JOINT IMPLEMENTATION PROJECT

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

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 "ARTEMUGOL" _____ **A.D.Goncharov**
(position) (signature) (surname, name and patronymic of the person)

S. P.

Horlivka - 2012

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

CONTENTS

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 "Artemugol"

Sectoral scope:
Sector 8 – Mining/mineral production.
Sector 3 – Energy demand.

PDD Version: 2.0

Date: 31/08/2012.

A.2. Description of the project:

Purposes of the project activity

The Joint Implementation (JI) Project is aimed at a reduction of greenhouse gases (GHG) emissions by modernization of technological equipment operated in the course of coal mining and through activities on extinction of waste heaps inclined to self-ignition and combustion. Project implementation will reduce fossil fuel and electricity on-site consumption and lower GHG emissions from waste heap combustion, which would cause GHG emission reductions against the current practice.

Situation that existed prior to the Project

Ukraine's coal industry is a complex business system incorporating 167 operating coal mines and 3 coal open-pits, mines at a decommissioning stage, as well as coal beneficiation companies, transporters and other enterprises. Ukraine is Europe's largest coal producer and one of the eight leading coal producers globally.

SE "Artemugol" is one of major fuel and energy producers in Ukraine and is the initiator of the JI project. The primary manufacturing activity is production of high-quality coke and steam coal supplied to domestic coke plants and power plants. SE "Artemugol" was established on December 28, 2002, in accordance with the Decree of the Ministry of Fuel and Energy and is controlled by the Ministry of energy and coal industry. However, some mines on the books of the State Enterprise were commissioned back in 1930-1950s. Old traditional technlogies and coal mining systems accompanied with permanent wear and tear of equipment and growing energy consumption. Improvement of equipment efficiency is only possible via its complex modernization since partial implementation of activities would not yield any notable results. 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.

This is also typical of SE "Artemugol", because prior to the JI project implementation modernization or replacement of equipment were hardly carried out on 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. Thus, the condition of manufacturing equipment got worse permanently and the operational efficiency decreased on a constant basis.

Coal production in Donetsk region is based on mining, so 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 been low-effective historically. 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, which makes them inclined to self-ignition. Under different estimates, the rock raised from a mine is 65-70% coal and the remainder is waste rock. Up to 60% of this rock goes to waste heaps.[1]. The waste heaps, which are currently burning or threaten to ignite, are sources of uncontrolled greenhouse gas and harmful substance emissions. The latter include sulphur dioxide, which consequently transforms into sulphurous acid, the cause of acid rains, hydrogen sulphide and carbon dioxide. Long-term erosion may lead to the complete ruining of the waste heap and its ransformation into a massive fault dangerous both as a direct threat to people and facilities and as a source of solid particles and harmful substance emissions into the atmosphere. Erosion also intensifies the process of spontaneous ignition. Coal combustion in waste heaps is a long process that may last up to 15 years.[2]. Despite the danger caused by waste heap combustion, their extinction is not a customary practice in Donbas. Owners responsible for waste heaps are obliged to pay rather small penalties for environmental pollution. Thus, they have no major incentive to solve this issue and burning waste heaps may not be extinguished.
Thus, with relatively low penalties for environmental pollution, owners responsible for waste heapsare not interested in taking any measures on pollutant emission (including GHG) reduction, associated with additional expenses.

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. The baseline envisages the continuation of the existing practice on waste heap 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 waste heap extinction technology at SE “Artemugol”.

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.

[1] Geology of Coal Fires: Case Studies from Around the World, Glenn B. Stracher, Geological Society of America, 2007, p. 47

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

The project also provides for waste heap extinction activities by insulation of hot spots and baring 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, willl be included into emission reduction calculations in the case of recurrent ignition during the project implementation.

Activities implemented within the project framework (see Section A.4.2. below) as well as constant monitoring will reduce electricity and fossil fuel consumption used in technological processes of coal mining and stop waste heap burning at SE "Artemugol", which altogether will ensure a major reduction of GHG emissions into the atmosphere.
SE "Artemugol" 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 Euroean manuafcturers on a tender basis.

Table 1. Historical details of the project

Project milestones	Documentary evidence	Date
Installation of SINET-1 system (starting date of the project) at Rumiantsev Mine	Commissioning Certificate for SINET-1 (System of Energy-Saving Information Technologies)	05/09/2004
Preparation and submission of the project idea note to support anthropogenic GHG emission reductions, to the State Environmental Investment Agency of Ukraine.	Supporting materials for the possible JI project "Implementation of the energy efficiency measures and reduction of greenhouse gas emissions into the atmosphere at State Enterprise "Artemugol"	15/06/2012
Obtaining of a Letter of Endorsement from the State Environmental Investment Agency of Ukraine	Letter of Endorsement No.2425/23/7 dated 30/08/2012 of the Joint Implementation project "Implementation of the energy efficiency measures and reduction of greenhouse gas emissions into the atmosphere at State Enterprise "Artemugol" of 30/08/2012	30/08/2012

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	• SE "Artemugol"	No

(Host Party)		
Switzerland	• CEP Carbon Emissions Partners S.A.	No
*Please indicate if the Party involved is a host Party.		

State Enterprise "Artemugol" is an organization that implements the project (Applicant, Supplier). USREOU Code is 32270533. Type of activity: 10.10.1 Extraction and enrichment of coal**.** State Enterprise "Artemugol" is one of the leaders in fuel and energy complex of Ukraine. The main activity of the company is the production of high-quality energy coal and anthracite. The company has all licenses and permits required under the Ukrainian law to produce coal and concentrate. State Enterprise "Artemugol" is responsible for design, construction and installation work performed by its own staff or through contractors. The enterprise finances the project and does not receive profit.

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 is located in Donetsk region, Ukraine.
The geographical location of the roject is shown in Figure 1.

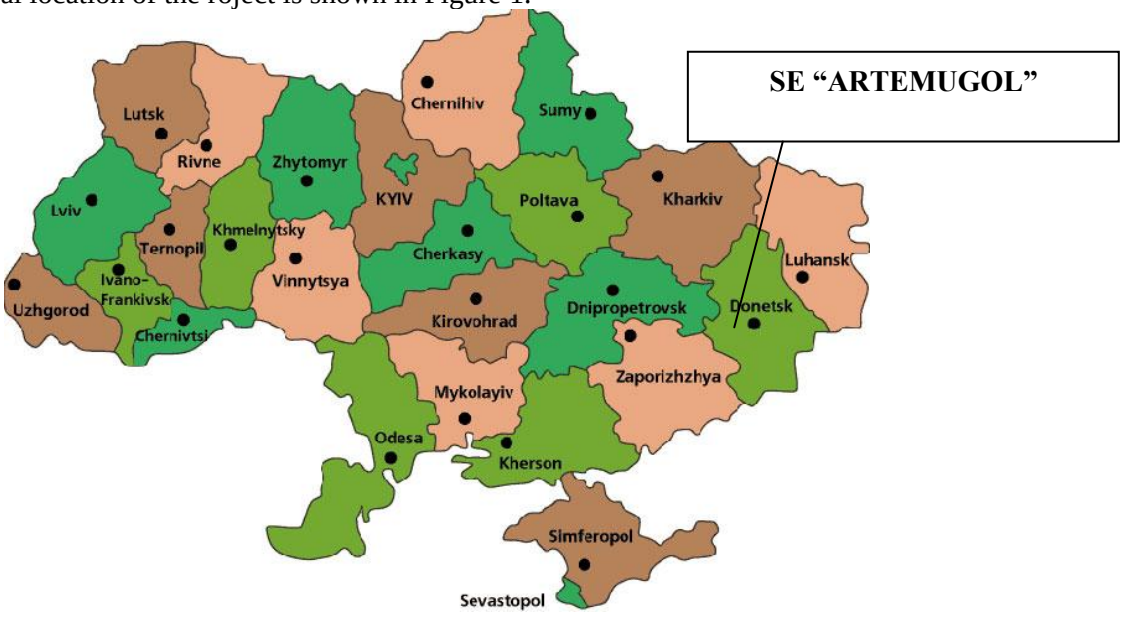

Figure 1. Location of SE “Artemugol” facilities on the map of Ukraine.

Figure 2. Location of SE "Artemugol" facilities on the map of Horlivka.

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.[3]It is listed in Annex 1 and meets the requirements of participation in Joint Implementation projects.[4].

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

Donetsk region.

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

SE "ARTEMUGOL" is located in Horlivka city, Donetsk region.

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

Horlivka is located in the south-west of Donetsk region.
Mine coordinates:
Haiovyi Mine:
Latitude: 48°17'17" N;
Longitude: 38°5'55" E
Rumiantsev Mine:
Latitude: 48°20'71" N
Longitude: 38°3'65" E
Lenin Mine:
Latitude: 48°19'51" N
Longitude: 38°0'34" E
Kalinin Mine:
Latitude: 48°19'83" N
Longitude: 38°7'41" E

[3] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1430-15
[4] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?page=1&nreg=995_801

The JI project is planned to be implemented at SE "Artemugol".

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

The JI project "Implementation of the energy efficiency measures and reduction of greenhouse gas emissions into the atmosphere at State Enterprise "Artemugol"provides for the complex modernization of coal mining process, waste heap monitoring systems and urgent extinction in the case of hot spot detection.

Modernization of coal mining process at SE "Artemugol" 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.

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, 2.5 m. If the temperature increases 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 15-30 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. Implementation of waste heap monitoring and urgent extinction programmes as further prevention of waste heaps from burning has no time limitations.

1. Modernization of production, implementation of energy-efficient and energy-saving technological equipment to cause GHG emission reductions provides for the following steps:

1.1. Improvement of ventilation system (ensuring optimal working mode of VGP ventilation units, reduction of air inflow)

Modernization of VTs-32K Ventilation Unit.

VTs-32K is designed based on Ts35-15 aerodynamic scheme. VTs-32 has different air intake constrution of a collector, which enables locating the working wheel on the axis between two stands, which reduces the vibration and makes the operation more stable against VTs-25 unit[5].

[5] http://evert.3dn.ru/news/centrobezhnye_ventiljatory_glavnogo_provetrivanija/2011-02-18-352

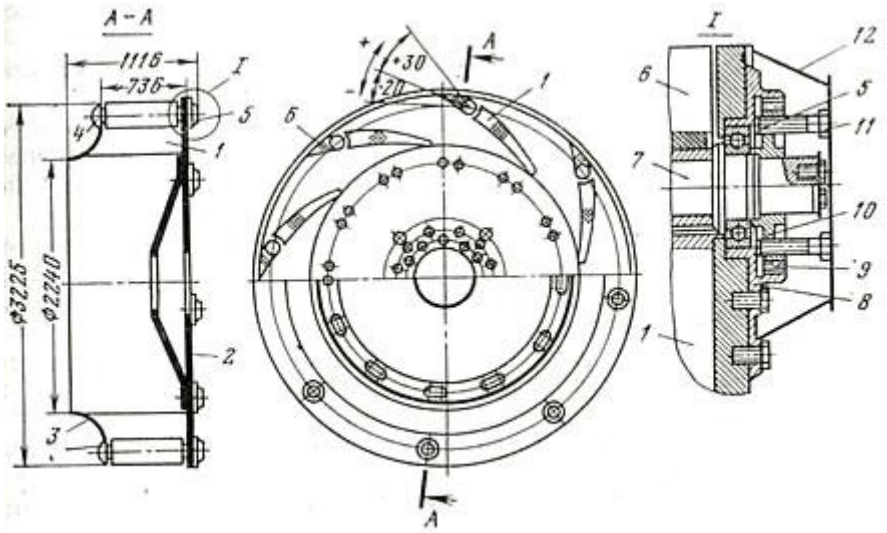

Figure 3. VTs-32K working wheel. [6]

Expected specifications under the VTs-32K modernization plan:

- Capacity - Q=6696 m^3/min;
- Vane angle: +50^o;
- Motor stator current - I_{st}=30A;
- Consumed motor power ΔP=40-60 kW.

Electricity savings, per year ~ 336 000 kWh.

Thus, modernization of the ventilation system (ventilation units) will reduce electricity consumption and cause lower GHG emissions into the atmosphere.

1.2. Improvement of mine drainage (optimal operation of mine drainage units, which excludes working in peak hours).

This activity is aimed at the reduction of electricity consumption by re-distributing colliery water inflows, changing their direction and pressure flow levels.

One third of colliery waters are planned to be drained out at hor.355 m in order to prevent their drain to hor.620 m and further pumping in two stages: from hor.620 m to hor.480 m and then to hor.355 m).

The first stage (from hor.620 m to hor.480 m) is decrease of tide level. The drainage is performed by 2 pumping plants, which will consume lower amount of electricity - down 400 kWh per day. The second stage from hor.480 m to hor.355 m) is performed by one pumping unit, which will consume by 300 kWh less electricity per day.

This saving of energy ensures rational use of energy resourses of Ukraine and thus lower GHG emissions.

1.3. Increase in operating efficiency of hoists (maintaining steady operation of hoists, carrying people up and down according to the schedule, conforming to norms of loading the conveyances)

People are carried up and down at the mine by cage hoists (mine hoist designed to transport minerals, rock, people, materials and equipment in cages). Inspection and repair works are done, column is reinforced and supported.

[6] http://ven--a.narod.ru/

The analysis of the work of mine cage hoists show that if the schedule of carrying people up and down is met and if caged are fully loaded, the number of "up-down" cycles falls by 4-6 and 3-5 per day when one cage and two cages are involved respectively.

Table 2. Specifications of cage hoists

No. No.	Cage hoist name	Rated power of engine, kW	Actual power, kW	Electricity consumption per cycle, kWh
1	One-cage hoist MK 3.25x4.	700	420	25.2
2	Two-cage hoist MK 3.25x4.	1000	600	36.0
	Total	1700	1020	

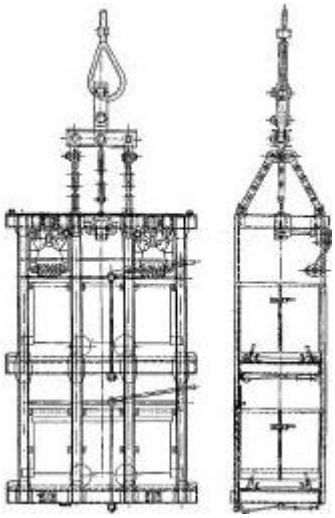

Figure 4. Cage hoist

So, the decrease in the number of "up-down" cycles means efficient consumption of electricity and reduced GHG emissions.

1.4. Replacement of belt conveyors. An overview and specifications are available below as well as on the seller's website.[7]

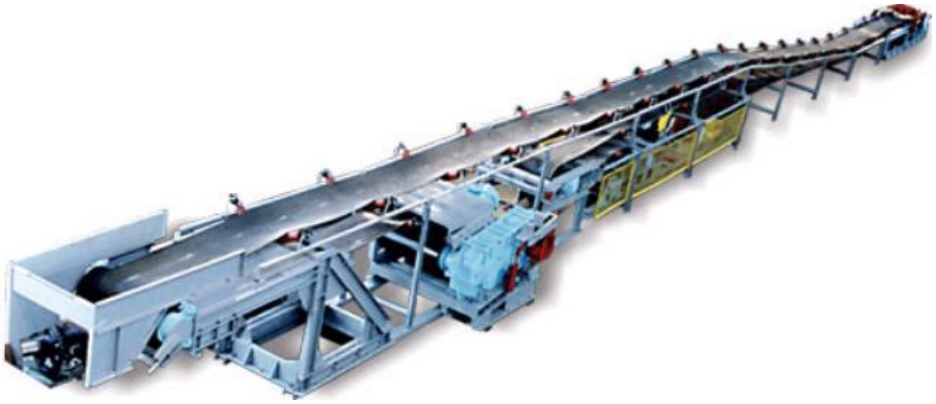

Figure 5. An underground belt conveyor.

[7] http://www.metalweb.ru/%D0%9E%D0%B1%D0%BE%D1%80%D1%83%D0%B4%D0%BE%D0%B2%D0%B0%D0%BD%D0%B8%D0%B5/1%D0%9B80/

Table 3. Specifications of 1L-80 underground belt conveyor:

Transportation distance at maximum efficiency of a horizontal unit, m	Max 600
Total drive capacity, kW:	40
Voltage in power grid, V:	660 1200
Fraction of rocks, mm, max:	300
Pulley/roller diameter, mm:	152
Receiving capacity, m^3/min:	200
Belt speed, m/s:	1.6
Belt width, mm:	800
Trhoughput, t/h:	270

GHG emission reduction is achieved due to modernization of old equipment and installation of new units, which lowers the consumption of fossil fuel (coal) and electricity.

1.5. Improvement of the system of energy resource consumption control (taking measures against changes in daily voltage profile if calculations are based on zonal tariffs)

The data on working schedule and the analysis of the electricity consumed show that during the first quarter 1,400 kWh can be rescheduled every day (from peak and half-peak zones to the night one) by changing the working time of mine conveyor lines, hoists of the skip shaft, surface processing complex depending on how coal is extracted at the mine. Likewise, during the second quarter, by shifting temporary intervals of tariff zone 2,200 kWh can be rescheduled from peak zone to night zone, and 1,930 kWh – from peak zone to the half-peak one. During the third quarter, 2,550 kWh can be rescheduled from peak zone to the night one, and 2,300 kWh – from peak zone to the half-peak one. During the third quarter, 1450 kWh can be rescheduled from peak zone to the night one, and 2,300 kWh – from peak zone to the half-peak one.[8].

Besides, it is planned to introduce new electricity meters and other control systems that allow more efficient energy resource consumption.

SINET-1 system (the System of Informational Energy-Saving Technologies) is designed to create complexes of local control, which means distributive automatic control systems of energy consumption will be built.

If taken, the above measures improve monitoring process, make control easier, ensure safe use and lead to drop in the volume of fossil fuel burnt and thus to reduction in GHG amounts emitted into the atmosphere.

Figure 6. Electricity meter[9]

[8] http://donetskoblenergo.dn.ua/2009-01-25-14-18-54/2009-02-09-07-29-43.html

[9] http://strumok.kiev.ua/home/category/401/elektroschetchiki.html

1.6. Replacement of outdated movable mine transformer plants

Replacement of outdated movable mine transformer plants This electrical unit is designed to receive, transform and distribute three-phase electricity current. A explosion-proof complex transformer plant consists of one or two transformer plants, high-voltage unit (high-voltage switchgear) with commutation equipment, low-voltage switchgear, and is used to distribute electricity among separate electrical receivers or groups of electrical receivers in a shop. Specifications of explosion-proof complex transformer plant-25 are given below as an example.

Table 4. Технічні характеристики КТПВ - 25 ? 2500 кВА

Nominal voltage, kV:	
HV side	6; 10
LV side	0.4; 0.69
Nominal short-time thermal current for 1 sec, kA:	
HV side	- min 20
LV side	min 30
Nominal short-time electrodynamic current, kA:	
HV side	min 51
LV side	min 50
Surrounding air temperature	- up to 40°C
protection level	- IP31
Climatic modification and placement category	- U3

Figure 7. Complex transformer plants[10]

Utilization of modern transformer plants will help to efficiently use and save electricity, ensuring also safe operation, long lifetime and positive effect on the company's financial positions.

2. Implementation of waste heap extinction technology at SE "Artemugol", which will lead to GHG emission reduction, provides for the following steps:

The project provides for stabilization of waste heaps accompanied with application of expensive extinction technology with the use of vermiculite.

[10] http://electricalschool.info/main/ekspluat/247-jekspluatacija-komplektnykh.html

Description of waste heap stabilization technology:
Prior to extinction activities pathways and working sites are formed from nonflammable 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

Figure 8. SP-8800 concrete pump[11]

The concrete pump pumps vermiculite under pressure into a burning spot of a waste heap. Vermiculite is a hydrated mica phyllosilicate, which expands by 15-30 times when heated to 300-1000□C. Air layers in vermiculite structure ensure heat and sound insulation.

- Underground rig

Figure 9. Waste heap burning and NKR100MPA underground rig [12]

The underground rig is designed for drilling blastholes through which vermiculite is pumped.
The rear and frontal part of waste heap channels are treated with vermiculite mud powder, by means of replacement of automatic concrete pump and mixer.[13]. Vermiculite expands by 15-30 times when heated to 300-1000□C. Air layers in vermiculite structure ensure low density and greatv 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

[11] http://www.schwingstetter.ru/product/staczionarnyie-betononasosyi/sp-8800

[12] http://www.oaokmo.ru/ru/catalogue/underground-equipment/stanki-podzemnyie/7294.html

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

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

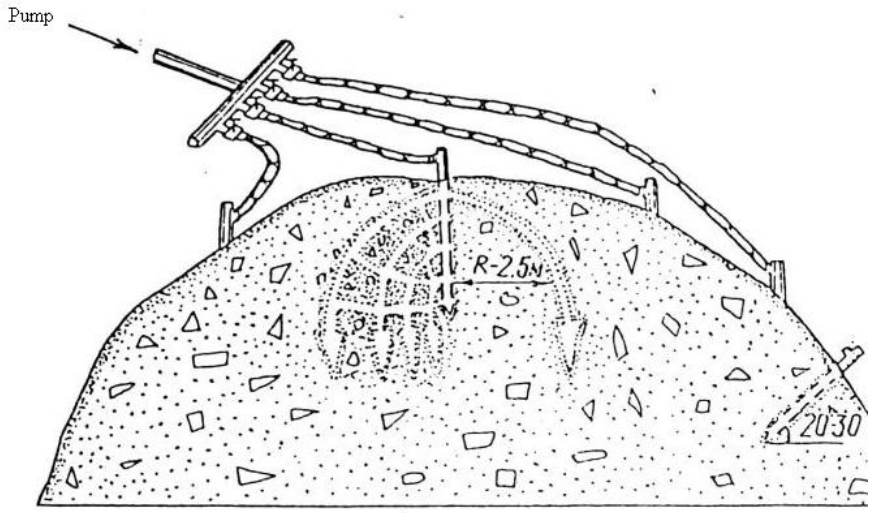

Figure 10. Scheme of antipyrogen pumping with use of several perforated pipes.

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 with bulldozers; filling the trenches with antipyrogen so that it can freely filter into the heap until the rock absorbs it all.
The last phase is to seed perennial cereals and legumes. Per 1 hectare of land, 20-30% more seeds are planted than normal for the zone.
Thus, waste heap hot spots extinction will reduce greenhouse gases emissions and improve environmental situation in Donetsk Basin.

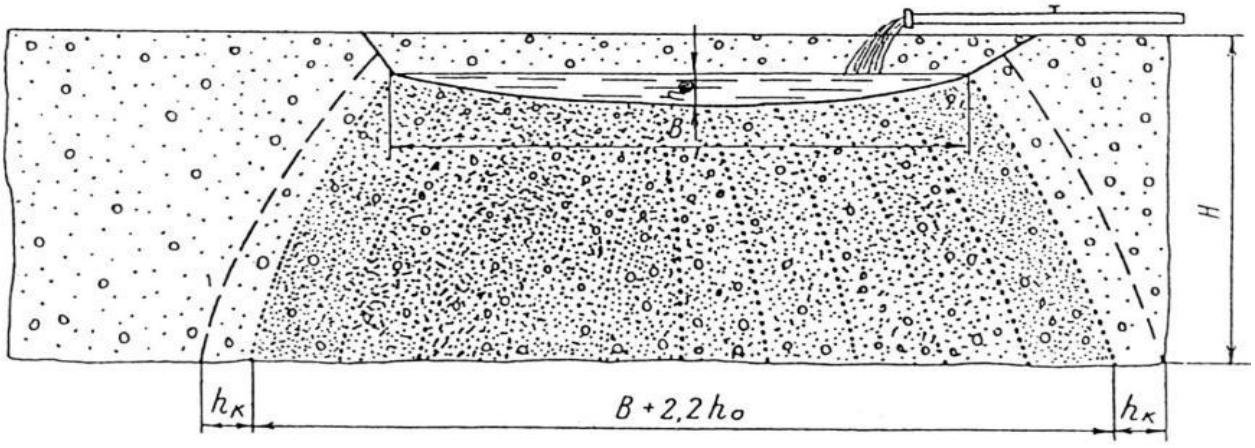

Figure 11. Scheme of hydrating heaps with antipyrogen filtering freely.

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 are 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.

There is no intensive preliminary training the project calls for. As many staff members as needed can undergo basic training on the site where the project is carried out. The staff, particularly heavy equipment operators, truck and excavator drivers, mechanics and electrician, work on the site of project implementation. Local resources are used to meet the project needs for maintenance – the company's workers who service its equipment as well as repair contractors. The project provides that practical courses are done. All staff members must be certificated to do the work, regularly be given instructions on safety norms, and take examinations. Locally, in Donetsk region, it is possible to get education in any professional area required for the project.

On May 13, 2005, following a temperature survey, the Rumiantsev Mine waste heap of SE "Artemugol" was declared a burning one. A project to stabilize the heap started to be developed immediately. The heap extinction and stabilization works were all completed in August 2005. Emission reductions started to be generated in October 2005.

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 condition of the manufacturing at SE "Artemugol" was rather unsatisfactory. 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 economically not feasible and risky. Legislatively, operations at SE "Artemugol" meet the requirements of the state standards. Ukraine has not developed any system of dotations or incentives for GHG eission reduction to encourage the producers to implement similar project activities.

Thus, without the JI project, modernization of technological equipment 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 is aimed at the reduction of energy consumption by modernizaton of technological equipment involved in the manufacturing of products measured in tonnes, by implementation of innovative energy-efficient and energy-saving equipment and technologies.

The project is unlikely to beimplemented without the JI mechanism, which is a strong additional incentive. This is caused by the following:

– GHG emission restrictions are absent and not expected to be implemented until 2012 at the earliest;

– Implementation of the roject activity requires consderable investments into the mining industry, which is associated with financial risks and risks due to application of new technology. The project is not attractive enough in terms of investment without the income from sales of emission reduction units (ERUs).

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

Table 5. Estimated emission reductions for the period preceding the first commitment period (2005-2007)

	Years
Duration of the crediting period	3
Years	Estimated annual GHG emission reductions in tonnes of CO_2 equivalent
2005	2 941
2006	313 840
2007	401 768
Total estimated GHG emission reductions over the crediting period (tonnes of CO_2 equivalent)	**718 549**
Annual average of estimated GHG emission reductions over the crediting period (tonnes of CO_2 equivalent)	239 516

Table 6. Estimated emission reductions for the first commitment period (2008-2012)

	Years
Duration of the crediting period	5
Years	Estimated annual GHG emission reductions in tonnes of CO_2 equivalent
2008	365 665
2009	378 836
2010	376 823
2011	435 085
2012	435 085
Total estimated GHG emission reductions over the crediting period (tonnes of CO_2 equivalent)	**1 991 494**
Annual average of estimated GHG emission reductions over the crediting period (tonnes of CO_2 equivalent)	398 299

Table 7. Estimated emission reductions after the first commitment period (2013-2021)

	Years
Duration of the crediting period	9

Years	Estimated annual GHG emission reductions in tonnes of CO_2 equivalent
2013	435 085
2014	435 085
2015	435 085
2016	435 085
2017	435 085
2018	435 085
2019	435 085
2020	435 085
2021	435 085
Total estimated GHG emission reductions after the crediting period (tonnes of CO_2 equivalent)	**3 915 765**
Annual average of estimated GHG emission reductions after the crediting period (tonnes of CO_2 equivalent)	435 085

A.5. Project approval by the Parties involved:

Letter of Endorsement No. 2425/23/7 dated 30/08/2012 for the JI project "Implementation of the energy efficiency measures and reduction of greenhouse gas emissions into the atmosphere at State Enterprise "Artemugol" was issued by the State 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:

None of the existing methodologies can be applied for the proposed project aimed at modernization of operations and waste heap monitoring and urgent extinction systems at SE "Artemugol" 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 envisages the continuation of the existing practice of accumulation of rock in waste heaps, which would burn and cause GHG emissions into the atmosphere. Specific consumption of power resources for technological needs would remain stable, which would cause GHG emissions at the pre-project level. The baseline provides for the continuation of the existing practice of waste heap monitoring and extinction if hot 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 re-emerging hot spots in a waste heap. Since waste heaps consist of coal (10-15%), its combustion is accompanied by a great amount of emissions of GHGs and other pollutants into the atmosphere.

Baseline will be set for each year when emission reductions are traded, in order to correct the adjusting factors influencing the baseline. For more details see Section D.

According to p. 9 of the "Guidance on criteria for baseline setting and monitoring", Version 03, approved by the JI Supervisory Committee, project participants may select either:

(a) An approach for baseline setting and monitoring developed in accordance with appendix B of the JI guidelines (JI-specific approach); or
(b) A methodology for baseline setting and monitoring approved by the Executive Board of the clean development mechanism (CDM); or
(c) An approach for baseline setting and monitoring already taken in comparable JI cases.

The proposed project applies a specific approach to baseline setting and monitoring based on the "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities" Version 01.1.0.

A stepwise approach was chosen to describe and justify the baseline:

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

The proposed project applies a JI-specific approach based on the JI Guidance on criteria for baseline setting and monitoring, Version 03[14] , which meets with the requirements of Decision 9/CMP.1, Appendix B of the "Criteria for baseline setting and monitoring".

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 made to determine the most plausible baseline scenario:

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

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 applicable law in the mining sector;
- Economic situation in the mining sector of Ukraine and demand forecast for mining products;
- Technical aspects of management system and equipment operation;
- Availability of capital (including investment barriers);
- Local availability of technology / equipment;
- Price and availability of fuel.

In addition, uncertaintly 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 mining alternatives, which potentially could occur.

These alternatives are the following:

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.

All of these Alternatives comply with the requirements of the legislation of Ukraine.

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 are 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 [15]) in order to fight the crisis in the industry. 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

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

peculiarities of transitive stage in economy and market system of that time, which lead to an obvious failure. Regional mining output fropped 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"[16] 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"[17], 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 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 "Artemugol" 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 "Artemugol" 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.

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

[17] http://zakon2.rada.gov.ua/laws/show/1205-2001-п

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

The choice of the plausible baseline scenario is based on assessment of coal mining alternatives, which potentially could occur as of 2005.

Alternative 1.3: Partial implementation of the project (only some of project activities implemented) without the use of the JI mechanism.
This alternative provides for the exclusion of some project implementation measures from the project boundary such as modernization of air ventilation system, boiler equipment, etc. Being a complex system, the new technology requires a complex approach to modernization, since partial implementation would not ensure good energy efficiency results and a major decrease in fuel 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.

The analysis of the above alternatives shows that Alternative 1.1 is the most plausible one.

The results of the investment analysis in Section B.2. show that Alternative 1.2 and Alternative 1.3 cannot be seen as the most attractive as regards financing. The analysis carried out in accordance with the "Tool for the demonstration and assessment of additionality" (Version 06.0.0)[18] in Section B.2. show that the project is additional.

Baseline scenario description
The baseline scenario provides for the continuation of the current practice with minimum repairs against general worsening of the technological manufacturing complex. Waste heaps (2 units) 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 at SE "Artemugol" if no project activity is undertaken, the data on coal volumes produced was used, as well as that on consumption of electricity and mineral fuel

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

as it was extracted between 2000 and 2004. The pre-project efficiency rate was calculated as the average specific electricity and fossil fuel consumption per unit of manufacture over the three years of the above historical period. 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 production are calculated for each particular monitoring year.
To work out the baseline scenario stipulating that no project activity is done at waste heaps, 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. If no project activity is undertaken, the waste heaps would continue burning, which would entail big amounts of GHG emissions into the atmosphere.

For detailed algorithm of baseline emissions calculation see below and in Section D.

Greenhouse gas emissions under the Baseline scenario:

Baseline emissions in period *y* are calculated using the following formula:

$$BE^{y} = BE^{y}_{elec} + BE^{y}_{PO}, \quad \text{(B.1)}$$

where:

BE^{y} - total GHG emissions in monitoring period y of the baseline scenario, t $CO2_{eq;}$

BE^{y}_{elec} - total GHG emissions from electricty consumption by technological equipment in the course of coal production in monitoring period y of the baseline scenario, t $CO2_{eq;}$

BE^{y}_{PO} - GHG emissions from waste heap combustion in monitoring period y of the baseline scenario, t $CO2_{eq;}$

y - index for monitoring period;

elec - index for electricity consumption system;

PO - index for waste heaps.

$$BE^{y}_{elec} = N^{y}_{p} \cdot BPER; \quad \text{(B.2)}$$

where:

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

$BPER$ - pre-project coal mining efficiency factor, t CO_2eq/t.

$$BPER = \sum_{n=1}^{5} \frac{BE^{j}_{b,elec} / N^{j}_{b}}{5}; \quad \text{(B.3)}$$

where:

$BE^{j}_{b,elec}$ - GHG emissions from combustion of fossil fuel used in the course of generation of electricity consumed 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;

y - index for monitoring period;

p - index for project scenario;

j - index for historical period;

b - index for baseline scenario;

elec - index for electricity consumption system;

5 - number of years in the historical period.

where:

$$BE_{b,elec}^j = \sum_{j=1}^{5} (EC_b^j \cdot EF_{b,CO2,elec}^j), \quad \text{(B.4)}$$

where:

EC_b^j - total 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 related to electricity consumption from the national power grid of Ukraine in historical period j of the baseline scenario, t CO_2/MWH;

elec - index for electricity consumption system;

j - index for historical period

5 - number of years in the historical period;

b - baseline scenario;

According to the research, the period of waste heap combustion is 15 years[19]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.

$$BE_{PO}^y = \sum_{i=1}^{12} \frac{FC_{b,PO,coal} \cdot NCV_{b,coal}^y \cdot k_i^y \cdot EF_{b,CO2,coal}^y}{180}, \quad \text{(B.5)}$$

where:

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

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

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

k_i^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,

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

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;

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

$$FC_{b,PO,coal} = \frac{V_{PO} \cdot \rho_n \cdot C_{coal}}{1000000}, \quad \text{(B.6)}$$

where:

$FC_{b,PO,coal}$ - 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.

$$EF^{y}_{b,CO2,coal} = EF^{y}_{b,C,coal} \cdot OXID^{y}_{b,coal} \cdot 44/12, \quad \text{(B.7)}$$

where:

$EF^{y}_{b,C,coal}$ - 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, relatve 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.

Leakage:

No leakage is expected within the baseline, i.e.:

$$\boldsymbol{LE_{Bly}} = 0 \quad \text{(B. 8)}$$

Key data used for baseline identification is presented in tables below.

Data / Parameter	N_b^j
Data unit	t
Description	Total coal production in historical period j of the baseline scenario
Time of determination/monitoring	Prior to the start of the project in baseline years: 2000-2004 – Rumiantsev Mine 2000-2005 – Haiovyi Mine 2000-2005 – Kalinin Mine 2001-2006 – Lenin Mine
Source of data (to be) used	Daily run-of-mine coal production logs by mine
Value of data applied (for ex ante calculations/determinations)	The value is determined for the historical period
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Coal production rates are fixed in monthly form No.1-P and submitted to the economic planning department where annual form No.1-P-NPP "Routine report on production (goods and services) by types, tabular" is drawn up
QA/QC procedures (to be) applied	Information on production rates is official data of the company stored at the economic planning department for minimum 2 years following the transfer of the last emission reduction units and is annually submitted to the Main Statistics Administration of Donetsk region.
Any comment	Information on production rates is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	N_p^y
Data unit	t
Description	Total production in monitoring period y of the project scenario
Time of determination/monitoring	Information on coal production is collected from mines daily and form the basis for annual report
Source of data (to be) used	Daily run-of-mine coal production logs by mine
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	Production rates by each shift are fixed in monthly form No.1-P and submitted to the economic planning department where annual form No.1-P-NPP "Routine report on production (goods and services) by types, tabular" is drawn up
QA/QC procedures (to be) applied	Information on production rates is official data of the company stored at the economic planning department for minimum 2 years following the transfer of the last emission reduction units and is annually submitted to the Main Statistics Administration of Donetsk region.
Any comment	Information on production rates is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	EC_b^j
Data unit	MWh
Description	Total electricity consumption in the course of coal mining in historical period j of the baseline scenario

Time of determination/monitoring	Prior to the start of the project in baseline years: 2000-2004 – Rumiantsev Mine 2000-2005 – Haiovyi Mine 2000-2005 – Kalinin Mine 2001-2006 – Lenin Mine
Source of data (to be) used	Electricity meters, readings
Value of data applied (for ex ante calculations/determinations)	Electricity meters readings over the historical period
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Electricity consumption is measured by electricity meters
QA/QC procedures (to be) applied	Measurements by meters calibrated on a regular basis
Any comment	Data to calculate greenhouse gas emissions in the baseline scenario Data will be archived in paper and electronic format.

Data / Parameter	$EF^{j}_{b,CO_2,elec}$
Data unit	t CO_2eq/MWh
Description	Carbon dioxide emission factor related to electricity consumption from the national power grid of Ukraine in historical period j of the baseline scenario
Time of determination/monitoring	Annually
Source of data (to be) used	For 2000-2005: according to table B2 "Baseline carbon emission factors for JI projects reducing electricity consumption" from the Operational Guidelines for Project Design Documents of Joint Implementation Projects, Volume 1: General guidelines, Version 2.3 of the Ministry of Economic Affairs of the Netherlands dated May 2004, page 42 (ERUPT 4, Senter, Netherlands) For 2006: according to table 8: "Emission Factors for the Ukrainian grid 2006 - 2012" in Annex 2 "Standardized emission factors for the Ukrainian electricity grid" of "Ukraine - Assessment of new calculation of CEF" verified by TUV SUD Industrie Service GmbH, 17/08/2007.
Value of data applied (for ex ante calculations/determinations)	**Year** / **Value** 2000 – 0.916 2001 – 0.916 2002 – 0.916 2003 – 0.916 2004 – 0.916 2005 – 0,896 2006 – 0,896
Justification of the choice of data or description of measurement methods and procedures (to be) applied	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.
QA/QC procedures (to be) applied	N/A
Any comment	N/A

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	"National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"[20]
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	Guidance on criteria for baseline setting and monitoring
QA/QC procedures (to be) applied	Officially approved national data effective as of the moment of monitoring report preparation
Any comment	Data allowing for the calculation of GHG emissions in the baseline scenario will be stored in hard and electronic copies.

Data / Parameter	$NCV^{y}_{b,coal}$
Data unit	TJ/ths t
Description	Net calorific value of coal in monitoring period y of 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[21]
Value of data applied (for ex ante calculations/determinations)	21.34
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the "Guidance on criteria for baseline setting and monitoring"
QA/QC procedures (to be) applied	Officially approved national data effective as of the moment of monitoring report preparation shall be applied
Any comment	N/A

Data / Parameter	$OXID^{y}_{b,coal}$
Data unit	Relative units
Description	Carbon oxidation factor for coal combustion in hisotrical period j

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

	of 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)	The value is determined for each monitoring period
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The parameter is applied in accordance with approved CDM methodology ACM0009 and the Guidance on criteria for baseline setting and monitoring. Values based on officially approved national data will be applied.
QA/QC procedures (to be) applied	Officially approved national data effective as of the moment of monitoring report preparation shall be applied
Any comment	Data allowing for the calculation of GHG emissions in the baseline scenario will be stored in hard and electronic copies.

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)	Rumiantsev Mine- 2934700 Haiovyi Mine - -1367655 Kalinin Mine - -1367655 Lenin Mine - -1367655
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. 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	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 wast 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 density at the moment of its extinction and stabilization 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	COUNTRY REVIEW. Capacity Building Needs Assessment for the Implementation of the UN/ECE Strategic Environmental Assessment Protocol. Ukraine[22]
Value of data applied (for ex ante calculations/determinations)	10% (0.1)
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Unfortunately, the company has no documents with records of the amount of coal in the rock stocked in the waste heap. Taking into account the impossiility of using the actual value, baseline emissions were calculated using the coal content in the waste heap sourced from a scientific research carried out in Donetsk region. [23]. Besides, this value was usedin some determined and approved JI projects (i.e. UA1000317[24]).
QA/QC procedures (to be) applied	Standard procedures
Any comment	According to principle of conservatism minimal coal content value is used. Information on mass fraction of coal in the waste heap is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

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 "Artemugol", implementation of permanent waste heap monitoring and extinction technologies at SE "Artemugol" mines.

[22] http://www.unece.org/fileadmin/DAM/env/eia/documents/SEA_CBNA/Ukraine_needs_ru.pdf

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

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

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 "Tools for the demonstration and assessment of additionality"[25] (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" [26] waste heaps are considered potential pollutant sources. In a general case, ignited waste heaps should be extinguished and future 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 a mere insignificant penalties[27]. 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 occurences 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 "Artemugol" did not conduct major activities on modernization of energy-consuming equipment and waste heap extinction technology. Moreover, SE "Krasnoarmeyskugol" has neither incentives nor means of implementation of activities provided for by the JI project, other than income within the mechanism

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

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

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

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. 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 "Artemugol" and therefore unlikely. 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"[28] (Version 06.0.0), further justification of additionality shall be performed by means of investment analysis.

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 "Artemugol" mine. (Sub-

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

project B) The company receives no financial or economic profit other that 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 "Artemugol" will be implemented by a project participant State Enterprise "Artemugol". 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[29] the cost of own capital is calculated as the sum of risk-free rate (3%)[30], the risk premium on investment in own capital (6.5%)[31] and country risk (6.75%)[32]. 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 2003 according to the NBU, which was 11.6%[33]. The nominal discount rate (WACC) equals to 14%. Cash flow is adjusted by inflation index for eurozone (2.1%)[34].

The project requires investments of over EUR 95.941 mln (at the NBU rate)[35], including:

- Sub-project A requires investment of over EUR 92.271 mln;
- Sub-project B requires investment of over EUR 3.67 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" [36] (Version 06.0.0), common practice analysis is applied to Sub-project B.

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 92.271 mln (at the NBU exchange rate) [37];

1. The project lifetime is 15 years (minimal equipment operational life);
2. The residual value is calculated as the result of multiplication of unused resource by initial expenses.

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

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

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

[32] http://pages.stern.nyu.edu/~adamodar/pc/archives/ctryprem04.xls

[33] http://www.bank.gov.ua/doccatalog/document?id=36553

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

[35] 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

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

[37] 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

Analysis of cash flow takes into account the cash outflow connected with investment and operating costs[38] 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 Tables 8 below.

Table 8. Financial indicators of the project

Revenues without VAT (ths EUR)	Cash flow (ths EUR)	dr (discount rate)	NPV (ths EUR)	IRR (%)	Residual value (ths EUR)
135 127.638	90 871.636	13.9%	-5 492.898	11.26%	48 015.516

The source of revenues and expenses of SE "Artemugol" 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 2000-2004 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 11.26%. Therefore the project cannot be considered financially attractive.

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)	0	0	0
Investment costs of the company (EUR)	74 834 985	74 834 985	74 834 985
Company profit (EUR)	121 614 874	135 127 638	148 640 401
NPV (EUR)	-9 359 234	-5 492 898	-1 626 562
IRR (%)	9,5%	11,3%	13,1%

Investment and operational costs

	-10%	0%	10%
Operational costs (EUR)	0	0	0
Investment costs of the company (EUR)	82 318 483	74 834 985	67 351 486
Company profit (EUR)	135 127 638	135 127 638	135 127 638
NPV (EUR)	-617 822	-5 492 898	-10 367 975
IRR (%)	13,6%	11,3%	9,3%

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 coam mining complex. Analysis of changes in revenues for coal mining between -10% and +10% demonstrated that the IRR has a value of between 9.5% and 13.1%. Analysis of changes of investment and operational costs between -10% and +10% demonstrated that the IRR is within 9.3-13.6%. Expenditures that are considered in the framework of the

[38] Accompanying document 2

project are high, and their increase will result in a negative NPV. Even expected price of the investment and the income from the sale of ERUs are unable to make the project viable and it will not bring enough profit even in case of loan financing of the project and even if the forementioned 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.
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 "Artemugol" 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"[39] (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 "Artemugol" has no obstacles for further operation of old coal mining equipment at the previous level. Therefore, the identified obstacles can not 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 includes the entire complex of equipment involved into coal mining process. The State Enterprise "Artemugol" uses the technological complex as a unified system; however, the

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

following functional components may be classified: coal mining equipment using heat and electricity, heat-generating equipment, metering devices and waste heaps that are burning.

Table 9. Emission sources under the baseline scenario

Source	Gas	Included / excluded	Substantiation / Explanation
Baseline scenario			
Emissions from power plant(s) due to electricity generation to the National Power Grid. Emissions from coal self-ignition in waste heaps.	CO_2	Included	Source of emissions
	CH_4	Excluded	Excluded for simplification. This is a conservative practice.
	N_2O	Excluded	Excluded for simplification. This is a conservative practice.

Table 10. Emission sources under the project scenario

Source	Gas	Included / excluded	Substantiation / Explanation
Project activity			
Emissions from power plant(s) due to electricity generation to the National Power Grid. Emissions due to self-ignition of coal in waste heaps	CO_2	Included	Emission source. The project scenario provides for frozing a waste heap that burns. As a result, the probability of further combustion or recurrent ignition is almost neutralized. In the case of emergency, when monthly monitoring detects the waste heap temperature grew higher than the allowable error, emissions from combustion of coal from the heap will be included into emission reduction calculations for the previous month. This is conservative.
	CH_4	Excluded	Excluded for simplification. This is a conservative practice.
	N_2O	Excluded	Excluded for simplification. This is a conservative practice.

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: 21/05/2011
The baseline is set by CEP CARBON EMISSIONS PARTNERS S.A. and SE "Artemugol".

State Enterprise "Artemugol"
Donetsk region, Ukraine
13 Lenin Ave., Horlivka
Anatolii Honcharov – Director General
E-mail: dogovor_417@ mail.ru
Phone: +38 0624 56-51-18
SE "Artemugol" is a project participant (stated in Annex 1).

CEP Carbon Emissions Partners S.A.

52 Route de Thonon, Geneva, Casepostale 170 CH-1222 Vésenaz, Switzerland
Telephone: +41 (76) 3461157
Fabian Knodel, Director
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 was identified using the "Glossary of Joint Implementation Terms" version 03[40] and is considered 05/09/2004, when a contract for equipment purchase was signed.

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 15 years upon due maintenance.
Project lifetime is from 01/01/2005 to 31/12/2021 (17 years, or 204 months).

C.3. Length of the crediting period:

The total crediting period will be 17 years / 204 months, including:
• 01/01/2005-31/12/2007 – early crediting period (the project will apply for early quota offset under Article 17 of the Kyoto Protocol);
• 01/01/2008-31/12/2012 – crediting period (commitment period);
• 01/01/2013-31/12/2021 – status of emission reduction or increase of net removals generated by JI projects after the end of the first commitment period under the Kyoto Protocol (continuation of the crediting period after 2012) can be determined in line with the corresponding settlements and procedures within the UNFCCC framework and the Host Party (the crediting period for the project will be extended by 9 years / 108 months to December 31, 2021).
The ERU generation crediting period starts at the beginning of 2008 and will continue during the whole project life.

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

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

The proposed project applies a JI-specific approach based on the JI Guidance on criteria for baseline setting and monitoring, Version 03[41] , which meets with the requirements of Decision 9/CMP.1, Appendix B of the "Criteria for baseline setting and monitoring".
The monitoring plan for this project was developed based on the temperature surveys of waste heaps, as well as on the "Tool to calculate project emissions of CO_2 from fossil fuel combustion" Version 02.[42].
The key variables subject to monitoring are coal production, electric energy consumption and waste heap condition.
After separation from rock and then from waste materials, coal is dehydrated. The obtained material is loaded on railroad cars and weighed together with the cars on VT-200 scales. Operators enter the readings of VT-200 scales and volume of produced coal in the corresponding books, and the figures are every day submitted according to the internal B2S form "Data on raw coal production at the mine" to the Sectoral information-computing centre and form the basis for reported data in monthly reports in conformity with "Instruction on keeping a record of coal volumes produced and processed at mines, open pits and preparation plants of the Ministry of Coal Industry of Ukraine" approved by the Decree of the Minister of Coal Industry of Ukraine" as of 17.09.1996 No. 466 and SOU 10.1.00186080.002-2006 "Rules about conducting underground survey and calculating production volumes according to its results".[43]. The data is then entered in yearly Reports according to the 1P-NPP form (Report on industrial production), which are submitted to the State Statistics Service of Ukraine.
The amount of electricity consumed is measured by meters that are regularly calibrated. Every month, operators take readings each electricity meter shows and submit them further to the calculating department of the company and entered in Reports according to the 11-MTP form.
All key parameters required for calculation of GHG emission volumes are taken the same way as they used to at SE "Artemugol", for measuring fuel, energy, waste materials and environmental impact. Monitoring under the project does not require changes in existing data accounting and collection system. All data is calculated and recorded in any case. All leakage was considered and taken into account using the conservative approach and seen as insignificat. Refer to section E.2. Monitoring plan data should be stored for at least 2 years after the crediting period.

[41] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf
[42] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf

[43] http://www.uazakon.com/document/fpart02/idx02256.htm

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

V_{PO}	Waste heap volume, m^3
ρ_n	Waste heap density, kg/m^3
C_{coal}	Coal content in a waste heap, %
N_b^j	Total coal production in historical period *j* of the baseline scenario, t
EC_b^j	Total electricity consumption in the course of coal production in historical period j of the baseline scenario, MWh

Data and parameters that are monitored throughout the crediting period:

N_p^y	Total coal production, t
EC_p^y	Total electricity consumption in the course of coal mining, MWh
$EF_{p,CO2,elec}^y$	Carbon dioxide emission factors from electricity consumption from the national power grid of Ukraine, t CO_2e/MWh
$EF_{p,C,coal}^y$	Carbon emission factor for coal combustion, tC/TJ
$NCV_{p,coal}^y$	Net calorific value of coal, TJ/ths t
$EF_{b,CO_2,elec}^j$	Carbon dioxide emission factors from electricity consumption from the national power grid of Ukraine, t CO_2e/MWh
$EF_{b,C,coal}^y$	Carbon emission factor for coal combustion, t C/TJ
$NCV_{b,coal}^y$	Net calorific value of coal, TJ/ths t
$OXID_{b,coal}^y$	Carbon oxidation factor for coal combustion, relative units
$OXID_{p,coal}^y$	Carbon oxidation factor for coal combustion, relative units

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.

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	N_p^y
Data unit	t
Description	Total production in monitoring period y of the project scenario
Time of determination/monitoring	Information on coal production is collected from mines daily and form the basis for annual report
Source of data (to be) used	Daily run-of-mine coal production logs by mine
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	Production rates by each shift are fixed in monthly form No.1-P and submitted to the economic planning department where annual form No.1-P-NPP "Routine report on production (goods and services) by types, tabular" is drawn up
QA/QC procedures (to be) applied	Information on production rates is official data of the company stored at the economic planning department for minimum 2 years following the transfer of the last emission reduction units and is annually submitted to the Main Statistics Administration of Donetsk region.
Any comment	Information on production rates is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	$EF_{p,CO_2,elec}^y$
Data unit	t CO_2eq/MWh
Description	Carbon dioxide emission factors from electricity consumption from

	the national power grid of Ukraine in monitoring period *y* of the project scenario
Time of determination/monitoring	Annually
Source of data (to be) used	For 2005: according to table B2 “Baseline carbon emission factors for JI projects reducing electricity consumption” from the Operational Guidelines for Project Design Documents of Joint Implementation Projects, Volume 1: General guidelines, Version 2.3 of the Ministry of Economic Affairs of the Netherlands dated May 2004, page 42 (ERUPT 4, Senter, Netherlands) For 2006-2007: according to Table 8: “Emission factors for the Ukrainian power grid 2006-2012” Annex 2 ”Standartized emission factors for UPG of Ukraine” to “Ukraine - Assessment of new calculation of CEF”, approved by TUV SUD Industrie Service GmbH on 17/08/2007[44]. - specific indirect emissions of carbon dioxide related to electricity consumption in 2008, sourced from the Decree of the National Agency of Ecological Investments of Ukraine (hereinafter NAEIU) No.62 dated 15.04.2011. "On approval of carbon dioxide specific emission values in 2008"[45]; - Specific indirect emissions of carbon dioxide related to electricity consumption in 2009, sourced from the Decree of NAEIU No.63 dated 15.04.2011 "On approval of carbon dioxide emission factors for 2009"[46] - Specific indirect emissions of carbon dioxide related to electricity consumption in 2010, sourced from the Decree of

[44] *http://ji.unfccc.int/UserManagement/FileStorage/46JW2KL36KM0GEMI0PHDTQF6DVI514*

[45] *http://www.neia.gov.ua/nature/doccatalog/document?id=127171*

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

	NAEIU No.43 dated 28.03.2011 "On approval of carbon dioxide specific emission values in 2010"[47] - Specific indirect emissions of carbon dioxide related to electricity consumption in 2011, sourced from the Decree of NAEIU No.75 dated 12.05.2011 "On approval of carbon dioxide specific emission values in 2011"[48]
Value of data applied (for ex ante calculations/determinations)	**Year** / **Value** 2005 / 0.896 2006 / 0.896 2007 / 0.896 2008 / 1.082 2009 / 1.096 2010 / 1.093 2011 / 1.090 2012 / 1.090
Justification of the choice of data or description of measurement methods and procedures (to be) applied	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.
QA/QC procedures (to be) applied	N/A
Any comment	Data will be archived in paper and electronic format.

Data / Parameter	$NCV^{y}_{p,coal}$
Data unit	TJ/ths t
Description	Net calorific value of coal in monitoring period y of the project scenario
Time of	Annually

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

[48] *http://www.neia.gov.ua/nature/doccatalog/document?id=127498*

determination/monitoring	
Source of data (to be) used	IPCC default values (Chapter 1 Volume 2 (Energy) of 2006 IPCC Guidelines)[49]
Value of data applied (for ex ante calculations/determinations)	

Year	Value
2006	23,23
2007	23,43
2008	21,50
2009	21,80
2010	21,60
2011	21,60
2012	21,60

Justification of the choice of data or description of measurement methods and procedures (to be) applied	2006 IPCC Guidelines
QA/QC procedures (to be) applied	If 2006 IPCC Guidelines are revised, the changes will be taken into account.
Any comment	Data will be archived in paper and electronic format.

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	"National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"[50]
Value of data applied	

Year	Value

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

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

(for ex ante calculations/determinations)		2006	26,02
		2007	26,04
		2008	25,95
		2009	25,97
		2010	25,99
		2011	25,99
		2012	25,99
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Guidance on criteria for baseline setting and monitoring		
QA/QC procedures (to be) applied	Officially approved national data will be applied valid as of the moment of monitoring report preparation		
Any comment	Data will be archived in paper and electronic format.		

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		
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"[51]		
Value of data applied (for ex ante calculations/determinations)		**Year**	**Value**
		2006	0,960
		2007	0,964
		2008	0,963
		2009	0,963
		2010	0,962

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

		2011	0,962
		2012	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	If 2006 IPCC Guidelines are revised, the changes will be taken into account.		
Any comment	Data will be archived in paper and electronic format.		

Data / Parameter	V_{PO}
Data unit	m^3
Description	Waste heap volume
Time of determination/monitoring	Annually
Source of data (to be) used	Waste heap passport
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Monistry of Energy and Coal Industry of Ukraine
QA/QC procedures (to be) applied	N/A
Any comment	N/A

Data / Parameter	EC_p^y
Data unit	MWh
Description	Total electricity consumption by technological equipment in the course of coal mining in monitoring period y of the project scenario

Time of determination/monitoring	Annually
Source of data (to be) used	Industrial scales (Company data)
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Company data
QA/QC procedures (to be) applied	Readings of electricity meters calibrated on a regular basis
Any comment	Data to calculate greenhouse gas emissions in the project scenario Data will be archived in paper and electronic format.

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 kg/m^3
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 wast 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 density at the moment of its extinction and stabilization 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	COUNTRY REVIEW. Capacity Building Needs Assessment for the Implementation of the UN/ECE Strategic Environmental Assessment Protocol. Ukraine
Value of data applied (for ex ante calculations/determinations)	10% (0.1)
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Unfortunately, the company has no documents with records of the amount of coal in the rock stocked in the waste heap. Taking into account the impossiility of using the actual value, baseline emissions were calculated using the coal content in the waste heap sourced from a scientific research carried out in Donetsk region. Besides, this value was usedin some determined and approved JI projects (i.e. UA1000317).
QA/QC procedures (to be) applied	Standard procedures
Any comment	No

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)	Rumiantsev Mine- 2934700 Haiovyi Mine - -1367655 Kalinin Mine - -1367655 Lenin Mine - -1367655
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. 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.

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

Greenhouse gas emission under the Project scenario:

$$PE^{y} = PE^{y}_{elec} + PE^{y}_{PO}; \quad \text{(D.1)}$$

where:

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

PE^{y}_{elec} - total GHG emissions from electricity consumption by technological equipment in the course of coal production 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;

elec - index for electricity consumption system;

PO - index for waste heaps.

$$PE^{y}_{elec} = EC^{y}_{p} * EF^{y}_{p,CO2,elec}, \quad \text{(D.2)}$$

where:

EC^{y}_{p} - total 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 factors from electricity consumption from the national power grid of Ukraine in monitoring period *y* of the project scenario, t CO_2/MWh;

y - index for monitoring period;

p - index for project scenario;

elec - index for electricity consumption system;

According to the research, the period of waste heap combustion is 15 years[52]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.

$$PE^{y}_{PO} = \sum_{i=1}^{12} \frac{FC_{p,PO,coal} \cdot NCV^{y}_{p,coal} \cdot k^{y}_{i} \cdot EF^{y}_{p,CO2,coal}}{180} + PE^{y}_{p,PO,disel}, \quad \text{(D.3)}$$

where:

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;

$PE^{y}_{p,PO,disel}$ - 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;

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

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

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

k^{y}_{i} - 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);

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.

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:

$$PE^{y}_{PO} = \sum_{i=1}^{12} \frac{FC_{p,PO,coal} \cdot NCV^{y}_{p,coal} \cdot k^{y}_{i} \cdot EF^{y}_{p,CO2,coal}}{180}, \quad \text{(D.4)}$$

$$FC_{b,PO,coal} = \frac{V_{PO} \cdot \rho_{n} \cdot C_{coal}}{1000000}, \quad \text{(D.5)}$$

where:

$FC_{b,PO,coal}$ - 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;

n - index for waste heap density;

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

coal - index for coal.

$$EF^{y}_{p,CO2,coal} = EF^{y}_{p,C,coal} \cdot OXID^{y}_{p,coal} \cdot 44/12, \quad \text{(D.6)}$$

where:

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

$OXID^{y}_{b,coal}$ - 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.

Option 1 was chosen for monitoring.

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^{j}_{b}
Data unit	t
Description	Total coal production in historical period j of the baseline scenario
Time of determination/monitoring	Prior to the start of the project in baseline years: 2000-2004 – Rumiantsev Mine 2000-2005 – Haiovyi Mine 2000-2005 – Kalinin Mine 2001-2006 – Lenin Mine
Source of data (to be) used	Daily run-of-mine coal production logs by mine
Value of data applied (for ex ante calculations/determinations)	The value is determined for the historical period

Justification of the choice of data or description of measurement methods and procedures (to be) applied	Coal production rates are fixed in monthly form No.1-P and submitted to the economic planning department where annual form No.1-P-NPP "Routine report on production (goods and services) by types, tabular" is drawn up
QA/QC procedures (to be) applied	Information on production rates is official data of the company stored at the economic planning department for minimum 2 years following the transfer of the last emission reduction units and is annually submitted to the Main Statistics Administration of Donetsk region.
Any comment	Information on production rates is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

Data / Parameter	N_p^y
Data unit	t
Description	Total production in monitoring period y of the project scenario
Time of determination/monitoring	Information on coal production is collected from mines daily and form the basis for annual report
Source of data (to be) used	Daily run-of-mine coal production logs by mine
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	Production rates by each shift are fixed in monthly form No.1-P and submitted to the economic planning department where annual form No.1-P-NPP "Routine report on production (goods and services) by types, tabular" is drawn up
QA/QC procedures (to be) applied	Information on production rates is official data of the company stored at the economic planning department for minimum 2 years following the transfer of the last emission reduction units and is annually submitted to the Main Statistics Administration of Donetsk region.
Any comment	Information on production rates is the basis for greenhouse gas

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

Data / Parameter	EC_b^j
Data unit	MWh
Description	Total electricity consumption in the course of coal mining in historical period j of the baseline scenario
Time of determination/monitoring	Prior to the start of the project in baseline years: 2000-2004 – Rumiantsev Mine 2000-2005 – Haiovyi Mine 2000-2005 – Kalinin Mine 2001-2006 – Lenin Mine
Source of data (to be) used	Electricity meters, readings
Value of data applied (for ex ante calculations/determinations)	Electricity meters readings over the historical period
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Electricity consumption is measured by electricity meters
QA/QC procedures (to be) applied	Measurements by meters calibrated on a regular basis
Any comment	Data to calculate greenhouse gas emissions in the baseline scenario Data will be archived in paper and electronic format.

Data / Parameter	$EF_{b,CO_2,elec}^j$
Data unit	t CO_2eq/MWh
Description	Carbon dioxide emission factor related to electricity consumption from the national power grid of Ukraine in historical period j of the baseline scenario
Time of determination/monitoring	Annually

Source of data (to be) used	For 2000-2005: according to table B2 "Baseline carbon emission factors for JI projects reducing electricity consumption" from the Operational Guidelines for Project Design Documents of Joint Implementation Projects, Volume 1: General guidelines, Version 2.3 of the Ministry of Economic Affairs of the Netherlands dated May 2004, page 42 (ERUPT 4, Senter, Netherlands) For 2006: according to table 8: "Emission Factors for the Ukrainian grid 2006 - 2012" in Annex 2 "Standardized emission factors for the Ukrainian electricity grid" of "Ukraine - Assessment of new calculation of CEF" verified by TUV SUD Industrie Service GmbH, 17/08/2007.
Value of data applied (for ex ante calculations/determinations)	**Year** / **Value** 2000 / 0.916 2001 / 0.916 2002 / 0.916 2003 / 0.916 2004 / 0.916 2005 / 0,896 2006 / 0,896
Justification of the choice of data or description of measurement methods and procedures (to be) applied	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.
QA/QC procedures (to be) applied	N/A
Any comment	N/A

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	"National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010"[53]
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	Guidance on criteria for baseline setting and monitoring
QA/QC procedures (to be) applied	Officially approved national data effective as of the moment of monitoring report preparation
Any comment	Data allowing for the calculation of GHG emissions in the baseline scenario will be stored in hard and electronic copies.

Data / Parameter	$NCV^{y}_{b,coal}$
Data unit	TJ/ths t
Description	Net calorific value of coal in monitoring period y of 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[54]
Value of data applied (for ex ante calculations/determinations)	21.34
Justification of the choice of data or description of measurement	According to the "Guidance on criteria for baseline setting and monitoring"

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

methods and procedures (to be) applied	
QA/QC procedures (to be) applied	Officially approved national data effective as of the moment of monitoring report preparation shall be applied
Any comment	N/A

Data / Parameter	$OXID_{b,coal}^{y}$
Data unit	Relative units
Description	Carbon oxidation factor for coal combustion in hisotrical period j of 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)	The value is determined for each monitoring period
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The parameter is applied in accordance with approved CDM methodology ACM0009 and the Guidance on criteria for baseline setting and monitoring. Values based on officially approved national data will be applied.
QA/QC procedures (to be) applied	Officially approved national data effective as of the moment of monitoring report preparation shall be applied
Any comment	Data allowing for the calculation of GHG emissions in the baseline scenario will be stored in hard and electronic copies.

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)	See Supporting Document 1
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. 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	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 wast 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 density at the moment of its extinction and stabilization 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	COUNTRY REVIEW. Capacity Building Needs Assessment for the Implementation of the UN/ECE Strategic Environmental Assessment Protocol. Ukraine[55]
Value of data applied (for ex ante calculations/determinations)	10% (0.1)
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Unfortunately, the company has no documents with records of the amount of coal in the rock stocked in the waste heap. Taking into account the impossiility of using the actual value, baseline emissions were calculated using the coal content in the waste heap sourced from a scientific research carried out in Donetsk region. [56]. Besides, this value was usedin some determined and approved JI projects (i.e. UA1000317[57]).

[55] http://www.unece.org/fileadmin/DAM/env/eia/documents/SEA_CBNA/Ukraine_needs_ru.pdf

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

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

QA/QC procedures (to be) applied	Standard procedures
Any comment	According to principle of conservatism minimal coal content value is used. Information on mass fraction of coal in the waste heap is the basis for greenhouse gas emission calculation, to be archived in paper and electronic form.

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

Greenhouse gas emissions under the Baseline scenario:

Baseline emissions in period *y* are calculated by the following formula:

$$BE^{y} = BE^{y}_{elec} + BE^{y}_{PO}, \quad \text{(D.7)}$$

where:

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

BE^{y}_{elec} - total GHG emissions from electricty consumption by technological equipment in the course of coal production 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 - monitoring period;

elec - index for electricity consumption system;

PO - index for waste heaps.

$$BE^{y}_{elec} = N^{y}_{p} \cdot BPER; \quad . \quad \text{(D.8)}$$

where:

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

$BPER$ - pre-project coal mining efficiency factor, t CO_2eq/t.

$$BPER = \sum_{n=1}^{5} \frac{BE_{b,elec}^{j} / N_{b}^{j}}{5}; \quad \text{(D.9)}$$

where:

$BE_{b,elec}^{j}$ - GHG emissions from combustion of fossil fuel used in the course of generation of electricity consumed 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;

5 – years in historical period,;

[illegible] - monitoring period;

[illegible] - project scenario;

[illegible] - historical period;

[illegible] - baseline scenario;

elec - index for electricity consumption system;

[5] - number of years in the historical period.

$$BE_{b,elec}^{j} = \sum_{j=1}^{5} (EC_{b}^{j} \cdot EF_{b,CO2,elec}^{j}), \quad \text{(D.10)}$$

where:

EC_{b}^{j} - total 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 related to electricity consumption from the national power grid of Ukraine in historical period *j* of the baseline scenario, t CO_2/MWH;

elec - index for electricity consumption system;

[illegible] - index for historical period;

5-number of years in the historical period;

b - index for baseline scenario;

According to the research, the period of waste heap combustion is 15 years[58]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.

$$BE_{PO}^{y} = \sum_{i=1}^{12} \frac{FC_{b,PO,coal} \cdot NCV_{b,coal}^{y} \cdot k_{i}^{y} \cdot EF_{b,CO2,coal}^{y}}{180}, \quad \text{(D.11)}$$

where:

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

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

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

k_{i}^{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 - baseline scenario;

coal - index for coal;

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

$$FC_{b,PO,coal} = \frac{V_{PO} \cdot \rho_{n} \cdot C_{coal}}{1000000}, \quad \text{(D.12)}$$

where:

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

$FC_{b,PO,coal}$ - 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 - 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.

$$EF^{y}_{b,CO2,coal} = EF^{y}_{b,C,coal} \cdot OXID^{y}_{b,coal} \cdot 44/12, \quad \text{(D.13)}$$

where:

$EF^{y}_{b,C,coal}$ - 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, relatve units;

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

y - monitoring period;

b - 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

Option 1 was chosen for monitoring.

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):

Option 1 was chosen for monitoring.

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

GHG emissions from leakage within and beyond the project boundary, which may result from the project activity, are not expected to increase. The company conducts permanent control over energy resource consumption and waste heap condition, which ensures that leakage from technological equipment are absent.

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

No leakage is expected.

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

No leakage is expected.

D.1.4. Description of formulae used to estimate emission reductions for the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

Emission reductions in the project scenario are calculated under the formula that follows:

$$ER_y = BE_y - PE_y \quad \text{(D.14)}$$

where:
ER_y – emission reduction due to project activity in period y, t CO_2eq;
BE_y – baseline GHG emissions in period y, t CO_2eq;
PE_y – project GHG emissions in period y, t CO_2eq;
[y] - index for monitoring period.
Supporting Document 1 contains a calculation of baseline emissions and project emissions as well as emission reductions for each year of the reporting 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:

Law of Ukraine "On environmental protection"[59] and the State Building Norms A.2.2-1-2003, "Structure and content of environmental impact assessment (EIA) in the process of design and construction of plants, buildings and structures"[60] SE "Artemugol" is not obliged to carry out collection of data on the environmental impact for this type of 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.

[59] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1264-12

[60] http://www.budinfo.com.ua/dbn/8.htm

k_i^y	Low	Waste heap monitoring is carried out in accordance with manufacturer's manuals, aproved 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.
$NCV_{p,coal}^y$	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.
$NCV_{b,coal}^y$	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.
$EF_{p,CO_2,coal}^y$	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", issued by the State Environmental Investment Agency of Ukraine This document is subject to periodic revision and updating.
$EF_{b,CO_2,coal}^y$	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", issued by the State Environmental Investment Agency of Ukraine This document is subject to periodic revision and updating.
$OXID_{p,coal}^y$	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", issued by the State Environmental Investment Agency of Ukraine This document is subject to periodic revision and updating.
$OXID_{b,coal}^y$	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", issued by the State Environmental Investment Agency of Ukraine This document is subject to periodic revision and updating.
$EF_{b,CO_2,elec}^j$	Low	Carbon dioxide emission factors from electricity consumption from the national power grid of Ukraine. Issued by the State Environmental Investment Agency of Ukraine. This document is subject to periodic revision and updating.
$EF_{p,CO_2,elec}^y$	Low	Carbon dioxide emission factors from electricity consumption from the national power grid of Ukraine. Issued by the State Environmental Investment Agency of Ukraine. This document is subject to periodic revision and updating.

For the sake of conservativeness of parameters, metering equipment is subject to regular calibration and the latest versions of regulations and specifications are used. If the latest versions are unavailable, the previous versions are used.
Verification (calibration) of measurement devices is carried out in accordance with manufacturer's manuals, aproved methodologies on metering devices verification/calibration, as well as with the state standards of Ukraine.

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 "Artemugol".
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:
The management structure includes the Director of SE "Artemugol" and CEP CARBON EMISSIONS PARTNERS S.A. project developers.
Detailed operational structure and data collection scheme for the project activity are provided in Figure 12.

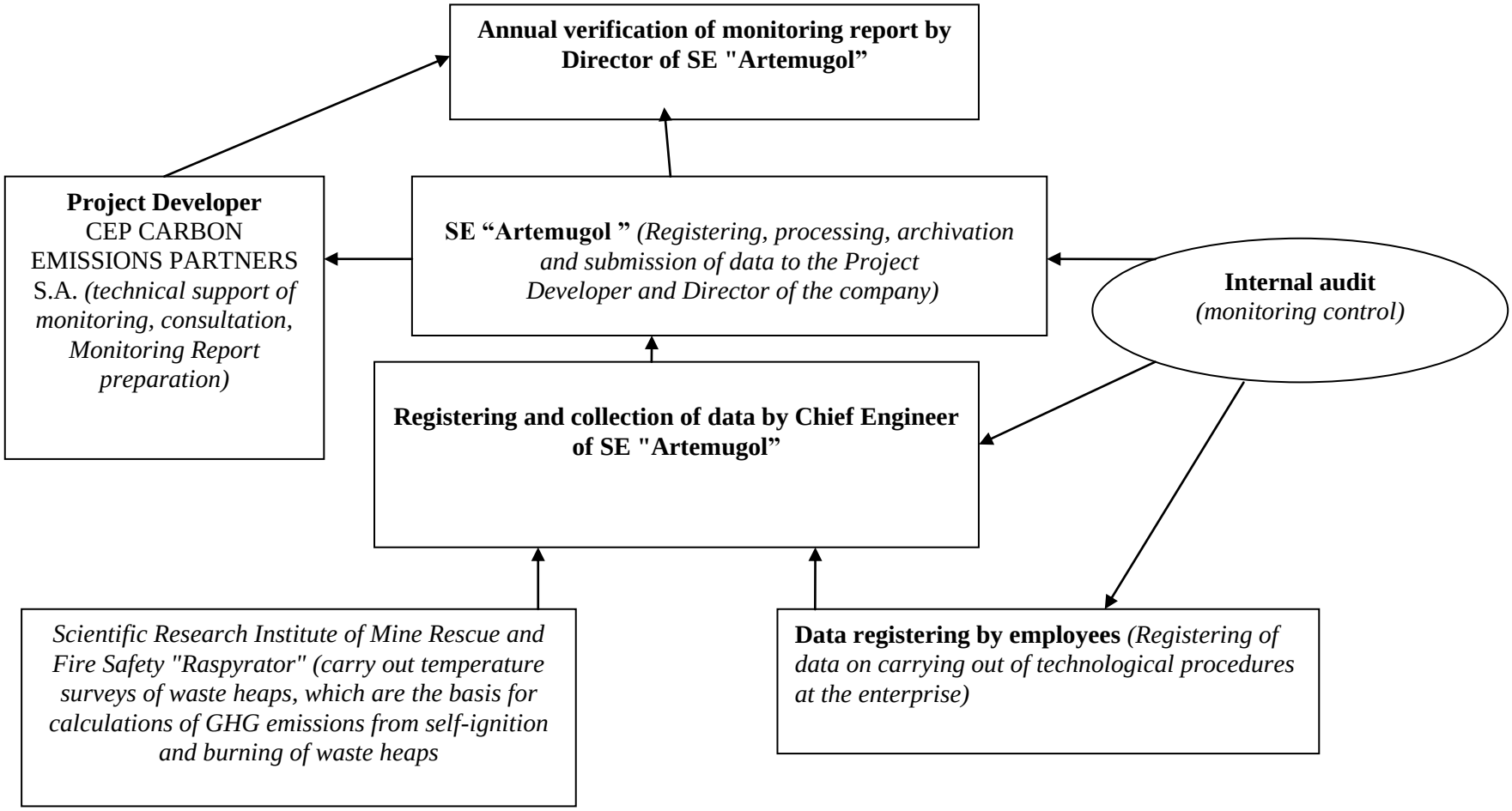

Figure 12. Operational structure and data collection scheme for the project monitoring

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

The monitoring plan is established by SE "Artemugol" CEP Carbon Emissions Partners S.A.

State Enterprise "Artemugol"
Donetsk region, Ukraine
13 Lenin Ave., Horlivka
Anatolii Honcharov – Director General
Phone: +38 0624 56-51-18
SE "Artemugol" is a project participant (stated in Annex 1).

CEP Carbon Emissions Partners S.A.
52 Route de Thonon, Geneva, Casepostale 170 CH-1222 Vésenaz, Switzerland
Telephone: +41 (76) 3461157
Fabian Knodel, Director
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. Calculations are provided in Supporting Document 1 enclosed to the PDD.

Table 11. Estimated project emissions for the period of January 1, 2005 – December 31, 2007

Year	Project emissions (t CO_2 equivalent)
2005	61 399
2006	124 558
2007	295 592
Total (t CO_2 equivalent)	**481 549**

Table 12. Estimated project emissions for the period of January 1, 2008 – December 31, 2012

Year	Project emissions (t CO_2 equivalent)
2008	338 938
2009	251 143
2010	273 128
2011	296 158
2012	296 158
Total (t CO_2 equivalent)	**1 455 525**

Table 13. Estimated project emissions for the period of January 1, 2013 – December 31, 2021

Year	Project emissions (t CO_2 equivalent)
2013	296 158
2014	296 158
2015	296 158
2016	296 158
2017	296 158
2018	296 158
2019	296 158
2020	296 158
2021	296 158
Total (t CO_2 equivalent)	**2 665 422**

E.2. Estimated leakage:

All emissions from diesel fuel combustion are included into potential project emissions, not into leakage, because diesel fuel is combusted on the site and is encompassed by the project boundary.
No leakage is expected.

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

Since no leakage is expected, the sum of E.1 and E.2 equals E.1.

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. Calculations are provided in Supporting Document 1 enclosed to the PDD.

Table 14. Estimated baseline emissions for the period of January 1, 2005 – December 31, 2007

Years	Estimated baseline emissions (t CO_2 equivalent)
2005	64 340
2006	438 398
2007	697 360
Total (t CO_2 eq)	**1 200 098**

Table 15. Estimated baseline emissions for the period of January 1, 2008 – December 31, 2012

Year	Estimated baseline emissions (t CO_2 equivalent)
2008	704 603
2009	629 979
2010	649 951
2011	731 243
2012	731 243
Total (t CO_2 equivalent)	**3 447 019**

Table 16. Estimated baseline emissions for the period of January 1, 2013 – December 31, 2021

Year	Estimated baseline emissions (t CO_2 equivalent)
2013	731 243
2014	731 243
2015	731 243
2016	731 243
2017	731 243
2018	731 243
2019	731 243
2020	731 243
2021	731 243
Total (t CO_2 equivalent)	**6 581 187**

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

Emission reductions are calculated according to formula (D.14) given in Section D.1.4.
Results of the calculations are provided in tables below. Calculations are provided in Supporting Document 1 enclosed to the PDD.

Table 17. Estimated emission reductions for the period of January 1, 2005 – December -31, 2007

Year	Estimated emission reductions (t CO_2 equivalent)
2005	2 941
2006	313 840
2007	401 768
Total (t CO_2 equivalent)	**718 549**

Table 18. Estimated emission reductions for the period of January 1, 2008 – December 31, 2012

Year	Estimated emission reductions (t CO_2 equivalent)
2008	365 665
2009	378 836
2010	376 823
2011	435 085
2012	435 085
Total (t CO_2 equivalent)	**1 991 494**

Table 19. Estimated emission reductions for the period of January 1, 2013 – December 31, 2021

Year	Estimated emission reductions (t CO_2 equivalent)
2013	435 085
2014	435 085
2015	435 085
2016	435 085
2017	435 085
2018	435 085
2019	435 085
2020	435 085
2021	435 085
Total (t CO_2 equivalent)	**3 915 765**

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

Table 20. Table containing results of estimation of emission reductions for the period of January 1, 2005 – 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)
2005	61 399	0	64 340	2 941
2006	124 558	0	438 398	313 840
2007	295 592	0	697 360	401 768
Total (t CO_2 equivalent)	**481 549**	0	**1 200 098**	**718 549**

Table 21. Table containing results of estimation of emission reductions for the period of January 1, 2008 – 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)
2008	338 938	0	704 603	365 665
2009	251 143	0	629 979	378 836
2010	273 128	0	649 951	376 823
2011	296 158	0	731 243	435 085
2012	296 158	0	731 243	435 085
Total (t CO_2 equivalent)	**1 455 525**	0	**3 447 019**	**1 991 494**

Table 22. Table containing results of estimation of emission reductions for the period of January 1, 2013 – December 31, 2021

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	296 158	0	731 243	435 085
2014	296 158	0	731 243	435 085
2015	296 158	0	731 243	435 085
2016	296 158	0	731 243	435 085
2017	296 158	0	731 243	435 085
2018	296 158	0	731 243	435 085
2019	296 158	0	731 243	435 085
2020	296 158	0	731 243	435 085
2021	296 158	0	731 243	435 085
Total (t CO_2 equivalent)	**2 665 422**	0	**6 581 187**	**3 915 765**

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:

According to Law of Ukraine "On environmental protection"[61] and the State Building Norms A.2.2-1-2003, "Structure and content of environmental impact assessment (EIA) in the process of design and construction of plants, buildings and structures"[62] SE "Artemugol" is not obliged to carry out EIA for this type of project.

Both global and local ecological effects from project implementation are positive as a result of greenhouse gas emission reductions.

Transboundary impacts from the project activity, according to their definition in the text of "Convention on long-range transboundary pollution" ratified by Ukraine, will not take place.

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

As mentioned above, the environmental impact assessment has proved that the project has a positive impact on the environment.

Impact on water medium
The impact on water medium is absent.

Impact on air environment
Permanent, insignificant.
Harmful emissions will decrease due to waste heap extinction and modernization of technological equipment.

Impact on land use
The project will have a positive impact on land use, because due to modernization and replacement of technological equipment mine performance and workers' safety will be at a high level, waste heap extinction will allow to use waste heaps again and eliminate the need to search new territories for rock accumulation.

SECTION G. Stakeholders' comments

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

SE "Artemugol" informed the community through mass media. All comments relating to the project implementation were positive. No negative comments were received.

[61] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1264-12

[62] http://www.budinfo.com.ua/dbn/8.htm

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Owner of the project

Organisation:	State Enterprise “Artemugol”
Street/P.O.Box:	Lenin Ave.
Building:	13
City:	Horlivka
State/Region:	Donetsk region.
Postal code:	84601
Country:	Ukraine
Phone:	062-332-02-39
Fax:	062-332-02-39
E-mail:	dogovor_417@ mail.ru
URL:	
Represented by:	
Title:	Director General
Salutation:	Mr
Last name:	Honcharov
Middle name:	
First name:	Anatolii
Department:	
Phone (direct):	0624-56 – 51-18 (reception of CTO)
Fax (direct):	
Mobile:	
Personal e-mail:	

Project developer

Organisation:	CEP Carbon Emissions Partners S.A.
Street/P.O.Box:	Route de Thonon
Building:	52
City:	Geneva
State/Region:	
Postal code:	Casepostale 170 CH-1222 Vésenaz
Country:	Switzerland
Phone:	+41 (76) 3461157
Fax:	+41 (76) 3461157
E-mail:	0709bp@gmail.com
URL:	
Represented by:	
Title:	Director
Salutation:	Mister
Last name:	Knodel
Middle name:	
First name:	Fabian
Department:	
Phone (direct):	+41 (76) 3461157
Fax (direct):	
Mobile:	
Personal e-mail:	

Annex 2

BASELINE INFORMATION

Baseline was set according to the JI specific approach, based on the "Guidance on criteria for baseline setting and monitoring" (Version 3) of the JI Supervisory Committee. For more information, please refer to the section B in this PDD.

Annex 3

MONITORING PLAN

The project monitoring plan is provided in Section D of this PDD.