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

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SECTION A. General description of the project

A.1. Title of the project:

"Improvement of the Energy efficiency at Energomashspetsstal (EMSS), Kramatorsk, Ukraine".

Date 31 August 2009, version 3.9

Sectoral scope 3: Energy demand[1]

A.2. Description of the project:

The envisaged JI project takes place as the production facilities of Energomashspetsstal (EMSS). The main scope of activity of EMSS is the production of special casting and forged steel forms for energy and transport machine building, power engineering, metallurgical, mining, cement and other industries in Ukraine and abroad (Russia, France, Belgium, Denmark).

The machine-building production sector is a highly energy intensive industry. Ukraine has inherited from the Soviet Union large machine-building production sector. The majority of the machine-building plants in Ukraine were constructed in the middle of 20^{th} century, but no major energy efficiency projects or refurbishment works were implemented in the machine-building sector of Ukraine during the past 15 years.

In the machine-building sector in Ukraine there is no policy in place which requires companies to reduce the CO_2 emissions.

The machine-building sector in Ukraine is facing significant competition from China, Russia and other countries. China has recently built several machine-building plants which will lower export opportunities for Ukrainian plants. Therefore Ukrainian machine-building companies need continuously to increase there competitiveness and market share in order to survive. The meagre investment climate creates additional burden for Ukrainian companies to attract capital and optimize their processes. Additionally the increasing price for natural gas in Ukraine decreases profitability of production of steel and steel details for machine-building in the sector.

EMSS produces and sells special casting and forged steel forms for energy and transport machine building, power engineering, metallurgical, mining, cement and other industries in Ukraine and abroad. With the planned modernization at the plant, EMSS aims to increase energy efficiency of its production and quality of steel forms to expand export.

The project activity consists of the improvement of the energy efficiency at the premise of EMSS by the implementation of four subprojects:

Subproject 1. Reconstruction of thermal and heating furnaces – there are 35 thermal and heating furnaces in operation in different shops at the premises of EMSS. The main goal of this subproject is the reduction of the natural gas (NG) consumption on 26 of these furnaces by commissioning of new automated NG burners (this enables to maintain the required temperature inside of the furnace) and by implementation of new thermal insulation for the walls, front doors and roofs of the furnaces. The first seven furnaces (from the total 35) will be reconstructed to the end of 2007 and the other nineteen furnaces will be reconstructed from January 2008 to September 2009.

[1] http://ji.unfccc.int/AIEs/CallForInputs/index.html

Subproject 2. Installation of a new vacuum system – Installation of a new vacuum system for the vacuumed steel production. The amount of vacuumed steel is equal to the amount of total steel produced. The existing vacuum system uses heat (1.16 MWh/t steel) and electricity (28 Wh/t steel). The new vacuum system will use only electricity (1.92 kWh/t steel).

Subproject 3. Installation of an arc ladle furnace – New arc ladle furnace will be installed for the steel production. This means that the part of the process of the steel preparation will be done in the ladle from which the steel will be cast into the forms. As a result there will be reduction of the electricity consumption (from 1.03 MWh/t electro steel to 0.713 MWh/t electro steel).

Subproject 4. Modernization of press equipment – Replacing the old pump system, serving the 15,000 ton press, with a new one, more effective pump system. The number of old pumps is 24 (with 500 kW installed capacity each), and the number of new pumps will be 11 (with 800 kW installed capacity each).

With the implementation of described energy efficiency measures, EMSS will be able to reduce direct and indirect CO_2 emissions at the production of steel and steel details. These emissions reductions can be sold as ERUs on the international emission reduction market.

A.3. Project participants:

Party involved	Legal entity project participant (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Ukraine (Host party)	Open Joint Stock Company “Energomashspetsstal” (EMSS)	No
Netherlands	Global Carbon BV	No

Table A.3.1: Project participants

Global Carbon BV is developer of this JI project and buyer of emission reductions.

A.4. Technical description of the project:

A.4.1. Location of the project:

The physical location of the project is at the premise of Energomashspetsstal (EMSS) located in the town of Kramatorsk, Donetsk region, Ukraine.

Graph A.4.1: Location of Kramatorsk

A.4.1.1. Host Party(ies):

Ukraine

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

Donetsk region.

A.4.1.3. City/Town/Community etc:

City of Kramatorsk

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

The city of Kramatorsk is located 150 kilometres North from Donetsk – the biggest industrial centre of Ukraine. Kramatorsk is an industrial centre with around 300,000 inhabitants, mainly occupied in the different industries in the region – coal mines, several heavy machine building entities like EMSS, metallurgical plants and the concomitant industries.

The geographical coordinates of the city of Kramatorsk are:

- 48 degrees, 44 minutes and 11.44 seconds North and
- 37 degrees, 34 minutes and 18.11 seconds East.

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

EMSS is a scrap-based electric arch furnace process steel producer, fully capable of producing products in carbon, low, medium and high alloy grades. The EMSS main products are special steels (round and square), forged and cast details for the nuclear power plants in Ukraine and Russia with extra big dimensions and volume.

Recovered metal materials from different sources, including dismantled plants and industries, motors and old appliances, are delivered to EMSS plant via truck and rail. The recovered metal is stored and processed in a Scrap Yard and then carried into the EAF Shop and charged into the Electric Arc Furnaces.

Subproject 1

Reconstruction of thermal and heating furnaces - The main goal of this subproject is the reduction of the specific natural gas (NG) consumption per tone of steel heated in the thermal and heating furnaces. The reconstruction will take place at 26 furnaces – the first of them will be commissioned on January 2008 and the last – on September 2009. The reconstruction includes:

- Implementation of a new impulse burners based system for heating the metal inside of the furnaces – the new impulse burners will be very fast and with high level of automation of the burning process – this enables to sustain the exact needed temperature inside of the furnace in function of the time of treatment and the technological exigencies;
- Implementation of a new thermal insulation for the walls and the roofs of the furnaces. The new insulation will be based on the materials with low specific weight – this reduce the heat accumulation on the walls and roofs and directly reduce the heat loses of the furnaces;
- Implementation of full hermetic front doors for the furnaces – this enables to reduce the heat loses of the furnaces;
- Utilization of the waste heat from the exhaust gases in field to heat the input burners air;
- Implementation of a new fully automated system for the control of the technological processes in the furnaces.

The different type of furnaces with their capacities and specific consumption of NG are represented at the table below:

Quantity of furnaces	Capacity of the furnace [t steel/y]	Before reconstruction Specific NG consumption [nm3 NG/t steel]	After reconstruction Specific NG consumption [nm3 NG/t steel]
2	5,486	240	132
4	8,108	373	205
5	5,879	381	209
2	4,033	388	213
4	6,240	682	375
3	6,250	694	381
4	7,625	861	473
1	9,800	931	512
1	10,700	1005	552

Table A.4.2.1: Furnaces, subject of reconstruction and their specific NG consumption.

The new burning systems made by Eclipse company will be supplied by Promgasservice, Ukraine. The new thermal insulation will be supplied by Keratech, Czech Republic. The automated system for the control will be supplied by Siemens. The general subcontractors for new thermal and heating furnaces are such companies as Thermostal, Locher and Bosio. The introduction of new impulse burners, thermal insulation, utilization of the waste heat and automated control system for the thermal and heating furnaces is a novel technology for Ukrainian machine-building sector.

Subproject 2

Installation of a new vacuum system (Vacuum Degasser (VD)) – Installation of a new vacuum system for the vacuumed steel production. The amount of vacuumed steel is equal to the amount of the total steel produced. The existing vacuum system uses heat (1.16 MWh/t steel) and electricity (28 Wh/t steel). The new vacuum system will use only electricity (1.92 kWh/t steel).

Year	Vacuumed steel produced [tons]
2008	158,200
2009	201,343
2010	210,000
2011	240,000
2012	240,000

Table A.4.2.2: Quantities of the vacuumed steel that will be produced during 2008-2012.

The existing vacuum systems for the extraction of the gases from the liquid steel are based on the steam injector pump installations. The main elements on the new vacuum installations are dry mechanical pumps with high dust resistance. This principle of work permits to avoid the big heat demand of the old steam injection installations. The new dry pumps will consume only electricity – 1.92 kWh/t vacuumed steel.

The supplier of the new equipment is BOC Edwards, England. This technology is common in Western countries, but new for Ukraine.

Subproject 3

Installation of arc ladle furnace – New arc ladle furnace will be installed for the steel production. This means that the part of the process of the steel melting will be done besides electric arc furnace also in the ladle furnace from which the steel will be cast into the forms.

As a result there will be reduction of the electricity used (from 1.03 MWh/t of steel for electric arc furnace to 0.713 MWh/t of steel for electric arc furnace with ladle furnace). This reduction of consumed electricity will lead to reduction of the off side emissions of the Ukrainian electricity system.

The quantities of the produced electro steel for different periods are shown in table A.4.2.3.

The supplier of the technology is NKMZ, Ukraine. This technology is a best practice for Ukraine.

Subproject 4

Modernization of press equipment – Replacing the old pump system, serving the 15,000 ton press, with a new, more effective pump system.

The number of old pumps, serving now the big 15,000 press is 24 (with 500 kW installed capacity each), and the number of new pumps will be 11 (with 800 kW installed capacity each).

The producer of the new pumps is Rexroth company (Bosch Group). This technology is a best practice for Ukraine.

As it can be seen the technologies employed by the project are above current good practice in Ukraine. The lifetime of these technologies is 20 years and the new equipment will not be substituted during at least 10 years since it is the minimal term for depreciation of equipment at EMSS. For mastering of project technologies by employees of EMSS, suppliers of equipment will train the staff of EMSS how to use the supplied equipment in practice and will support EMSS in use of the equipment during trial period (according to agreed contracts).

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

The CO_2 emissions are reduced by lowering the specific energy consumption at EMSS. In Subproject 1 combustion of NG per ton of steel will be reduced on 45 % and this will lead to reduction of CO_2 emission. In Subproject 2 combustion of coal at Kramatorsk CHPP will be reduced and thus CO_2 emission will be also reduced. In Subproject 3 consumption of electricity per ton of steel will be reduced and this will lead to reduction of CO_2 emission. In Subproject 4 also consumption of electricity per ton of steel will be reduced and thus CO_2 emission will be reduced through decrease of coal combustion at the thermal power stations. As a result of all subprojects the combustion of fossil fuels is reduced leading to less CO_2 emission. The energy consumption is reduced through lower natural gas, coal and electricity consumption.

Although the proposed energy efficiency measures are beneficial for EMSS, there are barriers for the implementation of the proposed project:

Investment barrier
The machine-building industry is a capital intensive industry and the proposed project requires a significant amount of financing. For Energomashspetsstal it would be difficult to obtain financing of million Euro on the domestic financial market, since the sources for project financing are very limited, and the interest rates are high. On the international market obtaining financing for this project would also be difficult due to the low credit rating of Ukraine and the high perceived risks of the country's market.

Lack of prevailing practise
No major modernisation projects in the Ukrainian machine-building sector were reported in past 15 years. The majority of the machine-building producers operate the existing equipment, in most cases inherited from the times of Soviet Union. Energy efficiency measures are encouraged by the national law; however, there is no legal requirement of introducing energy efficiency measures in the machine-building industry.

Taking into account the identified barriers and the impact of Joint Implementation, the proposed JI project is additional to what would otherwise occur. A more detailed description on baseline setting and full additionality test can be found in section B of this PDD.

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

	Years
Length of the crediting period	5
Year	**Estimate of annual emission reductions in tonnes of CO2 equiv.**
Year 2008	141,722
Year 2009	205 635
Year 2010	219 909
Year 2011	238 205
Year 2012	238 205
Total estimated emission reductions over the crediting period (tonnes of CO_2 equiv.)	1,043 676
Annual average of estimated emission reductions over the crediting period (tonnes of CO2 equiv.)	208 735

Table A.4.3.1.1: Estimated emission reductions over the crediting period

	Years
Period after 2012, for which emission reductions are estimated	8
Year	**Estimate of annual emission reductions in tonnes of CO2 equiv.**
Year 2013	238 205
Year 2014	238 205
Year 2015	238 205
Year 2016	238 205
Year 2017	238 205
Year 2018	238 205
Year 2019	238 205
Year 2020	238 205
Total estimated emission reductions over the period indicated (tonnes of CO_2 equiv.)	1 905 640

Table A.4.3.1.2: Estimated emission reductions after the crediting period

A.5. Project approval by the Parties involved:

The Project Idea Note had been submitted for review to the Ministry of Environment of Ukraine. A Letter of Endorsement for the proposed project was issued in April 2007. The PDD and the Determination Protocol have presented to the National Environmental Investment Agency of Ukraine and Letter of Approval was issued in January 2009.

SECTION B. Baseline

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

The "Guidance on criteria for baseline setting and monitoring", issued by the Joint Implementation Supervisory Committee allows using approved methodologies of the CDM. At the moment of writing this PDD, there is no approved methodology with the CDM that would apply to the proposed JI project.

For baseline setting, all CDM methodologies require the identification of alternative scenarios, a compliance check with mandatory laws and regulations and barriers facing particular projects. This approach will be used for establishing the baseline.

Step 1: Identification of alternative scenarios

Step 1a. Define alternative scenarios to the proposed JI project activity

Alternative scenario will be defined for each proposed subproject. For the identification of each scenario it is assumed that the same output of product is produced.

1.1 Reconstruction of thermal and heating furnaces (subproject 1).

There are two alternatives to the reconstruction:

a) Continuation of the existing situation
In this scenario the furnaces will continue to produce steel with high specific consumption of NG, due to the big heat losses of walls, roofs and doors of the furnaces, and also due to the old burners with their low efficiency and incapability to have automated regime of work. The actual specific NG consumption per tone of steel is almost twice bigger than the project's one.

b) Implementation of the proposed intervention without the JI incentive
In this scenario the furnaces will produce steel with low specific consumption of NG, but no additional income from ERUs will be generated.

1.2 New vacuum system (subproject 2)

There are two alternatives to the installation of the new vacuum system:

a) Continuation of the existing situation
In this scenario EMSS can continue working with the existing vacuum steel degasser. For this EMSS need to purchase steam from Kramatorsk CHPP – 1.16 MWh/ton of steel. This quantity of heat purchased will increase the price of the produced vacuumed steel and decrease the competitiveness of the plant.

b) Implementation of the proposed intervention without the JI incentive
In this scenario EMSS will produce vacuumed steel using only electricity, but no additional income from ERUs will be generated.

1.3 New arc ladle furnace (subproject 3)

There are two alternatives to the implementation of the new ladle furnace system:
a) Continuation of the existing situation
In this scenario EMSS can continue working using the old arc furnaces with specific electric consumption of 1.03 MWh/ton of steel. EMSS will not be in position to increase the quality of the produced electro steel. This will decrease the competitiveness of the plant.

b) Implementation of the proposed intervention without the JI incentive
In this scenario EMSS will produce steel of high quality with specific electricity consumption of 0.713 MWh/ton of steel, but no additional income from ERUs will be generated.

1.4 New pump system for the 15,000 tonnes press (subproject 4)

There are two alternatives to the implementation of the new pump system:

a) Continuation of the existing situation
In this scenario EMSS will continue to exploit the big press with the old pumps (24 pumps, 500 kW installed capacity each). This manner of work requires also keeping in good condition the existing pump facilities.

b) Implementation of the proposed intervention without the JI incentive
In this scenario EMSS will implement the new pump equipment (11 pumps, 800 kW installed capacity each), but no additional income from ERUs will be generated.

Sub-step 1b. Consistency with mandatory applicable laws and regulations

All the alternatives defined in the Step 1 above are compliant with the national law and regulation. There is neither a mandatory requirement to reduce energy consumption nor any of the alternative scenarios are not in compliance with any applicable law or regulation.

Step 2: Barrier analysis

Sub-step 2a. Identification of barriers that would prevent the implementation of alternative scenarios

Investment barrier.
The machine-building industry is a capital intensive industry and the proposed project requires a significant amount of financing. For Energomashspetsstal it would be difficult to obtain financing of 1 million Euro on the domestic financial market, since the sources for project financing are very limited, and the interest rates are high. On the international market obtaining financing for this project would also be difficult due to the low credit rating of Ukraine and the high perceived risks of the country's market.

Technological barrier.
For this project technological barriers can be observed, due to the lack of prevailing practice. No major modernisation projects in the Ukrainian machine-building sector were reported in the past 15 years. The majority of the machine-building producers operate the existing equipment, in most cases inherited from the times of Soviet Union. The new technologies, employed on the four subprojects, are new ones for Ukraine, but common on the Western countries.

Sub-step 2b. Eliminate alternative scenarios which are prevented by the identified barriers

All alternative scenarios that represent a continuation of the existing situation, are not prevented by the identified barriers. The scenarios do not require any investment or change of the technology.

The alternative scenarios that represent the proposed project without the JI incentive, do face all identified barriers. Please note that the proposed subprojects were considered as one investment by the management. Implementing not all subprojects was not feasible given the interdependencies between the different steps in the production process. Hence the project as a whole faces the investment barrier.

As a result of the barrier analysis only the continuation of the existing situation remains as an alternative scenario and hence constitutes the baseline scenario.

The registration[2] of the project as a JI project will alleviate the investment barrier as it will reduce the payback time of the project significantly. Hence the project can be financed partially from the cash flow of EMSS. Please refer to section B.2 for more information. The registration as JI project will also provide an incentive to the management to accept risk associated with implementing a new technology. With a higher return on the investment an extra buffer is created to cushion any delays or underperformance of the equipment. Furthermore it will allow EMSS to attract external expertise and training opportunities.

Conclusion: Continuation of the existing situation is the baseline scenario for the proposed JI project.

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

Traceable and transparent information showing that the baseline was identified on the basis of conservative assumptions, that the project scenario is not part of the identified baseline scenario and that the project will lead to reductions of anthropogenic emissions by sources or enhancements of net anthropogenic removals by sinks of GHGs is provided to prove that the anthropogenic emissions are reduced below those that would have occurred in the absence of the JI project.

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

Please refer to step 1 of section B.1.

Step 2: Investment analysis

Sub-step 2a. Determination of the analysis method

The proposed JI project will generate additional revenues from natural gas, electricity and heat consumption reduced during different stages of steelmaking. So cost analysis (sub-step 2b Option I) of the CDM Additionality tool version 04 can not be used. Obtaining financial indicators for similar projects in Ukraine is problematic as this project is unique in its kind; therefore the investment comparison analysis (Option II) cannot be performed for the identified alternatives. Therefore the benchmark analysis (Option III) will be used to test the additionality of the proposed JI activity.

[2] In JI registration does not exists. In this context the approval of the JI project and/or making the determination final at the JISC is meant.

Sub-step 2b. Application of the benchmark analysis

The EMSS has not formalized an internal benchmark for investment project therefore and internal company IRR approach can not be used (option 4c in CDM Additionality Tool version 3).

As the company has not passed an IPO, i.e. its shares have no market price. Thus the Weighted Average Cost of Capital (WACC) method can not be used for company's discount rate calculation that is often used as minimum IRR benchmark. Therefore option 4b of CDM Additionality Tool Version 3 is not applicable in this case. The most applicable is the "accumulated method" of calculations (i.e. option 4a). This method calculates IRR benchmark as sum of without risk factor and risk factor. One of the most relevant without risk factors in line with recommendations of the mentioned above documents is long term state bonds yield. Ukraine regularly issues state bonds for covering internal state debt. For internal political reasons the bonds were not issued from July 2005 till September 2006. In September 2006 the trial auction took place for two and three year bonds. The latter were not sold with proposed 9.4% yield.[3] Bearing in mind that three year bonds are not long term bonds (the papers with longer payment period should have higher % to be attractive for investment) and their unattractiveness (low value of yield proposed) the without risk rate of 9.4% considered here looks more than conservative.

When using "accumulated method" the risk factor may be identified on the basis of expert opinion in case of lack of the data for the similar projects in the country. The information on similar projects in Ukraine did not exist at the moment of project activities start (January 1st, 2006) as the described project was completely new at that time. It remains completely new still as the Company produces so called special steel that is used only for internal purposes to produce different type of capital intensive equipment with high requirements for the steel quality. There are no risk factors for different industries to be recommended for use officially in Ukraine. Bearing in mind the similarity of this type of machinery building and metal works production in Ukraine and Russia, the Company uses the risk factors proposed in the official Russian methodology on investment projects efficiency assessment.[4] The medium risk factor is applied (8-10% - investment into production development based on proved technologies plus sales growth of existing products). It should be stressed that conservative risk factor is used as due to the improvement of steel quality the Company will diversify the final product range and plans to produce new types of equipment. In case of a new product promotion risk factor amounts to 13-15%. So the upper border of medium risk factor (10%) was used. Thus based on conservative estimation of risk and without risk factor, the IRR benchmark amounts to 19.4%.

Sub-step 2c. Calculation and comparison of the indicators

The financial indicators for the proposed project (alternative b) has been calculated under the following assumptions:

- All calculations were made in constant January 1st, 2006 prices in Euro.
- Operation savings comprise natural gas, electricity and heat consumption reductions and were calculated in line with SP1 – SP4 description above ;
- Additional operation cost consists of labour cost due to increase of working places;
- The steel produced and capacity used by furnace was calculated on basis of the average final product structure on January 1st, 2006;
- Though the Company optimistically plans to use 100% in 2010 and afterwards, more conservative 80% approach was used.

[3] Minfin of Ukraine "investigated "the lending market. – Economitcheskie izvestia. 18.09.06
[4] Methodological recommendations on evaluation of investment projects efficiency. Approved by Ministry of Economy of the RF, Ministry of Finance of the RF, State Committee of the RF on Construction, Architecture and Housing Policy of the RF 21.06.1999 N ВК 477.

The project has the following financial indicators:

IRR	16.8%
Discounted PBP	10 years

Table B.2.1: Financial Indicators of Project

Discounted pay back period was calculated from the year of the last investment (the same approach is used in table B.2.2). Investments are split for 4 years. So the actual PBP is 13 years. Project IRR is lower than conservative IRR benchmark. As clearly can been seen the project is not an attractive financial investment.

Sub-step 2d. Sensitivity analysis

A sensitivity analysis of the proposed project was made based on the market forecasts available at the moment of making the financial analysis of the proposed project. The key tested indicators included natural gas price, electricity and heat tariff prices and final product volumes. The steel price was not considered as steel is not sold out but used internally.

The table below presents the result of sensitivity analysis.

Scenario	IRR (%)	Discounted PBP (full years)
Natural gas price 10% up	17,3	9
Electricity price 10% up	17,2	9
Heat tariff 10% up	17,5	9
NG, Electricity and heat price 10% up	18,5	8
Steel production down 10%	15,1	13
Steel production up 10%	18.4	8

Table B.2.2: Results of Sensitivity Analysis

We considered quite significant – 10% fluctuations of the main revenue driving indicators. As it can be seen from the table the project results are rather robust to price fluctuations and even in case of joint electricity, natural gas and heat prices increase by 10% the IRR bench mark is not reached. The natural gas price will increase more only in case of political crisis as it is already reached 80% of European price and Russia as the main NG supplier keeps Ukraine in a group of former Soviet republics for which price is kept lower then for Europe. The project is sensitive to the enterprise economic performance in terms volumes of steel and steel products produced. As soon 80% capacity use is considered the steel production can increase maximum by 20%. This can be reached only in case of stable long term orders. The annual profit generated by project is not so big even in the case of the lowest discounted pay back period of 8 years the project investment.

Thus, financial and sensitivity analysis shows the project being completely additional and not raising additional revenues sufficient to make decision on it implementation without Kyoto protocol flexible economic mechanism opportunities.

Step 3. Barrier analysis

Please refer to step 2 of section B.1

Step 4. Common practice analysis

Several machine-building and steel companies are *considering* reducing the energy consumption, in particular after the NG price hike in 2006. However, no investment projects are known that have been implemented. The project developer is aware of energy efficiency projects that are currently under consideration or under construction in Ukraine, but which are considered as a JI project being:

- Introduction of energy efficiency measures at ISTIL mini steel mill, Ukraine;
- Revamping and Modernization of the Alchevsk Steel Mill - Using Higher Efficiency Technology to replace Open Hearth Furnaces (OHF), Ingot Casting and Blooming Mills;
- Displacement of electricity generation with fossil fuels in the electricity grid by an electricity generation project with introduction of Steel Mill Waste Gas Firing Turbine power generation system.

In accordance with the methodological tool, these projects do not have to be considered in the common practice analysis.

The proposed JI project is not common practice.

Conclusion: The project is additional to what would have occurred otherwise.

Since the project scenario (see A.4.2.) comparing with the baseline scenario will lead to reduction of energy consumption (natural gas, electricity, heat), the anthropogenic emissions of GHG at EMSS will be reduced below those that would have occurred in the absence of the JI project.

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

There are following sources of GHG emissions related to the proposed four subprojects:

- Emissions that are related to the direct fuel combustion at the premises of EMSS;
- Indirect GHG emissions at the premises of Kramatorsk CHPP as result of heat consumption;
- Indirect GHG emission in the Ukrainian grid as a result of electricity consumption.

In the table below an overview of all emission sources are given. The following approach has been used in determining whether they have been included in the project boundary:

- All sources of emissions that are not influenced by the project have been excluded;
- All sources of emissions that are influenced by the project have been included.

No	Source	Gas	direct/indirect	included/excluded	Justification/Explanation
1	Fuel combustion in thermal and heating furnaces	CO_2	Direct	included	Fuel consumption will decrease after implementation of SP1
2	Fuel combustion at Kramatorsk CHPP	CO_2	Indirect	included	Fuel consumption at Kramatorsk CHPP will decrease after implementation of SP2
3	Electricity consumption by: - new vacuum system; - ladle furnace; - pumps of press.	CO_2	Indirect	included	Electricity consumption will: -Increase in result of SP2; -Decrease in result of SP3; -Decrease in result of SP4.
4	All other emissions due to fuel and electricity consumption, which are not influenced directly by the proposed project	CO_2	Direct/Indirect	excluded	

Table B.3.1: Emissions at EMSS

Only CO_2 emissions are taken into account. CH_4 and N_2O emissions have not been included into the data calculations. As a result, resulting reduction in emissions of CH_4 and N_2O are not being claimed.

The boundary of the project includes all stages of the EMSS production cycle which are influenced by the described four subprojects. All other stages are excluded from the project boundaries.

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

Date of completion of the baseline study: 31 August 2009

Name of person/entity determining the baseline:
Lennard de Klerk
Phone: +31 70 3142456
Fax: +31 70 8910791
E-mail: deklerk@global-carbon.com
Web: www.global-carbon.com

SECTION C. Duration of the project / crediting period

C.1 Starting date of the project:

The proposed JI project consists of four interventions to the production cycle. Equipment for the proposed interventions will be installed and commissioned in the following order:

- SP1: From 01 January 2008 to 01 November 2009 – 19 furnaces will be commissioned (besides 7 furnaces commissioned in 2007);
- SP2: May 2007;
- SP3: April 2007;
- SP4: December 2007;

Therefore the starting date of the project is April 2007.

C.2. Expected operational lifetime of the project:

For all proposed measures the lifetime of equipment will be at least 20 years. Thus operational lifetime of the project will be 20 years or 240 months.

C.3. Length of the crediting period:

Start of crediting period: 01/01/2008.
Length of crediting period: 5 years or 60 months.

Emission reductions generated after the crediting period may be used in accordance with an appropriate mechanism under the UNFCCC.

SECTION D. Monitoring Plan

D.1. Description of monitoring plan chosen

The Project involves four different interventions:

- SP1 - Reconstruction of thermal and heating furnaces;
- SP2 - Installation of a new vacuum system (Vacuum Degasser (VD));
- SP3 - Installation of arc ladle furnace;
- SP4 - Modernization of press equipment.

These interventions will involve savings of different energy sources, mainly of electricity and natural gas. The energy consumption at the EMSS depends on the steel production, which could be different from EMSS previsions. In particular there are productions that have to be considered:

- The production of electro steel in [tonnes/y];
- The production of vacuumed steel in [tonnes/y];
- The production level of each of the 26 reconstructed thermal and heating furnaces in [tonnes/y];

The specific energy consumption can be measured in terms of electricity and natural gas, divided by the production of steel and steel details.
The total energy and total GHG emissions can be evaluated directly from these consumptions, but a comparison with the baseline – and thus a global evaluation of GHG reductions – can not be done without taking into account the production levels.
Data can be collected by means of electric power meters and gas flow meters at each of the plants where improvements will take place; the monitoring plan will depend on direct measurements.

The project emissions are mainly emissions of CO_2 from the burning process of natural gas and emissions lied to electricity generation elsewhere on the Ukrainian electricity system. There is an insignificant quantity of methane emissions (assessed as insignificant and excluded from supervision) and emissions from nitrous oxide released during the natural gas burning process. These quantities are insignificant, because:

- the technology employed for the burning process is state-of-art one and there is not unburned quantity of natural gas in the flue gases;
- the quantity of nitrous oxide in the flue gases released during the burning process will be lower than in the existing situation.

Additionally, to the natural gas quantity feed for burning, there is a quantity of emissions from methane, from natural gas leakages during its delivery through the gas pipeline. These indirect greenhouse emissions are assessed by the delivered natural gas parameters through the incorporate gas pipelines and their length, using standard assessments for the specific leakages and emissions factors. These indirect greenhouse emissions are not taken into account. Given the fact the project will lead to lower leakages, the monitored emission reductions are conservative.

Considering the project scope, the following data/parameters need to be monitored:

- Natural gas consumed by the reconstructed furnaces, in thousand Nm3;
- The production level of each of the 26 reconstructed thermal and heating furnaces, in tonnes;
- The production of electro steel, in tonnes;
- The production of vacuumed steel, in tonnes;
- Electricity consumed by the new vacuum system (VD), in MWh;
- Electricity consumed by the ladle furnace, in MWh;
- Electricity consumed by the new pumps of the 15,000 tonnes press, in MWh.

There is a monitoring model, expressing the specific requirements, during the assessments in this PDD. Such model is prepared under MS-Excel and is presented below in the annexes. The model requirements are to enter the monitored parameters as an input data, so it will automatically calculates simultaneously the project and the baseline emissions, for each year after the project commissioning. The electronic worksheets should be filled with information by the project manager and also the inspecting personnel, through the whole operational lifetime of the project related to the crediting period.

The monitoring process should meet the requirements of the Law of Ukraine on metrology and metrological activities 113/98 – VR.

The baseline emissions relate to the energy consumption that would have occurred when operating the existing infrastructure (baseline scenario) assuming that the same volume of products would be produces as monitored in the project scenario. The specific energy consumption for each subproject is fixed ex-post by taking the average specific energy consumption of the years 2002- 2006. With the formulae given below the baseline CO_2 emissions are calculated.

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

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

ID number (Please use numbers to ease cross-referencing to D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1	PE_y, project emissions of all four interventions	Monitoring of GHG emissions in year *y* (all four interventions)	tCO_2	c	yearly	100%	Electronic and paper	Calculated using the formulae in Section D.1.1.2
2	PE_{sp1}, project emissions of subproject 1	Monitoring of GHG emissions in year *y* from subproject 1	tCO_2	c	yearly	100%	Electronic and paper	Calculated using the formulae in Section D.1.1.2
3	PE_{sp2}, project emissions of subproject 2	Monitoring of GHG emissions in year *y* from subproject 2	tCO_2	c	yearly	100%	Electronic and paper	Calculated using the formulae in Section D.1.1.2
4	PE_{sp3}, project emissions of	Monitoring of GHG emissions in	tCO_2	c	yearly	100%	Electronic and paper	Calculated using the formulae in

	subproject 3	year *y* from subproject 3						Section D.1.1.2
5	PE_{sp4}, project emissions of subproject 4	Monitoring of GHG emissions in year *y* from subproject 4	tCO_2	c	yearly	100%	Electronic and paper	Calculated using the formulae in Section D.1.1.2
6 - 31	$NG_{tf,y}$, quantity of NG, used by the 26 reconstructed furnaces	Measuring devices of the thermal shop	1,000 nm3	m	monthly	100%	Electronic and paper	Accuracy of the NG measuring devices – 1%.
32	LCV_{NG}, Low Calorific Value of the NG	Supplier of the NG	MWh/1000nm3	c	monthly	100%	Electronic and paper	The reports of the local gas supplier will be used.
33	EF_{NG}, emission factor of the NG burning process	IPCC 2006	tCO2/MWh	c	fixed value	100 %	Electronic	IPCC 2006 default value = 0.202 tCO2/MWh.
34	EL_{VD}, electricity consumed by the new vacuum system (VD)	Measuring devices of VD	MWh	m	monthly	100%	Electronic and paper	

35	$EF_{el,y}$, emission factor of the Ukrainian grid for reducing project	See Annex 4	tCO2/MWh	c	fixed ex-ante	100 %	Electronic and paper	= 0.896 tCO2/MWh
36	EL_{LF}, Electricity consumed by the ladle furnace	Measuring devices of ladle furnace	MWh	m	monthly	100%	Electronic and paper	
37	EL_{EAF}, Electricity consumed by the EAFs	Measuring devices of EAFs	MWh	m	monthly	100%	Electronic and paper	
38	EL_{PR}, electricity consumed by the new pumps of the 15,000 tonnes press	Measuring devices of the press equipment	MWh	m	monthly	100%	Electronic and paper	

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

The annual project emissions are done by the equation:

$$PE_y = \sum_{i=1}^{i=4} PE_{spi} \; ; \qquad (Equation\ 1)$$

Where:

PE_y - are the annual project emissions for the year *y* (ID1), [tCO_2];

PE_{spi} - are the annual project emissions from each subproject, from SP1 to SP4;

The annual project emissions [tCO2/y] from SP1 are:

$$PE_{sp1} = NG_{tf,y} * LCV_{NG} * EF_{NG} ; \quad (Equation\ 2)$$

Where:

PE_{sp1} - is the project emissions of subproject 1 in year *y* (ID2), [tCO_2];

$NG_{tf,y}$ - is the annual quantity of NG, used by the 26 reconstructed furnaces (sum from ID6 to ID31), [1000 nm3];

LCV_{NG} - is the lower calorific value of the NG (ID32), [MWh/1000nm3];

EF_{NG} - is the emission factor of the NG burning process (ID33), [tCO2/MWh].

The annual project emissions [tCO2/y] from SP2 are:

$$PE_{sp2} = EL_{VD} * EF_{el,y} ; \quad (Equation\ 3)$$

Where:

PE_{sp2} - is the project emissions of subproject 2 in year *y* (ID3), [tCO_2];

EL_{VD} - is the annual electrical consumption of the new VD (ID34), [MWh];

$EF_{el,y}$ - is the calculated emission factor of the Ukrainian grid (ID35), [tCO2/MWh].

The annual project emissions [tCO2/y] from SP3 are:

$$PE_{sp3} = (EL_{LF} + EL_{EAF}) * EF_{el,y} ; \quad (Equation\ 4)$$

Where:

PE_{sp3} - is the project emissions of subproject 3 in year *y* (ID4), [tCO_2];

EL_{LF} - is the annual electrical consumption of the new ladle furnace (ID36), [MWh];

EL_{EAF} - is the annual electrical consumption of the electric arc furnace (ID37), [MWh];

The annual project emissions [tCO2/y] from SP4 are:

$$PE_{sp4} = EL_{PR} * EF_{el,y};\qquad (Equation\ 5)$$

Where:

PE_{sp4} - is the project emissions of subproject 4 in year *y* (ID5), [tCO_2];

EL_{PR} - is the annual electrical consumption of the new pumps of the 15,000 tonnes press (ID38), [MWh].

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	**Data variable**	**Source of data**	**Data unit**	**Measured (m), calculated (c), estimated (e)**	**Recording frequency**	**Proportion of data to be monitored**	**How will the data be archived? (electronic/ paper)**	**Comment**
39	BE_y, baseline emissions of all four interventions	Monitoring of GHG emissions in year *y* (all four interventions)	tCO_2	c	yearly	100%	Electronic and paper	Calculated using the formulae in Section D.1.1.4

40	BE_{sp1}, baseline emissions of subproject 1	Monitoring of GHG emissions in year *y* from subproject 1	tCO_2	c	yearly	100%	Electronic and paper	Calculated using the formulae in Section D.1.1.4
41	BE_{sp2}, baseline emissions of subproject 2	Monitoring of GHG emissions in year *y* from subproject 2	tCO_2	c	yearly	100%	Electronic and paper	Calculated using the formulae in Section D.1.1.4
42	BE_{sp3}, baseline emissions of subproject 3	Monitoring of GHG emissions in year *y* from subproject 3	tCO_2	c	yearly	100%	Electronic and paper	Calculated using the formulae in Section D.1.1.4
43	BE_{sp4}, baseline emissions of subproject 4	Monitoring of GHG emissions in year *y* from subproject 4	tCO_2	c	yearly	100%	Electronic and paper	Calculated using the formulae in Section D.1.1.4
44-69	$SPNG_{tf}$, the baseline ex-ante specific NG consumption of the 26 reconstructed furnaces	Baseline information	1000nm3/t steel	c	once	100%	Electronic and paper	
70-95	$PRST_{tf}$, the production level of each of the 26 reconstructed thermal and	Measuring devices of the thermal shop and forge and press shop	Tonnes	m	monthly	100%	Electronic and paper	

	heating furnaces							
96	*SPH_{VD}*, the baseline ex ante specific heat consumption of the old VD	Baseline three years information	MWh/t	e	once	100%	Electronic and paper	
97	*$PRVS_{VD}$*, the production volume of vacuumed steel	Measuring devices of the VD	Tonnes	m	monthly	100%	Electronic and paper	
98	*EB_{DHC}*, efficiency of the steam boilers at the DHC	DHC	-	c	yearly	100%	Electronic and paper	
99	*EF_{Coal}*, emission factor for local (anthracite) coal burning	IPCC 2006	tCO2/MWh	c	fixed value	100%	Electronic	IPCC 2006 default value = 0.353 tCO2/MWh
100	*$SPEL_{VD}$*, baseline ex ante specific electrical consumption of the old VD	Baseline information	MWh/t	c	once	100%	Electronic and paper	
101	*$EF_{el,y}$*, emission factor of the Ukrainian grid for reducing	See Annex 4	tCO2/MWh	c	fixed ex-ante	100%	Electronic and paper	= 0.896 tCO2/MWh

	project							
102	*$SPEL_{ES}$*, baseline ex ante specific consumption of electricity per tone of electro steel	Baseline three years information	MWh/t	e	once	100%	Electronic and paper	
103	*PRES*, the production volume of electro steel	Measuring devices of the electro steel shop	Tonnes	m	monthly	100%	Electronic and paper	
104	*T_{pp}*, Working hours of the press	Workshop's registry	hours	m	daily	100%	Paper	
105	*EL_{mot}*, installed capacity of the press' serving motors before reconstruction	Project design documentation	MW	c	fixed value	100%	Electronic and paper	It was 24 motors, 500kW each. So, **EL_{MOT} =12MW**

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

The annual baseline emissions are done by the equation:

$$BE_y = \sum_{i=1}^{i=4} BE_{spi};$$ (*Equation 6*)

Where:

BE_y - are the annual baseline emissions for the year *y* (ID39), [tCO_2];

BE_{spi} - are the annual baseline emissions from each subproject, from SP1 to SP4.

The annual baseline emissions for SP1 [tCO2/y] are:

$$BE_{sp1} = SPNG_{tf} * PRST_{tf} * LCV_{NG} * EF_{NG};$$ (*Equation 7*)

Where:

BE_{sp1} - is the baseline emissions of subproject 1 in year *y* (ID40), [tCO_2];

$SPNG_{tf}$ - is the baseline ex-ante specific NG consumption of the 26 reconstructed furnaces (from ID44 to ID69), [1000nm3/t steel];

$PRST_{tf}$ - is the annual production steel level of each of the 26 reconstructed thermal and heating furnaces (from ID70 to ID95), [tonnes].

The annual baseline emissions for SP2 [tCO2/y] are:

$$BE_{sp2} = SPH_{VD} * PRVS_{VD} \div EB_{DHC} * EF_{Coal} + SPEL_{VD} * PRVS_{VD} * EF_{el,y};$$ (*Equation 8*)

Where:

BE_{sp2} - is the baseline emissions of subproject 2 in year *y* (ID41), [tCO_2];

SPH_{VD} - is a baseline ex ante specific heat consumption of the old VD (ID96), [MWh/t];

$PRVS_{VD}$ - is the annual production volume of vacuumed steel (ID97), [t];

EB_{DHC} - is the efficiency of the steam boilers at the DHC (ID98);

EF_{Coal} - is the emission factor for local (anthracite) coal burning (ID99), [tCO2/MWh];

$SPEL_{VD}$ - is a baseline ex ante specific electrical consumption of the old VD (ID100), [MWh/t];
$EF_{el,y}$ - is the calculated emission factor of the Ukrainian grid (ID101), [tCO2/MWh].

The annual baseline emissions for SP3 [tCO2/y] are:

$$BE_{sp3} = SPEL_{ES} * PRES * EF_{el,y} ; \quad (Equation\ 9)$$

Where:

BE_{sp3} - is the baseline emissions of subproject 3 in year *y* (ID42), [tCO_2];
$SPEL_{ES}$ - is the baseline ex ante specific consumption of electricity per tone of electro steel (ID102), [MWh/t steel];
$PRES$ – is the annual production volume of electro steel (ID103), [t].

The annual baseline emissions for SP4 [tCO2/y] are:

$$BE_{sp4} = T_{pp} * EL_{MOT} * EF_{el,y} ; \quad (Equation\ 10)$$

Where:

BE_{sp4} - is the baseline emissions of subproject 4 in year *y* (ID43), [tCO_2];
T_{pp} - is a working hours of the press (ID104), [h];
EL_{MOT} - is the press' serving motors before reconstruction (ID105), [MW].

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

D.1.2.1. Data to be collected in order to monitor emission reductions from the project, and how these data will be archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	**Data variable**	**Source of data**	**Data unit**	**Measured (m), calculated (c), estimated (e)**	**Recording frequency**	**Proportion of data to be monitored**	**How will the data be archived? (electronic/ paper)**	**Comment**

Not applicable

D.1.2.2. Description of formulae used to calculate emission reductions from the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

See D.1.4.

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

D.1.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project:								
ID number (Please use numbers to ease cross-referencing to table D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

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

Not applicable

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

The annual emission reduction is done by the equation:

$$ER_y = BE_y - PE_y, \text{ [tCO}_2\text{]}; \qquad (\textit{Equation 11})$$

Where:

BE_y - Annual baseline emissions, calculated in respect of D.1.1.4;

PE_y - Annual project emissions, calculated in respect of D.1.1.2.

D.1.5. Where applicable, in accordance with procedures as required by the host Party, information on the collection and archiving of information on the environmental impacts of the project:

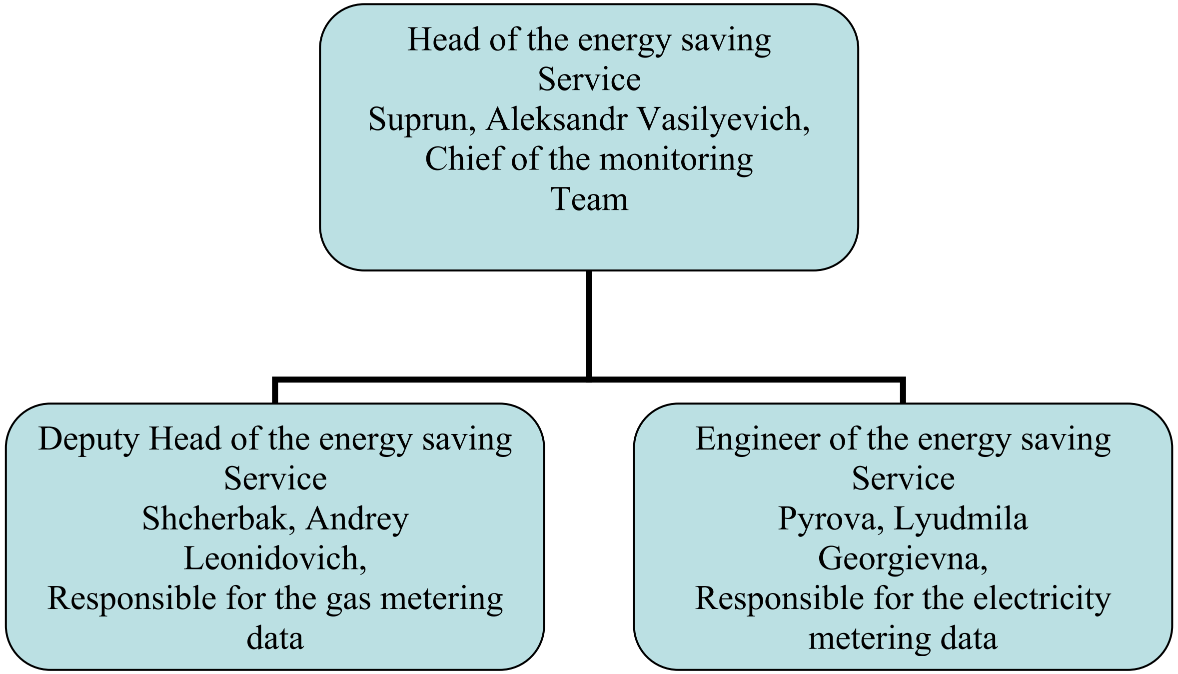
Not applicable. There is no information related to the environmental impacts of this project which will especially be collected.

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:

Data *(Indicate table and ID number)*	**Uncertainty level of data (high/medium/low)**	**Explain QA/QC procedures planned for these data, or why such procedures are not necessary.**
1-5	Low	These data are calculation of project emissions
6-31	1 %	The natural gas meters will be calibrated once in 3 years
32	Low	The data will be provided by local gas supplier
33	Low	This is IPCC 2006 default value
34	0,5 %	The electricity meters will be calibrated once in 3 years
35	Low	This is fixed ex ante value
36-38	2 %	The electricity meters will be calibrated once in 4 or 6 years (depends on meter type)
39-43	Low	These data are calculation of baseline emissions
44-69	Low	These data are baseline ex-ante specific NG consumption of the 26 reconstructed furnaces
70-95	Low	The scales will be will be calibrated once per year
96	Low	The data are baseline ex ante specific heat consumption of the old VD
97	Low	The scales will be will be calibrated once per year
98	Low	The data will be provided by DHC
99	Low	This is IPCC 2006 default value
100	Low	These data are baseline ex ante specific electrical consumption of the old VD
101	Low	This is fixed ex ante value
102	Low	These data are baseline ex ante specific consumption of electricity per tone of electro steel
103	2 %	The scales will be will be calibrated once per year
104	Low	These data are logging in a special registry book
105	Low	These data are baseline ex ante installed electrical capacity of the press' serving motors

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

For monitoring, collection, registration, visualization, archiving, reporting of the monitored dates and periodical checking of the measurement devices is responsible the measurement team from 2 people and its manager Mr Suprun. The responsibilities are shown on the next flowchart:



Flowchart D.3.1: Responsibilities within the monitoring team.

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

Name of person/entity determining the baseline:
Lennard de Klerk

Phone: +31 70 3142456
Fax: +31 70 8910791
E-mail: deklerk@global-carbon.com
Web: www.global-carbon.com

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

The amount of the estimated project emissions are shown in the next tables:

	SP1	SP2	SP3	SP4	**Total**
Project Emissions [tCO_2]	362,936	1,881	536,436	293,315	**1,194,567**

Table E.1.1: Project emissions over the crediting period.

	SP1	SP2	SP3	SP4	**Total**
Project Emissions [tCO_2]	689,410	3,441	981,339	469,303	**2,143,494**

Table E.1.2: Project emissions after the crediting period.

E.2. Estimated leakage:

Not applicable. There was no leakage identified

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

	SP1	SP2	SP3	SP4	**Total**
Sum of E.1 and E.2 [tCO_2]	362,936	1,881	536,436	293,315	**1,194,567**

Table E.3.1: The sum of project emissions and leakage over the crediting period.

	SP1	SP2	SP3	SP4	**Total**
Sum of E.1 and E.2 [tCO_2]	689,410	3,441	981,339	469,303	**2,143,494**

Table E.3.2: The sum of project emissions and leakage after the crediting period.

E.4. Estimated baseline emissions:

	SP1	SP2	SP3	SP4	**Total**
Baseline emissions [tCO_2]	659,883	404,508	773,879	399,974	**2,238,244**

Table E.4.1: Baseline emissions over the crediting period.

	SP1	SP2	SP3	SP4	**Total**
Baseline emissions [tCO_2]	1,253,473	739,993	1,415,709	639,959	**4,049,134**

Table E.4.2: Baseline emissions after the crediting period.

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

	SP1	SP2	SP3	SP4	**Total**
Emission reductions [tCO_2]	296,947	402,627	237,442	106,660	**1,043,676**

Table E5.1: Emission reductions over the crediting period.

	SP1	SP2	SP3	SP4	**Total**
Emission reductions [tCO_2]	564,063	736,552	434,369	170,656	**1,905,640**

Table E5.2: Emission reductions after the crediting period.

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

YEAR	Estimated Project Emissions (tonnes CO_2 Equivalent)	Estimated Leakage (tonnes CO2 Equivalent)	Estimated Baseline Emissions (tonnes CO_2 Equivalent)	Estimated Emissions Reductions (tonnes CO_2 Equivalent)
2008	169,029	0	310,751	141,722
2009	237,115	0	442,750	205,635
2010	252,550	0	472,459	219,909
2011	267,937	0	506,142	238,205
2012	267,937	0	506,142	238,205
Total (tonnes CO_2 Equivalent)	**1,194,567**	**0**	**2,238,244**	**1,043,676**

Table E6.1: Estimated balance of emissions under the proposed project over the crediting period

YEAR	Estimated Project Emissions (tonnes CO_2 Equivalent)	Estimated Leakage (tonnes CO2 Equivalent)	Estimated Baseline Emissions (tonnes CO_2 Equivalent)	Estimated Emissions Reductions (tonnes CO_2 Equivalent)
2013	267,937	0	506,142	238,205
2014	267,937	0	506,142	238,205
2015	267,937	0	506,142	238,205
2016	267,937	0	506,142	238,205
2017	267,937	0	506,142	238,205
2018	267,937	0	506,142	238,205
2019	267,937	0	506,142	238,205
2020	267,937	0	506,142	238,205
Total (tonnes CO_2 Equivalent)	**2,143,494**	**0**	**4,049,134**	**1,905,640**

Table E6.1: Estimated balance of emissions under the proposed project after the crediting period

SECTION F. Environmental impacts

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

The project improves efficiency of use of natural gas, electricity and heat at the enterprise and thus lead to decrease of harmful emissions. In accordance with Ukrainian legislation, Environmental Impact Assessments were made by independent consultants on each subproject. After this EMSS have sent applications to the Kramatorsk city authority to obtain the necessary approvals for construction of the individual subprojects.

In Subproject 1 due to combustion of natural gas there will be emissions of CO, CO_2 and NO_X. The impact of CO and NO_X emissions will be only on the territory of EMSS and there will be no harmful impact of these emissions beyond the limits of EMSS sanitary zone.
In Subproject 2 there will be emissions of dust and CO. The impact of these emissions will be only on the territory of EMSS.
In Subproject 3 there will be emissions of CO, dust and NO_2. The impact of these emissions will be only on the territory of EMSS.
In Subproject 4 there will be no harmful emissions due to decrease of electricity consumption.
Generally environmental impact of all subprojects will be not beyond sanitary zone of EMSS and thus there will be no transboundary impacts.

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

Project participants and host Party considered the environmental impacts of the project as not significant. Therefore this section is not applicable.

SECTION G. Stakeholders' comments

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

In accordance with Ukrainian legislation, EMSS has consulted the regional authority to obtain the necessary approvals for construction of the individual subprojects. No stakeholder consultation is required by Host Party for JI project. Stakeholder comments will be gathered during one month after publication of this PDD at UNFCCC website in the frame of determination process.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Organisation:	Global Carbon BV
Street/P.O.Box:	Niasstraat 1
Building:	
City:	Utrecht
State/Region:	
Postal code:	3531 WR
Country:	Netherlands
Phone:	+31 30 8506724
Fax:	+31 70 8910791
E-mail:	focalpoint@global-carbon.com
URL:	www.global-carbon.com
Represented by:	
Title:	
Salutation:	
Last Name:	de Klerk
Middle Name:	
First Name:	Lennard
Department:	
Phone (direct):	
Fax (direct):	
Mobile:	
Personal e-mail:	deklerk@global-carbon.com

Organization:	Energomashspetsstal
Street/P.O.Box:	
Building:	
City:	Kramatorsk
State/Region:	
Postal code:	84306
Country:	Ukraine
Phone:	+380 6264 855 71
Fax:	+380 6264 655 67
E-mail:	central@emss.dn.ua
URL:	www.emss.krm.net.ua
Represented by:	
Title:	
Salutation:	
Last Name:	Masyuk
Middle Name:	Grigoryevich
First Name:	Alexander
Department:	
Phone (direct):	
Fax (direct):	+380 6264 725 58
Mobile:	+380 6264 655 86
Personal e-mail:	masjuk@emss.dn.ua

Annex 2

BASELINE INFORMATION

Determination of baseline factors

Baseline natural gas consumption by thermal and heating furnaces

The baseline specific natural gas consumption by 26 thermal and heating furnaces $SPNG_{tf}$ (m^3/t steel) has been determined from special research made by Scientific Engineering Center of Automatic Control System of Technical Processes and Equipment in 1991. Since there are no natural gas meters on old (before reconstruction) thermal and heating furnaces we consider this data as an appropriate one. Besides, since the efficiency of the furnaces after this research has decreased due to depreciation of equipment, we consider these data to be conservative.

The results of the research are:

Type and # of furnace, name of shop	Baseline specific NG consumption, (m^3/t steel)
Thermal furnace # 9,Thermal Shop	388.7
Thermal furnace # 10, Thermal Shop	388.7
Thermal furnace # 1, Thermal Shop	373
Thermal furnace # 2, Thermal Shop	373
Heating furnace # 10, Forge and Press Shop #1	931.4
Heating furnace # 9, Forge and Press Shop #1	861.5
Heating furnace # 8, Forge and Press Shop #1	861.5
Heating furnace # 7, Forge and Press Shop #1	1005.3
Thermal furnace # 30, Forge and Press Shop #1	694.4
Thermal furnace # 3, Thermal Shop	373
Thermal furnace # 4, Thermal Shop	373
Thermal furnace # 18, Forge and Press Shop #1	381.4
Thermal furnace # 19, Forge and Press Shop #1	381.4
Thermal furnace # 20, Forge and Press Shop #1	381.4
Thermal furnace # 32, Forge and Press Shop #1	381.4
Thermal furnace #1, Steel-Casting Shop	381.4
Thermal furnace #33, Forge and Press Shop #1	694.4
Thermal furnace #34, Forge and Press Shop #1	694.4
Heating furnace #35, Forge and Press Shop #1	861.5
Heating furnace #36, Forge and Press Shop #1	861.5
Heating furnace #1, Forge and Press Shop #1	682
Heating furnace #2, Forge and Press Shop #1	682
Heating furnace #3, Forge and Press Shop #1	682
Heating furnace #4, Forge and Press Shop #1	682
Heating furnace #5, Forge and Press Shop #1	240
Heating furnace #6, Forge and Press Shop #1	240

Table A2.1: Measured baseline specific NG consumption of thermal and heating furnaces

Baseline heat consumption of vacuum degasser

The baseline specific heat consumption of the vacuum degasser SPH_{VD} (MWh/t steel) has been determined by extrapolating historic measured consumption.
The results of historic measurements are:

Year	2004	2005	2006	Average
Specific heat consumption	1.21 MWh/t steel (1.042 Gcal/t steel)	1.12 MWh/t steel (0.969 Gcal/t steel)	1.15 MWh/t steel (0.993 Gcal/t steel)	1.16 MWh/t steel (1.001 Gcal/t steel)

Table A2.2: Measured specific heat consumption of vacuum degasser.

As can be seen from the table above, the specific heat consumption of the vacuum degasser was a stable figure. We take as baseline specific heat consumption the average figure for last three years - 1.16 MWh/t steel.

Baseline electricity consumption of electric arc furnace

The baseline specific electricity consumption of electric arc furnace $SPEL_{ES}$ (MWh/t steel) was determined based on the measured data of the last three years:

Year	2004	2005	2006	Average
Specific electricity consumption, (MWh/t steel)	1.075	1.024	0.987	1.03

Table A2.3: Measured specific heat consumption of electric arc furnace.

We take as baseline specific heat consumption the average figure for last three years - 1.03 MWh/t steel.

Baseline electricity consumption of the pumps serving the 15,000 tons press

The baseline electricity consumption of the pumps serving the 15,000 tons press EL_{pp} (MWh/y) was determined based on capacity of the pumps (24 pumps with capacity 0.5 MW) and the known time of their annual work – 7,440 hours per year.

For the electricity baseline of the Ukrainian grid, please see below the separate document.

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Ukraine - Assessment of new calculation of CEF

Introduction

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

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

Objective

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

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

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

Scope

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

Date: 17.08.2007

Our reference:
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This document consists of
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Headquarters: Munich
Trade Register: Munich HRB 96 869

Supervisory Board:
Dr. Axel Stepken (Chairman)
Board of Management:
Dr. Manfred Bayerlein (Spokesman)
Dr. Udo Heisel

Telefon: +49 89 5791-0
Telefax:
www.tuev-sued.de

TÜV SÜD Industrie Service GmbH
Carbon Management Service
Westendstrasse 199
80686 Munich
Germany

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origin of the data. The team consists of:

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

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

Conclusion

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

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

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

Munich,17/08/2007	Munich, 17/08/2007
Markus Knödlseder	Werner Betzenbichler
GHG-Auditor and Project Manager	Head of the certification Body "Climate and Energy" and Carbon Management Service

Standardized emission factors for the Ukrainian electricity grid

Introduction
Many Joint Implementation (JI) projects have an impact on the CO_2 emissions of the regional or national electricity grid. Given the fact that in most Economies in Transition (IET) an integrated electricity grid exists, a standardized baseline can be used to estimate the amount of CO_2 emission reductions on the national grid in case of:
a) Additional electricity production and supply to the grid as a result of a JI project (=producing projects);
b) Reduction of electricity consumption due to the JI project resulting in less electricity generation in the grid (= reducing projects);
c) Efficient on-site electricity generation with on-site consumption. Such a JI project can either be a), b), or a combination of both (e.g. on-site cogeneration with partial on-site consumption and partial delivery to the grid).

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

This new baseline has been based on the following guidance and approaches:
- The "Guidance on criteria for baseline setting and monitoring" for JI projects, issued by the Joint Implementation Supervisory Committee[1];
- The "Operational Guidelines for the Project Design Document", further referred to as ERUPT approach or baseline [2];
- The approved CDM methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" [3];
- Specific circumstances for Ukraine as described below.

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

The weak point of this approach is the fact that the date sources are not specific. For example, the Net Calorific Value (NCV) of coals was not determined on installation level but was taken from IPCC default values. Furthermore the IEA data included electricity data until 2002 only. ERUPT assumes that Ukraine would switch all its fossil-fuel plant from coal to natural gas. In Ukraine such an assumption is unrealistic as the tendency is currently in the opposite direction.

[1] Guidance on criteria for baseline setting and monitoring, version 01, Joint Implementation Supervisory Committee, ji.unfccc.int
[2] Operational Guidelines for Project Design Documents of Joint Implementation Projects. Ministry of Economic Affairs of the Netherlands, May 2004
[3] Consolidated baseline methodology for grid-connected electricity generation from renewable sources, version 06, 19 May 2006, cdm.unfccc.int

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

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

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

Table 1: Share of nuclear power plant in the annual electricity generation

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

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

Table 2: Electricity demand in Ukraine on 31 March 2005[4]

Development of the Ukrainian electricity sector
The National Energy Strategy[5] sets the approach for the overall energy complex of Ukraine and the electricity sector in particular. The main priority of Ukraine is to reduce the dependence of imported fossil fuels. The strategy sets the following priorities[6]:

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

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

[4] Ukrenergo, http://www.ukrenergo.energy.gov.ua/ukrenergo/control/uk/publish/article?art_id=39047&cat_id=35061
[5] http://mpe.kmu.gov.ua/fuel/control/uk/doccatalog/list?currDir=50505
[6] Energy Strategy of Ukraine for the Period until 2030, section 16.1, page 127.

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

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

Table 3: Installed capacity in Ukraine in 2004[7]

According to IEA's estimations, about 25% of thermal units might not be able to operate (though there is no official statistics). This means that still at least 45% of the installed thermal power capacity could be utilized, but is currently not used. In accordance with the IEA report the 'current capacity will be sufficient to meet the demand in the next decade'[8].

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

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

Table 4: Peak load in Ukraine in 2001 - 2005[9]

New nuclear power plants will take significant time to be constructed will not get on-line before the end of the second commitment period in 2012. There is no nuclear reactor construction site at such an advanced stage remaining in Ukraine, it is unlikely that Ukraine will have enough resources to commission any new nuclear units in the foreseeable future (before 2012)[10].

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

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

Approach chosen
In the selected approach of the new Ukrainian baseline the BM is not a valid parameter. Strictly applying BM in accordance with ACM0002 would result in a BM of zero as the latest additions to the Ukrainian grid were nuclear power plants. Therefore applying BM taking past additions to the Ukrainian grid would result in an unrealistic and distorted picture of the emission factor of the Ukrainian grid. Therefore the Operating Margin only will be used to develop the baseline in Ukraine.

The following assumptions from ACM0002 will be applied:
1) The grid must constitute of all the power plants connected to the grid. This assumption has been met as all power plants have been considered;

[7] Source: Ukraine Energy Policy Review. OECD/IEA, Paris 2006. p. 272, table 8.1
[8] Source: Ukraine Energy Policy Review. OECD/IEA, Paris 2006. p. 269
[9] Ministry of Energy, letter dated 11 January 2007
[10] http://www.xaec.org.ua/index-ua.html

2) There should be no significant electricity imports. This assumption has been met in Ukraine as Ukraine is a net exporting country as shown in the table below;
3) Electricity exports are not accounted separately and are not excluded from the calculations.

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

Table 5: Imports and exports balance in Ukraine[11]

ACM0002 offers several choices for calculating the OM. Dispatch data analysis cannot be applied, since the grid data is not available[12]. Simple adjusted OM approach is not applicable for the same reason. The average OM calculation would not present a realistic picture and distort the results, since nuclear power plants always work in the base load due to the technical limitations (and therefore cannot be displaced) and constitute up to 48% of the overall electricity generation during the past 5 years.

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

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

Table 6: Share of power plants in the annual electricity generation of Ukraine[13]

[11] Source: State Committee of Statistics of Ukraine. Fuel and energy resources of Ukraine 2001-2003. Kyiv, 2004
[12] Ministry of Energy, letter dated 11 January 2007
[13] "Overview of data on electrical power plants in Ukraine 2001 - 2005", Ministry of Fuel and Energy of Ukraine, 31 October 2006 and 16 November 2006.

The simple OM is calculated using the following formula:

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

Where:

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

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

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

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

The CO2 emission coefficient $COEF_i$ is obtained as:

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

Where:

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

$OXID_i$ is the oxidation factor of the fuel;

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

Individual data for power generation and fuel properties was obtained from the individual power plants[14]. The majority of the electricity (up to 95%) is generated centrally and therefore the data is comprehensive[15].

The Net Calorific Value (NCV) of fossil fuel can change considerably, in particular when using coal. Therefore the local NCV values of individual power plants for natural gas and coal were used. For heavy fuel oil, the IPCC[16] default NCV was used. Local CO_2 emission factors for all types of fuels were taken for the purposes of the calculations and Ukrainian oxidation factors were used. In the case of small-scale power plants some data regarding the fuel NCV is missing in the reports. For the purpose of simplicity, the NCV of similar fuel from a power plant from the same region of Ukraine was used.

Reducing JI projects

The Simple OM is applicable for additional electricity production delivered to the grid as a result of the project (producing JI projects). However, reducing JI projects also reduce grid losses. For example a JI project reduces on-site electricity *consumption* with 100,000 MWh and the losses in the grid are

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

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

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

10%. This means that the actual reduction in electricity *production* is 111,111 MWh. Therefore a reduction of these grid losses should be taken into account for reducing JI projects to calculate the actual emission reductions.

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

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

Table 7: Grid losses in Ukraine[17]

As one can see grid losses are divided into technical losses and non-technical losses. For the purpose of estimating the EF only technical losses[18] are taken into account. As can been seen in the table the technical grid losses are decreasing. The average decrease of grid losses in this period was 0.275% per annum. Extrapolating these decreasing losses to 2012 results in technical grid losses of 12% by 2012. However, in order to be conservative the grid losses *over the full period 2006-2012* have been taken as 10%.

Further considerations

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

- The grid emission factor is actually expected to grow due to the current tendency to switch from gas to coal;
- Hydro power plants have been included in the OM. This is conservative;
- With the growing electricity demand, out-dated mothballed fossil fired power plants are likely to come on-line as existing nuclear power plants are working on full load and new nuclear power plants are unlikely to come on-line before 2012. The emission factor of those moth-balled power plants is higher as all of them are coal of heavy fuel oil fired[19];
- The technical grid losses in Ukraine are high, though decreasing. With the current pace the grid losses in Ukraine will be around 12% in 2012. To be conservative the losses have been taken 10%;
- The emissions of methane and nitrous oxide have not taken into consideration, which is in line with ACM0002. This is conservative.

Conclusion

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

$$EF_{grid,produced,y} = EF_{OM,y}$$ *(Equation 3)*

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

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

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

and

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

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

The following result was obtained:

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

Table 8: Emission Factors for the Ukrainian grid 2006 - 2012

Monitoring
This baseline requires the monitoring of the following parameters:
- Electricity produced by the project and delivered to the grid in year y (in MWh);
- Electricity consumption reduced by the project in year (in MWh);
- Electricity produced by the project and consumed on-site in year y (in MWh);

The baseline emissions are calculated as follows:

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

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

This baseline can be used as ex-ante (fixed for the period 2006 – 2012) or ex-post. In case an ex-post baseline is chosen the data of the Ukrainian grid have to be obtained of the year in which the emission reductions are being claimed. Monitoring will have to be done in accordance with the monitoring plan of ACM0002 with the following exceptions:
- the Monitoring Plan should also include monitoring of the grid losses in year y;
- power plants at which JI projects take place should be excluded. Such a JI project should have been approved by Ukraine and have been determined by an Accredited Independent Entity.

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Ministry of Energy for supplying the data and the Ministry of Environmental Protection for their support. This baseline study can be used freely in case of proper reference.

Global Carbon B.V.
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Annex 3

MONITORING PLAN

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