JOINT IMPLEMENTATION PROJECT

«Implementation of the energy efficiency measures and reduction of greenhouse gas emissions into the atmosphere at State Enterprise "Coal Company «Krasnolimanska»

Position of the head of the organization, institution, body, which prepared the document

Director
CEP Carbon Emissions Partners S.A. _______________ **Fabian Knodel**
(position) (signature) (name and patronymic, last name)
PS

Position of the economic entity – owner of the source, where the Joint Implementation Project is planned to be carried out

General Director
SE "Coal Company "Krasnolimanska" _______________ **Oleksyi Kozlov**
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PS

Rodynske - 2012

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

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

Implementation of the energy efficiency measures and reduction of greenhouse gas emissions into the atmosphere at State Enterprise "Coal Company "Krasnolimanska"

Sectoral scope:

Sector 3 – Energy demand;

Sector 8 – Mining/mineral production.

PDD Version: 2.0
Date: 17/08/2012

A.2. Description of the project:

Purposes of the project activity
The main purpose of the Joint Implementation Project (hereinafter - JI project) "Implementation of the energy efficiency measures and reduction of greenhouse gas emissions into the atmosphere at State Enterprise "Coal Company "Krasnolimanska" is improvement of energy efficiency and safety of operations (coal mining), as well as improvement of environmental situation in the region by complex modernization of operations, implementation of colliery gas (CG) recovery technology, as well as implementation of waste heap monitoring program and urgent extinction technology at Krasnolimanska Mine.

History of SE "CC "Krasnolimanska" development
State Enterprise "Coal Company "Krasnolimanska" (hereinafter - SE "CC "Krasnolimanska") is one of the oldest coal miners in Ukraine. The mine was built in 1950-1958, reaching its full capacity (4,000 t of coal per year) by 1962. Over the 50 years of its activity, the mine produced over 100 mln tonnes of high-quality coking coal. In 1977, Krasnolimanska Mine was awarded the Order of Lenin and named after the 50th anniversary of the Great October Socialistic Revolution.

Circumstances in which the project is implemented
Coal mining is a complex system of primary and secondary procedures, such as: mine field opening, mine field preparation, stoping, coal transportation to a warehouse or to consumers, etc. Therefore, only complex approach to mining equipment modernization can ensure higher efficiency of production, whereas partial implementation would be ineffective. This fact is confirmed by a large number of governmental initiatives on the modernization of mining industry and improvement of its efficiency, aimed at individual mine operation aspects and individual segments of technological processes, every time ending with a failure.

In particular, prior to the project implementation, SE "CC "Krasnolimanska" hardly carried out any modernization of equipment due to crisis phenomena taking place in Ukraine's mining industry and, as a result, a lack of financing, absence of effective anti-crisis mechanisms and means to stabilize the situation at the governmental level, so the condition of manufacturing equipment gets worse permanently while operation efficiency goes down.

Most of equipment operated is worn-out and obsolete, which pushes up natural gas and electricity consumption to maintain stable level of electricity of the company.

Despite the poor condition of low-efficient equipment, which is still able to operate, taking account of operational experience and economic indicators, the equipment operated before the JI project implementation can function for another 15-20 years.

Coal mining is directly associated with methane emissions from the rock, which creates the danger of explosion in underground mines. Donbas mines and Krasnolimanska Mine in particular have high gas content, which makes coal mining there particularly dangerous, so mining safety issues are extremely serious. The previous gas drainage technology at the mine, commissioned back in Soviet times, provided for CG draining-out into the atmosphere, which has a harmful effect on the environment, since CG consists mainly from methane, a greenhouse gas.

Coal production in Donetsk region is based on underground mining. Rock after coal separation is stacked into huge waste heaps, making large areas unfit for practically any usage, which is a common practice in Ukraine. The coal separation process has historically been low-effective. Moreover, over a long period, it was considered economically unreasonable to extract 100% of coal from the rock raised. As a result, waste heaps in Donbas contain a great amount of coal. Eventually, coal-containing waste heaps become inclined to self-ignition. The combustion process is accompanied with emissions of large amount of pollutants into the atmosphere. However, relatively small penalties for environmental pollution make waste heap owners uninterested in any additional investments into the waste heaps.

Baseline scenario
The baseline scenario provides for the continuation of operation of the existing equipment with routine repairs without any major investments, which meets the requirements of the state standards and legislation of Ukraine. Specific energy consumption for electricity supply and heat supply of technological processes remain stable or growing, causing higher GHG emissions into the atmosphere. According to the existing technology, colliery gas, which consists mainly from methane, is drained out into the atmosphere. The baseline envisages the continuation of the existing practice on waste heap No.2 monitoring and extinction if burning spots are detected, in accordance with NPAOP 10.0-5.21-04 “Manual on self-ignition prevention, extinction and demolition of waste heaps”. However, these activities proved to be ineffective, which is evidenced by annual temperature surveys detecting recurrent hot spots in a waste heap. Since waste heaps consist from coal (10-15%), its combustion is accompanied by a great amount of emissions of GHGs and other pollutants into the atmosphere. For detailed baseline justification see Section B.

Project scenario
Main project activities aimed at the reduction of GHG emissions into the atmosphere are:

1. complex modernization of coal mining equipment;
2. implementation of coal mine methane (CMM) recovery technology;
3. implementation of waste heap No.2 extinction technology at SE “CC “Krasnolimanska”.

Implementation of energy-efficient and energy-saving equipment and technologies provided for by a complex modernization within the framework of the JI project, will lead to better production efficiency and, as a result, lower energy resource consumption in the course of coal mining, which, in turn, will reduce GHG emissions into the atmosphere.

The technology of CMM recovery by its combustion in boiler equipment, will substitute for the previous mine gas drainage technology, which provided for withdrawal of CMM (a greenhouse gas with Global Warming Potential of 21 t CO_2/t CH_4) directly to the atmosphere. Thermal energy generated as a result of combustion of coal mine methane, the main CG component, will substitute heat from combustion of coal which is currently the primary energy carrier at SE “CC “Krasnolimanska”. By substituting coal with more environment-friendly fuel, namely CMM, GHG emissions to the atmosphere are reduced.

The project also provides for waste heap No.2 extinction activities by insulation of hot spots and barring oxygen to the burning rock. As a result, burning stops and the possibility of recurrent ignition is minimized. Implementation of the effective waste heap monitoring program providing for monthly waste heap monitoring, as well as urgent extinction activities in the case of emergency (control spots temperature exceeding the permissible level). According to conservative principles, GHG emissions generated in the course of waste heap burning will be included into emission reduction calculations in the case of recurrent ignition during the project implementation. Nevertheless, project activities embrace the entire waste heap along with the rock stocked after the start of the project activity.

Activities implemented within the project framework (see Section A.4.2. below) as well as constant monitoring will reduce electricity consumption used in technological processes of coal mining, reduce CG emissions into the atmosphere and stop waste heap burning at SE “CC “Krasnolimanska”, which, in turn, will cause lower GHG emissions into the atmosphere.

SE “CC “Krasnolimanska” has all licenses and permits to implement the project.

Major contracts for the purchase of raw materials (electricity and coal) have been signed and are subject to annual revision in line with the existing practice. Necessary equipment for the project is planned to be purchased from leading Ukrainian and European manufacturers on a tender basis.

Historical details of the Joint Implementation project “Implementation of the energy efficiency measures and reduction of greenhouse gas emissions into the atmosphere at State Enterprise “Coal Company “Krasnolimanska”

21/07/2003 – the starting date of the project, when SE “CC “Krasnolimanska” started to implement activities within the framework of the Joint Implementation Project (Certificate No.12).

13/06/2012 – preparation and submission of the project idea note to support anthropogenic GHG emission reductions, to the State Environmental Investment Agency of Ukraine.

26/07/2012– obtaining of a Letter of Endorsement No.1996/23/7 from the State Environmental Investment Agency of Ukraine.

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)	SE "CC "Krasnolimanska"	No
Switzerland	CEP Carbon Emissions Partners S.A.	No
*Please indicate if the Party involved is a host Party.		

State Enterprise «CC «Krasnolimanska» is an organization that implements the project (Applicant, Supplier). Code in the Unified State Register of Enterprises and Organizations of Ukraine 31599557. Type of activity: 10.10.1 Extraction and enrichment of coal, 10.10.3 Coal agglomeration.

CEP Carbon Emissions Partners S.A. is a research and engineering organization. It is responsible for the development of project design documents for the joint implementation project. Besides, it will participate in determination, monitoring and verification of the project.

A.4. Technical description of the project:

A.4.1. Location of the project:

The project location is shown in the map of Ukraine (Figure 1).

Figure 1. Location of SE "CC "Krasnolimanska" in the map of Ukraine

A.4.1.1. Host Party(ies):

The project is located in the territory of Ukraine.

Ukraine is an Eastern European country that ratified the Kyoto Protocol to the UN Framework Convention on Climate Change on February 4, 2004. It is listed in Annex 1 and meets the requirements of participation in Joint Implementation projects[1].

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

Donetsk region.

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

Rodynske town.

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

The project is located in Donetsk region, Ukraine.
Geographical coordinates of Krasnolimanska Mine: 48°21′235″ N 37°14′30″ E
Geographical coordinates of Krasnolimanska Mine waste heap No.248º 21' 29" N 37º 14' 32" E

Figure 2. Location of Krasnolimanska Mine and waste heap No.2 with respect to Rodynske town

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

1 http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?page=1&nreg=995_801

The JI project “Implementation of the energy efficiency measures and reduction of greenhouse gas emissions into the atmosphere at State Enterprise "Coal Company "Krasnolimanska" provides for the complex modernization of coal mining process, implementation of CMM recovery technology and waste heap No.2 monitoring systems and urgent extinction in the case of hot spot detection.

Modernization of production process at Krasnolimanska Mine is achieved by implementation of innovative, energy-efficient, energy-saving equipment taking account of the latest trends in the manufacturing industry, aimed at higher efficiency of consumption of electricity, fossil fuel as well as at greenhouse gas emission reductions.

CMM recovery, which substituted the previous mine gas drainage technology, which involved release of colliery gas directly into the atmosphere, provides for its combustion in high-efficient boiler equipment; heat generated by CMM combustion is used to generate energy for on-site needs. The implementation of the CMM recovery technology provides for gas pipeline reconstruction, installation of vacuum pumping plants, commissioning of high-precision gas analysers, installation of compressor plants, CMM-fuelled boiler equipment, drilling of operational wells for stope gas drainage.

Implementation of waste heap monitoring system and urgent extinction system provides for monthly temperature surveys to monitor waste heap condition change. For this purpose, waste heap temperature is measured using thermocouples at different levels: 0.1 m, 0.5 m, and 2.5 m. If the temperature increases to 80˚C in the depth of 2.5 m, which indicates the hot spot in a waste heap, the latter is classified as a burning waste heap and urgent extinction activities take place with the use of innovative technologies and materials. According to the project urgent extinction programme, vermiculite is used as necessary along with/instead of previously used pulp or burned-out rock. Vermiculite is a hydrated mica phyllosilicate, which expands by 10-15 times when heated to 300-1000 □C. Air layers in vermiculite structure ensure heat and sound insulation. Concrete pumps pump vermiculite under pressure into a hot spot of a waste heap, barring it from oxygen and stopping the burning process.

Main activities within the boundary of the project follow; more details on JI project “Implementation of the energy efficiency measures and reduction of greenhouse gas emissions into the atmosphere at State Enterprise "Coal Company "Krasnolimanska" activities will be provided at the monitoring stage:

1. Implementation of CMM recovery equipment.

1.1 Implementation of GBH-1/89/12 drilling rig with seam gas drainage. Specifications of the drilling rig are available below as well as at the seller’s web-site.[2]

Figure 3. GBH-1/89/12 drilling rig with seam gas drainage manufactured by Deilmann-Haniel mining systems GmbH

[2] http://www.uer.com.ua/Default.aspx

Table 1. Specifications of GBH-1/89/12 drilling rig

Drive type	electrohydraulic
Drilling method	rotary
Diameter of rock wells	114 mm
Maximum depth of rock drilling	350 m
Drilling angle	20º
Rock drilling efficiency	up to 80 mPa-15-20 m/h
	up to 140 mPa-10-15 m/h
Drill rod diameter	88.9 mm
Remote control - hydraulic	30 m
Motor rotation	Reverse
A8V080-type hydropump efficiency	2x110 l/min
	1x30 l/min
HP63 unit motor drive power	63 kW
Carriage feed force	12 t
Working pressure	180 bar

The rigs help to pump part of CMM to boiler equipment that adopted for CMM for further combustion (against the old practice of CMM release into the atmosphere), which reduces GHG emissions into the atmosphere. Heat generated during CMM combustion will substitute the same amount of heat generated during coal combustion, which was common practice in the company, while causing less GHG emissions into the atmosphere.

1.2. Implementation of movable PDU-50M gas drainage units. Specifications of the gas drainage units are available below as well as at the seller's web-site.[3]

Figure 4. A movable PDU-50M gas drainage unit.

Table 2. Specifications of a movable PDU-50M gas drainage unit.

Parameter	Value
Maximum gas throughput, m^3/min	50
Maximum vacuum, % of barometer pressure	80

[3] http://www.ua.all.biz/g1439526/

Maximum working discharge pressure, MPa (kg/cm^2), max	0.07 (0.7)
Minimum discharge pressure, MPa (kg/cm2), min	0.02 (0.2)
Volume of water in cooling system, m^3, min	2.75
Total installed power, kW	113
Dimensions in working position, mm: Length Width Height	 10000 2060 2115
Mass of the unit (without water), kg, max:	9400
Mean time to failure, h, min	560
Average overhaul life, h, min	150000
Voltage, V	380 V/660 V

The unit is designed for:

- coal seam gas drainage and containing rock during stoping and mine opening at mines under construction, in operation and at the stage of decommissioning;
- gas removal (methane, hydrogen sulphide, carbon dioxide, etc.) from mine openings, tectonic faults;
- ensuring forced aeration of mine openings.

Implementation of GBH-1/89/12 drilling rigs and PDU-50M movable gas drainage unit will improve the safety of mining operations, reduce accident and injury rate, raise coal production by minimizing idle periods due to dangerous methane concentration. Due to the implementation of GBH-1/89/12 drilling rigs and PDU-50M movable gas drainage unit, part of methane from the mine is drained out directly to the air-shaft. The next stage is combustion of methane in boiler equipment, causing GHG emission reduction against the previous practice of methane release into the atmosphere and using coal for heating.

2. Implementation of waste heap monitoring and urgent extinction programmes.

Waste heap monitoring takes place monthly when specially trained people measure waste heap temperature at the following depths: 0.1 m, 0.5 m, and 2.5 m. If the temperature increases to 80˚C in the depth of 2.5 m, which indicates the hot spot in a waste heap, the latter is classified as a burning waste heap and urgent extinction activities are carried out. Monitoring results are fixed in monthly temperature survey reports stored in electronic form at the enterprise. If force majeure prevents from the measurement, the results of temperature surveys for the skipped month are taken from the month when the surveys resume.

The project programme of waste heap No.2 monitoring enables quick and correct identification of waste heap dynamics and extinction method efficiency.

The project program of waste heap extinction will be carried out using the following technology:

Prior to extinction activities pathways and working sites are formed from non-flammable material (burned-out rock, boiler slag) to create access for the machinery to the waste heap. While carrying out these activities, wind direction is taken into account and the following equipment is used: concrete pump trucks designed to discharge working liquids while grouting wells in the course of drilling and overhauling; concrete mixer trucks for concrete mixture transportation and unloading it directly to the site; pumping units used for solution preparation and pumping thereof under the pressure to the wells; autonomous drilling rig; underground drilling workbench.

The rear and frontal part of waste heap channels are treated with vermiculite[4] mud powder, by means of reinstallation of automatic concrete pump and mixer. The material increases in volume by 15-30 times when heated to the temperature of 300-1000°C. Air layers ensure low density and high heat- and sound insulation. Apart from vermiculite, clay-based grout mixtures can be used to create the surface layer over the hot spots by pumping the mixtures through up to 2.0-meter-deep wells.

The mixture is supplied via a hinged concrete carrier of a concrete pump truck in several stages. The mixture is applied in the areas with burning rock, heated rock and rock that is not burning, including slopes. After it stops steaming and the temperature falls in the burning areas of the waste heap, works to estimate how deep the hot spots are located are to be done so that the height of heap lowering can be known which is needed for the operation safety and effective extinction.

To this end, drilling works are carried out and clay-based grout mixtures (vermiculite) are applied. Drilling works are aimed to reach the hottest spots. The number of the drilling workbench being reinstalled is to be minimal taking into account drilling of well ring in opposite directions from the axis of the heap towards the hottest spots.

One third of the length of the well (pipe column) is measured, and there casing pipes are perforated.

Fluids can be pumped simultaneously via several pipes joined with high-pressure flexible hoses with pipe manifold valves (Figure 5).

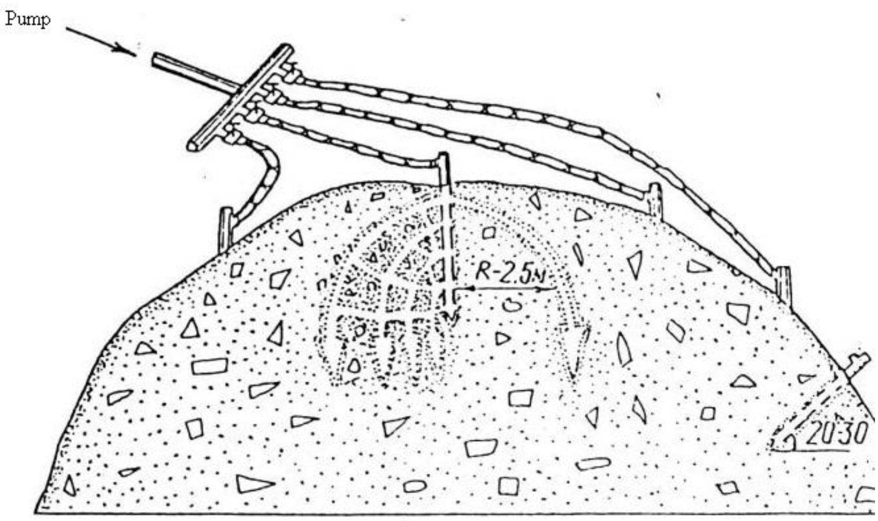

Figure 5. Scheme of antipyrogen pumping with use of several perforated pipes.

To prevent antipyrogen emission along the outer walls of the casing pipe, equipment that seals the top of the well is used. Radiation levels are reduced in the heap by digging trenches of a particular size with bulldozers; filling the trenches with antipyrogen so that it can freely filter into the heap until the rock absorbs it all (Figure 6).

[4] http://en.wikipedia.org/wiki/Vermiculite

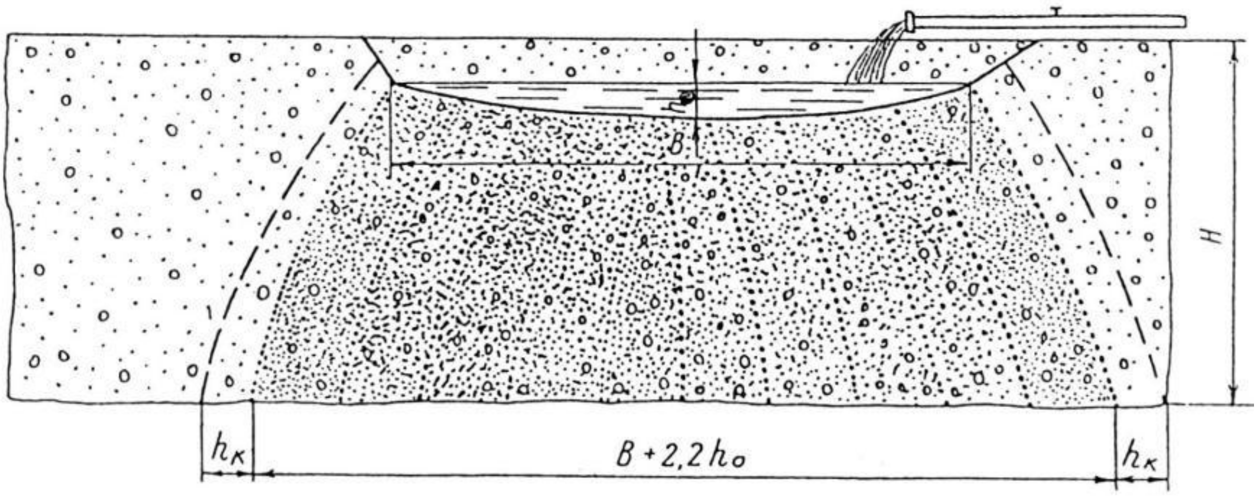

Figure 6. Scheme of hydrating heaps with antipyrogen filtering freely.

The bulldozer pushes the cooled rock layer into crest splits with extra antipyrogen hydrating (the spraying method), increasing the density to the level at which air is as permeable as to exclude the possibility of ignition. In case rock amount is not enough to fill the space between the crests, trenches are dug and filled with antipyrogen repeatedly until a horizontal site is created.

The site, which covers the three waste heap channels, is made denser after antipyrogen is sprayed.

The last phase is to seed perennial cereals and legumes. Per 1 hectare of land, 20-30% more seeds is planted than normal for the zone.

Most of equipment under the project, such as trucks, excavators, bulldozers, is standard industrial machinery used worldwide. For the works under the project to be carried out, no equipment needs to be ordered individually.

3. Implementation of the energy efficiency measures (modernization of technological equipment used in coal mining and in related technological processes).

3.1 Implementation of KDK 500 cutter-loader. Specifications of KDK 500 cutter-loader are available below as well as at the seller's web-site[5]

The cutter-loader is intended for the extraction of coal in the breakage faces advancing along the course of bed with the thickness of 1.35-3.2 m with the angle of dip up to 35° as well as along the pitch or rise of the seam up to 10° at the coal cuttability up to 360 kN/m. Key specifications are as follows:

- Body of the machine is designed as a boxlike power frame with the compartments for the allocation of the independent blocks;
- the main units of the machine are made as block structures;
- availability of the cooling system for the reducers of the cutting point and electrical equipment;
- load-carrying elements of the gear group are estimated to have a 15,000-hour lifetime;
- the machine can be controlled from the remote gangway console or by means of the wireless portable control console. It is equipped with the diagnostic and control system for the monitoring of the state of the main units, indication of the process and diagnostic information on the display.

[5] http://www.mmc.kiev.ua/production/detail.php?ID=58

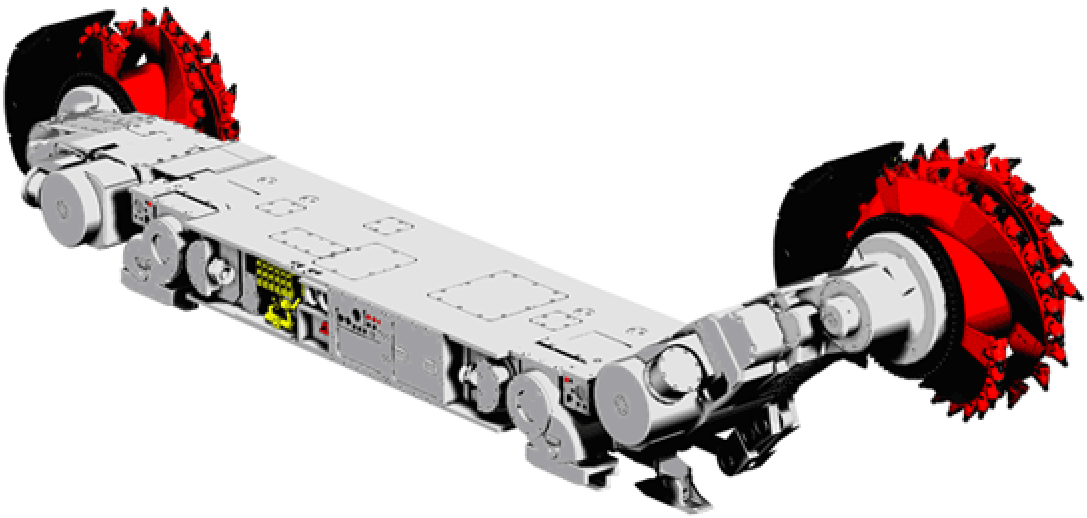

Figure 7. KDK 500 cutter-loader.

Table 3. KDK 500 cutter-loader specifications.

Weight, kg	24000/27000
Voltage, V	1140
Maximum driving force of the feed system, kN	450
Maximum operating feed rate, m/min	20
Productivity (at 2-3 coal cuttability levels), t/min	18.0
Nominal operating width, mm	630
Cutter diameter, mm	1120,1250, 1400,1600, 1800,2000, 2200
Coal cuttability, kN/m	360
Angle of dip and pitch/rise of seam, degrees	35/10
Size, mm	8900/8600x2083x950/1150
Total rated power of drives, kW	597.5
Total rated power of drive of effectors, kW	2x250
Total rated power of power-operated actuator, kW	2x45
Applicability in extracted height, min/max, m	1.35-2.6/1.8-3.2
Purpose	Coal, medium-thickness seams

3.2 Implementation of SP 326 conveyor. Specifications of conveyor are available below as well as at the seller's web-site[6]

[6] http://www.shaht.kharkov.ua/index.php/2012-05-25-08-44-23/2012-05-25-08-44-37/2012-05-28-11-45-47/10

Figure 8. SP 326 mining drag conveyor.

Table 4. Specifications of SP 326 conveyor

Specifications	Value
Throughput, t/h	1000
Length of conveyor, m	570
Width of pan on sides	754
Profile height	245
Length of pan	1500 or 1900
Electric engine voltage, V	1140/660
Chain type	24x92
Traverse speed of pulling movable operating element, m/s: Operating – for single-speed engine For double-speed engine Manoeuvring – for double-speed engine	1 1.12; 1.24 0.37; 0.41

SP 326 series movable mining drag conveyor is intended for the coal transportation from the breakage faces from the seams with the power of 1000 t/h.

The conveyer can be used with all types of support and combines that correspond to the seam thickness and are produced in Ukraine and abroad.

3.3 Implementation of 3KD-90 power roof support. Specifications of the roof support are available below as well as at the seller's web-site[7]

[7] http://www.coal.dp.ua/index.php?option=com_content&view=article&id=426%3Agimli&catid=76%3A2009-05-26-19-54-12&Itemid=61

Figure 9. 3KD-90 power roof support

Table 5. Specifications of 3KD-90

Parameter	*3KD-90*
Thickness of serviced seams, m	1.35-2.0
Allowable angles of bedding:	
for operations in strike of seam, degrees	35
for operations in pitch and seam rise, degrees	10
Specific resistance per 1 m2	542-558
Resistance of unit, kN	3149-3241
Coefficient of hydraulic separation	2.0
Advancing force of unit, kN	392
Mounting pitch of units, m	1.5
Astel factor	0.91
Height min-max, mm	1000-2000
Width, mm	1420
Weight of unit, t, max	7.65

It is intended for the mechanization of the processes of support and roof control in the working area of the longwall and advancing of the drag conveyor during the extraction of the flat-lying seams with the thickness of 0.85-2.0 m complete with the mining machine, SP326.

3.4 Implementation of KTPV-1000/6 transformer plant. Specifications of the transformer plant are available below as well as at the seller's site[8]

Figure 10. KTPV-1000/6 transformer plant

[8] http://www.elektro-mashina.ru/section/140.html

Table 6. Specifications of KTPV-1000/6

Parameter	KTPV-1000/6
Rated power, **kVA**	1000
Frequency, Hz	50
Rated voltage HV, kV	6.0
Rated voltage LV, kV	1.20 0.69
Voltage of short circuit, %	5.0
Short circuit loss of power transformer at 115^{o}C temperature, kW	7.25
Excitation current, %	1.0
Idling loss of power transformer, kW	2.80
Size, mm length/width/height	3700/1080/1400
Weight, kg (without wheel pair)	6000

The transformer plant is intended for the power supply of the electric receivers installed in the underground openings dangerous in gas (methane) and (or) powdered coal with the three-phase current as well as for the protection against the leakage current and maximum current protection of the low-voltage lines.KTPV-1000/6 transformer plant shows much lower electricity consumption and improved effectiveness as compared with the previous plant.

3.5 Implementation of SND 300/40 pump unit. Specifications of the pump unit are available below as well as at the seller's web-site.[9]

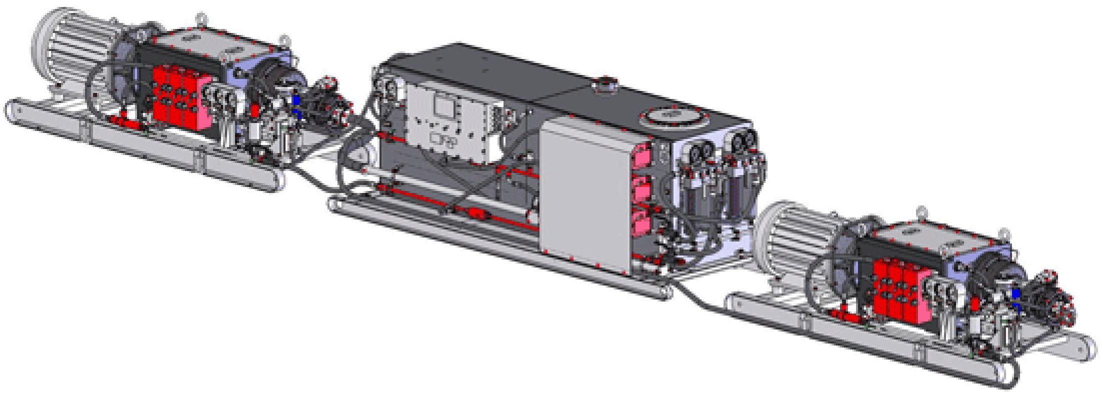

Figure 11. SND-300/40 pump unit

Table 7. Specifications of SND-300/40 pump unit

Parameter	*SND-300/40*
Head, l/min	300 (150+150)
Nominal pressure, MPa	40
Pressure setting range, MPa:	
- upper end, max	40
- lower end, min	18
Pressure to activate safety valve, MPa, max	45
Pump-inlet pressure, MPa, min	0.3
Rated power of engine, kW	220 (110+110)
Tank capacity, l, min	1600
Number of pump units	2
Size, mm, max	

[9] http://www.dgum.com.ua/ns/snd300.php

Pump unit:	
Length	3200
Width	1200
Height	780
Weight, kg, max:	
Pump unit	3100
Tank	1600
Pump plant	7800
Working liquid	Any water and oil emulsions allowed to be used in coal mines
Slope angle (plant's base to horizon), degrees, max	5

SND 300/40 pump units are intended for the pumping of working liquid into hydrosystems of refining equipment, power supports and other machinery in mines of any gas and powdered coal mines. Plants include two autonomous pump units with five plunger pumps and a tank. A plant with one pump unit can also be assembled. Pump units can work both independently (each works for its consumer) and simultaneously (for general consumers; when high-efficiency mechanical complexes are serviced, or as part of central pump plants).

3.6 Implementation of LV-45 winch. Specifications of the winch are available below as well as at the seller's web-site.[10]

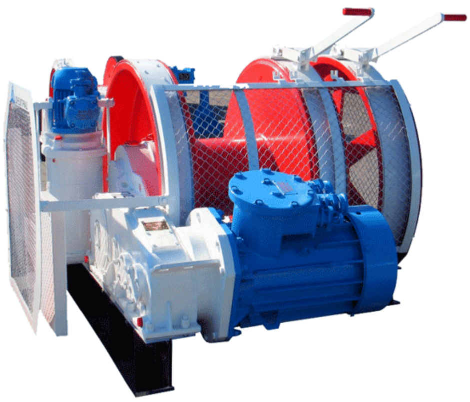

Figure 12. LV-45 winch.

Table 8. Specifications of LV-45 winch

Parameter	LV-45
Tractive force at last layer of winding, kN	45
Rope speed at last layer of winding, m/s	1.3±0.06
Reeling capacity of drum, m	1100
Installed capacity, kW	57.2
Brakes of winch:	
- type of brake assemblies	Band
- closing of automatic brake	Load
- opening of automatic brake by electrical-and-hydraulic pusher	Electrohydraulic pusher
Size, mm	
Length	2000
Width	200
Height	1500
Weight, t	4.5

[10] http://www.dgum.com.ua/trans/lv45.php

The winch is intended for the transportation of materials along straightways of the coal mines, including mines dangerous in gas and dust.
The winch has a drum and a reducer, two hand brakes (brakes and friction) and a power brake, installed at the general frame. Drum rotation can be controlled with the help of friction at a planet gear carrier and a hand brake at the drum. Speed adjustment, smooth start. The winch is equipped with a double-reduction speed reducer. The high-speed stage is a helical double-reduction speed cylindrical reducer in an integral body.

Implementation of energy-efficiency technological equipment with high efficiency rate will cause an increase in production efficiency and in mining capacity, which will lead to a drop in energy resources consumption during production, and thus to a GHG emission reduction.

4. Replacement of meters with lower accuracy class by meters with higher accuracy class. An overview and specifications are available below as well as on the seller's website[11].

Figure 13. NIK 2303 AP2T high-precision electricity meters
Table 9. Specifications of meters

Rated current	5 – 60 A
Accuracy class	1.0
Number of tariffs	4
Working temperature	-30 - +50 ^{0}C
Speed of data transfer	9600 baud.
Possibility of connection of external power source (12 V) for reading in case of voltage absence	

Application of new meters with higher accuracy class will reduce electricity consumption by meters and improve the monitoring of electricity consumption; this will reduce GHG emissions into the atmosphere.

Project implementation schedule

Table 10. The schedule of technological equipment implementation within the framework of the project at SE "CC "Krasnolimanska"

Project implementation	Year								
	2004	2005	2006	2007	2008	2009	2010	2011	2012
Implementation of GBH-1/89/12 drilling rig with seam gas drainage.									

[11]http://www.eliton.com.ua/good_533.htm

Implementation of movable PDU-50M gas drainage units.									
Reconstruction of solid fuel boilers for combustion of opportunities they CMM									
Implementation of waste heap monitoring and urgent extinction programmes.									
Implementation of KDK 500 cutter-loader.									
Implementation of SP 326 conveyor.									
Implementation of 3KD-90 power roof support.									
Implementation of KTPV-1000/6 transformer plant.									
Implementation of SND 300/40 pump unit.									
Implementation of LV-45 winch.									
Replacement of meters									

Project implementation started on 21/07/2003 (Certificate No.12). However, emissions generated in 2003 are excluded from the calculation from a conservative standpoint. Therefore, the starting date of the crediting period is deemed 01/01/2004.

Before the project was started, SE “CC “Krasnolimanska” used to take measures needed only for keeping technological equipment and production complex in service. The company mainly carried our repairs to correct operational faults and replaced outdated and inoperative equipment with similar facilities as they were cheap. Apart from electricity, coal was the major energy material for the company. SE “CC “Krasnolimanska” consumed its own coal as well as bought it from other Donbas mines since availability was high and purchase and transportation expenses were inconsiderable. After separating coal from rock, SE “CC “Krasnolimanska” dumped the waste material on the heap, which covered large areas of land and made it impossible to use this land in any other way. Introduction of technologies to get all of coal found in rock was believed to be unfeasible and time-consuming, so the technology was not introduced and the rock dumped on the heap had 10-15% of coal in it. The usual moves to monitor the condition and to ensure effective extinction were not enough to prevent new hot spots from regularly emerging and rock that stopped burning from burning again in the waste heap. The project is aimed at introducing new energy efficient technological equipment into coal production process, adopting the CMM recovery technology and the waste heap monitoring and urgent extinction systems based on the latest trends and technologies. The average operational life at nominal rates of the equipment implemented under the project is 17 years. If the equipment introduced under the project is serviced properly, it is not expected to need replacement before the above term runs out, as the technologies employed are in line with the present-day global practice. Workers and specialists of SE “CC “Krasnolimanska” will be trained the same way they used to before the project was launched. If needed, which means if their skill level is not high enough to work with the equipment introduced under the project, equipment producers will give instructions and training, which is mentioned in the contracts for equipment purchase.

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:

Pre-project sate of operations at State Enterprise "Coal Company "Krasnolimanska" was rather poor. Most equipment was obsolete and worn-out because it was installed back in Soviet times. Thus, it was low-efficient and consumed a lot of energy resources per unit of output. Taking into account the current practice, such equipment is capable of operation for another 20 years with timely repairs. Limited financing and a lack of long-term industry development plan made the modernization of technological processes and implementation of innovative technologies or organizational measures economically not feasible and risky. Legislatively, operations at SE "CC "Krasnolimanska" meet the requirements of the state standards. Ukraine has not developed any system of dotation or incentives for GHG emission reduction to encourage the producers to implement similar project activities. Thus, without the JI project, modernization of technological equipment, implementation of CMM recovery system and prevention of waste heap from burning would be unlikely, which would cause high energy resource consumption and high GHG emissions into the atmosphere.
Project activity aimed at lower consumption of electricity by modernization of technological equipment used for coal mining, installation of equipment for CMM recovery and waste heap monitoring and urgent extinction programs.

Activities under the project "Implementation of the energy efficiency measures and reduction of greenhouse gas emissions into the atmosphere at State Enterprise "Coal Company "Krasnolimanska" will minimize energy resource consumption, ensure CMM recovery technology implementation and stop waste heap burning, leading to GHG emission reductions.

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

Table 11. Estimated emission reductions for the period preceding the first commitment period (2004-2007)

	Years
Length before the crediting period	4
Years	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2004	7 986
2005	8 580
2006	275 564
2007	291 986
Total estimated emission reductions before the crediting period (tonnes of CO_2 equivalent)	584 116
Annual average of estimated emission reductions before the crediting period (tonnes of CO_2 equivalent)	146 029

Table 12. Estimated emission reductions for the first commitment period (2008-2012)

	Years
Length of the crediting period	5
Years	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2008	278 208
2009	260 277
2010	259 394
2011	246 760
2012	265 606
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	1 310 245
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	262 049

Table 13. Estimated emission reductions for the period following the first commitment period (2013-2020)

	Years
Length after the crediting period	8
Years	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2013	277 149
2014	277 149
2015	277 149
2016	277 149
2017	277 149
2018	277 149
2019	277 149
2020	277 149
Total estimated emission reductions after the crediting period (tonnes of CO_2 equivalent)	2 217 192
Annual average of estimated emission reductions after the crediting period (tonnes of CO_2 equivalent)	277 149

For more details refer to Supporting Document 1.

For the description of the formula used for calculation of emission reductions see Sections D.1.1.2., D.1.1.4. and D.1.4.

A.5. Project approval by the Parties involved:

Letter of Endorsement No.1996/23/7 dated 26/07/2012 for the JI project "Implementation of the energy efficiency measures and reduction of greenhouse gas emissions into the atmosphere at State Enterprise

"Coal Company "Krasnolimanska" was issued by the State Environmental Investment Agency of Ukraine.
After the project determination, the project design document (PDD) and the Determination Report will be submitted to the State Environmental Investment Agency of Ukraine to obtain a Letter of Approval.

SECTION B. Baseline

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

A **baseline** is the scenario that reasonably represents the anthropogenic emissions by sources of GHGs that would occur in the absence of the proposed project. The baseline should be established in accordance with the requirements of the "Guidance on criteria for baseline setting and monitoring," Version 03[12]. In line with the "Guidelines for users of the joint implementation project design document form," Version 04,[13] a stepwise approach is used for baseline description and justification:

Step 1. Identification and description of the approach chosen to establish the baseline.

None of the existing methodologies can be applied for the proposed project aimed at modernization of operations equipment, implementation of CMM recovery technology and waste heap monitoring and urgent extinction systems at SE "CC "Krasnolimanska" and, as a result, reduction of GHG emissions into the atmosphere. The project participant has chosen a JI-specific approach in accordance with paragraph 9 (a) of the "Guidance on criteria for baseline setting and monitoring", Version 03.

The baseline is established by selecting the most plausible scenario from the list and description of plausible future scenarios based on conservative assumptions.
The following steps were applied to establish the most plausible baseline scenario:
1. Identification of plausible alternatives that could be the baseline scenario
2. Justification of exclusion from consideration of alternatives, which are unlikely to take place from a technical and / or economic point of view.

To set the baseline scenario and further development of additionality justification in Section B.2. the following was taken into account:

- State policy and legislation in the ore mining sector;
- Economic condition of Ukraine's ore mining sector and forecasted demand for services;
- Technical aspects of equipment operation;
- Availability of capital (including investment barriers);
- Local availability of technology / equipment;
- Price and availability of fuel.

In addition, uncertainty of ERU generation possibility due to lower activity beyond the project boundary or due to force-majeure circumstances is also taken into account, using conservative assumptions.

Step 2. Application of the approach chosen.
The choice of the plausible baseline scenario is based on assessment of alternatives, which potentially could occur.
These alternatives are the following:

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

[13] http://ji.unfccc.int/Ref/Documents/Guidelines.pdf

Alternative 1.1: Continuation of the current situation, without the JI project implementation.
Alternative 1.2: Proposed project activity without the use of the JI mechanism.
Alternative 1.3: Partial project activities (some of the project activities are implemented) without the use of the Joint Implementation Mechanism.
The detailed analysis of each alternative follows.

Alternative 1.1
Continuation of the existing practice with minimum repairs against the general worsening of technological complex.
Condition of the mining industry in Ukraine.
The condition and development trends of Ukraine's mining industry are rather unsatisfactory.
The technological level of Ukrainian mines is very poor, which makes the coal quality low and its production costs high, leading to low competitiveness of the product in global markets and causing high energy consumption per unit of output.
Since Ukraine became independent, the energy industry in general and coal mining in particular have been in a state of crisis. The Government of Ukraine elaborated the "Development program for coal industry and social sphere of mining regions till 2005" (the program "Coal" approved by the Decree of the Cabinet of Ministers in March 1994[14]). The program envisaged an expansion of production capacity at a number of mines; implementation of innovative technologies, general technological upgrade in coal mining industry, social improvements in mining regions and higher coal production. The program failed almost in every line. That was mainly because the program did not take account of a complex approach to coal industry restructuring and modernization, as well as peculiarities of transitive stage in economy and market system of that time, which leads to an obvious failure. Regional mining output dropped by a quarter and coal production lost 40%. Another attempt to make it work was made in 1996 by the President of Ukraine who issued the Decree "On restructuring of coal industry"[15] intended to liquidate coal production companies with no prospects, to give stronger financial support to the industry, to ensure social security for the workers who retire, to allow coal mine privatisation and high competitiveness of coal market. In fact, only mines were liquidated, with other targets not achieved because of fund diversion schemes. Before the program "Coal" was completed, the Cabinet of Ministers approved the next one in September 2001. The new program, "Ukrainian coal"[16], stipulated a rise in the quality of miners' output, growth of production capacity, decrease in production costs and other moves meant to upgrade coal production equipment. Some of the previous mistakes were repeated though. Specifically, the approach to the industry modernization was again incomprehensive, which made the program unsuccessful. Particularly, coal production was 30% below the expected level; the material's ash content was 7 points higher than planned, production costs – 87.6% higher, price – 80% higher, and losses increased by a factor of three. During the following ten years, the Ukrainian government was trying to find an acceptable solution for backing the loss-making mines. In August 2003, the Cabinet of Ministers approved the procedure of providing financial support to coal miners by allocating budget funds for covering part of production costs and for construction and upgrade of coal production facilities. The funds were to be used for lowering production costs and improving performance. The support procedure

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[14] http://zakon2.rada.gov.ua/laws/show/141-94-%D0%BF/page

[15] http://search.ligazakon.ua/l_doc2.nsf/link1/U116_96.html

[16] http://zakon2.rada.gov.ua/laws/show/1205-2001-%D0%BF

was repeatedly revised, but its basic principle – allocation of funds to cover part of production costs commensurately with mines' losses – was not changed. The effect was that coal producers aimed to retain their right for getting money from the government by staying unprofitable, rather than to look for reserves, develop production facilities through modernization, innovative technologies, or daring management and organizational decisions. Several bills have been passed and programs launched since then, but the industry is still suffering the crisis that started the year when Ukraine achieved independence.

SE "CC "Krasnolimanska" faces the same situation as the whole coal industry does. Up to 80% of technological equipment currently in operation at the plant is obsolete and worn-out, being over 30 years old. However, the long payback period and high value make equipment modernization and introduction of new technologies at SE "CC "Krasnolimanska" an unattractive investment, as the miner's economic position is weak. The experience suggests that, if repaired regularly, the existing facilities can run for 15-20 more years, even though the efficiency is low. The above shows that Ukraine has created no effective lawful tools to prompt modernization of technological and technical state of the industry, which means companies do not pay much attention to such matters as energy efficiency, production upgrade and reduction of environmental pollution.

The Ukrainian government has adopted no effective action to develop coal industry by now, but it is probable that in the short term, as against the period the project has been carried out for, the country will not produce less coal than planned, considering that coal industry has always been taken as a guarantee that the country will not depend on foreign energy resources. If the output declines, which is unlikely though, ERU generation might drop at the company due to the factors that are beyond the project boundary. In case of a force majeure, Ukraine will primarily focus on minimizing its impact on local coal industry.

There are measures that, while carrying out its usual operations, SE "CC "Krasnolimanska" can take to avoid declaring a force majeure and thus suspending production, as well as measures to eliminate the effect of a probable force majeure.

This Alternative is the most plausible baseline scenario because it:

- ensures the production volume is large enough due to the increased use of relatively available energy resources;
- requires no investment into new technological equipment.

Consequently, *Alternative 1.1* can be considered the most plausible baseline.

Alternative 1.2

Proposed project activity without the use of the JI mechanism.

There are two obstacles in this case: investment (for more details see Section B.2), as this scenario implies additional serious financing, a very long payback period and high risks, and thus is unattractive; the second is technology, as the use of new modern equipment calls for additional staff re-training, which is also money spent. Equipment reconstruction aimed at improving energy efficiency at mining companies, particularly those extracting coal, is not a usual practice in Ukraine.

This Alternative is the least plausible baseline scenario, as it needs investments made into new technological equipment and means there is no skilled staff to service the equipment, so *Alternative 1.2* cannot be seen as a plausible baseline.

Alternative 1.3

Partial project activities (some of the project activities are implemented) without the use of the Joint Implementation Mechanism.

Alternative 1.3 stipulates that measures to implement the project are not included into the project boundary, for example movable PDU-50M gas drainage units, cutter-loaders, etc. are not part of the project. The coal production process is a complex system where a large number of technological processes are connected closely, so only a comprehensive approach can be taken to modernization, since partial implementation of measures will not lead to a significant decrease in consumption of energy resources. Besides, *Alternative 1.3* needs investments made into new technological equipment and means there is no skilled staff to service the equipment. At the same time, implementation of the waste heap monitoring and urgent extinction programs brings no profit to the company, but calls for heavy expenditure. Without the JI project, its implementation is unprofitable for SE "CC "Krasnolimanska" and therefore unlikely. Thus, *Alternative 1.3* cannot be considered a plausible baseline.

The analysis of the above alternatives shows that the most plausible baseline is *Alternative 1.1*, and the least plausible ones are *Alternative 1.2* and *Alternative 1.3*.

The results of the analysis of the additionality in Section B.2. show that *Alternative 1.2* and *Alternative 1.3* cannot be seen as the most plausible as regards financing. These assumptions are confirmed in Section B.2. The result of the analysis done according to "Tools for the demonstration and assessment of additionality" (Version 06.0.0) in Section B.2 indicate that the project scenario is additional.

Baseline scenario description

Baseline scenario provides for the continuation of the current practice with minimum repairs against general worsening of equipment, participating in the technological manufacturing process, heat generation at low-efficient boiler equipment with considerable heat loss during its transportation to the consumer, as well as further release of CG into the atmosphere, under the existing gas drainage technology. Waste heap No.2 would continue burning on account of ineffective monitoring and extinction, which would entail big amounts of GHG emissions into the atmosphere.
To develop the baseline scenario stipulating that no modernization of operations equipment is undertaken at SE "CC "Krasnolimanska", the data on coal produced were used, as well as data on consumption of electricity during coal mining in the historical period of 2009-2011. The pre-project efficiency rate of coal mining was calculated for the three years of the aforementioned historical period as the average specific electricity consumption per unit of manufacture, respectively. The calculation of the pre-project efficiency coefficient for three years is used for conservatism reasons, in order to rule out accidental downturns or upturns in efficiency caused by external factors in one particular year of the period. Applying the pre-project efficiency coefficient, GHG volumes emitted (which can happen if the project is not implemented) during coal mining are calculated for each particular monitoring year.
To work out the baseline scenario – it implies that CMM recovery technology is not employed and thus CMM release into the atmosphere is practiced according to the previous gas drainage technology, leading to the use of coal as the only fuel when meeting heating needs in production – the volume of CMM captured and burnt in boiler equipment was taken into account, and with the help of global warming potential for methane GHG emissions into the atmosphere were calculated in CO_2 equivalent, and then the amount of heat generated following CMM combustion was estimated. The next step is to calculate the volume of GHG emissions resulting from burning of as much coal as needed to generate the amount of heat produced from burning of CMM which was actually burnt and consumed to meet production requirements.

To work out the baseline scenario stipulating that no project activity is done at waste heap No.2, passport data on the heap was used, particularly apparent density and volume as well as the data on coal part in the heap by weight as of the start of the project, which complies with the requirements of conservativeness. If no project activity is undertaken, the waste heap would continue burning, which would entail big amounts of GHG emissions into the atmosphere.
Description of formulae to calculate GHG emissions in the baseline scenario is provided below:

$$BE^y = BE^y_{M,coal} + BE^y_{CH_4} + BE^y_{PO}; \quad (B1)$$

BE^y - total GHG emissions in monitoring period y of the baseline scenario, t CO_2eq;

$BE^y_{M,coal}$ - GHG emissions from electricity consumption in the course of coal mining in monitoring period y of the project scenario, t CO_2eq;

$BE^y_{CH_4}$ - GHG emissions from previous mine gas drainage technology in monitoring period y of the baseline scenario, t CO_2eq;

BE^y_{PO} - GHG emissions from waste heap combustion in monitoring period y of the baseline scenario, t CO_2eq;

y - index for monitoring period;

$coal$ - index for coal mining procedures at SE “CC “Krasnolimanska”;

M - index for technological equipment modernization;

CH_4 - index for methane recovery technology;

PO - index for waste heaps.

$$BE^y_{M,coal} = N^y_p * BPER_{coal}, \quad (B2)$$

$BE^y_{M,coal}$ - GHG emissions from electricity consumption in the course of coal mining in monitoring period y of the baseline scenario, t CO_2eq;

N^y_p - coal production in monitoring period y of the project scenario, t;

$BPER_{coal}$ - pre-project coal mining efficiency factor, t CO_2eq/t.

y - index for monitoring period;

p - index for project scenario;

M - index for coal mining technological procedures;

$coal$ - index for coal mining.

$$BPER_{coal} = \frac{\sum_{i=1}^{3} \frac{BE^j_{b,ELEC}}{N^j_b}}{3}, \quad (B3)$$

$BPER_{coal}$ - pre-project coal mining efficiency factor, t CO_2eq/t;

$BE^j_{b,ELEC}$ - total GHG emissions from electricity generation in the course of coal mining in historical period j of the baseline scenario, t CO_2eq;

N_b^j - total coal production in historical period *j* of the baseline scenario, t;
3 – years in historical period, 2009-2011;
i - index for historical period;
b - index for baseline scenario;
$ELEC$ - index for electricity;
3 - index for three years of historical period 2009-2011.

$$BE_{b,ELEC}^{j} = \sum_{i=1}^{3} EC_{b,M}^{j} * EF_{b,CO2,ELEC}^{j} \quad \text{(B4)}$$

$BE_{b,ELEC}^j$ - total GHG emissions from electricity generation in the course of coal mining in historical period *j* of the baseline scenario, t CO_2eq;
$EC_{b,M}^j$ - electricity consumption in the course of coal mining in historical period *j* of the baseline scenario, MWh;
$EF_{b,CO2,ELEC}^j$ - carbon dioxide emission factor for electricity consumption by consumers in historical period j of the baseline scenario, t CO_2/MWh;
i - index for historical period;
3 – number of years in the historical period 2009-2011;
b - index for baseline scenario;
$ELEC$ - index for electricity.

Since implementations of energy-efficient equipment aimed at the increase of coal mining efficiency, are planned for 2012, as shown in the project implementation schedule, the results of the 2012 complex modernization of equipment are not full as of the date of PDD development; taking account of the frequency of data monitoring, the results are difficult to be calculated for a several-months period. Pursuant to conservative principles, the calculation of GHG emission reductions from equipment modernization (formulae (B2) - (B4)) will be performed after all project implementations are completed, i.e. starting 2013, which will be reflected in monitoring reports for the project.

$$BE_{CH_4}^{y} = BE_{b,MR}^{y} + BE_{b,heat}^{y}, \quad \text{(B5)}$$

$BE_{CH_4}^y$ - GHG emissions from previous mine gas drainage technology in monitoring period *y* of the baseline scenario, t CO_2eq;
$BE_{b,MR}^y$ - GHG emissions from previous mine gas drainage technology in monitoring period *y* of the baseline scenario, t CO_2eq;
$BE_{b,heat}^y$ - GHG emissions from combustion of coal natural gas by boiler modules for heat generation in monitoring period *y* of the baseline scenario, t CO_2eq;
$heat$ - index for heat generation;
y - index for monitoring period;
b - index for baseline scenario;
MR - index for the previous mine gas drainage technology;
CH_4 - index for methane recovery technology.

$$BE_{b,MR}^{y} = GWP_{CH_4} \cdot MD_{p}^{y}, \qquad \text{(B6)}$$

$BE_{b,MR}^{y}$ - GHG emissions from previous mine gas drainage technology in monitoring period *y* of the baseline scenario, t CO_2eq;

GWP_{CH_4} - Global Warming Potential of methane, 21 t CO_2eq/t CH_4;

MD_{p}^{y} - CMM combustion in the course of its recovery in monitoring period *y* of the project scenario, t CH_4;

y - index for monitoring period;

MR - index for the previous mine gas drainage technology;

b - - index for baseline scenario;

p - index for project scenario;

CH_4 - index for methane.

$$MD_{p}^{y} = Q_{real}^{y} \cdot \rho_{real}, \qquad \text{(B7)}$$

MD_{p}^{y} - CMM combustion in the course of its recovery in monitoring period *y* of the project scenario, t CH_4;

Q_{real}^{y} - measured CMM volume collected in the course of recovery in monitoring period *y* of the project scenario, ths m^3;

ρ_{real} - coal mine methane density under standard conditions, t/ths m^3;

$real$ - index for standard conditions;

p - - index for project scenario;

y - - index for monitoring period.

$$BE_{b,heat}^{y} = HEAT_{p,CH_4}^{y} \cdot EF_{b,heat,coal}^{y}, \qquad \text{(B8)}$$

$BE_{b,heat}^{y}$ - GHG emissions from combustion of coal natural gas by boiler modules for heat generation in monitoring period *y* of the baseline scenario, t CO_2eq;

$HEAT_{p,CH_4}^{y}$ - heat generation within the project activity by CMM combustion in monitoring period *y* of the project scenario, TJ;

$EF_{b,heat,coal}^{y}$ - carbon dioxide emission factor for heat generation at the mine in monitoring period *y* of the baseline scenario, t CO_2/TJ;

y - index for monitoring period;

b - - index for baseline scenario;

$heat$ - index for fuel consumption for heat generation;

$coal$ - index for coal.

$$HEAT_{p,CH_4}^{y} = Q_{real}^{y} * NCV_{p,NG}^{y}, \qquad \text{(B9)}$$

$HEAT_{p,CH_4}^{y}$ - heat generation within the project activity by CMM combustion in monitoring period *y* of the project scenario, TJ;

Q^{y}_{real} - measured CMM volume collected in the course of recovery in monitoring period *y* of the project scenario, ths m^3;

$NCV^{y}_{p,NG}$ - net calorific value of natural gas in monitoring period y of the project scenario, TJ/ths m^3;

$real$ - index for standard conditions;

p - index for project scenario;

y - index for monitoring period;

NG - index for natural gas.

$$EF^{y}_{b,heat,coal} = EF^{y}_{b,CO2,coal} = EF^{y}_{b,C,coal} \cdot OXID^{y}_{b,coal} \cdot 44/12, \quad (B10)$$

$44/12$ - stoichiometric ratio of carbon dioxide and carbon molecular weight, t CO_2/t C;

$EF^{y}_{b,C,coal}$ - carbon emission factor for coal combustion in monitoring period *y* of the baseline scenario, t C /TJ;

$OXID^{y}_{b,coal}$ - carbon oxidation factor for coal combustion in monitoring period *y* of the baseline scenario, relative units;

y - index for monitoring period;

b - index for baseline scenario;

$coal$ - index for coal.

According to the research, the period of waste heap combustion is 15 years[17], which means that the entire amount of coal in a waste heap can burn down over this period. Waste heap monitoring programme provides an opportunity to control the heap condition and prevent its inflammation, and if the latter occurs, to take measures for its rapid extinction. It also provides for monthly monitoring of waste heap. Based on the conditions of the waste heap monitoring programme, the formula for the calculation of GHG emissions from waste heap combustion in the baseline was adjusted to the monthly waste heap monitoring activities.

$$BE^{y}_{PO} = \sum_{i=1}^{12} \frac{FC_{b,PO,coal} \cdot NCV^{y}_{b,coal} \cdot k^{b}_{m,y} \cdot EF^{y}_{b,CO2,coal}}{180}, \quad (B11)$$

$FC_{b,PO,coal}$ - total amount of coal in a waste heap as of the beginning of extinction works, ths t;

$NCV^{y}_{b,coal}$ - net calorific value of coal in monitoring period *y* of the baseline scenario, TJ/ths t;

$EF^{y}_{b,CO_2,coal}$ - default carbon dioxide emission factor for stationary coal combustion in monitoring period *y* of the baseline scenario, t CO_2/TJ;

$k^{b}_{m,y}$ - waste heap combustion factor for month *i* of year *y* (if waste heap combustion was detected in the reporting month, it is assumed that k=1, if the combustion was not detected, as provided by the project, it is assumed that k=0. Since the waste heap continues to burn under the baseline scenario, k=1 for all months of the monitoring period);

PO - index for waste heap;

b - index for baseline scenario;

$coal$ - index for coal;

[17] http://www.nbuv.gov.ua/portal/natural/Pb/2010_17/Statti/10.pdf

y - index for monitoring period;

i - index for the sequence number of month, year *y*.

$$FC_{b,PO,coal} = \frac{V_{PO} \cdot \rho_n \cdot C_{coal}}{1000000}, \quad \text{(B12)}$$

$FC_{b,PO,coal}$ - total amount of coal in a waste heap as of the beginning of extinction works, ths t;

V_{PO}. – waste heap volume, m^3;

C_{coal} - coal content in a waste heap, %;

ρ_n - waste heap density, kg/m^3;

PO - index for waste heap;

b - index for baseline scenario;

n - index for waste heap density;

$coal$ - index for coal;

$\left[\frac{1}{1000000}\right]$ - index for kilogrammes to thousand tonnes conversion factor.

$$EF^{y}_{b,CO2,coal} = EF^{y}_{b,C,coal} \cdot OXID^{y}_{b,coal} \cdot 44/12, \quad \text{(B13)}$$

$EF^{y}_{b,C,coal}$ - carbon emission factor for coal combustion in monitoring period *y* of the baseline scenario, t C /TJ;

$OXID^{y}_{b,coal}$ - carbon oxidation factor for coal combustion in monitoring period *y* of the baseline scenario, relative units;

$44/12$ - stoichiometric ratio of carbon dioxide and carbon molecular weight, t CO_2/t C;

y - index for monitoring period;

b - index for baseline scenario;

$coal$ - index for coal.

This scenario is less attractive in terms of future environment (including the first commitment period of 2008-2012), when greenhouse gas emissions stay at the same or even higher level, but from the economic standpoint, this scenario is more attractive. Therefore, this practice is unable to ensure greenhouse gas emission reduction. Moreover, continued operation of old equipment (most of which was manufactured back in the USSR) would lead to higher fossil fuel and electricity consumption. In the absence of CMM recovery technology, CMM, which is a greenhouse gas with a global warming potential of 21 t CO_2/t CH_4, would be released into the atmosphere; without the project waste heap monitoring and extinction program, the waste heap would continue burning. Accordingly, the baseline provides for pertaining negative impact on the atmosphere (GHG pollution).

For detailed algorithm of baseline calculation see Section D.1.1.4.

The following parameters were used for setting the baseline:

For more details on baseline emissions see Sections D, E and Annex 2.

Data / Parameter	N^{y}_{p}
Data unit	t
Description	Coal production in monitoring period *y* of the project scenario

Time of determination/monitoring	Monthly
Source of data (to be) used	Based on working logs with coal production records, mechanical supervisor department draws up periodic (annual or semi-annual) forms No.1-P-NPP for the entire plant.
Value of data applied (for ex ante calculations/determinations)	The value is determined for each monitoring period.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measurement of coal production is to be conducted with scales and recorded in working logs, after which mechanical supervisor department shall sum up the data and draw up 1-P-NPP form, to be stored in the company's archive.1-P-NPP forms are annually submitted to the Main Statistics Administration of Donetsk region.
QA/QC procedures (to be) applied	Measurements were carried out with scales which were calibrated and verified on a regular basis in accordance with quality assurance procedures and Law of Ukraine "On metrology and metrological activity"[18]. Periodical report form No. 1-P-NPP is stored for minimum 2 years after the transfer of the last emission reduction units at the chief power engineer department as well as at the Main Statistics Administration of Donetsk region.
Any comment	Information on coal production is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

<table>
<tr><th>Data / Parameter</th><th>N_b^j</th></tr>
<tr><td>Data unit</td><td>t</td></tr>
<tr><td>Description</td><td>Coal production in historical period j of the baseline scenario</td></tr>
<tr><td>Time of determination/monitoring</td><td>Once at the beginning of the project</td></tr>
<tr><td>Source of data (to be) used</td><td>Based on working logs with coal production records, mechanical supervisor department draws up periodic (annual or semi-annual) forms No.1-P-NPP for the entire plant.</td></tr>
<tr><td>Value of data applied
(for ex ante calculations/determinations)</td><td><table><tr><th>2009</th><th>2010</th><th>2011</th></tr><tr><td>1640</td><td>1455</td><td>1457</td></tr></table></td></tr>
<tr><td>Justification of the choice of data or description of measurement methods and procedures (to be) applied</td><td>To determine coal production prior to the project implementation, a historical period of 2009-2011 (period j) was chosen Measurement of coal production was conducted with scales and recorded in working logs, after which mechanical supervisor department summed up the data and drew up 1-P-NPP form, stored in the company's archive.1-P-NPP forms were annually submitted to the Main Statistics Administration of Donetsk region.</td></tr>
<tr><td>QA/QC procedures (to be) applied</td><td>Measurements were carried out with scales which were calibrated and verified on a regular basis in accordance with quality assurance procedures and Law of Ukraine "On metrology and metrological activity"[19]. Periodical report form No. 1-P-NPP is stored for minimum 2 years after the transfer of the last emission reduction units at the chief power engineer department as well as at the Main Statistics Administration of Donetsk region.</td></tr>
<tr><td>Any comment</td><td>Information on coal production is the basis for greenhouse gas</td></tr>
</table>

[18] http://zakon1.rada.gov.ua/laws/show/113/98-%D0%B2%D1%80

[19] http://zakon1.rada.gov.ua/laws/show/113/98-%D0%B2%D1%80

	emission calculation, to be archived in paper and electronic form.

Data / Parameter	$EC_{b,M}^{j}$
Data unit	MWh
Description	Electricity consumption in historical period *j* of the baseline scenario
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Based on monthly reports on electricity consumption by each shop individually, the chief power engineer department draws up periodic (annual or semi-annual) forms No.24-enerhetyka and No.11-MTP for the entire plant.
Value of data applied (for ex ante calculations/determinations)	**2009**: 107219; **2010**: 106480; **2011**: 100591
Justification of the choice of data or description of measurement methods and procedures (to be) applied	To determine electricity consumed prior to the implementation of technical equipment modernization activities, a historical period of 2004-2005 (period *j*) was chosen
QA/QC procedures (to be) applied	Measurements were carried out with flow meters which were calibrated and verified on a regular basis in according with quality assurance procedures and Law of Ukraine "On metrology and metrological activity".[20] Periodic report forms No.24-energy and No.11-MTP are stored for minimum 2 years after the transfer of the last emission reduction units at the chief power engineer department as well as at the Main Statistics Administration of Donetsk region.
Any comment	Information on electricity consumption is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	$EF_{b,CO2,ELEC}^{j}$
Data unit	t CO_2/MWh
Description	Carbon dioxide emission factor for electricity consumption by consumers in historical period *j* of the baseline scenario
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Carbon dioxide emission factors for 2009 are sourced from Decree No.63 of the National Environmental Investments Agency of Ukraine (hereinafter NEIAU) dated 15/04/2011 “On approval of carbon dioxide emission factors for 2009”[21] Carbon dioxide emission factors for 2010 are sourced from the NEIAU Decree No.43 of 28/03/2011 "On approval of carbon dioxide specific emission values in 2010"[22]

[20] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1765-15

[21] http://www.neia.gov.ua/nature/doccatalog/document?id=127172

[22] http://www.neia.gov.ua/nature/doccatalog/document?id=126006

	Carbon dioxide emission factors for 2011 are sourced from the NEIAU Decree No.75 of 12/05/2011 "On approval of carbon dioxide specific emission values in 2011"[23]
Value of data applied (for ex ante calculations/determinations)	**2009**: 1.096; **2010**: 1.093; **2011**: 1.090
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	National carbon dioxide emission factors are used in the Joint Implementation project development.
Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in paper and electronic format.

Data / Parameter	GWP_{CH_4}
Data unit	t CO_2eq/tCH_4
Description	Global Warming Potential of methane
Time of determination/monitoring	Throughout the crediting period
Source of data (to be) used	IPCC (International Panel on Climate Change) 1996 „Revised Guidelines for National Greenhouse Gas Inventories"[24]
Value of data applied (for ex ante calculations/determinations)	21
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	If CO_2 emission factors for methane change, the baseline and the project scenario will be recalculated based on the new values
Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in paper and electronic format.

Data / Parameter	Q_{real}^{y}
Data unit	ths m^3
Description	CMM volume collected in the course of recovery in monitoring period y of the project scenario
Time of determination/monitoring	Monthly
Source of data (to be) used	Volume of CMM consumed is recorded in fuel consumption logs by each boiler module Based on fuel consumption logs, CMM consumption data are recorded in annual CMM consumption reports to be stored in the mechanical supervisor department
Value of data applied	The value is determined for each monitoring period.

[24] http://unfccc.int/ghg_data/items/3825.phphttp://unfccc.int/ghg_data/items/3825.php

(for ex ante calculations/determinations)	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Daily measurements of CMM combustion will be carried out using gas flow meters and then recorded and stored in the mechanical supervisor department.
QA/QC procedures (to be) applied	Measurements are carried out with flow meters which are calibrated and verified on a regular basis in accordance with quality assurance procedures and Law of Ukraine "On metrology and metrological activity".[25]
Any comment	Information on CMM consumption is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	ρ_{real}
Data unit	t/ths m^3
Description	Coal mine methane density under standard conditions
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Physical properties of methane
Value of data applied (for ex ante calculations/determinations)	0.668
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	N/A
Any comment	Information on methane density is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	$NCV^{y}_{p,NG}$
Data unit	TJ/ths m^3
Description	Net calorific value of natural gas in monitoring period y of the project scenario
Time of determination/monitoring	Annually
Source of data (to be) used	Net calorific value of natural gas is sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"[26]
Value of data applied (for ex ante calculations/determinations)	**2004**: 33.82 **2005**: 33.82 **2006**: 33.85 **2007**: 33.85 **2008**: 34

[25] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1765-15

[26] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip

	2009	34.1
	2010	34.1
	2011	34.1

Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	National inventory reports of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine are official reports submitted to the Secretariat of the UN Framework Convention on Climate Change (UNFCCC).
Any comment	According to principle of conservatism minimal calorific value of gas is used. Values for 2011 were sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"[27]; if new inventory reports come into effect, new values will be set and ERUs will be recalculated for any reporting period in accordance with the monitoring plan.Net calorific value of natural gas combustion is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	$EF^{y}_{b,C,coal}$
Data unit	t C/TJ
Description	Carbon emission factor for coal combustion in monitoring period *y* of the baseline scenario
Time of determination/monitoring	Annually
Source of data (to be) used	Carbon emission factor is sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"[28];
Value of data applied (for ex ante calculations/determinations)	see table below

Year	Value
2004	26.19
2005	26.05
2006	26,02
2007	26,04
2008	25,95
2009	25,97
2010	25,99
2011	25,99

Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	National inventory reports of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine are official reports submitted to the Secretariat of the UN Framework

[27] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip
[28] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip

	Convention on Climate Change (UNFCCC).
Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in hard and electronic form. Values for 2011 were sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"[29]; if new inventory reports come into effect, new values will be set and ERUs will be recalculated for any reporting period in accordance with the monitoring plan.

Data / Parameter	$OXID_{b,coal}^{y}$
Data unit	Relative units
Description	Carbon oxidation factor for coal combustion in monitoring period *y* of the baseline scenario
Time of determination/monitoring	Annually
Source of data (to be) used	Carbon oxidation factor is sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"[30]
Value of data applied (for ex ante calculations/determinations)	**2004**: 0.956 **2005**: 0.957 **2006**: 0,960 **2007**: 0,964 **2008**: 0,963 **2009**: 0,963 **2010**: 0,962 **2011**: 0,962
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	National inventory reports of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine are official reports submitted to the Secretariat of the UN Framework Convention on Climate Change (UNFCCC).
Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in hard and electronic form. Values for 2011 were sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"[31]; if new inventory reports come into effect, new values will be set and ERUs will be

[29] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip

[30] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip

[31] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip

	recalculated for any reporting period in accordance with the monitoring plan.

Data / Parameter	V_{PO}
Data unit	m^3
Description	Waste heap volume
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Waste heap passport
Value of data applied (for ex ante calculations/determinations)	8 565 500
Justification of the choice of data or description of measurement methods and procedures (to be) applied	In accordance with NPAOP 10.0-5.21-04 “Manual on self-ignition prevention, extinction and demolition of waste heaps”, main parameters, including waste heap volume, are updated annually and recorded in the waste heap passport.
QA/QC procedures (to be) applied	Information on waste heap volume is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form. The passport fixes the volume of rock accumulated in the waste heap, which ensures data cross-check against direct measurements of waste heap volume.
Any comment	Information on waste heap volume is the basis for coal content calculation, to be archived in paper and electronic form.

Data / Parameter	$NCV^{y}_{b,coal}$
Data unit	TJ/ths t
Description	Net calorific value of coal in monitoring period *y*, in the baseline scenario
Time of determination/monitoring	Annually
Source of data (to be) used	"National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"[32]
Value of data applied (for ex ante calculations/determinations)	**2006**: 23,23 **2007**: 23,43 **2008**: 21,5 **2009**: 21,8 **2010**: 21,6 **2011**: 21,6
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	The National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine is an official report submitted to the Secretariat of the UN Framework Convention on Climate Change (UNFCCC).

[32] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip

Any comment	According to conservative principles minimal calorific value of coal is used. Net calorific value of coal is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	ρ_n
Data unit	kg/m^3
Description	Waste heap density
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Waste heap passport
Value of data applied (for ex ante calculations/determinations)	2000
Justification of the choice of data or description of measurement methods and procedures (to be) applied	In accordance with NPAOP 10.0-5.21-04 "Manual on self-ignition prevention, extinction and demolition of waste heaps", main parameters, including waste heap volume, are updated annually and recorded in the waste heap passport.
QA/QC procedures (to be) applied	Measurements are conducted by entities authorized in accordance with the state standard and in line with the methodologies approved at the governmental level.
Any comment	Information on waste heap volume is the basis for coal content calculation, to be archived in paper and electronic form.

Data / Parameter	C_{coal}
Data unit	%
Description	Coal content in a waste heap
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	ENVSEC: GRID Arendal "Risk Assessment Considerations in the Donetsk Basin"[33]
Value of data applied (for ex ante calculations/determinations)	10
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The data were applied in the determined UA1000317 JI project[34]
QA/QC procedures (to be) applied	N/A
Any comment	According to principle of conservatism minimal coal content value is used. Information on waste heap volume is the basis for coal content calculation, to be archived in paper and electronic form.

Data / Parameter	$k^b_{m,y}$
Data unit	N/A
Description	Waste heap combustion factor in month *m* year *y* of the baseline

[33] http://www.envsec.org/publications/Risk%20Assessment%20Considerations%20in%20the%20Donetsk%20Basin%20Report_RUS.pdf

[34] http://ji.unfccc.int/JIITLProject/DB/0RQXGLUAS7ETAGMUQZWFQPJLN1SIAW/details

	scenario
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Annual waste heap monitoring data in 2004-2005
Value of data applied (for ex ante calculations/determinations)	1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Information on waste heap ignitions, including starting dates of burnings and end dates of burnings are recorded in waste heap passports
QA/QC procedures (to be) applied	Temperature surveys were conducted in line with NPAOP 10.0-5.21-04 Manual on self-ignition prevention, extinction and demolition of waste heaps[35]
Any comment	Current practice shows that activities carried out in “Krasnolimanska” mine to prevent waste heap self-ignition and to extinguish hot spots are ineffective, which is evidenced by hot spots registered in the period of 2004-2005.

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:

Anthropogenic greenhouse gas emissions in the project scenario will decrease due to complex modernization of operations, implementation of energy-efficient and energy-saving equipment at SE “Coal Company “Krasnolimanska” mine, implementation of permanent waste heap monitoring and extinction technologies at SE “Coal Company “Krasnolimanska” mine.

Implementation of these activities will considerably reduce fuel and energy resources consumption during production, entailing a reduction of greenhouse gas emissions into the atmosphere.

Additionality of the project

Additionality of the project activity is demonstrated and assessed below using the "Tool for the demonstration and assessment of additionality"[36] (Version 06.0.0). This tool was originally developed for CDM projects but it is also applicable to JI projects.

Step 1. Identification of alternatives to the project activity and their consistency with current laws and regulations

Sub-step 1a. Definition of alternatives to the project activity
There are two alternatives to this project (which have already been discussed in Section B.1 above):
Alternative 1.1: Continuation of the current situation, without the JI project implementation.
Alternative 1.2: Proposed project activity without the use of the JI mechanism.
Alternative 1.3: Partial project activities (some of the project activities are implemented) without the use of the Joint Implementation Mechanism.

Sub-Step 1b. Consistency of the alternatives with mandatory laws and regulations
Pursuant to the Law of Ukraine “On approval of safety rules in coal mines” [37] waste heaps are considered potential pollutant sources. In a general case, ignited waste heaps should be extinguished and future

[35] http://dnop.com.ua/dnaop/act2799.htm

[36] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.0.0pdf

ignition prevention measures should be taken, as stated in the Coal Mines Safety Rules. The document has weak effectiveness, so the relationship is in most cases regulated by the Code of Administrative Offences of Ukraine providing for mere insignificant penalties[38]. However, taking account of the large number of waste heaps and their large sizes, combined with limited financial resources of their owners, the latter usually do not even carry out the necessary waste heap monitoring. Even when a hot spot is detected, the owners prefer paying a penalty for atmospheric pollution rather than taking extinction measures. Burning waste heaps are rather common occurrences and the situation is unlikely to improve in the near future. The experts believe the permanent lack of financing made the waste heap monitoring system in Ukraine totally ineffective.
Under such circumstances, it is obvious that the identified alternatives are consistent with the current legislation and standards of Ukraine.

Alternative 1.1: Continuation of the existing practice with minimum repairs against the general worsening of technological complex is the most realistic and plausible alternative to Project implementation, being associated with minimum financial investments.

Alternative 1.2: Proposed project activity without the use of the JI mechanism.
SE "Coal Company "Krasnolimanska" did not conduct major activities on modernization of energy-consuming equipment and waste heap extinction technology. Moreover, SE "Coal Company "Krasnolimanska" has neither incentives nor means of implementation of activities provided for by the JI project, other than income within the mechanism established by p.6 of the Kyoto Protocol to the UN Framework Convention on Climate Change, so *Alternative 1.2* cannot be considered a plausible baseline.

Alternative 1.3: Partial implementation of the project (only some of project activities implemented) without the use of the JI mechanism.
Alternative 1.3 provides for the exclusion of some project implementation measures from the project boundary. Being a complex system, coal mining requires a complex approach to modernization, since partial implementation would not ensure a major decrease in fuel and energy consumption. Besides, *Alternative 1.3* requires investments into new technological equipment and is characterized by a lack of qualified servicing personnel; therefore Alternative 1.3 cannot be considered a plausible baseline. Implementation of waste heap monitoring and extinction programs yields no economic benefits for the company while requiring large investments; without the JI project, it would be unattractive for SE "CC "Krasnolimanska" and thus hardly plausible. Thus, *Alternative 1.3* cannot be considered a plausible baseline.

Outcome of Sub-step 1b. Under such circumstances, it is believed that all the scenarios are consistent with current laws and regulatory acts.

Therefore, Step 1 is satisfied.
According to the "Tool for the demonstration and assessment of additionality"[39] (Version 06.0.0), further justification of additionality shall be performed by means of investment analysis.

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[37] http://zakon1.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=z0398-10

[38] http://zakon2.rada.gov.ua/laws/show/80731-10

[39] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.0.0pdf

Step 2 – Investment analysis.
The main purpose of investment analysis is to determine whether the proposed project:

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

Sub-step 2a - Determination of appropriate analysis method.
There are three methods used for investment analysis:

- a simple cost analysis (Option I);
- an investment comparison analysis (Option II); and
- a benchmark analysis (Option III).

If the project activities and alternatives identified in Step 1 generate no financial or economic benefits other than JI related income, then the simple cost analysis (Option I) is applied. Otherwise, the investment comparison analysis (Option II) or the benchmark analysis (Option III) are used.
Additionality guidelines allow for performance of investment comparison analysis, which compares corresponding financial indicators for the most realistic and plausible investment alternatives (Option II), or the benchmark analysis (Option III). Taking account of main project activities aimed at the reduction of GHG emissions into the atmosphere, various methods of analysis are applied to this project:

a) Investment analysis using Option III benchmarks, according to the instructions of the Tool for the demonstration and assessment of additionality, which takes into account complex modernization of technological and heat-generating equipment, implementation of coal mine methane recovery technologies (Sub-project A).
b) Investment analysis using Option I simple cost analysis, according to the instructions of the Tool for the demonstration and assessment of additionality, which takes into account implementation of waste heap monitoring system and extinction technology at SE "CC "Krasnolimanska" mine. (Sub-project B) The company receives no financial or economic profit other than those from the JI mechanism.

Sub-step 2b – Benchmark analysis
The proposed project "Implementation of the energy efficiency measures and reduction of greenhouse gas emissions into the atmosphere at State Enterprise "Coal Company "Krasnolimanska" will be implemented by a project participant State Enterprise "Coal Company "Krasnolimanska". The approach proposed in paragraph 6 of the Additionality guidelines provides for using a discount rate that is determined by considering the weighted average cost of capital (WACC). WACC is calculated as a weighted average cost of own and debt capital. Since details on financing structure are not available, the structure of capital is taken in the form of 50% of own and 50% of debt capital. In accordance with paragraph 18 of the "Guidelines on the assessment of investment analysis" ver. 05,[40] the cost of own capital is calculated as the sum of risk-free rate (3%)[41], the risk premium on investment in own capital (6.5%)[42] and country risk (6.75%)[43]. Thus, the cost of own capital is 16.25%. The cost of own capital is estimated at the average cost of credit in foreign currency as of 2004 according to the NBU, which was 11.8%.[44] The nominal discount rate (WACC) equals to 14%. Cash flow is adjusted by inflation index for

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40 http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

41 http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

42 http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

43 http://pages.stern.nyu.edu/~adamodar/pc/archives/ctryprem04.xls

44 http://www.bank.gov.ua/doccatalog/document?id=36526

Eurozone (1.9%).[45] The project requires investments of over EUR 9.24 mln (at the NBU rate)[46], including:

- Sub-project A requires investment of over EUR 5.79 mln;
- Sub-project B requires investment of over EUR 3.45 mln.

Sub-project B costs more than one of the alternative scenarios, because waste heap monitoring and rapid extinction programme does not bring any financial profit to the company, still requiring considerable investments. According to the "Tool for the demonstration and assessment of additionality" (Version 06.0.0)[47], common practice analysis is applied to Sub-project B. If the proposed project (not implemented as a JI project) has a less favourable rate, i.e. lower internal rate of return (IRR), than the total limit level, the project may not be considered financially attractive.

Sub-step 2c – Calculation and comparison of financial indicators.
Financial analysis refers to the time of making investment decisions. The following assumptions were used based on information provided by the company.
The project requires investment of over EUR 5,79 mln (at the NBU exchange rate) [48];
1. The project lifetime is 16 years (minimal equipment operational life);
2. The residual value is calculated as the result of multiplication of unused resource by initial expenses.
Analysis of cash flow takes into account the cash outflow connected with investment and operating costs[49] and cash inflow associated with the receipt of revenues from the sale of products by the enterprise.
Financial indicators of the project are shown in the table below.

Revenues without VAT (EUR)	Cash flow (EUR)	dr (discount rate)	NPV (EUR)	IRR (%)	Residual value (EUR)
12 150 355	8 044 417	14%	-672 061	10,7%	3 505 089

The source of data on the revenues and expenses of SE "CC "Krasnolimanska" is information provided by the company. The revenues were calculated as the difference between the cost of electricity consumed prior to the implementation of energy-efficient equipment (based on 2009-2011 data) and after its installation. Besides, an account was taken of revenues from production and utilization of coal mine methane to substitute coal used prior to the project as the source of thermal energy.
When analysing the cash flow the IRR shows below the established limit level and is negative. As a result, the net present value (NPV) is 10.7%. Therefore the project cannot be considered financially attractive.

[45] http://www.finfacts.ie/inflation.htm

[46]http://www.bank.gov.ua/control/uk/curmetal/currency/search?formType=searchPeriodForm&time_step=daily&currency=196&periodStartTime=01.09.2004&periodEndTime=30.09.2004&outer=table&execute=%D0%92%D0%B8%D0%BA%D0%BE%D0%BD%D0%B0%D1%82%D0%B8

[47]http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v06.0.0.pdf

[48]http://www.bank.gov.ua/control/uk/curmetal/currency/search?formType=searchPeriodForm&time_step=daily&currency=196&periodStartTime=01.09.2004&periodEndTime=30.09.2004&outer=table&execute=%D0%92%D0%B8%D0%BA%D0%BE%D0%BD%D0%B0%D1%82%D0%B8

[49] Supporting Document 2

Sub-step 2d: Sensitivity analysis

The sensitivity analysis is conducted to confirm whether the conclusions on the financial / economic attractiveness are stable enough for different reasoned variants of the change of baseline conditions.

The account of the following two key factors was taken in the sensitivity analysis: investment and operational costs. According to the "Guidelines on the assessment of investment analysis" (Paragraph 17) the sensitivity analysis should be made for key indicators in the range of variation ± 10%.

Revenues from sales of products

	-10%	0%	10%
Operational costs, EUR	1 820 604	1 820 604	1 820 604
Investment costs of the company, EUR	5 790 422	5 790 422	5 790 422
Company income, EUR	10 935 319	12 150 355	13 365 390
Net present value (NPV), EUR	-913 086	-672 061	-431 036
Internal rate of return (IRR), %	9.37%	10.70%	11.95%

Investment and operational costs

	-10%	0%	10%
Operational costs, EUR	1 820 604	1 820 604	1 820 604
Investment costs of the company, EUR	5 211 380	5 790 422	6 369 465
Company income, EUR	12 150 355	12 150 355	12 150 355
Net present value (NPV), EUR	-383 806	-672 061	-960 315
Internal rate of return (IRR), %	12.02%	10.70%	9.51%

Sensitivity analysis was used to assess the sensitivity of the project to changes that may occur during the project implementation and operation of the integrated coal mining complex. Analysis of changes in revenues for coal mining between -10% and +10% demonstrated that the IRR has a value of 9.37-11.95%. Analysis of changes of investment and operational costs between -10% and +10% demonstrated that the IRR is within the range of 9.51-12.02%. Expenditures that are considered in the framework of the project are high, and their increase will result in a negative NPV. However, the expected price of the investment and the income from the sale of ERUs are able to make the project viable and it should bring revenues even in case of loan financing of the project and even if the aforementioned changes in investment costs occur.

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

Step 3: Barrier analysis

According to the Additionality guidelines, the barrier analysis was not conducted.

Step 4: Common practice analysis

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

Analysis similar activities demonstrated the absence of similar projects in Ukraine, which would be implemented without the JI mechanism.

The existing practice of operation of the existing facilities presented in the baseline option chosen for this Project is the common one for Ukraine. Due to the current practice all the modernization activities and measures to upgrade technological equipment operated in the course of coal production through implementation of more efficient production technologies shall be borne by the enterprise, and SE "CC “Krasnolimanska” does not have any incentive to implement new equipment and technologies.

Outcome of Sub-step 4a: Since there are no similar projects in Ukraine, there is no need to conduct the analysis of similar project activity.
According to the "Tool for the demonstration and assessment of additionality"[50] (Version 06.0.0), all steps are satisfied although there are some obstacles.
One of them is additional expenses for the JI project implementation to modernize operations;

The obstacle is associated with the structure of the existing tariffs for products manufactured at SE "CC "Krasnolimanska", which does not consider investment in improvement of coal mining complex by creating appropriate conditions for the reduction of GHG emissions. This causes permanent lack of funding and impossibility to conduct timely overhauls, ensure stable operation of equipment and invest into industry modernization and development.
We may conclude that the above-mentioned factors might hamper the implementation of the proposed project as well as other alternatives - Partial implementation of the project (only some of project activities implemented) without the use of the JI mechanism.
However, one of the alternatives is continuation of "business as usual" scenario. Since the barriers identified above are directly related to investment in technology upgrade, SE "CC "Krasnolimanska" has no obstacles for further operation of old coal mining equipment at the previous level. Therefore, the identified obstacles cannot prevent the introduction of at least one alternative scenario - "business as usual."

Conclusion
Based on the above analysis it can be concluded that the project is additional.

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

The project boundary encompasses:

1. technological equipment being in lawful ownership of SE "CC "Krasnolimanska" and taking part in technological procedures:
   - coal mining;
   - CMM recovery.
2. Waste heap No.2 where project activities are to be implemented.
3. Land plots with the total area of 222.0492 ha where technological equipment and the waste heap are located.

The detailed list of technological equipment included into the project boundary is provided in the "Registry of key energy-consuming equipment at SE "CC "Krasnolimanska".

Table 14 contains an overview of greenhouse gases emission sources within the JI baseline scenario.

Table 14. Emission sources under the baseline scenario

Source	Gas	Included / excluded	Substantiation / Explanation
		Baseline emissions	
GHG emissions from electricity consumption for	CO_2	Included	In the course of coal mining, SE "CC "Krasnolimanska" consumes electricity generated by fossil fuel combustion at a

[50] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.0.0.pdf

production needs in the course of coal mining			conventional power plant, which causes GHG emissions into the atmosphere.
GHG emissions from CMM release into the atmosphere	CH_4	Included	According to the pre-project mine gas drainage technology, CMM (a greenhouse gas with Global Warming Potential of 21 t CO_2/t CH_4) was released directly to the atmosphere.
GHG emissions from coal combustion for heat generation in an amount equivalent to the amount of heat obtained from CMM combustion in the project scenario	CO_2	Included	Coal is combusted to meet the heat demand of the company, which causes GHG emissions into the atmosphere.
GHG emissions from waste heap combustion	CO_2	Included	In the absence of project activities of waste heap monitoring and urgent extinction, the waste heap would continue burning, which would cause GHG emissions into the atmosphere.

Figure 14 illustrates the baseline boundary (outlined with a black line).

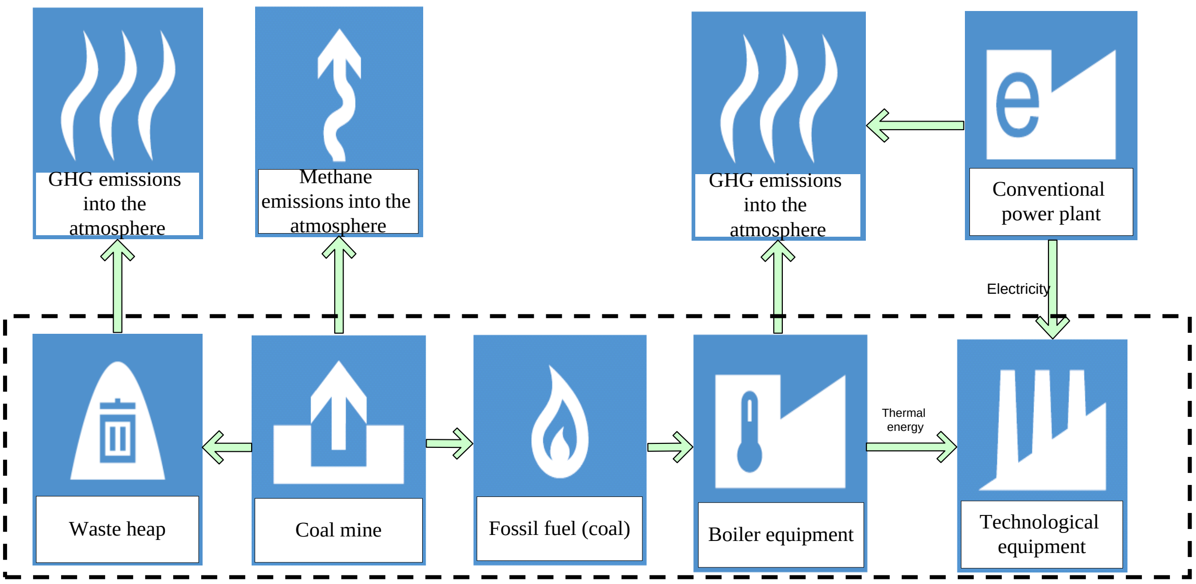

Figure 14. The boundary of the baseline scenario

Table 15 contains an overview of greenhouse gases emission sources within the JI project scenario.

Table 15. Emission sources under the project scenario

Source	Gas	Included / excluded	Substantiation / Explanation
Project emissions			
GHG emissions from electricity consumption for	CO_2	Included	In the course of coal mining, SE “CC “Krasnolimanska” consumes electricity

production needs in the course of coal mining			generated by fossil fuel combustion at a conventional power plant, which causes GHG emissions into the atmosphere.
GHG emissions from electricity consumption by technological equipment involved in CMM recovery	CO_2	Included	In the course of methane recovery, SE "CC "Krasnolimanska" consumes electricity generated by fossil fuel combustion at a conventional power plant, which causes GHG emissions into the atmosphere.
GHG emissions from CMM recovery	CO_2	Included	CMM recovery technology provides for combustion of the gas in boiler equipment, which causes GHG emissions into the atmosphere
GHG emissions from incomplete CMM combustion in the course of CMM recovery	CH_4	Included	GHG emissions are caused by incomplete CMM combustion in boiler equipment since part of CMM fed into boiler equipment is not combusted and released into the atmosphere
GHG emissions from waste heap combustion	CO_2	Included	GHG emissions from waste heap ignition in the project period

Figure 15 illustrates the project scenario boundary (outlined with a black line).

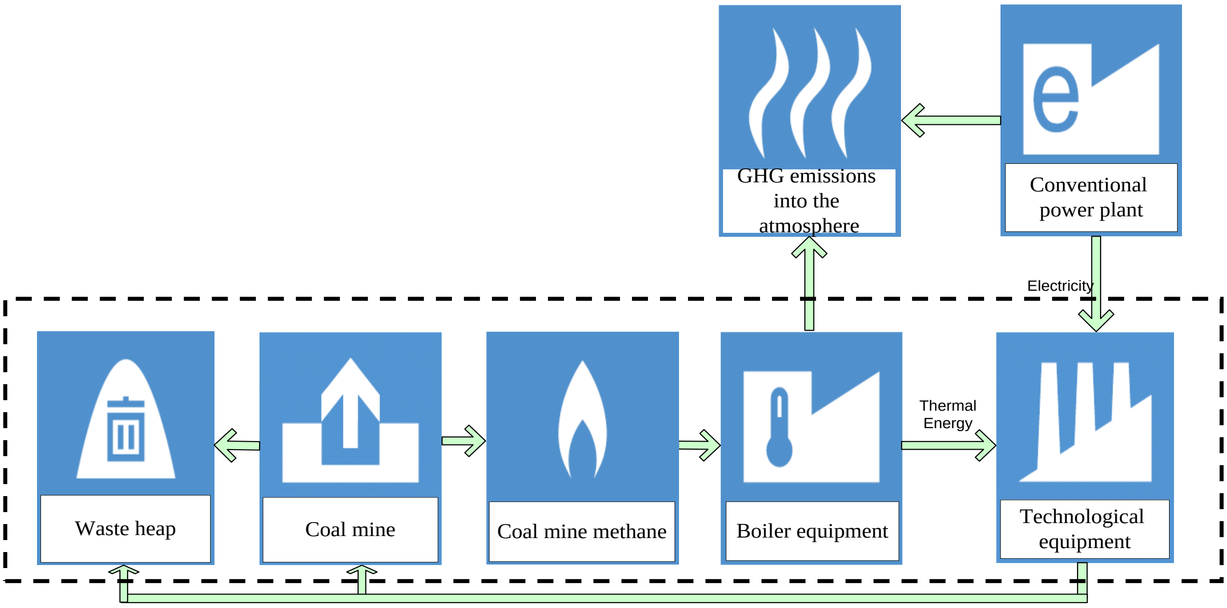

Figure 15. Project boundary for the project scenario

Indirect CO_2, CH_4, N_2O emissions (leakage) from fuel production and transportation are excluded. Leakage is beyond the control of the project developer (leakage cannot be measured) and therefore have been excluded.

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

Date of baseline setting: 14/06/2012.
The baseline is identified by CEP Carbon Emissions Partners S.A., project developer, and SE "CC "Krasnolimanska"
State Enterprise "Coal Company "Krasnolimanska"

Oleksii Kozlov
Director General
Phone: (06239) 4-12-96
Fax:(06239) 4-10-52
e-mail: mazur.ev@rambler.ru
State Enterprise "Coal Company “Krasnolimanska” is a project participant (stated in Annex 1).

CEP Carbon Emissions Partners S.A.
Route de Thonon, 52, Geneva, Switzerland,
Fabian Knodel
Director
Phone: +41 763461157
Fax: +41 763461157
e-mail: 0709bp@gmail.com
CEP Carbon Emissions Partners S.A. is a project participant (stated in Annex 1).

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

The starting date of the project is determined using the Glossary of Joint Implementation Terms, version 03[51] and is deemed 21/07/2003, when SE "CC "Krasnolimanska" started to implement activities within the framework of the Joint Implementation Project.

C.2. Expected operational lifetime of the project:

Project participants estimate the average operational life at nominal rates of the equipment implemented under the project at 17 years upon due maintenance.
Project lifetime is from 01/01/2004 to 31/12/2020 (17 years, or 204 months).

C.3. Length of the crediting period:

The duration of the crediting period in years and months is 17 years, or 204 months. The starting date of the crediting period is the date when the first emission reductions are expected to be generated, namely January 01, 2004. 01/01/2008- 31/12/2012 (5 years, or 60 months), prolongation 01/01/2013- 31/12/ 2010 (8 years, or 96 months)
The starting date of the crediting period is the date when the first emission reductions are expected to be generated, namely January 01, 2004. ERU generation belongs to the first commitment period of 5 years (January 1, 2008 – December 31, 2012). Prolongation of the crediting period beyond 2012 is subject to approval by the Host Party and estimation of emission reductions is presented separately for those until 2012 and those after 2020.
If after the first commitment period under the Kyoto protocol it is prolonged, the crediting period under the project will be prolonged by 8 years/96 months until December 31, 2020.

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

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

The proposed project uses a JI-specific approach in accordance with paragraph 9 (a) of the “Guidance on criteria for baseline setting and monitoring”, Version 03.[52]

The monitoring plan is designed for accurate and clear measurement and calculation of greenhouse gas emissions and is implemented according to practices established at SE “CC “Krasnolimanska” for measurement of coal and electricity consumed in the course of CMM recovery and waste heap monitoring. Monitoring under the project does not require changes in existing data accounting and collection system, but provides for additional measurements to determine the condition of the waste heap. All relevant data are calculated and recorded and stored within two years after the transfer of the last emission reduction units generated by the project.

The monitoring plan includes measures (measurements, maintenance, registration and calibration), which should be implemented to satisfy the requirements of the monitoring methodology chosen and guarantee verifiability of GHG emission reductions calculations. The main monitoring stages are described below.

Data and parameters not monitored throughout the crediting period, but are determined only once and that are available already at the stage of PDD development:

N_b^j	Total coal production in historical period j of the baseline scenario, t
$EC_{b,M}^j$	Electricity consumption in the course of coal mining at mine *i* in historical period *j* of the baseline scenario, MWh
$EF_{b,CO2,ELEC}^j$	Carbon dioxide emission factor for electricity consumption by consumers in historical period j of the baseline scenario, t CO_2eq/MWh
Eff_{heat}	Methane combustion efficiency factor, %
ρ_{real}	Coal mine methane density under standard conditions, t/ths m^3
V_{PO}	Waste heap volume as of the moment of extinction start under the project activity, m^3

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

ρ_n	Waste heap density, kg/ m^3
c_{coal}	Coal content in waste heap, %
$k^{b}_{m,y}$	Waste heap combustion factor in month *m* year *y* of the baseline scenario
EF_{CH4}	CO_2 emission factor for coal mine methane combustion, t CO_2/t CH_4

i - index for historical period;

b - index for baseline scenario;

y - index for monitoring period;

$real$ - index for standard conditions;

$ELEC$ - index for electricity;

PO - index for waste heap;

n - index for density;

m - index for month;

$coal$ - index for coal.

Data and parameters not subject to monitoring during the crediting period but identified only once and are not available at the PDD development stage: none.

Data and parameters controlled during the whole crediting period:

N^{y}_{p}	Total coal production in monitoring period *y* of the project scenario, t
$EC^{y}_{p,M}$	Electricity consumption in monitoring period *y* of the project scenario, MWh
$EF^{y}_{p,CO_2,ELEC}$	Carbon dioxide emission factor for electricity consumption by consumers, in monitoring period *y* of the project scenario, t CO_2eq/MWh
GWP_{CH_4}	Global warming potential of methane, t CO_2eq/t CH_4

$CONS^{y}_{p,ELEC}$	Electricity consumption in the course of CMM recovery in monitoring period *y* of the project scenario, MWh
$NCV^{y}_{p,NG}$	Net calorific value of natural gas in monitoring period *y* of the project scenario, TJ/ths m^3
$EF^{y}_{p,C,NG}$	Carbon emission factor for natural gas combustion in monitoring period *y* of the project scenario, t C /TJ
$OXID^{y}_{p,NG}$	Carbon oxidation factor for natural gas combustion in monitoring period *y* of the project scenario, relative units
GWP_{CH_4}	Global Warming Potential of methane, t CO_2eq/t CH_4
Q^{y}_{real}	CG volume recovered in monitoring period *y* of the project scenario, ths m^3
$NCV^{y}_{b,coal}$, $NCV^{y}_{p,coal}$	Net calorific value of natural gas in monitoring period *y* of the baseline scenario, TJ/ths t
$EF^{y}_{p,C,coal}$, $EF^{y}_{b,C,coal}$	Carbon emission factor for natural gas combustion in monitoring period *y* of the baseline scenario, t C /TJ
$OXID^{y}_{p,coal}$, $OXID^{y}_{b,coal}$	Carbon oxidation factor for coal combustion in monitoring period *y* of the baseline scenario, relative units
$k^{p}_{m,y}$	Waste heap combustion factor in month *m* year *y* of the project scenario

y - index for monitoring period;

p - index for project scenario;

NG - index for natural gas;

$ELEC$ - index for electricity;

CH_4 - index for methane;

m - index for month;

$coal$ - index for coal.

Tables of parameters for monitoring and verification of ERU calculation are provided in Sections D.1.1.1 and D.1.1.3.

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

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

Data / Parameter	EF_{CH4}
Data unit	t CO_2/t CH_4
Description	CO_2 emission factor from coal mine methane combustion
Time of determination/monitoring	Once
Source of data (to be) used	M_{CO2}/M_{CH4} = 44/16 = 2,75 т CO_2/т CH_4
Value of data applied (for ex ante calculations/determinations)	2.75
Justification of the choice of data or description of measurement methods and procedures (to be) applied	-
QA/QC procedures (to be) applied	-
Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in paper and electronic format.

Data / Parameter	$EC_{p,M}^{y}$
Data unit	MWh
Description	Electricity consumption in monitoring period y of the project scenario
Time of determination/monitoring	Annually
Source of data (to be) used	Based on monthly reports on electricity consumption by each shop individually, the mechanical supervisor department draws up

	periodic (annual or semi-annual) forms No.24-energy and No.11-MTP for the entire plant.
Value of data applied (for ex ante calculations/determinations)	The value is determined for each monitoring period.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Electricity consumption was measured and stored using the Automatic Commercial Power Consumption Control System (ACPCCS)
QA/QC procedures (to be) applied	Measurements were carried out with flow meters which were calibrated and verified on a regular basis in according with quality assurance procedures and Law of Ukraine "On metrology and metrological activity".[53] Periodical report forms No.24-energy and No.11-MTP are stored for minimum 2 years after the transfer of the last emission reduction units at the chief power engineer department as well as at the Main Statistics Administration of Donetsk region.
Any comment	Information on electricity consumption is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	$EF^{y}_{p,CO2,ELEC}$
Data unit	t CO_2/MWh
Description	Carbon dioxide emission factor for electricity consumption by consumers in monitoring period y of the project scenario
Time of determination/monitoring	Annually
Source of data (to be) used	Carbon dioxide emission factors for 2004-2005 are sourced from the Operational Guidelines for Project Design Documents of Joint Implementation Projects, Volume 1: General guidelines (ERUPT)[54]

[53] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1765-15

[54] http://ji.unfccc.int/CallForInputs/BaselineSettingMonitoring/ERUPT/index.html

	Carbon dioxide emission factors for 2006-2007 are sourced from “Ukraine - Assessment of new calculation of CEF”, approved by TUV SUD on 17/08/2007[55]; Carbon dioxide emission factors for 2008 are sourced from Decree No.62 of the National Environmental Investment Agency of Ukraine (hereinafter NEIAU) dated 15/04/2011 “On approval of carbon dioxide emission factors for 2008”[56]; Carbon dioxide emission factors for 2009 are sourced from Decree No.63 of the National Environmental Investment Agency of Ukraine (hereinafter NEIAU) dated 15/04/2011 “On approval of carbon dioxide emission factors for 2009”[57] Carbon dioxide emission factors for 2010 are sourced from the NEIAU Decree No.43 of 28/03/2011 "On approval of carbon dioxide specific emission values in 2010"[58] Carbon dioxide emission factors for 2011 are sourced from the NEIAU Decree No.75 of 12/05/2011 "On approval of carbon dioxide specific emission values in 2011"[59] If other carbon dioxide emission factors are adopted for Ukraine, the baseline will be recalculated for any reporting period in accordance with the monitoring plan.
Value of data applied (for ex ante calculations/determinations)	**2004**: 0.916 **2005**: 0.896 **2006**: 0.896 **2007**: 0.896 **2008**: 1.082 **2009**: 1.096

55 http://ji.unfccc.int/UserManagement/FileStorage/46JW2KL36KM0GEMI0PHDTQF6DVI514

56 http://www.neia.gov.ua/nature/doccatalog/document?id=127171

57 http://www.neia.gov.ua/nature/doccatalog/document?id=127172

58 http://www.neia.gov.ua/nature/doccatalog/document?id=126006

59 http://www.neia.gov.ua/nature/doccatalog/document?id=127498

	2010 1.093 **2011** 1.090
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	National carbon dioxide emission factors are used in the Joint Implementation project development; in the absence thereof ERUPT factors for 2004-2005, TUV SUD CO2 Emission Factors for 2006-2007 are used.
Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in paper and electronic format.

Data / Parameter	$CONS_{p,ELEC}^{y}$
Data unit	MWh
Description	Electricity consumption in the course of CMM recovery in monitoring period y of the project scenario
Time of determination/monitoring	Annually
Source of data (to be) used	Based on monthly reports on electricity consumption by each shop individually, the mechanical supervisor department draws up periodic (annual or semi-annual) forms No.24-energy and No.11-MTP for the entire plant.
Value of data applied (for ex ante calculations/determinations)	The value is determined for each monitoring period.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Electricity consumption in the course of CMM recovery was measured and stored using the Automatic Commercial Power Consumption Control System (ACPCCS)
QA/QC procedures (to be) applied	Measurements were carried out with flow meters which were calibrated and verified on a regular basis in according with quality assurance procedures and Law of Ukraine "On metrology and

	metrological activity".[60] Periodical report forms No.24-energy and No.11-MTP are stored for minimum 2 years after the transfer of the last emission reduction units at the chief power engineer department as well as at the Main Statistics Administration of Donetsk region.
Any comment	Information on electricity consumption in the course of CMM recovery is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	Q_{real}^{y}
Data unit	ths m^3
Description	CMM volume recovered in monitoring period y of the project scenario
Time of determination/monitoring	Monthly
Source of data (to be) used	Volume of CMM consumed is recorded in fuel consumption logs by each boiler module Based on fuel consumption logs, CMM consumption data are recorded in annual CMM consumption reports to be stored in the mechanical supervisor department
Value of data applied (for ex ante calculations/determinations)	The value is determined for each monitoring period.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Daily measurements of CMM combustion will be carried out using gas flow meters and then recorded and stored in the mechanical supervisor department for at least two years after the transfer of the last emission reduction units.
QA/QC procedures (to be) applied	Measurements are carried out with flow meters which are calibrated and verified on a regular basis in accordance with quality assurance procedures and Law of Ukraine "On metrology and metrological activity".[61]
Any comment	Information on CMM consumption is the basis for greenhouse gas

[60] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1765-15

[61] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1765-15

	emission calculation, to be archived in paper and electronic form.

Data / Parameter	ρ_{real}
Data unit	t/ths m^3
Description	Coal mine methane density under standard conditions
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Physical properties of methane
Value of data applied (for ex ante calculations/determinations)	0.668
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	N/A
Any comment	Information on methane density is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	$NCV_{p,NG}^{y}$
Data unit	TJ/ths m^3
Description	Net calorific value of natural gas in monitoring period y of the project scenario
Time of	Annually

determination/monitoring	
Source of data (to be) used	Net calorific value of natural gas is sourced from *the* "National inventory report of anthropogenic emissions *by* sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"[62]
Value of data applied (for ex ante calculations/determinations)	**2004**: 33.82 **2005**: 33.82 **2006**: 33.85 **2007**: 33.85 **2008**: 34 **2009**: 34.1 **2010**: 34.1 **2011**: 34.1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	National inventory reports of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine are official reports submitted to the Secretariat of the UN Framework Convention on Climate Change (UNFCCC).
Any comment	According to principle of conservatism minimal calorific value of gas is used. Values for 2011 were sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"; if new inventory reports come into effect, new values will be set and ERUs will be recalculated for any reporting period in accordance with the monitoring plan.Net calorific value of natural gas combustion is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

[62] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip

<table>
<tr><td>Data / Parameter</td><td>$EF^{y}_{p,C,NG}$</td></tr>
<tr><td>Data unit</td><td>t C/TJ</td></tr>
<tr><td>Description</td><td>Carbon emission factor for natural gas combustion in monitoring period y of the project scenario</td></tr>
<tr><td>Time of determination/monitoring</td><td>Annually</td></tr>
<tr><td>Source of data (to be) used</td><td>Carbon emission factor is sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"[63];</td></tr>
<tr><td>Value of data applied
(for ex ante calculations/determinations)</td><td><table>
<tr><td>2004</td><td>15.18</td></tr>
<tr><td>2005</td><td>15.19</td></tr>
<tr><td>2006</td><td>15.22</td></tr>
<tr><td>2007</td><td>15.16</td></tr>
<tr><td>2008</td><td>15.17</td></tr>
<tr><td>2009</td><td>15.2</td></tr>
<tr><td>2010</td><td>15.17</td></tr>
<tr><td>2011</td><td>15.17</td></tr>
</table></td></tr>
<tr><td>Justification of the choice of data or description of measurement methods and procedures (to be) applied</td><td>N/A</td></tr>
<tr><td>QA/QC procedures (to be) applied</td><td>National inventory reports of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine are official reports submitted to the Secretariat of the UN Framework Convention on Climate Change (UNFCCC).</td></tr>
<tr><td>Any comment</td><td>Data allowing of calculation of GHG emissions in the baseline scenario will be archived in hard and electronic form. Values for 2011 were sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"; if new inventory</td></tr>
</table>

[63] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip

	reports come into effect, new values will be set and ERUs will be recalculated for any reporting period in accordance with the monitoring plan.

Data / Parameter	$OXID_{p,NG}^{y}$
Data unit	Relative units
Description	Carbon oxidation factor for natural gas combustion in monitoring period y of the project scenario
Time of determination/monitoring	Annually
Source of data (to be) used	Carbon oxidation factor is sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"[64]
Value of data applied (for ex ante calculations/determinations)	**2004**: 0.995 **2005**: 0.995 **2006**: 0.995 **2007**: 0.995 **2008**: 0.995 **2009**: 0.995 **2010**: 0.995 **2011**: 0.995
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	National inventory reports of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine are official reports submitted to the Secretariat of the UN Framework Convention on Climate Change (UNFCCC).

[64] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip

Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in hard and electronic form. Values for 2011 were sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"; if new inventory reports come into effect, new values will be set and ERUs will be recalculated for any reporting period in accordance with the monitoring plan.

Data / Parameter	GWP_{CH_4}
Data unit	t CO_2eq/tCH_4
Description	Global Warming Potential of methane
Time of determination/monitoring	Throughout the crediting period
Source of data (to be) used	IPCC (International Panel on Climate Change) 1996 „Revised Guidelines for National Greenhouse Gas Inventories”. GWP of methane is available at the UNFCCC web-site[65].
Value of data applied (for ex ante calculations/determinations)	21
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	Project developer will monitor any changes in Global Warming Potential of methane published by IPCC and approved by COP.
Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in paper and electronic format.

Data / Parameter	Eff_{heat}

65 http://unfccc.int/ghg_data/items/3825.phphttp://unfccc.int/ghg_data/items/3825.php

Data unit	%
Description	Methane combustion efficiency factor for boiler equipment in period y of the project scenario
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	The value is calculated as the product of the volume of methane captured and fed to boiler equipment by its density under standard conditions.
Value of data applied (for ex ante calculations/determinations)	92
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	N/A
Any comment	Information on CMM consumption is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form. If conditions under which CMM is captured and combusted are different than standard conditions, the data are adjusted to standard conditions.

Data / Parameter	V_{PO}
Data unit	m^3
Description	Waste heap volume
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Waste heap passport
Value of data applied (for ex ante calculations/determinations)	8 565 500
Justification of the choice of data or description of measurement	In accordance with NPAOP 10.0-5.21-04 “Manual on self-ignition prevention, extinction and demolition of waste heaps”, main

methods and procedures (to be) applied	parameters, including waste heap volume, are updated annually and recorded in the waste heap passport.
QA/QC procedures (to be) applied	Measurements are conducted by entities authorized in accordance with the state standard and in line with the methodologies approved at the governmental level. The passport fixes the volume of rock accumulated in the waste heap, which ensures data cross-check against direct measurements of waste heap volume.
Any comment	Information on waste heap volume is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	c_{coal}
Data unit	%
Description	Coal content in a waste heap
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	ENVSEC: GRID Arendal "Risk Assessment Considerations in the Donetsk Basin"[66]
Value of data applied (for ex ante calculations/determinations)	10
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The data were applied in the determined UA1000317 JI project[67]
QA/QC procedures (to be) applied	N/A
Any comment	Information on coal content in waste heap is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

[66] http://www.envsec.org/publications/Risk%20Assessment%20Considerations%20in%20the%20Donetsk%20Basin%20Report_RUS.pdf

[67] http://ji.unfccc.int/JIITLProject/DB/0RQXGLUAS7ETAGMUQZWFQPJLN1SIAW/details

Data / Parameter	ρ_n
Data unit	kg/m^3
Description	Waste heap density
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Waste heap passport
Value of data applied (for ex ante calculations/determinations)	2000
Justification of the choice of data or description of measurement methods and procedures (to be) applied	In accordance with NPAOP 10.0-5.21-04 “Manual on self-ignition prevention, extinction and demolition of waste heaps”, main parameters, including waste heap density, are updated annually and recorded in the waste heap passport.
QA/QC procedures (to be) applied	Measurements are conducted by entities authorized in accordance with the state standard and in line with the methodologies approved at the governmental level.
Any comment	Information on waste heap density is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	$NCV_{p,coal}^{y}$
Data unit	TJ/ths t
Description	Net calorific value of coal in monitoring period y of the project scenario
Time of determination/monitoring	Annually
Source of data (to be) used	Net calorific value of natural gas is sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"[68]

[68] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip

Value of data applied (for ex ante calculations/determinations)	**2006** 23,23 **2007** 23,43 **2008** 21,5 **2009** 21,8 **2010** 21,6 **2011** 21,6
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	National inventory reports of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine are official reports submitted to the Secretariat of the UN Framework Convention on Climate Change (UNFCCC).
Any comment	According to conservative principles minimal calorific value of coal is used. Values for 2011 were sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"; if new inventory reports come into effect, new values will be set and ERUs will be recalculated for any reporting period in accordance with the monitoring plan.Net calorific value of coal is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	$EF^{y}_{p,C,coal}$
Data unit	t C/TJ
Description	Carbon emission factor for coal combustion in monitoring period y of the project scenario
Time of determination/monitoring	Annually
Source of data (to be) used	Carbon emission factor is sourced from the "National inventory

	report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"[69];
Value of data applied (for ex ante calculations/determinations)	**2006** 26,02 **2007** 26,04 **2008** 25,95 **2009** 25,97 **2010** 25,99 **2011** 25,99
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	National inventory reports of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine are official reports submitted to the Secretariat of the UN Framework Convention on Climate Change (UNFCCC).
Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in hard and electronic form. Values for 2011 were sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"; if new inventory reports come into effect, new values will be set and ERUs will be recalculated for any reporting period in accordance with the monitoring plan.

Data / Parameter	$OXID^{y}_{p,coal}$
Data unit	Relative units
Description	Carbon oxidation factor for coal combustion in monitoring period *y* of the project scenario

[69] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip

<table>
<tr><td>Time of determination/monitoring</td><td>Annually</td></tr>
<tr><td>Source of data (to be) used</td><td>Carbon oxidation factor is sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"[70]</td></tr>
<tr><td>Value of data applied
(for ex ante calculations/determinations)</td><td><table><tr><td>2006</td><td>0,960</td></tr><tr><td>2007</td><td>0,964</td></tr><tr><td>2008</td><td>0,963</td></tr><tr><td>2009</td><td>0,963</td></tr><tr><td>2010</td><td>0,962</td></tr><tr><td>2011</td><td>0,962</td></tr></table></td></tr>
<tr><td>Justification of the choice of data or description of measurement methods and procedures (to be) applied</td><td>N/A</td></tr>
<tr><td>QA/QC procedures (to be) applied</td><td>National inventory reports of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine are official reports submitted to the Secretariat of the UN Framework Convention on Climate Change (UNFCCC).</td></tr>
<tr><td>Any comment</td><td>Data allowing of calculation of GHG emissions in the baseline scenario will be archived in hard and electronic form. Values for 2011 were sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"; if new inventory reports come into effect, new values will be set and ERUs will be recalculated for any reporting period in accordance with the monitoring plan.</td></tr>
</table>

Data / Parameter	$k_{m,y}^{p}$
Data unit	N/A

[70] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip

Description	Waste heap combustion factor in month *m* year *y* of the project scenario
Time of determination/monitoring	Monthly
Source of data (to be) used	Monthly waste heap monitoring throughout the crediting period
Value of data applied (for ex ante calculations/determinations)	The value is determined for each monitoring period.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Information on waste heap ignitions, including starting dates of burnings and end dates of burnings are recorded in waste heap passports
QA/QC procedures (to be) applied	Temperature surveys were conducted in line with NPAOP 10.0-5.21-04 Manual on self-ignition prevention, extinction and demolition of waste heaps[71]
Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in hard and electronic form.

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

$$PE^y = PE^y_{M,coal} + PE^y_{CH_4} + PE^y_{PO}; \qquad (1)$$

PE^y - total GHG emissions in monitoring period *y* of the project scenario, t CO_2eq;

$PE^y_{M,coal}$ - GHG emissions from electricity consumption in the course of coal mining in monitoring period *y* of the project scenario, t CO2eq;

$PE^y_{CH_4}$ - total GHG emissions in the course of CMM recovery in monitoring period *y* of the project scenario, t CO_2eq;

PE^y_{PO} - GHG emissions from repeated waste heap ignition after activities on its extinction took place in period *y* of the project scenario, t CO_2eq;

y - index for monitoring period;

M - index for coal mining procedures at SE “CC “Krasnolimanska”;

[71] http://dnop.com.ua/dnaop/act2799.htm

$coal$ - index for coal mining;

CH_4 - index for methane recovery technology;

PO - index for waste heaps.

$$PE^{y}_{M,coal} = EC^{y}_{p,M} * EF^{y}_{p,CO2,ELEC}, \quad (2)$$

$PE^{y}_{M,coal}$ - GHG emissions from electricity consumption in the course of coal mining in monitoring period *y* of the project scenario, t CO2eq;

$EC^{y}_{p,M}$ - electricity consumption in the course of coal mining in monitoring period *y* of the project scenario, MWh;

$EF^{y}_{p,CO2,ELEC}$ - carbon dioxide emission factor for electricity consumption by consumers, in monitoring period *y* of the project scenario, t CO_2/MWh;

y - index for monitoring period;

p - index for project scenario;

M - index for coal mining technological procedures;

$ELEC$ - index for electricity.

Since implementations of energy-efficient equipment aimed at the increase of coal mining efficiency, are planned for 2012, as shown in the project implementation schedule, the results of the 2012 complex modernization of equipment are not full as of the date of PDD development; taking account of the frequency of data monitoring, the results are difficult to be calculated for a several-months period. Pursuant to conservative principles, the calculation of GHG emission reductions from equipment modernization will be performed after all project implementations are completed, i.e. starting 2013, which will be reflected in monitoring reports for the project.

$$PE^{y}_{CH_4} = PE^{y}_{p,ME} + PE^{y}_{p,MD} + PE^{y}_{p,UM}, \quad (3)$$

$PE^{y}_{CH_4}$ - GHG emissions generated in the course of CMM recovery in monitoring period *y* of the project scenario, t CO_2eq;

$PE^{y}_{p,ME}$ - GHG emissions from energy consumption in the course of CMM recovery in monitoring period *y* of the project scenario (for CMM capturing and utilization), t CO_2eq;

$PE^{y}_{p,MD}$ - GHG emissions from CMM combustion for generation of heat or other energy in monitoring period *y* of the project scenario, t CO_2eq;

$PE^{y}_{p,UM}$ - GHG emissions from incomplete CMM combustion in the course of CMM recovery in monitoring period *y* of the project scenario, t CO_2eq;

y - index for monitoring period;

p - index for project scenario;

CH_4 - index for CMM recovery technology;

ME - index for CMM recovery technology (capturing and further utilization);

MD - index for methane combustion for on-site needs;

UM - index for incomplete methane combustion.

$$PE^{y}_{p,ME} = CONS^{y}_{p,ELEC} \cdot EF^{y}_{p,CO_2,ELEC}, \quad (4)$$

where:

$PE^{y}_{p,ME}$ - GHG emissions from energy consumption in the course of CMM recovery in monitoring period *y* of the project scenario (for CMM capturing and utilization), t CO_2eq;

$CONS^{y}_{p,ELEC}$ - electricity consumption in the course of CMM recovery in monitoring period *y* of the project scenario, MWh

$EF^{y}_{p,CO_2,ELEC}$ - carbon dioxide emission factor for electricity consumption by consumers, in monitoring period *y* of the project scenario, t CO_2/MWh;

y - index for monitoring period;

p - index for project scenario;

ME - index for CMM capturing and further utilization;

$Elec$ - index for electricity.

Methane will be combusted in boilers. Flaring is not applied.

Ratio of non-methane hydrocarbons is below 1%, so they can be excluded from the calculation. However, the content of non-methane hydrocarbons will be analysed on the periodic basis and if the content is high they will be included into project emissions. Thus:

$$PE^{y}_{p,MD} = MD^{y}_{p} * EF_{CH4}; \quad (5)$$

$PE^{y}_{p,MD}$ - GHG emissions from CMM combustion for generation of heat or other energy in monitoring period *y* of the project scenario, t CO_2eq;

MD^{y}_{p} - CMM combustion in the course of its recovery in monitoring period *y* of the project scenario, t CH_4;

EF_{CH4} - CO_2 emission factor for CMM combustion, t CO_2/t CH_4.

y - index for monitoring period;

p - index for project scenario;

CH_4 - index for methane;

MD - index for methane combustion for industrial needs;

$$PE^{y}_{p,UM} = GWP_{CH_4} \cdot MD^{y}_{p,} \cdot \ 1 - Eff_{heat} \ , \qquad (6)$$

GWP_{CH_4} - Global warming potential of methane (21 t CO_2eq/t CH_4)

MD^{y}_{p} - CMM combustion in the course of its recovery in monitoring period y of the project scenario, t CH_4;

Eff_{heat} - CMM combustion efficiency factor in heating equipment in the course of CMM recovery, %;

y - index for monitoring period;

p - index for project scenario;

UM - index for incomplete methane combustion.

CH_4 - index for methane;

$heat$ - index for heat generation.

$$MD^{y}_{p} = Q^{y}_{real} \cdot \rho_{real} , \qquad (7)$$

MD^{y}_{p} - CMM combustion in the course of its recovery in monitoring period y of the project scenario, t CH_4;

Q^{y}_{real} - measured CMM volume collected in the course of recovery in monitoring period y of the project scenario, m^3;

ρ_{real} - coal mine methane density under standard conditions, t/ths m^3;

$real$ - index for standard conditions;

p - index for project scenario;

y - index for monitoring period.

According to the research, the period of waste heap combustion is 15 years[72], which means that the entire amount of coal in a waste heap can burn down over this period. Waste heap monitoring programme provides an opportunity to control the heap condition and prevent its inflammation, and if the latter occurs, to take measures for its rapid extinction. It also provides for monthly monitoring of waste heap. Based on the conditions of the waste heap monitoring programme, the formula for the calculation of GHG emissions from waste heap combustion in the baseline was adjusted to the monthly waste heap monitoring activities.

$$PE_{PO}^{y} = \sum_{i=1}^{12} \frac{FC_{p,PO,coal} \cdot NCV_{p,coal}^{y} \cdot k_{m,y}^{p} \cdot EF_{p,CO2,coal}^{y}}{180} + PE_{p,PO,disel}^{y}, \quad (8)$$

PE_{PO}^{y} - GHG emissions from repeated waste heap ignition after activities on its extinction took place in period *y* of the project scenario, t $CO2_{eq;}$

$PE_{p,PO,disel}^{y}$ - GHG emissions from diesel fuel combustion in the course of waste heap extinction in monitoring period *y* of the project scenario, t CO_2eq;

$FC_{p,PO,coal}$ - total amount of coal in a waste heap as of the beginning of extinction works, ths t;

$NCV_{p,coal}^{y}$ - net calorific value of coal in monitoring period *y* of the project scenario, TJ/ths t;

$EF_{p,CO_2,coal}^{y}$ - default carbon dioxide emission factor for stationary coal combustion in monitoring period *y* of the project scenario, t CO_2/TJ;

$k_{m,y}^{p}$ - waste heap combustion factor for month *m* of year *y* of the project scenario (if waste heap combustion was detected in the reporting month, it is assumed that k=1, if the combustion was not detected, as provided by the project, it is assumed that k=0);

180 - number of months in a 15-year period (15 years is the period of total combustion of a waste heap);

disel - index for diesel fuel;

y - index for monitoring period;

i - index for the sequence number of month, year *y*.

p - index for project scenario;

n - index for waste heap density;

coal - index for coal;

PO - index for waste heaps.

[72] http://cdm.unfccc.int/UserManagement/FileStorage/LV8NU1GYWTK06COJPDIXQ35FR2MA47

Emissions from diesel fuel consumption by technological equipment in the course of waste heap extinction occur only if repeated ignition takes place; these emissions constitute for less than 1% of the total emissions from waste heap burning, so they can be neglected in the calculation. Thus:

$$PE_{PO}^{y} = \sum_{i=1}^{12} \frac{FC_{p,PO,coal} \cdot NCV_{p,coal}^{y} \cdot k_{m,y}^{p} \cdot EF_{p,CO2,coal}^{y}}{180}, \quad (9)$$

$$FC_{p,PO,coal} = \frac{V_{PO} \cdot \rho_n \cdot C_{coal}}{1000000}, \quad (10)$$

$FC_{b,PO,coal} = FC_{p,PO,coal}$ - total amount of coal in a waste heap as of the beginning of extinction works, ths t;

V_{PO} – waste heap volume, m^3;

C_{coal} - coal content in a waste heap, %;

ρ_n - waste heap density, kg/m^3;

PO - index for waste heap;

n - index for waste heap density;

$\left[\frac{1}{1000000}\right]$ - index for kilogrammes to thousand tonnes conversion factor.

$coal$ - index for coal.

$$EF_{p,CO2,coal}^{y} = EF_{p,C,coal}^{y} \cdot OXID_{p,coal}^{y} \cdot 44/12, \quad (11)$$

$EF_{p,C,coal}^{y}$ - carbon emission factor for coal combustion in monitoring period *y* of the project scenario, t C /TJ;

$OXID_{p,coal}^{y}$ - carbon oxidation factor for coal combustion in monitoring period *y* of the project scenario, relative units;

$44/12$ - stoichiometric ratio of carbon dioxide and carbon molecular weight, t CO_2/t C;

y - index for monitoring period;

p - index for project scenario;

$coal$ - index for coal.

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:

Data / Parameter	N_p^y
Data unit	t
Description	Coal production in monitoring period *y* of the project scenario
Time of determination/monitoring	Monthly
Source of data (to be) used	Based on working logs with coal production records, mechanical supervisor department draws up periodic (annual or semi-annual) forms No.1-P-NPP for the entire plant.
Value of data applied (for ex ante calculations/determinations)	The value is determined for each monitoring period.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measurement of coal production is to be conducted with scales and recorded in working logs, after which mechanical supervisor department shall sum up the data and draw up 1-P-NPP form, to be stored in the company's archive.1-P-NPP forms are annually submitted to the Main Statistics Administration of Donetsk region.
QA/QC procedures (to be) applied	Measurements were carried out with scales which were calibrated and verified on a regular basis in accordance with quality assurance procedures and Law of Ukraine "On metrology and metrological activity"[73]. Periodical report form No. 1-P-NPP is stored for minimum 2 years after the transfer of the last emission reduction units at the chief power engineer department as well as at the Main Statistics Administration of Donetsk region.
Any comment	Information on coal production is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	N_b^j

[73] http://zakon1.rada.gov.ua/laws/show/113/98-%D0%B2%D1%80

Data unit	t
Description	Coal production in historical period *j* of the baseline scenario
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Based on working logs with coal production records, mechanical supervisor department draws up periodic (annual or semi-annual) forms No.1-P-NPP for the entire plant.
Value of data applied (for ex ante calculations/determinations)	**2009**: 1640; **2010**: 1455; **2011**: 1457
Justification of the choice of data or description of measurement methods and procedures (to be) applied	To determine coal production prior to the implementation of technological equipment modernization activities, a historical period of 2009-2011 (period *j*) was chosen Measurement of coal production was conducted with scales and recorded in working logs, after which mechanical supervisor department summed up the data and drew up 1-P-NPP form, stored in the company's archive.1-P-NPP forms were annually submitted to the Main Statistics Administration of Donetsk region.
QA/QC procedures (to be) applied	Measurements were carried out with scales which were calibrated and verified on a regular basis in accordance with quality assurance procedures and Law of Ukraine "On metrology and metrological activity". Periodical report form No. 1-P-NPP is stored for minimum 2 years after the transfer of the last emission reduction units at the chief power engineer department as well as at the Main Statistics Administration of Donetsk region.
Any comment	Information on coal production is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	$EC_{b,M}^{j}$
Data unit	MWh
Description	Electricity consumption in historical period *j* of the baseline scenario
Time of	Once at the beginning of the project

determination/monitoring	
Source of data (to be) used	Based on monthly reports on electricity consumption by each shop individually, the chief power engineer department draws up periodic (annual or semi-annual) forms No.24-enerhetyka and No.11-MTP for the entire plant.
Value of data applied (for ex ante calculations/determinations)	**2009**: 107219; **2010**: 106480; **2011**: 100591
Justification of the choice of data or description of measurement methods and procedures (to be) applied	To determine electricity consumed prior to the implementation of technological equipment modernization activities, a historical period of 2004-2005 (period *j*) was chosen
QA/QC procedures (to be) applied	Measurements were carried out with flow meters which were calibrated and verified on a regular basis in according with quality assurance procedures and Law of Ukraine "On metrology and metrological activity". Periodic report forms No.24-energy and No.11-MTP are stored for minimum 2 years after the transfer of the last emission reduction units at the chief power engineer department as well as at the Main Statistics Administration of Donetsk region.
Any comment	Information on electricity consumption is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	$EF^{j}_{b,CO2,ELEC}$
Data unit	t CO_2/MWh
Description	Carbon dioxide emission factor for electricity consumption by consumers in historical period *j* of the baseline scenario
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Carbon dioxide emission factors for 2009 are sourced from Decree No.63 of the National Environmental Investments Agency of Ukraine (hereinafter NEIAU) dated 15/04/2011 “On approval of

	carbon dioxide emission factors for 2009" Carbon dioxide emission factors for 2010 are sourced from the NEIAU Decree No.43 of 28/03/2011 "On approval of carbon dioxide specific emission values in 2010" Carbon dioxide emission factors for 2011 are sourced from the NEIAU Decree No.75 of 12/05/2011 "On approval of carbon dioxide specific emission values in 2011"
Value of data applied (for ex ante calculations/determinations)	**2009**: 1.096; **2010**: 1.093; **2011**: 1.090
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	National carbon dioxide emission factors are used in the Joint Implementation project development.
Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in paper and electronic format.

Data / Parameter	GWP_{CH_4}
Data unit	t CO_2eq/tCH_4
Description	Global Warming Potential of methane
Time of determination/monitoring	Throughout the crediting period
Source of data (to be) used	IPCC (International Panel on Climate Change) 1996 „Revised Guidelines for National Greenhouse Gas Inventories"
Value of data applied (for ex ante calculations/determinations)	21
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A

QA/QC procedures (to be) applied	If CO_2 emission factors for methane change, the baseline and the project scenario will be recalculated based on the new values
Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in paper and electronic format.

Data / Parameter	Q_{real}^{y}
Data unit	ths m^3
Description	CMM volume collected in the course of recovery in monitoring period y of the project scenario
Time of determination/monitoring	Monthly
Source of data (to be) used	Volume of CMM consumed is recorded in fuel consumption logs by each boiler module Based on fuel consumption logs, CMM consumption data are recorded in annual CMM consumption reports to be stored in the mechanical supervisor department
Value of data applied (for ex ante calculations/determinations)	The value is determined for each monitoring period.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Daily measurements of CMM combustion will be carried out using gas flow meters and then recorded and stored in the mechanical supervisor department.
QA/QC procedures (to be) applied	Measurements are carried out with flow meters which are calibrated and verified on a regular basis in accordance with quality assurance procedures and Law of Ukraine "On metrology and metrological activity".
Any comment	Information on CMM consumption is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	ρ_{real}
Data unit	t/ths m^3
Description	Coal mine methane density under standard conditions

Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Physical properties of methane
Value of data applied (for ex ante calculations/determinations)	0.668
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	N/A
Any comment	Information on methane density is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	$NCV_{p,NG}^{y}$
Data unit	TJ/ths m^3
Description	Net calorific value of natural gas in monitoring period y of the project scenario
Time of determination/monitoring	Annually
Source of data (to be) used	Net calorific value of natural gas is sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"
Value of data applied (for ex ante calculations/determinations)	**2004**: 33.82 **2005**: 33.82 **2006**: 33.85 **2007**: 33.85 **2008**: 34 **2009**: 34.1 **2010**: 34.1 **2011**: 34.1

Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	National inventory reports of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine are official reports submitted to the Secretariat of the UN Framework Convention on Climate Change (UNFCCC).
Any comment	According to principle of conservatism minimal calorific value of gas is used. Values for 2011 were sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"; if new inventory reports come into effect, new values will be set and ERUs will be recalculated for any reporting period in accordance with the monitoring plan.Net calorific value of natural gas combustion is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	$EF_{b,C,coal}^{y}$
Data unit	t C/TJ
Description	Carbon emission factor for coal combustion in monitoring period *y* of the baseline scenario
Time of determination/monitoring	Annually
Source of data (to be) used	Carbon emission factor is sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"
Value of data applied (for ex ante calculations/determinations)	**2004** 26.19 **2005** 26.05 **2006** 26,02 **2007** 26,04 **2008** 25,95

	2009 25,97 **2010** 25,99 **2011** 25,99
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	National inventory reports of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine are official reports submitted to the Secretariat of the UN Framework Convention on Climate Change (UNFCCC).
Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in hard and electronic form. Values for 2011 were sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"; if new inventory reports come into effect, new values will be set and ERUs will be recalculated for any reporting period in accordance with the monitoring plan.

Data / Parameter	$OXID_{b,coal}^{y}$
Data unit	Relative units
Description	Carbon oxidation factor for coal combustion in monitoring period *y* of the baseline scenario
Time of determination/monitoring	Annually
Source of data (to be) used	Carbon oxidation factor is sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"
Value of data applied (for ex ante calculations/determinations)	**2004** 0.956 **2005** 0.957

	2006 0,960 **2007** 0,964 **2008** 0,963 **2009** 0,963 **2010** 0,962 **2011** 0,962
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	National inventory reports of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine are official reports submitted to the Secretariat of the UN Framework Convention on Climate Change (UNFCCC).
Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in hard and electronic form. Values for 2011 were sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"; if new inventory reports come into effect, new values will be set and ERUs will be recalculated for any reporting period in accordance with the monitoring plan.

Data / Parameter	V_{PO}
Data unit	m^3
Description	Waste heap volume
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Waste heap passport
Value of data applied (for ex ante calculations/determinations)	8 565 500
Justification of the choice of data or description of measurement	In accordance with NPAOP 10.0-5.21-04 “Manual on self-ignition prevention, extinction and demolition of waste heaps”, main

methods and procedures (to be) applied	parameters, including waste heap volume, are updated annually and recorded in the waste heap passport.
QA/QC procedures (to be) applied	Information on waste heap volume is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form. The passport fixes the volume of rock accumulated in the waste heap, which ensures data cross-check against direct measurements of waste heap volume.
Any comment	Information on waste heap volume is the basis for coal content calculation, to be archived in paper and electronic form.

Data / Parameter	$NCV_{b,coal}^{y}$
Data unit	TJ/ths t
Description	Net calorific value of coal in monitoring period *y*, in the baseline scenario
Time of determination/monitoring	Annually
Source of data (to be) used	"National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"
Value of data applied (for ex ante calculations/determinations)	**2006**: 23,23 **2007**: 23,43 **2008**: 21,5 **2009**: 21,8 **2010**: 21,6 **2011**: 21,6
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A

QA/QC procedures (to be) applied	The National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine is an official report submitted to the Secretariat of the UN Framework Convention on Climate Change (UNFCCC).
Any comment	According to conservative principles minimal calorific value of coal is used. Net calorific value of coal is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	ρ_n
Data unit	kg/m^3
Description	Waste heap density
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Waste heap passport
Value of data applied (for ex ante calculations/determinations)	2000
Justification of the choice of data or description of measurement methods and procedures (to be) applied	In accordance with NPAOP 10.0-5.21-04 “Manual on self-ignition prevention, extinction and demolition of waste heaps”, main parameters, including waste heap volume, are updated annually and recorded in the waste heap passport.
QA/QC procedures (to be) applied	Measurements are conducted by entities authorized in accordance with the state standard and in line with the methodologies approved at the governmental level.
Any comment	Information on waste heap volume is the basis for coal content calculation, to be archived in paper and electronic form.

Data / Parameter	C_{coal}
Data unit	%
Description	Coal content in a waste heap
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	ENVSEC: GRID Arendal “Risk Assessment Considerations in the Donetsk Basin”

Value of data applied (for ex ante calculations/determinations)	10
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The data were applied in the determined UA1000317 JI project[74]
QA/QC procedures (to be) applied	N/A
Any comment	According to principle of conservatism minimal coal content value is used. Information on waste heap volume is the basis for coal content calculation, to be archived in paper and electronic form.

Data / Parameter	$k^{b}_{m,y}$
Data unit	N/A
Description	Waste heap combustion factor in month *m* year *y* of the baseline scenario
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Annual waste heap monitoring data in 2004-2005
Value of data applied (for ex ante calculations/determinations)	1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Information on waste heap ignitions, including starting dates of burnings and end dates of burnings are recorded in waste heap passports
QA/QC procedures (to be) applied	Temperature surveys were conducted in line with NPAOP 10.0-5.21-04 Manual on self-ignition prevention, extinction and demolition of waste heaps[75]

[74] http://ji.unfccc.int/JIITLProject/DB/0RQXGLUAS7ETAGMUQZWFQPJLN1SIAW/details

[75] http://dnop.com.ua/dnaop/act2799.htm

Any comment	Current practice shows that activities carried out in “Krasnolimanska” mine to prevent waste heap self-ignition and to extinguish hot spots are ineffective, which is evidenced by hot spots registered in the period of 2004-2005.

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

$$BE^{y} = BE^{y}_{M,coal} + BE^{y}_{CH_4} + BE^{y}_{PO}; \quad (12)$$

BE^{y} - total GHG emissions in monitoring period *y* of the baseline scenario, t CO_2eq;

$BE^{y}_{M,coal}$ - GHG emissions from electricity consumption in mining process in monitoring period *y* of the baseline scenario, t CO_2eq;

$BE^{y}_{CH_4}$ - GHG emissions from CMM recovery technology in monitoring period *y* of the baseline scenario, t CO_2eq;

BE^{y}_{PO} - GHG emissions from waste heap combustion in monitoring period *y* of the baseline scenario, t CO_2eq;

y - index for monitoring period;

$coal$ - index for coal mining procedures at SE “CC “Krasnolimanska”;

M - index for technological equipment modernization;

CH_4 - index for methane recovery technology;

PO - index for waste heaps.

$$BE^{y}_{M,coal} = N^{y}_{p} * BPER_{coal} \quad (13)$$

$BE^{y}_{M,coal}$ - GHG emissions from electricity consumption in the course of coal mining in monitoring period *y* of the baseline scenario, t CO_2eq;

N^{y}_{p} - coal production in monitoring period *y* of the project scenario, t;

$BPER_{coal}$ - pre-project coal mining efficiency factor, t CO_2eq/t.

y - index for monitoring period;

p - index for project scenario;

M - index for coal mining technological procedures;

$coal$ - index for coal mining.

$$BPER_{coal} = \frac{\sum_{i=1}^{3} \frac{BE_{b,ELEC}^{j}}{N_{b}^{j}}}{3}, \quad (14)$$

$BPER_{coal}$ - pre-project coal mining efficiency factor, t CO_2eq/t;

$BE_{b,ELEC}^{j}$ - total GHG emissions from electricity generation in the course of coal mining in historical period j of the baseline scenario, t CO_2eq;

N_{b}^{j} - total coal production in historical period j of the baseline scenario, t;

3 – years in historical period, 2009-2011;

i - index for historical period;

b - index for baseline scenario;

$ELEC$ - index for electricity;

3 - index for three years of historical period.

$$BE_{b,ELEC}^{j} = \sum_{i=1}^{3} \left(EC_{b,M}^{j} * EF_{b,CO2,ELEC}^{j} \right) \quad (15)$$

$BE_{b,ELEC}^{j}$ - total GHG emissions from electricity generation in the course of coal mining in historical period j of the baseline scenario, t CO_2eq;

$EC_{b,M}^{j}$ - electricity consumption in the course of coal mining in historical period j of the baseline scenario, MWh;

$EF_{b,CO2,ELEC}^{j}$ - carbon dioxide emission factor for electricity consumption by consumers in historical period j of the baseline scenario, t CO_2/MWh;

i - index for historical period;

b - index for baseline scenario;

[3] – number of years in the historical period;

$ELEC$ - index for electricity.

Since implementations of energy-efficient equipment aimed at the increase of coal mining and heat generation efficiency, are planned for 2012, as shown in the project implementation schedule, the results of the 2012 complex modernization of equipment are not full as of the date of PDD development; taking account of the frequency of data monitoring, the results are difficult to be calculated for a several-months period. Pursuant to conservative principles, the calculation of GHG emission reductions from equipment modernization (formulae (2) - (7) and (14) - (16)) will be performed after all project implementations are completed, i.e. starting 2013, which will be reflected in monitoring reports for the project.

$$BE_{CH_4}^{y} = BE_{b,MR}^{y} + BE_{b,heat}^{y}, \quad (16)$$

$BE_{CH_4}^{y}$ - GHG emissions from previous mine gas drainage technology in monitoring period *y* of the baseline scenario, t CO_2eq;

$BE_{b,MR}^{y}$ - GHG emissions from previous mine gas drainage technology in monitoring period *y* of the baseline scenario, t CO_2eq;

$BE_{b,heat}^{y}$ - GHG emissions from combustion of coal natural gas by boiler modules for heat generation in monitoring period *y* of the baseline scenario, t CO_2eq;

$heat$ - index for heat generation;

y - index for monitoring period;

b - index for baseline scenario;

MR - index for the previous mine gas drainage technology;

CH_4 - index for methane recovery technology.

$$BE_{b,MR}^{y} = GWP_{CH_4} \cdot MD_{p}^{y}, \quad (17)$$

$BE_{b,MR}^{y}$ - GHG emissions from previous mine gas drainage technology in monitoring period *y* of the baseline scenario, t CO_2eq;

GWP_{CH_4} - Global Warming Potential of methane, 21 t CO2eq/t CH4;

MD_{p}^{y} - CMM combustion in the course of its recovery in monitoring period *y* of the project scenario, t CH_4;

y - index for monitoring period;

MR - index for the previous mine gas drainage technology;

b - index for baseline scenario;

p - index for project scenario;

CH_4 - index for methane.

$$MD_p^y = Q_{real}^y \cdot \rho_{real}, \quad (18)$$

MD_p^y - CMM combustion in the course of its recovery in monitoring period y of the project scenario, t CH_4;

Q_{real}^y - measured CG volume collected in the course of recovery in monitoring period y of the project scenario, ths m^3;

ρ_{real} - coal mine methane density under standard conditions, t/ths m^3;

$real$ - index for standard conditions;

p - - index for project scenario;

y - - index for monitoring period.

$$BE_{b,heat}^y = HEAT_{p,CH_4}^y \cdot EF_{b,heat,coal}^y, \quad (19)$$

$BE_{b,heat}^y$ - GHG emissions from combustion of coal natural gas by boiler modules for heat generation in monitoring period y of the baseline scenario, t CO_2eq;

$HEAT_{p,CH_4}^y$ - heat generation within the project activity by CMM combustion in monitoring period y of the project scenario, GJ;

$EF_{heat,coal}^y$ - carbon dioxide emission factor for heat generation at the mine in monitoring period y of the baseline scenario, t CO2/TJ;

y - index for monitoring period;

b - - index for baseline scenario;

$heat$ - index for fuel consumption for heat generation;

$coal$ - index for coal.

$$HEAT_{p,CH_4}^y = Q_{real}^y * NCV_{p,NG}^y, \quad (20)$$

$HEAT_{p,CH_4}^y$ - heat generation within the project activity by CMM combustion in monitoring period y of the project scenario, TJ;

Q^{y}_{real} - measured CMM volume collected in the course of recovery in monitoring period *y* of the project scenario, ths m^3;

$NCV^{y}_{p,NG}$ - net calorific value of natural gas in monitoring period *y* of the project scenario, TJ/ths m^3;

$real$ - index for standard conditions;

p - index for project scenario;

y - index for monitoring period;

NG - index for natural gas.

$$EF^{y}_{b,heat,coal} = EF^{y}_{b,CO2,coal} = EF^{y}_{b,C,coal} \cdot OXID^{y}_{b,coal} \cdot 44/12, \qquad (21)$$

$44/12$ - stoichiometric *ratio* of carbon dioxide and carbon molecular weight, t CO_2/t C;

$EF^{y}_{b,C,coal}$ - carbon emission factor for coal combustion in monitoring period *y* of the baseline scenario, t C /TJ;

$OXID^{y}_{b,coal}$ - carbon oxidation factor for coal combustion in monitoring period *y* of the baseline scenario, relative units;

y - index for monitoring period;

b - index for baseline scenario;

$coal$ - index for coal.

According to the research, the period of waste heap combustion is 15 years[76], which means that the entire amount of coal in a waste heap can burn down over this period. Waste heap monitoring programme provides an opportunity to control the heap condition and prevent its inflammation, and if the latter occurs, to take measures for its rapid extinction. It also provides for monthly monitoring of waste heap. Based on the conditions of the waste heap monitoring programme, the formula for the calculation of GHG emissions from waste heap combustion in the baseline was adjusted to the monthly waste heap monitoring activities.

$$BE^{y}_{PO} = \sum_{i=1}^{12} \frac{FC_{b,PO,coal} \cdot NCV^{y}_{b,coal} \cdot k^{b}_{m,y} \cdot EF^{y}_{b,CO2,coal}}{180}, \qquad (22)$$

$FC_{b,PO,coal}$ - total amount of coal in a waste heap as of the beginning of extinction works, ths t;

[76] http://cdm.unfccc.int/UserManagement/FileStorage/LV8NU1GYWTK06COJPDIXQ35FR2MA47

$NCV^{y}_{b,coal}$ - net calorific value of coal in monitoring period *y* of the baseline scenario, TJ/ths t;

$EF^{y}_{b,CO_2,coal}$ - default carbon dioxide emission factor for stationary coal combustion in monitoring period *y* of the baseline scenario, t CO_2/TJ;

$k^{b}_{m,y}$ - waste heap combustion factor for month *m* of year *y* of the project scenario (if waste heap combustion was detected in the reporting month, it is assumed that k=1, if the combustion was not detected, as provided by the project, it is assumed that k=0. Since the waste heap continues to burn under the baseline scenario, k=1 for all months of the monitoring period);

PO - index for waste heap;

b - - index for baseline scenario;

$coal$ - index for coal;

y - index for monitoring period;

i - index for the sequence number of month, year *y*.

$$FC_{b,PO,coal} = \frac{V_{PO} \cdot \rho_n \cdot C_{coal}}{1000000}, \qquad (23)$$

$FC_{b,PO,coal}$ - total amount of coal in a waste heap as of the beginning of extinction works, ths t;

V_{PO} . – waste heap volume, m^3;

C_{coal} - coal content in a waste heap, %;

ρ_n - waste heap density, kg/m^3;

PO - index for waste heap;

b - - index for baseline scenario;

n - index for waste heap density;

$coal$ - index for coal;

$\left[\frac{1}{1000000}\right]$ - index for kilogrammes to thousand tonnes conversion factor.

$$EF^{y}_{b,CO2,coal} = EF^{y}_{b,C,coal} \cdot OXID^{y}_{b,coal} \cdot 44/12, \qquad (24)$$

$EF_{b,C,coal}^{y}$ - carbon emission factor for coal combustion in monitoring period *y* of the baseline scenario, t C /TJ;

$OXID_{b,coal}^{y}$ - carbon oxidation factor for coal combustion in monitoring period *y* of the baseline scenario, relative units;

$44/12$ - stoichiometric *ratio* of carbon dioxide and carbon molecular weight, t CO_2/t C;

y - index for monitoring period;

b - index for baseline scenario;

$coal$ - index for coal.

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

N/A

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):

N/A

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

No leakage associated with project implementation is expected.

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

N/A

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

N/A

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 in the project scenario are calculated under the JI-specific approach:

$$ER^y = BE^y - PE^y \quad (25)$$

ER^y – emission reductions due to the project activity in monitoring period y of the project scenario, t CO_2eq;

BE^y - total GHG emissions in monitoring period y of the baseline scenario, t CO_{2eq};

PE^y – total GHG emissions in monitoring period y of the project scenario, t CO_{2eq};

y - index for monitoring period;

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 company conducts systematic control over environmental emissions in accordance with the current legislation of Ukraine:

- Law of Ukraine No.1264-XII "On environmental protection"[77] dated 25/06/1991;
- Law of Ukraine No.2707-XII "On atmospheric air protection"[78] dated 16/10/1992;
- "Standards of maximum permissible emissions of pollutants from stationary sources"[79] approved by the Ministry of Environmental Protection of Ukraine dated 27/06/2006, No.309 and registered in the Ministry of Justice of Ukraine dated 01/09/2006, No.912/12786.

In the framework of the procedures under the Law of Ukraine “On state statistics”, the company reports on its environmental indicators on a periodic basis, i.e. environmental department of SE “CC “Krasnolimanska” quarterly draws up forms No.2-TP (air), No.2-TP (water facilities), No.1-environmental expenses (annual) to be submitted to the State Statistics.

Information on the environmental impact of the project is collected as part of the company's operations and stored for the entire project lifetime and two years after the transfer of the last emission reduction units generated by the project.

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.
N_p^y, N_b^j	Low	Verification (calibration) of production measurement devices is carried out in accordance with manufacturer’s manuals, approved methodologies on metering devices verification/calibration, as well as with the state standards of Ukraine. Information on output volumes is official data of the company submitted to and stored at the Main Statistics Administration of Donetsk region.
$NCV_{p,NG}^y$	Low	Net calorific value of natural gas is sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine”, issued by the State Environmental Investment Agency of Ukraine This document is subject to periodic revision and updating.
$EF_{p,C,NG}^y$	Low	Carbon emission factor for natural gas combustion is sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine”, issued by the State Environmental Investment Agency of Ukraine This document is subject to periodic revision and updating.

[77] http://zakon2.rada.gov.ua/laws/show/1264-12

[78] http://zakon1.rada.gov.ua/laws/show/2707-12

[79] http://search.ligazakon.ua/l_doc2.nsf/link1/RE12786.html

$OXID^{y}_{p,NG}$	Low	Carbon oxidation factor for natural gas combustion is sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine", issued by the State Environmental Investment Agency of Ukraine This document is subject to periodic revision and updating.
$EC^{y}_{p,M}$, EC^{j}_{b},M	Low	Verification (calibration) of electricity measurement devices is carried out in accordance with manufacturer's manuals, approved methodologies on metering devices verification/calibration, as well as with the state standards of Ukraine.
$EF^{y}_{p,CO_2,ELEC}$, $EF^{j}_{b,CO2,ELEC}$	Low	Carbon dioxide emission factor for electricity consumption by consumers under official documents, namely: Operational Guidelines for Project Design Documents of Joint Implementation Projects, Volume 1: General guidelines (ERUPT); Ukraine - Assessment of new calculation of CEF", approved by TUV SUD 17/08/2007 and Decrees of the State Environmental Investment Agency of Ukraine
$NCV^{y}_{b,coal}$, $NCV^{y}_{p,coal}$	Low	Net calorific value of coal is sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine", issued by the State Environmental Investment Agency of Ukraine This document is subject to periodic revision and updating.
$EF^{y}_{p,C,coal}$, $EF^{y}_{b,C,coal}$	Low	Carbon emission factor for coal combustion is sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010", issued by the State Environmental Investment Agency of Ukraine This document is subject to periodic revision and updating.
$OXID^{y}_{p,coal}$, $OXID^{y}_{b,coal}$	Low	Carbon oxidation factor for coal combustion is sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010", issued by the State Environmental Investment Agency of Ukraine This document is subject to periodic revision and updating.
GWP_{CH_4}	Low	IPCC Second Assessment Report: Climate Change 1995 (SAR) and approved by COP. GWP of methane is provided in UNFCCC website
$CONS^{y}_{p,ELEC}$	Low	Verification (calibration) of electricity measurement devices is carried out in accordance with manufacturer's manuals, approved methodologies on metering devices verification/calibration, as well as with the state standards of Ukraine.
Q^{y}_{real}	Low	Measurements are carried out with flow meters calibrated and verified on a regular basis in according with quality assurance procedures and Law of Ukraine "On metrology and metrological activity". Final results are fixed in official reports, submitted to state regulation entities for additional verification.

$k_{m,y}^{p}$	Low	Waste heap monitoring is carried out in accordance with manufacturer's manuals, approved methodologies on metering devices verification/calibration, as well as with the state standards of Ukraine. Monitoring is performed by qualified workers and is subject to control from the company administration.

*for parameter definitions see Section D.1.

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

Since the monitoring plan is designed for accurate and clear measurement and calculation of greenhouse gas emissions, data necessary to calculate GHG emission reductions generated by the project are collected in accordance with the practice established at SE "CC "Krasnolomanska".

The operational structure of the company envisages data collection, compilation and cross-verification, as part of monitoring plan preparation, as demonstrated in a figure below:

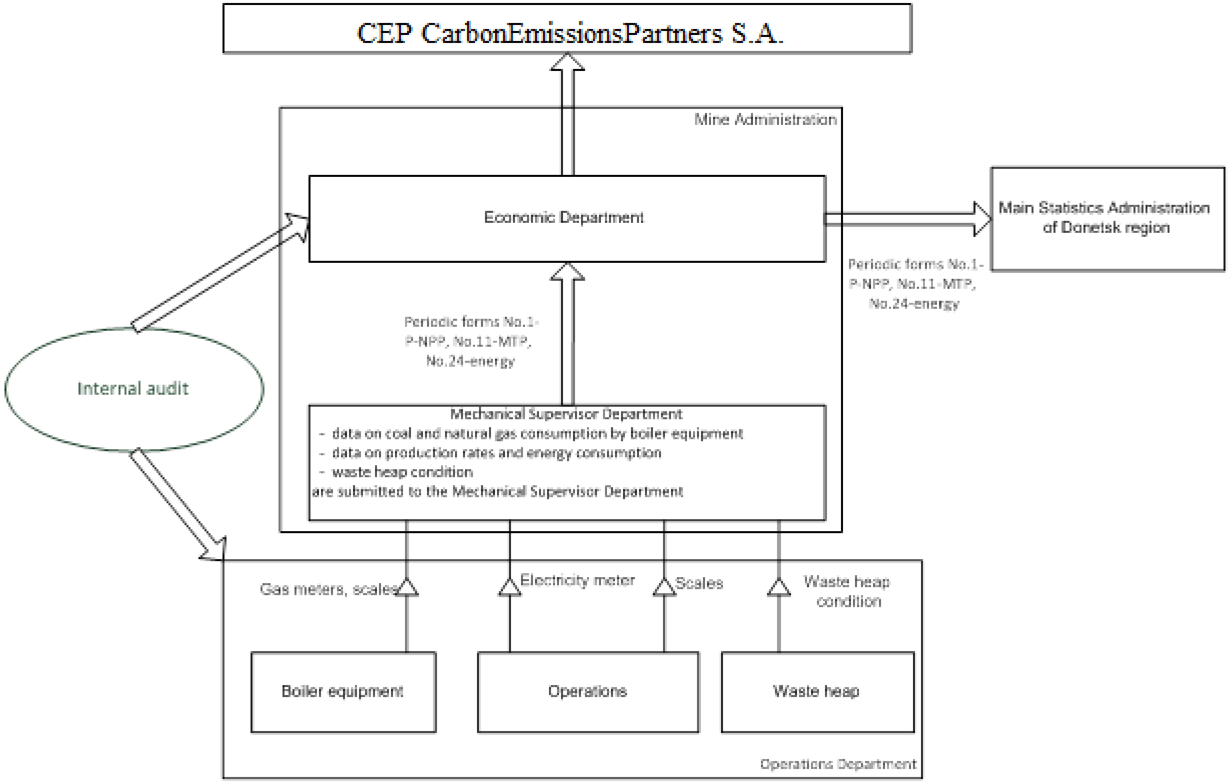

Figure 16. The structure of data collection and processing under the monitoring plan

The system of monitoring will be integrated into the current systems of control and reporting at structural units of the company. This will provide reliable data related to project performance, which will ensure the quality and effectiveness of monitoring system.

Information from all sources on the parameters of effectiveness and calculations will be directed to the operator's workplace.

Working parameters of coal production, fuel consumption and waste heap condition in the monitoring period are subject to additional verification by CEP Carbon Emissions Partners S.A. consultants to ensure quality and reliability of monitoring data.

The monitoring plan provides for the following measures:

1. Identification of all potential sources of emissions within the project boundary.

2. Collection of information on greenhouse gas emissions within the project during the crediting period.
3. Assessment of the project implementation schedule.
4. Collection of information on metering devices, their calibration.
5. Collection and archiving information on the environmental impact of project activities.
6. Data archiving.
7. Determination of the structure of responsibility for project monitoring.

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

The monitoring plan is established by CEP Carbon Emissions Partners S.A. , project developer, and SE "CC "Krasnolimanska", project owner.

State Enterprise "Coal Company "Krasnolimanska"
Oleksii Kozlov
Director General
Phone: (06239) 4-12-96
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E-mail: mazur.ev@rambler.ru
State Enterprise "Coal Company "Krasnolimanska" is a project participant (stated in Annex 1).

CEP Carbon Emissions Partners S.A.
Route de Thonon, 52, Geneva, Switzerland,
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e-mail: 0709bp@gmail.com
CEP Carbon Emissions Partners S.A. is a project participant (stated in Annex 1).

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Project emissions were estimated in accordance with the formulae given in Section D.1.1.2.

Results of the calculations are provided in the tables below. The calculations are provided in Supporting Document 1 annexed to the PDD.

For the period of 2004-2011, ex-post data on company output are used, while for the period of 2012-2020, ex-ante data are used taken from the company's development plan.

Table 16. Estimated project emissions for the period of January 1, 2004 – December 31, 2007

Years	Project emissions (t CO_2 equivalent)
2004	1 201
2005	4 115
2006	15 485
2007	19 847
Total project emissions in 2004-2007 (t CO_2 equivalent)	**40 648**

Table 17. Estimated project emissions for the period of January 1, 2008 – December 31, 2012

Years	Project emissions (t CO_2 equivalent)
2008	24 158
2009	17 416
2010	17 838
2011	38 144
2012	19 298
Total project emissions in 2008-2012 (t CO_2 equivalent)	**116 854**

Table 18. Estimated project emissions for the period of January 1, 2013 – December 31, 2020

Years	Project emissions (t CO_2 equivalent)
2013	123 460
2014	123 460
2015	123 460
2016	123 460
2017	123 460
2018	123 460
2019	123 460
2020	123 460
Total project emissions in 2013-2020 (t CO_2 equivalent)	**987 680**

E.2. Estimated leakage:

No leakage is expected. Natural gas leaks from technological equipment during the manufacturing process are absent. Gas pipelines as source of natural gas leaks are not owned by project participants and cannot be included into the project boundary.

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

Since no leakage is expected, the sum of estimated project emissions and estimated leakage equals project emissions.

E.4. Estimated baseline emissions:

Baseline emissions were estimated in accordance with the formulae given in Section D.1.1.4.

Results of the calculations are provided in the tables below. The calculations are provided in Supporting Document 1 annexed to the PDD.

For the period of 2004-2011, ex-post data on company output are used, while for the period of 2012-2020, ex-ante data are used taken from the strategic plan for the coal mining industry.

Table 19. Estimated baseline emissions for the period of January 1, 2004 – December 31, 2007

Years	Estimated baseline emissions (t CO_2 equivalent)
2004	9 187
2005	12 695
2006	291 049
2007	311 833
Total baseline emissions in 2004-2007 (t CO_2 equivalent)	**624 764**

Table 20. Estimated baseline emissions for the period of January 1, 2008 – December 31, 2012

Years	Estimated baseline emissions (t CO_2 equivalent)
2008	302 366
2009	277 693
2010	277 232
2011	284 904
2012	284 904
Total baseline emissions in 2008-2012 (t CO_2 equivalent)	**1 427 099**

Table 21. Estimated baseline emissions for the period of January 1, 2013 – December 31, 2020

Years	Estimated baseline emissions (t CO_2 equivalent)
2013	400 609
2014	400 609
2015	400 609
2016	400 609
2017	400 609
2018	400 609
2019	400 609
2020	400 609
Total baseline emissions in 2013-2020 (t CO_2 equivalent)	**3 204 872**

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

Emission reductions are calculated according to formula (23) given in Section D.1.4. Results of the calculations are provided in the tables below. The calculations are provided in Supporting Document 1 annexed to the PDD.

Table 22. Estimated emission reductions for the period of January 1, 2004 – December 31, 2007

Years	Estimated emission reductions (t CO_2 equivalent)
2004	7 986
2005	8 580
2006	275 564
2007	291 986
Total estimated emission reductions in 2004-2007 (t CO_2 equivalent)	**584 116**

Table 23. Estimated emission reductions for the period of January 1, 2008 – December 31, 2012

Year	Estimated emission reductions (t CO_2 equivalent)
2008	278 208
2009	260 277
2010	259 394
2011	246 760
2012	265 606
Total estimated emission reductions in 2008-2012 (t CO_2 equivalent)	**1 310 245**

Table 24. Estimated emission reductions for the period of January 1, 2013 – December 31, 2020

Year	Estimated emission reductions (t CO_2 equivalent)
2013	277 149
2014	277 149
2015	277 149
2016	277 149
2017	277 149
2018	277 149
2019	277 149
2020	277 149
Total estimated emission reductions in 2013-2020 (t CO_2 equivalent)	**2 217 192**

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

Table 25. Table containing results of estimation of emission reductions for the period from January 1, 2004 to December 31, 2007

Year	Estimated project emissions (t CO_2 equivalent)	Estimated leakage (t CO_2 equivalent)	Estimated baseline emissions (t CO_2 equivalent)	Estimated emission reductions (t CO_2 equivalent)
2004	1 201	0	9 187	7 986

2005	4 115	0	12 695	8 580
2006	15 485	0	291 049	275 564
2007	19 847	0	311 833	291 986
Total estimated emission reductions (t CO_2 equivalent)	**40 648**	0	**624 764**	**584 116**

Table 26. Table containing results of estimation of emission reductions for the period from January 1, 2008 to December 31, 2012

Year	Estimated project emissions (t CO_2 equivalent)	Estimated leakage (t CO_2 equivalent)	Estimated baseline emissions (t CO_2 equivalent)	Estimated emission reductions (t CO_2 equivalent)
2008	24 158	0	302 366	278 208
2009	17 416	0	277 693	260 277
2010	17 838	0	277 232	259 394
2011	38 144	0	284 904	246 760
2012	19 298	0	284 904	265 606
Total estimated emission reductions (t CO_2 equivalent)	**116 854**	0	**1 427 099**	**1 310 245**

Table 27. Table containing results of estimation of emission reductions for the period from January 1, 2013 to December 31, 2020

Year	Estimated project emissions (t CO_2 equivalent)	Estimated leakage (t CO_2 equivalent)	Estimated baseline emissions (t CO_2 equivalent)	Estimated emission reductions (t CO_2 equivalent)
2013	123 460	0	400 609	277 149
2014	123 460	0	400 609	277 149
2015	123 460	0	400 609	277 149
2016	123 460	0	400 609	277 149
2017	123 460	0	400 609	277 149
2018	123 460	0	400 609	277 149
2019	123 460	0	400 609	277 149
2020	123 460	0	400 609	277 149
Total estimated emission reductions (t CO_2 equivalent)	**987 680**	0	**3 204 872**	**2 217 192**

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:

All the required documents for the environmental impact assessment are as follows:

- Law of Ukraine No.1264-XII "On environmental protection" dated 25/06/1991;
- Law of Ukraine No.2707-XII "On atmospheric air protection" dated 16/10/1992;
- "Standards of maximum permissible emissions of pollutants from stationary sources" approved by the Ministry of Environmental Protection of Ukraine dated 27/06/2006, No.309 and registered in the Ministry of Justice of Ukraine dated 01/09/2006, No.912/12786.

A full-scale EIA in accordance with the legislation of Ukraine was performed for the proposed project in 2004. The main outcomes of that EIA follow:

- The main impact of the project activity on the environment is the impact on air. Dust emissions related to erosion and the project activity will be limited. There will also be emissions from transport vehicles used for project implementation. The impact will not be above the highest possible concentration at the border of the sanitary protection area;
- The impact on water is insignificant. The closed circuit water systems will be applied during the project implementation, and no waste water will be discharged. Some refined water may be discharged, without any effect on the quality of surface storage waters;
- The impact on flora and fauna is small. No threatened animal species will come under influence of the project. The project activity will be done in the area remote from national parks or protected zones;
- The noise impact is limited. The distance between the main source of noise and residential districts will be as short as allowed, and the operation of movable noise sources (motor vehicles) will comply with local regulations;
- No transboundary impact has been detected. Implementation of the project, all of which is physically located in Ukraine, exerts no environmental impact on any other 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:

A full-scale EIA in accordance with the legislation of Ukraine was performed for the proposed project in 2004. The main outcomes of that EIA are provided in Section F.1 above. The report was verified by a commission of environmental experts which made a conclusion on the compliance of the project documents to environmental legislation. Environmental impact of the project is not seen as harmful or prohibited. In line with Ukrainian laws and regulations, preparation of EIA reports and positive Opinions of the State Administration of Environment and Natural Resources constitute the environmental impact assessment procedure.

SECTION G. Stakeholders' comments

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

Since the project activity does not provide for any negative environmental or social impact, there was no necessity to hold special public discussions. Stakeholders were consulted with by local authorities at their meetings.

The programme for better efficiency of fuel and energy resources is spotlighted regularly in mass media: Numerous publications by company's employees in specialized national periodicals took place.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

State Enterprise "Coal Company "Krasnolimanska", the project owner

Organisation:	State Enterprise "Coal Company "Krasnolimanska"
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State/Region:	Donetsk region
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E-mail:	http://www.shkl.com.ua
Represented by:	
Title:	Director General
Salutation:	
Last name:	Kozlov
Middle name:	
First name:	Oleksii
Department:	
Phone (direct):	
Fax (direct):	
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Personal e-mail:	

Project developer:

Organisation:	CEP Carbon Emissions Partners S.A.
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Annex 2

BASELINE INFORMATION

A baseline is the scenario that reasonably represents the anthropogenic emissions by sources of GHGs that would occur in the absence of the proposed project. The baseline should be established in accordance with the requirements of the "Guidance on criteria for baseline setting and monitoring," Version 03. In line with the "Guidelines for users of the joint implementation project design document form," Version 04, a stepwise approach is used for baseline description and justification:

None of the existing methodologies can be applied for the proposed project aimed at modernization of operations and implementation of innovative technologies of CMM recovery and waste heap operation at SE "CC "Krasnolimanska" and, as a result, reduction of GHG emissions into the atmosphere. The project participant has chosen a JI-specific approach in accordance with paragraph 9 (a) of the "Guidance on criteria for baseline setting and monitoring", Version 03.

Data / Parameter	N_p^y
Data unit	t
Description	Coal production in monitoring period *y* of the project scenario
Time of determination/monitoring	Monthly
Source of data (to be) used	Based on working logs with coal production records, mechanical supervisor department draws up periodic (annual or semi-annual) forms No.1-P-NPP for the entire plant.
Value of data applied (for ex ante calculations/determinations)	The value is determined for each monitoring period.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measurement of coal production is to be conducted with scales and recorded in working logs, after which mechanical supervisor department shall sum up the data and draw up 1-P-NPP form, to be stored in the company's archive.1-P-NPP forms are annually submitted to the Main Statistics Administration of Donetsk region.
QA/QC procedures (to be) applied	Measurements were carried out with scales which were calibrated and verified on a regular basis in accordance with quality assurance procedures and Law of Ukraine "On metrology and metrological activity". Periodical report form No. 1-P-NPP is stored for minimum 2 years after the transfer of the last emission reduction units at the chief power engineer department as well as at the Main Statistics Administration of Donetsk region.
Any comment	Information on coal production is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	N_b^j
Data unit	t
Description	Coal production in historical period *j* of the baseline scenario
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Based on working logs with coal production records, mechanical

	supervisor department draws up periodic (annual or semi-annual) forms No.1-P-NPP for the entire plant.
Value of data applied (for ex ante calculations/determinations)	**2009**: 1640; **2010**: 1455; **2011**: 1457
Justification of the choice of data or description of measurement methods and procedures (to be) applied	To determine coal production prior to the implementation of equipment modernization activities, a historical period of 2009-2011 (period *j*) was chosen Measurement of coal production was conducted with scales and recorded in working logs, after which mechanical supervisor department summed up the data and drew up 1-P-NPP form, stored in the company's archive.1-P-NPP forms were annually submitted to the Main Statistics Administration of Donetsk region.
QA/QC procedures (to be) applied	Measurements were carried out with scales which were calibrated and verified on a regular basis in accordance with quality assurance procedures and Law of Ukraine "On metrology and metrological activity". Periodical report form No. 1-P-NPP is stored for minimum 2 years after the transfer of the last emission reduction units at the chief power engineer department as well as at the Main Statistics Administration of Donetsk region.
Any comment	Information on coal production is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	$EC_{b,M}^{j}$
Data unit	MWh
Description	Electricity consumption in historical period *j* of the baseline scenario
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Based on monthly reports on electricity consumption by each shop individually, the chief power engineer department draws up periodic (annual or semi-annual) forms No.24-enerhetyka and No.11-MTP for the entire plant.
Value of data applied (for ex ante calculations/determinations)	**2009**: 107219; **2010**: 106480; **2011**: 100591
Justification of the choice of data or description of measurement methods and procedures (to be) applied	To determine electricity consumed prior to the implementation of equipment modernization activities, a historical period of 2004-2005 (period *j*) was chosen
QA/QC procedures (to be) applied	Measurements were carried out with flow meters which were calibrated and verified on a regular basis in according with quality assurance procedures and Law of Ukraine "On metrology and metrological activity". Periodic report forms No.24-energy and No.11-MTP are stored for minimum 2 years after the transfer of the last emission reduction units at the chief power engineer department as well as at the Main Statistics Administration of Donetsk region.
Any comment	Information on electricity consumption is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	$EF^{j}_{b,CO2,ELEC}$
Data unit	t CO_2/MWh
Description	Carbon dioxide emission factor for electricity consumption by consumers in historical period *j* of the baseline scenario
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Carbon dioxide emission factors for 2009 are sourced from Decree No.63 of the National Environmental Investments Agency of Ukraine (hereinafter NEIAU) dated 15/04/2011 "On approval of carbon dioxide emission factors for 2009" Carbon dioxide emission factors for 2010 are sourced from the NEIAU Decree No.43 of 28/03/2011 "On approval of carbon dioxide specific emission values in 2010" Carbon dioxide emission factors for 2011 are sourced from the NEIAU Decree No.75 of 12/05/2011 "On approval of carbon dioxide specific emission values in 2011"
Value of data applied (for ex ante calculations/determinations)	**2009**: 1.096; **2010**: 1.093; **2011**: 1.090
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	National carbon dioxide emission factors are used in the Joint Implementation project development.
Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in paper and electronic format.

Data / Parameter	GWP_{CH_4}
Data unit	t CO_2eq/tCH_4
Description	Global Warming Potential of methane
Time of determination/monitoring	Throughout the crediting period
Source of data (to be) used	IPCC (International Panel on Climate Change) 1996 „Revised Guidelines for National Greenhouse Gas Inventories"
Value of data applied (for ex ante calculations/determinations)	21
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	If CO_2 emission factors for methane change, the baseline and the project scenario will be recalculated based on the new values
Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in paper and electronic format.

Data / Parameter	Q_{real}^{y}
Data unit	ths m^3
Description	CMM volume collected in the course of recovery in monitoring period y of the project scenario
Time of determination/monitoring	Monthly
Source of data (to be) used	Volume of CMM consumed is recorded in fuel consumption logs by each boiler module Based on fuel consumption logs, CMM consumption data are recorded in annual CMM consumption reports to be stored in the mechanical supervisor department
Value of data applied (for ex ante calculations/determinations)	The value is determined for each monitoring period.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Daily measurements of CMM combustion will be carried out using gas flow meters and then recorded and stored in the mechanical supervisor department.
QA/QC procedures (to be) applied	Measurements are carried out with flow meters which are calibrated and verified on a regular basis in accordance with quality assurance procedures and Law of Ukraine "On metrology and metrological activity".
Any comment	Information on CMM consumption is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	ρ_{real}
Data unit	t/ths m^3
Description	Coal mine methane density under standard conditions
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Physical properties of methane
Value of data applied (for ex ante calculations/determinations)	0.668
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	N/A
Any comment	Information on methane density is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	$NCV_{p,NG}^{y}$
Data unit	TJ/ths m^3
Description	Net calorific value of natural gas in monitoring period y of the project scenario
Time of determination/monitoring	Annually

Source of data (to be) used	Net calorific value of natural gas is sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"
Value of data applied (for ex ante calculations/determinations)	**2004**: 33.82 **2005**: 33.82 **2006**: 33.85 **2007**: 33.85 **2008**: 34 **2009**: 34.1 **2010**: 34.1 **2011**: 34.1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	National inventory reports of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine are official reports submitted to the Secretariat of the UN Framework Convention on Climate Change (UNFCCC).
Any comment	According to principle of conservatism minimal calorific value of gas is used. Values for 2011 were sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"; if new inventory reports come into effect, new values will be set and ERUs will be recalculated for any reporting period in accordance with the monitoring plan.Net calorific value of natural gas combustion is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	$EF_{b,C,coal}^{y}$
Data unit	t C/TJ
Description	Carbon emission factor for coal combustion in monitoring period *y* of the baseline scenario
Time of determination/monitoring	Annually
Source of data (to be) used	Carbon emission factor is sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010";
Value of data applied (for ex ante calculations/determinations)	**2004**: 26.19 **2005**: 26.05 **2006**: 26,02 **2007**: 26,04 **2008**: 25,95 **2009**: 25,97 **2010**: 25,99 **2011**: 25,99
Justification of the choice of data or description of measurement methods and procedures (to be)	N/A

applied	
QA/QC procedures (to be) applied	National inventory reports of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine are official reports submitted to the Secretariat of the UN Framework Convention on Climate Change (UNFCCC).
Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in hard and electronic form. Values for 2011 were sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"; if new inventory reports come into effect, new values will be set and ERUs will be recalculated for any reporting period in accordance with the monitoring plan.

Data / Parameter	$OXID_{b,coal}^{y}$
Data unit	Relative units
Description	Carbon oxidation factor for coal combustion in monitoring period *y* of the baseline scenario
Time of determination/monitoring	Annually
Source of data (to be) used	Carbon oxidation factor is sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"
Value of data applied (for ex ante calculations/determinations)	**2004**: 0.956 **2005**: 0.957 **2006**: 0,960 **2007**: 0,964 **2008**: 0,963 **2009**: 0,963 **2010**: 0,962 **2011**: 0,962
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	National inventory reports of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine are official reports submitted to the Secretariat of the UN Framework Convention on Climate Change (UNFCCC).
Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in hard and electronic form. Values for 2011 were sourced from the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"; if new inventory reports come into effect, new values will be set and ERUs will be recalculated for any reporting period in accordance with the monitoring plan.

Data / Parameter	V_{PO}
Data unit	m^3
Description	Waste heap volume
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Waste heap passport
Value of data applied (for ex ante calculations/determinations)	8 565 500
Justification of the choice of data or description of measurement methods and procedures (to be) applied	In accordance with NPAOP 10.0-5.21-04 "Manual on self-ignition prevention, extinction and demolition of waste heaps", main parameters, including waste heap volume, are updated annually and recorded in the waste heap passport.
QA/QC procedures (to be) applied	Information on waste heap volume is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form. The passport fixes the volume of rock accumulated in the waste heap, which ensures data cross-check against direct measurements of waste heap volume.
Any comment	Information on waste heap volume is the basis for coal content calculation, to be archived in paper and electronic form.

Data / Parameter	$NCV^{y}_{b,coal}$
Data unit	GJ/t
Description	Net calorific value of coal in monitoring period *y*, in the baseline scenario
Time of determination/monitoring	Annually
Source of data (to be) used	"National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"
Value of data applied (for ex ante calculations/determinations)	**2006**: 23,23 **2007**: 23,43 **2008**: 21,5 **2009**: 21,8 **2010**: 21,6 **2011**: 21,6
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	The National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine is an official report submitted to the Secretariat of the UN Framework Convention on Climate Change (UNFCCC).
Any comment	According to conservative principles minimal calorific value of coal is used. Net calorific value of coal is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	ρ_n

Data unit	kg/m^3
Description	Waste heap density
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Waste heap passport
Value of data applied (for ex ante calculations/determinations)	2000
Justification of the choice of data or description of measurement methods and procedures (to be) applied	In accordance with NPAOP 10.0-5.21-04 "Manual on self-ignition prevention, extinction and demolition of waste heaps", main parameters, including waste heap volume, are updated annually and recorded in the waste heap passport.
QA/QC procedures (to be) applied	Measurements are conducted by entities authorized in accordance with the state standard and in line with the methodologies approved at the governmental level.
Any comment	Information on waste heap volume is the basis for coal content calculation, to be archived in paper and electronic form.

Data / Parameter	C_{coal}
Data unit	%
Description	Coal content in a waste heap
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	ENVSEC: GRID Arendal "Risk Assessment Considerations in the Donetsk Basin"
Value of data applied (for ex ante calculations/determinations)	10
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The data were applied in the determined UA1000317 JI project
QA/QC procedures (to be) applied	N/A
Any comment	According to principle of conservatism minimal coal content value is used. Information on waste heap volume is the basis for coal content calculation, to be archived in paper and electronic form.

Data / Parameter	$k^b_{m,y}$
Data unit	N/A
Description	Waste heap combustion factor in month *m* year *y* of the baseline scenario
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Annual waste heap monitoring data in 2004-2005
Value of data applied (for ex ante calculations/determinations)	1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Information on waste heap ignitions, including starting dates of burnings and end dates of burnings are recorded in waste heap passports

QA/QC procedures (to be) applied	Temperature surveys were conducted in line with NPAOP 10.0-5.21-04 Manual on self-ignition prevention, extinction and demolition of waste heaps
Any comment	Current practice shows that activities carried out in "Krasnolimanska" mine to prevent waste heap self-ignition and to extinguish hot spots are ineffective, which is evidenced by hot spots registered in the period of 2004-2005.

Annex 3

MONITORING PLAN

For monitoring plan, see Section D of this PDD.