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

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Annexes

SECTION A. General description of the project

A.1. Title of the project:

"Production modernisation at JSC Amurmetal, Komsomolsk-on-Amur, Khabarovsk Krai, Russian Federation".

Sectoral scope 9: Metal production.

Project design document (PDD) version 2

16 of March, 2012

A.2. Description of the project:

Enterprise description

JSC Amurmetal is the only producer of steel, such as long products and sheet products, in the Russian Far East. Amurmetal steelmaking capacity is about 2.1 million tonnes of steel per year. Enterprise specialization is the production of reinforcing steel, angle bars, round steel bars, wire rods, wires, hot-rolled plates, rolled sheet materials, formed sections, road fences, electric-welded pipes, pipes for gas and water conveyance, billet and slab. Scrap metal is used for steel production at Amurmetal.
The plant consists of a scrap shop, electric furnace shops, and two rolling-mill shops (production of long and sheet products).

Project purpose

The goal of the proposed Joint Implementation (JI) project is to reduce impact of the steelmaking process on the climate through modernization of the existing production process by application of a more energy efficient technology. Emissions of GHG will be reduced significantly as a result of the project implementation. In order to achieve the goal of the project, Amurmetal will construct a new EAF #2 and upgrade existing EAF #1.

Before project

There was EAF#1 (in electric arc shop #2) with annual capacity of about 600 thousand tonnes of steel. It was fully renovated in 2001. Also there was electric arc shop #1 with annual capacity of about 200 thousand tonnes of steel. This shop was seriously outdated and could not continue operating without modernization. Open hearth shop was mothballed in 1996.

Current status

There are a scrap shop, electric furnace shop, and two rolling-mill shops at Amurmetal. Electric furnace shop produces continuous cast square billets and blooms for production of long and sheet products in the rolling-mill shops.
Electric furnace shop includes two DSP-125 (EAF) (made by Sibelectroterm, Novosibirsk and Concast, Switzerland), two ladle furnaces for shaping-up and depuration of steel and two continuous casting machines (CCM). EAF design capacities are 1 and 1.15million tonnes of steel respectively.
Total production of CCMs is approximately 2.1 million tonnes of slabs and blooms.

Project scenario

The project consists of two subprojects:

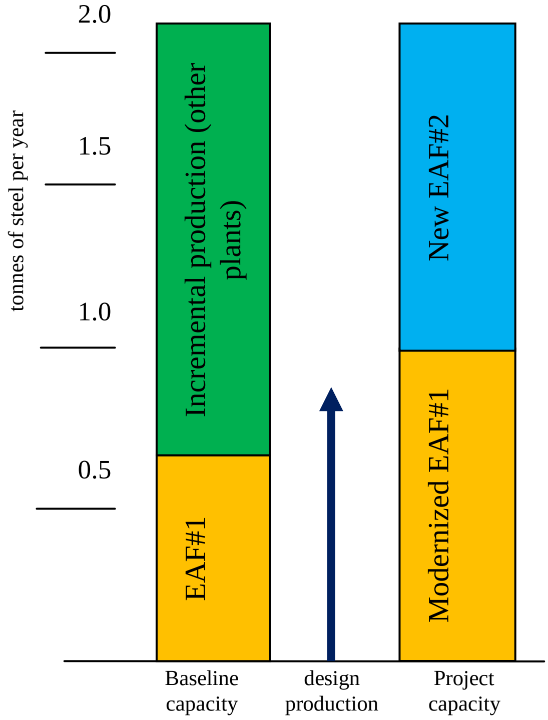
1. Construction of new EAF #2;
2. Modernisation EAF #1.

Capacity of EAF#1 is increased by approximately 400 thousand tonnes of steel per year. Also its electricity, coke and other carbon content substances consumption is reduced. Expected annual capacity of modernised EAF #1 is about 1 million tonnes of steel.
Annual capacity of new EAF#2 is approximately 1.15 million tonnes of steel. Accordingly, the modernized EAF#1 and the new EAF#2 will work together but EAF#2 will have priority in case of a drop of the overall production. Total annual steel production is estimated based on assumption that both of EAF will be loaded continuously. So, annual capacity of the workshop is 2.1 million tonnes of steel.

Baseline scenario

In the baseline scenario it is assumed that the level of steel production will be equal to the project scenario level. However there is a limitation on the existing steelmaking production of the EAF#1 and, depending on its expected capacity, third party steel producer would have produced the incremental part.

Figure A.2.1: Baseline and project capacity



Baseline and project capacity are presented in the Figure A.2.1. EAF#1 expected capacity[1] is about 0.6 million tonnes of steel per year. In case of the project absence and increased market steel demand, other steel producer can produce incremental part of requested steel by increasing the number of run-days, decreasing duration of stops or new capacities installation. The incremental capacity emissions are determined in line with the methodological approach as described in Annex 2. The detailed baseline scenario is presented in Section B1. Incremental part of baseline can reach 1.5 million tonnes of steel per year but total baseline production corresponds to the project production.

Project background and description

Initially the plant had two EAFs with combined capacity of 560.000 tonnes per year. Those EAFs were constructed at the end of 1985. EAF#1 was fully renovated in 2001. After the modernization its productivity became approximately 600.000 tonnes per year. EAF#2 was dismantled in 2001 because it became ineffective compared to EAF#1.

A plan of technical and economic development was introduced in 2004. Its primary task was to create a modern electrometallurgical plant with capacity not less than two million tonnes of melted steel in the Russian Far East.

[1] Average steel production during full last three years (2004-2006)

Amurmetal decided to begin modernization of its production in two stages in 2006. Contract for project design development was signed in March 2006. The project design document is developed taking into account GHGs reduction and additional revenues earning due to project implementation as JI. It makes possible economic indicators improving and minimizes project realization risks. The first stage includes construction of the new EAF#2. The second stage includes modernisation of the existing EAF #1. Glavgosexpertiza of Russian Federation approved the design documents in December 2007. The new EAF#2 was commissioned in October 2007 but warranty test was finished in December 2007. Its annual capacity is 1.150.000 tonnes. EAF #1 was stopped for modernisation in November 2007. Amurmetal has contacted with Global Carbon for PDD development in 2008. The modernisation was finished in January 2010 but EAF#1 was not operating at the moment due to low market demand. Annual expected productivity of modernised EAF#1 is approximately 1.0 million tonnes of steel. Only new EAF#2 is operating at the moment. Project implementation schedule is presented in Section A.4.2 below.

A.3. Project participants:

Party involved	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Party A -The Russian Federation (host Party)	JSC Amurmetal	No
Party B - The Netherlands	Global Carbon BV	No

Role of the project participants:

- JSC Amurmetal is an exclusive steelmaker in the Russian Far East. Amurmetal will implement the JI project. It invests in the JI project implementation and will own ERUs generated. Amurmetal 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 project participant.

A.4. Technical description of the project:

A.4.1. Location of the project:

Amurmetal is located in Komsomolsk-on-Amur 270 km to the North-East from Khabarovsk (see Figure A.4.1.2), the capital of Khabarovsk Territory. Geographical location of Khabarovsk Territory and Komsomolsk-on-Amur are presented in Figure A.4.1.1 and Figure A.4.1.2 below.

Figure A.4.1.1: Map of Russia with location of Khabarovsk Territory (selected by red colour)

Source: http://en.wikipedia.org/wiki/File:Map_of_Russia_-_Khabarovsk_Krai_(2008-03).svg

Figure A.4.1.2: Map of Khabarovsk Territory with the project location

Source: http://maps.yahoo.com/#mvt=m&lat=50.561948&lon=136.999405&zoom=9

A.4.1.1. Host Party(ies):

The Russian Federation

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

Khabarovsk Territory is located in the centre of Russian Far East (Far East Federal District). Administrative centre of the Territory is. Khabarovsk. Population of the Territory is about 1,402,000 (2009) on the land area of 788,600 sq. km.

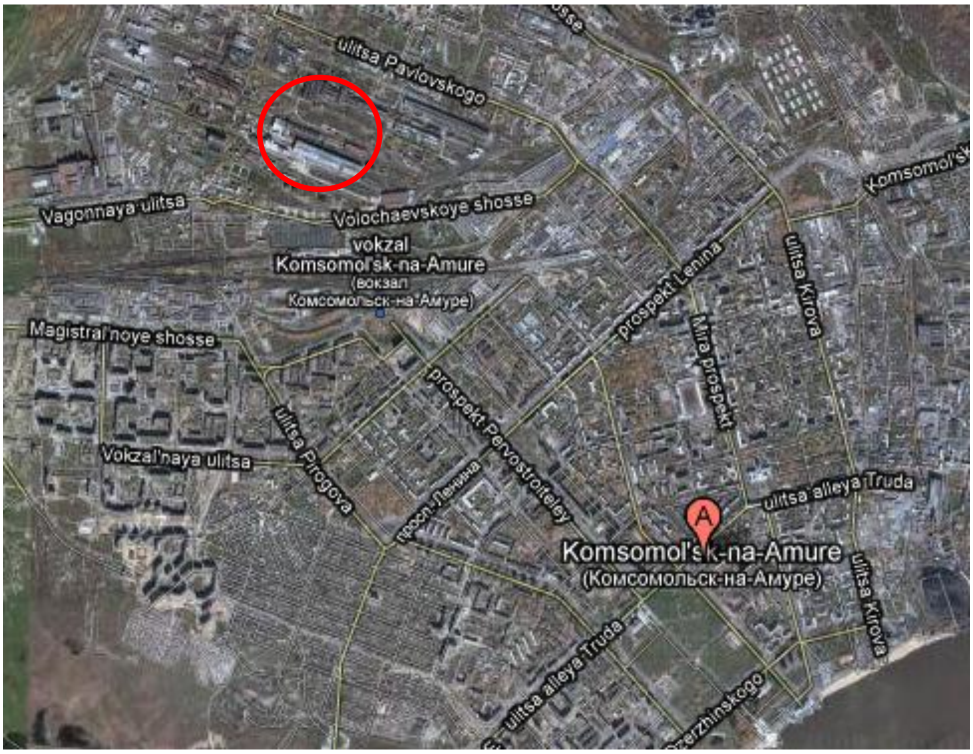
A.4.1.3. City/Town/Community etc.:

Komsomolsk-on-Amur is located in 270 km to the North-East from Khabarovsk. Komsomolsk-on-Amur population was 270.9 thousand in 2009. The town's economy is based on four main enterprises (aircraft factory, shipyard, oil refinery, and a metallurgical plant).

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

The Amurmetal production site is located at the north-west outskirts of Komsomolsk-on-Amur (see Figure A.4.1.4.1). The project site coordinates are: 135° 59' 5"E longitude, 50° 33' 50" N latitude (by the program Google Earth).

Figure A.4.1.4.1: Satellite image of Komsomolsk-on-Amur town with Amurmetal plant



Source: http://maps.google.com/maps?hl=en&tab=wl

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

The proposed JI project aims at modernisation of steelmaking process and increase of steel production up to 2.1 million tonnes per year using modern energy-efficient technology. New EAF#2 made by Concast (Switzerland) was constructed. EAF#1 was modernised towards steel capacity increasing. EAF#1 and EAF#2 use same technology. The main benefit of this process is that EAF allows using 100 % metal scrap during steel production and also to regulation of the composition of fluid metal inside the Ladle furnace (more energy efficiently) and exclude this way iron from steel production (iron production connected with significant CO_2 emission). Steelmaking process at Amurmetal is described below. Main technical data of EAFs are presented in Table A.4.2.1 below.

Table A.4.2.1: Main technical data of EAFs

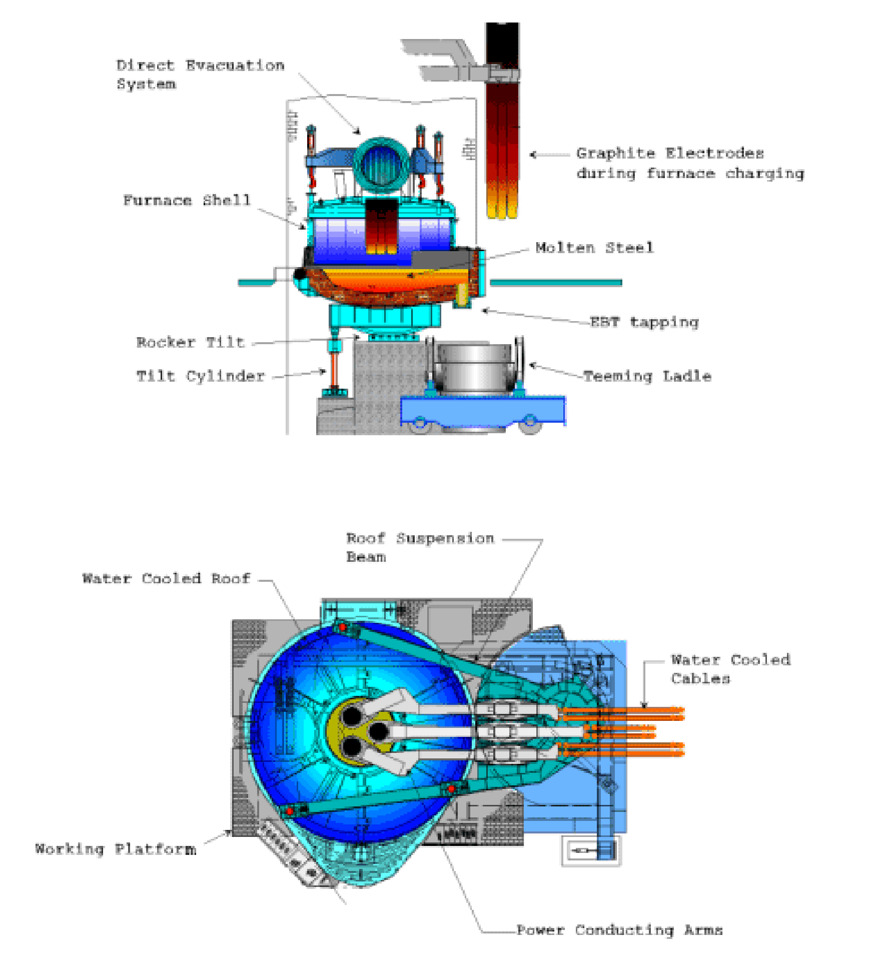
Indicator	Unit	EAF#1	EAF#2
Electricity consumption of EAF	kWh/t	334.08	365
Electricity consumption of Ladle furnace	kWh/t	39.38	36.0
Electrode consumption of EAF	kg/t	2.06	1.5
Electrode consumption of Ladle furnace	kg/t	0.24	0.28
Melting time	minute	59.75	48.0
Natural gas consumption	m^3/t steel	8.24	7.8
Oxygen consumption	m^3/t steel	46.87	43

Source: Amurmetal

General description of the steelmaking process

Electric arc furnace
The manufacturing process for electric steel starts with the fusion of the steel mixture which is then loaded into the large basket. Then the scrap basket is transported to the melt shop, the roof is swung off the furnace, and the furnace is charged with scrap from the basket. The EAF layout is presented in Figure A4.2.1 below.

Figure A.4.2.1: Electric arc furnace



Source: http://en.wikipedia.org/wiki/Electric_arc_furnace.

After the mixture is charged, the roof is swung back and the melting starts. The electrodes are lowered onto the scrap, and an arc is struck. Oxygen and natural gas are injected into the scrap to accelerate scrap melting.

An important part of steelmaking is the formation of slag, which floats on the surface of the molten steel. Slag consists of metal oxides, acts as a destination for oxidized impurities, and as a thermal blanket (stopping excessive heat loss) helping to reduce the erosion of the refractory lining. The slag consists mainly of calcium oxide (CaO, in the form of burnt lime). The slag blanket covers the arcs, preventing damage of the furnace roof and protecting sidewalls from radiant heat.

Once flat bath conditions are reached, and the scrap has been completely melted down, another bucket of scrap can be charged into the furnace and melted down. After the second charge is completely melted, refining operations take place, the steel chemical composition is checked and adjusted, and the melt is heated to just above its freezing temperature. Once the temperature and composition are correct, the steel is tapped out into a preheated ladle furnace.

Ladle furnace

The ladle furnace is used to correct the temperature and composition of liquid melt. This also allows the molten steel to be kept ready for use in case of a delay later in the steelmaking process. After treatment in the ladle furnace, which consists of only the refractory roof and electrode, furnace steel is processed by vacuum in the de-airing equipment and having reached its optimal chemical composition, is appropriately cleaned. After ladle furnace steel is directed to CCM for bloom and slab production.

Pre-planned annual Amurmetal will be approximately 2.1 million tonnes of melted steel. The project implementation schedule is presented in Table A.4.2.2 below.

The plant trains staff continuously in the institute of Komsomolsk-on-Amur. The institute training covers the main subject areas of (several specialities):

- smelt;
- metalwork.

Table A.4.2.2: Project implementation schedule

N	Title	2006				2007				2008				2009				2010			
		I q	II q	III q	IV q	I q	II q	III q	IV q	I q	II q	III q	IV q	I q	II q	III q	IV q	I q	II q	III q	IV q
1	Project documentation development																				
3	Modernisation of EAF#1: • gas flue; • slag corridor; • coke line; • furnace transformer; • feed lines.																				
4	Construction of EAF#2: • foundation; • delivery of equipment; • installation of equipment; • cold tests and test with hot metal.																				

Source: Amurmetal

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

The main benefit of electric arc steelmaking process is that EAF allows using 100 % metal scrap during steel production in comparison with basic oxygen steel. Basic oxygen steel is requested to use iron during production. Iron production is connected with significant CO_2 emission. Thus, this technology allows excluding iron from steel production. Also EAF is more environmental friendly than Open Hearth Furnace (OHF) which is absolutely obsolete technology and still used in CIS only. Also a basic oxygen furnace together with a blast furnace has biggest EF of GHG emissions. The Ladle furnace is included in steelmaking process by EAF. It is reducing of power consumption too. Also information on baseline setting and additionality are presented in Section B.
Total estimated amount of emission reductions due to project implementation is 3,339,629 tonnes of CO_2 equivalent as determined in Section E.

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

Estimated amount of emission reductions are presented in the Table A.4.3.1.1 and Table A.4.3.1.2. More detailed calculation of emission reductions is described in Section E.

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

	Years
Length of the crediting period	5
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2008	403,971
2009	16,365
2010	409,672
2011	1,254,811
2012	1,254,811
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	3,339,629
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	667,926

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

	Years
Period after 2012, for which emission reductions are estimated	8
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2013	1,254,811
2014	1,254,811
2015	1,254,811
2016	1,254,811
2017	1,254,811
2018	1,254,811
2019	1,254,811
2020	1,254,811
Total estimated emission reductions over the period indicated (tonnes of CO_2 equivalent)	10,038,485
Annual average of estimated emission reductions over the period indicated (tonnes of CO_2 equivalent)	1,254,811

A.5. Project approval by the Parties involved:

The project was approved by the Parties involved:

Russia (Host party) – the Letter of approval from the Ministry of Economic Development decision dated 12 March 2012 No 112.

The Netherlands (Investor) – the Letter of approval from NL Agency, Ministry of Economic Affairs dated 15 October 2010 No 2010JI29.

SECTION B. Baseline

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

A baseline for the JI project has to be set in accordance with Appendix B to decision 9/CMP.1 (JI guidelines)[2], and with further guidance on baseline setting and monitoring developed by the Joint Implementation Supervisory Committee (JISC). In accordance with the Guidance on Criteria for Baseline Setting and Monitoring (version 2)[3] (hereinafter referred to as Guidance), the baseline for a JI project is the scenario that reasonably represents the anthropogenic emissions by sources or anthropogenic removals by sinks of GHGs that would occur in **the absence of the proposed project**. In accordance with the Paragraph 9 of the Guidance the project participants may select either: an approach for baseline setting and monitoring developed in accordance with appendix B of the JI guidelines (JI specific approach); or a methodology for baseline setting and monitoring approved by the Executive Board of the clean development mechanism (CDM), including methodologies for small-scale project activities, as appropriate, in accordance with paragraph 4(a) of decision 10/CMP.1, as well as methodologies for afforestation/reforestation project activities. Paragraph 11 of the Guidance allows project participants that select a JI specific approach to use selected elements or combinations of approved CDM baseline and monitoring methodologies or approved CDM methodological tools, as appropriate.

Description and justification of the baseline chosen is provided below in accordance with the "Guidelines for users of the Joint Implementation Project Design Document Form", version 04[4], using the following step-wise approach:

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

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

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

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

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

Key factors that affect the baseline are taken into account:

a) **Sectoral reform policies and legislation.** The main development goal of the metallurgical industry is reducing of domestic metal demand.[5] JSC Amurmetal does not have any obligations for construction of new production capacity;

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

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

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

[5] http://www.minprom.gov.ru/activity/metal/strateg/2

b) **Economic situation/growth and socio-demographic factors in the relevant sector as well as resulting predicted demand. Suppressed and/or increasing demand that will be met by the project can be considered in the baseline as appropriate (e.g. by assuming that the same level of service as in the project scenario would be offered in the baseline scenario)**. It is assumed that the level of steel production and demand are not influenced by the project. The steel industry is a transparent market where standardized types of steel products exist. Within a certain region or country steel can be transported from the producer to the consumer without constrains. If the facility in question cannot provide the amount of steel that is needed third party steel producer would have produced the incremental part. In case of the project absence and increased market steel demand, other steel producer can produce incremental part of requested steel by increasing the number of run-days, decreasing duration of stops or new capacities installation. The incremental capacity emissions are determined in line with the methodological approach as described in Annex 2**;**

c) **Availability of capital (including investment barriers).** Capital is available but high bank rate and high country investment risk make unprofitable of new equipment introduction in Russia;

d) **Local availability of technologies/techniques, skills and know-how and availability of best available technologies/techniques in the future.** Steel production process by OHF, EAF, BOF is better-known and applied in Russia;

e) **Fuel prices and availability.** Electricity, natural gas and coke are widely used and available in Russia. All of them are produced inland. Fuel prices in Russia are less than world market price.

The baseline is established in a transparent manner with regard to the choice of approaches, assumptions, methodologies, parameters, data sources and key factors. Most information is taken from the international publicly available sources and is referenced. Uncertainties are taken into account and conservative assumptions are used. ERUs cannot be earned for decreases in activity levels outside the project activity or due to force majeure as emission factors based on specific production are used (e.g. tCO_2/t steel).

The baseline for this project will be the most plausible future scenario on the basis of conservative assumptions and key factors described above. The basic principle applied is that the demand for steel is not influenced by the project and is identical in the project and the baseline scenario. This means that, depending on the actual production in the project scenario, there is an option in the baseline scenario where this amount of steel is produced by other steel plants in Russia.

Step 2. Application of the approach chosen

Basic oxygen steel is the predominant steel in Russia (58.9%). Amurmetal produces arc-furnace steel. Steel production by EAF is similar to production by OHF (23% and 18.2%)[6]. EAF allows using 100 % metal scrap during steel production. Besides that, ladle furnace allows for regulation of the composition of fluid metal outside of the EAF. It makes the production process more energy efficient and excludes pig iron from steel production (iron production connected with significant CO_2 emission).

The baseline assumptions are based on the current situation in the region and industry while investment analysis is to be implemented as at the moment of taking the decision on the project (i.e. 2006).

Amurmetal had the electric arc shop #1 with annual capacity about 200 thousand tonnes of steel and the open hearth shop with annual capacity about 800 thousand tonnes of steel. Electric arc shop #1 was seriously outdated and could not continue operating without modernization. It was mothballing in 2006. The open hearth shop was mothballing in 1996.

At JSC Amurmetal four options for the steel production are technically feasible and are discussed below.

Production capacity:

a. Steel plants will satisfy any remaining steel demand;
b. Construction of a new EAF;
c. Modernisation of an old EAF;
d. Demothballing of open-hearth plant.

Combining these options, results in possible future scenarios that may allow reaching annual capacity of about 2.1 million tonnes of steel at Amurmetal:

Scenario 1: Using of the existing EAF#1 and other steel plants will produce the remaining steel demand;
Scenario 2: Construction of new EAF and modernisation of the old EAF #1;
Scenario 3: Modernisation of the EAF #1 and demothballing of the open-hearth plant;
Scenario 4: Using the existing EAF#1, modernisation of the arc-furnace plant #1 combined with demothballing of the open-hearth plant.

These scenarios are described below in more detail.

1) Using of the existing EAF#1 and other steel plants will produce the remaining steel demand

It is the continuation of the existing situation. The existing EAF #1 will continue to operate. Annual steel production of EAF #1 will be about 600 thousand tonnes. As the market demand is growing Amurmetal will loose market share under Scenario 1. In other words, the incremental steel volume (about 1.4 million tonnes of steel) would be produced by the other (new and/or existing) steel plants. It will depend on demand for steel. Other steel plants can increase steel production in Russia. Also new plants can be built in Russia to cover steel market demand. Amurmetal continues operating the existing steelmaking capacity (EAF#1) without implementation of the proposed project. Reconstruction/modernization is not being implemented under this scenario. There are no legal or other requirements that enforce Amurmetal to stop EAF #1. No additional investment is required. Thus, scenario 1 is feasible and plausible.

[6] Worldsteel Committee on Economic Studies – Brussels, 2009. Steel Statistical Yearbook 2008(Table 6).

2) Construction of new EAF and modernisation of the old EAF #1

In this scenario, expected total annual steel production will be approximately 2.1 million tonnes of steel. It will depend on demand for steel. Capacity of EAF#1 and EAF#2 are approximately 1.0 and 1.1million tonnes of steel respectively. EAF#2 will have priority in case of underutilization of capacity (low demand for steel). Construction of a new EAF and modernization of EAF #1 require significant investment. Thus this scenario cannot be considered as a plausible scenario.

3) Modernisation of the EAF #1 and demothballing of open-hearth plant

In this scenario, the *open-hearth plant* will be demothballed. EAF#1 will be modernised. Capacity of EAF#1 will be increased by about 400 thousand tonnes of steel per year. Annual capacity of the open hearth plant will be about 1 million tonnes of steel. In this case, volume of natural gas consumption will be the highest out of all scenarios. Also it means investment in an outdated technology it does not make sense. Steelmaking by EAF is a more modern technology than OHF. It would be unreasonable to invest in an outdated technology. Moreover, this scenario is not conservative in terms of greenhouse gas emissions. Thus this scenario cannot be considered as a plausible scenario

4) Using the existing EAF#1, modernisation of arc-furnace plant #1 combined with demothballing of open-hearth plant

This scenario is the same as the scenario 2 mentioned above, but in this scenario instead of EAF #1 arc-furnace plant #1 will be modernised. EAF #1, the arc-furnace plant #1 and the open hearth plant will be used together. Capacity of the arc-furnace plant will be about 400 thousand tonnes of steel per year (increased by 200 thousand tonnes of steel). Arc-furnace plant #1 uses several furnaces with small capacity. During operation this shop has not been significantly modernised. Also modernisation of several furnaces will require higher investment than EAF#1 modernisation. As for the rest this scenario is the same as the scenario 3 above. Thus this scenario cannot be considered as a plausible scenario.

Conclusions

Scenario 1 is the only remaining plausible scenario and is therefore identified as the baseline.

Baseline emissions are elaborated in Sections D and E, as well as Annex 2 below.

The key data used to establish the baseline in tabular form is presented below.

Data/Parameter	$BP_{cap}^{EAF\,1}$
Data unit	Tonnes
Description	Steel production of EAF#1
Time of determination/monitoring	Ex ante
Source of data (to be) use	Plant records
Value of data applied (for ex ante calculations/determinations)	614,891
Justification of the choice of data or description of measurement methods and procedures (to be) applied	It is defined according to the technical documentation of Amurmetal.
OA/QC procedures (to be) applied	Steel production of EAF#1 was calculated as average for three years according to the plant technical report. Steel production is

	calculated as sum of daily reports of Production department during a year. Annual data is being checked. The check is based on the annual technical report and weighing of goods.
Any comment	This parameter is calculated as average for 2005-2007 years.

Data/Parameter	PP_y
Data unit	Tonnes
Description	Total steel production in the project scenario in year *y*
Time of determination/monitoring	During the crediting period
Source of data (to be) use	Plant records
Value of data applied (for ex ante calculations/determinations)	2,131,000
Justification of the choice of data or description of measurement methods and procedures (to be) applied	It is defined according to the technical documentation of Amurmetal.
OA/QC procedures (to be) applied	Steel production will be calculated as sum of daily reports of Production department during a month. Monthly data is checked. The check is based on the monthly technical report and weighing of goods.
Any comment	-

Data/Parameter	EF^{EAF1}
Data unit	tCO_2/tonnes of steel
Description	Emission factor of EAF#1
Time of determination/monitoring	Ex ante during monitoring
Source of data (to be) use	Plant records
Value of data applied (for ex ante calculations/determinations)	0.563
Justification of the choice of data or description of measurement methods and procedures (to be) applied	It is defined according to the technical documentation of Amurmetal.
OA/QC procedures (to be) applied	-
Any comment	This parameter is calculated as average for 2005-2007 years.

Data/Parameter	BEF_y^{incr}
Data unit	tCO_2/tonnes of steel
Description	Baseline emission factor for incremental steel production in year *y*
Time of determination/monitoring	Ex -post
Source of data (to be) use	LLC "Korporatsiya proizvoditeley chernykh metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	1.308
Justification of the choice of data or description of	The approach of "Tool to calculate the emission factor for an electricity system" is used. IPCC default values are used for CO_2

measurement methods and procedures (to be) applied	emission factor of fossil fuels. The default grid emission factors for the regional power systems of Russia are used. Please see Annex 2 for more detail information.
OA/QC procedures (to be) applied	-
Any comment	If data required to calculate the baseline emission factors for the year y is usually available six months later after the end of the year y, alternatively emission factors of the previous year (y-1) may be used. If data is available latter than 18 months after the end of year y, emission factors of the year preceding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout the crediting period. After the data for the last three years is available, emission factor may be fixed ax-ante as three-year average.

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

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

Step 1. Indication and description of the approach applied

As suggested by Paragraph 2 (c) of the Annex 1 of the Guidance the most recent version of the "Tool for the demonstration and assessment of additionality" approved by the CDM Executive Board is used to demonstrate additionality. At the time of this document completion the most recent version of the "Tool for the demonstration and assessment of additionality" approved by the CDM Executive Board is version 05.2[7] and it is used to demonstrate additionality of the project activity.

Step 2. Application of the approach chosen

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

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

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

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

The following alternatives to the proposed project were identified:

Alternative 1: Continuation of the current situation. The existing EAF #1 will continue to operate. Annual steel production of EAF #1 will be about 600 thousand tonnes. As the market demand is growing Amurmetal will lose market share under this alternative. In other words, the incremental steel volume (about 1.4 million tonnes of steel) would be produced by the other (new and/or existing) steel plants;

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

Alternative 2: The proposed project activity undertaken without being registered as a JI project activity. Construction of new EAF and modernisation of the old EAF #1. Expected total annual steel production will be approximately 2.1 million tonnes of steel;

Alternative 3: Modernisation of the EAF #1 and demothballing of open-hearth plant. In this alternative the *open-hearth plant* would be demothballed. EAF#1 will be modernised. Capacity of EAF#1 will be increased on about 400 thousand tonnes of steel per year. Annual capacity of the open hearth plant will be about 1 million tonnes of steel. Steelmaking by EAF is more modern technology than by OHF. It would be unreasonable that an investment is spent on an out dated technology. Moreover, this alternative is not conservative in terms of greenhouse gas emissions. Thus this alternative cannot be considered as a reasonable alternative;

Alternative 4: Using the existing EAF#1, modernisation of arc-furnace plant #1 combined with demothballing of open-hearth plant. In this alternative instead of EAF #1 arc-furnace plant #1 will be modernised. EAF #1, the arc-furnace plant #1 and the open hearth plant will be used together. Capacity of arc-furnace plant will be about 400 thousand tonnes of steel per year (increased by 200 thousand tonnes of steel). Arc-furnace plant #1 uses several furnaces small capacity. During operation this shop was not significant modernised. Also modernisation of several furnaces will require higher investment than EAF#1 modernisation. As for the rest this alternative is the same as alternatives 3 above. Thus this alternative cannot be considered as a reasonable alternative.

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

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

All of the alternatives identified above are consistent with mandatory laws and regulations of the Russian Federation.

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

Step 2. Investment Analysis

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

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

Sub-step 2a: Determine appropriate analysis method

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

A simple cost analysis (Option I) shall be applied if the proposed JI project and the alternatives identified in step 1 generate no financial or economic benefits other than JI related income. The proposed JI project results in sales revenues due to the new steel production capacity installed and modernised. Thus, this analysis method is not applicable.

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

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

The proposed project, installation and modernisation of steel production, shall be implemented by JSC Amurmetal. Amurmetal has no internal IRR benchmark for its investment decision making. IRR benchmark analysis is calculated according to the Table B.2.1. If the proposed project (not being implemented as a JI project) has less favourable indicator, i.e. a lower IRR, than this benchmark, then the project cannot be considered as financially attractive.

Table B.2.1. Financial indicators used to set benchmark

#	Factor	Rate	Description	Source
1	Risk-free rate	4.24%	German long-term interest rate in euro as a secondary market yields of government bonds with remaining maturity close to ten years, March 2006. This rate is taken as Germany is the largest Euro economy.	European Central Bank[8]
2	Russian interest rate	6.81%	Weighted average interest rate of Russian federal bonds and short-dated bond.	Bulletin of bank statistics [9]
3	Country risk premium	**3.17%**	Non-specific risk associated with investments in Russia. Equals to Russian interest rate less Risk-free rate.	-
4	Euro inflation	2.20%	5-year average inflation in euro zone	Eurostat[10]
5	Real risk-free rate	**1.41%**	*Real interest rate=(1+Nominal Interest Rate)/(1+Inflation)-1*	-
6	Company related risk premium	**4%**	Company-specific risk premium associated with company stability, reputation, overall estimation.	Amurmetal assessment
7	Project risk premium	**10%**	This type of projects has the medium risk factor of 8-10%. Thus the lowest range is applied to be conservative.	Methodological recommendations on evaluation of investment projects efficiency. Approved by Ministry of Economy of the RF, Ministry of Finance of the RF, State Committee of the RF on Construction, Architecture and Housing Policy of the RF 21.06.1999 N BK 477.
	Total expected return	**18.58%**	This rate takes into account real (inflation adjusted) risk-free rate increased by a general expected market return, country risk and specific project risk.	

[8] The calculation at constant prices as of the time of decision-making provides an objective view of the long-term future. It allows to perform a “pure” sensitivity analysis not impacted by expert estimations of inflation levels, prices etc., and to identify the most important factors actually impacting the project’s financial performance.
[9] http://www.cbr.ru/publ/main.asp?Prtid=BBS
[10] http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&language=en&pcode=tsieb060&tableSelection=1&footnotes=yes&labeling=labels&plugin=1

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

The financial analysis refers to the time of investment decision-making.

The following assumptions have been used based on the information provided by the enterprise:

1. Investment decision: 2nd March 2006, commissioning date: 01 January 2010;
2. The project investment cost accounts for approximately EUR 354 million during four years;
3. The calculations are made at constant prices as of 2005[11];
4. The exchange rate (EUR/RUR) is rounded up to 1/33.45 in accordance with the enterprise's conversion practice;
5. The project lifetime is around 20 years (lifetime of the main equipment);
6. Raw material consumption and electricity for new EAF is taken into account in line with the technical specifications of the project design;
7. Raw material consumption and electricity for modernised EAF is taken into account in line with the indicators achieve;
8. Metal stock is the bigger cost component constituting about 66 % of total operation cost.
9. Production is assumed at the maximum technical capacity of 2.15 million tonnes of steel per year.

The project cash flow focuses on revenue flows generated by sales of steel produced by EAF1 and EAF2. The project's financial indicators are presented in the Table B.2.2 below.

Table B.2.2. Financial indicators of the project

Scenario	IRR (%)
Base case	2.7

Cash flow analysis shows IRR of 2.7 %. It is way below the benchmark determined of 18.58 %. Hence, the project cannot be considered as a financially attractive course of action.

Sub-step 2d: Sensitivity analysis

A sensitivity analysis should be made to show whether the conclusion regarding the financial/economic attractiveness is robust to reasonable variations in the critical assumptions, as it can be seen by application of the Methodological Tool "Tool for the demonstration and assessment of additionality" (Version 05.2).

The following four key indicators were considered in the sensitivity analysis: investment cost, steel prices, metal stock. The other cost components account for less than 20 % of total or operation cost and therefore are not considered in the sensitivity analysis. In line with the Additionality Tool the sensitivity analysis should be undertaken within the corridor of ±10 % for the key indicators.

It is unlikely that steel and metal stock price will go up or down independently one from another because these parameters are considered together. Scrap cost occupies fixed part in steel coast of Amurmetal. Also

[11] The calculation at constant prices as of the time of decision-making provides an objective view of the long-term future. It allows to perform a "pure" sensitivity analysis not impacted by expert estimations of inflation levels, prices etc., and to identify the most important factors really impacting the project's financial performance.

Amurmetal is exclusive scrap consumer in Russian Far East (exclusive steel producer). Therefore Amurmetal dictates metal stock price for this region.

Scenario 1 considers a 10% investment cost growth. Scenario 1 shows that this assumption worsened the cash flow performance due to significant cost increase. IRR is equal 1.8%.

Scenario 2 is based on the assumption of a 10% investment cost decrease that improves cash flow and performance indicators making IRR the higher on 1.1%.

Scenario 3 implies metal stoke and steel price climbing up to 8.0%. Steel prices are the most revenue driving indicator. But despite increase in steel price proposed scenario is robust.

Scenario 4 implies metal stoke and steel price reduce 10%. As plant revenues are one of the main components reducing worsens the cash flow performance indicators. The project is unprofitable in this scenario.

A summary of the results is presented in the Table B.2.3 below.

Table B.2.3: Sensitivity analysis (summary)

Scenario	**IRR (%)**
Scenario 1	1.9
Scenario 2	3.8
Scenario 3	8.0
Scenario 4	-

Hence, the sensitivity analysis consistently supports (for a realistic range of assumptions) the conclusion that the project is unlikely to be financially/economically attractive.

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

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

Step 4: Common practice analysis

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

Electric arc steel production method is not the dominant method in the Russian steelmaking industry. Technology offered in the project, specifically the electric arc steel furnace method. Share of arc furnace steel in total Russian steel output was 23% in 2006. Shares of basic oxygen steel and open hearth furnace steel were 58.9 % and 18.2 % accordingly. Modernization of existing equipment instead of installation of the new equipment is a common practice in Russia due to the lower investment costs and shorter payback periods that are associated with substandard financial performance. Also there are several bigger steelmaking enterprises that may not change steelmaking process therefore its pioneer activities (ore processing). Thus share of basic oxygen steel will not change significantly in the course of time in Russia12.
The steelmaking technology usage by Amurmetal does not use iron in charging (accidental iron in scrap is equal to 0.22%). Average iron consumption for EAFs in Russia is 11.45% (Average iron consumption for all steelmaking processes in Russia is 55.24% (OHF = 45.27%; BOF = 76.6%). There are only three plants from 18 electric furnace steelmakings in Russia which consume less iron than Amurmetal (such as CSC Nizhneserginsky MMZ, JSC Oskolsky EMK, JSC MMZ Serp i Molot). But Oskolsky EMK consumes much more pellets (ore mixture) and production of MMZ Serp i Molot is insignificant.
Thus the proposed JI project does not reflect a widely observed and commonly carried out activity.

Sub-step 4b: Discuss any similar Options that are occurring:
It is required to follow Sub-step 4b according to the Tool when this project is widely observed and commonly carried out. The proposed JI project does not represent a widely observed practice in the area considered (see Sub-step 4a). So, this sub-step is not applied.

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

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

Step 3. Provision of additionality proofs

Supporting documents including the calculation spreadsheets and other proofs will be made available to the accredited independent entity.

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

There are three different sources of GHG emissions during the steel production:
- Emission from the raw materials (iron, coke, electrodes) during the steelmaking process;
- Fuel (gas) combustion;
- GHG emissions from the Russian electricity grid.

An overview of all emission sources in the steelmaking process of proposed project is given in Table B.3.1 below. The subproject boundary shall encompass all anthropogenic emissions by sources of GHGs which are:

- Under the control of the project participants;
- Reasonably attributable to the project;

[12] Worldsteel Committee on Economic Studies – Brussels, 2009. Steel Statistical Yearbook 2008 (Table 6).

- Significant, i.e., as a rule of thumb, would by each source account on average per year over the crediting period for more than 1 per cent of the annual average anthropogenic emissions by sources of GHGs, or exceed an amount of 2,000 tonnes of CO_2 equivalent, whichever is lower.

Table B.3.1: Sources of emissions

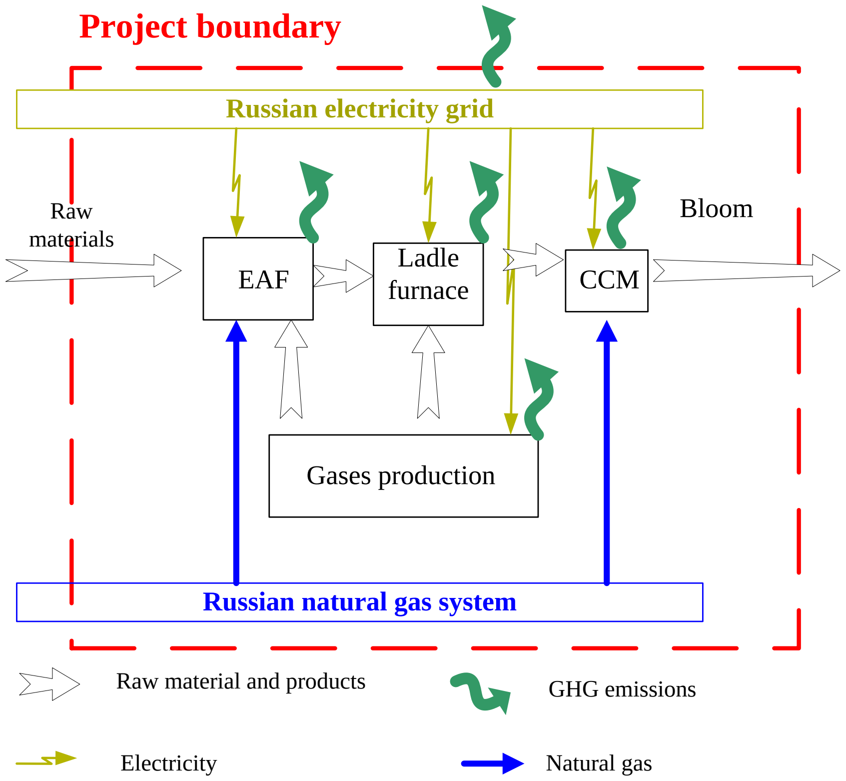
№	Source	Gas	Included/ excluded	Justification/Explanation
1	Electricity consumption during the process of the compressed air and other gases (oxygen, argon, nitrogen)	CO_2	Included	• All steel producers have comparable emissions from these sources, thus including these sources is conservative; • Emissions 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.
2	Electricity consumption during the steelmaking process (EAF and LF)	CO_2	Included	• The electricity consumption will increase; • Emissions are calculated using standardized regional electricity factors for Russia[13].
3	Fuel consumption during the steelmaking process	CO_2	Included	• The fossil fuel combustion will decrease.
4	Raw materials (lime, coke) consumption during steelmaking process	CO_2	Included	• lime and coke consumption will decrease after the project implementation; • All steel producers have comparable emissions from raw material consumption.
5	Electrode consumption during smelting process	CO_2	Included	• In the project scenario and in the baseline the volume of electrode will be different.
6	Gas consumption in CCM (electricity for blooms production).	CO_2	Included	• This parameter does not take into account in baseline because including this parameter in project scenario is conservative.
7	Electricity consumption in CCM (electricity for blooms production).	CO_2	Excluded	• This parameter does not take into account in baseline and project scenario; • Electricity consumption in the project scenario is less than in the baseline scenario, therefore excluding this emission is conservative (also this source is to less than 1 % of the total emissions (CO_2 equivalent).
8	Methane origination during fuels burning	CH_4	Excluded	• The gas was excluded from the consideration due to their small volume of emissions (see the description in section D.1).

[13] Amurmetal does not have on-site power generation facilities.

№	Source	Gas	Included/ excluded	Justification/Explanation
9	Nitrous oxide origination during fuels burning	N_2O	Excluded	• The gas was excluded from the consideration due to their small volume of emissions (see the description in section D.1).

The emission sources within the project boundary are also shown in Figure B.3.1 below.

Figure B.3.1: Sources of emissions and project boundary



Please see Sections D. and E. for detailed data on the emissions within the project boundary.

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: 09/07/ 2010

Name of person/entity setting the baseline:
Mikhail Butyaykin
Global Carbon BV
Phone: +31 30 298 2310
Fax: +31 70 891 0791
E-mail: butyaykin@global-carbon.com
Global Carbon BV is a project participant.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

Project start date is 2 March 2006 when contract between JSC Amurmetal and OJSC "Uralgipromez" was signed. OJSC "Uralgipromez" has developed design documents for construction new EAF.

C.2. Expected operational lifetime of the project:

The operational lifetime of the project is 20 years or 240 months. This corresponds to expected operational lifetime of EAFs – the biggest investment cost item.

C.3. Length of the crediting period:

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

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

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

In accordance with paragraph 30 of the JISC's Guidance, as part of the PDD of a proposed JI project, a monitoring plan has to be established by the project participants in accordance with appendix B of the JI guidelines. In this context two options apply:

a) Project participants may apply approved CDM baseline and monitoring methodologies;
b) Alternatively, a monitoring plan may be established in accordance with appendix B of the JI guidelines, i.e. a JI specific approach may be developed. In this case, inter alia, selected elements or combinations of approved CDM baseline and monitoring methodologies may be applied, if deemed appropriate.

In this PDD, a JI specific approach regarding monitoring is used. As elaborated in Section B.3, the project activity only affects the emissions related to the electricity, the fuel, the raw materials and the electrodes consumption. Emissions related to the raw material and products transportation and the fuel consumption is excluded.

The following assumptions for calculation of both baseline and project emissions were used:

- The steel demand in the market is the same in the project and baseline scenario;
- The type of fuel combusted and raw material consumed in EAFs is not influenced by the project;
- The emissions from electricity consumption are established using the relevant regional Russian standardized grid emission factor, as described in Annex 2.

The project emissions are established in the following way:

- The project emission is the emission from modernised EAF#1 and new EAF#2;
- Greenhouse emissions are determined using actual production data for 2008-2009 years;
- Greenhouse emissions during 2010-2012 are determined using performance data of 2009 year.

The baseline emissions are established in the following way:

- The baseline emissions of the production in the project scenario are established using the approach as given in Annex 2;
- The baseline emissions of the grid are established using the Russian standardized grid factor as described in Annex 2;
- Baseline emission factor of the replacement production is fixed ex-ante;
- Baseline emission factor of the incremental production is fixed ex-ante for three years;

General remarks:

- Social indicators, such as number of people employed, safety records, training records etc., will be available to a verifier, if required;
- Only CO_2 emissions as GHG are taken into account. Major source of CH_4 and N_2O emission at a steelmaking process is the burning of fuel (coke and natural gas). Given fuel specific consumption, in normally blast furnace process for basic oxygen steel in Russia, CH_4 emission is of 99 g/tonne of steel and N_2O emissions of 15 g/tonne of steel compared with about 530 kg CO_2/ tonne of project steel (calculation according to 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 2, STATIONARY COMBUSTION and specific fuels consumption). Omitting these two pollutants for a steelmaking process is conservative, because they contribute to less than 1 % of the total emissions (CO_2 equivalent), far below the confidence level for the CO_2 emission calculation. The CH_4 and N_2O emission reductions will not be claimed in the baseline scenario. This is conservative.

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
P1	PE_m	Monthly plant calculations	tCO_2	C	Monthly	100%	Electronic and paper	-
P2	PE_m^{EAF1}	Monthly plant calculations	tCO_2	C	Monthly	100%	Electronic and paper	-
P3	$PE_m^{EAF\,2}$	Monthly plant calculations	tCO_2	C	Monthly	100%	Electronic and paper	-
P4	$PE_{el,\,m}^{EAF\,1}$	Monthly plant calculations	tCO_2	C	Monthly	100%	Electronic and paper	-
P5	$PE_{coke\,m}^{EAF\,1}$	Monthly plant calculations	tCO_2	C	Monthly	100%	Electronic and paper	-
P6	$PE_{lime,m}^{EAF1}$	Monthly plant calculations	tCO_2	C	Monthly	100%	Electronic and paper	-
P7	$PE_{fuel,\,m}^{EAF\,1}$	Monthly plant	tCO_2	C	Monthly	100%	Electronic and	-

		calculations						paper	
P8	$PE_{RM,\ m}^{EAF1}$	Monthly plant calculations	tCO_2	C	Monthly	100%	Electronic and paper	-
P9	$PE_{oxy,m}^{EAF\ 1}$	Monthly plant calculations	tCO_2	C	Monthly	100%	Electronic and paper	-
P10	$PE_{air,m}^{EAF\ 1}$	Monthly plant calculations	tCO_2	C	Monthly	100%	Electronic and paper	-
P11	$PEL_{m}^{EAF\ 1}$	Monthly technical report, measuring instrumentation	MWh	M/C	Continuously	100 %	Electronic and paper	-
P12	PC_{m}^{EAF1}	Monthly technical report, measuring instrumentation	tonnes	M/C	Monthly	100%	Electronic and paper	-
P13	PL_{m}^{EAF1}	Monthly technical report, measuring instrumentation	tonnes	M/C	Monthly	100%	Electronic and paper	-
P14	$PF_{fuel\,i,\ m}^{EAF\ 1}$	Monthly technical report, measuring instrumentation	tonne or nm^3	M/C	Monthly	100%	Electronic and paper	-
P15	$PRM_{RM\_i,m}^{EAF1}$	Monthly technical report, measuring instrumentation	tonnes	M/C	Monthly	100%	Electronic and paper	-
P16	$PO_{oxy,m}^{EAF1}$	Monthly technical report, measuring instrumentation	nm^3	M/C	Monthly	100%	Electronic and paper	-
P17	$PA_{air,m}^{EAF1}$	Monthly technical report, measuring instrumentation	nm^3	M/C	Monthly	100%	Electronic and paper	-

P18	EF_{el}	See Annex 2	tCO_2/ MWh	C	Fixed ex ante	100 %	Electronic and paper	Electricity grid GHG emission factor for JI projects in Russian Regional Energy System "North-West". See Annex 2.
P19	EF_{coke}	IPCC	tCO_2/tonne of coke	C	Fixed ex ante	100 %	Electronic and paper	Default values (IPCC 2006)
P20	EF_{lime}	IPCC	tCO_2/tonne of lime	C	Fixed ex ante	100 %	Electronic and paper	Default values (IPCC 2006)
P21	EF_i	IPCC	tCO_2/GJ	C	Fixed ex ante	100 %	Electronic and paper	Default values (IPCC 2006)
P22	$NCV_{i,\ m}$	Monthly technical report or IPCC	GJ/ m^3or tonne	C	Monthly or Fixed ex ante	100 %	Electronic and paper	Default values (IPCC 2006)
P23	$EF_{RM\_i,}$	IPCC	tCO_2/tonne of RM	C	Fixed ex ante	100 %	Electronic and paper	Default values (IPCC 2006)
P24	EC_{oxy}	Monthly technical report	MWh/m^3	C	Fixed ex ante	100 %	Electronic and paper	-
P25	EC_{air}	Monthly technical report	MWh/m^3	C	Fixed ex ante	100 %	Electronic and paper	-
P26	$PE^{EAF2}_{el,\ m}$	Monthly plant calculations	tCO_2	C	Monthly	100%	Electronic and paper	-
P27	$PE^{EAF2}_{coke\ m}$	Monthly plant calculations	tCO_2	C	Monthly	100%	Electronic and paper	-
P28	$PE^{EAF2}_{lime,m}$	Monthly plant calculations	tCO_2	C	Monthly	100%	Electronic and paper	-
P29	$PE^{EAF\ 2}_{fuel,\ m}$	Monthly plant calculations	tCO_2	C	Monthly	100%	Electronic and paper	-
P30	$PE^{EAF2}_{RM,m}$	Monthly plant calculations	tCO_2	C	Monthly	100%	Electronic and paper	-

P31	$PE_{oxy,m}^{EAF2}$	Monthly plant calculations	tCO_2	C	Monthly	100%	Electronic and paper	**-**
P32	$PE_{air,m}^{EAF2}$	Monthly plant calculations	tCO_2	C	Monthly	100%	Electronic and paper	**-**
P33	PEL_{m}^{EAF2}	Monthly technical report, measuring instrumentation	MWh	M/C	Continuously	100 %	Electronic and paper	-
P34	PC_{m}^{EAF2}	Monthly technical report, measuring instrumentation	tonnes	M/C	Monthly	100%	Electronic and paper	-
P35	PL_{m}^{EAF2}	Monthly technical report, measuring instrumentation	tonnes	M/C	Monthly	100%	Electronic and paper	-
P36	$PF_{fuel\,i,\,m}^{EAF\,2}$	Monthly technical report, measuring instrumentation	tonne or nm^3	M/C	Monthly	100%	Electronic and paper	-
P37	$PRM_{RM\_i,m}^{EAF2}$	Monthly technical report, measuring instrumentation	tonnes	M/C	Monthly	100%	Electronic and paper	-
P38	$PO_{oxy,m}^{EAF2}$	Monthly technical report, measuring instrumentation	nm^3	M/C	Monthly	100%	Electronic and paper	-
P39	$PA_{air,m}^{EAF\,2}$	Monthly technical report, measuring instrumentation	nm^3	M/C	Monthly	100%	Electronic and paper	-

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

As described in Section B and A, there are two subprojects modernization EAF#1 and construction EAF#2. Therefore project emission includes emissions of subprojects the formula below reflects.

$$PE_m = PE_m^{EAF\,1} + PE_m^{EAF\,2} \qquad (1)$$

Where:

PE_m	Project emissions in month *m* (tCO_2);
PE_m^{EAF1}	Modernized EAF#1 emissions in month *m* (tCO_2);
$PE_m^{EAF\,2}$	EAF#2 emission in month *m* (tCO_2).

Calculation of EAF emissions

Steel production comprises three stages: sinter (or pellet), coke, iron and steel production. Amurmetal has steel production stage only. The iron and coke are bought and delivered from other metallurgical plants. Therefore emissions associated with coke production are taken into account in the emissions from EAF. Amurmetal does not consume steelmaking iron, it consume only iron scrap. Therefore emissions associated with iron production are not taken into account in the emissions from EAF.

Subproject 1 (modernization EAF#1)

$$PE_m^{EAF1} = PE_{el,\,m}^{EAF1} + PE_{coke,\,m}^{EAF1} + PE_{lime,m}^{EAF1} + PE_{fuel,\,m}^{EAF\,1} + PE_{RM,\,m}^{EAF1} + PE_{oxy,m}^{EAF1} + PE_{air,m}^{EAF1} \qquad (2)$$

Where:

$PE_{el,\,m}^{EAF\,1}$	Emissions from electricity consumption in month *m* (tCO_2);
$PE_{coke\ m}^{EAF\,1}$	Emissions associated with coke production in month *m* (tCO_2);
$PE_{lime,m}^{EAF1}$	Emissions associated with lime production in month *m* (tCO_2);
$PE_{fuel,\,m}^{EAF\,1}$	Emissions from fuel combustion in month *m* (tCO_2);
$PE_{RM,\ m}^{EAF1}$	Emissions from raw material consumption in month *m* (tCO_2);
$PE_{oxy,m}^{EAF\,1}$	Emissions associated with oxygen production in month *m* (tCO_2);

$PE_{air,m}^{EAF\,1}$ Emissions associated with air production in month *m* (tCO_2).

Emissions from electricity is determined according to the following formula:

$$PE_{el,\,m}^{EAF\,1} = PEL_{y}^{EAF\,1} \times EF_{el} \quad (3)$$

Where:

$PEL_{m}^{EAF\,1}$ Electricity consumption of electric arc furnace and ladle furnace in month *m* (MWh);

EF_{el} Carbon emission factor of electricity grid of Russia (tCO_2/MWh) (it is a fixed value for 2008 – 2012, see Annex 2).

Emissions are associated with coke productions are determined according to the following formulas:

$$PE_{coke,\,m}^{EAF1} = PC_{m}^{EAF1} \times EF_{coke} \quad (4)$$

Where:

PC_{m}^{EAF1} Coke consumption in month *m* (tonnes);

EF_{coke} Default emission factor of coke production[14] (tCO_2/tonne of coke).

Emissions are associated with lime productions are determined according to the following formulas:

$$PE_{lime,\,m}^{EAF1} = PL_{m}^{EAF1} \times EF_{lime} \quad (5)$$

Where:

PL_{m}^{EAF1} Lime consumption for EAF#1 in month *m* (tonnes);

EF_{lime} Default emission factor of lime production[15] (tCO_2/tonne of lime).

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[14] IPCC Guidelines for National Greenhouse Gas Inventories (2006), Volume 3, Chapter 4, page 25.

[15] IPCC Guidelines for National Greenhouse Gas Inventories (2006), Volume 3, Chapter 2, page 22.

The fuel is burnt during melting in the EAF. Emissions from natural gas combustion are calculated according to the formula 6. Coke isn't used as fuel. It is additive in furnace feed, but when being combusted it generates CO_2 emissions. Therefore this emission from coke combustion is calculated according to the formula 6 too but NCV for coke is defined accordingly IPCC[16].

$$PE^{EAF\,1}_{fuel,\,m} = \sum_i PF^{EAF\,1}_{fueli,\,m} \times EF_i \times NCV_{i,\,m} \qquad (6)$$

Where:

$PE^{EAF\,1}_{fuel,\,m}$	Emissions from fuel (natural gas and coke) combustion in month *m* (tCO_2);
$PF^{EAF\,1}_{fuel\,i,\,m}$	Consumption of fuel *i* by CCM, EAF and auxiliary equipment in month *y* (tonne or nm^3);
EF_i	Emission factor of fuel *i* (tCO_2/GJ);
$NCV_{i,\,m}$	Net Calorific Value of fuel *i* in month *m* (GJ/m^3).

Electrodes are raw materials. Emissions from raw materials (RM) consumption are calculated according to the following formula:

$$PE^{EAF1}_{RM,\,m} = \sum_i PRM^{EAF1}_{RM\_i,\,m} \times EF_{RM\_i} \qquad (7)$$

Where:

$PRM^{EAF1}_{RM\_i,m}$	RM *i* (electrodes) consumption in month *m* (tonne of RM);
$EF_{RM\_i,}$	RM *i* emission factor (tCO_2/tonne of RM) [17].

Emissions associated with oxygen production are calculated according to the following formula:

$$PE^{EAF1}_{oxy,m} = PO^{EAF1}_{oxy,m} \times EC_{oxy} \times EF_{el} \qquad (8)$$

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[16] 2006 IPCC Guidelines on National GHG Inventories, http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html Volume 2, table 1.2.

[17] EF of electrodes is calculated accordingly IPCC electrodes carbon content, 2006 IPCC Guidelines on National GHG Inventories, , Volume 3, Chapter 4, page 27.

Where:

$PO^{EAF1}_{oxy,m}$	Oxygen consumption in month *m* (nm^3);
EC_{oxy}	Specific energy consumption for oxygen production (MWh/m^3) [18];
EF_{el}	Carbon emission factor of electricity grid of Russia (tCO_2/MWh) (it is a fixed value for 2008 – 2012, see Annex 2).

Emissions associated with air production are calculated according to the following formula:

$$PE^{EAF1}_{air,m} = PA^{EAF1}_{airy,m} \times EC_{air} \times EF_{el} \qquad (9)$$

Where:

$PA^{EAF1}_{air,m}$	Air consumption in month *m* (nm^3);
EC_{air}	Specific energy consumption for air production (MWh/m^3) [19];
EF_{el}	Carbon emission factor of electricity grid of Russia (tCO_2/MWh) (it is a fixed value for 2008 – 2012, see Annex 2).

Subproject 2 (construction EAF#2)

$$PE^{EAF2}_{m} = PE^{EAF2}_{el,\,m} + PE^{EAF2}_{coke,\,m} + PE^{EAF2}_{lime,m} + PE^{EAF\,2}_{fuel,\,m} + PE^{EAF2}_{RM,\;m} + PE^{EAF2}_{oxy,m} + PE^{EAF2}_{air,m} \qquad (10)$$

Where:

$PE^{EAF2}_{el,\,m}$	Emissions from electricity consumption in month *m* (tCO_2);
$PE^{EAF2}_{coke\,m}$	Emissions associated with coke production in month *m* (tCO_2);
$PE^{EAF2}_{lime,m}$	Emissions associated with lime production in month *m* (tCO_2);
$PE^{EAF\,2}_{fuel,\,m}$	Emissions from fuel combustion in month *m* (tCO_2);

[18] This parameter is fixed ex-ante (average for 2005-2007 years).
[19] This parameter is fixed ex-ante (average for 2005-2007 years).

$PE_{RM,\ m}^{EAF2}$ Emissions from raw material consumption in month *m* (tCO_2);

$PE_{oxy,m}^{EAF2}$ Emissions associated with oxygen production in month *m* (tCO_2);

$PE_{air,m}^{EAF2}$ Emissions associated with air production in month *m* (tCO_2).

Emissions from electricity is determined according to the following formula:

$$PE_{el,\ m}^{EAF2} = PEL_{m}^{EAF2} \times EF_{el} \qquad (11)$$

Where:

PEL_{m}^{EAF2} Electricity consumption of electric arc furnace and ladle furnace in month *m* (MWh);

EF_{el} Carbon emission factor of electricity grid of Russia (tCO_2/MWh) (it is a fixed value for 2008 – 2012, see Annex 2).

Emissions are associated with coke productions are determined according to the following formulas:

$$PE_{coke,\ m}^{EAF2} = PC_{m}^{EAF2} \times EF_{coke} \qquad (12)$$

Where:

PC_{m}^{EAF2} Coke consumption in month *m* (tonnes);

EF_{coke} Default emission factor of coke production[20] (tCO_2/tonne of coke).

Emissions are associated with lime productions are determined according to the following formulas:

$$PE_{lime,\ m}^{EAF2} = PL_{m}^{EAF2} \times EF_{lime} \qquad (13)$$

Where:

PL_{m}^{EAF2} Lime consumption for EAF#1 in month *m* (tonnes);

EF_{lime} Default emission factor of lime production[21] (tCO_2/tonne of lime).

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[20] IPCC Guidelines for National Greenhouse Gas Inventories (2006), Volume 3, Chapter 4, page 25.

The fuel is burnt during melting in the EAF. Emissions from natural gas combustion are calculated according to the formula 6. Coke isn't used as fuel. It is additive in furnace feed, but when being combusted it generates CO_2 emissions. Therefore this emission from coke combustion is calculated according to the formula 6 too but NCV for coke is defined accordingly IPCC[22].

$$PE^{EAF\,2}_{fuel,\,m} = \sum_i PF^{EAF\,2}_{fueli,\,m} \times EF_i \times NCV_{i,\,y} \qquad (14)$$

Where:

$PE^{EAF\,2}_{fuel,\,m}$ Emissions from fuel (natural gas and coke) combustion in month *m* (tCO_2);

$PF^{EAF\,2}_{fuel\,i,\,m}$ Consumption of fuel *i* by CCM, EAF and auxiliary equipment in month *m* (tonne or nm^3);

EF_i Emission factor of fuel *i* (tCO_2/GJ);

$NCV_{i,\,m}$ Net Calorific Value of fuel *i* in month *m* (GJ/m^3).

Electrodes are raw materials. Emissions from raw materials (RM) consumption are calculated according to the following formula:

$$PE^{EAF2}_{RM,\,m} = \sum_i PRM^{EAF2}_{RM\_i,\,m} \times EF_{RM\_i} \qquad (15)$$

Where:

$PRM^{EAF2}_{RM\_i,m}$ RM *i* (electrodes) consumption in month *m* (tonne of RM);

$EF_{RM\_i,}$ RM *i* emission factor (tCO_2/tonne of RM)[23].

Emissions associated with oxygen production are calculated according to the following formula:

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[21] IPCC Guidelines for National Greenhouse Gas Inventories (2006), Volume 3, Chapter 2, page 22.

[22] 2006 IPCC Guidelines on National GHG Inventories, http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html Volume 2, table 1.2.

[23] EF of electrodes is calculated accordingly IPCC electrodes carbon content, 2006 IPCC Guidelines on National GHG Inventories, , Volume 3, Chapter 4, page 27.

$$PE_{oxy,m}^{EAF2} = PO_{oxy,m}^{EAF2} \times EC_{oxy} \times EF_{el,} \qquad (16)$$

Where:

$PO_{oxy,m}^{EAF2}$ Oxygen consumption in month *m* (nm^3);

EC_{oxy} Specific energy consumption for oxygen production (MWh/m^3) [24];

EF_{el} Carbon emission factor of electricity grid of Russia (tCO_2/MWh) (it is a fixed value for 2008 – 2012, see Annex 2).

Emissions associated with air production are calculated according to the following formula:

$$PE_{air,m}^{EAF2} = PA_{airy,m}^{EAF2} \times EC_{air} \times EF_{el,} \qquad (17)$$

Where:

$PA_{air,m}^{EAF\,2}$ Air consumption in month *m* (nm^3);

EC_{air} Specific energy consumption for air production (MWh/m^3) [25];

EF_{el} Carbon emission factor of electricity grid of Russia (tCO_2/MWh) (it is a fixed value for 2008 – 2012, see Annex 2).

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
B1	BE_m	Monthly plant calculations	tCO_2	C	Monthly	100%	Electronic and paper	-

[24] This parameter is fixed ex-ante (average for 2005-2007 years).
[25] This parameter is fixed ex-ante (average for 2005-2007 years).

B2	$BE_m^{EAF\,1}$	Monthly plant calculations	tCO_2	C	Monthly	100%	Electronic and paper	-
B3	$BE_{incr,m}$	Monthly plant calculations	tCO_2	C	Monthly	100%	Electronic and paper	-
B4	PP_m	Monthly technical report	tonnes	M/C	Monthly	100%	Electronic and paper	-
B5	$BP_{cap}^{EAF\,1}$	Monthly technical report	tonnes	M/C	Fixed ex ante	100%	Electronic and paper	-
B6	$BP_m^{EAF\,1}$	Monthly technical report	tonnes	C	Monthly	100%	Electronic and paper	-
B7	EF^{EAF1}	Monthly plant calculations	tCO_2/tonnes of steel	M/C	Fixed ex ante	100%	Electronic and paper	-
B8	BP_m^{incr}	Monthly technical report	tonnes	C	Monthly	100%	Electronic and paper	-
B9	BEF_m^{incr}	Monthly plant calculations	tCO_2/tonnes of steel	M/C	Fixed ex ante	100%	Electronic and paper	-

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

As further described in Annex 2, the baseline emissions have two sources:

- Production at EAF#1 (replacement production);
- Production by other steel plants (incremental production).

The first part in formula 18 reflect the baseline emissions connected with EAF#1, the second part refers to the baseline emissions of the incremental production (other steel plants).

$$BE_m = BE_m^{EAF\,1} + BE_{incr,m} \qquad (18)$$

Where:

BE_m Baseline emissions in month *m* (tCO_2);

$BE_m^{EAF\,1}$ Baseline emissions due to on-site production (EAF1) in month *m* (tCO_2);

$BE_{incr,m}$ Baseline emissions due to incremental production in month *m* (tCO_2).

Steel production (on-site)

In the baseline scenario, EAF#1 will continue production up to the technical capacity (average for three last years). Steel production on EAF#1 in the baseline scenario will be as follows:

$$BP_m^{EAF1} = MIN[PP_m, BP_{cap}^{EAF1}] \quad (19)$$

Where:

BP_m^{EAF1} Steel production in the baseline scenario on EAF#1 in month *m* (tonnes);

PP_m Total steel production in the project scenario in month *m* (tonnes);

BP_{cap}^{EAF1} Steel production of EAF#1 (tonnes) [26];

Incremental steel production

Steel production in the incremental part of the baseline scenario is calculated as follows:

$$BP_m^{incr} = PP_m - BP_m^{EAF1} \text{ ; in case if } PP_m = BP_m^{EAF1} \text{ then } BP_m^{incr} = 0 \quad (20)$$

Where:

BP_m^{incr} Incremental steel production in the baseline scenario in month *m* (tonnes);

PP_m Total steel production in the project scenario in month *m* (tonnes);

BP_m^{EAF1} Steel production in the baseline scenario on EAF#1 in month *m* (tonnes);

Baseline emissions due to on-site steel production

The on-site baseline emission due to steel production is calculated as follows:

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[26] This parameter is fixed ex-ante (average for 2005-2007 years).

$$BE_m^{EAF\,1} = BP_m^{EAF\,1} \times EF^{EAF\,1} \qquad (21)$$

Where:

$BE_m^{EAF\,1}$ Baseline emissions due to on-site production (EAF1) in month *m* (tCO_2);

$BP_m^{EAF\,1}$ Steel production in the baseline scenario on EAF#1 in month *m* (tonnes);

EF^{EAF1} Emission factor of EAF#1 (tCO_2/tonnes of steel) [27].

Baseline emissions due to incremental production

$$BE_{incr,m} = BP_m^{incr} \times BEF_y^{incr} \qquad (22)$$

Where:

$BE_{incr,m}$ Baseline emissions due to incremental production in month *m* (tCO_2) (see also annex 2).

BP_m^{incr} Incremental steel production in the baseline scenario in month *m* (tonnes);

BEF_y^{incr} Baseline emission factor for incremental steel production in year *y* (tCO_2/t steel) (see Annex 2).

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

[27] This parameter is fixed ex-ante, see Annex 1 (average for 2004-2006 years).

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):

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

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):

In the baseline scenario energy consumptions (natural gas, coke) is bigger than in project scenario. Because estimated leakage is neglected by applying conservative method of ER calculation.

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):

$$ER = \sum (BE_m - PE_m) \qquad (23)$$

Where:

ER	Emission reductions due to the proposed JI project in a period (tCO_2);
BE_m	Baseline emissions in month *m* (tCO_2);
PE_m	Project emissions in month *m* (tCO_2).

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

The main relevant Russian Federation environmental regulations:

- Federal law of Russian Federation "On Environment Protection" (10 January 2002, N 7-FZ);
- Federal law of Russian Federation "On Air Protection" (04 May 1999, N 96-FZ).

According to national requirements, emissions connected with the plant operation have to be measured once a year or once in three years. It is described in the Volume of Maximum Allowable Emissions approved by Rostekhnadzor RF (Russian Federal Service for Ecological, Technical and Atomic Supervision) and Rospotrebnadzor (Federal Service on Surveillance for Consumer rights protection and human well-being). Amurmetal will systematically collect pollution data that may have negative impact on the local environment. Monitoring, data collection and archiving is done by Amurmetal laboratory. Collected and archived Data will be stored for more than five years in hardcopy and electronically.

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.
P11	Medium	The electricity consumption of electric arc furnace and de-airing equipment will be recorded and controlled by the Chief Power Engineer Department using electricity meters calibrated and maintained in line with the Russian regulations and will be transferred to the Environmental protection department. Meters are interconnected with certificated automatic system for commercial accounting of power consumption for continuous data checking.
P12	Medium	Coke consumption for steelmaking process will be calculated as sum of daily reports in Production department. Monthly data is checked. The check is based on the monthly inventory reports of remaining raw materials and materials. The weighing apparatus is calibrated annually. Information will be calculated by the Production management department and transferred to the Environmental protection department.

P13	Medium	Lime consumption for steelmaking process will be calculated as sum of daily reports in Production department. Monthly data is checked. The check is based on the monthly inventory reports of remaining raw materials and materials. The weighing apparatus is calibrated annually. Information will be calculated by the Production management department and transferred to the Environmental protection department.
P14	Medium	Fuel consumption for EAF will be recorded and controlled by the Chief Power Engineer Department using fuel meters calibrated and maintained in line with the Russian regulations and will be transferred to the Environmental protection department.
P15	Medium	Raw materials consumption for steelmaking process will be calculated as sum of daily reports in Production department. Monthly data is checked. The check is based on the monthly inventory reports of remaining raw materials and materials. The weighing apparatus is calibrated annually. Information will be calculated by the Production management department and transferred to the Environmental protection department.
P16	Medium	Oxygen consumption for EAF will be recorded and controlled by the Chief Power Engineer Department using fuel meters calibrated and maintained in line with the Russian regulations and will be transferred to the Environmental protection department.
P17	Medium	Air consumption for EAF will be recorded and controlled by the Chief Power Engineer Department using fuel meters calibrated and maintained in line with the Russian regulations and will be transferred to the Environmental protection department.
P22	Medium	The natural gas supplier's laboratory will carry out the measurement of NCV of gas supplied and issue a certificate. The Chief Power Engineer Department will store these certificates and will calculate the weighted average value of the Net Calorific Value at the end of each year and will be transferred to the Environmental protection department.
P33	Medium	The electricity consumption of electric arc furnace and de-airing equipment will be recorded and controlled by the Chief Power Engineer Department using electricity meters calibrated and maintained in line with the Russian regulations and will be transferred to the Environmental protection department.
P34	Medium	Coke consumption for steelmaking process will be calculated as sum of daily reports in Production department. Monthly data is checked. The check is based on the monthly inventory reports of remaining raw materials and materials. The weighing apparatus is calibrated annually. Information will be calculated by the Production management department and transferred to the Environmental protection department.

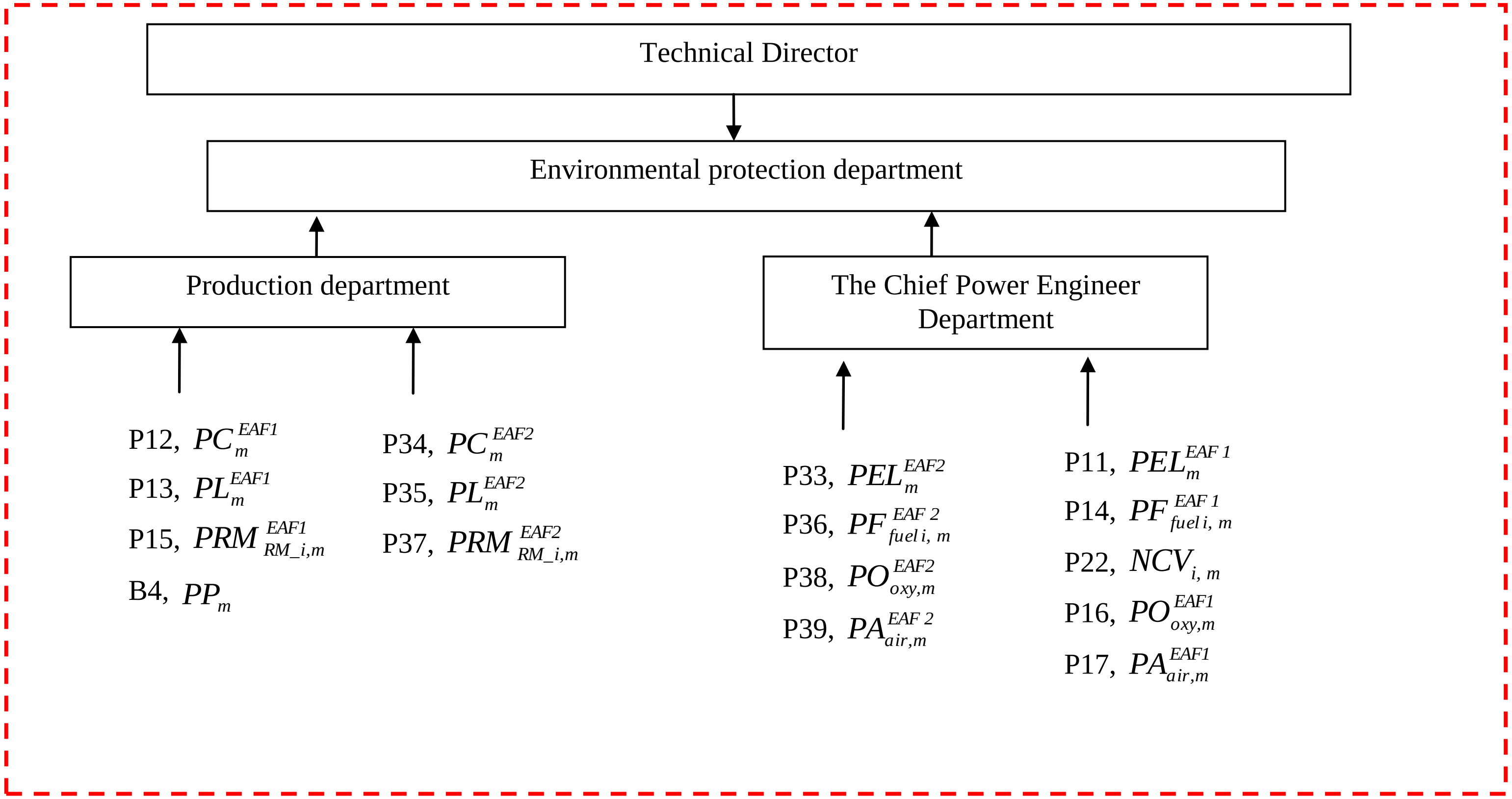
P35	Medium	Lime consumption for steelmaking process will be calculated as sum of daily reports in Production department. Monthly data is checked. The check is based on the monthly inventory reports of remaining raw materials and materials. The weighing apparatus is calibrated annually. Information will be calculated by the Production management department and transferred to the Environmental protection department.
P36	Medium	Fuel consumption for EAF will be recorded and controlled by the Chief Power Engineer Department using fuel meters calibrated and maintained in line with the Russian regulations and will be transferred to the Environmental protection department.
P37	Medium	Raw materials consumption for steelmaking process will be calculated as sum of daily reports in Production department. Monthly data is checked. The check is based on the monthly inventory reports of remaining raw materials and materials. The weighing apparatus is calibrated annually. Information will be calculated by the Production management department and transferred to the Environmental protection department.
P38	Medium	Oxygen consumption for EAF will be recorded and controlled by the Chief Power Engineer Department using fuel meters calibrated and maintained in line with the Russian regulations and will be transferred to the Environmental protection department.
P39	Medium	Air consumption for EAF will be recorded and controlled by the Chief Power Engineer Department using fuel meters calibrated and maintained in line with the Russian regulations and will be transferred to the Environmental protection department.
B4	Medium	Steel production will be calculated as sum of daily reports in Production department. Monthly data is checked. The check is based on the monthly inventory reports of remaining raw materials and steel. The produced steel is measured by volume-to-mass conversion method. Information will be calculated by the Production department and transferred to the Environmental protection department.

The internal quality system at Amurmetal is functioning in accordance with the national standards and regulations in force. Electricity and gas meters for commercial accounting and master gages are calibrated by accredited organizations. Plant meters are calibrated by master gages. Certificated automatic system for commercial accounting of power consumption is introduced at Amurmetal. Electric Arc Shop is powered from separate power line and it has separate commercial electrical meter.

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

The scheme of monitoring data collection at Amurmetal is described in Figure D.3.1.

Figure D.3.1: Data collection, quality assurance and monitoring at Amurmetal



Source: Amurmetal

Collecting information for monitoring purposes will consist on the following stages:

1) Technical director
The Technical director is responsible for both short and long term production strategy planning and implementation. The Technical director will hold the overall responsibility for implementation of the monitoring plan and will check month monitoring reports of Environmental protection department.

2) Environmental protection department
The Environmental protection department will be responsible for Monitoring plan implementation and logs keeping, i.e. for organizing and storing the data and the calculation of the emission reductions. It will also prepare the monthly monitoring reports to be presented to the verifier of the emission reductions. These reports will be submitted to Technical director. Production department and The Chief Power Engineer Department of Amurmetal will submit relevant data to Environmental protection department. It will also store the data received from external organizations for three years for the purpose of the audit. Monitoring results will be kept at least for two years after the last transfer of project ERUs. In addition to the preparation of the monitoring reports, the department will conduct an internal audit annually to assess project performance and, if necessary, make corrective actions.

4) Production department
Production department is responsible for accounting, controlling and planning of raw materials, produced semi and final products. It collects to check production data. It will submit data to Environmental protection department for project supervision regularly.

5) The Chief Power Engineer Department
For monitoring purposes, The Chief Power Engineer Department will report fuel, oxygen and air consumption and data received from the laboratory of the Gas transportation organization to Ecology laboratory. The laboratory of the Gas transportation organization provides data on the Net Calorific Value of the natural gas consumed with its certificate.

Global Carbon will visit Amurmetal for preparation of the monitoring report, template and the manual (two months before the project commissioning).

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

- JSC Amurmetal, Mr. Pavel Kosolapov, Manager of Environmental protection department
  Phone: +7 4217 529368
  E-mail: kosolapov@amurmetal.ru
  JSC Amurmetal is a project participant.

- Global Carbon BV, Mr Mikhail Butyaykin, JI Consultant
  Phone: +31 30 298 2310
  Fax: +31 70 891 0791
  E-mail: butyaykin@global-carbon.com
  Global Carbon BV is a project participant.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Table E.1.1: Estimated project emissions within the crediting period

Project emissions	Unit	2008	2009	2010	2011	2012
Technology elecricity	[tCO_2/y]	370,171	178,592	368,745	671,431	671,431
Gas production	[tCO_2/y]	41,753	25,383	52,409	93,395	93,395
Fuel consumption	[tCO_2/y]	34,453	26,813	55,361	92,646	92,646
Raw materials	[tCO_2/y]	110,827	62,771	129,606	204,569	204,569
Electrodes	[tCO_2/y]	5,104	2,652	5,477	12,370	12,370
Total	[tCO_2/y]	562,307	296,211	611,597	1,074,410	1,074,410
Total 2010 - 2012	[tCO_2]	3,618,936				

Table E.1.2: Estimated project emissions after the crediting period

Project emissions	Unit	2013	2014	2015	2016	2017	2018	2019	2020
Technology elecricity	[tCO_2/y]	671,431	671,431	671,431	671,431	671,431	671,431	671,431	671,431
Gas production	[tCO_2/y]	93,395	93,395	93,395	93,395	93,395	93,395	93,395	93,395
Fuel consumption	[tCO_2/y]	92,646	92,646	92,646	92,646	92,646	92,646	92,646	92,646
Raw materials	[tCO_2/y]	204,569	204,569	204,569	204,569	204,569	204,569	204,569	204,569
Electrodes	[tCO_2/y]	12,370	12,370	12,370	12,370	12,370	12,370	12,370	12,370
Total	[tCO_2/y]	1,074,410	1,074,410	1,074,410	1,074,410	1,074,410	1,074,410	1,074,410	1,074,410
Total 2013 - 2020	[tCO_2]	8,595,279							

E.2. Estimated leakage:

Not applicable

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

Table E.3.1: Estimated project emissions including leakage within the crediting period

Project emissions	Unit	2008	2009	2010	2011	2012
Technology elecricity	[tCO_2/y]	370,171	178,592	368,745	671,431	671,431
Gas production	[tCO_2/y]	41,753	25,383	52,409	93,395	93,395
Fuel consumption	[tCO_2/y]	34,453	26,813	55,361	92,646	92,646
Raw materials	[tCO_2/y]	110,827	62,771	129,606	204,569	204,569
Electrodes	[tCO_2/y]	5,104	2,652	5,477	12,370	12,370
Total	[tCO_2/y]	562,307	296,211	611,597	1,074,410	1,074,410
Total 2010 - 2012	[tCO_2]	3,618,936				

Table E.3.2: Estimated project emissions inclusive leakage after the crediting period

Project emissions	Unit	2013	2014	2015	2016	2017	2018	2019	2020
Technology elecricity	[tCO_2/y]	671,431	671,431	671,431	671,431	671,431	671,431	671,431	671,431
Gas production	[tCO_2/y]	93,395	93,395	93,395	93,395	93,395	93,395	93,395	93,395
Fuel consumption	[tCO_2/y]	92,646	92,646	92,646	92,646	92,646	92,646	92,646	92,646
Raw materials	[tCO_2/y]	204,569	204,569	204,569	204,569	204,569	204,569	204,569	204,569
Electrodes	[tCO_2/y]	12,370	12,370	12,370	12,370	12,370	12,370	12,370	12,370
Total	[tCO_2/y]	1,074,410	1,074,410	1,074,410	1,074,410	1,074,410	1,074,410	1,074,410	1,074,410
Total 2013 - 2020	[tCO_2]	8,595,279							

E.4. Estimated baseline emissions:

Table E.4.1: Estimated baseline emissions for the project within the crediting period

Baseline emissions	Unit	2008	2009	2010	2011	2012
Other steel plant	[tCO_2/y]	620,053	0	675,045	1,982,996	1,982,996
EAF1	[tCO_2/y]	346,225	312,576	346,225	346,225	346,225
Total	[tCO_2/y]	966,278	312,576	1,021,270	2,329,221	2,329,221
Total 2010 - 2012	[tCO_2]	6,958,565				

Table E.4.2: Estimated baseline emissions for the project after the crediting period

Baseline emissions	Unit	2013	2014	2015	2016	2017	2018	2019	2020
Other steel plant	[tCO_2/y]	1,982,996	1,982,996	1,982,996	1,982,996	1,982,996	1,982,996	1,982,996	1,982,996
EAF1	[tCO_2/y]	346,225	346,225	346,225	346,225	346,225	346,225	346,225	346,225
Total	[tCO_2/y]	2,329,221	2,329,221	2,329,221	2,329,221	2,329,221	2,329,221	2,329,221	2,329,221
Total 2013 - 2020	[tCO_2]	18,633,764							

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

Table E.5.1: Difference representing the emission reductions of the project within the crediting period

Emission reductions	Unit	2008	2009	2010	2011	2012
Total	[tCO_2/y]	403,971	16,365	409,672	1,254,811	1,254,811
Total 2010 - 2012	[tCO_2]	3,339,629				

Table E.5.2: Difference representing the emission reductions of the project after the crediting period

Emission reductions	Unit	2013	2014	2015	2016	2017	2018	2019	2020
Total	[tCO_2/y]	1,254,811	1,254,811	1,254,811	1,254,811	1,254,811	1,254,811	1,254,811	1,254,811
Total 2013 - 2020	[tCO_2]	10,038,485							

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

Table E.6.1:Project, baseline, and emission reductions within the crediting period

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
Year 2008	562,307	0	966,278	403,971
Year 2009	296,211	0	312,576	16,365
Year 2010	611,597	0	1,021,270	409,672
Year 2011	1,074,410	0	2,329,221	1,254,811
Year 2012	1,074,410	0	2,329,221	1,254,811
Total (tonnes of CO_2 equivalent)	3,618,936	0	6,958,565	3,339,629

Table E.6.2: Project, baseline, and emission reductions after the crediting period

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
Year 2013	1,074,410	0	2,329,221	1,254,811
Year 2014	1,074,410	0	2,329,221	1,254,811
Year 2015	1,074,410	0	2,329,221	1,254,811
Year 2016	1,074,410	0	2,329,221	1,254,811
Year 2017	1,074,410	0	2,329,221	1,254,811
Year 2018	1,074,410	0	2,329,221	1,254,811
Year 2019	1,074,410	0	2,329,221	1,254,811
Year 2020	1,074,410	0	2,329,221	1,254,811
Total (tonnes of CO_2 equivalent)	8,595,279	0	18,633,764	10,038,485

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:

Steel production has a certain impact on the local environment. In Russia emission levels in industry are regulated by operating licenses issued by the regional offices of Ministry of Natural Resources and Environment of Russian Federation on an individual basis for every enterprise that has significant impact on the environment. Environmental Impact Assessment (EIA) in Russia is regulated by the Federal Law "On the Environmental Expertise" and consists of two stages EIA (OVOS –in Russian abbreviation) and state environmental expertise (SEE). Significant changes into this procedure were made by the Law on Amendments to the Construction Code effective of January 1st, 2007. This Law reduced the scope of activities subject to SEE, transferring them to so called State expertise (SE) in accordance with Article 49 of the Construction Code of RF. In compliance with the Construction code the Design Document should contain Section "Environment Protection". Compliance with the environmental regulations (so called technical regulations in Russian on Environmental Safety) should be checked during the process of SE. In the absence of the abovementioned regulations compliance is checked in a very general manner.

The project foresees introduction of modern equipment, designed to meet the strict pollution standards (mainly enhanced bag filtering systems) instead of existing worn outdated systems.

Section "Environment Protection" specifies the project equipment (EAF, CCM), contribution to air pollution. Calculation of air pollution is made by program complex UPRZA "PDV-Ekolog" in accordance with OND-86 ("Methodology of calculation of harmful substances content in free air, contained in plants emissions" Goskomgydromet RF, 1987).

Calculation analysis of pollutions dispersion including emission points and approved plant's development plans that there is no excess of maximum allowable concentration for all substances. Project impact is insignificant. Maximum accidental and gross emissions will be increased insignificantly by 1.069 times. Specific emission will be reduced by 1.977 times. Quantitative composition of atmospheric air in the residential area after project start up will remain within limits inside the radius of Sanitary Protection Zone (500 meters).

Section "Environment Protection" as part of Design Document was got positive conclusion by The Main Agency of the State expertise. According to Section "Environment Protection" of Design Document, project does not have any transboundary environmental impacts.

Following documents were taken into consideration during environmental impact assessment: State Law "About environment protection" N7 –FZ dated 10 Jan 2002; State Law "About sanitary and epidemiological wellness of the population" N52-FZ dated 17 March 1999 and others.

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:

As it is shown in Section F1 project does not have significant negative environmental impact.

SECTION G. Stakeholders' comments

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

JSC Amurmetal and OJSC "Uralgipromez" signed contract for development of project design document on 2nd March 2006. There was a public hearing at Komsomolsk-on-Amur on the 21st February 2007 to make awareness of reconstruction of the electric arc shop #2 in accordance with Federal laws N 7-FZ from 10/01/2002 (About environment protection) and N 174-FZ from 23/11/1995 (About environmental impact audit). Project received a public consent for plant reconstruction.
21st December 2007 "The Main Agency of the State expertise" (FGU "Glavgosexpertiza" in Russian abbreviation) approved reconstruction of the electric arc shop #2, positive conclusion of FGU "Glavgosexpertiza" N 309-07/HGE-0309/18.

Amurmetal provided stakeholders with project information. Amurmetal had publications about the project in mass media. Komsomolsk-on-Amur town government approved the proposed project. List of publications is presented below:

- Newspaper: "Dalnevostochniy Komsomolsk" 21/02/2007, announcement – Public hearing;
- Newspaper: "Za stal" 14 November 2008, article – Reconstruction is in progress;
- Newspaper: "Za stal" 06 February 2009, article – Nevertheless we construct;
- Newspaper: "Metalosnabjenie i sbit" September 2009, article –Amurmetal presents modernisation programm;
- Newspaper: "Nash region – Dalniy Vostok" March 2010, article – New horizons of JSC Amurmetal .

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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Annex 2

BASELINE INFORMATION

As shown in Section B.1.above, the most plausible baseline scenario is that the existing steel production equipment will be kept and third Party producers will satisfy steel demand instead.

In this case, the baseline emissions consist of two parts:

- Production emissions by the existing equipment;
- Production emissions by other metallurgical plants.

The replacement part of baseline emissions is calculated on the basis emission factor of EAF#1 before modernization. Specific energy consumption factors for oxygen and air production are fixed in project scenario, they are ex ante. In this context, some baseline and project parameters are calculated by determining a three year average prior to project start.

The incremental part of baseline emission is calculated on the basis steel production emission factor (other steel plants) in Russia.

Baseline emissions of CO_2 calculation's approach is described in Section D.1.1.4. Methodologies and calculations for definition of baseline fixed parameter used are shown bellow.

Baseline fixed parameters (replacement part)

Average technical parameters of EAF#1

The data of technical parameters of EAF#1 at Amurmetal in 2004-2006 and average amounts are presented in Table Anx.2.1 below:

Table Anx.2.1: Technical parameters of EAF#1(including LF)

	Unit	2004	2005	2006	Average
Steel production	**t steel**	**522,598**	**621,776**	**700,300**	**614,891**
Electricity consumption	MWh/t	0.4892	0.5020	0.4488	0.4800
Emissions from electricity	**tCO_2**	**210,391**	**256,884**	**258,670**	**241,982**
Gas consumption	1000m3/t steel	0.0157	0.0202	0.0200	0.0186
Emissions from gas	**tCO_2**	**15,487**	**23,752**	**26,461**	**21,900**
Coke consumption per tonnes	kg coke/t	14.2	17.07	9.69	13.65
Emissions from coke combustion and production	**tCO_2**	**24,288**	**34,738**	**22,210**	**27,079**
Electrodes consumption	kg/t	2.92	3.36	2.89	3.06
Emissions from electrodes	**tCO_2**	**4,644**	**6,358**	**6,159**	**5,720**
Lime consumption	t lime/t	0.0592	0.0532	0.0559	0.0561
Emissions from lime production	**tCO_2**	**23,195**	**24,790**	**29,381**	**25,789**
Oxygen consumption	1000m3/t steel	0.0379	0.0376	0.0398	0.0384
Emissions from oxygen consumption	**tCO_2**	**14,830**	**17,468**	**20,842**	**17,713**
Compressed air consumption	1000m3/t steel	0.0376	0.0872	0.0975	0.0741
Electricity consumption for	MWh/1000m3	0.154	0.13	0.175	0.153

compressed air production **Emissions from compressed air**	**tCO_2**	**2,491**	**5,800**	**9,833**	**6,041**
Total emissions from EAF	**tCO_2**	**295,327**	**369,791**	**373,556**	**346,225**
EF for EAF		0.57	0.59	0.53	0.563

The average technical parameters are calculated according to Formula 1.

$$P_j = \sum_{y} P_{j\_y} \times \frac{1}{3} \qquad (1)$$

Where:

P_j Average amount of technical parameter *j* (GJ or tonnes);
P_{j_y} Amount of technical parameter *j* in year *y* (GJ or tonnes);
j Steel production and gas, coke, lime and electricity consumption;
y Years 2004, 2005, 2006.

The average amount of steel production ($BP_{cap}^{EAF\,1}$) is **614,891** tonnes per years or **51,241** tonnes per month and fixed ex-ante.
Emission factor of EAF#1 (EF^{EAF1}) is **0.563** tCO2/tonnes of steel and fixed ex-ante.

Calculation of baseline emission in year *y* is based on next formulas:

$$BE_y^{EAF1} = BE_{el,\,y}^{EAF1} + BE_{coke,\,y}^{EAF1} + BE_{lime,y}^{EAF1} + BE_{gas,\,y}^{EAF1} + BE_{RM,\,\,y}^{EAF1} + BE_{oxy,y}^{EAF1} + BE_{air,y}^{EAF1} \quad (2)$$

Where:

$BE_{el,\,y}^{EAF\,1}$ Emissions from electricity consumption in year *y* (tCO_2);
$BE_{coke\,y}^{EAF\,1}$ Emissions associated with coke production in year *y* (tCO_2);
$BE_{lime,y}^{EAF1}$ Emissions associated with lime production in year *y* (tCO_2);
$BE_{gas,\,y}^{EAF\,1}$ Emissions from natural gas combustion in year *y* (tCO_2);
$BE_{RM,\,\,y}^{EAF1}$ Emissions from raw material consumption in year *y* (tCO_2);
$BE_{oxy,y}^{EAF\,1}$ Emissions associated with oxygen production in year *y* (tCO_2);
$BE_{air,y}^{EAF\,1}$ Emissions associated with air production in year *y* (tCO_2).

Emissions from electricity is determined according to the following formula:

$$BE_{el,\,y}^{EAF\,1} = BEL_y^{EAF\,1} \times EF_{el,\,y} \quad (3)$$

Where:

$BEL_y^{EAF\,1}$ Electricity consumption of electric arc furnace and ladle furnace in year *y* (MWh);
$EF_{el\,,y}$ Carbon emission factor of electricity grid of Russia in year *y* (tCO_2/MWh).

Emissions are associated with coke productions are determined according to the following formulas:

$$BE_{coke,y}^{EAF1} = BC_{y}^{EAF1} \times EF_{coke} \ (4)$$

Where:

BC_{y}^{EAF1}	Coke consumption in year *y* (tonnes);
EF_{coke}	Default emission factor of coke production[28] (tCO_2/tonne of coke).

Emissions are associated with lime productions are determined according to the following formulas:

$$BE_{lime,y}^{EAF1} = BL_{y}^{EAF1} \times EF_{lime} \ (5)$$

Where:

BL_{y}^{EAF1}	Lime consumption for EAF#1 in year *y* (tonnes);
EF_{lime}	Default emission factor of lime production[29] (tCO_2/tonne of lime).

The fuel is burnt during melting in the EAF. Emissions from natural gas combustion are calculated according to the formula 6. Coke isn't used as fuel. It is additive in furnace feed, but when being combusted it generates CO_2 emissions. Therefore this emission from coke combustion is calculated according to the formula 6 too but NCV for coke is defined accordingly IPCC[30].

$$BE_{gas,y}^{EAF\,1} = BF_{gas,\ y}^{EAF\,1} \times EF_{gas} \times NCV_{gas,\ y} \ (6)$$

Where:

$BE_{gas,y}^{EAF\,1}$	Emissions from natural gas combustion in year *y* (tCO_2);
$BF_{gas,y}^{EAF\,1}$	Natural gas consumption in year *y* (tonne or m^3);
EF_{gas}	Emission factor of natural gas (tCO_2/GJ);
$NCV_{gas,y}$	Net Calorific Value of natural gas in year *y* (GJ/m^3).

Electrodes are raw materials. Emissions from raw materials (RM) consumption are calculated according to the following formula:

$$BE_{RM,y}^{EAF1} = \sum_{i} BRM_{RM\_i,\ y}^{EAF1} \times EF_{RM\_i} \ (7)$$

Where:

$BRM_{RM\_i,y}^{EAF1}$	RM *i* (electrodes) consumption in year *y* (tonne of RM);
$EF_{RM\_i,y}$	RM *i* emission factor (tCO_2/tonne of RM) [31].

Emissions associated with oxygen production are calculated according to the following formula:

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[28] IPCC Guidelines for National Greenhouse Gas Inventories (2006), Volume 3, Chapter 4, page 25.

[29] IPCC Guidelines for National Greenhouse Gas Inventories (2006), Volume 3, Chapter 2, page 22.

[30] 2006 IPCC Guidelines on National GHG Inventories, http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html Volume 2, table 1.2.

[31] EF of electrodes is calculated accordingly IPCC electrodes carbon content, 2006 IPCC Guidelines on National GHG Inventories, , Volume 3, Chapter 4, page 27.

$$BE_{oxy,y}^{EAF1} = BO_{oxy,y}^{EAF1} \times BEC_{oxy,y} \times EF_{el,y} \quad (8)$$

Where:

$BO_{oxy,y}^{EAF1}$ Oxygen consumption in year y (m^3);

$BEC_{oxy,y}$ Specific energy consumption for oxygen production (MWh/m^3);

$EF_{el,y}$ Carbon emission factor of electricity grid of Russia in year y (tCO_2/MWh).

Emissions associated with air production are calculated according to the following formula:

$$BE_{air,y}^{EAF1} = BA_{airy,y}^{EAF1} \times BEC_{air,y} \times EF_{el,y} \quad (9)$$

Where:

$BA_{air,y}^{EAF1}$ Air consumption in year y (m^3);

BEC_{air} Specific energy consumption for air production (MWh/m^3);

$EF_{el,y}$ Carbon emission factor of electricity grid of Russia in year y (tCO_2/MWh).

Emission factor of EAF#1 is calculated according to the following formula:

$$EF_{y}^{EAF1} = \frac{BE_{y}^{EAF1}}{BP_{y}^{EAF1}} \quad (10)$$

Project fixed parameters

Average technical parameters of compressed air and oxygen production

The data of technical parameters of the compressed air and oxygen production at Amurmetal in 2005-2007 and average amounts are presented in Table Anx.2.2 below:

Table Anx.2.3: Technical parameters of the compressed air and oxygen production

Parameter	Unit	2005	2006	2007	Average
Compressed air production	1000m3	271,023	275,983	267,461	271,489
Electricity consumption for air production	MWh	35,266	48,321	37,866	40,484
Specific energy consumption factor for air production	**$MWh/1000m^3$**	**0.130**	**0.175**	**0.142**	**0.149**
Oxygen production	1000m3	62,002	66,351	72,615	66,989
Electricity consumption for oxygen production	MWh	60,656	53,433	68,517	60,869
Specific energy consumption factor for oxygen production	**$MWh/1000m^3$**	**0.978**	**0.805**	**0.944**	**0.909**

The specific energy consumptions are calculated according to the following formula:

$$EC_j = \frac{EC_{j,y}}{BP_{j,y}} \qquad (11)$$

Where:

EC_j	Specific energy consumption parameter *j* (MWh/1000m^3);
$EC_{j,y}$	Total electricity consumption for *j* production in year *y* (MWh);
P_{j_y}	Total production of *j* in year *y* (1000m^3);
j	Air, oxygen;
y	Years 2005, 2006, 2007.

Average parameters (for the three years) are calculated according to Formula 1 too.
The average specific energy consumption for air production (EC_{air}) is **0.149** MWh/1000m^3 and fixed ex-ante. The average specific energy consumption for oxygen production (EC_{oxy}) is **0.909** MWh/1000m^3 and fixed ex-ante.

Baseline emission factor for incremental production

Methodological approach
The baseline emissions of the incremental production are calculated on the basis of steel production covered by the third party producers.
The steel industry is a transparent market where standardized types of steel products exist. Within a certain region or country steel can be transported from the producer to the consumer without constrains.

A similar situation exists in an electricity system where electricity can be transported from the producer to the consumer without significant transmission constraints. Given the similarity, the following approach takes into account the underlying principles of the "Tool to calculate the emission factor for an electricity system" (version 02) (hereinafter referred to as "CDM Tool"), adopted by the CDM Executive Board, which deals with the capacity additions to the electricity grid.

About the steel industry and emissions
Steel production is a complex and multilevel process. It consists of:
- Sinter (or pellet) production;
- Coke production;
- Iron production;
- Steel production (there are three steelmaking methods – Basic Oxygen Furnace, Electric Arc Furnace and Open Hearth Furnace);
- Other auxiliary production.

Most of the big metal works are integrated facilities comprising all these production stages but some enterprises outsource some stages like sinter and coke production. Also there are secondary steelmaking facilities having steelmaking process only based on scrap.

At each stage different types of fuels are burned and different types of raw materials are used. Emissions from these fuels and raw materials are direct emissions. Also there are indirect emissions which are associated with electricity consumption.

For steel production iron is used as raw material and for iron production coke and sinter (or pellet) are used as raw materials. Therefore total emissions at the each stage include emissions from previous stages, for example, emissions from iron production include emissions from used energy resources and used raw material at this stage and emissions which are associated with coke and sinter (pellet) production.

At each stage some energy resources are used, for example: coal, natural gas, mazut, coke, electricity and etc. Also almost at each production stage derived gases are being produced, which are used in other stages of production:

- Sinter gas is produced during the sinter production;
- Coke oven gas and coke breeze are produced during coke production. They are used in sinter, iron, steel production and also for electricity and heat production at the local power plants or boilers,
- Blast furnace gas is produced during iron production and it can be used in the sinter, coke, iron production, for electricity and heat production and in rolling process (in the heating furnaces).

Therefore when emissions are being calculated at each stage emissions from derived gases combustion offsite should be excluded.

Multiple default emission factors
In accordance with IPCC Guidelines[32] there are three methods for calculating CO_2 emissions by steel industry:

- Tier 1 method – calculation of emissions is based on the production data at all stages of production;
- Tier 2 method – calculation of emissions is based on the data of energy resources and raw materials consumption;
- Tier 3 method – the use of facility's emission data.

All these methods take into account only direct emissions (from fuel, limestone and etc.) and don't take into account indirect emissions (from electricity, oxygen production and etc.). Also they don't take into account indirect emissions associated with raw materials (iron, coke, sinter and pellet) production at the previous stages for non-integrated facilities. Therefore indirect emissions should include in total emissions for purpose JI project.

Tier 3 and Tier 2 methods are preferably to use for emission calculations (with indirect emissions).

Tier 1 method can use for emission calculations for sinter, pellet and coke production only if data of energy resources and raw materials consumption is not available. According to IPCC Guidelines multiple default emission factors for Tier 1[33] are:

- for sinter production – 0.2 tCO_2/tonne of sinter;
- for pellet production – 0.03 tCO_2/tonne of pellet;
- for lime production – 0.75 tCO_2/tonne of lime;
- for coke production – 0.56 tCO_2/tonne of coke.

But it is impossible for iron and steel production as the most CO_2 (approximately 70 %) is emitted at these stages (see discussion tree of IPCC Guidelines[34]).

Methodological approach of emission factors calculation using Tier 2 method for steel and iron production (when Tier 1 multiple default emission factors are used for coke, sinter (pellet) production) are described below.

[32] 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

[33] These factors are more conservative than emission factors of sinter (pellet) and coke production calculated in accordance with Tier 2 method because they don't include indirect emissions.

[34] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 4: Metal Industry Emission, p.4.19.

Calculation of emission factors for iron production
Iron production emission factor is calculated according to the following formula:

$$EF_y^{iron} = \frac{E_y^{iron}}{IP_y} \quad (12)$$

Where:

EF^{iron}	Iron production emission factor (tCO_2/tonne of iron);
E_y^{iron}	Iron production emissions in year *y* (tCO_2);
IP_y	Iron production by metal works in year *y* (tonnes).

Iron production emissions inclusive emissions from burned fuels, raw materials and emissions associated with sinter (pellet) and coke production are calculated in accordance with following formula:

$$E_y^{iron} = \sum_i Fuel_y^i \times NCV_{fuel\_i,y} \times EF_{fuel\_i} + \sum_j RM_y^j \times EF^j - (\sum_k SER_y^k \times CO_y^k) \times \frac{28}{22.4} \times \frac{88}{56} + E_y^{sin} + E_y^{pel} + E_y^{coke} \quad (13)$$

Where:

E_y^{iron}	Iron production emissions in year *y* (tCO_2);
$Fuel_y^i$	Fuel *i* (gas, coal, coke) consumption in year *y* (tonnes or m^3);
RM_y^j	Raw material *j* (limestone, dolomite and etc) consumption in year *y* (tonnes);
SER_y^k	Secondary energy resource *k* (blast furnace, coke oven gases) output in year *y* (1000 m^3);
CO_y^k	Carbon oxide content in *k* (blast furnace, coke oven gases) in year *y* (fraction);
28	Molar weight of carbon oxide;
22.4	Gas molar volume (Avogadro's law);
88	Molar weight of two molecule of carbon dioxide ($2CO + O_2 \rightarrow 2CO_2$);
56	Molar weight of two molecule of carbon oxide ($2CO + O_2 \rightarrow 2CO_2$);
EF_{fuel_i}	Emission factor of fuel of type *i* including coke (tCO_2/GJ);
$NCV_{fuel\_i,y}$	Net Calorific Value of fuel of type *i* in year *y* (GJ/(tonnes or m^3));
E_y^{sin}	Sinter consumption emissions in year *y* (tCO_2);
E_y^{pel}	Pellet consumption emissions in year *y* (tCO_2);
E_y^{cok}	Coke consumption emissions in year *y* (tCO_2).

Sinter (pellet) and coke production emissions are calculated in accordance with the following formulae:

$$E_y^{cok} = Coke_y \times EF^{cok} \quad (14)$$

$$E_y^{sin} = Sin_y \times EF^{sin} \quad (15)$$

$$E_y^{pel} = Pel_y \times EF^{pel} \quad (16)$$

Where:

$E_y^{\sin}$	Sinter consumption emissions in year *y* (tCO_2);
E_y^{pel}	Pellet consumption emissions in year *y* (tCO_2);
E_y^{cok}	Coke consumption emissions in year *y* (tCO_2);
Coke_y, Sin_y, Pel_y	Coke, sinter and pellet consumption in year *y* (tonnes);
EF^{cok}	Coke production emission factor equals 0.56 tCO_2/ tonne of coke;
$EF^{\sin}$	Sinter production emission factor equals 0.2 tCO_2/ tonne of sinter;
EF^{pel}	Pellet production emission factor equals 0.03 tCO_2/ tonne of pellet.

Calculation of emission factors for steel production

There are three steelmaking methods – Basic Oxygen Furnace (BOF), Electric Arc Furnace (EAF) and Open Hearth Furnace (OHF). Each method differs from others by: type of fuel, iron share in the fusion mixture, etc. Emission for steel production is calculated according to the following formula:

$$E_y^{steel,\ m} = \sum_i Fuel_y^i \times NCV_{fuel\_i,\ y} \times EF_{fuel\_i} + \sum_j RM_y^j \times EF^j + EF_{el,\ y}^{RPS\_n} \times EL_y + E_y^{iron} \qquad (17)$$

Where:

$E_y^{steel,m}$	Steel production emissions by steelmaking method *m* in year *y* (tCO_2);
$Fuel_y^i$	Fuel *i* (gas, coal) consumption in year *y* (tonnes);
RM_y^j	Raw material *j* (limestone, electrodes, lime) consumption in year *y* (tonnes);
EL_y	Electricity consumption in year *y* (MWh);
EF_{fuel_i}	Emission factor of fuel type *i* including coke (tCO_2/GJ);
$EF_{el,\ y}^{RPS\_n}$	Carbon emission factor of electricity grid of national (regional) power system *n* in year *y* (tCO_2/MWh);
$NCV_{fuel\_i,\ y}$	Net Calorific Value of fuel of type *i* in year *y* (GJ/(tonnes or m^3));
E_y^{iron}	Iron consumption emissions in year *y* [tCO_2).

Where iron consumption emissions are calculated as follows:

$$E_y^{iron} = Iron_y \times EF_y^{iron} \qquad (18)$$

Where:

E_y^{iron}	Iron consumption emissions in year *y* [tCO_2);
$Iron_y$	Iron consumption in year *y* (tonnes);
EF^{iron}	Iron production emission factor (tCO_2/tonne of iron)..

Emission factor for steel production of method *m* is calculated according to the following formula:

$$EF_y^{steel,m} = \frac{E_y^{steel,m}}{SP_y^m} \qquad (19)$$

Where:

$EF^{steel,m}$	Steel production emission factor by steelmaking method *m* in year *y* (tCO_2/tonne of steel);
$E_y^{steel,m}$	Steel production emissions by steelmaking method *m* in year *y* (tCO_2);
SP_y^m	Steel production by metal works using steelmaking method *m* in year *y* (tonnes).

The CO_2 emission factor of steel production incremental part by calculating the "operating margin" (OM) and "build margin" (BM) as well as the "combined margin" (CM). The operating margin refers to a cluster of metallurgical works whose steel production would be affected by the proposed JI project. The build margin refers to a cluster of metallurgical works whose construction would be affected by the proposed JI project.

Operating margin (OM) emission factor

It is not feasible to define exactly which other existing metal works would produce the incremental amount of steel. The most transparent approach is to calculate the weighted average of specific CO_2 emission factor.

$$OM_y = \frac{\sum_m E_y^{steel,m}}{\sum_m SP_y^m} \qquad (20)$$

Where:

OM_y	Emission factor or Operating Margin for steel production in year *y* (tCO_2/tonne of steel);
$E_y^{steel,m}$	Steel production emissions by steelmaking method *m* in year *y* (tCO_2);
SP_y^m	Steel production by metal works using steelmaking method *m* in year *y* (tonnes).

Build margin (BM) emission factor

In absence of the project, a competitor could decide to build new metal works/installations or extend an existing steel production capacity to meet the market demand. It is not feasible to define exactly what new metallurgical works/installations would be built and produce the incremental amount of steel. Four options can be applied to calculate the BM emissions:

a) The five most recent capacity additions built within the last 10 years are taken into account. This approach is applicable if relevant capacity additions can be observed;
b) Alternatively, five new capacity additions planned for the near future can be taken into account, if their implementation is realistic/probable;
c) Provided objective data exist, it can be assumed, for reasons of conservativeness, that an installation would be built based on Best Available Technology (BAT) of steel production;
d) If no recent capacity additions have occurred and it is unclear which new installations will be built or when, it is reasonable and most realistic to assume the BM emission factor to be zero ex-ante, but monitor it during the crediting period ex-post. In this context, the five most recent capacity additions built within the last 10 years (or all, if less than five exist) are taken into account, in accordance with the formula below.

$$BM_y = \frac{\sum_i E_y^{steel,i}}{\sum_i SP_y^i} \qquad (21)$$

Where:

BM_y	Emission factor or Build Margin for steel production in year *y* (tCO_2/tonne of steel);

$E_y^{steel,i}$ Emission at the new metallurgical works/installations *i* in year *y* (tCO_2/tonne of steel);

SP_y^i Steel production of new metallurgical works/installations *i* in year *y* (tonnes).

The BM_y emission factor can either be calculated and fixed ex-ante for the whole crediting period, or estimated ex-ante and monitored and calculated ex-post in case of option a), it is fixed ex-ante in case of options b) and c), and it is monitored and calculated ex-post in case of option d).

Combined margin (CM) emission factor

The CM emission factor is calculated by weighing the OM emission factor and the BM emission factor on a 50 % / 50 % basis.

$$CM_y = \frac{OM_y + BM_y}{2} \qquad (22)$$

Where:

CM_y CM emission factor for incremental steel production (tCO_2/tonne of steel).

The CM emission factor is used for estimating/calculating the baseline emissions of the incremental production, unless the BM emission factor is zero, as described in option d) above. In the latter case, only the OM emission factor is taken into account.

In principle, the CM emission factor can both be calculated and fixed ex-ante for the whole crediting period or estimated ex-ante and monitored and calculated ex-post.

JI projects with a final positive determination under the JI Track 2 procedure and projects approved under the JI Track 1 procedure[35] and shown accordingly on the UNFCCC JI website are excluded from the sample units for the OM/BM/CM emission factor calculation.

If the data required to calculate the OM/BM/CM emission factors for year y is only available later than six months after the end of year y, the emission factors of the previous year (y-1) may be used. If the data is only available for more than 18 months after the end of year y, the emission factors of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout the crediting period.

<u>Application of methodological approach</u>

Background data for the calculation of the OM emission factor

Information on the metallurgical works and emissions and emission factors calculation for iron production in 2007 are presented in the Table Anx.2.4.

Table Anx.2.4: Results of emissions and emission factors calculations for iron production

Facility	Iron production	Total emissions	Emission factors
	Tones	tCO_2	tCO_2/tonne of iron
JSC "MMK"	9,482,448	15,900,695	1.677
JSC "NTMK"	5,333,614	9,171,425	1.720

[35] Under the JI Track 1 procedure, it is the sole responsibility of the Host Party to verify emission reductions (or enhancements of removals) as being additional to any that would otherwise occur.

JSC "NKMK"	1,471,977	2,923,987	1.986
JSC "Uralsteel"	2,791,373	5,014,937	1.797
JSC "Cherepovecky MK"	8,758,538	13,328,789	1.522
JSC "NLMK"	9,050,188	17,121,344	1.892
JSC "ZSMK"	5,246,170	8,875,330	1.692
JSC "Kosogorsky MK"	279,611	515,213	1.843
JSC "Chusovskoy MZ"	610,996	1,109,560	1.816
JSC "Verhnesaychihinsky MZ"	163,374	403,683	2.471
JSC "TulaCherMet"	2,663,584	4,344,263	1.631
JSC "Chelyabinsky MK"	3,685,893	6,548,669	1.777
JSC "MZ imeni Serova"	366,642	635,354	1.733
JSC "Svobodny Sokol"	514,391	863,393	1.678
Total	**50,418,799**	**86,756,641**	**1.721**

Source: LLC "Korporatsiya proizvoditeley chernykh metalov"

Iron production emission factor is equal to **1.721** tCO_2/tonne of iron (see Table Anx.2.4).

Data of electricity consumption by blast furnaces and electricity used for compressed air production is not available. Therefore emissions associated with this electricity consumption don't include the emissions from the mentioned above sources.

This emission factor is estimated ex-ante and monitored and calculated ex-post.

Information on the metallurgical works and emissions and emission factors calculation for steel production are presented in the Table Anx.2.5.

Table Anx.2.5: Emission factors and Operating Margin calculation for steel production

Method	Emissions	Steel	EF
	tCO_2	tonnes	tCO_2/tonne of steel
Basic Oxygen Furnace	**66,386,529**	**41,207,039**	**1.611**
Electric Arc Furnace	**9,637,454**	**16,913,311**	**0.570**
Open Hearth Furnace	**10,497,965**	**8,030,412**	**1.307**
Operating Margin	**86,521,948**	**66,150,762**	**1.308**

Source: LLC "Korporatsiya proizvoditeley chernykh metalov"

OM emission factor in 2007, which is equal to **1.308** tCO_2/tonne of steel.

The OM_y emission factor is estimated ex-ante for the purpose of emission reduction estimation in sector E and monitored and calculated ex-post.

Background data for the calculation of the BM emission factor
Some new metallurgical works/installations have been built recently and are presented in the Table Anx.2.6. But they may get JI status.

Table Anx.2.6: New metal works (installations) in Russia

Metal works (installations)	Commissioning year	Method	Status
JSC "MMK" (two furnaces)	2006	EAF	JI
JSC "MZ imeni Serova"	2006	EAF	n/a
JSC "Amurmetal"	2008	EAF	JI
JSC "Rostovsky electometallurgichesky zavod"	2007	EAF	JI

More new metallurgical works/installations were planned in Russia, but, due to the financial crisis, it is unclear whether they will be commissioned at all or at least in the near future.

Therefore, it is reasonable and most realistic to assume the BM emission factor to be zero ex-ante, but monitor it during the crediting period ex-post. In this context, the five most recent capacity additions built within the last 10 years (or all, if their quantity is less than five) are taken into account.

OM or CM emission factor
The OM emission factor is estimated ex-ante and monitored and calculated ex-post.

For the reasons mentioned above, the BM emission factor is set to be zero ex-ante, but monitored during the crediting period ex-post. If none relevant capacity additions can be identified, the OM emission factor is applied, otherwise the CM emission factor is used on a 50 % / 50 % basis.

The baseline emission factor for the incremental steel production (BEF_y^{inc}) is therefore can be estimated ex-ante, the level of the ex-ante OM emission factor. During the crediting period it is either the relevant ex-post OM or CM emission factor, in accordance with the definition above.

The key data used to establish the baseline in tabular form is presented below.

Data/Parameter	$BP_{cap}^{EAF\,1}$
Data unit	Tonnes
Description	Steel production of EAF#1
Time of determination/monitoring	Ex ante
Source of data (to be) use	Plant records
Value of data applied (for ex ante calculations/determinations)	614,891
Justification of the choice of data or description of measurement methods and procedures (to be) applied	It is defined according to the technical documentation of Amurmetal.
OA/QC procedures (to be) applied	Steel production of EAF#1 was calculated as average for three years according to the plant technical report. Steel production is calculated as sum of daily reports of Production department during a year. Annual data is being checked. The check is based on the annual technical report and weighing of goods.
Any comment	This parameter is calculated as average for 2005-2007 years.

Data/Parameter	PP_y
Data unit	Tonnes

Description	Total steel production in the project scenario in year *y*
Time of determination/monitoring	During the crediting period
Source of data (to be) use	Plant records
Value of data applied (for ex ante calculations/determinations)	2,131,000
Justification of the choice of data or description of measurement methods and procedures (to be) applied	It is defined according to the technical documentation of Amurmetal.
OA/QC procedures (to be) applied	Steel production will be calculated as sum of daily reports of Production department during a month. Monthly data is checked. The check is based on the monthly technical report and weighing of goods.
Any comment	-

Data/Parameter	EF^{EAF1}
Data unit	tCO_2/tonnes of steel
Description	Emission factor of EAF#1
Time of determination/monitoring	Ex ante
Source of data (to be) use	Plant records
Value of data applied (for ex ante calculations/determinations)	0.563
Justification of the choice of data or description of measurement methods and procedures (to be) applied	It is defined according to the technical documentation of Amurmetal.
OA/QC procedures (to be) applied	-
Any comment	This parameter is calculated as average for 2005-2007 years.

Data/Parameter	BEF_y^{incr}
Data unit	tCO_2/tonnes of steel
Description	Baseline emission factor for incremental steel production in year *y*
Time of determination/monitoring	Ex ante (or ex-post)
Source of data (to be) use	LLC “Korporatsiya proizvoditeley chernykh metalov” annual statistical report “Russian Chermet information “. This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	1.308 (2007 year)
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The approach of “Tool to calculate the emission factor for an electricity system” is used. IPCC default values are used for CO_2 emission factor of fossil fuels. The default grid emission factors for the regional power systems of Russia are used. Please see Annex 2 for more detail information.
OA/QC procedures (to be) applied	-
Any comment	If data required to calculate the baseline emission factors for the year y is usually available six months later after the end of the

	year y, alternatively emission factors of the previous year (y-1) may be used. If data is available latter than 18 months after the end of year y, emission factors of the year preceding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout the crediting period. After the data for the last three years is available, emission factor may be fixed ex-ante as three-year average.

Standardized electricity grid emission factor

In this PDD, a standardized CO_2 emission factor is used to calculate emissions related to electricity consumption in the project and baseline scenarios.

Standardized CO_2 emission factors were elaborated for Russian power systems in the Study commissioned by "Carbon Trade and Finance SICAR S.A." [36].

Based on approved CDM "Tool to calculate the emission factor for an electricity system" (version 01.1), operating, build and combined margin emission factors were calculated for seven regional Russian electricity systems (RESs). Within these RESs no major transmission constraints exist, while they operate at the same time relatively "independently" from each other (i.e. electricity exchange between regional systems is rather insignificant).

For the PDD at hand, emission related characteristics of the relevant regional electricity system, RES "East", the largest unified power system of the national energy system of Russia, were taken into account.
For calculation of emission from baseline replacement part and project is applied and fixed ex-ante

$EF_{el,y}$ = 0.823 tCO_2/MWh.

For calculation of emission from baseline incremental part is applied and fixed ex-ante

Regional power system	**EF_{CM} (tCO_2/MWh)**
"Center"	0,511
"North-West"	0,548
"Mid Volga"	0,506
"Urals"	0,541
"South"	0,5
"Siberia"	0,894
RES "East"	0,823

[36] The study "Development of grid GHG emission factors for power systems of Russia" commissioned by "Carbon Trade and Finance" in 2008.

Annex 3

MONITORING PLAN

See Section D for monitoring plan.