PROJECT DESIGN DOCUMENT
for the project:
"Waste Coke Oven Gas Utilization at OOO PO "Khimprom"
(Kemerovo City, Russia)

CONTENTS

SECTION A. General description of the project

A.1. Title of the project:

>> Waste Coke Oven Gas Utilization at OOO PO Khimprom, Kemerovo, Russia

Version 04

20 December 2006

A.2. Description of the project:

>> **The purpose of the project** is to contribute to the energy efficiency, economy, reliability of energy (steam) supply to the facilities of Khimprom as well as to reduce GHG emissions and local environmental impact..

The objective is to utilize as a fuel waste coke-oven gas from the JSC «Cox» in the two new Khimprom's steam boilers to cover the own energy demand. Thus some of the waste coke oven gas will not be flared and fired in the open air by JSC «Cox» reducing use of fossil fuels at Khimprom's boiler house and at Novo-Kemerovo CHP Plant (N-K Plant).

The essence of the Project

Khimprom is the biggest producer of industrial and consumer chemicals in the region. In 2005 the facility produced over 20 types of chemicals, the most important of which are: caustic soda - 42669 t, hydrochloric acid - 23498 t, automobile liquids - 5401 t, calcium chloride - 4671 t, liquid chlorine - 23556 t, sodium hypochlorite - 11783 t. In 2006 production of 2 new products is planned.

Most of the implemented chemical technologies need steam of industrial parameters (2.4 MPa and 270 C and lower). Steam is also used at Khimprom for heating and hot water supply. At the time being steam is provided by the following two sources:

- 3 Khimprom's boilers (25 tons of steam/hour each) firing natural gas;
- Novo-Kemerovo CHP Plant which supplies steam to Khimprom by a 3 km long pipeline.

Figures of heat (steam) supply are shown in Table A2 -1.

Table A2 -1. Khimprom heat (steam) supply

Steam source	2003	2004	2005	Jan-March 2006
3 Khimprom's boilers, TJ (natural gas consumption, mln. m3)	527.136 (15.529192)	1176.112 (34.0508)	1234.835 (34.668652)	352.576
Purchased from Novo-Kemerovo CHP plant, TJ	811.176	340.023	306.624	140.340
Total, TJ	1338.312	1516.135	1541.459	492.916

JSC «Cox» is located close to Khimprom. The main production is coke (several million ton/year). The technological process is accompanied by coke oven gas formation. After commissioning in 2007 of the fourth coke oven battery gas outlet will reach at least 1300 mln. m^3/year. Approx. 50% of coke oven gas will be used by JSC «Cox» for own consumption, 30% forwarded to Kemerovskaya Thermal Power Plant and 20% flared with firing in the open air. The waste flare gas amount will be 150-200 mln. m^3/year.

The essence of the project activity is showed on Fig. F2-1. It comprises the following:

- construction of 2 new 25 t/hour steam boilers at Khimprom for firing waste coke oven gas from JSC "Cox"; these two boilers are to carry maximum loads burning 64 mln. m^3 of coke oven gas per year. This will displace corresponding amount of natural gas from 3 existing boilers (3 x 25 ton steam/hour) leaving one natural gas boiler as a reserve one to cover peak loads, and one for emergency;
- increased capacity of Khimprom's boiler house will make it possible to refuse from steam supply from Novo-Kemerovo CHP Plant that is burning coal and gas.

- after project implementation 100% of Khimprom's steam demand will be covered by its own sources: 2 coke oven gas boilers (covering approx. 2/3 of the heat demand) and the rest - by natural gas boilers.

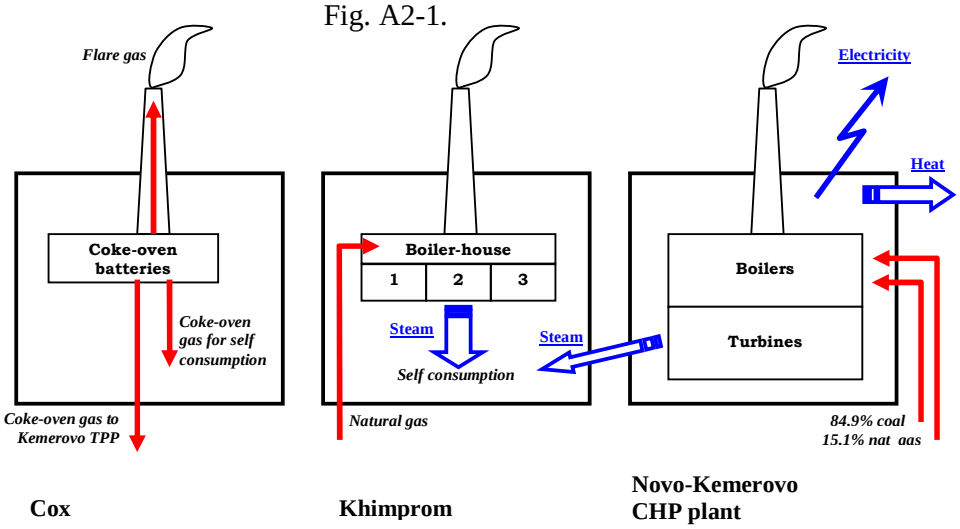
To realize the project, the following investments will be made:

- 2 x 25 t/hour boilers for coke oven gas firing are to be installed;
- an extension building is to be constructed for the 2 new boilers;
- 1.7 km trestle with the pipeline for coke oven gas is to be constructed;
- additional water treatment station in the new building is to be installed;
- coke oven gas consumption commercial measuring system is to be introduced, new boilers are to be equipped with automation systems and measuring devices.

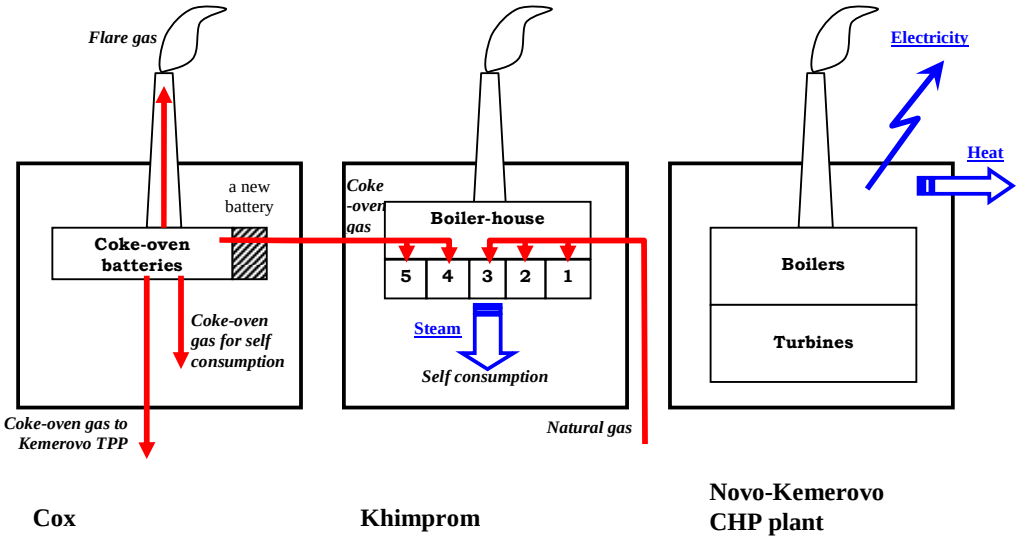
No coke oven gas compressor will be needed since the initial gas pressure at JSC "Cox" and the chosen diameter of the pipes will be sufficient to transport gas to Khimprom without compression.

Project design is close to completion.
OOO PO Khimprom and JSC "Cox" signed the Contract (of 30 August 2006 No 35-3/06-4) on coke oven gas supply up to 2012 with all the main terms and conditions, commercial and technical (its translation can be found in Annex 4).

Fig. A2-1.



1. Before Project implementation



2. After Project implementation

A.3. Project participants:

>> Table A3-1. Project participants

Party involved	Legal entity project participant	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Russian Federation (host Party)	• OOO PO «Khimprom»	No
One of the investor countries in the TGF, tbc. The investor countries in the TGF are: Kingdom of Denmark, Republic of Finland, Federal Republic of Germany, Republic of Iceland, Kingdom of Norway and Kingdom of Sweden.	• Nordic Environment Finance Corporation (NEFCO) acting in its capacity as Fund Manager to the Baltic Sea Region Testing Ground Facility (TGF)	No

NEFCO, the Nordic Environment Finance Corporation, is a multilateral risk capital institution financing environmental projects in Central and Eastern Europe, increasingly with an emphasis on the Russian Federation and Ukraine. Its purpose is to facilitate the implementation of environmentally beneficial projects in the neighboring region, with transboundary effects that also benefit the Nordic region. Today, NEFCO manages funds in an aggregate of approximately €250 million. NEFCO is located in Helsinki, in conjunction with the Nordic Investment Bank (NIB). It has participated in over 80 investments in Russia.

The Baltic Sea Region Testing Ground Facility (TGF) was established at the end of December 2003, as a regional carbon fund to provide financial assistance to concrete projects by purchasing emission reduction credits. The TGF was initially set up by the governments of Denmark, Finland, Germany, Iceland, Norway and Sweden. Currently it also includes 9 companies from the Baltic Sea Region: DONG Naturgas A/S (Denmark), Vattenfall Europe Berlin AG & Co. KG (Germany), Vattenfall Europe Generation AG & Co. KG (Germany), Gasum Oy, Keravan Energia Oy, Kymppivoima Tuotanto Oy, Fortum Power and Heat Oy, Outokumpu Oy and Vapo Oy (all of Finland). The TGF is now a Public Private Partnership which acts as a compliance vehicle for its investors' Kyoto and EU Emissions Trading Scheme commitments.

NEFCO is the Fund Manager of the TGF, and has been authorized by the governments investing in the TGF to participate on their behalf in actions leading to the generation, transfer and acquisition of ERUs under Article 6 of the Kyoto Protocol.

OOO PO Khimprom is a Russian privately owned company with limited liability.

Khimprom is a business unrelated company to JSC "Cox". Novo-Kemerovo CHP Plant is owned by regional power utility JSC «KuzbassEnergo»[1], the daughter company of JSC “RAO Unified Energy System of Russia” which is also business unrelated to Khimprom.

Contact information is provided in Annex 1.

A.4. Technical description of the project:

A.4.1. Location of the project:

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[1] At the time being JSC “KuzbassEnergo” is under transformation splitting into 4 separate companies; one of which is a generating one which will own power plants

Fig. A4-1. Kemerovo city on the map of Russia

A.4.1.1. Host Party(ies):

>> Russian Federation

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

>> Kemerovskaya oblast (Region) - shown on Fig. A4-1.

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

>> The city of Kemerovo (capital of the Region) - shown on Fig. A4-1.

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

>> Kemerovo is the capital of the Kemerovskaya oblast (Region) that is located in West Siberia, approximately 3500 km east of Moscow. Its population is approx. 540,000. Kemerovo is a big industrial center, the so called «capital» of the biggest in Russia coal mining region «Kuzbass» (coal output in 2005 was 167 mln. t). Besides coal industry power production, metallurgy, chemical facilities are essential components of the regional economy.

OOO PO Khimprom (as well as JSC "Cox", Novo-Kemerovo CHP Plant, Kemerovskaya Thermal Power Plant mentioned in this PDD) is located in a city district called «Zavodskoy».

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

>> The technology to be implemented by the project is steam generation by industrial boilers firing coke oven gas. According to the Khimprom's project design 2 new boilers are standard boilers for natural gas and heavy oil burning marked as DE-25-24-250 GM-O manufactured by «Byisk Boilers Works». The only difference is a special

type of a burner adjusted for coke oven gas firing. The capacity according to the technical certificate is 25 t of steam/hour, steam parameters are 2.3 MPa and 250 (+25/-10) ^{0}C.

The technology of coke oven gas firing in boilers is used for decades in Russia practically at every coke oven site. This project employs commercially available technology. This very equipment has been employed at JSC "Cox" boiler house where the same coke oven gas boilers (DE-25-24-380 GM manufactured by the same plant «Byisk Boilers Works») as projected for Khimprom are in long-term operation. Specialists from JSC "Cox" informed of good operational results, absence of problems and provision of projected parameters.

According to the project steam supply from N-K CHP Plant will be stopped before beginning 2008 and the pipeline will be set in lay-up.

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 burning of organic and process fuels causes GHG emissions. Natural gas, coal and coke oven gas generate the following GHGs: CO_2, N_2O, CH_4 of which the amount of N_2O, CH_4 is negligible compared with CO_2 (according to the IPCC emission factors [R1]).

Under the project part of waste coke oven gas from JSC "Cox" will be used as a fuel at 2 new Khimprom's boilers. Now the waste coke oven gas is flared and fired in a nozzle specially designed to burn the gas. According to the *"Good Practice Guidance and Uncertainty Management in National GHG Inventories"* [R9]: "During the combustion process, most of carbon is emitted as CO_2 immediately. However, some carbon is released as CO, CH_4 and non-methane volatile organic compounds (NMVOCs), all of which will oxidize to CO_2 in the atmosphere within a period of a few days to about 12 years. *The Revised 1996 IPCC Guidelines for National GHG Inventories* account for all the released carbon as CO_2 emissions" (quoted). Thus, in respect of the amount of GHG emissions coke oven gas firing in the open air is the same as its firing in boilers.

The anthropogenic emissions of greenhouse gases by sources are to be reduced by the proposed JI project in the way illustrated on Fig. A 4-2.

Approx. 2/3 of the Khimprom's energy (fuel) demand for steam generation will be covered by the captive waste coke oven gas use. Of this amount of the substituted energy approx. 30% is the elimination of steam production for Khimprom by N-K CHP Plant with a mix of fuels (coal and natural gas) and 70% is the reduction of natural gas consumption by existing Khimprom's boilers. These fuel savings will lead to GHG emission reductions.

1. **Before Project implementation**

Emissions (EM) →	**EM_{1cog}**	**EM_{1ng}**	**EM_{1mix} ***
Fuel →	**Captive coke oven gas (cog) flared**	**Natural gas (ng)**	**Coal+natural gas (mix)**
Enterprise →	**JSC "Cox"**	**Khimprom**	**N-K CHP Plant**

2. After Project implementation

Emissions (EM) →	**EM_{2cog} = 0**	**EM_{2ng}+EM_{1cog}**	**EM_{2mix}=0 ***
Fuel →	**Captive coke oven gas removed to Khimprom**	**Captive coke oven gas + natural gas**	**Coal+natural gas is displaced by coke oven and natural gas at Khimprom**
Enterprise →	**JSC "Cox"**	**Khimprom**	**N-K CHP Plant**

* EM_{1mix} and EM_{2mix} correspond to steam production for Khimprom.

Emission reductions: ER = EM_{1ng} - EM_{2ng} + EM_{1mix},

where EM_{1ng} will be approx. 2 times higher than EM_{2ng}.

Fig. A4-2

In the absence of the project emission reductions would not occur because each of the 3 enterprises involved in the project will be operational under the current conditions and have no serious barriers (national and/or sectoral polices and circumstances) that could prevent their work in the existing mode:

- Khimprom can substantially increase its production facing no limitations of steam supply because 3 existing boilers at Khimprom have a 30% reserve most of the year and N-K CHP Plant can without any problem increase steam delivery.
- Coke oven gas flaring is an integral part of coke production technology at JSC "Cox". 64 mln. m3/year of coke oven gas that is to be supplied to Khimprom makes up 5-8% of the total amount of flare gas that will be generated at JSC "Cox". From the point of view of environment JSC "Cox" has a permit to commission a new coke oven battery in 2007 that will increase generation of coke oven gas.
- Novo-Kemerovo CHP Plant can triple steam supply to Khimprom without any technical problem. Before Khimprom commissioned its own 3 boilers by 2003 the N-K Plant sold steam to Khimprom 2.6 times more than in 2005. In 2005 steam supply to Khimprom made only 2.3% of the Plant's overall heat output (which was 13110 TJ).

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

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	Years
Length of the crediting period	5 years
Year	Estimate of annual emission reductions in tonnes CO_2eq.
2008	70811
2009	70811
2010	70811

2011	70811
2012	70811
Total estimated emission reductions over the crediting period (ton of CO_{2eq})	354055
Annual average of estimated emission reductions over the crediting period (ton of CO_{2eq})	70811

A.5. Project approval by the Parties involved:

>> Requests for the Letter of Endorsement from OOO PO "Khimprom" and NEFCO have been submitted to the Ministry of Economic Development and Trade of the Russian Federation on May 23, 2006.

A designated national authority for JI has not been appointed in the Russian Federation. The Letter of Approval or some other kind of a document from a designated national authority of the Russian Federation is a matter of national procedures which are to be established in Russia by special regulations approved by the Government. Discussion of draft documents is under way.

In case there is a positive determination report on the PDD both OOO PO "Khimprom" and NEFCO will request for the approval from the Ministry of Economic Development and Trade of the Russian Federation or from the national designated authority (if appointed). OOO PO "Khimprom" takes the responsibility to go through the national procedures for the JI projects' approval as soon as they are launched in the Russian Federation.

The investor country approval will be issued by one of the investor countries to the TGF prior to submission of the PDD and Determination Report to the JI Supervisory Committee.

Written approvals by the Parties involved, including the necessary authorizations, will be attached to the final PDD as soon as they are available.

SECTION B. Baseline

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

>> Analysis of the baseline methodologies from the list of approved CDM methodologies shows that there is no one exactly applicable to this project. At the same time methodology ACM004 «Consolidated baseline methodology for waste gas and/or heat and/or pressure for power generation» (version 02 dated 3 March 2006) is very close to the subject.
The methodology is available at the web-site:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

The methodology can be adjusted to the project in the following way (text that needs adaptation and proposed changes are marked with underlined *italics*).

Table B1-1. Analysis of Methodology Applicability

Applicability conditions of ACM004 methodology (abstract)	Adjusted version
This methodology applies to project activities that generate *electricity* from *waste heat or* the combustion of waste gases in industrial facilities. The methodology applies to *electricity generation* project activities: • that displace *electricity* generation with fossil fuels *in the electricity grid or displace captive electricity generation from fossil fuels;* • where no fuel switch is done in the process, where *the waste heat or pressure or* the waste gas is *produced*, after the implementation of the project activity. The methodology covers both new and existing facilities. For existing facilities, the methodology applies to existing capacity, as well as to planned increases in capacity during the crediting period. If capacity expansion is planned, the added capacity must be treated as a new facility. This consolidated baseline methodology shall be used in conjunction with the approved consolidated monitoring methodology ACM004 («Consolidated monitoring methodology for waste gas and/or heat and/or pressure for power generation»).	This methodology applies to project activities that generate *steam* from the combustion of waste gases in industrial facilities. The methodology applies to *steam* generation project activities: • that displace *steam* generation with fossil fuels; • where no fuel switch is done in the process, where the waste gas is *available* after the implementation of the project activity. The methodology covers both new and existing facilities. For existing facilities, the methodology applies to existing capacity, as well as to planned increases in capacity during the crediting period. If capacity expansion is planned, the added capacity must be treated as a new facility. This consolidated baseline methodology shall be used in conjunction with the approved consolidated monitoring methodology ACM004 («Consolidated monitoring methodology for waste gas and/or heat and/or pressure for power generation»).

Comparison of applicability conditions in Table B1-1 shows that with small changes (mainly referring to different type of energy - steam instead of grid connected electricity) the methodology ACM004 can be adopted to the project and can be used in the context of the project:

- waste coke oven gas (or in the terminology of ACM004 methodology “captive” energy) will be available at Khimprom after the implementation of the project;
- energy generation from captive waste gas by new boilers will displace energy generation from other sources (Novo-Kemerovo CHP Plant and Khimprom’s existing boilers);
- 2 new coke oven gas boilers will be treated as a new facility;
- no fuel switch is taking place, just the displacement of energy by other sources.

All changes made for adaptation of the ACM004 methodology will be explained in the process of the baseline development and emission reduction calculations.

According to the ACM004 methodology the following steps shall be followed in determining the baseline scenario:

- alternative options of the BL scenario;

- exclusion of some BL options;
- choice of the most economically attractive alternative.

The baseline scenario alternatives should include all possible options that provide steam for Khimprom's needs. The alternative scenarios according to ACM004 methodology recommendations in the context of this project are:
(a) The proposed project activity not undertaken as a JI project activity.
(b) Energy import (of steam from Novo-Kemerovo CHP Plant).
(c) Existing or new captive energy generation on-site, using other energy sources than waste coke oven gas, such as diesel, natural gas, hydro, wind, etc.
(d) A mix of options (b) and (c), in which case the mix of grid and captive energy should be specified.
(e) Other uses of the waste gas.
(f) The continuation of the current situation.

Option (a) - the proposed project activity not undertaken as a JI project activity.
The option faces serious investment barrier. In 1998-2004 Khimprom's financial situation was extremely dangerous. From 2003 the situation improved but the 2003 and 2004 balances were still with losses:

in 2003 losses = 2187 thous. RUR
in 2004 losses = 0.985 thous. RUR.

Official bankruptcy procedures were taking place in 1998-2003. From 2000 the enterprise got new owners, now is controlled by the private partnership «Sibconcord»; its organizational form was changed (from formerly JSC to the company with limited liability). After a long period of economical inefficiency 2005 showed a small profit of 2896 thous. RUR (87.2 thous. Euro) which makes it possible to request for credits.
In this scenario it is supposed that the investments for project implementation (2376 thous. Euro or 27 times more than the 2005 profit) can be entirely covered by means of own and borrowed funds without the attraction of carbon financing. Khimprom envisages to attract 62% of investment by credits, partly from the bank "Sberbank" and partly from Khimprom's owners – financial-industrial alliance "Sibconcord". The latter in February 2006 informed Khimprom that it will have to attract maximum amount of investments from their own funds. The loan from "Sibconcord" is possible in case it will be returned in 2-3 years (copy of the letter from "Sibconcord" and its translation is presented in Annex 4).
The request for credits from banks will be accepted under certain conditions: the proposed project should be extremely economically attractive and reliable. Taking into account recent Khimprom's financial history it will be quite a problem to get a long-term credit from a bank.
Carbon credits will substantially reduce the payback period and carbon co-financing is therefore an integral part of the financing expectations.
This option is quite a problematic without carbon credits while option (f) needs no incremental investments.

Option (b). Import of big amounts of steam from Novo-Kemerovo CHP Plant appeared to be economically less efficient than on-site steam generation and 3 natural gas boilers were installed in 2002-2003 at Khimprom, the amount of purchased steam was reduced from 2003 by 2.6 times. Khimprom's executives are intended to further reduce steam supply from Novo-Kemerovo CHP Plant to a technically acceptable minimum.

Option (c). Different fuels and different energy sources.
All of the options connected with construction of new boilers at Khimprom unrelated to fuel choice for them face the same investment barrier as option (a) which makes them problematic to implement.
From the technical point of view it is possible to generate steam by additional boilers burning heavy oil (mazut) and/or natural gas, and/or coal at Khimprom's site. In the region diesel fuel is used for vehicles, and is not available for use in the energy sector (for boilers).
There will a change in investments for a project "additional boilers with alternative fuels" as compared with option (a): no trestle and pipeline from JSC "Cox" will be needed which reduces project cost by 1035 thous. Euro. At the same time additional investments will take place for use of each of the alternative fuels:

- extension of gas distribution substation and additional 1.2 km pipeline - for natural gas;
- rails for transportation, unloader devices and storage tanks - for heavy oil;
- coal yard, precipitators, ash and slag disposal, coal supply and handling auxiliaries - for coal.

Roughly it can be estimated that the investments for natural gas or heavy oil options will be at the same level as for option (a) while for coal they will be even higher. Besides coal option will lead to the highest environmental impact compared with other fuel options.

Thus within option (c) fuel prices (shown in Table B1-2) become the main factor in economical analysis.

Table B1-2. 2006 Prices of Conventional Fuels

Fuel	Price for 1 t.c.e. (29330 MJ), RUR	Price for 1 t.c.e. (29330 MJ), Euro (34 RUR)
Natural gas	1160	34.1
Coal (delivered to N-K Plant)	770	22.6
Diesel	10430	306.8
Heavy oil (mazut)	3130	92.0
Coke oven gas	612	18

Thus, the "cheapest" coal option will economically lose if compared with option (a) - coke oven gas is by 25% cheaper than coal and will face investment barrier which option (f) is free from .

There is no industrial production of biofuels in the Region and this option is not discussed further.
Other sources such as power renewables are not applicable for steam generation.

Option (d). Mix of (b) and (c) leads to economically less efficient decisions and faces the same investment barrier as option (a).

Option (e). Other uses of coke oven gas, i.e. processing of coke oven gas to produce new chemicals is possible in principle though this option has nothing to do with provision of Khimprom's facilities with steam. Such a project will need tremendous amount of investments which is impossible at the time being. This can be economically attractive in case huge amounts of coke oven gas will be processed (several times more than 64 mln. m3/y needed for the project).

Option (f). The continuation of the current situation provides economically acceptable steam supply to Khimprom without incremental investments.

Taking into account that option (a) faces serious investment barrier option (f) which needs no incremental investments appears to be the most economically attractive one among the others and is proposed as a baseline scenario.

The key information and data used to determine the BL scenario (variables, parameters, data, sources, etc.)

As it is recommended by the methodology ACM004 the baseline emissions refer only to the area of utilization of the waste energy (in the case of the project – of captive coke oven gas) and the project emissions can be assumed as zero: "Project emissions are applicable only if auxiliary fuels are fired for generation start up, in emergencies or to provide additional heat gain before entering the waste heat recovery boiler" (quoted from ACM004). None such a case is applicable to the project not speaking of start-up operations that will take place at coke oven gas boilers. Fuel consumption for such operations is much less than 1% of the overall fuel consumption by the boilers and it can be neglected.
As it is forecasted Khimprom's heat consumption will grow by 1% annually. This growth will not affect coke oven gas consumption and will just cause additional natural gas demand. According to the project coke oven gas is a preferable fuel since it is substantially cheaper than natural gas and it will be used in the maximal amount by the two new boilers. The rest of the heat demand (approx. 1/3) including its growth will be covered by natural gas.
Thus, the baseline emissions (and at the same time emission reductions) will be the function of the heat produced by N-K CHP Plant for Khimprom and the heat produced by Khimprom's natural gas boilers as a substitution of coke oven gas boilers' heat production.
The key information and data used to determine the BL scenario (variables, parameters, data, sources, etc.) are presented in Table B 1-2. Explanation of assumptions can be found in Annex 2 Table B2.

Table B1. Data used for the BL calculations and its sources

ID No	Data	Figure	Source and explanations
1	Heat import from Novo-Kemerovo CHP Plant in 2008-2012	300 TJ/y	Assumption explained in Annex 2 Table B2
2	Share of coal and natural gas in the fuel mix of Novo-Kemerovo CHP Plant, SHARE	Coal = 84.9% (of fuel heat in TJ) Natural gas =15.1% (of fuel heat in TJ)	2005 figures got from the report by N-K Plant and explained in Annex 2 Table B2
3	Natural gas emission factor, EF_{ng}	56.1 tCO2/TJ	[R1] – IPCC data
4.	Coal emission factor, EF_{coal}	94.6 tCO2/TJ	[R1] – IPCC data
5.	Efficiency of natural gas boilers at Khimprom, Eff_{ng}	93.9%	From the operational regulations based on boilers' tests
6.	Efficiency of coke oven gas boilers, Eff_{cog}	92%	From the operational regulations based on boilers' tests at JSC Cox
7	Losses in the steam pipeline from N-K CHP Plant	33 TJ/y	Assumption explained in Annex 2 Table B2
8	Amount of captive coke oven gas, B_{cog}	64 mln. m3/y	The main project figure (agreed between Khimprom and JSC Cox).
9	Net calorific value of coke oven gas, NCV_{cog}	16.76 MJ/m3	2004-2006 data from JSC Cox
10	Specific fuel consumption for production of 1 TJ of heat at N-K Plant, $b_{N\text{-}KPlant}$	1.044 TJ/TJ	Assumption explained in Annex 2 Table B2

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:

(a) A description of the BL scenario.

Implementing the ACM004 methodology option (f) is chosen for the BL scenario, i.e. the continuation of the current situation which provides the economically acceptable supply of steam to Khimprom without incremental investments (see justification in Section B1).

- Overall Khimprom's heat (steam) demand in 2008-2012 will be covered by the following two sources: 3 existing Khimprom's natural gas boilers will produce approx. 80% of the needed heat and Khimprom will purchase 300 TJ of heat (steam) annually from N-K Plant;
- Novo-Kemerovo CHP Plant will generate steam with a mix of coal - 84.9% (per cent of fuel heat expressed in TJ) and natural gas -15.1% (of fuel heat in TJ).
- JSC "Cox" will go on flaring coke oven gas.

(b) A description of the project scenario.

The project scenario is:

- Overall Khimprom's heat demand in 2008-2012 will be covered by the following two sources:
  - 2 new coke oven gas boilers burning 64 mln. m3 of coke oven gas per year working with maximum loads covering approx. 2/3 of Khimprom's demand;
  - existing Khimprom's natural gas boilers will cover the rest of the demand.
- There will be no steam supply from Novo-Kemerovo CHP Plant to Khimprom from the end 2007;
- GHG emissions from captive coke oven gas will be displaced from JSC "Cox" to Khimprom.

(c) An analysis showing why the emissions in the BL scenario would exceed the emissions in the project scenario by sources is given in Section A4-3.

To illustrate how and why the project is additional the Additionality Test is executed. "Tool for the demonstration and assessment of additionality" (Version 02 of 20 Nov. 2005, CDM - Executive Board) [R7] was implemented.

Step 0. Preliminary screening based on the starting date of the project activity
The project crediting period 2008-2012 will be not started prior to the registration of the project activity.
→Proceed to Step 1.

Step 1. Identify the of alternatives to the project activity consistent with current laws and regulations
Sub-step 1a. Define the alternatives to the project activity:
The main necessary task of the project is to provide economically acceptable and reliable heat (steam) supply of Khimprom's facilities. Five alternatives to the project activity indicated below are chosen in regard to this condition:
(i) The proposed project activity not undertaken as a JI project activity.
(ii) Import of steam from Novo-Kemerovo CHP Plant.
(iii) Existing or new captive energy generation on-site, using other energy sources than waste coke oven gas, such as diesel, natural gas, hydro, wind, etc.
(iv) A mix of options (b) and (c), in which case the mix of grid and captive energy should be specified.
(v) The continuation of the current situation.

All these alternatives are the same as alternatives of the BL scenario (with the only exclusion of (e) – "other uses of the waste gas") described in Section B1.
Analysis of these alternatives presented in Section B1 shows that the only realistic and credible one is (v) – "the continuation of the current situation".

Sub-step 1b. Enforcement of applicable laws and regulations:
Alternative (v) - "the continuation of the current situation" is in compliance with all applicable legal and regulatory requirements of the Russian Federation. It is being implemented at Khimprom since 2003.
→Proceed to Step 2.
Step 2. Investment analysis
Not applicable for this option.
Step 3. Barrier analysis
Sub-step 3a. Identify barriers that would prevent the implementation of type of the proposed project activity:
Equity/Investment Barrier: In 1998-2003 Khimprom was under official procedures of bankruptcy and was unprofitable. Losses in 2003 were 2187 thous. RUR and in 2004 - 0.985 thous. RUR. Only 2005 showed a small profit of 2896 thous. RUR (or 87.2 thous. Euro) which is 27 times less than investments for the project implementation. Thus Khimprom is lacking own funds for the project implementation.
The other possibility is credits and loans. From time to time "Sberbank" gives Khimprom short-term credits, just for replenishment of circulating assets and not for the investment activity. Long–term credits and loans for investment activities were impossible in the period "under the bankruptcy" and are problematic at the time being. As a confirmation we apply the letter of the Vice-President of financial-industrial union «Sibconcord» Mr. Cherepanov, where the attraction of additional carbon financial assets is considered as a pre-condition for making a positive decision on loan for the project implementation (copy and the translation are attached in Annex 4). This is why Khimprom approached NEFCO/Testing Ground Facility for carbon financing in September 2005.
Sub-step 3 b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):
The identified barrier would not prevent the implementation of the alternative (v) that doesn't demand capital investments.
→Proceed to Step 4
Step 4. Common practice analysis
Sub-step 4a. Analyze other activities similar to the proposed project activity:
The technology of utilizing coke gas suggested by the project is common at the metallurgy sites in Russia for decades. Many metallurgy facilities are using coke oven gas generated in coke batteries as a secondary fuel: it is burned both in technological heating furnaces and steam/hot water boilers. The same takes place at many various industrial enterprises which have economical and technical preconditions of coke oven gas utilization (short distance to coke oven batteries and energy demand from fuel use are essential). This measure provides fossil fuels saving and improve environment. For instance, coke oven gas in Kemerovo is being used at JSC "Cox" itself (for own technological needs + at its boiler house) and at Kemerovskaya Thermal Power Plant (2 x 420 t of steam/hour utility boilers). In the city of Cheliabinsk coke oven gas from "Cheliabinsky Metallurgy Combinat" is used in the same way. These examples present common practice in Russia. The facility which utilize the waste coke oven gas aside is unrelated to the main technology (chemical products or power or something else).

Sub-step 4b. Discuss any similar options that are occurring:
The project activity is both common and financially attractive once initial investment barriers are overcome. Such kind of a project was implemented several years ago by Kemerovskaya Thermal Power Plant (2 x 420 t of steam/hour utility boilers were switched from coal to coke oven gas). The decision by JSC "Kuzbassenergo" was taken both on economical and environmental reasons and the company invested its own funds in the project realization. In 2002 Khimprom developed the design documentation for constructing 2 coke oven gas boilers and 1 natural gas boiler but had to change the initial project design on financial reasons and all of the 3 boilers were constructed for natural gas firing. Khimprom had to refuse from building the trestle for coke oven gas pipeline while natural gas was available at site. This decision was irrevocable though coke oven gas project was economically more attractive than natural gas option. In those years Khimprom had no own funds and had no possibility to get credits for the coke oven gas project being under the bankruptcy procedures. Khimprom could have easily implement the project in the absence of the investment barrier.
→Proceed to Step 5
Step 5. Impact of JI/CDM registration
Obtaining of carbon credits could lead to access to the credits at the financial market of Russia. In case of registration of this JI project, «Sibconcord» and «SberBank» will undertake to finance the suggested project, and it will be implemented.
Conclusion:
→Project activity is not the baseline scenario and it is additional.

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

>> Using recommendations of the ACM004 methodology the spatial extent of the project boundary comprises the following emission sources:

- JSC "Cox" facility flaring captive coke oven gas that is fired in the open air;
- Khimprom's boilers;
- Novo-Kemerovo CHP Plant.

There is no auxiliary fossil fuels combustion in the project.

Table B3-1 illustrates which emission sources included in or excluded from the project boundary (in the zone of fuel substitution by captive coke oven gas).Table B3-1. Overview of emission sources included in or excluded from the project boundary

	Source	Gas		Justification/ Explanation
BL	Steam generation by Khimprom with natural gas (in the zone of fuel substitution by the captive coke oven gas)	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded because emissions are negligible. This is conservative
		N_2O	Excluded	Excluded because emissions are negligible. This is conservative
	Steam generation by Novo-Kemerovo CHP Plant with a mix of coal+natural gas (in the zone of fuel substitution by the captive coke oven gas)	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded because emissions are negligible. This is conservative
		N_2O	Excluded	Excluded because emissions are negligible. This is conservative
Project activity	Combustion of the captive waste coke oven gas for steam generation at Khimprom's boiler house	CO_2	Excluded	It is assumed that this gas would have been burned in the BL scenario
		CH_4	Excluded	Excluded because emissions are negligible.
		N_2O	Excluded	Excluded because emissions are negligible.

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

>> Date of BL setting: 30 September 2006

BL was developed by Mikhail Rogankov from Ecopolice Ltd. (Moscow) - the Consultant for the project participants hired for the PDD development. Neither the person nor the entity is a project participant listed in Annex 1.
Contact information: tel. +7 495 361 57 22; fax. +7 495 787 8898 (ext. 150). Address: 17 build. 2, Rozhdestvenka Str., Moscow, 107031, Russia.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

>> October 2007

C.2. Expected operational lifetime of the project:

>>25 years (corresponds to the lifetime of Khimprom's natural gas and coke oven gas boilers)

C.3. Length of the crediting period:

>>5 years, starting on 1 January 2008 (Kyoto Protocol first commitment period - from 1st January 2008 to 31st December 2012)

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

>> Analysis of the list of approved CDM methodologies shows that there is no one methodology exactly applicable to this project. At the same time methodology ACM004 «Consolidated monitoring methodology for waste gas and/or heat and/or pressure for power generation» (version 02, dated 3 March 2006) is very close to the subject. The methodology is available at the web-site: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

The methodology can be adjusted to the project in the following way (changes are marked with underlined *italics*).

Table D1-1. Analysis of Methodology Applicability

Applicability conditions of ACM004 methodology (abstract)	Adjusted version
This methodology applies to project activities that *generate electricity* from *waste heat or* the combustion of waste gases in industrial facilities. The methodology applies to *electricity* generation project activities: • that displace *electricity generation* with fossil fuels *in the electricity grid or displace captive electricity generation from fossil fuels*; • where no fuel switch is done in the process, where *the waste heat or pressure or* the waste gas is *produced*, after the implementation of the project activity. The methodology covers both new and existing facilities. For existing facilities, the methodology applies to existing capacity, as well as to planned increases in capacity during the crediting period. If capacity expansion is planned, the added capacity must be treated as a new facility. This consolidated baseline methodology shall be used in conjunction with the approved consolidated baseline methodology ACM004 («Consolidated baseline methodology for waste gas and/or heat and/or pressure for power generation»).	This methodology applies to project activities that generate *steam* from the combustion of waste gases in industrial facilities. The methodology applies to *steam* generation project activities: • that displace *steam* generation with fossil fuels; • where no fuel switch is done in the process, where the waste gas is *available*, after the implementation of the project activity. The methodology covers both new and existing facilities. For existing facilities, the methodology applies to existing capacity, as well as to planned increases in capacity during the crediting period. If capacity expansion is planned, the added capacity must be treated as a new facility. This consolidated baseline methodology shall be used in conjunction with the approved consolidated baseline methodology ACM004 («Consolidated baseline methodology for waste gas and/or heat and/or pressure for power generation»).

Comparison of applicability conditions in Table D1-1 shows that with small changes (mainly referring to different type of energy - steam instead of grid connected electricity) the methodology ACM004 can be adopted to the project and can be used in the context of the project:

- waste coke oven gas (or in the terminology of ACM004 methodology “captive” energy) will be available at Khimprom after the implementation of the project activity;
- energy generation from captive waste gas by new boilers will displace energy generation from other sources (Novo-Kemerovo CHP Plant and Khimprom’s existing boilers);
- 2 new coke oven gas boilers will be treated as a new facility;
- no fuel switch is taking place, just the displacement of energy by other sources.

All changes that will be made for the adaptation of the ACM004 methodology will be explained in the process of the baseline development and emission reduction calculations.

Monitoring objects according to the ACM004 methodology and the proposed changes for its adaptation are analyzed in Table D1-2.

Table D1-2. Analysis of the Monitoring Objects for adjustment of ACM004 methodology

Monitoring objects according to the ACM004 methodology (abstract)	Adjusted version
The Methodology requires monitoring of the following: ▪ Net *electricity* generation from the proposed project activity; ▪ Data needed to calculate carbon dioxide emissions from fossil fuel consumption due to the project activity; ▪ *Data needed to recalculate the operating margin emission factor, if needed, based on the choice of the method to determine the operating margin (OM), consistent with "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002);* ▪ *Data needed to recalculate the build margin emission factor, if needed, consistent with "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002);* Data needed to calculate the emissions factor of captive *power* generation.	The Methodology requires monitoring of the following: ▪ Net *steam* generation from the proposed project activity; ▪ Data needed to calculate carbon dioxide emissions from fossil fuel consumption due to the project activity. *Comment: this does not apply to the project* Data needed to calculate the emissions factor of captive *steam* generation.

In its activities in the field of measurements and monitoring Khimprom follows the requirements of the Federal Law of 27 April 1993 # 4871-1 "On Provision of the Unified Measuring System", a number of national regulations and prescriptions of the Regional Metrological Inspection. There is a Metrological Department at Khimprom which is responsible for appropriate plans, documentation, organization of tests, calibration, etc. Measuring instruments have official permits for operation and are tested; Khimprom has annual metrological plans for checking instruments' parameters.

Measurements of the main project parameters are fully in line with those that are carried out at the time being. The only new instruments will be the coke oven gas meter and the heat meters at coke oven gas boilers which will be treated as any other instrument as far as the metrological requirements are concerned.

Considering two options of the monitoring plan, Option 2 is the appropriate one, fully meeting the requirements of ACM004 methodology.

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

Option 1 is not applied. Option 2 is the appropriate one, fully meeting the requirements of ACM004 methodology.

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

ID number *(Please use numbers to ease cross-referencing to D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.1.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :

ID number *(Please use numbers to ease cross-referencing to table D.3)*	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.1.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

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
MB1	Heat generation by Khimprom's coke oven gas boilers (HG_{cog})	Khimprom's reports	TJ	m	Continuously	100%	Electronic and paper	Directly measured at Khimprom's coke oven gas boilers.
MB2	Share of coal (per cent of fuel heat in TJ) in the fuel mix of N-K Plant ($SHARE_{coal}$)	JSC KuzbassEnergo	%/100	m	Annually	100%	Electronic and paper	This data is one of the main ones annually reported by JSC "KuzbassEnergo " in the report for the national statistics # 6-tp.

MB3	Share of natural gas (per cent of fuel heat in TJ) in the fuel mix of N-K Plant ($SHARE_{ng}$)	JSC KuzbassEnergo	%/100	m	Annually	100%	Electronic and paper	This data is one of the main ones annually reported by JSC "KuzbassEnergo" in the report for the national statistics # 6-tp.

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):

>> Implementing the recommendations of the ACM004 methodology the resulting formula to illustrate emission reductions is:

$$\mathbf{ER_y = BE_y - PE_y,}$$

where:
BE_y – baseline emissions in the year **y** (according to the ACM004 these emissions should be calculated only for the area of captive waste gas utilisation);
PE_y – project emissions in the year **y** (as explained in Section B1 PE_y should be assumed as zero)

Data used for the BL calculations and its sources and assumptions of the key data for the BL calculations can be found in Annex 2.

In the ACM 004 methodology the BL emissions are calculated as:

$$BE_{electricity,y} = EG_y \,.\, EF_{electricity,y}$$

where
EG_y – net quantity of electricity supplied to the manufacturing facility by the project during year y in MWh, and
$EF_{electricity,y}$ – CO2 baseline emission factor (tCO_2/MWh)

In case of this project there are 2 sources that will emit GHGs in the BL scenario (in the zone of fuel substitution by the captive coke oven gas): Khimprom's natural gas boilers and N-K Plant and the formula above should be turned to:

$$BE_y = H_{ng,y} \,.\, EF_{ng} + b_{N\text{-}KP,y}\, H_{N\text{-}KP,y} \,.\, EF_{mix,y} \quad (TJ) \qquad (d1)$$

where
$EF_{mix,y}$ – emission factor for the mix of fuels; calculated as: $EF_{mix,y} = EF_{coal,} \times SHARE_{coal,y} + EF_{ng} \times SHARE_{ng,y}$ (tCO_2/TJ)
$SHARE_{coal,y}$ and $SHARE_{ng,y}$ - shares of coal and gas (of fuel heat in TJ) at N-K plant;
EF_{ng} – IPCC emission factor for natural gas (tCO_2/TJ);

EF_{coal} - IPCC emission factor for coal (tCO_2/TJ);

b_{N-KP} - specific fuel consumption per 1 TJ of heat production at N-K CHP Plant (TJ/TJ);

$H_{N-KP,y}$ – heat import from N-K Plant (TJ);

$H_{ng,y}$ – heat from Khimprom's natural gas boilers in the baseline scenario that will be substituted by the coke oven gas boilers' production; it can be calculated from the equation:

$HG_{cog} = H_{ng} . Eff_{ng} + (H_{N-KP,y} – Losses)$ (TJ), or

$H_{ng} = (HG_{cog} - H_{N-KP,y} + Losses)/ Eff_{ng}$ (TJ)

where

HG_{cog} - heat generated by Khimprom coke oven gas boilers (TJ);

Eff_{ng} – efficiency of natural gas boilers (%/100);

$H_{N-KP,y}$ – heat import from N-K Plant (TJ),

Losses – losses in the steam pipeline from N-K Plant (TJ).

Constant numerical values of the formulae's components above can be taken from Annex 2 Table B1 (for convenience they are partly repeated below); explanations of the assumptions can be found in Annex 2 Table B2.

Data used for the BL (emission reduction) calculations and its sources:

ID No	Data	Figure	Source and explanations
1	Heat import from Novo-Kemerovo CHP Plant in 2008-2012, $H_{N-KP,y}$	300 TJ	Assumption explained in Annex 2 Table B2
2	Natural gas emission factor, EF_{ng}	56.1 tCO2/TJ	[R1] – IPCC data
3	Coal emission factor, EF_{coal}	94.6 tCO2/TJ	[R1] – IPCC data
4	Efficiency of natural gas boilers at Khimprom	93.9%	From the operational regulations based on boilers' tests

5	Losses in the steam pipeline from N-K CHP Plant	33 TJ	Assumption explained in Annex 2 Table B2
6	Specific fuel consumption for production of 1 TJ of heat at N-K Plant, (b_{N-KP})	1.044 TJ/TJ	Assumption explained in Annex 2 Table B2

Using the above values Formula (d1) for the monitoring purpose can be expressed as:

$BE_y = 59.74 (HG_{cog} - 267) + 29629\ SHARE_{coal,y} + 17571\ SHARE_{ng,y}$ (TJ) (d2)

In the process of the monitoring and in the Monitoring plan formula (d2) will be used. HG_{cog} will be directly measured at Khimprom's coke oven gas boilers and . $SHARE_{coal,y}$ and $SHARE_{ng,y}$ will be got from the reports of N-K CHP Plant.

As it is explained in section B3 there is no need to consider GHGs others than CO_2; all of the main sources are covered by the formulae d1 and d2.

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

As shown in Section E2 all of the leakages can be neglected

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

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

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

>> As shown in Section E2 all of the leakages can be neglected.

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):

>> Emission reductions equal to emissions in the BL scenario and the formulae to be used are the same as in Section D 1.2.2.
No new measurements or data are needed than those indicated in D1.2.1.

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:

>> The monitoring of project environmental impacts can be carried out both by the direct calculation and by the indirect indicators. The facts of using coke oven gas by "Khimprom" and zero steam import from Novo-Kemerovo CHP Plant are the indirect evidence of pollutants' emission reduction as well of ash and slag wastes formation reduction achieved by the project.
In Section F numerical assessment of pollutants' reductions is presented. It is based on use of the annual reports of N-K Plant and Khimprom for the national statistics on fuel use (report according to the form # 6-tp "Information on fuel use") and emissions (report according to the form # 2tp -Air «Information of atmospheric air protection»). Table F2 in Section F summarizes analysis of pollutants' emission reductions against captive coke oven gas consumption by Khimprom. Use of this Table is proposed for monitoring purpose of environmental impact reduction of the project. Information of the achieved reductions is included in the Monitoring Plan (Annex 3).

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)*	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
PROJECT ACTIVITY		
		Not needed
BL SCENARIO		
Table D1.2.1., MB1 Heat generation by Khimprom's coke oven gas boilers, (HG_{cog})	Low	Standardized steam meter marked as STD together with instruments to measure gas consumption Metran 22DD-2440, steam pressure Sapfir 22Du-2161 and temperature by thermocouples is used to provide continuous control of heat volume with the measurement error of the meter is 4%. Tested every 2-4 years according to metrological regulations.
Table D1.2.1, MB2 ($SHARE_{coal}$)	Low	Calculated using measurements of coal and natural gas consumption by Novo-Kemerovo CHP Plant. The data will be an abstract from the report of KuzbassEnergo # 6-tp for the national statistics.

Table D1.2.1., MB3 ($SHARE_{ng}$)	Low	Calculated using measurements of coal and natural gas consumption by Novo-Kemerovo CHP Plant. The data will be an abstract from the report of KuzbassEnergo # 6-tp for the national statistics

As explained in Annex 2 Table B2 natural gas boilers efficiency is assumed as 93.9%.

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

>> Operational and management structure that the project operator will implement to monitor emission reductions is as follows:

- monitoring will be carried out by the Khimprom's personnel;
- the person responsible of the whole of the monitoring system and coordination of monitoring activities is Mr. Rusakov A. – Chief Energy Manager; he will be also responsible for annual Monitoring Protocol;
- the person responsible for QA/QC procedures is Mr. Samylin V. – Chief of the Metrology Service ;
- the person responsible for measurements' data collection is Mr. Schastlivtsev A.. – Chief of the Instruments' and Measurements Service (subordinate of Mr. Rusakov);
- The person responsible for data archiving is Ms Kostromina T. – Chief of Producing and Technical Management Department: she will be responsible for getting data from other enterprises (KuzbassRegionGas Ltd., JSC KuzbassEnergo, JSC "Cox").

Data collection

ID number	Data variable	Department responsible
Table 1.2.1, MB1	(HG_{cog}) - heat generation by Khimprom's coke oven gas boilers, TJ	Instruments and Measurements Service
Table 1.2.1, MB2	$SHARE_{coal}$ - share of coal in the fuel mix of N-K Plant	Producing and Technical Management Department
Table 1.2.1, MB3	$SHARE_{ng}$ - share of natural gas in the fuel mix of N-K Plant	Producing and Technical Management Department

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

>> The monitoring plan was developed by Mikhail Rogankov from Ecopolice Ltd. (Moscow) - the Consultant for the project participants hired for the PDD development. Neither the person nor the entity is a project participant listed in Annex 1.
Contact information: tel. +7 495 361 57 22; fax. +7 495 787 8898 (ext. 150). Address: 17 build. 2, Rozhdestvenka Str., Moscow, 103031, Russia.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Table E1–1

	2008	2009	2010	2011	2012
tCO2	0	0	0	0	0

E.2. Estimated leakage:

>> Table E2-1 illustrates possible leakage sources included in or excluded from the project

Table E2-1. Leakage sources

Source	Gas		Justification/ Explanation
1. Energy for coke oven gas transportation from JSC Cox to Khimprom	CO_2	Excluded	Dose not exist because there is no need in coke oven gas compression
	CH_4	Excluded	Negligible compared with CO2
	N_2O	Excluded	Negligible compared with CO2
2. Less energy is needed to transport natural gas to Khimprom	CO_2	Excluded	Short distance from the main gas pipeline and gas distribution station to Khimprom (3 km). Zero leakage is proposed, this is conservative
	CH_4	Excluded	Negligible compared with CO2
	N_2O	Excluded	Negligible compared with CO2
3. Less energy is needed to transport natural gas and coal to N-K CHP Plant	CO_2	Excluded	Short distance from the main gas pipeline and gas distribution station to the plant (3 km) and short distance from local coal mine to the plant (30-50 km); small amounts of coal and gas are reduced., this is conservative.
	CH_4	Excluded	Negligible compared with CO2
	N_2O	Excluded	Negligible compared with CO2
4. Since Novo-Kemerovo CHP Plant will be producing less heat there will be a change in the Plant's efficiency	CO_2	Excluded	Plant's heat production will be reduced by 2.3 % and change in efficiency will be negligible. Zero leakage is proposed.
	CH_4	Excluded	Negligible compared with CO2
	N_2O	Excluded	Negligible compared with CO2

5. Two new coke oven gas boilers will need additional electricity (1.6 mln. kWh/y) for feed water pumping, air fans and flue gas exhausters; At the same time: one or two natural gas boilers in operation will reduce their power consumption because of lower loads; N-K Plant will reduce its self power consumption because heat will be produced by 2.3% less.	CO_2	Excluded	Additional emissions from electricity use by 2 new coke oven gas boilers (approx. 800 tCO2/y) will be compensated (with excess) by the reductions of electricity consumption by Khimprom natural gas boilers and self power consumption that will take place at N-K Plant. For simplification zero leakage is proposed, this is conservative.
	CH_4	Excluded	Negligible compared with CO2 emissions
	N_2O	Excluded	Negligible compared with CO2 emissions

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

>> Since leakages can be neglected: E.1 + E.2 = E.1

Table E3 –1

	2008	2009	2010	2011	2012
tCO_2	0	0	0	0	0

E.4. Estimated baseline emissions:

>> In the ACM 004 methodology the BL emissions are calculated as:

$BE_{electricity,y} = EG_y \,.\, EF_{electricity,y}$

where
EG_y – net quantity of electricity supplied to the manufacturing facility by the project during year y in MWh, and
$EF_{electricity,y}$ – CO2 baseline emission factor (tCO_2/MWh)

In case of this project there are 2 sources that will emit GHGs in the BL scenario (in the zone of fuel substitution by the captive coke oven gas): Khimprom's natural gas boilers and N-K Plant and the formula above should be turned to:

$BE_y = H_{ng,y} \,.\, EF_{ng} + b_{N\text{-}KP,y}\, H_{N\text{-}KP,y} \,.\, EF_{mix,y}$ (TJ) (the same as d1)

where
$EF_{mix,y}$– emission factor for the mix of fuels; calculated as: $EF_{mix,y} = EF_{coal,} \times SHARE_{coal,y} + EF_{ng} \times SHARE_{ng,y}$ (tCO_2/TJ);
$SHARE_{coal,y}$ and $SHARE_{ng,y}$ - shares of coal and gas (of fuel heat in TJ) at N-K plant;
EF_{ng} – IPCC emission factor for natural gas (tCO_2/TJ);

EF_{coal} - IPCC emission factor for coal (tCO_2/TJ);

b_{N-KP} - specific fuel consumption for 1 TJ of heat production at N-K CHP Plant (TJ/TJ);

$H_{N-KP,y}$ – heat import from N-K Plant (TJ);

$H_{ng,y}$ – heat from Khimprom's natural gas boilers in the baseline scenario that will be substituted by the coke oven gas boilers' production; it can be calculated from the equation:

$HG_{cog} = H_{ng} . Eff_{ng} + (H_{N-KP,y} – Losses)$ (TJ), or

$H_{ng} = (HG_{cog} - H_{N-KP,y} + Losses)/ Eff_{ng}$ (TJ),

where

HG_{cog} - heat generated by Khimprom coke oven gas boilers (for calculation can be expressed as: $HG_{cog} = B_{cog} .NCV_{cog} .Eff_{cog}$) (TJ);

Eff_{ng} – efficiency of natural gas boilers (%/100);

$H_{N-KP,y}$ – heat import from N-K Plant (TJ),

Losses – losses in the steam pipeline from N-K Plant (TJ).

Constant numerical values of the formulae's components above can be taken from Annex 2 Table B1 (for convenience they are repeated below); explanations of the assumptions can be found in Annex 2 Table B2.

Data used for the BL (emission reduction) calculations and its sources:

ID No	Data	Figure	Source and explanations
1	Heat import from Novo-Kemerovo CHP Plant in 2008-2012, $H_{N-KP,y}$	300 TJ	Assumption explained in Annex 2 Table B2
2	Share of coal and natural gas in the fuel mix of Novo-Kemerovo CHP Plant, $SHARE_{coal}$, $SHARE_{ng}$	Coal = 84.9% (of fuel heat in TJ) Natural gas =15.1% (of fuel heat in TJ)	2005 figures got from the report by N-K Plant and explained in Annex 2 Table B2
3	Natural gas emission factor, EF_{ng}	56.1 tCO2/TJ	[R1] – IPCC data
4	Coal emission factor, EF_{coal}	94.6 tCO2/TJ	[R1] – IPCC data

5	Efficiency of natural gas boilers at Khimprom, Eff_{ng}	93.9%	From the operational regulations based on boilers' tests
6	Efficiency of coke oven gas boilers, Eff_{cog}	92%	From the operational regulations based on boilers' tests at JSC Cox
7	Losses in the steam pipeline from N-K CHP Plant	33 TJ	Assumption explained in Annex 2 Table B2
8	Projected amount of captive coke oven gas, B_{cog}	$64 . 10^6$ m^3	The main project figure (agreed between Khimprom and JSC Cox).
9	Net calorific value of coke oven gas, NCV_{cog}	$16.76 .10^{-6}$ TJ/m^3	2004-2006 data from JSC Cox
10	Specific fuel consumption for production of 1 TJ of heat at N-K Plant, b_{N-KP}	1.044 TJ/TJ	Assumption explained in Annex 2 Table B2

Using the above values Formula (d1) for the monitoring purpose can be expressed as:

$BE_y = 59.74 (HG_{cog} – 267) + 29629 SHARE_{coal,y} + 17571 SHARE_{ng,y}$ (TJ) (the same as d2),

or for calculation of emissions at the projected volume of coke oven gas:

$BE_y = 59.74 (B_{cog} NCV_{cog} Eff_{cog} – 267) + 29629 SHARE_{coal,y} + 17571 SHARE_{ng,y}$ (TJ) (d3),

where

B_{cog} – consumption of coke oven gas (m^3);

NCV_{cog} - coke oven gas net calorific value (TJ/m3),

Eff_{cog} – efficiency of coke oven gas boilers (%/100),

Table B1-3. Values obtained when applying formula d3

ID No	Data used and algorithm	Unit	2008	2009	2010	2011	2012
1	Projected captive coke oven gas consumption, $B_{cog,}$	m^3	$64 . 10^6$	$64 . 10^6$	$64 . 10^6$	$64 . 10^6$	$64 . 10^6$
2	Coke oven gas net calorific	TJ/m^3	$16.76 .10^{-6}$	$16.76 .10^{-6}$	$16.76 .10^{-6}$	$16.76 . 10^{-6}$	$16.76 . 10^{-6}$

	value, NCV_{cog}						
3	Share of coal in the fuel mix of N-K Plant	-	0.849	0.849	0.849	0.849	0.849
4	Share of natural gas in the fuel mix of N-K Plant	-	0.151	0.151	0.151	0.151	0.151
5	Emission factor for the mix of fuels, EF_{mix}: 94.6 x (3) + 56.1 x (4)	tCO2/ TJ	88.79	88.79	88.79	88.79	88.79
6	Efficiency of coke oven gas boilers, Eff_{cog}	%/100	0.92	0.92	0.92	0.92	0.92
7	BL emissions: formula d3 is applied	tCO2	70811	70811	70811	70811	70811

Estimated baseline emissions:

Table E.4-1

	2008	2009	2010	2011	2012
tCO_2	70811	70811	70811	70811	70811

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

Table E.5-1

	2008	2009	2010	2011	2012
BL, tCO_2	70811	70811	70811	70811	70811
PE, tCO_2	0	0	0	0	0
Emission reduction, tCO_2	70811	70811	70811	70811	70811

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

>>

Year	Estimated project emissions (tonnes of $CO_{2\ eq.}$)	Estimated leakage (tonnes of $CO_{2\ eq.}$)	Estimated BL emissions (tonnes of CO_2 eq.)	Estimated emission reductions (tonnes of CO2 eq.)
2008	0	0	70811	70811
2009	0	0	70811	70811
2010	0	0	70811	70811
2011	0	0	70811	70811
2012	0	0	70811	70811
Total (tonnes of CO2 eq.)	0	0	354055	354055

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 approach for pollutants' emission reductions estimates can be accepted the same as for calculation of GHG emission reductions. The emissions of pollutants at JSC «Cox» from combustion of 64 mln. m^3 of coke oven gas (nitrogen oxides, sulfur dioxide and carbon monoxide) are replaced from one industrial site to another. The amount of captive coke oven gas utilization at Khimprom means savings of natural gas and coal at N-K plant and natural gas at Khimprom. Those savings in its turn mean that:

- NO_x, SO_2, particulates (ash) and solid wastes (ash&slag) will be reduced at N-K plant;
- NO_2 and CO will be reduced at Khimprom.

F.1.1. Ambient Air Protection

The consideration is fully concentrated on the area of fuel substitution by coke oven gas.
Fuel savings can be calculated using the same formulae as in Sections B and D. But for simplification of the assessment it is assumed that coke oven gas boilers and natural gas boilers have the same efficiency (92%) and the heat losses in the pipeline from N-K plant are 8%, i.e. all of the steam sources for Khimprom consumers have the same "efficiency". This assumption will cause a mistake in the results of calculations of 3-4% which we think is acceptable for this very assessment but makes calculations and the monitoring plan very simple.

Energy (fuel) substitution can be described by the equation:

$H_{cog} = H_{ng} + H_{N\text{-}Kpt}$

where
H_{cog} – heat from captive coke oven gas, TJ;
H_{ng} – heat from natural gas at Khimprom, TJ;
$H_{N\text{-}Kp}$ – heat delivered by N-K plant , TJ (assumed as 300 TJ as explained in Annex 2 Table B2).

To calculate fuel savings at N-K plant the following formula is applied:

$B_{N\text{-}Kplant} = 300.b_{N\text{-}Kplant} /0.02933$ (t c.e),

where
$b_{N\text{-}Kplant}$ – specific fuel consumption for 1TJ heat output (TJ/TJ); as explained in Annex 2 Table B2 is assumed 1.044 TJ/TJ as a constant figure;
0.02933 TJ/ t c.e or – calorific value of 1 t c.e.

Thus: $B_{N\text{-}Kplant}$ = 10678 t c.e.

Natural gas consumption by Khimprom ($B_{ng,}$ m3/y):

$B_{ng} = (H_{cog} – 300)/NCV_{ng}$,

where
NCV_{cog} – coke oven gas net calorific value, (TJ/m3); $NCV_{cog} = 34.57.10^{-6}$ TJ/m^3;
Thus:
$B_{ng} = (H_{cog} – 300)/ 34.57.10^{-6}$ (m^3/y).

For the purpose of numerical assessment of pollutants' emission reductions for the project parameters, i.e. 64 mln. m^3 of captive coke oven gas utilization:

- $H_{cog} = 64.10^{-6} . 16.76/10^{-6} = 1073$ TJ/y;
- $B_{N\text{-}Kplant}$ = 10678 t c.e./y;

- B_{ng} = (1073 -300)/ $34.57.10^{-6}$ = $22.4 . 10^6$ m^3/y.
- The fuel balance at N-K plant is accepted the same for the period 2008-2012 as it was in 2005, i.e. $SHARE_{coal}$ = 0.849 (of fuel heat in TJ); $SHARE_{ng}$ = 0.151(of fuel heat in TJ).
- Specific emissions of pollutants ($SE_{N\text{-}Kplant}$) at N-K plant are accepted the same for the period 2008-2012 as they were in 2005 (from the data in the N-K Plant's reports for the national statistics No 2 tp-air and No 6-tp):
  Particulates (ash) = $3.97. 10^{-3}$ t/t c.e.;
  SO_2 = $4.69\ 10^{-3}$ t /t c.e.;
  NO_x = $5.90. 10^{-3}$ t /t c.e.
- Specific emissions (SE_{Kh}) of pollutants at Khimprom are accepted the same for the period 2008-2012 as they were in 2005 (from the data in the Khimprom's reports for the national statistics No 2 tp-air and No 6-tp):
  NO_x = $1.36 . 10^{-3}$ t/1000 m^3;
  CO = $3.65. 10^{-3}$ t/1000 m^3.

The results of calculations are presented in Table F1

Substance and its source	Formula applied	Calculation	Emission reductions, ton
N-K CHP Plant:			
ER_{total} of SO2	$B_{N\text{-}Kplant}$ x $SE_{N\text{-}Kplant,SO2}$	10678 x $4.69. 10^{-3}$	50.0
Reduction of NOx	$B_{N\text{-}Kplant}$ x $SE_{N\text{-}Kplant,NOx}$	10678 x $5.90.10^{-3}$	63.0
Reduction of particulates (ash)	$B_{N\text{-}Kplant}$ x $SE_{N\text{-}Kplant,part}$	10678 x $3.97. 10^{-3}$	42.4
		Total:	165.4
Khimprom natural gas boilers:			
Reduction of NOx	B_{ng} x $SE_{Kh,\ NOx}$	$22.4x10^6$ x $1.36\ 10^{-6}$	30.5
Reduction of CO	B_{ng} x $SE_{Kh,\ CO}$	$22.4x10^6$ x $3.65. 10^{-6}$	81.8
		Total	122.3
Total reductions, ERP_{total} :			267.8

For the purpose of pollutants' emissions monitoring the pollutants' emission reductions (ERP_{total}) are calculated against different values of coke oven gas consumption (B_{cog}) as a linear change (since all of the formulae used above are of the linear type) and presented in Table F2.

Table F2. Pollutants' emission reductions, ER_{total} against coke oven gas consumption, B_{cog} for monitoring.

Coke oven gas consumption, B_{cog} , mln. m^3/y	20	30	40	50	60	70
Pollutants' emission reductions, ERP_{total} , ton	170	192	214	236	258	280

Evaluation of pollutants' concentrations at ground level.
The three enterprises are located in the Zavodskoy district of the city of Kemerovo in immediate proximity one to another.
The calculations for dissipation of pollutants' ground level concentration were fulfilled in accordance with «Methodology of calculating concentrations of pollutants from industrial enterprises in atmospheric air. OND-86» [R8].
All estimated figures for inputs due to combustion of natural gas are insignificant and less than 0.05 MAC (maximum allowable concentration). They will not practically change the existing level of air contamination on the boundary of sanitary-protective zone of Khimprom and the nearest residential area of the city.

F.1.2. Trans-boundary flows at long-range distances

UN Convention "On transboundary flows" and a 7 Protocols on sulfur dioxide and nitrogen oxides emissions, etc. that were signed by Russia refer only to the European territory of Russia while Kemerovo city is in Western Siberia.

Kazakhstan is the nearest country to Kemerovo city (approx. 500 km far). The Khimprom's boilers will emit pollutants through the 60 m stack and the negative effect connected with these emissions will disappear long before the territory of Kazakhstan. As for Novo-Kemerovo CHP Plant with high stacks, the realization of the project, as it is shown above, will result in reductions of sulfur dioxide and nitrogen oxides emissions.

The conclusion is: the project implementation will reduce trans-boundary flows (if they ever take place).

F.1.3. Protection of water basin

The project implementation will result in increasing the water consumption and water drain by the Khimprom's boilers proportionally to the increase of steam generation at these boilers and, hence, the increase of chemical reagents consumption for chemical water treatment. However, zero steam supply from Novo-Kemerovo CHP Plant will result in the proportional reduction of water consumption and water drain at this CHP Plant. Taking into account the energy losses in the 3 km pipeline (approx. 11%) it can be assumed that this reduction even exceeds the increase of water consumption and water drain at Khimprom.

The conclusion is: the project implementation will not result in the additional discharge to water basins in the area.

F.1.4. Waste formation

"Khimprom"

The technological process (combustion of coke and natural gas in boilers) doesn't result in the formation of solid wastes.

JSC «Cox»

Coke oven gas flaring with firing in the open air doesn't result in formation of solid wastes.

Novo-Kemerovo CHP Plant

Reduction of ash&slag ($R_{ash\&slag}$) removal to the deposit at N-K Plant can be calculated as:

$$R_{ash\&slag} = B_{N\text{-}Kplant} \times SHARE_{coal} \times SF_{ash\&slag},$$

where

$B_{N\text{-}Kplant}$ – fuel consumption by N-K Plant, t c.e./y.

$SHARE_{coal}$ - share of coal in the fuel mix (of fuel heat in TJ) at N-K plant (assumed as 2005 figure of 0.849 for 2008-2012);

$SF_{ash\&slag}$ – specific ash&slag formation at N-K Plant (assumed as 2005 figure of $201.6 \cdot 10^{-3}$ t/t c.e. of coal for 2008-2012).

Thus: $R_{ash\&slag} = 10678 \times 0.849 \times 201.6 \cdot 10^{-3} = 1828.6$ ton

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:

>> As shown in Section F.1. the environment will in any case benefit from the project implementation.

SECTION G. Stakeholders' comments

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

>> A list of stakeholders from whom comments on the project have been received, nature of comments, how the comments have been addressed are presented in Table G1-1.

Table G1-1

Stakeholder	Nature of comments	How the comments have been addressed
Administration of the Region	Informative (at the web-site http://www.adm.polenet.ru)	Were not addressed
Administration of the Region Deputy Governor (acting) Mr. V.G Smolego	Positive	Addressed by the PDD developer Ecopolice Ltd.
Journal «Heat Supply in Russia», March 2006, No 3	Informative (an article was published in the journal)	Were not addressed
Mr. Evgeny S. Ivanov, citizen of Kemerovo	Positive (published in the article "The First Portent" in the newspaper "Continent Siberia" of May 2006 No. 18)	Through the journal «Heat Supply in Russia», March 2006, No 3
Kemerovo Energy Saving Center	Positive (published in the article "The First Portent" in the newspaper "Continent Siberia" of May 2006 No. 18)	Through the journal «Heat Supply in Russia», March 2006, No 3

Short information about the project was placed on the official web-site of the Administration of the Region http://www.adm.polenet.ru. (attached in Annex 4). The article entitled «Some industrial enterprises of Kemerovo Region are now undertaking measures to refurbish their capacities». The article informs of the Khimprom project being under development. The core element of the project, utilization of coke oven gas supplied by JSC "Cox", is mentioned.

On the request of the PDD developer «Ecopolice Ltd.» to the Administration of the Kemerovo Region towards the Khimprom project Deputy Governor (acting) Mr V.G Smolego gave a positive endorsement of the project (quoted):

" With regard to the project of utilization of the coke oven gas provided by JSC "Cox" to the boiler-house of OOO PO "Khimprom" our position is as follows.

Utilization of coke oven gas as a fuel for the boilers is a vital issue in the Kuzbass region which can be solved by the switch of the traditional boilers' fuel (pulverized coal or natural gas) to coke oven gas.

In 2002 boiler No. 4 of Kemerovo TPP was refurbished which provided annual saving of 130 000 tons of coal, coke oven gas was utilized instead of its flaring in the open air.

The total volume of the utilized coke oven gas supplied by JSC Cox to the boilers No. 2, 3, 4 at the Kemerovo TPP exceeds 300 million cubic meters per year.

The realization of the project of utilization of coke oven gas at the boiler-house of OOO PO Khimprom will mean additional utilization of 64 million cubic meters per year and provision of stable heat supply of the facilities as well as resources-saving and ecological effects. Therefore we think it reasonable to realize this Joint Implementation project, the pioneer experience for our region".

Since the design documentation of the extension of existing Khimprom's boiler house with 2 coke oven gas boilers is under development it hasn't been yet submitted to the Regional Committee of Natural Resources of the Ministry of Natural Resources of Russia (which is the official state entity responsible for environmental expertise of projects and for issuing permits for emissions). In 2003 Khimprom got the Committee's approval for the project of constructing 2 coke oven gas and 1 natural gas boilers at Khimprom (at that time there were no own steam sources at Khimprom). The conclusion was that the contamination of atmosphere at the ground level in living areas caused by the emissions from the new boiler-house will not be higher than 5% of permissive harmful gases' concentrations

(clean air standards). Another aspect was pointed out that the new boiler-house at Khimprom will use waste coke oven gas from JSC "Cox" and the flare gas emissions will be just displaced to Khimprom's boilers not changing environmental impact. Clean air standards and environmental regulations were not changed since 2003 and it can be expected that this project will get an approval from the Committee. A beneficial reason for that is that the project implementation will lead to emission reductions of traditional substances (SO2, NOx and ash) at Novo-Kemerovo CHP Plant.

An article about the development of the JI project was published in a journal «Heat Supply in Russia», March 2006, No 3 (attached in Annex 4) that describes the NEFCO site visit to Khimprom and negotiations held. The journal was distributed in Kemerovo and there is a reply from a local citizen Mr. Evgeny S. Ivanov. It is published in the article "The First Portent" in the newspaper "Continent Siberia" of May 2006 No. 18 (attached in Annex 4). The latter also includes the positive attitude of the Kemerovo Energy Saving Center (which co-ordinates business appropriate activities in the Region) towards both the Khimprom project and JI initiatives.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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Annex 2

BASELINE INFORMATION

Table B1. Data used for the BL calculations and its sources

ID No	Data	Figure	Source and explanations
1	Heat import from Novo-Kemerovo CHP Plant in 2008-2012, $H_{N-KP,y}$	300 TJ/y	Assumption explained in Annex 2 Table B2
2	Share of coal and natural gas in the fuel mix of Novo-Kemerovo CHP Plant, SHARE	Coal = 84.9% (of fuel heat in TJ) Natural gas =15.1% (of fuel heat in TJ)	2005 figures got from the report by N-K Plant and explained in Annex 2 Table B2
3	Natural gas emission factor, EF_{ng}	56.1 tCO2/TJ	[R1] – IPCC data
4.	Coal emission factor, EF_{coal}	94.6 tCO2/TJ	[R1] – IPCC data
5.	Efficiency of natural gas boilers at Khimprom, Eff_{ng}	93.9%	From the operational regulations based on boilers' tests
6.	Efficiency of coke oven gas boilers, Eff_{cog}	92%	From the operational regulations based on boilers' tests at JSC Cox
7	Losses in the steam pipeline from N-K CHP Plant, Losses	33 TJ/y	Assumption explained in Annex 2 Table B2
8	Amount of captive coke oven gas, B_{cog}	64 mln. m3/y	The main project figure (agreed between Khimprom and JSC Cox).
9	Net calorific value of coke oven gas, NCV_{cog}	$16.76 . 10^{-6}$ TJ/m3	2004-2006 data from JSC Cox
10	Specific fuel consumption for production of 1 TJ of heat at N-K Plant, b_{N-KP}	1.044 TJ/TJ	Assumption explained in Annex 2 Table B2

Table B2. Assumptions of the key data for the BL calculations

Key data	Explanations of assumptions
Heat imported from Novo-Kemerovo CHP Plant, $H_{N-KP,y}$	Steam imported from N-K Plant can range from 10 t/h (or 23 GJ/h) to 27.9 t/h (65 GJ/h), the maximum figure is indicated in the 2006 contract between Khimprom and the regional power utility JSC «KuzbassEnergo». Minimum amount is the technical limit below which losses in the 3 km pipeline increases over 12% and lower steam parameters do not meet requirements of chemical technologies. Though steam from Khimprom's own boilers are 2 times cheaper than purchased from N-K Plant at the time being, Khimprom cannot refuse from the imported steam. Khimprom boilers' capacities are not enough to carry the demanded load the whole year through, besides their steam parameters for certain extent are dependent of the load while 2.4 MPa steam is needed for some chemical technologies. General intention is to minimize steam import. In 2004 it was 340 TJ and in 2005 - 307 TJ. 3 months of 2006 show the increase of imported heat by 16% as compared with the same period of 2005. As declared by Khimprom executives figure of 2005 steam import is optimal from the point of view of providing chemicals production technologies with 2.4 MPa steam, operation of 3 km pipeline and synchronization with Khimprom boilers' steam generation. Using conservative approach the imported heat from N-K Plant is assumed as 300 TJ/y for the period 2008-2012.
Share of coal and natural gas in the fuel mix of Novo-Kemerovo CHP Plant, SHARE	Share of coal/natural gas in the fuel mix at N-K Plant in 2003, 2004 and 2005 was 76.6:23.4%, 87.1:13.9% and 84.9:15/1% (of fuel heat in TJ). This data is taken from the official reports for national statistics # 6-tp "Fuel use" by JSC «KuzbassEnergo». Natural gas was used by the plant for start-up operations,

	and support of coal firing. A bit of gas was also available for the plant in summer time when there is a surplus of this fuel in the region. The general policy of the Regional Administration is to use as much coal as possible because Kemerovo Region is a coal producing region and its economy very much depends on coal production and use. Besides price for coal is 1.5 times lower than for natural gas and the difference between coal and gas prices will grow in the coming 10 years [R2]. In the coming 5-7 years the plant is going to consume less natural gas (just for start-up operations), gas share may reach 10%. Using conservative approach, 2005 figures of 84.9% and 15.1% are assumed for calculations of emissions in the BL scenario in 2008-2012.
Efficiency of natural gas boilers at Khimprom, Eff_{ng}	Each boiler has individual operational regulations (the so called "regime instructions") where the boiler efficiency is indicated based on tests. At Khimprom boiler # 1 efficiency varies from 92.7 to 93.4% depending on the load, # 2 - from 93.4 to 94.0% and # 3 - from 93.4 to 94.46% (higher levels refer to medium boiler loads). The average figure for medium loads characteristic of boilers' operation in the BL scenario is assumed as 93.9%.
Efficiency of coke oven gas boilers, Eff_{cog}	Each boiler has individual operational regulations (the so called "regime instructions") where the boiler efficiency is indicated based on tests. At JSC Cox where the same boilers as projected for Khimprom are in a long term operation boilers' efficiency vary from 90.6% to 92.4% depending on the load. Since these boilers will be run at maximum loads the figure of 92% is assumed.
Losses in the steam pipeline from N-K CHP Plant, Losses	Data from Khimprom. Losses vary from 6.7% for large amounts of steam to 12.6% for small amounts. In the BL scenario minimum steam supply is assumed (300 TJ/y). The figure of 11% (33 TJ) of losses will correspond to this supply.
Net calorific value of coke oven gas, NCVcog	NCVcog = $16.76 .10^{-6}$ TJ/m3 is the actual figure of 2005 and 2006 got from JSC "Cox".
Specific fuel consumption for 1 TJ of heat production at N-K CHP Plant, b_{N-KP}	It was in the range of 1.044-1.047 TJ/TJ in the last 3 years and it can't dramatically change for lower values in the future (theoretical minimum is 1 TJ/TJ); this figure is assumed as minimal from the above range (b_{N-KP} = 1.044 TJ/TJ) and this is conservative. It is also assumed constant for simplification of emission reductions assessment and monitoring. The possible error of such an assumption is less than 1%.

Annex 3

MONITORING PLAN

ID number	Data variable	Unit	Measured/calculated as/received from	Value in the year **y**
Project activity – no need to be monitored				
Baseline scenario				
Table D1.2.1 MB1	Heat output from Khimprom's coke oven gas boilers, HG_{cog}	TJ	Measured directly at Khimprom's coke oven gas boilers	
Table D1.2.1 MB2	Share of coal (of fuel heat in TJ) in the fuel mix of N-K Plant, $SHARE_{coal}$	-	Got from N-K Plant's report No 6 tp	
Table D1.2.1 MB3	Share of natural gas (of fuel heat in TJ) in the fuel mix of N-K Plant, $SHARE_{ng}$	-	Got from N-K Plant's report No 6 tp	
BE	Baseline emissions (BE) calculated by formula (d3): $BE_y = 59.74 \times (HG_{cog,y} - 267) + 29629 \times SHARE_{coal,y} + 17571 \times SHARE_{ng,y}$	tCO2	Calculated as: 59.74(MB1 – 267) + +29629 x MB2 + + 17571 x MB3	
ER	Emission reductions	tCO2	ER = BE	

Table D1.4-2. Monitoring Plan for pollutants' emission reductions in 20__.

Data variable	Unit	Value in the year y
Coke oven gas consumption	mln. m^3/y	
Pollutants' emission reductions, ERP_{total}: (to be taken from Table F2 of Section F repeated below)	ton/y	

Table F2. Pollutants' emission reductions (ERP_{total}) against coke oven gas consumption (B_{cog}) for monitoring.

Coke oven gas consumption, B_{cog} , mln. m^3/y	20	30	40	50	60	70
Pollutants' emission reductions, ERP_{total} , ton	170	192	214	236	258	280

For intermediate values of B_{cog} ERP_{total} must be calculated by interpolation.

Annex 4

Auxiliary materials, documents and calculations

Section A. General description of the project

Translation of the "Agreement on the Purchase of Coke Oven Gas" between JSC "Cox" and OOO PO "Khimprom" of 30.08.2006 No 35-3/06-04 can be found below and the scanned original is attached in a separate file.

Translation

Agreement
on the Purchase of Coke Oven Gas

The city of Kemerovo 30.08.2006 No 35-3/06-04

Kemerovo JSC "Cox" named hereinafter as the Supplier represented by the Managing Director Mr. Diakov N.S. acting under a power of attorney No 57K/06-03/49 of 15.03.06 as one Party and OOO PO Khimprom named hereinafter as the Consumer represented by the General Director Mr. Kazantsev I.Y. acting under Regulations as the other Party has concluded the following Agreement on the following.

The Supplier and the Consumer under this Agreement states that potentials of both parties make it possible to establish a long-term and profitable cooperation in the supply and consumption of coke oven gas.

1. The Supplier shall supply waste coke oven gas and the Consumer shall accept it for firing in boilers in the amounts that will be agreed each quarter by both parties and fixed in the extensional agreements as Annexes to this Agreement not later than 15 days before the beginning of each quarter. The targeted amount of coke oven gas will be 64 mln. m^3 per year.
2. The account of the supplied coke oven gas shall be conducted by the gas meter unit belonging to the Consumer and sited at the Supplier's territory.
3. The coke oven gas meter shall be tested by the state metrological service (inspection) in accordance with the methodology MI 2240-2000 for testing of such instruments. The results of such testing will be stated in protocols signed by the Supplier, the Consumer and the state metrological service representatives.

Final calculation of delivered/consumed coke oven gas shall be made by summarizing of accounts on daily basis, gas pressure, temperature and density shall be taken into account. Revision of the gas meter shall be made by the Consumer in the presence of the representative of the Supplier, a protocol shall be conducted for the results of revision of linier parameters of the unit.

Periodicity of such revisions shall be the same as intervals between such tests for the meters as stated in technical certificates of the instruments.

4. The amount of coke oven gas shall be calculated to 20^0 C and 760 mm hg column.
5. The quality of coke oven gas shall meet the requirements of TU 147-48-79 (with the amendment No 8).

The coke oven gas component composition will be: CO=6-10%, H_2 = 52-60%; CH_4 = 22-26%, N_2 = 3-6%, H_2S =0.27%, C_nH_m = 1.5-3.2%, CO_2 = 2-4%, NH_4 up to 0.03 gr/m^3, CNH up to 0.5%, benzene hydrogen carbons not more than 10 gr/m^3. Periodicity of chromatographic tests and exchange of the results will be: benzene and toluene content - daily, methane, ethane and propane content – monthly with the agreement of the date of parallel analysis by the Khimprom's laboratory.

6. Coke oven gas pressure at the gas pipeline border Supplier-Consumer shall be provided by the Supplier stable, not higher than 1300 mm water column and not lower than 1000 mm water column with the deviation not more than 10%.
7. In case there appears the necessity from the Supplier or the Consumer to change the amount of supplied/delivered coke oven gas they will deal through the shift chief and the plant's dispatcher defining the concrete quantity of such a change.
8. The quantity of the delivered coke oven gas in the previous month will be defined by the Supplier on the first day of the next month by summarizing daily amounts got on the basis of the measurements by commercial gas meters.

Calculated as mentioned the monthly quantity of the consumed coke oven gas is the background for payments.

Protocol of the consent of the delivered/consumed gas for the previous month shall be signed by the representatives of the technical services of the Supplier and the Consumer not later than by the second working day after the month under consideration.

9. Payments for the consumed coke oven gas shall be made before the end of the current month to the bank account of the Supplier or in case there is a debt from the Supplier to the Consumer by counting it as payment of the debt.

10. The supplier shall daily inform the Consumer of the quantity of the delivered coke oven gas calculated on the basis on measurements, the results shall be submitted to the technical service of the Consumer on the telephone number 57 03 38 before 1 p.m.

11. The price for the coke oven gas and the way it will be changed will be defined in the additional (extensional) agreements that will be inalienable part of this Agreement. The price of the coke oven gas will include all of the gains that can be got from the gas use.

12. As for the rest that is not covered by this Agreement the Parties will use the civil laws of the Russian Federation.

13. The Agreement has been conducted in two originals, one for each Party, and entered into force from the date it is signed till 31 December 2012. The Agreement will be considered as prolonged for the next calendar year on the same terms if only one of the Parties does not declare of the need to cease or alter it or to conclude the new agreement one month before its expiration.

14. All the disagreements issuing from the execution of this Agreement will be the matter of arbitration in the court of the Kemerovo Region.

15. Additions and amendments to this Agreement will be accepted by additional (extension) agreements signed by both Parties.

Addresses and bank accounts of the Supplier and the Consumer: …….

Signed by
Supplier: … Mr. Diakov S.N. Consumer: … Mr Kazantsev I.Y.

Seal of JSC Cox Seal of OOO PO Khimprom

Section B. Setting of the baseline

Annex 4, Table A2. Heat consumption by main chemicals' produced in 2005.

Chemical product	Heat consumption per 1 t of the product, TJ/1000 t	Volume of the chemical produced in 2005, tonne	Heat consumption for just technology* in 2005, TJ	%% of facility's capacity used in 2005
Liquid chloride	2.5-2.9	23556	59.7	52.3
Caustic soda	16.0-17.0	42669	731.0 (83.1%)	94.8
Ethilcellozolve	23.0	2384	54.8	22.4
14 other chemicals			33.9	

Total amount: 879.4 (100%)

* Without heat for general buildings' heating and hot water supply for people's needs.

Section B2 (additionality test)

Scanned copy of the letter from Sibconcord of 01.02.2006 No 53 and its translation is attached in a separate file.

Section D. Setting of the Monitoring Plan

JSC "KuzbassRegionGas" (natural gas supplier) and OOO PO "Khimprom" monthly sign Statements on acceptance-and-turn over of natural gas. Each contains daily gas supply data and average over the month net calorific value. One of such statements (scanned original) is attached in a separate file.

Section G. Stakeholders' Comments

Attached in a separate file are scanned:

- Copy of the information from the web-site of Kemerovo Administration
- Copy of reply from Mr. Smolego, Acting Deputy Governor of the Kemerovo region on the Khimprom project
- Copy of the article in the journal «Heat Supply in Russia», March 2006, No 3
- Copy of the article “The First Portent” in the newspaper “Continent Siberia” of May 2006 No. 18.

References [R]

[R1] Revision of the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (2006 IPCC Guidelines).

[R2] Energy Strategy of Russia by 2020.

[R3] Project Design "Boiler House with 2 Coke Oven Gas Boilers and One Natural Gas Boiler» (Khimprom, 2002)

[R4] Delyagin G.N., Lebedev V.I. and Permiakov B.A. Heat Generating Installations. Moscow. "Stroyizdat". 1986.

[R5] Methodological Instructions for Calculation of Emissions into Atmosphere from Steam Boilers of Capacities 30 t/h and Less. Hydrometeoizdat. 1996. M.

[R6] RD 34.02.305-98 "Methodology of Calculation of Emissions into Atmosphere from Power Plants' Boilers".

[R7] "Tool for the demonstration and assessment of additionality" (Version 02 of 20 Nov. 2005, CDM - Executive Board)

[R8] «Methodology of calculating the concentration in atmospheric air of pollutants from industrial enterprises. OND-86» Hydrometeoizdat, 1986, M.

[R9] "Good Practice Guidance and Uncertainty Management in the National GHG Inventories" (GPG 2000) . IPCC. 2001

Abbreviations

BL - baseline

CHP - combined heat and power

cog - coke oven gas

GHG - greenhouse gas

IPCC - Intergovernmental Panel on climate change

NCV - net calorific value of a fuel

ng - natural gas

N-K plant - Novo-Kemerovo CHP Plant

RUR - rubles of the Russian Federation

t.c.e. - ton of coal equivalent
t.o.e. - ton of oil equivalent