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

CONTENTS

SECTION A. General description of the project

A.1. Title of the project:

Implementation of steam-gas turbine units at the CHP of JSC "Mosenergo",Russia

Sectoral scope: 1 - Energy industries (renewable/non-renewable sources)
Version No.: 03, Date: April 20, 2012

A.2. Description of the project:

The project objectives:

- Increase in the production of energy.
- Increase in the level of technological and environmental safety and reliability of the equipment.
- Increase in the level of energy safety, reliability and quality of the heat and electric supply.
- Reduction of electricity costs (prime costs).
- Reduction of greenhouse gas emissions.

The project tasks:
To increase the generating capacities of OJSC "Mosenergo" through a modern gas turbine units: a SGTU-420 at CHP-26, with two SGTU -450 units at CHP-27 and a SGTU -450 at CHP-21. To make the best use of the existing infrastructure at the CHP, buildings, structures, equipment and utility lines of OJSC "Mosenergo".

The baseline scenario

The baseline scenario is based on the assumption that if the project is not implemented (i.e. additional electricity will not be supplied to the grid) third parties will cover the energy demand. The energy companies within the same regional energy system (UPS "Center") can increase electricity generation at the existing capacities by delaying decommissioning of outdated capacity and/or installing new energy units. Additional heat generation will be covered by existing facilities and new facilities at CHPs and new gas boiler houses.

The project

The project scenario involves the installation of additional generating facilities: a SGTU-420 at CHP-26, two SGTU-450 units at CHP-27 and a SGTU-450 at CHP-21.

As a result of the project, electricity will be generated at the new power-generating units constructed at OJSC "Mosenergo" using more efficient technology, which will replace the electricity generated at the UPS Center where less efficient technologies are used, as well as heat energy which will replace the heat energy from heating stations which are less efficient in comparison with the project.

Table A.2.1 The specific fuel consumption for the electric supply at the SGTUs of OJSC "Mosenergo", grammes of equivalent fuel/ KWh

Year	SGTU-450 at CHP-21	SGTU-420 at CHP-26	SGTU-450 unit №3 at CHP-27	SGTU-450 unit №4 at CHP-27
2008	225,6		234,5	145,8
2009	233,8		220,0	230,6

2010	246,3		224,8	221,7
2011	242,2	181,6	211,3	217,7

Table A.2.2 The specific fuel consumption for the heat supply at the SGTUs of OJSC "Mosenergo", grammes of equivalent fuel/ Gcal

Year	SGTU-450 at CHP-21	SGTU -420 at CHP-26	SGTU -450 unit №3 at CHP-27	SGTU -450 unit №4 at CHP-27
2008	138,3		134,0	125,4
2009	133,8		135,9	135,1
2010	141,6		135,6	135,2
2011	141,3	124,6	151,1	151,5

The project implementation results in a fuel saving at the power stations of the UPS Center that leads to a corresponding reduction in greenhouse gases and pollutant emissions due to the reduced fuel combustion at CHP and SDPS, as well a fuel saving for heat supply at the regional gas boiler houses of Moscow and the Moscow region, which has less fuel combustion efficiency in comparison with the project.

Project history

At the beginning of 2005 OJSC "Mosenergo" has made first consideration of possibility for SGTUs installations at CHP 21, CHP 26 and CHP 27. Economic estimations showed that the project is economic unattractive and consideration of project realization in the frame of Kyoto protocol was made.

Decision about implementation of 4 SGTUs on 3 CHPs of OJSC "Mosenergo" with use of JI mechanism was made on February,17 2005.

Before the project realization CHP 21, CHP 26 and CHP 27 operated on prevalent steam-power equipment. Installed heat and electric power capacity of CHP 21, CHP 26 and CHP 27 are presented in table A.2.3

Table A.2.3 Installed capacity of CHP 21, CHP 26 and CHP 27 before the project realization

	CHP 21	CHP 26	CHP 27
Electric power capacity (MW)	1340	1410	160
Heat power capacity (Gcal/hour)	4618	4006	1265

Table A.2.4 Commissioning of the equipment

	SGTU -450 at CHP-21	SGTU -420 at CHP-26	Two-unit SGTU -450 at CHP-27
Entry date of facilities	30 May of 2008	1 July of 2011	27 of November of 2007 – Unit №3 19 of December of 2008 – Unit №4

So, the project implementation will result in a reduction of greenhouse gas emissions of 8 731 589 tons of CO_2 in 2008-2012.

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)	OJSC «Mosenegro»	No
Party B – no	-	-

OJSC "Mosenergo" is the largest generating company in Russia operating on fossil fuel. "Mosenergo" consists of 18 stations with an installed electric capacity of 11,000 MW and an installed heating capacity of 34,000 Gcal/ h. OJSC "Mosenergo" is the largest producer of heat energy in the world.
The date of its foundation is considered to be 1887 (the birth of the electric system in the Moscow region), as the practical work on the electrification of Moscow had begun.

A.4. Technical description of the project:

A.4.1. Location of the project:

A.4.1.1. Host Party(ies):

The Russian Federation

Figure A.1. Russia on the world map

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

The Moscow region

Figure A.2. Moscow region on the map of Russian Federation

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

City of Moscow

Figure A.3. Moscow on the map of the Moscow region

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

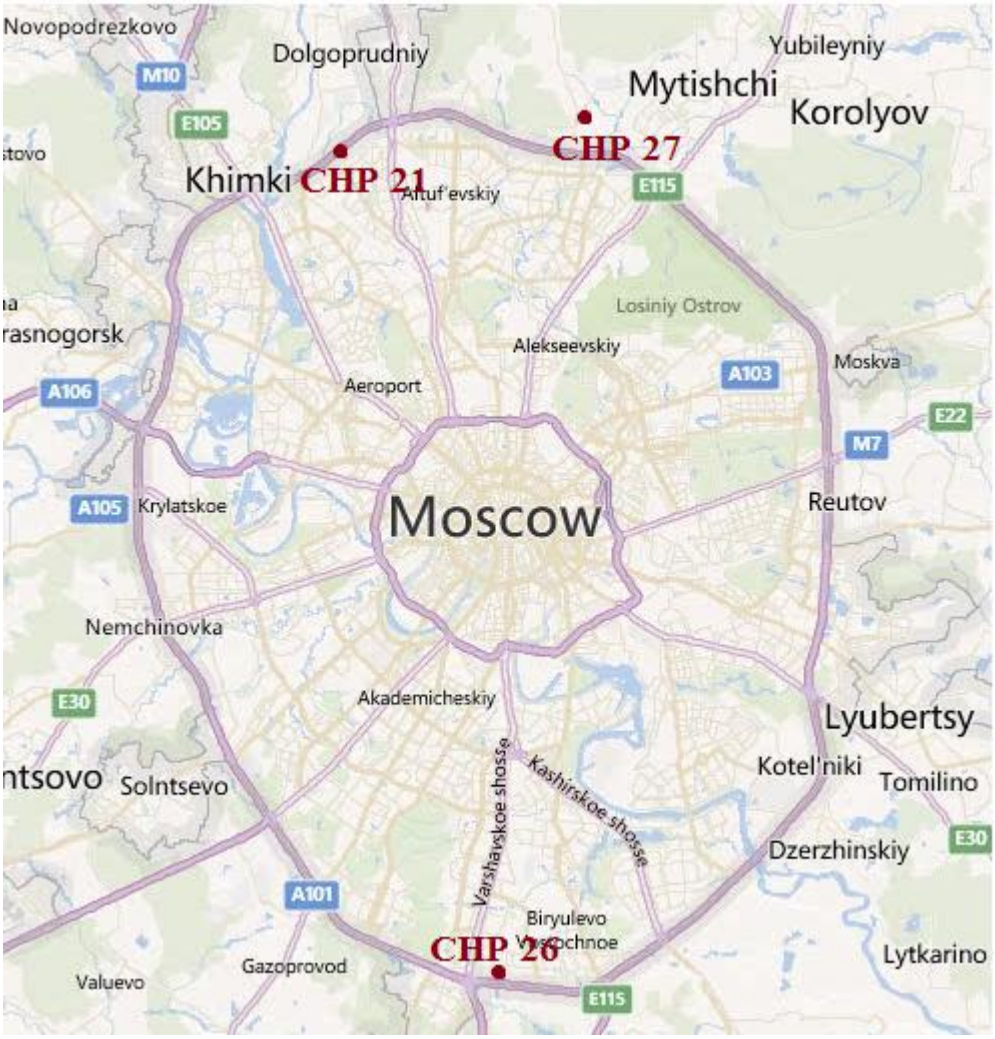
The project shall be implemented within the city of Moscow and the Moscow region:

CHP-21 is located in the Northern autonomous area of the city of Moscow (Dmitrovski district, industrial zone Korovino), coordinates 55°53′40.83″ N 37°30′38.59″ E

CHP-26 is located in the Southern autonomous area of the city of Moscow, (Biryulyovo Zapadnoe district), coordinates 55°34′39″ N 37°37′48″ E

CHP-27 is located in the village Chelobit'evo of Mytishchinsky district of Moscow region, coordinates 55°54′58.5″ N 37°41′16.33″ E

Figure A.4.1.4 Project location



CHP-21, CHP-26 and CHP-27 form part of the territorial generating company "Mosenergo" under control of OJSC "Gasprom".

At the present day the installed capacities of CHP-21, CHP-26 and CHP-27 are:

	CHP-21	CHP-26	CHP-27
Electric power, MW	1800	1830	1060
Heat power, Gcal/h	4958	4006	1876

CHP-21 - is the largest producer of heat energy in Europe. The power station provides heat to nearly one-fifth of the population of Moscow - more than 3 million people. Natural gas is the main fuel. The reserve one is fuel oil.

CHP-26 – is one of the largest combined heat and power stations in Moscow. The main fuel is natural gas; the reserve one is fuel oil. The power station provides central heating to industrial plants, public and residential buildings with a population of more than 2 million people in the Chertanovo, Yasenevo, Kolomenskoye, Biryulyovo, and Maryino districts.

CHP-26 accounts for more than 14.5 % of the electricity generated by Mosenergo and 1% of the electricity generated by all the utility companies of Russia.

CHP-27 is recognized as the most environmentally friendly not only in Russia but also in Europe. Natural gas is used as the main and reserve fuel which eliminates the emissions of soot, sulfur oxides and hydrocarbons into the atmosphere.

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

During the implementation of the investment project, power plants will be constructed with a rated electrical capacity of 450 MW according to the cycle of SGTU -CHP at CHP-21 and CHP-27, and 420MW at CHP-26 of OJSC "Mosenergo".

The main purpose of the SGTU unit is to provide the housing and communal sector of Moscow and the Moscow region with electric and heat energy and to supply electricity to the Moscow network and the regional generation center.

The composition of the main equipment of the SGTU -450 unit at CHP-21:

- two CTD -160 gas turbine plants produced by OJSC "Silovye mashiny" ("LMZ") with air-cooled electric generators T3FG-1602MUZ, produced by OJSC "Silovye mashiny" ("Elekrosila"). The case is heat-insulated with general heat and acoustic insulation,

- two Pr-224/51-7.70/0.58-509/206 (P-107) vertical waste heat recovery boilers (compressor stations) produced by OJSC "IK "ZIOMAR". The compressor station – drum-type, double-circuit, with forced circulation,

- one T-125/150-7.4 steam turbine, produced by OJSC "Silovye mashiny" ("LMZ") with an air-cooled T3FAU-160-2U3 electric generator, produced by OJSC "Silovye mashiny" ("Elekrosila"),

- two-stage regional heating plant consisting of PSG No.1 of PSG -4000-0 .35-1.6-1, PSG No.2 of PSG -4000-0.35-1, 6-2, and an OG-300 -1.6-1.6-1 boiler condensate cooler,

- steam bypasses – a fast-response pressure-reducing and desuperheating high pressure station and low pressure switching equipment,

- auxiliary equipment (pumps, ejectors, expanders, etc.).

The composition of the main equipment of the SGTU -420 unit at CHP-26:

- a GT-26 gas turbine (ALSTOM, Switzerland) with a synchronized generator (ALSTOM, Switzerland);

- a waste heat recovery boiler, three flow, for operation in the unit with GT-26 (ALSTOM, Switzerland);
- a steam turbine (ALSTOM, Switzerland).

The composition of one SGTU -450 unit at CHP-27:

- two GTE-160 turbogroups, OJSC "Silovye mashiny", "LMZ" branch;
- one T-125/150-7.4 steam turbine, OJSC "Silovye mashiny", "LMZ" branch;
- two generators with air cooling, OJSC "Silovye mashiny", "LMZ" branch:

TZFG-160-2MUZ
TNo.FA-160-2UZ

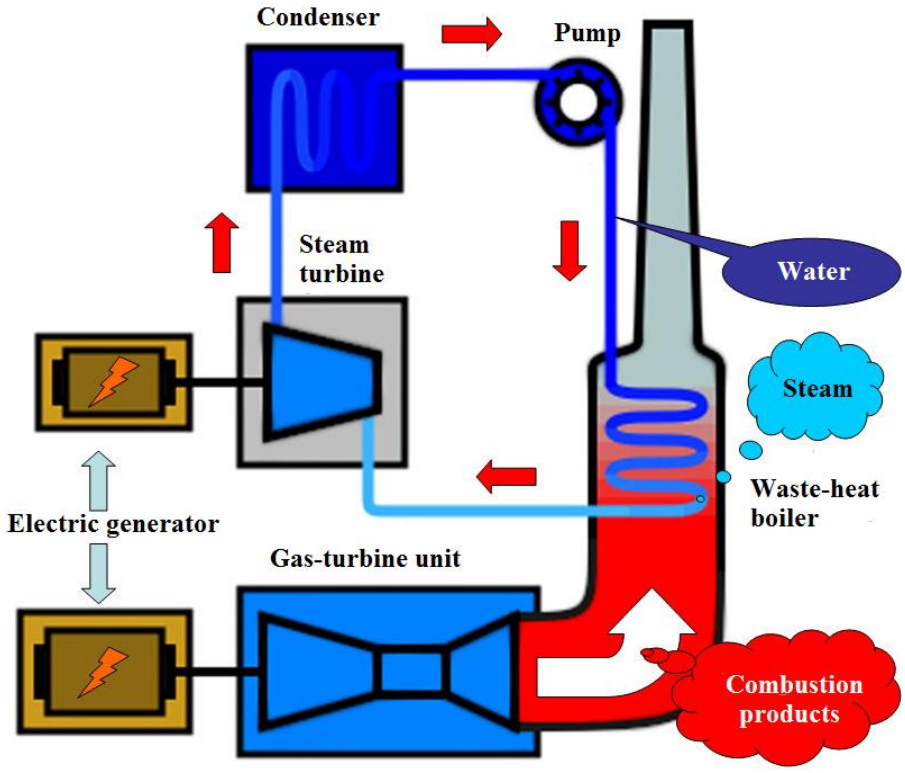
- two Pr-224/51-7.70/0.58-509/206(P-107) vertical waste heat recovery boilers, OJSC "IK "ZIOMAR", Podolsk.

As a result of the project implementation the heat capacity of OJSC "Mosenergo" will increase by 1136.7 Gcal/ h, and the electric capacity - by 1774.9 MW.

Natural gas is the main fuel for the SGTU.

Power units based on the SGTU are designed for operating in the base mode; during the heating period electricity is produced to meet demand.

Figure A.4.2 Functional diagram of the SGTU



Schedule of the project implementation

Event	CHP-21	CHP -26	CHP -27

			Unit №3	Unit №4
Decision about project realization	Begin of 2005			
Pre-project (Approved of technical specification);	27 November of 2005	03 August of 2005	09 September of 2005	09 September of 2005
Approved of design estimates, start of construction	March of 2006	December of 2006	December of 2005	December of 2005
Ending supply of equipment, CAW, start-up work, signing the CS-14 form.	30 May of 2008	1 July of 2011	27 November of 2007	19 December of 2008

The main technical-economic performance indicators of the SGTUs are presented in tables A-4-1, A-4-2, A-4-3:

Table A-4-1. Technical-economic performance indicators of the SGTU-450 unit at CHP-21

Electric power capacity

Maximal electric power capacity	MW	447.5
Electricity output	mln. kWh/year	3173.9
Specific fuel consumption	g.f.e/kWh	192.9
Fuel consumption	ths. t.f.e/year	612.2

Heat power capacity

Maximal heat power capacity	Gcal/h	308,0
Heat power output	ths.Gcal/year	1579.7
Specific fuel consumption	kg.f.e/Gcal	150.0
Fuel consumption	ths. t.f.e/year	236.9

Table A-4-2 Technical-economic performance indicators of the SGTU-420 unit at CHP-26

Electric power capacity

Maximal electric power capacity	MW	427.5
Electricity output	mln. kWh/year	3068.7
Specific fuel consumption	g.f.e/kWh	183,5
Fuel consumption	ths. t.f.e/year	563,1

Heat power capacity

Maximal heat power capacity	Gcal/h	227.9
Heat power output	ths.Gcal/year	1146.6
Specific fuel consumption	kg.f.e/Gcal	150.3
Fuel consumption	ths. t.f.e/year	172.3

Table A-4-3 Technical-economic performance indicators of two SGTU-450 units at CHP-27

Electric power capacity

Maximal electric power capacity	MW	900
Electricity output	mln. kWh/year	5744.2
Specific fuel consumption	g.f.e/kWh	216.2
Fuel consumption	ths. t.f.e/year	1241.9

Heat power capacity

Maximal heat power capacity	Gcal/h	600.8
Heat power output	ths.gcal/year	4105.3
Specific fuel consumption	kg.f.e/Gcal	133.8
Fuel consumption	ths. t.f.e/year	549.3

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 implementation will result in the generation of additional electricity and heat energy at the CHP of OJSC "Mosenergo" by installing SGTU units. Four new SGTUs will annually supply on average 11,987 million kWh with the specific fuel consumption to supply electricity equal to on average 202.2 grammes of equivalent fuel/ KWh, which corresponds to greenhouse gas emissions of 0.332 tons CO_2/MWh. The electricity produced by the SGTUs will replace the electricity which in the absence of the project would have been produced at the existing and new facilities of power stations of the UPS Center. The emissions of greenhouse gases at the UPS Center are on average 0.583 tons of CO_2/MWh. Also, the heat energy generated from the four new SGTUs, which is on average 6 831 ths.Gcal, will replace less efficient, in comparison with the project, existence and new regional gas boiler houses.

Thus, at the expense of lower fuel combustion efficiency at power stations of the UPS Center and regional gas boiler houses (compared to the fuel combustion efficiency of the SGTUs) for the generation of electricity and heat energy it will be necessary to burn a larger amount of fuel. The result of the project is a reduction of greenhouse gas emissions due to the fact that less fossil fuel will be burnt at the UPS Center and the regional gas boiler houses.

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

	Years
Length of the crediting period	5
Year	Estimate of annual emission reductions in tonnes of CO_2equivalent
2008	**629 668**
2009	**1 484 553**
2010	**1 748 031**

2011	**1 993 688**
2012	**2 875 649**
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	**8 731 589**
Annual average of emission reductions over the crediting period (tonnes of CO_2 equivalent)	**1 746 318**

A.5. Project approval by the Parties involved:

On September 15, 2011 the Resolution of the Government of the Russian Federation "Concerning the measures on the implementation of Article 6 of the Kyoto protocol to the UN FCCC concerning climate changes" was adopted. This document approves the Regulations concerning the implementation of Article 6 of the Kyoto protocol. In accordance with item 8 of the Regulations Projects shall be approved by the ministry of Economic Development of the Russian Federation based on the results of the competitive selection of applications. The competitive selection of applications is made by the operator of carbon units (Sberbank of Russia) in accordance with item 5 of the Resolution of the Government of the Russian Federation No.780.

The application should contain "a positive expert opinion regarding the project documentation, prepared in accordance with international requirements by an independent body, chosen by the applicant". Thus, in accordance with the applicable laws of the Russian Federation in the implementation of CO projects, Project approval is possible only after a positive opinion is received from the determining company.

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.

SECTION B. Baseline

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

As appropriate, project participants may, but are not obliged to, apply approved clean development mechanism (CDM) baseline and monitoring methodologies. Based on that a JI specific approach regarding baseline setting is used. This approach is based on the provisions of Guidelines for users of the JI PDD Form (Version 04) and includes the following steps:

Step. 1. Indication and description of the approach chosen regarding the baseline setting.
Step. 2. Application of the approach chosen.

The following is a detailed presentation of the two steps:

Step. 1. Indication and Description of the Approach Chosen Regarding the Baseline Setting

The baseline is determined on the basis of considering various alternatives for the development of the situation, including the proposed project. The key factors will be determined as the criteria for the selection of the baseline scenario. All alternatives will be considered based on the impact of these factors on them. The alternative scenario in which the key factors have the least negative impact will be selected as the baseline.

Thus, the steps for determining the baseline are as follows:

a) Identification of alternative scenarios.
b) Description of the key factors.
c) Analysis of the influence of the key factors on the alternatives.
d) Choosing the most plausible alternative scenario.

Step. 2. Application of the Scenario Chosen

Identification of alternative scenarios

At this stage the alternative scenarios are defined and checked for compliance with the applicable law.

There are two alternative scenarios:

Alternative scenario 1. The electricity to be generated by project is provided by the other existing plants and the other new energy units of UPS Center. The heat to be generated by project is provided by newly constructed boilers and by increasing the load on the existing boiler equipment heating network of the Moscow region.

Alternative scenario 2. Realization of the project without it being registered as a joint implementation project - installation of SGTU units at the CHP of OJSO "Mosenergo" to generate additional power.

The project involves the installation of SGTU units at the CHP of OJSC "Mosenergo" with waste heat recovery boilers and turbines which will allow additional electricity and heat energy to be generated on an annual basis. The SGTUs have good operational performance indicators, the specific fuel consumption for the electric supply is on average 202.2 grammes of equivalent fuel/ KWh. Additional electricity generated at the CHP of OJSC "Mosenergo" will replace the electricity generated at the UPS Center, which has the worst performance indicators and, therefore, consumes more fuel when generating

electricity. Also, it will replace the heat energy generated at regional heating stations, which are less efficient in comparison with the project

Table B 1.1. Electric and heat energy supply from the SGTUs according to alternative scenario 2

	2008	2009	2010	2011	2012
Electricity output (mln. kWh)	3 247	7 019	7 775	9 193	10 717
Heat energy output (ths. Gcal.)	792	2183	2029	2485	3530

None of the stated alternatives contradict the applicable law and may be considered in the proceeding analysis.

Description of the key factors and analysis of the impact of the key factors on these alternatives.

The baseline will be created taking into account the following key factors that influence the selection of the situation development scenarios in the field of electricity and heat generation at the CHP of OJSC "Mosenergo":

- Economic situation and availability of funds (including investment barrier);
- Local availability of technologies, equipment, experience and know-how;
- Price and availability of fuel

The impact of the key factors on these alternative scenarios is determined using a factor analysis.

Table B1.2. Factor analysis.

Factor	Alternative 1	Alternative 2
Local availability of technologies, equipment, experience and know-how	An insignificant impact The use of the existing equipment for the generation of energy at the CHP of OJSC "Mosenergo" is general practice in Russia and does not require upgrading and training of personnel.	A significant impact SGTU technology is not widespread in Russia. Additional training of personnel to operate the project equipment will be required.
Economic situation and availability of funds (including investment barrier)	An insignificant impact This alternative does not require any investment. Accordingly, there is no need for additional capital.	A significant impact For the implementation of the project it is necessary to raise 38% borrowed funds, which amounts to 20 billion rubles. The high interest rates[I] of Russian banks significantly affect the

[I] http://www.cbr.ru/statistics/print.asp?file=credit_statistics/refinancing_rates.htm

		implementation of this alternative scenario.
Price and availability of fuel	An insignificant impact For the operation of the CHP of OJSC "Mosenergo" in the current conditions no increase in fuel consumption is required and, consequently, fuel costs will not influence on this alternative.	A significant impact As a result of the implementation of this alternative, there is an increase in fuel consumption. Additional agreements for the increase in the natural gas limits for the CHP of OJSC "Mosenergo" are required. Taking into account the high cost of gas the fuel costs substantially increase.

Conclusion:

Based on the analysis it is clear that the key factors contribute to the implementation of Alternative Scenario 1 and have a negative impact on Alternative Scenario 2. Therefore, Alternative Scenario 1 is **the baseline**.

Key information and data to establish baseline

$$\mathbf{BE_y = BE_{el} + BE_{heat}} \qquad \textbf{(formula B.1-1)}$$

Where:
BE_{el} – emissions from the generation of energy at the UPS Center according to the baseline scenario (Electric supply after the project implementation), tons of CO_2/month
BE_{heat} – emissions from the generation of heat energy on the gas boiler houses and stations of UPS Center, tons of CO_2/month

$$\mathbf{BE_{el} = EO_{el} * EF_{grid}} \qquad \textbf{(formula B.1-2)}$$

Where:
EF_{grid} – greenhouse gas emission factor during the generation of energy at the UPS Center, tons of CO2/ Megawatt-hour;
EO_{el} – electricity output from the UPS Center according to the baseline scenario (electric supply from the four new SGTUs under the project), Megawatt-hour;

$$\mathbf{EO_{el} = EO_{SGTU,\ CHP\text{-}21} + EO_{SGTU,\ CHP\text{-}26} + EO_{SGTU,\ CHP\text{-}27}} \qquad \textbf{(formula B.1-3)}$$

Where:
$EO_{SGTU,\ CHP\text{-}21}$ – electricity output from the SGTU-450 at CHP-21, Megawatt-hour**;**
$EO_{SGTU,\ CHP\text{-}26}$ – electricity output from the SGTU-420 at CHP-26, Megawatt-hour;
$EO_{SGTU,\ CHP\text{-}27}$ – electricity output from the SGTU-450s at CHP-27, Megawatt-hour;

$$\mathbf{EO_{SGTU,\ CHP\text{-}21} = EG_{SGTU,\ CHP\text{-}21} - EC_{aux\ SGTU,\ CHP\text{-}21}} \qquad \textbf{(formula B.1-4)}$$

Where:
$EG_{SGTU,\ CHP\text{-}21}$ - energy generation at the SGTU-450 at CHP-21, Megawatt-hour;

$EC_{aux\ SGTU,\ CHP\text{-}21}$ – consumption of electric power for the SGTU-450 auxiliaries at CHP-21

$EO_{SGTU,\ CHP\text{-}26} = EG_{SGTU,\ CHP\text{-}26} - EC_{aux\ SGTU,\ CHP\text{-}26}$ **(formula B.1-5)**

Where:
$EG_{SGTU,\ CHP\text{-}26}$ - energy generation at the SGTU-420 at CHP-26, Megawatt-hour;
$EC_{aux\ SGTU,\ CHP\text{-}26}$ – consumption of electric power for the SGTU-420 auxiliaries at CHP-26

$EO_{SGTU,\ CHP\text{-}27} = (EG_{SGTU,\ CHP\text{-}27\ №3} + EG_{SGTU,\ CHP\text{-}27\ №4}) - EC_{aux\ SGTU,\ CHP\text{-}27}$ **(formula B.1-6)**

Where:
$EG_{SGTU,\ CHP\text{-}27\ №3}$ - energy generation at unit No.3 of the SGTU-450 at CHP-27, Megawatt-hour;
$EG_{SGTU,\ CHP\text{-}27\ №4}$ - energy generation at unit No.4 of the SGTU-450 at CHP-27, Megawatt-hour;
$EC_{aux\ SGTU,\ CHP\text{-}27}$ – consumption of electric power for the unit No.3 and No.4 of SGTU-450 auxiliaries at CHP-27

$BE_{heat} = (HO_{SGTU} * EF_{NG} * 4{,}1868*10^{-3}) / \eta_{gas\ boiler\text{-}house}$ **(formula B.1-7)**

Where:
HO_{SGTU} – total output of heat energy from the SGTUs under the project, thous. Gcal.
EF_{NG} – CO2 emission factor for natural gas, tons of CO2/TJ.
$\eta_{gas\ boiler\text{-}house}$ – efficiency of the gas-boiler, %.
$4{,}1868*10^{-3}$ – factor of conversion from Gcal to TJ

$HO_{SGTU} = HO_{SGTU,\ CHP\text{-}21} + HO_{SGTU,\ CHP\text{-}26} + HO_{SGTU,\ CHP\text{-}27\ №3} + HO_{SGTU,\ CHP\text{-}21\ №4}$ **(formula B.1-8)**

where:
$HO_{SGTU,\ CHP\text{-}21}$ – heat output from the SGTU-450 at CHP-21 under the project, thous. Gcal.
$HO_{SGTU,\ CHP\text{-}26}$ – heat output from the SGTU-420 at CHP-26 under the project, thous. Gcal.
$HO_{SGTU,\ CHP\text{-}27\ №3}$ – heat output from the unit No.3 of the SGTU-450 at CHP-27 under the project, thous. Gcal.
$HO_{SGTU,\ CHP\text{-}27\ №4}$ – heat output from the unit No.4 of the SGTU-450 at CHP-27 under the project, thous. Gcal.

Tables with the key indicators and variables used for determining the baseline are given below:

Data/Parameter 1	**$EG_{SGTU,\ CHP\text{-}21}$**
Data unit	Megawatt-hour
Description	Energy generation from the SGTU-450 at CHP-21 under the project.
Time of determination/monitoring	Monthly
Source of data (to be) used	Form "3 TEH" for 2008-2011, forecast for 2012г.
Value of data applied (for ex ante calculations/determinations)	2008 – 778 758 Megawatt-hour/year 2009 – 1 948 891 Megawatt-hour/year 2010 – 1 963 522 Megawatt-hour/year 2011 – 2 471 908 Megawatt-hour/year 2012 – 2 137 471 Megawatt-hour/year

Justification of the choice of data or description of measurement methods and procedures (to be) applied	It is measured using multifunctional electrical meters, and all data from the meters is automatically sent to the "Automated information and measuring system of commercial energy metering."
QA/QC procedures (to be) applied	All measurements are performed with calibrated metering instruments in accordance with test procedure «SSM. Automated information and measuring system of commercial energy metering. Test procedure" № 38899-08 approved by FGUP "VNIIMS" in august of 2008.
Any comment	

Data/Parameter 2	**EG** $_{\text{SGTU, CHP-26}}$
Data unit	Megawatt-hour
Description	Energy generation from the SGTU-420 at CHP-26 under the project.
Time of determination/monitoring	Monthly
Source of data (to be) used	Model 15506 for 2011, forecast for 2012г.
Value of data applied (for ex ante calculations/determinations)	2011– 1 270 485 Megawatt-hour/year 2012 – 3 222 900 Megawatt-hour/year
Justification of the choice of data or description of measurement methods and procedures (to be) applied	It is measured using multifunctional electrical meters, and all data from the meters is automatically sent to the "Automated information and measuring system of commercial energy metering."
QA/QC procedures (to be) applied	All measurements are performed with calibrated metering instruments in accordance with test procedure «SSM. Automated information and measuring system of commercial energy metering. Test procedure" № 38899-08 approved by FGUP "VNIIMS" in august of 2008.
Any comment	

Data/Parameter 3	**EG** $_{\text{SGTU, CHP-27 №3}}$
Data unit	Megawatt-hour
Description	Energy generation from unit No.3 of the SGTU-450 at CHP-27 under the project.
Time of determination/monitoring	Monthly
Source of data (to be) used	Annual form "TEP" for 2008-2011, forecast for 2012
Value of data applied (for ex ante calculations/determinations)	2008 – 2 464 486 Megawatt-hour/year 2009 – 2 369 151 Megawatt-hour/year 2010 – 3 067 668 Megawatt-hour/year 2011 – 2 579 674 Megawatt-hour/year 2012 – 2 579 674 Megawatt-hour/year
Justification of the choice of data or description of measurement methods and procedures (to be) applied	It is measured using multifunctional electrical meters, and all data from the meters is automatically sent to the "Automated information and measuring system of commercial energy metering."

QA/QC procedures (to be) applied	All measurements are performed with calibrated metering instruments in accordance with test procedure «SSM. Automated information and measuring system of commercial energy metering. Test procedure" № 38899-08 approved by FGUP "VNIIMS" in august of 2008.
Any comment	

Data/Parameter 4	**EG** $_{\text{SGTU, CHP-27 №4}}$
Data unit	Megawatt-hour
Description	Energy generation from unit No.4 of the SGTU-450 at CHP-27 under the project.
Time of determination/monitoring	Monthly
Source of data (to be) used	Form "TEP" for 2008-2011, forecast for 2012
Value of data applied (for ex ante calculations/determinations)	2008 – 126 886 Megawatt-hour/year 2009 – 2 957 070 Megawatt-hour/year 2010 – 2 985 456 Megawatt-hour/year 2011 – 3 176 188 Megawatt-hour/year 2012 – 3 176 188 Megawatt-hour/year
Justification of the choice of data or description of measurement methods and procedures (to be) applied	It is measured using multifunctional electrical meters, and all data from the meters is automatically sent to the "Automated information and measuring system of commercial energy metering."
QA/QC procedures (to be) applied	All measurements are performed with calibrated metering instruments in accordance with test procedure «SSM. Automated information and measuring system of commercial energy metering. Test procedure" № 38899-08 approved by FGUP "VNIIMS" in august of 2008.
Any comment	

Data/Parameter 5	**EC**$_{\text{aux SGTU, CHP-21}}$
Data unit	Megawatt-hour
Description	Consumption of electric power for the SGTU-450 auxiliaries at CHP-21
Time of determination/monitoring	Monthly
Source of data (to be) used	Form "3 TEH" for 2008-2011, forecast for 2012г.
Value of data applied (for ex ante calculations/determinations)	2008 – 35 674 Megawatt-hour/year 2009 – 74 073 Megawatt-hour/year 2010 – 66 707 Megawatt-hour/year 2011 - 86 543 Megawatt-hour/year 2012 – 76 093 Megawatt-hour/year
Justification of the choice of data or description of measurement methods and procedures (to be) applied	It is measured using multifunctional electrical meters, and all data from the meters is automatically sent to the "Automated information and measuring system of commercial energy metering."

QA/QC procedures (to be) applied	All measurements are performed with calibrated metering instruments in accordance with test procedure «SSM. Automated information and measuring system of commercial energy metering. Test procedure" № 38899-08 approved by FGUP "VNIIMS" in august of 2008.
Any comment	

Data/Parameter 6	$EC_{aux\ SGTU,\ CHP-26}$
Data unit	Megawatt-hour
Description	Consumption of electric power for the SGTU-420 auxiliaries at CHP-26
Time of determination/monitoring	Monthly
Source of data (to be) used	Model 15506 for 2011, forecast for 2012г.
Value of data applied (for ex ante calculations/determinations)	2011 – 45 402 Megawatt-hour/year 2012 – 154 200 Megawatt-hour/year
Justification of the choice of data or description of measurement methods and procedures (to be) applied	It is measured using multifunctional electrical meters, and all data from the meters is automatically sent to the "Automated information and measuring system of commercial energy metering."
QA/QC procedures (to be) applied	All measurements are performed with calibrated metering instruments in accordance with test procedure «SSM. Automated information and measuring system of commercial energy metering. Test procedure" № 38899-08 approved by FGUP "VNIIMS" in august of 2008.
Any comment	

Data/Parameter 7	$EC_{aux\ SGTU,\ CHP-27}$
Data unit	Megawatt-hour
Description	Consumption of electric power for the unit No. 3 and № 4of the SGTU-450 auxiliaries at CHP-27
Time of determination/monitoring	Monthly
Source of data (to be) used	Form "TEP" for 2008-2011, forecast for 2012
Value of data applied (for ex ante calculations/determinations)	2008 – 87 842 Megawatt-hour/year 2009 – 182 034 Megawatt-hour/year 2010 – 175 295 Megawatt-hour/year 2011 – 172 660 Megawatt-hour/year 2012 – 172 660 Megawatt-hour/year
Justification of the choice of data or description of measurement methods and procedures (to be) applied	It is measured using multifunctional electrical meters, and all data from the meters is automatically sent to the "Automated information and measuring system of commercial energy metering."
QA/QC procedures (to be) applied	All measurements are performed with calibrated metering instruments in accordance with test procedure «SSM. Automated information and measuring system of commercial energy metering. Test procedure" № 38899-08 approved by FGUP "VNIIMS" in august of 2008.

Any comment	

Data/Parameter 8	**$HO_{SGTU, CHP-21}$**
Data unit	thous. Gcal
Description	Heat output from the SGTU-450 at CHP-21 under the project.
Time of determination/monitoring	Monthly
Source of data (to be) used	Form "3 TEH" for 2008-2011, forecast for 2012г.
Value of data applied (for ex ante calculations/determinations)	2008 – 150.980 thous. Gcal 2009 – 616.471 thous. Gcal 2010 – 273.780 thous. Gcal 2011 – 467.520 thous. Gcal 2012 – 450.084 thous. Gcal
Justification of the choice of data or description of measurement methods and procedures (to be) applied	It is calculated automatically by Automated measuring and information system for heat power fiscal accounting.
QA/QC procedures (to be) applied	All calculations are performed on the basis of the measured data. All measurements are performed with calibrated metering instruments in accordance with the test procedure MP 4218-010-42968951-2006.
Any comment	

Data/Parameter 9	**$HO_{SGTU, CHP-26}$**
Data unit	thous. Gcal
Description	Heat output from the SGTU-420 at CHP-26 under the project.
Time of determination/monitoring	Monthly
Source of data (to be) used	Model 15506 for 2011, forecast for 2012г.
Value of data applied (for ex ante calculations/determinations)	2011 – 83.71 thous. Gcal 2012 – 1 146.6 thous. Gcal
Justification of the choice of data or description of measurement methods and procedures (to be) applied	It is calculated automatically by Automated measuring and information system for heat power fiscal accounting.
QA/QC procedures (to be) applied	All calculations are performed on the basis of the measured data. All measurements are performed with calibrated metering instruments in accordance with the test procedure MP 4218-010-42968951-2006.
Any comment	

Data/Parameter 10	**$HO_{SGTU, CHP-27 №3}$**
Data unit	thous. Gcal
Description	Heat output from unit No.3 of the SGTU-450 at CHP-27 under the project.

Time of determination/monitoring	Monthly
Source of data (to be) used	Form "TEP" for 2008-2011, forecast for 2012
Value of data applied (for ex ante calculations/determinations)	2008 – 630.215 thous. Gcal 2009 – 788.738 thous. Gcal 2010 – 899.468 thous. Gcal 2011 – 997.769 thous. Gcal 2012 – 997.769 thous. Gcal
Justification of the choice of data or description of measurement methods and procedures (to be) applied	It is calculated automatically by Automated measuring and information system for heat power fiscal accounting.
QA/QC procedures (to be) applied	All calculations are performed on the basis of the measured data. All measurements are performed with calibrated metering instruments in accordance with the test procedure MP 4218-010-42968951-2006.
Any comment	

Data/Parameter 11	$\mathbf{HO_{SGTU,\ CHP\text{-}27\ №4}}$
Data unit	thous. Gcal
Description	Heat output from unit No.4 of the SGTU-450 at CHP-27 under the project.
Time of determination/monitoring	Monthly
Source of data (to be) used	Form "TEP" for 2008-2011, forecast for 2012
Value of data applied (for ex ante calculations/determinations)	2008 – 10.893 thous. Gcal 2009 – 779.500 thous. Gcal 2010 – 855.365 thous. Gcal 2011 – 935.761 thous. Gcal 2012 – 935.761 thous. Gcal
Justification of the choice of data or description of measurement methods and procedures (to be) applied	It is calculated automatically by Automated measuring and information system for heat power fiscal accounting.
QA/QC procedures (to be) applied	All calculations are performed on the basis of the measured data. All measurements are performed with calibrated metering instruments in accordance with the test procedure MP 4218-010-42968951-2006.
Any comment	

Data/Parameter 12	$\mathbf{EF_{grid}}$
Data unit	tons of CO2/ Megawatt-hour
Description	Greenhouse gas emissions during the generation of energy at the UPS Center.
Time of determination/monitoring	It is determined once
Source of data (to be) used	Research conducted by Lahmeyer International: "Dynamics of the development of the carbon emission factor

	during the generation of electric energy in Russia" http://www.ebrd.com/downloads/sector/eecc/Baseline_Study_Russia.pdf (page 5.2, table 5.1) http://www.ebrd.com/downloads/sector/eecc/Validation_report_Russia.pdf
Value of data applied (for ex ante calculations/determinations)	2008 – 0.562 tons CO2/ Megawatt-hour 2009 – 0.576 tons CO2/ Megawatt-hour 2010 – 0.593 tons CO2/ Megawatt-hour 2011– 0.574 tons CO2/ Megawatt-hour 2012 – 0.614 tons CO2/ Megawatt-hour
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The emission factor for 2009-2012 was estimated by Lahmeyer International in accordance with the approved methodology of the Clean Development Mechanism "Guidance for the assessment of the emission factor during the generation of energy in the network" (version 02) Emission factor for 2008 was extrapolated from selection of values for 2009-2014. (see calculation in Annex 4.)
QA/QC procedures (to be) applied	The research is recommended by Ministry of economic development of RF.
Any comment	

Data/Parameter 13	$\eta_{\text{gas boiler-house}}$
Data unit	%
Description	Efficiency of the gas boiler houses
Time of determination/monitoring	It is determined once
Source of data (to be) used	AM 0058, version 03.1
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	The data is taken from approved CDM methodology. This value of efficiency corresponds to New natural gas fired boiler (w/o condenser). This way is conservative.
QA/QC procedures (to be) applied	
Any comment	

Data/Parameter 14	$EF_{CO2,NG}$
Data unit	t CO_2/TJ
Description	CO_2 emission factor for natural gas combustion
Time of determination /monitoring	It is determined once
Source of data	
Value of data applied (for ex ante calculations/determinations)	56.1 t /TJ

Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is provided in 2006 IPCC Guidelness for National Greenhouse Gas Inventories, Table 1.4.
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 presented in Section B.1. clearly shows that the proposed project is not the baseline.

To prove additionality a JI specific approach was selected for social accountability projects.
For this purpose a provision was selected a) as defined in section 2 of Annex I to " Guidance on criteria for baseline setting and monitoring" (version 03), i.e. the presentation of traceable and transparent information showing that the baseline is identified on the basis of conservative assumptions, that the project is not part of the identified baseline scenario and that the project will result in a reduction of anthropogenic emissions from the sources of greenhouse gases.
This section shows that the project provides a reduction in emissions from the sources that are additional to the emissions that would occur otherwise, using the following stepwise approach:

- At the first step the applicable approach is determined and described to prove additionality.
- At the second step the selected approach is applied.
- At the third step the additionality is proven.

In conclusion, explanations of the achieved reductions of greenhouse gas emissions are provided.

Below a detailed outline of this approach is presented.

Step 1. Indication and description of the applied approach to prove additionality.

A JI specific approach is based on the explanation that in any case the project could not happen due to the presence of the financial barrier, and that this activity is not common practice.

1. Financial barrier
Description of the financial barrier is given with the investment analysis.
The investment analysis includes a cost effectiveness analysis, from which a conclusion can be made about the attractiveness of the project if implemented without it being registered as a social accountability project.
The result of the investment analysis is a quantitative determination of economic efficiency indicators such as NPV, IRR and the discounted payback period.
As part of the investment analysis a sensitivity analysis is performed on variables such as electricity tariffs, the cost of natural gas and capital investments.
The project is additional if it is not economically attractive without the sales of Emission Reduction Units.

2. Common practice analysis

This stage corroborates the research conducted at the previous stage by analyzing the prevalence of the technology used in the Project and in the region. The project is additional if it is not common practice.

Step 2. Application of the selected approach

1. Investment analysis

The Investment analysis is performed for alternative scenario 2 in order to prove the additionality of the implemented project.
The Methodology for calculation of economic efficiency of the project corresponds to principles of budget approach. The Methodology is based on commonly used formulae for calculation of key financial/economic indicators of an investment project.
The calculations are made in rubles in current prices at the moment of assessment.
Following indicators of project efficiency are determined in calculations:

- Net present value
- Discount payback period
- Internal rate of return

Calculations of project efficiency are made in nominal prices (inflation is included) with discounted rate 18%.
Given discount rate is consist of:

- Refinancing interest rate of Central Bank of Russian Federation for the moment of decision making - 13%[II]
- Premium for the risk – 5 %[III]

Assumed investments in 2005 are presented in table 2.1

Table 2.1 Investments (mln. rub)

	2006	2007	2008	2009
SGTU 450 CHP 21	572	9 278	2 326	
SGTU 420 CHP 26	572	4 024	4 258	1 976
SGTU 450 №3 CHP 27	2 388	9 796		
SGTU 450 №4 CHP 27		1 900	2 599	9 301

For modeling of operating costs and cash flow current tariff rates in 2005 was used.

Forecast rate of growth for tariffs on electricity, heat energy, fuel prices and inflation in 2006-2010 was taken from “Scenary conditions of electrical energy industry development in 2006-2010”. Rate of growth for the further years equal to the last forecast year.

[II] Telegram of Bank of Russia from 11.06.2004 № 1443-U (http://www.cbr.ru/statistics/print.asp?file=credit_statistics/refinancing_rates.htm)

[III] Investment management, Sheremet V.V., 1998, Volume 2, p.151, Table 13.5.1, row “New investment-category 1”

For repair costs modeling for new equipment expert recommendations of DIP JSC "RAO UES of Russia" at the basis of similar experience at North-West CHP. Repair costs (with current and capital repairs) is equal to 3,5 dollars/MWh per a year.
Other costs is equal to 20% from the sum of repair costs and depreciation.
For salary costs modeling average salary of OJSC "Mosenergo" collaborators (18 thous.rub) was taken. Number of maintenance staff for each SGTU is taken equal to 40 persons.
Depreciation rate calculated according to integral rate of 6,7%. This rate was formed in according to service life of new equipment – about 15 years.
Following economic efficiency indicators on the assumption of given methodology are come out.

Table B.2.2. Economic efficiency indicators

Indicator	Unit of measurement	The project values without taking into account the sales of Emission Reduction Units
Investments (without VAT)	million roubles/ year	48 990
Average annual income	million roubles/ year	26 131
Average annual operating expenses	million roubles/ year	32 762
Average annual fuel costs	million roubles/ year	27 863
Average annual depreciation	million roubles/ year	2 881
Discounted payback period	years	Not compensated
Internal rate of return	%	N/A
Net present value	million roubles	- 21 485

Sensitivity analysis:

The sensitivity analysis is performed for the project scenario, for alternative scenario 2. The impact of indicators such as the volume of investments, the price of natural gas, and electricity and heating tariffs are considered. The table below shows the results of the sensitivity analysis.

Investments		+10%	-10%
		Alternative scenario 2	
Discounted payback period	Years	>25 years	>25 years
Internal rate of return	%	N/A	N/A
Net present value	million roubles	- 24 998	- 17 994

Electricity tariffs		+10%	-10%
		Alternative scenario 2	
Discounted payback period	Years	>25 years	>25 years
Internal rate of return	%	N/A	N/A
Net present value	million roubles	- 15 537	- 27 750

Heating tariffs		+10%	-10%
		Alternative scenario 2	
Discounted payback period	Years	>25 years	>25 years
Internal rate of return	%	N/A	N/A
Net present value	million roubles	- 19 737	- 23 256

Gas prices		+10%	-10%
		Alternative scenario 2	
Discounted payback period	Years	>25 years	>25 years
Internal rate of return	%	N/A	N/A
Net present value	million roubles	- 27 311	- 15 880

The sensitivity analysis shows that the electricity tariffs have the greatest impact on the project performance indicators.

2. Common practice analysis

Before taking a decision in 2005 about the installation of the SGTUs at CHP of OJSC "Mosenergo", gas-vapor technologies were not widely used in Russia. At that time the average installed capacity of the SGTU units at the thermal power stations of Russia amounted to 1342 MW, or 0.61 % of the total capacity of the thermal power stations.

Table B.2.2. Commissioning of combined cycle electric generating plants in Russia by 2005

№	Name	SGTU capacity (MW)	Commissioned
1	Nevinnomysskaya SDPS Power Plant [IV]	145	1972
2	North-West Central Heating and Power Plant[V]	450	2000
3	Gas-turbine Thermal Power Plant of the Igolsko-Talovoye oil field [VI]	24	End of 2004

[IV] http://www.yug.so-ups.ru/Page.aspx?IdP=84

[V] http://ru.wikipedia.org/wiki/%D1%E5%E2%E5%F0%EE-%C7%E0%EF%E0%E4%ED%E0%FF_%D2%DD%D6

[VI] http://www.engin.ru/projects/projects_4.html

4	Sochinskaya Thermal Power Station [VII]	78	2004
5	Dzerzhinskaya Central Heating and Power Plant [VIII]	195	2005
6	Kaliningradskaya Central Heating and Power Plant [IX]	450	2005
TOTAL		1 342	-
Installed capacity of the Russian electric power system, MW(2005)[X]		219 000	-
Share of the SGTUs in the total amount, %		**0,61%**	-

The total installed capacity of the power stations of the united energy system of Russia in 2005 amounted to 219 GW. Thus, the share of the SGTU was 0.61 %.
Project of implementation SGTU at Dzerzhinskaya CHP was realized as JI project. At present time approving of the project by the host party is carrying out.
The similar projects to the proposed activity was constructed during the time that RAO UES as a monopolistic company still existed. It was the biggest energy company almost fully controlled by the state.
This fact indicates that the project to install a SGTU is not general practice in Russia.
Conclusion: The performed analysis shows that the project is not economically attractive without the sales of Emission Reduction Units. The analysis of common practice shows that the project is not common practice. Thus, the project activity is additional.

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

The boundaries of the project include the sources of greenhouse gas emissions related to the project.

The assessment of emissions includes greenhouse gases which significantly contribute to greenhouse gas emissions (more than 1%).

The boundaries of the project include one SGTU-420 unit and three SGTU-450 units of OJSC "Mosenergo".

Table B 3.1: Sources of emissions within the baseline scenario and the project

	Source	GHG	Included/	Comments

[VII] http://ru.wikipedia.org/wiki/%D0%A1%D0%BE%D1%87%D0%B8%D0%BD%D1%81%D0%BA%D0%B0%D1%8F_%D0%A2%D0%AD%D0%A1
[VIII] Functionin and development of electrical energy industry of Russia Federation 2005, APBE, Section 3, p 28
[IX] http://ru.wikipedia.org/wiki/%D0%9A%D0%B0%D0%BB%D0%B8%D0%BD%D0%B8%D0%BD%D0%B3%D1%80%D0%B0%D0%B4%D1%81%D0%BA%D0%B0%D1%8F_%D0%A2%D0%AD%D0%A6-2

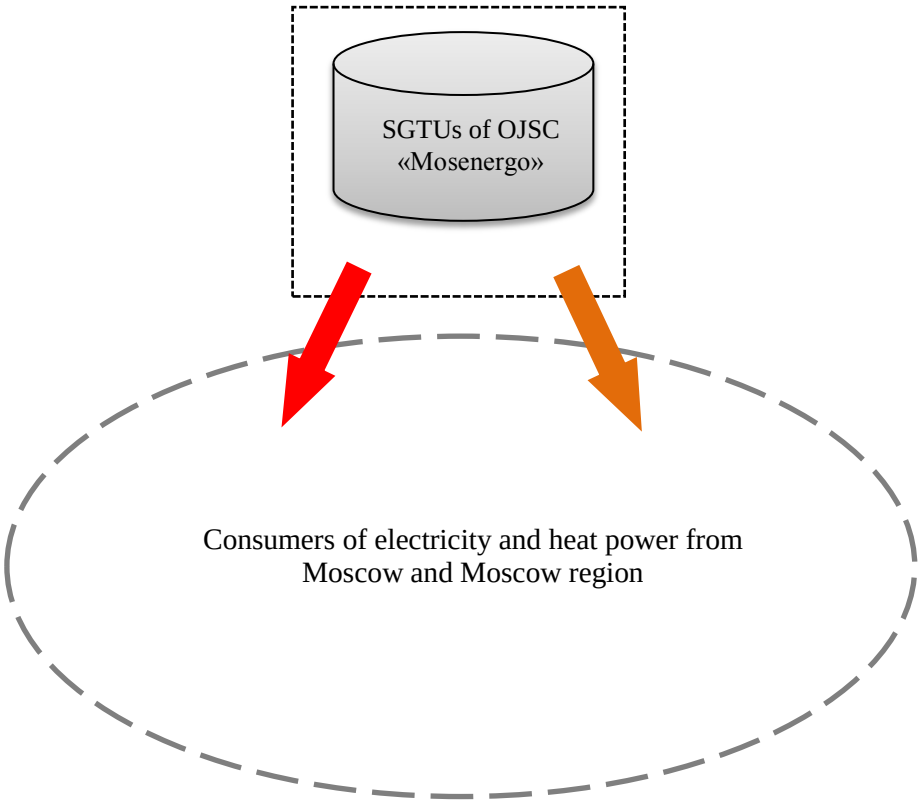
[X] http://www.rao-ees.ru/ru/investor/reporting/reports/report2005/8_1.htm

			Not included	
Baseline	Combustion of fuel for the generation of energy in the UPS Center	CO_2	Included	Major source of emissions
		CH_4	Not included	Emissions are very insignificant. In accordance with the IPCC Guidelines for National Greenhouse Gas Inventories, 2006, Volume 2, Chapter 2, Table 2.2 the emission factor for the stationary combustion of fuel in the energy industry for CH4 is very insignificant
		N_2O	Not included	Emissions are very insignificant. In accordance with the IPCC Guidelines for National Greenhouse Gas Inventories, 2006, Volume 2, Chapter 2, Table 2.2 the emission factor for the stationary combustion of fuel in the energy industry for N2O is very insignificant
	Combustion of fuel at the regional gas boiler houses	CO_2	Included	Major source of emissions
		CH_4	Not included	Emissions are very insignificant. In accordance with the IPCC Guidelines for National Greenhouse Gas Inventories, 2006, Volume 2, Chapter 2, Table 2.2 the emission factor for the stationary combustion of fuel in the energy industry for CH4 is very insignificant
		N_2O	Not included	Emissions are very insignificant. In accordance with the IPCC Guidelines for National Greenhouse Gas Inventories, 2006, Volume 2, Chapter 2, Table 2.2 the emission factor for the stationary combustion of fuel in the energy industry for N2O is very insignificant

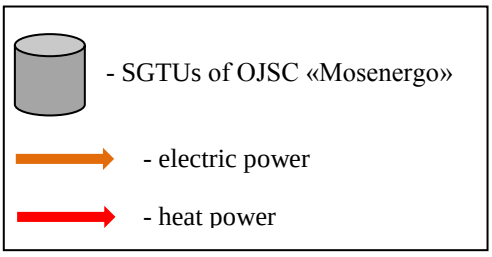
Project	Combustion of fuel at the SGTU	CO_2	Included	Major source of emissions
		CH_4	Not included	Emissions are very insignificant. In accordance with the IPCC Guidelines for National Greenhouse Gas Inventories, 2006, Volume 2, Chapter 2, Table 2.2 the emission factor for the stationary combustion of fuel in the energy industry for CH4 is very insignificant
		N_2O	Not included	Emissions are very insignificant. In accordance with the IPCC Guidelines for National Greenhouse Gas Inventories, 2006, Volume 2, Chapter 2, Table 2.2 the emission factor for the stationary combustion of fuel in the energy industry for N2O is very insignificant

On the basis of the performed analysis the boundaries of the project are presented in graphic form as follows:

Diagram B 3.1: Boundaries of the project



Legend:



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: 31/01/2012

The baseline was developed by:
Closed Joint-Stock Company "National Carbon Sequestration Foundation" (Moscow);

Contact: Evgeniya Baydakova, Senior Expert of the Project Development Department;
Phone: 8 499 788 78 35 ext. 104
Fax: 8 499 788 78 35 ext. 107
e-mail: BaydakovaEV@ncsf.ru

Contact: Nikolay Trofimov, Expert of the Project Development Department;
Phone: 8 499 788 78 35 ext. 111
Fax: 8 499 788 78 35 ext. 107
e-mail: TrofimovN@ncsf.ru

Closed Joint-Stock Company "National Carbon Sequestration Foundation" is not the project participant.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

27.11.2007

C.2. Expected operational lifetime of the project:

18 years and 8 months, or 224 months: 27.11.2007 – 01.07.2026

C.3. Length of the crediting period:

5 years or 60 months 01.01.2008 - 31.12.2012.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

1. Indication and description of the monitoring approach applied

In accordance with "Guidelines for users of the JI PDD form" version 04 for monitoring of the project it is necessary to apply either approved CDM methodology or the JI Specific approach approach.

Monitoring plan of the given project based on the JI Specific approach in accordance with following regulations:

- Guidelines for the implementation of Article 6 of the Kyoto Protocol (Appendix B. Criteria for baseline setting and monitoring, II. Monitoring
- Guidance on criteria for baseline setting and monitoring, Version 03 (D. Guidance on monitoring) .

In accordance with "Guidelines for users of the JI PDD form" version 04, in section D it is necessary explicitly and clearly distinguish:

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;

c) Data and parameters that are monitored throughout the crediting period.

2. Application of the approach chosen

The project involves the installation of the SGTU-450 at CHP-21, SGTU-420 at CHP-26 and two SGTU-450 units at CHP-27 which will result in the generation of additional electricity which will replace the electricity produced by the regional energy system and import sources into the regional energy system. And also it will replace the supply of heat energy at regional heating stations which are less efficient compared with the project.

Thus, the reduction of greenhouse gas emissions is calculated by comparing the fuel consumption to supply the same amount of electric and heat energy according to the baseline scenario and as a result of the Project.

For the purpose of monitoring, the following data will be measured and calculated:

1. 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:

- Efficiency of gas boiler houses
- Emission factor from the combustion of fuel
- Emission factor for electric power plant of the UPS Center

1. 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:

-there is no such data

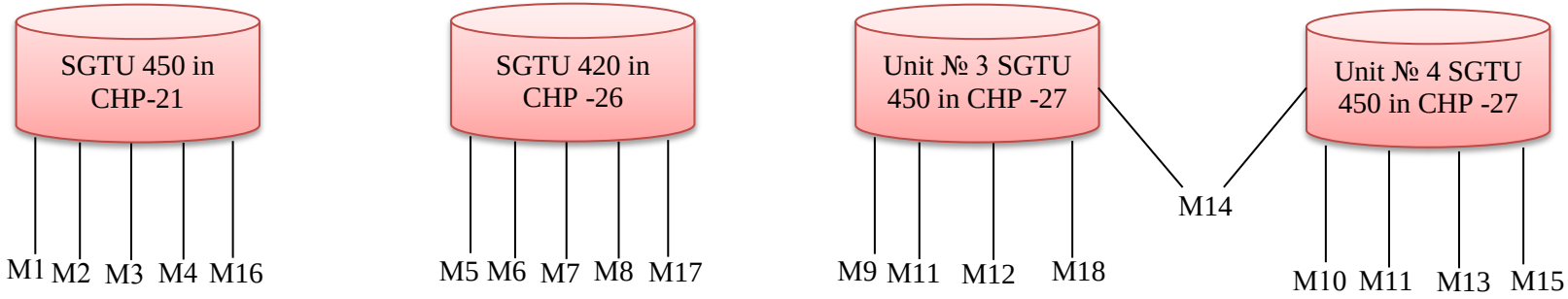
2. monitored throughout the crediting period:

- Generation of energy at the SGTU-450 at CHP-21
- Generation of energy at the SGTU-420 at CHP-26
- Generation of energy at unit No. 3 of the SGTU-450 at CHP-27
- Generation of energy at unit No. 4 of the SGTU-450 at CHP-27
- Consumption of electric power for the SGTU-450 auxiliaries at CHP-21
- Consumption of electric power for the SGTU-420 auxiliaries at CHP-26
- Consumption of electric power for the unit No. 3 and № 4 of the SGTU-450 auxiliaries at CHP-27
- Supply of heat energy at the SGTU-450 at CHP-21
- Supply of heat energy at the SGTU-420 at CHP-26
- Supply of heat energy at unit No.3 of the SGTU-450 at CHP-27
- Supply of heat energy at unit No.4 of the SGTU-450 at CHP-27
- Amount of consumable fuel at the SGTU-450 at CHP-21
- Amount of consumable fuel at the SGTU-420 at CHP-26
- Amount of consumable fuel at unit No.3 of the SGTU-450 at CHP-27

- Amount of consumable fuel at unit No.4 of the SGTU-450 at CHP-27
- NCV natural gas at the SGTU-450 at CHP-21
- NCV natural gas at the SGTU-420 at CHP-26
- NCV natural gas at two SGTU-450 units at CHP-27

Oxidation factor from burning of natural gas is taken equal to 1 according with IPCC 2006 "Guidelines for National Greenhouse Gas Inventories", Volume 1, Chapter 1, Table 1.4

Scheme D.1-1: Monitoring points



Legend:

M1 – point of monitoring

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
M1	**$FC_{SGTU\ CHP-21}$** Natural gas consumption at SGTU-450 at CHP-21	Automated measuring and information system for gas fiscal accounting	Ths.m3	m	Constantly	100%	Electronic/paper	Form "3 TEH"
M2	**$NCV_{NG,\ CHP-21}$** NCV of natural gas consumption at SGTU-450 at CHP-21	Reports of plant chemical laboratory	Kcal per m3	m	Daily	100%	Electronic/paper	
M5	**$FC_{SGTU\ CHP-26}$** Natural gas consumption at SGTU-420 at CHP-26	Automated measuring and information system for gas fiscal accounting	Ths.m3	m	Constantly	100%	Electronic/paper	Model 15506
M6	**$NCV_{NG,\ CHP-26}$** NCV of natural gas has consumption at SGTU-420 at CHP-26	Reports of plant chemical laboratory	Kcal per m3	m	Daily	100%	Electronic/paper	

M9	**FC** $_{SGTU\ CHP\text{-}27\ №3}$ Natural gas consumption at Unit №3 SGTU-450 at CHP-27	Automated measuring and information system for gas fiscal accounting	Ths.m3	m	Constantly	100%	Electronic/paper	Form "TEP"
M10	**FC** $_{SGTU\ CHP\text{-}27\ №4}$ Natural gas consumption at Unit №4 SGTU-450 at CHP-27	Automated measuring and information system for gas fiscal accounting	Ths.m3	m	Constantly	100%	Electronic/paper	Form "TEP"
M11	**NCV**$_{NG,\ CHP\text{-}27}$ NCV of natural gas has consumption at two-unit SGTU-450 at CHP-27	Reports of plant chemical laboratory	Kcal per m3	m	Daily	100%	Electronic/paper	
Data and parameters that are not monitored throughout the crediting period, but are determined only once								
	EF_{NG}, emission factor for NG,	IPCC 2006 "Guidelines for National Greenhouse Gas Inventories", Volume 2, Ch1, Table 1.4	t CO2/TJ	e	Determined once	100%	Electronic/Paper	56.1 t CO2 per TJ

D.1.1.2. Description of formulae used to estimate project emissions (for each gas, source etc.; emissions in units of CO2 equivalent):

$$PE_y = PE_{CHP\text{-}21} + PE_{CHP\text{-}26} + PE_{CHP27}$$ **(formula D.1-1)**

where:

PE_{CHP-21} –project emissions from the SGTU-450 at CHP-21, tons of CO2
PE_{CHP-26} – project emissions from the SGTU-420 at CHP-26, tons of CO2
PE_{CHP-27} – project emissions from the two SGTU-450 units at CHP-27, tons of CO2

$$PE_{CHP-21} = FC_{SGTU\ CHP-21} * NCV_{NG\ CHP-21} * 4{,}1868*10^{-6} * EF_{CO2,\ NG} \quad \textbf{(formula D.1-2)}$$

Where:
$FC_{SGTU\ CHP-21}$ – natural gas consumption at the SGTU-450 at CHP-21, thous. m3;
NCV_{CHP-21}– net calorific value of the gas consumed at CHP-21 , Kcal/m^3,
4,1868*10^-6 – factor of conversion from Kcal to TJ
$EF_{CO2,NG}$– CO2 emission factor when combusting natural gas, tons of CO2/TJ

$$PE_{CHP-26} = FC_{SGTU\ CHP-26} * NCV_{NG\ CHP-26} * 4{,}1868*10^{-6} * EF_{CO2,\ NG} \quad \textbf{(formula D.1-3.)}$$

where:
$FC_{SGTU\ CHP-26}$ – natural gas consumption at the SGTU-420 at CHP-26 ,thous. m3;
NCV_{CHP-26}– net calorific value of the gas consumed at CHP-26 , Kcal/m^3
$EF_{CO2,NG}$– CO2 emission factor when combusting natural gas, tons of CO2/TJ
4,1868*10^-6 – factor of conversion from Kcal to TJ

$$PE_{CHP-27} = (FC_{SGTU\ CHP-27\ №3} + FC_{SGTU\ CHP-27\ №4}) * NCV_{NG\ CHP-26} * 4{,}1868*10^{-6} * EF_{CO2,\ NG} \quad \textbf{(formula D.1-4)}$$

where:
$FC_{SGTU\ CHP-27\ №3}$ – – natural gas consumption at the unit № 3 of SGTU-450 at CHP-27, thous. m3;
$FC_{SGTU\ CHP-27\ №4}$ – natural gas consumption at the unit № 3 of SGTU-450 at CHP-27, thous. m3;
NCV_{CHP-27}– net calorific value of the gas consumed at CHP-27 , Kcal/m^3
4,1868*10^-6 – factor of conversion from Kcal to TJ
$EF_{CO2,NG}$– CO2 emission factor when combusting natural gas, tons of CO2/TJ

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
M3	**$EG_{SGTU\ CHP-21}$** Electricity generation by SGTU-450 at CHP-21	Automated information and measuring system of commercial energy metering.	MWh	m	Constantly	100%	Electronic	Form "3 TEH"
M4	**$EC_{aux\ SGTU\ CHP-21}$** Consumption of electric power for the SGTU-450 auxiliaries at CHP-21	Automated information and measuring system of commercial energy metering.	MWh	m	Constantly	100%	Electronic	Form "3 TEH"
M7	**$EG_{SGTU\ CHP-26}$** Electricity generation by SGTU-420 at CHP-26	Automated information and measuring system of commercial energy metering.	MWh	m	Constantly	100%	Electronic	Model 15506
M8	**$EC_{aux\ SGTU\ CHP-}$**	Automated	MWh	m	Constantly	100%	Electronic	Model 15506

	26 Consumption of electric power for the SGTU-420 auxiliaries at CHP-26	information and measuring system of commercial energy metering.						
M12	**$EG_{SGTU\ CHP-27\ №3}$** generation by Unit SGTU-450 №3 at CHP-27	Automated information and measuring system of commercial energy metering.	MWh	m	Constantly	100%	Electronic	Form "TEP"
M13	**$EC_{aux\ SGTU\ CHP-27}$** Consumption of electric power for the Unit SGTU-450 №3 and №4 auxiliaries at CHP-27	Automated information and measuring system of commercial energy metering.	MWh	m	Constantly	100%	Electronic	Form "TEP"
M14	**$EG_{SGTU\ CHP-27\ №4}$** generation by Unit SGTU-450 №4 at CHP-27	Automated information and measuring system of commercial energy metering.	MWh	m	Constantly	100%	Electronic	Form "TEP"
M15	**$HO_{SGTU,\ CHP-21}$**	Automated	Gcal	m	Constantly	100%	Electronic and	Form "3 TEH"

	Heat output from the SGTU-450 at CHP-21	measuring and information system for heat power fiscal accounting					paper	
M16	**$HO_{SGTU, CHP-26}$** Heat output from the SGTU-420 at CHP-26	Automated measuring and information system for heat power fiscal accounting	Gcal	m	Constantly	100%	Electronic and paper	Model 15506
M17	**$HO_{SGTU, CHP-27 №3}$** Heat output from the Unit SGTU-450 №3 at CHP-27	Automated measuring and information system for heat power fiscal accounting	Gcal	m	Constantly	100%	Electronic and paper	Form "TEP"
M18	**$HO_{SGTU, CHP-27 №4}$** Heat output from the Unit SGTU-450 №4 at CHP-27	Automated measuring and information system for heat power fiscal accounting	Gcal	m	Constantly	100%	Electronic and paper	Form "TEP"
Data and parameters that are not monitored throughout the crediting period, but are determined only once								
	$\eta_{gas\ boiler-house}$ coefficient efficiency of gas boiler-house	AM 0058, version 03.1, Table 2, data for new natural gas fired boiler (w/o condenser)	%	e	Determined once	100%	Electronic/Paper	92%
	EF_{grid}	Research	tCO2/MWh	E	Determined	100%	Electronic/Pape	2008-0,562;

	Emission factor for electric power plant of the UPS Center	conducted by Lahmeyer International: "Dynamics of the development of the carbon emission factor during the generation of electric energy in Russia" http://www.ebrd.com/downloads/sector/eecc/Baseline_Study_Russia.pdf (page 5.2, table 5.1) Emission factor for 2008 was extrapolated from selection of values for 2009-2014. (see calculation in Annex 4.)			once		r	2009-0,576; 2010-0,593; 2011-0,574; 2012-0,614.

D.1.1.4. Description of formulae used to estimate baseline emissions (for each gas, source etc.; emissions in units of CO2 equivalent):

$BE_y = BE_{el} + BE_{heat}$ **(formula D.1-5)**

Where:
BE_{el} – emissions from the generation of energy at the UPS Center according to the baseline scenario (Electric supply after the project implementation), tons of CO_2/month
BE_{heat} – emissions from the generation of heat energy on the gas boiler houses and stations of UPS Center, tons of CO_2/month

$BE_{el} = EO_{el} * EF_{grid}$, **(formula D.1-6)**

Where:
EF_{grid} – greenhouse gas emission factor during the generation of energy at the UPS Center, tons of CO2/ Megawatt-hour;
EO_{el} – electricity output from the UPS Center according to the baseline scenario (electric supply from the four new SGTUs under the project), Megawatt-hour;
$EO_{el} = EO_{SGTU, CHP-21} + EO_{SGTU, CHP-26} + EO_{SGTU, CHP-27}$ **(formula D.1-7)**

Where:
$EO_{SGTU, CHP-21}$ – electricity output from the SGTU-450 at CHP-21, Megawatt-hour**;**
$EO_{SGTU, CHP-26}$ – electricity output from the SGTU-420 at CHP-26, Megawatt-hour;
$EO_{SGTU, CHP-27}$ – electricity output from the SGTU-450s at CHP-27, Megawatt-hour;

$EO_{SGTU, CHP-21} = EG_{SGTU, CHP-21} - EC_{aux\ SGTU, CHP-21}$ **(formula D.1-8)**

Where:
$EG_{SGTU, CHP-21}$ - energy generation at the SGTU-450 at CHP-21, Megawatt-hour;
$EC_{aux\ SGTU, CHP-21}$ – consumption of electric power for the SGTU-450 auxiliaries at CHP-21

$EO_{SGTU, CHP-26} = EG_{SGTU, CHP-26} - EC_{aux\ SGTU, CHP-26}$ **(formula D.1-9)**

Where:
$EG_{SGTU, CHP-26}$ - energy generation at the SGTU-420 at CHP-26, Megawatt-hour;
$EC_{aux\ SGTU, CHP-26}$ – consumption of electric power for the SGTU-420 auxiliaries at CHP-26

$EO_{SGTU, CHP-27} = (EG_{SGTU, CHP-27\ №3} + EG_{SGTU, CHP-27\ №4}) - EC_{aux\ SGTU, CHP-27}$ **(formula D.1-10)**

Where:
$EG_{SGTU, CHP-27 №3}$ - energy generation at unit No.3 of the SGTU-450 at CHP-27, Megawatt-hour;
$EG_{SGTU, CHP-27 №4}$ - energy generation at unit No.4 of the SGTU-450 at CHP-27, Megawatt-hour;
$EC_{aux\ SGTU, CHP-27}$ – consumption of electric power for the unit No.3 and No.4 of SGTU-450 auxiliaries at CHP-27

$$BE_{heat} = (HO_{SGTU} * EF_{NG} * 4{,}1868*10^{\wedge -3}) \ / \ \eta_{gas\ boiler\text{-}house} \qquad \textbf{(formula D.1-11)}$$

Where:
HO_{SGTU} – total output of heat energy from the SGTUs under the project, thous. Gcal.
EF_{NG} – CO2 emission factor for natural gas, tons of CO2/TJ.
$\eta_{gas\ boiler\text{-}house}$ – efficiency of the gas-boiler, %.
$4{,}1868*10^{\wedge -3}$ – factor of conversion from Gcal to TJ

$$HO_{SGTU} = HO_{SGTU, CHP-21} + HO_{SGTU, CHP-26} + HO_{SGTU, CHP-27 №3} + HO_{SGTU, CHP-21 №4} \qquad \textbf{(formula D.1-12)}$$

where:
$HO_{SGTU, CHP-21}$ – heat output from the SGTU-450 at CHP-21 under the project, thous. Gcal.
$HO_{SGTU, CHP-26}$ – heat output from the SGTU-420 at CHP-26 under the project, thous. Gcal.
$HO_{SGTU, CHP-27 №3}$ – heat output from the unit No.3 of the SGTU-450 at CHP-27 under the project, thous. Gcal.
$HO_{SGTU, CHP-27 №4}$ – heat output from the unit No.4 of the SGTU-450 at CHP-27 under the project, thous. Gcal.

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

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):

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

At the expense of lower fuel combustion efficiency at power stations of the UPS Center and regional gas boiler houses (compared to the fuel combustion efficiency of the SGTUs) for the generation of electricity and heat energy it will be necessary to burn a larger amount of fuel. So, reduction of natural gas consumption in UPS Center due to project realization will occur. Therefore, reduction of volume of natural gas extraction and transportation will occur. Thus, the leakage is assumed be equal to zero as conservative.

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):

The leakage is assumed be equal to zero.

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

$$ER_y = BE_y – PE_y - LE$$

(formula D.1-16)

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 decision of the Federal State Statistics Service No.157 dated April 30, 2004 "On the approval of statistical tools for the organization of the statistical observation of production and consumer wastes by the Russian Federal Service for Ecological, Technical and Atomic Supervision" and the order of the Federal State Statistics Service No.166 dated August 10, 2009 "On the approval of statistical tools for the organization of federal statistical observation of agriculture and the environment" the CHPs of the branches of OJSC "Mosenergo" annually submit reports to the Office of the Federal Service for Supervision in the field of Natural Resources for the Central Federal District (Federal Service for the Supervision of Natural Resource Usage), as follows:

2 tp (air) – Information about the protection of the atmosphere

2 tp (wastes) – Information about the formation, decontamination, transportation and disposal of production and consumer wastes, in natural units

2 tp (water resources) – Information on water use, in natural units

To develop the "Draft regulations on the emissions of harmful substances (pollutants) into the atmosphere and the harmful physical impact on it" a specialized organization is involved. Every 5 years an "inventory of stationary sources of pollutant emissions" is performed at the CHPs of the branches of OJSC "Mosenergo". The inventory results are approved by the Federal Service for the Supervision of Natural Resource Usage and the "Draft regulations on the emissions of harmful substances (pollutants) into the atmosphere and the harmful physical impact on it" are developed. These draft regulations are sent to the Federal Service for the Supervision of Natural Resource Usage. On the basis of the conclusion approved by the Federal Service for the Supervision of Natural Resource Usage a "permit to emit pollutants into the atmosphere for a period of five years" is issued.

Once a year the requirements for the maximum permissible emissions of pollutants are monitored, a report on the emission of pollutants into the atmosphere is drawn up and sent to the Federal Service for the Supervision of Natural Resource Usage. Every month an environmental engineer calculates the emissions released into the atmosphere. To confirm the calculations, pollutant emissions from stationary sources are measured every quarter, and the results are recorded in the Registration book of measurements.

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-1, M-5, M-9, M-10 (Table D1.1.1)	Low	It is calculated automatically by Automated measuring and information system for gas fiscal accounting. All calculations are performed on the basis of the measured data. All measurements are performed with calibrated metering instruments in accordance with the test procedure KRAU 1.456.001 MI and ZI2.838.009 D2. Grade of accuracy – 0.5%
M-2, M-6, M-11 (Table D1.1.3)	Low	This parameter is measured by certified Plant chemical laboratories. Laboratories pass certification every 4 years.
M-3, M-4,M-7, M-8, M-12, M-13, M-14, (Table D1.1.3)	Low	All measurements are performed with calibrated metering instruments in accordance with test procedure «SSM. Automated information and measuring system of commercial energy metering. Test procedure" № 38899-08 approved by FGUP "VNIIMS" in august of 2008. Grade of accuracy – 0.2%
M-15, M-16, M-17, M-18 (Table D1.1.3)	Low	It is calculated automatically by Automated measuring and information system for heat power fiscal accounting. All calculations are performed on the basis of the measured data. All measurements are performed with calibrated metering instruments in accordance with the test procedure MP 4218-010-42968951-2006. Grade of accuracy – 0.5%

The implementation of the monitoring procedures and the quality of the abovementioned parameters are guaranteed by meeting the requirements of the following documents:

- Federal law 26.6.2008 N 102-FZ "On ensuring the uniformity of measurements";
- "Requirements for the performance of calibration work" approved by Regulation No.17 of the RF Standardisation Metrology and Certification Committee dated September 21, 1994;
- State register of the international system of units;
- Industrial Regulations 50.2.006-94.

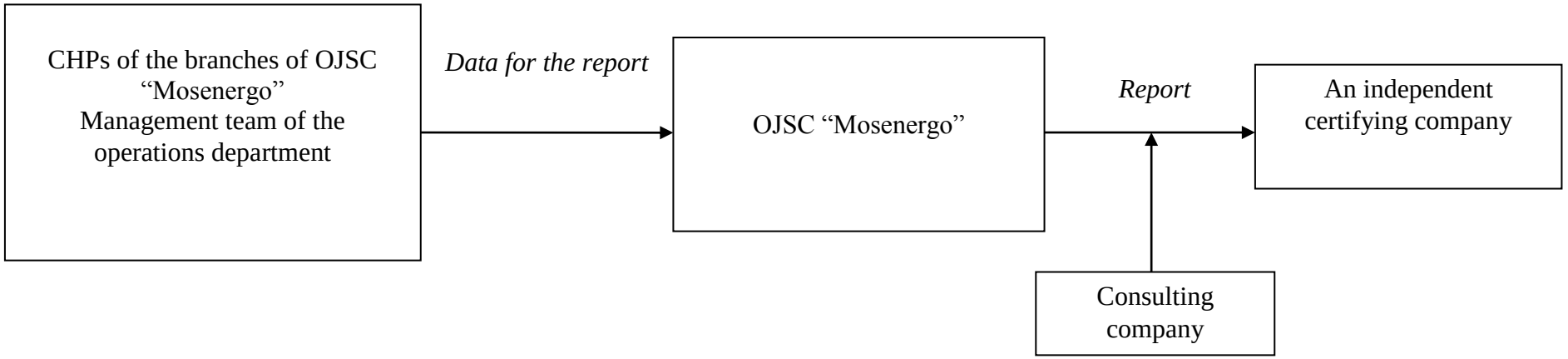
All measure devices have duplicate analogue on the case of fall out of measurement devices and data unavailable.

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

The Project operation structure refers to the data collection, transfer and storage system existing at a plan. All data required for determination will be stored for two years after the last transfer of the Emission Reduction Units under the project.

When implementing the monitoring plan, the scheme presented in Fig. D.3. will be applied to prepare verification reports.

Figure D.3. Operating and management scheme of the Project



For the implementation of the Project and the operational activity under the Project it is necessary to attract 46 additional operating personnel, and also conduct additional training. This is done under contract with the general contractor.

Table D.3-1 Data collection

Index	CHP-21	CHP-26	CHP-27	
			Unit No.3	Unit No.4
Generation of energy at the SGTU	Senior engineer from the production and technical department uploads the data from the Automated information and measuring system of commercial energy metering for importation into the form 3 TEH.	Senior engineer from the group of calculation uploads the data from the Automated information and measuring system of commercial energy metering for importation into the model 15506.	Senior engineer from the group of calculation uploads the data from the Automated information and measuring system of commercial energy metering for importation into the form TEP.	
Consumption of electric power for the SGTU auxiliaries				
Heat output from the SGTU	Senior engineer from the production and technical department uploads the data from the Automated measuring and information system for heat power fiscal accounting for importation into the form 3 TEH.	Senior engineer from the group of calculation uploads the data from the Automated measuring and information system for heat power fiscal accounting for importation into the model 15506	Senior engineer from the group of calculation uploads the data from the Automated measuring and information system for heat power fiscal accounting for importation into the form TEP	
Fuel consumption at the SGTU	Senior engineer from the production and technical department uploads the data from the Automated measuring and information system for gas fiscal accounting into the form 3 TEH.	Senior engineer from the group of calculation uploads the data from the Automated measuring and information system for gas fiscal accounting into the model 15506	Senior engineer from the production and technical department uploads the data from the Automated measuring and information system for gas fiscal accounting into the form TEP	
Net calorific value	The data from reports of plant chemical laboratory goes to ARM of production and technical department.	The data from reports of plant chemical laboratory goes to ARM of group of calculation.	The data from reports of plant chemical laboratory goes to ARM of group of calculation.	

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

The monitoring plan was developed by:
Closed Joint-Stock Company "National Carbon Sequestration Foundation" (Moscow);

Contact: Evgeniya Baydakova, Senior Expert of the Project Development Department;
Phone: 8 499 788 78 35 ext. 104
Fax: 8 499 788 78 35 ext. 107
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Contact: Nikolay Trofimov, Expert of the Project Development Department;
Phone: 8 499 788 78 35 ext. 111
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Closed Joint-Stock Company "National Carbon Sequestration Foundation" is not the project participant.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Following formulas are used to estimate project emissions:

$$PE_y = (FC_{SGTU\ CHP-21}+FC_{SGTU\ CHP-26}+ FC_{SGTU\ CHP-27\ №3} + FC_{SGTU\ CHP-27\ №4})_{21} *4{,}1868*10^{-6}* NCV_{f.e} *EF_{CO2,\ NG}$$ **(formula E.1-1)**

Where:
$FC_{SGTU\ CHP-21}$ – natural gas consumption at the SGTU-450 at CHP-21, t.f.e;
$FC_{SGTU\ CHP-26}$ – natural gas consumption at the SGTU-420 at CHP-26 , t.f.e;
$FC_{SGTU\ CHP-27\ №3}$ – natural gas consumption at the unit № 3 of SGTU-450 at CHP-27, t.f.e;
$FC_{SGTU\ CHP-27\ №4}$ – natural gas consumption at the unit № 3 of SGTU-450 at CHP-27, t.f.e;
$NCV_{f.e.}$ – Net calorific value of fuel equivalent, Kcal
$EF_{CO2,NG}$ – CO2 emission factor when combusting natural gas, tons of CO2/TJ
$4{,}1868*10^{-6}$ - factor of conversion from Kcal to TJ

Table E.1.1

Parameter	Units	Year				
		2008	2009	2010	2011	2012
Fuel consumption at SGTU 450 of CHP 21	t.f.e	188510	520850	505890	637605	552168
Fuel consumption at SGTU 420 of CHP 26	t.f.e				232922	735440
Fuel consumption at unit № 3 of SGTU 420 of CHP 27	t.f.e	642763	610468	791600	679252	679252
Fuel consumption at unit № 4 of SGTU 420 of CHP 27	t.f.e	19285	763975	758425	833106	833106
Net calorific value of fuel equivalent	Kcal	7000				
CO2 emission factor for natural gas	tons of CO2/TJ	56.1				
Project GHG emission	tCO2	**1 398 450**	**3 116 158**	**3 380 246**	**3 917 836**	**4 603 582**

E.2. Estimated leakage:

Table E.2.2

	2008	2009	2010	2011	2012
tCO_2	0	0	0	0	0

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

Table E.3.1

Year	Estimated GHG project emissions	Estimated leakage	The sum of project and leakages
2008	1 398 450	0	1 398 450
2009	3 116 158	0	3 116 158
2010	3 380 246	0	3 380 246
2011	3 917 836	0	3 917 836
2012	4 603 582	0	4 603 582
Total in 2008-2012.	**16 416 272**	**0**	**16 416 272**

E.4. Estimated baseline emissions:

Baseline emissions are determined in according with formulas presented in Section D 1.1.4.

Table E.4.1

№ of the line	Parameter	Units	Year				
			2008	2009	2010	2011	2012
1	Electricity output from SGTU 450 of CHP 21	MWh	743 084	1 874 818	1 896 815	2 385 365	2 061 378
2	Heat output from SGTU 450 of CHP 21	Gcal	150 980	616 471	273780	467 520	450 084
3	Electricity output from SGTU 420 of CHP 26	MWh				1 225 083	3 068 700
4	Heat output from SGTU 420 of CHP 26	Gcal				83710	1146600
5	Electricity output from unit № 3 of SGTU 450 of CHP 27	MWh	2 380 658	2287306	2979193	2501255	2501255
6	Heat output from unit №3 of SGTU 450 of CHP 27	Gcal	630 215	788 736	899 468	997 769	997 769
7	Electricity output from unit № 3 of SGTU 450 of CHP 27	MWh	122 872	2 856 881	2 898 636	3 176 188	3 176 188
8	Heat output from unit №3 of SGTU 450 of CHP 27	Gcal	10 893	779 500	855 365	935 761	93 5761
9	Emission factor	tCO2/MW	0.562	0.576	0.593	0.574	0.614

	for UPS Center	h					
10	Efficiency of gas boiler	%	92				
11	Emission factor for natural gas	tCO2/TJ	56.1				
12	Baseline emissions	tCO2	**2 028 119**	**4 600 711**	**5 128 276**	**5 911 524**	**7 479 231**

Detailed calculation is presented in excel tables.

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

Table E.5.1

	2008	2009	2010	2011	2012
tCO_2	629 668	1 484 553	1 748 031	1 993 688	2 875 649
Total (2008-2012)	**8 731 589**				

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

Table E.6.1

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)**
1	2	3	4	5
2008	1 398 245	0	2 028 119	629 668
2009	3 115 907	0	4 600 711	1 484 553
2010	3 379 926	0	5 128 276	1 748 031
2011	3 866 172	0	5 911 524	1 993 688
2012	4 653 789	0	7 479 231	2 875 649
Total (tonnes of CO2 equivalent)	**16 416 272**	**0**	**25 208 651**	**8 731 589**

Tables with calculations are in separate excel file in Annex 4.

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:

On January 10, 2005 the Town-Planning Code of the Russian Federation entered into force (of December 29, 2004 No. 190-FZ) which determines the procedure for project planning and the construction and commissioning of permanent buildings and facilities, according to which on the basis of Article 3 clause 2 "Any Federal laws and other normative legal acts of the Russian Federation taken in accordance with these laws, which contain the standards governing the relations towards town-planning development, cannot contravene this Code."

On the basis of Article 48 of Chapter 6 paragraph 12 - there is no requirement (or recommendation) to develop EIA documentation as part of the project documentation of permanent buildings and facilities.

On the basis of Article 49. About the State Expert Examination of the project documentation:

Clause 5. "The subject of the state expert examination of the project documentation is the assessment of compliance of the project documentation with the requirements of technical regulations, including sanitary and epidemiological requirements, ecological requirements, requirements of state protection cultural heritage sites, fire, industrial, nuclear, radiation and other safety requirements, as well as the results of engineering surveys".

Clause 9. "The result of the state expert examination of the project documentation is a conclusion about the compliance (approval) or incompliance (negative conclusion) of the project documentation with the requirements of the technical regulations and the results of the engineering surveys".

Technical regulations regarding sanitary, epidemiological and environmental requirements do not require the development of EIA documentation.

The list of required documents to be submitted to the state ecological expert examination at the project stage (issued by the Administration of the Russian Federal Service for Ecological, Technical and Atomic Supervision for the Moscow region, see Appendix No. 1), does not include EIA documentation.

Therefore, CHP-21,CHP-26 and CHP-27 developed, approved and provided in full accordance with the Town- Planning Code and the List all the required materials, and received approval from the State Environmental Expert Examination for the projects to expand the four combined-cycle units SGTU, and constructed and commissioned them.

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:

Based on the results of the conclusion of the expert commission of the Moscow Interregional Territorial Administration of Technical and Environmental Surveillance, CHP-21 was given a favourable conclusion approved by the order of the administration No. 344 dated November 3, 2006.

Based on the results of the State Environmental Expert Examination (SEEE) the State institution "The central administration of the State Expert Examination" gave CHP-26 a favourable conclusion of the State expert examination No. 330-08/SEEE – dated May 4, 2008.

Based on the results of the SEEE the State institution "The central administration of the State Expert Examination" gave CHP-27 a favourable conclusion of the State expert examination No. 02-EE-91603-06 dated February 15, 2006.

SECTION G. Stakeholders' comments

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

In accordance with the decision No. 1-2-PMC of the "Municipal meeting of the Dmitrovskoe intra-city municipality in the city of Moscow" the decision was taken to approve the project to expand CHP-21 with the power unit SGTU-450.

The SGTU-420 power unit at CHP-26 is being constructed on the territory of the operating plant in the industrial area of the city of Moscow. Public hearings were held on September 14, 2006, and comments have not been received. According to Decision No. MBZ-03-67/6 dated September 14, 2006, the Municipal meeting approves the construction of the additional power unit No.8 of the SGTU-420 MW at CHP-26.

Public hearings on the construction of two SGTU-450s were held on September 21, 2005. According to the decision the meeting of the Council of Deputies of the Mytischi district approved the project. No comments have been received.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Organisation:	**Open Joint Stock Company** "Mosenergo"
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Annex 2

BASELINE INFORMATION

Key information and data to establish baseline are presented in section B1 of the PDD.

Annex 3

MONITORING PLAN

Detailed description of the monitoring plan is presented in section D of the PDD.

Annex 4

Excel tables with initial data and calculations of emission reduction and financial/economic indicators and sensitivity analysis (attached in a separate excel file)


Лист Microsoft Excel 97-2003


Лист Microsoft Excel 97-2003

Calculation of $EF_{grid2008}$

For calculation $EF_{grid2008}$ data from Research conducted by Lahmeyer International:
"Dynamics of the development of the carbon emission factor during the generation of electric energy in Russia" were used.
Calculation was made by the least square method with use of trend line diagram.
For calculation the sample of EF_{grid} UPS Center for the period 2009-2014 was taken:

	2009	2010	2011	2012	2013	2014
EF_{grid} (t CO_2/MWh)	0,576	0,593	0,574	0,614	0,635	0,623

The following equation was obtained: $y = 0.0115 x + 0.5624$; $R^2 = 0.7148$
So, $EF_{grid2008}$=0.5624.

More detailed calculation is presented in excel file "Mosenergo ERU v.3", sheet "$EF_{grid2008}$"

Annex 5

List of abbreviations

SGTU- steam-gas turbine unit

CHP –heat and power station

UPS – unified power system

OJSC – open joint stock company

LMZ – Leningradskyi metal zavod

SDPS – State district power station

DIP – Department of investment policy