JI MONITORING REPORT
(for reporting period 01.01.2012 – 30.09.2012)

Title of manager of the developer of documentation

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MONITORING REPORT OF JI PROJECT

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

for the period of 01/01/2012-30/09/2012

Version 2.0

05/10/2012

CONTENTS

ANNEXES

[1]Annex 2 is submitted in electronic form.
[2]Annex 3 is submitted in electronic form.

SECTION A. General project activity and monitoring information

A.1. Title of the project:

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

Sectoral scope: 8. Mining/mineral production

Sectoral scope: 3. Energy demand.

A.2. JI project number:

UA1000416

A.3. Brief description of the project:

The Project is initiated by SE "Artemugol" will result in the reduction of greenhouse gas emissions into the atmosphere and will improve the environmental situation in the region. The project is aimed at the increase in production efficiency by modernization of mining equipment; extinction and stabilization of waste heaps on the books of SE "Artemugol", located in Gorlivka city, Donetsk region. The project activity will prevent greenhouse gases emissions to the atmosphere. Project activities are complex modernization of coal mining equipment and waste heap stabilization with the use of vermiculite.

In the baseline scenario, the common practice will persist: technological equipment will wear out, and waste heaps will burn, causing permanent non-controlled GHG emissions into the atmosphere.

A.4. Monitoring period:

- Starting date of the monitoring period: 01/01/2012.
- End date of the monitoring period: 30/09/2012[3]

A.5. Methodology applied to the project activity (including the version number):

The proposed project uses a JI-specific approach in accordance with the "Guidance on criteria for baseline setting and monitoring", Version 03.

A.5.1. Baseline methodology:

The Project is initiated by SE "Artemugol" will result in the reduction of greenhouse gas emissions into the atmosphere and will improve the environmental situation in the region.
Ukraine's coal industry is a complex business system incorporating 167 operating coal mines and 3 coal open-pits, mines at a decommissioning stage, as well as coal beneficiation companies, transporters and other enterprises. Ukraine is Europe's largest coal producer and one of the eight leading coal producers globally. Donetsk Basin is the leading coal mining region, located mainly in the territory of Donetsk and Luhansk regions.
Most of coal is located at a depth of 400-800 m on average, and the average thickness of a coal seam is 0.6-1.2 m. The material is mainly extracted at underground mines. Most of them are located as deep as 400-800 m, but there are 35 mines in Donbas where coal is extracted at a depth of 1,000-1,300 m. Coal beds of Donetsk basin are interstratified with rock and are normally found each 20-40 m. In such conditions, deposit development results in a big amount of rock extracted and moved to the surface. Coal is separated from rock subsequently dumped to waste heaps. Such heaps are detected almost everywhere in Donbas. The coal separation process has historically been low-effective. Moreover, over a long period, it was considered economically unreasonable to extract 100% of coal from the rock raised. As a result, waste heaps in Donbas contain a great amount of coal. Eventually, coal-containing waste heaps become inclined to self-ignition and smoulding. Under different estimates, the rock raised from a mine is 65-70% coal and the remainder is waste rock. Up to 60% of this rock goes to waste heaps. According to the surveys, the content of inflammable materials in waste heaps is 15-30%, whereas coal makes up

[3] Both dates are included.

7% to 28-32% of such materials.[4] The waste heaps, which are currently burning or threaten to ignite, are sources of uncontrolled greenhouse gas and harmful substance emissions. The latter include sulphur dioxide, which consequently transforms into sulphurous acid, the cause of acid rains, hydrogen sulphide and carbon dioxide. Long-term erosion may lead to the complete ruining of the waste heap and its ransformation into a massive fault dangerous both as a direct threat to people and facilities and as a source of solid particles and harmful substance emissions into the atmosphere. Erosion also intensifies the process of spontaneous ignition. Coal combustion in waste heaps is a long process that may last up to 15 years[5].

Despite the danger caused by waste heap combustion, their extinction is not a customary practice in Donbas. Owners responsible for waste heaps are obliged to pay rather small penalties for environmental pollution. Thus, they have no major incentive to solve this issue and burning waste heaps may not be extinguished.

In the baseline scenario, the common practice will persist: technological equipment will wear out, and waste heaps will burn, causing permanent non-controlled GHG emissions into the atmosphere.

Since waste heaps in Donetsk Coal Basin contain coal (10-15%), its combustion is accompanied by a great amount of emissions of GHGs and other pollutants into the atmosphere. Waste heap extinction activities failed to lead to the full extinction because hot spots emerged occasionally.

Project emissions are generated by the following sources:

1) CO_2 emissions due to electricity consumption (indirect emissions) for technological needs.
2) CO_2 emissions resulting from waste heap burning. These emissions are calculated as those from stationary coal combustion. Since the baseline scenario provides for the continuation of the current situation, burning of waste heaps on the books of the project owner will continue for a long period.

A.5.2. Monitoring methodology:

The proposed project uses a JI-specific approach in accordance with the "Guidance on criteria for baseline setting and monitoring", Version 03. The relevant monitoring plan was determined in the course of determination.

The project provides for the following sources of emission reductions:

- Lower electricity consumption due to modernization of equipment and higher production efficiency.
- Removal of GHG emission sources associated with waste heap combustion by extinction and stabilization of waste heaps.

Data on the following parameters should be collected and recorded for every monitoring period:

- Total electricity consumption in the course of coal mining
- Total coal production
- Temperature of rock in a waste heap A waste heap is considered burning if there is at least one hot spot inside (irrelevant of its area) with rock temperature at up to 2.5 m deep exceeding 80^oC. Project emissions are to be nil. It is expected that conservation of a waste heap would neutralize the possibility of its further burning or repeated ignition. However, the waste heap condition will be permanently controlled. If, because of an emergency, temperature readings indicate that there are hot spots, the related emissions will be taken into account in emission reduction calculations. This parameter is used to understand whether there are hot spots. The temperature of the waste heap is under strict control. Monitoring of the parameter is done once per month. The measurement results are entered in working logs and submitted to the company's management. Based on the data, according to NPAOP 10.0-5.21-04 "Manual on self-ignition prevention, extinction and demolition of waste heaps", coefficient "k" is estimated. The coefficient is used

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

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

for emission reduction calculation (if there are signs that the waste heap is burning, coefficient “k” is considered equal to 1; if there are no signs, coefficient “k” is equal to 0).

A.6. Status of implementation including schedule of project milestones:

On May 13, 2005, following a temperature survey, the waste heap of SE “Artemugol” Rumiantsev Mine was declared a burning one. A project to stabilize the heap started to be developed immediately. The heap extinction and stabilization works were all completed in August 2005.
Simultaneously, stabilization of waste heaps of Haiovyi, Kalinin and Lenin mines, which were declared burning ones later, took place. (see Annex 2).
Emission reductions started to be generated in January 2006. Thus, temperature surveys of the waste heaps of the aforementioned mines were conducted permanently; as a result, the waste heaps were declared non-burning.
Energy efficiency measures implemented at SE “Artemugol” in the period of 01/01/2012-30/09/2012 are provided in Annex 3. (Activities that were implemented under the project).

The project obtained Letter of Endorsement (#2425/23/7 dated 30/08/2012) from the State Environmental Investment Agency of Ukraine.
The project obtained approval from Ukraine (the Host country) (Letter of Approval No.2895/23/7, issued by the State Environmental Investment Agency of Ukraine on 04/10/2012), as well as from the country-purchaser of GHG emission reductions, Switzerland (Letter of Approval No.J294-0485, issued by the Federal Office for the Environment (FOEN) dated 21/09/2012).

A.7. Possible deviations from or revisions to the registered PDD version:

There have been no deviations from the registered PDD.
Ex-post emission reductions in the monitoring report differ from the estimated emissions provided in the PDD:

Table 1: Emission reductions comparison

Values in t CO_2eq	Emission reductions according to the PDD	Emission reductions according to the monitoring report
Total emission reductions over the monitoring period	**326 314**	**391 157**

At the time of PDD development available data on the quantitative characteristics of the waste heaps for the year to the start of work on the stabilization of waste heaps: as of 2004 (Rumiantsev, Kalinin mines) and as of 2005 (Haiovyi, Lenin mines) were taken to calculate the amount of GHG emission reductions. At the stage of monitoring the actual data on the characteristics of the waste heap of 2006 were used in calculations. This explains the difference between the amount of GHG emission reductions specified in the registered PDD (version 2.0) and actually reached values of GHG emission reductions provided in this monitoring report.

Conservative approach on volume of waste heaps used in the PDD is used in this monitoring report

Because in calculation of GHG emission reductions after 2006 data on the quantitative characteristics of the waste heaps of 2006 were used, although there was a shipment of rock after 2006, because waste heaps are active.

A.8. Possible deviations from or revisions to the registered monitoring plan:

No revisions to the monitoring plan took place. It is noteworthy, formulae D.8-D.9 were changed.

A.9. Changes since the latest verification:

Not applicable.

A.10. Persons responsible for the preparation and submission of monitoring report:

State Enterprise “Artemugol”:

- Anatolii Honcharov, Director

CEP Carbon Emissions Partners S.A.:

- Fabian Knodel, Director

SECTION B. Key monitoring activities according to monitoring plan for monitoring period stated in Section A.4.

Data on the following parameters should be collected and recorded for every monitoring period:

- Total electricity consumption in the course of coal mining
- Total coal production
- Temperature of rock in a waste heap A waste heap is considered burning if there is at least one hot spot inside (irrelevant of its area) with rock temperature at up to 2.5 m deep exceeding 80^{o}C. Project emissions are to be nil. It is expected that conservation of a waste heap would neutralize the possibility of its further burning or repeated ignition. However, the waste heap condition will be permanently controlled. If, because of an emergency, temperature readings indicate that there are hot spots, the related emissions will be taken into account in emission reduction calculations. This parameter is used to understand whether there are hot spots. The temperature of the waste heap is under strict control. Monitoring of the parameter is done once per month. The measurement results are entered in working logs and submitted to the company's management. Based on the data, according to NPAOP 10.0-5.21-04 "Manual on self-ignition prevention, extinction and demolition of waste heaps", coefficient "k" is estimated. The coefficient is used for emission reduction calculation (if there are signs that the waste heap is burning, coefficient "k" is considered equal to 1; if there are no signs, coefficient "k" is equal to 0).

B.1. Types of monitoring equipment

1. Electricity meters:

Electricity meters used by SE "Artemugol" are on the books of "Uzlova" PJSC "DOE" and are property of the Donetsk Branch of SE "Rehionalni elektrychni merezhi".

Every month, operators take readings of electricity meters and submit them further to the calculating department of the company and entered in Reports according to the 11-MTP form.

Organisation that conducts verification (calibration) of metering equipment:

- SE "Donetsk research centre for standartization, metrology and certification"
- SE "Mekhanichni maisterni DVGRS".

2. VT-200 scales

Operators enter readings of VT-200, the volume of produced coal in the corresponding books, and the figures are every day submitted according to the internal B2S form "Data on raw coal production at the mine" to the Sectoral information-computing centre and form the basis for reported data in monthly reports in conformity with "Instruction on keeping a record of coal volumes produced and processed at mines, open pits and preparation plants of the Ministry of Coal Industry of Ukraine" approved by the Decree of the Minister of Coal Industry of Ukraine" as of 17.09.1996 No.466 and SOU 10.1.00186080.002-2006 "Rules about conducting underground survey and calculating production volumes according to its results"[6]. The data is then entered in yearly Reports according to the 1P-NPP form (Report on industrial production), which are submitted to the State Statistics Service of Ukraine.

3. General-purpose thermometer

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

Temperature range: from 0^oC to $300\,^oC$. Accuracy class: 0.5. Working principle: Technical glass thermometer in a protective case.

Calibration is conducted in accordance with the legislation of the host party - the State Standard of Ukraine DSTU 2708:2708 "Metrology. Verification of metering devices. Organization and procedure." Temperature surveys are conducted by "Zefir" Luhansk Industrial Environmental Company the data form the basis for GHG calculation.

B.1.2. Involvement of third parties:

- SE "Donetsk research centre for standartization, metrology and certification"
- SE "Mekhanichni maisterni DVGRS"
- "Zefir" Luhansk Industrial Environmental Company.

B.2. Data collection (data collected for all the monitoring period):

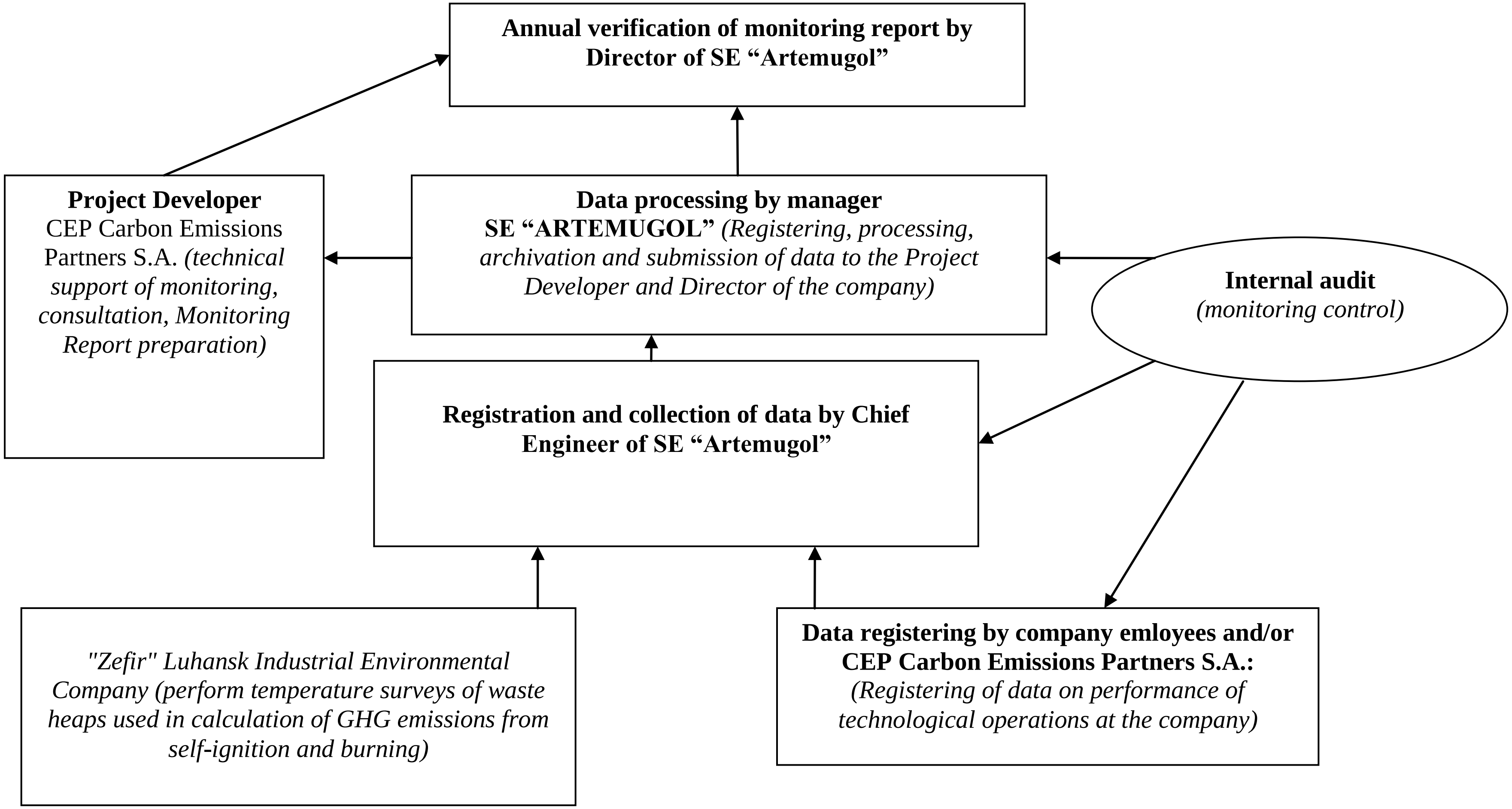

Figure 1: Data collection

B.2.1. Data and parameters used for GHG emission calculation in the project scenario:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Data source	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_p^y	*Total electricity consumption in the course of coal mining in monitoring period y of the project scenario*	*Readings of electricity meters entered into report forms 11-MTP*	*MWh*	*m*	*annually*	*100%*	*Electronic/ paper*	
2. $EF_{p,CO_2,elec}^y$	*Carbon dioxide emission factors from electricity consumption from the national power grid of Ukraine in monitoring period y of the project scenario*	*Carbon dioxide emission factors associated with electricity consumption for 2012 are sourced from NEIAU Decree No.75 dated 12/05/2011 "On approval of carbon dioxide emission factors for 2011"*[7]	*t CO_2eq/MWh*	*c*	*annually*	*100%*	*Electronic/ paper*	*Year Value* *2012 1.090*
3. N_p^y	*Total production in monitoring period y of the project scenario*	*Official data of the company stored at the economic planning department for minimum 2 years following the transfer of the last emission reduction units and is annually submitted*	*t*	*m*	*annually*	*100%*	*Electronic/ paper*	

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

		to the Main Statistics Administration of Donetsk region.						
4. $FC_{p,PO,coal}$	*Total amount of coal in a waste heap as of the beginning of extinction works*	*Calculated according to the Monitoring Plan*	*ths t*	*c*	*Once*	*100%*	*Electronic/ paper*	
5. $NCV^{y}_{p,coal}$	*Net calorific value of coal in monitoring period y of the project scenario*	*Reference value National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010*[8]	*TJ/ths t*	*e*	*annually*	*100%*	*Electronic/ paper*	*Year Value* *2012 21.60*
6. $EF^{y}_{p,C,coal}$	*Default carbon emission factor for stationary coal combustion in monitoring period y of the project scenario*	*Reference value National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010*[9]	*t C/TJ*	*e*	*annually*	*100%*	*Electronic/ paper*	*Year Value* *2012 25.99*
7. V_{PO}	*Waste heap volume as of the moment of its extinction and stabilization*	*Waste heap passport*	*m^3*	*e*	*Once*	*100%*	*Electronic/ paper*	*Rumiantsev Mine - 3668375 m3* *Haiovyi Mine - 2136961 m3* *Kalinin Mine -*

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

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

								618625 m3 *Lenin Mine - 5595750 m3*
8. C_{coal}	*Coal content in a waste heap*	*Publications based on scientific research.*[10]	*%*	*e*	*Once*	*100%*	*Electronic/ paper*	*10%*
9. ρ_n	*Waste heap density as of the moment of its extinction and stabilization*	*Waste heap passport*	*kg/m³*	*e*	*Once*	*100%*	*Electronic/ paper*	*2000 kg/m³*
10. k_i^y	*Waste heap combustion factor in month i year y*	*Waste heap temperature survey results*	*-*	*m*	*Monthly*	*100%*	*Electronic/ paper*	*If waste heap combustion was detected in the reporting month, it is assumed that k=1, if the combustion was not detected, as provided by the project, it is assumed that k=0.*
11. $OXID_{p,coal}^y$	*Carbon oxidation factor for coal combustion in monitoring period yof the project scenario*	*Reference value National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010*[11]	*Relative units*	*e*	*annually*	*100%*	*Electronic/ paper*	*Year Value* *2012 0.962*

B.2.2. Values used for calculation of GHG emissions in the baseline scenario:

ID number (Please use numbers	Data variable	Data source	Data unit	Measured (m), calculated (c),	Recording	Proportion of data to be	How will the data be archived?	Comment

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

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

to ease cross-referencing to D.2.)				estimated (e)	frequency	monitored	(electronic/paper)	
1. N_p^y	*Total production in monitoring period y of the project scenario*	*Official data of the company stored at the economic planning department for minimum 2 years following the transfer of the last emission reduction units and is annually submitted to the Main Statistics Administration of Donetsk region.*	*t*	*m*	*annually*	*100%*	*Electronic/ paper*	
2. N_b^j	*Total coal production in year j of the historical period of the baseline scenario*	*Official data of the company stored at the economic planning department for minimum 2 years following the transfer of the last emission reduction units and is annually submitted to the Main Statistics Administration of Donetsk region.*	*t*	*m*	*annually*	*100%*	*Electronic/ paper*	
3. EC_b^j	*Total electricity consumption in the course of coal mining in year j of the*	*Readings of electricity meters entered into report forms 11-MTP*	*MWh*	*m*	*annually*	*100%*	*Electronic/*	*Prior to the start of the project in baseline years:* *2000-2004 - Rumiantsev Mine*

	historical period of the baseline scenario							*2000-2006 – Haiovyi Mine* *2000-2005 – Kalinin Mine* *2001-2006 – Lenin Mine*
4. $EF^{j}_{b,CO_2,elec}$	*Carbon dioxide emission factors from electricity consumption from the national power grid of Ukraine in year j of the historical period of the baseline scenario*	*For 2000-2005: according to table B2 "Baseline carbon emission factors for JI projects reducing electricity consumption" from the Operational Guidelines for Project Design Documents of Joint Implementation Projects, Volume 1: General guidelines, Version 2.3 of the Ministry of Economic Affairs of the Netherlands dated May 2004, page 42 (ERUPT 4, Senter, Netherlands)* *For 2006: according to Table 8: "Emission factors for the Ukrainian power grid 2006-2012" Annex 2 "Standartized emission factors for UPG of Ukraine"*	*t CO_2eq/MWh*	*c*	*annually*	*100%*	*Electronic/ paper*	

		to "Ukraine - Assessment of new calculation of CEF", approved by TUV SUD Industrie Service GmbH on 17/08/2007.						
5. $FC_{b,PO,coal}$	*Total amount of coal in a waste heap as of the beginning of extinction works*	*Calculated according to the Monitoring Plan*	*ths t*	*c*	*Once*	*100%*	*Electronic/ paper*	
6. $NCV^{y}_{b,coal}$	*Net calorific value of coal in monitoring period yof the baseline scenario*	*Reference value National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010*[12]	*TJ/ths t*	*e*	*annually*	*100%*	*Electronic/ paper*	
7. $EF^{y}_{b,C,coal}$	*Default carbon emission factor for stationary coal combustion in monitoring period y of the baseline scenario*	*Reference value National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010*[13]	*t C/TJ*	*e*	*annually*	*100%*	*Electronic/ paper*	
8. V_{PO}	*Waste heap*	*Waste heap*	m^3	*e*	*Once*	*100%*	*Electronic/*	*Rumiantsev Mine -*

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

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

	volume as of the moment of its extinction and stabilization	*passport*					*paper*	*3668375 m3 Haiovyi Mine - 2136961 m3 Kalinin Mine - 618625 m3 Lenin Mine - 5595750 m3*
9. C_{coal}	*Coal content in a waste heap*	*Publications based on scientific research.*	*%*	*e*	*Once*	*100%*	*Electronic/ paper*	*10%*
10. ρ_n	*Waste heap density as of the moment of its extinction and stabilization*	*Waste heap passport*	*kg/m^3*	*e*	*Once*	*100%*	*Electronic/ paper*	*2000 kg/m^3*
15. $OXID^{y}_{b,coal}$	*Carbon oxidation factor for coal combustion in monitoring period yof the baseline scenario*	*Reference value National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010*	*Relative units*	*e*	*annually*	*100%*	*Electronic/ paper*	

B.2.3. Leakage:

No leakage is expected.

B.2.4. Data on environmental impacts:

Ukraine is the Host Party in the project. Environmental Impact Assessment (EIA) is part of procedures for projecting and obtaining permissions within the framework of the Ukrainian project. The rules about carrying out EIA can be found in the Ukrainian state regulatory document on construction DBN A.2.2.-1-2003 (Title: Structure and Contents of Environment Impact Assessment (EIA) materials during design and construction of enterprises, buildings and facilities).

B.3. Data processing and archiving (including applied software):
Data on the following parameters should be recorded for every monitoring period:

1. Total electricity consumption in the course of coal mining
2. Total coal production
3. Temperature of rock in a waste heap A waste heap is considered burning if there is at least one hot spot inside (irrelevant of its area) with rock temperature at up to 2.5 m deep exceeding 80^{o}C. Project emissions are to be nil. It is expected that conservation of a waste heap would neutralize the possibility of its further burning or repeated ignition. However, the waste heap condition will be permanently controlled. If, because of an emergency, temperature readings indicate that there are hot spots, the related emissions will be taken into account in emission reduction calculations. This parameter is used to understand whether there are hot spots. The temperature of the waste heap is under strict control. Monitoring of the parameter is done once per month. The measurement results are entered in working logs and submitted to the company's management. Based on the data, according to NPAOP 10.0-5.21-04 "Manual on self-ignition prevention, extinction and demolition of waste heaps", coefficient "k" is estimated. The coefficient is used for emission reduction calculation (if there are signs that the waste heap is burning, coefficient "k" is considered equal to 1; if there are no signs, coefficient "k" is equal to 0).

B.4. Force majeure registry log:

All force majeure situations are fixed in documents and submitted in a special form to te company management. The essence of the project and the project activity does not provide for any factors, which may lead to unexpected GHG emissions apart from those provided in the project design documents.

SECTION C. Quality assurance and quality control measures

C.1. Training:

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

Instructions on safety norms are compulsory and are to be given to all the staff members under the local legislation. The procedure of giving instructions on safety norms includes training volume, training intervals, training methods, examination. The management of the company where the project is implemented is to ensure that registration entries for this training and regular examinations are made.

C.2. Involvement of third parties:

No third parties were involved.

C.3. Internal audit and control activities:

Internal cross-check and audits are conducted for all data subject to direct monitoring, i.e. for waste heap temperature. Company director reviews monthly and annual reports and performs spot check of primary docments.

For constant values and fixed parameters and factors, quality assurance is verification and assurance of reliability of data sources (generally acknowledged and / or based on scientific research), their verifiability (data having public access or available for the project participants).

C.4. Malfunction detection procedures:

All extraordinary situations and malfunctions are documented in internal report forms.

In case of any mistakes, careless actions or contradictions that the management of the company where the project is implemented will detect during monitoring, a committee will be set up to conduct investigation into such cases and to issue an order that will include regulations on necessary adjustment actions to be taken and to help avoid such situations in future.
The management of the company where the project is implemented is to establish connection that will make it possible that any person engaged to monitor waste heap condition can submit proposals, suggest improvements and contribute ideas for more precise monitoring in future. This connection between the workers and the management will enable the latter to react and take the necessary adjustment actions or suggest improvement. The project participant – CEP Carbon Emissions Partners S.A. – will do regular analysis of the monitoring plan and procedures and offer necessary improvements to other project participants if needed.

SECTION D. Calculation of GHG emission reductions

D.1. Formulae used for calculation of GHG emission reductions:

D.1.1. Formulae used to calculate project GHG emissions:

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

where:

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

- PE^{y}_{elec} GHG emissions from electricity consumption by technological equipment in the course of coal production in monitoring period *y* of the project scenario, t CO_2eq;

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

y - index for monitoring period;

$elec$ - index for electricity consumption system;

PO - index for waste heap;

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

where:

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

$EF^{y}_{p,CO2,elec}$ - carbon dioxide emission factors from electricity consumption from the national power grid of Ukraine in monitoring period *y* of the project scenario, t CO_2/MWh;

y - index for monitoring period;

p - index for project scenario;

$elec$ - index for electricity consumption system;

According to the research, the period of waste heap combustion is 15 years[14], which means that the entire amount of coal in a waste heap can burn down over this period. Waste heap monitoring programme provides an opportunity to control the heap condition and prevent its inflammation, and if the latter occurs, to take measures for its rapid extinction. It also provides for monthly monitoring of waste heap.
Based on the conditions of the waste heap monitoring programme, the formula for the calculation of GHG emissions from waste heap combustion in the project scenario was adjusted to the monthly waste heap monitoring activities.

$$PE_{PO}^{y} = \sum_{i=1}^{12} \frac{FC_{p,PO,coal} \cdot NCV_{p,coal}^{y} \cdot k_i^y \cdot EF_{p,CO2,coal}^{y}}{180} + PE_{p,PO,disel}^{y}, \qquad (D.3)$$

where:

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

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

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

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

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

k_i^y - waste heap combustion factor for month *i* of year *y* (if waste heap combustion was detected in the reporting month, it is assumed that k=1, if the combustion was not detected, as provided by the project, it is assumed that k=0.

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

disel - index for diesel fuel;

y - index for monitoring period;

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

p - index for project scenario;

coal - index for coal.

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

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

$$PE_{PO}^{y} = \sum_{i=1}^{12} \frac{FC_{p,PO,coal} \cdot NCV_{p,coal}^{y} \cdot k_i^y \cdot EF_{p,CO2,coal}^{y}}{180}, \quad (D.4)$$

$$FC_{p,PO,coal} = \frac{V_{PO} \cdot \rho_n \cdot C_{coal}}{1000000}, \quad (D.5)$$

where:

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

. V_{PO} – waste heap volume, m^3;

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

ρ_n - waste heap density, kg/m^3;

PO - index for waste heap;

n - index for waste heap density;

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

$coal$ - index for coal.

$$EF_{p,CO2,coal}^{y} = EF_{p,C,coal}^{y} \cdot OXID_{p,coal}^{y} \cdot 44/12, \quad (D.6)$$

where:

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

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

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

y - index for monitoring period;

p - index for project scenario;

$coal$ - index for coal.

D.1.2. Formulae used to calculate baseline GHG emissions:

$$BE^y = BE^y_{elec} + BE^y_{PO}, \tag{D.7}$$

where:

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

BE^y_{elec} - total GHG emissions from electricty consumption by technological equipment in the course of coal production in monitoring period *y* of the baseline scenario, t CO_2eq;

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

y - index for monitoring period;

$elec$ - index for electricity consumption system;

PO - index for waste heaps.

$$BE^y_{elec} = N^y_p \cdot BPER_J; \tag{D.8}$$

where:

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

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

$$BPER_J = \sum_{j=1}^{5} \frac{BE^j_{b,elec} / N^j_b}{5}; \tag{D.9}$$

where:

$BE^j_{b,elec}$ -GHG emissions from combustion of fossil fuel used in the course of generation of electricity consumed in the course of coal mining in year *j* of the historical period of the baseline scenario, t CO_2eq;

N^j_b - total coal production in year *j* of the historical period of the baseline scenario, t;

5 – years in historical period, 2000-2004;

y - index for monitoring period;

p - index for project scenario;

i - index for the year of historical period;

J - index for historical period;

b - index for baseline scenario;

$elec$ - index for electricity consumption system;

where:

$$BE^{j}_{b,elec} = EC^{j}_{b} \cdot EF^{j}_{b,CO2,elec}, \quad (D.10)$$

where:

EC^{j}_{b} - total electricity consumption in the course of coal mining in year *j* of the historical period of the baseline scenario, MWh;

$EF^{j}_{b,CO2,elec}$ - carbon dioxide emission factor related to electricity consumption from the national power grid of Ukraine in year *j* of the historical period of the baseline scenario, t CO_2/MWh;

$elec$ - index for electricity consumption system;

i - index for the year of historical period;

5 – years in historical period, 2000-2004;

b - index for baseline scenario.

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

$$BE^{y}_{PO} = \sum_{i=1}^{12} \frac{FC_{b,PO,coal} \cdot NCV^{y}_{b,coal} \cdot k^{y}_{i} \cdot EF^{y}_{b,CO2,coal}}{180}, \quad (D.11)$$

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

where:

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

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

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

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

PO - index for waste heap;

b - index for baseline scenario;

$coal$ - index for coal;

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

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

where:

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

V_{PO} – waste heap volume, m^3;

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

ρ_n - waste heap density, kg/m^3;

PO - index for waste heap;

b - index for baseline scenario;

n - index for waste heap density;

$coal$ - index for coal;

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

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

where:

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

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

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

y - index for monitoring period;

b - index for baseline scenario;

$coal$ - index for coal.

D.1.3. Formulae used to calculate GHG emission reductions:

$$ER_y = BE_y - PE_y \qquad (D.14)$$

ER_y - greenhouse gas emission reductions in period *y*, t CO_2eq;

BE_y - greenhouse gas emissions in period *y* of the baseline scenario, t CO_2eq;

PE_y - greenhouse gas emissions in period *y* of the project scenario, t CO_2eq;

y - index for monitoring period.

D.2. Description and estimation of data uncertainty level:

All the uncertainties for measurements are in line with the manuals of metering device manfacturers. The uncertainty level of external data, fixed values and pre-set values is low, because the data are taken from reliable, accessible and verfiable sources.

D.3. GHG emission reductions:

D.3.1. GHG emissions under the project scenario:

Table 2: Project emissions

		2012
Project emissions	(t CO_2 equivalent)	203828

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D.3.2. GHG emissions in the baseline scenario:

Table 3: Emissions in the baseline scenario

		2012
Baseline emissions	(t CO_2 equivalent)	594985

D.3.3. Leakage:

Table 4: Leakage.

		2012
Leakage	(t CO_2 equivalent)	0

D.3.4. Total GHG emission reductions over the monitoring period:

Table 5: Emission reductions.

		2012
Emission reductions	(t CO_2 equivalent)	391157

For detailed calculation of GHG emissions, see Annex 2: “Calculation of CO_2 emissions by implementation of the energy efficiency measures and waste heap stabilization at State Enterprise “Artemugol” in monitoring period 01/01/2012-30/09/2012”.

Annex 1

Definitions and abbreviations

Abbreviations

CO_2	CARBON DIOXIDE
GHG	GREENHOUSE GASES
IPCC	INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE
PDD	PROJECT DESIGN DOCUMENT

Definitions

Baseline scenario	The scenario that reasonably represents the situation with greenhouse gases in the absence of the proposed project. A baseline shall cover emissions from all gases, sectors and source categories listed in Annex A of the Kyoto Protocol, and anthropogenic removals by sinks, within the project boundary.
Emission reductions	Emission reductions due to JI project implementation, which is not subject to verification or determination, as defined by the JI Guidelines, but agreed for the purpose of purchase.
Greenhouse gas (GHG)	Gas that influences the climate change.The Kyoto Protocol lists the following greenhouse gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), carbon-hydrofluoric compounds, perfluorocarbons (PFC) and sulfur hexafluoride (SF6).)
Joint Implementation (JI)	The mechanism referred to in Article 6 of the Kyoto Protocol. The mechanism enables Annex I countries or their companies to implement emission reduction or sequester projects jointly to generate Emission Reduction Units.
Monitoring plan	The plan describing the way in which emission reduction monitoring will be carried out. The monitoring plan is part of the Project Design Document (PDD).