to applying for validation for projects validated until 31 December 2025, and no earlier than 2 years prior to applying for validation for projects validated after 1 January 2026.

4.2. The additionality and baseline shall be evaluated at the beginning of the crediting period and confirmed or revised at the beginning of the next 5-year phase if the project is implemented in three 5-year phases.

5.Additionality

5.1. Additionality shall be demonstrated using Guidelines #1 "Demonstration of the additionality of the project activity".

5.2. The project developer should demonstrate the additionality of the project activity in the PDD. Paragraphs 5.3-5.4 provide explanatory information on this methodology and the Guidlines "Demonstration of the additionality of the project activity".

5.3. In order to identify alternatives to project activities compliant with legal and regulatory requirements, the project developer should consider the following alternatives:

5.3.1. Step 1 point a: "the proposed project activity undertaken without being registered as a project activity". In this case, the project developer should consider an alternative to switching power plant from coal to natural gas without registering a climate project and obtaining carbon units.

5.3.2. Step 1 point c: "continuation of the current practice". The current situation for the project developer is the continuation of the existing practice of using coal or petroleum fuel at the power plant.

5.4. To demonstrate that the proposed project activity is not considered as a "common practice", it is necessary to provide a special justification. Common practice may differ depending on the

[14] See: https://docs.cntd.ru/document/1200008390

[15] See: https://docs.cntd.ru/document/420377440

region of implementation of the climate project. In the case of regional specifics, such aspects as the use of local fuels are important. For example, for the regions of Siberia and the Far East coal generation has historically been crucial. The main obstacles to switching to other types of fuel are associated with the lack of a centralized energy infrastructure in most of the macro region and state regulation of electricity prices. Another example is a demonstration of the factors of maintaining and increasing coal supplies to power plants in the regions, a description of the sustainability of the energy sector, etc. The project developer should demonstrate the main obstacles that are inherent in this climate project, for example, the lack of centralized energy infrastructure, state regulation of electricity prices in the region, the cost of equipment and its availability, etc. All these factors together need to be considered for the analysis of common practice.

5.5. This methodology is only applicable if the continuation of the use of coal or petroleum fuel throughout the crediting period is the most plausible baseline scenario, and the proposed project activity has passed the Additionality criterion.

6.Monitoring plan requirements

6.1. All data collected as part of monitoring of project emissions should be archived electronically and kept for at least two years after the end of the last crediting period. One hundred per cent (100%) of data required for the quantitative evaluation of emissions 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. The list of parameters that need to be monitored is presented in Tables 2-9.

Table 2. Data / Parameter monitored

Data / Parameter:	**Installed capacity**
Data unit:	MW
Description:	Installed capacity of the project power plant
Source of data:	Project site
Measurement procedures (if any):	The installed capacity of the power plant before and after the fuel switch activity needs to be tested using internationally approved standard methods or equivalent national standards available with the help of reputed players or manufacturers in the market. In the Russian Federation, the System Operator is an authorized body that certifies the capacity of power plants. Changes in capacity must remain within +/- five per cent of the capacity before the implementation of the project activity, as per the applicability conditions (Chapter 2)
Monitoring frequency:	Annually
Any comment:	-

Table 3. Data / Parameter monitored

Data / Parameter:	$EG_{PJ,y}$, $EC_{PJ,aux,y}$
Data unit:	MWh
Description:	Electricity generation / auxiliary electricity consumption by PAPP by the project activity in year *y*
Source of data:	On-site measurements
Measurement procedures (if any):	Use of electricity meters
Monitoring frequency:	Continuously, aggregated at least annually
Any comment:	The results of the accounting should be reflected in the forms of statistical observation No. 23-N and No. 6-TP.

Table 4. Data / Parameter monitored

Data / Parameter:	$EF_{BL,plant,y}$
Data unit:	t CO2/MWh
Description:	Baseline emission factor of the project activity power plant in year *y*
Source of data:	Calculation method
Measurement procedures (if any):	-
Monitoring frequency:	Aggregated at least annually
Any comment:	Calculated as the ratio between the emissions produced at the power plant (calculated according to the category "stationary fuel combustion", Guidelines No. 371) and the gross electricity generated by the PAPP in year *y*.

Table 5. Data / Parameter monitored

Data / Parameter:	**EFgrid,y**
Data unit:	t CO2/MWh
Description:	Emission factor of the electricity grid to which the PAPP is connected
Source of data:	See Appendix 2

Measurement procedures (if any):	-
Monitoring frequency:	Aggregated at least annually
Any comment:	-

Table 6. Data / Parameter monitored

Data / Parameter:	$FC_{PAPP,i,y}$
Data unit:	mass or volume unit
Description:	Quantity of type *i* fossil fuel (coal/petroleum fuel/natural gas) combusted in the project activity power plant in year *y*
Source of data:	On-site measurements
Measurement procedures (if any):	Petroleum fuel/ Natural gas - use mass or volume meters Coal - batch metering/data from the suppliers' waybills
Monitoring frequency:	Continuously
Any comment:	The consistency of metered fuel consumption quantities should be crosschecked using the annual energy balance that is based on purchased quantities (deliveries) and stock changes. Where the purchased fuel invoices can be identified specifically for the project, the metered fuel consumption quantities should also be crosschecked against the available purchase invoices from the financial records. The results of the accounting should be reflected in the form of statistical observation No. 4-TER

Table 7. Data / Parameter monitored

Data / Parameter:	$NCV_{i,y}$
Data unit:	TJ per mass or volume unit
Description:	Weighted average net calorific value of type *i* fossil fuel used in year *y*
Source of data:	Values provided by the fuel supplier in invoices is the preferred source. In the absence of such data, it is necessary to use measurements made by the project participants. For more information, see Guidelines No. 371
Measurement procedures (if any):	Natural gas - according to GOST 31369 Petroleum fuel - according to GOST 21261

Monitoring frequency:	According to the monthly natural gas invoices
QA/QC procedures:	-
Any comment:	Note that the same basis (pressure or/and temperature) should be used for the NCV as for the fuel consumption. The invoices for natural gas should be issued on the basis of the results of measurements of physical and chemical parameters in accordance with GOST 5542.

Table 8. Data / Parameter monitored

Data / Parameter:	$\boldsymbol{PE_{FC,j,y}}$
Data unit:	t CO2
Description:	Project emissions from combustion of natural gas and auxiliary fossil fuel use in the project activity power plant in year *y*, where *j* refers to the combustion of fossil fuels in the project activity power plant and, if applicable, any other fossil fuel consumption at the project site that is attributable to the project activity
Source of data:	Calculation method
Measurement procedures (if any):	-
Monitoring frequency:	Aggregated at least annually
Any comment:	The principle of calculating CO2 emission is provided in Guidelines No. 371.

Table 9. Data / Parameter monitored

Data / Parameter:	$\eta_{PAPP,\,y}$
Data unit:	-
Description:	Efficiency of the project activity power plant in year y
Source of data:	-
Measurement procedures (if any):	-
Monitoring frequency:	Aggregated at least annually
Any comment:	-

6.2. Data and parameters that are not monitored should be calculated once and remain fixed throughout the crediting period. The list of non-monitored parameters is presented in Tables 10-13.

Table 10. Data / Parameter not monitored

Data / Parameter:	**$EGPAPP_{,x}$**
Data unit:	MWh/yr
Description:	Quantity of electricity generated by the PAPP in year *x*, where *x* are the three most recent historical years prior to the implementation of the project activity
Source of data:	Data logs at the project activity power plant
Measurement procedures (if any):	-
Any comment:	The results of the accounting should be reflected in the forms of statistical observation No. 23-N and No. 6-TP.

Table 11. Data / Parameter not monitored

Data / Parameter:	**$FC_{i,x}$**
Data unit:	mass or volume unit
Description:	Quantity of type *i* fossil fuel combusted in the project activity power plant in year *x*, where *x* are the three most recent historical years prior to the implementation of the project activity
Source of data:	Data logs at the project activity power plant
Measurement procedures (if any):	-
Any comment:	The results of the accounting should be reflected in the form of statistical observation No. 4-TER

Table 12. Data / Parameter not monitored

Data / Parameter:	**$\eta_{PAPP,\,hist}$**
Data unit:	-
Description:	Efficiency of the project activity power plant prior to the implementation of the project activity
Source of data:	-

Measurement procedures (if any):	-
Any comment:	-

Table 13. Data / Parameter not monitored

Data / Parameter:	$\boldsymbol{NCV_{i,x}}$
Data unit:	TJ per mass or volume unit
Description:	Weighted average net calorific value of type *i* fossil fuel used in year *x*, where *x* are the three most recent historical years prior to the implementation of the project activity
Source of data:	Values provided by the fuel supplier in invoices is the preferred source. In the absence of such data, it is necessary to use measurements made by the project participants. For more information, see Guidelines No. 371
Measurement procedures (if any):	Petroleum fuel - according to GOST 21261
Monitoring frequency:	
QA/QC procedures:	-
Any comment:	

7. Project scenario

7.1. Emissions from project activities (project emissions) should be calculated on the basis of the same approach that was chosen for calculating emissions under the baseline scenario.

7.2. For this type of projects, project emissions are calculated as follows:

$$PE_y = PE_{FC,j,y} + EC_{PJ,aux,y} \times EF_{grid,y} \quad (11)$$

Where:

PEy - Project emissions during the year *y* in t CO2;

$PE_{FC,j,y}$ - Project emissions from combustion of natural gas and auxiliary fossil fuel used in the project activity power plant in year *y* (t CO2);

$EC_{PJ,aux,y}$ - Auxiliary electricity consumption by the project activity in year *y* (MWh)[16];

$EF_{grid,y}$ - Emission factor of the electricity grid to which the project activity power plant is connected (t CO2/MWh).

7.3. It the PAPP provides electricity to captive consumer(s), project emissions do not include $EC_{PJ,aux,y}$ and$EF_{grid,y}$.

[16] It is assumed that in order to cover losses in the production of electricity, power plants consume electricity from the grid. In this case, it is necessary to take into account the consumption of electricity for production needs of the power plant (For the CHP, its own costs for the production of thermal energy are deducted).

7.4. To determine project emissions from combustion of natural gas and auxiliary fossil fuel, the latest methodology for quantifying greenhouse gas emissions and removals, approved by Order No. 371 of the Ministry of Natural Resources and Environment of the Russian Federation dated 27 May 2022 (Guidance No. 371) should be followed. Where measurements are taken, project participants should document measurement results after implementation of the project activity in their monitoring reports.

7.5. The emission reduction by the project activity during a given year y (ERy) is the difference between the baseline emissions (BEy) and project emissions (PEy) and leakage emissions (LEy), as follows:

$$ER_y = BE_y - PE_y - LE_y$$

where:

ERy – Emissions reductions of the project activity during the year y in t CO_2;

BE_y – Baseline emissions during the year y in t CO_2;

PEy – Project emissions during the year y in t CO_2;

LE_y – Leakage emissions (upstream) in the year y in t CO_2;

7.6. In the process of implementing a climate project, project developers may face certain risks and barriers. To assess the risks, the project developer should develop a risk matrix. For more details, see Appendix 1.

8. Leakage assessment

8.1. According to Order No. 248 of the Ministry of Economic Development of Russia dated 11 May 2022[17], project activities should not lead to an aggregate increase in greenhouse gas emissions or reduce their absorption levels outside the scope of such activities. At the same time, it is necessary to consider and fully account for any leakage in the course of a project activity[18] in line with the following methodology:

8.2. For this type of project activity, leakage upstream emissions (LEUS,y) from fuel extraction, processing, liquefaction, transportation, re-gasification and distribution of fossil fuels outside of the project boundary has to be considered. It is necessary to compare upstream leakage for the use of coal/petroleum fuel and natural gas.

8.3. Leakage upstream emissions in year *y* ($LE_{US,y} = LE_y$) shall be determined on the basis of coefficients available to the project developer, national special studies or any available specialized fact-based, transparent life cycle assessment (LCA) database[19].

8.4. The project developer should refer in PDD to the data source that was used to estimate fuel leaks and describe the properties of the selected coefficients.

8.5. Leakage Upstream emissions are calculated as follows:

---

[17] Appendix 1, point «в».

[18] Leakage (for a project activity) means the net change of anthropogenic emissions by sources of GHGs which occurs outside the project boundary, and which is measurable and attributable to the climate project activity, as applicable (CDM-EB07-A04-GLOS Glossary CDM terms. Version 11.0)

[19] Database sources example: DEFRA database, SimaPro life cycle assessment (LCA) software, Ecoinvent database, industry association reports, etc.

$$LE_{US,y} = (FC_{project,i,y} \times EF_{default,NG,y}) - (FC_{baseline,i,y} \times EF_{default,C(P),y})$$

Where:

$LE_{US,y}$ – Leakage upstream emissions in year y (t CO2e/yr);

$FC_{project,i,y}$ – Quantity of Natural gas used in the project situation in year *y*, thousand m3, TEF or TJ;

$EF_{default,NG,y}$ – Default emission factor for upstream emissions associated with consumption of Natural gas in year *y*, t CO_2/unit.

$FC_{baseline,i,y}$ – Quantity of coal or petroleum fuel used in the baseline scenario in year *y*, t, TEF or TJ;

$EF_{default,C(P),y}$- Default emission factor for upstream emissions associated with consumption of coal or petroleum fuel in year *y*, t CO_2/unit;

8.6. Where total net leakage effects from upstream emissions are negative (LEUS,y < 0), project participants should assume LEUS,y = 0

9. Non-permanence risk analysis

9.1. Not applicable for this type of project.

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

10.1. Climate project should demonstrate its compliance with all legal requirements in the jurisdiction where it is located. The project developer needs to minimize the risk that his project might result in negative impacts for local communities, biodiversity and the environment. Projects should not cause an increase in atmosphere, soil, surface and ground water pollution or 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 natural area.

10.2. The project developer should make efforts to avoid double counting[20] between project areas (project boundaries), between company reporting and reporting on the project, between the reporting of different companies, between the constituent entities 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 contribution of the Russian Federation defined at the national level.

[20] Double counting: accounting for GHG emissions or removals more than once. Double counting can occur between organizations, i.e. two or more reporting organizations take ownership of the same GHG emissions or removals. Double counting can also occur inside an organization when GHG emissions or removals are taken into account in different categories (this type of double counting should not occur). (ISO/TR 14069:2013 Greenhouse gases - Quantification and reporting of greenhouse gas emissions for organizations - Guidance for the application of ISO 14064-1). See also GOST R ISO 14080-2021. National Standard of the Russian Federation. Greenhouse gas management and related activities. A system of approaches and methodological support for the implementation of climate projects.

11.Recommendations for updating or keeping the baseline unchanged at the renewal of the crediting period and project activity

11.1.At the renewal of crediting period, the project is subject to verification with elements of validation and a technical assessment by a validation and verification body to determine necessary updates to the baseline, the additionality and the quantification of emission reductions. In order to update the baseline, it is necessary to revise and update the main parameters and assumptions used in established baseline approach (point's 3.2.1-3.2.3). The baseline shall be representative of the conditions for the beginning of a new crediting period and be valid for that period. The additionality at the renewal of the crediting period is checked for compliance to the criteria under Guidelines No. 1 at the date of the beginning of the new crediting period.

11.2. The baseline approach established earlier (best available technologies; ambitious benchmark; or existing actual or historical emissions) may not be changed at the renewal of the crediting period.

12.References

1. Order No. 248 of the Ministry of Economic Development of Russia dated 11.05.2022 "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 reporting on the implementation of a climate project" (registered with the Ministry of Justice of Russia on 30.05.2022, No.68642).
2. Order No. 330 of the Ministry of Natural Resources and Ecology of the Russian Federation dated 29.06.2017 "On approval of guidelines for quantifying the volume of indirect energy emissions of greenhouse gases".
3. 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 No. 1029-st dated 30.09.2021).
4. GOST R ISO 14064-2-2021. National Standard of the Russian Federation. Greenhouse Gases. Part 2. Requirements and Guidelines for Quantification, Monitoring and Reporting Documentation for Projects to Reduce Greenhouse Gas Emissions or Increase Their Absorption at the Project Level (approved and enacted by Rosstandart Order No. 1030-st dated 30.09.2021).
5. GOST R ISO 14064-3-2021. National Standard of the Russian Federation. Greenhouse Gases. Part 3. Requirements and Guidance for Validation and Verification of Greenhouse Gas Statements (approved and enacted by Rosstandart Order No. 1031-st of 30.09.2021).
6. GOST R ISO 14065-2014 National Standard of the Russian Federation. Greenhouse Gases. Requirements for Greenhouse Gas Validation and Verification Bodies for Their Application in Accreditation or Other Forms of Recognition (approved and enacted by Rosstandart Order No. 1869-st 26.11.2014).
7. GOST R ISO 14066-2013. National Standard of the Russian Federation. Greenhouse Gases. Requirements for Competence of Greenhouse Gas Validation and Verification Groups (approved and enacted by Rosstandart Order No. 2274-st dated 17.12.2013).

8. GOST R ISO 14080-2021. National Standard of the Russian Federation. Greenhouse Gas Management and Related Activities. System of Approaches and Methodological Support for the Implementation of Climate Projects (approved and enacted by Rosstandart Order No. 1033-st dated 30.09.2021).
9. Order No. 371 of the Ministry of Natural Resources and Environment of Russia dated 27.05.2022 "On approval of methods for quantitative determination of greenhouse gas emissions and greenhouse gas removals" (from 1 March 2023, except for certain provisions, coming into force on 1 March 2024).
10. 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.
11. ACM0011: Fuel switching from coal or petroleum fuel to natural gas. Version 5.0. CDM Methodology.

Appendix 1. Risk management

As a part of the project implementation, it is recommended to develop a risk assessment system with a description of the most likely risks that may arise at all stages of the climate project. For such an assessment, the project developer should develop a detailed matrix with the following information, as a minimum:

(i) The main stages of the implementation of the climate project;

(ii) Description of the risks that may arise at each stage of the climate project;

(iii) Description of the probability of occurrence of risks. For this, the rating options "low, medium, high" or any other understandable numerical scales can be used;

(iv) Description of the impact of each risk on the results of the entire project. This can also be done using "low, medium, high" or any other understandable numerical scale;

(v) Description of the period of influence of each risk on the entire climate project;

(vi) Development of measures to minimize or avoid each type of risks;

(vii) The time for the implementation of each measure that reduces or prevents the occurrence of risks is indicated.

An example of a template with a risk matrix is shown in Table 1.

Table 1. Risk matrix template

Stage of climate project implementation	**Description of risks**	**Probability of occurrence**	**Impact on the project**	**Impact period**	**Risk minimization methods**	**Implementation period**
		low medium high	low medium high	Preparation period 1-2 years after the implementation The entire period of the climate project	Detailed description of mitigation measures for each risk	Description of the time frame for the implementation of these activities
		Scale from 1 to 5 or others	Scale from 1 to 5 or others			

Appendix 2. 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 No. 330 of the Ministry of Natural Resources and Environment dated 29.06.2017[21]) and the principles for calculating indirect energy emissions defined in GOST R ISO 14064-1-2021[22].

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 No. 330 of the Ministry of Natural Resources and Environment).

According to GOST R ISO 14064-1-2021 (Appendix E), emissions from imported electricity must be calculated by the project developer using a location-based approach[23] 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[24].

---

[21] Order No. 330 of the Ministry of Natural Resources and Environment of the Russian Federation dated 29.06.2017 "On approval of guidelines for quantifying the volume of indirect energy emissions of greenhouse gases".

[22] 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 No. №1029-st dated 30.09.2021).

[23] 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.

[24] For example, calculation of specific fuel consumption in accordance with the "Methodological Guidelines for the Distribution of the Specific Consumption of Reference Fuel in the Production of Electric and Thermal Energy in the Cogeneration Mode Used for Tariff Regulation in the Field of Heat Supply", legislatively approved by Order No. 952 of the Ministry of Energy of the Russian Federation dated 12.09.2016.

Association "NP Market Council" and JSC "TSA" have developed a concept for calculating and publishing greenhouse gas emission factors for the energy system of the Russian Federation[25]. Based on the results of the peer review, independent international auditors issued an assurance certificate, and this concept received a validation report[26]. It is assumed that the 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. In 2021, JSC "Trading System Administrator of Wholesale Electricity Market Transactions" launched (in test mode) 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) [27].

Source 2. Emission factors of the International Energy Agency (IEA). The data is updated annually for the entire energy system of the regions of presence (including the Russian Federation) and reflects the average carbon intensity of electricity and heat generation[28].

Source 3. Climate Transparency Global Partnership develops G20 climate indicators. The agency publishes annual reports from the G20[29] 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.

[25] 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

[26] 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

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

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

[29] URL: https://www.climate-transparency.org/g20-climate-performance/g20report2022#1531904804037-423d5c88-a7a7