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

"Reconstruction of Kramatorsk heat and power plant"

CONTENTS

SECTION A. General description of the project

A.1. Title of the project:

"Reconstruction of Kramatorsk heat and power plant"

PDD Version: 2.2, dated 28/08/2009

A.2. Description of the project:

Currently, Kramatorsk heat and power plant (HPP) with installed electrical capacity of 150 MW provides heat and electric power to the largest industrial consumers as well as population of Kramatorsk. It was constructed as coal-fired and natural gas-fired heat and power plant. The volume of generated electric power in 2007 was 205 490 MWh, heat power – 536 169 Gcal.

Kramatorsk HPP supplies heat to the consumers in the form of hot water through the system of heat supply network as well as in the form of steam by the steam pipeline to JSC "Novokramatorsk machine-building plant". Today HPP works against direct contracts with consumers, and main electric and heat power consumers are the enterprises of the town. Electric power supply to the grid (United Energy System / UES) of Ukraine has begun since the 1st of October 2007. Produced electricity is transmitted via 110 kV lines to the national power market and also via the main distribution unit GRU-6 kV to JSC "Donetskoblenergo", JSC "Novokramatorsk machine-building plant" and other consumers.

The main goal of Joint implementation project "Reconstruction of Kramatorsk heat and power plant" is implementation of measures which will improve fuel consumption efficiency and will reduce own consumption of electric power by the plant, therefore resulting in GHG emissions reduction to the atmosphere.

The project foresees large-scale reconstruction of existing equipment of Kramatorsk HPP. The program of reconstruction of Kramatorsk HPP within Joint implementation includes the following measures:

- Reconstruction of boilers № 7, 9;
- Reconstruction of turbines № 3, 4;
- Reconstruction of cooling tower № 1;
- Frequency controllers' installation;
- Feeding pump replacement №5;
- Hydraulic ash removal modernization;

In addition to this, rehabilitation of district heating system in Kramatorsk is foreseen within JI project. It includes:

- Replacement of old heat pipelines which supply consumers with heat power generated at HPP by new pre-insulated pipes in polyurethane foam cover and pipes with lagging from mineral cotton;
- Replacement of 200 capacitive heat exchangers by plate heat exchangers at substations of the town;
- Major rehabilitation of boiler-rooms with replacement of pipes and valves.

As the result of reconstruction the efficiency of Kramatorsk HPP equipment will increase from 56% of gross efficiency (combined heat and electric capacity with the use of natural gas) to approximately 78% of efficiency with the use of natural gas and 65% of efficiency – with the use of coal. The

increase of the equipment efficiency will lead to reduction of the level of fuel consumption. As far as natural gas is more expensive compared to coal, it is considered that fuel savings are to be completely savings of natural gas. This is conservative assumption. Besides, the reduction of own electric power consumption will allow increasing supply of electricity into the grid therefore contributing to additional emission reductions.

The project with the total investment costs over 67 million UAH will give the following benefits:

- Positive effect on the environment;
- Improvement of technical and economic indicators of work of HPP;
- Positive social effect.

Therefore, project implementation will be economically and socially beneficial.

Positive aspects of social and economic effect from the project implementation:

-The national grid of Ukraine and industrial consumers of Kramatorsk are expected to benefit from increased of reliability of power supply by the Kramatorsk HPP;

- Local community and employees of Kramatorsk HPP will benefit from the jobs available on long term prospective due to more reliable work of the enterprise in future*;*

- The industrial and residential consumers of Kramatorsk who will receive a better quality heat supply service.

Positive aspects of project effect on the environment of Kramatorsk:
-as a result of project implementation the amount of fossil fuel (valuable non-renewable source of energy) will be reduced at the process of heat and power energy generation;
- project implementation will reduce greenhouse and toxic gases emissions (carbon dioxide, nitric oxide and carbon monoxide) and prevent further GHG accumulation at the atmosphere what in its turn causes climate change.

A.3. Project participants:

Party involved	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Ukraine (Host Party)	«Kramatorskteploenergo» LLC	No
Ukraine (Host Party)	CJSC "ContourGlobal Ukraine"	No
United Kingdom of Great Britain and Northern Ireland (Investor Party)	ContourGlobal Solutions (Northern Ireland) Ltd	No
Germany	GreenStream Network GmbH	No

1) "Kramatorskteploenergo" LLC

"Kramatorskteploenergo" LLC is the project owner. "Kramatorskteploenergo" LLC was founded with direct participation of the City government because HPP is a communal property. 40% of company's shares belong to the city and 60% - to "Hamachi Limited", the subsidiary of ContourGlobal.

«Kramatorskteploenergo» LLC was founded on 01.01.2007. Since then the following activities have been done by the new owners:
- executed the analysis of existing economic activities of the enterprise,
- developed the short-term and long-term development strategy;
- indentified the priority task for modernization and maintenance of main equipment.

HPP of Kramatorsk heavy machine tool building was commissioned in 1937. The installed capacity of HPP was 25 MW. During the World War II the equipment was partially relocated from the town. During the war the main buildings and constructions were damaged. HPP was renovated after the War.
1954-1957 – the construction of the second stage of HPP. The installed capacity was 50 MW.
1972-1978 - the construction of the third stage of Kramatorsk HPP with increase of installed capacity to 150 MW.

During the period of economic depression during 1994 -1999 there was annual decrease of heat and power production by the power plant. However, since 2000 HPP has been providing stable annual power and heat production of 230 GWh and 500 thousand Gcal, respectively

2) CJSC "ContourGlobal Ukraine"

ContourGlobal is a private US company, which develops, acquires and operates electric power businesses. The company focuses upon high-growth markets with high cost price of power generation

and lack of reliable generating capacity. The company works in innovative niches within developed markets, such as renewable energy sources and combined heat and power generation.

ContourGlobal was founded in 2005 by the Chief Executive Officer Joseph Brandt and Reservoir Capital Group, a $3 billion fund based in New York. Harry Levsley holds the position of Executive Vice-President in the Eastern European countries and CIS.

The portfolio of ContourGlobal currently consists of eight businesses on four continents with approximately 1,000 megawatts of installed capacity:

"KramatorskTeploEnergo", HPP with 150 MW of installed capacity, Ukraine;

Compressor station "Bohorodchany", 25 MW steam turbine power plant using waste heat for electricity generation, the project in under development in Ukraine;

Santa Cruz, 222 MW run-of-river hydroelectric Plants, Brazil;

Sochagota, 165 MW coal-fired power plant, Colombia;

100 MW power generation plant using natural gas, Togo, Africa

PowerMinn, 62,5 MW *turkey-manure-fueled Power Plant*, USA

Lake Kivu, 100 MW methane gas-fired power station, Rwanda, Africa

ContourGlobal Solutions, Europe and Africa. The cogeneration units' introduction for international industrial and drink production corporations.

In Ukraine ContourGlobal owns the control stake in and operates the Kramatorsk HPP. From 2007 to 2008 the company has invested approximately US $ 20 million into the reconstruction and modernization of boilers and other main HPP equipment. As a result of implemented reconstruction natural gas consumption has been reduced in 2 times to compare with 2007 (actual natural gas consumption in 2007 was 129 mln .m3, the expected consumption in 2009 – 59 mln. m3). The heating season in 2008-2009 in Kramatorsk passed without failures due to involved investor's funds.

The power project Bogorodchany includes the construction of new power plant which will use waste heat of gas compressor station Bogorodchany. The plant uses exhaust heat from the Bogorodchany KC21 compressor station on the Soyuz natural gas pipeline that transports Russian and Central Asian natural gas through Ukraine to Western Europe. The project cost is approximately $90 million, but the project financing is delayed because of current macroeconomic situation. The project envisages electric power generation from waste heat not used at the moment, which is high effective energy saving technology.

On January 2008 the *Coca-Cola* Hellenic Bottling Company SA and ContourGlobal, are launching a major *industrial emissions reduction initiative* in Europe with plans to install a total of 15 combined heat and power plants at bottling facilities in 12 countries, including Ukraine (Kyiv region).
ContourGlobal also has an active pipeline of new development business with 10,000 megawatt total capacity.

3) GreenStream Network (GSN) is the group of companies with approximately 60 employees, having its offices in Germany, Finland, Lithuania, Norway, Sweden, Estonia and China. The main offices are located in Finland (Helsinki) and Germany (Hamburg). GSN proposes advisory, brokerage, financial services in field of renewable energy, emissions trading by such schemes as EU ETS and GHG emission abatement projects as JI, CDM, voluntary standards.

GreenStream is a member of the International Emissions Trading Association (IETA), Renewable Energy Certification System (RECS) and registered member of exchange by EU allowances Powernext Carbon located in Paris.

The key GSN staff has extensive experience in field of energy markets, emissions trading, green certificates, JI/CDM project development and advisory services.

GSN's staff members have been involved, inter alia, in one of the first transatlantic CO2 trades, in the first EU emission allowance trade between Nordic companies, in the first JI and CDM projects developed by Nordic governments, in the establishment of some of the first energy companies in the Baltic States' liberalized energy markets and in numerous advisory assignments for energy and industrial enterprises as well as public organizations. GSN has closely followed the key JI and CDM countries' climate policies and the developments of the carbon markets, e.g. through the IETA (activities in several working groups) and BALTREL cooperation (e.g. chairmanship of the Task Force on JI), the World Bank (cooperation on marketing the CDM-fund Community Development Carbon Fund to companies in Northern Europe) and NEFCO (cooperation on preparing documentation for and launching the JI-fund Testing Ground Facility to companies).

A.4. Technical description of the project:

A.4.1. Location of the project:

The Project is located in Kramatorsk of Donetsk Region in the Eastern part of Ukraine (**Figure 1**).

Figure. 1. The map of Ukraine with neighboring countries

A.4.1.1. Host Party(ies):

Ukraine.

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

Donetsk Region.

Donetsk region is located in the South-Eastern part of Ukraine. Its territory is 26500 km^2. Donetsk region's climate is mostly continental, which is characterized by hot summers and relatively cold winters with changeable snow surfaces.

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

Kramatorsk town, Donetsk Region .

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

Kramatorsk HPP is located in the town of Kramatorsk.

Kramatorsk is the town of regional subordination in Donetsk region. It is located in the Northern part of the region on the river of Kazenniy Torets (tributary of the Siverskiy Donets).

Kramatorsk is one of the important centers of the region, the main industry sectors of which are machinery construction, metallurgic industry, construction materials' production, etc. The town's population is approximately 250 000 people.

Kramatorsk HPP is the main producer of heat and power in the town. Heat from Kramatorsk HPP is consumed by 528 residential buildings and 168 enterprises of various ownership.

Total length of heat distribution network in 2-pipe dimension is 104.9 km, the number of central substations is 7. Total heating area is approximately 2 mln. m^2. The number of residents which consume heat from Kramatorsk HPP is 60 000 people. Heat is also supplied to commercial, state and industrial consumers.

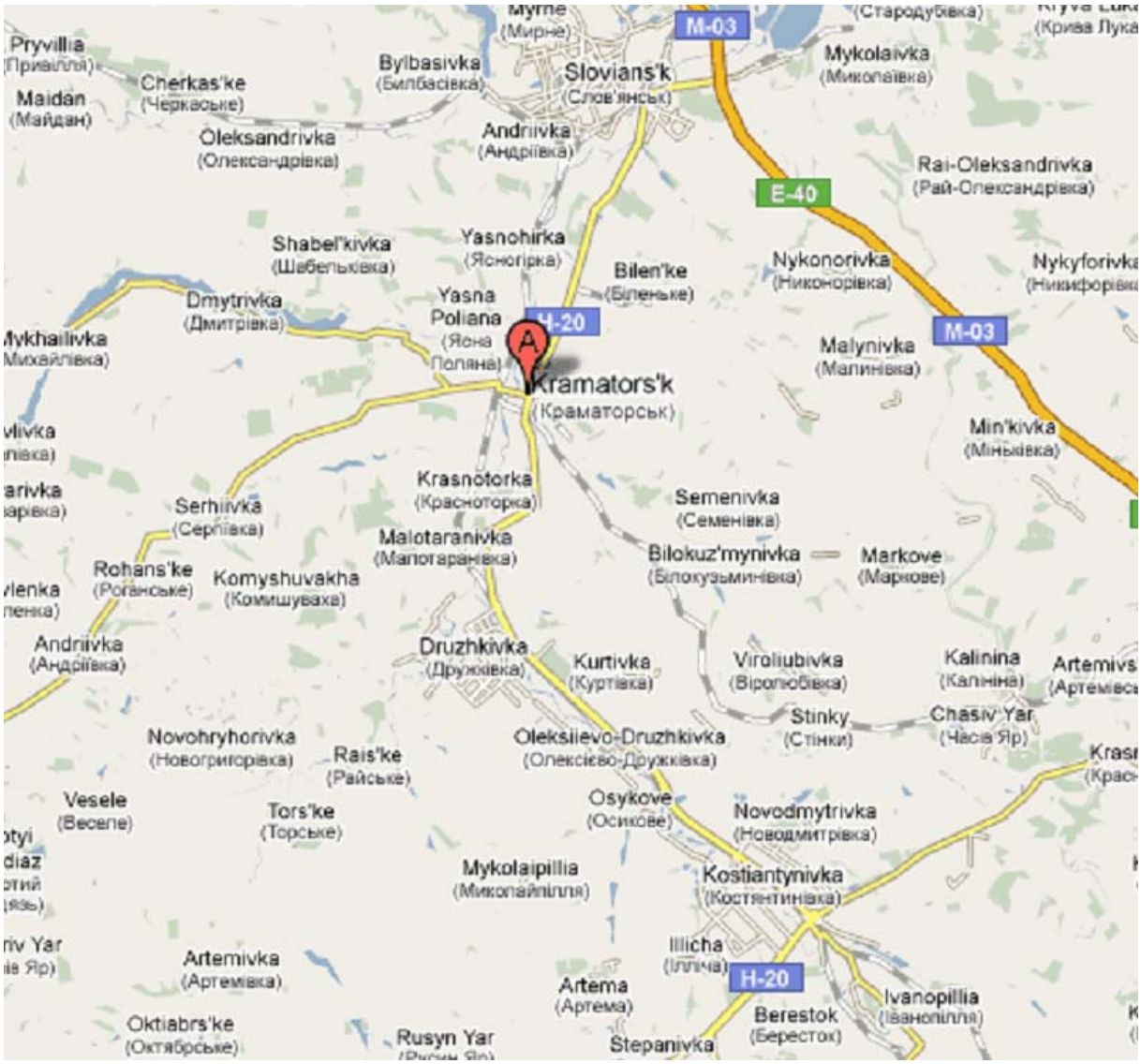


Figure 2. Location of the town of Kramatorsk where the project will be implemented

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

Currently there are three cogeneration turbines at Kramatorsk HPP: turbine № 2 of the type PTR-30-90/13 with installed capacity of 30 MW; turbines №3 and №4 of the type PTR-60-90/13 with installed capacity of 60 MW each. Turbine №2 has been commissioned in 1955; turbines № 3 and № 4 – in 1973 and 1976 respectively. At the moment turbine № 2 has been mothballed and is not used for electric power generation.

There are 8 steam boilers at Kramatorsk HPP, 6 of which are under operation: 2 boilers of type TP-170 (boilers №4 and №5) as well as 4 boilers of the type BKZ-160-100 PT (boilers №№ 6, 7, 8 and 9).

Currently the boilers of the type LMZ (TKZ) 90/100 (№2 and 3) are mothballed. Steam boilers which are under operation are connected to the steam pipelines where the steam is distributed and supplied further to the turbines.

Current state of Kramatorsk HPP equipment is satisfactory and allows operation at least till 2017 inclusive, subject to scheduled repairs and timely technical maintenance.
The scheduled measures will improve the efficiency of fuel consumption and reduce own power consumption.

1) Reconstruction of turbine PT-60-90/13, station №3

Heating steam turbine PT-60-90/13 has nominal capacity of 60 MW. It was commissioned in 1973. The project foresees modernization the turbine's condensor. This measure implementation will reduce the pressure of exhausted steam of turbine by 0.01 kgf/cm^2. These measures will provide reduction of fuel consumption by 1192 tons of standard fuel[1] per year.

2) Reconstruction of turbine PT-60-90/13, station №4

Heating steam turbine PT-60-90/13 has nominal capacity of 60 MW. It was commissioned in 1976. The project foresees replacement of control valves. Fuel saving after modernization of turbine will be 1166.5 tons of standard fuel per year (due to achieving of project parameters of steam distribution system).

3) Reconstruction of BKZ-160-100-PT boiler, station № 7

Currently the BKZ -160-100-PT № 7 boiler is using mixed fuel as the primary fuel (coal and gas spot lightning) with 76% efficiency. At the moment heavy fuel combustion in the boiler is not possible due to the technical state of the furnace cell's heating surface. It would be possible only if a major reconstruction is done. After the rehabilitation works the efficicency of boiler № 7 will increase to 85% in case of hard fuel combustion, Heating insulation of the boiler's gasproof furnace will be replaced as one of the measures of rehabilitation.
Annual fuel savings achieved after the reconstruction will be 9161 t of standard fuel.

[1] Standard fuel or coal equivalent is the energy unit widely used in the former USSR states. 1 ton of standard fuel equals 7 000 kcal.

4) Reconstruction of BKZ-160-100-PT boiler, station №9

Currently the BKZ -160-100-PT № 7 boiler is using mixed fuel as the primary fuel (coal and gas spot lightning) with 76% efficiency. At the moment heavy fuel combustion in the boiler is not possible due to the technical state of the furnace cell's heating surface. It would be possible only if a major reconstruction is done. After the rehabilitation works the efficicency of boiler № 7 will increase to 85% in case of hard fuel combustion. Heating insulation of the boiler's gasproof furnace will be replaced as one of the measures of rehabilitation.

Annual fuel savings achieved after the reconstruction will be 7480.5 t of standard fuel.

5) Reconstruction of cooling tower №1

The hot water from cooling equipment flows to water-cooling tower by the pipelines. The system of circulating water supply of Kramatorsk HPP is reverse with two cooling towers (№1, 2). The area of irrigation is 1600 m^2. Cooling tower has been commissioned in 1975. Today the cooling tower is under reconstruction. The existing cooling tower №2 can serve the needs of the power plant until at least 2017. Reconstruction of the cooling tower №1 will allow reduction of temperature of cooled water at the exit from cooling tower with the similar other conditions by 4-5 ^{0}C.

Use of cooling tower №1 will allow operating with load regimes similar to nominal – 40 MW during the summer period. The operation in this regime is more economically efficient by 4-5% than with the existing regime with loading 20-25 MW when cooling capacities of cooling tower №2 are utilized. Fuel savings will be 1519 tons of standard fuel per year.

6) Replacement of feeding electric pump, station №5 PE-150-145-2

The feeding pump #5 (similarly to the feeding pumps ## 6, 7, 8, 9) takes water from the plant's water collectors – the absorbing collector (6 kgf/cm2) and pumping collector (150 kgf/cm2). Electricity is supplied to the feeding pump from the distribution equipment of the main distribution unit, and from the 6 kV distribution units which are used for the plant's own needs.

The replacement of feeding pump reduces electricity consumption. During the winter period two pumps PE-270-150 consume the total capacity of 2650 kWh; in case if one PE-270-150 or one PE-150-145 device is in operation, the total consumed capacity is 2075 kWh. In 2006 according to the annual power plant report the operational time of pumps in the single pump regime was 2400 hours. During the summer the pump PE-270-250 consumes total capacity of 1450 kWh, PE-150-145 consumes the capacity of 825 kWh. Annual operational period, taking into account maintenance stops, is 4200 hours. During the summer period electricity savings are expected to be 2002 MWh.

7) Modernization of hydraulic ash removal

As a result of modernization, 4 km-long pipeline (325 mm width) will be constructed replacing the existing dredging pump. Power savings constitute 3894 MWh per year.

8) Rehabilitation of district heating system in Kramatorsk

The envisaged rehabilitation of district heating system in Kramatorsk includes the following measures:

8.1. Replacement of old pipelines by new pipes covered by foamed polyurethane

The heat supply pipelines replacement will reduce actual heat losses from heat supply pipeline what will result in annual fuel savings of 1161 tons of standard fuel during 2008-2012.

8.2. Rehabilitation of boiler-rooms with replacement of capacitive heat exchangers by lamellar heat exchangers;
Vapor-water capacitive heat exchangers STD 3068-3071 of six sizes (№ 1, 2, 3, 4, 5, 6) are used in the baseline scenario. These exchangers have changed their capacity during the lifetime. In 2008 capacitive heaters are to be replaced by lamellar at 35 substations. Heat exchangers are working in two stages; two lamellar heat exchangers are to be installed at each substation. During the first stage water is heated by heat carrier, returning from building heating systems (already exhausted of heat) to 30-40 ^{o}C. During the second stage the water is heated by heat carrier from pipeline rising the temperature to 50 ^{o}C. According to previous data in 2009 it is planned to install 40 heat exchangers,65 heat exchangers in 2010, 60 heat exchangers in 2011. Expected electricity savings after the measure's implementation vary from 50 MWh in 2008 to 2486 MWh in 2011.

8.3.Major rehabilitation of boiler-rooms with replacement of pipes and valves
Physically exhausted and partially blocked pipes with hard to remove deposits in piped packages of network heaters are to be replaced by new pipes. Expected results of the measure:
- reduction of hydraulic resistance of boiler-rooms; reduction of electricity consumption for pumping of heat carrier (network water). This measure is expected to providde fuel savings of 48.9 tons of standard fuel per year.
- increase of heat generation by the heater by means of low-potential heat utilization with additional generation of power. This measure implementation is expected to result in fuel savings of 702 tons of standard fuel per year.

No changes into the reconstruction programme are foreseen throughout the whole project lifetime.

Six staff members of 'Kramatorskteploenergo' LLC were trained to operate the new equipment installed at the power plant. The trainings were performed at the BKZ-220 boiler of Chernigiv heat and power plant. The training cost was UAH 21,000.

Expected schedule of measures execution foreseen in JI project is presented in Table 1.

Table 1. Expected schedule of measures execution foreseen in the JI project

№	Measures	Beginning of design stage	Beginning of construction	Commissioning
1	*Reconstruction of boiler № 7*	–	*September 2008*	*January 2008*
2	*Reconstruction of boiler № 9*		*April 2008*	*November 2008*
3	*Modernization of turbine PT*-60-90/13 *st*. №3	*September 2007*	*April 2008*	*August 2008*
4	*Modernization of turbine PT-60-90/13 st.* №4	*September 2008*	*April 2009*	*August 2009*
5	*Reconstruction of cooling tower* № 1	*May 2006*	*June 2008*	*September 2008*

6	Capital repair of boiler-rooms with replacement of tubes and valves	*April 2008*	*June 2008*	*November 2008*
7	Replacement of capacitive heat exchangers by lamellar - 35 un. 40 un. 65 un. 60 un.	*May 2008* *May 2009* *May 2010* *May 2011*	*July 2008* *July 2009* *July 2010* *July 2011*	*November 2008* *November 2009* *November 2010* *November 2011*
8	*Replacement of heat supply pipelines by pipeline from polyurethane foam*	*June 2008*	*June 2008* *2009* *2010* *2011* *2012*	*November 2008* *2009* *2010* *2011* *2012*
9	*Replacement of feeding pump*	–	*May 2007*	*April 2008*
10	*Modernization of hydro ash removal*	*December 2007*	*May 2009*	*September 2009*

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 proposed measures within the JI project include replacement and rehabilitation of power generating equipment; this will increase overall energy efficiency and reduce fuel consumption for power generation. Fuel savings for power generation and reduction of power consumption for the own needs will lead to CO_2 emissions reduction.

Part of the emission reductions of the proposed JI project are based on rehabilitation of district heating system, i.e. heat supply network and its substations. In the absence of the proposed project, all equipment would operate in usual regime and emission reductions would not occur.

In March 2006 the government of Ukraine approved "The Energy strategy of Ukraine until 2030". The strategy foresees gradual increase of electricity consumption following the stable economic growth during next years. Increasing of energy efficiency from both supply and demand sides is one of the main strategy priorities. The proposed JI project corresponds with the priorities of the state energy strategy as it is expected to increase specific efficiency of heat and electric power generation at Kramatorsk HPP.

"The Energy strategy of Ukraine until 2030" does not enforce the owners of Kramatorsk HPP to implement the project. This project implementation requires substantial investment that cannot be attracted by the host company. The availability of long-term project financing in Ukraine is strictly limited, loans are given by banks for a very short term and at high interest rates. ContourGlobal being the major shareholder of the power plant is ready to provide financing only under condition of receiving additional benefit from emission reduction units.

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

	Year
Period when ERUs are generated	10
Crediting period	10
Year	Estimation of annual emission reduction in tons of CO_2e
2008	33379
2009	60059
2010	67782
2011	71539
2012	74404
2013	74404
2014	74404
2015	74404
2016	74404
2017	74404
Total estimated amount of emission reduction for which ERUs will be received (t CO_2e) during 2008 – 2012	**307 163**
Total estimated amount of emissions reduction for which ERUs will be received (t CO_2e) during 2008 – 2017	**679 182**

Table 2. Calculated emissions reduction during crediting period

A.5. Project approval by the Parties involved:

Project Idea Note (PIN) has been reviewed by the Ministry of the Environment of Ukraine in 2007. The Project had received the Letter of Endorsement from the Ministry of the Environment № 12035/11/10-07 dated 08/11/2007.

After finishing of project determination procedure, the PDD and Determination Report will be given to National Agency of Environmental Investments of Ukraine for receiving of the Letter of Approval.

SECTION B. Baseline

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

Choosing the methodology

Each baseline of JI project should be established according to Annex B of Marrakech Accords[2].

According to the decision 10/CMP.1, approved CDM methodologies may be used for JI PDD development. The ACM0002 methodology («Consolidated baseline methodology for grid electricity generated from renewable sources» (version 10)) was used to establish the baseline.

The approach to establish baseline and estimate emission reductions originating from the project's implementation is taken from the approved methodology ACM0002 «Consolidated baseline methodology for grid electricity generated from renewable sources". The monitoring approach of ACM0002 was also used to establish the monitoring plan. The latest version of the *Tool for the demonstration and assessment of additionality* (Version 05.2) was used for the analysis of additionality.

It has to be mentioned that methodology ACM0002 is used with deviations to the original methodological guidance due to being not directly applicable to the proposed JI project.

The following aspects allow to use the methodology chosen:

• The proposed project makes the process of heat and power generation more effective;
• The proposed project replaces of power generated within UES;

Two approaches were used to calculate emission reductions in the proposed project: the ACM0002 "Consolidated methodology for grid-connected electricity generation from renewable sources" (version 10) and the approach used in the JI PDD 0081 "District Heating System Rehabilitation of Chernihiv Region" that passed determination.

According to the "Identification of the baseline scenario" section of the ACM0002 "Consolidated methodology for grid-connected electricity generation from renewable sources", the following procedure shall be applied if the project activity involves retrofit of the existing grid-connected plant:

Step 1. Identify realistic and credible alternative baseline scenarios for power generation

Step 2: Barrier analysis

Step 3: Investment analysis

These steps are performed below.

ACM0002 "Consolidated methodology for grid-connected electricity generation from renewable sources" with some deviations will be used for the baseline identification. The methodology is directly applicable for the projects involving retrofit of hydro, wind, geothermal, solar, wave or tidal power plants. Kramatorsk HPP is using fossil fuel both in the baseline and the project scenario. However, the formulae of this methodology can be applied for calculating baseline emissions for grid-based power consumption. The ACM0002 methodology also may be applied to calculated baseline emissions from fossil fuel consumed at conventional power plants, which are displaced after the project activity implementation; similarly to the case of Kramatorsk HPP.

[2] FCCC/CP/2001/13/Annex.2 16/CP.7.

The main parameters of the power plant are presented in the Table 3.

Table 3. Greenhouse gases emissions by the baseline scenario

Item	2008	2009	2010	2011	2012
Electric power generation, MWh	356319	462843	462843	462843	462843
Own electric power consumption, MWh	76830	92130	92130	92130	92130
Heat power generation, Gcal	571319	694264	724835	724835	724835
Coal consumption, tons	79135	153520	153520	153520	153520
Natural gas consumption, ths. m3	148897	141880	144880	144880	144880

Item	2013	2014	2015	2016	2017
Electric power generation, MWh	462843	462843	462843	462843	462843
Own electric power consumption, MWh	92130	92130	92130	92130	92130
Heat power generation, Gcal	724835	724835	724835	724835	724835
Coal consumption, tons	153520	153520	153520	153520	153520
Natural gas consumption, ths. m3	144880	144880	144880	144880	144880

Calculation of Baseline Emissions

For all fuels we used CO_2 emission factors from the data table provided in Annex C of the Operational Guidelines for Project Design Documents of Joint Implementation Projects (Volume 1: General guidelines; Version 2.2).

Cef (natural gas) = 0.0561 kt CO_2/TJ;
Cef (coal) = 0.0946 kt CO_2/TJ; (taken as "Antracite").

For our calculations we assume that net calorific value (NCV) will be the same during the project lifetime. Net calorific value of fuels used by Kramatorsk HPP doesn't change during that time. NCV of fuels used on Kramatorsk HPP:

Natural gas – 8000 Gcal;

Coal – 5000 Gcal.

Carbon emission factor (CEF) for the electricity generation in the grid of Ukraine for 2008-2012 is given according to the JI PDD 0018 «Energy efficiency program at "Istil" mini steel mill, Ukraine".

Table 4. Carbon emission factor for the grid of Ukraine for 2008-2012

Year	2008	2009	2010	2011	2012
EFx for electricity generation$_{,y}$ tons of CO_2e/MWh	0.807	0.807	0.807	0.807	0.807

Identification of baseline scenario

Alternative baseline scenarios can be all possible realistic alternatives similar to the proposed project activities within Joint Implementation (including proposed project activities without JI mechanism). There are six alternative variants of baseline scenario which have been identified before the beginning of project implementation:

1) Operation of existing equipment of Kramatorsk HPP in usual regime with regular technical maintenance at least until 2017.

2) Implementation of rehabilitation without use of JI mechanism (without ERUs sale).

3) Construction of new HPP in Kramatorsk.

4) Construction of new steam turbine and gas –fired boilers.

5) Construction of new steam turbine and coal–fired boilers.

6) Construction of new steam turbine and biomass–fired boilers.

Analysis of alternative baseline scenarios

First alternative:
Kramatorsk HPP will continue its operation with the existing capacities. The consumption of electric power for own needs of HPP will be supplied with existing equipment of Kramatyorsk HPP and other power plants connected to the UES of Ukraine.

Second alternative
The proposed project will not be registered as JI project. CO_2 emission reductions will not be registered as ERUs. Implementation of project without JI mechanism will mean decrease of the positive cashflow by approximately 3 million Euro during 2008-2012; or by 6.8 million Euro (ERU price considered to be EUR 10/t CO2).

Third alternative
The third alternative foresees the construction of absolutely new HPP with 120 MW installed electric capacity and 200 MW of heat capacity.

Forth alternative
The new steam turbines will be installed instead of rehabilitation of the existing turbines № 3, 4; new gas-fired boilers will be installed instead of rehabilitation of the existing boilers 7, 9. New equipment will be operated with the same installed capacity (150 MW) as today. The quantity of power produced will be the same as in case of the JI project implementation.

Fifth alternative
The new steam turbines will be installed instead of rehabilitation of the existing turbines № 3, 4; new coal-fired boilers will be installed instead of rehabilitation of the existing boilers 7, 9. New equipment will be operated with the same installed capacity (150 MW) as today. The quantity of power produced will be the same as in case of the JI project implementation.

Sixth alternative
The new steam turbines will be installed instead of rehabilitation of the existing turbines № 3, 4; new biomass boilers will be installed instead of rehabilitation of the existing boilers 7, 9. New equipment will be operated with the same installed capacity (150 MW) as today. The quantity of power produced will be the same as in case of the JI project implementation.

Substabtial volumes of fossil fuel will be saved in this scenario. Due to constant increase of natural gas prices in Ukraine this alternative is a realistic one. CO_2 emissions will be much less compared to other alternative scenarios due to use of biomass (wood, wood waste).

Identification of the realistic baseline scenarios

First alternative
This scenario is realistic. However, no investments into energy efficiency measures can be done because of lack of financing available from the city budget. No changes in operation of equipment besides of regular technical maintenance will occur. In this case, there is dependence from electric power which is supplied from UES of Ukraine.

Second alternative
Implementation of the reconstruction programme without use of Joint Implementation mechanism. This variant has not been approved because in this case the project is not attractive for investments. Implementation of the project without JI mechanism will mean decrease of the positive cashflow by approximately 3 million Euro during 2008-2012; or by 6.8 million Euro (ERU price considered to be EUR 10/t CO2).

Third alternative
The construction of new HPP in Kramatorsk.
The construction of new HPP in Kramatorsk will demand sufficient investment of some 300 mln. US dollars. In addition, the existing HPP should be decommissioned in spite of its satisfactory condition and possibility to generate and supply heat and power energy to Kramatorsk consumers. The construction of new HPP will take a few years and its construction should be located in a new place. All necessary licenses have to be obtained for this scenario; the new HPP has also to be connected to the necessary infrastructure.

Forth alternative
Construction of new steam turbines and natural gas-fired boilers
The main barrier for implementation of this alternative is extremely high costs of the proposed actions estimated at some USD 500 million. The costs are considered too high compared to the overall income of the Kramatorsk city, the major shareholder of Kramatorsk HPP. The total projected budget income in 2009 is UAH 403.2 million (approximately USD 50 million).

Fifth alternative
Installation of new steam turbines and coal-fired boilers
The main barrier for implementation of this alternative is extremely high costs of the proposed actions estimated at some USD 500 million. The costs are considered too high compared to the overall income of the Kramatorsk city, the major shareholder of Kramatorsk HPP. The total projected budget income in 2009 is UAH 403.2 million (approximately USD 50 million).

Sixth alternative

Construction of new steam turbine and biomass boilers.

The main barrier for implementation of this variant is the absence of infrastructure for biomass supply in the Eastern Ukraine. The region where Kramatorsk power plant is located is heavily industrialized. In Ukraine the production of wood is developed mainly in the Western regions (Zakarpatska, Lvivska regions etc.), therefore wood transportation from the Western regions to Donesk region will need substantial additional costs. A very large amount of wood would be necessary to meet the fuel demand of Kramatorsk HPP. This alternative would require purchasing a large-scale biomass generation equipment (150 MW). Such equipment is not available from the existing Ukrainian suppliers and the imported equipment is quite expensive. The equipment cost is the main barrier for biomass projects implementation in Ukraine; this barrier also applies for this alternative scenario.

Therefore, of all proposed scenarios that were determined only the first and second are realistic. ***The first variant*** suits most of all in case of project absence and presents **baseline scenario** of all discussed baseline scenarios**.**

The key information and data used to establish the baseline is given in Section D 1.1.3 of this PDD, Table 6.

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:

GHG emissions will be reduced due to Kramatorsk HPP equipment modernization proposed in project activities. Within the proposed project the following measures will be implemented: reconstruction of turbines, boilers and cooling tower, installation of frequency controllers, rehabilitation of district heating system of the town.

The project additionality analysis is presented below with the use of the last version of the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 02.2). according to the instructions given in CDM AM0062 methodology.

Step 1. Determination of alternatives of project activities in accordance with existing laws and rules

The detailed analysis of alternatives of project activities is given above in the section B.1. The list of defined alternatives according to the project scenario is given below.

1) Operation of existing equipment of Kramatorsk HPP in usual regime with implementation of regular technical maintenance at least till 2012 including.

2) Reconstruction of the power plant without JI mechanism (without ERUs sale)

3) Construction of new HPP in Kramatorsk

4) Construction of two new steam turbines and gas fired-boilers.

5) Construction of two new steam turbines and coal fired-boilers.

6) Construction of two new steam turbines and biomass boilers.

All mentioned alternative scenarios have no contradictions with the existing national legislation.

During the process of possible alternative scenario analysis (see Section B.1) it was concluded that the only realistic alternative to the JI project implementation is continuation of existing situation at least till 2017.

Step 2. Barrier analysis

Step 2a. Barriers identification

The *proposed project has the following barriers:*

a) Possibility of the profit loss due to the decrease of regulated tariff on heat and power after the project implementation

Kramatorsk HPP operates on the regulated market of heat and power supply, where heat and power tariffs are set by the state regulator (National Commission of Power Sector Regulation / "NKRE"). Heat and power tariffs are set annually by NKRE based on the previous year's data on fuel

consumption by an individual generator[3]. At the same time, reconstruction costs are not included directly in the cost analysis of power plants by NKRE.

Thus the decrase of heat and power tariff should be included into the investment analysis of the Kramatorsk HPP project as one of the side effects of rehabilitation measures involved in the project. Since such tariff decrease cannot be estimated quantitatively for the period 2008-2017, the investment analysis cannot provide the full picture of the project's attractiveness, and barrier analysis is the right method for demonstrating additionality for the proposed project.

b) Limited access to financial resources

The access to financial resources at the international level for proposed project is very limited. Investment climate in Ukraine is considered to be risky especially compared to the neighboring countries. The confirmation of this is Fitch sovereign ratings of Ukraine compared with neighboring countries of Eastern Europe.

- Ukraine B+
- Poland A-
- Hungary BBB
- Slovakia A+

Considering substantial amount of capital investments necessary for the proposed project, obtaining of financing from international sources can be very difficult. The possibilities for financing at the national level are also limited at the moment. The typical interest rate of commercial banks in Ukraine is about 30% for the period of up to three years. The examples are the largest banks of Ukraine: Raiffaisen Bank Aval (www.aval.ua), Privat Bank (www.privatbank.com.ua), Pravex bank (www.pravex.com.ua). The limited availability to the financing is a substantial barrier in implementation of proposed project.

c) Barriers due to the prevailing practice

Most of municipal power plants with combined generation of electric power in Ukraine belong to the state or the state owns significant stake in these companies. In spite that average age of such power plants is 30-40 years, the large scale HPP[4] modernization similar to the proposed project have not been observed for the last years in Ukraine. Implementation of the proposed project would result in market disadvantage of Kramatorsk HPP compared to other producers of electricity because of possible risk of operation stops or equipment failure during the modernization process.

Step 2b. The impact of identified barriers on the alternative scenarios

As it was shown in part B.1 the only realistic alternative to the proposed JI project is continuation of existing situation at least till 2017. This scenario does not need substantial capital investments except the routine maintenance costs. Therefore, identified barriers do not influence the alternative scenario of continuing the existing situation.

[3] Decree of NKRE #896 dated 12.10.2005

[4] IEA, 2006

Step 3. Investment analysis

Sub-step 2b shows, that the only feasible baseline scenario is the continuation of the existing situation. Therefore, using the barrier analysis and common practice analysis should be satisfactory for demonstrating additionality of the Kramatorsk HPP project in accordance with the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 02.2). Examples of similar approach used in similar district heating rehabilitation projects that have passed determination:

- Rehabilitation of the district heating system of Crimea[5]
- Rehabilitation of the District Heating System in Donetsk Region[6]

Step 4. Common practice analysis

At this moment the common practice in energy sector of Ukraine is operation of existing equipment without implementation of large scale modernization projects. At the same time the projects similar to renovation of heat supply network of Kramatorsk HPP have been implemented at some enterprises of Ukraine. All this projects are now on different stages of JI registration. For example see JI PDD 0150 "Rehabilitation of district heating system in Kharkiv city", JI PDD 0140 "Rehabilitation of the district heating system of Crimea", JI PDD 0081 "Rehabilitation of district heating system in Chernihiv region". However, existing JI projects should not be included into analysis of common practice. Therefore, proposed project is not the common practice in Ukraine.

Conclusion

Registration of the proposed project as JI will allow overcoming barriers connected with financing of the project. ContourGlobal , the mother company of Kramatorsk HPP is ready to finance the project provided the rehabilitation measures are registered as a Joint Implementation project and ERUs are generated. The additional benefit obtained from emission reductions sale will help to overcome barriers connected with the existing practice, because ContourGlobal is ready to invest in project implementation and provide necessary knowledge and expertize with the assumption the project is registered as JI.

Conclusion: implementation of the proposed project as JI will eliminate economical/financial barriers and improve the project's indicators. The project scenario is additional compared to the baseline scenario.

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

Project Boundaries include those sources of CO_2 emissions which are accounted during the calculation of greenhouse gases emissions in the project.

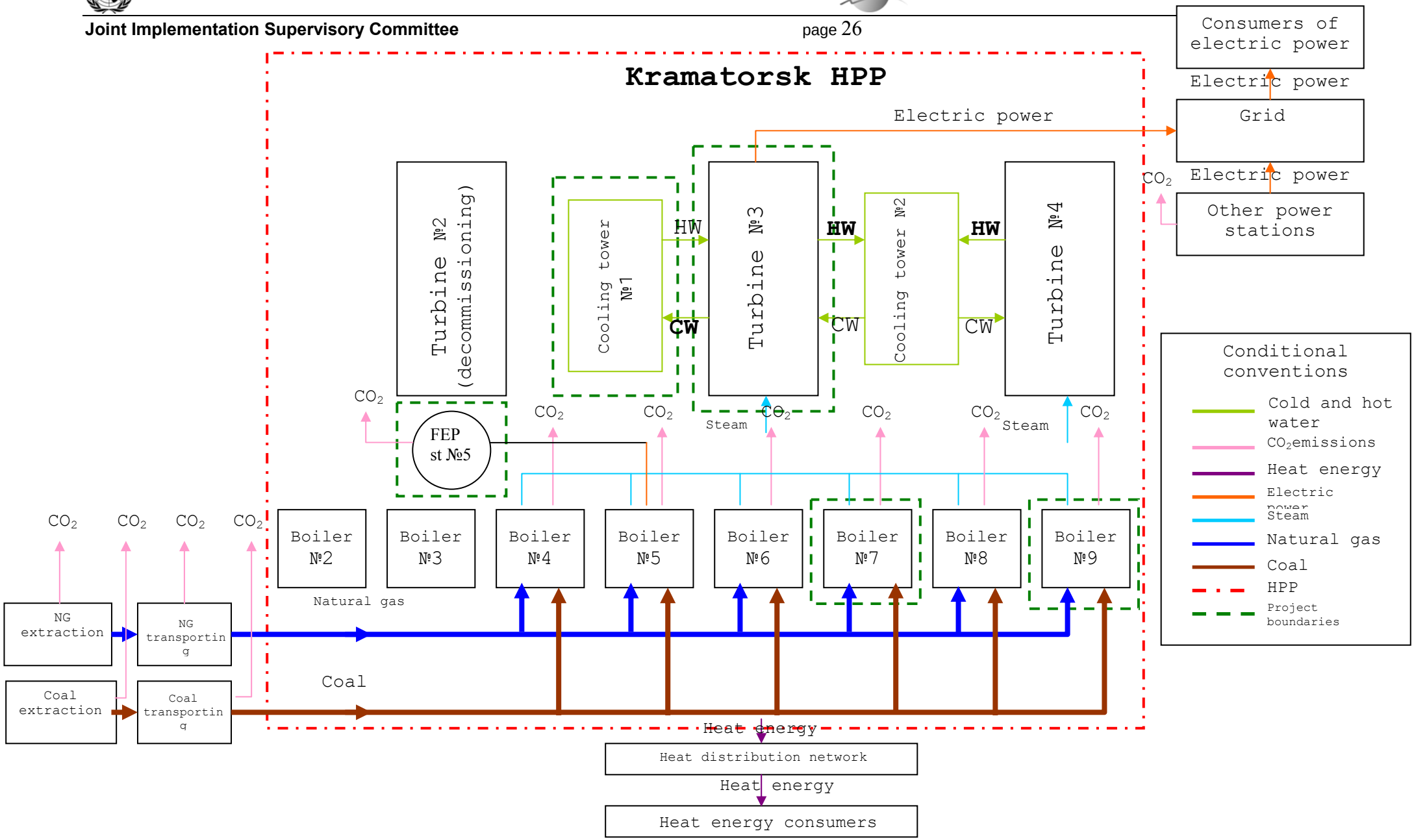
Figure 3 shows project boundaries separated with dashed lines. Today electric power generation happens within UES of Ukraine.The proposed project implementation will lead to decrease of the effective fuel consumption per kWh produced; plant's own electricity consumption will also be decreased. As a result of these effects, the output of electricity from Kramatorsk HPP to the grid will increase.

[5] http://ji.unfccc.int/JIITLProject/DB/KWHXFPDA7LXPLNZ8XUI7GVPWNUTFTO/details

[6] http://ji.unfccc.int/JIITLProject/DB/I71KB95JEW3XSFWSOSHFZG2TA5VUSF/details

Heat network rehabilitation will reduce heat losses resulting in fuel consumption reduction. Heat exchangers replacement at the substations of the town will reduce electricity consumption from the grid.

Figure 3. The scheme of project scenario


Kramatorsk HPP
Consumers of electric power
Electric power
Grid
Electric power
Other power stations
Electric power
CO2
Turbine №2 (decommissioning)
Cooling tower №1
HW
CW
Turbine №3
HW
CW
Cooling tower №2
HW
CW
Turbine №4
CO2
FEP st №5
Steam
Steam
Boiler №2
Boiler №3
Boiler №4
Boiler №5
Boiler №6
Boiler №7
Boiler №8
Boiler №9
Natural gas
NG extraction
NG transporting
Coal extraction
Coal transporting
Coal
Heat energy
Heat distribution network
Heat energy
Heat energy consumers
Conditional conventions
Cold and hot water
CO2 emissions
Heat energy
Electric power
Steam
Natural gas
Coal
HPP
Project boundaries

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

The date of completion of baseline determination: 01/04/2009

Names/titles of persons/organizations, which determine baseline:
- «ContourGlobal»
- «Kramatorskteploenergo» LLC
- GreenStream Network GmbH

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

2007

C.2. Expected operational lifetime of the project:

Kramatorsk HPP equipment can be operated at least till 2017 (120 months / 10 years) in case of implementation of JI project, as well as in the baseline scenario.

C.3. Length of the crediting period:

120 months (10 years) of the project operational lifetime, 2008-2017.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

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

All data collected for monitoring will be archieved in electronic and/or paper form. All measurements are executed by standardized equipment according to relevant industrial standards. Some parameters shown below in the section of table "Variable" need permanent monitoring during the crediting period depending on chosen data, in accordance with the baseline methodology procedure described above and guideline on "Monitoring frequency" for the parameters.

The monitoring plan was developed according to the ACM0002 "Consolidated methodology for grid-connected electricity generation from renewable sources" (Version 10).

The main parameter which objectively reflects the changes in CO_2 emissions reduction is fuel consumption reduction. "Kramatorskteploenergo" LLC collects and archieves the fuel data in the form of accounting reports for fuel, supplier reports and laboratory reports based on chemical analysis on fuel quality and amount.

Requirements on fuel accounting
Fuel accounting in the energy sector of Ukraine is based on existing system of fuel control, management and registration "Fuel on power stations. The rules of accounting. Sector guidelines 34.09. 101-95", issued by the Ministry of Power and Fuel as well as other relevant scientific and technical guidelines. According to the power sector guidelines all fuel supplied to HPP should be clearly accounted.
The accounting is based on:

- Fuel quality and amount determination;
- Periodical registration of fuel;

Monitoring of consumed fuel amount and quality is performed by the Production Department. The measurements of natural gas amount are done by "Universal-02" gas meter. Measurements of the coal quantity supplied to the plant are done by means of the railway weighbridge of Novokramatorsk machine building plant under the lease agreement. Starting from April 1, 2009 all coal supplies will be measured by the new KNV-2D-2R conveyor weighbridge.

To register fuel amount and quality, HPP should be equipped with special meters, facilities and instruments. The data on delivered and consumed fuel should be represented in statistic reports. The primary data on fuel consumption is registered in special journals, supply bills and is used for monthly and annual reports.

Kramatorsk HPP has followed these norms and acts of Ukraine:
DNAOP 0.00-1.07 “Rules on setup and safe operation of vessels under high pressure”
DNAOP 0.00-1.08 “Rules on setup and safe operation of steam boilers
The Law of Ukraine “On fire safety” dated December 17, 1993, #3745-KhP;
The Law of Ukraine “On standartization” dated May 17, 2001, #2408-Sh;
DSTU 12.2.085-82 SSBT. Vessels operated under pressure. Safety valves. Safety requirements;
DSTU 14202-69 Pipelines at industrial facilities. Identification, warning marks and marking shields.

According to the host country procedures the monitoring plan does not require collection and storage of the data on environmental impacts.

Environmental parameters such as emissions of dust, SOx and NOx will be available for the verifier. This data is communicated in monthly and annual reports to Donetsk regional authorities, and stored at the plant.

Partial reconstruction of measuring equipment of Kramatorsk HPP will be done to ensure accurate measurements of fuel quality and amount. The table of parameters which will be included into the monitoring process as well as calculation control of emissions reduction units are represented in Sections **D.1.1.1** and **D.1.1.3.**

D.1.1.1. Data to be collected in order to monitor emissions from the project, and how these data will be archived:								
ID number ***(Please use numbers to ease cross-referencing to D.2.)***	**Data variable**	**Source of data**	**Data unit**	**Measured (m), calculated (c), estimated (e)**	**Recording frequency**	**Proportion of data to be monitored**	**How will the data be archived? (electronic/ paper)**	**Comment**
К1	Coal consumption	Meter of consumed fuel, diagram, Journal of registration data of consumed fuel	Tons	M	Monthly	100 %	Electronic/ paper	The primary data source weighting of coal on the weighbridge; secondary data source is the fuel diagram.
К2	Net calorific value of coal	Report of the Supplier, analytical report of chemical analysis laboratory, IPCC	Kcal/kg	E	Monthly	100 %	Electronic/ paper	In the invoices of fuel supplier, laboratory reports on chemical analysis and IPCC values given in the Table 1.2 of Section 1 of IPCC Guidelines for National Greenhouse Gas Inventories (Volume 2 (Energy), 1996)
К3	Carbon emission factor for	IPCC	t C/TJ	IPCC	Constant value	100 %	Electronic/ paper	IPCC values are given in Section 2 of IPCC Guidelines for National Greenhouse Gas Inventories (Volume

	coal							2 (Energy), 1996)
К4	Natural gas consumption	Meter of consumed fuel, diagram, Journal of registration data of consumed fuel	1000 m^3	M	Monthly	100 %	Electronic/ paper	Fuel consumption by boilers is the main data source allowing calculation of GHG emissions in the report year
К5	Net calorific value of natural gas	Report of the Supplier, analytical report of chemical analysis laboratory, IPCC	Kcal/kg	E	Monthly	100 %	Electronic/ paper	In the passport of fuel from fuel supplier or IPCC data is given at the Table 1.2 of Section 1 of National Greenhouse Gas Inventories (Volume 2 (Energy), 2006)
К6	Carbon emission factor for natural gas	IPCC	t C/TJ	IPCC	Constant value	100 %	Electronic/ paper	IPCC values are given in Section 2 of IPCC Guidelines for National Greenhouse Gas Inventories (Volume 2 (Energy), 1996)
К7	Power generation	Meters of Kramatorsk HPP, balance data	kWh	M, C	Monthly	100 %	Electronic/ paper	Annual report
	Own	Meters of	kWh	M, C	Monthly	100 %	Electronic/	

К8	electricity consumption	Kramatorsk HPP, calculation of consumed amount					paper	
К9	Power supplied to customers (to the grid)	Meters of Kramatorsk HPP, balance data	kWh	M, C	Monthly	100 %	Electronic/ paper	Annual report
К10	Carbon emission factor of the electric grid of Ukraine	Baseline study of UES of Ukraine	t CO2/ kWh	C	Annualy	100 %	Electronic/ paper	Carbon emission factor for national grid of Ukraine is given in JI PDD 0018 «Energy saving programme at "Istil" mini steel mill, Ukraine»
К11	Steam generation	Meters of Kramatorsk HPP	Gcal	M	Annually	100 %	Electronic/ paper	Annual report
К12	Heat supplied to consumers	Meters of Kramatorsk HPP, balance data	Gcal	M, C	Annually	100 %	Electronic/ paper	Annual report

K13	Length of the heat pipes replaced by pipes in poliurethane foam in the year y	Reports	*m*	M, C	Annually	100 %	Electronic/ paper	Annual report

Table 5: Data collected for the purposes of monitoring

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

Project emissions (E_p) are determined by the following formula:

$E_p = PE_{FC,elec,y} + PE_{heat\_ex}$

where:

$PE_{FC,elec,y}$ – project emissions from actual amount of consumed fuel of each type by HPP for generation of electric and heat power, tons of CO2. Actual – is the amount of fuel consumed by boilers at HPP not including the fuel which will be saved due to heat supply network rehabilitation.

PE_{heat_ex} – project emissions from electric power consumption by boiler-rooms, on which heat-exchangers replacement will be implemeted, t CO_2

1) Project emissions from combustion of each type of fuel consumed by power plant's boilers for power and heat generationare calculated according to the methodology applied in the "District Heating System Rehabilitation of Chernihiv Region" JI project:

$$PE_{FC,elec,y} = \sum_i \left(F_{i,PJ,y} - FS_{network}\right) \times COEF_{i,y}$$

$FS_{network}$ – total amount of fuel, which will be saved due to heat network rehabilitation (ton/ 1000 m^3)

$COEF_{i,y}$ – carbon emission factor (t CO_2 / tons (1000 m^3)) for fuel of type «i» consumed during the year «y», obtained in the following way:

$COEF_{i,y} = NCV_{i,y} * EFCO2_{i,y} * OXID$

Where:

$F_{i,PJ,y}$ – total amount of fuel of type «i» consumed during the year «y» in the project scenario (tons / 1000 m^3)
$NCV_{i,y}$ – net calorific value of each type of fuel «i» consumed during the year «y», (kcal/ ton ((1000 m^3)
$EFco2,i,y$ - CO_2 emissions factor of fuel of type «i» consumed during the year«y», (t CO_2/GJ)
$OXID$ – oxidation factor of fuels

$$FS_{network} = (HS_y * SF_y) / 1000$$

HS_y – total amount of heat power saved during the year in each hydraulic zone after heat network rehabilitation during the year *y*, Gcal/year
SF_y – specific natural gas consumption in h/p, kg/Gcal

2) Project emissions from power consumption by boiler-rooms after replacement of capacitive heat-exchangers by lamellar exchangers are calculated using the ACM0002 Consolidated methodology for grid-connected electricity generation from renewable sources (Version 10):

$$PE_{heat\_ex} = EH_{p,heat\_ex} * EF_{BL,CO2,y}$$

where:

$EH_{b,heat\_ex}$ – power consumption from the grid by boiler-rooms in the project scenario, MWh
$EF_{BL,CO2,y}$ - CO_2 emission factor in the year y for the project reducing power consumption, t CO_2e/MWh

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:								
ID number ***(Please use numbers to ease cross-referencing to D.2.)***	**Data variable**	**Source of data**	**Data unit**	**Measured (m), calculated (c), estimated (e)**	**Recording frequency**	**Proportion of data to be monitored**	**How will the data be archived? (electronic/ paper)**	**Comment**
K1	Coal consumption	Meter of consumed fuel, diagram, Journal of registration data of consumed fuel	Tons	M	Monthly	100 %	Electronic/ paper	The primary data source weighting of coal on the weighbridge; secondary data source is the fuel diagram.
K2	Net calorific value of coal	Report of the Supplier, analytical report of chemical analysis laboratory, IPCC	Kcal/kg	E	Monthly	100 %	Electronic/ paper	In the invoices of fuel supplier, report of chemical analysis laboratory and IPCC values given in the Table 1.2 of Section 1 of Guidelines of national register of greenhouse gases (Volume 2 (Energy), 1996)
K3	Carbon emission factor for	IPCC	t C/TJ	IPCC data	Constant value	100 %	Electronic/ paper	IPCC values given in Section 2 of IPCC Guidelines for National Greenhouse Gas Inventories (Volume

	coal							2 (Energy), 1996)
К4	Natural gas consumption	Meter of consumed fuel, diagram, Journal of registration data of consumed fuel	Ths. m^3	M	Monthly	100 %	Electronic/ paper	Fuel consumption by boilers is the main data which allows calculation of GHG emissions in the reporting year
К5	Net calorific value of natural gas	Report of the Supplier, analytical report of chemical analysis laboratory, IPCC	Kcal/kg	E	Monthly	100 %	Electronic/ paper	In the passport of fuel from fuel supplier or IPCC data is given at the Table 1.2 of Section 1 of National Greenhouse Gas Inventories (Volume 2 (Energy), 2006)
К6	Carbon emission factor for natural gas	, IPCC	t C / TJ	C	Monthly	100 %	Electronic/ paper	IPCC data is given at the Table 1.2 of Section 1 of National Greenhouse Gas Inventories (Volume 2 (Energy), 2006)
К7	Power generation	Meters of Kramatorsk HPP, balance data	kWh	M, C	Monthly	100 %	Electronic/ paper	Annual report
К8	Own electricity	Meters of Kramatorsk	kWh	M, C	Monthly	100 %	Electronic/	Annual report

	consumption	HPP, calculation of consumed amount					paper	
К9	Power supplied to customers (to the grid)	Meters of Kramatorsk HPP, balance data	kWh	M, C	Monthly	100 %	Electronic/ paper	Annual report
К10	Carbon emission factor of the electric grid of Ukraine	Baseline study of UES of Ukraine	t CO2/ kWh	C	Annualy	100 %	Electronic/ paper	Carbon emission factor for national grid of Ukraine is given in JI PDD 0018 «Energy saving programme at "Istil" mini steel mill, Ukraine»
К11	Steam generation	Meters of Kramatorsk HPP	Gcal	M	Annually	100 %	Electronic/ paper	Annual report
К12	Heat supplied to consumers	Meters of Kramatorsk HPP, balance data	Gcal	M, C	Annually	100 %	Electronic/ paper	Annual report

K13	Length of the heat pipes replaced by pipes in poliurethane foam in the year y	Reports	*m*	M, C	Annually	100 %	Electronic/ paper	Annual report

Table 6: Relevant data, necessary for determination of the baseline of antropogenic emissions by the sources of GHG within the project

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

The following formula is used for calculation of baseline emissions from Kramatorsk HPP (***BE$_y$***) :

$$BE_y = BE_{FC,elec,y} + BE_{electricity,y} + BE_{heat\_ex}$$

where:
BEFC,elec,y – baseline emissions from combustion of each type of fuel consumed by power plant for heat and power generation in the baseline scenario that are calculated by multiplication of amount of consumed fuel i in the project by CO_2 emissions factor (t CO_2/t (ths.m^3)) for fuel of type «i» consumed in the year «y», t CO_2

BE$_{electricity,y}$ – baseline emissions from power in the grid, that will be replaced due to project implementation at HPP, t CO_2

BE$_{heat_ex}$ **-** baseline emissions from power consumption by boiler-rooms, where the replacement of heat exchangers is planned, t CO_2

1) Baseline emissions from combustion of each type of fuel consumed by power plant's boilers for power and heat generationare calculated according to the methodology applied in the "District Heating System Rehabilitation of Chernihiv Region" JI project:

$$BE_{FC,elec,y} = \sum_i F_{i,BJ,y} * COEF_{i,y}$$

F$_{i,BJ,y}$ – total fuel amount of type «i» consumed in the year «y» in baseline scenario, t/ ths.m^3,
COEF$_{i,y}$ –CO_2 emissions factor for fuel of the type «i» consumed in the year «y», t CO_2/ths.t (ths. m^3)

2) Baseline emissions from the grid power consumption replaced by the proposed project's measures are calculated using the ACM0002 Consolidated methodology for grid-connected electricity generation from renewable sources (Version 10):

$$BE_{electricity,y} = (EG_{base\_own} - EGpr_{\_own}) * EF_{BL,CO2,y},$$

where:
EG_{base_own} - power consumed for own needs of HPP in baseline scenario, MWh
$EGpr_{\_own}$ - power consumed for own needs of HPP in project scenario, MWh
$EF_{BL,CO2,y}$ –CO_2 emission factor in the year y for the project producing electric power, t CO_2e/ MWh

3) Baseline emissions from power consumption by boiler-rooms where replacement of capacitive heat-exchangers by lamellar exchangers is planned are calculated using the ACM0002 Consolidated methodology for grid-connected electricity generation from renewable sources (Version 10):

$$BE_{heat\_ex} = EH_{b,heat\_ex} * EF_{BL,CO2,y}$$

where:

$EH_{b,heat\_ex}$ –power consumption from the grid by boiler-rooms in baseline scenario, MWh
$EF_{BL,CO2,y}$ - CO_2 emission factor in the year *y* for the project, reducing power consumption, t CO_2e/ MWh

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

Not used

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

There are no data to be collected in order to monitor emission reductions from the project, because emission reductions will be calculate by means of formulae presented in paragraph **D.1.2.2.**

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

Not used

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

The proposed JI project results in the decrease of consumption of natural gas and coal. The reduction of fossil fuel consumption may lead to decreasing the emissions from the related sources, such as coal transportation via railroad, or natural gas transportation by pipelines. Therefore, the only leakage that could be expected in relation with the proposed JI project, would be negative (emission reduction outside of the boundaries set). The possible leakage in the project was considered to be zero. This is a conservative assumption.

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):

No leakage expected.

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):

GHG emission reduction from the project is estimated by means of the following formula:

$$ER_y = BE_y - PE_y - LE_y$$

Where:
BE_y – baseline emissions, t CO_2e
PE_y – project emissions, t CO_2e

LE_y – leakages, t CO_{2e}.
LEy = 0

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:

Information on environmental impacts is presented in the Section F of this PDD.

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:			
Data ***(Indicate table and ID number)***	**Uncertainty level of data (high/medium/low)**	**Explain QA/QC procedures planned for these data, or why such procedures are not necessary.**	**Data** ***(Indicate table and ID number)***
K1	Amount of coal consumed	Low	Until 01.04.2009 the arrival of coal had been controlled by means of RS-150C13V mechanical car scale, which was leased from Novokramatorsk machine building plant. The accuracy class of scale is average. The reserves of coal at the store for the campaign period are measured by independent experts. Coal amount is calculated by means of accounting of coal carrier's capacity and content of the bunkers. Coal remains are measured during quarterly inventories. From 01.04.2009 the coal amount will be measured by KNV-2D-2R conveyor weighbridge, accuracy class is 0.5 – 1 %. The measurement procedure is approved by the State Committee for Standards and Metrology of Ukraine. The deviation is within the standard approved values. The accuracy of determination of coal's physical and chemical parameters is regulated by the methodologies approved by State

			Standards of Ukraine.
K4	Amount of natural gas consumed	Low	The volume of consumed gas is measured by means of "Universal-02" gas meter . The accuracy class of "Universal-02" gas meter is 0.2 %. The procedure of measurement is approved by the State Committee for Standards and Metrology of Ukraine. The deviation of measurement is within the state standards.
K2, K5	Fuel quality (net calorific value)	Low	The HPP chemical laboratory controls the data provided by fuel suppliers by performing fuel chemical analysis of the respective fuel.
K7	Electric power generation	Low	The brutto amount of electricity generated by turbines is measured by means of the technical meters.
K8	Electric power consumption for own needs	Low	There are 114 meters at HPP which measure electric power consumption for own needs. The meters are of the following types: GANZ (0,7)-1 unit, CE6808B(0,2s)-2 units, CE6805B(0,5s) - 1 unit, "Alfa"- 5 units, ACE 3000- 4 units, STK-3 "Energy-9"- 3 units, EA05RALX- 1 unit, Merkuriy 230- 52 units, SL7000(0,5s)-43 units. The meters accuracy class is 0.5%.

K9	Electric power supply to the grid	Low	There are 14 meters at HPP, which measure power supply to the grid. The meters are of the following types: EA02RALX (0.5)-8 units, SL7000(0,2s) – 6 units. Meters accuracy class is 0.2% and 0.5%.
K11	Steam generation	Low	There are meters which measure the amount of generated steam.
K12	Heat supply to customers	Low	There are 6 meters of heat carrier installed at every boiler. Measurement accuracy is 1%.
K6	CO2 emission factor for the fuel type i	Low	No QC/QA measures foreseen
K10	CO2 emission factor of the Ukrainian grid	Low	No QC/QA measures foreseen

Table 7: Procedures of quality control and quality assurance used during the monitoring

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

Collection of information necessary for GHG emissions calculation in the project is done in accordance with theexisting procedures of Kramatorsk HPP, because monitoring does not require any additional information except the data which is collected and processed on the routine basis.

The following departments of Kramatorsk HPP are responsible for collection and archieving of the monitoring information:

Kramatorsk HPP Chemical Laboratory
Laboratory performs fuel quality analysis. It gives data on quality (i.e. net calorific value) of natural gas and coal supplied to the Kramatorsk HPP. For natural gas the laboratory analyzes its net calorific value, for coal – the net calorific value, ash content, sulphur content, moisture content.

The Department of Fuel Supply
The Department of Fuel Supply is responsible for collection of coal and natural gas consumption data. The department also conducts sampling of the fuel which are later given to the Laboratory for quality control.

Production department
The production department is responsible for accounting the consumed coal and natural gas. The department consists of the Accounting Group and Group of Regimes.

Accounting group:
The main tasks of this group are calculation of the main technical and economic parameters of the plant (heat production and supply to consumers, power production and supply to the grid, amount of the fuel consumed, accounting for the types of fuel consumed, estimating effective fuel consumption, control of the own electricity consumption by the plant). Also the group is responsible for monitoring the auxiliary equipment parameters (boilers, turbines, network equipment). Main parameters being monitored for boilers and network equipment are: the amount of heat carrier, temperature of the carrier, amount of additional carrier feeding, temperature of the additional feeding, etc. All this data is archived by the group.
The group is also responsible for supply agreements preparation for natural gas and other heat/power carriers (water, pressurized air), and transfer of the agreements for the approval by financial department. The group is preparing statistical reports (monthly, quarterly and annual reports) on the main technical and economic parameters of the plant (generation, effective fuel consumption etc).

Group of regimes:
This group is responsible for maintaining the optimal regimes of equipment operation. The group also performs equipment tests and maintenance according to the approved regime procedures.

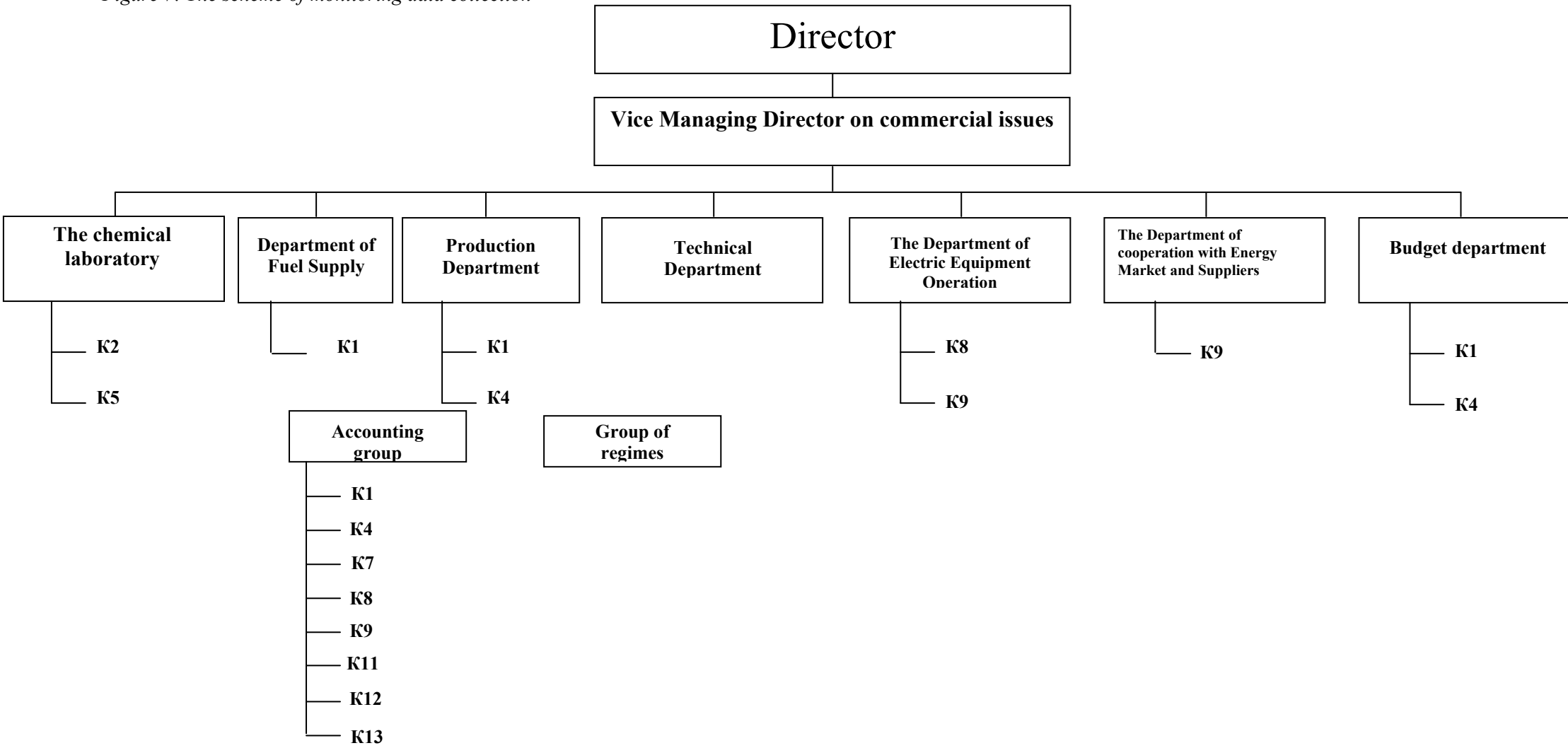
Technical department
The group of construction and maintenance
The group is responsible for preparing maintenance works, for developing technical designs and blueprints, collection of the necessary technical and legislative documentation, procurement of maintenance works' subcontractors, ad-hoc maintenance and repair actions.

The Department of Electric Equipment Operation
The Department of Electric Equipment Operation is responsible for routine operation of electric equipment of the enterprise (following the specified operational regime, identification and registration of discrepancies). The other function is support of reliable automatic operation of electric power accounting system. The Department also collects the meters' data for of electric power consumption for own needs of HPP and electric power supply to the grid.

The Department of Work with Energy Market and Suppliers
The Department of work with Energy Market and suppliers is responsible for managing the balance of electric power. The department is responsible for preparing the agreements with the Energy Market and power consumers; and transfers the drafted agreements to the financial department for further approval.

The Budgeting Department
The department registers existing agreements in a special log and supports electronic registry using 1C software (version 8). The Department carries out accounting of delivering and reversion of contracts. It collects hard copies of the agreements signed.

Figure 7: The scheme of monitoring data collection



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

- «ContourGlobal»
- «Kramatorskteploenergo» LLC
- GreenStream Network

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

The following assumptions were used to calculate the project scenario emissions:

1) Only CO2 emissions are included into the project emissions; emissions of other greenhouse gases (e.g. methane, N2O) were excluded from the calculations. This is a conservative assumption.
2) The plant's boilers are using the mixture of coal and natural gas as fuel. In the emission reductions calculation it was assumed that only natural gas is saved as the result of reconstruction measures. This is a conservative assumption.
3) According to the IPCC guidance the NCV of coal was taken at 5000 kcal/t; the NCV of natural gas was taken at 8000 kcal/1000 m3. This is a conservative assumption.

Project scenario emissions		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Emissions from actual amount fuel of each type consumed by HPP for heat and power generation (taking into account heat supply network rehabilitation)	t CO_2/y	406 129	519 000	520 530	520 530	520 538	520 538	520 538	520 538	520 538	520 538
Total for 2008-2017	t CO_2	**5 060 576**									

E.2. Estimated leakage:

0

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

Project Emissions + Leakages = **5 060 576** + **0** = **5 060 576** t CO_2

E.4. Estimated baseline emissions:

The following conservative assumptions were used during the calculation of the baseline emissions:

1) Only CO2 emissions were taken into account. Emissions of other greenhouse gases, such as methane or N2O were excluded from the calculations.
2) The NCV of coal is taken at 5000 kcal / t. The NCV of natural gas is taken at 8000 kcal / 1000 m3.

Baseline scenario emissions	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017

Emissions from each type of fuel consumed by HPP for heat and power generation	t CO_2/y	438290	575 426	581 036	581 036	582195	582195	582195	582195	582195	582195
Emissions from electric power consumption from the grid	t CO_2/y	1218	3633	7275	8382	8382	8382	8382	8382	8382	8382
Total	t CO_2/y	439 508	579 059	588 311	589418	590577	590577	590577	590577	590577	590577
Total for 2008-2017	t CO_2	**5 739 758**									

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

Project Emission Reduction = Baseline emission-(Project emission +Estimated leakage) =
= 5 739 758 - 5 060 576 т CO2 = 679 182 t CO2

Emissions reduction		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Emissions reduction from each fuel type consumed by HPP for heat and power generation	t CO_2/y	32161	56426	60506	63157	66022	66022	66022	66022	66022	66022
Emissions reduction from electric power consumption from the grid which will be replaced at HPP due to project implementation	t CO_2/y	1218	3633	7275	8382	8382	8382	8382	8382	8382	8382
Total	t CO_2/y	33379	60059	67782	71539	74404	74404	74404	74404	74404	74404
Total for 2008–2017	t CO_2	**679 182**									

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

Year	Estimated project emissions: (t CO_2e)	Estimated leakage: (t CO_2e)	Estimated baseline scenario emissions: (t CO_2e)	Estimated emissions reduction (t CO_2e)
2008	406 129	0	439 508	33379
2009	519 000	0	579 059	60059
2010	520 530	0	589 418	67782
2011	520 530	0	590 577	71539
2012	520 538	0	530 577	74404
2013	520 538	0	530 577	74404
2014	520 538	0	530 577	74404
2015 2016	520 538	0	530 577	74404
2017	520 538	0	530 577	74404
Total (tons of CO_2e)	**5 060 576**	**0**	**5 739 758**	**679 182**

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:

In Ukraine the Environmental Impact Assessment is regulated by the state norms DBN A.2.2.1-2003 "On the content and composition of documents assessing the environmental impacts during design and construction of production facilities, buildings or houses". The proposed JI project involves only rehabilitation of the existing equipment of the power plant without commissioning of any new equipment. Therefore, the Environmental Impact Assessment procedure is not required.

Regular independent checks of the emission levels compliance with the acceptable limits are performed by "NPO Ekologia" (Donetsk). Results of the checks are issued in a standard form of a "Report on the check of compliance against the allowed volumes of atmospheric emissions".

"Kramatorskteploenergo" LLC has received the permit for atmospheric emissions from stationary sources #1412900000-12 issued by the Ministry of Environment of Ukraine. Emissions of hazardous substances from the plant are within the limits specified in the emission permit. Since the proposed JI project does not involve any capital construction and does not lead to increase of hazardous substances' emissions, no assessment of the project by either the local environmental authority or other relevant bodies is required.

The proposed project will not result in any "air pollution whose physical origin is situated wholly or in part within the area under the national jurisdiction of one State and which has adverse effects in the area under the jurisdiction of another State" (the transboundary effect as defined in the text of the Convention on Long-range Transboundary Air Pollution ratified by Ukraine on March 19th, 1999). The proposed project does not create any new sources of pollution and only reduces hazardous emissions by means of decreasing fossil fuel consumption. It also has to be noted that the distance from Kramatorsk HPP to the nearest border of Ukraine is more than 200 km (see Figures 1 and 2), therefore there is no possibility of a transboundary effect.

The Letter of Approval from Ukraine is expected after the submission of the PDD to the National Agency for Environmental Investments (the DFP for Ukraine). The Letter of Approval is an evidence of the project's compliance with the requirements of the host country.

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

The proposed Joint Implementation Project "Reconstruction of Kramatorsk HPP" will have positive effect on the environment.

Project implementation will allow saving approximately 105337 thousand m^3 of natural gas and 24781 t of coal during 2008-2012. Natural gas and coal are non-renewable resources and their saving is therefore important. Project implementation will also allow saving approximately 51 169 MWh of electric power during 2008-2012.

The project is expected to have the following effects on the environment:

Atmosphere

The project's implementation will reduce atmospheric emissions of NOx, SOx, CO and solid particles due to the decrease of consumption of fossil fuel and power from the grid. Therefore, the project is expected to have a positive effect on the atmosphere.

Water

The impact on water is expected to be the same for the project compared to the baseline scenario. Impact on water is regulated by The Water Code of Ukraine and the state norms SNiP 4630-92 that defines the maximum limits on poluutant's concentration in domestic water reservoirs.

Land/Soils

No impact on the land use or the state of soils is identified within the project.

The land use procedures are regulated by the Land Code of Ukraine and the national technical standard DSTU 17.4.1.02.-83 "On Protection of environment and soils. Classes of chemical pollutants to be controlled".

Biodiversity

No impact on biodivestisy is identified within the proposed project.

Waste generation, handling and utilization

In the course of the project's implementation some waste is generated after dismantling of the old equipment, pipes and so on.
The old equipment parts will be utilized to avoid waste generation.

SECTION G. Stakeholders' comments

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

A summary of project has been submitted to Kramatorsk City Council at the stage of the PDD development. The response of the City Council is attached in Annex 4.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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Annex 2

BASELINE INFORMATION

For the details on the Baseline information please refer to Section B of this PDD.

Annex 3

MONITORING PLAN

For the details on the Monitoring Plan please refer to Section D of this PDD.

Annex 4: A letter from interested stakeholder (translation from Ukrainian)

UKRAINE
EXECUTIVE COMMITTEE OF KRAMATORSK CITY COUNCIL
2, Lenin av., Kramatorsk, Donetsk region, 84131

From 29.10.2008
On support of Joint implementation project

To the Head of National Agency
of Ecological Investments of Ukraine
I.V.Lupaltsov

Dear Ihor Volodymyrovuch,

I got acquainted with program of reconstruction of Kramatorsk HPP which consists of the following measures: reconstruction of boilers, turbines, cooling-tower, installation of frequency controllers, replacement of feeding pump, reconstruction of lighting system, as well as partial rehabilitation of district heating system in the town of Kramatorsk.

The proposed Joint implementation project on reconstruction of Kramatorsk HPP is economically and socially important and has positive effect on the environment. The financing of HPP modernization will become essential investment to the heat and power production industry in Kramatorsk. The reconstruction of Kramatorsk HPP will result in essential fuel consumption reduction at the process of heat and power generation as well as power consumption reduction for own needs of HPP.

Large-scale modernization of Kramatorsk HPP with the use of Joint implementation mechanism will ensure work places available on long term prospective. The reduction of dust and toxic gases emissions due to modernization of energy generating equipment at HPP will improve labor conditions at the enterprise and will have positive environmental effect at the local level.

The use of Joint implementation mechanism according to Kyoto protocol will give the possibility to "Kramatorskteploenergo" LLC to involve substantial investments for HPP modernization. The project implementation will result in greenhouse gases reduction, in particular CO_2.

Kramatorsk City Council supports the proposed project of Kramatorsk HPP modernization and asks for your assistance in participation of the enterprise in JI mechanism to ensure the project implementation.

The Mayor of Kramatorsk G.A. Kostuykov