JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM
Version 01 - in effect as of: 15 June 2006

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SECTION A. General description of the project

A.1. Title of the project:

Fuel switch at the Arkhangelskaya and Severodvinskaya combined heat-and-power plants of the JSC Territorial Generation Company # 2, Russian Federation

Sectoral scope: 1 - Energy industries (renewable/non-renewable sources)
PDD version: 05
Date: 24.08.2011

A.2. Description of the project:

Project targets:

- Reduction of the high-carbon fuel consumption at the Arkhangelsk combined heat-and-power plant (ATES[1]) and the Severodvinsk combined heat-and-power plant #2 (STES-2[2]) of the "Territorial Generating Company #2" (TGC-2), JSC;
- Application of up-to-date technologies for fuel preparation and combustion;
- Reduction of greenhouse gas emissions;
- Reduction of pollutant emissions into the atmosphere.

Project tasks:

- Start using natural gas at boiler units TGM-84B No.1, 2, 3 and 4 at the ATES;
- Start using natural gas at boiler units TGME-464 No.1, 2 and 3 at the STES-2;
- Construction of the fuel gas infrastructure.

The situation which existed before the project started

The ATES and STES-2 are located in the industrial area of the city. The designed projects are located within their premises. The core business of the ATES and STES-2 is thermal and electric power generation. Both the ATES and the STES-2 were designed to use the same fuel type, i.e. heavy fuel oil.

The project includes boiler units TGM-84B No.1, 2, 3 and 4 of the ATES and boiler units TGME-464 No.1, 2 and 3 of the STES-2 (hereinafter – "boiler units"). Boiler units produce steam, which is directed to turbines to generate heat and electric power. The specific fuel consumption of boiler units during steam production is 0.15 tce/Gcal[3].

[1] hereinafter referred to as "ATES"
[2] hereinafter referred to as "STES-2"
[3] Production Report "Model 15506-1" for 2008-2010 for the ATES and STES-2.
Value of 0.15 tce/Gcal takes into account an introduced heat. It means that a fire chamber of the boiler has a heat before the entry of fuel

Table A.1. Steam production by boiler units

Boiler	Acronym	Unit	2008	2009	2010
ATES boiler TGM-84B, #1	$HG_{ATES\ 1}$	Gcal/year	794 660.00	1 095 563.00	1 040 838.00
ATES boiler TGM-84B, #2	$HG_{ATES\ 2}$	Gcal/year	1 005 942.00	1 037 212.00	651 229.00
ATES boiler TGM-84B, #3	$HG_{ATES\ 3}$	Gcal/year	1 095 194.00	1 132 731.00	1 044 488.00
ATES boiler TGM-84B, #4	$HG_{ATES\ 4}$	Gcal/year	775 614.00	942 013.00	931 171.00
ATES boilers ## 1-4	**$HG_{ATES,\ y}$**	**Gcal/year**	**3 671 410.00**	**4 207 519.00**	**3 667 726.00**
STES-2, boiler TGME-464, #1	$HG_{STES\ 1}$	Gcal/year	495 202.00	477 798.00	654 071.00
STES-2, boiler TGME-464, #2	$HG_{STES\ 2}$	Gcal/year	314 584.00	370 393.00	588 137.00
STES-2, boiler TGME-464, #3	$HG_{STES\ 3}$	Gcal/year	1 107 453.00	924 068.00	650 598.00
STES-2 boilers ## 1-3	**$HG_{STES,y}$**	**Gcal/year**	**1 917 239.00**	**1 772 259.00**	**1 892 806.00**

Table A.2. Fuel consumption of boiler units

Boiler	Acronym	Unit	2008	2009	2010
ATES boiler TGM-84B, #1	$FC_{ATES\ 1}$	t.c.e.	121 036.00	165 747.00	156 804.00
ATES boiler TGM-84B, #2	$FC_{ATES\ 2}$	t.c.e.	151 771.00	155 578.00	99 690.00
ATES boiler TGM-84B, #3	$FC_{ATES\ 3}$	t.c.e.	166 732.00	171 772.00	160 007.00
ATES boiler TGM-84B, #4	$FC_{ATES\ 4}$	t.c.e.	116 625.00	141 782.00	141 589.00
ATES boilers ## 1-4	**FC_{ATES}**		**556 164.00**	**634 879.00**	**558 090.00**
STES-2 boiler TGME-464, #1	$FC_{STES\ 1}$	t.c.e.	74 798.00	71 284.00	98 236.00
STES-2 boiler TGME-464, #2	$FC_{STES\ 2}$	t.c.e.	47 211.00	55 969.00	88 428.00
STES-2 boiler TGME-464, #3	$FC_{STES\ 3}$	t.c.e.	166 411.00	138 776.00	97 557.00
STES-2 boilers ## 1-3	**FC_{STES}**		**288 420.00**	**266 029.00**	**284 221.00**

Baseline scenario

If there were no project (the replacement of heavy fuel oil with natural gas) boiler units would be fed with the Kuznetsky coal, and heavy fuel oil would remain the backup fuel.

According to the project specification, the capacity and operational mode of the ATES and STES-2 shall not be altered. For the implementation of this scenario, business plans were developed in 2007 to replace heavy fuel oil with coal. The business plans were approved by the company management.[2] As it follows from TGC-2, JSC strategy in thermal and electric power generation markets until 2011" and the analysis of the upward trend in fuel prices represented in the business plans, the replacement of heavy fuel oil with coal is the most favourable scenario for the development of TGC-2, JSC facilities in the Arkhangelsk Region. Besides, the business plan includes an environmental impact assessment of coal consumption, according to which the usage of coal will lead to a significant reduction in the environmental impact. The Investments Commission of Business Unit #1 (BU-1) decided to include the

[2] This can be proved by the following documents:
- The minutes of the meeting at the managing director of BU-1of RAO UES of Russia Chikunov A.V. dated October 2, 2006 "Development of an investment program for "Arkhangelsk Generating Company" (AGC), JSC;
- The investment program for "Arkhangelsk Generating Company", JSC for 2007 as a part of the Society business-plan;
- The concept of the TGC-2, JSC strategy in the thermal and electric power generation markets till 2010;
- The project specification for development of the Feasibility study and business plan of the investment project "Reconstruction of Arkhangelsk combined heat-and-power plant of AGC, JSC and the replacement of the project fuel (heavy fuel oil) with coal at the boiler units of Arkhangelsk combined heat-and-power plant";

project on the replacement of heavy fuel oil with coal into a five-year program for BU-1 for 2006-2001 and 2007-2011.[3]

In baseline scenario the GHG emission would be **5,136,739.75 t CO2 over 2011-2012.**

Project scenario

According to the project scenario natural gas will be used as main fuel, and heavy fuel oil will remain backup fuel.

For implementation of this scenario business plans and a detailed design were developed in 2007. According to the project specification, capacity and operational mode of the ATES and STES-2 shall not be altered after natural gas is started to be used.

Under the project scenario the GHG emission would be **3,219,142.32 t CO2 over 2011-2012.**

The project implementation will result in reduction of GHG emission **1,917,597.43 t CO2 over 2011-2012 and average will be 1 000 485.62 t CO2.**

History of the project

The Company started to apply the provisions of the Kyoto Protocol at its business units when RAO UES of Russia existed, prior to TGC-2, JSC foundation. The "history" of the implementation of the Kyoto mechanisms at TGC-2, JSC (its business units being part of RAO UES of Russia) can be divided into the following stages:

- 1998-2007: The Non-Profit Investment Environmental Organization "Energy Carbon Fund" carries out a periodic Inventory of greenhouse gas emissions for RAO UES of Russia.
- 2007: RAO UES of Russia analyzed the compliance of investment projects of the generating companies with the criteria applied to the joint implementation projects (JI projects). The design and administration of the project were entrusted to the Non-Profit Investment Environmental Organization "Energy Carbon Fund" and its subsidiary – "Carbon Projects", LLC. (Extract from the Minutes of the Board meeting at RAO UES of Russia").
- 2008: The contract is signed with "Carbon Projects", LLC for the preparation of documents for five investment projects on the implementation of the combined cycle gas turbine units (CCGT units). The Project Idea Note (PIN) is prepared.
- 2010: A tender is held to select a contractor, which is to design and administer the investment projects of TGC-2, JSC as JI projects.

In 2007 replacing heavy fuel oil with another kind of fuel at the ATES and STES-2 meant its replacement with coal. But in 2008, following the recommendations of the Non-Profit Investment Environmental Organization "Energy Carbon Fund", the decision was made to replace heavy fuel oil with natural gas, and not with coal. The projects on the replacement of heavy fuel oil with natural gas at the ATES and STES-2 are to be implemented as JI projects.

[3] Minutes of the meeting of BU-1 Investments Commission dated 12.04.2007

A.3. Project participants:

Party involved	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Party A Russian Federation (Host Party)	JSC Territorial Generation Company # 2	No
Party B	-	-

"**Territorial Generating Company #2" Joint-Stock Company (TGC-2, JSC)** was founded on February 25, 2005 after the corporate resolution of RAO UES of Russia. TGC-2, JSC is one of the major heat and power producing companies in the north and north-west of Russia. It generates thermal and electric power, and sells heat (steam and hot water) to customers. The TGC-2 structure comprises generating companies from 6 regions – Arkhangelsk, Vologda, Kostroma, Novgorod, Tver, Yaroslavl. The total installed electric power of TGC-2 enterprises is 2,542.5 MW, and the installed thermal power is 12,285.82 Gcal/h.

The Arkhangelsk combined heat-and-power plant is a baseload plant designed to satisfy the electric energy demand of the Arkhangelsk energy grid and the steam demand of firms, and also to provide heat to the city of Arkhangelsk. The installed electric power of the Arkhangelsk combined heat-and-power plant is 450MW, and its thermal power is 1,292 Gcal/h. Supplying 82% of the thermal power demand of the city of Arkhangelsk, the plant is the only centralized heat supply source. The Arkhangelsk combined heat-and-power plant produces more than 50% of the electric energy generated at the Headquarters of TGC-2, JSC for the Arkhangelsk Region.

The Severodvinsk combined heat-and-power plant #2 provides energy and heat supply to industry and residential areas of the town of Severodvinsk and the Arkhangelsk Region. The Severodvinsk combined heat-and-power plant #2 is the only block-type combined heat-and-power plant in the structure of the Headquarters of TGC-2, JSC for the Arkhangelsk Region. It has an installed electric power of 410MW, thermal power – 1,105 Gcal/h, including that of the turbine generating units - 705 Gcal/h, and steam water heaters – 400 Gcal/h.

A.4. Technical description of the project:

A.4.1. Location of the project:

The Project is located in Arkhangelsk and Severodvinsk cities, Russian Federation.

A.4.1.1. Host Party(ies):

Russian Federation

Figure A.1. Russian federation on the world map

A.4.1.2. Region/State/Province etc.:

Arkhangelsk Oblast

Figure A.2. Arkhangelsk Oblast on the map of Russian Federation

A.4.1.3. City/Town/Community etc.:

Cities Arkhangelsk and Severodvinsk

Figure A.3. Arkhangelsk and Severodvinsk

A.4.1.4. Detail of physical location, including information allowing the unique identification of the project (maximum one page):

The project is implemented at two premises of TGC-2:

ATES 19 Talazhskoe shosse, Oktyabrskiy territorial district, Arkhangelsk.
Coordinates - 64° 34′ 31″ N, 40° 34′ 23″ E

STES-2 21 Okruzhnaya st., Severodvinsk, Arkhangelsk Region.
Coordinates - 64° 33′ 49.9″ N, 39° 54′ 23.3″ E

A.4.2. Technology(ies) to be employed, or measures, operations or actions to be implemented by the project:

The project involves the replacement of heavy fuel oil with natural gas. Neither the heat and energy production capacity nor the energy flow pattern will be altered.

The main engineering solutions
The replacement of heavy fuel oil with natural gas requires the correction of project design documents for the Arkhangelsk combined heat-and-power plant. The current documents were developed in 1994 by

"Siltumelektroprojekts", JSC because of changes in the industrial safety requirements to the gas transmission networks of thermal power plants.

Gas is delivered to the main distribution unit of the combined heat-and-power plant through a subsurface gas pipeline with an outer diameter of 630 mm. The pipeline is being constructed in compliance with the construction data sheet of the Directorate of the pipeline under construction. The project frame is determined at the point where the subsurface gas pipeline breaks the surface not far from the main distribution unit. At present, the construction of the "Nyuksenitsa-Arkhangelsk" pipeline is not finished. According to the letter of the Government of the Arkhangelsk Region No.06-25/29 dated 18.11.2004, the construction of the cross-country gas pipeline is finished in 2008, and gas is supplied to the cities of Arkhangelsk and Severodvinsk from 2009.

The main activities at the ATES and STES-2:
- Pipeline installation from the gas cabinets to the boiler units;
- Restoration of boiler units TGM-84B No.1,2,3,4 (ATES) including the replacement of burner units, the bringing of protection and automation systems in conformity with the requirements of the specifications for process protections and interlocks when using heavy fuel oil and natural gas at the boiler units in compliance with explosive safety requirements (RD 153-34.1-35.108-2001);
- Restoration of boiler units TGME-464 No.1,2,3 (STES-2) including the replacement of burner units, the bringing of protection and automation systems in conformity with the requirements of the specifications for process protections and interlocks when using heavy fuel oil and natural gas at the boiler units in compliance with explosive safety requirements (RD 153-34.1-35.108-2001);
- Reconstruction of the main building of the boiler bay including the extension of the daylight area;

Gas is delivered to a gas cabinet through a gas pipeline with an outer diameter of 630 mm. The gas cabinet functions include an automatic gas pressure adjustment from 1.3MPa to 0.25MPa. The gas cabinet is semi-open. Inside the cabinet there are pressure controllers and sound attenuators. In the open part of the cabinet there are gas filters, flow meters, valve, and single-turn actuators. The gas cabinet has 3 regulatory lines. The maximum transmission capacity of the gas cabinet on the assumption of the operation of a line with a diameter of 630mm is 475,200 mn3/h. From the gas cabinet natural gas is forwarded to power boiler units though gas pipelines with a diameter of 1,220 mm on a piping rack along row "G" of the main building. The gas flow per hour per power boiler unit is 31,450 mn3/h.

In accordance with actual data for the period January-June of 2011 the average specific fuel consumption of the refurbished boiler units is following:

ATES, boiler No.	t.e.f per Gcal
1	0.153
2	0.159
3	0.157
4	0.157

Project schedule

ATES 26 09 2010 - 24 01 2011

Pipeline installation	15.10.2010 - 26.12.2010
Construction of the gas distribution substation	15.10.2010 - 04.01.2011
Reconstruction of the main building	26.09.2010 - 29.11.2010
Reconstruction of boilers	
#3	12.11.2010 - 04.01.2011
#4	20.12.2010 - 11.01.2011
#1	20.12.2010 - 17.01.2011
#2	20.12.2010 - 24.01.2011

STES-2 14 12 2010 – 30 06 2011

Pipeline installation	15.11.2010 - 26.05.2011
Construction of the gas distribution substation	15.11.2010 - 10.05.2011
Reconstruction of the main building	14.12.2010 - 04.04.2011
Reconstruction of boilers	
#3	12.02.2011 - 20.09.2011
#1	20.03.2011 - 17.06.2011
#2	18.03.2011 - 15.08.2011

A.4.3. Brief explanation of how the anthropogenic emissions of greenhouse gases by sources are to be reduced by the proposed JI project, including why the emission reductions would not occur in the absence of the proposed project, taking into account national and/or sectoral policies and circumstances:

The project shall result in electric and thermal power generation using natural gas. If there were no project, heavy fuel oil would be replaced with coal.

Thus, the project implementation leads to the replacement of a high-carbon fuel (coal) with a low-carbon one (natural gas). This will lead to a reduction in greenhouse gas emissions because natural gas firing releases less greenhouse gases than coal firing.

Greenhouse gas emissions can be reduced only in the case of the project implementation, and not under baseline scenario. According to the Master plan for the allocation of energy facilities until 2020, developed in 2007, the proportion of coal in the regional fuel mix was to be doubled, and the proportion of natural gas was to be reduced, so the trend of coal consumption was the key component of the industry strategy. But the replacement of heavy fuel oil with coal does not result in a decrease in greenhouse gas emissions.
Russian legislation does not require that generating companies replace heavy fuel oil with another type of fuel, such as coal or natural gas.

Prior to making its decision on the project implementation, the Company considered the possibility of replacing heavy fuel oil with coal as a more cost-effective scenario as compared to replacing heavy fuel oil with natural gas. Replacing heavy fuel oil with natural gas became real due to the possibilities of the Joint Implementation Mechanism of the Kyoto Protocol.

That is why greenhouse gas emissions would not be reduced if the project is not implemented.

A detailed estimation of the reduction in greenhouse gas emissions is given in section A.4.3.1.

A.4.3.1. Estimated amount of emission reductions over the crediting period:

	Years
Length of the crediting period	4
Years	Estimate of annual emission reductions in tonnes of CO2 equivalent
2011	808 961.24
2012	1 108 636.19
Total estimated emission reductions over the crediting period (tonnes of CO2 equivalent)	**1 917 597.43**
Annual average of estimated emission reductions over the crediting period (tonnes of CO2 equivalent)	**1 000 485.62**

A.5. Project approval by the Parties involved:

On October 28, 2009 the Government of the Russian Federation adopted the Resolution "On Measures for Implementation of Article 6 of the Kyoto Protocol to the UN Framework Convention on Climate Change"[4]. This document approves Regulations on the implementation of article 6 of the Kyoto Protocol. According to paragraph 8 of the Resolution the projects will be approved by the Ministry of Economic Development and Trade of the Russian Federation on the grounds of the results of the applications of the competitive selection. The competitive selection of applications is held by the carbon unit operator (Sberbank of Russia) in compliance with paragraph 5 of the Resolution of the Government of the Russian Federation No.843.

The Order of the Ministry of Economic Development and Trade "On Approval of the Rules for Competitive Selection of Applications Submitted for Approval of Projects Implemented in Accordance with Article 6 of the Kyoto Protocol to the UN Framework Convention on Climate Change"[5] specifies the requirements to an application structure and content. An application should contain a "positive expert opinion on the project documents prepared in compliance with international requirements by an independent agency chosen by an applicant". Thus, in accordance with the law of the Russian Federation applicable to CO projects implementation, the Project can be approved after receiving a positive opinion from a determiner.

The project approval by a Party involved other than the host Party is absent at the time of the determination. The party involved other than the host Party will be determined after the approved by the Ministry of Economic Development and Trade of the Russian Federation.

[4] Resolution of the RF Government No.843 dated 28.10.2009 - http://www.government.ru/gov/results/8030

[5] Order of the Ministry of Economic Development and Trade No.485 dated 23.11.2009 - http://merit.consultant.ru/doc.asp?ID=10297

SECTION B. Baseline

B.1. Description and justification of the baseline chosen:

1. Determination and description of the approach to be applied to define the baseline scenario

The baseline scenario is validated with the help of an JI specific approach developed in compliance with the provisions of:

- Guidelines for the implementation of article 6 of the Kyoto Protocol (Appendix B. Criteria for baseline setting and monitoring);[6]
- Guidance on criteria for baseline setting and monitoring. Version 02 (C. Guidance on criteria for baseline setting)[7].

The JI specific approach implies the consideration and assessment of alternative scenarios through the following stages:

Stage 1. Identification of the alternative scenarios
Stage 2. Analysis of the key factors influencing each alternative scenario
Stage 3. Selection of the alternative scenario least influenced by the key factors

2. Application of the chosen approach

Stage 1. Identification of the alternative scenarios

At this stage the alternative scenarios are identified and checked for conformity with legislation.

The following alternative scenarios are being considered:

Alternative scenario 1. Continuation of the current situation, i.e. heavy fuel oil consumption

This scenario implies using heavy fuel oil at the boiler units included in the project. The capacity of the boilers does not change.

Alternative scenario 2. Replacement of heavy fuel oil with natural gas

This scenario implies using natural gas at the boiler units included in the project. The capacity of the boilers does not change.

Alternative scenario 3. Replacement of heavy fuel oil with coal

This scenario implies using coal at the boiler units included in the project. The capacity of the boilers does not change.

Stage 2. Analysis of the key factors

At this stage the influence of the key factors on the alternative scenarios selected at the first stage is considered. The analysis of the key factors is made in compliance with paragraph 25 of the Guidance on criteria for baseline setting and monitoring.

The key factors are:

- Policy of reforms in the industry and legislation. National plans for energy development;
- Economic environment. Fuel price and availability;

[6] Report of the Conference of the Parties, Montreal, 28 November - 10 December 2005
[7] Report of JISC 18, Bonn, 23 October 2009

- Capital availability (investment barrier);
- Local availability of technology and equipment, skills and know-how.

Analysis of the key factors influencing the above alternative scenarios.

Factor – Policy of reforms in the industry and legislation. National plans for energy development

At the beginning of 2006 the Concept of RAO UES of Russia strategy for 2003-2008 "5+5" "Generating companies of the wholesale electricity market" was adopted. The companies founded in the course of the reform specialize in certain types of activities (electric power generation, transmittance, etc.). These companies have a larger core business than former regional monopolies: they unite the companies with the same core business either in several regions or all over Russia. Generating activities are concentrated in the two types of interregional companies: wholesale generating companies (WGC) and territorial generating companies (TGC). TGC comprise mainly combined heat-and-power plants (HPP) producing both electric and thermal power. In December 2007 – January 2008 the target structure of all the heat WGC and TGC was formed.

At a time when institutional reforms were being implemented the task for the staff of the companies involved was to ensure conformity with legislation. Thus, the ATES and STES-2 using heavy fuel oil were systematically exceeding the standards for maximum permissible emissions (MPE) and were operating with temporary agreed emissions (TAE) defined, which led to an increase in the environmental payments.

From the business-plan:

- *Replacement of heavy fuel oil with solid fuel at the Severodvinsk combined heat-and-power plant #2 will improve the environmental situation in the town of Severodvinsk due to the reduction of sulfur dioxide emissions by 11,679 t/year.*
- *Replacement of heavy fuel oil with solid fuel at the Arkhangelsk combined heat-and-power plant will significantly improve the environmental situation in the city of Arkhangelsk. A reduction of sulfur dioxide emissions by 21,377 t/year and nitrogen dioxide emissions by 1,048 t/year will enable the company to comply with the standards for maximum permissible emissions and reduce the environmental pressure on the territory and population of the city of Arkhangelsk to the maximum allowable concentrations at the boundary of the sanitary protection area with the Arkhangelsk combined heat-and-power plant operating at its full capacity.*

Assessment of the influence of this factor on the implementation of the scenarios:

1. Maintenance of the existing situation, i.e. usage of heavy fuel oil, is less plausible because of the standards for maximum permissible emissions being systematically exceeding;
2. Heavy fuel oil replacement with natural gas - possible;
3. Heavy fuel oil replacement with coal - possible.

Factor - Economic environment. Fuel price and availability

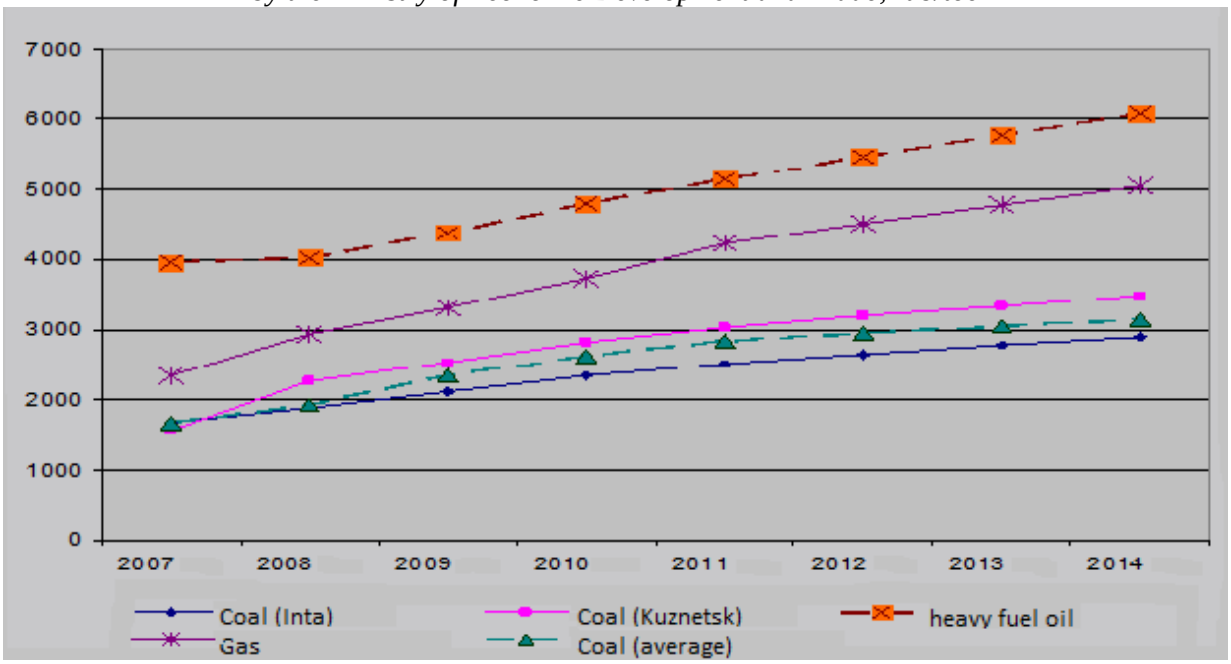
In 2007 the increase in prices for natural gas and heavy fuel oil corresponded to a trend estimated by the Government of the Russian Federation. The forecast for controlled gas prices until 2010 corresponds to price levels given in the protocol of the Government of the Russian Federation dated November 30, 2006. According to the forecast, the price of heavy fuel oil will decrease in 2007 and 2008 and rise in 2010-2011 to the level determined by an equilibrium price. The rise in coal prices guarantees that by 2010 the net-back price[8] of the export price will be reached in the domestic market. The forecast for fuel process after 2010 proceeds from the assumption that in 2011 the forecasted trend for gas prices will be maintained. The forecast for gas and heavy fuel oil prices after 2011 is made with regard to the free

[8] Net-back is an analytical concept not used in contracting. It denotes an indirect price of raw materials on the base target market minus transportation costs.

market price (on the basis of the data provided by information agencies Annual Energy Outlook 2006 and Energy Information Administration). Forecast for coal price proceeds from the assumption that by 2010 price for the Kuznetsky coal will become equal to an export price.

From the business-plan – The increase in gas price makes it inefficient to replace heavy fuel oil with natural gas at the boiler units of the electric power stations at AGC, JSC. At the same time, the price of coal does not increase so rapidly. Besides, the coal reserves are much larger than those of natural gas, that's why replacing heavy fuel oil with coal at the boiler units of the electric power stations of AGC, JSC is more efficient and a primary measure to help AGC, JSC come out of a recession.

Figure B.1. The energy price trend according to the forecast made by the Ministry of Economic Development and Trade, rub/toe



Assessment of the influence of this factor on the implementation of the scenarios:

1. Continuation of the existing situation, i.e. usage of heavy fuel oil, is less plausible because of the increase in heavy fuel oil prices;
2. Heavy fuel oil replacement with natural gas - less plausible because of the increase in gas prices;
3. Heavy fuel oil replacement with coal - possible because coal is the cheapest fuel with the lowest rate of price increase.

Factor – Capital availability. Investment barrier

The investment valuation is given below, in section B.2.

Assessment of the influence of this factor on the implementation of the scenarios:

1. Continuation of the existing situation, i.e. usage of heavy fuel oil – less plausible;
2. Heavy fuel oil replacement with natural gas - less plausible;
3. Heavy fuel oil replacement with coal - possible.

Factor - Local availability of technology and equipment, skills and know-how.

Assessment of the influence of this factor on the implementation of the scenarios:

1. Continuation of the existing situation, i.e. usage of heavy fuel oil – possible because it doesn't require changes in the technology and replacement of the equipment;
2. Heavy fuel oil replacement with natural gas – difficult and needs to be designed;

3. Heavy fuel oil replacement with coal – possible, documents for similar HPP boilers are available.

Stage 3. Selection of the alternative scenario least influenced by the key factors

As it is seen from the analysis above scenario 3 is the least sensitive to the influence of the key factors, so this scenario - heavy fuel oil replacement with coal is the **baseline scenario**.

Theoretical description of the baseline

The baseline is the replacement of boiler units which consume HFO. The heavy fuel oil would remain the backup fuel.

Yearly baseline emission is the sum of emission from fuel consumption ATES and STES-2. Baseline emission from the electricity consumption for the pulverization of coal is excluded in accordance with the principle of conservativeness.

Formula B.1. $BE_{y} = BE_{fuel, A, y} + BE_{fuel, S, y}$

where:

BE_{y} - total GHG emission in baseline, t CO2-eq

$BE_{fuel, A, y}$ - total GHG emission from the fuel consumption in baseline for ATES, t CO2-eq

$BE_{fuel, S, y}$ - total GHG emission from the fuel consumption in baseline for STES-2, t CO2-eq

Formula B.1.1 $BE_{fuel, A, y} = \sum_{i=1}^{4} BE_{fuel, A, i, y} = \sum_{i=1}^{4} (EF * HG_{A, i, y} / \eta_{coal, A})$

where:

$BE_{fuel, A, y}$ - total GHG emission from the fuel consumption in baseline for ATES, t CO2-eq

$BE_{fuel, A, i, y}$ - GHG emission from the fuel consumption in baseline at the ATES by i-boiler, t CO2-eq

$HG_{A, i, y}$ - steam production at the ATES by i-boiler, Gcal/ year

$EF_{CO2, coal}$ - GHG emission factor for coal, equal 98.3 t CO2 per TJ or 0.4113 t CO2 per Gcal

$\eta_{coal, A}$ - efficiency of the ATES with coal, 91%

i - boilers of ATES ##1-4

Formula B.1.2. $BE_{fuel, S, y} = \sum_{i=1}^{3} BE_{fuel, S, i, y} = \sum_{i=1}^{3} (EF * HG_{S, i, y} / \eta_{coal, S})$

where:

$BE_{fuel, S, y}$ - total GHG emission from the fuel consumption in baseline for STES-2, t CO2-eq

$BE_{fuel, S, i, y}$ - GHG emission from the fuel in baseline at the STES-2 by i-boiler, t CO2-eq

$HG_{S, i, y}$ - steam production at the STES-2 by i-boiler, Gcal/ year

$EF_{CO2, coal}$ - GHG emission factor for coal, equal 98.3 t CO2 per TJ or 0.4113 t CO2 per Gcal

$\eta_{coal, S}$ - efficiency of the STES-2 with coal, 92.3%

i - boilers of STES-2 ## 1-3

Key factors for the baseline scenario:

Data/Parameter	$HG_{A, i, y}$
Data unit	Gcal
Description	Steam production by i-boiler of ATES
Time of determination/monitoring	continuously
Source of data (to be) used	Metering complex: flow steam - metran 150- CD3, pressure - metran 150-TG5 and EKM, temperature - TP 2088E/9-XA
Value of data applied (for ex ante calculations/determinations)	boiler 1 977 020.33 boiler 2 898 127.67 boiler 3 1 090 804.33 boiler 4 882 932.67
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is needed for the calculation of the fuel consumption
QA/QC procedures (to be) applied	Recalibration interval– 24 months. Error – 0.25%. Recent calibration – 01.12.2009. Calibrated in accordance with methodological rule "MI 4212-012-2006"
Any comment	Data is measured continuously and formed into monthly and annual production reports.

Data/Parameter	$HG_{S, i, y}$
Data unit	Gcal
Description	Steam production by i-boiler of STES-2
Time of determination/monitoring	continuously
Source of data (to be) used	Metering complex: flow steam – KSD-2, pressure – KSU1-002 and MP 22517, temperature – TXA0179
Value of data applied (for ex ante calculations/determinations)	boiler 1 542 357.00 boiler 2 424 371.33 boiler 3 894 039.67
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is needed for the calculation of the fuel consumption in baseline
QA/QC procedures (to be) applied	Recalibration interval– 24 months. Error – 0.25%. Recent calibration – 01.12.2009. Calibrated in accordance with methodological rule "MI 4212-012-2006"
Any comment	Data is measured continuously and formed into monthly and annual production reports.

Data/Parameter	$\eta_{A, coal}$
Data unit	%
Description	Efficiency of ATES boiler on coal
Time of determination/monitoring	Once, during the determination
Source of data (to be) used	business plan "The reconstruction of the ATES with fuel switching from heavy fuel oil to coal"
Value of data applied (for ex ante calculations/determinations)	91%
Justification of the choice of data or description of measurement methods and procedures (to be)	This parameter is needed for the calculation of the coal consumption on the ATES

applied	
QA/QC procedures (to be) applied	-
Any comment	-

Data/Parameter	$\eta_{S, coal}$
Data unit	%
Description	Efficiency of STES-2 boiler on coal
Time of determination/monitoring	Once, during the determination
Source of data (to be) used	business plan "The reconstruction of the STES-2 with fuel switching from heavy fuel oil to coal"
Value of data applied (for ex ante calculations/determinations)	92%
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is needed for the calculation of the coal consumption on the STES-2
QA/QC procedures (to be) applied	-
Any comment	-

Data/Parameter	$EF_{CO2, coal}$
Data unit	kg CO2 per TJ
Description	CO2 factor for coal
Time of determination/monitoring	Once, during the determination
Source of data (to be) used	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value of data applied (for ex ante calculations/determinations)	98 300 kg CO2 per TJ 0.4113 t CO2 per Gcal
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is needed for the calculation of the GHG emission from the coal consumption
QA/QC procedures (to be) applied	-
Any comment	-

B.2. Description of how the anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the JI project:

The analysis represented in subsection B.1. clearly shows that the proposed project is not a baseline scenario.

1. Determination and description of the selected approach

The fact that the Project is an additional one is proved with the help of the rules and principles published in the following documents:

- Tool for the demonstration and assessment of additionality (version 05.2);[9]
- Guidelines for implementation of article 6 of the Kyoto Protocol (paragraph 33);
- Guidance on criteria for baseline setting and monitoring. Version 02 (Annex 1. Additionality)

[9] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf

"Tool for the demonstration and assessment of additionality" is a sequence analysis and comprises 4 stages. If the investment analysis shows that the project activities are not the most attractive scenario from the point of view of financial indicators, stage 2 shall be followed by stage 4.

Stage 1. Determination of the alternative scenarios;
Stage 2. Investment analysis of the scenarios and (or)
Stage 3. Analysis of the barriers;
Stage 4. Analysis of the common practice.

2. Application of the selected approach

Stage1. Determination of the alternative scenarios

The scenarios identified in section B.1. are accepted for further analysis. Alternative scenario 1 is not to be further considered because its implementation leads to the MPE standards applicable to the company being systematically exceeded. The scenarios to be further considered are:

- Alternative scenario 1. Continuation of the current situation, i.e. heavy fuel oil consumption;
- Alternative scenario 2. Replacement of heavy fuel oil with coal;
- Alternative scenario 3. The project (without JI), i.e. fuel switch of heavy fuel oil with natural gas.

Stage 2. Investment analysis

This stage involves the identification of:
(a) the most economically or financially attractive scenario, or
(b) the scenario, which can be implemented economically or financially without return on ERU sales

In accordance with the recommendations for investment analysis from the UN Framework Convention on Climate Change in PDD, *simple cost analysis, investment comparison analysis, and benchmark analysis* can be applied. A simple cost analysis is used when the project has only one source of revenue – ERU sales. This type of analysis is used in the project because steam produced by the boiler units is used on-site and not distributed to other organizations.

The project cost over 10 years[10] will be estimated to assess the financial attractiveness of each scenario relying on the information about capital and operational expenditures expressed in terms of fuel costs:

- Capital expenditures;
- Fuel costs for steam generation.

The most financially attractive scenario is that with the lowest expenditures.

Alternative scenario 2. Replacement of heavy fuel oil with coal

[10] The analysis period is taken to be equal to 10 years in accordance with UNFCCC recommendations. Report EB 39, annex 10, paragraph 3.

Table B.1. Cost for the realization of the alternative 2[4]

	Calendar year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
	index year	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
ATES											
Steam production	Gcal / year	4 229 543.96									
Fuel consumption	t.c.e. / year	604 220.57									
CAPEX of coal alternative	mln rub	3293.0									
Coal price	ths rub / t.c.e.	2.58	2.70	2.82	2.93	2.99	3.05	3.10	3.16	3.19	3.23
Cost for coal	mln rub			1 704.55	1 772.23	1 806.67	1 841.11	1 875.55	1 909.99	1 929.93	1 949.87
Sum of CAPEX and OPEX	mln rub	3 293.00	0.00	1 704.55	1 772.23	1 806.67	1 841.11	1 875.55	1 909.99	1 929.93	1 949.87
Cumulative cost	**mln rub**	**3 293.00**	**3 293.00**	**4 997.55**	**6 769.78**	**8 576.45**	**10 417.56**	**12 293.11**	**14 203.10**	**16 133.03**	**18 082.89**
STES-2											
Steam production	Gcal / year	2 015 017.60									
Fuel consumption	t.c.e. / year	287 859.66									
CAPEX of coal alternative	mln rub	2515									
Coal price	ths rub / t.c.e.	2.58	2.70	2.82	2.93	2.99	3.05	3.10	3.16	3.19	3.23
Cost for coal	mln rub			812.08	844.32	860.72	877.13	893.54	909.95	919.45	928.95
Sum of CAPEX and OPEX	mln rub	2 515.00	0.00	812.08	844.32	860.72	877.13	893.54	909.95	919.45	928.95
Cumulative cost	**mln rub**	**2 515.00**	**2 515.00**	**3 327.08**	**4 171.39**	**5 032.11**	**5 909.25**	**6 802.78**	**7 712.73**	**8 632.18**	**9 561.13**
Sum for ATES and STES-2	**mln rub**	**5 808.00**	**5 808.00**	**8 324.63**	**10 941.17**	**13 608.56**	**16 326.80**	**19 095.89**	**21 915.83**	**24 765.20**	**27 644.02**

[4] Busyness plan of the project on the stage of investment substantiation "The reconstruction of the Arkhangelskaya HPP with the fuel switch from heavy fuel oil to coal", 2007.

Alternative scenario 3. The project (without JI), i.e. fuel switch of heavy fuel oil with natural gas

Table B.2. Cost for the realization of the alternative 3[5]

	calendar year	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
	index year	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
ATES											
Steam production	Gcal / year	4 224 437.49									
Fuel consumption	t.c.e. / year	603 491.07									
CAPEX of gas alternative	mln rub	438.8									
Gas price	ths rub per t.c.e.	3.34	3.62	3.90	4.19	4.27	4.35	4.43	4.51	4.55	4.59
Cost for gas	mln rub			2 352.32	2 527.94	2 576.22	2 624.50	2 672.78	2 721.06	2 745.20	2 769.34
Sum of CAPEX and OPEX	mln rub	438.80	0.00	2 352.32	2 527.94	2 576.22	2 624.50	2 672.78	2 721.06	2 745.20	2 769.34
Cumulative cost	**mln rub**	**438.80**	**438.80**	**2 791.12**	**5 319.06**	**7 895.28**	**10 519.78**	**13 192.56**	**15 913.61**	**18 658.81**	**21 428.15**
STES-2											
Steam production	Gcal / year	1 994 392.28									
Fuel consumption	t.c.e. / year	284 913.18									
CAPEX of gas alternative	mln rub	346.7									
Gas price	ths rub per t.c.e.	3.34	3.62	3.90	4.19	4.27	4.35	4.43	4.51	4.55	4.59
Cost for gas	mln rub			1 110.55	1 193.46	1 216.25	1 239.05	1 261.84	1 284.63	1 296.03	1 307.43
Sum of CAPEX and OPEX	mln rub	346.70	0.00	1 110.55	1 193.46	1 216.25	1 239.05	1 261.84	1 284.63	1 296.03	1 307.43
Cumulative cost	**mln rub**	**346.70**	**346.70**	**1 457.25**	**2 650.71**	**3 866.97**	**5 106.02**	**6 367.86**	**7 652.49**	**8 948.52**	**10 255.95**
Sum for ATES and STES-2	**mln rub**	**785.50**	**785.50**	**4 248.38**	**7 969.78**	**11 762.25**	**15 625.80**	**19 560.41**	**23 566.10**	**27 607.33**	**31 684.09**

[5] [5] Busyness plan of the project on the stage of investment substantiation "The reconstruction of the Arkhangelskaya HPP with the fuel switch from heavy fuel oil to gas", 2008

Alternative scenario 1. Continuation of the existing situation, i.e. usage of heavy fuel oil

Table B.3. Cost for the realization of the alternative 1[6]

	calendar year	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
	index year	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
ATES											
Steam production	Gcal / year	3 848 885.00									
Fuel consumption	t.c.e. / year	549 840.71									
ecopayments	mln rub	63.89	87.94	67.71	73.18	73.18	73.18	73.18	73.18	73.18	73.18
HFO price	ths rub per t.c.e.	4.35	4.44	4.54	4.61	4.69	4.77	4.85	4.93	4.97	5.01
Cost for HFO	mln rub	2 391.97	2 440.90	2 494.79	2 533.28	2 577.26	2 621.25	2 665.24	2 709.22	2 731.22	2 753.21
Sum of CAPEX and OPEX	mln rub	2 455.85	2 528.84	2 562.49	2 606.45	2 650.44	2 694.43	2 738.42	2 782.40	2 804.40	2 826.39
Cumulative cost	**mln rub**	**2 455.85**	**4 984.70**	**7 547.19**	**10 153.65**	**12 804.09**	**15 498.52**	**18 236.93**	**21 019.33**	**23 823.73**	**26 650.12**
STES-2											
Steam production	Gcal / year	1 860 768.00									
Fuel consumption	t.c.e. / year	265 824.00									
ecopayments	mln rub	- *									
HFO price	ths rub per t.c.e.	63.89	87.94	67.71	73.18	73.18	73.18	73.18	73.18	73.18	73.18
Cost for HFO	mln rub	1 156.41	1 180.07	1 206.12	1 224.73	1 245.99	1 267.26	1 288.53	1 309.79	1 320.42	1 331.06
Sum of CAPEX and OPEX	mln rub	1 156.41	1 180.07	1 206.12	1 224.73	1 245.99	1 267.26	1 288.53	1 309.79	1 320.42	1 331.06
Cumulative cost	**mln rub**	**1 156.41**	**2 336.48**	**3 542.60**	**4 767.33**	**6 013.32**	**7 280.58**	**8 569.11**	**9 878.90**	**11 199.33**	**12 530.39**
Sum for ATES and STES-2	**mln rub**	**3 612.27**	**7 321.18**	**11 089.79**	**14 920.98**	**18 817.41**	**22 779.10**	**26 806.04**	**30 898.24**	**35 023.06**	**39 180.51**

** Data is not available. Ecopayments for STES-2 are neglected and that is in accordance with principle of conservativeness.*

[6] [6] Busyness plan of the project on the stage of investment substantiation "The reconstruction of the Arkhangelskaya HPP with the fuel switch from heavy fuel oil to gas", 2008

The results represented in tables B.1-3 show that, in 10 years the coal scenario becomes more attractive than other alternatives.

Table B.3. Comparative analyses of the expenditures on the implementation of the scenarios, mln rub

Year	Gas	Coal	HFO
1	785.5	5 808	3 612.27
2	785.5	5 808	7 321.179
3	4 248.375	8 324.63	11 089.79
4	7 969.776	10 941.17	14 920.98
5	11 762.25	13 608.56	18 817.41
6	15 625.8	16 326.8	22 779.1
7	19 560.41	19 095.89	26 806.04
8	23 566.1	21 915.83	30 898.24
9	27 607.33	24 765.2	35 023.06
10	**31 684.09**	**27 644.02**	**39 180.51**

The decision on the project financing was made with regard to the assessment carried out by order of the company management.

Conclusion at stage 2: Alternative scenario 2 – the replacement of heavy fuel oil with coal at the boiler units of the ATES and STES-2 is the most attractive.

According to Tool for the demonstration and assessment of additionality (version 05.2)[11], if at stage 2 it was proved that the project is not the most attractive scenario, both economically and financially, stage 2 shall be followed by stage 4 – an analysis of the common practice.

Stage 4. Common practice analysis

Here is the analysis which shows if the replacement of heavy fuel oil with natural gas was common practice in the Arkhangelsk Region in 2007. The project to convert generating facilities is unique, because in 2007 the common practice was to increase the proportion of coal in the regional fuel mix. This statement is backed up by the information below.

The Energy development strategy for the Northwest federal district[12]

According to the information on "The master plan for the allocation of energy facilities until 2020," given in July 2007, the proportion of coal in the regional fuel mix is forecasted to increase from 10% to 22%, and the proportion of gas is forecasted to decrease from 67% to 62%.

Fuel mix of the Arkhangelsk Region in 2007[13]

As of 01.01.2007 the fuel reserves in the regional municipalities were as follows: coal – 83.66 thous. tons, heavy fuel oil – 39.3 thous. tons. In 2006 all the purchase and delivery contracts for coal and diesel fuel in the Extreme North and equivalent areas with limited delivery periods, which were signed after the tenders, were duly executed.

[11] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf
[12] http://www.e-apbe.ru/scheme/fo-sov.php
[13] http://www.dvinaland.ru/economy/tek/2006.html

During the period, 62.55 thous. tons of coal and 0.673 thous. tons of diesel fuel were delivered at the expense of the local budget to the Extreme North, which corresponds to the actual limits of budget financing in 2006. Besides this, 6.51 thous. tons of coal and 12.71 thous. tons of diesel fuel were purchased at the expense of municipal budgets and power supply companies.

Development of the gas transmission network[14]
In 2007 there was little possibility of the development of the gas transmission network in the Arkhangelsk Region because the region is located away from cross-country main pipelines. The funds invested into the development of the gas transmission network were mainly used for the construction of the Russian part of the Yamal-Europe pipeline, the pipelines in the Northern and the Tyumen Region (NLTR)-Torzhok and Pochinki-Izobilnoe, and for the extension of the Urengoy gas transmission unit.

Energy price trends[15]

According to the Federal State Statistics Service, in 2007 the trends for the average producer and consumer prices for the main types of energy resources were as follows:
Gas - 14% increase from the previous year
Coal - 1% decrease from the previous year
Heavy fuel oil - 73% increase from the previous year.

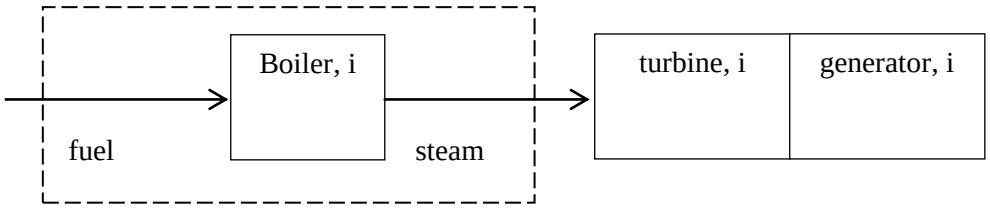
That is why replacing heavy fuel oil with coal was a more common practice.

Conclusion: In 2007 scenario 3 – switching generating facilities to natural gas – was a unique project for the region where the common practice was to increase the proportion of coal in the regional fuel mix. This is a clear evidence of *additionality* of the Project.

B.3. Description of how the definition of the project boundary is applied to the project:

Project boundary includes:
- Boilers ## 1-4 ATES
- Boilers ## 1-3 STES-2

Figure B.1.Project boundary



– – – – – – – – – – – – – – – *Project boundary*

GHG emission sources in baseline and project scenarios are listed in table B.4.

Table B.4. GHG emission sources in baseline and project scenarios

	Source	GHG	Included / excluded	Explanation
Baseline	Fuel consumption	CO_2	Yes	Main source
		CH_4	No	Negligible
		N_2O	No	Negligible

[14] http://www.gazprom.ru/production/transportation/development/
[15] http://www.gks.ru/bgd/regl/b10_17/IssWWW.exe/Stg/04-14.htm

Project	Fuel consumption	CO_2	Yes	Main source
		CH_4	No	Negligible
		N_2O	No	Negligible

B.4. Further baseline information, including the date of baseline setting and the name(s) of the person(s)/entity(ies) setting the baseline:

Date of baseline setting: 08/02/2011.
The baseline has been designed by National Carbon Sequestration Foundation – (NCSF, Moscow);
Contact persons:

Marat Latypov, Head of Project Development Department
Tel. +7 499 788 78 35 ext. 103
Fax +7 499 788 78 35 ext. 107
E-mail LatypovMF@ncsf.ru

Agrafena Bugdaeva, Ph.D. in Economics, Lead expert of Project Development Department;
Tel. +7 499 788 78 35 ext. 104
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E-mail BugdaevaAV@ncsf.ru

National Carbon Sequestration Foundation is not a participant of the Project.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

Starting date of the project is the date of the building permits – 28.01.2010

C.2. Expected operational lifetime of the project:

23 years or 276 months: 04.01.2011 – 31.12.2034

C.3. Length of the crediting period:

1 year and 11 months or 23 months 04.01.2011 - 31.12.2012

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

1. Identification and description of the monitoring approach

The monitoring plan for the project is developed in compliance with an JI specific approach based on the provisions:

- Guidelines for the implementation of article 6 of the Kyoto Protocol (Appendix B. Criteria for baseline setting and monitoring)[16]
- Guidance on criteria for baseline setting and monitoring. Version 02 (D. Guidance on monitoring).[17]

In compliance with the Guidelines for users of JI PDD form[18] in section D it is necessary to examine in detail and clearly mark the data and ratios, which are:

a) Data and parameters that are not monitored throughout the crediting period, but are determined only once (and thus remain fixed throughout the crediting period), and that are available already at the stage of determination regarding the PDD;
b) Data and parameters that are not monitored throughout the crediting period, but are determined only once (and thus remain fixed throughout the crediting period), but that are not already available at the stage of determination regarding the PDD; and
c) Data and parameters that are monitored throughout the crediting period.

2. Application of the selected approach

The project envisages the same energy flow pattern for all boiler units, so the monitoring plan will also be the same for all boiler units. The observed values will be marked as $M\text{-}1_i$ and $M\text{-}n2_i$

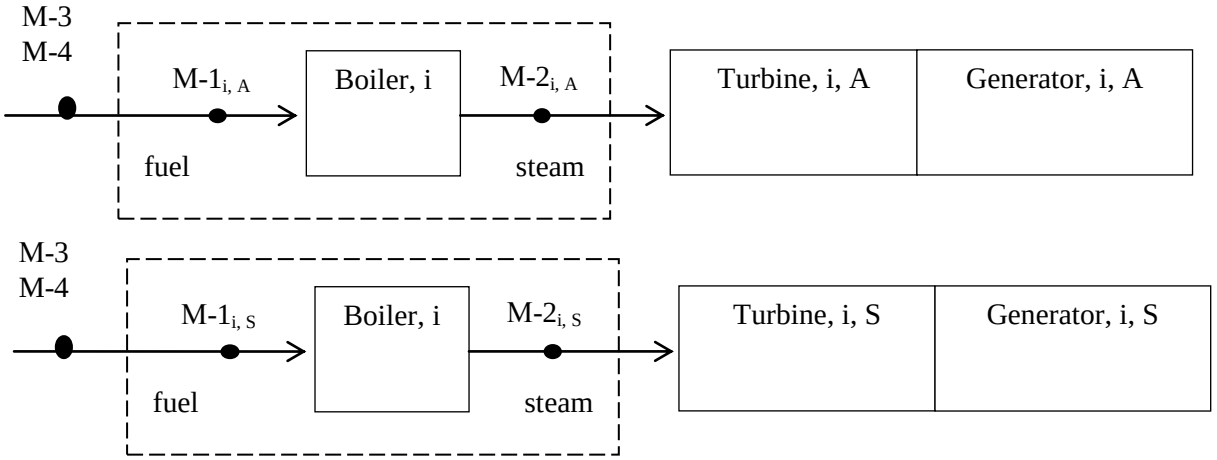
To estimate the reduction in the greenhouse gas emissions in the case of the project implementation information is required on the volume of natural gas consumed.[19] In the case of the baseline scenario implementation, the volume of steam produced is required, as well as the performance efficiency of the coal-fired boiler unit and the electric power consumption during pulverization.

This section contains information about the data collection and storage procedure necessary to estimate the greenhouse gas emissions under both the baseline and project scenarios:

[16] http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=2
[17] http://ji.unfccc.int/Sup_Committee/Meetings/index.html
[18] Guidelines for users of JI PDD form. Version 04
[19] The monitoring plan does not count for heavy fuel oil consumption because this type of fuel is a reserve one in both scenarios.

1. Data and parameters that are not monitored throughout the crediting period, but are determined only once (and thus remain fixed throughout the crediting period), and that are available already at the stage of determination regarding the PDD:
   - the rate of greenhouse gas emissions resulting from the consumption of electric power;[20]
   - the rate of greenhouse gas emissions resulting from the consumption of natural gas;[21]
2. Data and parameters that are monitored throughout the crediting period
   - consumption of natural gas by the boiler units at the ATES and STES-2;
   - steam generation by the boiler units at the ATES and STES-2.

More detailed information on the data and ratios is given in table D.1.1.1.



M-1$_{i, A}$	-	*fuel consumption by boiler unit i at the ATES*	*M-1$_{i, S}$*	-	*fuel consumption by boiler unit i at the STES-2*
M-2$_{i, A}$	-	*steam generation by boiler unit i at the ATES*	*M-2$_{i, S}$*	-	*steam generation by boiler unit i at the STES-2*
M-3	-	*density of natural gas*			
M-4	-	*NCV of natural gas*			

Figure. D.1. Monitoring points

[20] Equal to the rate of greenhouse gas emissions resulting from the consumption of coal because each HPP consumes the electric power produced at the firm.

[21] IPCC Guidelines for National Greenhouse Gas Inventories, 2006. Table 1.4. Rate of CO2 emissions from combustion

D.1.1. Option 1 – Monitoring of the emissions in the project scenario and the baseline scenario:

D.1.1.1. Data to be collected in order to monitor emissions from the project, and how these data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
Data and parameters that are monitored throughout the crediting period								
M-$1_{i, A}$	$FC_{NG, A, i, y}$ fuel consumption by i-boiler ATES	flowmeter metran 150 CD ## 1) 895741 , 898137 2) 896070 , 896058 3) 895656 , 896037 4) 895722 , 899684	m3 per hour	m	continuously	100%	Electronic and paper	Data are cumulated into the internal monthly report «Maket 15506-1»
M-$1_{i, S}$	$FC_{NG, S, i, y}$ fuel consumption by i-boiler STES-2	flowmeter metran 150 CD2 ## 1) 1N460BF01 2) 1N460BF02 3) 1N460BF03	m3 per hour	m	continuously	100%	Electronic and paper	
M-3	ρ_{NG} Density of natural gas	-	Kg per m3	e	Once per month	100%	paper	Passport of fuel
M-4	NCV_{NG} NCV of natural gas	-	Kcal per m3	e	Once per month	100%	paper	Passport of fuel
Data and parameters that are not monitored throughout the crediting period, but are determined only once (and thus remain fixed throughout the crediting period), and that are available already at the stage of determination regarding the PDD								
	$EF_{CO2, NG}$ CO2 emission factor for the natural gas	2006 IPCC Guidelines for National Greenhouse Gas Inventories	kg CO2 per TJ	e	Once During the determination			56 100 kg CO2 per TJ

D.1.1.2. Description of formulae used to estimate project emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

Project emission is the sum of fuel consumption by ATES and STES-2

Formula D.1.1.2.1 $PE_y = PE_{fuel,y} = PE_{fuel,A,y} + PE_{fuel,S,y}$

where:

PE_y - *total GHG emission in project, t CO2-eq*
$PE_{fuel,y}$ - *total GHG emission from the fuel consumption in project, t CO2-eq*
$PE_{fuel,y}$ - *total GHG emission from the fuel consumption in project, t CO2-eq*
$PE_{fuel,A,y}$ - *GHG emission from the fuel consumption in project at the ATES, t CO2-eq*
$PE_{fuel,S,y}$ - *GHG emission from the fuel consumption in project at the STES-2, t CO2-eq*

Annual value is the sum monthly values of all JI-boilers

Formula D.1.1.2.1.1 $PE_{fuel,A,y} = \sum_{i=1}^{4} \sum_{m=1}^{12} PE_{fuel,A,i,m} = \sum_{i=1}^{4} \sum_{m=1}^{12} (FC_{NG,A,i,m} * NCV_{NG} * 4.1868 * 10^{-9} * EF_{CO2,NG})$

where:

$PE_{fuel,A,i,m}$ - *GHG emission from the fuel consumption in project by i-boiler at the ATES in m-month, t CO2-eq*
i - *index number of boiler ATES, ## 1, 2, 3 and 4*
m - *index number of month, 1 - 12*
$FC_{NG,A,i,m}$ - *fuel consumption by i-boiler ATES, ## 1, 2, 3 and 4, m3 per month*
NCV_{NG} - *net calorific value of natural gas, kcal per m3*
4.1868 - *ratio J and Cal*
$EF_{CO2,NG}$ - *CO2 emission factor for the natural gas, equal to 56.1 t CO2 per TJ*
$\sum_{i=1}^{4}$ - *sum of emission of boilers*
$\sum_{m=1}^{12}$ - *sum of values of months*

Formula D.1.1.2.1.2 $PE_{fuel,S,y} = \sum_{i=1}^{3} \sum_{m=1}^{12} PE_{fuel,S,i,m} = \sum_{i=1}^{3} \sum_{m=1}^{12} (FC_{NG,S,i,m} * NCV_{NG} * 4.1868 * 10^{-9} * EF_{CO2,NG})$

where:

$PE_{fuel,A,i,m}$ - *GHG emission from the fuel consumption in project by i-boiler at the STES-2, t CO2-eq*
i - *index number of boiler STES-2, ## 1, 2 and 3*
m - *index number of month, 1 - 12*
$FC_{NG,A,i,m}$ - *fuel consumption by i-boiler STES-2, ## 1, 2 and 3, m3 per month*

NCV_{NG} - *net calorific value of natural gas, kcal per m3*
4.1868 - *ratio J and Cal*
$EF_{CO2, NG}$ - *CO2 emission factor for the natural gas, equal to 56.1 t CO2 per TJ*[7]
$\sum_{i=1}^{3}$ - *sum of value of boilers*
$\sum_{m=1}^{12}$ - *sum of values of months*

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
Data and parameters that are monitored throughout the crediting period								
$M\text{-}2_{i, A}$	*$HG_{A, i, y}$* Steam production by i-boiler at the ATES	Steam flowmeter Metran 150- CD3 pressure - Metran 150-TG5 and EKM Temperature - TP 2088Э/9-XA	Gcal	m	Once per month	100%	Electronic and paper	
$M\text{-}2_{i, S}$	*$HG_{S, i, y}$* Steam production by i-boiler at the STES-2	Steam flow - KSD-2 temperature - TXA-0179 thermoelement pressure KSU1-002 and	Gcal	m	Once per month	100%	Electronic and paper	

[7] 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Chapter 2. Stationary combustion. Table 2.2 CO2 factor for stationary combustion

		pressure pick-off MP 22517						
Data and parameters that are not monitored throughout the crediting period, but are determined only once (and thus remain fixed throughout the crediting period), and that are available already at the stage of determination regarding the PDD								
	η_A efficiency of boilers of ATES with coal	Busyness plan "The reconstruction of the ATES with the fuel switch from heavy fuel oil to coal", 2007	%	e	once		Paper	91%
	η_S efficiency of boilers of STES-2 with coal	Busyness plan "The reconstruction of STES-2 with the fuel switch from heavy fuel oil to coal", 2008	%	e	once		Paper	92.741%
	$EF_{CO2, coal}$ CO2 factor for coal	2006 IPCC Guidelines for National Greenhouse Gas Inventories	Kg CO2 per TJ	e	once		Paper	98 300 kg CO2 per TJ

D.1.1.4. Description of formulae used to estimate baseline emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

Formula D.1.1.4. $BE_y = BE_{fuel, A, y} + BE_{fuel, S, y}$

where:

BE_y *- total GHG emission in baseline, t CO2-eq*

$BE_{fuel, A, y}$ *- total GHG emission from the fuel consumption in baseline for ATES, t CO2-eq*

$BE_{fuel, S, y}$ *- total GHG emission from the fuel consumption in baseline for STES-2, t CO2-eq*

Formula D.1.1.4.1 $BE_{fuel, A, y} = \sum_{i=1}^{4} BE_{fuel, A, i, y} = \sum_{i=1}^{4} (EF_{CO2, coal} * HG_{A, i} / \eta_{coal, A})$

where:

$BE_{fuel, A, y}$ *- total GHG emission from the fuel consumption in baseline for ATES, t CO2-eq*

$BE_{fuel, A, i, y}$ *- GHG emission from the fuel consumption in baseline for i-boiler of ATES, t CO2-eq*

$HG_{A,i}$ - steam production at the ATES by i-boiler, Gcal/ year
$EF_{CO2,coal}$ - GHG emission factor for coal, equal 98.3 t CO2 per TJ or 0.4113 t CO2 per Gcal
$\eta_{coal,A}$ - efficiency of the ATES with coal, 91%
i - boilers of ATES 1-4

Formula D.1.1.4.2. $BE_{fuel,S,y} = \sum_{i=1}^{3} BE_{fuel,S,i,y} = \sum_{i=1}^{3} (EF * HG_{S,i,y} / \eta_{coal,S})$

where:
$BE_{fuel,S,y}$ - total GHG emission from the fuel consumption in baseline for STES-2, t CO2-eq
$BE_{fuel,S,i,y}$ - GHG emission from the fuel consumption in baseline at the STES-2 by i-boiler, t CO2-eq
$HG_{S,i,y}$ - steam production at the STES-2 by i-boiler, Gcal/ year
$EF_{CO2,coal}$ - GHG emission factor for coal, equal 98.3 t CO2 per TJ or 0.4113 t CO2 per Gcal
$\eta_{coal,S}$ - efficiency of the STES-2 with coal, 92%
i - boilers of STES-2 ## 1-3

D. 1.2. Option 2 – Direct monitoring of emission reductions from the project (values should be consistent with those in section E.):

Not applicable.

D.1.2.1. Data to be collected in order to monitor emission reductions from the project, and how these data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

Not applicable.

D.1.2.2. Description of formulae used to calculate emission reductions from the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

Not applicable.

D.1.3. Treatment of leakage in the monitoring plan:

Leakage are not considered in accordance with principle of conservativeness. Possible leakages are technological loss during the transportation of fuel. Loss is bigger in baseline than in the project scenario:

- 4,75 g CO2 / t.c.e. for coal[8]
- 0,016 g CO2 / mln t.c.e. for natural gas[9]

D.1.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.1.3.2. Description of formulae used to estimate leakage (for each gas, source etc.; emissions in units of CO_2 equivalent):

D.1.4. Description of formulae used to estimate emission reductions for the project (for each gas, source etc.; emissions/emission reduction in units of CO_2 equivalent):

Formula D.1.4. 1 $ER_y = BE_y - PE_y$

where

ER_y *GHG emission reduction in project per year, t CO2 / year;*

BE_y *GHG emission in baseline per year, t CO2 / year;*

PE_y *GHG emission in project per year, t CO2 / year;*

D.1.5. Where applicable, in accordance with procedures as required by the host Party, information on the collection and archiving of information on the environmental impacts of the project:

According to the environmental law firms must monitor pollutant emissions and sewage discharge, organize and maintain industrial and consumer waste management, submit the required reports to authorized state agencies (Federal Service for Ecological, Technological and Nuclear Supervision). At TGC-2, JSC

[8] 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Section "Emission after the recovery", p. 4,14

[9] 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Table 4.2.5 "Tier 1 emission factors for fugitive emissions (including venting and flaring) from oil and gas operations in developing countries and countries with economies in transition", p. 4.55

Headquarters for the Arkhangelsk Region, environmental activities are arranged by an environmental group headed by the Supervisor of the Industrial Engineering Department at the TGC-2, JSC Headquarters for the Arkhangelsk Region. The environmental protection measures are developed and implemented on an annual basis, including environmental monitoring of the production and economic activities of the firm. Within the prescribed time limits, the TGC-2, JSC

Headquarters for the Arkhangelsk Region prepares and submits to the authorized state agencies official statistical reports and forms including:

- 2-TP (air) - information on atmospheric air protection including data on pollutants entrapped and detoxified, detailed information on specific pollutant emissions, quantity of emission sources, measures taken on emissions reduction and emissions from certain groups of pollutant sources;

- 2-TP (waterworks) – information on water use, including water consumption from natural sources, sewage water discharge and the content of pollutants in water, water capacity etc. of treatment facilities;

- 2-TP (wastes) - information on the generation, usage, processing, transportation and disposal of production and consumption wastes, including the annual

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
$M\text{-}1_{i, A}$ (table D1.1.1)	low	Recalibration interval – 4 year. Error – 0,25%. Recent calibration - 24 .04.2010. Calibrated in accordance with methodological rule “MI 4212-012-2006”
$M\text{-}1_{i, S}$ (table D1.1.1)	low	Recalibration interval – 4 year. Error – 0,25%. Recent calibration - 24 .04.2010. Calibrated in accordance with methodological rule “MI 4212-012-2006”
$M\text{-}2_{i, A}$ (table D1.1.3.)	low	Recalibration interval– 24 months. Error – 0,25%.. Recent calibration – 01.12 2009. Calibrated in accordance with methodological rule “MI 4212-012-2006”
$M\text{-}2_{i, S}$ (table D1.1.3.)	low	Recalibration interval– 24 months. Error – 0,25%. Recent calibration – 01.12 2009. Calibrated in accordance with methodological rule “MI 4212-012-2006”

The quality of the parameters stated above and compliance with the monitoring procedures are ensured by meeting the requirements of Federal Law No.102-FZ dated 26.06.2008 “On Ensuring the Uniformity of Measurements”.

D.3. Please describe the operational and management structure that the project operator will apply in implementing the monitoring plan:

The operational structure of the Project comprises the system of data collection, transfer and storage existing at the enterprise. All data necessary for determination will be stored for two years after the last ERU transmission under the project.

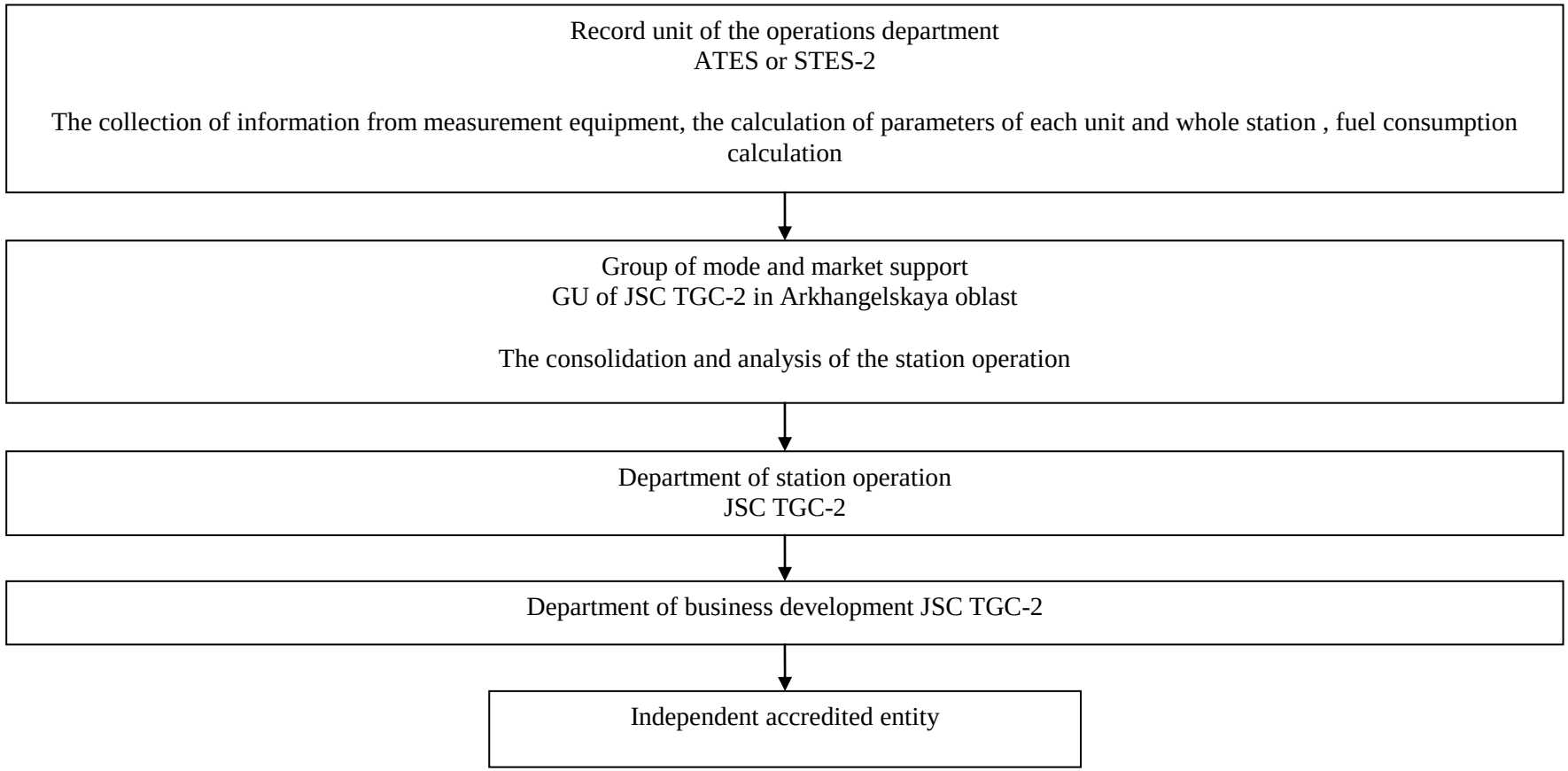
Internal regulating documents and rules:

1. Statute of exploration department of ATES of GU of JSC TGC-2 in Arkhangelskaya oblast
2. Statute of the group of mode and market support of GU of JSC TGC-2 in Arkhangelskaya oblast
3. Order of JSC TGC-2 No.4 dated January 21, 2011 “About the organization of report in accordance with theh statute of indicative system
4. Order of JSC TGC-2 No.37 dated March 01, 2011 “About the approval of the regulation of information interaction of departments on forecasting and accounting of natural gas”.

The Operations Department of the TGC-2, JSC Headquarters for the Arkhangelsk Region is liable for the preparation of reports on fuel consumption and steam generation. This information will be forwarded to Administration.

When implementing the monitoring plan verification reports will be prepared in accordance with the scheme given in figure D.3.

Figure D.3. Operation-Administrative Scheme of the Project



D.4. Name of person(s)/entity(ies) establishing the monitoring plan:

The monitoring plan has been designed by National Carbon Sequestration Foundation – (NCSF, Moscow);

Contact persons:
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Head of Project Development Department
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National Carbon Sequestration Foundation is not a participant of the Project.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

GHG emission in project is calculated based on the fuel consumption.

GHG emission from the fuel consumption

Table E 2. Steam production

	Acronym	Unit	2011	2012
ATES boiler TGM-84B, #1	HG ATES 1	Gcal per year	1 072 352.47	1 072 352.47
ATES boiler TGM-84B, #2	HG ATES 2	Gcal per year	985 761.90	985 761.90
ATES boiler TGM-84B, #3	HG ATES 3	Gcal per year	1 197 238.87	1 197 238.87
ATES boiler TGM-84B, #4	HG ATES 4	Gcal per year	969 084.26	969 084.26
ATES boilers 1-4	**HG y**	**Gcal per year**	**4 224 437.49**	**4 224 437.49**
STES-2 boiler TGME-464, #1	HG STES 1	Gcal per year	581 304.39	581 304.39
STES-2 boiler TGME-464, #2	HG STES 2	Gcal per year	454 846.02	454 846.02
STES-2 boiler TGME-464, #3	HG STES 3	Gcal per year	958 241.87	958 241.87
STES-2 boilers 1-3	**HG y**	**Gcal per year**	**1 994 392.28**	**1 994 392.28**

Table E.3. GHG emission, t CO2-eq

	2011	2012
ATES boiler TGM-84B, #1	267 534.30	251 711.19
ATES boiler TGM-84B, #2	245 931.38	231 385.95
ATES boiler TGM-84B, #3	298 691.40	281 025.53
ATES boiler TGM-84B, #4	241 770.58	227 471.24
ATES boilers 1-4	**1 053 927.67**	**991 593.91**
STES-2 boiler TGME-464, #1	189 004.90	136 448.44
STES-2 boiler TGME-464, #2	161 596.05	106 765.11
STES-2 boiler TGME-464, #3	354 880.02	224 926.23
STES-2 boilers 1-3	**705 480.97**	**468 139.78**

Table E.3. GHG emission in project

Year	Expected GHG emission in project, t of CO2 eq.
2011	1 759 408.64
2012	1 459 733.68
2011-2012	**3 219 142.32**

E.2. Estimated leakage:

Table E.4. GHG emission from leakage

Year	Expected GHG emission as leakage, t of CO2 eq.
2011	-
2012	-
2011-2012	**-**

E.3. The sum of E.1. and E.2.:

Table E.5. Total GHG emission from leakages and project

Year	Expected GHG emission in project, t of CO2 eq.	Expected GHG emission as leakage, t of CO2 eq.	Expected GHG emission in project, t of CO2 eq.
2011	1 759 408.64	-	1 759 408.64
2012	1 459 733.68	-	1 459 733.68
2011-2012	**3 219 142.32**	**-**	**3 219 142.32**

E.4. Estimated baseline emissions:

GHG emission in baseline are calculated based on the consumption of coal

Table E 2. Steam production

	Acronym	Unit	2011	2012
ATES boiler TGM-84B, #1	HG ATES 1	Gcal per year	1 073 648.72	1 073 648.72
ATES boiler TGM-84B, #2	HG ATES 2	Gcal per year	986 953.48	986 953.48
ATES boiler TGM-84B, #3	HG ATES 3	Gcal per year	1 198 686.08	1 198 686.08
ATES boiler TGM-84B, #4	HG ATES 4	Gcal per year	970 255.68	970 255.68
ATES boilers 1-4	**HG y**	**Gcal per year**	**4 229 543.96**	**4 229 543.96**
STES-2 boiler TGME-464, #1	HG STES 1	Gcal per year	587 316.04	587 316.04
STES-2 boiler TGME-464, #2	HG STES 2	Gcal per year	459 549.88	459 549.88
STES-2 boiler TGME-464, #3	HG STES 3	Gcal per year	968 151.68	968 151.68
STES-2 boilers 1-3	**HG y**	**Gcal per year**	**2 015 017.60**	**2 015 017.60**

Table E.3. GHG emission, t CO2-eq

	2011	2012
ATES boiler TGM-84B, #1	441 588.57	441 588.57
ATES boiler TGM-84B, #2	405 931.08	405 931.08
ATES boiler TGM-84B, #3	493 016.07	493 016.07

ATES boiler TGM-84B, #4	399 063.32	399 063.32
ATES boilers 1-4	**1 739 599.04**	**1 739 599.04**
STES-2 boiler TGME-464, #1	241 561.37	241 561.37
STES-2 boiler TGME-464, #2	189 011.52	189 011.52
STES-2 boiler TGME-464, #3	398 197.95	398 197.95
STES-2 boilers 1-3	**828 770.84**	**828 770.84**

Table E.8. GHG emission in baseline

Year	Expected GHG emission in baseline, t CO2 eq.
2011	2 568 369.88
2012	2 568 369.88
2011-2012	**5 136 739.75**

E.5. Difference between E.4. and E.3. representing the emission reductions of the project:

Formula E.5. ER = BE - PE

where
ER – GHG emission reduction in project per year, t CO2/year;
BE – GHG emission in baseline per year, t CO2/year;
PE – GHG emission in project per year, t CO2/year;

E.6. Table providing values obtained when applying formulae above:

Year	Estimated project emissions (tonnes of CO2 equivalent)	Estimated leakage (tonnes of CO2 equivalent)	Estimated baseline emissions (tonnes of CO2 equivalent)	Estimated emission reductions (tonnes of CO2 equivalent)
2011	1 759 408.64	-	2 568 369.88	808 961.24
2012	1 459 733.68	-	2 568 369.88	1 108 636.19
Total (tonnes of CO2 equivalent)	**3 219 142.32**	**-**	**5 136 739.75**	**1 917 597.43**

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts of the project, including transboundary impacts, in accordance with procedures as determined by the host Party:

Environmental impact assessment reports, which describe the results of the analysis of the impact on natural, social (including peoples' daily living) and anthropogenic environment and which validate the projected activity are the mandatory part of PDD.

The environmental impact analysis showed that the project implementation does not lead to pollutant emission concentrations exceeding sanitary and hygienic standards, thus the emissions can be considered as permissible. The actual level of sound power of the constant noise in the HPP operating area is 85 dBA within 1 meter from the machinery (according to the information from the CCGT units producer), outside the sanitary protection area it will not exceed the permissible limits of 45 dBA. The projected methods of waste collection, temporary storage, disposal and transfer comply with the requirements of the environmental regulations.

STES-2 – An analysis of the estimates of the concentration of pollutants in the surface layer of the atmosphere shows that under the conditions counted for the maximum allowable concentrations of all pollutants on the border of the sanitary protection area do not exceed the standard limits.

ATES – The environmental efficiency in the case of converting several boiler units to natural gas combustion increases due to the fact that the emissions resulted from natural gas combustion contain only nitrogen and carbon oxides.

Specific discharge of pollutants (t/1 thous. toe)

Pollutant	Using heavy fuel oil	Using natural gas	Specific discharge decrease when using natural gas	Specific discharge increase when using natural gas
Sulfur dioxide	37.3	0.0	37.3	0.0
Nitrogen oxide	0.9	0.4	0.5	0.0
Nitrogen dioxide	5.6	2.3	3.3	0.0
Carbon oxide	0.5	1.2	0.0	0.7
Oil ash	0.12	0.0	0.12	0.0

The analysis of the negative environmental impact of pollutant emissions and noise showed that the boundaries of the sanitary protection zone determined in accordance with SanPiN 2.2.1./2.1.1.1200-03 are sufficient.

The documentation, which was subjected to Glavgosexpertiza:

1. Technical report of engineering survey. JSC "Arkhangelsk TISIz", 2009 – for ATES
2. Design document with enclosure. 5-2010 RUS – for ATES
3. 1048.01 – design document for STES-2

Other documentation of projects

1. Business plan "Reconstruction of ATES with fuel switch from HFO to natural gas"
2. Business plan "Reconstruction of STES-2 with fuel switch from HFO to natural gas"

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to supporting documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

The projects received positive conclusions from the "Glavgosekspertiza" Federal State Institution:

1. ATES – No.554-10/GGE-6566/02 dated 25.06.2010
2. STES-2 – No.013-11/GGE-7114/02 dated 14.01.2011

Rostekhnadzor permits for air emissions are granted:

1. The ATES – No.10-10/01-90 dated 07.02.2011
2. The STES-2 – No. 04-26 AB 101025 dated 13.06.2007

SECTION G. Stakeholders' comments

G.1. Information on stakeholders' comments on the project, as appropriate:

Information about the Project was published in the company press release dated October 28, 2010. No comments have been received.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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Salutation:	Ms.
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Annex 2

BASELINE INFORMATION

Information on the baseline scenario

The baseline scenario involved the replacement of heavy fuel oil with the Kuznetsky coal. Heavy fuel oil would remain a reserve fuel. The BU-1 Investments Commission[24] decided to include the project to replace heavy fuel oil with coal into the five-year program for BU-1 for 2006-2001 and 2007-2011[25].

"On the basis of the energy price trends and steam balance estimation, and taking into account the remaining lifetime of the capital equipment of the Arkhangelsk HPP, the decision was made to modernize the existing boiler units and convert them to coal fuel combustion. This will enable the costs of electric and thermal power generation to be reduced and will stabilize the financial position of the company without installing new equipment. In addition, the cost price of the electric power will be competitive." [26]

Replacing heavy fuel oil with solid fuel at the Arkhangelsk HPP and Severodvinsk HPP will significantly improve the environmental situation in the region:

- The reduction of sulfur dioxide emissions by 21,377 t/year and nitrogen dioxide emissions by 1,048 t/year will enable the company to comply with the maximum permissible emission standards and reduce the environmental pressure on the territory and population of the city of Arkhangelsk to the maximum allowable concentrations at the boundary of the sanitary protection area with the Arkhangelsk combined heat-and-power plant operating at its full capacity.

- The replacement of heavy fuel oil with solid fuel at the Severodvinsk combined heat-and-power plant #2 will improve the environmental situation in the town of Severodvinsk due to the reduction of sulfur dioxide emissions of 11.679 t/year.

According to the project specification, the capacity and operational mode of the ATES and STES-2 shall not be altered. The emissions under the baseline scenario are estimated on the grounds of the average steam generation value over the last three years. Greenhouse gas emissions under the baseline scenario are defined as the sum of the emissions resulting from the combustion of fuel and the emissions resulting from the energy consumption during the fuel preparation process.

[24] BU-1 stands for the structural unit "Business Unit-1" actual in the period of RAO UES reforming
[25] Minutes of the meeting of the BU-1 Investments Commission dated 12.04.2007
[26] Busyness plans of fuel switch of ATES and STES-2 from the heavy fuel oil to coal

Key factors for the baseline scenario:

Data/Parameter	$HG_{A,i,y}$
Data unit	Gcal
Description	Steam production by i-boiler of ATES
Time of determination/monitoring	continuously
Source of data (to be) used	Metering complex: flow steam - metran 150- CD3, pressure - metran 150-TG5 and EKM, temperature - TP 2088E/9-XA
Value of data applied (for ex ante calculations/determinations)	boiler 1 977 020.33 boiler 2 898 127.67 boiler 3 1 090 804.33 boiler 4 882 932.67
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is needed for the calculation of the fuel consumption
QA/QC procedures (to be) applied	Recalibration interval– 24 months. Error – 0.25%. Recent calibration – 01.12.2009. Calibrated in accordance with methodological rule "MI 4212-012-2006"
Any comment	Data is measured continuously and formed into monthly and annual production reports.

Data/Parameter	$HG_{S,i,y}$
Data unit	Gcal
Description	Steam production by i-boiler of STES-2
Time of determination/monitoring	continuously
Source of data (to be) used	Metering complex: flow steam – KSD-2, pressure – KSU1-002 and MP 22517, temperature – TXA0179
Value of data applied (for ex ante calculations/determinations)	boiler 1 542 357.00 boiler 2 424 371.33 boiler 3 894 039.67
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is needed for the calculation of the fuel consumption in baseline
QA/QC procedures (to be) applied	Recalibration interval– 24 months. Error – 0.25%. Recent calibration – 01.12.2009. Calibrated in accordance with methodological rule "MI 4212-012-2006"
Any comment	Data is measured continuously and formed into monthly and annual production reports.

Data/Parameter	$\eta_{A, coal}$
Data unit	%
Description	Efficiency of ATES boiler on coal
Time of determination/monitoring	Once, during the determination
Source of data (to be) used	business plan "The reconstruction of the ATES with fuel switching from heavy fuel oil to coal"
Value of data applied (for ex ante calculations/determinations)	91%
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is needed for the calculation of the coal consumption on the ATES
QA/QC procedures (to be) applied	-
Any comment	-

Data/Parameter	$\eta_{S, coal}$
Data unit	%
Description	Efficiency of STES-2 boiler on coal
Time of determination/monitoring	Once, during the determination
Source of data (to be) used	business plan "The reconstruction of the STES-2 with fuel switching from heavy fuel oil to coal"
Value of data applied (for ex ante calculations/determinations)	92%
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is needed for the calculation of the coal consumption on the STES-2
QA/QC procedures (to be) applied	-
Any comment	-

Data/Parameter	$EF_{CO2, coal}$
Data unit	kg CO2 per TJ
Description	CO2 factor for coal
Time of determination/monitoring	Once, during the determination
Source of data (to be) used	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value of data applied (for ex ante calculations/determinations)	98 300 kg CO2 per TJ 0.4113 t CO2 per Gcal
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is needed for the calculation of the GHG emission from the coal consumption
QA/QC procedures (to be) applied	-
Any comment	-

Annex 3

MONITORING PLAN

Detailed description of the monitoring plan is presented in section D of the PDD. Required data should be provided in following format:

Form for data required for monitoring report

ID	Acronym	Variable	Unit	Value	Comment
M-$1_{i, A}$	$FC_{NG, A, i, y}$	fuel consumption by i-boiler ATES	t/year		
M-$1_{i, S}$	$FC_{NG, S, i, y}$	fuel consumption by i-boiler STES-2	t/year		
M-$2_{i, A}$	$HG_{A, i, y}$	steam production by i-boiler of ATES	Gcal per year		
M-$2_{i, S}$	$HG_{S, i, y}$	steam production by i-boiler of STES-2	Gcal per year		
M-3	ρ_{NG}	density of natural gas	Kg per m3		
M-4	NCV_{NG}	NCV of natural gas	Kcal per m3		

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