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

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

«Implementation of 800 MW power generating unit No.2 at Nizhnevartovskaya GRES»

Sectoral scope 1: Energy industries (renewable - / non-renewable sources)

PDD Version: 05

Date: 10/04/2012

A.2. Description of the project:

Situation existing prior to the starting date of the project

The Nizhnevartovskaya GRES (Nizhnevartovsk State Regional Power Plant (SRPP)) is located 15 km away from Nizhnevartovsk city, on the banks of the Vakh River. It was built to supply power to the largest region of Khanty-Mansy Autonomous Okrug - Yugra, where the main oil and gas companies are located. The power plant was built for the purposes of these companies.

Nizhnevartovskaya GRES is the youngest of its kind in Europe. It is one of the most environmentally friendly plants. The plant is one of the largest suppliers of electrical power in the Ural Federal District.

Nizhnevartovskaya GRES runs on associated petroleum gas (APG). Its installed capacity in terms of electric energy before the project was 800 MW of electricity and 140 Gcal/h of heat energy. APG supply is provided by the Nizhnevartovsk and Belozernyi gas treatment plants. Due to the projected deficiency of power in the Ural region, the issue of the need for new generating capacity and a modern approach to achieving this target arose.

One of the measures aimed at addressing the shortage of electricity was the decision to commission the second power generating unit at Nizhnevartovskaya GRES with the involvement of joint implementation mechanism.

Project scenario

The project aims to improve the reliability and quality of electrical and thermal energy supply to the different groups of consumers of the Ural Federal District by the use of modern technologies that reduce pollution, including greenhouse gas (GHG) emissions.

The project activities include construction of the second power generating unit at Nizhnevartovsk State Regional Power Plant with installed capacity of 800 MW of electricity and 140 Gcal/h of heat energy. Fuel for the new power generating unit will be dry stripped gas obtained from treatment of associated petroleum gas from oil fields in the Nizhnevartovsk region at Nizhnevartovsk and Belozernyi gas treatment plants. The quality of the APG supplied meets the requirements of OST 51.40-93 (Combustible natural gases supplied and transported by trunk pipelines). This APG composition is almost identical to natural gas. The methane content in this APG is about 94-95%.

After the project implementation the new power generating unit will supply electricity to the United Regional Power System (UPS) “Ural” grid. Electricity produced by the new power generating unit, will replace electricity that in case of the absence of the project would be generated by other existing power plants and other new power generating units of UPS “Ural”.

Greenhouse gas emissions will be reduced due to the substitution of electricity from the grid produced by combusting fossil fuel with the electricity generated by Nizhnevartovskaya GRES that will produce electricity with lower GHG emissions in comparison with electricity from UPS “Ural”.

Baseline scenario

The baseline scenario is based on the assumption that if the project is not implemented, i.e. additional electricity equivalent to capacity of the second power generating unit of Nizhnevartovskaya GRES is not supplied to the grid, other power generating companies will cover the energy demand. The power generating companies within the unified power system (UPS "Ural") can increase electricity generation at the existing capacities by delaying decommissioning of outdated equipment and/or installing new power generating units.

A JI specific approach was used for the baseline setting. More detailed information is provided in Section B.

Brief history of the project

RAO "UPS of Russia" (Unified Power Systems of Russia) had started gearing up for implementation of the Kyoto mechanisms long before the Protocol was ratified by the Russian Federation. RAO "UPS of Russia" has made every effort to cooperate with the UNFCCC (United Nations Framework Convention on Climate Change). For those purposes, the Energy Carbon Fund[1] was established in 2000.

The main results of the Fund's operation are as follows:

- Together with OJSC RAO "UPS of Russia" it took a comprehensive survey of greenhouse gas emissions from energy sector covering the period from 1990 in accordance with the world standards; an emission inventory was created;
- A greenhouse gas emission monitoring system, including an accounting and reporting system, is up and running; emission inventories are developed;
- A number of joint implementation (JI) projects were prepared for approval by government authorities, some of these projects already have positive determination by international auditors; foreign investors were involved in these projects;
- Together with regional energy generators, the Fund participated in international tenders for purchase of GHG emissions;
- "Greenhouse Gases", an information analysis system, was developed and introduced at a number of regional energy companies;
- Projected volumes of emissions of the Unified Power System of Russia have been estimated;
- Several regulatory and methodological guidelines were issued and are in effect in the energy sector, including the method for calculation of GHG emissions from thermal power plants.

On June 1, 2000, a contract No. E/4 for the engineering services, equipment supply, construction and assembly operations, commissioning works and development and implementation of an automated technological process control system was signed. OJSC "IK Quartz" acts as general contractor under this contract.

On October 13, 2003, power generating unit № 2 was thrown on the load. On November, 14 a ceremony of commissioning of the second power generating unit of Nizhnevartovskaya GRES, which was attended by heads of Government of the Russian Federation, RAO UPS of Russia, Presidential Plenipotentiary in the Ural Federal District, Governor of the Tyumen Region and KMAO.

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[1] http://www.carbonfund.ru/about/general_information

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)
Russia (host Party)	• CJSC “Nizhnevartovskaya GRES”	No
Switzerland	• VEMA S.A.	No
*Please indicate if the Party involved is a host Party.		

A.4. Technical description of the project:

A.4.1. Location of the project:

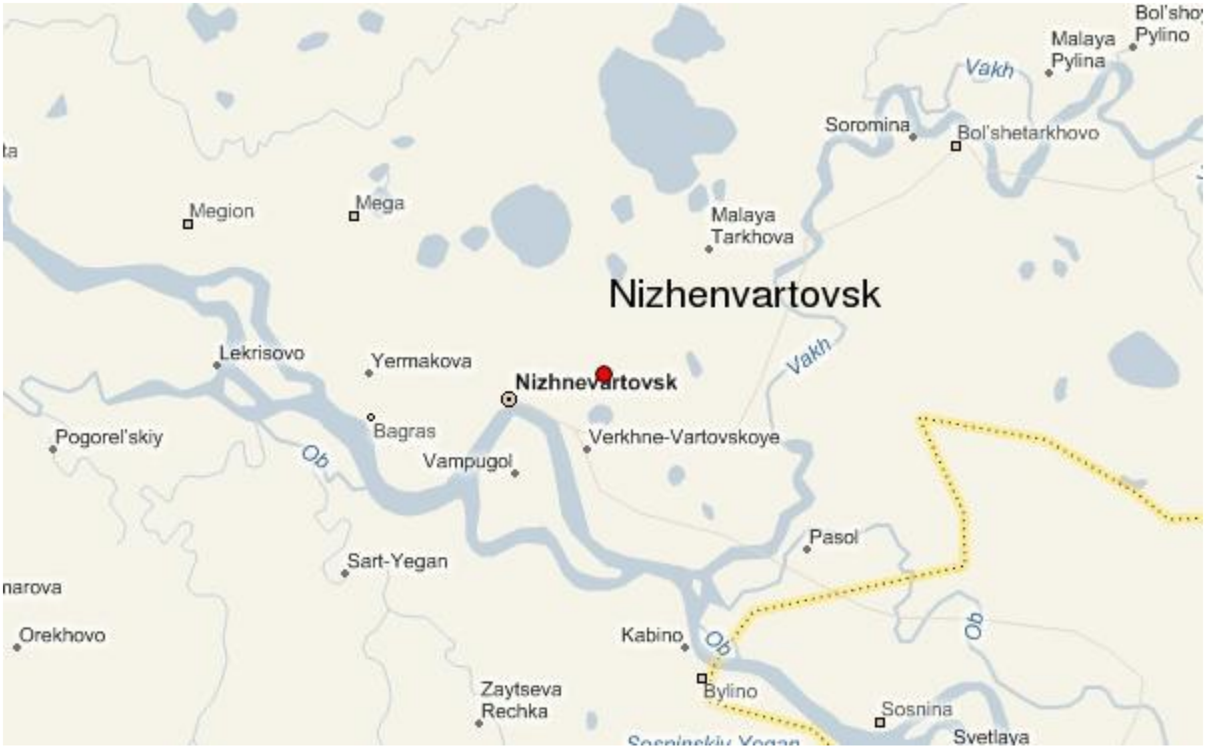

Figure A.4.1.1 – Location of the Nizhnevartovsk State Regional Power Plant on the map

The site of Nizhnevartovsk State Regional Power Plant is located in the turn of the Vakh river in the east of the Khanty-Mansy Autonomous Okrug in the Nizhnevartovsk region near Izluchinsk urban settlement, the Russian Federation.

Figure A.4.1.2 – Photo of Nizhnevartovsk State Regional Power Plant

A.4.1.1. Host Party(ies):

The project is located in the territory of the Russian Federation.

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

Khanty-Mansy Autonomous Okrug – Yugra.

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

Izluchinsk urban settlement.

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

Geographic coordinates are 60 ° 59 ' north latitude, 76 ° 57' east longitude.

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

A new power generating unit with installed power capacity of 800 MW was implemented under the project. Fuel for the new power generating unit will be dry stripped gas obtained from treatment of associated gas from oil fields in the Nizhnevartovsk region at Nizhnevartovsk and Belozernyi gas treatment plants. (NVGTP and BGTP). The quality of the APG supplied meets the requirements of OST 51.40-93 (Combustible natural gases supplied and transported by trunk pipelines).

APG supply to the plant is provided from the gas transmission system pipeline BGTP – trunk pipeline "NVGTP - Parabel - Kuzbass» via GDS - 1. Fuel oil facilities are in place to be used as an emergency fuel (for heating purposes). The APG transportation system of the plant provides APG compression. Power generating unit No. 2 is located in the territory of existing Nizhnevartovskaya GRES. The operation of the power generating unit is in base-load operation condition.

Power delivery from the power plant is carried out through the open distribution units (ODU) by the transmission lines (overhead lines (OL)) with a voltage of 220 kV and 500 kV.

The connection between ODU of 220 kV and 500 kV is carried out by auto-transformer (AT) of 500/220/35 kV with power of 3x167 MVA. The winding of 35 kV of AT is used to power 2PTCH (standby power generating unit transformer).

Main generators 1 and 2 are connected to MRF-220 MRF-500 kV, correspondingly, through step-up transformers with capacities of 1000 MVA each.

The in-house consumption has a block design. Motor drives with powers of 220 kW and above operate at a voltage of 6 kV, motor drives of lower power use 0.4 kV.

Auxiliary switchgears of power generating unit № 2 V 6/0,4 kV are powered by an auxiliary transformer (TSN) 24/6/6 kV 40 MVA. For reserve, two auxiliary transformers 40 MVA each are used, one having a voltage of 220/6/6 kV and another - 35/6/6 kV.

The power generating unit is equipped with a high-power steam boiler PP-2650/255GM (TGMP-204KhL). The supercritical gas-oil-fired close-coupled arch unifold reheat boiler is produced by the Taganrog Boiler Plant "Krasnyi kotelshchik". The boiler consists of a furnace, a horizontal flue and a convection shaft. The state-of-the-art balanced-flue boiler is designed to work with positive pressure.

APG is combusted in the furnace on 36 burners (situated in 3 tiers, 12 burners each, plus 6 burners in the front and 6 in the rear end of the furnace). Flue gases generated in the course of fuel combustion are used for steam superheating in a platen reheater, high-pressure convective reheater and low-pressure convective reheater. Flue gases then pass through a regenerator-type air heater to go to a chimney flue. Supercritical-pressure steam is transferred via two steam conduits to a high-pressure cylinder (HPC) with multiple steam nozzle control. After the HPC, steam returns to the boiler where it is reheated through low-pressure convective reheater (counter flow steam and flue gas movement). After the reheater, steam returns to the turbine, passing through medium-pressure cylinders and low-pressure cylinders 1, 2, 3.

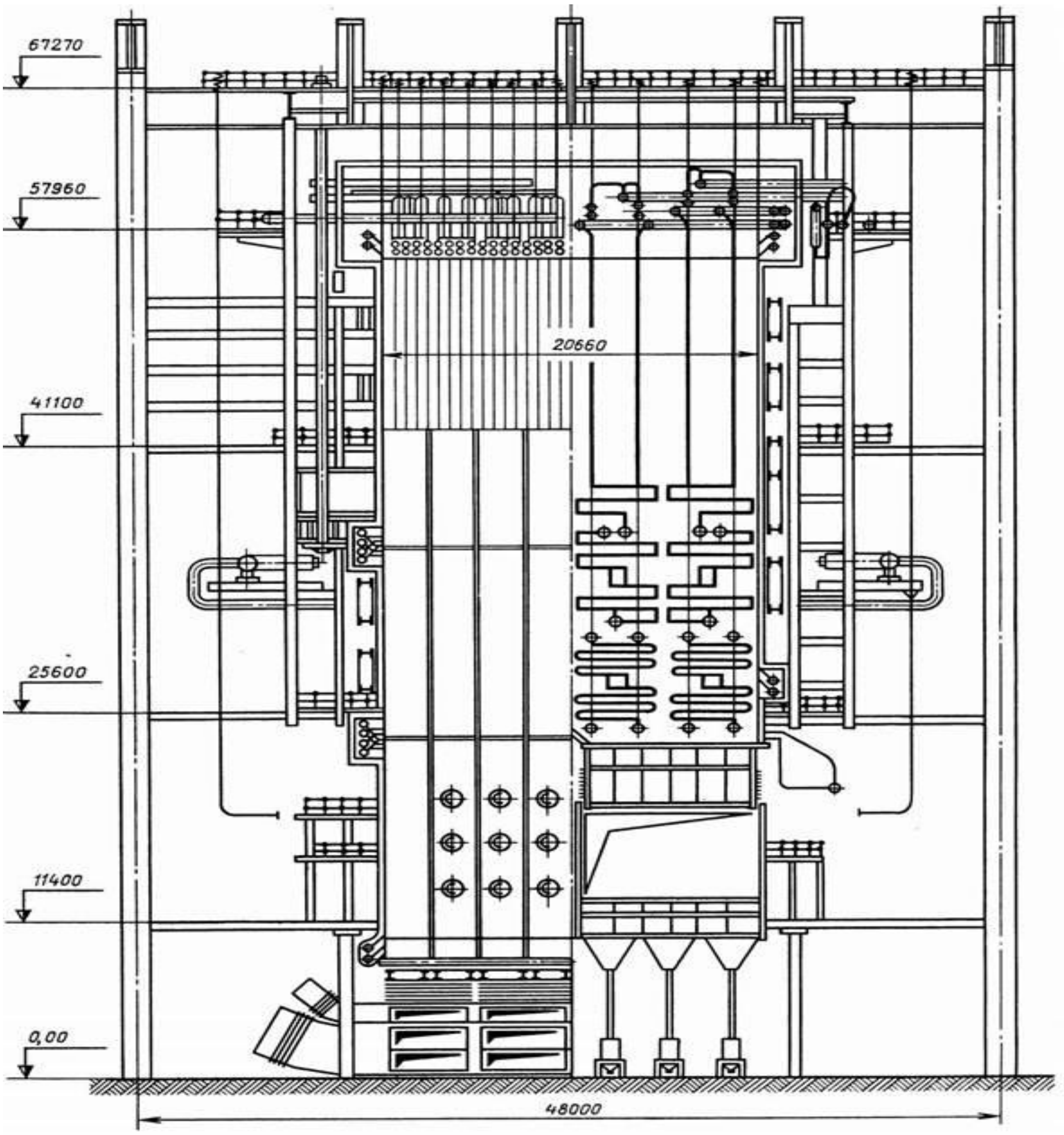

Figure A.4.2.1 – A cross-sectional view of boiler PP-2650/255GM (TGMP-204KhL)

Turbine K 800-240-5LZM is a 800 MW condensing turbine designed for direct alternating current generator drive TVV 800-2 LEO "Elektrosila" with terminal voltage of 24 kV.
The turbine consists of:

– A high-pressure cylinder (HPC) – 12 stages
– A medium-pressure cylinder (MPC) – 18 stages
– A low-pressure cylinder (LPC) – 1, 2, 3.

LPCs are double-flow, each consisting of 10 stages (5 stages per flow).
Steam from the LPC is fed to a condensing unit.
The turbine has eight bleed-offs to supply steam to regenerator-type heaters and charge pump turbo-drives.
This turbine is a five-cylinder consing turbine with steam reheater and six exhausts into two capacitors.
An extensive alternate-stress operational background of the turbines proves their unique reliability and cyclic load capability.
Index 5 modification of K 800-240 turbine is the latest modernization of K 800-240 turbine.

Figure A.4.2.2 – A photo of K-800-240-5LZM turbine

The principal scheme of K-800-240-5LZM is shown in Figure A.4.2.3.

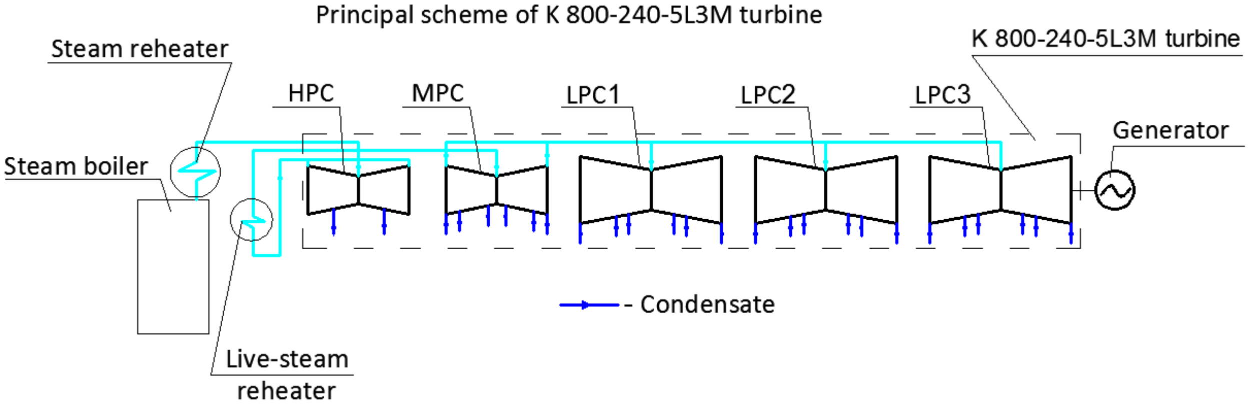

Figure A.4.2.3 – The principal scheme of K-800-240-5LZM turbine

Generator TVV-800-2UZ is a double-pole conductor-cooled 800 MW turbine generator designed to operate indoors under the moderate climate conditions without artificial climate control. The turbine generator is designed for electricity generation for a long standard-rating duration with direct connection with K-800-240-5LZM.

Turbine generator is one of the most up-to-date machine types, making 81-82% of the total generator capacity in Russia.

Main transformer TNTs-1000000/500-U1 is a three-phase double wound power transformer. The unit is designed to work along with a 500 000 kW generator with AC network frequency of 50 GHz.

In general, turbine generators with hydrogen-water cooling system are highly economic, cyclic load capable, easy to operate and able to operate in various climatic conditions. Main specifications of power generating unit No.2 of the Nizhnevartovskaya GRES are provided in Table A.4.2.1, and simplified electricity generation scheme is shown in Figure A.4.2.4.

Table A.4.2.1 – Main specifications of power generating unit No.2 of the Nizhnevartovskaya GRES

Equipment	Number	Specification

K 800-240-5LZM turbine	1	Rated / maximum power 800/850 MW, initial steam parameters: P=23,5 MPa, temperature 540 °C, rated consumption of live steam 2450 t/h
Boiler PP-2650/255GM (TGMP-204KhL)	1	P=25 MPa, unit power 800 MW, steam capacity 2650 t/h, live steam temperature 545°C, efficiency factor 94.7%
Generator TVV-8002UZ	1	Power 800 MW, cos φ=0.9, primary voltage 24 kV, stator current 21.4 kA, rotation frequency 3000 rpm, efficiency factor 98.75%
Main transformer TNTs-1000000/500-83U1	1	Cooling system - oil injection, rated voltage (primary) 525 kV, rated voltage (secondary) 24 kV, rated power 1000000 kVA

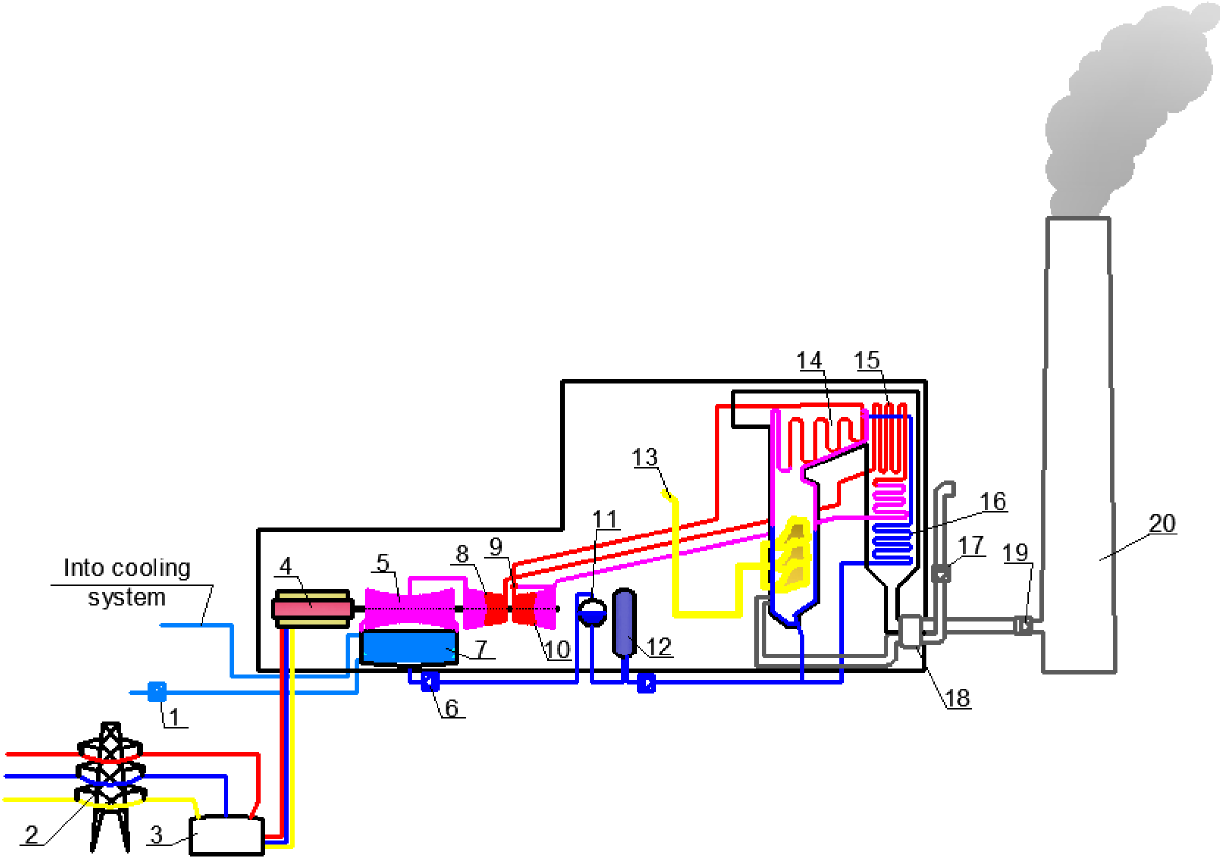

Figure A.4.2.4 –Simplified scheme of electricity generation at power generating unit No.2
1 – circulating pump; 2 – transmission line; 3 – step-up transformer; 4 – turbine generator; 5 – low-pressure cylinder; 6 – condensate pump; 7 – surface condenser; 8 – medium-pressure cylinder; 9 – shut-off valve; 10 – high-pressure cylinder; 11 – deaerator; 12 – regenerative reheater; 13 – APG supply; 14 – superheater; 15 – reheater; 16 – economizer; 17 –blow fan; 18 – regenerative air preheater; 19 – smoke exhauster; 20 – smoke flue.

Feedwater pump feeds the water under high pressure, fuel and atmospheric air to the boiler. Combustion process occurs in the furnace where chemical energy is transformed into thermal or radiant energy. Feedwater passes through a system of pipes within the boiler. The fuel combusted is a powerful source of heat that is transferred to the feedwater which boils and evaporates. The steam generated is superheated to approximately 540° C under the pressure of 13-24 MPa and is transferred to a steam turbine via several pipelines.
The steam turbine, an electric generator and an exciter comprise a turbine unit. In the steam turbine, steam expands at extremely low pressure (some 20 times lower than atmospheric pressure), and potential energy of compressed and heated to high temperature steam is converted to motional energy that makes

turbine rotor spin. The turbine gears the electric generator that converts the motional energy of spinning generator rotor into electric current. The electric generator consists of a stator whose electric coils generate current, and a rotor, which is a spinning electric magnet driven by the exciter.
Condenser is used for condensing of steam from the turbine and creation of deep draft that makes steam expand in the turbine. It creates vacuum at the turbine outlet, so steam that passes through high-pressure turbine moves towards the condenser and expands, which converts its potential energy to mechanical work.

Table A.4.2.2 – Project implementation schedule

Stage	Period
Engineering	2000-2002
Equipment procurement	2000-2002
Construction & Assembly	2000-2002
Pre-commissioning	2000-2002
Commissioning	2003

Power generating unit No.2 of the Nizhnevartovskaya GRES is the most economic of its kind used at thermal power plants of such a class. The unit employs new highly efficient technologies, including the cutting-edge control system based on the automated technological process control system (ATP CS).

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 lead to reduction of greenhouse gas emissions from fossil fuel combustion. The main greenhouse gas from fossil fuel combustion is CO_2. Emissions of N_2O and CH_4 from fuel combustion are negligible and were not taken into consideration in the process of project development.

Reduction of GHG emissions from the project will be achieved due to replacement of the electricity produced by the Ural UPS at, as a rule, less efficient thermal power plants than Nizhnevartovsk State Regional Power Plant. The Russian energy sector has a large number of old, worn-out power plants that are characterized by low efficiency. They have been operated for decades. According to OJSC “RAO UPS of Russia”, the average life of turbines is approximately 30 years. Most of the generating capacity of UPS "Ural" was put into operation in 1971-1980 (31.4% of installed capacity).

Specific emissions from electricity generation by the second power generating unit of Nizhnevartovsk State Regional Power Plant are 0.54 t CO_2/MWh, and the baseline emission factor for electricity production in the UPS "Ural" is 0.606 t CO_2/MWh.

It is unlikely that the project would be implemented in the absence of the joint implementation mechanism, considering the following circumstances:

- The project implementation requires serious investments whereas the return on investments without additional revenues from sale of greenhouse gas emission reductions is not sufficiently high for this project;
- There are no restrictions on GHG emissions for companies in Russia;
- It is not expected that there will be any significant changes in Russian environmental legislation relating to restrictions on GHG emissions of companies.

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

Table A.4.3.1.1 – Estimated amount of emission reductions over the first commitment period (2008-2012)

	Years
Length of the crediting period	5
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2008	648 201
2009	555 145
2010	669 792
2011	655 929
2012	545 768
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	3 074 834
Annual average of estimated emission reduction over the crediting period (tonnes of CO_2 equivalent)	614967

Table A.4.3.1.2 – Estimated amount of emission reductions for the period following the first commitment period (2013-2020)

	Years
Length of the crediting period	8
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2013	583 873
2014	583 873
2015	583 873
2016	583 873
2017	583 873
2018	583 873
2019	583 873
2020	583 873
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	4 670 980
Annual average of estimated emission reduction over the crediting period (tonnes of CO_2 equivalent)	583 873

A.5. Project approval by the Parties involved:

After completing the project analysis, the PDD and other relevant documents will be submitted to the Ministry of Economic Development of the Russian Federation for approval of the project. Project approval from Switzerland will be also obtained.

SECTION B. Baseline

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

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

In accordance with paragraph 9 of the "Guidance on criteria for baseline setting and monitoring"[2], version 03 (hereinafter - the Guidance), Project participants may select either:
(a) An approach for baseline setting and monitoring developed in accordance with appendix B of the JI guidelines (JI-specific approach); or
(b) A methodology for baseline setting and monitoring approved for the clean development mechanism (CDM); or
(c) An approach for baseline setting and monitoring already taken in comparable JI cases.

The proposed project uses the JI-specific approach for baseline setting and monitoring for this JI project. This approach employs some elements of approved methodology AM0029 "Baseline methodology for grid connected electricity generation plants using natural gas"[3], version 03.

The proposed approach includes the following three stages:

1. Establishment of the baseline in accordance with paragraphs 23-29 of the Guidance;
2. Detailed description of baseline scenario;
3. Demonstration of additionality in accordance with the "Tool for the demonstration and assessment of additionality"[4] version 05.2.1;

The following key factors were taken into account during establishing the baseline[5]:

- Sectoral policies and legislation;
- Economic situation in the relevant sector as well as expected energy demand;
- Availability of capital (including investment barriers);
- Fuel prices and availability;
- Local availability of technologies/techniques;
- Taking account of uncertainties and using conservative assumptions;
- In such a way that ERUs cannot be earned for decreases in activity levels outside the project activity or due to force majeure.

Step 2. Application of the approach chosen

Stage 1: Establishing the baseline by choosing the most plausible one

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[2] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf

[3] http://cdm.unfccc.int/filestorage/C/D/M/CDMWF_AM_15YH7UTNQ40J8MGMVX62CGNE0K49Y0/EB39_repan03_AM0029_ver03.pdf?t=Unh8bHkxd2RpfDCByH6lunDlb7X5uSGSQrSw

[4] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.1.pdf

[5] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf

Sub-stage 1a. Identification and list of the most plausible alternative baseline scenarios The proposed project provides for commissioning of new 800 MW power generating unit No.2 fuelled by APG at Nizhnevartovskaya GRES. As shown in Section A.2, power generating units of other types and other fuel types were not considered as alternatives for the proposed project. After the project implementation, the new power generating unit will supply electricity to the grid of the United Regional Power System (UPS) "Ural". Therefore, based on the JI specific approach presented above, four plausible alternative baseline scenarios were identified:

Alternative scenario 1: The proposed project is not implemented as a JI project.
Alternative scenario 2: Electricity to be generated by the project is supplied to the grid by other existing power plants of UPS "Ural";
Alternative scenario 3: Electricity to be generated by the project is supplied to the grid by other new power generating units of UPS "Ural";
Alternative scenario 4: Electricity to be generated by the project is supplied to the grid by other existing power plants and other new power generating units of UPS "Ural".

These four alternative scenarios are described below in more detail.

1) The proposed project is not implemented as a JI project

New power generating unit No.2 with a capacity of 800 MW will be constructed at Nizhnevartovskaya GRES and commissioned in November 2003. APG will be used as fuel. After the project implementation, electricity generated by the new power generating unit will be supplied to the grid of UPS "Ural". It will substitute electricity which otherwise would be generated at other power plants of UPS "Ural".

2) Electricity to be generated by the project is provided by other existing plants of UPS "Ural"

Nizhnevartovskaya GRES does not install the new power generating unit and project electricity generation shall be covered by other existing power plants within UPS "Ural" existing in the particular year of planned electricity production.

3) Electricity to be generated by the project is provided by other new power generating units of UPS "Ural"

Nizhnevartovskaya GRES does not install the new power generating unit and project electricity generation shall be covered by other new power generating units within UPS "Ural" constructed by other power producers.

4) Electricity to be generated by the project is provided by other existing plants and other new power generating units of UPS "Ural"

Nizhnevartovskaya GRES does not install the new power generating unit and project electricity generation shall be covered by other existing power plants and other new power generating units within UPS "Ural" constructed by other power producers. This alternative combines alternatives 2 and 3.

Sub-stage 1b. Identification of the most plausible alternative scenario

Assessment of alternative scenario 1: The proposed project is not implemented as a JI project

There are no technical barriers for implementation of the proposed project: required volume of APG is available, the technology as such has been implemented and electricity generated by the new power generating unit may be supplied into the grid without any limitations.

However, as Section B.2 demonstrates, the project is economically unattractive and is associated with major investment and long payback period. Taking into account this fact, the scenario is not the most plausible one.

Assessment of alternative scenario 2: Electricity to be generated by the project is provided by other existing plants of UPS "Ural"

One of the main infrastructure problems of Urals region is energy shortage. The problem is aggravated by poorly developed grid complex of the region for necessary traffic to the consumer. Rapidly developing megalopolises (e.g. Tyumen, Yekaterinburg) and large industrial generation centres suffer the most from short power generation and energy traffic problems. Estimated power requirements of UPS "Ural" for 2007 are around 3700–3800 MW.

Thus, the existing power plants alone are unable to cover the future demand for electricity. Since this alternative scenario entails no financial expenses, it is realistic and feasible.

Assessment of alternative scenario 3: Electricity to be generated by the project is provided by other new power generating units of UPS "Ural"

Only one new power generating unit is planned for installation in 2002-2004: power generating unit No.1 at the Tyumen TPP-1. The new unit will have an installed capacity of 190 MW and combined cycle turbines. The Tyumen TPP-1 will be fuelled by gas. This is insufficient to substitute electricity generation in the project framework.

Therefore, this alternative scenario 3 is not realistic.

Assessment of alternative scenario 4: Electricity to be generated by the project is provided by other existing plants and other new power generating units of UPS "Ural"

As demonstrated in assessment of alternatives 2 and 3, future demand in the electricity market cannot be covered by neither the existing power plants nor new power generating units.
However this scenario is not associated with any investments or risks for company. It is not require any actions from company and reflects existing practice.

Thus, this alternative is realistic and feasible.

Conclusion

Only Alternative 4 appears to be realistic and reasonable and is selected as the baseline scenario.

Stage 2: Detailed description of baseline scenario

The baseline scenario is based on the assumption that if the project is not implemented, i.e. additional electricity equivalent to capacity of the second power generating unit of Nizhnevartovskaya GRES is not supplied to the grid, other power generating companies will cover the energy demand. The power generating companies within the unified power system (UPS "Ural") can increase electricity generation at the existing capacities by delaying decommissioning of outdated equipment and/or installing new power generating units. Baseline scenario doesn't require the involving long-term investments. There are no legislation barriers for baseline scenario. There are no barriers for CJSC "Nizhnevartovskaya GRES" for further operation of the existing facilities at the previous level and this practise is most desirable for the company because it is not associated with any risks.

For the production of heat energy on the generating unit #2 of Nizhnevartovskaya GRES is used heating-water converter plant, including the main boiler types of PSV-500-3-23 and the peak boiler type PSV-500-14-23, a total installed capacity of 140 Gcal/h, which uses waste steam from the turbine extractions for heat generation. Heat production schedule is determined by the temperature (outside air temperature), the load of power generation unit #2 (steam pressure at turbine extractions). Heat produced is used for the own needs of CJSC "Nizhnevartovskaya GRES" to heat supply of Izluchinsk urban settlement, whose residents service the station (The settlement arose in 1988 in connection with the construction at the Nizhnevartovskaya GRES). The use of waste steam in heating-water converter plant in such volumes does not affect the efficiency of electricity production. Emissions associated with the production of heat energy are not included in the calculations, following the principle of conservatism. Therefore, it is not assumed additional heat generation in the ECO "Ural" in baseline scenario.

The methodology of calculating the baseline emissions:

Baseline GHG emissions for monitoring period *"y"* are determined as follows:

$$BE_y = BE_{elec,y} + BE_{heat,y}, \qquad (B.1)$$

where:

$BE_{elec,y}$ - Baseline emissions from generation of electricity equivalent to electricity generated by the second power generating unit of Nizhnevartovskaya GRES into the UPS "Ural" in monitoring period "*y*", t CO_2e;

$BE_{heat,y}$ - Baseline emissions from generation of heat energy by the second power generating unit of Nizhnevartovskaya GRES in monitoring period "*y*", t CO_2e;

Taking into account mentioned above, we assume that $BE_{heat,y}$ =0. This assumption is consistent with the principle of conservatism.

$$BE_{elec,y} = (EG_{PJ,y} - EG_{AUX,y}) \cdot EF_{BL,CO2,y}, \qquad (B.2)$$

where

$BE_{elec,y}$ - Baseline emissions from generation of electricity equivalent to electricity generated by the second power generating unit into the UPS "Ural" in monitoring period "*y*", t CO_2e;

$EG_{PJ,y}$ - Electricity generated by the second power generating unit of Nizhnevartovskaya GRES and supplied into UPS "Ural" in monitoring period *y*, MWh;

$EG_{AUX,y}$ On-site electricity consumption by Nizhnevartovskaya GRES in period *y*, MWh;

$EF_{BL,CO2,y}$ - Baseline GHG emission factor in the course of electricity generation in UPS "Ural", t CO_2/MWh.

The calculations are presented in Supporting Document 1 attached to the PDD.

Data and parameters for determining the baseline emissions 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:

Data / Parameter:	$EF_{BL,CO2,y}$
Data unit:	t CO_2/MWh
Description:	Baseline emission factor in the course of electricity generation in UPS "Ural"
Time of determination / monitoring	Fixed value for the first commitment period
Data source:	JI project JI0422 "Installation of two CCGT-400 at Surgutskaya TPP-2, OGK-4, Tyumen area, Russia", determined by Bureau Veritas

	Russia[6].
Value of data applied:	0.606
Justification of the choice of data or description of measurement methods and procedures (to be) applied:	Since the value of this factor was determined in the JI Project JI0422 "Installation of two CCGT-400 at Surgutskaya TPP-2, OGK-4, Tyumen area, Russia"[7], the use of this factor is reasonable as it was developed for the same UPS (UPS "Ural") and the power generating units are comparable by their capacity (Surgutskaya TPP-2 launches two units with the total capacity of 800 MW).
QA/QC procedures (to be) applied	-
Any comment	Calculation of the factor made in the JI project JI0422 "Installation of CCGT-400 at Surgutskaya TPP-2, OGK-4, Tyumen area, Russia" is provided in Annex 2 for information.

Data and parameters for determining the baseline emissions 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 is absent.

Data and parameters for determining the baseline emissions that are monitored throughout the crediting period:

Data / Parameter:	$EG_{PJ,y}$
Data unit:	MWh
Description:	Net electricity generated by power generating unit No.2 of Nizhnevartovskaya GRES (electricity substituted by third parties in the baseline scenario)
Time of determination / monitoring	Crediting period
Data source:	Information provided by Nizhnevartovskaya GRES
Value of data applied:	Refer to Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied:	The amount of electricity generated by power generating unit No.2 is metered with standartized electricity meters.
QA/QC procedures (to be) applied	Electricity meters are subject to calibration in accordance with legislation of the Russian Federation and requirements of the manufacturer. For more details refer to Section D.
Any comment	

Data / Parameter:	$EG_{AUX,y}$
Data unit:	MWh
Description:	On-site electricity consumption by Nizhnevartovskaya GRES
Time of determination /	Crediting period

[6] http://www.sbrf.ru/common/img/uploaded/files/tender/kioto2/27_OGK4_Surgutskaya_PGU800.pdf

[7] http://www.sbrf.ru/common/img/uploaded/files/tender/kioto2/27_OGK4_Surgutskaya_PGU800.pdf

monitoring	
Data source:	Information provided by Nizhnevartovskaya GRES
Value of data applied:	Refer to Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied:	The amount of electricity consumed on-site is metered with standartized electricity meters.
QA/QC procedures (to be) applied	Electricity meters are subject to calibration in accordance with legislation of the Russian Federation and requirements of the manufacturer. For more details refer to Section D.
Any comment	

Stage 3: Demonstration of additionality of the project
Refer to Section B.2.

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:

In accordance with paragraph 44 of Annex 1 of the "Guidance on criteria for baseline setting and monitoring”"[8], additionality can be demonstrated by using one of the following approaches:

(a) Provision of traceable and transparent information showing that the baseline was identified on the basis of conservative assumptions that the project scenario is not part of the identified baseline scenario and that the project will lead to reductions of anthropogenic emissions by sources or enhancements of net anthropogenic removals of GHGs;

(b) Provision of traceable and transparent information that an accredited independent entity has already positively determined that a comparable project (to be) implemented under comparable circumstances (same GHG mitigation measure, same country, similar technology, similar scale) would result in a reduction of anthropogenic emissions by sources or an enhancement of net anthropogenic removals by sinks that is additional to any that would otherwise occur. In addition, a justification why this determination is relevant for the project at hand shall be provided.

(c) Application of the most recent version of the “Tool for the demonstration and assessment of additionality” approved by the CDM Executive Board (allowing for a grace period of eight months when the PDD is submitted for publication on the UNFCCC JI website), or any other method for proving additionality approved by the CDM Executive Board.

In this PDD, the most recent version of the “Tool for the demonstration and assessment of additionality”[9] (version 05.2.1) is applied to prove that the emission reductions by the proposed JI project are additional to any that would otherwise occur.

Step 1: Identification of alternatives to the project consistent with current laws and regulations

[8] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf

[9] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.1.pdf

Sub-step 1a. Define alternatives to the project

The most plausible alternatives to the project were identified in Section B.1 above:
Alternative scenario 1: The proposed project is not implemented as a JI project.
Alternative scenario 2: Electricity to be generated by the project is provided by other existing plants of UPS “Ural”;
Alternative scenario 3: Electricity to be generated by the project is provided by other new power generating units of UPS “Ural”;
Alternative scenario 4: Electricity to be generated by the project is supplied to the grid by other existing power plants and other new power generating units of UPS “Ural”.

Only alternatives 1 and 4 can be identified as realistic and reasonable.

Sub-step 1b. Consistency with mandatory laws and regulations

All the alternatives defined in sub-step 1a are in compliance with mandatory legislation and regulations.

Clause 2 Article 23 of Law of the Russian Federation "On electric energy industry"[10]states:

The following key principles should be met in state regulation of prices (tariffs):

- determination of economic feasibility of planned (design) production cost and revenues in the course of calculation and approval of prices (tariffs);
- ensuring the economic feasibility of expenditures by commercial organizations for generation, transfer and sale of electric energy;
- taking into account the results of activity of organizations engaged in regulated activities, for the effective period of prices (tariffs) previously approved;
- taking into account the compliance with legal requirements on energy saving and improvement of energy efficiency, including requirements of development and implementation of programmes in the field of energy saving and improvement of energy efficiency, requirements towards organization of metering and control of consumed energy resources, reduction of energy resource waste;
- ensuring the openness and availability for consumers, including population, of the process of tariff regulation;
- mandatory separate records for organizations engaged in regulated activities of production (service provision), income and expenses for generation, transfer and sale of electric energy.

The existing system of electricity tariffs shaping in the Russian Federation does not envisage an investment component for state regional power plants. According to Law of the Russian Federation "On electric energy industry", CJSC "Nizhnevartovskaya GRES" is neither obliged nor encouraged to construct and implement new facilities and technologies at its own expense.

Step 2: Investment Analysis

The main purpose of investment analysis is to determine whether the proposed project:

(a) is the most economically or financially attractive; or

(b) is economically or financially feasible without income from sale of emission reduction units (ERUs) related to the JI project.

To conduct investment analysis, the following sub-steps should be applied.

Sub-step 2a. Determine appropriate analysis method

[10] http://www.fstrf.ru/docs/gkh/52

In principle, there are three methods applicable to investment analysis: simple cost analysis, investment comparison analysis and benchmark analysis, for example, using internal rate of revenue of an investment project or net reduced value.
A simple cost analysis (Option I) shall be applied if the proposed JI project and the alternatives identified in step 1 generate no financial or economic benefits other than JI related income. The proposed JI project results in additional sales revenues due to the electricity that will be generated. Thus, this analysis method is not applicable. "Tool for the demonstration and assessment of additionality"[11] (version 05.2.1) allows for an investment comparison analysis which compares suitable financial indicators for realistic and credible investment alternatives (Option II) or a benchmark analysis (Option III). For this project a benchmark analysis (Option III) is appropriate in accordance with the recommendations of the "Tool for the demonstration and assessment of additionality"[12] (version 05.2.1).

Sub-step 2b: Option III. Apply benchmark analysis
The proposed project, **"Implementation of 800 MW power generating unit No.2 at Nizhnevartovskaya GRES"** will be implemented by the project participant CJSC "Nizhnevartovskaya GRES". In accordance with the Decree of the Government of the Russian Federation No.1470 dated 22/11/1997 "On approval of the procedure of granting the state guarantee on the basis of competitive bidding at the expense of the Development Budget of the Russian Federation and the resolution on assessment of investment project efficiency with placement through competitive bidding of centralized investment resources of the Development Budget of the Russian Federation"[13], the discount factor (benchmark) is identified as a ratio of refinancing rate (r) – 33%[14] set by the Central Bank of the Russian Federation to the inflation rate (i) for the current year claimed by the Government of the Russian Federation – 20.2%[15]:

$$1+d=\frac{1+\frac{r}{100}}{1+\frac{i}{100}} \qquad (B.3)$$

This gives us the real discount rate of 10.65%.
The discount factor that takes into account project risks is identified by the formula:

$$d=d_i+\frac{P}{100} \qquad (B.4)$$

where $\frac{P}{100}$ is adjustment for risk.
According to the "Guidelines on the assessment of investment project performance" No.VK 477 dated 21/06/1999[16] (paragraph 11.2), risk adjustment takes into account three types of investment project risks:
- country risk (accounting the fact that data on country risk for 2000 is not publicly available and reliable, we decided not to take into account this factor following to the principle of conservatism) – 0 %;
- project participant unreliability risk – 2.5% (the rate in this document does not exceed 5%, so the average range limit is used as a conservative value);
- project performance risk – 4% (the document provides the rate of 3-5%; the average range limit is used as a conservative value).

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[11] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.1.pdf

[12] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.1.pdf

[13] http://lawru.info/legal2/se11/pravo11551/index.htm

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

[15] http://damoney.ru/million/inflyaciya.php

[16] http://www.businesspravo.ru/Docum/DocumShow_DocumID_18269_DocumIsPrint__Page_4.html

Thus, the approximate risk adjustment rate is 6.5% in total.
Using the formula provided above we get the discount rate (benchmark) of 17.15%[17].
If the proposed project, not implemented as JI project, has less favourable rate, i.e. lower internal rate of return (IRR) than the overall ceiling, the project cannot be deemed financially attractive. This is also applicable to net profit value (NPV); if NPV is negative - the project cannot be deemed financially attractive. Profitability index should be ≥1, otherwise cannot be considered as financially attractive.
Calculation of financial indicators showed that IRR cannot be calculated because the indexed cash flow is negative and the difference between company revenues and costs associated with the project (investment costs, operational costs) is too high.

Sub-step 2c: Calculation and comparison of financial indicators
Investment analysis refers to the time of making investment decisions. To conduct investment analysis, the following assumptions were used based on information provided by the company:

1. The project requires investments of about USD 112 million or RUB 3 billion;
2. The project lifetime is 20 years (minimal term of the equipment operation);
3. The residual value is included in calculation in the end of calculation period;
4. The tariff for electricity sale in 2000 was 46 rubles/MWh; the data were used on the basis of RF Government Decree No. 1444 dated December 7, 1998 "On the basis of pricing for electricity consumed by the population"[18].
5. The tariff for APG consumption in 2000 was 350 rubles/ths m^3; the data were used on the basis of the Contract for gas supply No. AKS.914.30-5 dated January 20, 2000.
6. Costs associated with the operation and maintenance as well as forecast data on the volume of APG consumption, production of electrical energy by second power unit of Nizhnevartovsk GRES are based on the document "Forecast dynamic of energy consumption, production and supply as well as operating costs at Nizhnevartovsk GRES at the second power generating unit" provided by the company.

Analysis of cash flow takes into account the cash outflow connected with investments and operating costs and cash inflow associated with the receipt of revenues from providing services by the company.
Financial indicators of the project are provided in Table B.2.1.

Table B.2.1 – Financial indicators of the project

Company income excluding VAT (ths RUB)	Cash flow (ths RUB)	dr Discount rate (%)	NPV (ths RUB)	IRR (%)	Residual value (ths RUB)	Profitability index (PI)
37460313	-43448523	17,15%	-6 627 419	<0	600207	-2

Analysis of cash flow gives IRR <0, which is below the established IRR benchmark of 17.15%. Thus, NPV is negative. Therefore, the project cannot be considered as financially attractive.

Sub-step 2d: Sensitivity analysis
A sensitivity analysis shall be conducted to show whether the conclusion regarding the financial / economic attractiveness is stable enough for reasonable variations in baseline conditions.
The following two key factors were considered in the sensitivity analysis: investment cost and company income. In accordance with paragraph 21 of the "Guidelines on the assessment of investment analysis"

[17] Supporting Document 2

[18] http://kgrct.ru/filemanager/download/42

version 05[19] the sensitivity analysis should be undertaken within the corridor of ±10% for the key indicators.

Table B.2.2. Company income

	-10%	0%	10%
Operational costs	78 508 008	78 508 008	78 508 008
Investment costs	809517	809517	809517
Company revenues	33 714 282	37 460 313	41 206 344
Net present value (NPV)	-7033014	-6627419	-6221823
Internal rate of return (IRR)	<0%	<0%	<0%
Profitability Index (PI) of investment	-9	-2	-2

Table B.2.3. Investment costs

	-10%	0%	10%
Operational costs	78 508 008	78 508 008	78 508 008
Investment costs	890469	809517	728565
Company revenues	37460313	37460313	37460313
Net present value (NPV)	-6411219	-6627419	-6843618
Internal rate of return (IRR)	<0%	<0%	<0%
Profitability Index (PI) of investment	-2	-2	-2

Sensitivity analysis was used to assess the sensitivity of the project to changes that may occur during the project implementation and operation. Analysis of changes of company income in the range between +10% and +10% demonstrated that the IRR stays on the level <0%. Analysis of investment costs in the range between +10% and +10% demonstrated that the IRR also stays on the level <0%. Expenditures that are considered in the framework of the project are high and their increase will result in a negative NPV. However, even if the price of investment is at the expected level and on condition of revenue from ERUs sale the project is not viable and will generate insufficient profit; even in the case of credit financing of the project and even if the above changes of investment cost occur the project will bring no profit.

Outcome of Step 2: sensitivity analysis consistently supports (for a realistic range of assumptions) the conclusion that the project is unlikely to be financially / economically attractive.

Sub-step 3: Barrier Analysis

In line with the the "Tool for the demonstration and assessment of additionality"[20] version 05.2.1, a barrier analysis is not conducted.

Step 4: Common practice analysis

Sub-step 4a. Analysis of other activities similar to the proposed project activity

Concerning the first 800 MW power generating unit of Nizhnevartovskaya GRES (which was commissioned in 1993) and six units of Surgut SRPP-2 power of 800 MW (which were commissioned:

[19] http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

[20] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.1.pdf

power generating unit № 1 - 1985, № 2 - 1985, № 3 - 1986, № 4 - 1987, № 5 - 1987, № 6 - 1988), it should be accounted that their construction had been started before the advent of the state of Russian Federation (before the collapse of the USSR). Accordingly, the decision about construction of these power generating units was made on the basis of an entirely different criteria in the conditions of a planned economy. Although the implementing of the second power generating unit was originally planned in the design of the I stage of the Nizhnevartovskaya GRES, it should be considered the fact that the start of the construction of power unit № 2 in the new market conditions became possible only after the appearance of possibility to use the Joint Implementation Mechanism. Therefore the implementing of the first power generating unit of Nizhnevartovskaya GRES and six power generating units of Surgut SRPP-2 cannot be an example of a similar practice.
Current practice of operating existing facilities which represents the baseline determined for this project is common for the Russian Federation in most cases. Due to the current practice of implementing of new generation units is an initiative of power generating companies, for which the incentive to introduce new system is missing.

Outcome of Sub-Step 4a: Since there are no similar projects in Khanty-Mansy Autonomous Area of the Russian Federation, there is no need to conduct analysis of similar project activity.

According to the "Tool for the demonstration and assessment of additionality"[21] version 05.2.1, all steps are satisfied although there are some barriers.
One of them is additional expenses for the JI project implemented at CJSC "Nizhnevartovskaya GRES";
The barrier is associated with the structure of existing tariffs for electricity generation, which are regulated by the state without taking into account amortization and investment needs of electricity generation companies. This situation causes a permanent lack of funding and the impossibility of conducting timely overhauls, ensuring operation of equipment, investing into modernization and development of infrastructure.
Thus, all the above listed factors may prevent the proposed project from implementation without the Joint Implementation mechanism.
However, one of the alternatives is continuation of the current practice of Nizhnevartovskaya GRES without implementing the power generation unit No.2, and electricity to be generated by the project is supplied to the grid by other existing power plants and other new power generating units of UPS “Ural”..
Since the barriers identified above are directly related to investments into expansion of electricity generation system, there are no barriers for CJSC "Nizhnevartovskaya GRES" for further operation of the existing facilities at the previous level.
Therefore, the barriers cannot prevent at least one of the alternative scenarios – electricity to be generated by the project is supplied to the grid by other existing power plants and other new power generating units of UPS “Ural”.

Conclusion

The analysis provided above demonstrates that the project is additional.

[21] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.1.pdf

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

Project boundary embraces new power generating unit of Nizhnevartovskaya GRES and its auxiliary equipment.
The table provided below shows GHG sources included into the project boundary.

Table B.3.1. GHG emission sources included into the project boundary

	Source	Gas	Included?	Justification / Explanation
Baseline scenario	Generation of electricity equivalent to electricity generated by the second power generating unit of Nizhnevartovskaya GRES into the UPS "Ural"	CO_2	**Yes**	Main emission source in the baseline scenario
		CH_4	**No**	This gas is not considered in line with AM0029[22] methodology. This is conservative.
		N_2O	**No**	
	Generation of heat energy by the second power generating unit of Nizhnevartovskaya GRES	CO_2	**No**	Since the second power generating unit of Nizhnevartovskaya GRES is in use primarily for the purpose of electricity production and produces a relatively small amount of heat energy (which is mainly used for own needs of the company), we decided not to take into account the emissions associated with the production of thermal energy. This is consistent with the principle of conservatism.
		CH_4	**No**	see noted above
		N_2O	**No**	see noted above
Project scenario	Combustion of APG in the second power generating unit of Nizhnevartovskaya GRES for electricity production	CO_2	**Yes**	Main emission source in the project scenario
		CH_4	**No**	This gas is not considered in line with AM0029[23] methodology. This is conservative.
		N_2O	**No**	

Project boundaries are presented in a Figure B.3.1 below.

[22] http://cdm.unfccc.int/methodologies/DB/WW4I82DG7LJUQE5E5YGT1NZE4PNS60

[23] http://cdm.unfccc.int/methodologies/DB/WW4I82DG7LJUQE5E5YGT1NZE4PNS60

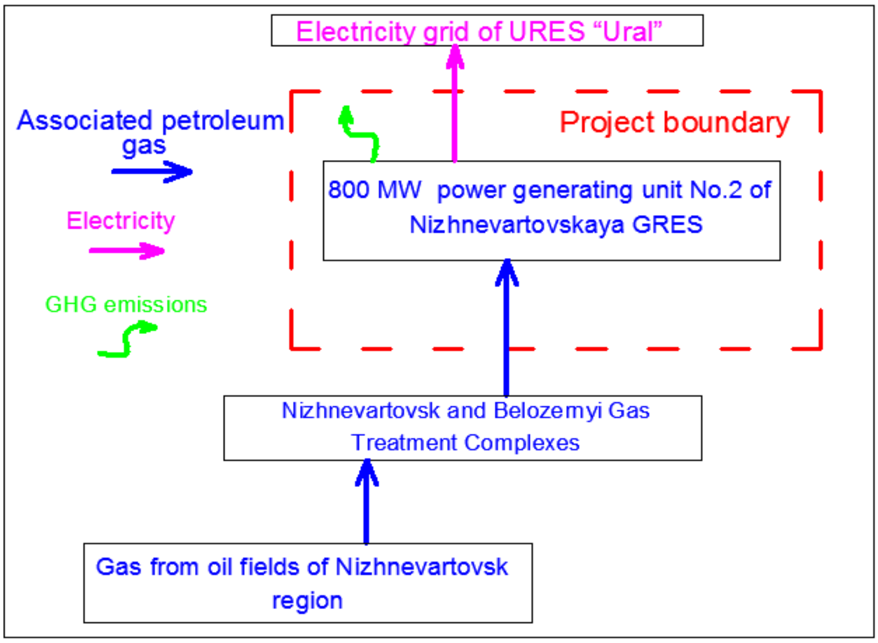

Figure 3.1 – Project boundaries

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 completion of the baseline study:15/01/2012.

The baseline scenario was developed by project developer VEMA S.A. and project owner CJSC "Nizhnevartovskaya GRES"

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SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

The starting date of the project was determined using the "Glossary of Joint Implementation terms"[24] version 03 and is deemed to be June 1, 2000, when contract No. E/4 for engineering services, equipment supply, construction and assembly work, pre-commissioning and development and implementation of the automatic operation monitoring system was signed.

C.2. Expected operational lifetime of the project:

The lifetime of the project equals to minimum operational life of key equipment, which is 20 years or 240 months.

C.3. Length of the crediting period:

Starting date of the crediting period: 01/01/2008

The length of the crediting period is 5 years and 0 months (01/01/2008 – 31/12/2012) during the first commitment period;

Prolongation of the crediting period after 2012 is subject to approval by the host Party.

[24] http://ji.unfccc.int/Ref/Documents/Glossary_JI_terms.pdf

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

A JI-specific approach to monitoring plan development was applied for this project on the basis of paragraph 9 (a) of the "Guidance on criteria for baseline setting and monitoring"[25] version 03. As elaborated in Section B.3, the project activity only affects the emissions related to the APG combustion. To establish the baseline emissions and to monitor the project emissions, only these emissions will be monitored.
The key variables subject to monitoring are consumption of APG by power generating unit No.2, electricity generation by power generating unit No.2 and net calorific value of APG.

The following assumptions for calculation of both baseline and project emissions were used:

- Used start-up fuel at the new power generating unit is excluded[26];
- Project electricity is net electricity generation by the power generating unit defined as electricity generation minus on-site electricity consumption;
- Electricity demand in the market is not influenced by the project (i.e. baseline net electricity generation = project net electricity generation);
- The baseline emissions are established using the combined emission factor for UPS "Ural" as described in Annex 2;
- The combined emission factor is set ex-ante for the length of the crediting period;
- The power generating unit lifetime extends to at least 2023.

Data and parameters that are not subject to monitoring during the crediting period and are available at the PDD development stage:

$EF_{BL,CO2,y}$	-	Baseline GHG emission factor in the course of electricity generation in UPS "Ural", t CO_2/MWh

Data and parameters controlled during the entire crediting period:

[25] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf

[26] http://cdm.unfccc.int/filestorage/C/D/M/CDMWF_AM_15YH7UTNQ40J8MGMVX62CGNE0K49Y0/EB39_repan03_AM0029_ver03.pdf?t=N0p8bHlybGF4fDB4BsygfhsjRk8GnIRooipG

FC_y	-	Consumption of APG by the second power generating unit of Nizhnevartovskaya GRES in monitoring period *y*, norm. m^3;
NCV_y	-	Net calorific value of APG consumed over the monitoring period *y*, GJ/norm. m^3;
$EF_{CO_2,NG,y}$	-	Default CO_2 emission factor for natural gas according to IPCC, t CO_2/GJ;
$EG_{PJ,y}$	-	Electricity generated by the second power generating unit of Nizhnevartovskaya GRES and supplied into UPS "Ural" in period *y*, MWh;
$EG_{AUX,y}$	-	On-site electricity consumption by Nizhnevartovskaya GRES in period *y*, MWh.

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 crossreferencing 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
P1. PE_y	Project emissions in monitoring period *y*	Determined using collected data for the project	t CO_2e	c	Annually	100%	Electronic	Defined according to paragraph D.1.1.2.
P2. FC_y	Consumption of APG by the second power generating unit of Nizhnevartovskaya GRES in monitoring period *y*	Readings of supersonic flow meter Daniel	norm.m^3	m	Continuously	100%	Electronic	The data are provided by the project owner
P3. NCV_y	Net calorific value of APG in monitoring period *y*	Results of analyses made in authorized laboratories	GJ/norm.m^3	m	Monthly	100%	Electronic	Data provided by fuel supplier

		provided by APG supplier						
P4. $COEF_y$	CO_2 emission factor for associated petroleum gas	Calculated within the project boundary	t CO_2/norm.m^3	c	Annually	100%	Electronic	Defined according to paragraph D.1.1.2.
P5. $EF_{CO_2,NG,y}$	Default CO_2 emission factor for natural gas according to IPCC	Table 1.4 Chapter 1 of Volume 2 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories[27]	t CO_2/GJ	e	Annually	100%	Electronic	

.

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 emissions are calculated by the following formula:

$$PE_y = FC_y \cdot COEF_y, \tag{D.1}$$

where

PE_y - Project emissions in monitoring period y, t CO_2e;

FC_y - Consumption of APG by the second power generating unit of Nizhnevartovskaya GRES in monitoring period y, norm. m^3;

$COEF_y$ - CO_2 emission factor for APG, t CO_2/norm.m^3.

CO_2 emission factor for APG is determined as follows:

$$COEF_y = NCV_y \cdot EF_{CO_2,NG,y}, \tag{D.2}$$

[27] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf

where

NCV_y - Net calorific value of APG in monitoring period y, GJ/norm.m^3;

$EF_{CO_2,NG,y}$ - Default CO_2 emission factor for natural gas according to IPCC in period y, t CO_2/GJ[28].

Since the composition of APG consumed is almost identical to that of natural gas, it appears reasonable to use carbon dioxide emission factor for natural gas in calculation. This is conservative. The justification of application of the carbon dioxide emission factor for natural gas for APG consumed is provided in Annex 2.

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 crossreferencing 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
B1. BE_y	Baseline emissions in monitoring period y	Determined using collected data for the project	t CO_2e	c	Annually	100%	Electronic	Defined according to paragraph D.1.1.4
B2. $EG_{PJ,y}$	Electricity generated by the second power generating unit of Nizhnevartovskaya GRES and supplied into UPS "Ural" in period y	Electricity meter	MWh	m	Annually	100%	Electronic	The data are provided by the project owner

[28] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf

B3. $EG_{AUX,y}$	On-site electricity consumption by Nizhnevartovskaya GRES in period y	Electricity meter	MWh	m	Annually	100%	Electronic	The data are provided by the project owner
B4. $EF_{BL,CO2,y}$	Baseline emission factor in the course of electricity generation in UPS "Ural"	Determined JI project JI0422 "Installation of two CCGT-400 at Surgutskaya TPP-2, OGK-4, Tyumen area, Russia"[29]	t CO_2/MWh	c,e	Fixed value	100%	Electronic	

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

>>

Baseline GHG emissions for monitoring period *"y"* are determined as follows:

$$BE_y = BE_{elec,y} + BE_{heat,y} , \quad (D.3)$$

where:

$BE_{elec,y}$ - Baseline emissions from generation of electricity equivalent to electricity generated by the second power generating unit into the UPS "Ural" in monitoring period "*y*", t CO_2e;

$BE_{heat,y}$ - Baseline emissions from generation of heat energy by the second power generating unit of Nizhnevartovskaya GRES in monitoring period "*y*", t CO_2e;

Since the second power generating unit of Nizhnevartovskaya GRES is in use primarily for the purpose of electricity production and produces a relatively small amount of heat energy (which is mainly used for own needs of the company), we decided not to take into account the emissions associated with the production of thermal energy. So we assume that $BE_{heat,y}$ =0. This assumption is consistent with the principle of conservatism.

$$BE_{elec,y} = (EG_{PJ,y} - EG_{AUX,y}) \cdot EF_{BL,CO2,y} , \quad (D.4)$$

[29] http://www.sbrf.ru/common/img/uploaded/files/tender/kioto2/27_OGK4_Surgutskaya_PGU800.pdf

where

$BE_{elec,y}$	-	Baseline emissions from generation of electricity equivalent to electricity generated by the second power generating unit into the UPS "Ural" in monitoring period "*y*", t CO_2e;
$EG_{PJ,y}$	-	Electricity generated by the second power generating unit of Nizhnevartovskaya GRES and supplied into UPS "Ural" in monitoring period *y*, MWh;
$EG_{AUX,y}$		On-site electricity consumption by Nizhnevartovskaya GRES in period *y*, MWh;
$EF_{BL,CO2,y}$	-	Baseline GHG emission factor in the course of electricity generation in UPS "Ural", t CO_2/MWh.

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

Not applicable because Option 1 was chosen.

D.1.2.2. Description of formulae used to estimate project emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

Not applicable because Option 1 was chosen.

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

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 crossreferencing 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

There are fugitive CH_4 emissions associated with fuel extraction, processing, liquefaction, transportation, re-gasification and distribution of APG used in the project and fossil fuels of all types combusted at power plants in the absence of the project[30]

[30] http://cdm.unfccc.int/methodologies/DB/WW4I82DG7LJUQE5E5YGT1NZE4PNS60

These leaks have not been taken into account for simplicity and conservatism.

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

Not applicable

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):

The following equation shall be applied for calculating the emission reductions:

$$ER_y = BE_y - PE_y , \qquad \text{(D.5)}$$

where

ER_y - Emission reductions in monitoring period *y*, t CO_2e;

BE_y - Baseline emissions in monitoring period *y*, t CO_2e;

PE_y - Emission reductions in monitoring period *y*, t CO_2e;

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

The basic Russian Federation environmental regulations are:
 Federal law of the Russian Federation ― On Environment Protection (10 January 2002, No. 7-FZ);
 Federal law of the Russian Federation ― On Air Protection‖ (04 May 1999, No. 96-FZ).

These laws and other national regulations establish the order and the frequency of the emission sources inventory, standards of the pollutant emissions and sinks and their monitoring.
Emissions into the atmosphere are the only important source of pollution at Nizhnevartovskaya GRES, which has a negative impact on the local environment. These are: nitrogen oxides (NO and NO_2), carbon oxide and sulphur oxide. Water protection also takes place.

Specialists of Nizhnevartovskaya GRES carry out collection and archivation of data on emissions, sinks and generation of pollutants in accordance with national requirements. They prepare quarterly and annual reports on emissions and sinks and generation of pollutants at Nizhnevartovskaya GRES and submit the reports to the State Organization of Environmental Supervision.

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
P2	Low	In accordance with State Standard the allowed inaccuracy of APG consumption metering is ±0.3-4% (GOST R 8.618-2006). The APG flow meter to be installed shall provide necessary accuracy. At Nizhnevartovskaya GRES, supersonic gas flow meters from Daniel (the USA) are installed. The metering range of the flow meters is 0÷450 ths.m^3, inaccuracy is 0.5%. Calibration of the metering devices is made in accordance with the requirements of the manufacturer annually. Data from the meters are read automatically 24h a day and archived. Specialists of PCS department are responsible for servicing and operation of supersonic flow meters and data archiving.
P3	Low	Information on component composition, net calorific value and other characteristics of APG is provided by APG suppliers. Analyses are conducted in laboratories authorized in accordance with state standards of the Russian Federation (Accreditation certificate No. ROSS RU.001.512211). APG quality is confirmed by APG quality certificates that confirm that APG meets OST 51.40-93 and GOST 5542-87.
B2	Low	Electricity generated by the second power generating unit of Nizhnevartovskaya GRES is determined using standard electricity meters. Accuracy class of electricity meters shall be 0.5S or higher. Nizhnevartovskaya GRES has multi-purpose electricity meters SET-4TM.03 installed, with accuracy class of 0.2 S active and 0.5 reactive energy, manufactured by FSUE "NZiF". These meters are a part of the commercial automatic system of energy accounting, which ensures compliance with the accuracy requirements of the system. Calibration of the electricity meters is made in accordance with the calibration schedule which is approved by the Chief Engineer of Nizhnevartovskaya GRES in accordance with requirements of manufacturer and standards of the Russian Federation. The metering devices are calibrated by an independent entity which has a state licence. The data from meters are automatically and regularly imported into an electronic database and saved. Supervision of data archiving is performed by the Department of heat automatic and measurement.

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
B3.	Low	Electricity generated by the second power generating unit of Nizhnevartovskaya GRESis determined using standard electricity meters. Accuracy class of electricity meters shall be 0.5S or higher. Nizhnevartovskaya GRESPhas multi-purpose electricity meters SET-4TM.03 installed, with accuracy class of 0.2 S active and 0.5 reactive energy, manufactured by FSUE "NZiF". These meters are a part of the commercial automatic system of energy accounting, which ensures compliance with the accuracy requirements of the system. Calibration of the electricity meters is made in accordance with the calibration schedule which is approved by the Chief Engineer of Nizhnevartovskaya GRES in accordance with requirements of manufacturer and standards of the Russian Federation. The metering devices are calibrated by an independent entity which has a state license. The data from meters are automatically and regularly imported into an electronic database and archived. Supervision of data archiving is performed by PCS department specialists.

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

All the data on various parameters obtained as a result of monitoring will be archived in electronic form with an option of immediate compilation and printing of all the data collected.

No.	Responsible	Tasks
1	Nizhnevartovskaya GRES: • EC&A Department • Operations staff of power generating unit No.2 • Industrial Engineering Department • Chief Engineer	Daily data collection; Quality control during metering equipment operation; Collection, processing and archivation of data, preparation of the annual Monitoring Report Organization of the process of monitoring
2	OGK-1	Preparation and approval of internal monitoring procedure; Approval of the Monitoring Report; General management.

3	Vema S.A.	Training for personnel on monitoring and reporting; Calculation of ERUs and preparation of the annual Monitoring Report

Procedures to be followed if the expected data are unavailable:
In the event of accident or breakdown of the APG meters:
-In case of failure or lack of metering devices (instrumentation) for a period of eleven days or more, the amount of delivered gas is calculated by the supplementary agreement of the parties.
-If necessary, removal of meters associated with their repair or checking in the entities which have a state license of Russian Federation, the parties shall notify each other of such circumstances. In the absence of devices for a period of ten or less days, the volume of delivered gas per day is calculated as the average daily reading data of metering in the last full 10 days of gas metering.
In the case of absence the monthly APG quality certificates:

- In the case of data absence for one month, the average value of net calorific value for last six months will be used in calculation;
- In the case of data absence for more than one month, it will be elaborated the supplementary agreement of the parties concerning this issue.

The data monitored and required for verification will be kept for two years after the last transfer of ERUs for the project.

Scheme of organizational structure of implementation of the Monitoring Plan is provided in Figure D.3.1.1.

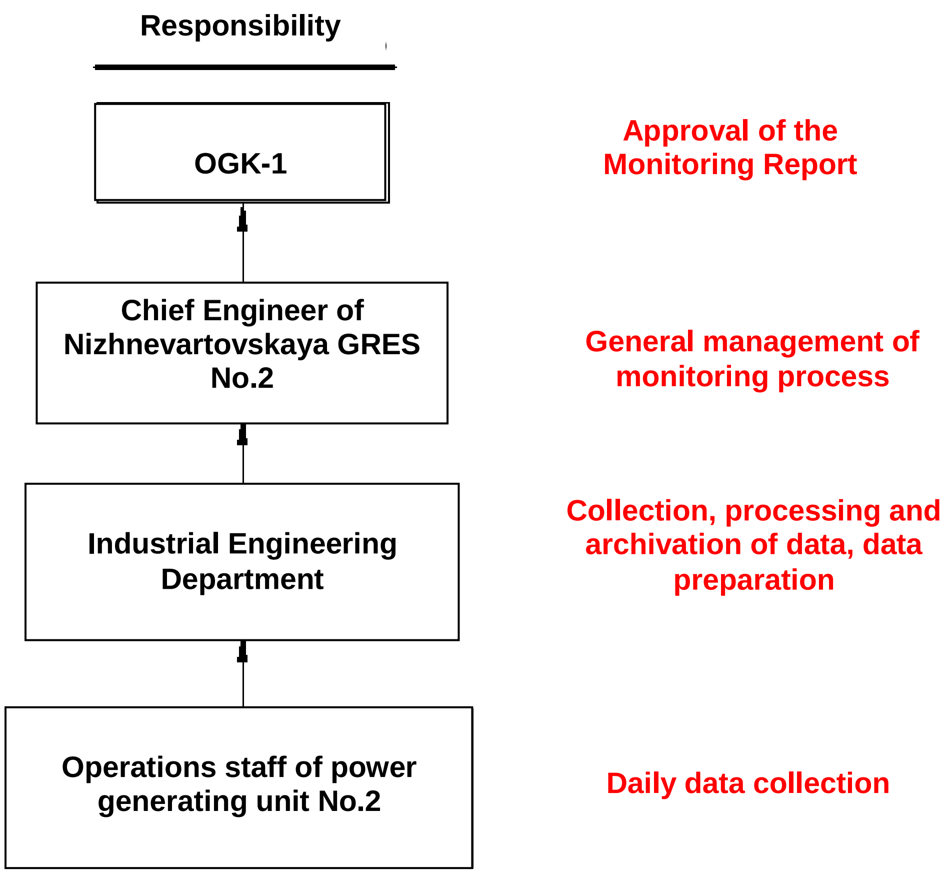

Figure D.3.1.1 – Scheme of organizational structure of the Monitoring Plan implementation

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

The monitoring plan was developed by project developer VEMA S.A. and project owner CJSC "Nizhnevartovskaya GRES".

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CJSC "Nizhnevartovskaya GRES" is a project participant (Annex 1)

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VEMA S.A. is a project participant (Annex 1)

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Table E.1.1 – Estimated project GHG emissions in the first commitment period (January 1, 2008 - December 31, 2012)

Source of emissions	Project emissions (t CO_2e)				
	2008	2009	2010	2011	2012
Emissions due to fuel combustion in power generating unit No.2, t CO_2e	2 958 514	2 617 057	3 108 659	3 027 349	2 700 250
Total in 2008-2012, tCO_2e	**14 411 830**				

Table E.1.2 – Estimated project GHG emissions in the period following the first commitment period

Source of emissions	Project emissions (t CO_2e)			
	2013	2014	2015	2016
Emissions due to fuel combustion in power generating unit No.2, t CO_2e	3 042 471	3 042 471	3 042 471	3 042 471
	2017	2018	2019	2020
Emissions due to fuel combustion in power generating unit No.2, t CO_2e	3 042 471	3 042 471	3 042 471	3 042 471
Total in 2013-2022	**24 339 767**			

E.2. Estimated leakage:

There are fugitive CH_4 emissions associated with fuel extraction, processing, liquefaction, transportation, re-gasification and distribution of APG used in the project and fossil fuels of all types combusted at power plants in the absence of the project[31].

These leaks have not been taken into account for simplicity and conservatism.

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

Since no leakages are expected, see E.1.

E.4. Estimated baseline emissions:

Table E.1.3 – Estimated baseline GHG emissions in the first commitment period (January 1, 2008 - December 31, 2012)

Source of emissions	Baseline emissions (t CO_2e)				
	2008	2009	2010	2011	2012
Emissions due to electricity generation into UPS "Ural", in an amount equivalent to generation by power generating unit No.2, t CO_2e	3 606 715	3 172 202	3 778 451	3 683 278	3 246 018

[31] http://cdm.unfccc.int/methodologies/DB/WW4I82DG7LJUQE5E5YGT1NZE4PNS60

Total in 2008-2012, tCO_2e	17 486 663

Table E.1.4 – Estimated baseline GHG emissions in the period following the first commitment period

Source of emissions	Baseline emissions (t CO_2e)			
	2013	2014	2015	2016
Emissions due to electricity generation into UPS "Ural", in an amount equivalent to generation by power generating unit No.2, t CO_2e	3 626 343	3 626 343	3 626 343	3 626 343
	2017	2018	2019	2020
Emissions due to electricity generation into UPS "Ural", in an amount equivalent to generation by power generating unit No.2, t CO_2e	3 626 343	3 626 343	3 626 343	3 626 343
Total in 2013-2022	29 010 747			

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

Calculation of estimated emission reductions was carried out using the formula (D.5).

Table E.1.5 – Estimated emission reductions in the first commitment period (January 1, 2008 - December 31, 2012)

Year	Estimated emission reduction (t CO_2e)
2008	648 201
2009	555 145
2010	669 792
2011	655 929
2012	545 768
Total (t CO_2e)	**3 074 834**

Table E.1.6 – Estimated emission reductions in the period following the first commitment period

Year	Estimated emission reduction (t CO_2e)
2013	583 873
2014	583 873
2015	583 873
2016	583 873
2017	583 873
2018	583 873
2019	583 873
2020	583 873
Total (t CO_2e)	4 670 980

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

Table E.1.7 – Table providing results of emission reduction estimation during the first commitment period (January 1, 2008 - December 31, 2012)

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
2008	2 958 514	0	3 606 715	648 201
2009	2 617 057	0	3 172 202	555 145
2010	3 108 659	0	3 778 451	669 792
2011	3 027 349	0	3 683 278	655 929
2012	2 700 250	0	3 246 018	545 768
Total (t CO_2e)	14 411 830	**0**	17 486 663	3 074 834

Table E.1.8 – Table providing results of emission reduction estimation in the period following the first commitment period

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
2013	3 042 471	0	3 626 343	583 873
2014	3 042 471	0	3 626 343	583 873
2015	3 042 471	0	3 626 343	583 873
2016	3 042 471	0	3 626 343	583 873
2017	3 042 471	0	3 626 343	583 873
2018	3 042 471	0	3 626 343	583 873
2019	3 042 471	0	3 626 343	583 873
2020	3 042 471	0	3 626 343	583 873
Total (t CO_2e)	**24 339 767**	**0**	29 010 747	4 670 980

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:

The necessity of an Environmental Impact Assessment (EIA) in Russia is regulated by the Federal Law "On the Environmental Expertise"[32] and consists of two stages: EIA (OVOS —in Russian abbreviation) and state environmental expertise (SEE). Significant changes into this procedure were made by the Law in Amendments to the Construction Code which came into force on the 1st of January 2007[33]. This Law reduced the scope of activities subject to SEE transferred them to the so called State Expertise (SE) done in line with the Article 49 of the Construction Code of the Russian Federation[34]. In line with the Construction code the Design Document should contain the Section "Environment Protection".
Compliance with the environmental regulations (so called technical regulation in Russian on Environmental Safety) should be checked during the process of SE.
This project obtained the conclusion of the State Expertise No.61 from 26.07.1991 issued by Nizhnevartovsk Committee on nature protection, which states "Project of I stage of Nizhnevartovskaya GRES is agreed by Nizhnevartovsk Committee" (power generating unit No.2 was included in I turn of Nizhnevartovskaya GRES but its construction became possible only with appearance a possibility of JI mechanism usage).
The report "Environmental impact assessment of the I stage of Nizhnevartovskaya GRES" was prepared by the Research and Production Enterprise "Sibneftekhim" and approved at 20.06.1991.
Atmospheric air:
«…in the territory of Nizhnevartovsk the pollution level due to Nizhnevartovskaya GRES will be 0.18 MAC (maximum allowable concentration). Thus, the maximum concentration of all the ingredients due to sources of will not exceed the maximum allowable concentration, with allowance for background concentration...The amount of other pollutants emitted into the atmosphere is negligible and will have no impact on the environment...";
Water protection:
«…The calculation of oxygen condition and suspended materials in mixture of sewage and Vakh River waters in 10m control section showed that pollutant content in the control section does not exceed MAC…
Thus, as there is little industrial drain without previous purification from MIC, the qualitative composition of water in a 500 m control section virtually remains unchanged after the mixture with the Vakh River…»

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 analysis of environmental impacts conducted for the project documentation, it is concluded that there is no significant negative impact on environment.

[32] http://www.ecoguild.ru/docs/expertiselow.htm

[33] http://norm-load.ru/SNiP/Data1/45/45583/index11180.htm

[34] http://base.consultant.ru/cons/cgi/online.cgi?req=doc;base=LAW;n=122790

SECTION G. Stakeholders' comments

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

>>

Public awareness on this project was created through mass media. All the comments on the project were positive. No negative comments were received.

A few references to publications on the project are provided below:

http://www.regnum.su/news/165306.html
http://www.regnum.ru/news/169171.html
http://www.oilcapital.ru/industry/86437.html
http://www.1tv.ru/news/election/88110
http://www.e1.ru/news/spool/news_id-120675.html
http://ural.ria.ru/economy/20031114/204109.html
http://www.finam.ru/analysis/newsitem0BB37/default.asp
http://www.akm.ru/rus/news/2003/november/14/ns1116331.htm
http://www.pravda.ru/society/fashion/14-11-2003/39529-energomash-0/

Annex 1:

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Organisation:	Closed Joint Stock Company "Nizhnevartovskaya GRES"
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URL:	
Represented by:	Borodin Viktor Nikolayevich
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Salutation:	Mr.
Last name:	Borodin
Middle name:	Nikolayevich
First name:	Viktor
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Mobile:	
Personal e-mail:	

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Title:	Director
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Annex 2:

BASELINE INFORMATION

The baseline scenario implies that the electricity generated by the power generating unit No.2 of the Nizhnevartovskaya GRES, would be generated by other generating facilities of UPS "Ural" characterised by higher GHG emissions per MWh of electricity generated.

Power generating unit No.2 uses dry stripping gas as fuel, which is obtained as a result of processing of associated petroleum gas from oil fields of Nizhnevartovsk district at the Nizhnevartovsk and Belozerny gas processing complexes. The APG quality meets OST 51.40-93 (Natural flammable gases supplied and transported via main pipelines). The composition of this APG is almost identical to that of natural gas.
In the Table A.2.1. the results of the calculation of the CO_2 emissions factor for the APG, which is used at the Nizhnevartovsk GRES, are provided. The calculation showed that the value of CO_2 emissions factor for the APG of 0.8% lower than the value of IPCC default CO_2 emission factor for natural gas. Since this emission factor is used in the calculation of project emissions, the usage of IPCC default CO_2 emission factor for natural gas meets the principle of conservatism.

Table Anx.2.1 – Average composition of associated petroleum gas and results of emission factor calculation for associated petroleum gas

Composition/months, 2010	1	2	3	4	5	6	7	8	9	10	11	12
Methane (CH_4)	94,077	93,997	94,649	94,283	94,326	94,851	95,403	94,117	94,308	94,441	94,482	94,515
Ethane (C_2H_6)	3,519	3,61	2,993	3,363	3,024	2,79	2,219	3,385	3,297	3,148	3,158	3,147
Propane (C_3H_8)	0,678	0,657	0,622	0,618	0,768	0,67	0,748	0,658	0,652	0,657	0,639	0,646
I-butane (и-C_4H_{10})	0,026	0,02	0,018	0,019	0,038	0,018	0,029	0,016	0,014	0,017	0,017	0,017
N-butane (н-C_4H_{10})	0,027	0,02	0,019	0,02	0,047	0,02	0,034	0,018	0,014	0,017	0,017	0,017
I-pentane (и-C_5H_{12})	0,003	0,002	0,002	0,002	0,005	0,001	0,001	0,002	0,001	0,001	0,001	0,002
N-pentane (н-C_5H_{12})	0,002	0,001	0,001	0,002	0,004	0,001	0,001	0,001	0,001	0,001	0,001	0,001
Hexane (C_6H_{14})	0	0	0	0	0	0	0	0	0	0	0	0
Oxygen (O_2)	0,019	0,022	0,034	0,028	0,042	0,028	0,249	0,037	0,025	0,029	0,028	0,023
Nitrogen (N_2)	1,362	1,389	1,388	1,367	1,461	1,326	1,298	1,434	1,369	1,361	1,346	1,343
Carbon dioxide (CO_2)	0,287	0,282	0,274	0,298	0,286	0,295	0,018	0,332	0,319	0,328	0,311	0,289
NET CALORIFIC VALUE OF GAS, GJ/m^3	0,0342	0,0322	0,034	0,0341	0,0341	0,034	0,034	0,0341	0,0341	0,0341	0,0341	0,0341
Emission factor CO_2 for associated petroleum gas, tCO_2/GJ	0,0554	0,0589	0,0554	0,0554	0,0554	0,0554	0,0551	0,0554	0,0554	0,0553	0,0553	0,0553
Average emission factor CO_2 for associated petroleum gas, tCO_2/GJ	0,0557											
IPCC default CO_2 emission factor for natural gas, tCO_2/GJ	0,0561	0,0561	0,0561	0,0561	0,0561	0,0561	0,0561	0,0561	0,0561	0,0561	0,0561	0,0561

Key information and data used to determine the baseline scenario are provided in tabular form below.

Data / Parameter:	$EG_{PJ,y}$
Data unit:	MWh
Description:	Net electricity generated by power generating unit No.2 of Nizhnevartovskaya GRES (electricity substituted by third parties in the baseline scenario)
Time of determination / monitoring	Crediting period
Data source:	Information provided by Nizhnevartovskaya GRES
Value of data applied:	Refer to Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied:	The amount of electricity generated by power generating unit No.2 is metered with standartized electricity meters.
QA/QC procedures (to be) applied	Electricity meters are subject to calibration in accordance with legislation of the Russian Federation and requirements of the manufacturer. For more details refer to Section D.
Any comment	

Data / Parameter:	$EG_{AUX,y}$
Data unit:	MWh
Description:	In-house electricity consumption by Nizhnevartovskaya GRES
Time of determination / monitoring	Crediting period
Data source:	Information provided by Nizhnevartovskaya GRES
Value of data applied:	Refer to Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied:	The amount of electricity consumed on-site is metered with standartized electricity meters.
QA/QC procedures (to be) applied	Electricity meters are subject to calibration in accordance with legislation of the Russian Federation and requirements of the manufacturer. For more details refer to Section D.
Any comment	

Data / Parameter:	$EF_{BL,CO2,y}$
Data unit:	t CO_2/MWh
Description:	Baseline emission factor in the course of electricity generation in UPS "Ural"
Time of determination / monitoring	Fixed value for the first commitment period
Data source:	JI project JI0422 "Installation of two CCGT-400 at Surgutskaya TPP-2, OGK-4, Tyumen area, Russia", determined by Bureau Veritas Russia[35].
Value of data applied:	0.606

[35] http://www.sbrf.ru/common/img/uploaded/files/tender/kioto2/27_OGK4_Surgutskaya_PGU800.pdf

Justification of the choice of data or description of measurement methods and procedures (to be) applied:	Since the value of this factor was determined in the JI Project JI0422 "Installation of two CCGT-400 at Surgutskaya TPP-2, OGK-4, Tyumen area, Russia"[36], the use of this factor is reasonable as it was developed for the same UPS (UPS "Ural") and the power generating units are comparable by their capacity (Surgutskaya TPP-2 launches two units with the total capacity of 800 MW).
QA/QC procedures (to be) applied	-
Any comment	Calculation of the factor made in the JI project JI0422 "Installation of CCGT-400 at Surgutskaya TPP-2, OGK-4, Tyumen area, Russia" is provided in Annex 2 for information.

Value of the baseline CO2 emission factor in the course of electricity generation in UPS "Ural" was taken from the determined JI project JI0422 "Installation of two CCGT-400 at Surgutskaya TPP-2, OGK-4, Tyumen area, Russia"[37]. The use of this factor is reasonable as it was developed for the same UPS (UPS "Ural") and the power generating units are comparable by their capacity (Surgutskaya TPP-2 launches two units with the total capacity of 800 MW).

The calculation presented in the JI project mentioned above is provided below for information:
"This baseline emission factor was defined in accordance with approved CDM “Tool to calculate the emission factor for an electricity system” (version 02) with some deviations, further referred as “The Tool”.
The full version of the Tool is published on the UFCCC website at the following address: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf/history_view

Scope and applicability

This Tool “…may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity, i.e. where a project activity supplies electricity to a grid…”.

Two combined cycle gas turbine units with electricity capacity of 400 MW each will be constructed at Surgutskaya TPP-2 and commissioned in July 2011. After project implementation the new electricity energy units will supply electricity to grid of United Regional Energy System (URES) “Ural”. It will substitute electricity that would have been otherwise generated by the other power plants of URES “Ural”. Therefore, this Tool can be used for determination of CO2 baseline emission factor.

Parameters

The Tool provides procedures to determine the following parameters:

Parameter	SI Unit	Description
EFgrid,CM,y	t CO_2/MWh	Combined margin CO_2 emission factor for grid connected power generation in year *y*
EFgrid,BM,y	t CO_2/MWh	Build margin CO2 emission factor for grid connected power generation in year *y*
EFgrid,OM,y	t CO_2/MWh	Operating margin CO2 emission factor for grid connected power generation in year *y*

Data source

The following sources of information were used for the OM development:

[36] http://www.sbrf.ru/common/img/uploaded/files/tender/kioto2/27_OGK4_Surgutskaya_PGU800.pdf

[37] http://www.sbrf.ru/common/img/uploaded/files/tender/kioto2/27_OGK4_Surgutskaya_PGU800.pdf

- Federal Service of State Statistics (Rosstat RF). This is aggregated data provided by energy companies using the official statistical form 6-TP;
- JSC "Unified Energy System of Russia" (UES);
- OJSC «System Operator of Unified Energy System» (JSC "SO of UES");
- CJSC "Agency of Energy Balances in the power industry".

The combined heat and power plants (CHP) can operate as cogeneration and as simple (only electricity generation) cycles and some TPPs have cogeneration energy units. Each power plant submits the electricity and heat generation and fuel consumption data in RosStat RF according to the annually statistic report (6-TP).

CHPs produce electricity predominantly in the prescribed heat supply mode. Therefore they can be excluded from OM and BM calculation. However the reports (according to form 6-TP) do not contain any information about fired fuel amount for cogeneration or simple cycles and it is impossible to exclude from calculation the fired fuel amount and electricity generation with cogeneration cycle. Therefore, the parameters of cogeneration energy units were taken into account in the OM and BM calculation. It is a deviation from the Tool but it is conservative because cogeneration cycles are more efficient than simple (or combined) cycles.

The reports contain information about the total fired fuel amount (for each fuel type), fired amount fuel for electricity and heat generation (separately). The part of the fired amount fuel for electricity generation was used in the OM and BM emission factors calculation.

BM calculation is based on the data from:

- Official annual reports of energy companies;
- Energy companies investment programs;
- Technical manual "Territorial Generating Companies", CJSC "IT energy analyst", 2007;
- Reports containing information on new power capacities put in operation in recent years, "General Scheme of Power Facilities' Allocation by 2020" approved by the Government of the Russian Federation (Order of February 22 2008 # 215p).

The "General Scheme" is not a legislative act but a research work which was implemented by a commission from the Government of the Russian Federation. OJSC "RAO UES of Russia" (and some research institutes) prepared the draft of "General Scheme" in 2007. It was based on the electricity consumption forecast and the inquiry of energy companies about their investment plans. The "General Scheme" is compilation of such information and doesn't contain any recommendations and is not responsible for where, when, what and who will construct energy units etc. The main aim of "General Scheme" is definition of the sufficiency of consumers power supply. In case of insufficiency of consumers power supply the Government of RF will prepare the arrangements on stimulation of new energy project implementation. The Government of RF approved this document in 2008 (Order of February 22 2008 # 215p). It means that this work was done according to the commission of the Government of the Russian Federation.

Also according to the Order the Ministry of Energy organizes the monitoring of the GS implementation. Currently CJSC "Agency of Energy Balances in the power industry" is preparing a revised version of the "General Scheme" [38]. The new power consumption forecast and the revised investment plans of energy companies are taken into account. In comparison with the previous version of the "General Scheme" some supposed power projects are delayed and some supposed power projects are stopped.
As stated above the "General Scheme" is not an obligatory document especially for private energy companies but data from the "General Scheme" can be used for emission factors calculation in accordance with the Tool.

Methodology procedure
The Tool determines the CO_2 emission factor for an electricity, generated by power plants, displacement in an electricity system, by calculating the "operating margin" (OM) and "build margin" (BM) as well as the "combined

[38] http://www.e-apbe.ru/scheme/

margin" (CM). Operating margin refers to a cohort of power plants that reflects the existing power plants whose electricity generation would be affected by the proposed project activity. Build margin refers to a cohort of power units that reflect the type of power units whose construction would be affected by the proposed project activity.

In line with the Tool the following steps presented in detail below should be followed. Possible deviations should be identified and justified.

STEP 1: Identify the relevant electric power systems

A *project electricity system* is the system defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints.

Similarly, a *connected electricity system* is defined as a system that is connected by transmission lines to the project electricity system. Power plants within connected system can be dispatched without significant transmission constraints but transmission to the project electricity system has significant transmission constraint.

If the Designated National Authority of the host country (in Russia it is the Ministry of Economic Development RF) has published a delineation of the project electricity system and connected power systems, these delineations should be used. The Designated Focal Point (DFP) of the Russian Federation didn't publish a delineation of the project electricity system and connected electricity systems. In this case the Tool recommends: "… to use a regional grid definition in case of large countries with layered dispatch systems (e.g. provincial / regional / national)".

Electric power industry in Russian Federation comprises nearly 400 power plants: thermal power plants (about 70% of total installed capacity), hydro power stations (20% of total installed capacity) and nuclear power stations (10% of total installed capacity). Power stations and consumers are connected by transmission lines. Power stations, consumers and regulatory organizations (JSC "SO of UES" for instance) constitute the national energy system (hereinafter referred to as UES of Russia). The UES of Russia is functioning centralized. JSC "SO of UES" contributes a great value to the operative-dispatching management. Power stations are unified by transmission lines in 60 area electricity systems (AESs), while these systems have in its turn the electric connections with the neighbouring ones (excluding some isolated area systems). AESs are unified in seven united regional electricity systems (URESs), that are connected between each other through backbone and interconnection networks: "North-Western", "Ural", "South", "Volga", "Ural", "Siberia" and "The East".

The scheme of UES of Russia is presented in Figure Anx.2.1.

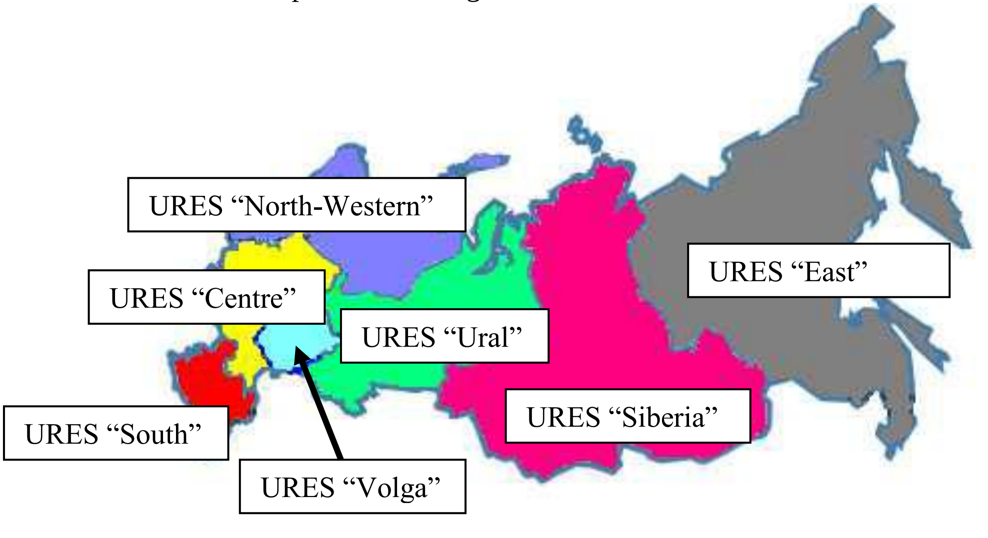

Figure Anx.2.1: Scheme of UES of Russia

Source: JSC "SO UES"

The status of these URESs is defined in State Standard (GOST) 21027-75 "Power systems. Terms and definitions" as: "the group of some area energy systems with common operating conditions and dispatching management".

Surgutskaya TPP-2 is located in URES "Ural". Installed capacity of this URES is 42,758.4 MW (status 2009). Project capacity (800 MW) is only 1.9% of the URES "Ural" total electric capacity, therefore project capacity '"…can be dispatched without significant transmission constraints".

As a result URES “Ural” is selected as a *project electricity system*.

Power plants located at areas of Kirov, Kurgan, Orenburg, Perm, Sverdlovsk, Tyumen, Chelyabinsk and Republics of Bashkiriya and Udmurtiya.

The structure of installed capacity of URES “Ural” (status 2008) is as follows:

- 94.6% – TPPs (including combined heat and power plants and units);
- 4.0% – Hydro power stations (HPSs);
- 1.3% – Nuclear power stations (NPSs);
- 0.005% - Wind power stations (WPSs).

NPSs operate as “must-run” resources and HPSs and WPSs – as “low-cost”.

URES “Ural” receives some electricity from other URESs. The most recently available date of annual URES “Ural” electricity import is presented in Table Anx.2.1.

Table Anx.2.1: The recently date of annual URES “Ural” electricity generation, consumption and import

Parameter	Data unit	2004[39]	2005[40]	2008[41]	Average
Generation	mln MWh	215.8	220.8	248.1	228.2
Consumption	mln MWh	222.7	228.1	251.0	233.9
Electricity import	mln MWh	6.9	7.3	2.9	5.7
	%	3.2	3.3	1.2	2.5

The electricity import to URES “Ural” is mostly from URES “Volga” [42]. Therefore URES “Volga” is *connected electricity system*.

STEP 2: Choose whether to include off-grid power plants in the project electricity system (optional)

Some power plants can be considered as off-grid power plants. For Ural region they can be power plants of oil and gas companies (located on the remote oil and gas deposits) and power plants of villages located within sparsely populated area. Usually these power plants are based on the gas turbine and diesel-engine technologies with a small electric and heat capacity.

As shown above in the Russian Federation the individual plant data is considered strictly confidential and only aggregate data on the regional basis are available. The off-grid power plants report according to statistic form also. Therefore Rosstat RF data includes off-grid power plants data.

Part of off-grid power plants electricity generation can be estimated using the “ODU Ural” (branch of “SO UES” is superior body of operating-dispatching management in URES “Ural”) operative data[43]. The comparison of Rosstat RF and “ODU Ural” data by 2008 are presented in Table Anx.2.2.

Table Anx.2.2: The comparison of Rosstat RF and “ODU Ural” data by 2008

[39] http://www.e-apbe.ru/analytical/doklad2005/doklad2005_4.php#p5
[40] http://www.e-apbe.ru/analytical/doklad2005/doklad2005_4.php#p5
[41] http://www.e-apbe.ru/5years/detail.php?ID=19193

[42] http://www.e-apbe.ru/5years/detail.php?ID=19193

[43] http://so-ups.ru/index.php?id=odu_ural

Area (Republic)	Installed capacity, kW		Diff[44]	Electricity generation, ths kWh		Diff
	Rosstat RF	ODU Ural	%	Rosstat RF	ODU Ural	%
Bashkiriya	5 212 458	5 194 198	0.4	24 662 943	24 491 000	0.7
Udmurtiya	589 980	585 400	0.8	3 177 553	3 162 300	0.5
Perm	6 121 100	6 139 000	-0.3	32 101 553	32 095 700	0.0
Kirov	966 980	940 300	2.8	4 685 264	4 610 300	1.6
Orenburg	3 655 000	3 655 000	0.0	16 678 094	16 677 300	0.0
Kurgan	482 800	480 000	0.6	1 990 018	1 982 600	0.4
Sverdlovsk	9 337 925	9 219 400	1.3	52 518 823	52 318 100	0.4
Tyumen	13 822 851	11 575 000	16.3	89 788 398	84 021 000	6.4
Chelyabinsk	5 108 855	4 997 000	2.2	28 639 308	28 583 900	0.2
Total	***45 297 949***	***42 785 298***	***5.5***	***254 241 954***	***247 942 200***	***2.5***

The off-grid power electricity generation of URES “Ural” is only two and half percent of total electricity generation.

According to the Tool project participants may choose between the following two options:
Option I: Only grid power plants are included in the calculation.
Option II: Both grid power plants and off-grid power plants are included in the calculation.

In accordance with the Tool, “option II aims to reflect that in some countries off-grid power generation is significant and can partially be displaced by CDM project activities, e.g. if off-grid power plants are operated due to an unreliable and unstable electricity grid.”. As the off-grid power generation is not significant, option I was chosen.

STEP 3: Select an operating margin (OM) method

The Tool recommends calculating the $EF_{grid,OM,y}$ based on one of the following methods:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis, or
(d) Average OM.

Any of these listed methods can be used; however, the simple OM method (a) can only be used if low-cost/must run resources constitute less than 50% of total grid generation calculated:
1) As average of the five most recent years or,
2) Based on long-term averages for hydroelectricity production.

Low-cost/must run resources are defined as power plants with low marginal generation costs or that are dispatched independently of the daily or seasonal load of the grid. Typically they include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. In URES “Ural” geothermal, low-cost biomass, and solar generation are negligible for the power balance. Sterlitomakskaya CHP partially burning wood waste was not considered as low-cost plant because it uses natural gas as fuel as well. Therefore nuclear stations (as “must-run”) and wind (2.2 MW) and hydro plants (as “low-cost”) are defined as low-cost/must run resources. Table Anx.2.3 represents” total electricity generation during the five last years and the five year average share of low-cost/must run resources in URES “Ural (2003-2007).

[44] Difference

Table Anx.2.3: Total electricity generation during the last five years and share of RES's low-cost/must run net electricity generation (MWh)

URES "Ural"	2004	2005	2006	2007	2008	Five year average % (low-cost + mustrun)
All power plants	215800000	220827000	216623216	233136584	238373664	4.2
Hydro- (and wind)	5000000	5426500	4564149	6493146	6226915	
Nuclear	4200000	4086500	3838542	3791896	3775284	

Source: JSC "SO of UES" and Rosstat RF

As this indicator is lower than 50% the nuclear and hydro energy generation may not be taken into account. Therefore simple OM (method "a") can be used and is selected for calculation of emission factor of URES "Ural".

STEP 4: Calculate the operating margin emission factor according to the selected method

The Tool specifies how simple OM is calculated - as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost/must run plants/units (e.g. hydro and nuclear).

The Tool suggests making calculations based on:

- the net electricity generation and CO_2 emission factor of each power unit (Option A);
- total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (Option B).

The Option B was chosen because:

(a) The necessary data for Option A is not available;
(b) Only nuclear and renewable power generation are considered as low-cost/must run power sources and the quantity of electricity supplied to the grid by these sources is known;
(c) Off-grid power plants are not included in the calculation.

Under this option the simple OM emission factor is defined by the following formula:

$$EF_{grig,OMsimple,y} = \frac{\sum_i FC_{i,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{EG_y} \quad (1)$$

Where:

$EF_{grig,OMsimple,y}$	–	simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh);
$FC_{i,y}$	–	amount of fossil fuel ***i*** consumed in the project electricity system in year *y* (mass or volume unit);
$NCV_{i,y}$	–	net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit);
$EF_{CO2,i,y}$	–	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ);
EG_y	–	net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year ***y*** (MWh);
i	–	all fossil fuel types combusted in power sources in the project electricity system in year *y*;
y	–	three most recent years for which data is available (2006-2008).

The net electricity generation and fossil fuels consumed in the project electricity system are received from Rosstat RF. The amount of fossil fuels are expressed in tonne of coal equivalent with net calorific value is equal to 7,000 kcal/kg c.e. or 29.33 GJ/t.c.e.
The net electricity generation and fuel consumption data at all TPPs of URES "Ural" in 2006-2008 are presented in the Table Anx.2.4.

Table Anx.2.4: The net electricity generation and fuel consumption data[45]

Parameter	Unit	2006	2007	2008
Net electricity generation	MWh	135934405	222265106	228371465
Natural gas	t.c.e	33740941	63050220	64719198
	GJ	989621797	1849262966	1898214087
Fuel oil	t.c.e	145938	795762	686134
	GJ	4280348	23339689	20124303
Coal	t.c.e	11311241	8663920	10294424
	GJ	331758695	254112781	301935465
Peat	t.c.e	0	72635	55212
	GJ	0	2130388	1619371
Other	t.c.e	70	755646	966516
	GJ	2063	22163103	28347914

Source: Rosstat RF

Exclusion of off-grid power plants data

The above mentioned data include net electricity generation and fuel consumption of the off-grid power plants. And the individual data of off-grid power plants is not available by this source. To exclude the off-grid power plants the following conservative assumptions were taken:

- The net electricity generation of the off-grid power plants is two and half percent (as shown in the Table Anx.2.3) of total net electricity generation of URES "Ural" in year *y*;
- Efficiency factor of the off-grid power plants was defined according to the Annex 1 of the Tool.

The off-grid power plants fuel consumption is defined based on the analysis of OJSC "Zvezda Energetika" (the biggest company constructing such type of power plant in Russia). The results of the analysis are presented in Table Anx.2.5.

Table Anx.2.5: The analysis results of OJSC "Zvezda Energetika" activity and value of default efficiency factors of the energy unit types

[45] Здесь и далее, потребление топлива только для выработки электроэнергии

Type of power unit (CAP is nominal capacity in MW)	Total capacity	Percentage	Default efficiency factor[46]
	MW	%	%
Diesel-engine units (10<CAP<50)	105.4	49.3	33.0
Diesel-engine units (CAP<10)	34.0	15.9	28.0
Gas turbine units (10<CAP<50)	24.0	11.2	32.0
Gas turbine units (CAP<10)	50.3	23.5	28.0
Total	***213.7***	***100***	-

Source: http://www.energostar.com/activity/power_plants.php
The net electricity generation and fuel consumption data at TPPs of URES "Ural" excluding off-grid power plants in 2006-2008 are presented in the Table Anx.2.6.

Table Anx.2.7: The net electricity generation and fuel consumption data excluding off-grid power plants

Parameter	Unit	2006	2007	2008
Net electricity generation	MWh	132 536 045	216 708 478	222 662 178
Natural gas	GJ	988 496 754	1 847 423 418	1 896 324 000
Fuel oil	GJ	2 392 219	20 252 427	16 952 224
Coal	GJ	331 758 695	254 112 781	301 935 465
Peat	GJ	0	2 130 388	1 619 371
Other	GJ	2 063	68 890 550	64 664 591

Definition of other fuel types
According to statistic form 6-TP the electricity and heat producers must indicate following fuel types: natural gas (including associated gas), heavy fuel oil, coal, peat, oil-shales (slate), firewood and other fuels are indicated as other fuel types.
In the Ural region some power stations use such type of fuel as blast furnace and coke even gases (power plants at the metallurgical works) and wood waste (Solikamskaya CHP). These types are reflected in statistic form 6-TP as other fuel types. The "other" fuel type (see table above) is third fuel of URES "Ural" power plants for last years. The most relevant areas are Perm, Orenburg, Sverdlovsk and Chelyabinsk.
The amount of other fuel type consumption on the regional basis during 2006-2008 is presented in the Table Anx.2.7.

Table Anx.2.7: Consumption of other fuel types on the regional basis during 2006-2008

Area (Republic)	Unit	2006	2007	2008
Bashkiriya	GJ		883 532	984 579
Udmurtiya	GJ	n/a	0	0
Perm	GJ		12 585 722	11 405 119

[46] Tool to calculate the emission factor for an electricity system, version 02, Annex I, Methodological Tool, CDM Executive board

Kirov	GJ		259 333	120 000
Orenburg	GJ		8 433 172	8 423 833
Kurgan	GJ		0	0
Sverdlovsk	GJ		12 682 643	12 679 865
Tyumen	GJ		1 344	5 111
Chelyabinsk	GJ		34 044 805	31 046 083
Total	GJ	2 063	68 890 550	64 664 591

Source: Rosstat RF
In Perm area there is Solikamsk CHP (163 MW) which used a wood waste from “Solikamskbumprom” (the pulp-and-paper mill) as fuel besides natural gas. Coke oven gas is burned at “Kizilovsk GRES” (26 MW, OJSC “TGK-9”) in proportion to 30%[47] (it is about 4% of the total “other” fuel type amount in Perm area) and they plan to increase this proportion up to 50-60%. Some power plants burn some oil waste types but data about the amount of these fuels is not available.
Orenburg, Sverdlovsk and Chelyabinsk areas are relevant metallurgical regions in Russia. The big metallurgical works are located within these regions:

- “Magnitogorsk Iron&Steel Works” (Chelyabisk area) has power units with about 650 MW of total electrical capacity;
- “Chelyabinsk Metallurgical Plant (Chelyabinsk area) has power units with about 250 MW of total electrical capacity;
- “Nizhniy Tagil Iron and Steel Works” (Sverdlovsk area) has power units with about 150 MW of total electrical capacity;
- “Ural Steel” (Orenburg area) has power units with about 170 MW of total electrical capacity.

These metallurgical plants have blast-furnace production and by-product coke plant. The blast furnace and coke oven gases are utilized practically completely at the works for different purposes: for recuperation, in heating and for electricity and heat generation. The blast furnace gas part of Sverdlovsk area in the fuel balance is about 3%[48]. Usually the major part of coke oven gas is used for recuperation and in heating furnaces, not for electricity and heat generation as it has a higher calorific value than blast furnace gas. Percentages of blast furnace gas and coke oven gas in the fuel balance of “Ural Steel” CHP are about 37% and 20%, respectively[49].
There are some energy units at other metallurgical and machine building plants: “Uralvagonzavod”, “Sinarsky trubny zavod”, “Ashinsky metallurgichesky zavod”.
Besides these gases coke breeze, refinery waste and other can be burned for electricity and heat generation at TPPs and CHPs.
For emission calculation the following assumptions were taken:

- The proportion of coke oven gas in the fuel balance of Perm area is 4% and the emission factor of other fuel types in Perm area was considered as zero;
- Other type of fuel is blast furnace and coke oven gases in the fuel balance of Orenburg, Sverdlovsk and Chelyabinsk areas. The proportion of these gases is 50%/50%;

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[47] http://www.tgk9.ru/publications_rus.html?id=873

[48] http://www.icfinternational.ru/doc_files/projTACIS/russian/PIER_Regional%20Energy%20Balances%20&%20EE-indicators%20%28rus%29.pdf

[49] http://www.bureau-veritas.ru/wps/wcm/connect/bv_ru/local/home/about-us/our-business/certification/our_areas_of_expertise/environment_and_climate_change/news-cer-ural-steel-monitoring-report/?presentationtemplate=bv_master/news_full_story_presentation

- Emission from the other fuel type consumption in Bashkiria, Kirov, Tyumen areas were not taken into account in the calculation (hence emission factor for this amount is considered as zero).

The data of total fuel balance and net electricity generation of URES "Ural" is presented in the Table Anx.2.9.

Table Anx.2.9: The data of total fuel balance and net electricity generation of URES "Ural"

Parameter	Unit	2006	2007	2008
Net electricity generation	MWh	132 536 045	216 708 478	222 662 178
Natural gas	GJ	988 496 754	1 847 423 418	1 896 324 000
Fuel oil	GJ	2392 219	20 252 427	16 952 224
Coal	GJ	331 758 695	254 112 781	301 935 465
Peat	GJ	0	2 130 388	1 619 371
Coke oven gas	GJ	0	28 083 739	26 531 095
Blast furnace gas	GJ	0	27 580 310	26 074 890
Other	GJ	2 063	13 226 502	12 058 605

Calculation of emission at the TPPs of URES "Ural"

The default fuel emission factors are presented in the Table Anx.2.10.

Table Anx.2.10: The default fuel emission factors

Fuel type	Default emission factor[50]
	tCO_2/GJ
Natural gas	0.0561
Fuel oil	0.0774
Coal	0.0961
Peat	0.1060
Coke oven gas	0.0444
Blast furnace gas	0.2596
Other fuel types[51]	0.0

The results of CO2 emissions calculation at the TPPs of URES "Ural" in 2006-2008 are presented in Table Anx.2.11.

Table Anx.2.11: Results of CO2 emission calculation at the TPPs of URES "Ural"

Parameter	Unit	2006	2007	2008
Natural gas	$t\ CO_2$	55 454 668	103 640 454	106 383 776
Fuel oil	$t\ CO_2$	185 158	1 567 538	1 312 102
Coal	$t\ CO_2$	31 882 011	24 420 238	29 015 998

[50] Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 2: Stationary Combustion (corrected chapter as of April 2007), IPCC, 2006.

[51]Emission factor for other types of fuel is taken as zero. It is conservative

Peat	t CO_2	0	225 821	171 653
Coke oven gas	t CO_2	0	1 245 982	1 177 096
Blast furnace gas	t CO_2	0	7 159 848	6 769 042
Other fuel types	t CO_2	0	0	0
Total	t CO_2	**87 521 836**	**138 259 881**	**144 829 668**

Emission calculation of the net electricity consumption from a connected electricity system

According to the Tool recommendation the emission from net electricity imports from a connected electricity system (in this case URES "Volga") should be included into OM emission factor calculation.

The amount of net electricity imports is defined as multiplication of the net electricity generation in URES "Ural" in year *y* and portion of net electricity imports in year *y* (Table Anx.2.3, 2.5 % for 2006-2007 and 1.2% for 2008).

The CO_2 emission factor for net electricity imports was supposed 0.506 tCO2/MWh[52].

The calculation results of CO_2 emission from net electricity imports from URES "Volga" in 2006-2008 are presented in the Table Anx.2.12.

Table Anx.2.12: The calculation results of CO2 emission from net electricity imports from URES "Volga" in 2006-2008

Parameter	Unit	2006	2007	2008
Import electricity	MWh	3 313 401	5 417 712	2 671 946
Emissions	t CO_2	1 676 581	2 741 362	1 352 005

The results of $EF_{grig,OMsimple,y}$ and the average electricity weighted OM emission factor calculation are presented in the Table Anx.2.13.

Table Anx.2.13: Results of $EF_{grig,OMsimple,y}$ and the average electricity weighted OM emission factor calculation

Parameter	Unit	2006	2007	2008
OM emission factor	t CO_2/MWh	0.657	0.635	0.649
Average electricity weighted OM emission factor	**t CO_2/MWh**	**0.645**		

The OM emission factor is fixed ex-ante for the period 2008-2012.

STEP 5: Identify the cohort of power units to be included in the BM
The Tool provides the recommendations on how to form the sample groups of power units used to calculate the BM. They consist of either:
(a) The set of five power units that most recently have been built, or

[52]Development of grid GHG emission factors for power systems of Russia", Carbon Trade and Finance, 2008

(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.
The option (b) was chosen for identification of the cohort of power units to be included in the BM. Capacity additions from retrofits of power plants should not be included in the calculations of BM. The total installed capacity of the proposed project is 800 MW (2×400). Therefore the energy units with installed capacity less than 100 MW were excluded from the group of prospective power plants. Such energy units are: at Tchaikovsky CHP (50 MW, commissioned 2007), at "Kizilovsk GRES" (26 MW, 2006), at Berezniky CHP-2 (30 MW, 2005), at "Uralkaly" (2×24 MW, 2007), at "Lukoil-West Siberia" (6×12 MW, 2007) and others.
Table Anx.2.14 provides the five power units that most recently have been built (since 1993) in URES "Ural".

Table Anx.2.14: The five power units that most recently have been built in URES "Ural"

No.	Power plant / unit	Year of commissioning	Capacity, MW	Technology	Fuel
Commissioned in 1993-2008					
1	Tyumen CHP-1	2003	190	CC GT	Gas
2	Chelyabinsk CHP-3, No.2	2006	180	Steam cycle	Gas
3	Chelyabinsk CHP-3, No.1	1996	180	Steam cycle	Gas
4	Nizhnevartovsk TPP, No.2	2003	800	Steam cycle	Gas
5	Nizhnevartovsk TPP, No.1	1993	800	Steam cycle	Gas

Source: Energy companies
For the first commitment period of the Kyoto Protocol projects participants can choose between one of the two options:
(1) ex-ante based on the most recent information available on units already built;
(2) ex-post based on information updated during each relevant monitoring period.
The approach presented above is based upon ex-ante option.

STEP 6: Calculate the build margin emission factor
In line with the Tool the BM emission factor is the generated-weighted average emission factor of all power units *m* during the year y and is calculated as follows:

$$EF_{grig,BM,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_5 EG_y} \quad (2)$$

Where:

$EF_{grig,BM,y}$ – BM emission factor in year y (tCO_2/MWh);
$EG_{m,y}$ – net quantity of electricity generated and delivered to the grid by the power unit *m* in year *y* (MWh);
$\sum_5 EG_y$ – net quantity of electricity generated and delivered to the grid by the cohort of 5 units in year y;
$EF_{EL,m,y}$ – CO_2 emission factor of the power unit *m* in year *y* (tCO_2/MWh);
m – power units included in the BM;
y – most recent historical year for which power generation data is available.

Method of $EF_{EL,m,y}$ calculation here is the same as for $EF_{grig,OMsimple,y}$ described under Step 4, i.e. by using specific fuel consumption per 1 kWh of energy output $b_{m,y}$ (kg c.e./kWh).

$$EF_{EL,m,y} = b_{m,y} \cdot EF_{CO2,fuel} \quad (3)$$

Where:

$EF_{CO2,fuel}$	–	fuel emission factor (fuel type weighted) in tCO_2/MJ or tCO_2/t.c.e; the IPCC factors for main types of fuel values;
$b_{m,y}$	–	specific fuel consumption by the unit *m* (MJ/MWh or t.c.e./MWh).

In the Russian Federation individual plant based data is considered strictly confidential. Therefore the specific factors of the power units (or similar power units) from open sources were used.

The background data for *grig, BM, y EF* calculation is presented in the Table Anx.2.15.

Table Anx.2.15: Background data for $EF_{grig,BM,y}$ calculation

<table>
<tr><th>Parameter</th><th>Unit</th><th>Nizhne-vartovsk TPP, No.1</th><th>Nizhne-vartovsk TPP, No.2</th><th>Chelyabinsk CHP-3, No.1</th><th>Chelyabinsk CHP-3, No.2</th><th>CC GT at Tyumen CHP-1**</th></tr>
<tr><td>Electric capacity</td><td>MW</td><td>800</td><td>800</td><td>180</td><td>180</td><td>190</td></tr>
<tr><td>Annual net generation of electricity</td><td>MWh</td><td colspan="2">11 326 030</td><td colspan="2">1 231 000</td><td>865 488</td></tr>
<tr><td rowspan="2">Specific fuel consumption</td><td>g c.e./kWh</td><td colspan="2">303.4</td><td colspan="2">267.4</td><td>239.9</td></tr>
<tr><td>GJ/MWh</td><td colspan="2">8.899</td><td colspan="2">7.843</td><td>7.036</td></tr>
<tr><td rowspan="2">Fuel</td><td>-</td><td colspan="2">Associated petroleum gas</td><td colspan="3">Natural gas</td></tr>
<tr><td>GJ</td><td colspan="2">100 787 192</td><td colspan="2">9 654 539</td><td>6 089 805</td></tr>
<tr><td>Annual net generation of electricity</td><td>t CO₂GJ</td><td colspan="5">0,0561[31]</td></tr>
</table>

*Source: * http://www.ogk1.com/?ch=pl&id=5&art=new&nid=970;*
*** according to the standards from the Concept of Technical policy of JSC UES;*
**** Manual "Territorial Generate Companies", CJSC "IT Energy Analytics", 2007*

The results of $EF_{EL,m,y}$ calculation are presented in the Table Anx.2.16.

Table Anx.2.16: Results of $EF_{EL,m,y}$ calculation

<table>
<tr><th>Parameter</th><th>Unit</th><th>Nizhne-vartovsk TPP, No.1</th><th>Nizhne-vartovsk TPP, No.2</th><th>CC GT at Tyumen CHP-1**</th><th>Chelyabinsk CHP-3, No.1</th><th>Chelyabinsk CHP-3, No.2</th></tr>
<tr><td>Power unit CO₂ emission factor</td><td>tCO₂/MWh</td><td>0.499</td><td>0.499</td><td>0.395</td><td>0.440</td><td>0.440</td></tr>
<tr><td>Average weighted BM emission factor</td><td>tCO₂/MWh</td><td colspan="5">0.487</td></tr>
</table>

BM emission factor is ex-ante for period 2008-2012.

STEP 7: Calculate combined margin emission factor

The combined margin emission factor (CM) is calculated as follows:

$$EF_{grid,CM,y} = w_{OM} \cdot EF_{grid,OM,y} + w_{BM} \cdot EF_{grid,BM,y} \quad (4)$$

Where:

$EF_{grid,CM,y}$ – CM emission factor in year *y* (tCO2/MWh);

$EF_{grid,OM,y}$ – OM emission factor in year *y* (tCO2/MWh);

$EF_{grid,BM,y}$ – BM emission factor in year *y* (tCO2/MWh);

w_{OM} – weight of OM emission factor;

w_{BM} – weight of BM emission factor.

In most cases, the Tool recommends to apply $_{OM}$ w = $_{BM}$ w = 0.5. But developers may propose other weights, as long as $w_{OM}+w_{BM}$ = 1.

As a starting point the weighting factor for $_{OM}$ w is taken as 0.5.

When looking at the factor for $_{BM}$ w the specific of the Russian power system have to be taken into account. The Russian power system has a big quantity of old, worn-out, low efficient power plants being in operation for decades. According to the JSC "UES of Russia" average turbines operational life time is around 30 years. Most of these capacities were put in operation in 1971-1980 that corresponds to 31.4% of the total installed capacity.

In accordance with General Scheme[53], dated 22 February 2008, it was planned to approximately 33 GW of old capacity has to be dismantled by 2015. To meet the growth in demand for new energy units with total capacity of 120 GW will be commissioned by 2015. This means that the JI project will not only avoid the construction of new power plants, but also accelerate the decommissioning of existing capacities. Given the impact of the financial crises on demand growth and the capability to finance new projects, the new estimation[54] (September 2008) expects that out of the planned 120 GW only about 80 GW will be operational by 2015. Out of the 33 GW of old capacity only 10 GW will be dismantled. This means that 1 GW of any project delay is a delay of 0.5 GW of old capacity dismantling. So the effect of the JI project on the acceleration of decommissioning of existing capacities will only be stronger as result of the financial crisis.

The estimation, that the effect of the JI project on the decommissioning of power plants and the delays of new power plants construction is approximately 50% / 50%. For the avoidance of new power plants the emission factor of the BM is representative whereas for the accelerated decommissioning effect the emission factor of the OM is representative. And it means that 0.25 of BM refers to the group of prospective power plants and another 0.25 of BM refers to the dismantling of existing capacities and can be related to OM.

Therefore effective w_{OM}= 0,50 + 0,25 = 0,75, and w_{BM}= 0,25.

The resulting grid factor is $EF_{grid,CM,y}$= 0.606 tCO_2/MWh.

CM emission factor is ex-ante for period 2008-2012, because OM and BM emission factors are ex-ante as well.

[53] http://www.e-apbe.ru/library/detail.php?ID=11106

[54] http://www.e-apbe.ru/library/detail.php?ID=11106

This emission factor is the baseline emission factor ($EF_{BL,CO_2,y}$) which is used to establish the baseline emissions of the baseline scenario.

Annex 3:

MONITORING PLAN

See Section D for monitoring plan.