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

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

Implementation of Arc furnace Steelmaking Plant “Electrostal” at Kurakhovo, Donetsk region

Sectoral scope: 9 (Metal Production).

Version of the document: 2.0.

Date of the document: 27 May 2010.

A.2. Description of the project:

The purpose of this project is to reduce emissions of greenhouse gases by using modern technologies to improve steel production in the region. The project envisages the construction of a green field steel manufacturing plant, based on a modern electric arc furnace (EAF). The EAF installed allows production of steel from almost 100% scrap metal feedstock[1]. The new production facility will use less a carbon intensive method to produce steel than a typically used by the majority of existing Ukrainian enterprises. This will allow reducing of GHG emissions.

This project was initiated by Donetsk Metal Rolling Plant (DMRP), the owner of Electrostal. DMRP wishes to create a plant that would produce square billets required for DMRP. Previously all square billets were purchased from external suppliers. Therefore, the construction of an wholly owned plant will allow DMRP to improve their supply chain.

The project activities are limited physically to the premises of “Electrostal” Ltd. At the same time, the source of GHG emission is indirect, because the substitution of technologies has taken place at the more carbon intensive Ukrainian metallurgical plants.

As shown in Section B, the most probable scenario which would have taken place without the project is a continuation of existing practice. In this scenario, different plants in Ukraine would produce similar production using different technologies, which are mostly more carbon intensive than the proposed one.

Before the decision making to implement this project the management of DMRP was consulted by State Authority for Environmental Questions in Donetsk region concerning the possibility to use additional financing, including Joint Implementation mechanism.

[1] It is required to use iron as a source of carbon, in the amount of 5 kg per 1 tonne of steel. All pig iron used under the project is a scrap and therefore can be considered as a climate neutral.

A.3. Project participants:

Table A.3.1 - 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)	"Electrostal" Ltd.	No
Netherlands	Global Carbon BV	No
* Please indicate if the Party involved is a host Party.		

Role of the project participants:

- "Electrostal" Ltd will implement the JI project including the monitoring phase. It invests in the JI project and will be the owner of ERUs generated. "Electrostal" Ltd is a project participant;
- Global Carbon BV is a leading expert on environmental consultancy and financial brokerage services in the international greenhouse emissions trading market under the Kyoto Protocol. Global Carbon has developed the first JI project that has been registered at the United Nations Framework Convention on Climate Change (UNFCCC). The first verification under JI mechanism was also completed for Global Carbon B.V. project. The company focuses on Joint Implementation (JI) project development in Bulgaria, Ukraine, Russia. Global Carbon BV is responsible for the preparation of the investment project as a JI project including PDD preparation, obtaining Party approvals, monitoring and transfer of ERUs. Global Carbon BV is a potential buyer of the ERUs generated under the proposed project. Global Carbon BV is a project participant.

A.4. Technical description of the project:

A.4.1. Location of the project:

Premises of the Electrostal Plant

A.4.1.1. Host Party(ies):

Ukraine

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

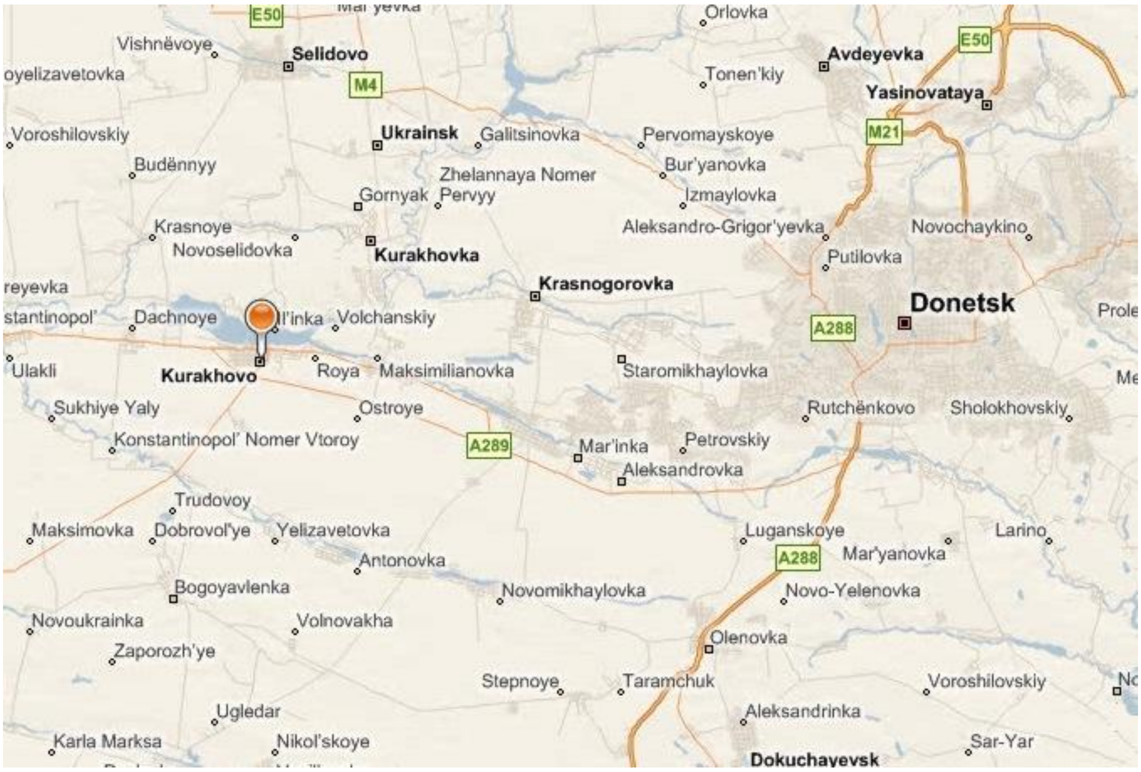
Donetsk region

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

Kurakhovo town

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

Kurakhovo, Donetsk Region, Ukraine



The address and detailed contact information are given in Annex 1.

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

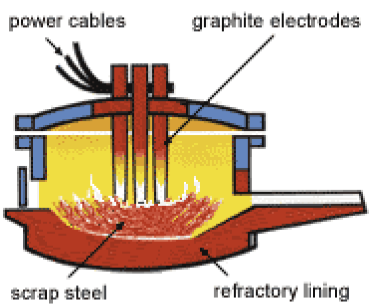
The project includes the construction of a steel manufacturing plant based on a modern electric arc furnace. The steel produced will substitute similar production volumes from the Ukrainian market that have been produced due to more carbon intensive technologies. Detailed technical information is provided in section B.1 of this PDD.

A modern electric arc furnace is a highly efficient recycler of steel scrap. The use of EAFs allows steel to be made from 100% scrap metal feedstock. Therefore, the primary benefit is the substitution of virgin iron which requires much energy to be produced, with scrap that has no emission as it is waste. It is also significant that there is a large reduction in specific energy (energy per unit weight) required to produce steel. In addition, modern EAFs are more flexible, being able to vary production to meet demand, as opposed to traditional Ukrainian production that is less flexible to change in demand requirements.

EAFs are significantly less carbon intensive than other widespread methods in Ukraine, such as Open Hearth Furnaces (OHF), and Basic Oxygen Furnaces (BOF).

Scrap metal is delivered to a scrap bay located next to the melt shop. The scrap is loaded into large buckets called baskets, with 'clamshell' doors for a base.

The scrap basket is then taken to the melt shop, the roof is swung off the furnace, and the furnace is charged with scrap from the basket. After charging, the roof is swung back over the furnace and meltdown commences. The electrodes are lowered onto the scrap, the arc is struck and the electrodes are then set to bore into the layer of shred at the top of the furnace. Lower voltages are selected for this first part of the operation to protect the roof and walls from excessive heat and damage from the arcs. Once the electrodes have reached the heavy melt at the base of the furnace and the arcs are shielded by the scrap, the voltage is increasing and the electrodes are raised slightly, lengthening the arcs and increasing power to the melt. This enables a molten pool to form more rapidly, reducing tap-to-tap times.



Once flat bath conditions are reached, i.e. the scrap has been completely melted down, the melted metal is heating and hot metal is tapping.

Another bucket of scrap can be charged into the furnace and melted down, thus closing the cycle.

All oxygen consumed by Electrostal is produced by mini-plant Linde, which is situated on the Electrostal territory.

Main project equipment also includes the Ladle Furnace (LF) and Continuous Casting Machine (CCM).

The purpose of the Ladle Furnace is to act as a holding furnace between the EAF and the continuous casting machine. During this secondary steelmaking argon bubbling is applied to homogenize the steel composition and temperature. In the LF all necessary dopes can be added to the steel.

After secondary steelmaking, the molten steel is usually continuously cast via a tundish into a water-cooled copper mold causing a thin shell to solidify. This ‘strand’ is then withdrawn through a set of guiding rolls and further cooled by spraying with a fine water mist. The solidified shell continues to thicken until the strand is fully solidified. Finally, the strand is cut into desired lengths and these are either discharged to a storage area or to the hot rolling mill.

All technical staff working with new equipment has necessary permissions and had successfully completed relevant training. "Electrostal" Ltd has the license[2] which allows providing education on working specialties concerning iron and steel works.
All work on the proposed JI project does not require extensive maintenance effort for monitoring.

Equipment used for this project can run at least for 25 years.

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:

This project intends to reduce greenhouse gas emissions by using modern technology to improve the steel production at the site. The new production facility will use a STB[3] Electric Arc Furnace, which uses a less carbon intensive method than a typically used one by the majority of Ukrainian enterprises.
Taking into account that no national and/or sectoral policies oblige for such activity, in the absence of the proposed project, it is assumed that no similar plant will be constructed at least during the Kyoto period.

The implementation schedule is shown in the diagram below:

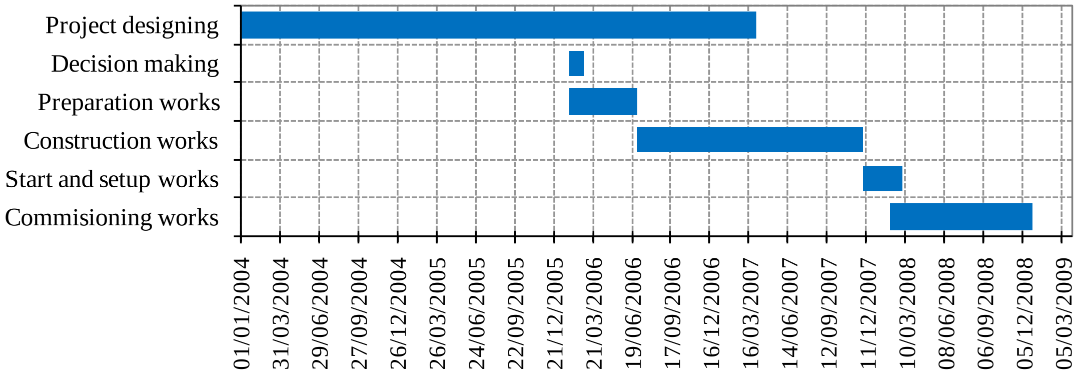


Figure A.4.2. Implementation schedule diagram.

For more information please see Section B.

[2] License of Ministry of Education and Science of Ukraine No 363304

[3] http://www.stbtecnosiderurgica.it

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

Table A.4.1 - Estimated amount of emission reductions over the crediting period

	Years
Length of the crediting period	57 months
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
Year 2008	158,354
Year 2009	393,065
Year 2010	432,929
Year 2011	486,160
Year 2012	486,160
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	1,956,668
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	391,334

Table A.4.2 - Estimated amount of emission reductions after the crediting period

	Years
Length of the crediting period	120 months
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
Year 2013	486,160
Year 2014	486,160
Year 2015	486,160
Year 2016	486,160
Year 2017	486,160
Year 2018	486,160
Year 2019	486,160
Year 2020	486,160
Year 2021	486,160
Year 2022	486,160
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	4,861,600
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	486,160

A.5. Project approval by the Parties involved:

The Project Idea Note was submitted for review to the National Environmental Investment Agency of Ukraine. A Letter of Endorsement (LoE) # 213/23/7 for the proposed project was issued on 12 March 2010. Due to the Netherlands legislation, no LoE from the Netherlands is needed. After AIE has completed the determination report, the PDD and the Determination Report will be presented to the National Environmental Investment Agency of Ukraine to obtain a Letter of Approval from Ukraine. LoA from the Netherlands #2010JI11 was issued on 22 April 2010 .

SECTION B. Baseline

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

STEP 1 Indication and description of the approach chosen regarding baseline setting

In accordance with the paragraph 24 of the "Guidance on criteria for baseline setting and monitoring", Version 02[4], the project developer proposes the identification of a baseline scenario by listing and describing plausible future scenarios on the basis of conservative assumptions and selecting the most plausible one.

For the emission reduction calculation and monitoring, the project developer proposes using a JI specific approach in accordance with the JI Guidance on Criteria for Baseline Setting and Monitoring, Version 02[4]. No approved CDM methodologies are used and if elements of CDM methodologies are used, it is clearly indicated. All information concerning the methodological approach for the emissions reduction calculation chosen is given below in section B.1. All information concerning methodological approach for monitoring of emission reductions is given in section D.

The baseline scenario has been identified as the most plausible scenario among all realistic and credible alternatives. Taking into account that proposed project activity is a green-field project and does not substitute any separate technology, there are only several alternatives that can be considered as plausible:

1. Production of the similar to project activity products by other metallurgical plants in Ukraine (continuation of existing practice);
2. Construction of a separate plant similar to project activity, using another technology (OHF or BOF)
3. Construction of a modern EAF steelmaking plant without a JI incentive (Project activity without JI)
4. Construction of a new plant by another party using EAF technology
5. The combination of alternative 1 and 4

STEP 2 Application of the approach chosen.

The detailed analysis of alternatives mentioned is given below.

Alternative 1 "Continuation of existing practice". In this case, the same volume of billets would be produced by other metallurgical plants in Ukraine. The metallurgical market in Ukraine is very flexible in a sense that plants are not working on full load and hence it is easily possible to have all Electrostal production produced by other plants.

In this scenario emissions would be generated from the similar sources connected with steelmaking process. The level of these emissions can be considered as a higher one than from the proposed project, because of usage of outdated and more carbon intensive technologies.

This alternative does not require any additional investment and is the most plausible.

Alternative 2 "Construction of the separate plant similar to project activity using another technology (OHF or BOF)". In this case, the plant based on different from project activity technology but with similar capacity would be constructed. The possible technologies which can substitute the

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

project number one are Open Hearth Furnace and Basic Oxygen Furnace. Both technologies are very widespread in Ukraine. Nevertheless, significant technological barriers, listed below, exist, which does not allow considering this alternative as realistic.

- It is not possible to build a Basic Oxygen Furnace without Blast Furnace (BF) for pig iron production. It is supposed to use a hot-casting pig iron to produce steel by BOF technology. There are no iron production plants in Kurakhovo, therefore, a construction of BOF steelmaking plant would be connected with construction of a new blast furnace, which makes the costs for such project realization incomparable with proposed project activity costs.

- Construction of a new Open Hearth Furnace is not realistic. This technology is outdated and there are only several countries in the world where this technology is still in use. There exist a lot of projects connected with OHF decommissioning.

In this scenario emissions would be generated from the similar sources connected with steelmaking process. The level of these emissions can be considered as higher than from the proposed project, because of usage of more carbon intensive technologies.

Therefore, this alternative cannot be considered as the most plausible scenario.

Alternative 3 "Project activity without the JI incentive". In this case, a modern EAF steelmaking plant would be implemented by the DMRP in Kurakhovo, Donetsk region. All technologies and processes used would be identical to those used in the proposed project.
The main revenue will come from sale of the square billets produced. No additional revenue from generation and sale of ERUs will be earned. This alternative is identical to the proposed JI project activity, however without the JI incentive.
As it is shown in the barrier analysis below, this alternative is credible, because it meets significant barriers which prevent project realization (for more information please see Section B.2, Barrier analysis).

Emissions level in this scenario will be identical to the proposed project, however, emission reductions generated will not be sold under the JI mechanism.

Therefore, taking into account the information mentioned above, this alternative cannot be considered as a baseline.

Alternative 4 "Construction of a new plant by another party using EAF technology"

In this case, a modern EAF steelmaking plant would be implemented by another party somewhere in Ukraine. All technologies and processes used can be considered similar to those used in the proposed project.
The main revenue will come from selling of steel. No additional revenue from generation and sale of ERUs will be earned. Thus, this alternative can be considered identical to the proposed JI project activity, however, without the JI incentive.
As it is shown in the barrier analysis below, this alternative is not the most plausible, because it meets significant barriers which prevent project realization (for more information please see Section B.2, Barrier analysis). Therefore, if such alternative is implemented, it will most probably be implemented as a JI project

Emissions level in this scenario will be identical to the proposed project.

Therefore, taking into account the information mentioned above, this alternative cannot be considered as a baseline.

Alternative 5 "The combination of alternatives 1 and 4"

In this case, the similar to project activity products would be partially produced by EAF technology, similar to the proposed one; and partially by other metallurgical plants in Ukraine, using different technologies (EAF, OHF, BOF). As it was stated in the description to the Alternatives 3 and 4, there are several barriers which prevent implementation of EAF with scale, similar to the proposed one. It means that if this alternative concerned the project similar to the proposed one and in the same scale, this would make the alternative similar to the proposed project. In this case the same barriers mentioned in the Section B.2 will be met and, therefore, such a project would not be implemented without a JI incentive. The variant when a smaller enterprise is being implemented cannot be considered as an alternative to the proposed project (more adjustments are given in the Section B.2 under the Common practice analysis).

In other words, alternative "combination of the alternatives 1 and 4" can be considered either similar to proposed project or irrelevant at all. Therefore, this alternative cannot be considered as a baseline.

Consistency with mandatory applicable laws and regulations

All the alternatives defined above are compliant with national laws and regulations.

Therefore, the most plausible scenario for the baseline is Alternative 1 *"Continuation of the existing practice".*

All information concerning approach for calculation of emission reduction are given in the Annex 2

Conservative assumptions used for baseline emissions calculation can be described the following way:

1. Conservative emission factors were used for baseline calculations (please see the tables in Annex 3);
2. Baseline emission factor for EAF steelmaking is based on performance of the project emission factor of the new EAF. This is very conservative, taking into account that the plant works with 100% metal scrap feedstock and does not use iron, as opposite to most other plants in Ukraine. Thus, baseline emission factor will be lower than real emission factor for Ukrainian plants using EAF;
3. Baseline emission factors do not take into account usage of CCM (continuous casting machine) which is used under the project activity. Nevertheless, calculation of project emissions is based on the data with CCM consideration, which is conservative;
4. Emission factor for oxygen production based on total electricity consumption by the oxygen production plant and amount of actual oxygen consumption by Electrostal. Nevertheless, some oxygen produced goes to external consumers.

Key parameters

No national policies and circumstances can significantly influence the baseline. Therefore, only some technical parameters have to be described.

As key parameters that can significantly influence ER amount, the following parameters can be considered:

<table>
<tr><th>Data/Parameter</th><th>Forecast level of steel production</th></tr>
<tr><td>Data unit</td><td>t</td></tr>
<tr><td>Description</td><td>Forecast level of steel production, based on the PO plans, and historical data</td></tr>
<tr><td>Time of determination/monitoring</td><td>To be continuously monitored</td></tr>
<tr><td>Source of data to be used</td><td>Electrostal technical reports</td></tr>
<tr><td>Value of data applied (for ex ante calculations/determinations)</td><td><table><tr><td>2008</td><td>2009</td><td>2010</td><td>2011</td><td>2012</td></tr><tr><td>190384.9</td><td>413984.6</td><td>450000</td><td>500000</td><td>500000</td></tr></table></td></tr>
<tr><td>Justification of the choice of the data or description of measurement methods and procedures (to be) applied</td><td>There are only two ways to determine this parameter. One of them is based on the maximum capacity of EAF. The second way which was applied is based on real expectations of the PO[5], that is conservative</td></tr>
<tr><td>QA/QC procedures (to be) applied</td><td>The relevant metering devices will be calibrated according to the host Party’s legislation and requirements of the supplier.</td></tr>
<tr><td>Any comment</td><td></td></tr>
</table>

Data/Parameter	**Global Emission factor for steel production under the baseline**
Data unit	t CO_2/t steel
Description	Global Emission factor for steel production under the baseline, needed for ER calculations
Time of determination/monitoring	Monitored during crediting period (this value is based on constants and monitoring data)
Source of data to be used	IPCC, PDD, Electrostal data, etc.
Value of data applied (for ex ante calculations/determinations)	1.543
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This value can be calculated using the formula 1.1 in Annex 2, this PDD.
QA/QC procedures (to be) applied	-
Any comment	

[5] The technical department of the Electrostal plant estimates which production level could be achieved during further years. This expectation is based on results achieved and plans concerning possible improvements in the regimes and technology.

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

The project includes the construction of a steel manufacturing plant, based on a modern electric arc furnace. The steel produced will substitute similar production volumes from the Ukrainian market that have been produced using more carbon intensive technologies. The core of the project is that emission factor for local metallurgical market is higher than for project activity.

Therefore, emissions in the baseline scenario would likely exceed the emissions in the project scenario.

No national policies and circumstances can significantly influence the baseline.

To demonstrate additionality the "Tool for the demonstration and assessment of additionality", Version 05.2[6] is used. In accordance with the Tool, the following sequence shall be used:

STEP 1. Identification of alternatives to the project activity consistent with current laws and regulations

The purpose of this step is to define realistic and credible alternatives to the project activity through the following Sub-steps:

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

Alternatives to the project activity have been identified in the section B.1. Two of the identified alternatives can be considered as realistic and credible:

- Production of the products similar to project activity's by the other metallurgical plants in Ukraine (continuation of existing practice);
- Construction of a modern EAF steelmaking plant without JI incentive (Project activity without JI);

Outcome of Step 1a: Identified realistic and credible alternative scenario(s) to the project activity.

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

The identified alternatives are in compliance with all mandatory applicable legal and regulatory requirements, including its enforcement, in the country.

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

STEP 2. INVESTMENT ANALYSIS

This step is omitted in this project.

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

STEP 3. BARRIER ANALYSIS

The purpose of this Step is to determine whether the proposed project activity faces barriers that: prevent the implementation of this type of proposed project activity and do not prevent the implementation of at least one of the alternatives.

Sub-step 3a: Identify barriers that would prevent the implementation of the proposed CDM project activity:

There are realistic and credible barriers that would prevent the implementation of the proposed project activity from being carried out if the project activity was not registered as a JI project. Such realistic and credible barriers include:

a) Investment barriers

Ukraine is considered to be a risky country for doing business and investment. No private capital is available from domestic or international capital markets for mid to long term investments. And capital that is available has a high cost. The table below represents risks of doing business in Ukraine according to various international indexes and studies.

Table 1 International ratings of Ukraine[7]

Indicators	2006	2007	2008	Note
Corruption index of Transparency International	99 position from 163	118 position from 180	134 position from 180	Index of corruption
Rating of business practices of The World Bank (The Doing Business)	124 position from 155	118 position from 179	139 position from 178	Rating of conduct of business (ease of company opening, licensing, staff employment, registration of ownership, receipt of credit, defense of interests of investors)
The IMD World Competitiveness Yearbook	46 position from 55	46 position from 55	54 position from 55	Research of competitiveness (state of economy, efficiency of government, business efficiency and state of infrastructure)
Index of Economic Freedom of Heritage Foundation	99 position from 157	125 position from 161	133 position from 157	Determination of degrees of freedom of economy (business, auction, financial, monetary, investment, financial, labour freedom, freedom from Government, from corruption, protection of ownership rights)
Global Competitiveness Index of World Economic Forum	69 position from 125	73 position from 131	72 position from 134	Competitiveness (quality of institutes, infrastructure, macroeconomic stability, education, development of financial market, technological level, innovative potential)

These data show that both real and perceived risks of investing in Ukraine are in place and influence the availability of capital in Ukraine both in terms of size of the investments and in terms of capital costs. The comparison of commercial lending rates in Ukraine and in Eurozone for the loans over 5 years in EUR is presented in a figure below:

[7] State Agency of Ukraine for Investments and Innovations http://www.in.gov.ua/index.php?lang=en&get=225&id=1990

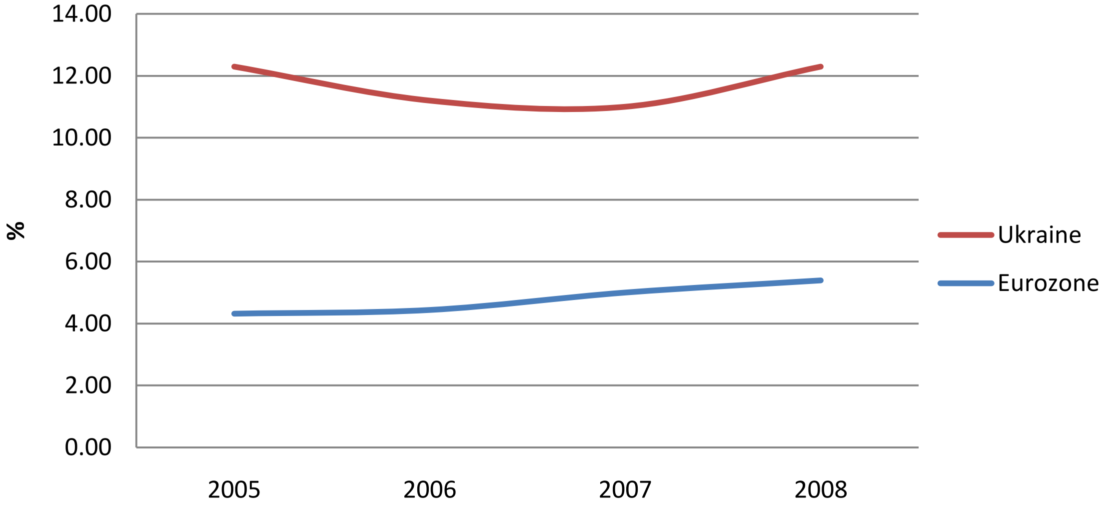


Figure 1 Commercial lending rates, EUR, over 5 years[8]

Cost of debt financing in Ukraine is at least two times higher than in the Eurozone. The risks of investing into Ukraine are additionally confirmed by the country rating provided by the Moody's international rating agency and the associated country risk premium. The table below compares country risk premiums for Russia and Ukraine[9]:

Total Risk Premium, %	**2004**	**2005**	**2006**
Russia	7.02	6.6	6.64
Ukraine	11.59	10.8	10.16

As it is demonstrated by this table, Russia, while offering a comparable set of investment opportunities, is significantly less risky country for investments than Ukraine. An assessment of investment process throughout metallurgical sectors shows that in 2000-2003 average investments in $ per 1 tonne of steel were $30 in US, $25 in EU, $15 in Russia and $7.8 in Ukraine[10]. In this sector in Ukraine financing is needed but is inadequate, and most of the investments are covered by equity.

As stated at the OECD Round Table on Enterprise Development and Investment Climate in Ukraine, the current legal basis is not only inadequate, but to a large extent sabotages the development of market economy in Ukraine. Voices in the western press can basically be summarized as follows: The reforms in the tax and legal systems have improved considerably with the adoption of the Commercial Code, Civil Code and Customs Code on 1 January 2004 but still contain unsatisfactory elements and pose a risk for foreign investors[11]. Ukraine is considered to be heading in the right direction with significant reforms having been put into action but still has a long way to go to realize its full potential. Frequent and unpredictable changes in the legal system along with conflicting and inconsistent Civil and Commercial

[8] Data for Ukraine from National Bank of Ukraine http://www.bank.gov.ua/Statist/Electronic%20bulletin/data/4-Financial%20markets(4.1).xls

Data for Eurozone from European Central Bank http://sdw.ecb.europa.eu/browseSelection.do?DATASET=0&REF_AREA=308&BS_COUNT_SECTOR=2240&node=2018783

[9] Data from Aswath Damodaran, Ph.D., Stern School of Business NYU http://pages.stern.nyu.edu/~adamodar/

[10] Metallurgical Sector of Ukraine Investment Problems, Chentukov Y.I., Problems of foreign economic relations development and attraction of foreign investments: regional aspect., ISSN 1991-3524, Donetsk, 2007. p. 535-538

[11] Foreign Direct Investment in Ukraine – Donbass, Philip Burris, Problems of foreign economic relations development and attraction of foreign investments: regional aspect., ISSN 1991-3524, Donetsk, 2007. p. 507-510

Codes do not allow a transparent and stable, enforced legal business environment. This is perceived as a great source of uncertainty by international companies, which makes future predictions of business goals and strategy risky.

The conclusion from the abovementioned is as follows: the investment climate of Ukraine is risky and unwelcoming, private capital is not available from domestic or international sources or available at prohibitively high cost due to real and perceived risks of doing business in Ukraine, as shown by various sources. Alternative markets, such as Russia, offer similar profile of investment opportunities with a lower risk and better business environment. In the concept of the proposed project, the needed investment in the amount of ~$95 mil looks like very risky and uncertain.

b) Barriers due to prevailing practice

The proposed project activity can be considered as the first of its kind, under the following criteria:

- Activity based on EAF technology;
- Enterprise which produce non special steel;
- The purpose of production is trading at open market in Ukraine (not production for internal use only).

The full analysis of prevailing practice is shown below in the Step 4, Common practice analysis.

*Outcome of Step 3a***.** The listed barriers may prevent the project activity implemented without JI to occur.

Sub-step 3 b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

Listed barriers do not prevent only continuation of existing practice to occur, because no investment is required in this case, as well as no other barriers can be observed during the existing common practice.

The JI incentives alleviate the identified barriers for the project activity. The lack of access to capital as demonstrated in the investment barrier in sub-step 3a is preventing the projects participants from financing the project using cost-effective capital from the international financial markets. The financing for this project is provided as equity by the project participants. Equity financing in general requires higher returns as it is associated with higher risk exposure for the project owners and is only used for projects that can generate additional benefits. The estimated amount of ERUs for this project is presented in the table below:

Price of ERUs, EUR	5	10	15
Total Amount of ERU Revenues (2008-2012), EUR million	9.8	19.6	29.4
Total Project Cost, EUR million	53.6	53.6	53.6
ERU Revenues to Project Cost	18.3%	36.5%	54.8%

Even according to this conservative estimate, the potential revenues from the ERUs that exclude any revenues from the sales of emission reductions generated after 2012 are significant and at the realistic assumptions account for up to the 36.5% of the total project cost. As the expected revenues from ERUs are significant when put into comparison with the total project cost this additional revenue can help mitigate the risk associated with equity investment and, therefore, alleviate the investment barrier.

This project being the “first of its kind” in the country faces additional implementation risks and uncertainties and has no benchmark to draw assumptions from. As the expected revenues from ERUs are significant when put into comparison with the total project cost this additional revenue can help mitigate the risk associated with the project being the “first of its kind” and, therefore, alleviate this barrier.

Also, the existence of barriers for modern steelmaking plant based on EAF technology in Ukraine is confirmed by evidence that demonstrates that the use of this technology in the steelmaking sector of Ukraine is marginal – 3.7% (see Annex 2).

Both Sub-steps 3a – 3b are satisfied, proceed to Step 4 (Common practice analysis).

STEP 4. COMMON PRACTICE ANALYSIS

As it is shown on the table B.1.1 (please see Annex 2) common practice in Ukrainian steel production is OHF and BOF methods. The share of this technology in Ukraine is only 3.7% and therefore cannot be considered as a common practice.

Nevertheless, to follow the "Tool for the demonstration and assessment of additionality", a brief analysis was done to demonstrate that similar activities have a serious distinctions from the proposed project, which make them incomparable.

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

Electric arc furnaces are mainly installed in the machine-building plants and have comparatively small capacity. The purpose of these furnaces is to produce steel for small details production on-site.

This category of activities can't be used for comparison, because EAF is the only type of technology that allows producing steel in small amount. Therefore, neither negative NPV nor other barriers can influence the owner's decision concerning its implementation.

The next category is the alloy steel producers. The best way to produce alloy steel or special steel is to use EAF because of easiness of parameters and capacity control. Moreover, there are no "non-EAF" producers of special steel in Ukraine. Therefore, this category is also irrelevant for comparison, because for those who have to produce alloy steel there is no choice and, therefore, no barriers can influence the decision concerning the project realization.

The only plant that can be considered as a really similar activity is an ISTIL plant in Donetsk. In 1999 Mini Steel Mill ISTIL (Ukraine) was established[12]. Moreover, decision and design works took place a few years before then.

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

Although similar activity is observed (Mini Steel Mill ISTIL), implementation of that project took place too long ago. A lot of parameters, including market conditions, taxation policy and financial situation at that time were completely different from the situation at hand.

Based on the information above, one can conclude that the construction of a modern steelmaking plant based on EAF technology in Ukraine is not a common practice.

Conclusion: The above stated confirms to recognize that the GHG emission reductions generated by the proposed JI project activity are additional to those that could have occurred otherwise.

[12] http://firstline.com.ua/portal/m2/demze/index.php?id=7894&show=32942

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

The project activities are limited physically by the premises of the "Electrostal" ltd. At the same time, the source of GHG emission is indirect, because the substitution of technologies is taking place from the more carbon intensive Ukrainian metallurgical plants.
The table below shows an overview of all emission sources in the baseline and project scenarios process:

Table B.3.1 – Sources of emissions in the baseline and project scenarios

	Source	Gas	Included/ Excluded	Justification / Explanation
Baseline scenario	Metallurgical conversion stages: by-product coke plants, BF plants, OHF plants, BOF plants, EAF plants at the local market	**CO_2**	**Included**	**Main emission source. Baseline concerns production of steel at the metallurgical plants in Ukraine**
		CH_4	Excluded	Excluded for simplification. Conservative.
		N_2O	Excluded	Excluded for simplification. Conservative.
	Raw material production (iron, anthracite)	**CO_2**	**Included**	**Emissions for mentioned raw material production included into baseline emission factors for steel production.**
		CH_4	Excluded	Excluded for simplification. Conservative.
		N_2O	Excluded	Excluded for simplification. Conservative.
	Carbon-bearing raw material consumption (electrodes, lime, limestone)	**CO_2**	**Included**	**Electrodes, lime and limestone used can be considered as a source of carbon in steel.**
		CH_4	Excluded	Excluded for simplification. Conservative.
		N_2O	Excluded	Excluded for simplification. Conservative.
	Electricity consumption from the grid	**CO_2**	**Included**	**It is assumed that electricity from the grid would be consumed under the baseline**
		CH_4	Excluded	Excluded for simplification. Conservative.
		N_2O	Excluded	Excluded for simplification. Conservative.
Project scenario	Carbon-bearing raw material production (electrodes, lime, anthracite)	**CO_2**	**Included**	**The main feed-stock under the project activity is the scrap metal. Nevertheless, some amount of iron as also used. Emissions generated due to production of this amount will be considered in calculation of project emission. Also anthracite amount will be considered. Electrodes, lime and limestone used can be considered as a source of carbon in steel**
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.
	Electricity consumption from the grid	**CO_2**	**Included**	**Electricity from the grid consumed under the project activity**
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.

The baseline scenario is a continuation of the existing situation. Thus, the source of emissions is the Ukrainian metallurgical market.
The main feed-stock under the project activity is scrap metal which can be assumed as a climate neutral.

The following figure shows the project boundaries and sources of emissions in the baseline and project scenarios.

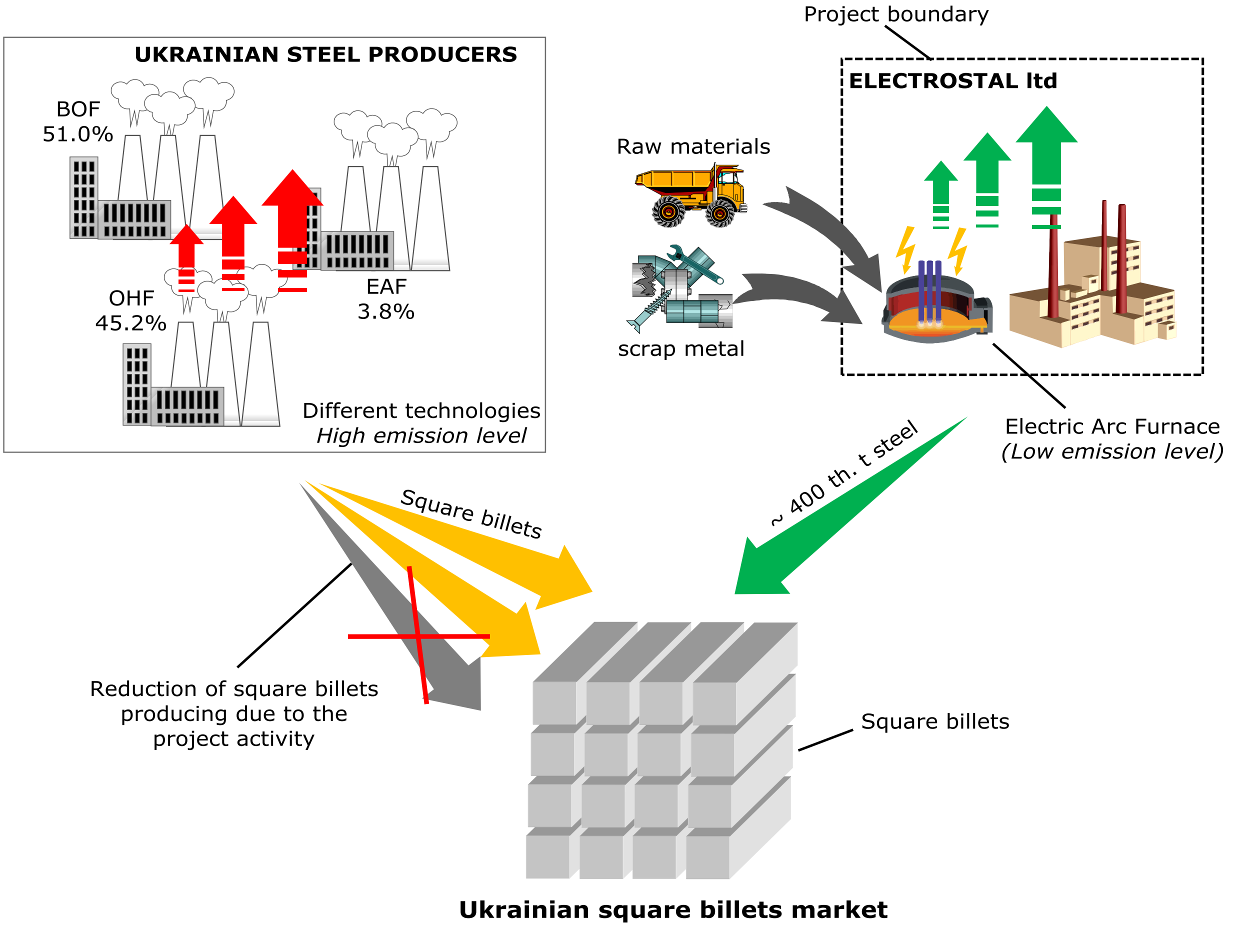


Figure B.3.1 - Project boundaries

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

Date of completion of the baseline study: 01/04/2010

Name of person/entity determining the baseline:
Denis Rzhanov
Global Carbon B.V.

For the contact details please refer to Annex 1.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

Starting date of the project is 27 February 2006

C.2. Expected operational lifetime of the project:

The lifetime of the equipment will be at least 25 years. Thus, operational lifetime of the project will be 25 years or 300 months.

C.3. Length of the crediting period:

Start of crediting period: 01.04.2008.

Length of crediting period: 4 years and 9 months or 57 months.

Emission reductions generated after the crediting period may be used in accordance with an appropriate mechanism under the UNFCCC or any other international agreement.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

In accordance with JI Guidance on Criteria for Baseline Setting and Monitoring[13], Version 02 project participants propose JI specific approach for monitoring.

STEP 1 Indication and description of the approach chosen regarding monitoring
In accordance with the approach chosen and taking into account that proposed project concerns new construction, baseline emissions should be calculated based on project level of steel production and relevant emission factor.

The best practice for monitoring for JI project should not influence (or minimally influence) on common monitoring practice, used in the plant. Therefore, existing statistical documents (Technical Reports, etc.) will be used as a source of data. All metering devices used for metering the data, necessary for ER calculations should be regularly checked and calibrated, if necessary, to provide insignificant level of uncertainties. Therefore, all data in the calculation of the baseline and project emissions have insignificant level of uncertainties due to regular calibration of meters.

All data needed for ER calculation will be collected in the official statistic documents used by plant and after that recalculated into the value of emission reductions by the method described below.

If the main metering device fails, and there are no reserve metering devices available, the monitoring report will use indirect data and evidence, but only if their applicability (data and evidence) is justifiably proved. Likely, a conservative approach will be used. The possible way to solve some problems in this case is to use the reports developed under ISO 9001, which has been implemented on the plant.
The data monitored and required for calculation of the ERUs will be archived and kept for 2 years after the last transfer of ERUs.

STEP 2 Application of the approach chosen
In accordance with the approach chosen, monitoring will concern project data for steel production level and feed stock consumption.

The main source of data will be monthly Technical Reports which are official documents with sufficient level of reliability. These monthly data will be summarized into annually data, at the end of each year.

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

The following parameters have to be continuously monitored:

1. Amount of steel produced under the project activity
2. Electrodes consumption by EAF
3. Oxygen consumption
4. Electricity consumption by EAF and LF
5. Natural gas consumption
6. Anthracite consumption (includes all anthracite sources)
7. Lime consumption (includes lime, magnesite and dolomite sources)
8. Electrodes consumption by LF

Approach used for calculation of emission reduction can be explained as follows. All source of feed-stock consumed due to steelmaking can be considered as a "pollutant". Emission level of this source can be estimated with help of relevant emission factor. Thus, the emission factor relevant for EAF steelmaking process will be obtained. Emission level for project condition will be compared to emission level under the baseline, using the following data:

- Emission factors for different processes and technologies in Ukraine;
- Dispersion of these technologies;
- Different auxiliary emissions factors needed to calculate emission level from all relevant sources.

Data needed for calculations are emission factors, which are not monitored throughout the crediting period, but are determined only once (and thus remain fixed throughout the crediting period).

The values of these parameters are collected in the Table D.1.

Table D.1. – Emission factors used

Parameter	Unit	Value	Source
BOF steel	tCO_2/t steel	1.460	2006 IPCC Guidelines for National Greenhouse Gas Inventories. Chapter 4
EAF steel	tCO_2/t steel	0.571	Electrostal data
OHF steel	tCO_2/t steel	1.720	2006 IPCC Guidelines for National Greenhouse Gas Inventories. Chapter 4
Electrodes	tCO_2/tonne	3.007	2006 IPCC Guidelines for National Greenhouse Gas Inventories. Chapter 4
Electricity	tCO_2/MWh	0.896	“Standardized emission factors for the Ukrainian electricity grid” research (please find in Annex 2), made by Global Carbon and positively determined by TÜV SÜD
Natural gas	tCO_2/1000 m^3	1.879	2006 IPCC Guidelines for National Greenhouse Gas Inventories. Chapter 2
Anthracite	tCO_2/tonne	2.346	2006 IPCC Guidelines for National Greenhouse Gas Inventories. Chapter 2
Lime	tCO_2/tonne	0.77	2006 IPCC Guidelines for National Greenhouse Gas Inventories. Chapter 3, Table 2.4. Value for dolomitic lime for developing countries.
Oxygen	tCO_2/1000 m^3	1.188	This value can be calculated based on data from the Electrostal plant concerning electricity transferring level for oxygen production (please see Annex 2 for details).

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

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

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1	$Steel_{PL}$ Amount of steel produced under the project	Monthly technical report	t	m	continuously	100%	Electronic and paper	
2	$G_{electrodes\_EAF,y}$ Electrodes consumption	Monthly technical report	t	m	continuously	100%	Electronic and paper	
3	$G_{oxygen,y}$ Oxygen consumption	Monthly technical report	th. m3	m	continuously	100%	Electronic and paper	
4	$G_{electricity\_EAF+LF,y}$ Electricity consumption	Monthly technical report	MWh	m	continuously	100%	Electronic and paper	
5	$G_{NG,y}$ Natural gas consumption	Monthly technical report	th. m3	m	continuously	100%	Electronic and paper	
6	$G_{antracite,y}$ Anthracite consumption	Monthly technical report	t	m	continuously	100%	Electronic and paper	
7	$G_{lime,y}$ Lime consumption	Monthly technical report	t	m	continuously	100%	Electronic and paper	
8	$G_{electrodes\_LF,y}$ Electrodes consumption by ladle furnace (LF)	Monthly technical report	t	m	continuously	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 following sources of emissions can be observed during the EAF operation:

1. Electrodes consumption by EAF
2. Oxygen consumption
3. Electricity consumption by EAF and LF
4. Natural gas consumption
5. Anthracite consumption
6. Lime consumption
7. Electrodes consumption by LF

Therefore, as project emissions one the sum of the emissions values listed above can be considered.

$$PE_y = PE_1 + PE_2 + \cdots + PE_7, \text{ where} \quad \text{(D.1.1)}$$

$PE_1 - PE_7$ - Emissions relevant to the sources listed above, t $CO_{2\ eq}$.

The value of each emission under the project scenario can be found by multiplying amount/volume of «pollutant» on relevant emission factor:

$$PE_{electrodes,y} = (G_{electrodes\_EAF,y} + G_{electrodes\_EAF,y}) \times EF_{electrodes,y} \quad \text{(D.1.2)}$$

$$PE_{oxygen,y} = G_{oxygen,y} \times EF_{oxygen,y} \quad \text{(D.1.3)}$$

$$PE_{electricity,y} = G_{electricity_{EAF+LF,y}} \times EF_{electricity,y} \quad \text{(D.1.4)}$$

$$PE_{NG,y} = G_{NG,y} \times EF_{NG,y} \quad \text{(D.1.5)}$$

$$PE_{antracite,y} = G_{antracite,y} \times EF_{antracite,y} \quad \text{(D.1.6)}$$

$$PE_{lime,y} = G_{lime,y} \times EF_{lime,y} \quad \text{(D.1.7)}$$

Where,

$PE_{i,y}$- project emissions for relevant source *i* for year *y*, t $CO_{2\ eq}$.
$G_{i,y}$ - amount/volume of each source *i* for year *y*. These data are the monitoring parameters (units are different; please see Table D.1.1.1 for details).
$EF_{,y}$ - factor of emission for each source *i* for year *y*, t CO_2/amount (units are different; please see Table D.1.1.2 below for details).

In accordance with approach chosen, default emission factors for different processes can be applied. As a source of these emission factors IPCC Guidelines can be used. Nevertheless, national emission factor for electricity from the grid was used. The summary of emission factors used is listed in the table D.1.

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
9	$Steel_{BL}$ Amount of steel produced under the baseline	Plant records	t	c	continuously	100%	Electronic and paper	This value based on similar value for project scenario

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

GHG emissions in the baseline scenario can be found by the following formula:

$$BE_y = Steel_{BL} \times GlEF_{Bl,steel}, \text{ where} \qquad (D.1.8)$$

$Steel_{BL}$ - Amount of steel produced under the baseline, t

$GlEF_{Bl,steel}$ - Global emission factor for steel production, t CO_2 /t steel

In accordance with approach chosen, steel production levels for baseline and for the project scenario are the same, therefore:

$$Steel_{BL} = Steel_{PL} \quad \text{(D.1.9)}$$

Global emission factor for steel production can be found, using the following formula:

$$GlEF_{Bl,steel} = EF_{BOF} \times \omega_{BOF} + EF_{EAF} \times \omega_{EAF} + EF_{OHF} \times \omega_{OHF}, \text{ where} \quad \text{(D.1.10)}$$

EF_{BOF} - emission factor for steel making process based on basic oxygen furnaces, t CO_2 /t steel

EF_{EAF} - emission factor for steel making process based on electric arc furnaces, t CO_2 /t steel

EF_{OHF} - emission factor for steel making process based on open hearth furnaces, t CO_2 /t steel

ω_{BOF} , ω_{EAF}, ω_{OHF} – share of relevant technology in the market, %. In accordance with Worldsteel's Statistical Yearbook[14] 2008, the latest actual data for Ukrainian market are the following: BOF 51.7%; EAF 3.7%; OHF 44.6%.

Emission factor for EAF is assumed ex-ante for all crediting period (Please see table D.1 for details) and equal to minimum ration between project emissions and steel production level estimated for the period 2008-2012, that is conservative:

$$EF_{EAF} = min\left(\frac{PE_{2008-2012}}{Steel_{PL,2008-2012}}\right) \quad \text{(D.1.11)}$$

[14] http://www.worldsteel.org/index.php?action=publicationdetail&id=81

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

This option is 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):

This option is not applicable

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 D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

This option is not applicable

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

This option is 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):

Emission reductions are calculated as:

$$ER_y = BE_y - PE_y, \qquad (D.1.12)$$

where:

ER_y – GHG emission reductions in year *y*, t CO_2 equivalent,

BE_y – GHG emissions in the baseline scenario in year *y*, t CO_2 equivalent,
PE_y - GHG emissions in project scenario in year *y,* t CO_2 equivalent.

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

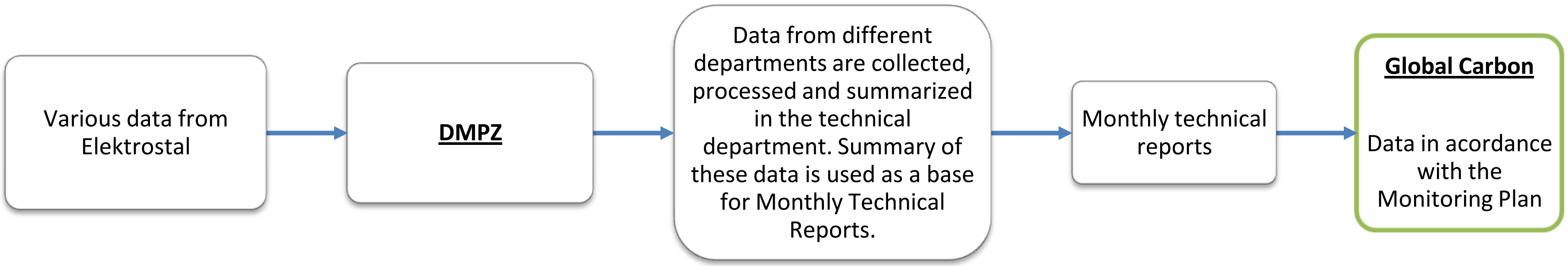
Collection and archiving of the information on the environmental impacts of the project was done based on the approved EIA (see Section F.1 for details).

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.
Table D.1.1.1, ID 1 $Steel_{PL}$	Low	This parameter is metered by motor-truck scales BTA-60. It also possible to use railway truck scale VVET-150 (in dependence of what kind of transport is used) The devices will be calibrated annually
Table D.1.1.1, ID 2 $G_{electrodes\_EAF,y}$	Low	This input of electrodes to the plant is metered by motor-truck scales BTA-60 or railway truck scale VVET-150 (in dependence of what kind of transport is used). The usage of electrodes in the furnaces is metered by crane strain-gage weighers, as well as by means of a calculation. The necessary devices will be calibrated according to the host Party's legislation and producer's requirements
Table D.1.1.1, ID 3 $G_{oxygen,y}$	Low	This parameter is metered by special flow meter The device will be calibrated according to the host Party's legislation and producer's requirements
Table D.1.1.1, ID 4 $G_{electricity\_EAF+LF,y}$	Low	This parameter is metered by electricity meter "EuroAlpha Metronics" The device will be calibrated according to the host Party's legislation and producer's requirements
Table D.1.1.1, ID 5 $G_{NG,y}$	Low	This parameter is metered by special flow meter The device will be calibrated according to the host Party's legislation and producer's requirements
Table D.1.1.1, ID 6 $G_{antracite,y}$	Low	This parameter is metered by motor-truck scales BTA-60. It also possible to use railway truck scale VVET-150 (in dependence of what kind of transport is used) The devices will be calibrated annually
Table D.1.1.1, ID 7 $G_{lime,y}$	Low	This parameter is metered by motor-truck scales BTA-60. It also possible to use railway truck scale VVET-150 (in dependence of what kind of transport is used) The devices will be calibrated annually
Table D.1.1.1, ID 8 $G_{electrodes\_LF,y}$	Low	This input of electrodes to the plant is metered by motor-truck scales BTA-60 or railway truck scale VVET-150 (in dependence of what kind of transport is used). The usage of electrodes in the furnaces is metered by crane strain-gage weighers, as well as by means of a calculation. The necessary devices will be calibrated according to the host Party's legislation and producer's requirements
Table D.1.1.3, ID 9 $Steel_{BL}$	Low	This data based on level of steel produced under the project scenario. Please see description of value $Steel_{PL}$, ID1, Table D.1.1.1

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

Technical department is responsible for monitoring, collection, registration, visualization, archiving, reporting of the monitored data. The measurement team from Electrostal plant is responsible for periodical checking of all measurement devices.
In the context of this project the following scheme can be performed:



All data needed for calculation of the emission reduction is collected at the Electrostal during the common operation. Resulting statistics is forwarded to the DMRP (owner of Electrostal) for recalculation and summarising in the Monthly Technical Reports. These reports will be the main source of monitoring data.

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

Name of person/entity establishing the monitoring plan:
Denis Rzhanov
Global Carbon B.V.
For the contact details please refer to Annex 1.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

	2008	2009	2010	2011	2012	Total
Project emissions during the crediting period, tCO_2/year	135,421	245,737	254,564	254,564	254,564	1,144,849

Table 1: Estimated project emissions during the crediting period

	2013-2020	Total
Project emissions after the crediting period, tCO_2/year	2,853,686	2,853,686

Table 2: Estimated project emissions after the crediting period

E.2. Estimated leakage:

	2008	2009	2010	2011	2012	Total
Leakage during the crediting period, tCO_2/year	0	0	0	0	0	0

Table 3: Estimated leakage during the crediting period

	2013-2020	Total
Leakage after the crediting period, tCO_2/year	0	0

Table 4: Estimated leakage after the crediting period

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

	2008	2009	2010	2011	2012	Total
Project emissions during the crediting period, tCO_2/year	135,421	245,737	261,447	285,369	285,369	1,213,341

Table 5: Estimated total project emissions during the crediting period

	2013-2020	Total
Project emissions after the crediting period, tCO_2/year	2,853,686	2,853,686

Table 6: Estimated total project emissions after the crediting period

E.4. Estimated baseline emissions:

	2008	2009	2010	2011	2012	Total
Baseline emissions during the crediting period, tCO_2/year	293,775	638,802	694,376	771,529	771,529	3,170,010

Table 7: Estimated baseline emissions during the crediting period

	2013-2020	Total
Baseline emissions after the crediting period, tCO_2/year	7,715,286	7,715,286

Table 8: Estimated baseline emissions after the crediting period

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

	2008	2009	2010	2011	2012	Total
Emission reduction during the crediting period, tCO_2/year	158,354	393,065	432,929	486,160	486,160	1,956,668

Table 9: Estimated emission reduction during the crediting period

	2013-2020	Total
Emission reduction after the crediting period, tCO_2/year	4,861,601	4,861,601

Table 10: Estimated emission reduction after the crediting period

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

Year	Estimated project emissions (tones of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tones of CO_2 equivalent)	Estimated emissions reductions (tones of CO_2 equivalent)
2008	135,421	0	293,775	158,354
2009	245,737	0	638,802	393,065
2010	261,447	0	694,376	432,929
2011	285,369	0	771,529	486,160
2012	285,369	0	771,529	486,160
Total (tones of CO_2 equivalent)	1,213,341	0	3,170,010	1,956,668

SECTION F. Environmental impacts

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

The Host Party for this project is Ukraine. Environmental Impact Assessment (EIA) is the part of the Ukrainian project planning and permitting procedures. Implementation regulations for EIA are included in the Ukrainian State Construction Standard DBN A.2.2.-1-2003[15] (Title:"Structure and Contents of the Environmental Impact Assessment Report (EIR) for Designing and Construction of Production Facilities, Buildings and Structures").

The EIA has been completed for the proposed project and approved by local authority. Analysis of this document shows that construction of the Plant will not lead to negative impacts, due to the following:

- Equipment installed under the project activity is modern and efficient;
- There are different efficient cleaning systems that were installed as a part of project equipment;
- Recycling water system is used. Therefore, no unsanctioned discharge of sewage waters is possible;
- All project emissions will not exceed MPEs (maximum permit emissions)

According to calculations made in EIA, emissions of air pollutants will be considered as insignificant. The following value of main environmental parameters expected under the project activity:

No	Parameter	Concentration in comparison with MPE
1	Total dust	0.2085
2	Manganese compounds	0.4284
3	Ferrous oxides	0.1696
4	Calcium oxides	0.1288
5	Calcium carbonates	0.4073
6	Carbon oxides	0.1004
7	Sulphur dioxide	0.1952
8	Nitrogen oxides	0.486

Extracts of important sections of EIA are available to the AIE on request.

As shown in the EIA, the proposed project will not harm the environmental conditions in the region, so no negative transboundary effects are expected.

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

Project activity is permitted by:

- Environment Impact Assessment (EIA) 92307-3A. Explanation note. Book 9 dated 2008.
- State environmental expertise conclusion C№08.10.298 in the accordance with the project documentation to the environmental legislation dated 16.10.2008. №07-7636.
- Permit №1 413 845 600-3 on the emissions to the atmosphere by the stationary sources dated 08.12.2008. Valid from 08.12.2008 till 08.12.2013.
- Report on the control of the permitted amount of the emissions to the atmospheric air at the LLC "Electrostal" stage 1 dated 2009
- Action plan of the under flare control of the condition and quality of the atmospheric air at 2009 dated 18.02.2009
- Action plan of the sanitary zone solid research at LLC "Electrostal" dated 04.01.2010
- Register of the objects of waste formation, treatment and utilization №237 dated 01.12.2008
- Technical passport of the luminescent lamp waste and mercury containing waste, damaged or out of use
- Information on the content and characteristics of the waste with indication of the danger class and treatment recommendations LLC "Electrostal".
- Waste treatment instructions LLC "Electrostal" №01-08 dated 30.05.2008.
- Waste collection, audit, storage and treatment instruction at LLC "Electrostal" for 2009
- Report on the atmospheric air protection 2-TP annual for 2009
- License No446836 issued by Ministry of Industrial Policy of Ukraine for storing, recycling and metallurgical processing of metal scrap.
- Permits for exploitation of dangerous equipment No794.08.30-27.10.0; 793.08.30-27.10.0; 1124.08.30-27.10.0;
- Project documentation "Construction of steelmaking plant based on electric arc furnace at Kurakhovo", #92307-PZ, 2007 year.
- Act of State Admission Committee on taking into operation of finally constructed facility dated 25.12.2008.
- Decision #104 Kurakhovo City Council dated 22.03.2006.

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:

Environmental impacts are not considered significant by the project participants or the host Party

SECTION G. Stakeholders' comments

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

In accordance with Ukrainian legislation, DMRP has consulted the regional authority to obtain the necessary approvals for construction of the Electrostal plant. Decree No104 from 22.03.2006 was issued by Kurakhovo city council as an official approval of this project. No stakeholder consultation is required by Host Party. Nevertheless, it was a newspaper article[16] published to inform stakeholders about a new steelmaking plant which is going to be constructed. For the JI project, stakeholder comments will be gathered during the month following publication of this PDD on the UNFCCC website in accordance with the determination process.

[16] "Vecherniy Donetsk", No54 from 08.04.2006

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Organisation:	Limited society "Electrostal"
Street/P.O.Box:	70 Industrial zone
Building:	
City:	Kurakhovo
State/Region:	Donetsk region
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Annex 2

BASELINE INFORMATION

Description of the approach for the baseline and emissions reduction calculation

For the emission reduction calculation and monitoring, the project developer proposes to use a JI specific approach in accordance with the JI Guidance on Criteria for Baseline Setting and Monitoring, Version 02[4]. No approved CDM methodologies are used.

Main assumptions which have been made for baseline emissions calculation:
- Amount of steel produced under the baseline is equal to amount of steel produced under the project activity.
- In case of absence of the project, all products, similar to ones produced under the project activity, would be produced by other enterprises in Ukraine, which used different technologies. The ratio of these technologies is based on real historical data.
- As an electricity source, technological electricity consumption for EAF and LF was used.
- In case of unavailability of national sectoral emission factors, 2006 IPCC Guidelines for National Greenhouse Gas Inventories emission factors have to be used as the default.

The following emission factors were used (more details concerning justification of choice can be found bellow):

Table B.1.1 – Emission factors chosen

Parameter	Unit	Value	Share of technology[17]	Source
Iron production	tCO_2/t iron	1.350		IPCC, Chapter 4
BOF steel	tCO_2/t steel	1.460	51.0%	IPCC, Chapter 4
EAF steel	tCO_2/t steel	0.571	3.7%	Electrostal' data
OHF steel	tCO_2/t steel	1.720	45.2%	IPCC, Chapter 4
Global EF for steel	tCO_2/t steel	1.543		Formula 1.1
Electrodes	tCO_2/tonne	3.007		IPCC, Chapter 4
Electricity	tCO_2/MWh	0.896		GC approved
Natural gas	tCO_2/1000 m^3	1.879		IPCC, Chapter 1
Anthracite	tCO_2/tonne	2.346		IPCC, Chapter 1
Lime[18]	tCO_2/tonne	0.77		IPCC, Chapter 3
Oxygen[19]	tCO_2/1000 m^3	1.188		Electrostal' data

Project activity includes the construction of a steel manufacturing plant, based on a modern electric arc furnace. The steel produced will substitute similar production volumes from the Ukrainian market that has been produced due to use of more carbon intensive technologies. The EAF installed allows producing steel from 100% scrap metal feedstock.

[17] Annual report of Worldsteel's Statistical Yearbook 2008, page 22; http://www.worldsteel.org/index.php?action=publicationdetail&id=81

[18] IPCC, Chapter 3, Table 2.4. Value for dolomitic lime for developing countries

[19] Emissions associated with nitrogen and argon production are not calculated separately, these emissions are included in emissions associated with oxygen production because they are byproducts of oxygen production

The core of the methodology proposed is the comparison of the emission levels relevant for baseline and for project scenarios. Project scenario emission level is based on the actual data gathered from the "Electrostal" and includes all sources of emissions with necessary level of conservativeness.

For the baseline scenario there are no national sectoral emission factors that have been developed. Therefore, IPCC (Volume 3 "Metal Industry") emission factors should be used.
Global emission factor for steel production listed bellow in the table was found, using the following formula:

$$GlEF_{Bl,steel} = EF_{BOF} \times \omega_{BOF} + EF_{EAF} \times \omega_{EAF} + EF_{OHF} \times \omega_{OHF}, \text{ where} \quad (1.1)$$

EF_{BOF} - emission factor for steel making process based on basic oxygen furnaces, t CO_2 /t steel

EF_{EAF} - emission factor for steel making process based on electric arc furnaces, t CO_2 /t steel

EF_{OHF} - emission factor for steel making process based on open hearth furnaces, t CO_2 /t steel

ω_{BOF} , ω_{EAF}, ω_{OHF} – Share of relevant technology in the market, %

In accordance with the approach chosen, emission factors for different processes can be considered as key elements. In this case, analysis of applicability of different emission factors is to be described.
As it was stated above, in case of unavailability of national sectoral emission factors, IPCC Guidelines for emission factor have to be used as the default. Nowadays there is only national emission factor for electricity from the grid exists. More information concerning development of this factor can be found in the Annex 2.

Emission factor for oxygen production can be calculated based on project data, relevant for 2009 year.
All oxygen consumed by Electrostal is produced by mini-plant Linde, which is located at the Electrostal territory. All electricity for Linde plant is transported via the Electrostal grid through a separate flow meter. Data concerning electricity consumption can be used as a base for emission factor calculation. Some oxygen produced by the Linde plant is going to external consumer. Therefore, use of the total electricity consumption for oxygen consumed by Electrostal will be conservative.

The formula for emission factor calculation is the following:

$$EF_{oxygen,y} = \frac{G_{electricity_{oxygen,y}}}{G_{oxygen,y}} \times 10^3 \times EF_{electricity,y}, \text{ where} \quad (1.2)$$

$EF_{oxygen,y}$ - emission factor for oxygen production, t CO_2/1000 m^3 The amount of electricity transferred to Linde plant in 2009 amounts 22 760 MWh
$G_{electricity\_oxygen,y}$ - amount of electricity consumed by oxygen plant, MWh. In accordance with statistic data, usage of oxygen for technological needs at Electrostal was equal to 17 170 th. m^3
$G_{oxygen,y}$ - amount of oxygen transported to the Electrostal plant, th. m_3
$EF_{electricity,y}$ - emission factor for Ukrainian electricity grid. This value is equal to 0.896 t CO_2/MWh, in accordance with "Standardized emission factors for the Ukrainian electricity grid" research (please find in Annex 2 below), made by Global Carbon and positively determined by TÜV SÜD.

Therefore, $EF_{oxygen,y}$ is determined ex ante for all monitoring period and equal to 1.188 t CO_2/1000 m^3.

Brief analysis of applicability of emission factor from IPCC:

Advantage	Disadvantage
All emission factors used in IPCC are based on Best Available Techniques. Ukrainian technologies are less developed. Using IPCC values is conservative	Emission factor for EAF does not include emission due to electricity consumption. This source is the main source of emissions for electric arc furnace, therefore, it must be taken into account. Another emission factor should be used this case.
Share of technologies for the metallurgical sector is based on the European reality for which the following ratio is applicable: BOF 65%; EAF 30%; OHF 5%	This proportion does not reflect the Ukrainian situation and has to be justified. World Steel Statistical Yearbook 2008[20] contains the latest actual data for Ukrainian market: BOF 51.7%; EAF 3.7%; OHF 44.6%
All other emission factors from IPCC in the frame of this project have an exhaustive level of conservativeness and can be used for further calculations	None

Therefore, usage of IPCC default emission factors with actual share of technologies in the local market for Global emission factor calculation can be considered as a logical way, with exhaustive level of conservativeness.

Calculation of emission reduction
The main purpose of the proposed method for calculation of emission reductions is that steel production levels for baseline and for the project scenario are the same, therefore:

$$Steel_{BL} = Steel_{PL} \tag{1.3}$$

This approach allows using realistic curve for the amount of steel which are going to be produced in the future and preventing the possibility of generation emissions reductions due to decrease of steel production level.

Emission reductions are calculated as:

$$ER_y = BE_y - PE_y, \tag{1.4}$$

where:

ER_y – GHG emission reductions in year *y*, t CO_2 equivalent,

BE_y – GHG emissions in the baseline scenario in year *y*, t CO_2 equivalent,
PE_y - GHG emissions in project scenario in year *y,* t CO_2 equivalent.

GHG emissions in the baseline scenario can be found by the following formula:

$$BE_y = Steel_{BL} \times GlEF_{Bl,steel} \tag{1.5}$$

[20] http://www.worldsteel.org/index.php?action=publicationdetail&id=81

As for the project scenario, the following sources of emissions can be observed during the EAF operation:

1. Electrodes consumption by EAF
2. Oxygen consumption
3. Electricity consumption by EAF and LF
4. Natural gas consumption
5. Anthracite consumption (includes all anthracite sources)
6. Lime consumption (includes lime, magnesite and dolomite sources)
7. Electrodes consumption by LF

Therefore, as project emissions, the sum of the emissions values listed above can be considered.

$$PE_y = PE_1 + PE_2 + \cdots + PE_7, \text{ where} \quad (1.6)$$

$PE_1 - PE_7$ - Emissions relevant to the sources listed above.
The value of each emission under the project scenario can be found by multiplying amount/volume of «pollutant» by relevant emission factor (please see formulae 1.6-1.14 below):

$$PE_{electrodes,y} = G_{electrodes,y} \times EF_{electrodes,y} \quad (1.7)$$

$$PE_{oxygen,y} = G_{oxygen,y} \times EF_{oxygen,y} \quad (1.8)$$

$$PE_{electricity,y} = G_{electricity,y} \times EF_{electricity,y} \quad (1.9)$$

$$PE_{NG,y} = G_{NG,y} \times EF_{NG,y} \quad (1.10)$$

$$PE_{antracite,y} = G_{antracite,y} \times EF_{antracite,y} \quad (1.11)$$

$$PE_{lime,y} = G_{lime,y} \times EF_{lime,y} \quad (1.12)$$

Where,

$PE_{i,y}$- project emissions for relevant source *i* for year *y*, t CO_2
$G_{i,y}$ – amount/volume of each source *i* for year *y*, amount/volume
$EF_{i,y}$ - factor of emission for each source *i* for year *y*, t CO_2/amount

Emission factor for EAF can be found as minimum ration between project emissions and steel production level estimated for the period 2008-2012:

$$EF_{EAF} = min\left(\frac{PE_{2008-2012}}{Steel_{PL,2008-2012}}\right) \quad (1.13)$$

All calculations concerning emission reductions were made in the Excel spreadsheets.

Leakages
All possible leakages which can take place under the project activity would also take place under the baseline and therefore can be excluded. Among them:

- Fugitive emission due to natural gas transportation;
- Emissions due to transportation of raw material to the plant;

- Energy used for auxiliary needs (lighting, etc.)

Only temporary leakages due to construction works during the project implementation can be considered as an additional to baseline. Nevertheless, they are also can be excluded as a temporary source.

Summary of the key elements in tabular form:

No	Parameter	Data unit	Source of data
1	Forecast level of steel production	t	Electrostal' technical reports
2	Electrodes consumption by EAF	t	Electrostal' technical reports
3	Oxygen consumption	1000 m^3	Electrostal' technical reports
4	Electricity consumption by the EAF and LF	MW	Electrostal' technical reports
5	Natural gas consumption	1000 m^3	Electrostal' technical reports
6	Anthracite consumption	t	Electrostal' technical reports
7	Lime consumption	t	Electrostal' technical reports
8	Electrodes consumption by the LF	t	Electrostal' technical reports
9	Emission factor for BOF steel production	t CO_2/t steel	2006 IPCC Guidelines for National Greenhouse Gas Inventories. Chapter 4
10	Emission factor for EAF steel production	t CO_2/t steel	This data will be calculated by the method given in this PDD (Annex 2, formula 1.14)
11	Emission factor for OHF steel production	t CO_2/t steel	2006 IPCC Guidelines for National Greenhouse Gas Inventories. Chapter 4
12	Emission factor for electrodes consumption	t CO_2/t	2006 IPCC Guidelines for National Greenhouse Gas Inventories. Chapter 4
13	Emission factor for electricity consumption from the grid	t CO_2/MW	“Standardized emission factors for the Ukrainian electricity grid” research (please find in Annex 2, value $EF_{grid,reduced,y}$), made by Global Carbon and positively determined by TÜV SÜD
14	Emission factor for natural gas combustion	t CO_2/1000 m^3	2006 IPCC Guidelines for National Greenhouse Gas Inventories. Chapter 1
15	Emission factor for anthracite consumption	t CO_2/t	2006 IPCC Guidelines for National Greenhouse Gas Inventories. Chapter 1
16	Emission factor for lime consumption	t CO_2/t	2006 IPCC Guidelines for National Greenhouse Gas Inventories. Chapter 3, Table 2.4. Value for dolomitic lime for developing countries.
17	Emission factor for oxygen production	t CO_2/1000 m^3	This value can be calculated based on electricity consumption data from the plant (Annex 2, formula 1.2).
18	Global Emission factor for steel production under the baseline	t CO_2/t steel	This data will be calculated by the method given in this PDD (Annex 2, formula 1.1)

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 exist a similar need 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[21];

- The "Operational Guidelines for the Project Design Document", further referred to as ERUPT approach or baseline[22];

- The approved CDM methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"[23];

- 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);

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

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

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

- 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.

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 2: 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 showed 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 3: Electricity demand in Ukraine on 31 March 2005[24]

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

Development of the Ukrainian electricity sector

The National Energy Strategy[25] 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[26]:

- 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.
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 4: Installed capacity[27] in Ukraine in 2004

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'[28].
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 5: Peak load in Ukraine in 2001 - 2005[29]

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)[30].

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

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

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

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

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

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

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;

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 6: Imports and exports balance in Ukraine[31]

ACM0002 offers several choices for calculating the OM. Dispatch data analyze cannot be applied, since the grid data is not available[32]. 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.

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

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

%	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 7: Share of power plants in the annual electricity generation of Ukraine[33]

The simple OM is calculated using the following formula:

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

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:

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

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[34]. The majority of the electricity (up to 95%) is generated centrally and therefore the data is comprehensive[35].
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[36] 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

[33] "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.

[34] "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.

[35] 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.

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

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 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 8: Grid losses in Ukraine[37]

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[38] 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[39];

- 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%;

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[37] "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.

[38] 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.

[39] "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 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:

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

and

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

Where:
$EF_{grid,produced,y}$ is the emission factor for JI projects supplying additional electricity to the grid (tCO_2/MWh);
$EF_{grid,reduced,y}$ is the emission factor for JI projects reducing electricity consumptionfrom the grid (tCO_2/MWh)factor of the fuel;
$EF_{OM,y}$ is the simple OM of the Ukrainian grid (tCO_2/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 9: 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 (tCO_2);
$EF_{grid,produced,y}$ is the emission factor of producing projects (tCO_2/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 (tCO_2/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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Annex 3

MONITORING PLAN

Key elements for the monitoring plan are the following:

Data/Parameter	**Forecast level of steel production**
Data unit	t
Description	Forecast level of steel production, based on the PO plans, and historical data
Time of determination/monitoring	Monitored during crediting period
Source of data to be used	Electrostal' technical reports
Value of data applied (for ex ante calculations/determinations)	2008: 190384.9; 2009: 413984.6; 2010: 450000; 2011: 500000; 2012: 500000
Justification of the choice of data or description of measurement methods and procedures (to be) applied	There are only two ways to determine this parameter. One of them is based on the maximum capacity of EAF. The second way which was applied is based on real expectations of the PO, that is conservative
QA/QC procedures (to be) applied	The relevant metered devices will be calibrated according to the host Party's legislation and requirements of the supplier.
Any comment	

Data/Parameter	**Global Emission factor for steel production under the baseline**
Data unit	t CO_2/t steel
Description	Global Emission factor for steel production under the baseline, needed for ER calculations
Time of determination/monitoring	Fixed ex-ante during determination
Source of data to be used	IPCC, PDD, Electrostal data, etc.
Value of data applied (for ex ante calculations/determinations)	1.543
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This value can be calculated using the formula 1.1 in Annex 2, this PDD.
QA/QC procedures (to be) applied	-
Any comment	

Data/Parameter	**Electrodes consumption by EAF**
Data unit	t
Description	Carbon electrodes consumption due to the EAF exploitation
Time of determination/monitoring	Monitored during crediting period
Source of data to be used	Electrostal' technical reports
Value of data applied (for ex ante calculations/determinations)	2008: 591.3; 2009: 957.4; 2010: 900; 2011: 950; 2012: 950
Justification of the choice of data or description of measurement methods and procedures (to be) applied	There are only two ways to determine this parameter. One of them is based on the maximum capacity of EAF. The second way which was applied is based on real expectations of the PO, that is conservative
QA/QC procedures (to be) applied	The relevant metering devices will be calibrated according to the host Party's legislation and requirements of the supplier.
Any comment	In a majority of scrap-charged EAF, CO_2 emissions are mainly associated with consumption of the carbon electrodes

2008	2009	2010	2011	2012
591.3	957.4	900	950	950

Data/Parameter	**Oxygen consumption**
Data unit	1000 m^3
Description	Oxygen consumption in the EAF during steelmaking process
Time of determination/monitoring	Monitored during crediting period
Source of data to be used	Electrostal' technical reports
Value of data applied (for ex ante calculations/determinations)	2008: 8138.3; 2009: 17170.1; 2010: 17550.0; 2011: 19250.0; 2012: 19250.0
Justification of the choice of data or description of measurement methods and procedures (to be) applied	There are only two ways to determine this parameter. One of them is based on the maximum capacity of EAF. The second way which was applied is based on real expectations of the PO, that is conservative
QA/QC procedures (to be) applied	The relevant metering devices will be calibrated according to the host Party's legislation and requirements of the supplier.
Any comment	

2008	2009	2010	2011	2012
8138.3	17170.1	17550.0	19250.0	19250.0

Data/Parameter	**Electricity consumption by the EAF and LF**
Data unit	MW
Description	Electricity consumption for the melting of metal in the EAF and LF
Time of determination/monitoring	Monitored during crediting period
Source of data to be used	Electrostal' technical reports
Value of data applied (for ex ante calculations/determinations)	2008: 98059.1; 2009: 190472.2; 2010: 198900.0; 2011: 216500.0; 2012: 216500.0
Justification of the choice of data or description of measurement methods and procedures (to be) applied	There are only two ways to determine this parameter. One of them is based on the maximum capacity of EAF. The second way which was applied is based on real expectations of the PO, that is conservative
QA/QC procedures (to be) applied	The relevant metering devices will be calibrated according to the host Party's legislation and requirements of the supplier.
Any comment	

Data/Parameter	**Natural gas consumption**
Data unit	1000 m^3
Description	Natural gas consumption for heating the metal and auxilary needs
Time of determination/monitoring	To be continuously monitored
Source of data to be used	Electrostal' technical reports
Value of data applied (for ex ante calculations/determinations)	2008: 7208.7; 2009: 9854.1; 2010: 9073.4; 2011: 9583.5; 2012: 9583.5
Justification of the choice of data or description of measurement methods and procedures (to be) applied	There are only two ways to determine this parameter. One of them is based on the maximum capacity of EAF. The second way which was applied is based on real expectations of the PO, that is conservative
QA/QC procedures (to be) applied	The relevant metering devices will be calibrated according to the host Party's legislation and requirements of the supplier.
Any comment	

Data/Parameter	**Anthracite consumption**
Data unit	t
Description	Anthracite consumption in the main process
Time of determination/monitoring	Monitored during crediting period
Source of data to be used	Electrostal' technical reports
Value of data applied (for ex ante calculations/determinations)	2008: 19998.0; 2009: 20380.3; 2010: 27447.4; 2011: 30497.1; 2012: 30497.1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	There are only two ways to determine this parameter. One of them is based on the maximum capacity of EAF. The second way which was applied is based on real expectations of the PO, that is conservative
QA/QC procedures (to be) applied	The relevant metering devices will be calibrated according to the host Party's legislation and requirements of the supplier.
Any comment	This value includes all anthracite sources used at the plant

Data/Parameter	**Lime consumption**
Data unit	t
Description	Lime consumption during the steelmaking process
Time of determination/monitoring	Monitored during crediting period
Source of data to be used	Electrostal' technical reports
Value of data applied (for ex ante calculations/determinations)	2008: 8428.4; 2009: 20692.9; 2010: 22349.3; 2011: 24832.5; 2012: 24832.5
Justification of the choice of data or description of measurement methods and procedures (to be) applied	There are only two ways to determine this parameter. One of them is based on the maximum capacity of EAF. The second way which was applied is based on real expectations of the PO, that is conservative
QA/QC procedures (to be) applied	The relevant metering devices will be calibrated according to the host Party's legislation and requirements of the supplier.
Any comment	This value includes all lime sources used at the plant (lime, dolomite and magnesite).

Data/Parameter	**Electrodes consumption by the LF**
Data unit	t
Description	Electrodes consumption for LF exploitation
Time of determination/monitoring	Monitored during crediting period
Source of data to be used	Electrostal' technical reports
Value of data applied (for ex ante calculations/determinations)	2008: 481.4; 2009: 874.7; 2010: 811.8; 2011: 751.7; 2012: 751.7
Justification of the choice of data or description of measurement methods and procedures (to be) applied	There are only two ways to determine this parameter. One of them is based on the maximum capacity of EAF. The second way which was applied is based on real expectations of the PO, that is conservative
QA/QC procedures (to be) applied	The relevant metering devices will be calibrated according to the host Party's legislation and requirements of the supplier.
Any comment	

Data/Parameter	**Emission factor for BOF steel production**
Data unit	t CO_2/t steel
Description	Emission factor for BOF steel production, needed for baseline calculations
Time of determination/monitoring	Fixed ex ante during determination
Source of data to be used	2006 IPCC Guidelines for National Greenhouse Gas Inventories. Chapter 4 “Metal industry emissions”, Table 4.1, page 25
Value of data applied (for ex ante calculations/determinations)	1.46
Justification of the choice of data or description of measurement methods and procedures (to be) applied	As long as any national sectoral emission factors are unavailable, IPCC value has to be used as a default
QA/QC procedures (to be) applied	-
Any comment	

Data/Parameter	**Emission factor for EAF steel production**
Data unit	t CO_2/t steel
Description	Emission factor for EAF steel production, needed for baseline calculations
Time of determination/monitoring	Fixed ex-ante during determination
Source of data to be used	This data will be calculated by the method given in this PDD (Please see Annex 2)
Value of data applied (for ex ante calculations/determinations)	0.571
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This emission factor is calculated in accordance with the project data. This approach has the following advantages: - Project equipment is one of the most modern technologies in the world, that is conservative; - Project equipment uses metal scrap instead of iron, that is conservative
QA/QC procedures (to be) applied	-
Any comment	

Data/Parameter	**Emission factor for OHF steel production**
Data unit	t CO_2/t steel
Description	Emission factor for OHF steel production
Time of determination/monitoring	Fixed ex ante during determination
Source of data to be used	2006 IPCC Guidelines for National Greenhouse Gas Inventories. Chapter 4 “Metal industry emissions”, Table 4.1, page 25
Value of data applied (for ex ante calculations/determinations)	1.72
Justification of the choice of data or description of measurement methods and procedures (to be) applied	As long as any national sectoral emission factors are unavailable, IPCC value have to be used as a default
QA/QC procedures (to be) applied	-
Any comment	