12JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM
Version 01 - in effect as of: 15 June 2006

Switch of Khabarovsk CHP-1 from Coal to Fire Natural Gas

(town of Khabarovsk, Russia)

Version 1.0
21 December 2006

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

CONTENTS

SECTION A. General description of the project

A.1. Title of the project:

"Switch of Khabarovsk CHP-1 Plant from Coal to Fire Natural Gas"
PDD Version 2 dated December 21, 2006

A.2. Description of the project:

The Project is designed to modernize and switch boilers No. 1-19 from coal to fire natural gas with implementation of the measures to substantially increase the economic and ecological efficiency of CHP-1:

- implementation of the gas supply technological complex for the Khabarovsk CHP-1 plant for gas transportation and supply directly to the boilers complete with the commercial gas accounting system at the CHP-1 plant in the gas distribution station and the process gas flow rate accounting for each boiler;
- equipping of the gas distribution station with the process control system;
- optimization of the equipment mix and operation of the boilers.

Switching the boilers from coal to natural gas carried out at the CHP-1 will not result in any changes in the plant circuit and operating conditions and the amount of the products supplied. Khabarovsk CHP-1 delivers power and heat to the industrial and community consumers of Khabarovsk City and is operated according to the schedule of consumers' demand.

Project implementation will not change heat output (there will be no replacement) and the amount of fuel-fired at other enterprises beyond Khabarovsk CHP-1.

The project implementation will allow increasing the power system stability and profitability, considerably improving the ecological situation (to reduce the amount of harmful emissions into the atmosphere of the city and to the water basin of the Amur River), and also working conditions at Khabarovsk CHP-1.

Main Goals of the Project:

- increasing economic and ecological efficiency of Khabarovsk CHP-1 activities, the Open Joint Stock Company "Khabarovskenergo" subsidiary;
- obtaining extra profits due to electric power and heat primary cost reduction under existing electricity tariffs;
- satisfying the energy consumption growth by generating electric power and heat by using more efficient equipment;
- providing grounds for heat and electric power output increase from the CHP-1 plant.

Implementation of the project will allow receiving the following results:

- increasing boiler efficiency by switching to natural gas and replacing the existing burners with more efficient burners;
- significant reduction of low-temperature corrosion that will result in service life of the boiler and the gas/air path increase;
- decreasing the CHP-1 auxiliary power requirements by 6%;
- decreasing specific fuel consumption of released heat from 351.7 to 322.5 g/kWh, and from 144.4 to 142.1 kg/Gcal for released electricity, respectively;
- annual fuel saving about 55 tce;
- CO_2 emissions reductions for 1 220 thous. t/y;

- annual atmospheric emissions of sulfur dioxide reduction by 7.7 thous. t., nitrogen oxide by 2.8 thous. t., fuel oil ash calculated on vanadium basis by 14.1 thous. t.

The results are given for 2008.

Implementation schedule and costs of the project
On 5th of October 2006 one of the boilers of Khabarovsk CJP-1 was switched from coal to fire natural gas because of the commissioning into the constant operation of the main gas pipeline Sakhalin-Komsomolsk-on the Amur river – Khabarovsk.

According to *Decision 9/CMP.1* [16], the project may be recognized as a joint implementation project, if its technical implementation began not earlier than in the year 2000.

The project has been considered as JI project since December 2005.
The first version of PDD was prepared in February 2006.
The Letter of Endorsement of the project by the Khabarovsk Regional Board of Ecological and Technological Supervision dated March 25, 2006 is presented in Annex 2.4.

The total cost of the project is equal to 25.92 mln. Euro.

Estimated amount of emission reductions over the crediting period:
It will be estimated as 6,100,000 tones from 2008 till 2012.

A.3. Project participants:

Party involved	Legal entity project participant (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Russian Federation (Host party)	• JSC Khabarovskenergo • Energy Carbon Fund	No
Japan	J-Power	No
Switzerland	Cargill International SA	No

JSC Khabarovskenergo
Open Joint-Stock Company (Open JSC) "Khabarovskenergo", founded in 1993 on the basis of the regional agency "Khabarovskenergo" is the main producer of electric power and heat in Khabarovsk region.
"Khabarovskenergo" is a part of integrated power system "Vostokenergo" –representative of the Russian Open JSC "UES of Russia" on the management of the power systems in the Eastern part of Russia - is a diversified power enterprise, which activities include generation and distribution of electric power and heat, and associated research activity, design and construction.
Now, the structure of Open JSC "Khabarovskenergo" includes 24 enterprises with 7 thermal power stations, 3 large heating boiler plants, 6 enterprises of electric networks, 2 enterprises of heat networks and others.
Open JSC "Khabarovskenergo" has nine wholly-owned subsidiaries: Open JSC "Khabarovsk production and repair company", Open JSC "Khabarovsk repair and construction company", Open JSC "Khabarovsk repair and mounting company", Open JSC "Khabarovsk energy technological company", Open JSC "Avtotransportenergo", Open JSC "Energotorg", Open JSC "CK" Agroenergo", Open JSC "Rodnik zdorovia (Spring of health)" and Open JSC "OL" Amurskaya zhemchuzhina (Amur pearl) ".

The installed electric capacity of the power system is 2153 MW with heat capacity of - 7194 Gcal/h (8367 MW)[1]. Open JSC "Khabarovskenergo" includes 15000 km of electric transmission lines of all voltage levels and more than 400 km of heat lines. It's connected with Amur region by 220 and 500 kV transmission lines and with Primorsk region - by 110/220 kV transmission lines.
The Khabarovsk power system includes two energy areas – the interconnected energy area incorporating six power stations coupled by the system-forming transmission lines and Nikolaev energy area in the structure of Nikolaev CHP plant and 110kV networks. The Nikolaev energy area operates independently.
The power system supplies the central and southern areas of Khabarovsk territory and the Jewish autonomous region with electric power and heat.
The power system territory embraces 788 thousand sq. km with the population of 1605 thousand people.
The heat from the district heating system sources, which belong to the power system, is supplied to Khabarovsk, Komsomolsk-on-the-Amur River, Amursk, Nikolaevsk-on-the-Amur River, and Birobidzhan.
Heat and electrical energy supply in the rural and northern areas is carried out from more than 330 local boiler plants with the total capacity of about 1600 Gcal/h and from 86 small diesel power stations of the total installed capacity of more than 118 MW.
The specific feature of the power industry of the region is that with the availability of enormous hydro resources the basic energy sources are the CHP plants, operating on the imported fuel. The major fuels for the power stations are brown and bituminous coals (68 %), furnace fuel oil (13.5 %) and natural gas (18.5 %).

Energy Carbon Fund was established in February 2001 by Russian JSC "Unified Energy System of Russia", one of the largest energy utility companies in the world. Energy Carbon Fund (ECF) is designed as revolving investment mechanism for implementation of energy efficiency improvement projects to promote sustainable development by taking the opportunities of market based mechanisms laid down in the Kyoto protocol to the United National Framework Convention on Climate Change.
The main activities of the ECF are the follows:

- ECF is conducting of the inventory of the greenhouse gas emissions and development of the GHG emission monitoring system at the RAO "UES of Russia" enterprises (the inventories were completed for 107 entities);
- ECF carried out the analysis of all projects including in the Investment Program of RAO "UES of Russia" till 2010;
- ECF provides complete cycle for JI project from PIN to signing ERPA.

J-Power
Electric Power Development Co., Ltd. (J-POWER) is a leading Japanese power wholesaler with 67 power stations and 2,400 kilometers of transmission lines in Japan. J-POWER has over 45 years of experience assisting the development of power projects worldwide through consulting and direct investment, and more recently, J-POWER has become very active overseas in the development of carbon emission reduction projects under the mechanisms of the Kyoto Protocol. J-POWER participated in many CDM/JI projects worldwide, including fuel switch (coal to gas).

Cargill International SA
Cargill is an international provider of food, agriculture and risk management products and services. With 153,000 employees in 63 countries, the company is committed to using its knowledge and experience to collaborate with customers to help them succeed.

[1] See the official information on installed capacities at the web-site of Khabarovskenergo http://www.khabenergo.ru/show.cgi?/finance/power.htm

The emissions team is a part of the Power&Gas Trading Desk within Cargill International SA, Geneva and helps to originate (through Cargill Emission Reduction Services in Minneapolis), develop and market emission reductions from JI and/or CDM projects around the world. To date, the emissions team has developed a diversified portfolio of projects from more than 10 countries and methodologies.
With over US$300 million worth of investments in the food and agricultural sectors in Russia, Cargill is one of the leading foreign investors in Russia and regularly looks for existing and future JI projects to add to its already strong commercial presence in Russia.

A.4. Technical description of the project:

A.4.1. Location of the project:

The project is located in Khabarovsk CHP-1, Khabarovsk town, Khabarovsk Region, which is situated in the Far East of the Russian Federation.

A.4.1.1. Host Party(ies):

Russian Federation

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

Khabarovsk Region

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

Town of Khabarovsk

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

The Territory of the Khabarovsk Region
Khabarovsk Region is situated in the Far East of the Russian Federation and is part of the Far East Federal district. Its total area is 788.6 thousand sq. km.
The territory of Khabarovsk Region includes 17 administrative districts and two cities of regional submission: Khabarovsk (about 617.8 thousand people) and Komsomolsk-on-the-Amur (about 298.5 thousand people). The total number includes 7 cities, 27 towns 186 rural administrations, with the population more than 1571 thousand people, 81 % of which live in the cities.
Khabarovsk Region is an industrial center of the Far East region. In its economic system the most important sectors are power-intensive branch and highly-developed social sphere.
The main industries include mechanical engineering and metallurgy (agricultural machineries production, power engineering industry, shipbuilding and ship repair, manufacture of the foundry equipment), nonferrous metallurgy, forestry, wood processing and pulp-and-paper, oil refining, chemical engineering and fishing industry.
Also, there are two oil refineries - in the cities of Khabarovsk and Komsomolsk-on-the-Amur, which provide petroleum products for almost all the Far East economic region.
The total processing capacity is 10 million t/y of crude petroleum, from which about 10 % is supplied from the Sakhalin island deposits through the oil pipeline Okha - Komsomolsk-on-the-Amur River, 90 % is delivered by railway from Siberia.
The main coal-mining plant is a Joint-Stock Company "Urgalugol" with production capacity more than 2.5 million tons of coal p. a.

The Town of Khabarovsk

Today the town of Khabarovsk is considered to be a capital of the Far East region. It is located in the central part of the Far East, where most of federal and regional offices are located (the Far East military district headquarters, the Far East railway headquarters, Glavdalstrroj, Dallesprom, Dallesstroj holdings and etc.

Khabarovsk is the second populated town in the region and the fourth by the territory. It is located on the right bank of the Amur River at its junction with the Ussuri River, and is 45 km long with total area about 37 thousand ha. The city is subdivided into five districts: Krasnoflot, Kirov, Central, Zheleznodorozhny (Railway) and Promyshlenny (Industrial).

Khabarovsk town is the largest industrial, transport, cultural and scientific center of the Far East. There are about 100 enterprises of mechanical engineering, metallurgy, construction, food, light and other industries n the city. The Khabarovsk railway hub is the largest in the region, and its river port is the largest on the Amur River.

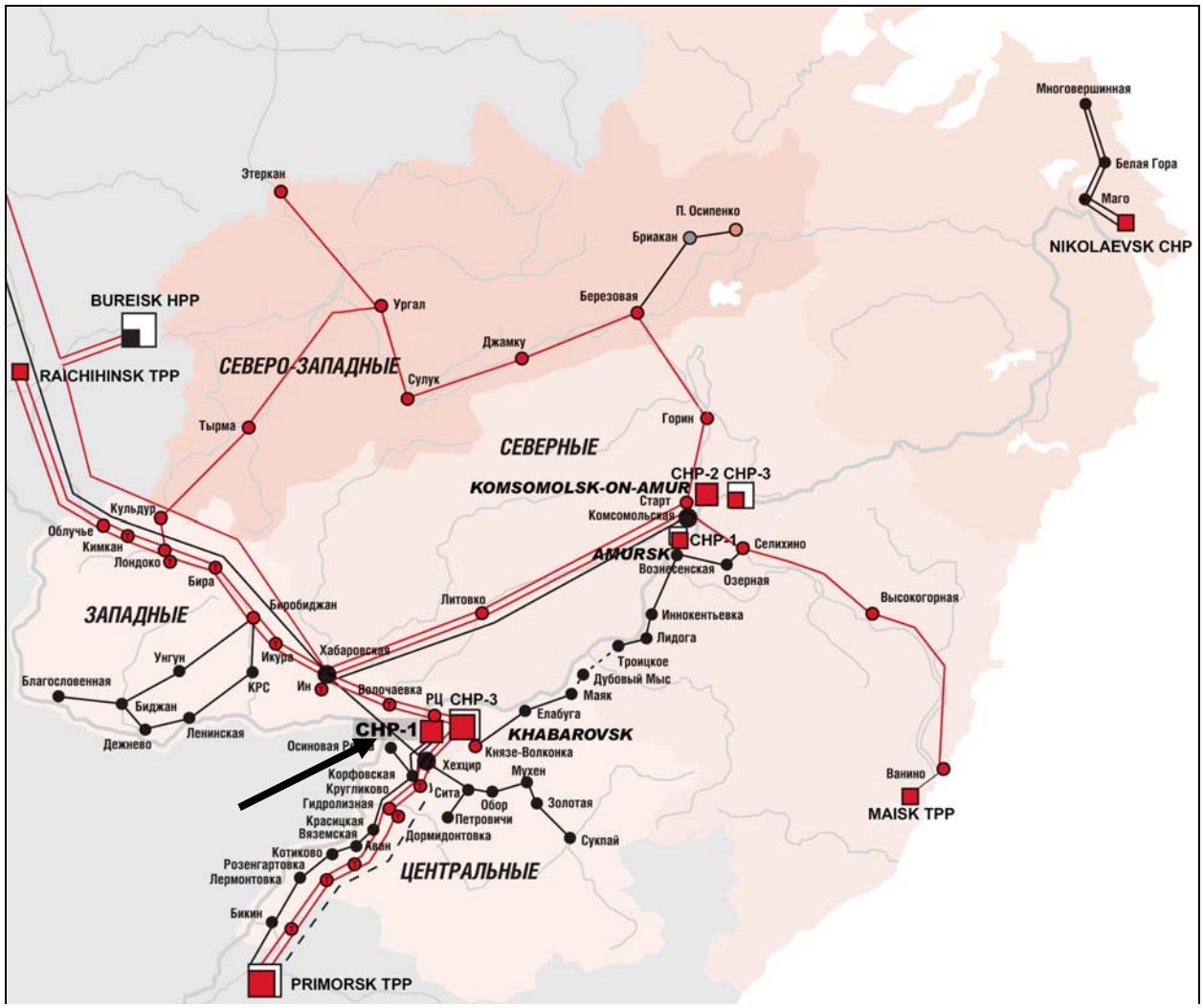


Fig. A.4.1.4. Location of the project

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

Now, the Khabarovsk CHP-1 installed electrical capacity is 435 MW, installed heat capacity is 1200.2 Gcal/h, main fuel used is a mixture of black and brown coals. The connected heat load of heating system

with hot water is 753 Gcal/h, with steam – 114 Gcal/h in 2002. Annual heat output from CHP-1 in 2002 was – 3,563,621 Gcal/y, power output – 1,571,092 MW/y. Actual annual heat output was 2,361,000 Gcal, including with steam – 124,000 Gcal. The technical personnel of CHP-1 boiler department includes up to 110 persons in shift, the operation staff and maintenance staff of the boiler department consists of 18 people.

The following boilers are installed in the boiler department of the Khabarovsk CHP-1:

- steam boilers – 4 boilers (No. 1-4) of the TP-170-100, 2 boilers (No. 5 and 6) of the BKZ-160-100F, 2 boilers (No. 7 and 8) of the BKZ-220-100F, 8 boilers (No. 7-16) of the BKZ-210-100F;
- hot water boilers – 3 boilers (No. 18-20) of the PTVM-100.

The following turbo units are installed in the turbine department: 1 - PT/50-90/13; 1 - PT-30-90/13; 1 - T-27.5-90; 2 - PR-25-90/10/0.9; 2 - T-100-130; 1 - T-105-130.

The characteristics of the boilers and turbines are given in Annex 2.1.

To restore the condensate losses, the CHP plant is provided with the chemical water treatment plant. The capacity of the chemical water treatment plant is 1800 t/h to make up the district heating system (heat network).

In the existing flow sheet the mixture of black and brown coal as the main and reserve fuel is used. The combustion products generated when firing coal are emitted into the atmosphere via the stack.

The design flow sheet uses natural gas as the main fuel and coal – as the reserve one.

As a result of switching the Khabarovsk CHP-1 to natural gas combustion while keeping the existing boiler capacity, the labor conditions and ecological situation in the city will be significantly improved - the emissions of ashes and sulfur from these boilers will be fully eliminated.

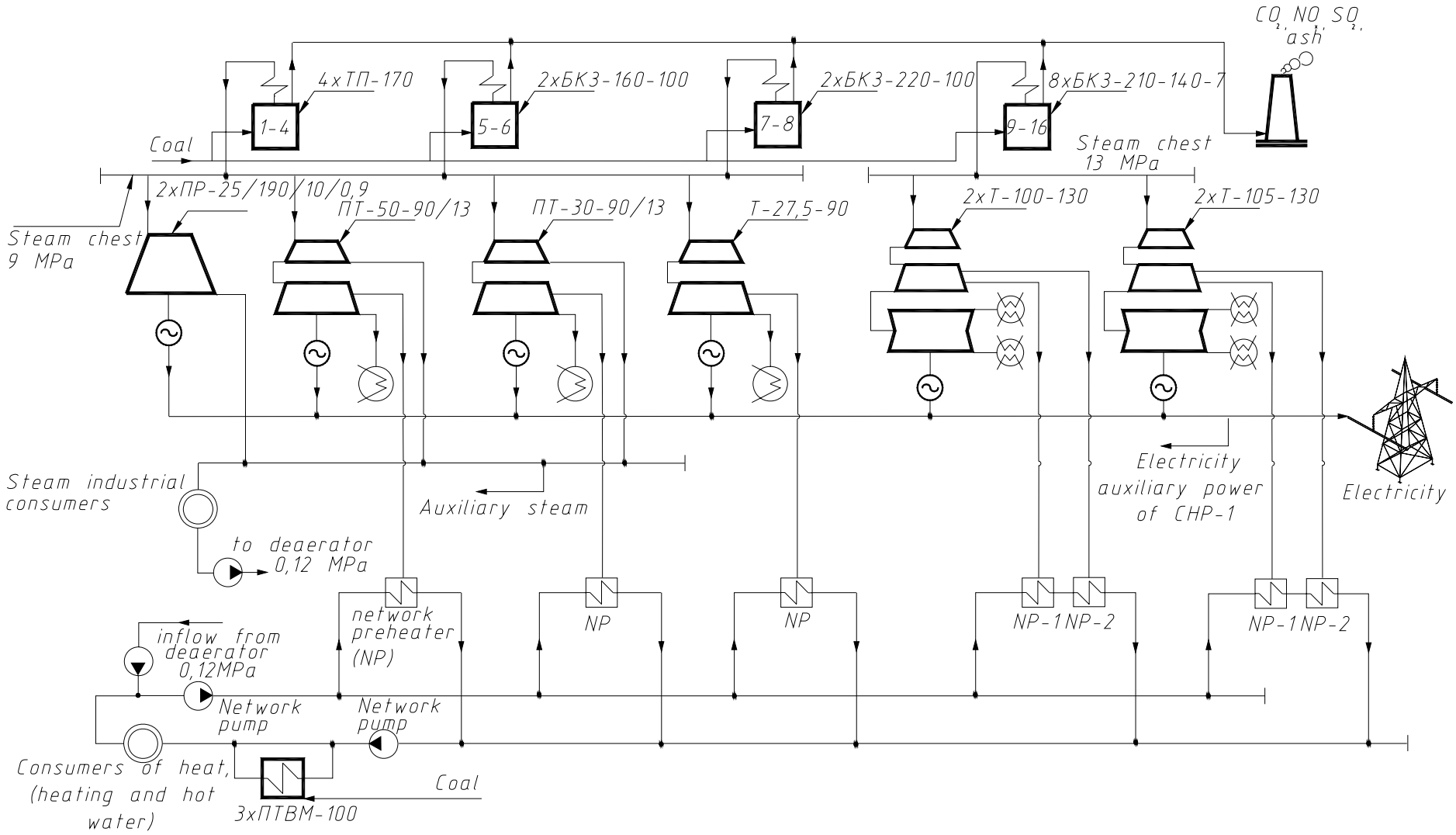
The Khabarovsk CHP-1 plant will be supplied with natural gas from the shelf of the Sakhalin Island via the main gas line "Komsomolsk-on-the Amur – Khabarovsk". The proposed date of the main gas line commissioning is 2006.
The Khabarovsk CHP-1 will be supplied with natural gas via the city high-pressure gas line from the gas distribution station (GDS) No. 1. The maximum gas pressure of the gas line connected to the Khabarovsk CHP-1 is 0.6 MPa.

No natural gas storage tanks are envisaged on the site of the Khabarovsk CHP-1. The natural gas pressure reduction and maitenance at the specified level in the gas supply system of the Khabarovsk CHP-1 will be provided by the equipment located on the factory-made gas distribution point (GDP).

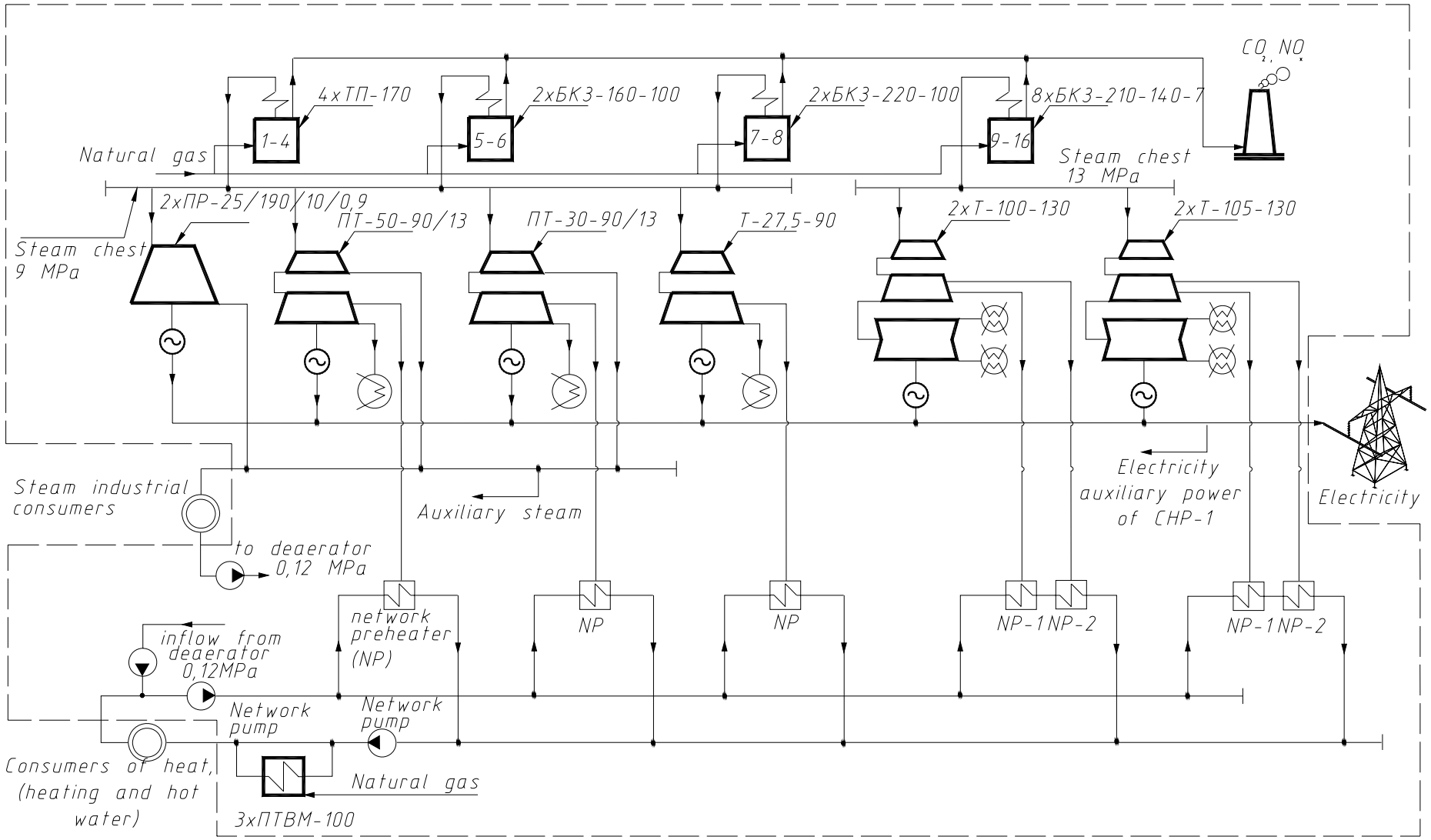
Via the gas pipeline the dried gas with following (average) physical and chemical characteristics will be transported (letter 74/346f of 2.06.03 "SakhalinNIPImorneft"):

- low heat value - 34830 kJ/m^3 (8320 kcal/m^3):
- relative specific weight by air – 0.6;
- methane 91.6; ethane – 3.5; propane – 0.9; butane – 0.5;
- pentane – 0.2; carbon dioxide – 0.8; nitrogen – 0.6;
- hydrogen sulfide - none.

The current flowsheet of Khabarovsk CHP-1 and the product delivery system and the flowsheet Khabarovsk CHP-1 and the product delivery system with JI project implementation are presented in Figs. A.4.2.1-A.4.2.2



Figs.A.4 2.1 The current flowsheet of Khabarovsk CHP-1 and the product delivery system



Figs. A.4.2.2 The flowsheet Khabarovsk CHP-1 and the product delivery system with JI project implementation

The state of the main and auxiliary equipment depends on duration and conditions of its operation, timely maintenance and repairs including replacement of components, parts or mechanisms, observance of the requirements and rules of technical operation, as well as of other directives. The equipment of the heat cycle of the Khabarovsk CHP-1 plant is in a satisfactory condition due to timely maintenance and replacement of some components during the repair.

The operating boilers of the Khabarovsk CHP-1 plant had been manufactured and commissioned during the period of 1953-1981 (Annex 2.1). The duration of operation of the main and auxiliary equipment is specified in accordance with the statement of the Expert and Technical Committee carrying out the relevant examinations.

The technological complex of the gas supply to the Khabarovsk CHP-1 plant, which is designed for gas transportation and supply directly to the consumer, includes:

- high pressure gas line from the right-of-way of the Khabarovsk CHP-1 plant to the gas distribution substation;
- factory-assembled gas distribution substations 1 and 2;
- gas flow commercial accounting system installed at the gas distribution substation;
- gas flow process accounting for each boiler;
- two medium pressure gas lines located on the territory of the Khabarovsk CHP-1 plant over the existing and designed trestles running from the gas distribution substation to the main building;
- gas lines within each boiler (inlet and control units) located in the boiler department;
- provision of gas equipment for the burners per each boiler;
- installation of gas burners;
- air inlet to boiler burners;
- gas firing process control system.

The project envisages provision for boilers No. 1-16, 18-19 of natural gas equipment ensuring fuel automatic control and firing. The gas lines located on the territory of Khabarovsk CHP-1 plant is laid over the existing and designed trestles running from the gas distribution substation to the main building.

The gas distribution substation is in fact the complex of the factory-made two-block complete set:

- block-box filters;
- reduction block-box with five trains of reduction;
- 3 working trains; 1 standby train; 1 small flow train.

The automation and alarm system of the reduction block envisages:

- block compartment gas content alarm;
- monitoring of gas flow, pressure and temperature;
- alarm on the trip of the relevant reduction lines;
- fire and block door opening alarms;
- Installation of the gas flow commercial accounting system.

The boilers are equipped with the gas-heavy oil device of gas burners. At the stage of the feasibility study the following equipment was included:

- 8 burners for PTVM-100 boilers (replacement of existing gas/oil burners);
- 6 burners for BKZ-220-100F boilers;
- 4 burners for TP-170 and BKZ-160-100F, BKZ-210-140F boilers;
- 2 burners for B-50-14/250 boilers.

During the installation process of gas burners provision shall be made for hot air inlet for combustion. The cross-section areas and locations of cutting-in the hot air ducts will be corrected at the stage of working design in accordance with layout drawings of the boiler manufacturers. To compensate for thermal displacement of the air ducts provision is made for lens compensators and spring-suspension fastening of

the air ducts. In accordance with the manufacturer drawings the burners will be insulated with the insulation materials complete with lining the gauze with special compound.

Each air duct running from the existing hot air manifold is connected to the burner with the installation of the valve complete with the MEO drive. The insulation of the hot air ducts is made of the mineral cotton wool with lining the gauze using special compound.

In connection with switching the boilers to fire gaseous fuel and in accordance with SNiP (Construction norms and rules) 11-58-75 "Ventilation and conditioning" in the boiler department within the boiler bays the plenum air will be supplied in the amount of the triple air exchange.

To implement the conditions of economic relations between the gas supplier and the gas consumer the subsidiary of the Open Joint Stock Company “Khabarovskenergo” Khabarovsk CHP-1 plant, the gas flow rate accounting system will be installed in the gas distribution substation at the inlet of the reduction block-box.

The system is designed for automated collection and transfer of the data on:
- gas temperature;
- gas flow rate for each gas line train;
- gas pressure in each gas line train.

The information from the sensors of temperature, pressure and flow rate is processed on the multifunctional transducer (information collection and transfer device) and is transmitted over the communication lines to the operator computer to be displayed, recorded and archived. This information can also be transmitted via the modem of the process control system of the Open Joint Stock Company “Khabarovskkraigas”.
The gas accounting system is independent.

The used sensors of temperature, pressure and flow rate are made of the commercial domestic or foreign equipment.

For accounting of gas consumed by each boiler, the inlet unit locates the diaphragm, flow rate sensors with the data transfer to the recording device (computer).

The gas distribution substation is equipped with the process control system. The system is based on the computers and conventional I&C devices and is capable of performing the following functions:
- information (collection and processing of the data on gas distribution substation process parameters, emergency trips, alarms on normal operation and deviations of process parameters from specified values);
- automatic control and keeping pressure within the specified range;
- remote control from the switchboard room:
- automatic standby connection.

The alarm circuit envisages:
- control of gas parameters;
- control of condition of filters and reduction lines;
- control of gas content in the block-boxes of the gas distribution substation.
  The gas distribution substation locates the local control board.

The engineering and technical personnel of the boiler department of the Khabarovsk CHP-1 plant has 110 people per shift with the number of the operating and maintenance personnel of this department amounting to 18 persons.

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 anthropogenic emissions of greenhouse gases by sources are to be reduced by the proposed JI project by two reasons.
The first and main reason is a switch from coal to natural gas. The effect will be achieved via using fuel with lower GHG emissions per unit of burned fuel energy.

For CO_2 emissions this parameter is equal:

	Default factors (Revised Guidelines of National Inventories of GHG Emissions, IPCC, 1996: Working Book)	Local coefficients (Inventory of GHG emissions of JSC "Khabarovskenergo")	
Fuel	**tCO_2/TJ**	**tCO_2/TJ**	**tCO_2/tce**
Gas	56.1	55.3	1.62
Heavy oil	773	77.7	2.28
Coal	94.5	98.2	2.88

Under switching from coal to fire natural gas on the same power and heat output within the project and baseline, GHG emissions reduce by 1.5 times.

The second component of the GHG emissions reduction is increasing energy efficiency of the existing equipment. Under firing natural gas instead of coal the fuel consumption for auxiliary will reduce and also the efficiency of technological process of fossil fuel firing will increase. Under the project implementation the auxiliary power requirements will be decreased by 6 % which will be resulted to reduction of fuel consumption per unit of energy output. The specific fuel consumption of released heat will be decreased from 144.4 to 142.1 kg/Gcal and for released electricity - from 351.7 to 322.5 g/kWh.

The baseline adopted for the project is based on the assumption that in the absence of carbon finance the company would continue operating its plant with coal, following the trends in the sector as a whole. Thus the proposed project activity is not the baseline and the estimated emission reductions would not occur in the absence of it. Therefore the project shows reduced GHG emissions since the CO_2 emissions from natural gas are lower than from coal and heavy oil.

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

	Years
Length of the period within which ERUs are to be earned	2007-2012
Length of the crediting period	2008-2012
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2007	1 200
2008	1 220
2009	1 220
2010	1 220

2011	1 220
2012	1 220
Total estimated emission reductions over the period within which ERUs are to be earned (tonnes of CO_2 equivalent)	7 300
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	6 100
Annual average of estimated emission reductions over the crediting period/period within which ERUs are to be earned (tonnes of CO_2 equivalent)	1220

A.5. Project approval by the Parties involved:

Project approved by the Parties involved:
The project will be approved by Russian Federation as soon as Russian Federation set up legislation of using the Kyoto mechanism.

The Parties' Approval Letters will be received later.

SECTION B. Baseline

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

Introduction
Any baseline for JI project should be established in accordance with the Appendix B of the Decision 9/CMP.1[2] and in accordance with the guidance of the Joint Implementation Supervisory Committee (JISC).

In accordance with the decision 10/CMP.1, approved CDM methodologies can be used to develop the PDDs of JI projects. But none of the CDM methodologies can be applied directly to the project. The used methodology is presented in Annex 2.

While identifying the baseline and project emissions, the general principles of Appendix B of the Decision 9/CMP.1 (in particular: project-specific approach, taking conservative assumption, and taking into account relevant politics) have been adhered to.

In approving the additionality of the project the most recent "Tool for the demonstration and assessment of additionality (version 2)" has been applied. Please refer to section B.2.

Retrospective and perspective analyses of fuel supply, heat and electricity delivery, operating conditions of the plant
The main operating parameters during 1990-2004 are given in Table B.1.1. The dynamics of variation of heat and power output from the Khabarovsk CHP-1 and specific consumption of fuel equivalent for electricity and heat supplied during this period is illustrated in Figs. B.1.1 and B.1.2.

List and quantity of coal burned at the Khabarovsk CHP-1 in 1998-2004 are presented in Table B.1.2.

The analysis of retrospective data illustrates that over the last five years power output from the Khabarovsk CHP-1 has de-facto reached the 1990 level and has become stable. The increase/decrease of these parameters as compared with the previous year mainly depends on the change of average outdoor temperature during heating season. Some revival in economy of Khabarovsk Region (for example, according to the final balance sheet of the Ministry of Economic Development and External Affairs of the Khabarovsk Region gross production output in 2004 equals to 104.5 % when compared to the same figure in 2003) allows making a tentative forecast of demand growth and concomitant increase of heat and power output from Khabarovsk CHP-1.

The growth in electricity and heat load as compared with 90s will lead to a more effective usage of generating equipment and to a decrease in specific fuel consumption.

[2] FCCC/KP/CMP/2005/8/Add.2

Table B.1.1 Basic performance characteristics of Khabarovsk CHP-1 during 1990-2004

Parameter	Value	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Electricity generation total, including auxiliary	mln. kWh	1928,4	1776,0	1717,7	1703,3	1671,4	1560,3	1718,6	1845,8	1889,8	1909,3	1967,9	1945,5	1908,2	2013.8	1908,1
Power output, total	mln. kWh	1539,8	1398,4	1367,8	1349,0	1323,3	1240,5	1393,2	1527,4	1576,1	1582,5	1636,5	1608,3	1571,1	1682.3	1589,1
Heat output, total	thous. Gcal	5316,6	5029,5	4498,8	4391,5	4303,4	3794,1	3700,3	3481,1	3524,3	3635,3	3731,7	3622,6	3563,6	3565.5	3468,8
Consumption of fuel equivalent, total	thous. tce	1363,7	1301,0	1206,0	1169,6	1138,0	1035,1	1072,4	1081,4	1099,1	1113,1	1137,8	1085,9	1064,3	1101.6	1054,2
Consumption of fuel equivalent for electricity supplied, total	thous. tce	400,6	384,4	382,7	369,5	354,4	340,9	521,0	570,8	583,7	582,5	597,5	563,1	550,0	587,0	554,46
Consumption of fuel equivalent for heat supplied, total	thous. tce	963,1	916,6	823,2	800,1	783,6	694,2	551,4	510,6	515,4	530,6	540,3	522,8	514,3	514,6	499,77
Specific consumption of fuel equivalent:																
for electricity supplied	g ce/kWh	260,2	274,9	279,8	273,9	267,8	274,8	373,9	373,7	370,4	368,1	365,1	350,1	350,1	349,0	344,4
for heat supplied	kg ce/Gcal	181,2	182,2	183,0	182,2	182,1	183,0	149,0	146,7	146,2	146,0	144,8	144,3	144,3	144,3	144,2

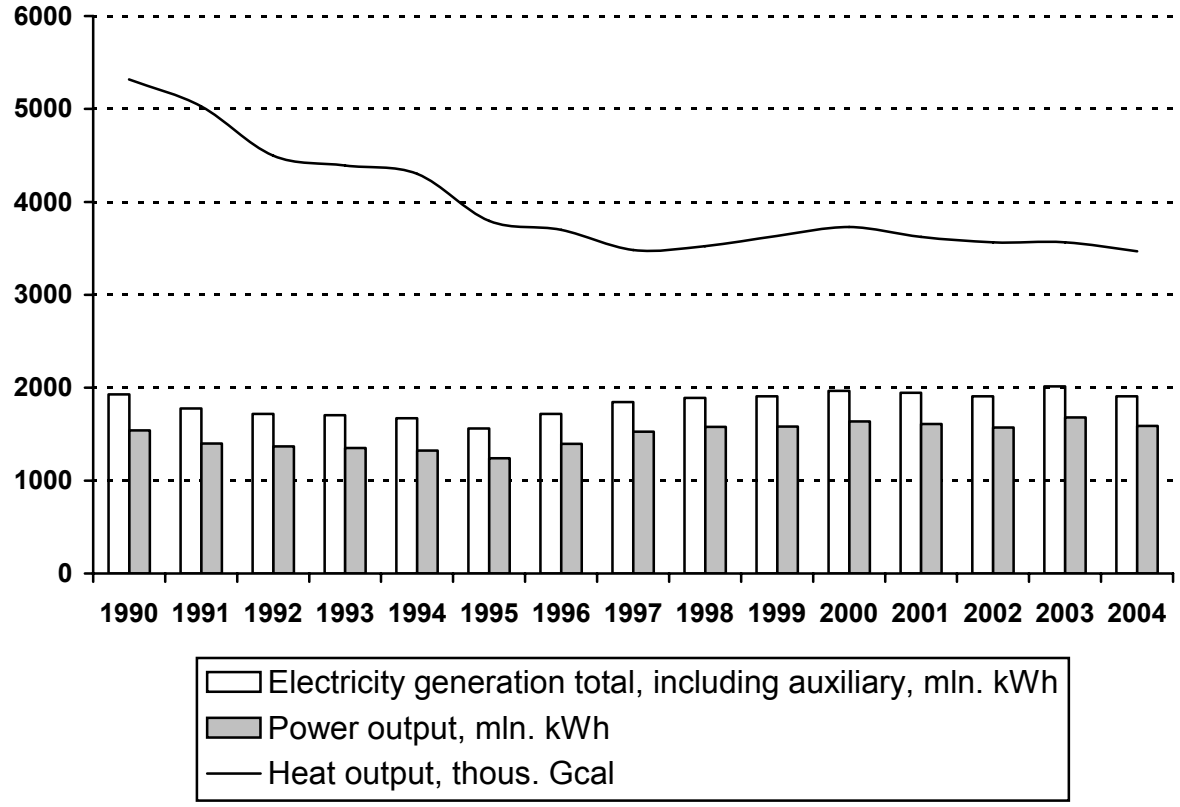


Fig. B.1.1 Electricity and heat generation and power and heat output in 1990-2004

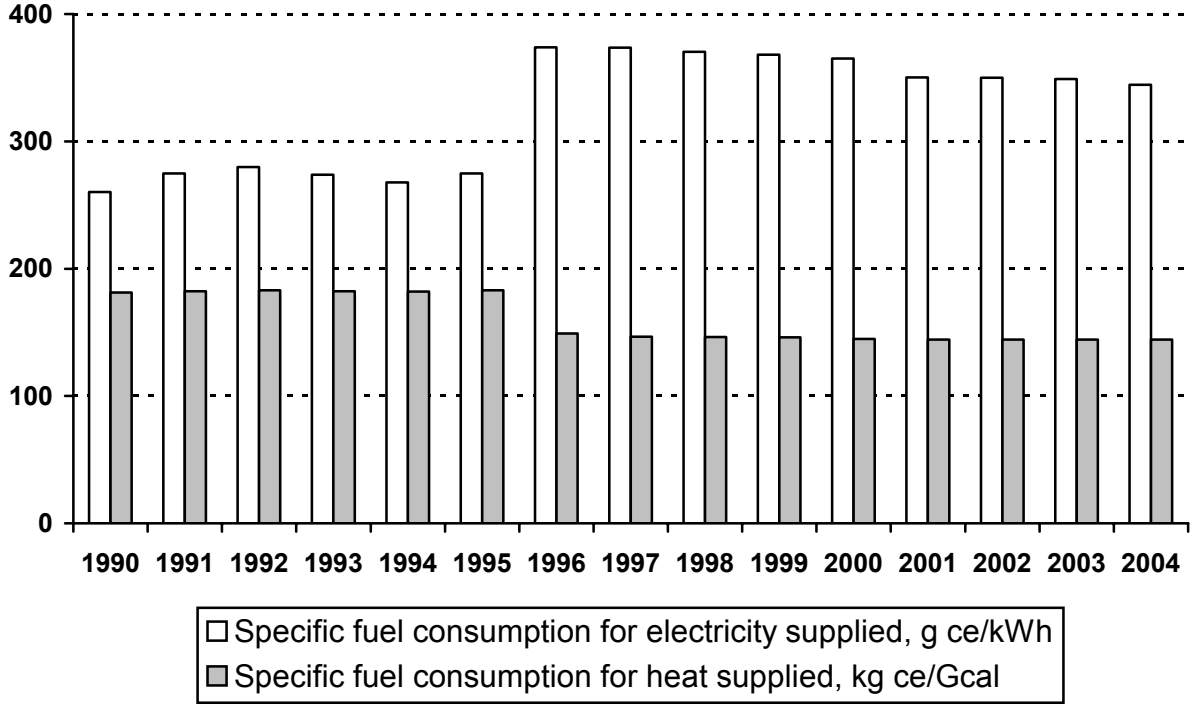


Fig. B.1.2 Specific consumption of fuel equivalent for electricity and heat supplied

Table B.1.2 List and quantity of the coals burned at the Khabarovsk CHP-1 in 1998-2004

Coal, region, deposit, coal type	Value	1998	1999	2000	2001	2002	2003	2004
1) Raichihinsk coal, FE*, Raichihinsk deposit, 2БР, Partizansk coalfield	thous. tce	45.6	11.2	0.45	0.03			
2) Urgalsk coal, FE, Urgalsk deposit, ГР, Partizansk coalfield	thous. tce	200.2	139.3	164.6	80.4	370.2	329.8	482.4
3) Haranorsk coal, ES**, Haranorsk deposit, 1БР, Chita region	thous. tce	164.6	395.0	427.8	251.2	232.2	261.6	171.1
4) Chernogorsk coal, ES, Chernogorsk deposit, ДР, Minusinsk coalfield	thous. tce	2.6					1.9	
5) Izykhinsk coal, ES, Izykhinsk deposit, ДР, Minusinsk coalfield	thous. tce	9.9					56.6	
6) Abakan coal, ES, Chernogorsk deposit, БР, Minusinsk coalfield	thous. tce	19.7						
7) Azeisk coal, ES, Azeisk deposit, 3БР, Minusinsk coalfield	thous. tce	651.2	564.0	321.1	104.5	78.4		
8) Urtuysk coal, ES, Urtuysk deposit, 2БР, Chita Region	thous. tce			221.2	646.6	379.5	448.7	397.3
9) Karakansk coal, ES, Kuznetsk coalfield, ДР	thous. tce				0.044			
Total for year:	**thous. tce**	**1093.8**	**1109.5**	**1135.2**	**1082.8**	**1060.3**	**1099**	**1051**

* - The Far East
** - Eastern Siberia

The decrease of specific fuel consumption is stipulated by change of fuel balance:

- Refusal to burn Raichihinsk coal that has significantly worse parameters as compared with the designed parameters at present;
- Replacement of Azeisk coal (the deposit is exhausted) by Urtuysk coal.

In last years the value of specific fuel consumption are practically stable (during 2001-2003 changes amounts to less than 0.3 %).

Perspective forecast of main baseline parameters

The perspective forecast of power and heat output (by the expert evaluation of "Khabarovskenergo" specialists) is presented in Table B.1.3.

Table B.1.3 Perspective forecast of power and heat output during 2006-2010

Parameters	2005	2006	2007	2008	2009	2010	2011	2012
Power output, mln. kWh	1 580	1 585	1 630	1 680	1 680	1 680	1 680	1 680
Heat output, thous. Gcal	3 465	3 465	3 465	3 465	3 465	3 465	3 465	3 465

For comparison, the average values of power and heat output during 2000-2004 is 1617.5 million kWh and 3590.4 thous. Gcal respectively.

Taking into account that JSC "Khabarovskenergo" refused to burn the Raichihinsk coal and that Azeisk deposit is exhausted it can be forecasted that at the Khabarovsk CHP-1 three main types of coal will be burned within the baseline - Haranorsk, Urgalsk and Urtuysk coal.
The perspective forecast of power and heat output corresponds to actual average values of these parameters during 2000-2004. Therefore for baseline estimate with the outlook up to 2012 the value of specific consumption of fuel equivalent is determined based on its average value over 2000-2004:

- for electricity supplied – 351.7 g ce/kWh,
- for heat supplied – 144.4 kg ce/Gcal.

Perspective forecast of main project parameters

The flow sheet of the Khabarovsk CHP-1 (existing equipment) under project implementation is illustrated in Fig. 5. As compared with the current flow sheet: **natural gas** will be the **main fuel** burned at the Khabarovsk CHP-1; SO_2 and ash emissions will be excluded almost completely.
Under project implementation the replacement of the electricity and heat generated from other sources does not take place, i.e. under the project the predictable heat and power output from Khabarovsk CHP-1 complies completely with heat and power output from Khabarovsk CHP-1 in the baseline (Table 3).
The switching of the boilers to natural gas leads to the increase of energy effectiveness of Khabarovsk CHP-1 due to gross efficiency of boilers increase and a decrease in the auxiliary electric power consumption.
Taking into account the increase of boilers energy effectiveness, the specific fuel consumption from natural gas combustion at Khabarovsk CHP-1 is equal to the following:

- for electricity supplied – 322.5 g ce/kWh,
- for heat supplied – 142.1 kg ce/Gcal.

These values are accepted based on conservative approach. Therefore, actual values of the specific fuel consumption are to be less than values given above. For example, at some CHP burning natural gas under the same conditions (type of used equipment, quantity and proportion of electric and heat power output etc.) the specific fuel consumption is equal to 305-320 g ce/kWh - for power output, 125-139 kg ce/Gcal - for heat output.
Justification and evaluation of the values of the specific fuel consumption from natural gas combustion at the Khabarovsk CHP-1 are presented in Annex 2.2.

Approach to select the baseline scenario
The baseline is the scenario that reasonable represents anthropogenic emissions by sources of greenhouse gases that would in absence of the proposed project[3]. In many CDM projects methodologies the approach to establish the baseline is firstly to identify several baseline alternative. The proposed project, not registered as a JI project, should be included as an alternative as well. These alternatives should be assessed whether or not these alternatives are credible and plausible. Where more credible and plausible alternative remains, project participants shall, as a conservative assumption, use the alternative baseline scenario that results in the lowest baseline emissions as the most likely baseline scenario. There should be consistency between baseline scenario determination and additionality determination.

Identification of alternatives
In the selection of the method for baseline determination consideration was given to the validity of the initial data and the possibility of quantitative checking of the submitted calculations. The analysis of the operation of the CHP-1 in recent (5-10) years enables extrapolation of the results for 2012.

At the same time the analysis was also made of the forecast for the demand by the customers of Khabarovsk Region and the Khabarovsk City on electricity and heat.

Therefore, in this case it is more correctly to use the combination of the «previous year method» and «forecast method».

The Khabarovsk CHP-1 is located in the industrial district of the Khabarovsk City. The plant supplies heat to the customers of the Southern district of the city and supplies the electricity to the networks of the JSC "Khabarovskenergo". More than 70 % of the electric power is generated in the heating cycle. The main fuel is coal.

[3] FCCC/KP/CMP/2005/8/Add.2 Appendix B

After termination of the lifetime in accordance with equipment certificate (Annex 2.3) it is supposed either extension of the lifetime or installation of the similar equipment with comparable engineering-and-economical performances.

Alternative 1
During the period of 2006-2012, in the Khabarovsk town (Southern district), the alternative power sources (for example, municipal boiler-houses) will be commissioned. In this connection, at the CHP-1 there is a decrease of heat and electricity generation, fuel consumption and greenhouse gas emissions.

Alternative 2
During the period of 2006-2012, the JSC "Khabarovskenergo" will increase the purchases of the electricity on the Wholesale Market of the Electricity and Power (OREM[4]), including electric power generated by the Bureisk Hydroelectric Power Plant, with the purpose of replacement of the electricity generated at the CHPs, the Khabarovsk CHP-1 included.

Alternative 3
During the period of 2006-2012, the replacement of the coals fired at the CHP-1 will be made by heavy oil. As a result of such replacement, with the same figures of electricity and heat generation at the CHP-1, the baseline will show less greenhouse gas emissions firing heavy oil.

Alternative 4
The existing equipment with adequate maintenance and on the assumption of extension of the lifetime or installation of the similar equipment with comparable engineering-and-economical performances will be exploited in the period until 2012 to generate electricity and heat energy pursuant to the forecast, given in Table B.1.4.

Assessment of the alternative scenarios
The following parameters were used to assess whether the different scenarios for the JI project are credible and plausible.

Table B.1.4. Key information used to assess the different baseline alternatives

Parameters	2006	2007	2008	2009	2010	2011	2012
Gas, Euro/tce	50.3	52.8	56.5	58.8	61.2	61.2	61.2
Coal, Euro/tce	37.6	41.0	44.3	47.4	47.4	47.4	47.4
Heavy oil, Euro/tce	125.3	136.2	145.8	154.5	159.1	159.1	159.1
Power output, mln. kWh	1 585	1 630	1 680	1 680	1 680	1 680	1 680
Heat output, thous. Gcal	3 465	3 465	3 465	3 465	3 465	3 465	3 465

Assessment of the alternative 1:
The main barrier of a development of the events within the baseline on **alternative 1** is the low investment attractiveness of the new energy source construction. The existing energy tariffs in Khabarovsk Region provide very low profitability of electricity and heat generation. For example, with the existing heat tariffs heat generation is unprofitable for JSC “Khabarovskenergo”. Under the totals of 2003, the incomes of the Open JSC "Khabarovskenergo" from heat sales were 76 % of the generating expenses. In combined electricity and heat generation, the profitability of generation as a whole at the Open JSC "Khabarovskenergo" in 2003 was about 2 %, and in 2002 was unprofitable.

[4] Detailed description of the OREM is available on the web-site of RAO UESR
http://www.rao-ees.ru/en/reforming/market/show.cgi?market.htm

Besides there are some secondary barriers obstructing the implementation of the project. For example, necessity in the land within the city boundaries to construct the new object, training of the operational personnel at the enterprise implementing the project, etc.
The combination of mentioned barriers makes the implementation of such projects improbable.

Assessment of the alternative 2:
The commissioning of capacities at the Bureisk Hydroelectric Power Plant is first of all aimed at the reliable delivery of energy to the customers of the Primorsk Territory, also with due account for the development in the Far East Region of the petrochemical, aluminum and forest industry.
The purchasing of the electricity from the OREM, including the Bureisk Hydroelectric Power Plant, is made on the previously concluded agreements. The share of the electric power received from OREM (balance of purchasing/sale of the electricity on /with OREM) makes in the general balance of the Open JSC "Khabarovskenergo" of about 2-3 %.

The large-scale purchasing of the electricity by the Open JSC "Khabarovskenergo" from the OREM (including the purpose of decreasing generation by the Khabarovsk CHP-1) is limited by the following factors (for Khabarovsk CHP-1).

More than 70 % of the electric power at the Khabarovsk CHP-1 is generated in the district heat cycle, which is the most economical mode of the CHP operation. Generation of the electric power in the condensation cycle or exploitation of the CHP equipment in the boiler-house mode impairs the overall performance of the plant. Therefore, the effect of replacing the electric power generated at the CHP by the electricity generated by the Hydroelectric Power Plant will be reduced due to lower overall performance of the CHP as a whole.

Generation of the electric power at the CHP-1 in the condensation cycle (30 %) is conditioned first of all by the necessity of covering the seasonal and diurnal load peaks. Thus, the actual values of peak loads can considerably differ from the scheduled loads. The given circumstance limits full replacement of the electricity generated in the condensation cycle by the electric power from OREM, as the violation of the agreements of purchasing can result in the penalties.
The technical minimum of electrical load at the Khabarovsk CHP-1 is equal:

- 100 MW for the summer period and it is limited by the necessity of providing with hot-water supply demand and reactive energy production.
- 300 MW for winter (heating) period and it is limited by the necessity of standing of heating-system water temperature.

The heating period (from October to April inclusive) amounts no less than 5 000 hours per year. Total annual electricity production under technical minimum will amount to:
Э = 300 MW × 5 000 hours + 100 MW × 3 760 hours = 1 876 000 MWh.
Under the auxiliary energy consumption of 17 % the power output will amount to 1 557 000 MW. This value is comparable with the value of perspective power output for baseline – 1 630-1680 MWh.

Therefore, the given option of the development of the events within the baseline is of low probability.
The above factors limit, but not fully eliminates the increase of the share of the electric power from OREM in the general balance of the JSC "Khabarovskenergo" and, as a consequence, the decrease of the share of the electric power generated at the Khabarovsk CHP-1. To eliminate the given circumstance the forecast of the generation of the electrical energy for the perspective after consultations with the specialists from the JSC "Khabarovskenergo" was made based on the conservative approach.

Assessment of the alternative 3:
The cost (in calculation per 1 ton of standard fuel) heavy oil exceeds the cost of coal as high as 3.3-3.4 times that makes **alternative 3** economically unreasonable.

Conclusion

The alternative 1, 2 and 3 are least probable.
Alternative 4 is only remaining realistic and credible alternative and is identified as the baseline scenario.

The baseline emissions of alternative 4 are elaborated in section D.

Key factors influencing the baseline and the project
General notes
All the factors made an impact on the baseline and on the project can be classified as follows:
- legal;
- political;
- economic;
- social-demographic;
- technical.

During JI project implementation in the power industry the main parameter that impacts on the baseline emissions and project emissions is heat and power output.

Khabarovsk CHP-1 is a typical power plant with local targets; it delivers generated electricity to of south district of the Khabarovsk.

Main industrial consumers of the town were strongly affected by economic crisis of '90s which resulted in significant reduction of heat and power output.

During the last years the parameters of Khabarovsk CHP-1 on power and heat output practically achieved the 1990 level. At that the number of factors allows to forecast increasing the demand and respectively the power and heat output in JSC "Khabarovskenergo" including the Khabarovsk CHP-1.

Development of Russian economy is envisaged with GDP annual growth rate from 5 % to 7 %, the most optimistic plans are to double GDP in the coming 10 years. At the same time the concept of leveling of disproportions between regions is adopted which should bring positive results for the Khabarovsk region with a comparatively low level of economic development. The regional Program "Main Directions of Development of the Fuel/Energy Complex of Khabarovsk Region for 2003-2005 and further up to 2010" is under development by the regional Government. The indicated factors will lead to the heat and electricity growth. Some revival of industrial production in the Khabarovsk Region during the last period confirms this forecast.

Big gas deposits (Sakhalin Shelf Deposits 1 and 2) are under development by international consortium. Main pipeline form those deposits will go through Khabarovsk Region. The Federal Program "Gasification of Sakhalin, Khabarovsk and Primorsk Regions" adopted by the Government of the Russian Federation on 4 July 1999 fixed the delivery of gas in needed quantities.

The gasification will stimulate the development of the industry in the Khabarovsk Region and, as a result, increasing of electricity and heat consumption.

For gas receiving from these deposits JSC "Khabarovskenergo" are to take the share holding in the construction of the gas pipeline (in 2004 the JSC "Khabarovsk repair and construction organization" – the subsidiary of the JSC "Khabarovskenergo" – by own strength constructed 17.5 km of gas pipeline) and to carry out the works under switching of Khabarovsk CHP-1 to fire the natural gas.
Taking into account macroeconomic, regional and local tendencies the following general conclusions can be carried out:

(1) State and macro-level **legal, political, economic and socio-demographic factors** will influence the project and GHG emissions indirectly; all assumptions have been made conservative and the risk for the selected baseline and project scenarios to overstate the emission reduction is not given;

(2) the possibility/impossibility of Kyoto Protocol mechanism usage under project realization will make the greatest intensive impact on the project;
(3) regional and local **legal, political, economic, environmental and socio-demographic factors** are as well in favor of the project implementation (revival of industry, environmental and social demands, etc.

Below, the qualitative estimation is given of the effect of the key factors on the propagation of the events within the baseline and in the project implementation.

Table B.1.5. Analysis of Key Factors

Factor description	Consequences	Influence
	Legal	
Federal Laws on the functioning of the power industry adopted by the Russian Parliament (Duma) in 2003	1.Libaralization processes in the power and gas sectors and easier access to various fuels 2. Creation of conditions for competition in the sector. 3. Limitation and reduction of tariffs for energy with reasonable regulation of tariffs by regional authorities.	1. The baseline development Will facilitate growth of energy demand and supply, raise of the baseline absolute figures and decrease in specific figures (per kWh) 2. The project's activity level and GHG emissions Will facilitate growth of energy demand and supply, raise of the baseline absolute figures and decrease in specific figures (per kWh) 3. The risks for the project Will facilitate reduction of risks
Regional laws: "On taxes in the Khabarovsk Region" "On investment activities in the Khabarovsk Region"	1. Preference tax treatment regime is imposed in the Region for investors. The list of preference treatment cases is revised annually.	1. The baseline Does not influence the baseline 2. The project's activity level and GHG emissions "Carbon" investments may benefit from the factor 3. The risks Directed at reduction of risks
Environmental laws	1.Environmental standards are becoming more tighten. 2. Environmental requirements have a tendency to meet European standards (for instance, ISO-14000). In the Russian Federation the standards are resumed after a two year interval	1. The baseline Auxiliary power consumption at the plant will slightly grow together with GHG emissions 2. The project's activity level and GHG emissions The factor will stimulate the implementation of the project 3. The risks for the project Directed at reduction of risks
The national procedure under JI projects approval (it will be referred to legal factors).	Assignment the JI projects authorized body under the Government of the Russian Federation, adoption of the national procedure under JI projects approval later.	1. The baseline Will not influence the baseline. 2. The project's activity level and GHG emissions This factor negatively influences the project activity level. 3. The risks for the project The factor increases the risks.
	Political	
Federal and regional elections. Political	• The political situation in Russia is comparatively	1. The baseline

tendencies.	stable, • During the recurrent Governor elections in the Khabarovsk Region (December 2004) the prior Governor V. Ishaev won. Thus, the main strategic and policy tendency in economy is unlikely to change.	Will facilitate growth of energy demand and supply, raise of the baseline absolute figures and decrease in specific figures (per kWh) 2. <u>The project's activity level and GHG emissions</u> Will facilitate growth of energy demand and supply, raise of the baseline absolute figures and decrease in specific figures (per kWh) 3. <u>The risks</u> – Slightly reduces risks
	Economic	
The growth of the industry and agriculture in the Khabarovsk Region, including owing to federal and regional program realization.	The growth of energy production at the Khabarovsk CHP-1	1. <u>The baseline</u> Absolute figures will grow, specific per unit of production will decrease 2. <u>The project's activity level and GHG emissions</u> Absolute figures will grow and specific figures will decrease (per kWh) 3. <u>The risks</u> Will not influence the risks
Company reforming with separation under the kinds of activities and liquidation of nonspecialized kind of activity.	Separation of the subsidiaries of JSC "Khabarovskenergo" engaged repair, construction and other nonspecialized kinds of activity into separate associated companies is to be brought to expenses reduction under electricity and heat production.	1. <u>The baseline</u> Will not influence the baseline 2. <u>The project's activity level and GHG emissions</u> Will not influence the project activities 3. <u>The risks for the project</u> Reduces the risks
Tariffs for energy and fuel price	Tariff for energy and fuel price constantly are reconsidered towards increase, at that the tariffs for energy directly depend on fuel price. From January 1, 2005 for JSC "Khabarovskenergo" the electricity tariff has been increased by 8.4 %, the heat tariff – by 9.9 % at inflation level in 2004 12 % (the forecast of the Ministry of Economic Development and Trade of the Russian Federation	The influence of (1) and (2) are unpredictable 3. <u>The risks</u> The factor will slightly enhance the risks and compensate the realization of the Expenses Control Program by the JSC "Khabarovskenergo"
	Socio-demographic	
The growth of population of Khabarovsk.	The population of Khabarovsk city increased more than	1. <u>The baseline</u>

Demand in additional work places and improving the living standard	15 thousand from 2002. Will cause the growth of energy demand and supply (and will be accompanied by the efficiency improvement of the plant).	Will facilitate growth of energy demand and, hence, generation with the increase of the absolute figures and decrease in specific figures (per kWh). 2. The project's activity level and GHG emissions Will facilitate growth of energy demand and, hence, generation with the increase of the absolute figures and decrease in specific figures (per kWh). 3. The risks for the project This factor slightly increases the risks for the project
Environmental		
Local environmental impact from Khabarovsk CHP-1	Due to low loads at Khabarovsk CHP-1 the impact at the time being is rather weak. With increase of energy production the impact for a coal firing option the factor may become considerable causing additional energy self consumption at the plant. Switch to gas will practically eliminate the factor.	1. The baseline The factor will slightly increase the baseline in absolute and specific figures 2. The project's activity level and GHG emissions The factor will not practically influence the emissions level 3. The risks Will not influence the risks
Technical		
Technology, know-how and experience	JSC "Khabarovskenergo" has the wide experience under realization of the boilers conversion to gas projects (more than 15 boilers).	1. The baseline The factor will not influence the baseline 2. The project's activity level and GHG emissions The factor will facilitate to implement the project and to operate the retrofitted equipment 3.The risks The factor will reduce the risks

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

The "Tool for demonstration and assessment of additionality" (version 2) has been applied to show that the anthropogenic emissions of the greenhouse gases are reduced below those that would have occurred in the absence of the JI project.

Step 0. Preliminary screen based on the starting date of the project activity.

a) The project starting date – 10/2006.

b) The evidence of seriously consideration of the project prior to the start of the project activity.
Such evidence is provided in the official letter from Khabarovsk Regional Board of Ecological and Technological Supervision (Annex 2.4).

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

Sub-step 1a. Define alternatives to the project activity:

Alternatives that are not JI and that provide outputs or services comparable with the proposed JI project activities are:

a) The proposed project is not undertaken as JI project.
b) During the period of 2006-2012, in the Khabarovsk City (Southern district), the alternative power sources (for example, municipal boiler-houses) will be commissioned. In this connection, at the CHP-1 there is a decrease of heat and electricity generation, fuel consumption and greenhouse gas emissions.
c) During the period of 2006-2012, the Open JSC "Khabarovskenergo" will increase the purchases of the electricity on the Wholesale Market of the Electricity and Power (OREM), including electricity generated by the Bureisk Hydroelectric Power Plant, with the purpose of replacement of the electricity generated at the CHPs, the Khabarovsk CHP-1 included.
d) During the period of 2006-2012, the replacement of the coals fired at the CHP-1 will be made by heavy oil. As a result of such replacement, with the same figures of electricity and heat generation at the CHP-1, the baseline will show less greenhouse gas emissions firing heavy oil.
e) Use of the existing equipment of Khabarovsk CHP-1 firing coal (baseline).

The above mentioned options (b) and (d) seem to be unrealistic, because:
a. There are many barriers make the implementation of the **option (b)** improbable.
b. The cost (in calculation per 1 ton of standard fuel) heavy oil exceeds the cost of coal as high as 1.5-2.5 time (for different types of coal) that makes **option (d)** economically unreasonable.

The option (c) as indicated in Charter 6.1 of Baseline Study will be possible if there is the growth of energy consumption in the Khabarovsk Region in the future till 2012. In order to avoid mistakes under calculation of the ERUs the perspective electricity production for baseline and the project is accepted based on the conservative approach (guaranteed electricity production by the Khabarovsk CHP-1). Under technical minimum of electrical load the power output will amount to 1 557 000 MW. This value is comparable with the value of perspective power output for baseline – 1 630-1680 MWh.

Thus, the electricity generated by the Bureisk Hydroelectric Power Plant will not substitute the electricity generated by the Khabarovsk CHP-1 within the range of the perspective power output indicated in PDD. Therefore the option (c) is not viable alternative.

Therefore, these options are not viable alternatives and they will be eliminated from consideration.

Further on option (a) and (e) are considered. For more details of the above mentioned option (b), (c) and (d), please, see charter 6 of Baseline Study.

Sub-step 1b. Enforcement of applicable laws and regulations:

All remaining alternatives fully meet the requirements of the Russian legislation on power supply and its implementation is fully under control of JSC "Khabarovskenergo" (the owner of CHP-1). JSC "Khabarovskenergo" has all necessary licenses for that.

1. Regulations and Standards of construction and operation of energy plants.
   These documents establish standards of secure operation of plant equipment. They can have both state and sectoral status, they establish terms of inspections. Fulfillment of regulations and standards are under control of state entities (such as Gosgortechnadzor) as well as JSC "Khabarovskenergo" and executives of CHP-1. In case of non-compliance the defects (for instance, deterioration) must be eliminated.

2. Environmental legislation.
   The Environmental legislation (both state and local requirements) establish individual emission and water discharge limits as well as payments for emissions and discharge within the limits and over the limits.
   The existing CHP-1 is equipped by devices to reduce environmental impact (flue ash removal system, water discharge cleaning system, etc.). Annually states supervising environmental entities hold inspections. The instructions issued by those entities are obligatory for implementation. There are no debts for environmental payments and fees from Khabarovsk CHP-1.

   The existing environmental legislation:
   - Federal Law "On protection of Atmosphere Air" of April 22, 1999;
   - The Order of the Minister of Environmental and Natural Resources of November 27, 1992 "Basic regulations of payments for emissions, water discharge and waste disposal";
   - Federal Law "On Environmental Protection" of December 26, 2001.

Conclusion: The existing mode and operational conditions of CHP-1 is most probable and realistic for all remaining alternatives. These alternatives are in compliance with all of existing legislation and regulations requirements.

Step 2. Investment analysis
Sub-step 2c. Calculation and comparison of financial indicators
The baseline/the alternative is more financially attractive for two major reasons:

Option (a)
The discounted cashflow analysis was carried out (please, see below summary results). The resulting free project cashflows are calculated with no account of the ERU sales and to take into account the ERU sales effects.

Table B.2.1. The discounted cashflow analysis results (mln. Euro and %%)

Project analysis	Without ERU sales	After ERU sales
Net Present Value	-16.8	2.3
Internal Rate of Return	na	14.9%

The obtained indicators generally confirm that the project is viable, subject ERU sales receipts. These figures show that without the revenue from the sale of ERUs the project cannot be implemented.

In other words, option (a) when the proposed project is not undertaken as JI project is not viable alternative and it shall be eliminated from consideration.

Option (e)
The baseline/the alternative is more financially attractive for two major reasons:
1/ The NPV for the proposed project (without taking into account the sales of the ERUs) is less than zero, meaning that the project is an inferior option, as compare to the baseline/the alternative, and the baseline/the alternative is a better financial option.

Table B.2.2 Baseline/Project analysis

	Project NPV without ERU sales
Net Present Value	-16.8
Internal Rate of Return	na
Modified Internal Rate of Return	na

2/ Sensitivity analysis of the project confirms that it is highly sensitive to one of the major project variables - gas price changes. With a minimum gas price increase of 2% above the annual level, assumed for the project scenario, the project NPV becomes significantly less than zero before ERUs sales and becomes insignificant less then zero even with the revenues from ERUs sales. These calculations confirm that the project becomes an inferior option, as compare to the baseline/the alternative, after a slight variation of one of its parameters, changed within the range of possible projections error. On the other hand a slight decrease in the gas price will significantly improve the viability of the project.

Table B.2.3 ***Sensitivity analysis***

	Without ERU sales	**After ERU sales**
Gas price real change above projected by an annual	+2%	+2%
Net Present Value	-23.1	-5.8
Internal Rate of Return	na	0,2%
Modified Internal Rate of Return	na	6,4%

Very high sensitivity of the project and associated risks make the baseline/the alternative a less risky and possibly more financially viable option.

3/ Generally, the undergoing formation of liberalized and competitive domestic gas and coal markets in Russia and resulting impossibility to use historical data to extrapolate prices for fuel (gas and coal), high sensitivity of both the baseline/the alternative and the project scenario to their major variables (gas and coal prices) could in itself be an important argument for the decision makers not to implement the project as it involves, rather large capital investments.

JSC "Khabarovskenergo" is at present negotiating a new gas contract with the company "Exxon Neftegas Ldt." where the gasprice is linked to the development in the international oil price. In the cash flow calculations it is assumed that this price is kept constant at the present relatively high level of USD 50/barrel throughout the project period. However, if it is instead assumed that the international oil price will follow the projections by the International Energy Agency, the viability of the project also improves.

Conclusion: The project should be considered additional, because under such market uncertainties, the decision to implement the project is not necessarily a reasonable business-as usual decision, and it was determined and dependent on the availability of the carbon finance.

Step 4: Common practice analysis.
Sub-step 4a. Analyse other activities similar to the proposed project activity:
Due to construction of gas-main pipeline 600 mm in diameter from Okha deposit (i. Sakhalin) to Komsomolsk-na-Amure JSC "Khabarovskenergo" has been converting boilers at Komsomolsky CHP-1, CHP-2 and CHP-3 to natural gas combustion since 1988. In 2000 the company started refurbishment of Amursk CHP-1 with boilers conversion to gas (two boilers No. 6 and 7 were switched from coal to gas).
To the date 16 power boilers of "Khabarovskenergo" power plants with total steam output 3685 t/hour have been switched to gas and are working successfully.

Unfortunately, the project developer has not the data concerning carrying out any similar activities by the enterprises of the other fields.

Sub-step 4b. Discuss any similar options that are occurring:
14 boilers were switched from coal to natural gas at the Komsomol'sk CHP-1, CHP-2 and CHP-3 during 1988-1990, 2 boilers at the Amursk CHP-1 were switched from coal to gas in 2000-2001.
Switch of 16 boilers carried out earlier does not differ from proposed project activity at the Khabarovsk CHP-1 in list of measures. But executed switch have been carried out in more favorable investment conditions because the gas price in 2001 was lower than the coal price. It made the project implementation practicable, i.e. the projects were recompensed and attractive for investment.

The fuel prices (historical and perspective data) for different periods are submitted in Annex 2.5.

Furthermore, 14 boilers were switched to gas during Soviet period when the principles of the project implementation were diverse than at the present time. At that time the most of investment projects were carried out at the expenses of large depreciation charges included into energy tariffs. At present time the depreciation charges are not included in the energy tariffs sufficiently by Regional Energy Commissions and that is not enough for JSC "Khabarovskenergo" for implementation of the proposed project activity.

Conclusion: Similar activities are observed, but essential distinctions between the project activity and similar activities are reasonably explained.

Step 5. Impact of JI registration.

The approval and registration of the project as a JI project will be allowed to obtain the following benefits and incentives:

- Anthropogenic greenhouse gas emission reductions will amount to 1200 thousand t/CO_2 on average during 2008-2012;
- The financial benefits of the revenue obtained by selling emission reductions;
- Revenue from the sale of emission reductions will be allowed to make the project financially attractive. The reason of unattractiveness of the project without the revenue from the sale of ERUs are as following:
  - the project implementation doesn't result in increased output and, therefore, doesn't have a direct effect on the sales revenues;
  - the prices for coal and gas are approximately equal since 2010 and JSC "Khabartovskenergo" will not obtain the revenue from switch of boilers from coal to gas.

  In the circumstances the main reason for the project implementation are obtaining supplementary environmental effect (significantly reduction of emissions of nitric oxide, sulfur dioxide and solid particles into free air) and improving the performance characteristics of energy production at CHP-1.

Conclusion: All steps of Additionality test are satisfied; therefore the proposed JI project activity is not the baseline scenario.

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

The project boundaries represent a list of enterprises, sites, installations and processes, which, to some extent, are associated with the project implementation and influence the GHG emissions.
All GHG emissions within the project boundaries should be monitored by the project Designer and can be related to the project activity.

Theoretically, the project boundaries for energy production at the CHP-1 plant can include GHG emissions associated with the production, transportation, reprocessing, distribution and combustion of fossil fuel, and distribution of the produced energy. However, such broad interpretation of the project boundaries for the present project is impracticable because all the above listed factors (besides fuel transportation) will not introduce any changes into GHG emissions when implementing the Project.

Practically, the optimal variant is the determination of the project boundaries for direct emissions associated only with energy production.

The essence of the project lies in modernization and switching coal-fired boilers of the Khabarovsk CHP-1 to fire gaseous fuel while keeping the possibility of using coal as the reserve oil and implementation of the measures that will substantially increase economic and ecological efficiency of the CHP-1 operation. Switching the boilers from coal to natural gas carried out at the CHP-1 will not result in any changes in the plant circuit and operating conditions and the amount of the products supplied. Khabarovsk CHP-1 delivers power and heat to the industrial and community consumers of Khabarovsk City and is operated according to the schedule of consumers' demand.

Project implementation will not change heat output (there will be no replacement) and the amount of fuel-fired at other enterprises beyond Khabarovsk CHP-1.

Thus, the project boundaries include only CHP-1 plant, however transportation is considered as well.

The flowchart of the project boundaries with basic components and connections is illustrated in Scheme. B.3.1. **The project boundaries are designated by the dotted line.**
The project boundaries include the following:

- Khabarovsk CHP-1.
- Fuel transportation to Khabarovsk CHP-1 plant is considered in spite of out of boundaries.

The boundaries of the analysis are broader that the project boundaries. They cover the heat and power energy consumers connected to the CHP-1. **The boundaries of the analysis are designated by the dotted line.** The project initiator will annually prepare the protocol of monitoring and verification of the parameters controlled within the project boundaries and detect and periodically analyze the changes occurring within the boundaries of the analysis.

This template shal gs or logo, format or font.

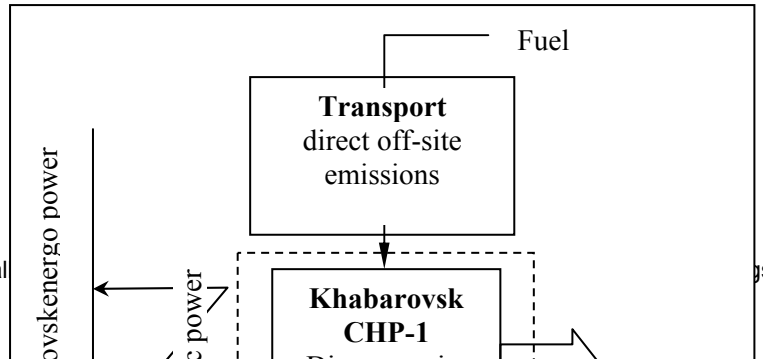


Fig. B.3.1. The Project boundary.

Classification and Preliminary Estimation of GHG Emissions
In accordance with Appendix A to the Kyoto Protocol the following gases relate to GHGs:

- CO_2;
- N_2O;
- CH_4;
- SF_6;
- PFCs;
- HFCs.

The proposed project «Switch of Khabarovsk CHP-1 from Coal to Fire Natural Gas" is implemented at the power plant typical enterprise including no specific production facilities. Only first four of the above GHGs are typical for such projects.

Gas insulated equipment on the Khabarovsk CHP-1 is not used therefore SF_6 emissions are absent in the baseline and project. Thus, the calculations include only - CO_2, CH_4, N_2O.
The total value of the GHG emissions is expressed in CO_2-eqv.
Recalculation of GHG into CO_2-eqv. is carried out using the following specified coefficients:

for CH_4 K3 = 21 t CO_2-eqv./t CH_4;
N_2O K2 = 310 tCO_2-eqv./t N_2O.

For calculation of GHG emissions, the emission coefficient for the definite fuel is multiplied by the flow rate of specified fuel (in tons of the standard fuel), the results are summed. The fuel consumption depends on the volume of heat generation at the TPP and its efficiency.

CO_2 emission coefficients for different fuels fired at the Russian TPPs were determined in the "Inventory of GHG emissions from TPPs and boiler plants of the «electric power industry» branch in Russia (1990-1997)" [6]. The average weighted CO_2 emissions coefficient in firing coal was 1.62 t CO_2/tce, firing heavy oil – 2.28 t CO_2/tce, and firing coal – 2.76 t CO_2/tce.

The methodology of the inventory has been checked by the independent organization Environmental Defense (USA) in 2001. The inventory calculation error was 4% [13].

Also, for each facility depending on the fuel chemical composition the individual GHG emissions coefficient is possible that may differ from the above mentioned coefficients.

In 2003 the inventory of GHG emissions of JSC "Khabarovskenergo" [5] including Khabarovsk CHP-1 was carried out by Energy Carbon Fund. The result of this inventory is presented in Annex 2.6 and fig. B.3.2. According this inventory for the mixture of coal burned at the Khabarovsk CHP-1 average weighted CO_2 emissions coefficient in firing coal in 1998-2002 (stabilization of fuel balance) was 2.88 t CO_2/tce.

The using individual CO_2 emissions coefficient represents the real situation and it would be correspond to factual report data under CO_2 emissions at the Khabarovsk CHP-1.

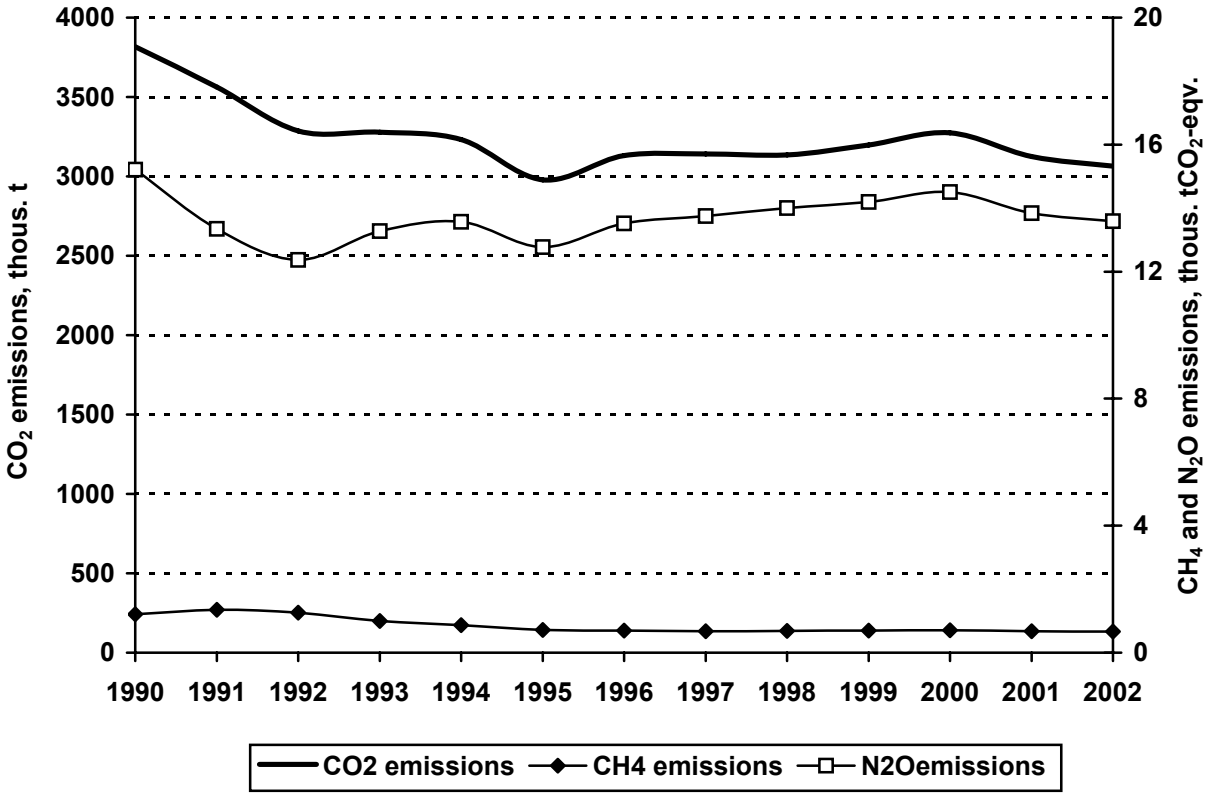


Fig. B.3.2

In the table below an overview of the all emission sources in the energy production of the plant are given.

Table B.3.1. Sources of GHG emissions

No	Source	Gas			Justification/ Explanation
1	Emissions from fuel combustion at Khabarovsk CHP-1	CO_2	Direct	Included	Please, see explanation (1) below
		CH_4	Direct	Excluded	0.02 % see (1)
		N_2O	Direct	Excluded	0.44 % see (1)
2	Emissions from auxiliary facilities at Khabarovsk CHP-1: • evaporation from oil tanks, • dusting, • burning of coal at the coal storage of CHP-1, • CH_4 leaks from plant gas facilities, • in lighting up of the boilers, • plant vehicles etc. Though they are not directly connected with fuel firing, nevertheless they are inevitable part of that system.	CO_2	Indirect	Excluded	0.08 % Please, see explanation (2) below
		CH_4	Indirect	Excluded	
4	Emissions as result of energy	CO_2	Indirect	Excluded	Please, see

	consumption of coal transportation from coal deposit to Khabarovsk CHP-1				explanation (4) and (5) below
5	Emissions as result of energy consumption of gas transportation from gas deposit to Khabarovsk CHP-1	CO_2	Indirect	Excluded	Please, see explanation (4) and (5) below
6	Methane leakages from the gas pipeline, compressors station and gas distribution station.	CH_4	Indirect	Included	Please, see explanation (6) below

(1) GHG emissions formed in fuel firing.

The share of the fuel oil in the total fuel balance of the Khabarovsk CHP-1 in the recent years (1998-2002) is 0.23-0,49 % maximum; hence, the share of the CO_2 emission in firing this fuel in the total GHG emissions will be not more than 0,4%. Therefore, to simplify the calculations, this fuel is ignored in the determination of the emissions.

In firing the fossil fuel at the power plants, apart from CO_2, CH_4 and N_2O are also formed.

CH_4 and N_2O emissions in firing gaseous fuel can be estimated using the emission coefficient recommended by IPCC:

$K_{CH4} = 1$ kg CH_4/TJ;

$K_{N2O} = 0.1$ kg N_2O/TJ;

in firing coal:

$K_{CH4} = 1$ kg CH_4/TJ;

$K_{N2O} = 1.4$ kg N_2O/TJ.

Using the recalculation coefficient of 29.308 TJ/thous. tce and those to recalculate to CO_2-eqv., the value of GHG emissions f this type in CO_2-eqv. per 1 t of standard fuel (tce) will be:

For the gaseous fuel:

$$M_{CH4} = 1*10^{-3}\ tCH_4/TJ\ *\ 21\ tCO_2\text{-}eqv./t\ CH4\ *\ 29.308\ *10^{-3}\ TJ/tce\ = \\ = 616*10^{-6}\ t\ CO_2\text{-}eqv./tce;$$

$$M_{N2O} = 0.1\ *10^{-3}\ tN_2O/TJ\ *\ 310\ tCO2\text{-}eqv./t\ CH4\ *\ 29.308\ *10^{-3}\ TJ/tce\ = \\ = 909*10^{-6}\ t\ CO_2\text{-}eqv./tce;$$

For the coal:

$$M_{CH4} = 1*10^{-3}\ tCH_4/TJ\ *\ 21\ tCO_2\text{-}eqv./t\ CH_4\ *\ 29.308\ *10^{-3}\ TJ/tce\ = \\ = 616*10^{-6}\ t\ CO_2\text{-}eqv./tce;$$

$$M_{N2O} = 1,4*10^{-3}\ tN_2O/TJ\ *\ 310\ tCO_2\text{-}eqv./t\ CH4\ *\ 29.308\ *10^{-3}\ TJ/tce\ = \\ = 12\ 720*10^{-6}\ t\ CO_2\text{-}eqv./tce.$$

The value of CO_2 emissions per 1 tce, as was shown above, will be for natural gas at 1.621 t CO_2/tce, and for fuel oil – 2.27 t CO_2/tce.

Thus, the share of CH_4 and N_2O emissions in the total amount of GHG will be as follows:

in firing natural gas:

CH_4 - $100\% * 616*10^{-6} / (616*10^{-6} + 909*10^{-6} + 1.62) = 0.04\ \%$

N_2O - $100\% * 909*10^{-6} / (616*10^{-6} + 909*10^{-6} + 1.62) = 0.06\ \%$

in firing coal:

CH_4 - $100\% * 616*10^{-6} / (616*10^{-6} + 12\ 720*10^{-6} + 2.28) = 0.02\ \%$

N_2O - $100\% * 12\ 720*10^{-6} / (616*10^{-6} + 12\ 720*10^{-6} + 2.28) = 0.55\ \%$

Under inventory data [5] the share of CH_4 emissions in total CO_2 emissions of Khabarovsk CHP-1 amounts to 0.02 %, and N_2O – 0.44 %.
Hence, the total share of CH_4 and N_2O formed in firing fuel will not exceed 0.6% and this type of fuel can be cancelled from further consideration.
Therefore, in determination of the emissions of this type of GHGs, only CO_2 are considered.

(2) Emissions from auxiliary facilities at Khabarovsk CHP-1
Under the maximum fuel consumption for the motor transport (1994) the GHG emissions for this GHG emissions group comes to 2700 t CO_2/y which equal only 0.08 % of the total GHG emissions from the Khabarovsk CHP-1 (Annex 2.6). Therefore these emissions were not taken into account.

(4) (5) Emissions due to energy consumption for fuel transportation.
The project implementation will cause the gas delivery instead of coal delivery. Both changes will cause the change of energy consumption for fuel transportation from deposits to CHP-1 and correspondingly change in GHG emissions.
There are too many uncertainties which accompany the evaluation of this component of emissions (what of three main coals will dominate in the future at CHP-1, whether electrified parts of railroad will be possible to use, what are actual energy consumption for transporting gas from the Sakhalin-1 gas field to the site and how this will change in the future with inevitable drop of initial gas pressure at the gas field, etc.). The main parameters are difficult to monitor. Nevertheless, evaluation of these emissions was conducted. Though these emissions make approx. 3 % in the whole GHG emissions it is the opinion of the developers to ignore them in further considerations. The main reason of the proposed decision is that it leads to a more conservative way of calculating project reductions refusing from some non apparent increment of reductions.

The assumptions, initial data for calculations, calculation of those emissions are given in Annex 2.7, the results – in the Table B.3.2.

Table B.3.2

Emissions from transportation of:	2008	2012
baseline (coal), thous. ton CO_2	70.6	70.6
project (gas), thous. ton CO_2	44.9	44.9

(6) Methane leaks from the gas pipeline, compressors station and gas distribution station
Actual escape figures for the case were not available. Figures from [4] were used which for the former USSR are 175000-384000 kg CH_4/PJ. They correspond to a special study by RURGAS and JSC "Gasprom" [7] which figure approx. 1% of gas leaks for the whole gas system of Russia. Evaluation calculations for 1000 thous. tce of gas shows that gas escape amounts to approx. 240 thous. ton CO_2-eq. which is more than 14% of what occur in the project. So this indirect emission will be taken into consideration further on. The maximum number of 384,000 kg CH_4/PJ will be used.

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 PDD: 21 December 2006

Name of person/entity determining the baseline:
- JSC "Khabarovskenergo"
- Energy Carbon Fund

See Annex 1 for detailed contact information

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

Implementation of the Project starts on 5 October 2006.

C.2. Expected operational lifetime of the project:

To the project lifetime (the objective emission crediting period for the project baselines in the field of electric generation) is determined on the basis of technical life of the equipment.

The technical lifetime of the main elements of the boilers, turbines and pipelines of TPPs in the Russian Federation is determined by the sectoral normative documents [9-13].

After termination of the lifetime in accordance with equipment certificate it is supposed either extension of the lifetime or installation of the similar equipment with comparable engineering-and-economical performances.

Nevertheless the achieved emission reductions are not defined by the equipment lifetime.

C.3. Length of the crediting period:

5 years/60 months (Kyoto Protocol first commitment period – from 1st January 2008 to 31st December 2012)

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

As elaborated in section B.3 the project activity only affects the emissions related to combust fuel at Khabarovsk CHP-1 and methane leakages from the gas pipeline, compressors station and gas distribution station. For the purpose of establishing the baseline emissions and to monitor the project emissions, only these emissions will be monitored.

The main methodology for defining GHG emissions is their calculation using fuel consumption data and emission factors for each type of fuel. Thus the fuel accounting system is the core element of GHG emission monitoring. Electricity and heat output should be also considered to define specific emissions per kWh of the equipment under control.

GHG emissions concerned with the leakage gas on transportation are taken into account in the calculation ERU and monitoring plan. These GHG emissions depend on two parameters:

- Volume of gas consumption at the CHP-1
- Leakage of natural gas.

GHG emissions are calculated as multiplication of volume of gas consumption at the CHP-1 by indicator of leakage of natural gas. The volume of gas consumption is under the control of the project initiator and is presented in the monitoring plan. Leakage of natural gas is not under the control of the GSC «Khabarovskenergo», therefore its direct monitoring is not possible. Nevertheless, leakage calculation at the monitoring plan is carried out using the specific indicator of the leakage, which is submitted in the research of JSC "Gasprom". Given index is varied from 175,000 to 384,000 kg of CH_4 per a 1 PJ of the transported gas. At the monitoring plan is applied maximal amount of this one (384.000). In this connection, GHG emissions, considering as a leakage will be maximum in view of well-known value of the transported gas. It meets the requirement of the conservative approach.

Requirements for fuel accounting

The fuel accounting in the power sector is based on existing system of fuel control and registration "Instructions on Fuel Accounting at TPPs. RD 34.09.105.96". According to this document all fuel that is delivered to a power plant, stored and used for technological purposes must be strictly accounted.
This includes:

- Determination of quantity and quality of the fuel;
- Periodic inventory;
- Claims to the fuel deliverers in case the fuel does not meet the contracted parameters.

To account fuel quantity and define fuel quality thermal power plants should be equipped by special meters, devices and apparatus. The data on fuel delivered and consumed is to be presented in state statistical reports as well as in inter-corporative reports. Primary data on fuel consumption is registered in special

register books, in invoices and are used to prepare monthly and annual reports (the so called form No. 15506, form No. 6-TP), both presenting the main performance parameters of a power plant. The latter report includes the aggregated data on the delivered and consumed fuel.
Forms of the already established monitoring measures (Form 6-TP, Form No. 15506) are given in Annex 3.2.
Besides, the annual report 6-TP includes aggregated monthly data on:

- installed capacities of a TPPs (electrical and thermal - Part 1, line 11, columns 1 and 2);
- power and heat output (Part 2, line 22, columns 10 and 3);
- fuel used for power and heat production (Part 3, column 2, lines 32 and 33);
- type and quantity burned fuel (Part 4, column 3, lines: mazut – 42, gas – 43, coal - 44).

The quantity and quality of liquid and solid fuels should be controlled before the fuel take-over from the deliverer and before fuel burning.
Fuel quality control is conducted by special chemical laboratories of TPPs, which periodically make tests of the fuel got from deliverers and taken from TPP stores for burning. Fail in meeting the contracted quality is the cause to claim the deliverers.
The list of the main parameters of fuel consumption is as follows:

Gas: gas pressure at the measuring device (diaphragm);
gas temperature before and after diaphragm.-
Heavy oil: weigh of oil when emptying the railway tanks;
oil level in tanks;
oil temperature in tanks;
oil density in tanks.
Coal: weigh of coal delivered to the plant;
weigh of coal delivered to the plant boilers;
moisture and ash content, heat value.

The statistical reports “15506” and “6-TP” can serve as basic documents for GHG emission monitoring provision. The report “15506” is filled in monthly used different primary data on daily fuel delivery, its consumption, generation of energy. The annual report 6-TP includes accumulated monthly data on:

- installed capacities of a TPP (electrical and thermal);
- power and heat output;
- fuel used for power and heat production;
- fuel by types and the fuel balance (delivery of fuel, fuel reserve, fuel quality – i.e. heat value, ash, moisture and sulfur content).

Maximum metering error of fuel consumption should not exceed:

- 3.5 % for coal;
- 1.6% for heavy oil;
- 2.0% for gas.

Actual magnitudes of inaccuracy and errors at concrete power plants can be lower than the above figures.

The coal to Khabarovsk CHP-1 is supplied via the electrified railway. The weighing of incoming fuel is carried out via the track scales. The personnel of fuel supply department shift-time estimate the solid fuel expended for process needs in natural expression. The tool measuring of available solid fuel is carried out periodically.
While implementing the project, the natural gas flow at the Khabarovsk CHP-1 will be measured by applying the up-to-date proven stationary measurement devices.

Requirements for electricity and heat output
The electricity and heat supplied are measured by the relevant electrical and heat meters applied in the power industry.
In the project implementation at the Khabarovsk CHP-1, all processes, including data measurement and recording are carried out from the operator location on the electrical engineering block.

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

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

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1 H	Heat output	Khabarovsk CHP-1	thousand Gcal	m	Annually	100 %	Hard copy, electronic worksheet	
2 P	Power output	Khabarovsk CHP-1	million kWh	m	Annually	100 %	Hard copy, electronic worksheet	
3 B_i	Fuel consumption for heat and electricity production, totally	Khabarovsk CHP-1	thousand ton of coal equivalent	m	Annually	100 %	Hard copy, electronic worksheet	

4 B_{gas}	Including gas consumption	Khabarovsk CHP-1	tons of coal equivalent	m	Annually	100 %	Hard copy, electronic worksheet	
5 B_{coal}	Including Coal consumption	Khabarovsk CHP-1	tons of coal equivalent	m	Annually	100 %	Hard copy, electronic worksheet	
6 $B_{h.oil}$	Including heavy oil consumption	Khabarovsk CHP-1	tons of coal equivalent	m	Annually	100 %	Hard copy, electronic worksheet	
7 B_i^{heat}	Fuel consumption for heat	Khabarovsk CHP-1	tons of coal equivalent	m	Annually	100 %	Hard copy, electronic worksheet	
8 B_{gas}^{heat}	Including gas consumption	Khabarovsk CHP-1	tons of coal equivalent	m	Annually	100 %	Hard copy, electronic worksheet	
9	Including Coal consumption	Khabarovsk CHP-1	tons of coal equivalent	m	Annually	100 %	Hard copy, electronic worksheet	
10	Including heavy oil consumption	Khabarovsk CHP-1	tons of coal equivalent	m	Annually	100 %	Hard copy, electronic worksheet	
11 B_i^p	Fuel consumption for electricity	Khabarovsk CHP-1	tons of coal equivalent	m	Annually	100 %	Hard copy, electronic worksheet	
12 B_{gas}^p	Including gas consumption	Khabarovsk CHP-1	tons of coal equivalent	m	Annually	100 %	Hard copy, electronic worksheet	
13	Including Coal consumption	Khabarovsk CHP-1	tons of coal equivalent	m	Annually	100 %	Hard copy, electronic worksheet	
14	Including heavy oil	Khabarovsk CHP-1	tons of coal equivalent	m	Annually	100 %	Hard copy, electronic	

	consumption						worksheet	
15 b^{heat}	Specific fuel equivalent consumption for heat supplied	Khabarovsk CHP-1	kg/Gcal	c	Annually	100 %	Hard copy, electronic worksheet	
16 b^{p}	Specific fuel equivalent consumption for electricity supplied	Khabarovsk CHP-1	g/kWh	c	Annually	100 %	Hard copy, electronic worksheet	
17 k_{gas}	Coefficient of CO_2 emission gas burning	Khabarovsk CHP-1	t CO_2/tce	c	Annually	100 %	Hard copy, electronic worksheet	
18 k_{coal}	Coefficient of CO_2 emission coal burning	Khabarovsk CHP-1	t CO_2/tce	c	Annually	100 %	Hard copy, electronic worksheet	
19 $k_{h.oil}$	Coefficient of CO_2 emission heavy oil burning	Khabarovsk CHP-1	t CO_2/tce	c	Annually	100 %	Hard copy, electronic worksheet	
20 E^{heat}_{direct}	CO_2 emission for heat output	Khabarovsk CHP-1	thous. tCO_2	c	Annually	100 %	Hard copy, electronic worksheet	
21 E^{p}_{direct}	CO_2 emission for power output	Khabarovsk CHP-1	thous. tCO_2	c	Annually	100 %	Hard copy, electronic worksheet	
22 ef_{heat}	Specific CO_2 emissions for 1 Gcal output	Khabarovsk CHP-1	kgCO_2/Gcal	c	Annually	100 %	Hard copy, electronic worksheet	
23 ef_{p}	Specific CO_2 emissions for 1 kWh output	Khabarovsk CHP-1	gCO_2/kWh	c	Annually	100 %	Hard copy, electronic worksheet	

24 E^{PR}_{direct}	Direct GHG project emissions	Khabarovsk CHP-1	thous. tCO_2	c	Annually	100 %	Hard copy, electronic worksheet	
25 E^{PR}	GHG project emissions	Khabarovsk CHP-1	thous. tCO_2-eqv	c	Annually	100 %	Hard copy, electronic worksheet	
26 E^{p}_{direct}	GHG project emissions associated with electricity production	Khabarovsk CHP-1	thous. tCO_2-eqv	c	Annually	100 %	Hard copy, electronic worksheet	
27 E^{PR}_{heat}	GHG project emissions associated with heat production	Khabarovsk CHP-1	thous. tCO_2-eqv	c	Annually	100 %	Hard copy, electronic worksheet	
28 ef^{PR}_{p}	EF under electricity production	Khabarovsk CHP-1	gCO_2/kWh	c	Annually	100 %	Hard copy, electronic worksheet	
29 ef^{PR}_{heat}	EF under heat production	Khabarovsk CHP-1	$kgCO_2/Gcal$	c	Annually	100 %	Hard copy, electronic worksheet	

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

Initial data

While implementation of the project the efficiency of Khabarovsk CHP-1 is increased and fuel rate to heat and power production is reduced accordingly.

It is necessary to calculate the net efficiency of boiler for coal and gas in order to determine how much firing efficiency will be increased. As two group of equipment with different efficiencies are used at the plant, it is necessary to apply the average value in the calculations.

The shares of groups of equipment (90 kg/cm^2 and 130 kg/cm^2) in fuel consumption (φ)

$$\varphi^{90} = \frac{B^{90}}{B}; \quad \varphi^{130} = \frac{B^{130}}{B} \qquad (1)$$

Where

$B_{90,130}$ – fuel consumption by the equipment group 90 and 130 kg/cm^2, correspondingly;

B – fuel consumption throughout the plant.

Net efficiency of boiler for coal (average value):

$$\eta_{coal} = \eta_{coal}^{90} \cdot \varphi^{90} + \eta_{coal}^{130} \cdot \varphi^{130} \qquad (2)$$

Where

$\eta_{coal}^{90,130}$ – efficiency of boiler for groups of equipment (90 kg/cm^2 and 130 kg/cm^2) (82.1%, 83.3%), correspondingly (see Table 2, 3, Annex 2.2)

Net efficiency of boiler for gas (average value):

$$\eta_{gas} = \eta_{gas}^{90} \cdot \varphi^{90} + \eta_{gas}^{130} \cdot \varphi^{130} \qquad (3)$$

Where

$\eta_{gas}^{90,130}$ – efficiency of boiler for groups of equipment (90 kg/cm^2 and 130 kg/cm^2) (87.3%, 87.5%), correspondingly (see Table 2, 3, Annex 2.2)

Increase the efficiency of Khabarovsk CHP-1:

$$\delta\eta = \frac{\eta_{gas}}{\eta_{coal}} \qquad (4)$$

In order to determine how much fuel, firing at the plant, are expended on heat generation or power generation, retrospective data has been used over 2000-2004. The fuel share, expending on heat output (S_{heat}):

$$S_{heat} = \frac{\sum_{i=2000}^{2004} B_i^{heat}}{\sum_{i=2000}^{2004} B_i} \qquad (5)$$

Where

B_i^{heat} – annual fuel consumption for heat (thous. ton. c.e.);

B_i – annual fuel consumption for heat and electricity, totally (thous. ton. c.e.).

The fuel share, expending on power output (S_p):

$$S_p = \frac{\sum_{i=2000}^{2004} B_i^p}{\sum_{i=2000}^{2004} B_i} \quad (6)$$

Where

B_i^p – annual fuel consumption for electricity (thous. ton. c.e.);

While implementation of the project the quantity of fuel heat, expended on unit of heat and power output, will decrease. Fuel consumption (quantity of fuel heat) will decrease proportionate to increase in efficiency of boiler ($\delta\eta$):

$$B_{gas} = \frac{B_{coal}}{\delta\eta} \quad (7)$$

Annual gas consumption for heat (thous. ton. c.e.):

$$B_{gas}^{heat} = B_{gas} \cdot S_{heat} \quad (8)$$

Annual gas consumption for electricity (thous. ton. c.e.):

$$B_{gas}^{p} = B_{gas} \cdot S_{p} \quad (9)$$

According to findings, fuel rate to heat and power output are calculated. Heat and power output are assumed equal at the baseline scenario and the project scenario, therefore:

$H = H^{BL} = H^{PR}$ (thous. Gcal) and $P = P^{BL} = P^{PR}$ (mln. kWh).

Specific fuel equivalent consumption for heat supplied (kg ce/Gcal).

$$b^{heat} = \frac{B_{gas}^{heat}}{H} \cdot 10^3 \quad (10)$$

Specific fuel equivalent consumption for electricity supplied (g ce/kWh).

$$b^{p} = \frac{B_{gas}^{p}}{P} \cdot 10^3 \quad (11)$$

Calculation GHG emission of the project

CO_2 emission for heat output (E_{direct}^{heat} , thous. tCO_2):

$$E_{direct}^{heat} = B_{gas}^{heat} * k_{gas} \quad (12)$$

Where

k_{gas} – Coefficient of CO_2 emission gas burning (t CO_2/tce, see section B.3)

CO_2 emission for power output (E_{direct}^{p} , thous. tCO_2):

$$E_{direct}^{p} = B_{gas}^{p} * k_{gas} \quad (13)$$

Total direct CO_2 emission: (E_{direct}^{PR} , thous. tCO_2)

$$E_{direct}^{PR} = E_{direct}^{heat} + E_{direct}^{P} \quad (14)$$

GHG project emissions (E^{PR} thous. tCO_2):

$$E^{PR} = E_{direct}^{PR} + E_{indirect}^{PR} \quad (15)$$

GHG project emissions associated with heat production (E_{heat}^{PR} thous. tCO_2):

$$E_{heat}^{PR} = E_{direct}^{heat} + E_{indirect}^{heat} \quad (16)$$

GHG project emissions associated with electricity production (E_{p}^{PR} thous. tCO_2):

$$E_{p}^{PR} = E_{direct}^{p} + E_{indirect}^{p} \quad (17)$$

Emission Factor (EF) under heat production (ef_{heat}^{PR} , $kgCO_2$/Gcal):

$$ef_{heat}^{PR} = \frac{E_{heat}^{PR}}{H} \cdot 10^3 \quad (18)$$

EF under electricity production (ef_{p}^{PR} , gCO_2/kWh):

$$ef_{p}^{PR} = \frac{E_{p}^{PR}}{P} \cdot 10^3 \quad (19)$$

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
30 ef_p^{BL}	EF under electricity production	Khabarovsk CHP-1	gCO_2/kWh	c	Annually	100 %	Hard copy, electronic worksheet	
31 ef_{heat}^{BL}	EF under heat production	Khabarovsk CHP-1	$kgCO_2/Gcal$	c	Annually	100 %	Hard copy, electronic worksheet	

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

BASELINE

Initial data

For calculations of baseline during 2007-2012 was accepted following initial data:

- Annual heat output = 3465 thous. Gcal
- Annual power output = 1680 mln. kWh

The accepted perspective forecast of power and heat output corresponds to actual average values of these parameters during 2000-2004.

- Specific fuel equivalent consumption for electricity supplied = 351.7 g ce/kWh
- Specific fuel equivalent consumption for electricity supplied = 144.4 kg ce/Gcal.

Specific consumption of fuel equivalent is determined based on its average value over 2000-2004.

Baseline calculation

Annual fuel consumption for heat (B^{heat} , thous. ton. c.e.)

$$B^{heat} = H \cdot b^{heat} \cdot 10^{-3} \qquad (20)$$

Where
H – annual heat output (thous. Gcal);
b^{heat} – specific fuel equivalent consumption for heat supplied (kg ce/Gcal).
Annual fuel consumption for electricity (B^p , thous. ton. c.e.)

$$B^p = P \cdot b^p \cdot 10^{-3} \quad (21)$$

Where
P – annual power output (mln. kWh);
b^p – specific fuel equivalent consumption for electricity supplied (g ce/kWh).
Annual fuel consumption for heat and electricity, totally (B , thous. ton. c.e.):

$$B = B^{heat} + B^p \quad (22)$$

Annual heavy oil consumption ($B_{h.oil}$, thous. ton. c.e.):

$$B_{h.oil} = B \cdot 0.003 \quad (23)$$

Where
0.003 – heavy oil share (0.3%) in the fuel balance. This value is determined based on its average value over 2000-2004.
Annual coal consumption (B_{coal} , thous. ton. c.e.):

$$B_{coal} = B - B_{h.oil} \quad (24)$$

CO_2 emissions from coal combustion (E_{coal} , thous. tCO_2)

$$E_{coal} = B_{coal} \cdot k_{coal} \quad (25)$$

Where
k_{coal} – Coefficient of CO_2 emission coal burning (t CO_2/tce, see section B.3)
CO_2 emissions from heavy oil combustion ($E_{h.oil}$, thous. tCO_2)

$$E_{h.oil} = B_{h.oil} \cdot k_{h.oil} \quad (26)$$

Where
$k_{h.oil}$ – Coefficient of CO_2 emission heavy oil burning
Total direct CO_2 emission: (E^{BL}_{direct} , thous. tCO_2)

$$E^{BL}_{direct} = E_{coal} + E_{h.oil} \quad (27)$$

CO_2 emission for heat output (E_{heat}^{BL} , thous. tCO_2):

$$E_{heat}^{BL} = E_{direct}^{BL} * \frac{B^{heat}}{B} \quad (28)$$

CO_2 emission for power output (E_{p}^{BL} , thous. tCO_2):

$$B_{p}^{BL} = B_{direct}^{BL} \cdot \frac{B^{P}}{B} \quad (29)$$

Emission Factor (EF) under heat production (ef_{heat}^{BL} , $kgCO_2/Gcal$):

$$ef_{heat}^{BL} = \frac{E_{heat}^{BL}}{H} * 10^3 \quad (30)$$

EF under electricity production (ef_{p}^{BL} , gCO_2/kWh)

$$ef_{p}^{BL} = \frac{E_{p}^{BL}}{P} * 10^3 \quad (31)$$

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

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

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

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

Not applicable

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 cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
29.309	Coal equivalent	Khabarovsk CHP-1	10^{-6}*PJ/tce	c	Annually	100 %	Hard copy, electronic worksheet	
384	CH_4 emission factor	Khabarovsk CHP-1	tCH_4/PJ	c	Annually	100 %	Hard copy, electronic worksheet	
21	Coefficient for recalculation of CH_4 to CO_2-eqv.	Khabarovsk CHP-1	t CO_2-eqv./t CH_4	c	Annually	100 %	Hard copy, electronic worksheet	
32 $E^{PR}_{indirect}$	CH_4 emissions in CO_2-eqv. associated with gas delivery and transportation	Khabarovsk CHP-1	thous. tCO_2-eqv	c	Annually	100 %	Hard copy, electronic worksheet	
4 B_{gas}	Including gas consumption	Khabarovsk CHP-1	tons of coal equivalent	m	Annually	100 %	Hard copy, electronic worksheet	
	Indirect GHG emissions associated with							

	production:							
33 $E^{p}_{indirect}$	-electricity	Khabarovsk CHP-1	thous. tCO_2-eqv	c	Annually	100 %	Hard copy, electronic worksheet	
34 $E^{heat}_{indirect}$	-heat	Khabarovsk CHP-1	thous. tCO_2-eqv	c	Annually	100 %	Hard copy, electronic worksheet	
35 $E^{PR}_{indirect}$	Indirect GHG project emissions	Khabarovsk CHP-1	thous. tCO_2-eqv	c	Annually	100 %	Hard copy, electronic worksheet	

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

CH_4 emissions in CO_2-eqv. associated with gas delivery and transportation (thous. tCO_2):

$$E^{PR}_{indirect} = B^{p}_{gas} \cdot 29.309 \cdot 384 \cdot 21 \cdot 10^{-6} \quad (32)$$

Where

29.309 PJ/tce – conversion factor from ton of coal equivalent to joule. (1 tce = $29.309*10^{-6}$ PJ);

384 tCH_4/PJ – leakage of CH_4 per a 1 PJ of the transported gas;

21 tCO_2-eqv/tCH_4 – the global warming potential of CH_4.

Indirect GHG emissions are associated with heat and electric power production such as fuel, firing at the station.

Indirect GHG emissions associated with heat production ($E^{heat}_{indirect}$, thous. tCO_2-eqv):

$$E^{heat}_{indirect} = E^{PR}_{indirect} \cdot \frac{B^{heat}_{gas}}{B_{gas}} \quad (33)$$

Indirect GHG emissions associated with electricity production ($E^{p}_{indirect}$, thous. tCO_2-eqv):

$$E^{p}_{indirect} = E^{PR}_{indirect} \cdot \frac{B^{p}_{gas}}{B_{gas}} \quad (34)$$

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):

Estimation of GHG Emission Reduction Units by the project (ERUs, thous. tCO_2):

$$ERUs = 0.001 \cdot \left[\left(ef_{heat}^{BL} - ef_{heat}^{PR} \right) \cdot H + \left(ef_{p}^{BL} - ef_{p}^{PR} \right) \cdot P \right]$$

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

In accordance with the Russian regulatory procedural documents the following substances are subject to monitoring at power plants and boilers:

- Fly ash
- Nitrogen dioxide
- Nitrogen oxide
- Sulfur dioxide
- Carbon oxide
- Heavy oil ash (recalculated to vanadium)
- Soot and carcinogenic hydrocarbons (both only for boilers with capacity less than 30 t/hour).

Emissions of the mentioned above substances are measured as follows: grams/second (average for 20 min) and in tones (for a longer period – a month, a quarter, half a year, a year).

The received data is tabulated in forms 2-TP (air) of governmental accounting.
In our case, at the plants within the project boundaries the following substances will be emitted: sulfur oxides and fuel oil ash – when fuel oil firing, nitrogen oxides - both when firing fuel oil and natural gas.

According to the Federal Laws of the Russian Federation "Environmental Protection Act" (No. 7-FZ dated 10.01.2002) and "Environmental Expert Review Act" (No. 65-FZ dated 25.06.1995) project environmental impact assessment is made. This document is developed together with other project design documentation and is its integral part. The projects for which such assessment is made are as follows:

- new construction;
- reconstruction/ rehabilitation of a plant with a full change of the main technology, production volume increase (due to the project implementation);
- substitution of currently used fuel and raw materials for the inferior ones.

The present project is not related to any listed above variants.

Nevertheless, the Feasibility Study, that contains "Environmental Protection" section with emissions verification and estimation data obtained from the boilers with nominal output and maximum ground level concentration on the boarder of residential and sanitary protection areas, shall pass obligatory State environmental expert review.

The summary of the Expert Committee Findings on the Feasibility Study materials (title page, conclusions) and of the Environmental Protection Agency of the Ministry of Natural Resources of the Russian Federation in Khabarovsk Region Regulation "Approval of the Expert Committee Findings" are given in Annex 4.

The main finding of the Committee is that the project conforms to the legislative requirements and the environmental impact level is permissible.

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
Heat output (1)	low	There are three measuring methods and three control means respectively for heat output definition: • Determination of matter consumption via pressure differential is carried out by restriction (diaphragms); • Pressure conversation into uniform current signal is carried out by measuring converter; • Dependence of resistance on temperature is defined by thermal converter of resistance.
Power output (2)	low	The power output is determined via the inductive method by the standardized electricity meters
Natural gas consumption (4, 8, 12)	low	To be determined via the method of differential pressure + pressure conversation into uniform current signal by the standardized measuring device (diaphragm + differential manometer + secondary device)
Coal consumption (5, 9, 13)	low	To be determined via conversation of mechanical power into electrical power using piezometric sensors by Track scales BB-200

Use is made of the measurement methods approved (certified) by the bodies of the State Standard of the Russian Federation. The measurement errors of the devices the readings of which are controlled in monitoring, meet the requirements laid down in the Rules effective in the Russian Federation.
Actual sectoral standards on inaccuracy of measurements of:

- coal weighing is not more than ±1.75%;
- heavy oil volume measurement (which is recalculated further on in weight units) is not more than ± 0.5-0.8%;
- direct gas consumption measurements is not more than ± 0.3-1.0%.

The Control Equipment and Facilities Workshop (CEFW) is available at the CHP-1 ensuring operation of the measurement equipment and carrying out monitoring of adequate readings thereof. The CEFW equipment and devices are subject to periodical checking in accordance with the relevant scheduled (Annex

3.3). Checking is carried out on the test facilities using the standard devices. The CHP-1 also has the fleet of I&C equipment and devices to be applied in case of failure of any equipment and devices.

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

Collection of information required for calculations of reductions of GHG emissions as a result of the project is performed in accordance with the procedure common for the enterprise, as monitoring requires no additional information to be obtained, apart from the data already being collected and processed.

Khabarovskenergo – full responsibilities of the project implementation, general management;
Khabarovsk CHP-1 – performance of the plant under the projected mode;
Khabarovsk energy technological company – "everyday" control and project monitoring;

Energy Carbon Fund:
- organizes and conducts the training seminar on recording the required data, monitoring and reporting on the project GHG emissions,
- methodological support in the project GHG emissions monitoring and control of the fulfillment thereof.

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

- JSC "Khabarovskenergo"
- Energy Carbon Fund

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Table E.1.1. Initial information for calculation GHG project emissions

Parameters	Unit	Years					
		2007	2008	2009	2010	2011	2012
Annual heat output	thous. Gcal	3 465	3 465	3 465	3 465	3 465	3 465
Annual power output	mln. kWh	1 630	1 680	1 680	1 680	1 680	1 680
Specific fuel equivalent consumption for heat supplied	kg/Gcal	139.8	142.1	142.1	142.1	142.1	142.1
Specific fuel equivalent consumption for electricity supplied	g/kWh	327.1	322.5	322.5	322.5	322.5	322.5
Annual fuel consumption for heat	thous. ton c.e.	484.5	492.4	492.4	492.4	492.4	492.4
Annual fuel consumption for electricity	thous. ton c.e.	533.1	541.9	541.9	541.9	541.9	541.9
Annual fuel consumption for heat and electricity, totally:	thous. ton c.e.	1 017.6	1 034.3	1 034.3	1 034.3	1 034.3	1 034.3
Coefficient of CO_2 emission gas burning	t CO_2/tce	1.62	1.62	1.62	1.62	1.62	1.62

Table E.1.2. Direct GHG project emissions

Parameters	Unit	Year					
		2007	2008	2009	2010	2011	2012
CO_2 emission for heat output	thous. tCO_2	784.9	797.7	797.7	797.7	797.7	797.7
CO_2 emission for power output	thous. tCO_2	863.7	877.8	877.8	877.8	877.8	877.8
Emission factor under heat production	kgCO_2/ Gcal	227	230	230	230	230	230
Emission factor under electricity production	gCO_2/kWh	530	523	523	523	523	523
Total direct GHG emissions	thous tCO_2	**1 649**	**1 676**	**1 676**	**1 676**	**1 676**	**1 676**

E.2. Estimated leakage:

Parameters	Unit	Year					
		2007	2008	2009	2010	2011	2012
Quantity of burning gas at the Khabarovsk CHP-1	thous. ton c.e.	1 017.6	1 034.3	1 034.3	1 034.3	1 034.3	1 034.3
Indirect GHG emissions associated with production:							
electricity	thous. t CO_2-eqv	126	128	128	128	128	128
heat	thous. t CO_2-eqv	115	116	116	116	116	116
CH_4 emissions in CO_2-eqv. associated with gas delivery and transportation	thous. t CO_2-eqv	**240.5**	**244.5**	**244.5**	**244.5**	**244.5**	**244.5**

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

Parameters	Unit	Years					
		2007	2008	2009	2010	2011	2012
Total direct GHG emissions	thous. t CO_2-eqv	1 649	1 676	1 676	1 676	1 676	1 676
Total indirect GHG emissions	thous. t CO_2-eqv	240.5	244.5	244.5	244.5	244.5	244.5
Total GHG emissions under the project implementation	thous. t CO_2-eqv	**1889.5**	**1920.5**	**1920.5**	**1920.5**	**1920.5**	**1920.5**

E.4. Estimated baseline emissions:

Table E.4.1. Initial information for calculation GHG baseline emissions

Parameters	Unit	Years						
		2006	2007	2008	2009	2010	2011	2012
Annual heat output	thous. Gcal	3465	3465	3465	3465	3465	3465	3465
Annual power output	mln. kWh	1585	1630	1680	1680	1680	1680	1680
Specific fuel equivalent consumption for heat supplied	kg/Gcal	144.4	144.4	144.4	144.4	144.4	144.4	144.4
Specific fuel equivalent consumption for electricity supplied	g/kWh	351.7	351.7	351.7	351.7	351.7	351.7	351.7
Annual fuel consumption for heat	thous. ton c.e.	500.3	500.3	500.3	500.3	500.3	500.3	500.3
Annual fuel consumption for electricity	thous. ton c.e.	557.5	573.3	590.9	590.9	590.9	590.9	590.9
Annual fuel consumption for heat and electricity, totally:	thous. ton c.e.	1057.8	1073.6	1091.2	1091.2	1091.2	1091.2	1091.2
coal firing	thous. ton c.e.	1054.6	1070.4	1087.9	1087.9	1087.9	1087.9	1087.9
heavy oil firing	thous. ton c.e.	3.2	3.2	3.3	3.3	3.3	3.3	3.3
Coefficient of CO_2 emission coal burning	t CO_2/tce	2.88	2.88	2.88	2.88	2.88	2.88	2.88
Coefficient of CO_2 emission heavy oil burning	t CO_2/tce	2.31	2.31	2.31	2.31	2.31	2.31	2.31

Table E.4.2 Results of the calculations of GHG baseline emissions

Parameters	Unit	Years						
		2006	2007	2008	2009	2010	2011	2012
Total GHG baseline emissions	**thous. t CO_2**	**3044.6**	**3090.2**	**3140.8**	**3140.8**	**3140.8**	**3140.8**	**3140.8**
GHG project emissions associated with electricity production	thous. t CO_2	1 605	1 650	1 701	1 701	1 701	1 701	1 701
GHG project emissions associated with heat production	thous.t CO_2	1 440	1 440	1 440	1 440	1 440	1 440	1 440
EF under electricity production	**gCO_2/kWh**	**1 012**	**1 012**	**1 012**	**1 012**	**1 012**	**1 012**	**1 012**
EF under heat production	**kgCO_2/ Gcal**	**416**	**416**	**416**	**416**	**416**	**416**	**416**

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

Parameters	Unit	Years					
		2007	2008	2009	2010	2011	2012
Total GHG baseline emissions	thous. t CO_2	3090.2	3140.8	3140.8	3140.8	3140.8	3140.8
Total GHG emissions under the project implementation	thous. t CO_2	1889.5	1920.5	1920.5	1920.5	1920.5	1920.5
Emission reductions	thous. t CO_2	**1200.7**	**1220.3**	**1220.3**	**1220.3**	**1220.3**	**1220.3**
Emission reductions in 2008-2012	thous. t CO_2	**6100**					

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

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)
2007	1649	240.5	3090.2	1200.7
2008	1676	244.5	3140.8	1220.3
2009	1676	244.5	3140.8	1220.3
2010	1676	244.5	3140.8	1220.3
2011	1676	244.5	3140.8	1220.3
2012	1676	244.5	3140.8	1220.3
Total (tonnes of CO_2 equivalent)	10029	1463	18794.2	7302.2

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 ecological effect gained from the project implementation (reduction of SO_2, NO_x and coal ash gross emissions) is reached due the following factors:

- Usage of pollution-free fuel (natural gas instead of coal),
- Increase of fuel combustion efficiency due to boilers efficiency coefficient increase and application of modern, more effective burners.

For estimation of the ecological effect the following data was used:

- From the base line - retrospective data for emissions from coal combustion at Khabarovsk CHP-1 during the period of 1999-2003,
- Under the project - data for NO_x emissions from natural gas combustion in steam boilers.

Returns on pollutant emissions from the Khabarovsk CHP-1

In accordance with Operating Rules and Regulations for power plants and electrical networks of the Russian Federation [14] at all power plants of JSC "Khabarovskenergo", including Khabarovsk CHP-1, emissions accounting and monitoring are regularly made.
Emissions assessment from CHP is carried out in accordance with the methodology of Russia [15].

Table F.1.1 shows the returns on emissions at Khabarovsk CHP-1 from 1999 till 2003.

Reported year	Total*	Coal ash	SO_2	NO_x	Fuel coal fired
	t/y	t/y	t/y	t/y	thous. tce
1999	36 892,6	14 723,0	16 427,3	4 632,6	1 109,5
2000	25 868,9	13 102,4	6 268,9	5 362,2	1 135,2
2001	24 713,7	11 979,6	6 022,6	5 628,5	1 082,8
2002	26 643,1	15 421,7	4 789,9	5 370,9	1 060,4
2003	27 676,5	15 617,2	5 377,1	5 583,6	1 098,4

* - besides the emissions given in Table 1 at Khabarovsk CHP-1 under fuel oil combustion oil ash is also emitted. However, the percentage of fuel oil in the fuel balance is only 0.23-0,49 %, and the amount of fuel oil ash in the gross emissions is less than 0.001 % (0.22-0.25 t/y), thus, such emissions are not accounted when assessing environmental impact.
Based on the returns, an average specific value of emissions per the combusted fuel amount is the following:

NOx - 4.84 t of NO_x/thous. tce of coal;
SO_2 - 7.09 t of SO_2/thous. tce of coal;
Fuel coal ash - 12.91 t /thous. tce of coal.

NO_x emissions data when combusting natural gas in steam boilers

The volume of NO_x emissions when combusting natural gas in steam boilers depends on many factors, such as the type of boilers, actual load, application of $DeNO_x$ technologies, etc.
According to the information received from the Environmental Protection Department of Russian Thermal Engineering Institute, the concentration of nitrogen oxides in flue gases when combusting natural gas in pulverized coal-fired boilers can reach 500 mg/nm^3.
For example, when combusting natural gas in the boilers of Pskov Thermal Power Plant (TPP) (project fuel - coal) in 2000 2824.7 t of NO_x were emitted into the atmosphere (annual gas consumption – 747.8

thous. t) which corresponds to the concentration of NO_x in the leaving gases at the level of 400 mg/nm^3, in 2001 – 2932.0 t of NO_x (747.8 thous. t) or 360 mg/nm^3.
When providing modernization of the boilers at Khabarovsk CHP–1 it is supposed to apply the cyclone-swirl technology for gaseous fuel combustion (designers - «Nonprofit scientific and educational organization of the Far East State Technical University» and Technological Center «Modernization of boiler equipment» in Vladivostok). The given technology allows reducing NO_x emissions for 70% in comparison with common conventional gas/oil devices (gas-heavy oil device burners) and is being successfully operated for boiler units at the Okhinskaya and Yakutskaya CHP.
For the estimation of ecological effect, the NO_x concentration in the flue gases was assumed at the level of 250 mg/nm^3, which corresponds to NO_x specific emissions at the level of 2.4 t of NO_x/thous. tce of gas.

Environmental Impact Assessment

When implementing the project of switching the boilers at Khabarovsk CHP-1 to natural gas combustion the gross emissions of sulphurous anhydride and of coal fly ash to the atmosphere will be eliminated, that will provide considerable improvement of the ecological situation not only in the Khabarovsk town, but also in Khabarovsk Region.
The results of pollutant emissions accounting in the base line and in the project for the period till 2012 are given in Tables E.1.2-E.1.4.

Table E.1.2 The forecast of pollutant emissions in the project base line

Year	Fuel consumption	Coal ash	SO_2	NOx	Total
	tce/y	t/y	t/y	t/y	t/y
2007	1 073,6	13 863,4	7 609,6	5 201,0	26 674,0
2008	1 091,2	14 090,5	7 734,2	5 286,2	27 110,9
2009	1 091,2	14 090,5	7 734,2	5 286,2	27 110,9
2010	1 091,2	14 090,5	7 734,2	5 286,2	27 110,9
2011	1 091,2	14 090,5	7 734,2	5 286,2	27 110,9
2012	1 091,2	14 090,5	7 734,2	5 286,2	27 110,9

Table E.1.3 The forecast of pollutant emissions when implementing the project

Year	Fuel consumption	Coal ash	SO_2	NOx	Total
	tce/y	t/y	t/y	t/y	t/y
2007	1 017,6	0,0	0,0	2 442,3	2 442,3
2008	1 034,3	0,0	0,0	2 482,3	2 482,3
2009	1 034,3	0,0	0,0	2 482,3	2 482,3
2010	1 034,3	0,0	0,0	2 482,3	2 482,3
2011	1 034,3	0,0	0,0	2 482,3	2 482,3
2012	1 034,3	0,0	0,0	2 482,3	2 482,3

Table E.1.4 Results of pollutant emissions assessment in the period from 2007 to 2012 under project implementation.

Year	Coal ash	SO_2	NOx	Total
	t/y	t/y	t/y	t/y
2007	13 863,4	7 609,6	2 758,7	24 231,7
2008	14 090,5	7 734,2	2 803,9	24 628,6
2009	14 090,5	7 734,2	2 803,9	24 628,6
2010	14 090,5	7 734,2	2 803,9	24 628,6
2011	14 090,5	7 734,2	2 803,9	24 628,6
2012	14 090,5	7 734,2	2 803,9	24 628,6

Transboundary Transfer

The Russian Federation has SO_2 and NO_x emissions reductions obligations under the Transboundary Transfer Convention. Such obligations are related only to the emissions made in Ciscaucasian Russia. Khabarovsk CHP-1 is located in the Far East. That is why OAO "Khabarovskenergo" and CHP-1 do not carry out special emissions monitoring under the Convention.
Besides, when implementing the project pollutant emissions into the atmosphere are reduced. The values of SO_2, NO_x and fly ash emission reductions are given above.

Conclusions:
The Khabarovsk CHP-1 is not considered to be a source of emissions under the Transboundary Transfer Convention.
Even if such emissions occurred, they would have been reduced when implementing the project.

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:

Not applicable. Impacts are not considered to be significant by the Project participants and the host Party.

SECTION G. Stakeholders' comments

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

Identification of stakeholders

The stakeholders identified for the project "Switch of Khabarovsk CHP-1 from Coal to Fire Natural" are the local population, which is represented by Khabarovsk City and Khabarovsk Region as well as elected body of representatives administration of the local area, which competent to issue No-Objection and Permission for the project.

Implementation of such project – switch from coal on environmentally advanced equipment – natural gas, can't exert negative influence on environment. Under the Russian legislation submission of environmental impact estimation of the project isn't required for Khabarovsk Regional Board of Ecological and Technological Supervision. Therefore, as stakeholders comments there are official letter from Khabarovsk Regional Board of Ecological and Technological Supervision as well as the Regulation of the Governor of Khabarovsk Region "About the measures on further development of gasification of the Khabarovsk Territory":

- Khabarovsk Regional Board of Ecological and Technological Supervision (on March 25 2005) (Annex 5);
- Governor of Khabarovsk Region (on 24 March 2003) (Annex 6).

Later JCS "Khabarovskenergo" will organize the meetings for the independent validator with the Mayor of Khabarovsk and Ministry of Fuel and Energy of Khabarovsk Region where the endorsements of fully support of the project by the authorized bodies of Khabarovsk Region will be obtained.

There were not address criticisms of project or objections.

The public was also involved in the whole process by published article posted announcement (at daily newspaper "The Power Engineer" dated 20 January 2005) (Annex 7).

Stakeholders involvement

The project proponents have already approached and obtained their consent from various stakeholders and statutory bodies as detailed above.

Stakeholders comments

All stakeholders have issued their approvals and consents for setting up the project.

The support letter copies are presented in Annex 5, 6 and 7.

Reference

1. "Methodical Instructions on drawing up of report of Power Plant and Joint-Stock Company of power system and electrification of thermal effectively of equipment". RD 34.08.552-95". Moscow: SPO ORGRES, 1995, page 124.
2. Alteration No. 1 RD 34.08.552-95. – Moscow: SPO ORGRES. 1998.
3. Feasibility Study for reconstruction of Khabarovsk CHP-1 with using the natural gas as main fuel. Feasibility Study. 002.12.03-MS. Volume 7. Agreements Data. Designed Institute "Khabarovskenergoproekt". Khabarovsk, 2003.
4. Working Book of Inventory of GHG Emissions. Revised Guidelines of National Inventories of GHG Emissions. IPCC, volume 2, 1996.
5. The Inventory of GHG emissions sources with the estimation of GHG reductions potential by Thermal Power Plants of JSC "Khabarovskenergo". Energy Carbon Fund, Moscow, 2003.
6. The Inventory of GHG Emissions by Thermal Power Plant and Boiler Houses of Power Industry of the Russian Federation for 1990-1997. RAO "UES of Russia", Moscow, 1999.
7. Untersuchung zum Kenntnisstand uber Methan-Emissionen beim Export von Erdgas aus Russland nach Deutschand, Marz 1997, W Zittel, Ludwig-Bolko-System-Technik, Ottobrunn.
8. Methodical Instructions on Fuel Accounting at Thermal Power Plants, RD 34.09.105-95.
9. Standard Instruction on metal control and lifetime extension of main elements of boilers, turbines and pipelines of TPPs. RD 10-262-98; РД 153-34.1-17.421-98. Moscow, 1998. Page 90.
10. Methodical Instructions on metal control and lifetime extension of pipelines II, III and IV categories. RD 153-34.0-17.464-00. Moscow, 2001.
11. RTM 108.031.105-77. The stationary steam and hot-water boilers and pipelines of steam and hot water. The method of longevity estimation under low-cycle fatigue and after flow.
12. RTM 108.031.112-80. The stationary steam and hot-water boilers and pipelines of steam and hot water. The method of longevity estimation of piping elbows. Methodical Instructions on pipes technical diagnosing of heating surface of steam and hot-water boilers with using metal magnetic memory: RD 4.17.446-97 - Moscow: NPO "Energodiagnostika", 1997.
13. Independent Expert Review of the RAO UESR GHG Emission Inventory Methodology". "Environmental Defense" – Center for Preparation and Implementation of International Projects on Technical Assistance, Moscow – Washington – New-York, 2001
14. "Technical Operational Rules of Power Plants and grid of Russian Federation". RD 34.20.501-95. The 15th issue revised and supplemented.
15. Methodology of Accounting Gross Polluting Substances Emissions from boiler houses of TPP", RD 34.02.305-98.
16. Decision 9/CMP.1. Guidelines for the implementation of Article 6 of the Kyoto Protocol FCCC/KP/CMP/2005/8/Add.2. 30 March 2006.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Organisation:	Joint Stock Company "Khabarovskenergo"
Street/P.O.Box:	Frunze Str.
Building:	49
City:	Khabarovsk
State/Region:	Khabarovsk Region
Postal code:	680000
Country:	Russia
Phone:	+7 4212 30 49 14
Fax:	+7 4212 21 30 87
E-mail:	Hab@khaben.elektra.ru
URL:	www.khabenergo.ru
Represented by:	
Title:	Depute General Director
Salutation:	Mr.
Last name:	Rozhkov
Middle name:	Borisovich
First name:	Alexander
Department:	
Phone (direct):	+7 4212 39 47 55
Fax (direct):	+7 4212 39 47 55
Mobile:	+7 914 772 49 18
Personal e-mail:	alex@energo.ru

Organisation:	Non-commercial Environmental Investment Organization "Energy Carbon Fund" (ECF)
Street/P.O.Box:	prospect Vernadsogo
Building:	101/3
City:	Moscow
State/Region:	Khabarovsk Region
Postal code:	119526
Country:	Russia
Phone:	+7 495 785 80 46
Fax:	+7 495 758 80 46
E-mail:	ecf@energyfund.ru
URL:	www.carbonfund.ru
Represented by:	
Title:	General Director
Salutation:	Mr.
Last name:	Gorkov
Middle name:	Vladimirovich
First name:	Andrey
Department:	
Phone (direct):	+7 495 785 80 46
Fax (direct):	+7 495 785 80 46
Mobile:	
Personal e-mail:	gorkovav@energyfund.ru

Organisation:	Electric Power Development Co., Ltd
Street/P.O.Box:	Ginza 6-Chome, Chuo-ku
Building:	15-1
City:	Tokyo
State/Region:	
Postal code:	104-8165
Country:	Japan
Phone:	+81 3 3546 2211
Fax:	
E-mail:	webmaster@jpower.co.jp
URL:	www.jpower.co.jp/english/
Represented by:	
Title:	Director, Climate Change
Salutation:	Mr.
Last name:	Nonaka
Middle name:	
First name:	Yuzuru
Department:	Corporate Planning and Administration
Phone (direct):	(81 3) 3546 9375
Fax (direct):	(81 3) 3546 9531
Mobile:	
Personal e-mail:	yuzuru_nonaka@jpower.co.jp

Organisation:	Cargill International SA
Street/P.O.Box:	Chemin De-Normandie
Building:	14
City:	Geneva
State/Region:	
Postal code:	CH-1206
Country:	Switzerland
Phone:	+ 41 22 703 21 11
Fax:	+ 41 22 703 25 55
E-mail:	
URL:	www.cargill.com
Represented by:	
Title:	CO_2 trader
Salutation:	Mr.
Last name:	Dwyer
Middle name:	
First name:	Michael
Department:	
Phone (direct):	+41 22 703 20 50
Fax (direct):	+41 22 703 21 52
Mobile:	-
Personal e-mail:	michael_dweyr1@cargill.com

Annex 2

BASELINE INFORMATION

This methodology is applied to the project activity for industrial fuel switching from coal or petroleum fuels to natural gas. The switch to another fuel is carried out in the technological process for combined production of power and heat.

It is necessary to determine the proper emission factor for the each technological process.

Emission Factor (EF) under heat production ($kgCO_2/Gcal$):

$$EF_{heat} = \frac{E_{heat}}{H} \cdot 10^3 \quad (1)$$

Where

E_{heat} – CO_2 emission for heat output (thous. tCO_2);

H – annual heat output (thous. Gcal).

EF under electricity production (gCO_2/kWh)

$$EF_P = \frac{E_P}{P} \cdot 10^3 \quad (2)$$

Where

E_P – CO_2 emission for power output (thous. tCO_2):

P – annual power output (mln. kWh);

For determination of the emissions generating under production of each type of the energy (heat and electricity) it is necessary to know the fuel consumption for heat production and electricity production separately and the type of fuel.

Annual fuel consumption for heat (thous. ton. c.e.)

$$B^{heat} = H \cdot b^{heat} \cdot 10^{-3} \quad (3)$$

Where

H – annual heat output (thous. Gcal);

b^{heat} – specific fuel equivalent consumption for heat supplied (kg ce/Gcal).

Annual fuel consumption for electricity (thous. ton. c.e.)

$$B^P = H \cdot b^p \cdot 10^{-3} \quad (4)$$

Where

P – annual power output (mln. kWh);

b^P – specific fuel equivalent consumption for electricity supplied (g ce/ kWh).

It is supposed that the emissions related with electricity and heat production will be allocated such as fuel, firing at the plant.

CO_2 emission for heat output (thous. tCO_2):

$$E_{heat} = E \cdot \frac{B^{heat}}{B} \quad (5)$$

CO_2 emission for power output (thous. tCO_2):

$$E_P = E \cdot \frac{B^P}{B} \quad (6)$$

Where

B – annual fuel consumption for heat and power, totally (thous. ton. c.e.)
B^{heat} – annual fuel consumption for heat (thous. ton. c.e.)
B^{P} – annual fuel consumption for electricity (thous. ton. c.e.)

Total direct CO_2 emission (thous. tCO_2):

$$E = \sum_i B_i \cdot k_i \quad (7)$$

Where
B_i – annual type of fuel i consumption for heat and electricity, totally (thous. tce);
k_i – coefficient of CO_2 emission type of fuel i consumption (t CO_2/tce).

Leakages
CH_4 emissions in CO_2-eqv. associated with gas delivery and transportation (thous. tCO_2):

$$L = B_{gas} \cdot l_{gas} \quad (8)$$

Where
B_{gas} – annual gas consumption (thous. tce)
l_{gas} – leakage of CH_4 per a 1 thous. ton. c.e. of the transported gas.

Emission reductions
Estimation of GHG Emission Reduction Units by the project (ERUs, thous. tCO_2):

$$ERUs = 0.001 \cdot \left[\left(EF_{heat}^{BL} - EF_{heat}^{PR} \right) \cdot H + \left(EF_{P}^{BL} - EF_{P}^{PR} \right) \cdot P \right] \quad (9)$$

Annex 2.1 Characteristics of the Khabarovsk CHP-1 main equipment

Steam boilers

Station No.	Type	Manufacturer	Year of commissioning	Fuel	Steam parameters		Nominal output, t/h
					Pressure, kg/cm^2	Temperature, ^{0}C	
1	2	3	4	5	6	7	8
1	TP-170	TKZ	1953	coal/heavy oil	100	540	170
2	TP-170	TKZ	1955	coal/heavy oil	100	540	170
3	TP-170	TKZ	1955	coal/heavy oil	100	540	170
4	TP-170	TKZ	1958	coal/heavy oil	100	540	170
5	BKZ-160-100-F	Barnaul boiler manufacturing works	1959	coal/heavy oil	100	540	160
6	BKZ-160-100-F		1960	coal/heavy oil	100	540	160
7	BK3-220-100-F		1964	coal/heavy oil	100	540	220
8	БKZ-220-100-F		1965	coal/heavy oil	100	540	220
9	BKZ-210-140-F		1966	coal/heavy oil	140	560	210
10	BKZ-210-140-F		1967	coal/heavy oil	140	560	210
11	BKZ-210-140-F		1968	coal/heavy oil	140	560	210
12	BKZ-210-140-F		1970	coal/heavy oil	140	560	210
13	BKZ-210-140-F		1971	coal/heavy oil	140	560	210
14	BKZ-210-140-F		1972	coal/heavy oil	140	560	210
15	BKZ-210-140-F		1972	coal/heavy oil	140	560	210
16	BKZ-210-140-F		1973	coal/heavy oil	140	560	210

Hot water boiler-house

Station No.	Type	Manufacturer	Year of manufacture	Fuel	Steam parameters		Nominal output, Gcal/h
					Pressure, kg/cm^2	Temperature, ^{0}C	
18	PTVM-100	Belgorod boiler manufacturing works	1978	heavy oil	25	70-150	100
19	PTVM-100		1979	heavy oil	25	70-150	100
20	PTVM-100		1981	heavy oil	25	70-150	100

Steam turbines

Station No.	Type	Manufacturer	Year of commissioning	Installed capacity, MW	Live steam parameters		Nominal heat capacity, Gcal/h	
					Pressure, kg/cm^2	Temperature, ^0C	Industrial	Heating
1	PT-50-90/13				90	535		
2	PT-30-90/13				90	535		
3	T-27,5-90				90	535		
4	PR-25-90/10/0,9				90	535		
5	PR-25-90/10/0,9				90	535		
6	T-100-130	UTMZ		100	140	565	-	160
7	T-100-130			100	140	565	-	160
8	T-105-130			100	140	565	-	160

Annex 2.2 Justification and evaluation of the values of the specific fuel consumption from natural gas combustion at the Khabarovsk CHP-1

The calculation of perspective specific fuel consumptions for power and heat output while gas firing at Khabarovsk CHP-1

On switching CHP-1 boilers from coal to fire natural gas the efficiency of electricity and heat production is increasing (Item 3.2).

The main generating equipment of Khabarovsk CHP-1 divides into two groups:

- Group of equipment with pressure 90 kg/cm^2: steam boilers No 1-8 and steam turbines No 1-5,
- Group of equipment with pressure 130 kg/cm^2: steam boilers No 9-16 and steam turbines No 6-8.

The shares of groups of equipment (φ^{90} и φ^{130}) in fuel consumption at CHP-1 are presented in Table 1.

Table 1

Parameters	Unit	Group of equipment with pressure 90 kg/cm^2	Group of equipment with pressure 130 kg/cm^2	Total
Annual fuel consumption - 2003	thous. tce	388 361	713 259	1 101 620
Annual fuel consumption - 2004	thous. tce	387 485	666 741	1 054 226
Share (φ)	-	0.36	0.64	-

According to the reports of CHPs the actual estimates of effective economy of boilers of 130 kg/cm^2 equipment group (БКЗ-210-140) и boilers of 90 kg/cm^2 equipment group data is presented in Table 2 and Table 3, respectively.

Increase of equipment operation efficiency may be calculated by the formula:

$$\beta = (N^{90}_{gas} \times \varphi^{90} + N^{130}_{gas} \times \varphi^{130}) / (N^{90}_{coal} \times \varphi^{90} + N^{130}_{coal} \times \varphi^{130}), \text{ где}$$

N^i - net efficiency of boiler while firing coal and gas for each i type of equipment.

At that the value of N^i (Table 2 and Table 3) is selected based on conservative approach – largest value for coal and least value for gas.

Table 2

The actual estimates of effective economy of boilers of 90 kg/cm^2 equipment group

CHP	Fuel		Boiler		Efficiency of boiler, %				
	Type	%	Type	Number	1987		1988		1997
					gross	net	gross	net	gross
Khabarovsk CHP-1	coal heavy oil	88 12	ТП-170 БКЗ-160-100Ф БКЗ-220-100Ф	4 2 2	87,7	81,9	87,6	82,1	85,6 (2004 – 87,53)
Vorkuta CHP-2	coal heavy oil	99 1	ТП-170 БКЗ-160-100F BKZ-220-100F	2 3 3	88,6	82,6	88,3	82,1	87,7
Barnaul CHP-2	coal heavy oil	96 4	TP-170 TP-230	3 2	86,9	81,0	86,1	80,8	86,5
Efremovsk CHP	gas heavy oil	72 28	BKZ-160-100GM	5	92,2	88	92,6	88,2	92,7
Penza CHP-1	gas heavy oil	92 8	TP-170 TP-15 TP-47	3 2 1	92,3	87,3	92	87,8	92,6
CHP-16 JSC “Mosenergo”	gas heavy oil	99 1	TP-170 TP-26	3 2	94		94		93,3
Saratov CHP-2	gas heavy oil	77 23	TP-170	5	91,3	86,7	91	86,6	92,5
Novomoskovsk TPP	gas coal	88 11	Shikhau BKZ-220-100F ТП-230	4 3 1	91,7	86,1	91,7	86,5	93,1 (gas)
Bezmensk TPP	gas	100	BKZ-160-100GM	5	93,8	88,6	93,6	88,7	

Table 3

The actual estimates of effective economy of boilers of 130 kg/cm^2 equipment group (БКЗ-210-140)

CHP	Fuel		Boiler		Average load	Efficiency of boiler, %					Excess air coefficient after boiler	air inflow in boiler-smoke sucker duct, %	Off-gas temperature, ^{0}C	Heat losses, %	
	Type	%	Type	Number		1988		1997		1998				q_2	q_4
						gross	net	gross	net	gross					
Khabarovsk CHP-1	coal heavy oil	94 6	BKZ-210-140	8	107	89,0	83,3	89,0	82,8	88,0	1,48	40	154	9,1	0,8
Smolensk CHP-2	gas heavy oil	92 8	BKZ-210-140 TGME-464	4 1	138	94,3	89,9	94,2	90,3	94,9	1,04	-	123	5,2	-
Tumen CHP-1	gas	100	BKZ-210-140	11	112	93,2	88,1	93,2	89,2	93,6	1,14	14	122	5,2	-
Chelyabinsk CHP-2	gas coal	84 16	BKZ-210-140	9	103	93,6	89,1	93,6	89,1	93,6	1,20	35	135	5,5	0,1
Svetlograd CHP	gas heavy oil	88 12	BKZ-210-140	4	97	93,1	87,5	93,2	87,6		-	-	152	5,5	-
Tver CHP-3	gas heavy oil coal	84 4 12	BKZ-210-140	4						93,4					
Chelaybinsk CHP-2	gas coal	90 10	BKZ-210-140	9						93,6					

The results of estimate are presented in Table 4.

Table 4

Parameters	Unit	Group of equipment with pressure 90 kg/cm^2	Group of equipment with pressure 130 kg/cm^2	Average value for CHP-1
Net efficiency of boiler for coal	%	82.1	83.3	82.5
Net efficiency of boiler for gas	%	87.3	87.5	87.4
β	-	-	-	1.06

The values of average coefficients (during 2000-2004) of fuel referring to electricity production (k^e) and heat production (k^h) at CHP-1 are presented in Table 5.

Table 5

	Unit	Fuel consumption for production		
		Electricity	Heat	Total
2000	thous. tce	597.5	540.3	1137.8
2001	thous. tce	563.1	522.8	1085.9
2002	thous. tce	550.0	514.3	1064.3
2003	thous. tce	587.0	514.6	1101.6
2004	thous. tce	554.5	499.8	1054.2
Average value of coefficient (k)	-	0.52	0.48	-

The estimate of perspective specific fuel consumption for power and heat output while gas firing at CHP-1 taking into account assumption are presented in Table 6.

Table 6

Parameters	Unit	Years					
		2007	**2008**	**2009**	**2010**	**2011**	**2012**
– Annual heat output	thous. Gcal	3465.0	3465.0	3465.0	3465.0	3465.0	3465.0
Annual power output	mln. kWh	1630.0	1680.0	1680.0	1680.0	1680.0	1680.0
Annual fuel consumption for coal firing	thous. tce	1073.6	1091.2	1091.2	1091.2	1091.2	1091.2
Annual fuel consumption for gas firing	thous. tce	1017.6	1034.3	1034.3	1034.3	1034.3	1034.3
Annual fuel consumption for heat	thous. tce	484.5	492.4	492.4	492.4	492.4	492.4
Annual fuel consumption for electricity	thous. tce	533.1	541.9	541.9	541.9	541.9	541.9
Specific fuel equivalent consumption for heat supplied	kg/Gcal	139.8	142.1	142.1	142.1	142.1	142.1
Specific fuel equivalent consumption for electricity supplied	g/kWh	327.1	322.5	322.5	322.5	322.5	322.5

Annex 2.3 The conditions of the existing equipment of Khabarovsk CHP-1

Station No.	Manufacturer	Type	Year of commissioning	Installed electrical capacity, MW	Heat capacity, Gcal/h	Lifetime in accordance with equipment certificate (LS), hours	Operating time from the date of commissioning, hours	Year of reaching of LS, years	Individual lifetime* (IL), hours	Year of reaching of IL taking into account extension of LS and additional lifetime
TP 01	Taganrogsky Metal Factory	PR-25-90/10/0.9	1974	25	74	270 000	302790	2025	0	0
TP 02	Taganrogsky Metal Factory	PT-25-90/10	1955	30	106	270 000	357840	1992	0	2032
TP 03	Taganrogsky Metal Factory	PR-25-90/10/0.9	1976	25	74	270 000	281920	2023	0	0
TP 06	Leningrad Metal Factory	PT-50-90/13	1964	50	148	270 000	281800	2002	307 000	2009
TP 07	Taganrogsky Metal Factory	T-100-130	1967	100	160	240 000	278700	1999	280 000	2006
TP 08	Taganrogsky Metal Factory	T-100-130	1969	100	160	240 000	25380	2001	270 000	2008
TP 09	Taganrogsky Metal Factory	T-100/120-130	1972	105	175	240 000	238100	2003	280 000	2011

*Individual lifetime – the additional lifetime of the equipment after fulfillment of capital repairs

Annex 2.4

Federal Service of Ecological, Technological and Atomic Supervision (RosTekhNadzor)

KHABAROVSK REGIONAL BOARD OF ECOLOGICAL AND
TECHNOLOGICAL SUPERVISION

76, Zaparina str., Khabarovsk, 680000 tel: (84212) 42-03-00, e-mail: postmaster@ggtn.khv.ru
OKPO 22151478, OGRN 1022700931681, INN/KPP 2721021699/272101001

Dated 25.03.2005 No. 13-0/1128

General director
JSC Khabarovskenergo
V.M. Levit

Of approval of the project

Khabarovsk Regional Board of Ecological and Technological Supervision of RosTekhNadzor approves joint implementation of the project "Switch of Khabarovsk CHP-1 from Coal to Fire Natural Gas" by JSC "Khabarovskenergo" and Japanese company "Toyota Tsusho Corporation".

Gasification of the boiler equipment of JSC "Khabarovskenergo" subsidiary Khabarovsk CHP-1 is a part of one development tendency of Khabarovsk Region – switch of power plants on burning of environmentally fuel – natural gas.

The project implementation allows reducing greatly emissions of nitric oxide, sulfur dioxide and solid particles into free air.

Reduction of carbon dioxide emissions amounts to 1.3 mln. t per year.

Cooperation with Japanese company "Toyota Tsusho Corporation" allows attracting foreign investment for project implementation.

Deputy Chief of Board V.M. Boltrushko

This is a true translation of the original document in Russian

ФЕДЕРАЛЬНАЯ СЛУЖБА ПО ЭКОЛОГИЧЕСКОМУ, ТЕХНОЛОГИЧЕСКОМУ И АТОМНОМУ НАДЗОРУ
(РОСТЕХНАДЗОР)
ХАБАРОВСКОЕ МЕЖРЕГИОНАЛЬНОЕ УПРАВЛЕНИЕ ПО ТЕХНОЛОГИЧЕСКОМУ И ЭКОЛОГИЧЕСКОМУ НАДЗОРУ

ул.Запарина, 76, г.Хабаровск, 680000 тел: (84212) 42-03-00, e-mail: postmaster@ggtn.khv.ru
ОКПО 22151478, ОГРН 1022700931681, ИНН/КПП 2721021699/272101001

25.03.05 № 13-0/1128

Генеральному директору
ОАО "Хабаровскэнерго"
Левиту В.М.

Об одобрении проекта

Хабаровское межрегиональное управление по технологическому и экологическому надзору Ростехнадзора одобряет совместное осуществление ОАО "Хабаровскэнерго" и японской фирмой ТОЙОТА ЦУСЕ КОРПОРЕЙШЕН проекта "Перевод Хабаровской ТЭЦ-1 на сжигание газового топлива".

Газификация котельного оборудования филиала ОАО "Хабаровскэнерго" "Хабаровская ТЭЦ-1" является частью одного из направлений промышленного развития Хабаровского края – перевода электростанций на сжигание экологически более чистого топлива – природного газа.

Реализация проекта позволит значительно снизить выбросы в атмосферный воздух оксидов азота, диоксида серы, твердых частиц.

Выбросы диоксида углерода сократятся на 1,3 млн. тонн в год.

Сотрудничество с японской фирмой ТОЙОТА ЦУСЕ КОРПОРЕЙШЕН позволит привлечь иностранные инвестиции в осуществление проекта.

Заместитель руководителя управления — В.М. Болтрушко

Annex 2.5

Fuel prices for different period

Fuel price	Units	2001	2002	2003	2004	2005	2006
Gas	Rub/tce	389.3	499.2	582.2	651.05	809.8	1843.3
Coal	Rub/tce	749.4	906.3	1157.83	1163.75	1171.35	1373.2

Fuel price estimate	Units	2007	2008	2009	2010	2011	2012
Gas	Rub/tce	1933.7	206.7	2153.6	2243.3	2243.3	2243.3
Coal	Rub/tce	1503	1624	1737	1737	1737	1737

Forecast for coal and natural gas prices

Example for 2010	Gas price	Coal price
Data from Business Plan	61.2 Euro/tce (based on the International Energy Agency forecast (Japan average annual crude oil import costs is equal to 37.58 $/barrel))	47.4 Euro/tce

1. Now, the contract was made with the Sakhalin-1deposit owners to supply gas. Because the grate part of the owners are “Exxon Neftegas Ldt.”, “Sakhalin Oil and Gas Development” and others, the gas prices will not be regulated by the legislation of the Russian Federation but will be set by the contracts made between the Open JSC "Khabarovskenergo" and the deposit owners for the period of 20 years. In accordance with said contract, the gas prices will be gradually increased to exceed the coal prices in 2005.

Therefore, the gas price is commercial and is not regulated by the Regional Energy Commission. It depends on oil price.

2. The Energy Strategy of the Russian Federation supposes the increase of coal share burned at the power plants at the expenses of economic incentives (coal price is lower than gas and oil price) as well.

Conclusion:
The coal price will not be lower than gas price neither under governmental regulation of fuel prices nor at the competing markets.

Annex 2.6

Fuel balance

Fuel type	Unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
1) Raichihinsk coal	thous. tce	78,584	115,471	1,592	8,139	12,529	0,281	15,637	68,724	45,581	11,231	0,453	0,029	
2) Urgalsk coal	thous. tce	0,706	0,204	4,244	55,303	268,799	347,572	289,900	371,695	200,200	139,344	164,596	80,366	370,202
3) Kharanorsk coal	thous. tce	432,014	386,282	493,647	504,425	541,322	527,477	673,334	412,973	164,556	394,960	427,848	251,207	232,238
4) Chernogorsk coal	thous. tce			52,821		13,791	0,039	32,600		2,608				
5) Izykhinsk coal	thous. tce			2,839	59,525	66,199	5,155	18,191		9,917				
6) Abakan coal	thous. tce									19,683				
7) Azeisk coal	thous. tce		7,696	38,391	78,097	30,218	55,903	16,886	205,414	651,192	564,010	321,118	104,480	78,442
8) Urtuysk coal	thous. tce											221,154	646,639	379,531
Oil fuel	thous. tce	299,853	445,144	415,374	227,296	133,415	62,07	24,226	8,902	5,401	3,544	2,643	3,112	3,857

Fuel consumption by transport

	Unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Petrol consumption	t/y	87,7	89,7	89,7	96,6	96,6	103,4	103,4	110,3	132,4	124,1	115,2	97,9	167,5
Diesel oil consumption	t/y	445,9	323,3	548,3	453,1	720,3	567,8	520,3	586,0	410,5	462,9	480,4	429,4	571,9

Average CO_2 emissions coefficients

	Unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Average CO_2 emissions coefficient for solid fuel	t CO_2/tce	2,96	3,01	2,99	2,95	2,92	2,92	2,93	2,91	2,85	2,87	2,88	2,88	2,88
Average CO_2 emissions coefficient for oil fuel	t CO_2/tce	2,21	2,22	2,22	2,20	2,23	2,24	2,30	2,33	2,35	2,44	2,53	2,41	2,39

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

GHG emissions

Total emissions

	Unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
CH_4 emission	thous. t CO_2	1,21	1,35	1,26	1,00	0,87	0,72	0,70	0,68	0,69	0,70	0,71	0,68	0,67
CH_4 share	%	0,03	0,04	0,04	0,03	0,03	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02
N_2O emissions	thous. t CO_2	15,21	13,35	12,37	13,28	13,57	12,77	13,52	13,75	14,00	14,19	14,51	13,84	13,59
N_2O share	%	0,40	0,37	0,38	0,40	0,42	0,43	0,43	0,44	0,44	0,44	0,44	0,44	0,44
CO_2 emissions	thous. t CO_2	3815,82	3561,69	3285,54	3277,47	3232,75	2978,71	3130,20	3140,85	3134,76	3197,57	3274,98	3125,15	3063,98
CO_2 share	%	99,57	99,59	99,59	99,57	99,56	99,55	99,55	99,54	99,53	99,54	99,54	99,54	99,54
GHG emissions total	thous. t CO_2	3832,25	3576,40	3299,17	3291,75	3247,19	2992,20	3144,41	3155,28	3149,45	3212,45	3290,20	3139,67	3078,23

Stationary fuelburn plants

	Unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
CH_4 emissions	thous. t CO_2	1,21	1,35	1,25	1,00	0,86	0,71	0,69	0,68	0,68	0,69	0,70	0,67	0,66
N_2O emissions	thous. t CO_2	15,17	13,31	12,32	13,22	13,51	12,72	13,46	13,69	13,94	14,13	14,45	13,79	13,51
CO_2 emissions	thous. t CO_2	3814,10	3560,36	3283,49	3275,70	3230,12	2976,55	3128,19	3138,61	3133,01	3195,68	3273,06	3123,46	3061,60
Emissions under the group total	thous. t CO_2	3830,48	3575,02	3297,06	3289,92	3244,49	2989,98	3142,35	3152,97	3147,64	3210,50	3288,22	3137,92	3075,77
Share in total emissions	%	99,95	99,96	99,94	99,94	99,92	99,93	99,93	99,93	99,94	99,94	99,94	99,94	99,92

Transport of enterprise

	Unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
CH_4 emissions	thous. t CO_2	0,00	0,00	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
N_2O emissions	thous. t CO_2	0,05	0,04	0,05	0,05	0,07	0,06	0,06	0,06	0,06	0,06	0,06	0,05	0,08
CO_2 emissions	thous. t CO_2	1,72	1,33	2,05	1,77	2,63	2,16	2,01	2,24	1,75	1,89	1,92	1,70	2,38
Emissions under the group total	thous. t CO_2	1,77	1,38	2,11	1,83	2,70	2,22	2,07	2,31	1,81	1,96	1,98	1,75	2,47
Share in total emissions	%	0,05	0,04	0,06	0,06	0,08	0,07	0,07	0,07	0,06	0,06	0,06	0,06	0,08

Annex 2.7

The most significant direct off-site emissions to be estimated are the emissions due to energy use of coal railway supply and gas pumping via the gas pipeline to Khabarovsk CHP-1.

According to the information obtained from the railway company, specific diesel fuel consumption for railway transport of goods is 47-52 kg per 10 thous. t×km.

To Khabarovsk CHP-1, the Urgalsk coal (Khabarovsk Region) is transported by diesel locomotive at a distance of 540 km, the Kharanorsk and the Urtuysk coals (Chita Region) is supplied via the electrified railway area and by diesel locomotive at a distance of 2700 km each. The share of the Urgalsk, Kharanorsk and Urtuysk coals in the total fuel balance constitutes 0.26, 0.4 and 0.34, respectively. CHP-1 as well consumes coals from Azeisk and Raichikhinsk deposits (during 1999-2002). But the reserve of coals from Azeisk deposit is estimated at в 0 year, and quality of Raichikhinsk coal became significantly worse of the project parameters (for example, heat value of delivered fuel – no more than 2100 kcal/kg, against designed– 2900-3100 kcal/kg). Therefore these coals most likely will not be burned at the CHP-1 and they were not taken into consideration.

According to the information obtained from Open JSC "Gasprom", specific energy consumption for pipeline pumping of natural gas is 32-35 kg of fuel eqv./mln.m^3×km.

Gas to the power station is supplied from the Sakhalin-1 gas field at a distance of about 900 km. In implementing the project, Khabarovsk CHP-1 gas requirements will be of the order of 260 mln. m^3/y.

The methodology of defining GHG emissions is to calculate absolute consumption of fuel needed to transport appropriate fuel from a certain deposit to the plant using specific figures and then through emission factors to calculate absolute emissions. Calculations are given in table below:

No	Parameters	Unit	*Calculation*	2008	2012
Baseline					
1	Coal consumption	10 thous. tce		109,2	109,2
2	Recalculation factor into natural fuel	t/tce		2,2	2,2
3	Coal consumed at CHP-1	10 thous.t	p.1*p.2	238,1	238,1
4	Kharanorsk	10 thous.t	0.22*p.3	52,4	52,4
5	Urtuysk coal	10 thous.t	0.40*p.3	95,2	95,2
6	Urgalsk	10 thous.t	0.38*p.3	90,5	90,5
7	Distance from the deposit	-	-		
8	Kharanorsk	km	-	2700	2700
9	For Urtuysk coal	km		2700	2700
10	Urgalsk	km	-	543	543
11	Specific diesel fuel consumption at the railway	kg/(10 thous. t x km)	-	52	52
12	Diezel fuel consumption	-	-		
13	Kharanorsk coal	ton (1000 kg)	p.4*p.8*p.11 /1000	7353	7353
14	For Urtuysk coal	ton (1000 kg)	p.5*p.9*p.11 /1000	13370	13370
15	Urgalsk coal	ton (1000 kg)	p.6*p.10*p.11 /1000	2554	2554
16	Total	ton	p.13+p.14+p.15	23277	23277
17	Recalculation factor of diesel fuel into ton c.e.	ton c.e./ton	-	1,4	1,4
18	Consumption of diesel fuel at the railway	ton c.e.	p.18 * p.19	32588	32588
19	Diezel emission factor	tCO_2/t c.e.	-	2,17	2,17
20	**Emissions due to coal transportation**	**t CO_2**	**p. 20 * p.21**	**70717**	**70717**
Project					
21	Gas consumption at CHP-1	thous. tce		1020,0	1020,0
22	Recalculation factor into natural fuel	mln.m3/tce		0,86	0,86
23	Gas consumed at CHP-1	mln.m3	-	881,3	881,3
24	Distance from the gas field	km	-	900	900
25	Specific gas consumption for gas transportation	kg of fuel eqv. /(mln.m^3 x km)	-	35	35
26	Gas consumption for gas transportation	tce (1000 kg of fuel eqv)	p.23*p.24*p.25 /1000	27760	27760
27	Gas emission factor	t CO_2-eqv./tce	-	1,62	1,62
28	**Emissions due to gas transportation**	**t CO2-eqv**	**p.26 * p. 27**	**44971**	**44971**

Annex 3.1

MONITORING PLAN

(for the purposes of the project the summarized reporting data is presented once a year)

	A	B	C	D
1	**Calculation of GHG emission reduction**			
2	***PROJECT***			
3	**Parameters**	**Unit**	**Year 2008**	**Formula/Source**
4	Annual heat output	thous. Gcal	3 465	Form 6-TP(annual),charter 2,col.4
5	Annual power output	mln. kWh	1 680	Form 6-TP(annual),charter 2,col.10
6	Annual fuel consumption for heat and electricity, totally	thous. ton c.e.	1 034	=C7+C8+C9, (Form 6-TP(annual),charter 4,col.5, line 50)
7	-including gas consumption	thous. ton c.e.	1 034	Form 6-TP(annual),charter 4,col.5, line 43
8	-including coal consumption	thous. ton c.e.	0	Form 6-TP(annual),charter 4,col.5, line 44
9	-including heavy oil consumption	thous. ton c.e.	0	Form 6-TP(annual),charter 4,col.5, line 41
10	Annual fuel consumption for heat	thous. ton c.e.	492	Form 6-TP(annual),charter 3,col.2, line 34
11	-including gas consumption	thous. ton c.e.	492	=C10*C7/C6
12	-including coal consumption	thous. ton c.e.	0	=C10*C8/C6
13	-including heavy oil consumption	thous. ton c.e.	0	=C10*C9/C6
14	Annual fuel consumption for electricity	thous. ton c.e.	542	Form 6-TP(annual),charter 3,col.2, line 33
15	-including gas consumption	thous. ton c.e.	542	=C14*C7/C6
16	-including coal consumption	thous. ton c.e.	0	=C14*C8/C6
17	-including heavy oil consumption	thous. ton c.e.	0	=C14*C9/C6
18	Specific fuel equivalent consumption for heat supplied	kg/Gcal	142,1	=C10*1000/C4, (Form 6-TP(annual),charter 2,col.13, line 22)
19	Specific fuel equivalent consumption for electricity supplied	g/kWh	322,5	=C14*1000/C5, (Form 6-TP(annual),charter 2,col.11, line 22)
20	Coefficient of CO_2 emission gas burning	t CO_2/tce	1,62	PDD
21	Coefficient of CO_2 emission coal burning	t CO_2/tce	2,88	PDD
22	Coefficient of CO_2 emission heavy oil burning	t CO_2/tce	2,31	PDD
23	CO_2 emission for heat output	thous. tCO_2	798	=C11*C20+C12*C21+C13*C22
24	CO_2 emission for power output	thous. tCO_2	878	=C15*C20+C16*C21+C17*C22
25	Specific CO_2 emissions for 1 Gcal output	kgCO_2/Gcal	230	=C23/C4*1000
26	Specific CO_2 emissions for 1 kWh output	gCO_2/kWh	523	=C24/C5*1000
27	**Direct on-site GHG project emissions**	**thous. tCO_2**	**1 676**	**=C23+C24**
28	Coal equivalent	10^{-6}*PJ/tce	29,309	PDD

29	CH_4 emission factor	tCH4/PJ	384	PDD
30	Coefficient for recalculation of CH4 to CO2-eqv.	t CO_2-eqv./t CH_4	21	PDD
31	CH_4 emissions in CO_2-eqv. associated with gas delivery and transportation	thous. tCO_2-eqv	244	=C7*C28*C29*C30*10^(-6)
	A	B	C	D
	Parameters	**Unit**	**Year 2008**	**Formula/Source**
32	Direct off-site GHG emissions associated with production:			
33	-electricity	thous. tCO_2-eqv	128	=C31*C15/C7
34	-heat	thous. tCO_2-eqv	116	=C31*C11/C7
35	**Direct off-site GHG project emissions**	**thous. tCO_2-eqv**	**244**	**=C31**
36	**GHG project emissions**	**thous. tCO_2-eqv**	**1920**	**=C27+C35**
37	GHG project emissions associated with electricity production	thous. tCO_2-eqv	1 006	=C24+C33
38	GHG project emissions associated with heat production	thous. tCO_2-eqv	914	=C23+C34
39	**CEF under electricity production**	**gCO_2/kWh**	**599**	**=C37/C5*1000**
40	**CEF under heat production**	**kgCO_2/Gcal**	**264**	**=C38/C4*1000**
41				
42	***BASELINE***			
43	**Parameters**	**Unit**	**Year 2008**	**Formula/Source**
44	**CEF under electricity production**	**gCO_2/kWh**	**1 012**	**PDD**
45	**CEF under heat production**	**kgCO_2/Gcal**	**416**	**PDD**
46				
47	***EMISSION REDUCTIONS***	**tCO_2/year**	**1 221**	**=((C44-C39)*C5+(C45-C40)*C4)*0,001**

Annex 3.2
Form 6-TP

FEDERAL STATE STATISTICAL OBSERVATION

THE CONFIDENTIALITY IS PROVIDED BY THE INFORMATION RECEIVER

Non submission of information brings to account statute-established by the Law of the Russian Federation «On responsibility of breaching of order of State statistical accounting» No. 2761-1 dated 13.05.92

DATA ABOUT CHP OPERATION FOR
20__

Submitting:	Date of submitting
TPPs and regional boiler-houses of the RAO UESR and AO-energos irrespective of capacity: - of higher organization	January 21
AO-energos of RAO UESR and subsidiaries of RAO UESR: – the body of the State Statistics on the place, established by the territorial body of Federal Statistical Committee of the Russian Federation in the republic, territory, region, city of federal value; – Economy department of RAO UESR and associated companies of RAO UESR; – governmental regulation body in the respective economics sector ; – regulation body of natural monopoly in the respective economics sector	February 7
other power plants with 500 kBW capacity and more: – the body of the State Statistics on the place, established by the territorial body of Federal Statistical Committee of the Russian Federation in the republic, territory, region, city of federal value; – Economy department of RAO UESR and associated companies of RAO UESR; – governmental regulation body in the respective economics sector ; – regulation body of natural monopoly in the respective economics sector	January 21

Form 6-TP

Approved by Regulation of the Federal Statistical Committee of the Russian Federation No. 54 dated 27.07.2001

Annual

Company name _____

Postal address

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font

Code of form on OKUD	Code (stated by the reporting organization)							
	Reporting organization on OKPO	Kind of activity on OKDP	Sector on OKONKh	Territory on OKATO	Ministry (department), authority on OKOGU	Legal form on OKOPF	Property form on OKFS	Power plant category
1	2	3	4	5	6	7	8	9
0610095								

Charter 1. General data

Code on ОКЕИ: kW - 214; Gcal/h - 238; hour - 356

Parameters	No of string	Installed capacities of TPPs at the end of year			Value and a cause of change of the installed capacity	Available capacities of TPPs at the end of year		Average installed capacities of the reporting year	
		power, kW	heat, Gcal/h			power, kW	Heat by turbo-units, Gcal/h	power, kW	Heat by turbo-units, Gcal/h
			total	Including by turbounits					
А	Б	1	2	3	4	5	6	7	8
Actually	11								

Parameters	No of string	Average working power capacity of the reporting year, kW	The number of hours of utilization of the average annual installed power capacity, h (row2 gr.1 : row 1 gr.7) x 1000)	The number of hours of utilization of the average annual installed heat capacity of turbounits, h	Maximum of load		Technical causes of limitation of the installed capacity of TPP
					power, kW	heat, Gcal/h	
А	Б	9	10	11	12	13	14
Actually	11						

Charter 2. Operational data

Code on ОКЕИ: thous. kWh - 246; Gcal - 233

Parameters	No of string	Power production, thous. kWh		Heat output to external consumers, Gcal				Electricity auxiliary power consumption, thous. kWh		
		total	Including district heating cycle	total (gr.4 + gr.6)	From TPP		From district boiler-house of RAO UESR and AO-energo	For TPP		For district boiler-house of RAO UESR and AO-energo
					total	в том числе отработавшим паром		for electricity production	for heat utput	
А	Б	1	2	3	4	5	6	7	8	9
Actually	22									
	23									

Code on OKEI: thous. kWh - 246; g/kWh - 510; kg/Gcal - 511

Parameters	No of string	Power output, thous. kWh (gr.1 - (gr.7+ gr.8))	Specific consumption of fuel equivalent				Specific electricity auxiliary power consumption		
			for electricity supplied, g/kWh	for heat supplied, kg/Gcal			for electricity production (gr.7:gr.1)x100	For heat output, kWh/Gcal	
				total	For TPP	For district boiler-house of RAO UESR and AO-energo		For TPP (gr.8 : gr.4) x 1000	For district boiler-house of RAO UESR and AO-energo (gr.9 : gr.6) x 1000
A	Б	10	11	12	13	14	15	16	17
Standard	21	X					X	X	X
Actually	22								
	23								

18 _____ 19 _____

Charter 3. Fuel consumption of fuel equivalent for power and heat output

Code on OKEI: tce - 172

Expended fuel	No of string	On standard for actual output	Actually	Saving (-); surcharge (+); (gr.1 - gr.2)
A	Б	1	2	3
Total (string 32 + string 33)	31			
For power output	32			
For heat output - total (string 34 + string 35)	33			
including: at TPP	34			
at district boiler-house of RAO UESR and AO-energo	35			
	36			

Charter 4. Fuel Balance

Fuel type	No of string	Units	Code on ОКЕИ	Remaining fuel at the beginning of the year	Fuel receipt for the year	Fuel consumption for the year			Remaining fuel by the end of the year	Quality of burned fuel		
						Total	Including for power and heat output			Fuel heating value (Q^p), kcal/kg (kcal/nm^3)	Moisture content (W^p), %	Ash content (A^p), %
							natural	equivalent				
А	Б	В	Г	1	2	3	4	5	6	7	8	9
Heavy oil	41	t	168									
including: fuel oil	42	t	168									
Gas	43	thous. m^3	114	X					X			X
Coal - total	44	t	168									
Including coal on type and rank												
From total quantity of coal: Black coal	45	t	168									
Peat – total	46	t conditional moisture	179									
Shales - total	47	t	168									
Firewood	48	solid $м^3$	121									
Other fuel type	49											
Total [1)]	50			X	X	X	X		X	X	X	X

[1)] Fuel consumption under string «Total» gr.5 is to be equal fuel consumption stated in the string 31 gr.2 charter 3.

Head of organization _____ *(Name)* _____ *(signature)*

Functionary, responsible for the form filling in _____ _____ _____

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

(Position) *(Name)* *(signature)*

_____ *«____» _____20__*

(contact telephone) *(date of document making)*

Form 15506

HEAT ECONOMY OF PLANT EQUIPMENT

KHABAROVSK CHP-1

2000.01-2000.12

CODE: 362212 3-TEK 1. POWER CAPACITY, PRODUCTION AND OUTPUT. FORM 1, PAGE 1

GROUP OF EQIPMENT	Average installed capacity over a period		MAXIMUM LOAD		Average installed capacity of turbines over a period		ELECTRICITY				Coefficient of turbine capacity utilization			
							PRODUCTION		OUTPUT		POWER		HEAT	
	MW	Change, MW	MW	Change, MW	Gcal/h	Change, Gcal/h	Thous. kWh	Change %	Thous. kWh	Change %	%	Change %АБС	%	Change %АБС
A	1	2	3	4	5	6	7	8	9	10	11	12	13	14
TOTALLY by TPP														
1														
…														

2000.01 - 2000.12

CODE KPO: 362212 3-TEK 2. HEAT OUTPUIT TO EXTERNAL CONSUMERS FORM 1, PAGE 2.

GROUP OF EQIPMENT	TOTAL		With hot water			Spent steam			from peaking hot-water boiler (PHWB)		
	Gcal	Change %	Gcal	%	Change % АБС	Gcal	%	Change %АБС	Gcal	%	Change % АБС
A	15	16	17	18	19	20	21	22	23	24	25
TOTALLY by TPP											
1											

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

2000.01 - 2000.12
CODE KPO: 362212 3-TEK 3.FUEL CONSUMPTION FORM 1, PAGE 3

GROUP OF EQIPMENT	For electricity					For heat					
	Actual			Nominal	Standard	Actual			Nominal	Standard	For PHWB
	tce	g/kWh	Change g/kWh	g/kWh	g/kWh	tce	kg/Gcal	Change, kg/Gcal	kg/Gcal	kg/Gcal	tce
A	26	27	28	29	30	31	32	33	34	35	36
TOTALLY by TPP											
1											
…											

2000.01 - 2000.12
CODE KPO: 362212 3-TEK 4. AUXILIARY HEAT CONSUMPTION FORM 1, PAGE 4

GROUP OF EQIPMENT	FOR TURBINES		FOR BOILERS				
	Gcal	%	Actual		Actual-nominal, %АБС		Reserve
			Gcal	%	Analyzable period	Base period	tce
A	37	38	39	40	41	42	43
TOTALLY by TPP							
1							
…							

2000.01 - 2000.12
CODE KPO: 362212 3-TEK 5. ELECTRICITY CONSUMPTION FOR ELECTRICITY PRODUCTION AND HEAT PRODUCTION FORM 1, PAGE 5

GROUP OF EQIPMENT	TOTAL		FOR ELECTRICITY					FOR HEAT				
	thous. kWh	%	Actual			Actual-nominal		Actual			Actual-nominal	
			thous. kWh	%	Change, % АБС	thous. kWh	%АБС	thous. kWh	Value kWh/Gcal	Actual-nominal kWh/Gcal	thous. kWh	kWh/Gcal
A	44	45	46	47	48	49	50	51	52	53	54	55
TOTALLY by TPP												
1												
…												

2000.01 - 2000.12
CODE KPO: 362212 3-TEK 6. AUXILIARY ELECTRICITY CONSUMPTION FOR TURBINES FORM 1, PAGE 6

GROUP OF EQIPMENT	TOTAL						For circulation pumps					
	Actual			Actual-nominal, %ABC		Reserve	Actual			Actual-nominal,% АБС		Reserve
	thous. kWh	%	Change, %ABS	Analyzable period	Base period	tce	thous. kWh	%	Change, %ABS	Analyzable period	Base period	tce
A	56	57	58	59	60	61	62	63	64	65	66	67
TOTALLY by TPP												
1												
…												

2000.01 - 2000.12
Code KPO: 362212 3-TEK 7. AUXILIARY ELECTRICITY CONSUMPTION FOR BOLERS TOTAL AND FOR FEED-PUMPS FORM 1, PAGE 7

GROUP OF EQIPMENT	Total						For feed-pumps					
	Actual			Actual-nominal		Reserve	Actual			Actual-nominal		Reserve
	thous. kWh	kWh/ Gcal	Change, kWh/ Gcal	Analyzable period, kWh/Gcal	Base period, kWh/Gcal	tce	thous. kWh	Value, kWh/t water	Change kWh/t water	Analyzable period, kWh/t water	Base period, kWh/t water	tce
A	68	69	70	71	72	73	74	75	76	77	78	79
TOTALLY by TPP												
1												
…												

2000.01 - 2000.12
CODE KPO: 362212 3-TEK

8. Q-Э INCREASE UNDER CONDITIONAL LACK OF HEAT OUTPUT FROM TURBINES. COEFFICIENTS OF FUEL CONSUMPTION INCREASE FOR BOILERS.

FORM 1, PAGE 8

GROUP OF EQIPMENT	Q-Э increase in the absence thereof heat output								Coefficient of fuel consumption change			
	From process extractions		From district heating extractions		From condensers		Total		For electricity		For heat	
	thous. Gcal	Change, %	thous. Gcal	Change, %	thous. Gcal	Change,%	thous. Gcal	Change, %	Value	Change	Value	Change
A	80	81	82	83	84	85	86	87	88	89	90	91
TOTALLY by TPP												
1												
…												

2000.01 - 2000.12
CODE KPO: 362212 3-TEK

9. ECONOMY, SURCHANGE OF FUEL

FORM 1, PAGE 9

GROUP OF EQIPMENT	ECONOMY (-), SURCHANGE (+) OF FUEL AGAINIST STANDARD				
	For electricity		For heat		Total
	tce	g/kWh	tce	kg/Gcal	tce
A	95	96	97	98	99
TOTALLY by TPP					
1					
…					

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

2000.01 - 2000.12
CODE KPO: 362212 3-TEK 10. ELECTRICITY PRODUCTION BY TURBINES. FORM 1, PAGE 10

GROUP OF EQIPMENT	Total		By district heating cycles												Average power load
			Total			On steam of process extractions			On steam of district heating extractions			On inferior vacuum			
	thous. kWh	Change, %	thous. kWh	%	Change %ABS	thous. kWh	Value, kWh/ Gcal	Change thous. kWh	KWh/ Gcal	Value, thous. kWh	Change, KWh/ Gcal	thous. kWh	Value	Change	MW
A	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114
TOTALLY by TPP															
1															
…															

2000.01 - 2000.12
КОД КРО: 362212 3-ТЕК 11.HEAT OUTPUT FROM TURBINE EXTRACTIONS. FORM 1, PAGE 11

GROUP OF EQIPMENT	Total		From steam of process extractions			From steam of district heating extractions			On inferior vacuum		
	Gcal	Change %	Gcal	Gcal/h	Change %	Gcal	Gcal/h	Change %	Gcal	Gcal/h	Change %
A	115	116	117	118	119	120	121	122	123	124	125
TOTALLY by TPP											
1											
…											

2000.01 - 2000.12
Code KPO: 362212 3-TEK 12. BALANCE OF OPERATING TIME AND SETTING OF TURBINES. FORM 1, PAGE 12

GROUP OF EQIPMENT	Operating time of turbine					Setting of turbine				
	In operation	In reserve	With one casing		Reserve	Total		Plan		Reserve
	Ч	Ч	%	Change, %ABS	tce	-	Change -	-	Change, tce	tce
A	126	127	128	129	130	131	132	133	134	135
TOTALLY by TPP										
1										
…										

2000.01 - 2000.12
Code KPO: 362212 3-TEK 13.STEAM PARAMETERS NEAR TURBINES. FORM 1, PAGE 13

GROUP OF EQIPMENT	Live steam pressure				Live steam temperature				Steam temperature after reheat			
	Actual	Actual-nominal, kg s/cm^2		Reserve	Actual	Actual-nominal, degree		Reserve	Actual	Actual-nominal, degree		Reserve
	kg s/cm^2	Analyzable period	Base period	tce	Degree	Analyzable period	Base period	tce	Degree	Analyzable period	Base period	tce
A	136	137	138	139	140	141	142	143	144	145	146	147
TOTALLY by TPP												
1												
…												

2000.01 - 2000.12
КОД КРО: 362212 3-ТЕК 14. STEAM PRESSURE IN STEAM EXTRACTION OF TURBINES. FORM 1, PAGE 14

GROUP OF EQIPMENT	In process extractions				In district heating extractions			
	Actual	Actual-nominal, kg s/cm^2		Reserve	Actual	Actual-nominal, kg s/cm^2		Reserve
	kg s/cm^2	Analyzable period	Base period	tce	kg s/cm^2	Analyzable period	Base period	tce
A	148	149	150	151	152	153	154	155
TOTALLY by TPP								
1								
…								

2000.01 - 2000.12
Code KPO: 362212 3-TEK 15. PARAMETERS OF HIGE PRESSURE HEATER AND CONDENSERS OF TURBINES. FORM 1, PAGE 15

GROUP OF EQIPMENT	Feedwater temperature				Steam pressure in condenser				Turbine temperature and head				Cooling water temperature		
	Actual	Actual-nominal, degree		Reserve	Actual	Actual-nominal, kg s/cm^2		Reserve	Actual	Actual-nominal, degree		Reserve	At the entry		At the output
	Degree	Analyzable period	Base period	tce	kg s/cm^2	Analyzable period	Base period	tce	Degree	Analyzable period	Base period	tce	Degree	Change degree	Degree
A	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170
TOTALLY by TPP															
1															
…															

2000.01 - 2000.12
Code KPO: 362212 3-TEK 16. STEAN AND HEAT CONSUMPTION FOR TURBINE. FORM 1, PAGE 16

GROUP OF EQIPMENT	Live steam consumption	Specific gross heat consumption			
		Actual	Actual-nominal,%		Reserve
	t/h	kcal/kWh	Analyzable period	Base period	tce
A	171	172	173	174	175
TOTALLY by TPP					
1					
…					

2000.01 - 2000.12
Code KPO: 362212 3-TEK 17. LOAD, SETTING OF BOILERS, MAZUT SURCHARGE. FORM 1, PAGE PAGE 17

GROUP OF EQIPMENT	Heat production		Operation time	Feedwater consumption		Number of setting					Mazut surcharge
	Gross Gcal	Gcal/h	h	Total, thous. t	Plan, t/h	-	Change	-	Change	Reserve tce	tce
A	176	177	178	179	180	181	182	183	184	185	186
Total of steam boiler units											
1											
…											
HIGE PRESSURE HEATER											

2000.01 - 2000.12
Code KPO: 362212 3-TEK 18. CONSMPTION AND STRUCRURE OF BURNED FUEL BY BOILERS. FORM 1, PAGE 18

GROUP OF EQIPMENT	Total		Gas fuel			Oil fuel			Solid fuel		
	tce	t/h	tce	%	Change %ABS	tce	%	Change %ABS	tce	%	Change %ABS
A	187	188	189	190	191	192	193	194	195	196	197
Total of steam boiler units											
1											
…											
HIGE PRESSURE											

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

HEATER											

2000.01 - 2000.12
Code KPO: 362212 3-TEK 19.TEMPERATURE OF AIR AND OFF-GAS FROM BOILERS. FORM 1, PAGE 19

GROUP OF EQIPMENT	Air temperature		Off-gas temperature			
	Cold	At the entry of air-heater	Actual	Actual-nominal, degree		Reserve
	Degree	Degree	Degree	Analyzable period	Base period	tce
A	198	199	200	201	202	203
Total of steam boiler units						
1						
…						
HIGE PRESSURE HEATER						

2000.01 - 2000.12
Code KPO: 362212 3-TEK 20. EXCESS AIR AND OFF-GAS OF BOILERS. FORM 1, PAGE 20

GROUP OF EQIPMENT	Coefficient of excess air in operating section				Inflows: operating section – last surface				Inflows: last surface – smoke exhauster
	Actual	Actual-nominal		Reserve	Actual	Actual-nominal, %ABS		Reserve	
	-	Analyzable period	Base period	tce		Analyzable period	Base period	tce	%
A	204	205	206	207	208	209	210	211	212
Total of steam boiler units									
1									
…									
HIGE PRESSURE HEATER									

2000.01 - 2000.12
Code KPO: 362212 3-TEK 21. COMPONENTS OF HEAT LOSS. BOILER GROSS EFFICIENCY. FORM 1, PAGE 21

GROUP OF EQIPMENT	With off-gas			With chemical and carbon loss				Gross efficiency by direct balance	Gross efficiency by back balance			
	Actual	Actual-nominal, %ABS	Actual		Actual-nominal %ABS		Reserve		Actual	Actual-nominal, %ABS		Reserve
	%	Analyzable period	Base period	%	Analyzable period	Base period	tce	%	%	Analyzable period	Base period	tce
A	213	214	215	216	217	218	219	220	221	222	223	224
Total of steam boiler units												
1												
…												
HIGE PRESSURE HEATER												

2000.01 - 2000.12
Code KPO: 362212 3-TEK 22. ELECTRICITY CONSUMPTION FOR TRACTION, BLOWING AND DUST-PREPARATION. FORM 1, PAGE 22

GROUP OF EQIPMENT	For traction and blowing						For dust-preparation					
	Actual			Actual-nominal		Reserve	Actual			Actual-nominal		Reserve
	thous. kWh	Value kWh/Gcal	Change, kWh/Gcal	Analyzable period, tce	Base period, thous. kWh	tce	thous. kWh	Value kWh/tce	Change, KWh/tce	Analyzable period	Base period	tce
A	225	226	227	228	229	230	231	232	233	234	235	236
Total of steam boiler units												
1												
…												
HIGE PRESSURE HEATER												

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

Annex 3.3.

JSC "Khabarovskenergo", subsidiary Khabarovsk CHP-1

Name of juridical person, individual person

15, Uzlovaya str., Khabarovsk, 680015, tel. 55-63-59

APPROVED
Head of State Metrological Service

Shaevich B.S.

SCHEDULE
Of calibration of measurement instrumentation
for 20__

No.	Name, type, factory marking	Metrological performance		Calibration frequency (month)	Date of last frequency	Place of calibration	Date of calibration	Field of state metrological control and
		Accuracy rating, inaccuracy	Bound (measurement range)					
1	2	3	4	5	6	7	8	9
1	Ammeter D566 57063	0.2	5-10A	12	19.04.04	Khabarovsk Center of Calibration and Metrology	04	Standard
2	Ammeter D566 345282	0.2	2.5-5A	12	07.09.04	Khabarovsk Center of Calibration and Metrology	09	-*-
3	Ammeter M104 21941	0.5	0.015-30A	12	29.11.04	Khabarovsk Center of Calibration and Metrology	11	Testing
4	Voltmeter D50152 5131	0.2	75-600B	12	19.04.04	Khabarovsk Center of Calibration and	04	Standard

						Metrology		
5	Voltmeter D566 47070	0.2	75-600B	12	24.02.04	Khabarovsk Center of Calibration and Metrology	02	-*-
6	Voltmeter M106 32144	0.5	3-600B	12	04.03.04	Khabarovsk Center of Calibration and Metrology	03	Testing
…	…	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…	…

Chief metrolog: Stetsenko A.P.

signature name

Chief Engineer: Pak Yo.M.

signature name

Annex 4

THE MINISTRY OF NATURAL RESOURCES OF THE RUSSIAN FEDERATION

Main Department of Natural Resources and Environmental Protection
The Ministry of Natural Resources of the Russian Federation on the Khabarovsk Territory

STATE ECOLOGICAL EXPERTISE

680013,. Khabarovsk, Kadrovy Pereulok , 6, tel. 21-19-98

Of 31.05 2004, No. 5-3/1698

APPROVED BY:
Order No. 419 P of 31.05.2004 on the Main Department of Natural Resources and Environmental Protection of the Ministry of Natural Resources of the Russian Federation on the Khabarovsk Territory

THE STATEMENT

of the Commission of experts of state ecological expertise on materials of the Feasibility Report on the reconstruction of the Khabarovsk CHP-1 to fire natural gas.

Town of Khabarovsk, May, 2004.

The Commission of experts approved by the order No.218/P of 02.04.2004 of the Main Department of Natural Resources and Environmental Protection of the Ministry of Natural Resources of the Russian Federation on Khabarovsk territory, including:

The chief of the Commission – Pilina T.N., freelance expert;.
The accountable secretary - Artemieva I.V. - leading specialist of the department of state ecological expertise;
The members of the commission of experts - Romakina N. P., freelance expert;
- Tarasova N.V., freelance expert;
- Krasnopolov A.V, freelance expert

Conclusions:

1. The commission of the experts, having considered the Feasibility Report on the reconstruction of the Khabarovsk CHP-1 to fire natural gas, hereby states that the submitted materials in the scope and contents, basically conform the requirements of the legislative acts of the Russian Federation and the normative documents on the issues of the environmental protection and natural resources.

   The Feasibility Report envisages the appropriate nature protection measures, contains the materials of evaluation of the environment impact and validates the ecological capability of implementation of the proposed activity.

2. Based on the results of the analysis of the submitted materials and considering the positive statements of the monitoring and supervisory bodies (agencies), the commission of experts considers that in the submitted materials of the project,

---

22

The accountable secretary _____ Artemieva I.V

the level of the environmental impact in implementing the Feasibility Report on the reconstruction of the Khabarovsk CHP-1 to fire natural gas is adequate.

The implementation of the design solutions is possible.

Signed by:

The chief of the Commission:	Pilina T.N.,
The accountable secretary:	Artemieva I.V.,
The members of the Commission:	Romakina N. P.,
	Tarasova N.V.,
	Krasnopolov A.V,

23

The accountable secretary _____ Artemieva I.V

THE MINISTRY OF NATURAL RESOURCES OF THE RUSSIAN FEDERATION

Main Department of Natural Resources and Environmental Protection
The Ministry of Natural Resources of the Russian Federation on the Khabarovsk Territory

THE ORDER
Town of Khabarovsk

about the approval of the statement by the Commission of experts of the State ecological expertise

on the materials "The Feasibility Report on the Reconstruction of the Khabarovsk CHP-1 to Fire Natural Gas"

Pursuant to the Federal Act "About Ecological Expertise" (Article 18):

1. Approve the Statement of the Commission of experts of the State ecological expertise set up to execute the Order No. 218/P of the Main Department of Natural Resources and Environmental Protection of the Ministry of Natural Resources of the Russian Federation on Khabarovsk territory of April 02, 2004

on the materials "The Feasibility Report on the Reconstruction of the Khabarovsk CHP-1 to fire natural gas "

2. Set up the term of action of said Statement to implement the object, but not more than for five years

Deputy Head of the Main Department of
Natural Resources on the Khabarovsk Territory **V.M. Boltrushko**

Копия верна

МИНИСТЕРСТВО ПРИРОДНЫХ РЕСУРСОВ РОССИЙСКОЙ ФЕДЕРАЦИИ
ГЛАВНОЕ УПРАВЛЕНИЕ ПРИРОДНЫХ РЕСУРСОВ И ОХРАНЫ ОКРУЖАЮЩЕЙ СРЕДЫ МПР РОССИИ ПО ХАБАРОВСКОМУ КРАЮ

ПРИКАЗ

г. ХАБАРОВСК

31. 05. 04. № 419/П

Об утверждении заключения экспертной комиссии Государственной экологической экспертизы

по материалам « ТЭО на реконструкцию Хабаровской ТЭЦ-1 под использование в виде топлива природного газа»

В соответствии с Федеральным законом «Об экологической экспертизе» (ст. 18)

ПРИКАЗЫВАЮ:

1. Утвердить заключение экспертной комиссии государственной экологической экспертизы, образованной во исполнение приказа Главного Управления природных ресурсов и охраны окружающей среды МПР России по Хабаровскому краю от «02» апреля 2004 г. № 218/П

по материалам «ТЭО на реконструкцию Хабаровской ТЭЦ-1 под использование в виде топлива природного газа»

2. Установить срок действия указанного заключения - **на срок реализации объекта, но не более 5 лет**

Заместитель начальника ГУПР по Хабаровскому краю **В.М.Болтрушко**

004135

Annex 5

Federal Service of Ecological, Technological and Atomic Supervision (RosTekhNadzor)

KHABAROVSK REGIONAL BOARD OF ECOLOGICAL AND TECHNOLOGICAL SUPERVISION

76, Zaparina str., Khabarovsk, 680000 tel: (84212) 42-03-00, e-mail: postmaster@ggtn.khv.ru
OKPO 22151478, OGRN 1022700931681, INN/KPP 2721021699/272101001

General director
JSC Khabarovskenergo
V.M. Levit

Dated 25.03.2005 No. 13-0/1128

Of approval of the project

Khabarovsk Regional Board of Ecological and Technological Supervision of RosTekhNadzor approves joint implementation of the project "Switch of Khabarovsk CHP-1 from Coal to Fire Natural Gas" by JSC "Khabarovskenergo" and Japanese company "Toyota Tsusho Corporation".

Gasification of the boiler equipment of JSC "Khabarovskenergo" subsidiary Khabarovsk CHP-1 is a part of one development tendency of Khabarovsk Region – switch of power plants on burning of environmentally fuel – natural gas.

The project implementation allows reducing greatly emissions of nitric oxide, sulfur dioxide and solid particles into free air.

Reduction of carbon dioxide emissions amounts to 1.3 mln. t per year.

Cooperation with Japanese company "Toyota Tsusho Corporation" allows attracting foreign investment for project implementation.

Deputy Chief of Board V.M. Boltrushko

This is a true translation of the original document in Russian

ФЕДЕРАЛЬНАЯ СЛУЖБА ПО ЭКОЛОГИЧЕСКОМУ, ТЕХНОЛОГИЧЕСКОМУ И АТОМНОМУ НАДЗОРУ
(РОСТЕХНАДЗОР)
ХАБАРОВСКОЕ МЕЖРЕГИОНАЛЬНОЕ УПРАВЛЕНИЕ ПО ТЕХНОЛОГИЧЕСКОМУ И ЭКОЛОГИЧЕСКОМУ НАДЗОРУ

ул.Запарина, 76, г.Хабаровск, 680000 тел: (84212) 42-03-00, e-mail: postmaster@ggtn.khv.ru
ОКПО 22151478, ОГРН 1022700931681, ИНН/КПП 2721021699/272101001

25.03.05 № 13-0/1128

Генеральному директору
ОАО "Хабаровскэнерго"
Левиту В.М.

Об одобрении проекта

Хабаровское межрегиональное управление по технологическому и экологическому надзору Ростехнадзора одобряет совместное осуществление ОАО "Хабаровскэнерго" и японской фирмой ТОЙОТА ЦУСЕ КОРПОРЕЙШЕН проекта "Перевод Хабаровской ТЭЦ-1 на сжигание газового топлива".

Газификация котельного оборудования филиала ОАО "Хабаровскэнерго" "Хабаровская ТЭЦ-1" является частью одного из направлений промышленного развития Хабаровского края – перевода электростанций на сжигание экологически более чистого топлива – природного газа.

Реализация проекта позволит значительно снизить выбросы в атмосферный воздух оксидов азота, диоксида серы, твердых частиц.

Выбросы диоксида углерода сократятся на 1,3 млн. тонн в год.

Сотрудничество с японской фирмой ТОЙОТА ЦУСЕ КОРПОРЕЙШЕН позволит привлечь иностранные инвестиции в осуществление проекта.

Заместитель руководителя управления — В.М. Болтрушко

Annex 6

Translation of the Regulation summary

THE GOVERNOR OF THE KHABAROVSK TERRITORY

THE REGULATION No. 92
of March 24, 2003

ABOUT THE MEASURES ON FURTHER DEVELOPMENT OF GASIFICATION OF THE KHABAROVSK TERRITORY
(In the edition of the Regulation No. 182 of the Governor of the territory of 14.07.2004)

Within the framework of federal purpose-oriented programs "Energy efficient economy for the period of 2002 - 2005 and up to 2010", "Economical and social development of the Far East and Transbaikalia for the period of 1996 - 2005 and up to 2010", "Gasification of the Sakhalin area, Khabarovsk and Primorsk territories", the step-by-step activity is conducted to switch the installations and facilities of the power sector, industrial and municipal enterprises to fire natural gas. For the last years about 200 km of the main and distributision gas pipelines has been constructed, the boilers of the Amursk CHP-1, the municipal heating boiler-houses in the settlements Solar, Khurba, Elban, Mendeleyev and more than 50 thousand flats have been switched to fire natural gas.

The adopted measures dealt with switching the heat sources on natural gas have allowed to lower the primary cost of heat generation and to reduce the annual consumptions of the territorial and municipal budgets.

In connection with full-scale development of the oil fields of the shelf of the Sakhalin island and with the scheduled delivery to the territory in 2006 of more than 3 bln. m^3/y of natural gas, the construction is underway of the 500 km main gas pipeline "Komsomolsk- on the Amur River - Khabarovsk". The commissioning of the gas pipeline and implementation of a further gasification will allow to improve the structure of the fuel balance, to improve stability and profitability of the activity of the utilities, and to solve the economical, social and ecological problems.

Considering the exclusive importance of the development of gasification for all structures of the economy of the territory, and in view of timely preparing the enterprises of the power sector, the industry, housing and municipal services and social area to receive natural gas, preservation of the fuel and energy balance, and also keeping the necessary rates of construction of the gas pipeline "Komsomolsk- on the Amur River - Khabarovsk",

I decree:

1. To establish the year of 2006 the termination date of construction of the gas pipeline "Komsomolsk- on the Amur River - Khabarovsk" and the completion by customers of natural gas of the main preparatory works in the Khabarovsk City.

This is a true translation of the original document in Russian.

ГУБЕРНАТОР ХАБАРОВСКОГО КРАЯ

ПОСТАНОВЛЕНИЕ
от 24 марта 2003 г. N 92

О МЕРАХ ПО ДАЛЬНЕЙШЕМУ РАЗВИТИЮ ГАЗИФИКАЦИИ ХАБАРОВСКОГО КРАЯ

(в ред. постановления Губернатора края от 14.07.2004 N 182)

В рамках федеральных целевых программ "Энергоэффективная экономика на 2002 - 2005 годы и до 2010 года", "Экономическое и социальное развитие Дальнего Востока и Забайкалья на 1996 - 2005 и до 2010 года", "Газификация Сахалинской области, Хабаровского и Приморского краев" в крае ведется поэтапная работа по переводу на природный газ объектов энергетики, промышленных и коммунально - бытовых предприятий. За последние годы построено около 200 км магистральных и распределительных газопроводов, переведены на природный газ котлоагрегаты Амурской ТЭЦ, муниципальные отопительные котельные в поселках Солнечный, Хурба, Эльбан, Менделеева и более 50 тысяч квартир.

Принятые меры по переводу теплоэнергоисточников на природный газ позволили снизить себестоимость выработки тепловой энергии и сократить ежегодные расходы краевого и муниципальных бюджетов.

В связи с полномасштабным освоением нефтегазовых месторождений шельфа о. Сахалин и планируемой поставкой в край в 2006 году природного газа в объеме свыше 3 млрд. куб. метров в год ведется строительство магистрального газопровода "Комсомольск-на-Амуре - Хабаровск" протяженностью более 500 км. Ввод в эксплуатацию газопровода и осуществление дальнейшей газификации позволит улучшить структуру топливного баланса, повысить устойчивость и экономичность работы энергоисточников, обеспечить решение экономических, социальных и экологических проблем.

Учитывая исключительную важность развития газификации для всех структур экономики края, в целях своевременной подготовки предприятий энергетики, промышленности, жилищно-коммунального хозяйства и социальной сферы к приему природного газа, сохранения топливно-энергетического баланса, а также обеспечения необходимых темпов строительства газопровода "Комсомольск-на-Амуре - Хабаровск" постановляю:

1. Установить 2006 год сроком окончания строительства газопровода "Комсомольск-на-Амуре - Хабаровск" и завершения потребителями природного газа основных подготовительных работ в г. Хабаровске.

2. Министерству имущественных отношений края (Громова Г.А.), министерству финансов края (Кацуба А.С.), министерству топлива и энергетики края (Сливко В.М.) обеспечивать в течение строительства газопровода "Комсомольск-на-Амуре - Хабаровск" долю Хабаровского края в уставном капитале открытого акционерного общества "Дальтрансгаз" в размере не менее 51 процента.

(п. 2 в ред. постановления Губернатора края от 14.07.2004 N 182)

3. Министерству финансов края, министерству экономического развития и внешних связей края (Левинталь А.Б.) при подготовке проекта закона о бюджетной системе Хабаровского края на очередной финансовый год предусматривать финансовые средства для выполнения пункта 2 настоящего Постановления.

4. Министерству топлива и энергетики края, открытому акционерному обществу энергетики и электрификации "Хабаровскэнерго" (Левит В.М.), открытому акционерному обществу "Хабаровсккрайгаз" (Володькин Ю.И.) в целях сохранения устойчивого топливного баланса, стабильного обеспечения потребителей энергоресурсами, предотвращения кризисного положения в энергетике края проработать в 2003 году с открытым акционерным обществом "НК "Роснефть":

(в ред. постановления Губернатора края от 14.07.2004 N 182)

4.1. Дополнительные меры, обеспечивающие до 2006 года ежегодные поставки природного газа в край с суши о. Сахалин в объеме не менее 1 млрд. куб. метров.

4.2. Вопросы проектирования и строительства газопровода от платформы "Моликпак" до существующего магистрального газопровода открытого акционерного общества "НК "Роснефть" - Сахалинморнефтегаз" в пос. Боатасино для подачи попутного газа в Хабаровский край.

5. Открытому акционерному обществу "Дальтрансгаз" (Чуйков Н.Ф.):

5.1. Совместно с институтами "СахалинНИПИморнефть" (Щукин Ю.В.) и "Дальгипротранс" (Дмитриев С.А.) обеспечить дальнейшую разработку проектно-сметной документации на строительство газопровода "Комсомольск-на-Амуре - Хабаровск":

- на 200 км - в 2003 году;

- в полном объеме - в первом полугодии 2004 г.

5.2. Совместно с генеральным подрядчиком - федеральным государственным унитарным предприятием "Управление специального строительства "Дальспецстрой" (Хризман Ю.Л.) обеспечить в 2003 году строительство не менее 100 км газопровода "Комсомольск-на-Амуре - Хабаровск".

5.3. Обеспечить своевременную поставку оборудования, трубопроводной арматуры, средств контроля, автоматизации и связи, кабельных и других изделий, комплектация которыми возложена на заказчика.

5.4. Для квалифицированного и оперативного решения вопросов, возникающих при строительстве газопровода, обеспечить проведение еженедельных штабов на трассе газопровода с участием ответственных работников министерств и иных органов исполнительной власти края, городов и районов, строительных организаций и государственных органов надзора.

6. Федеральному государственному унитарному предприятию "Управление специального строительства "Дальспецстрой":

6.1. Совместно с ОАО "Дальтрансгаз" в срок до 1 мая 2003 г. представить в министерство топлива и энергетики края организационно-технические мероприятия на 2003 - 2006 годы по строительству газопровода "Комсомольск-на-Амуре - Хабаровск".

(пп. 6.1 в ред. постановления Губернатора края от 14.07.2004 N 182)

6.2. Обеспечить в 2003 году поставку очередной партии труб, изоляционных и других материалов на строительство в 2003 году 100 км газопровода.

7. Министерству строительства края (Ващишин С.А.) обеспечить производство на предприятиях края необходимого количества конструкций, изделий и материалов для строительства газопровода.

8. Для целевого и своевременного финансирования строительства магистрального газопровода "Комсомольск-на-Амуре - Хабаровск":

8.1. Министерству экономического развития и внешних связей края, министерству топлива и энергетики края, ОАО "Дальтрансгаз":

(в ред. постановления Губернатора края от 14.07.2004 N 182)

- обеспечить в 2003 году поступление из федерального бюджета финансовых средств в сумме 110 млн. рублей;

- обеспечить своевременное оформление и согласование заявок с Минэнерго России, Минэкономразвития России по выделению в 2004 - 2006 годах из федерального бюджета финансовых средств в размере до 500 млн. рублей ежегодно.

8.2. Министерству финансов края обеспечить в соответствии с Законом Хабаровского края от 30 декабря 2002 г. N 82 "О бюджетной системе Хабаровского края на 2003 год" ежемесячное равномерное финансирование строительства газопровода.

8.3. Первому заместителю Председателя Правительства края по вопросам строительства и топливно-энергетического комплекса Попову В.А., заместителю Председателя Правительства края - министру финансов края Кацубе А.С. в срок до 5 апреля 2003 г. обеспечить открытие на 2003 год через Дальневосточный банк Сбербанк России, Банк внешней торговли (открытое акционерное общество) и открытое акционерное общество "Акционерный коммерческий банк "РОСБАНК" в г. Хабаровске кредитной линии на сумму 600 млн. рублей.

8.4. Открытому акционерному обществу "Дальтрансгаз", министерству экономического развития и внешних связей края, министерству финансов края, министерству топлива и энергетики края продолжить работу с министерствами и ведомствами Российской Федерации, Европейским банком реконструкции и развития по привлечению в 2004 - 2006 годах кредитных ресурсов в размере 150 млн. долларов США под гарантию Правительства Российской Федерации.

(пп. 8.4 в ред. постановления Губернатора края от 14.07.2004 N 182)

9. Возложить функции заказчика по проектированию и строительству в г. Хабаровске:

- распределительных газопроводов высокого давления от ГРС до ТЭЦ-1 и ТЭЦ-2 на открытое акционерное общество энергетики и электрификации "Хабаровскэнерго";

- газопроводов до объектов коммунально-бытового назначения, жилищно-коммунального хозяйства и промышленных предприятий на открытое акционерное общество "Хабаровскккрайгаз".

10. Открытому акционерному обществу энергетики и электрификации "Хабаровскэнерго":

10.1. Разработать в 2003 - 2004 годах проектно-сметную документацию на строительство распределительных газопроводов и техническое перевооружение ТЭЦ-1 и ТЭЦ-2 в г. Хабаровске с переводом их на природный газ.

10.2. Приступить в 2004 году к переводу теплоэлектроцентралей на природный газ с завершением работ в 2006 году.

10.3. Обеспечить действенную работу с Министерством промышленности и энергетики Российской Федерации, Министерством экономического развития и торговли Российской Федерации, Федеральной энергетической комиссией Российской Федерации, открытым акционерным обществом РАО "ЕЭС России" по включению начиная с 2004 года в ежегодный перечень важнейших строек и объектов капитального строительства в электроэнергетике, финансируемых за счет средств ОАО РАО "ЕЭС России", строительства газопровода "Комсомольск-на-Амуре - Хабаровск".

(пп. 10.3 в ред. постановления Губернатора края от 14.07.2004 N 182)

11. Открытому акционерному обществу "Хабаровскккрайгаз", администрации г. Хабаровска (Соколов А.Н.):

11.1. Разработать в 2003 году организационно-технические мероприятия по строительству газораспределительных сетей и подготовке объектов коммунально-бытового назначения и жилищно-коммунального хозяйства, промышленных предприятий г. Хабаровска к приему природного газа.

11.2. Определить в срок до 1 января 2004 г. долевое участие предприятий г. Хабаровска в строительстве газораспределительных сетей и представить в министерство топлива и энергетики края предложения по источникам финансирования проектирования и строительства распределительных газопроводов.

(п. 11.2 в ред. постановления Губернатора края от 14.07.2004 N 182)

11.3. Обеспечить в 2004 - 2005 годах разработку проектно-сметной документации на строительство распределительных газопроводов для объектов коммунально-бытового назначения и жилищно-коммунального хозяйства, промышленных предприятий.

12. Министерству топлива и энергетики края, министерству жилищно-коммунального хозяйства края (Чаткин Н.М.):

(в ред. постановления Губернатора края от 14.07.2004 N 182)

12.1. Осуществлять постоянный контроль за ходом строительства магистрального газопровода "Комсомольск-на-Амуре - Хабаровск", своевременной подготовкой объектов энергетики, жилищно-коммунального хозяйства и социальной сферы к переводу на природный газ.

12.2. Совместно с ОАО "Дальтрансгаз", ОАО "НК "Роснефть" в 2003 году проработать с консорциумами проектов "Сахалин-1", "Сахалин-2" и Правительством Российской Федерации вопросы объемов поставки с 2006 года природного газа в Хабаровский край.

13. Мэру г. Хабаровска Соколову А.Н., главе г. Амурска с Амурским районом Кузьминых Г.А., главе Комсомольского района Коломыцеву А.В., главе Нанайского района Курочкину А.В., главе Хабаровского района Алешко В.А. обеспечивать оперативное решение вопросов, связанных со строительством газопровода.

14. Для координации работ, связанных со строительством газопровода "Комсомольск-на-Амуре - Хабаровск" и расширением использования природного газа, создать краевую постоянно действующую комиссию в составе:

Попов В.А.	- первый заместитель Председателя Правительства края по вопросам строительства и топливно-энергетического комплекса, председатель комиссии
Кацуба А.С.	- заместитель Председателя Правительства края - министр финансов края, заместитель председателя комиссии
Левинталь А.Б.	- заместитель Председателя Правительства края - министр экономического развития и внешних связей

края, заместитель председателя комиссии

Сливко В.М. - министр топлива и энергетики края, заместитель председателя комиссии

Ващишин С.А. - министр строительства края

Володькин Ю.И. - генеральный директор открытого акционерного общества "Хабаровскккрайгаз"

Выродов В.В. - начальник управления перспективного развития топливно-энергетического комплекса министерства топлива и энергетики края

Левит В.М. - генеральный директор открытого акционерного общества энергетики и электрификации "Хабаровскэнерго" (по согласованию)

Почеревин Г.Е. - министр природных ресурсов края

Хризман Ю.Л. - начальник федерального государственного унитарного предприятия "Управление специального строительства "Дальспецстрой" (по согласованию)

Чуйков Н.Ф. - генеральный директор открытого акционерного общества "Дальтрансгаз"

Щербаков А.Г. - начальник инспекции государственного архитектурно-строительного надзора Правительства Хабаровского края.

(п. 14 в ред. постановления Губернатора края от 14.07.2004 N 182)

15. Созданной краевой комиссии взять под постоянный контроль выполнение мероприятий по строительству газопровода "Комсомольск-на-Амуре - Хабаровск" и подготовку всех структур экономики края к приему природного газа. Заседания комиссии проводить ежемесячно.

16. Контроль за выполнением настоящего постановления возложить на первого заместителя Председателя Правительства края по вопросам строительства и топливно-энергетического комплекса Попова В.А. и министерство топлива и энергетики края (Сливко В.М.).

(п. 16 в ред. постановления Губернатора края от 14.07.2004 N 182)

17. Настоящее постановление вступает в силу со дня его официального опубликования.

Губернатор края
В.И.Ишаев

Annex 7

Translation of the article summary at "The Power Engineer" (20 January 2005):

The pipeline on the way to Khabarovsk

The Khabarovsk power plants personnel are waiting for the natural Sakhalin gas.

Especially with large impatience - at the Khabarovsk CHP-1. The power system top management is also waiting for the natural gas. For power plants the natural gas means other, simplified technology of activity, higher culture of generation. In the long term it is a considerable reduction of the scope of equipment, repairs and service. For the power system it is a hope for improvement of economical parameters. The inhabitants of the Khabarovsk City expect the lower electricity and heat tariffs and considerable reduction of pollution of the environment.

What has already been made on switching the Khabarovsk CHPs to fire natural gas? In 2004, the design activities were carried out on the distribution gas pipelines and directly at the Khabarovsk CHP-1 and Khabarovsk CHP-2. The designers executed all technical and economic feasibility studies and the designing works are underway.

Труба на пути к Хабаровску

Природный сахалинский газ энергетики хабаровских электростанций ждут.

Особенно с большим нетерпением - на Хабаровской ТЭЦ-1. Ждут его и руководители энергосистемы. Для станций газ - это другая, легкая, технология работы, более высокая культура производства. В перспективе - значительное сокращение оборудования, ремонтов, обслуживания. Для энергосистемы - надежда на улучшение экономических показателей. А жители Хабаровска рассчитывают на снижение тарифов на электроэнергию и тепло и явное уменьшение загрязнения природной среды.

Между тем газопровод к Хабаровску приближается. Начала готовиться к приему природного газа и энергосистема. Для координации всех действий по подготовке к приему газа назначен помощник генерального директора ОАО «Хабаровскэнерго». Им стал бывший директор Хабаровской ТЭЦ-2 Лев Кириллович Полещук. .

По плану капитального строительства «Хабаровскэнерго» в 2004 году на проектных работах по переводу электростанций на газовое топливо освоено по ХТЭЦ-1 почти, три, миллиона рублей "ХТЭЦ-2 - более одного миллиона рублей. Кроме того, 2,5 миллиона рублей оплачено «Дальгипротрансу» за выполненные ' проектные работы по распределительным газопроводам.

Как рассказал начальник отдела инвестиций и капитального строительства «Хабаровскэнерго» Александр Михайлович Киселев, в плане капитального строительства на 2005 год включены проектные работы по переводу на газ ХТЭЦ-1 и ХТЭЦ-2 и непосредственно строительно-монтажные работы. В том числе перевод оборудования ХТЭЦ-1 и ХТЭЦ-2 на сжигание газового топлива и строительство распределительных газопроводов от ГРС-1 и ГРС-3 (ГРС-2) до станций.

В соответствии с решением правительства края магистральный газопровод заканчивается газовыми распределительными станциями ГРС-1, ГРС-2, ГРС-3. Газопроводы от них непосредственно к станциям - это уже забота «Хабаровскэнерго». Каждый распределительный газопровод от ГРС к соответствующей станции заканчивается ГРП-газовым распределительным пунктом непосредственно на территории станции. Газопровод от «тройника» в районе села Дружба протяженностью 19,7 километра заканчивается ГРС-1 в районе села Ильинка. Оттуда распределительный газопровод протянется на ХТЭЦ-1. ГРС-2, использование которой сейчас находится в стадии решения, расположится между поселком им. Горького и селом Тополево. Протяженность газопровода от «тройника» до ГРС-2 -13,95 километра, ГРС-3 будет построена между селом Матвеевка и ХТЭЦ-3.

Как сказал Александр Михайлович, решение по прохождению трассы распределительного газопровода к ХТЭЦ-2 еще не принято. Первоначально планировалось ХТЭЦ-2 запитать с ГРС-2, но в процессе согласования прохождения трассы газопровода к станции возникли такие сложности, что от этого варианта пришлось отказаться. По мнению специалистов «Хабаровскэнерго», распределительный газопровод на ХТЭЦ-2 предпочти тельнее протянуть с ГРС-3, а не с ГРС-2. Это позволит в том числе значительно снизить затраты на прокладку распределительного газопровода к ХТЭЦ-2 - самого протяженного, самого дорогостоящего и самого сложного из всех.

Что уже сделано по переводу на газ Хабаровских ТЭЦ? В 2004 году велись проектные работы по распределительным газопроводам и непосредственно по ХТЭЦ-1 и ХТЭЦ-2. Проектирование распределено между двумя проектными организациями. Институт «Хабаровскэнергопроект» выполняет все проектные работы по переводу оборудования станций на газовое топливо, а «Дальгипротранс» проектирует распределительные газопроводы от магистрального га-зопровода до территории станции. Проектировщиками выполнены все технико-экономические обоснования и ведется рабочее проектирование.

1. Готовность станций

О состоянии проектно-сметной документации по переводу ХТЭЦ-1 и ХТЭЦ-2 на сжигание газового топлива рассказал главный инженер проектов института «Хабаровскэнергопроект» Андрей Иосифович Авраменко.

Объем рабочей документации по Хабаровской ТЭЦ-1 включает в себя внутриплощадочные сети по территории станции, два ГРП производительностью по 150 тысяч кубометров газа в час и реконструкцию котельных агрегатов для возможности сжигания природного газа.

В 2004 году выполнена рабочая документация на внутриплощадочный газопровод от границы территории станции до ГРП в районе угольного склада и на сам ГРП.

Газораспределительный пункт блочный, заводского изготовления, в составе двух боксов - бокса фильтров и бокса регулирования; Изготавливается ГРП на одном из заводов Тюмени. От этого ГРП будет запитана первая группа реконструированных котлов - ст. № 8...№ 16. В первом полугодии 2005 года планируется выполнить рабочую документацию на реконструкцию котлов ст.№ 8,... ст.№16. Эту работу выполняет на субподряде у института СКБ котельных установок - разработчик самих котлов, изготовленных Барнаульским котельным заводом. Только после получения рабочих чертежей реконструкции котлов институт «Хабаровскэнергопроект» выполнит рабочую документацию по газификации котлов, проще говоря, по разводкам газопроводов внутри котельного цеха, включая систему регулирования, защиты и сигнализации.

Планируется, что управление горением будет при помощи АСУТП. Для этого предусматривается использовать для автоматизации комплектную систему производства московской компании «АМАКС». Аналогичная компьютерная система управления и контроля установлена на котле № 2 Амурской ТЭЦ.

Стр. 2

Окончание. Начало на1 стр.

При всей кажущейся простоте задач, проектировщики, как сказал Андрей Иосифович, столкнулись с большими проблемами. Котельные агрегаты Хабаровской ТЭЦ-1 переводятся на сжигание газа, но с возможностью работы на угле. Поскольку конструктивно котлы, работающие на газе, отличаются от котлов, работающих на угле, то с переводом на газ существующих котлов возникает ряд проблем, в том числе экологического характера. Хотя, казалось бы, перевод на газ должен снимать все экологические проблемы, но это не так... При использовании газовых горелок отечественного производства в дымовых газах образуется высокое содержание оксидов азота. Чтобы привести их в норму необходимо «городить» дополнительно громоздкую схему рециркуляции дымовых газов с установкой дополнительных дымососов. Это притом, что дополнительное оборудование ставить некуда: в котельном цехе нет места. В то же время есть совершенные горелки германской фирмы «SAACKE», но стоимость системы сжигания при этом возрастает с семи миллионов рублей до двадцати пяти миллионов на один котел!..

На состоявшемся 12 декабря заседании технического совета «Хабаровскэнерго» было принято решение на первых трех реконструируемых котлах ХТЭЦ-1 установить все же горелки отечественного производства. Для остальных — решать... В том числе и вопросы финансирования.

По Хабаровской ТЭЦ-2 дела с проектированием обстоят несколько по-иному. В 2004 году институтом была выполнена рабочая документация на внутри площадочные сети, включая ГРП, производительностью 80 тысяч кубометров газа в час с учетом подхода газопровода со стороны улицы Запарина от ГРС-2. Но городские власти этот вариант прохождения трубы по городу не согласовывают. Сейчас прорабатывается новый вариант прокладки газопровода к ХТЭЦ-2 со стороны Северного микрорайона (спиртзавода) от ГРС-3. После окончательного решения институт должен будет выполнять перепроектирование внутриплощадочных сетей.

С горелками дело обстоит несколько проще, чем на ХТЭЦ-1. Здесь установлены котлы Белгородского котельного завода, приспособленные как для сжигания мазута, так и для сжигания газа. Проект горелок будет выполнять «Белэнергомашпроект». Вместо существующих мазутных горелок будут установлены газово-мазутные, позволяющие работать как на газе, так и на мазуте. В 2005 году планируется выполнить рабочую документацию по газификации всех девяти котлов.

В целом же проектные работы по переводу станций на газ оказались для института далеко непростыми. И главным образом потому, что выполняется реконструкция в условиях действующего производства, рассчитанного на сжигание другого топлива и по совершенно другой технологии. Проектировщикам приходится много времени затрачивать на обмерные работы и согласования технических решений непосредственно на станциях. Тем не менее, специалисты тепломеханического (ведущего) отдела, электротехнического и строительного, руководимые, соответственно, Сергеем Михайловичем Моисеевым, Ольгой Александровной Мишустиной и Александром Петровичем Ко-стевским настроены выполнить все проектные работы в установленные руководством «Хабаровскэнерго» сроки. Правда, есть одно «если»... Если не будет объявляться, как это требуется последними решениями РАО ЕЭС «России», конкурс на поставку оборудования газификации. В случае несовпадения поставщика оборудования, предусмотренного в рабочей документации и победившего в конкурсе, рабочую документацию, полностью или частично, придется перепроектировать. А это новые сроки и новые деньги на проектирование...

Андрей КРИКЛИВЫЙ.

Газета «Энергетик» №1-2
от 20 января 2005 года