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

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

Processing of waste heaps at Monolith-Ukraine.

Sectoral scope: 8. Mining/mineral production

Version of the document: 1.1

Date of the document: 28th of November 2010.

A.2. Description of the project:

The Ukrainian coal mining industry is a complex business system that integrates around 167 active coal mines and 3 coal strip mines, mines at the decommissioning stage, coal washing, transportation and other enterprises. Ukraine is the largest coal mining region in Europe and is among top eight in the world. The main coal mining area is Donbas that is located in Donetsk and Luhansk regions for the most part.

Coal is found in the area of Donbas at the average depth of 400-800 m. The average thickness of coal-bed is 0.6-1.2 m. Therefore coal in Donbas is produced mostly by mining. Most mines operate on the depth of 400-800 m but there are 35 mines in Donbas that extract coal from the 1000-1300 m level. Coal-beds in Donetsk basin are interleaved with rock and are usually found every 20-40 m. Mining activities in such conditions result in vast amounts of matter being extracted and brought to the surface. Coal is separated from rock and this non-coal matter forms huge waste heaps of tailings found almost everywhere in Donbas. Separation process on the mines was not and sometimes is not entirely efficient. For a long period of time it was not economically feasible to extract 100% of coal from the rock that had been mined. That is why waste heaps of Donbas contain considerable masses of coal. In the course of time those waste heaps are vulnerable to spontaneous ignition and slow combustion. According to different estimates the rock that is mined contains only up to 65-70% of coal only, the rest is barren rock. Up to 60% of this rock is put into waste heaps. According to specialists' research, percentage of combustible material in waste heaps is 15-30%, meanwhile there can be from 7% to 28-32% of coal[1]. Waste heaps that are burning or are close to spontaneous ignition are sources of uncontrolled greenhouse gas and hazardous substances emissions. The latter include sulphurous anhydride that transforms into sulphur acid and is the reason for acid rains, hydrogen sulphide and carbon oxide. Ground water is contaminated with solid particles, becomes hard and acid when it contacts a waste heap. Erosion processes that often destroy the integrity of the waste heaps are responsible for contamination of nearby areas with particles that contain hazardous materials (like sulphur). Erosion can lead overtime to the total destruction of a waste heap in a massive landslide that is dangerous both in terms of direct hazard to population and property and massive emissions of particles and hazardous substances into the atmosphere. Erosion also helps to intensify the process of spontaneous combustion. Combustion of coal in the waste heap is rather long-term and lasts from 5 to 7 years.

The waste heaps also take up large space areas. As of 2002 the waste heaps in Donbas occupied 7190 hectares of land. And this figure keeps growing.

Despite the dangers caused by the burning waste heaps, it is common in the area of Donbas to not extinguish the fires immediately. The owners that are responsible for the waste heaps receive relatively

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

small fines for the air pollution, therefore there is little incentive for them to deal with the problem, and extinguishing those heaps that are currently alight can be postponed indefinitely.

In the baseline scenario it is assumed that this common practice will continue and waste heaps will be burning and emitting GHG into the atmosphere until the coal is consumed. Whereas using improved extraction techniques, proposed in this project, the residual coal can be extracted from the waste heaps and the coal can be used to for the energy needs of local consumers. The reclaimed coal will replace coal that would have otherwise been mined, causing fugitive emissions of methane during the mining process.

This Project is aimed at coal extraction from the mine's waste heaps near the Klenoviy village, Sverdlovsk district, Luhansk Region, Ukraine. This will prevent greenhouse gas emissions into the atmosphere during combustion of the heaps and will contribute an additional amount of coal, without the need for mining. The Project includes the installation of coal extraction units and the grading of the extracted coal. Extracted coal is then sold for heat and power production.

Figure 1 Project activity equipment

Therefore, in the project scenario the coal extracted from the waste heaps will partly substitute the coal from the mine, decreasing fugitive methane emissions, and reduce emissions GHG emissions due to waste heap combustion by extracting all of the combustible material from the waste heaps.

The first stage of the process includes removal of the waste heap with a bulldozer and transporting it to a mobile sorting unit that uses a dry vibrating screening process. At this stage grades "+100", "+40", and "-40" mm are separated. Grades "+100", "+40"mm are sorted out at a slow conveyor belt and moved to the ready product storage.

The second stage of the process includes sending "-40"mm grade to a special concentration facility made by Parnaby Cyclones International (Great Britain). The facility uses a dense medium cyclone with magnetite suspension to concentrate coal. The facility produces "1-3", "0-6", and "6-40" mm coal grades. The facility is fully automatic. The concentration facility is duly equipped with safety interlocks, alarms, emergency shut-off and operation sensors.

Once the waste heap has been processed and coal is extracted, the land released from under the waste heap is remediated and returned to the community. The residue after processing, which is mainly barren rock, is used to shape terrain of abandoned open-cast mining sites so that such areas may be used again for development purposes. The picture below illustrates the transformation of the terrain with the rock from processed waste heap.

The technological process is environmentally sound and does not require the use of hazardous materials. Waste heaps are processed with semi-steep separators that use water in a closed cycle as an operating fluid.

Brief summary of the history of the project: The project has been initiated in the early 2008. Project design has been completed by the end of 2008 and installation and construction works were initiated on 15th of January 2009. The operations at the facility have started on the 1st of January 2010. The JI was one of the drivers for the project from the start and financial benefits provided by the JI mechanism were considered as one of the reasons to start the project and are crucial in the decision to start the operations.

A.3. Project participants:

Table 1 Project participants

Party involved	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Ukraine (Host party)	• MONOLITH-UKRAINE LTD	No
Netherlands	• Global Carbon BV	No

MONOLITH-UKRAINE LTD is the project host. Global Carbon BV is developer of this JI project.

A.4. Technical description of the project:

A.4.1. Location of the project:

A.4.1.1. Host Party(ies):

Ukraine

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

Luhansk region

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

Klenoviy village.

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

Figure 2 Map of Ukraine and location of the project site

The physical location of the project is at the industrial site of the former Mine #6 "Daryevskaya" at Klenoviy village, Sverdlovsk district, Luhansk region, Ukraine. The geographic coordinates of the site are: 39°28′24.46″ E and 48°7′19.2″ N. The satellite image of the site is shown below:

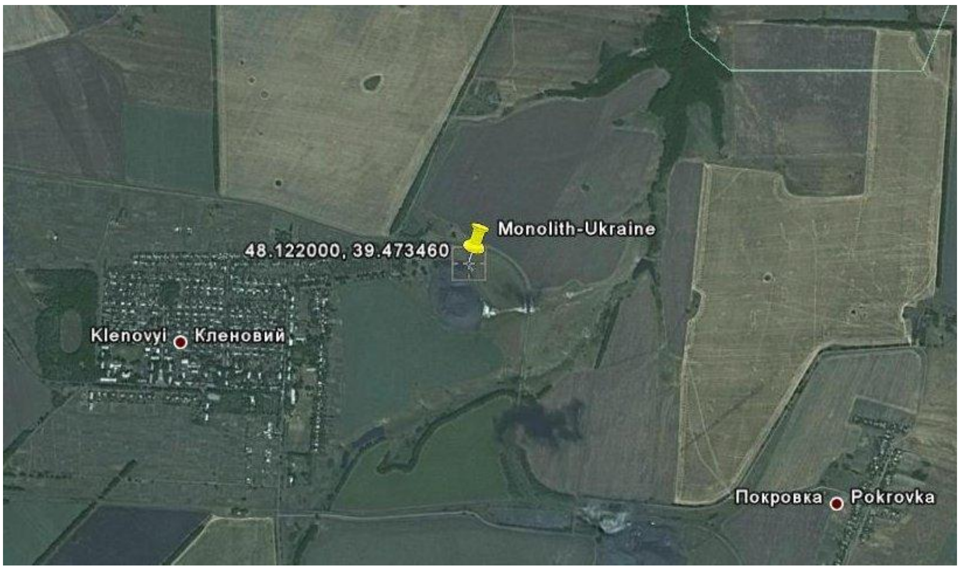

Figure 3 Satellite photo of the project location.

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

The technological process and equipment used in the project reflect current good engineering practices. The basic technology of dense medium coal washing plant has gained wide popularity in the 1990s as the most efficient process for coal washing. Technological process is advanced, does not require vast amounts of materials and workforce, is reliable and productive. This is one of the first applications of this technology in Ukraine. The technology used in this project is state-of-the-art technology and is unlikely to be replaced by any other technology during the lifetime of the project as it offer the best quality and efficiency of the coal washing process among other technologies commonly used in Ukraine such as simple vibration screens, hydro cyclones and spiral separators.

The dense medium washing plant is the very efficient separation process. It is ideally suited for difficult coal separation and cleaning high value coal for domestic and industrial use. The overall process differs from the water-based separation plant because the medium is created using magnetite (fine iron particles) instead of the fine particles in the raw material. This allows for more control and a wider range of separation gravities.

The simplified flow diagram on Figure 4 below shows the dense medium cyclone separation process:

Dense medium cyclones used for very accurate separation of particles of different density. Particles that are smaller than 0.5 mm are removed from the mixture before it enters the cyclone. Magnetite is added to the water/particle mixture to allow precise control of density. The dense medium cyclone is mounted at a 15° angle. The lighter particles (coal) come out the upper end and the heavier particles (shale) the lower.

In cyclones, the small particles are separated by centrifugal and vortex action (the cyclone itself does not move). The water/particle/magnetite mixture is pumped into the side of the cyclone tangentially (1) and swirls around creating a vortex in which the lighter particles are drawn out through the central vortex tube (2). The heavier particles are thrown by centrifugal force to the wall of the cyclone and are discharged at the opposite end (3).

The dense medium washing plant can efficiently separate raw material of a wide range of proportions. Other benefits include: low power requirement, high efficiency, low magnetite consumption, Robust modular design, quick to assemble easy to move design.

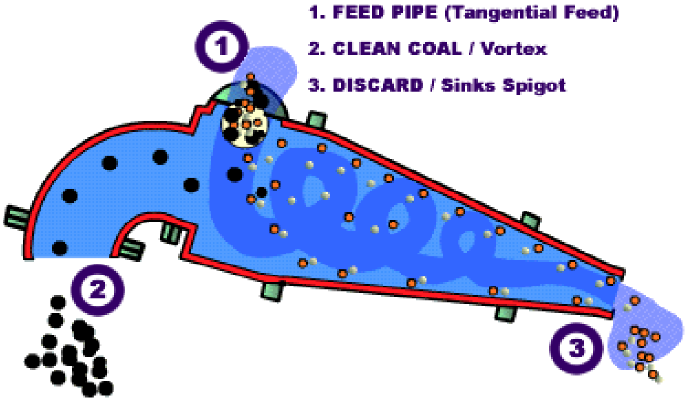

Figure 4 Dense medium cyclone operation[2].

The project will implement the technological scheme which consists of the following steps:

[2] http://www.parnaby.co.uk/dense-medium-cyclone-operation.html

1) The selected waste heaps are prepared for dismantlement. Access roads are prepared and access to the top is organized by the bulldozer.
2) The rock is disintegrated by the excavator at the place of excavation and is delivered by the front loader to the receiving unit. From here the bulldozer transports the rock to the mobile vibration screen.
3) The mobile vibration screen separates "+100 mm" class of rock on a simple separation screen. This product is delivered to the temporary storage of "+100 mm" class.
4) The rock under 100 mm proceeds to the vibration screen of the mobile unit. Here the metal is removed from the rock by the electric magnet. The vibration screen separates the "+40 mm" class of the rock. This class is loaded into the perpendicular slow conveyor belt where the coal is manually removed to a temporary storage.
5) The processed "+40 mm" rock is stored at the nearby temporary storage. This rock and the "+100 mm" rock is loaded into the trucks by front loader and transported to the newly prepared rock storage.
6) The coal extraction unit is located close to one of the waste heaps. The "-40 mm" class of rock is delivered here by trucks and is fed into the unit for the extraction process.
7) The extraction process consists of several operations. The raw material is first separated from shale by wet process on the vibration screen and is fed into the mixing tank. The working magnetite suspension is also fed into the tank. From the tank this mixture is pumped into the dense medium cyclone. Products of the cyclone are transported to the vibration screens that are separated into two sections: for the end product and shale. Here they are separated from the magnetite suspension, washed from magnetite remains and are transported by belt conveyors: coal concentrate is transported to the sorting unit and shale is transported to the shale storage unit. The diluted suspension is regenerated by the magnetic drum separator. At the sorting unit the coal concentrate is separated into two classes "+6 mm" and "-6 mm". The smaller clas is additionally dewatered in the centrifuge. These classes are fed into storage bunkers by conveyor belts. The shale that has been received after the washing of coal is fed into shale water tank and pumped into hydro cyclones. The fine shale after the cyclones is fed into radial concentrator and grain product "1-3 mm" is fed into the spiral separators that produce fine concentrate "1-3 mm" and shale. Products of spiral separators are dewatered on high-frequency vibration screens and are transported to storage units by the belt conveyors. Shale from the radial concentrators (concentrated with the flocculants) are fed into dewatering by the belt press-filter. All water streams in the process are closed and the water is purified by the concentrator. There is no discharge of the water into the environment.

Most of the equipment utilized by the project such as trucks, excavators, bulldozers is of a standard type used for industrial applications worldwide. The project activity will use a limited number of individually ordered equipment.

The extraction process is done by the Parnaby Cyclones International manufactured facility. It consists of the following modules:

1) Dense medium coal washing;
2) Sorting unit;
3) Fine shale washing by spiral separators;
4) Compact radial concentrator;
5) Belt press-filters for fine shale dewatering;
6) Flocculent preparation;
7) Water and magnetite suspension tanks.

The project does not require extensive initial training. The required workforce can get basic industrial profession training locally. Most of the required personnel such as heavy machinery operators, trucks and excavator drivers, electric and mechanical maintenance workers are locally available. Maintenance needs are covered by the local capacities: in-house maintenance workers and outsourced maintenance and repair subcontractors. The project makes provisions for training needs. All workers are required to have a valid professional education certificate and pass periodical safety trainings and exams. Professional education can be obtained locally in the Luhansk region in all of the professional areas covered by the project.

The first stage of the project implementation which is the design of the facility was completed in 2008. The construction has started on the 15th of January 2009. The operation has commenced on the 1st of January 2010. Initial number of waste heaps will be processed by this unit.

A.4.3. Brief explanation of how the anthropogenic emissions of greenhouse gases by sources are to be reduced by the proposed JI project, including why the emission reductions would not occur in the absence of the proposed project, taking into account national and/or sectoral policies and circumstances:

The proposed project is aimed at the extraction of coal from the waste heaps of underground coal mines. Waste heaps are frequently spontaneously igniting and burning, causing emissions of hazardous substances and green-house gases. The fraction of coal in the waste heaps can be as high as 28-32%[3], so the risk of spontaneous self-heating and burning is very high. The survey[4] shows that 69% of waste heaps in the Luhansk Region are, or have been burning at some point in time. If a waste heap has started burning, even if the fire is extinguished, it will continue burning after a while unless the fire is extinguished regularly. Burning waste heaps in Ukraine are very often not taken care of properly, especially when there is no immediate danger to population and property, i.e. if the waste heap is located at a considerable distance from a populated area, or is at the early stages of self-heating. The monitoring of the waste heaps condition is not done on a systematic and timely basis and information is frequently missing. The only way to prevent a waste heap from burning is to extract all the combustible matter, which is generally residual coal from the mining process. This project will reduce the emissions by extracting coal from the waste heap matter and using the remaining rock for land engineering.

Coal extracted from the waste heaps will substitute the coal from the mines and will be used mainly for energy production purposes at coal-fired power plants. Coal mining is a source of the fugitive emissions of methane, therefore, the project activity will reduce methane emissions by reducing the amount of coal required to be mined.

Emission reductions due to the implementation of this project will come from two major sources:

- Removing the source of green-house gas emissions from the combustion of waste heaps by the extraction of coal from the waste-heaps;
- Negative leakage through reduced fugitive emissions of methane due to the replacement of coal that would have been mined, by the project.

Waste heaps are sources of uncontrolled green-house gas emissions, hazardous substances emissions, particle emissions, ground water contamination. Addressing problems of waste heaps is costly and is not addressed in a systematic way in Ukraine. Efforts to stop burning of waste heaps and break them down completely are in line with the existing environmental legislation of Ukraine. The proposed project is positively evaluated by local authorities.

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

[4] *Analysis on the fire risk of Luhansk Region's waste heaps*, Scientific Research Institute "Respirator", Donetsk, 2010

Detailed description on the baseline setting and full additionality test can be found in section B of this PDD.

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

Table 2 Estimated amount of emission reductions during the crediting period

	Years
Length of the crediting period	3
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
Year 2010	133 649
Year 2011	226 781
Year 2012	226 781
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	587 211
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	195 737

Table 3 Estimated amount of emission reductions after the crediting period

	Years
Period after 2012, for which emission reductions are estimated	12
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
Year 2013	226 781
Year 2014	226 781
Year 2015	226 781
Year 2016	226 781
Year 2017	226 781
Year 2018	226 781
Year 2019	226 781
Year 2020	226 781
Year 2021	226 781
Year 2022	226 781
Year 2023	226 781
Year 2024	226 781
Total estimated emission reductions over the period indicated (tonnes of CO_2 equivalent)	2 721 372
Annual average of estimated emission reductions over the period indicated (tonnes of CO_2 equivalent)	226 781

A.5. Project approval by the Parties involved:

The project has been officially presented for endorsement to the Ukrainian authorities.

SECTION B. Baseline

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

A baseline for the JI project has to be set in accordance with Appendix B to decision 9/CMP.1 (JI guidelines)[5], and with further guidance on baseline setting and monitoring developed by the Joint Implementation Supervisory Committee (JISC). In accordance with the Guidance on Criteria for Baseline Setting and Monitoring (version 2)[6] (hereinafter referred to as Guidance), the baseline for a JI project is the scenario that reasonably represents the anthropogenic emissions by sources or anthropogenic removals by sinks of GHGs that would **occur in the absence of the proposed project**. In accordance with the Paragraph 9 of the Guidance the project participants may select either: an approach for baseline setting and monitoring developed in accordance with appendix B of the JI guidelines (JI specific approach); or a methodology for baseline setting and monitoring approved by the Executive Board of the clean development mechanism (CDM), including methodologies for small-scale project activities, as appropriate, in accordance with paragraph 4(a) of decision 10/CMP.1, as well as methodologies for afforestation/reforestation project activities. Paragraph 11 of the Guidance allows project participants that select a JI specific approach to use selected elements or combinations of approved CDM baseline and monitoring methodologies or approved CDM methodological tools, as appropriate.

Description and justification of the baseline chosen is provided below in accordance with the "Guidelines for users of the Joint Implementation Project Design Document Form", version 04[7], using the following step-wise approach:

Step 1. Indication and description of the theoretical approach chosen regarding baseline setting

Project participants have chosen the following approach regarding baseline setting, defined in the Guidance (Paragraph 9):

- An approach for baseline setting and monitoring developed in accordance with appendix B of the JI guidelines (JI specific approach).

The Guidance applies to this project as the above indicated approach is selected as mentioned in the Paragraph 12 of the Guidance. The detailed theoretical description of the baseline in a complete and transparent manner, as well as a justification in accordance with Paragraph 23 through 29 of the Guidance should be provided by the project participants.

The baseline for this project shall be established in accordance with appendix B of the JI guidelines. Furthermore, the baseline shall be identified by listing and describing plausible future scenarios on the basis of conservative assumptions and selecting the most plausible one.

The most plausible future scenario will be identified by performing a barrier analysis. Should only two alternatives remain, of which one alternative should represent the project scenario with the JI incentive, the CDM Tool “Tool for the demonstration and assessment of additionality” shall be used to prove that the project scenario cannot be regarded at the most plausible one. Key factors that affect the baseline such as sectoral reform policies and legislation, economic situation/growth and socio-demographic factors in the relevant sector as well as resulting predicted demand, suppressed and/or increasing demand that will be met by the project, availability of capital, local availability of technologies/techniques, skills and know-how and availability of best available technologies/techniques in the future, fuel prices and availability, national and/or subnational expansion plans for the energy sector, will be taken into account while formulating the plausible feature scenarios.

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[5] http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=2

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

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

Step 2. Application of the approach chosen

Plausible future scenarios will be identified in order to establish a baseline.

Sub step 2a. Identifying and listing plausible future scenarios.

Scenario 1. Continuation of existing situation

In the current situation waste heaps are not utilised. Spontaneous self-heating and subsequent burning of waste heaps is very common and measures to extinguish fire are taken sporadically. Burning waste heaps are sources of uncontrolled greenhouse gas emissions. Coal is not extracted from the waste heaps. Coal is produced by underground mines of the region and used for energy production or other purposes. Coal mining activities cause emissions of fugitive methane and also the formation of new waste-heaps.

Scenario 2. Direct energy production from the heat energy of burning waste heap

Waste heaps are not extinguished and not monitored properly. Some burning heaps are used to produce energy by direct insertion of heat exchangers into the waste heap[8]. This captures a certain amount of heat energy for direct use or conversion into electricity. The coal is not extracted from the waste heaps. Coal is produced by underground mines of the region and used for energy production or other purposes. Mining activities, resulting in fugitive gas release, and the formation of more waste-heaps.

Scenario 3. Production of construction materials from waste heap matter

Waste heaps are being processed in order to produce construction materials (bricks, panels, etc.). Coal in the waste heap matter is burnt during the agglomeration process[9]. Coal is produced by underground mines of the region and used for energy production or other purposes. Mining activities, resulting in fugitive gas release, and the formation of more waste-heaps.

Scenario 4. Coal extraction from waste heaps without JI incentives

This scenario is similar to the project activity only in this case the project does not benefit from the possible development as a joint implementation project. In this scenario waste heaps are processed in order to extract coal and used it the energy sector. Less coal is produced by underground mines of the region.

Scenario 5. Systematic monitoring of waste heaps condition and regular fire prevention and extinguishing measures

Waste heaps are systematically monitored and their thermal condition is researched. Regular fire prevention measures are taken. In case of a burning waste heap, the fire is extinguished and measures are taken to prevent burning in the future. Coal is not extracted from the waste heaps. Coal is produced by underground mines of the region and used for energy production or other purposes. Mining activities, resulting in fugitive gas release, and the formation of more waste-heaps.

Sub step 2b. Barrier analysis

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[8] *Method to utilize energy of the burning waste heaps*, Melnikov S.A., Zhukov Y.P., Gavrilenko B.V., Shulga A.Y., State Committee Of Ukraine For Energy Saving, 2004 (http://www.necin.kiev.ua/rus/publications/terikon.htm)

[9] *Opportunities for international best practice use in coal mining waste heap utilization of Donbas*, Matveeva N.G., Ecology: Collection of Scientific Papers, Eastern Ukrainian National University, Luhansk, #1 2007

Scenario 1. Continuation of existing situation

This scenario does not anticipate any activities and therefore does not face any barriers.

Scenario 2. Direct energy production from the heat energy of burning waste heap

Technological barrier: This scenario is based on the highly experimental technology, which has not been implemented even in a pilot project. It is also not suitable for all waste heaps as the project owner will have to balance the energy resource availability (i.e. waste heap location) and the location of the energy user. On-site generation of electricity addresses this problem but requires additional interconnection engineering. In general this technology has yet to prove its viability. In addition it does not allow the control and management of the emitted gases.

Investment barrier: Investment into unproven technology carries a high risk. In case of Ukraine, which carries a high country risk, investment into such unproven energy projects are less likely to attract investors than some other opportunities in the energy sector with higher returns. The pioneering character of the project may appeal to development programmes and governmental incentives but cost of the produced energy is likely to be much higher than alternatives.

Scenario 3. Production of construction materials from waste heap matter

Technological barrier: This scenario is based on known technology, however, this technology is not currently available in Ukraine and there is no evidence that such projects will be implemented in the near future. It is also not suitable for all types of waste heaps as the content of waste heap has to be predictable in order for project owner to be able to produce quality materials. High contents of sulphur and moisture can reduce the suitability of the waste heap for processing. A large scale deep exploration of the waste heap has to be performed before the project can start.

Scenario 4. Coal extraction from waste heaps without JI incentives

Investment barrier: This scenario is financially unattractive and faces barriers. Please refer to section B.2 for details.

Scenario 5. Systematic monitoring of waste heaps condition and regular fire prevention and extinguishing measures

Investment barrier: This scenario does not represent any revenues but anticipates additional costs for waste heaps owners. Monitoring of the waste heap status is not done systematically and in general actions are left to the discretion of the individual owners. Waste heaps are mostly owned by mines or regional coal mining associations[10]. Coal mines in Ukraine suffer from limited investment resulting often in safety problems due to complicated mining conditions and financial constraints, with miners' salaries often being delayed by few months.[11] Waste heaps in this situation are considered as additional burdens and mines often do not even perform minimum required maintenance. Spontaneous self-heating and subsequent burning of waste heaps is very common and among 176 surveyed waste heaps in Luhansk region alone, only 51 are known not to have been burning[11] at sometime, exact data are not

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[10] *Analysis on the fire risk of Luhansk Region's waste heaps*, Scientific Research Institute "Respirator", Donetsk, 2010.

[11] *Coal Sector of Ukraine: Problems and Sustainable Development Perspectives*, Yuri Makogon, National Institute For Strategic Research, 2008 (http://www.niss.gov.ua/Monitor/desember08/5.htm)

always available. From a commercial view point the fines that are usually levied by the authorities are considerably lower than costs of all the measures outlined by this scenario.

Sub step 2d. Baseline identification

All scenarios, except Scenario 1 - Continuation of existing situation, face prohibitive barriers. Therefore, continuation of existing situation is the most plausible future scenario and is the baseline scenario.

This baseline scenario has been established according to the criteria outlined in the JISC Guidance:

1) On a project specific basis. This project is the first of its kind and therefore other options could not be used;
2) In a transparent manner with regard to the choice of approaches, assumptions, methodologies, parameters, data sources and key factors. All parameters and data are either monitored by the project participants or are taken from sources that provide a verifiable reference for each parameter. Project participants use approaches suggested by the Guidance and methodological tools provided by the CDM Executive Board;
3) Taking into account relevant national and/or sectoral policies and circumstances, such as sectoral reform initiatives, local fuel availability, power sector expansion plans, and the economic situation in the project sector. It is demonstrated by the above analysis that the baseline chosen clearly represents the most probable future scenario given the circumstances of modern day Donbas coal sector;
4) In such a way that emission reduction units (ERUs) cannot be earned for decreases in activity levels outside the project activity or due to force majeure. According to the proposed approach emission reductions will be earned only when project activity will generate coal from the waste heaps, so no emission reductions can be earned due to any changes outside of project activity.
5) Taking account of uncertainties and using conservative assumptions. A number of steps have been taken in order to account for uncertainties and safeguard conservativeness:
    a. Same approaches as used for the calculation of emission levels in the National Inventory Reports (NIRs) of Ukraine are used to calculate baseline and project emissions when possible. NIRs use the country specific approaches and country specific emission factors that are in line with default IPCC values;
    b. Lower range of parameters is used for calculation of baseline emissions and higher range of parameters is used for calculation of project activity emissions;
    c. Default values were used to the extent possible in order to reduce uncertainty and provide conservative data for emission calculations.

Baseline Emissions

In order to calculate baseline emissions following assumptions were made:

1) The project will produce energy coal that will displace the same amount of the same type of coal in the baseline scenario;

2) The coal that is displaced in the baseline scenario and the coal that is generated in the project activity are used for the same type of purpose and is stationery combusted;

3) The coal that is displaced in the baseline scenario is produced by the underground mines of the region and as such causes fugitive emissions of methane;

4) Waste-heaps of the region are vulnerable to spontaneous self-heating and burning and at some point in time will burn;

5) The waste heaps that the project is dismantling are categorized as being at risk of ignition. This means that they will self-heat and start burning under normal circumstances. Coal burning in the waste heaps will oxidize to CO_2 completely if allowed to burn uncontrolled.
6) The processed rock is not vulnerable to self-heating and spontaneous ignition after the coal has been removed during the processing.
7) The correction factor is applied in order to address the uncertainty of the waste heaps burning process. This factor is defined on the basis of the survey of all the waste heaps in the area that provides a ratio of waste heaps that are or have been burning at any point in time to all existing waste heaps;

Baseline emissions come from two major sources:

1) Carbon dioxide emissions that occur during combustion of energy coal. These are calculated as stationery combustion emissions from coal in the equivalent of the amount of coal that is extracted from the waste heaps in the project scenario. This emission source is also present in the project scenario and the emissions are assumed to be equal in both project and baseline scenario. Therefore, this emission source is not included into consideration both in the project and the baseline scenario.
2) Carbon dioxide emissions from burning waste heaps. These are calculated as stationery combustion emissions from coal in the equivalent of the amount of coal that is extracted from the waste heaps in the project scenario, adjusted by the probability of a waste heap burning at any point in time. As the baseline suggests that the current situation is preserved regarding the waste heaps burning, and the waste heaps in question are at risk of burning it is assumed that actual burning will occur. The correction factor is applied in order to address the uncertainty of the waste heaps burning process. This factor is defined on the basis of the survey of all the waste heaps in the area that provides a ratio of waste heaps that are or have been burning at any point in time to all existing waste heaps.

The table below provides values for constant parameters used to determine the baseline emissions.

Table 4 List of constants used in the calculations of baseline emissions

Data / Parameter	***Data unit***	***Description***	***Data Source***	***Value***
GWP_{CH4}		Global Warming Potential of Methane	IPCC Second Assessment Report[12]	21
ρ_{CH4}	t/m^3	Methane density	Standard (at room temperature 20˚C and 1 ATM)	0.00067
NCV_{Coal}	TJ/kt	Net Calorific Value of coal	National Inventory Report of Ukraine 1990-2008[13], p. 258	21.59
$OXID_{Coal}$		Carbon Oxidation factor of coal	National Inventory Report of Ukraine 1990-2008, p.265	0.98
k^{C}_{Coal}	tC/TJ	Carbon content of coal	National Inventory Report of Ukraine 1990-2008, p.264	26.8

[12] "*IPCC Second Assessment: Climate Change 1995. A Report of the Intergovernmental Panel on Climate Change*".Bolin, B. et al. (1995). IPCC website. http://www.ipcc.ch/pdf/climate-changes-1995/ipcc-2nd-assessment/2nd-assessment-en.pdf.

[13] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2010-nir-22may.zip

Emissions in the baseline scenario are calculated as follows:

$$BE_y = BE_{WHB,y},$$ (Equation 1)

where:

BE_y, - Baseline Emissions in the year *y* (tCO_2e),

$BE_{WHB,y}$ - Baseline Emissions due to burning of the waste heaps in the year *y* (tCO_2).

These, in turn, are calculated as:

$$BE_{WHB} = \frac{FC_{BE,Coal,y}}{1000} \cdot p_{WHB} \cdot NCV_{Coal} \cdot OXID_{Coal} \cdot k^C_{Coal} \cdot 44/12,$$ (Equation 2)

where:

$FC_{BE,Coal,y}$ - Amount of coal that has been mined in the baseline scenario and combusted for energy use, equivalent to the amount of coal extracted from the waste heaps in the project activity in the year y, t.

p_{WHB} Correction factor for the uncertainty of the waste heaps burning process. This factor is defined on the basis of the survey of all the waste heaps in the area that provides a ratio of waste heaps that are or have been burning at any point in time to all existing waste heaps. This number is taken from the study[14] of waste heaps in Luhansk region and is defined as the ratio of waste heaps that are or have been on fire historically to all existing waste heaps of Luhansk region. This ratio is equal to 0.69 according to this study.

Leakage

Leakage is the net change of anthropogenic emissions by sources and/or removals by sinks of GHGs which occurs outside the project boundary, and that can be measured and is directly attributable to the JI project.

This project will result in a net change in fugitive methane emissions due to the mining activities. As coal in the baseline scenario is only coming from mines it causes fugitive emissions of methane. These are calculated as standard country specific emission factor applied to the amount of coal that is extracted from the waste heaps in the project scenario (which is the same as the amount of coal that would have been mined in the baseline scenario.

This leakage is significant and will be included in the calculation of the project emission reductions. Procedure for ex ante estimate and quantification of this source of leakage is provided below:

Table 5 List of constants used in the calculations of leakage

Data / Parameter	*Data unit*	*Description*	*Data Source*	*Value*
GWP_{CH4}		Global Warming Potential of Methane	IPCC Second Assessment Report[15]	21
ρ_{CH4}	t/m^3	Methane density	Standard (at 20˚C and 1 ATM)	0.00067

[14] *Analysis on the fire risk of Luhansk Region's waste heaps*, Scientific Research Institute "Respirator", Donetsk, 2010.

[15] "*IPCC Second Assessment: Climate Change 1995. A Report of the Intergovernmental Panel on Climate Change*".Bolin, B. et al. (1995). IPCC website. http://www.ipcc.ch/pdf/climate-changes-1995/ipcc-2nd-assessment/2nd-assessment-en.pdf.

Leakages in the year y are calculated as follows:

$$LE_y = -LE_{CH_4,y} \qquad \text{(Equation 3)}$$

Leakages due to fugitive emissions of methane in the mining activities in the year *y* (tCO_2e).

$$LE_{CH_4,y} = FC_{BE,Coal,y} \cdot EF_{CH_4,CM} \cdot \rho_{CH_4} \cdot GWP_{CH_4}, \qquad \text{(Equation 4)}$$

where:

$EF_{CH_4,CM}$ - Emission factor for fugitive methane emissions from coal mining (m^3/t). This is equal to 25.67 m^3/t according to the relevant study[16].

Key information and data used to establish the baseline are provided below in tabular form:

Data/Parameter	$FC_{BE,Coal,y}$
Data unit	t
Description	Amount of coal that has been mined in the baseline scenario and combusted for energy use, equivalent to the amount of coal extracted from the waste heaps in the project activity in the year *y*.
Time of determination/monitoring	Yearly monitoring.
Source of data (to be) used	Project owner records
Value of data applied (for ex ante calculations/determinations)	As provided by the project owner
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measured for the commercial purposes on site.
QA/QC procedures (to be) applied	According to the project owner policy.
Any comment	No

Data/Parameter	$EF_{CH_4,CM}$
Data unit	m^3/t
Description	Emission factor for fugitive methane emissions from coal mining.
Time of determination/monitoring	Fixed ex ante.
Source of data (to be) used	*National Inventory Report of Ukraine 1990-2008*, p.74
Value of data applied (for ex ante calculations/determinations)	25,67
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Default emission factor established according to the national report.
QA/QC procedures (to be) applied	According to the annual National Inventory Report.
Any comment	No

[16] *National Inventory Report of Ukraine 1990-2008*, p. 74

Data/Parameter	p_{WHB}
Data unit	ratio
Description	Correction factor for the uncertainty of the waste heaps burning process
Time of determination/monitoring	Fixed ex ante.
Source of data (to be) used	Scientific study
Value of data applied (for ex ante calculations/determinations)	0,69
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This factor is defined on the basis of the survey of all the waste heaps in the area that provides a ratio of waste heaps that are or have been burning at any point in time to all existing waste heaps. This number is taken from the study of waste heaps in Luhansk region and is defined as the ratio of waste heaps that are or have been on fire historically to all existing waste heaps of Luhansk region. This ratio is equal to 0.69 according to this study.
QA/QC procedures (to be) applied	Standard procedures are used.
Any comment	No

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

The following step-wise approach is used to demonstrate that the project provides reductions in emissions by sources that are additional to any that would otherwise occur:

Step 1. Indication and description of the approach applied

As suggested by Paragraph 2 (c) of the Annex 1 of the Guidance the most recent version of the "Tool for the demonstration and assessment of additionality" approved by the CDM Executive Board is used to demonstrate additionality. At the time of this document completion the most recent version of the "Tool for the demonstration and assessment of additionality" approved by the CDM Executive Board is version 05.2[17] and it is used to demonstrate additionality of the project activity.

Step 2. Application of the approach chosen

The following steps are taken as per "Tool for the demonstration and assessment of additionality" version 05.2

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

We will define realistic and credible alternatives to the project activity through the following Sub-steps:

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

The following alternatives to the proposed project were identified:

Alternative 1. Coal extraction from waste heaps without JI incentives

This scenario is similar to the project activity, only in this case, the project is not benefiting from the possible development as a joint implementation project. In this scenario waste heaps are processed in

[17] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf

order to extract coal and used it the energy sector. Less coal is produced by underground mines of the region.

Alternative 2. Continuation of existing situation

In the current situation waste heaps are not utilised. The spontaneous self-heating and subsequent burning of waste heaps is very common and measures to extinguish fire are taken sporadically. Burning waste heaps are sources of uncontrolled green-house gas emissions. Coal is not extracted from the waste heaps. Coal is produced by underground mines of the region and used for energy production or other purposes. Coal mining activities cause emissions of fugitive methane and also the formation of new waste-heaps.

Outcome of Step 1a: We have identified realistic and credible alternative scenarios to the project activity.

Sub-step 1b: Consistency with mandatory laws and regulations

Existing Ukrainian laws and regulations treat waste heaps as sources of possible dangerous emissions into the atmosphere. In general burning waste heaps should be extinguished and measures must be taken to prevent fires in the future. However, due to the large numbers of waste heaps and their substantial sizes, combined with the limited resources of the owners, they typically do not even undertake the minimum required regular monitoring. Even when informed of a burning waste heap, and measures have to be taken under existing legislation, it is more typical to accept the fine for air contamination, rather than take action to extinguish the burning waste heap itself[18].

In such circumstances it is obvious that identified alternatives do not contradict existing laws and regulations taking into account the enforcement of such in Ukraine.

Outcome of Step 1b: We have identified realistic and credible alternative scenarios to the project activities that are in compliance with mandatory legislation and regulations taking into account the enforcement in Ukraine.

Step 2. Investment Analysis

The purpose of the investment analysis in the context of additionality is to determine whether the proposed project activity is not:

a) The most economically or financially attractive; or
b) Economically or financially feasible, without the revenue from the sale of emission reductions.

Sub-step 2a: Determine appropriate analysis method

In principle, there are three methods applicable for an investment analysis: simple cost analysis, investment comparison analysis and benchmark analysis.

A simple cost analysis (Option I) shall be applied if the proposed JI project and the alternatives identified in step 1 generate no financial or economic benefits other than JI related income. The proposed JI project results in sales revenues due to the extraction of coal from the waste heaps. Thus, this analysis method is not applicable.

[18] *Sverdlovsk – Territory of disaster*, XXI vek, 2007 (http://xxi.com.ua/region/7_26_2.htm)

An investment comparison analysis (Option II) compares suitable financial indicators for realistic and credible investment alternatives. As only plausible alternative represents the continuation of existing situation, a benchmark analysis (Option III) is applied.

Sub-step 2b: Option III. Apply benchmark analysis

The proposed project which is the processing of a mining waste heap for the purpose of coal extraction is implemented by Monolith-Ukraine Ltd. For the benchmark analysis of the project the indicator of Net Present Value (NPV) was used. The goal of analysis will be to show that the project activity not undertaken as a joint implementation project will not be financially attractive and will lead to negative value of NPV. This benchmark has been selected for a number of reasons:

1. The project owner does not have formalized internal benchmark that is systematically applied during project evaluation;
2. No governmental approved benchmark is available for projects of this kind in Ukraine;
3. Positive/negative NPV is a generally accepted project evaluation benchmark. Its use is encouraged by many project finance professionals, while IRR is considered to be controversial and is not recommended as the single benchmark for project evaluation[19].

Sub-step 2c: Calculation and comparison of financial indicators

The financial analysis refers to the time of investment decision-making. The data provided by the project participant were used to perform calculations.

The following assumptions were used for the calculation of cashflows and indicators:

1) Investment decision date is taken as 15th of January 2009. Prices, tariffs and costs for the analysis are taken as of that date;
2) Project lifetime is 2010-2024 based on the physical expected depletion of the waste heaps that will be processed;
3) All calculations were done in local currency – UAH.
4) Discount rate for NPV calculation is taken as the National Bank of Ukraine discount rate which was 12% at the time of analysis date[20].

The Table 7 below demonstrates financial indicator calculated for the project activity.

Table 6 Financial indicators

#	***Project activity***	***NPV, thousand UAH***
1	Processing of waste heaps by Monolith-Ukraine Ltd.	-46 162

As it can be seen from the table the possible project activity results in negative NPV under current conservative discount rate. This means that any investor wishing to invest into such project will lose value of his investment instead of increasing it. Hence, the project cannot be considered as a financially attractive course of action.

Sub-step 2d: Sensitivity analysis

A sensitivity analysis should be made to show whether the conclusion regarding the financial/economic attractiveness is robust to reasonable variations in the critical assumptions, as it can be seen by application of the Methodological Tool “Tool for the demonstration and assessment of additionality” (Version 05.2). As suggested in the Guidance on the Assessment of Investment Analysis contained in

[19] *Principles of Corporate Finance* 7th edition, Richard A. Brealey, Stewart C. Myers, McGraw-Hill Higher Education, 2003 – p. 105

[20] http://www.bank.gov.ua/Statist/Stat_data/discount_rate.htm

this Tool, variations of the key factors in the sensitivity analysis should cover at least the range of +10% and –10%.

The following four key indicators were considered in the sensitivity analysis: investment cost, coal price, fuel price, operational expenses. The other cost components and factors account for less than 20 % of total project costs or total project revenues and therefore are not considered in the sensitivity analysis.

The following scenarios were proposed in order to explore the sensitivity of the analysis results.

Scenario 1 considers a 10% increase of investment cost and all significant cost components. At the same time it assumes 10% price drop on coal. Scenario 1 shows the worst possible case for the investor.

Scenario 2 is based on the assumption of a 10% investment cost and other significant cost components decrease that improves cash flow and simultaneous increase of coal price by 10%. This scenario represents the best case for investor

Scenario 3 implies coal price increase by 20%. At the same time it is assumed that investment cost will decrease by 10% and operational expenses will go up by 10%. This scenario represents a more realistic set of assumptions.

Results of the analysis are provided in the table 7 below.

Table 7 Sensitivity analysis

Scenario	***NPV, UAH thousand***
Base Case	-46 162
Scenario 1 (Investment cost +10%, fuel price +10%, operational expenses +10%, coal price -10%)	-89 666
Scenario 2 (Investment cost -10%, fuel price -10%, operational expenses -10%, coal price +10%)	-2 659
Scenario 3 (Investment cost -10%, fuel price +10%, operational expenses +10%, coal price +20%)	-14 829

As we can see from the table, the project does not reach positive NPV under any of the varying assumptions. Thus, the sensitivity analysis results presented above demonstrate the robustness of conclusions made in sub-step 2c. It can be concluded that project activity is unlikely to be financially/economically attractive.

Outcome of Step 2: After the sensitivity analysis it is concluded that the proposed JI project activity is unlikely to be financially/economically attractive.

Step 3: Barrier analysis
In line with the Additionality Tool no barrier analysis is needed when investment analysis is applied.

Step 4: Common practice analysis

Sub-step 4a: Analyze other activities similar to the proposed project activity:

No activities similar to the proposed project activity are observed in Ukraine except for those that are implemented with the support of JI mechanism[21]. Waste heaps are considered as increased safety risk waste objects. In only a limited number of cases some minor fire extinguishing measures are taken but generally no actions are taken to secure the coal mining waste heaps. Waste heaps rich in coal are often target for uncontrolled amateur coal extraction by local population. These activities lead to increased fire risk and expose local population to increased air pollution. Extracting coal from wastes is practiced by some coke beneficiation plants but they extract coal from organized slurry ponds and those activities are scarce.

Sub-step 4b: Discuss any similar Options that are occurring:

It is required to follow Sub-step 4b according to of the Tool when this project is widely observed and commonly carried out. The proposed JI project does not represent a widely observed practice in the area considered (see Sub-step 4a). There are no similar activities that can be observed in Ukraine and those implemented as JI projects are excluded from the analysis. So, this sub-step is not applied. Extraction of coal from the slurry ponds does not face risk of uncertainty regarding the coal content and is technologically a different process. The facts mentioned above allow concluding that the proposed JI project is not common practice

Sub-steps 4a and 4b are satisfied, i.e. similar activities cannot be widely observed. Thus proposed project activity is not a common practice.

Conclusion: Thus the additionality analysis demonstrates that project emission reductions are additional to any that would otherwise occur**.**

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

The project activities are physically limited to the waste heaps in the legal use of Monolith-Ukraine Ltd. At the same time, some sources of GHG emissions are indirect – fugitive methane emissions as the result of coal mining in Ukraine, carbon dioxide emissions due to the consumption of power from the Ukrainian electricity grid, as a result of electricity generation using fossil fuels. Fugitive methane emissions as the result of coal mining in Ukraine are treated as leakage.

The table below shows an overview of all emission sources in the baseline and project scenarios. Project boundary has been delineated in accordance with provisions of Paragraphs 11, 12, 13 of the Guidance.

21 http://ji.unfccc.int/JI_Projects/DB/VOZK3HERSNQGFLCY0YZ3AX5W676M5R/Determination/Bureau%20Veritas%20Certification1277814730.41/viewDeterminationReport.html

Table 8 Sources of emissions in the baseline and project scenarios

	Source	Gas	Included/Excluded	Justification / Explanation
Baseline	Waste heap burning	CO_2	Included	Main emission source
	Coal consumption	CO_2	Excluded	This coal is displaced in the project activity by the coal extracted from the waste heaps. This emission source is equal to the one present in the project scenario and, therefore is excluded from consideration.
Project scenario	Coal consumption	CO_2	Excluded	This coal is extracted from the waste heaps. This emission source is equal to the one present in the baseline scenario and, therefore is excluded from consideration.
	Electricity use for the process of coal extraction from the waste heap	CO_2	Included	Main emission source
	Fossil fuel (diesel) consumption for the process of coal extraction from the waste heap	CO_2	Included	Main emission source

Baseline scenario

The baseline scenario is the continuation of the existing situation. Coal is produced by the underground mines and is used for energy generation. Waste heaps are often self-heating and burning causing carbon dioxide emissions into the atmosphere. Emission sources in the baseline that are included into the project boundary are:

- Carbon dioxide emissions from the burning of coal in the waste heaps.

Project scenario

In the project scenario waste heaps under processing are taken down and all combustible matter is extracted. Therefore, the possibility of emissions due to spontaneous self-heating and burning of these waste heaps is eliminated. Project activity anticipates combustion of auxiliary diesel fuel to supply coal extraction plant with rock from the waste heaps. Electricity is used to run the project equipment. Additional coal provided by the project reduces the need for coal to be mined from underground. Emission sources in the project scenario:

- Carbon dioxide emissions from the use of fuel to run part of the project equipment (motor cars),
- Carbon dioxide emissions associated with the electricity consumption by the project equipment.

Carbon dioxide emissions that occur during the combustion of energy coal. These are calculated as stationery combustion emissions from coal in the equivalent of the amount of coal that is extracted from the waste heaps in the project scenario. This emission source is also present in the project scenario and the emissions are assumed to be equal in both project and baseline scenario. Therefore, this emission source is not included into consideration both in the project and the baseline scenario.

Leakage

This project will result in a net change (reduction) in fugitive methane emissions due to the mining activities. As coal in the baseline scenario is only coming from mines it causes fugitive emissions of methane. These are calculated as standard country specific emission factor applied to the amount of coal that is extracted from the waste heaps in the project scenario (which is the same as the amount of coal that would have been mined in the baseline scenario.

The following figures show the project boundaries and sources of emissions in the baseline scenario and in the project scenario.

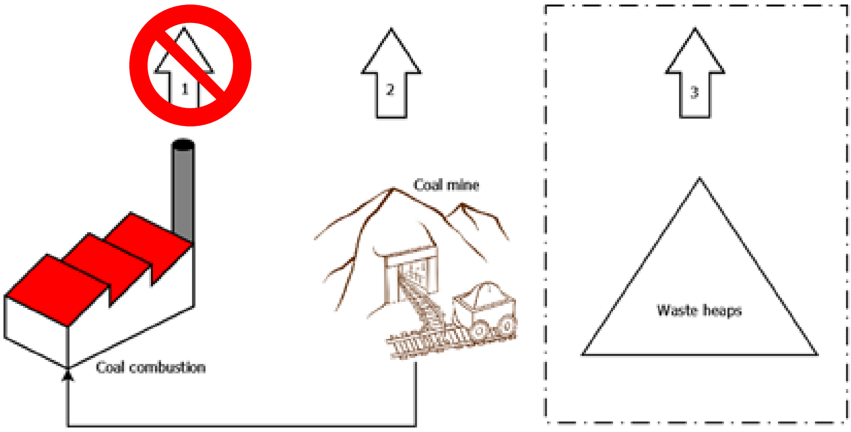

Figure 5. Project boundaries in the baseline scenario

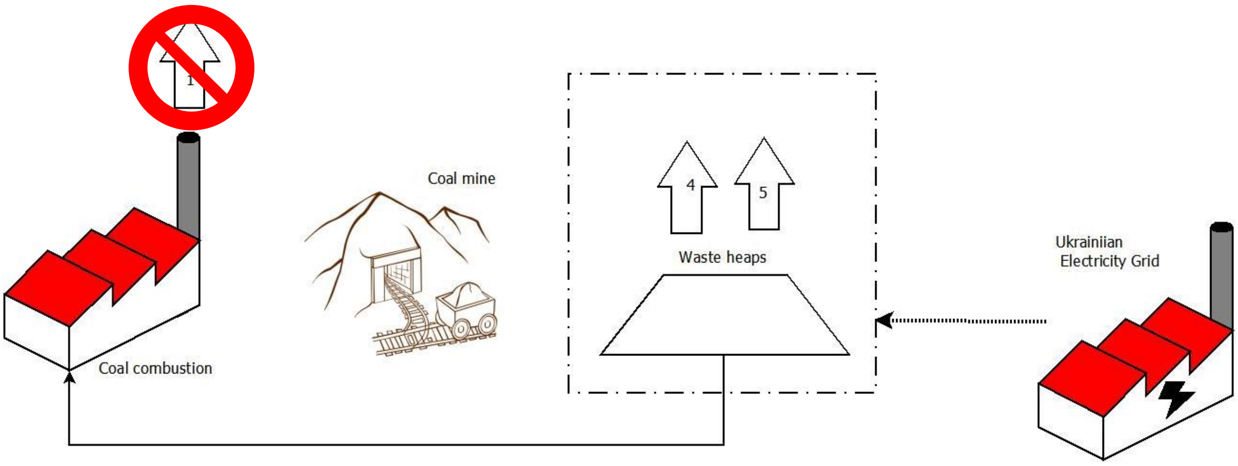

Figure 6. Project boundaries in the project scenario

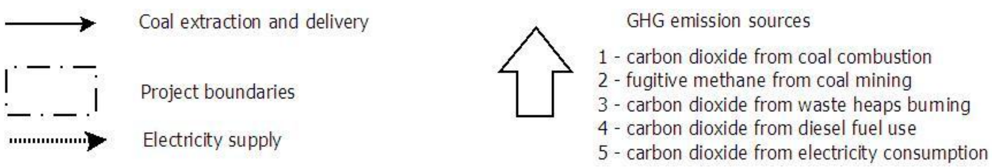

Figure 7 Legend for project boundary schematics

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: 28/11/2010

Name of person/entity setting the baseline:

Denis Prusakov

Global Carbon B.V.

Global Carbon B.V. is the project participant and contact details are available in Annex 1.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

Starting date of the project is 1st of January 2010.

C.2. Expected operational lifetime of the project:

The lifetime of the project is estimated to last until the end of 2024. Thus the operational lifetime of the project will be 15 years or 180 months.

C.3. Length of the crediting period:

Start of the crediting period: 01/01/2010.
Length of crediting period: 3 years or 36 months.

Emission reductions generated after the crediting period may be used in accordance with an appropriate mechanism under the UNFCCC. The crediting period can extend beyond 2012 subject to the approval by the Host Party. Taking this possible extension into account the length of the crediting period starting on the 01/01/2010 will be 15 years or 180 months.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

In order to provide a detailed description of the monitoring plan chosen a step-wise approach is used:

Step 1. Indication and description of the approach chosen regarding monitoring

Option *a* provided by the Guidelines For The Users Of The Joint Implementation Project Design Document Form, Version 04[22] is used: JI specific approach is used in this project and therefore will be used for establishment of monitoring plan.

Step 2. Application of the approach chosen

Baseline scenario

The baseline scenario is the continuation of the existing situation. Coal is produced by the underground mines and is used for energy generation. Waste heaps are often self-heating and burning causing carbon dioxide emissions into the atmosphere. Emission sources in the baseline that are included into the project boundary are:

- Carbon dioxide emissions from the burning of coal in the waste heaps.

Project scenario

In the project scenario waste heaps under processing are taken down and all combustible matter is extracted. Therefore, the possibility of emissions due to spontaneous self-heating and burning of these waste heaps is eliminated. Project activity anticipates combustion of auxiliary diesel fuel to supply coal extraction plant with rock from the waste heaps. Electricity is used to run the project equipment. Additional coal provided by the project reduces the need for coal to be mined from underground. Emission sources in the project scenario:

- Carbon dioxide emissions from the use of fuel to run part of the project equipment (motor cars),
- Carbon dioxide emissions associated with the electricity consumption by the project equipment.

Carbon dioxide emissions that occur during the combustion of energy coal. These are calculated as stationery combustion emissions from coal in the equivalent of the amount of coal that is extracted from the waste heaps in the project scenario. This emission source is also present in the project scenario and the emissions

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

are assumed to be equal in both project and baseline scenario. Therefore, this emission source is not included into consideration both in the project and the baseline scenario.

Emission reductions due to the implementation of this project will come from two major sources:

- Removing the source of green-house gas emissions from the combustion of waste heaps by the extraction of coal from the waste-heaps;
- Negative leakage from the reduced fugitive emissions of methane due to the replacement of coal that would have been mined, by the project.

For any monitoring period the following parameters have to be collected and registered:

1. **Additional electricity consumed in the relevant period as a result of the implementation of the project activity**

   This parameter is registered with a specialized electricity meters. The meter is situated next to the current transformers on the site of the project activity. These meters register all electric energy consumed by the project activity as they are located on the only electrical input available on site. Readings are used in the commercial dealings with the energy supply company. Monthly bills for electricity are available. Regular cross-checks with the energy supply company are performed. The monthly and annual reports are based on the monthly bills data.

2. **Amount of diesel fuel that has been used for the project activity in the relevant period.**

   For the metering of this parameter the commercial data of the company are used. Receipts and other accounting data are used in order to confirm the amount of fuel consumed. All fuel consumption is taken into account and is attributed to the project activity. If the data in the commercial documents mentioned are provided in litres rather than in tonnes the data in litres are converted into tonnes using the density of 0,85 kg/l[23]. Regular cross-checks with the suppliers are performed. The monthly and annual reports are based on these data.

3. **Amount of coal that has been extracted from the waste heaps and combusted for energy use in the project activity in the relevant period which is equal to the amount of coal that has been mined in the baseline scenario and combusted for energy use.**

   For the metering of this parameter the commercial data of the company are used. Receipts and acceptance certificates from the customers are used in order to confirm the amount of coal restored. Only shipped coal is taken into account and is attributed to the project activity. Weighting of the coal is done on site by the special automobile scales. Regular cross-checks with the customers are performed. The monthly and annual reports are based on these shipment data.

Data and parameters that are not monitored throughout the crediting period, but are determined only once (and thus remain fixed throughout the crediting period), and that are available already at the stage of determination regarding the PDD are provided in the table below:

[23] GOST 305-82 Diesel Fuel. Specifications. 0,85 kg/l is taken as an avearage between two suggested types of diesel: summer and winter http://elarum.ru/info/standards/gost-305-82/

Table 9 List of constants used in the calculations of emissions

Data / Parameter	***Data unit***	***Description***	***Data Source***	***Value***
GWP_{CH4}		Global Warming Potential of Methane	IPCC Second Assessment Report[24]	21
ρ_{CH4}	t/m^3	Methane density	Standard (at room temperature 20˚C and 1 ATM)	0.00067
NCV_{Coal}	TJ/kt	Net Calorific Value of coal	National Inventory Report of Ukraine 1990-2008[25], p. 258	21.59
NCV_{Diesel}	TJ/kt	Net Calorific Value of diesel fuel	National Inventory Report of Ukraine 1990-2008, p. 258	42.17
$OXID_{Coal}$	ratio	Carbon Oxidation factor of coal	National Inventory Report of Ukraine 1990-2008, p. 265	0.98
$OXID_{Diesel}$	ratio	Carbon Oxidation factor of diesel fuel	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook, Energy, p. 1-8	0.99
k^{C}_{Diesel}	tC/TJ	Carbon content of diesel fuel	National Inventory Report of Ukraine 1990-2008, p. 264	20.2
k^{C}_{Coal}	tC/TJ	Carbon content of coal	National Inventory Report of Ukraine 1990-2008, p. 265	26.8
$EF_{CO2,EL,y}$	tCO2/MWh	CO2 emission factor for electricity consumed by the project activity in year y equal to emission factor of Ukrainian grid for reducing projects.	See Annex 2. Emission factor is fixed ex ante.	0.896

[24] "*IPCC Second Assessment: Climate Change 1995. A Report of the Intergovernmental Panel on Climate Change*".Bolin, B. et al. (1995). IPCC website. http://www.ipcc.ch/pdf/climate-changes-1995/ipcc-2nd-assessment/2nd-assessment-en.pdf.

[25] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2010-nir-22may.zip

$EF_{CH_4,CM}$	m3/t	Emission factor for fugitive methane emissions from coal mining	National Inventory Report of Ukraine 1990-2008, p.74	25.67
p_{WHB}	ratio	Correction factor for the uncertainty of the waste heaps burning process	Scientific study - Analysis on the fire risk of Luhansk Region's waste heaps, Scientific Research Institute "Respirator", Donetsk, 2010	0.69

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

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

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1	$EC_{PJ,y}$ - Additional electricity consumed in year y as a result of the implementation of the project activity	Company records, electricity meters	MWh	m	continuously with monthly totals	100%	Electronic and paper	This parameter is registered with a specialized electricity meters.
2	$FC_{PJ,Diesel,y}$ - Amount of diesel fuel that has been used for the project activity in the year y	Company records	t	m	monthly	100%	Electronic and paper	For the metering of this parameter the commercial data of the company are used. Receipts and other

								accounting data are used in order to confirm the amount of fuel consumed.

The table above includes data and parameters that are monitored throughout the crediting period.

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

Emissions from the project activity are calculated as follows:

$$PE_y = PE_{EL,y} + PE_{Diesel,y},$$ (Equation 5)

where:

PE_y, - Project Emissions due to project activity in the year *y* (tCO_2e),

$PE_{EL,y}$ - Project Emissions due to consumption of electricity from the grid by the project activity in the year *y* (tCO_2e),

$PE_{Diesel,y}$ - Project Emissions due to consumption of diesel fuel by the project activity in the year *y* (tCO_2e).

These, in turn, are calculated as:

$$PE_{EL,y} = EC_{PJ,y} \cdot EF_{CO2,EL,y},$$ (Equation 6)

where:

$EC_{PJ,y}$ - Additional electricity consumed in year *y* as a result of the implementation of the project activity (MWh),

$EF_{CO2,EL,y}$ - CO_2 emission factor for electricity consumed by the project activity in year *y* equal to emission factor of Ukrainian grid for reducing projects (tCO_2/MWh). The emission factor has been selected from the study “Standardized emission factors for the Ukrainian electricity grid” version 5.2 (refer to Annex 2). The emission factor for the reducing projects includes grid losses into the estimation and, therefore, is higher than the emission factor for projects producing electricity. In this project additional electricity consumption is a part of the project scenario. Calculation of the project scenario emissions due to additional electricity consumption must take grid losses and associated emissions into account. The selected emission factor is conservative.

$$PE_{Diesel,y} = \frac{FC_{PJ,Diesel,y}}{1000} \cdot NCV_{Diesel} \cdot OXID_{Diesel} \cdot k^{C}_{Diesel} \cdot 44/12, \qquad \text{(Equation 7)}$$

where:

$FC_{PJ,Diesel,y}$ - Amount of diesel fuel that has been used for the project activity in the year *y*, t.

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
3	$FC_{BE,Coal,y}$ - Amount of coal that has been mined in the baseline scenario and combusted for energy use, equivalent to the amount of coal extracted from the waste heaps in the project activity in the year y	Company records, scales	t	m	monthly	100%	Electronic and paper	For the metering of this parameter the commercial data of the company are used. Receipts and acceptance certificates from the customers are used in order to confirm the amount of coal restored.

The table above includes data and parameters that are monitored throughout the crediting period.

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

Emissions in the baseline scenario are calculated as follows:

$$BE_y = BE_{WHB,y},$$ (Equation 8)

where:

BE_y, - Baseline Emissions in the year *y* (tCO_2e),

$BE_{WHB,y}$ - Baseline Emissions due to burning of the waste heaps in the year *y* (tCO_2e).

These, in turn, are calculated as:

$$BE_{WHB} = \frac{FC_{BE,Coal,y}}{1000} \cdot p_{WHB} \cdot NCV_{Coal} \cdot OXID_{Coal} \cdot k^{C}_{Coal} \cdot 44/12,$$ (Equation 9)

where:

$FC_{BE,Coal,y}$ - Amount of coal that has been mined in the baseline scenario and combusted for energy use, equivalent to the amount of coal extracted from the waste heaps in the project activity in the year y, t.

p_{WHB} - Correction factor for the uncertainty of the waste heaps burning process. This factor is defined on the basis of the survey of all the waste heaps in the area that provides a ratio of waste heaps that are or have been burning at any point in time to all existing waste heaps. This number is taken from the study[26] of waste heaps in Luhansk region and is defined as the ratio of waste heaps that are or have been on fire historically to all existing waste heaps of Luhansk region. This ratio is equal to 0.69 according to this study.

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

This section is left blank on purpose

[26] *Analysis on the fire risk of Luhansk Region's waste heaps*, Scientific Research Institute "Respirator", Donetsk, 2010.

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

This section is left blank on purpose

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):

This section is left blank on purpose

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

This project will result in a net change in fugitive methane emissions due to the mining activities. As coal in the baseline scenario is only coming from mines it causes fugitive emissions of methane. These are calculated as standard country specific emission factor applied to the amount of coal that is extracted from the waste heaps in the project scenario (which is the same as the amount of coal that would have been mined in the baseline scenario.

This leakage is significant and will be included in the monitoring plan and calculation of the project emission reductions.

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
5	$FC_{BE,Coal,y}$ - Amount of coal that has been mined in the baseline scenario and combusted for energy use, equivalent to the amount of coal extracted from the waste heaps in the project activity in the year y	Company records, scales	t	m	monthly	100%	Electronic and paper	For the metering of this parameter the commercial data of the company are used. Receipts and acceptance certificates from the customers are used in order to confirm the amount of coal restored.

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

Leakages in the year y are calculated as follows:

$$LE_y = -LE_{CH_4,y} \quad \text{(Equation 10)}$$

Leakages due to fugitive emissions of methane in the mining activities in the year *y* (tCO_2e).

$$LE_{CH_4,y} = FC_{BE,Coal,y} \cdot EF_{CH_4,CM} \cdot \rho_{CH_4} \cdot GWP_{CH_4}, \quad \text{(Equation 11)}$$

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):

The annual emission reductions are calculated as follows:

$$ER_y = BE_y - LE_y - PE_y \qquad \text{(Equation 12)}$$

where:

ER_y - Emissions reductions of the JI project in year y (tCO_2e)

LE_y – Leakages in the year y (tCO_2e);

BE_y - Baseline Emission in year y (tCO_2e);

PE_y - Project Emission in year y (tCO_2e);

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:

Collection and archiving of the information on the environmental impacts of the project will be done based on the approved EIA in accordance with the Host Party legislation - *State Construction Standard DBN A.2.2.-1-2003 :"Structure and Contents of the Environmental Impact Assessment Report (EIR) for Designing and Construction of Production Facilities, Buildings and Structures"* State Committee Of Ukraine On Construction And Architecture, 2004 (see Section F.1).

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.
D.1.1.1. – ID 1	Low	The electricity meters are calibrated according to the procedures of the Host Party. Calibration interval is 6 years.
D.1.1.1. – ID 2	Low	This data are used in the commercial activity of the company. Accounting documentation will be used.
D.1.1.3. – ID 3	Low	These data are used in commercial activities of the company. The scales are calibrated according to the procedures of the Host Party. Calibration interval is 1 year.

D.1.3.1. – ID 4	Low	These data are used in commercial activities of the company. The scales will be calibrated according to the procedures of the Host Party. Calibration interval is 1 year.

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

The project owner – Monolith-Ukraine Ltd. will implement provisions of this monitoring plan into its organizational and quality management structure. For monitoring, collection, registration, visualization, archiving, reporting of the monitored data and periodical checking of the measurement devices the management team headed by the Director of the company is responsible. A detailed structure of the team and team members will be established in the Monitoring Manual prior to initial and first verification. The principle structure presents on the following flow-chart:

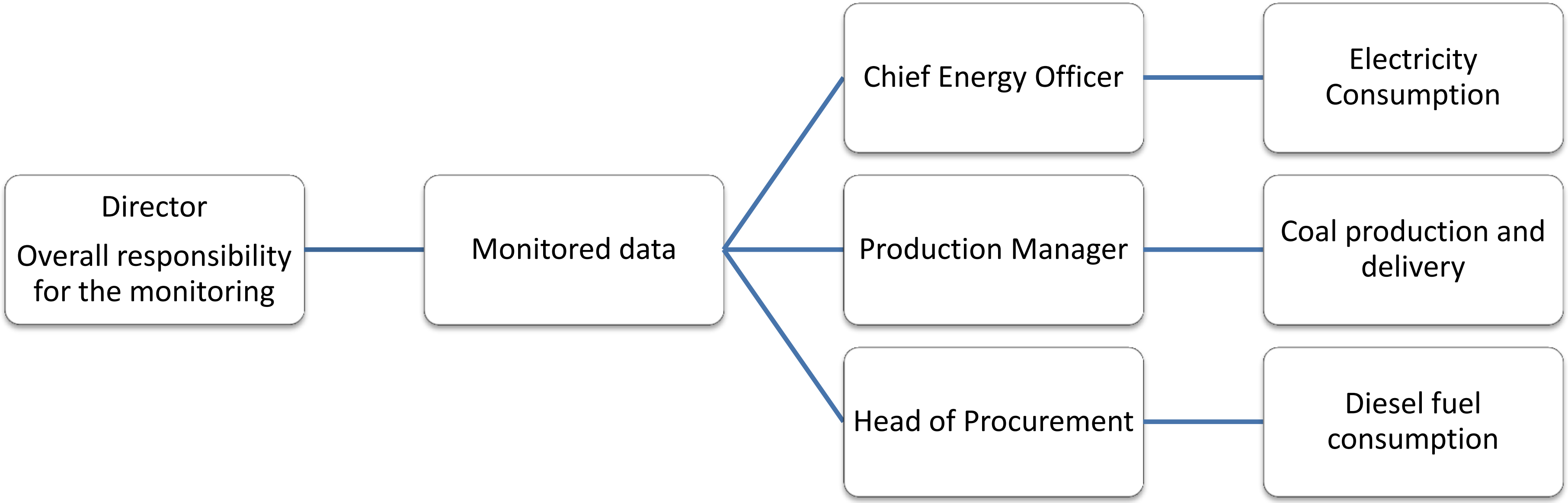

Figure 8 Monitoring flowchart

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

Global Carbon B.V.

Denis Prusakov,

Global Carbon B.V. is the project participant and contact details are available in Annex 1.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Table 10 Estimated project emissions during the crediting period

		2010	2011	2012	Total
Project Emissions due to consumption of electricity from the grid by the project activity	[tCO2/yr]	1 517	2 912	2 912	**7 341**
Project Emissions due to consumption of diesel fuel by the project activity	[tCO2/yr]	1 733	3 759	3 759	**9 251**
Total Project emissions during the crediting period	[tCO2/yr]	3 250	6 671	6 671	**16 592**

Table 11 Estimated project emissions after the crediting period

		2013-2024	Total
Project Emissions due to consumption of electricity from the grid by the project activity	[tCO2/yr]	34 944	**34 944**
Project Emissions due to consumption of diesel fuel by the project activity	[tCO2/yr]	45 108	**45 108**
Total Project emissions after the crediting period	[tCO2]	80 052	**80 052**

E.2. Estimated leakage:

Table 12 Estimated leakages during the crediting period

		2010	2011	2012	Total
Leakages due to fugitive emissions of methane in the mining activities in the year *y*	[tCO2/yr]	-27 534	-46 953	-46 953	**-121 440**
Total leakages during the crediting period	[tCO2/yr]	-27 534	-46 953	-46 953	**-121 440**

Table 13 Estimated leakages after the crediting period

		2013-2024	Total
Leakages due to fugitive emissions of methane in the mining activities in the year *y*	[tCO2/yr]	-563 436	**-563 436**
Total leakages during the crediting period	[tCO2]	-563 436	**-563 436**

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

Table 14 Estimated total project emissions during the crediting period

		2010	2011	2012	Total
Total Project emissions during the crediting period	[tCO2]	-24 284	-40 282	-40 282	**-104 848**

Table 15 Estimated total project emissions after the crediting period

		2013-2024	Total
Total Project emissions after the crediting period	[tCO2]	-483 384	**-483 384**

E.4. Estimated baseline emissions:

Table 16 Estimated baseline emissions during the crediting period

		2010	2011	2012	Total
Baseline Emissions due to burning of the waste heaps	[tCO2/yr]	109 365	186 499	186 499	**482 363**
Baseline emissions during the crediting period	[tCO2/yr]	109 365	186 499	186 499	**482 363**

Table 17 Estimated baseline emissions after the crediting period

		2013-2024	Total
Baseline Emissions due to burning of the waste heaps	[tCO2/yr]	2 237 988	**2 237 988**
Baseline emissions after the crediting period	[tCO2]	2 237 988	**2 237 988**

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

Table 18 Estimated emission reductions during the crediting period

		2010	2011	2012	Total
Emission reductions during the crediting period	[tCO2/yr]	133 649	226 781	226 781	**587 211**

Table 19 Estimated emission reductions after the crediting period

		2013-2024	Total
Emission reductions after the crediting period	[tCO2]	2 721 372	**2 721 372**

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

Table 20 Estimated balance of emissions under the proposed project over the crediting period

YEAR	Estimated Project Emissions (tonnes CO_2 Equivalent)	Estimated Leakage (tonnes CO2 Equivalent)	Estimated Baseline Emissions (tonnes CO_2 Equivalent)	Estimated Emissions Reductions (tonnes CO_2 Equivalent)
2010	3 250	-27 534	109 365	133 649
2011	6 671	-46 953	186 499	226 781
2012	6 671	-46 953	186 499	226 781
Total (tonnes CO_2 Equivalent)	**16 592**	**-121 440**	**482 363**	**587 211**

Table 21 Estimated balance of emissions under the proposed project after the crediting period

YEAR	Estimated Project Emissions (tonnes CO_2 Equivalent)	Estimated Leakage (tonnes CO2 Equivalent)	Estimated Baseline Emissions (tonnes CO_2 Equivalent)	Estimated Emissions Reductions (tonnes CO_2 Equivalent)
2013	6 671	-46 953	186 499	226 781
2014	6 671	-46 953	186 499	226 781
2015	6 671	-46 953	186 499	226 781
2016	6 671	-46 953	186 499	226 781
2017	6 671	-46 953	186 499	226 781
2018	6 671	-46 953	186 499	226 781
2019	6 671	-46 953	186 499	226 781
2020	6 671	-46 953	186 499	226 781
2021	6 671	-46 953	186 499	226 781
2022	6 671	-46 953	186 499	226 781
2023	6 671	-46 953	186 499	226 781
2024	6 671	-46 953	186 499	226 781
Total (tonnes CO_2 Equivalent)	**80 052**	**-563 436**	**2 237 988**	**2 721 372**

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts of the project, including transboundary impacts, in accordance with procedures as determined by the host Party:

The Host Party for this project is Ukraine. Environmental Impact Assessment (EIA) is the part of the Ukrainian project planning and permitting procedures. Implementation regulations for EIA are included in the Ukrainian State Construction Standard DBN A.2.2.-1-2003[27] (Title:"Structure and Contents of the Environmental Impact Assessment Report (EIR) for Designing and Construction of Production Facilities, Buildings and Structures").

Annex F of this standard contains a list of "types of projects or activities which constitute higher environmental risk" for which full EIA is mandatory, and the Ministry of Environment being the competent authority. Project activity, which is the utilization of coal mining waste and production of coal, is included in this list.

The full scope EIA in accordance with the Ukrainian legislation has been conducted for the proposed project in 2008 by the local developer PJSC "LUHANSKGIPROSHAKHT". Key findings of this EIA are summarized below:

- Impact on air is the main environmental impact of the project activity. Dust emissions due to the erosion and project activity such as loading and offloading operations of input rock and processed coal will be limited. Also emissions from transport will be present during the project operation stage. The impact will not exceed maximum allowable concentration at the edge of the sanitary zone;
- Impact on water is minor. The project activity will use water in a closed cycle without discharge of waste water. The possible discharge of the processed water will not have negative impact on the quality of water in the surface reservoirs;
- Impacts on flora and fauna are insignificant. The design documentation demands re-cultivation of the landscape. Grass and trees will be planted on the re-cultivated areas in order to prevent flora and fauna degradation. No rare or endangered species will be impacted. Project activity is not located in the vicinity of national parks or protected areas;
- Noise impact is limited. Main source of noise will be located at the minimum required distance from residential areas, mobile noise sources (automobile transport) will be in compliance with local standards;
- Impacts on land use are positive. Significant portions of land will be freed from the waste heaps and will be available for development. Fertile soil will be used to recultivate the land lot;
- Transboundary impacts are not observed. There are no impacts that manifest within the area of any other country and that are caused by a proposed project activity which wholly physically originates within the area of Ukraine.

The list of available EIA documentation includes:

1) *Project of the mining rock processing and coal benefication complex at the site of former mine #6 "Daryevskaya". Volume I: Explanatory Note. Book 3 Environmental Impact Assessment. P7221-3-P3, PJSC "LUHANSKGIPROSHAKHT", Luhansk 2008*

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[27] *State Construction Standard DBN A.2.2.-1-2003 :"Structure and Contents of the Environmental Impact Assessment Report (EIR) for Designing and Construction of Production Facilities, Buildings and Structures"* State Committee Of Ukraine On Construction And Architecture, 2004

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

The full scope EIA in accordance with the Ukrainian legislation has been conducted for the proposed project in 2008 by the local developer PJSC "LUHANSKGIPROSHAKHT". The findings of the report are summarized in the section F.1. above. The report has been reviewed by the competent authorities of Ukraine. The environmental impact of the project has not been considered significant or prohibitive. Completion of Environmental Impact Assessment reports and positive findings of the competent state authority conclude the procedure of the environmental impact assessment according to the Ukrainian laws and regulations.

SECTION G. Stakeholders' comments

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

No stakeholder consultation process for the JI projects is required by the Host Party. Stakeholder comments will be collected during the time of this PDD publication in the internet during the determination procedure.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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Annex 2

BASELINE INFORMATION

Table containing the key elements of the baseline

#	Parameter	Data unit	Source of data
1	$FC_{BE,Coal,y}$ - Amount of coal that has been mined in the baseline scenario and combusted for energy use, equivalent to the amount of coal extracted from the waste heaps in the project activity in the year y	t	Data of project owner
2	$EF_{CH_4,CM}$ Emission factor for fugitive methane emissions from coal mining.	m^3/t	National Inventory Report of Ukraine 1990-2008[28], p.74
3	p_{WHB} Correction factor for the uncertainty of the waste heaps burning process.	Dimentionless	Scientific study - Analysis on the fire risk of Luhansk Region's waste heaps, Scientific Research Institute "Respirator", Donetsk, 2010
4	GWP_{CH4} Global Warming Potential of Methane	Dimentionless	IPCC Second Assessment Report[29]
5	ρ_{CH4} Methane density	t/m^3	Standard (at room temperature 20˚C and 1 ATM)
6	NCV_{Coal} Net Calorific Value of coal	TJ/kt	National Inventory Report of Ukraine 1990-2008, p. 258
7	$OXID_{Coal}$ Carbon Oxidation factor of coal	Dimentionless	National Inventory Report of Ukraine 1990-2008, p.265
8	k^{C}_{Coal} Carbon content of coal	tC/TJ	National Inventory Report of Ukraine 1990-2008, p.265

[28] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2010-nir-22may.zip

[29] "*IPCC Second Assessment: Climate Change 1995. A Report of the Intergovernmental Panel on Climate Change*".Bolin, B. et al. (1995). IPCC website. http://www.ipcc.ch/pdf/climate-changes-1995/ipcc-2nd-assessment/2nd-assessment-en.pdf.

Standardized emission factors for the Ukrainian electricity grid

Introduction

Many Joint Implementation (JI) projects have an impact on the CO_2 emissions of the regional or national electricity grid. Given the fact that in most Economies in Transition (IET) an integrated electricity grid exists, a standardized baseline can be used to estimate the amount of CO_2 emission reductions on the national grid in case of:

a) Additional electricity production and supply to the grid as a result of a JI project (= producing projects);
b) Reduction of electricity consumption due to the JI project resulting in less electricity generation in the grid (= reducing projects);
c) Efficient on-site electricity generation with on-site consumption. Such a JI project can either be a), b), or a combination of both (e.g. on-site cogeneration with partial on-site consumption and partial delivery to the grid).

So far most JI projects in EIT, including Ukraine, have used the standardized Emission Factors (EFs) of the ERUPT programme. In the ERUPT programme for each EIT a baseline for producing projects and reducing projects was developed. The ERUPT approach is generic and does not take into account specific local circumstances. Therefore in recent years new standardized baselines were developed for countries like Romania, Bulgaria, and Estonia. In Ukraine a similar need exist to develop a new standardized electricity baseline to take the specific circumstances of Ukraine into account. The following baseline study establishes a new electricity grid baseline for Ukraine for both producing JI projects and reducing JI projects.

This new baseline has been based on the following guidance and approaches:

- The “Guidance on criteria for baseline setting and monitoring” for JI projects, issued by the Joint Implementation Supervisory Committee[30];
- The “Operational Guidelines for the Project Design Document”, further referred to as ERUPT approach or baseline [31];
- The approved CDM methodology ACM0002 “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” [32];
- Specific circumstances for Ukraine as described below.

ERUPT

The ERUPT baseline was based on the following main principles:

- Based mainly on indirect data sources for electricity grids (i.e. IEA/OECD reports);
- Inclusion of grid losses for reducing JI projects;
- An assumption that all fossil fuel power plants are operating on the margin and in the period of 2000-2030 all fossil fuel power plants will gradually switch to natural gas.

The weak point of this approach is the fact that the date sources are not specific. For example, the Net Calorific Value (NCV) of coals was not determined on installation level but was taken from IPCC default values. Furthermore the IEA data included electricity data until 2002 only. ERUPT assumes that Ukraine

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[30] Guidance on criteria for baseline setting and monitoring, version 01, Joint Implementation Supervisory Committee, ji.unfccc.int

[31] Operational Guidelines for Project Design Documents of Joint Implementation Projects. Ministry of Economic Affairs of the Netherlands, May 2004

[32] Consolidated baseline methodology for grid-connected electricity generation from renewable sources, version 06, 19 May 2006, cdm.unfccc.int

would switch all its fossil-fuel plant from coal to natural gas. In Ukraine such an assumption is unrealistic as the tendency is currently in the opposite direction.

ACM0002

The ACM0002 methodology was developed in the context of CDM projects. The methodology takes a combination of the Operating Margin (OM) and the Build Margin (BM) to estimate the emissions in absence of the CDM project activity. To calculate the OM four different methodologies can be used. The BM in the methodology assumes that recent built power plants are indicative for future additions to the grid in the baseline scenario and as a result of the CDM project activity construction of new power plants is avoided. This approach is valid in electricity grids in which the installed generating capacity is increasing, which is mostly the case in developing countries. However, the Ukrainian grid has a significant overcapacity and many power plants are either operating below capacity or have been moth-balled.

Nuclear is providing the base load in Ukraine

In Ukraine nuclear power plants are providing the base load of the electricity in Ukraine. To reduce the dependence on imported fuel the nuclear power plants are running at maximum capacity where possible. In the past five years nuclear power plants provide almost 50% of the total electricity:

Year	2001	2002	2003	2004	2005
Share of AES	44%	45%	45%	48%	48%

Table 22: Share of nuclear power plant in the annual electricity generation

All other power stations are operating on the margin. This includes hydro power plants which is show in the table below.

	Minimum; 03:00	Maximum; 19:00
Consumption, MW	21,287	27,126
Generation, MW	22,464	28,354
Thermal power plants	*10,049*	*13,506*
Hydro power plants	*527*	*3,971*
Nuclear power plants	*11,888*	*10,877*
Balance imports/export, MW	-1,177	-1,228

Table 23: Electricity demand in Ukraine on 31 March 2005[33]

Development of the Ukrainian electricity sector

The National Energy Strategy[34] sets the approach for the overall energy complex of Ukraine and the electricity sector in particular. The main priority of Ukraine is to reduce the dependence of imported fossil fuels. The strategy sets the following priorities[35]:

- increased use of local coal as a fuel;
- construction of the new nuclear power plants;
- energy efficiency and energy saving.

[33] Ukrenergo, http://www.ukrenergo.energy.gov.ua/ukrenergo/control/uk/publish/article?art_id=39047&cat_id=35061

[34] http://mpe.kmu.gov.ua/fuel/control/uk/doccatalog/list?currDir=50505

[35] Energy Strategy of Ukraine for the Period until 2030, section 16.1, page 127.

Due to the sharp increase of imported natural gas prices a gradual switch from natural gas to coal at the power plants is planned in the nearest future. Ukraine possesses a large overcapacity of the fossil-powered plants of which many are mothballed. These moth-balled plants might be connected to the grid in case of growing demand.

In the table below the installed capacity and load factor is given in Ukraine. As one can see the average load factor of thermal power plant is very low.

	Installed capacity (GW)	Average load factor, %
Thermal power plants	33.6	28.0
Hydro power plants	4.8	81.4
Nuclear power plants	13.8	26.0
Total	**52.2**	**39.0**

Table 24: Installed capacity in Ukraine in 2004[36]

According to IEA's estimations, about 25% of thermal units might not be able to operate (though there is no official statistics). This means that still at least 45% of the installed thermal power capacity could be utilized, but is currently not used. In accordance with the IEA report the 'current capacity will be sufficient to meet the demand in the next decade'[37].

In the table below the peak load of the years 2001- 2005 are given which is approximately 50% of the installed capacity.

	2001	2002	2003	2004	2005
Peak load (GW)	28.3	29.3	26.4	27.9	28.7

Table 25: Peak load in Ukraine in 2001 - 2005[38]

New nuclear power plants will take significant time to be constructed will not get on-line before the end of the second commitment period in 2012. There is no nuclear reactor construction site at such an advanced stage remaining in Ukraine, it is unlikely that Ukraine will have enough resources to commission any new nuclear units in the foreseeable future (before 2012)[39].

Latest nuclear additions (since 1991):
- Zaporizhzhya NPP unit 6, capacity 1 GW, commissioned in 1995;
- Rivne NPP unit 4, capacity 1 GW, commissioned in 2004;
- Khmelnitsky NPP unit 2, capacity 1 GW, commissioned in 2004.

Nuclear power plants under planning or at early stage of construction:
- South Ukraine NPP one additional unit, capacity 1 GW;
- Khmelnitsky NPP two additional units, capacity 1 GW each.

Approach chosen
In the selected approach of the new Ukrainian baseline the BM is not a valid parameter. Strictly applying BM in accordance with ACM0002 would result in a BM of zero as the latest additions to the Ukrainian

[36] Source: Ukraine Energy Policy Review. OECD/IEA, Paris 2006. p. 272, table 8.1

[37] Source: Ukraine Energy Policy Review. OECD/IEA, Paris 2006. p. 269

[38] Ministry of Energy, letter dated 11 January 2007

[39] http://www.xaec.org.ua/index-ua.html

grid were nuclear power plants. Therefore applying BM taking past additions to the Ukrainian grid would result in an unrealistic and distorted picture of the emission factor of the Ukrainian grid. Therefore the Operating Margin only will be used to develop the baseline in Ukraine.

The following assumptions from ACM0002 will be applied:
1) The grid must constitute of all the power plants connected to the grid. This assumption has been met as all power plants have been considered;
2) There should be no significant electricity imports. This assumption has been met in Ukraine as Ukraine is a net exporting country as shown in the table below;
3) Electricity exports are not accounted separately and are not excluded from the calculations.

	2001	2002	2003
Electricity produced, GWh	175,109	179,195	187,595
Exports, GWh	5,196	8,576	12,175
Imports, GWh	2,137	5,461	7,235

Table 26: Imports and exports balance in Ukraine[40]

ACM0002 offers several choices for calculating the OM. Dispatch data analysis cannot be applied, since the grid data is not available[41]. Simple adjusted OM approach is not applicable for the same reason. The average OM calculation would not present a realistic picture and distort the results, since nuclear power plants always work in the base load due to the technical limitations (and therefore cannot be displaced) and constitute up to 48% of the overall electricity generation during the past 5 years.

Therefore, the simple OM approach is used to calculate the grid emission factor. In Ukraine the low-cost must-run power plants are nuclear power stations. Their total contribution to the electricity production is below 50% of the total electricity production. The remaining power plants, all being the fossil-fuel plants and hydro power plants, are used to calculate the Simple OM.

%	2001	2002	2003	2004	2005
Nuclear power plants	44.23	45.08	45.32	47.99	47.92
Thermal power plants	38.81	38.32	37.24	32.50	33.22
Combined heat and power	9.92	11.02	12.28	13.04	12.21
Hydro power plants	7.04	5.58	5.15	6.47	6.65

Table 27: Share of power plants in the annual electricity generation of Ukraine[42]

[40] Source: State Committee of Statistics of Ukraine. Fuel and energy resources of Ukraine 2001-2003. Kyiv, 2004

[41] Ministry of Energy, letter dated 11 January 2007

[42] “Overview of data on electrical power plants in Ukraine 2001 - 2005“, Ministry of Fuel and Energy of Ukraine, 31 October 2006 and 16 November 2006.

The simple OM is calculated using the following formula:

$$EF_{OM,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum GEN_{j,y}} \quad \textit{(Equation 1)}$$

Where:

$F_{i,j,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources *j* in year(s) *y* (2001-2005);

j refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid;

$COEF_{i,j,y}$ is the CO2 emission coefficient of fuel *I* (tCO2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources *j* and the percent oxidation of the fuel in year(s) *y*;

$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source *j*.

The CO2 emission coefficient $COEF_i$ is obtained as:

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \quad \textit{(Equation 2)}$$

Where:

NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel *i*;

$OXID_i$ is the oxidation factor of the fuel;

$EF_{CO2,i}$ is the CO2 emission factor per unit of energy of the fuel *i*.

Individual data for power generation and fuel properties was obtained from the individual power plants[43]. The majority of the electricity (up to 95%) is generated centrally and therefore the data is comprehensive[44].

The Net Calorific Value (NCV) of fossil fuel can change considerably, in particular when using coal. Therefore the local NCV values of individual power plants for natural gas and coal were used. For heavy fuel oil, the IPCC[45] default NCV was used. Local CO_2 emission factors for all types of fuels were taken for the purposes of the calculations and Ukrainian oxidation factors were used. In the case of small-scale power plants some data regarding the fuel NCV is missing in the reports. For the purpose of simplicity, the NCV of similar fuel from a power plant from the same region of Ukraine was used.

Reducing JI projects

The Simple OM is applicable for additional electricity production delivered to the grid as a result of the project (producing JI projects). However, reducing JI projects also reduce grid losses. For example a JI

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[43] "Overview of data on electrical power plants in Ukraine 2001 - 2005", Ministry of Fuel and Energy of Ukraine, 31 October 2006 and 16 November 2006.

[44] The data for small units (usually categorized in the Ukrainian statistics as 'CHPs and others') is scattered and was not always available. As it was rather unrealistic to collect the comprehensive data from each small-scale power plant, an average CO2 emission factor was calculated for the small-scale plants that provided the data. For the purpose of simplicity it was considered that all the electricity generated by the small power plants has the same average emission factor obtained.

[45] IPCC 1996. Revised guidelines for national greenhouse gas inventories.

project reduces on-site electricity *consumption* with 100,000 MWh and the losses in the grid are 10%. This means that the actual reduction in electricity *production* is 111,111 MWh. Therefore a reduction of these grid losses should be taken into account for reducing JI projects to calculate the actual emission reductions.

The losses in the Ukrainian grid are given in the table below and are based on the data obtained directly from the Ukrainian power plants through the Ministry of Energy.

Year	Technical losses %	Non-technical losses %	Total %
2001	14,2	7	21,2
2002	14,6	6,5	21,1
2003	14,2	5,4	19,6
2004	13,4	3,2	16,6
2005	13,1	1,6	14,7

Table 28: Grid losses in Ukraine[46]

As one can see grid losses are divided into technical losses and non-technical losses. For the purpose of estimating the EF only technical losses[47] are taken into account. As can been seen in the table the technical grid losses are decreasing. The average decrease of grid losses in this period was 0.275% per annum. Extrapolating these decreasing losses to 2012 results in technical grid losses of 12% by 2012. However, in order to be conservative the grid losses *over the full period 2006-2012* have been taken as 10%.

Further considerations

The "Guidance on criteria for baseline setting and monitoring" for JI projects requires baselines to be conservative. The following measures have been taken to adhere to this guidance and to be conservative:

- The grid emission factor is actually expected to grow due to the current tendency to switch from gas to coal;
- Hydro power plants have been included in the OM. This is conservative;
- With the growing electricity demand, out-dated mothballed fossil fired power plants are likely to come on-line as existing nuclear power plants are working on full load and new nuclear power plants are unlikely to come on-line before 2012. The emission factor of those moth-balled power plants is higher as all of them are coal of heavy fuel oil fired[48];
- The technical grid losses in Ukraine are high, though decreasing. With the current pace the grid losses in Ukraine will be around 12% in 2012. To be conservative the losses have been taken 10%;
- The emissions of methane and nitrous oxide have not taken into consideration, which is in line with ACM0002. This is conservative.

Conclusion

An average CO_2 emission factor was calculated based on the years 2003-2005. The proposed baseline factors is based on the average constituting a fixed emission factor of the Ukrainian grid for the period of 2006-2012. Both baseline factors are calculated using the formulae below:

[46] "Overview of data on electrical power plants in Ukraine 2001 - 2005", Ministry of Fuel and Energy of Ukraine, 31 October 2006 and 16 November 2006.

[47] Ukrainian electricity statistics gives two types of losses – the so-called 'technical' and 'non-technical'. 'Non-technical' losses describe the non-payments and other losses of unknown origin.

[48] "Overview of data on electrical power plants in Ukraine 2001 - 2005", Ministry of Fuel and Energy of Ukraine, 31 October 2006 and 16 November 2006.

$$EF_{grid,produced,y} = EF_{OM,y} \qquad \textit{(Equation 3)}$$

and

$$EF_{grid,reduced,y} = \frac{EF_{grid,produced,y}}{1 - loss_{grid}} \qquad \textit{(Equation 4)}$$

Where:

$EF_{grid,produced,y}$ is the emission factor for JI projects supplying additional electricity to the grid (tCO2/MWh);
$EF_{grid,reduced,y}$ is the emission factor for JI projects reducing electricity consumptionfrom the grid (tCO2/MWh)factor of the fuel;
$EF_{OM,y}$ is the simple OM of the Ukrainian grid (tCO2/MWh);
$loss_{grid}$ is the technical losses in the grid (%).

The following result was obtained:

Type of project	**Parameter**	**EF (tCO2/MWh)**
JI project producing electricity	$EF_{grid,produced,y}$	0.807
JI projects reducing electricity	$EF_{grid,reduced,y}$	0.896

Table 29: Emission Factors for the Ukrainian grid 2006 - 2012

Monitoring

This baseline requires the monitoring of the following parameters:

- Electricity produced by the project and delivered to the grid in year y (in MWh);
- Electricity consumption reduced by the project in year (in MWh);
- Electricity produced by the project and consumed on-site in year y (in MWh);

The baseline emissions are calculated as follows:

$$BE_y = EF_{grid,produced,y} x EL_{produced,y} + EF_{grid,reduced,y} x \left(EL_{reduced,y} + EL_{consumed,y}\right) \qquad \textit{(Equation 5)}$$

Where:

BE_y are the baseline emissions in year y (tCO2);
$EF_{grid,produced,y}$ is the emission factor of producing projects (tCO2/MWh);
$EL_{produced,y}$ is electricity produced and delivered to the grid by the project in year y (MWh);
$EF_{grid,reduced,y}$ is the emission factor of reducing projects (tCO2/MWh);
$EL_{produced,y}$ is electricity consumption reduced by the project in year y(MWh);
$EL_{consumed,y}$ is electricity produced by the project and consumed on-site in year y (MWh).

This baseline can be used as ex-ante (fixed for the period 2006 – 2012) or ex-post. In case an ex-post baseline is chosen the data of the Ukrainian grid have to be obtained of the year in which the emission reductions are being claimed. Monitoring will have to be done in accordance with the monitoring plan of ACM0002 with the following exceptions:

- the Monitoring Plan should also include monitoring of the grid losses in year y;
- power plants at which JI projects take place should be excluded. Such a JI project should have been approved by Ukraine and have been determined by an Accredited Independent Entity.

Acknowledgements
The development of this new baseline has been made possible by funding of the EBRD and the Netherlands' Ministry of Economic Affairs. The authors would further like to thank the Ukrainian Ministry of Energy for supplying the data and the Ministry of Environmental Protection for their support. This baseline study can be used freely in case of proper reference.

Global Carbon B.V.
Version 5, 2 February 2007

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Ukraine - Assessment of new calculation of CEF

Introduction

Many Joint Implementation (JI) projects have an impact on the CO_2 emissions of the regional or national electricity grid. Given the fact that in most Economies in Transition an integrated electricity grid exists, a standardized baseline should be used to estimate the amount of CO_2 emission reductions on the national grid.

The Ukraine is one of the major JI host countries where many grid related projects have been developed or will be implemented. In order to enhance the project development and reliability in emission reductions from the Ukraine a standardized and common agreed grid factor expressing the carbondioxid density per kWh is crucial.

Objective

Global Carbon B.V. is one of the pioneers developing JI projects in Ukraine who has developed a baseline approach for determining the Ukrainian grid factor. The approach is implied from the approved CDM methodology ACM0002.

The team of Carbon Management Service (CMS) of TÜV SÜD Industrie Service GmbH with its accredited certification body "Climate and Energy" has been ordered to verify the developed approach and the calculated grid factor.

Once an approach is agreed it should be used for calculating the grid by using current available data served from the Ukraine Ministry for Fuel and Energy. Such annual grid factor shall be used as a binding grid factor for JI projects developed in the Ukraine.

Scope

The baseline approach to which this confirmation is referring is attached. The confirmation includes the inherent approach if the algorithms are developed reasonable and from a technical point of view correct. Furthermore the verified the

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origin of the data. The team consists of:

- Werner Betzenbichler (Head of the certification Body "Climate and Energy"),
- Thomas Kleiser (Head of division JI/CDM, GHG-Auditor and Project Manager)
- Markus Knödlseder (GHG-Auditor and Project Manager)

Mr. Kleiser and Betzenbichler assessed the baseline approach and agreed with Global Carbon on the conclusive approach. Mr. Kleiser and Mr. Knödlseder assessed the calculation model whereas Mr. Knödlseder interviewed also Mr. Nikolay Andreevich Borisov, Deputy Director for Strategic Development in Ministry of Fuel and Energy (+380 (44) 2349312 // borisov@mintop.energy.gov.ua) who explained the process of data gathering in the Ukraine. He also confirmed that GlobalCarbon B.V. uses the served data.

Conclusion

The conclusive assessment does not include potential uncertainties that might be occurred in the data gathering process of the ministry. Considering that we confirm that applied data served by Ministry of Fuel and Energy are reliable and correctly used.

Based on submitted calculation method, developed baseline study (see attachment), applied data and written confirmation from Ministry of Fuel and Energy (see attached documents) the team of Carbon Management Service of TÜV SÜD Industrie Service GmbH with its accredited certification body "Climate and Energy" confirms further that developed approach is eligible to determine the Ukrainian electricity grid factor as a standard value for JI project in the Ukraine.

The team recommends updating the calculation annually depending on point of time when national consolidated data are available.

Munich,17/08/2007

Markus Knödlseder

GHG-Auditor and Project Manager

Munich, 17/08/2007

Werner Betzenbichler

Head of the certification Body "Climate and Energy" and Carbon Management Service

Annex 3

MONITORING PLAN

For the monitoring plan please refer to section D of this PDD.

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