

MONITORING REPORT

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* as contained within the document entitled "Guidelines for completing the monitoring report form (CDM-MR)" (EB 54 meeting report, annex 34).

There is no mandatory JI MR template, therefore CDM MR template was used.

MONITORING REPORT

version #2, 05/09/2012

“WASTE HEAPS DISMANTLING BY TEMP LTD-A IN UKRAINE”

Monitoring period #3:

Monitoring period starting date: 01/01/2011

Monitoring period closing date: 31/07/2012

SECTION A. General description of the project activity

A.1. Brief description of the project activity:

1. Purpose of the project activity and the measures taken to reduce greenhouse gas emissions;

The main idea of the project is to process waste heaps originated due to coal extraction from mines. Coal extraction from the mine's waste heap will prevent greenhouse gas emissions into the atmosphere as if in the case of spontaneous burning and will produce additional amount of coal instead of its mining. Emission reductions due to the implementation of this project will come from three major sources:

- Removing the source of green-house gas emissions from the burning / slow burning waste heap by the extraction of non-combusted coal contained in a waste heap;
- Negative leakage through reduced fugitive emissions of methane due to the replacement of coal that would have been mined, by the coal extracted from the heap under the project activity.
- Reduce electricity consumption at waste heap dismantling in comparison with energy consumption at coal mine.

This Project is aimed at coal extraction from the mine's waste heaps of Luhansk Region of Ukraine. These waste heaps have been accumulated some time before the start of the project activity from the mining waste of underground mines. Project activity 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.

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.

Thus, **the baseline scenario** is the continuation of the current situation, which is the continuation of the situation before the project was installed, without beneficiation plant and waste heap dismantling.

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.

2. Brief description of the installed technology and equipments

The technology applied in this project is the dense medium coal washing plant. The technological process and equipment used in the project reflect current good engineering practices. The basic technology of 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. 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 and spiral separators.

3. Relevant dates for the project activity (e.g. construction, commissioning, continued operation periods, etc.).

The project has been initiated in the start of 2006. Installation and construction works were initiated by the end of 2007. 01st of April 2008 is the date of commissioning of the beneficiation plant equipment. The operations at the facility have started on the 01st of April 2008. 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.

4. Total emission reductions achieved in this monitoring period.

Total amount of emission reductions achieved from 01/01/2011 to 31/07/2012, rounded down to whole tons, is 2852091 tons of CO₂e.

A.2. Project Participants

<u>Party involved</u> *	Legal entity <u>project participant</u> (as applicable)	Please indicate if the <u>Party involved</u> wishes to be considered as <u>project participant</u> (Yes/No)
Ukraine (Host party)	Limited Liability Company Temp LTD-A	No
The Netherlands	Global Carbon B.V.	No

Table.1 Project Participants

Limited Liability Company Temp LTD-A is the project host.

A letter of endorsement from the Ukrainian Designated Focal Point had previously been received for the proposed project, reference No. 2168/23/7, dated 16/08/2011.

A letter of approval from the Ukrainian Designated Focal Point was received for the proposed project, reference No. 2456/23/7, dated 05/09/2012.

A letter of approval from the Netherland Designated Focal Point was received for the proposed project, reference 2011JI47, dated 22/11/2011.

A.3. Location of the project activity:

The Project activities are physically limited to the waste heaps that are legally operated by the company and territory under beneficiation facilities on waste heaps processing. The project boundary includes :

- Waste heaps processing facility “Voroshylivka” on waste heap #5 of former coal mine Voroshylivka at address: Luhansk region, Sverdlovsk, manufacturing facilities complex (near Novodar'yivka village, town of Rovenky, Luhansk region) +48° 3' 31.60", +39° 27' 55.37"¹;
- Waste heap # 5, Luhansk region., Sverdlovsk district., mine “Voroshylivka” +48° 3' 23.45", +39° 27' 47.64"²;

¹ <https://maps.google.com/maps?ll=48.077222,39.475833&spn=0.03,0.03&t=k&q=48.077222,39.475833&hl=uk>

² <https://maps.google.com/maps?ll=48.077222,39.475833&spn=0.03,0.03&t=k&q=48.077222,39.475833&hl=uk>

- Waste heap former mine # 54, Luhansk region, Rovenky, Str. Dzerzhinsky +48° 2' 44.61", +39° 27' 42.39"³.

A.4. Technical description of the project

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%⁴, so the risk of spontaneous self-heating and burning is very high. 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.

The Project envisages high-grade anthracite production for the needs of households energy sector. The main stages of coal extraction and sorting can be found below.

The technology applied in this project is the dense medium coal washing plant. The technological process and equipment used in the project reflect current good engineering practices. The basic technology of 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. 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 and spiral separators.

The coal washing by dense medium cyclone 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 below shows the separation process by dense medium cyclone.

³ <https://maps.google.com/maps?ll=48.039722,39.44&spn=0.03,0.03&t=k&q=48.039722,39.44&hl=uk>

⁴ *Geology of Coal Fires: Case Studies from Around the World*, Glenn B. Stracher, Geological Society of America, 2007, p. 47
<http://books.google.com.ua/books?id=eJU0WOABSWIC&printsec=frontcover&hl=ru#v=onepage&q&f=false>

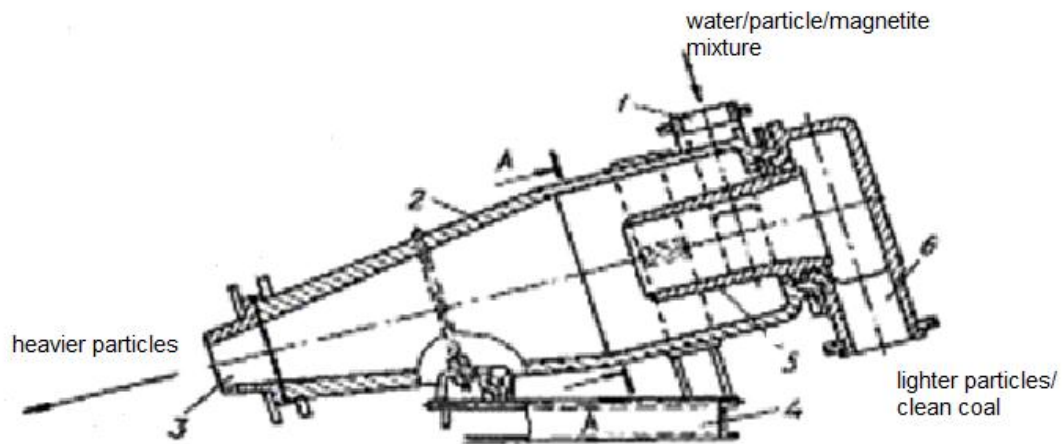


Fig.1 Dense medium cyclone operation⁵



Fig.2 Project activity equipment

Dense medium cyclones are 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 certain 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 (2) in which the lighter particles are drawn out through the central vortex tube (5) in the discharge chamber (6). 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 cyclone 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, and quick to assemble easy to move design.

For waste heap dismantling the following combined technology is foreseen:

- bulldozer gets to the top of the waste heap along its tail;

⁵ <http://masters.donntu.edu.ua/2007/fema/svetlichnaya/library/bedran.htm>

- the heap is gradually lowered by moving of the rocks by bulldozer to the edge of the heap in horizontal layers. Heap lowering by bulldozer is performed to a certain height, after which arrival of trucks on the heap is possible. Further dismantling is conducted by dump excavators usage;
- near the waste heap rock is moved to storage areas by machines and transported by automobiles.

Waste heap rock processing is performed according to the following technology:

- the rock of “1-125 mm” grade is fed by motor transport to the drop-off station;
- rock mass is put by conveyor from drop-off station into rocks sorting bunker;
- rock mass is graded at vibration screen into grades “0-40 mm” and “+40 mm”;
- rock mass of “+40 mm” grade is put by conveyor into bunker for shipment, in the process of which manual selection of coal takes place;
- “0-40 mm” rock mass is put by conveyor to enrichment unit;
- testing the rock mass before enrichment;
- wet grading into “0-1 mm” and “1-40 mm” grades takes place at vibration screen;
- “1-40 mm” grade is divided in dense medium cyclone with recovery of two products - coal concentrate and waste;
- suspension with concentrate is washed at the vibration screen with “1-13 mm” and “13-40 mm” grades coming out;
- “13-40 mm” grade feeding for shipment;
- additional dehydration “1-13 mm” grades in the centrifuge and feeding for shipment;
- wash off of suspension, waste dehydration on vibration screen and its transportation for shipment;
- regeneration of suspension at drum magnetic separators in two stages, to obtain magnetite concentrate, draining of turbidity-free and slime water;
- thickening of sludge in thickener with flocculation;
- condensed sludge dehydration at high-frequency screening.

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 consists of the following modules:

- 1) vibration screens (capacities: 180 t/h, 125 t/h, 115 t/h; screens square: 6.75 m², 10.5 m², 16 m²; motors power 15 kW, 30 kW, 44 kW);
- 2) dense medium cyclone (capacity 490 m³/h, size of the separated material 1-40 mm, pressure at the input 0.15 MPa);
- 3) centrifuge for fine concentrate dehydration (capacity 100 m³/t, moisture input material 25%, total moisture of sludge 7%; motor power 37 kW);
- 4) drum magnetic separators for the regeneration of magnetite suspensions (capacity 400 m³/h and 200 m³/h; induction on the drum surface 0.3 T and 0.3 T);
- 5) thickener of sludge (capacity on hard material 23 t/h; motor power 30 kW);
- 6) fine sludge washing by high-frequency screen (capacity 12 t/h; screen square 5 m²; motor power 1.6 kW)
- 7) flocculent preparation;
- 8) pumps (capacities: 13 m³/h, 176,5 m³/h, 16 m³/h; motors power 4 kW, 90 kW, 0.6 kW)
- 9) water and magnetite suspension tanks.

The above mentioned confirms that the conception of the project is based on the current modern common practice. The project is not expected replacement project technology to another technology during the period of the project.

<p>A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:</p>

A JI-specific methodology is applied, as described in the PDD.

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 that causes 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.
- Emissions of carbon dioxide due to consumption of coal for energy production. Carbon dioxide emissions that occur during the combustion of energy coal are calculated as stationary 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.

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 the 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 are calculated as stationary 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 baseline 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

Emission sources are:

- fugitive methane emissions due to the mining activities
- Emissions of carbon dioxide due to consumption of electricity and other forms of energy in coal mining in the mine.

Thus, emission reductions due to the implementation of this project will come from three major sources:

- Removing the source of green-house gas emissions from the burning / slow burning waste heap by the extraction of non-combusted coal contained in a waste heap;
- Negative leakage through reduced fugitive emissions of methane due to the replacement of coal that would have been mined, by the coal extracted from the heap under the project activity.
- Reduce electricity consumption at waste heap dismantling in comparison with energy consumption at coal mining.

A.6. Registration date of the project activity:
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The project has not received the ID number ITL at this time. For information about the Letter of Approval, see paragraph A.2 of this Monitoring Report.

A.7. Crediting period of the project activity and related information (start date and choice of crediting period):

The registered PDD uses crediting periods in line with the commitment periods under the Kyoto Protocol.

Therefore the first commitment period will cover 2008 to 2012, the second period will be for 2013 to 2022.

Period	Start date	End date
1	01/04/2008	31/12/2012
2	01/01/2013	31/12/2022

Table.2 Crediting period dates

A.8. Name of responsible person(s)/entity(ies):
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Contact information of the entity and persons responsible:

Mr. Tahir Musayev, Carbon Capital Services Limited,

Email t.musayev@gmail.com Tel/Fax: +38 044 490 6968.

SECTION B. Implementation of the project activity
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B.1. Implementation status of the project activity

1. The starting date of operation of the project activity.

The starting date of a JI project activity is the date on which the implementation or construction or real action of the project begins. This date is the date of putting into operation beneficial plant - 01/04/2008.

2. The information regarding the actual operation of the project activity during this monitoring period, including information on special events, for example overhaul times, downtimes of equipment, exchange of equipment, etc.

There were no special events during this monitoring period. Scheduled downtimes of equipment for repairs and due to the severe frosts during this monitoring period: 01/01/2011-28/02/2011, 01/02/2012-29/02/2012

3. A brief description of: (i) events or situations that occurred during the monitoring period, which may impact the applicability of the methodology, and (ii) how the issues resulting from these events or situations are being addressed.

There were no special events during this monitoring period.

Procedures identified for corrective actions in order to provide for more accurate future monitoring and reporting

In cases if any errors, fraud, inconsistencies or situations when monitoring data are unavailable will be identified during the monitoring process special commission will appointed by project host management that will conduct a review of such case and issue an order that must also include provisions for necessary corrective actions to be implemented that will ensure such situations are avoided in future.

The project host management will also establish a communication channel that will make it possible to submit suggestions, improvement proposals and project ideas for more accurate future monitoring for every person involved in the monitoring activities. Such communications will be delivered to the project host management who is required to review these communications and in case it is found appropriate implement necessary corrective actions and improvements. Project participant - will conduct periodic review of the monitoring plan and procedures and if necessary propose improvements to the project participants. Also, to prevent the situations in which monitoring data are unavailable, all parameters are fixed and saved on paper and electronically in a database the Owner and Developer of the project separately.

Emergency preparedness for cases where emergencies can cause unintended emissions

The project operation does not foresee any factors or emergencies that can cause unintended GHG emissions. Safe operation of equipment and personnel is ensured by systematic safety training. Procedures for dealing with general emergencies such as fire, major malfunction etc. are developed as part of the mandatory business regulations and are in accordance with local requirements.

B.2. Revision of the monitoring plan

The monitoring plan is presented in Section D PDD, used without revisions.

B.3. Request for deviation applied to this monitoring period

N/A

B.4. Notification or request of approval of changes
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N/A

SECTION C. Description of the monitoring system

The monitoring plan is described in Section D and Annex 3 to PDD.

1. Introduction

The project adopts a JI specific monitoring approach. This monitoring plan describes the responsibilities of the JI Project Management Team and the methods and procedures to be adopted to implement the monitoring plan described in the Project Design Document in respect of this project activity.

2. Project Management & Responsibilities

The operational and management structure (as shown in below the figure) and the responsibilities of the principals are as follows. Ultimate responsibility for the project rests with the JI Project Manager.

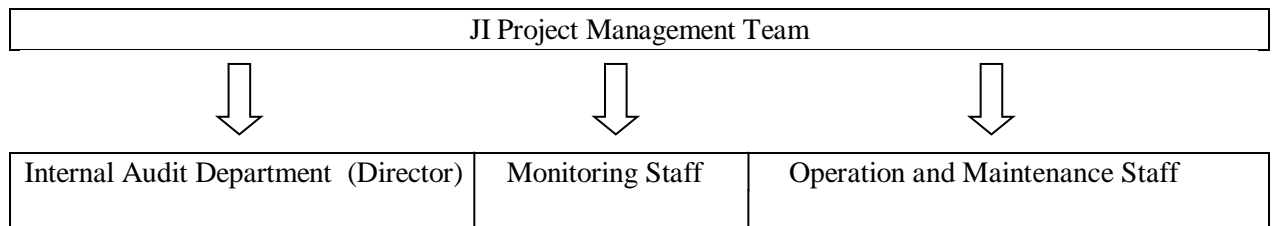


Fig.3 The management structure of the project

The JI Project Manager is responsible for:

- Checking and signing off all project operational-related activities
- Appointing and liaising with the accredited independent entity (AIE)
- Identifying an audit team leader to be appointed by the Chief Engineer or a delegated authority
- Appointing a JI technical team to undertake the operational activities
- Organizing training and refresher courses
- Preparing and supervising a Health and Safety Plan for the JI technical team
- Supervising the work of the JI technical team
- Cross checking reported volumes and sales receipts

Internal Audit Department (Director)

The project owner - Temp LTD-A LLC 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.

The monitoring staff is responsible for:

- Monitoring and recording of the relevant parameters

The operation and maintenance staff are responsible for:

- Operation and maintenance of the project infrastructure
- Service and maintenance equipment is performed by technical personnel beneficiation plant.

For monitoring period the following parameters have 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 by a specialized electricity meters. The meters are 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 have performed. Monthly and annual reports are based on the monthly bills.

2. Amount of diesel fuel that has been used for the project activity in the monitoring 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 liters rather than in tones the data in liters are converted into tones using the density of 0,85 kg/l⁶. Regular cross-checks with the suppliers are carried out. 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.

3.1. Amount of fraction.

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.

3.2. Ash content and moisture of fraction.

Ash content and moisture fraction is defined accredited for technical competence and independence of the laboratory in accordance with regulations (GOST 11022-95 "Mineral solid fuel. Methods of determination the ash content"⁷, GOST 11014-2001 "Brown coal, hard coal and oil shale. Accelerated methods for determining the moisture"⁸ and GOST 27314-91 «Mineral solid fuel. Methods of determination the moisture content»⁹). Analysis of ash content and moisture fraction is done in the laboratory. Ash content and moisture of coal fraction measured regularly with registration annually certificates.

Archiving, data storage and record handling procedure

Documents and reports on the data that are monitored is archived and stored by the project participants. The following documents is stored: primary documents for the accounting of monitored parameters in paper form; intermediate reports, orders and other monitoring documents in paper and electronic form; documents on measurement devices in paper and electronic form. These documents and other data monitored and required for determination and verification, as well as any other data that are relevant to the operation of the project is kept for at least two years after the last transfer of ERUs.

Training of monitoring personnel

The project utilizes technology that requires skills and knowledge in heavy machinery operation, coal beneficiation technology operation, electric equipment operation etc. This kind of skills and knowledge is available locally through the system of vocational training and education. This system is state-

⁶ GOST 305-82 Diesel Fuel. Specifications. 0,85 kg/l is taken as an average between two suggested types of diesel: summer and winter http://elarum.ru/info/standards/gost-305-82/table_2

⁷ <http://vsesnip.com/Data1/16/16768/index.htm>

⁸ <http://vsesnip.com/Data1/40/40907/index.htm>

⁹ <http://vsesnip.com/Data1/29/29367/index.htm>

supervised in Ukraine. Professionals who graduate from vocational schools receive a standard certificate in the field of their professional study. Only workers with proper training can be allowed to operate industrial equipment like. Management of the project host ensures that personnel of the project have received proper training and are eligible to work with the prescribed equipment.

Training on safety issues is mandatory and was provided to all personnel of the project as required by local regulations. Procedure for safety trainings includes the scope of the trainings, training intervals, forms of training, knowledge checks etc. The project host management ensures maintain records for such trainings and periodic knowledge check-ups.

Activities that are directly related to the monitoring do not require specific training other than provided by the professional education. However, monitoring personnel have received training on monitoring procedures and requirements. Personnel of the project host management provide necessary training and consultations on Kyoto Protocol, JI projects and monitoring from the project participant.

The program of training

The project does not require extensive initial training. The staff has got 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.

The program of maintenance service

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 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.

SECTION D. Data and parameters

D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors

Data / Parameter:	GWP_{CH_4}
Data unit:	tCO_2e/tCH_4
Description:	Global Warming Potential of Methane
Source of data used:	IPCC default value as per registered PDD
Value(s) :	21
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Leakage calculations
Additional comment:	

Data / Parameter:	ρ_{CH_4}
Data unit:	t/m^3
Description:	Density of methane under conditions of 20°C and 1 atm
Source of data used:	IPCC ¹⁰
Value(s) :	0.00067
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Leakage calculations
Additional comment:	

Data / Parameter:	$EF_{CH_4, CM}$
Data unit:	m^3/t
Description:	Average rate for fugitive methane emissions from coal mining
Source of data used:	National Inventory Report of Ukraine 1990-2009 ¹¹ , p.90
Value(s) :	25.67
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Leakage calculations
Additional comment:	

Data / Parameter:	$EF_{grid, y}$		
Data unit:	tCO_2e/MWh		
Description:	Relevant emission factor for the electricity from the grid ¹² by consumers of electricity, which referred to the 2-class in the year y		
Source of data used:	For the years 2008-2011 – NEIA Orders No.43 dated 28.03.2011, No.62 dated 15.04.2011, No.63 dated 15.04.2011, No.75 dated 12.05.2011		
Value(s) :	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center;">2011</td> <td style="text-align: center;">2012</td> </tr> </table>	2011	2012
2011	2012		

¹⁰ http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_4_Ch4_Fugitive_Emissions.pdf

¹¹ http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/5888.php

¹² For the years 2008-2011 – NEIA Orders No.43 dated 28.03.2011, No.62 dated 15.04.2011, No.63 dated 15.04.2011, No.75 dated 12.05.2011

http://neia.gov.ua/nature/control/uk/publish/category?cat_id=111922

	1.227	1.227	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project and baseline emission calculations		
Additional comment:			

Data / Parameter:	$N_{Coal,y}^E$		
Data unit:	MWh/t		
Description:	Average electricity consumption per ton of coal, produced in Ukraine in the year y		
Source of data used:	Fuel and energy resources of Ukraine, Statistical Yearbook, State Statistics Committee of Ukraine, Kiev 2009-2011 ¹³		
Value(s) :	2011	2012	
	0.0842	0.0842	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations		
Additional comment:			

Data / Parameter:	A_{Coal}		
Data unit:	%		
Description:	Average ash content of power station coal produced in Ukraine		
Source of data used:	Guide of quality, volume of coal production and enrichment products in 2008–2010, Ministry of Coal Industry of Ukraine, State Committee of Ukraine		
Value(s) :	2011	2012	
	39.80	39.80	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline, project emission and leakage calculations		
Additional comment:			

Data / Parameter:	W_{Coal}		
Data unit:	%		
Description:	Average moisture of power station coal produced in Ukraine		
Source of data used:	Guide of quality, volume of coal production and enrichment products in 2008–2010, Ministry of Coal Industry of Ukraine, State Committee of Ukraine		
Value(s) :	2011	2012	
	8.30	8.30	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline, project emission and leakage calculations		

¹³ <http://www.ukrstat.gov.ua/>

calculations)	
Additional comment:	

Data / Parameter:	ρ_{WHB}
Data unit:	ratio
Description:	Correction factor for the uncertainty of the waste heaps burning process
Source of data used:	Scientific research was verified and confirmed by accredited independent entities ¹⁴
Value(s) :	0.78
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Additional comment:	

Data / Parameter:	NCV_{coal}						
Data unit:	GJ/t						
Description:	Net Calorific Value of coal						
Source of data used:	National Inventory Report of Ukraine 1990-2010 ¹⁵						
Value(s) :	<table border="1"> <thead> <tr> <th></th> <th>2011</th> <th>2012</th> </tr> </thead> <tbody> <tr> <td></td> <td>21.60</td> <td>21.60</td> </tr> </tbody> </table>		2011	2012		21.60	21.60
	2011	2012					
	21.60	21.60					
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission and leakage calculations						
Additional comment:							

Data / Parameter:	$OXID_{COAL}$						
Data unit:	ratio						
Description:	Carbon Oxidation factor of coal						
Source of data used:	National Inventory Report of Ukraine 1990-2010						
Value(s) :	<table border="1"> <thead> <tr> <th></th> <th>2011</th> <th>2012</th> </tr> </thead> <tbody> <tr> <td></td> <td>0.962</td> <td>0.962</td> </tr> </tbody> </table>		2011	2012		0.962	0.962
	2011	2012					
	0.962	0.962					
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission and leakage calculations						
Additional comment:							

Data / Parameter:	k^C_{coal}
Data unit:	tC/TJ
Description:	Carbon content of coal

¹⁴ Report on the fire risk of Luhansk Region's waste heaps, Scientific Research Institute "Respirator", Donetsk, 2012.

¹⁵ http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/6598.php

Source of data used:	National Inventory Report of Ukraine 1990-2010		
Value(s) :	2011	2012	
	25.99	25.99	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission and leakage calculations		
Additional comment:			

Data / Parameter:	NCV_{diesel}		
Data unit:	GJ/t		
Description:	Net Calorific Value of diesel fuel		
Source of data used:	National Inventory Report of Ukraine 1990-2010		
Value(s) :	2011	2012	
	42.50	42.50	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission and leakage calculations		
Additional comment:			

Data / Parameter:	$OXID_{DIESEL}$		
Data unit:	Ratio		
Description:	Carbon Oxidation factor of diesel fuel		
Source of data used:	National Inventory Report of Ukraine 1990-2010		
Value(s) :	2011	2012	
	0.99	0.99	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations		
Additional comment:			

Data / Parameter:	k_{diesel}^C		
Data unit:	tC/TJ		
Description:	Carbon content of diesel fuel		
Source of data used:	National Inventory Report of Ukraine 1990-2010		
Value(s) :	2011	2012	
	20.20	20.20	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations		
Additional comment:			

D.2. Data and parameters monitored

Data / Parameter:	$FR_{Coal,y}$	
Data unit:	t	
Description:	Amount of sorted fraction, which is extracted from the waste heaps because of the project activity in a period y	
Measured /Calculated /Default:	m	
Source of data:	Weight Report	
Value(s) of monitored parameter:	Provided by the company	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission and leakage calculations	
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Electronic for static weighing of automobiles	
	Data unit	t
	Producer	Prizma Ltd ¹⁶
	Type	JU
	Serial number	3713
	Accuracy class	Medium (GOST 29329-92)
	Calibration	21/08/2009 07/06/2011
	Calibration frequency	2 years
Validity	SE «Luhanskstandartmetrologiya»	
Measuring/ Reading/ Recording frequency:	Monthly	
Calculation method (if applicable):	Direct measurement and calculation according to state standards	
QA/QC procedures applied:	Car scales are passed periodic calibration and verification by national standards. For cross-checking are used rail scales, the data are entered into the rail loading sheet.	

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 period y	
Measured /Calculated /Default:	c	
Source of data:	N/A	
Value(s) of monitored parameter:	Calculated by the equation 3	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission and leakage calculations	
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	N/A	
Measuring/ Reading/ Recording frequency:	Monthly	

¹⁶ http://prizma.com.ua/index.php?option=com_content&view=article&id=45&Itemid=54

Calculation method (if applicable):	Calculated by the equation 3.
QA/QC procedures applied:	N/A

Data / Parameter:	$A_{Rock,y}$
Data unit:	%
Description:	Average ash content of sorted fraction, which is extracted from waste heap in period y
Measured /Calculated /Default:	M
Source of data:	Laboratory research
Value(s) of monitored parameter:	Provided by the company
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission and leakage calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	N/A
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	Laboratory research
QA/QC procedures applied:	According to the national standards.

Data / Parameter:	$W_{Rock,y}$
Data unit:	%
Description:	Average moisture of sorted fraction, which is extracted from waste heap in period y
Measured /Calculated /Default:	M
Source of data:	Laboratory research
Value(s) of monitored parameter:	Provided by the company
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission and leakage calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	N/A
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	Laboratory research
QA/QC procedures applied:	According to the national standards.

Data / Parameter:	$EC_{PJ,y}$
Data unit:	MWh

Description:	Additional electricity consumed in period y as a result of the implementation of the project activity	
Measured /Calculated /Default:	M,C	
Source of data:	Acts from energy utility company	
Value(s) of monitored parameter:	Provided by the company	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations	
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Electronic meter LZQM	
	Data unit	kWh
	Producer	Elgama-Electronika ¹⁷
	Type	LZQM 321.02.534
	Serial number	446002
	Accuracy class	0.5
	Calibration	26/02/2007
	Calibration frequency	6 years
Validity	"Lugansk Energy Union" Ltd.	
Measuring/ Reading/ Recording frequency:	Monthly	
Calculation method (if applicable):	Direct measurement and calculation according to state standards	
QA/QC procedures applied:	Electronic meter within TP is passed periodic calibration and verification by national standards.	

Data / Parameter:	<i>FC_{PJ,Diesel,y}</i>	
Data unit:	t	
Description:	Amount of diesel fuel that has been used for the project activity in the period y	
Measured /Calculated /Default:	C	
Source of data:	Monthly data from the company	
Value(s) of monitored parameter:	Provided by the company	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations	
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	N/A	
Measuring/ Reading/ Recording frequency:	Monthly	
Calculation method (if applicable):	The calculation is based on actual value of fuel	
QA/QC procedures applied:	N/A	

¹⁷ <http://www.elgama.com.ua/>

SECTION E. Emission reductions calculation

E.1. Baseline emissions calculation

Emissions in the baseline scenario are calculated as follows:

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

where:

BE_y - baseline emissions in period y (tCO₂e),

$BE_{WHB,y}$ - baseline emissions due to burning of the waste heaps in period y (tCO₂).

Baseline Emissions due to burning of the waste heaps, in turn, are calculated as:

$$BE_{WHB,y} = FC_{BE,Coal,y} / 1000 * \rho_{WHB} * NCV_{Coal} * OXID_{Coal} * k_{Coal}^C * 44/12 \quad (\text{Equation 2})$$

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 period y , t. Calculated by the equation 3.

ρ_{WHB} - correction factor for the uncertainty of the waste heap burning process, ratio. 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.

NCV_{coal} - net calorific value of coal, GJ/t.

$OXID_{coal}$ - carbon oxidation factor of coal, ratio.

k_{coal}^C - carbon content of coal, tC/TJ.

44/12 - ration between molecular mass of CO₂ and C. Reflect oxidation of C to CO₂.

In order to correctly calculate the amount of energy coal produced in mines and substituted by coal, received by dismantling of waste heap, it is necessary to recount, taking into account different value of ash and moisture content of energy coal and fraction, obtained by dismantling of the waste heaps. If in the mass of carbonaceous rocks we extract moisture and substances that are not burned during combustion, and turn to ash, we obtain the conditional ideal coal with no moisture and ash content. Therefore, to obtain coal with averaged over Ukraine characteristics it is necessary to add to that ideal coal the averaged moisture and ash content. In addition to moisture and ash, the coal (carbonaceous rocks) also contains sulfur, but its amount does not exceed a few percent¹⁸, content of it in carbonaceous rocks always less than in coal, extracted from the mine, so to calculate the amount produced in coal mine, which replaced by coal from waste heaps, this value can be neglected. Thus, the amount of coal produced in mines in the baseline scenario is calculated by the equation:

$$FC_{BE,Coal,y} = FR_{Coal,y} * (1 - A_{Rock,y} / 100 - W_{Rock,y} / 100) / (1 - A_{Coal} / 100 - W_{Coal} / 100) \quad (\text{Equation 3})$$

Where:

$FR_{Coal,y}$ - amount of sorted fraction, which is extracted from the waste heaps because of the project in a period y , that came to blending with further combustion in thermal power plants, t;

$A_{Rock,y}$ - the average ash content of sorted fractions, which is extracted from waste heap in period y , %;

$W_{Rock,y}$ - the average moisture of sorted fractions, which is extracted from waste heap in period y , %;

A_{Coal} - the average ash content of power station coal, mined in Ukraine, %;

W_{Coal} - the average moisture of power station coal, mined in Ukraine, %;

100 - conversion factor from percent to fraction, ratio.

¹⁸ <http://masters.donntu.edu.ua/2009/feht/semkovskiy/library/article9.htm>

If the average ash content and the average moisture of sorted fraction, which are extracted from the waste heap in the period y, are not available for the developer, or are irregular with a high level of uncertainty (table D.2 of PDD), they are taken equal to the relevant nation indicators, and

$$FC_{BE,Coal,y} = FR_{Coal,y} \quad (\text{Equation 4})$$

The total baseline emissions are presented in the table below.

		2011	7 months 2012	Total
Baseline Emissions due to burning of the waste heaps	tCO ₂ e	1361381	835802	2197183
Total Baseline emissions during the period 01/01/2011-31/07/2012	tCO ₂ e	1361381	835802	2197183

Table.3 Total Baseline emissions

E.2. Project emissions calculation

The project emissions are calculated from the CO₂ emissions from the diesel fuel combustion and the additional energy consumption used by the formula given below.

Emissions from the project activity are calculated as follows:

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

where

PE_y , -project emissions due to project activity in the period y (tCO₂e),

$PE_{EL,y}$ -project emissions due to consumption of electricity from the grid by the project activity in the period y (tCO₂e),

$PE_{Diesel,y}$ -project emissions due to consumption of diesel fuel by the project activity in the period y (tCO₂e).

These, in turn, are calculated as:

$$PE_{EL,y} = EC_{PJ,y} * PE_{grid,y} \quad (\text{Equation 6})$$

where:

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

$EF_{grid,y}$ - relevant emission factor for the electricity from the grid in the period y, kgCO₂/kWh (tCO₂/MWh)

$$PE_{Diesel,y} = FC_{PJ,Diesel,y} / 1000 * NCV_{Diesel} * OXID_{Diesel} * k_{Diesel}^C * 44/12 \quad (\text{Equation 7})$$

where:

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

NCV_{Diesel} - net calorific value of diesel fuel, GJ/t;

$OXID_{Diesel}$ - carbon oxidation factor of diesel fuel, ratio;

k_{Diesel}^C - carbon content of diesel fuel, t C/TJ;

44/12 - ration between molecular mass of CO₂ and C. Reflect oxidation of C to CO₂.

The total project emissions are presented in the table below.

		2011	7 months 2012	Total
Project Emissions due to consumption of electricity from the grid by the project activity	tCO ₂ e	2211	1079	3290
Project Emissions due to consumption of diesel fuel by the project activity	tCO ₂ e	1496	1063	2559
Total Project emissions during period 01/01/2011-31/07/2012	tCO ₂ e	3707	2142	5849

Table.4 Total Project emissions

E.3. Leakage calculation

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. Source of the leakage is the fugitive methane emissions due to coal mining and electricity consumption due to coal mining. This leakage is directly attributable to the JI project activity according to the following assumption: the coal produced by the project activity from the waste heap will substitute the coal produced by underground mines of the region in the baseline scenario. This assumption is explained by the following logic: Energy coal market is demand driven as it is not feasible to produce coal without demand for it. Coal is a commodity that can be freely transported to the source of demand and coal of identical quality can substitute some other coal easily. The project activity cannot influence demand for coal on the market and supplies coal extracted from the waste heaps. In the baseline scenario demand for coal will stay the same and will be met by the traditional source – underground mines of the region. Therefore, the coal supplied by the project in the project scenario will have to substitute the coal mined in the baseline scenario. It is also important to mention that Ukraine is a net exporter of energy coal so the coal produced by the project activity will substitute domestically mined coal (in 2010 energy coal production was 40.3 Mt, import was 3 Mt and export was 6.1 Mt¹⁹). According to this approach equivalent product supplied by the project activity (with lower associated specific green-house gas emissions) will substitute the baseline product (with higher associated specific green-house gas emissions).

This leakage is measurable: through the same procedure as used in 2006 IPCC Guidelines²⁰ (See Volume 2, Chapter 4, Page 4-11) and also used in CDM approved methodology ACM0009²¹ (Page 8). Activity data (in our case amount of coal extracted from the waste heap which is monitored directly) is multiplied by the emission factor (which is sourced from the relevant national study - National Inventory Report²² of Ukraine under the Kyoto Protocol) and conversion coefficients. It is important to mention that IPCC and relevant National Inventories take into account raw amount of coal that is being mined in these calculations whereas in the PDD coal extracted from the waste heaps is high quality coal concentrate. Therefore, approach taken in the PDD is conservative as in coal mining more raw coal should be mined causing more fugitive methane emissions to produce equivalent amount of high quality coal concentrate.

Electricity consumption and related greenhouse gas emissions due to dismantling of waste heap to be taken into account in calculating the project emissions. Carbon dioxide emissions due to electricity

¹⁹ <http://www.uaenergy.com.ua/c225758200614cc9/0/d465824d78686a04c225787000542600>

²⁰ http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_4_Ch4_Fugitive_Emissions.pdf

²¹ <http://cdm.unfccc.int/UserManagement/FileStorage/K4P3YG4TNQ5ECFNA8MBK20SMR6HTEM>

²² http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/6598.php

consumption in the coal mine way in an amount, equivalent to the design of coal - a leakage, that can be taken into account at base of the State Statistics Committee data²³, concerning unit costs of electricity at coal mines in Ukraine in the relevant year.

The criteria for definition of the project boundary are provided in the *Guidance on criteria for baseline setting and monitoring*, JISC 18, Annex 2, paragraph 14. In the case of a JI project aimed at reducing emissions, the project boundary shall:

- (a) Encompass all anthropogenic emissions by sources of GHGs which are:
- (i) Under the control of the project participants;
 - (ii) Reasonably attributable to the project.

Therefore, fugitive CH₄ emissions from mining activities and CO₂ emission due to electricity consumption at coal mines cannot be included into the project boundary as they are not “Under the control of the project participants”. PDD correctly lists Temp LTD-A LLC as a project participant hosting this project activity. Temp LTD-A LLC is performing the dismantling of the waste heaps, processing waste heap matter with the dense medium cyclone technology. Temp LTD-A LLC does not operate or own any coal mines, therefore, any changes in fugitive methane emissions from mining are not under the direct control of project participants. This reason those leakages were included into the ‘leakages’ category and not considered the baseline emissions. Also, for example, approved CDM methodology ACM0009 “Consolidated baseline and monitoring methodology for fuel switching from coal or petroleum fuel to natural gas” Version 3.2 treats the same emission source as leakage – **Fugitive methane emissions** on Page 8 out of 16. It is also worth mentioning that leakage by definition is a “net change of anthropogenic emissions” and can be negative or positive depending on the nature of such change. It is also important to mention that including this particular source into baseline emissions or into leakages does not impact estimated emission reductions. For the value of Emission factor for fugitive methane emissions from coal mining (25,67 m³/t) the data provided in the National Inventory Report²⁴ of Ukraine 1990-2009, p.90 are used. This document is the official GHG Inventory prepared by the Host Country as part of the reporting requirements of the Kyoto Protocol.

The description of this particular emission factor states that it is the weighted average emission factor for the methane emissions from coal mining sourced from the study - Triplett J., Filippov A., Paisarenko A. Inventory of methane emissions from coal mines in Ukraine: 1990-2001. Partnership for Energy and Environmental Reform, 2002²⁵.

As for the analogy with the electricity from the grid versus renewable electricity: the source of the leakage here are the fugitive methane emissions due to coal mining. These emissions are specific to the coal that is being mined. Coal produced by the project activity is not mined but extracted from the waste heap through the advanced beneficiation process. Therefore, coal produced by the project activity substitutes the coal would have been otherwise mined in the baseline. Coal that is mined in the baseline has fugitive methane emissions associated with it and the coal produced by the project activity does not have such emissions associated with it.

Leakages in the period *y* are calculated as follows:

$$LE_y = LE_{CH_4, y} + LE_{EL, y} \quad (\text{Equation 8})$$

Leakages due to fugitive emissions of methane in the mining activities in the period *y* (tCO₂e).

$$LE_{CH_4, y} = -FC_{BE, Coal, y} * EF_{CH_4, CM} * \rho_{CH_4} * GWP_{CH_4} \quad (\text{Equation 9})$$

where:

$FC_{BE, Coal, y}$ - amount of coal that has been mined in the baseline scenario and combusted for energy use,

²³ <http://www.ukrstat.gov.ua/>

²⁴ http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/5888.php

²⁵ <http://www.epa.gov/cmop/docs/inventory2002.pdf>

equivalent to the amount of coal extracted from the waste heaps in the project activity in period y, t. Calculated by the equation 3.

$EF_{CH_4, CM}$ - average rate for fugitive methane emissions from coal mining, m³/t;

ρ_{CH_4} - methane density, t/m³;

GWP_{CH_4} - Global Warming Potential of Methane, tCO₂e/tCH₄.

Leakages due to electricity consumption at coal mines in a period y, calculated by the equation:

$$LE_{EL,y} = -FC_{BE,Coal,y} * N^E_{Coal,y} * EF_{grid,y} \quad (\text{Equation 10})$$

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 period y, t. Calculated by the equation 3.

$N^E_{Coal,y}$ - average electricity consumption per ton of coal, produced in Ukraine in the year y, MWh/t

$EF_{grid,y}$ - relevant emission factor for the electricity from the grid in the period y, tCO₂/MWh.

Leakages due to consumption of other types of energy in coal mines are insignificant compared to the emissions due to electricity consumption²⁶, so in connection with this, and for reasons of conservatism, take them equal to zero.

		2011	7 months 2012	Total
Leakages due to fugitive emissions of methane in the mining activities in the period y	tCO ₂ e	-318345	-195444	-513789
Leakages due to electricity consumption in the mining activities in the period y	tCO ₂ e	-91062	-55906	-146968
Total leakages during the period 01/01/2011-31/07/2012	tCO ₂ e	-409407	-251350	-660757

Table.5 Total leakages

E.4. Emission reductions calculation / table

The emission reductions are calculated as follows:

$$ER_y = BE_y - LE_y - PE_y \quad (\text{Equation 11})$$

where:

ER_y - emissions reductions of the JI project in period y (tCO₂e)

LE_y - leakages in period y (tCO₂e);

BE_y - baseline Emission in period y (tCO₂e);

PE_y - project Emission in period y (tCO₂e).

²⁶ www.mishor.esco.co.ua/2005/Thesis/10.doc

Year	Estimated project emissions (tonnes of CO ₂ equivalent)	Estimated leakage (tonnes of CO ₂ equivalent)	Estimated baseline emissions (tonnes of CO ₂ equivalent)	Estimated emission reductions (tonnes of CO ₂ equivalent)
2011	3707	-409407	1361381	1767081
7 months 2012	2142	-251350	835802	1085010
Total (tonnes of CO ₂ equivalent)	5849	-660757	2197183	2852091

Table.6 Total Emission Reductions

E.5. Comparison of actual emission reductions with estimates in the JI-PDD

Item	Values applied in ex-ante calculation of the registered JI-PDD	Actual values reached during the monitoring period
2011	1767092	1767081
7 months 2012	1039006	1085010
Emission reductions (tCO₂e)	2806098	2852091

Table.7 Comparison of actual emission reductions with estimates in the JI-PDD

E.6. Remarks on difference from estimated value in the PDD

Differences between the estimated volume of emission reductions in registered PDD is associated with using updated data from the National Inventory Report of Ukraine 1990-2010.
