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

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

Energy Efficiency measures at OJSC "Metallurgical plant named after A.K. Serov" UMMC Company.

Sectoral scope 9: Metal production[1].

PDD version 2.2.

28 February 2011.

A.2. Description of the project:

Enterprise description
Metallurgical plant in Serov town (hereinafter MZIS) was founded on 29 March 1894. The plant launch was connected with construction of Trans-Siberian railroad. The first steel was produced on 19 January 1896 and the first railroad rails were rolled on 3 March 1896.

Now Open Joint-Stock Company "Metallurgical plant named after A.K. Serov" (http://www.serovmet.ru/en/about/) is a part of the largest Russian holding - Ural Mining and Metallurgical Company (UMMC, http://www.ugmk.com/en/). The plant is an integrated iron-and-steel works. Now MZIS comprises the following production shops:

- Agglomeration factory (two sintering machines);
- Blast-furnace shop (three blast furnaces);
- Steelmaking shop (electric arc furnace);
- Heavy section shop (rolling mill "850");
- Section rolling shop (medium-section mill "450" and light-section mill "320");
- Calibration shop (two departments).

It produces more than 200 grades of high quality steel and other kinds of products.

Also MZIS has a power plant (named the Central Power Plant – CPP) with capacity 18 MW. It produces electricity, heat, compressed air and blast-furnace air.

Project purpose
The proposed project was implemented at the steelmaking shop of MZIS. A new electric arc furnace (EAF) was constructed at the steelmaking shop instead of five open hearth furnaces (OHF). The electric-furnace steelmaking method is more energy efficient in comparison with the open-hearth method. Also more scrap can be used in this technology and, respectively, less volume of cast iron (liquid iron from the blast furnace shop).

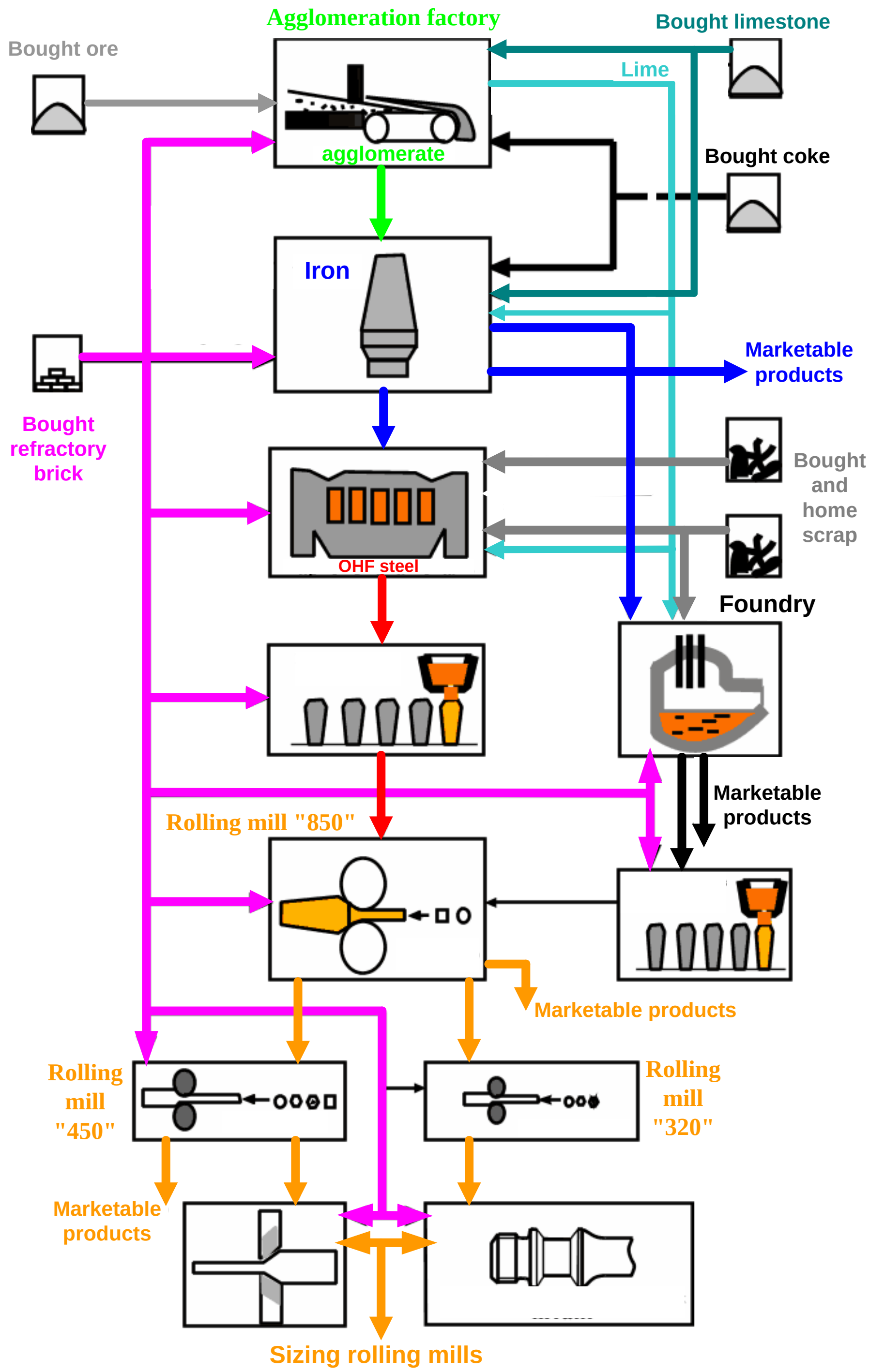
The goal of the proposed Joint Implementation (JI) project is to reduce GHG emission by application of a more energy efficient technology for steel production.

Situation existing prior to the project
As stated above MZIS is an integrated iron-and-steel works. The ore, limestone, dolomite, coke, etc. are delivered to MZIS from other facilities. Agglomerate (sinter), steel-making and foundry iron and other raw

[1] http://ji.unfccc.int/Ref/Documents/List_Sectoral_Scopes_version_02.pdf

materials (for example, burned lime) are produced at the plant. The scheme of the steel production existed before 2003 is presented in Figure A.2.1.

Figure A.2.1: The scheme of the steel production existed before 2003



Agglomerate (sinter) and burned lime are produced at an agglomeration factory. Ore, additives (e.g. limestone), coke breeze, iron-bearing recycled materials and other are used for sinter production. During sinter production process there is CO_2 emission associated with fuel burning, oxidation of the coke breeze and other inputs.

Also there is CO_2 emission associated with limestone burning at this stage:

$$CaCO_3 + heat \Rightarrow CaO + CO_2$$
$$MgCO_3 + heat \Rightarrow MgO + CO_2$$

The factory also receives stores and ships dolomite. The factory supplies sinter to the blast-furnace shop and sinter, dolomite and lime to the steelmaking shop.

Blast-furnace shop (BFS) consists of three blast furnaces. The purpose of blast furnace (BF) is to chemically reduce and physically convert iron oxides into liquid iron for the steelmaking shop. Sinter (iron oxides and lime), coke (carbon) and limestone are loaded into the top of BF and preheated air (blast-furnace air) is blown through tuyere stock. The main reactions into BF are presented below:

$$C + O_2 \Rightarrow CO_2 + heat$$
$$CO_2 + C \Rightarrow 2CO$$
$$3Fe_2O_3 + CO \Rightarrow CO_2 + 2Fe_3O_4$$
$$Fe_3O_4 + CO \Rightarrow CO_2 + 3FeO$$
$$FeS + CaO + C \Rightarrow CaS + FeO + CO$$
$$FeO + CO \Rightarrow CO_2 + Fe$$
$$FeO + C \Rightarrow CO + Fe$$

As a result of this process is the liquid iron is formed. Liquid iron consists of iron (93-95%), carbon (4.1-4.4%) and other components (Si, S, Mn, P, Ti and others). Available capacity of BFS is approximately 370,000 tonnes of liquid iron per year. Some part of liquid iron (about 0.1 % of total liquid iron) is used for iron casting production.

CaS becomes part of the slag. The slag is also formed from any remaining silica (SiO_2), alumina (Al_2O_3), magnesia (MgO) or calcium (CaO) that entered with the iron ore, sinter or coke. Other products of blast-furnace production are blast-furnace gas (BFG). BFG is composed of CO_2 (12-20%), CO (20-30%), CH_4 (0.5%), H_2 (1-8%), N_2 (50-58%) and others. Some part of BFG (about 26-28%) is used at BFS for an air preheating and other part – at rolling mills (heating furnaces) and at CPP for electricity, heat, compressed air and blast-furnace air production.

Liquid iron is moved to OHF shop. Before 2003 there were five OHFs (# 2-5, 8) of load 180 tonnes each of them. OHF steel after the treatment in the ladle furnace was cast into moulds of capacity 4.5, 5.25 and 5.5 tonnes using siphon method. Then main amount of valid steel was directed to a rolling mill 850 (and further to other rolling mills and calibration shop) and other steel was supplied to customers.

In 2003 at the steelmaking shop a ladle furnace (LF) for out-of furnace steel treatment, ladles for steel transportation and tapping-ladle cradles for heating, de-airing and weighting of ladles were put into operation. The ladle furnace, ladles and tapping-ladle cradles were produced by Italian company Danieli. Using of the ladle furnace enables to produce semifinished steel in OHFs and to dress it in LF that allows decreasing of melting time and increasing of steel production.

Baseline scenario
In the baseline scenario entire technological process of steel production, including five OHFs (# 2-5, 8), operates without any changes. Natural gas and heavy fuel oil are used as fuel. Annual maximum steel production is more than 720 thousand tonnes. Iron and scrap are used for steel production at a ratio of

0.49/0.51 (in metal stock). Other main technical parameters of OHFs (actual data) are presented in Annex 2. In 2008 a vacuum degassing unit is put into operation at the steelmaking shop. Some part of steel after LF s treated in the unit that enables to improve steel quality.

Project scenario
In the project scenario the existing five open hearth furnaces are dismantled in the steelmaking shop and the new electric arc furnace (EAF) is installed. This furnace's planned production capacity is 720 thousand tonnes per year. Description and technical parameters of the EAF are presented in Section A.4.2. The same as in the baseline scenario, the vacuum degassing unit was put into operation in 2008. Other technical processes of steel production operate without any changes. GHG emission is reduced because the new EAF consumes fossil fuel in significantly lower amount than OHFs. Also liquid iron consumption per tonne of steel is decreased and GHG emission associated with liquid iron production is decreased too.

At the end of 2003 UMMC Holding concluded a contract with Italian company "Danieli" about a delivery of a new electric arc furnace. Development of a project design was stated in 2004. At the end of 2006 the first melting was made in the new EAF. The project was considered as JI at the technical meeting in the middle 2003. However the project realization as JI was delayed till the acceptance of National approval procedure. In February 2008 Global Carbon offered UMMC Holding to realize some UMMC projects (including the proposed project) as JI. Finally UMMC Holding and Global Carbon concluded contract for implementation of proposed project as JI in 2010 (after the acceptance of National approval procedure in November 2009).

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)	UMMC Holding Co Ltd	No
Party B: The Netherlands	Global Carbon BV	No

Role of the Project Participants:

- UMMC Holding Co Ltd is the management company of the large Russian holding - Ural Mining and Metallurgical Company (UMMC). The holding consists of many facilities of mining industry, ferrous and nonferrous metallurgy, including OJSC "Metallurgical plant named after A.K. Serov" (since 2000). MZIS is an integrated iron-and-steel works which has its own raw material base and manufactures more than 200 grades of high quality steel and other kinds of products. Production of the Metallurgical plant is exported to Great Britain, the USA, Germany, Italy, Turkey, Korea and other countries. UMMC Holding Co Ltd will own ERUs generated. UMMC Holding Co Ltd is a project participant;
- Global Carbon BV is a leading expert on environmental consultancy and financial brokerage services in international greenhouse emissions trading market under Kyoto Protocol. Global Carbon BV is a project design document (PDD) developer including monitoring plan and baseline setting. Global Carbon BV has developed the first JI project that has been registered at United Nations Framework Convention on Climate Change (UNFCCC). The first verification under JI mechanism was also

completed for Global Carbon BV project. The company focuses on Joint Implementation (JI) project development in Bulgaria, Ukraine and 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:

The project is located at MZIS in Serov town in the Sverdlovsk area of the Russian Federation. The capital of Sverdlovsk area is Yekaterinburg. The geographical location of the project is presented in Figure A.4.1.1 below.

Figure A.4.1.1: Location of the project on the Russian Federation map

A.4.1.1. Host Party(ies):

The Russian Federation.

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

Sverdlovsk Area is located in the Ural region of the Russian Federation. The population of the area is approximately 4.4 mln. (5th place in Russia) and the surface area is approximately 194 thous.km^2 (17th place in Russia)[2].

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[2] http://ru.wikipedia.org

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

Serov town is located within Sverdlovsk area. The coordinates of the town are 59°60'N, 60°59'E.

Serov was founded in nineteenth century as a workmen's settlement. Now it is the fifth town of Sverdlovsk area with a population of approximately 98.5 thousand people and is the large industrial town. Besides MZIS large enterprises OJSC "Serov Ferro-alloy Plant" and "Serov mechanical plant" are located in Serov.

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

The project is located at MZIS in Serov town boundaries (see Figure A.4.1.4.1).

Figure A.4.1.4.1: Satellite image of Serov town with MZIS (marked by a red oval)

MZIS business address is Serov town, Aglomeratchikov Street, building 6[3]. The coordinates of MZIS are 59°60'N, 60°59'E[4].

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

[3] MZIS charter

[4] GPS MZIS coordinates

New EAF made by Danieli (Italy) was constructed at the steelmaking shop. Danieli is ranked among the three largest suppliers of plants and equipment for the metals industry worldwide (http://www.danieli.com/). New installation consists of:

- Electric arc furnace;
- Transformer;
- Gas-cleaning system;
- Casting-ladle transfer car;
- Automatic feed system;
- Other equipment.

Using of EAF enables to decrease iron consumption (iron production leads to significant CO_2 emission).The scrap consumption for steel production can be from 60% to 100%.

Annual technical capacity is about 720,000 tonnes of steel per year. Other main technical parameters of EAF (for 40% of liquid iron loading) are presented in Table A.4.2.1 below.

Table A.4.2.1: Main technical data of EAF[5]

Parameter	Unit	Value
Volume of EAF (metal stock)	Tonnes of metal stock	96
Scrap	Tonnes	59.4
Liquid iron	Tonnes	27.6
Volume of EAF (steel)	Tonnes of steel	80
Transformer power	MW	85
Specific electricity consumption	kWh/tonne of steel	245
Specific electrode consumption	Kg of electrodes/tonne of steel	1.3

Source: MZIS

General description of the steelmaking process

The scrap for EAF is prepared at the drop-hammer plant of the steelmaking shop. Then the scrap and liquid iron from the BFS are loaded into the furnace. The graphite electrodes are lowered onto the scrap, and an arc is struck. Oxygen and natural gas are injected into the furnace to accelerate a melting. In addition injection of oxygen assists to the reduction of carbon content in steel. During melting the alloying additions (ferromanganese, ferronickel and etc.) are added into liquid melt. The furnace has automatic feeding system for these materials. After heating of melt up to 1650 °C it is let to a steel-pouring ladle. Semifinished steel is produced in EAF. Then semifinished steel is let to the ladle furnace for further dressing it as it was done before the project implementation.

Automatic control system controls the technological process of melting and registers of energy and raw materials consumption.

The project implementation schedule is presented in Table A.4.2.2 below.

[5] "Reconstruction of the electric furnace steelmaking with installation of EAF-80", Project Design, OJSC "URALGIPROMEZ", 2005, p.20, Table 3

Table A.4.2.2: Project implementation schedule

N	Stage	Start of works	Finish of works
1	Preliminary works	January 2004	October 2004
2	Design work	May 2004	October 2006
3	Purchase and delivery of equipment	March 2005	July 2006
4	Construction works	November 2004	November 2007
5	Starting-up works	November 2006	November 2007

Source: MZIS

The specialists of new equipment suppliers trained MZIS's personnel (engineers, operators and maintenance personnel) during start-up works at project site. Also the personal visited supplier's metallurgical plants in Italy and Germany for training.

MZIS has an ISO 9001:2008 certificate[6] and ISO 16949:2009 certificate[7]. Also Global Carbon BV will provide a staff training on monitoring procedures, ERU calculation and preparation of annual monitoring reports.

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:

Steel production in EAF is less power-intensive technology than it is with OHF using. After project implementation anthropogenic emissions of greenhouse gases from fuel consumption will be reduced by approximately 250,000 tCO_2 per year. However electricity consumption will be increased and associated GHG emission will be increased by approximately 120,000 tCO_2 per year.

Other main benefit of electric arc steelmaking process is that EAF allows using more metal scrap during steel production in comparison with OHF using. It means that liquid iron consumption is reduced and emissions of greenhouse gases are also reduced because iron production is connected with significant CO_2 emission. Emission reduction will be about 220,000 tCO_2 per year.

Emission reduction associated with other factors (for example, raw materials consumption) of steelmaking process is not significant. Volume of this emission reduction is about 10,000 tCO_2. Therefore annual emission reduction is about 360,000 tCO_2.

There are not any national and/or sectoral policies and circumstances restricting OHF technology using. Therefore in the absent of the proposed project the existed five OHFs would continue to be operated and emission reduction would not be achieved.

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.

[6] http://serovmet.ru/common/img/uploaded/serovo/37479ms_rus.pdf

[7] http://serovmet.ru/common/img/uploaded/serovo/169492010msts_rus.pdf

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	330,414
2009	177,061
2010	370,440
2011	418,834
2012	418,834
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	1,715,583
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	343,117

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	418,834
2014	418,834
2015	418,834
2016	418,834
2017	418,834
2018	418,834
2019	418,834
2020	418,834
Total estimated emission reductions over the period indicated (tonnes of CO_2 equivalent)	3,350,676
Annual average of estimated emission reductions over the period indicated (tonnes of CO_2 equivalent)	418,834

A.5. Project approval by the Parties involved:

By the time of this JI project implementation, procedures for carrying out joint implementation projects in the Russian Federation were adopted by the Russian Ministry of Economic Development's Resolution dated November 23, 2009, No.485. The Resolution was accepted on 03 February 2010 by Ministry of Justice of the Russian Federation. After the PDD has gone through the preliminary determination process, the PDD, an Expert opinion and other related documents will be submitted to Sberbank for project approval procedure as a JI Project.

The project was approved by the Netherlands on 24 January 2011 (Letter of Approval from NL Agency, Ministry of Economic Affairs, Agriculture and Innovation dated 24 January 2011).

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)[8], 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)[9] (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[10], 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.

The baseline is established in a transparent manner with regard to the choice of approaches, assumptions, methodologies, parameters, data sources and key factors. Uncertainties are taken into account and conservative assumptions are used.

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

9 http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf

10 http://ji.unfccc.int/Ref/Documents/Guidelines.pdf

Step 2. Application of the approach chosen

The basic principle applied is that the steel production is identical in the project and the baseline scenario. 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. GJ/t steel).

Key factors that affect a baseline

The project was considered in 2003 (contract with main equipment supplier – Danieli & C. – was dated 29 September 2003). The following key factors that affect the baseline are taken into account:

a) **Sectoral reform policies and legislation.** The Russian metal market is free market and the internal and foreign demands of metal develop requires for a quality and sort of metal. The main development goal of the metallurgical industry is reducing of domestic metal demand.[11] MZIS does not have any obligations for construction of new production capacity. However any project must be approved by a local administration (permission for construction) and by a local conservancy. Also the most of metallurgical plants in Russia are large enterprises. Therefore they are important for region, area or town where they are located, especially, in a social aspect: workplaces, working conditions, environmental impact and etc**;**

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)**. In the beginning of 2002 in Russia the metal production decreased. It was related to the reduction of the metal demand within Russia and in the world (more than 50% of metal produced at the Russian metallurgical plants is exported to other countries). Financial indicators of metallurgical plants had decreased as a result[12]. Then the USA, European Union and other countries introduced the restrictive measures against the metal import from Russian metallurgical companies[13]. The situation was changed at the end of 2002 only and in the beginning of 2003 the metal demand was beginning to grow. However there was not reliable forecast of steel demand in the world. Growth of metal production in 2003-2007 (2-7% per year) was replaced by the fall of one in 2008 (about 6%)[14];

c) **Availability of capital (including investment barriers).** After default which was in Russia in 1998 there was the high level of inflation. It was 15% in 2002 and 12% in 2003 (Bank of Russia data[15]). Refinancing Rate of the Central Bank of the Russian Federation was 18-21%[16]. As result a capital is available but at high bank rate (the Moscow InterBank Actual Credit Rate came up to 20% in May 2003[17]), high country investment risk and other risks make new equipment introduction in Russia unprofitable;

d) **Local availability of technologies/techniques, skills and know-how and availability of best available technologies/techniques in the future.** All technologies applied in proposed project were well known and available. Some local and foreign companies could provide technology and equipment and implement project and construction works for the project implementation;

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

[12] http://www.eurasmet.ru/unpublished/met-ind/part02.php

[13] http://www.eurasmet.ru/unpublished/met-ind/part04.php

[14] Review of metallurgical production 2008-2009, ID Marketing, 2009, Table 1

[15] Bank of Russia, Quarterly Inflation Review, 2004, Quarter 4, page 3

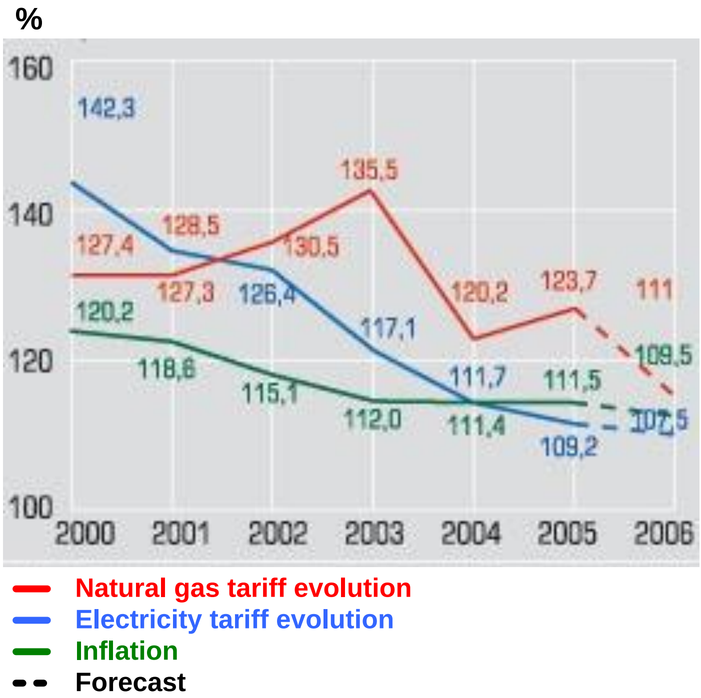
[16] Refinancing Rate of the Central Bank of the Russian Federation

[17] Moscow InterBank Actual Credit Rate

e) **Fuel prices and availability**. In the result of project implementation the fuel and liquid iron consumption is reduced and electricity consumption is increased. The following prices and availability of fuels and raw materials in the baseline scenario are important:
1. Electricity, natural gas and fuel heavy oil for steelmaking process;
2. Electricity, natural gas, coke and ore for iron production.

Electricity and natural gas are widely used and available in the Ural region of Russia and they are produced domestically. The natural gas and electricity prices were regulated by the Russian Government in 2003. In Russia they were lower than world market price. In 2003 for MZIS the tariff of natural gas was approximately 24 EUR/1000 m^3, the tariff of electricity was about 20 EUR/MWh and the one of fuel heavy oil was about 54 EUR/tonne. Before 2004 the annual growth of tariffs was 17-25% a year (it also includes inflation). Then the growth of tariffs had to decrease down to 7-10% (please see Figure B.1.1).

Figure B.1.1: Inflation and tariffs of electricity and natural gas evolution



Source: Expert-Ural[18]

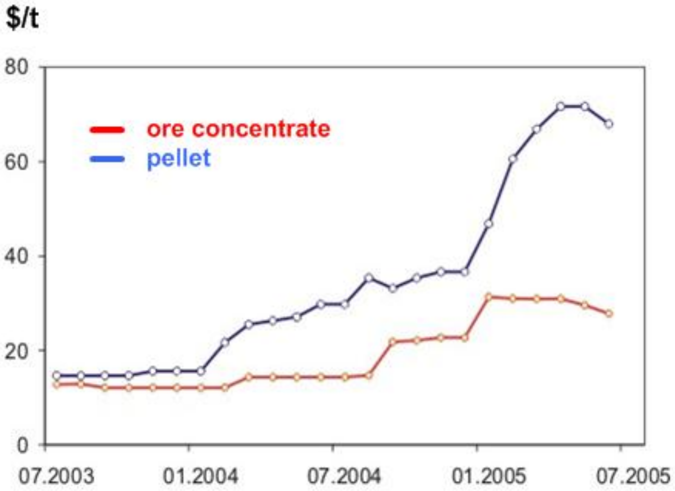
However, the forecast proved for 2006 is wrong. In 2006 the annual growth of natural gas tariff was about 16.4% and one of electricity tariff was 10.3%[19].

UMMC Holding has associated company OJSC “Bogoslovskoye mine” which produces ore concentrate for MZIS and other customers. Ore concentrate price evolution in 2003-2005 is presented in Figure B.1.2 below.

[18] "It is dawning", Expert-Ural, #6, 13 February 2006

[19] Annual report of OJSC "RAO UES of Russia", 2007

Figure B.1.2: Ore concentrate and pellet prices evolution in 2003-2005

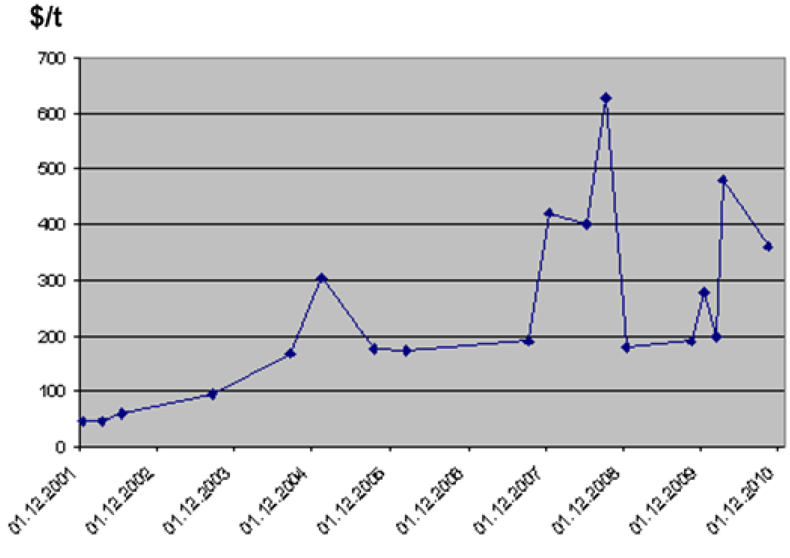


Source: National metallurgy[20]

It reached up to 200 $/tonne in the beginning of 2008 and down to 70 $/tonne in the end of 2008.

Other important fuel (raw material) for iron (steel) production is a coke. Capacity of coke production is limited, therefore when metal demand is high the coke price is very high and availability of coke is low and the opposite. Coke price evolution is presented in Figure B.1.3.

Figure B.1.3: Coke price evolution



Source: Institute ITKOR[21]*, INP of the Russian Academy of Sciences*[22]*, MetalTorg*[23]*, Metallurgical bulletin*[24]

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[20] "Raw materials market", National metallurgy, 2005

[21] "Russian coke market", Institute ITKOR, 2003

[22] Metallurgy and economic growth in Russia, INP of the RAS, 2005

[23] What does coke promise metallurgists, MetalTorg Trade System, 2005

[24] Metallurgical bulletin, 2010

Therefore there were not any reliable forecasts of main parameters of proposed project in 2003.

Conclusion
Only economic factors (prices and credit rate) affect baseline.

Listing and describing plausible future scenarios
There are three types of steelmaking furnaces:

- Basic oxygen furnace (BOF);
- Open hearth furnace (OHF);
- Electric arc furnace (EAF).

Available capacity of BFS is approximately 370,000 tonnes of liquid iron per year. Scrap is almost not used for BOF steel production technology (only 10-25% of metal stock) and annual steel production using this technology at MZIS would be approximately 500,000 tonnes of steel per year. Therefore installation of new BOF instead of existing OHFs was not considered because it would decrease steel production significantly and MZIS would lose benefits in this case.

Thus the only two future scenarios were plausible at that time:

- Continuation of a situation existing prior to the project;
- Installation of EAF instead of existing OHFs.

These scenarios are described below in more detail.

1) Continuation of a situation existing prior to the project

In this scenario all technological process of steel production, including five OHFs, is operated without any changes. All equipment is maintained with routine and capital repairs and they will be operated further without any constraints. Natural gas (NG) and heavy fuel oil (HFO) are used as fuel. Iron and scrap are used for steel production at a ratio of 0.49/0.51 (in metal stock) or 0.532 tonnes of liquid iron and 0.554 tonnes of scrap per tonne of steel production. Other parameters of OHFs are presented in Annex 2. There are no legal or other requirements that enforce MZIS to stop or to reconstruct the furnaces. And the additional investment is not required for this scenario. Thus, scenario 1 is feasible and plausible.

2) Installation of EAF

In this scenario the existing five open hearth furnaces are dismantled in the steelmaking shop and new electric arc furnace (EAF) is installed. Description and technical parameters of the EAF is presented in Section A.4.2. Other technological processes of steel production are operated without any changes. However, as is shown in Section B.2 this scenario is not economically attractive. Therefore it cannot be considered as the baseline scenario.

Conclusions
Scenario 1 is the most plausible scenario and therefore is identified as the baseline.

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

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

Data/Parameter	PS_y
Data unit	tonnes of steel
Description	Annual steel production at EAF in year *y*
Time of determination/monitoring	Monitored during the crediting period
Source of data (to be) use	MZIS data
Value of data applied (for ex ante calculations/determinations)	659,076 – for 2008, 459,948 – for 2009, 636,807 – for 2010, 720,000 – for 2011-2012
Justification of the choice of data or description of measurement methods and procedures (to be) applied	It is measured by weighting. Steel form EAF is let to a steel-pouring ladle. The ladle is weighed.
QA/QC procedures (to be) applied	It is an ordinary procedure at MZIS. Please see Table D.2 for more detailed information
Any comment	-

Data/Parameter	SFC_i
Data unit	GJ/tonne of steel
Description	Specific fuel type *i* consumption (*i* = *NG* for natural gas, *i* = *HFO* for heavy fuel oil)
Time of determination/monitoring	Ex-ante
Source of data (to be) use	MZIS records
Value of data applied (for ex ante calculations/determinations)	4.425 – for NG; 1.741 – for HFO
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is used for definition of the fuel consumption in the baseline and it was calculated based on historical data as an average value for 2004-2006
QA/QC procedures (to be) applied	-
Any comment	See Annex 2

Data/Parameter	$EF_{fuel\_i,y}$
Data unit	tCO_2/GJ
Description	CO_2 emission factor of fossil fuel type *i* in year *y* (*i* = *NG* for natural gas, *i* = *HFO* for heavy fuel oil)
Time of determination/monitoring	Ex-ante
Source of data (to be) use	Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 2: Stationary Combustion (corrected chapter as of April 2007), IPCC, 2006
Value of data applied (for ex ante calculations/determinations)	0.0561 – for NG; 0.0774 – for HFO
Justification of the choice of data or description of measurement methods and	-

procedures (to be) applied	
QA/QC procedures (to be) applied	-
Any comment	-

Data/Parameter	*SEC*
Data unit	MWh/tonne steel
Description	Specific electricity consumption
Time of determination/monitoring	Ex-ante
Source of data (to be) use	MZIS records
Value of data applied (for ex ante calculations/determinations)	0.008
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is used for definition of the electricity consumption at steelmaking shop in the baseline and it was calculated based on historical data as average value for 2004-2006
QA/QC procedures (to be) applied	-
Any comment	See Annex 2

Data/Parameter	EF_{el}
Data unit	tCO_2/MWh
Description	CO_2 emission factor for electricity consumption
Time of determination/monitoring	Ex-ante
Source of data (to be) use	Development of Grid GHG Emission Factors for Power Systems of Russia (2008). This report was prepared by Carbon Investments Ltd. by order of Carbon Trade & Finance SICAR S.A., and approved by Accredited Independent Entity (AIE) Bureau Veritas
Value of data applied (for ex ante calculations/determinations)	0.541
Justification of the choice of data or description of measurement methods and procedures (to be) applied	It is the CO_2 emission factor for JI projects in Russian Regional Energy System “Ural”
QA/QC procedures (to be) applied	-
Any comment	See Annex 2

Data/Parameter	*SLC*
Data unit	tonnes/tonne of steel
Description	Specific limestone consumption at the OHFs
Time of determination/monitoring	Ex-ante
Source of data (to be) use	MZIS records
Value of data applied (for ex ante calculations/determinations)	0.067
Justification of the choice of data or description of measurement methods and	This parameter is used for definition of the limestone consumption at OHFs in the baseline and it was calculated based on historical data as average value for 2004-2006

procedures (to be) applied	
QA/QC procedures (to be) applied	-
Any comment	See Annex 2

Data/Parameter	$EF_{\lim e}$
Data unit	tCO_2/tonne limestone
Description	CO_2 emission factor for limestone consumption
Time of determination/monitoring	Ex-ante
Source of data (to be) use	Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Process and Product Use, Chapter 2: Mineral Industry Emissions, Table 2.1, page 7, IPCC, 2006
Value of data applied (for ex ante calculations/determinations)	0.43971
Justification of the choice of data or description of measurement methods and procedures (to be) applied	-
QA/QC procedures (to be) applied	-
Any comment	-

Data/Parameter	*SDC*
Data unit	tonnes/tonne of steel
Description	Specific dolomite consumption at the OHFs
Time of determination/monitoring	Ex-ante
Source of data (to be) use	MZIS records
Value of data applied (for ex ante calculations/determinations)	0.046
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is used for definition of the dolomite consumption at OHFs in the baseline and it was calculated based on historical data as average value for 2004-2006
QA/QC procedures (to be) applied	-
Any comment	See Annex 2

Data/Parameter	EF_{dol}
Data unit	tCO_2/tonne dolomite
Description	CO_2 emission factor for dolomite consumption
Time of determination/monitoring	Ex-ante
Source of data (to be) use	Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Process and Product Use, Chapter 2: Mineral Industry Emissions, Table 2.1, page 7, IPCC, 2006
Value of data applied	0.47732

(for ex ante calculations/determinations)	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	-
QA/QC procedures (to be) applied	-
Any comment	-

Data/Parameter	*SIC*
Data unit	tonnes/tonne of steel
Description	Specific iron consumption at the OHFs
Time of determination/monitoring	Ex-ante
Source of data (to be) use	MZIS records
Value of data applied (for ex ante calculations/determinations)	0.532
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is used for definition of the liquid iron consumption at OHFs in the baseline and it was calculated based on historical data as average value for 2004-2006
QA/QC procedures (to be) applied	-
Any comment	See Annex 2

Data/Parameter	EF_{iron}
Data unit	tCO_2/tonne iron
Description	CO_2 emission factor of iron production at MZIS in year *y*
Time of determination/monitoring	Monitored during the crediting period
Source of data (to be) use	MZIS data
Value of data applied (for ex ante calculations/determinations)	1.862 – for 2008, 1.902 – for 2009-2012
Justification of the choice of data or description of measurement methods and procedures (to be) applied	-
QA/QC procedures (to be) applied	-
Any comment	It is calculated according to the formulae 9

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[25] 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 (hereinafter referred to as Tool) for project.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations
The realistic and credible alternatives to the project activity are defined through the following Sub-steps:

Sub-step 1a: Define alternatives to the project activity
The following alternatives to the project were considered before project implementation:

Alternative 1: Continuation of a situation existing prior to the project.
In this alternative all technological process of steel production, including five OHFs, is operated without any changes as before the project implementation. All equipment is maintained with routine and capital repairs and they will be operated further without any constraints. Natural gas (NG) and heavy fuel oil (HFO) are used as fuel. Iron and scrap are used for steel production at a ratio of 0.49/0.51 (in metal stock) or 0.532 tonnes of liquid iron per tonne of liquid steel and 0.554 tonnes of scrap per tonne of steel production. Other parameters of OHFs are presented in Annex 2. And the additional investment is not required for this scenario.

Alternative 2: The proposed project activity undertaken without being registered as a JI project activity.
In this alternative the existing five open hearth furnaces are dismantled and the new electric arc furnace (EAF) is installed in the steelmaking shop. Description and technical parameters of the EAF is presented in Section A.4.2. Other technological processes of steel production are operated without any changes. The investment cost necessary for this alternative implementation (EAF installation) is about 82 mln. Euro.

Outcome of Step 1a: The realistic and credible alternatives to the project activity were identified.

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: The realistic and credible alternatives to the project activities are identified 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.

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

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 generates benefits from fuels and raw materials saving. 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

Background
Investment decision of the project is dated 2003. Project benefits are from fuels and raw materials (including liquid iron) savings. Amount of steel production before and after the project implementation is equal. It means that revenues from steel sales are not changed however quantity of steel production influences fuels and raw materials savings.

There are two approaches of investment analysis: calculation in current prices and calculation in constant prices. As shown in Section B.1 there are non reliable forecasts of prices, tariffs and steel demand, especially, in 2003. Therefore second approach was used for investment analysis. In this case a benchmark must be cleared of inflation.

Benchmark definition
For proposed project an internal rate of return (IRR) was used as benchmark and the option 6a of sub-step 2b of the Tool was used for benchmark definition.

From investor's point of view the expected return will consist of the risk-free rate increased by the suitable risk premiums. In Russia there is not any treasury bonds (governmental bonds or T-bonds). Therefore the risk-free rate taken for this assessment is the German T-bonds rate[26] cleared inflation[27] at the time of investment decision. And the suitable risk premiums will include:

- Systematic market risk. This portion of risk relates to the variability in returns from the equity investments and uncertainty associated with that[28]. The rate used in the assessment reflects investment into a portfolio of steel companies[29]. This risk premium is the minimum possible expected return for the investor that holds a portfolio of existing steel businesses in a developed economy. This risk component can be seen as the basic risk-free rate for the investor in to equity market. Also this risk component can be interpreted as the "risks connected with project participants" as it addresses the issues of being involved into the project realization with different parties etc. while on the other hand there is an option of investing into considerably less risky environment of US stock market. It is conservative assumption for proposed project.
- Country risk[30]. This portion of the risk reflects unique risks of investment being made in Russia. The additional return (premium) is required to cover political uncertainty, ownership risks, profit repatriation risk etc.

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[26] European Central Bank website, Long-Term Interest Rate of Germany, September 2003

[27] European Commission website, Eurostat , Average Inflation Rate of Germany in 2003

[28] Principles of Corporate Finance 7th edition, Richard A. Brealey, Stewart C. Myers, McGraw-Hill Higher Education, 2003 – p. 168

[29] New York University, Leonard N. Sterm School of Business, Costs of Capital by Industry Sector in 2003

[30] New York University, Leonard N. Sterm School of Business, Risk Premiums for Other Markets in 2003

- Project specific risk. This risk component can be interpreted as the risk of uncertainty in getting projected cash inflows from the project. The data from the "Methodological recommendations on evaluation of investment projects efficiency" approved by Ministry of Economy of the RF, Ministry of Finance of the RF, State Committee of the RF on Construction, Architecture and Housing Policy of the RF 21.06.1999 N ВК 477" were taken. Value of this risk is 3%. It is minimal value of the risk for investment to the production development based on well-known technology (Table 11.1 of the Methodological recommendations).

The result of IRR benchmark estimation is present in Table B.2.1.

Table B.2.1. Result of IRR benchmark estimation

Indicator	Value (for 2003)
German interest rate	4.17%
Inflation	1.00%
Risk-free rate	***3.20%***
Systematic market risk	***4.04%***
Country risk Russia	***2.18%***
Project specific risk	***3.00%***
IRR benchmark	**12.42%**

If the proposed project (not being implemented as a JI project) has a less favourable indicator, i.e. a lower IRR, than this benchmark, then the project cannot be considered as financially attractive.

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 and from other sources:
1. Investment decision: September 2003[31], commissioning date: August 2006;
2. Bank of Russia exchange rate is 34.29 RUR/EUR;
3. The project investment cost includes EAF installation cost and accounts for of approximately EUR 81.8 million (excluding VAT);
4. The project lifetime is around 20 years (lifetime of the main equipment);
5. Steel production is a maximum technical capacity - 720,000 tonnes per year. It is conservative.
6. Fuel, electricity and raw materials consumption is taken into account in line with the actual data (for situation before project implementation, please see Annex 2) and the technical specifications of the project design[32] and MZIS plans (for situation after project implementation, please see Section A.4.2);
7. All input values of tariffs and costs are valid at the time of the investment decision (Para 6, Annex 2 of Tool) and they are constant for the period of assessment (approach with calculation in constant).
8. Only purchased scrap is taken into account for scrap cost definition.
9. Liquid iron cost is equal to MZIS internal cost.

[31] Contract #156Y.002/03 dated 25.09.2003 between OJSC "Metallurgical plant named after A.K. Serov" and DANIELI & C. OFFICINE MECCANICHE S.p.A "Steelmaking shop reconstruction". Also please see Section A.2.

[32] "Reconstruction of the electric furnace steelmaking with installation of EAF-80", Project Design, OJSC "URALGIPROMEZ", 2005, p.45, Table 14

The project cash flow focuses on revenue flows generated by fuels and raw materials (including liquid iron) savings and on cost flows generated by electricity, electrodes consumption and additional scrap buying in comparison with baseline.

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	7.19%

Cash flow analysis shows IRR of 7.19%. It is less than the benchmark determined of 12.63%. 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 key indicators were considered in the sensitivity analysis: investment cost, iron and scrap costs and electricity tariff. 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.

A summary of the results is presented in the Table B.2.4 below.

Table B.2.3: Sensitivity analysis (summary)

Scenario number	Scenario description	IRR (%)
Scenario 1	Investment cost increase up to 10%	5.93%
Scenario 2	Investment cost decrease down to 10%	8.67%
Scenario 3	Iron cost increase up to 10%	10.56%
Scenario 4	Iron cost decrease down to 10%	3.48%
Scenario 5	Scrap cost increase up to 10%	5.28%
Scenario 6	Scrap cost decrease down to 10%	9.01%
Scenario 5	Electricity tariff increase up to 10%	6.27%
Scenario 6	Electricity tariff decrease down to 10%	8.09%

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 can be 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:
Before 2000 about 28 % of steel in Russia originated from OHFs, about 57% from Basic-Oxygen Furnaces and about 15 % from Electric Arc Furnaces only.[33] After 2000 several investment projects of big EAF installation were implemented at Russian metallurgical plants:

- OJSC "Amurmetal";
- OJSC "MMK";
- OJSC "Uralsteel"
- OJSC "Cherepovecky MK";
- OJSC "Ashinsky metallurgical plant";
- TMK "Severskiy"
- CJSC "ChTPZ Group";
- OJSC NTMK.

However all of the projects were considered as JI projects and PDD were published on UNFCC web-page, and therefore project participants have to exclude them from analysis according to the Additionality Tool. Therefore the proposed project can not represent a widely observed practice in the area considered.

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

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:**

The project boundary shall encompass all anthropogenic emissions by sources of GHGs which are:

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

There are several sources of GHG emissions during the steel production at MZIS:

- Emission from the raw materials (iron, coke, electrodes) during the iron and steelmaking processes;
- Fuel combustion;
- GHG emissions from the Russian electricity grid;

[33] Steel and rolled metal in Russia in 2007, Info Mine, 2007, p. 25-26

- Emission associated with oxygen, blast-furnace air and compressed air production;
- Leakages.

Also GHG emissions associated with fuels combustion and electricity consumption (this process is related to fuels combustion too) include three types of GHG: CO_2, N_2O and CH_4.

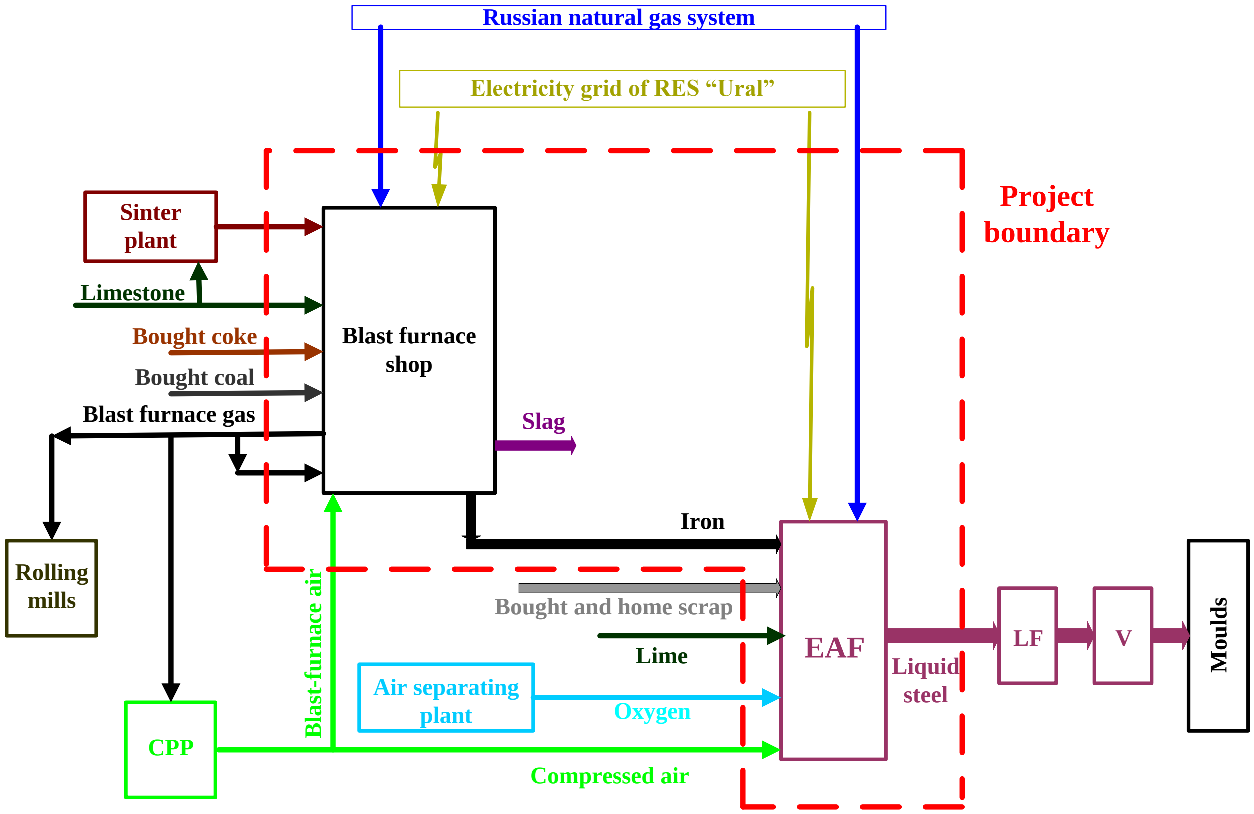
As shown in Section A.2 the Ladle Furnace (LF) was constructed in 2003 before the project implementation in 2006. LF was operated with OHFs during 2003-2006. It enabled to produce a semiproduct steel at the OHFs as at the new EAF.

In 2008 the Vacuum Degassing Unit (V) was put into operation at the steelmaking shop. Some part of steel after LF is treated in the unit that enables to improve steel quality only. It means that the Vacuum Degassing Unit would be operated in the baseline also.

Thus the emissions related to the Ladle Furnace and the Vacuum Degassing Unit operation are the same in the project scenario and in the baseline and can be excluded from the project boundary for simplicity.

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



Source: Data provided by MZIS

N_2O and CH_4 emissions
For stationary fuel combustion the CO_2 emission is more than 99.9% and, respectively, N_2O and CH_4 emissions are less than 0.1%. For example, in accordance with the IPCC Guidelines for National

Greenhouse Gas Inventories[34] for natural gas the default CO_2 emission factor is 56,100 $kgCO_2/TJ$, the default N_2O emission factor is 0.1 kgN_2O/TJ and the default CH_4 emission factor is 1.0 $kgCH_4/TJ$. Global Warming Potential of N_2O is 310 and CH_4 is 21. Then the share of total N_2O and CH_4 emissions is: $100\% \times (21 \times 1.0 + 310 \times 0.1)/(56,100 + 21 \times 1.0 + 310 \times 0.1) = 0.093\%$. Therefore N_2O and CH_4 emissions are not taken into account for baseline and project emissions calculation.

Leakages
The potential leakages are associated with:

- Fugitive CH_4 emissions associated with fuel extraction, processing, transportation and distribution of natural gas;
- Technical transmission and distribution losses of electricity;

As described above in project scenario consumption of fuels (natural gas and heavy fuel oil) is reduced but electricity consumption will increase in comparison with the baseline scenario.

Annual natural gas consumption in the baseline is higher than in project scenario for approximately 2.8 mln. GJ. Default emission factors for fugitive CH_4 emission is 961 tCH_4/PJ (for Eastern Europe and former USSR)[35] and the Global Warming Potential of CH_4 is 21[36]. And fugitive CH_4 emissions associated with that volume of natural gas extraction, processing, transportation and distribution is $21 \times 2,800,000 \times 961/10^6 = 56,500$ $tCO_{2\text{-eq}}$.

Annual electricity consumption in project scenario is approximately 23,320 MWh (for 720,000 tonnes of steel production, please see Section E). In Russian Federation the electricity losses are 11-13%[37]. The emission factor for grid is 0.541 tCO_2/MWh (please see Annex 2 of the PDD). And volume of emission is $0.541 \times 23,320 \times 13/100 = 1,640$ tCO_2.

Therefore the leakages in project scenario are less than in baseline scenario and these emissions have not been taken into account for simplicity and conservatism.

Emission associated with oxygen and compressed air consumption
Oxygen and compressed air are used for intensification of some process during the steel production in the both OHF and EAF technology. Electricity is used for oxygen and compressed air production. The emission factor for grid is 0.541 tCO_2/MWh (please see Annex 2).

Oxygen production
Oxygen is produced at an air separation station. Specific oxygen consumption at OHFs was 1.02 m^3 of oxygen per tonne of steel and at EAF is 38.0 m^3/t[38]. More volume of oxygen is needed for EAF than for

[34] Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 2: Stationary Combustion, Table 2.2, IPCC, 2006

[35] Approved baseline methodology AM0029 “Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas”, Version 03, CDM – Executive Board, 2008

[36] IPCC AR4. 2007a. The Physical Science Basis. Working Group I Report of the intergovernmental Panel on Climate Change..Editors: Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller . Cambridg University Press, Cambridge, United Kingdom and New York, NY, USA.

[37] http://www.abok.ru/for_spec/articles/14/2833/tb.htm

[38] “Reconstruction of the electric furnace steelmaking with installation of EAF-80”, Project Design, OJSC “URALGIPROMEZ”, 2005, p.45, Table 14

OHFs and new air separation station was constructed at MZIS. Specific electricity consumption of oxygen production at the air separation station is about 550 kWh per 1000 m^3.

Compressed air
Specific electricity consumption of compressed air production is about 110 kWh per 1000 m^3. Specific compressed air consumption at OHFs was 313.9 m^3 of compressed air per tonne of steel and is 29.6 m^3/t at EAF [39].

Oxygen and compressed air consumption and GHG emission estimation associated with their production for OHFs and EAF are presented in Table B.3.1.

Table B.3.1: Oxygen and compressed air consumption and GHG emission estimation associated with them production at OHFs and EAF

Parameter	Unit	OHFs (baseline)	EAF (project)
Steel production	**t steel**	720,000	720,000
Specific compressed air consumption	m^3/t	313.9	29.6
Compressed air consumption	1000 m^3	225,976	21,290
Electricity consumption for compressed air production	MWh	24,857	2,342
Emissions from electricity consumption for compressed air production	**tCO_2**	**13,448**	**1,267**
Specific oxygen consumption	m^3/t	1.02	38.0
Oxygen consumption	1000 m^3	735	27,360
Electricity consumption for oxygen production	MWh	404	15,048
Emissions from electricity consumption for oxygen production	**tCO_2**	**219**	**8,141**
Total	**tCO_2**	**13,667**	**9,408**

Therefore GHG emission associated with oxygen and compressed air consumption in baseline is higher than in the project scenario and these emissions will not be taken into account. It is conservative.

An overview of all emission sources in the steelmaking process of proposed project is given in Table B.3.2 below.

Table B.3.2: Sources of emissions

№	Source	Gas	Included/ excluded	Justification/Explanation
Steelmaking process				
1	Electricity consumption for steel production	CO_2	Included	Emissions are calculated using standardized regional electricity factors for Russia

[39] "Reconstruction of the electric furnace steelmaking with installation of EAF-80", Project Design, OJSC "URALGIPROMEZ", 2005, p.45, Table 14

№	Source	Gas	Included/ excluded	Justification/Explanation
2	Fuel consumption	CO_2	Included	In project scenario natural gas consumption will decrease in comparison with baseline; Heavy fuel oil consumption is in the baseline only
3	Electrodes consumption	CO_2	Included	Electrode consumption will be in the project scenario but there was not one in the baseline scenario
4	Limestone and dolomite consumption	CO_2	Included	Limestone and dolomite consumption is in the baseline only
5	Electricity consumption during oxygen and compressed air production	CO_2	Excluded	Please see explanation above
Liquid iron production process				
6	Coke consumption	CO_2	Included	Coke consumption will decrease after the project implementation
7	Natural gas consumption	CO_2	Included	Natural gas consumption will decrease after the project implementation
8	Coal consumption	CO_2	Included	Coal consumption will decrease after the project implementation
9	Coke and sinter production	CO_2	Included	Emissions due to coke and sinter production are calculated using IPCC emission factor
10	Blast furnace gas post-combustion in preheater.	CO_2	Excluded	Blast furnace gas consists of carbon monoxide, carbon dioxide and hydrogen. It is underfired exhaust gas which is formed in the blast furnace process. For emission calculation from raw material (coke) and fuel (natural gas) consumption IPCC emission factors are used. Thus, it means full combustion in a blast furnace without case of underfiring. Therefore blast furnace gas post-combustion in pre-heater is not included in the emission calculation (for the avoidance of double-counting)
11	Blast furnace gas burning outside of project boundary	CO_2	Included	Blast furnace gas consists of carbon monoxide, carbon dioxide and hydrogen. Part of blast furnace gas is used outside of the blast furnace shop. It means that some volume of carbon dioxide generated from carbon monoxide is not connected with the project activity. Therefore these emissions have to be deducted from the total emission
12	Limestone consumption	CO_2	Excluded	Iron production is reduced in the project scenario comparing to the baseline. Therefore

№	Source	Gas	Included/ excluded	Justification/Explanation
13	Electricity consumption for blast-furnace air production	CO_2	Excluded	limestone and blast-furnace air consumption at BFS in the project scenario is less than it is the baseline scenario. Exclusion of this emission is conservative assumption
CH_4 and N_2O emissions				
14	Methane emission during fuels burning	CH_4	Excluded	Please see explanation above
15	Nitrous oxide emission during fuels burning	N_2O	Excluded	

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: 29/11/2010

Global Carbon BV.
Global Carbon BV is a project participant. The contact information is presented in Annex 1.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

The starting date of the project is 25 September 2003[40].

C.2. Expected operational lifetime of the project:

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

C.3. Length of the crediting period:

Start of the crediting period: 01/01/2008.
Length of the 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.

[40] Contract #156Y.002/03 dated 25.09.2003 between OJSC “Metallurgical plant named after A.K. Serov” and DANIELI & C. OFFICINE MECCANICHE S.p.A “Steelmaking shop reconstruction”. Also please see Section A.2.

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 affects the emissions related to the electricity, the fuels, the raw materials and the electrodes consumption, coke and sinter production (please see Section B.3).

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

- Steel demand in the market is not influenced by the project (i.e. project steel production = baseline steel production);
- The baseline specific electricity, fuels and iron consumption are set ex-ante for the length of the crediting period;
- The emissions from electricity consumption are established using the relevant regional Russian standardized grid emission factor, as described in Annex 2;
- The default IPCC CO_2 emission factors of natural gas, heavy fuel oil, coal and coke for stationary combustion are used for calculation of combustion of them during iron and steelmaking processes;
- Default emission factors for sinter and coke production are used for calculation of emissions connected to production of them. It is conservative;
- Only CO_2 emissions as GHG are taken into account. The CH_4 and N_2O emissions were excluded (please see Section B.3).

General remarks:

- Social indicators such as number of people employed, safety records, training records, etc, will be available to the Verifier if required;
- Environmental indicators such as NO_x and other will be available to the Verifier if required;
- Monitored data required for verification and issuance will be kept for two years after the last transfer of ERUs for the project.

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_y	Calculated under project activity	tCO_2	C	Annually	100%	Electronic and paper	-
P2	$PE_{EAF\_el,\ y}$	Calculated under project activity	tCO_2	C	Annually	100%	Electronic and paper	-
P3	$PE_{EAF\_NG,\ y}$	Calculated under project activity	tCO_2	C	Annually	100%	Electronic and paper	-
P4	$PE_{EAF\_ed,\ y}$	Calculated under project activity	tCO_2	C	Annually	100%	Electronic and paper	-
P5	$PE_{EAF\_\mathrm{lim}e\ y}$	Calculated under project activity	tCO_2	C	Annually	100%	Electronic and paper	-
P6	$PE_{EAF\_cc,\ y}$	Calculated under project activity	tCO_2	C	Annually	100%	Electronic and paper	-
P7	$PE_{EAF\_iron,\ y}$	Calculated under project activity	tCO_2	C	Annually	100%	Electronic and paper	-
P8	$PEL_{EAF,\ y}$	Electricity meter reading	MWh	M	Annually	100%	Electronic and paper	-
P9	EF_{el}	See Annex 2	tCO_2/MWh	C	Fixed *ex-ante*	100%	Electronic and paper	Electricity grid CO_2 emission factor for JI projects in Regional Energy System “Ural”
P10	$PF_{EAF\_NG,y}$	Gas flow meter reading	m^3	M	Annually	100%	Electronic and paper	-

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
P11	EF_{NG}	IPCC	tCO_2/GJ	E	Fixed ex ante	100%	Electronic and paper	Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 2: Stationary Combustion (corrected chapter as of April 2007), Table 2.2, IPCC, 2006
P12	$NCV_{NG,y}$	Calculated under project activity	GJ/m^3	C	Annually	100%	Electronic and paper	It is calculated as weighted average according to formula 4
P13	$NCV_{NG,m,y}$	Natural gas certificate from fuel supplier	GJ/m^3	M	Monthly	100%	Electronic and paper	NCV of natural gas is provided by gas supplier every month
P14	$PF_{EAF\_NG,m,y}$	Gas flow meter reading	m^3	M	Monthly	100%	Electronic and paper	-
P15	$PED_{EAF,\ y}$	Electrode certificates	Tonnes	M	Annually	100%	Electronic and paper	-
P16	EF_{ed}	IPCC	tCO_2/tonne of electrode	E	Fixed ex ante	100%	Electronic and paper	Guidelines for National

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
								Greenhouse Gas Inventories, Volume 3: Industrial Process and Product Use, Chapter 4: Metal Industry Emissions, Table 4.3, page 27, IPCC, 2006
P17	$PLM_{EAF,\ y}$	Weighing machine	Tonnes	M	Annually	100%	Electronic and paper	-
P18	$EF_{\lim e}$	IPCC	tCO_2/tonne of lime	E	Fixed ex ante	100%	Electronic and paper	Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Process and Product Use, Chapter 2: Mineral Industry Emissions, Table 2.1, page 7, IPCC, 2006
P19	$PCC_{EAF,\ y}$	Weighing machine	Tonnes	M	Annually	100%	Electronic and paper	-

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
P20	EF_{cc}	IPCC	tCO_2/tonne of charge carbon	E	Fixed ex ante	100%	Electronic and paper	Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Process and Product Use, Chapter 4: Metal Industry Emissions, Table 4.3, page 27, IPCC, 2006
P21	$PIRC_{EAF,y}$	Weighing machine	Tonnes	M	Annually	100%	Electronic and paper	-
P22	EF_{iron}	Calculated under project activity	tCO_2/tonne of iron	C	Annually	100%	Electronic and paper	-
P23	$PE_{BFS\_el,y}$	Calculated under project activity	tCO_2	C	Annually	100%	Electronic and paper	-
P24	$PE_{BFS\_NG,y}$	Calculated under project activity	tCO_2	C	Annually	100%	Electronic and paper	-
P25	$PF_{BFS\_\mathrm{coal},y}$	Calculated under project activity	tCO_2	C	Annually	100%	Electronic and paper	-
P27	$PE_{BFS\_coke,y}$	Calculated under project activity	tCO_2	C	Annually	100%	Electronic and paper	-
P28	$PE_{BFS\_\mathrm{sin}ter,\mathrm{y}}$	Calculated under project activity	tCO_2	C	Annually	100%	Electronic and paper	-

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
P29	$PE_{BFGoutput,y}^{CO \rightarrow CO2}$	Calculated under project activity	tCO_2	C	Annually	100%	Electronic and paper	-
P30	$PIR_{BFS,y}$	Weighing machine	Tonnes	M	Annually	100%	Electronic and paper	-
P31	$PEL_{BFS\_el,y}$	Electricity meter reading	MWh	M	Annually	100%	Electronic and paper	-
P32	$PF_{BFS\_NG,y}$	Gas flow meter reading	m^3	M	Annually	100%	Electronic and paper	-
P33	$PF_{BFS\_coal,y}$	Weighing machine	Tonnes	M	Annually	100%	Electronic and paper	-
P34	$NCV_{coal,y}$	IPCC	GJ/tonne of coal	E	Fixed *ex-ante*	100%	Electronic and paper	Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 1: Introduction, Table 1.2, IPCC, 2006
P35	EF_{coal}	IPCC	tCO_2/GJ	E	Fixed *ex-ante*	100%	Electronic and paper	Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 2: Stationary Combustion (corrected

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
								chapter as of April 2007), Table 2.2, IPCC, 2006
P36	$PCOKE_{BFS,y}$	Weighing machine	Tonnes	M	Annually	100%	Electronic and paper	-
P37	$CC_{coke,y}$	Technical report	%	C	Annually	100%	Electronic and paper	-
P38	EF_{coke_prod}	IPCC	tCO_2/GJ	E	Fixed *ex-ante*	100%	Electronic and paper	Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Process and Product Use, Chapter 4: Metal Industry Emissions, Table 4.1, page 25, IPCC, 2006
P39	$PSIN_{BFS,y}$	Weighing machine	Tonnes	M	Annually	100%	Electronic and paper	-
P40	EF_{sinter_prod}	IPCC	tCO_2/tonne of sinter	E	Fixed *ex-ante*	100%	Electronic and paper	Guidelines for National Greenhouse Gas Inventories, Volume 3:

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
								Industrial Process and Product Use, Chapter 4: Metal Industry Emissions, Table 4.1, page 25, IPCC, 2006
P41	$PBFG_{outputy}$	Gas flow meter reading	m^3	M	Annually	100%	Electronic and paper	-
P42	$CO_{BFG,y}$	Gas analyzer	%	M	Annually	100%	Electronic and paper	-

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

The annual project emissions (PE_y) are calculated as follows:

$$PE_y = PE_{EAF\_el,\ y} + PE_{EAF\_NG,\ y} + PE_{EAF\_ed,\ y} + PE_{EAF\_lime\ y} + PE_{EAF\_cc,\ y} + PE_{EAF\_iron,\ y} \quad (1)$$

Where:

$PE_{EAF\_el,\ y}$ - is the annual project emission associated with electricity consumption at the EAF in the year *y*, (tCO_2);
$PE_{EAF\_NG,\ y}$ - is the annual project emission associated with natural gas consumption at the EAF in the year *y*, (tCO_2);
$PE_{EAF\_ed,\ y}$ - is the annual project emission associated with electrodes consumption at the EAF in the year *y*, (tCO_2);
$PE_{EAF\_lime\ y}$ - is the annual project emission associated with lime consumption at the EAF in the year *y*, (tCO_2);
$PE_{EAF\_cc,\ y}$ - is the annual project emission associated with charge carbon consumption at the EAF in the year *y*, (tCO_2);

$PE_{EAF\_iron,\ y}$ - is the annual project emission associated with iron consumption at the EAF in the year *y*, (tCO_2).

Project emission associated with electricity consumption ($PE_{EAF\_el,\ y}$) is calculated as follows:

$$PE_{EAF\_el,\ y} = PEL_{EAF,\ y} \times EF_{el} \qquad (2)$$

Where:

$PEL_{EAF,\ y}$ - is the annual electricity consumption at the EAF in the year *y*, (MWh);

EF_{el} - is the CO_2 emission factor of electricity grid of the Ural region (tCO_2/MWh) (it is a fixed value for 2008 – 2012, see Annex 2).

Natural gas is burnt during melting in the EAF. Emissions from natural gas combustion are calculated according to the formulae 3:

$$PE_{EAF\_NG,\ y} = PF_{EAF\_NG,y} \times NCV_{NG,y} \times EF_{NG} \qquad (3)$$

Where:

$PF_{EAF\_NG,y}$ - is the total volume of natural gas combusted at EAF in year *y* (m^3);

$NCV_{NG,y}$ - is the net calorific value per volume unit of natural gas in the year *y* (GJ/m^3);

EF_{NG} - is the default IPCC CO_2 emission factor per unit of energy of natural gas (tCO_2/GJ)[41].

$NCV_{NG,y}$ is calculated as:

$$NCV_{NG,y} = \sum_m (NCV_{NG,m,y} \times PF_{NG,m,y}) / \sum_m PF_{EAF\_NG,m,y} \qquad (4)$$

Where:

$NCV_{NG,m,y}$ - is the net calorific value of natural gas in the month *m* in year *y* (GJ/m^3);

$PF_{EAF\_NG,m,y}$ - is the total volume of natural gas combusted at the EAF in month *m* in year *y* (m^3);

[41] Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 2: Stationary Combustion (corrected chapter as of April 2007), Table 2.2, IPCC, 2006, http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html.

m - is the month m in year y.

Project emission associated with electrodes consumption ($PE_{EAF\_ed,\ y}$) is calculated as follows:

$$PE_{EAF\_ed,\ y} = PED_{EAF,\ y} \times EF_{ed} \quad (5)$$

Where:

$PED_{EAF,\ y}$ - is the annual electrodes consumption at the EAF in the year y, (MWh);

EF_{ed} - is the default IPCC CO_2 emission factor per unit of electrodes consumption (tCO_2/tonne of electrode)[42].

Project emission associated with lime consumption ($PE_{EAF\_lime\ y}$) is calculated as follows:

$$PE_{EAF\_lime\ y} = PLM_{EAF,\ y} \times EF_{lime} \quad (6)$$

Where:

$PLM_{EAF,\ y}$ - is the annual lime consumption at the EAF in the year y, (tonnes);

EF_{lime} - is the default IPCC CO_2 emission factor per unit of lime consumption (tCO_2/tonne of lime)[43].

Project emission associated with charge carbon consumption ($PE_{EAF\_cc,\ y}$) is calculated as follows:

$$PE_{EAF\_cc,\ y} = PCC_{EAF,\ y} \times EF_{cc} \quad (7)$$

Where:

$PCC_{EAF,\ y}$ - is the annual charge carbon consumption at the EAF in the year y, (tonnes);

EF_{cc} - is the default IPCC CO_2 emission factor per unit of charge carbon consumption (tCO_2/tonne of charge carbon)[44].

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[42] Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Process and Product Use, Chapter 4: Metal Industry Emissions, Table 4.3, page 27, IPCC, 2006

[43] Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Process and Product Use, Chapter 2: Mineral Industry Emissions, Table 2.1, page 7, IPCC, 2006

[44] Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Process and Product Use, Chapter 4: Metal Industry Emissions, Table 4.3, page 27, IPCC, 2006

Some part of liquid iron is used for commercial iron production. Therefore the emission associated with iron consumption at the EAF ($PE_{iron,\ y}$) is calculated as follows:

$$PE_{EAF\_iron,\ y} = PIRC_{EAF,y} \times EF_{iron,y} \quad (8)$$

Where:

$PIRC_{EAF,y}$ - is the annual liquid iron consumption at the EAF in the year *y*, (tonnes of iron);

$EF_{iron,y}$ - is the CO_2 emission factor of iron production in year *y* (tCO_2/tonne of iron).

CO_2 emission factor of iron production (EF_{iron}) is calculated as:

$$EF_{iron,y} = (PE_{BFS\_el,y} + PE_{BFS\_NG,y} + PF_{BFS\_coal,y} + PE_{BFS\_coke,y} + PE_{BFS\_sinter,y} - PE^{CO \to CO2}_{BFGoutputy})/PIR_{BFS,y} \quad (9)$$

Where:

$PE_{BFS\_el,y}$ - is the project emission due to electricity consumption at the BFS in year *y* (tCO_2);

$PE_{BFS\_NG,y}$ - is the project emission due to natural gas combustion at the BFS in year *y* (tCO_2);

$PF_{BFS\_coal,y}$ - is the project emission due to coal combustion at the BFS in year *y* (tCO_2);

$PE_{BFS\_coke,y}$ - is the project emission due to coke production and its burning at the BFS in year *y* (tCO_2);

$PE_{BFS\_sinter,y}$ - is the project emission due to sinter production in year *y* (tCO_2);

$PE^{CO \to CO2}_{BFGoutputy}$ - is the CO_2 emission is connected with blast furnace gas burning outside of project boundary in year *y* (tCO_2);

$PIR_{BFS,y}$ - is the liquid iron production at the BFS in year *y* (tonnes).

Project emission due to electricity consumption at the BFS is calculated as follows:

$$PE_{BFS\_el,y} = EF_{el} \times PEL_{BFS\_el,y} \quad (10)$$

Where:

$PEL_{BFS\_el,y}$ - is the electricity consumption at the BFS in year *y* (MWh);

EF_{el} - is the CO_2 emission factor of electricity grid of the Ural region (tCO_2/MWh) (it is a fixed value for 2008 – 2012, see Annex 2).

Project emission due to natural gas combustion at the BFS is calculated as:

$$PE_{BFS\_NG,\ y} = PF_{BFS\_NG,y} \times NCV_{NG,y} \times EF_{NG} \qquad (11)$$

Where:

$PF_{BFS\_NG,y}$ - is the total volume of natural gas combusted at the BFS in year *y* (m^3);

$NCV_{NG,y}$ - is the net calorific value per volume unit of natural gas in the year *y* (GJ/m^3). It is calculated according to the formulae 4.

EF_{NG} - is the default IPCC CO_2 emission factor per unit of energy of natural gas in year *y* (tCO_2/GJ)[45].

Project emission due to coal combustion at the BFS is calculated as:

$$PE_{BFS\_coal,\ y} = PF_{BFS\_coal,y} \times NCV_{coal,y} \times EF_{coal} \qquad (12)$$

Where:

$PF_{BFS\_coal,y}$ - is the total quantity of coal combusted at the BFS in year *y* (tonnes);

$NCV_{coal,y}$ - is the default IPCC net calorific value per volume unit of coal in the year *y* (GJ/tonne of coal);

EF_{coal} - is the default IPCC CO_2 emission factor per unit of energy of coal in year *y* (tCO_2/GJ)[46].

Project emission due to coke burning and production is calculated as:

$$PE_{BFS\_coke,y} = CC_{coke,y} \times PCOKE_{BFS,y} \times \frac{44}{12} + PCOKE_{BFS,y} \times EF_{coke\_prod} \qquad (13)$$

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[45] Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 2: Stationary Combustion (corrected chapter as of April 2007), Table 2.2, IPCC, 2006, http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html.

[46] Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 2: Stationary Combustion (corrected chapter as of April 2007), Table 2.2, IPCC, 2006, http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html.

Where:

$PCOKE_{BFS,y}$ - is the total consumption of coke at the BFS in year *y* (tonnes);

$CC_{coke,y}$ - is the carbon content in coke in year *y* (t C/ tonne of coke);

$\frac{44}{12}$ - is the molar mass ratio of CO_2 and C;

EF_{coke_prod} - is the default emission factor of coke production[47] (tCO_2/tonne of coke).

Project emission due to sinter production is calculated as:

$$PE_{BFS\_sinter,y} = PSIN_{BFS,y} \times EF_{sinter\_prod} \quad (14)$$

Where:

$PSIN_{BFS,y}$ - is the total consumption of sinter at the BFS in year *y* (tonnes);

EF_{sinter_prod} - is the default emission factor of sinter production[48] (tCO_2/tonne of sinter).

Emission associated with the output BFG volume is calculated as follows:

$$PE_{BFGoutputy}^{CO \rightarrow CO2} = (PBFG_{output,y} \times CO_{BFG,y}) \times \frac{28}{22.4} \times \frac{88}{56} \quad (15)$$

Where:

$PBFG_{outputy}$ - is volume of blast furnace gas burning outside of project boundary in year *y* (1000 m^3);

$CO_{BFG,y}$ - is carbon monoxide content in blast furnace gas in year *y* (fraction);

28 - is molar weight of carbon monoxide;

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[47] IPCC Guidelines for National Greenhouse Gas Inventories (2006), Volume 3, Chapter 4, page 25, table 4.1.

[48] IPCC Guidelines for National Greenhouse Gas Inventories (2006), Volume 3, Chapter 4, page 25, table 4.1.

22.4 - is gas molar volume (Avogadro's number);

88 - is molar weight of two molecules of carbon dioxide ($2CO + O_2 \rightarrow 2CO_2$);

56 - is molar weight of two molecules of carbon monoxide ($2CO + O_2 \rightarrow 2CO_2$).

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_y	Calculated under project activity	tCO_2	C	Annually	100%	Electronic and paper	-
B2	$BE_{el,\ y}$	Calculated under project activity	tCO_2	C	Annually	100%	Electronic and paper	-
B3	$BE_{fuel,\ y}$	Calculated under project activity	tCO_2	C	Annually	100%	Electronic and paper	-
B4	$BE_{\lim e,\ y}$	Calculated under project activity	tCO_2	C	Annually	100%	Electronic and paper	-
B5	$BE_{dol,\ y}$	Calculated under project activity	tCO_2	C	Annually	100%	Electronic and paper	-

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
B6	$BE_{iron,y}$	Calculated under project activity	tCO_2	C	Annually	100%	Electronic and paper	-
B7	SEC	See Annex 2	MWh/tonne of steel	E	Fixed *ex-ante*	100%	Electronic and paper	-
B8	EF_{el}	See Annex 2	tCO_2/MWh	E	Fixed ex ante	100 %	Electronic and paper	Electricity grid CO_2 emission factor for JI projects in Russian Regional Energy System "Ural"
B9	PS_y	Weighing machine	tonnes of steel	M	Annually	100%	Electronic and paper	-
B10	SFC_i	See Annex 2	GJ/tonne of steel	E	Fixed *ex-ante*	100%	Electronic and paper	*i* = *NG* for natural gas, *i* = *HFO* for heavy fuel oil

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
B11	$EF_{fuel\_i,y}$	IPCC	tCO_2/GJ	E	Fixed *ex-ante*	100%	Electronic and paper	Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 2: Stationary Combustion (corrected chapter as of April 2007), Table 2.2, IPCC, 2006. *i* = *NG* for natural gas, *i* = *HFO* for heavy fuel oil
B12	*SLC*	See Annex 2	tonnes/tonne of steel	E	Fixed *ex-ante*	100%	Electronic and paper	-

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
B13	$EF_{\lim e}$	IPCC	tCO_2/tonnes of limestone	E	Fixed ex ante	100%	Electronic and paper	Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Process and Product Use, Chapter 2: Mineral Industry Emissions, Table 2.1, page 7, IPCC, 2006
B14	*SDC*	See Annex 2	tonnes/tonne of steel	E	Fixed *ex-ante*	100%	Electronic and paper	-

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
B15	EF_{dol}	IPCC	tCO_2/tonnes of dolomite	E	Fixed ex ante	100%	Electronic and paper	Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Process and Product Use, Chapter 2: Mineral Industry Emissions, Table 2.1, page 7, IPCC, 2006
B16	SIC	See Annex 2	tonnes of iron/tonne of steel	E	Fixed *ex-ante*	100%	Electronic and paper	-
B17	$EF_{iron,y}$	Calculated under project activity	tCO_2/ tonne of iron	C	Annually	100%	Electronic and paper	It is calculated according to formulae 7

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

The annual baseline emissions (BE_y) are calculated as follows:

$$BE_y = BE_{el,y} + BE_{fuel,y} + BE_{\mathrm{lime},y} + BE_{dol,y} + BE_{iron,y} \quad (16)$$

Where:

$BE_{el,\ y}$	- is the annual baseline emission associated with electricity consumption at the OHFs in the year *y*, (tCO_2);
$BE_{fuel,\ y}$	- is the annual baseline emission associated with fuel consumption at the OHFs in the year *y*, (tCO_2);
$BE_{lime,\ y}$	- is the annual baseline emission associated with limestone consumption at the OHFs in the year *y*, (tCO_2);
$BE_{dol,\ y}$	- is the annual baseline emission associated with dolomite consumption at the OHFs in the year *y*, (tCO_2);
$BE_{iron,\ y}$	- is the annual baseline emission associated with iron consumption at the OHFs in the year *y*, (tCO_2).

$BE_{el,\ y}$ is calculated as follows:

$$BE_{el,\ y} = PS_y \times SEC \times EF_{el} \quad (17)$$

Where:

PS_y	- is the annual steel production at EAF in year *y* (tonnes of steel);
SEC	- is the specific electricity consumption at the OHFs in the year *y*, (MWh/tonne of steel);
EF_{el}	- is the CO_2 emission factor of electricity grid of Russia (tCO_2/MWh) (it is a fixed value for 2008 – 2012, see Annex 2).

Natural gas and heavy fuel oil are burnt during melting in the OHFs. $BE_{fuel,\ y}$ is calculated as follows:

$$BE_{fuel,\ y} = \sum_i PS_y \times SFC_i \times EF_{fuel\_i,y} \quad (18)$$

Where:

PS_y	- is the annual steel production at EAF in year *y* (tonnes of steel);
SFC_i	- is the specific fuel type *i* (*i* = *NG* for natural gas, *i* = *HFO* for heavy fuel oil) consumption (GJ/tonne of steel). They are fixed *ex-ante* values, see Annex 2;
$EF_{fuel\_i,y}$	- is the default IPCC CO_2 emission factors per unit of energy of fuel *i* (*i* = *NG* for natural gas, *i* = *HFO* for heavy fuel oil) in year *y* (tCO_2/GJ)[49].

$BE_{lime,\ y}$ is calculated as follows:

[49] Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 2: Stationary Combustion (corrected chapter as of April 2007), Table 2.2, IPCC, 2006, http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html.

$$BE_{\mathrm{lime},y} = PS_y \times SLC \times EF_{\mathrm{lime}} \quad (19)$$

Where:

PS_y - is the annual steel production at EAF in year *y* (tonnes of steel);

SLC - is the specific limestone consumption at the OHFs in the year *y*, (tonnes/tonne of steel);

EF_{lime} - is the default IPCC CO_2 emission factor per unit of limestone (tCO_2/tonne of limestone)[50].

$BE_{dol,y}$ is calculated as follows:

$$BE_{dol,y} = PS_y \times SDC \times EF_{dol} \quad (20)$$

Where:

PS_y - is the annual steel production at EAF in year *y* (tonnes of steel);

SDC - is the specific dolomite consumption at the OHFs in the year *y*, (tonnes/tonne of steel);

EF_{dol} - is the default IPCC CO_2 emission factor per unit of dolomite (tCO_2/tonne of dolomite)[51].

$BE_{iron,y}$ is calculated as follows:

$$BE_{iron,y} = PS_y \times SIC \times EF_{iron} \quad (21)$$

Where:

PS_y - is the annual steel production at EAF in year *y* (tonnes of steel);

SIC - is the specific iron consumption at the OHFs (tonnes of iron/tonne of steel). It is ex-ante fixed value, see Annex 2;

EF_{iron} - is the CO_2 emission factor of iron (tCO_2/tonne of iron). It is calculated according to formula 7.

[50] Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Process and Product Use, Chapter 2: Mineral Industry Emissions, Table 2.1, page 7, IPCC, 2006

[51] Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Process and Product Use, Chapter 2: Mineral Industry Emissions, Table 2.1, page 7, IPCC, 2006

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

D.1.2.1. Data to be collected in order to monitor emission reductions from the project, and how these data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

Not applicable

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

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. Please see Section B.3.

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

Not applicable. Please see Section B.3.

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):

$$ER_y = BE_y - PE_y \quad (22)$$

Where:

ER_y - is the emission reductions due to the proposed JI project in year *y* (tCO_2);

BE_y - is the baseline emissions in year *y* (tCO_2);

PE_y - is the project emissions in year *y* (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 the Russian Federation "On Environment Protection" (10 January 2002, N 7-FZ);
- Federal law of the Russian Federation "On Air Protection" (04 May 1999, N 96-FZ).

Ecological monitoring department of MZIS systematically collects and archives the air, water and other pollution data, including data of the environmental impacts of the project. The department prepares and submits annual report to local agency of Rostekhnadzor RF (The Russian Federal Service for Ecological, Technical and Atomic Supervision). The department is accredited by the Federal Agency on Technical Regulating and Metrology (Gosstandart)[52]. MZIS has ISO 14001 certificate. In 2010 TUV-ZUD carried out a re-certification audit. Validity of the new certificate is until 2011[53].

[52] http://www.serovmet.ru/common/img/uploaded/serovo/akkreditatsiya-2010-264-218.jpg

[53] http://www.serovmet.ru/common/img/uploaded/serovo/140012010_msum_rus.pdf

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
Table D.1.1.1. P8	Low	The electricity consumption is determined by standardized electricity meters. The Chief Power Engineer Department will collect and achieve daily data and transfer annual data to Technical Department of UMMC-Steel[54].
Table D.1.1.1. P10, P14	Low	Natural gas consumption is measured by a gas flow meter. Heat Technical Subdivision of Heat Automatic and Measurement Department will collect and process daily data. The Chief Power Engineer Department will achieve daily data and transfer annual data to Technical Department of UMMC-Steel.
Table D.1.1.1. P12, P13	Medium	Natural gas supplier's laboratory will carry out measurement of NCV of gas supplied and issue a Certificate. The Chief Power Engineer Department will achieve and process monthly data and transfer annual data to Technical Department of UMMC-Steel.
Table D.1.1.1. P15	Low	Electrodes consumption is taken into account according to electrode certificate. Personal of Steelmaking Shop will register data every day. Production department will collect and achieve daily data and transfer annual data to Technical Department of UMMC-Steel.
Table D.1.1.1. P17	Medium	Lime consumption for steelmaking process is determined for each melting by weighting method. Personal of Steelmaking Shop will register data every day. Production department will collect and achieve daily data and transfer annual data to Technical Department of UMMC-Steel.
Table D.1.1.1. P19	Medium	Charge carbon consumption for steelmaking process is determined for each melting by weighting method. Personal of Steelmaking Shop will register data every day. Production department will collect and achieve daily data and transfer annual data to Technical Department of UMMC-Steel.
Table D.1.1.1. P21	Medium	Iron consumption for steelmaking process is determined for each melting by weighting method. Personal of Steelmaking Shop will register data every day. Production department will collect and achieve daily data and transfer annual data to Technical Department of UMMC-Steel.
Table D.1.1.1. P30	Medium	Iron production is determined by ladle weighting at BFS. Personal of Blast Furnace Shop will register data every day. Production department will collect and achieve daily data and transfer annual data to Technical Department of UMMC-Steel.

[54] UMMC-Steel Co Ltd is the management company. It is a member of UMMC Holding and manages metallurgical companies of UMMC Holding, including MZIS

Table D.1.1.1. P31	Low	The electricity consumption is determined by standardized electricity meters. The Chief Power Engineer Department will collect and achieve daily data and transfer annual data to Technical Department of UMMC-Steel.
Table D.1.1.1. P32	Low	Natural gas consumption is measured by a gas flow meter. Heat Technical Subdivision of Chief Power Engineer Department will collect and process daily data. The Chief Power Engineer Department will achieve daily data and transfer annual data to Technical Department of UMMC-Steel.
Table D.1.1.1. P33	Medium	Coal consumption for iron making process is determined by weighting method. Production department will collect and achieve data and transfer annual data to Technical Department of UMMC-Steel.
Table D.1.1.1. P36	Medium	Coke and sinter consumption for ironmaking process is determined by weighting method. Personal of Blast Furnace Shop will register data every day. Production department will collect and achieve daily data and transfer annual data to Technical Department of UMMC-Steel.
Table D.1.1.1. P39	Medium	
Table D.1.1.1. P41	Medium	Output volume of blast furnace gas (at CPP and rolling shops) is measured by gas flow meters as a sum of reading. Personal of Blast Furnace Shop will register data every day. Production department will collect and achieve daily data and transfer annual data to Technical Department of UMMC-Steel.
Table D.1.1.1. P42	Medium	Content of CO is determined by a gas analyzer. Heat Technical Subdivision of Heat Automatic and Measurement measures it every day. The Chief Power Engineer Department will process, achieve and transfer data to Technical Department of UMMC-Steel.
Table D.1.1.3. B9	Medium	Steel production is determined as sum of metal yield and metal waste. They are defined by weighting method. Personal of Steelmaking Shop will register data every day. Production department will collect and achieve daily data and transfer annual data to Technical Department of UMMC-Steel.

The Heat Automatic and Measurement Department realizes a quality control of measuring devices. All measuring units are entered to automatic accounting system according to STP 00186387-7.6-03-07 “Equipment direction for monitoring and measurements. The order of registration, storage, operation, write-off and conservation of the measuring and test equipment”.

Calibration of the metering devices is made in accordance with the calibration schedule. Supervision of calibration and calibration is performed by the Central metrological laboratory (CML). CML has certificates (No 0070 dated 01/08/2007 and No 001004 dated 17/06/2010) and certified devices for calibration. Meters not calibrated at MZIS are calibrated by an independent entity which has a state licence. Devices calibration was taken according to STP 00186387-SMK-7.6-01-10 “Equipment direction for monitoring and measurements. The organization of repair and calibration of the measuring equipment. Certification of test equipment”.

Data collection and archiving is implemented according to MZIS's internal rules. Quality Management System of MZIS is certificated and MZIS has an ISO 9001:2008 certificate[55] and ISO 16949:2009 certificate[56].

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

Division of responsibilities for Monitoring Plan implementation and Monitoring Report preparation is presented in the Table D.3.1.

Table D.3.1: Division of responsibilities for Monitoring Plan implementation and Monitoring Report preparation

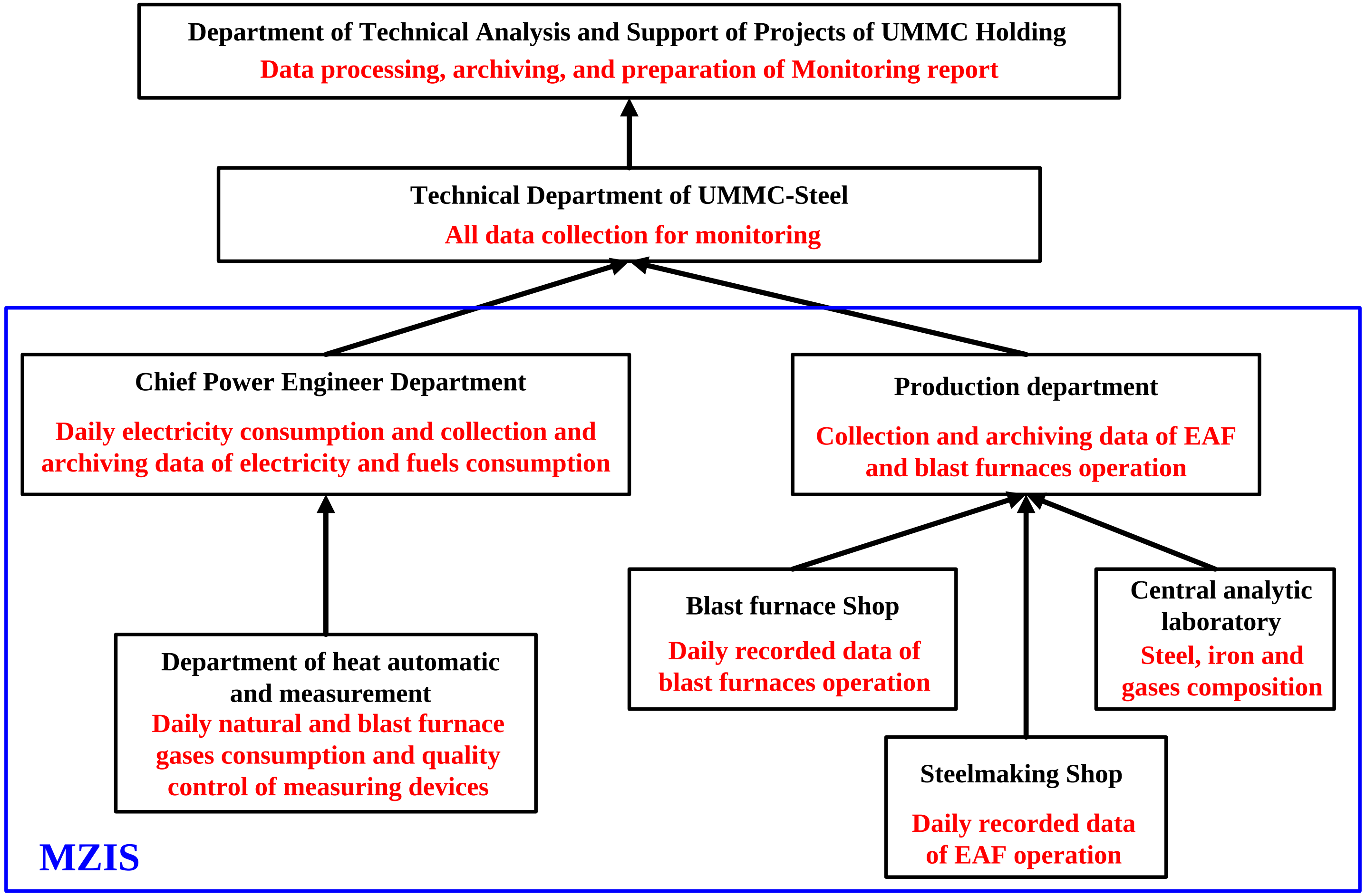
N	Responsible	Task
1	MZIS: • Department of heat automatic and measurement; • Chief Power Engineer Department • Steelmaking Shop; • Blast Furnace Shop; • Production department • Central analytical laboratory UMMC-Steel: Technical Department UMMC Holding Co Ltd (hereinafter UMMC Holding): Department of Technical Analysis and Support of Projects	Daily natural gas consumption and quality control of measuring devices; Daily electricity consumption and collection and archiving data of electricity and fuels consumption; Daily recorded data of EAF operation; Daily recorded data of blast furnaces operation; Collection and archiving data of EAF and blast furnaces operation; Steel, iron and gases composition data All data collection for monitoring Data processing, archiving, and preparation of Monitoring report
2	Global Carbon BV	Staff training on monitoring procedures and reporting; ERU calculation and preparation of annual Monitoring report

[55] http://serovmet.ru/common/img/uploaded/serovo/37479ms_rus.pdf

[56] http://serovmet.ru/common/img/uploaded/serovo/169492010msts_rus.pdf

The scheme of the operational and management structure for the monitoring plan implementation is presented in Figure D.3.1.

Figure D.3.1: The organisational structure of the Monitoring plan implementation



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

Name of person/entity determining the monitoring plan:

- UMMC Holding Co Ltd,

UMMC Holding Co Ltd is a project participant. The contact information is presented in Annex 1.

- Global Carbon BV,

Global Carbon BV is a project participant. The contact information is presented in Annex 1.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Volumes of default emission factors used for calculations are presented in Annex 2.

The actual data of EAF operation for 2008-2009 and the forecast for 2010-2012 are presented in Table E.1.1.

Table E.1.1: Actual and forecasted data of project

EAF parameters	Unit	Actual data		Forecast (project) data		
		2008	2009	2010	2011	2012
Steel production	**Tonnes of steel**	**659,076**	**459,948**	**636,807**	**720,000**	**720,000**
Electricity consumption	MWh	208,947	162,014	201,887	228,262	228,262
Gas consumption	m^3	9,975,000	7,171,000	9,644,868	10,904,882	10,904,882
Gas net calorific value	kcal/m^3	7,929	7,944	7,929	7,929	7,929
Iron consumption	Tonnes of iron	239,749	190,611	206,962	234,000	234,000
Scrap (incl. iron scrap) consumption	Tonnes of scrap	511,586	333,259	494,300	558,876	558,876
Electrodes consumption	Tonnes of electrodes	1,052	614	1,016	1,149	1,149
Lime consumption	Tonnes of lime	28,835	21,658	27,861	31,500	31,500
Charge carbon consumption	Tonnes of charge carbon	5,822	4,990	5,625	6,360	6,360

Source: Data provided by MZIS

The iron production emission factor was calculated according to formulas # 9-15 (please see Section D.1.1.2). The actual data of the blast furnace shop operation for 2008-2009 and estimation of the emission connected to iron production and the iron production emission factor are presented in Table E.1.2.

Table E.1.2: Actual data of the blast furnace shop operation for 2008-2009 and estimation of the emission connected to iron production and the emission factor for iron production

BFS parameters	Unit	2008	2009
Iron production at the BFS*	**Tonnes**	**350,855**	**236,088**
Electricity consumption at the BFS*	MWh	4,165	3,132
EF of Ural electricity system	tCO_2/MWh	0.541	0.541
Emission from electricity consumption	**tCO_2**	**2,253**	**1,694**
Natural gas consumption at the BFS*	m^3	38,918,000	26,915,000
Gas net calorific value*	kcal/ m^3	7,929	7,944
Gas consumption in GJ	GJ	1,292,954	895,875
Natural gas emission factor	tCO_2/GJ	0.0561	0.0561
Emissions from natural gas burning	**tCO_2**	**72,535**	**50,259**
Coal consumption at the BFS*	Tonnes	10,429	6,442
Coal net calorific value*	GJ/t coal	28.2	28.2
Coal consumption in GJ	GJ	294,098	181,664

BFS parameters	Unit	2008	2009
Coal emission factor	tCO_2/GJ	0.0946	0.0946
Emissions from coal burning	**tCO_2**	**27,822**	**17,185**
Coke consumption at the BFS*	Tonnes	172,036	115,630
Carbon content in coke*	%	86.6	87.1
Emissions from coke burning	**tCO_2**	**546,335**	**369,114**
Coke consumption at the BFS*	Tonnes	172,036	115,630
Emission factor of coke production	tCO_2/t coke	0.5600	0.5600
Emission connected with coke production	**tCO_2**	**96,340**	**64,753**
Sinter consumption at the BFS*	Tonnes	601,613	422,763
Emission factor of sinter production	tCO_2/t sinter	0.2000	0.2000
Emission connected with sinter production	**tCO_2**	**120,323**	**84,553**
Blast furnace gas outside of project boundary*	1000 m^3	464,058	308,030
Content of CO in blast furnace gas*	%	23,3	22,9
Emissions during CO burnt	**tCO_2**	**212,389**	**138,558**
Total emissions	**tCO_2**	**653,218**	**448,999**
Iron production emission factor	**tCO_2/t iron**	**1,862**	**1,902**

Source:
* - *Data provided by MZIS;*
** - *Please see Annex 2;*
*** - *Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 2: Stationary Combustion (corrected chapter as of April 2007), IPCC, 2006;*
**** - *Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Process and Product Use, Chapter 4: Metal Industry Emissions, Table 4.1, page 25, IPCC, 2006.*

These values of the iron production emission factor were used for project emission estimation for 2008-2009. And the value for 2009 was used for project emission estimation for 2010-2012.

Project emissions were calculated according to formulas # 1-9 (please see Section D.1.1.2). The used data and results of calculation of project emissions within the crediting period are presented in Table E.1.3.

Table E.1.3: Estimated project emissions within the crediting period

Parameter	Unit	2008	2009	2010	2011	2012
Steel production*	**t steel**	**659,076**	**459,948**	**636,807**	**720,000**	**720,000**
Electricity consumption*	MWh	208,947	162,014	201,887	228,262	228,262
Electricity EF of Ural**	tCO_2/MWh	0.541	0.541	0.541	0.541	0.541
Emissions from electricity	**tCO_2**	**113,040**	**87,650**	**109,221**	**123,490**	**123,490**
Gas consumption*	m^3	9,975,000	7,171,000	9,644,868	10,904,882	10,904,882
Gas net calorific value*	kcal/ m^3	7,929	7,944	7,944	7,944	7,944
Gas consumption in GJ	GJ	331,395	238,689	321,033	362,973	362,973
Natural gas emission factor***	tCO_2/GJ	0.0561	0.0561	0.0561	0.0561	0.0561
Emissions from gas	**tCO_2**	**18,591**	**13,390**	**18,010**	**20,363**	**20,363**
Electrodes consumption*	t electrodes	1,052	614	1,016	1,149	1,149
Electrode emission factor****	tCO_2/t electrodes	3.007	3.007	3.007	3.007	3.007

Parameter	Unit	2008	2009	2010	2011	2012
Emissions from electrodes	**tCO_2**	**3,163**	**1,846**	**3,056**	**3,455**	**3,455**
Iron consumption*	t iron	239,749	190,611	206,962	234,000	234,000
Iron production emission factor	tCO_2/t iron	1.862	1.902	1.902	1.902	1.902
Emissions from iron production	**tCO_2**	**446,362**	**362,510**	**393,607**	**445,028**	**445,028**
Lime consumption*	t lime	28,835	21,658	27,861	31,500	31,500
Lime emission factor*****	tCO_2/t lime	0.440	0.440	0.440	0.440	0.440
Emissions from lime	**tCO_2**	**12,679**	**9,523**	**12,251**	**13,851**	**13,851**
Charge carbon consumption*	t charge carbon	5,822	4,990	5,625	6,360	6,360
Charge carbon emission factor****	tCO_2/t charge carbon	3.043	3.043	3.043	3.043	3.043
Emissions from charge carbon	**tCO_2**	**17,718**	**15,186**	**17,120**	**19,356**	**19,356**
Project emissions	**tCO_2**	**611,554**	**490,105**	**553,265**	**625,543**	**625,543**
Project emissions for 2008-2012	**tCO_2**	**2,906,011**				

Source:

* - *Data provided by MZIS;*

** - *Please see Annex 2;*

*** - *Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 2: Stationary Combustion (corrected chapter as of April 2007), IPCC, 2006;*

**** - *Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Process and Product Use, Chapter 4: Metal Industry Emissions, Table 4.3, page 27, IPCC, 2006;*

***** - *Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Process and Product Use, Chapter 2: Mineral Industry Emissions, Table 2.1, page 7, IPCC, 2006*

Project emissions for the time frame after the crediting period are equal to 2011-2012 emissions. They are presented in Table E.1.4.

Table E.1.4: Estimated project emissions after the crediting period

Parameter	Unit	2013	2014	2015	2016	2017	2018	2019	2020
Project emission	tCO_2	625,543	625,543	625,543	625,543	625,543	625,543	625,543	625,543
Total 2013-2020	tCO_2	5,004,348							

E.2. Estimated leakage:

Not applicable. Please see Section B.3.

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

Table E.3.1: Estimated total project emission within the crediting period

Parameter	Unit	2008	2009	2010	2011	2012
Project emissions	tCO_2	611,554	490,105	553,265	625,543	625,543
Total 2008-2012	tCO_2	2,906,011				

Table E.3.2: Estimated total project emission after the crediting period

Parameter	Unit	2013	2014	2015	2016	2017	2018	2019	2020
Project emission	tCO_2	625,543	625,543	625,543	625,543	625,543	625,543	625,543	625,543
Total 2013-2020	tCO_2	5,004,348							

E.4. Estimated baseline emissions:

Baseline emissions were calculated according to formulas # 16-21 (please see Section D.1.1.4). Volume of specific data and emission factors are presented in Annex 2.

The used data and results of calculation of baseline emissions within the crediting period are presented in Table E.4.1.

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

Parameter	Unit	2008	2009	2010	2011	2012
Steel production	**t steel**	**659,076**	**459,948**	**636,807**	**720,000**	**720,000**
Specific natural gas consumption	GJ/t steel	4.425	4.425	4.425	4.425	4.425
Natural gas consumption	GJ	2,916,302	2,035,194	2,817,766	3,185,881	3,185,881
Natural gas emission factor	tCO_2/GJ	0.0561	0.0561	0.0561	0.0561	0.0561
Emissions from gas	**tCO_2**	**163,605**	**114,174**	**158,077**	**178,728**	**178,728**
Specific heavy fuel oil consumption	GJ/t steel	1.741	1.741	1.741	1.741	1.741
Heavy fuel oil consumption in GJ	GJ	1,147,159	800,565	1,108,398	1,253,200	1,253,200
Heavy fuel oil emission factor	tCO_2/GJ	0.0774	0.0774	0.0774	0.0774	0.0774
Emissions from heavy fuel oil	**tCO_2**	**88,790**	**61,964**	**85,790**	**96,998**	**96,998**
Specific electricity consumption	MWh/t steel	0.008	0.008	0.008	0.008	0.008
Electricity consumption	MWh	5,508	3,844	5,322	6,018	6,018
EF of Ural electricity system	tCO_2/MWh	0.541	0.541	0.541	0.541	0.541
Emissions from electricity	**tCO_2**	**2,980**	**2,080**	**2,879**	**3,255**	**3,255**
Specific iron consumption	t/t steel	0.532	0.532	0.532	0.532	0.532
Iron consumption	t iron	350,584	244,662	338,739	382,992	382,992
Iron production emission factor	tCO_2/t iron	1.862	1.902	1.902	1.902	1.902
Emissions from iron consumption	**tCO_2**	**652,714**	**465,305**	**644,224**	**728,386**	**728,386**
Specific limestone consumption	t/t steel	0.067	0.067	0.067	0.067	0.067
Limestone consumption	t limestone	44,460	31,027	42,958	48,570	48,570
Limestone emission factor	tCO_2/t limestone	0.440	0.440	0.440	0.440	0.440
Emissions from limestone	**tCO_2**	**19,550**	**13,643**	**18,889**	**21,357**	**21,357**
Specific dolomite consumption	t/t steel	0.046	0.046	0.046	0.046	0.046
Dolomite consumption	t dolomite	30,021	20,951	29,007	32,796	32,796
Dolomite emission factor	tCO_2/t dolomite	0.477	0.477	0.477	0.477	0.477
Emissions from dolomite	**tCO_2**	**14,330**	**10,000**	**13,846**	**15,654**	**15,654**
Baseline emissions	**tCO_2**	**941,968**	**667,166**	**923,704**	**1,044,378**	**1,044,378**

Parameter	Unit	2008	2009	2010	2011	2012
Baseline emissions for 2008-2012	**tCO_2**			**4,621,595**		

Source: Sources of data are indicated in Annex 2

Baseline emissions for the time frame after the crediting period are equal to 2011-2012 emissions. They are presented in Table E.4.2.

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

Parameter	Unit	2013	2014	2015	2016	2017	2018	2019	2020
Project emission	tCO_2	1,044,378	1,044,378	1,044,378	1,044,378	1,044,378	1,044,378	1,044,378	1,044,378
Total 2013-2020	tCO_2				8,355,023				

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

Table E.5.1: Estimated total emission reduction within the crediting period

Parameter	Unit	2008	2009	2010	2011	2012
Project emissions	tCO_2	330,414	177,061	370,440	418,834	418,834
Total 2008-2012	tCO_2			1,715,583		

Table E.5.2: Estimated emissions reduction after the crediting period

Parameter	Unit	2013	2014	2015	2016	2017	2018	2019	2020
Project emission	tCO_2	418,834	418,834	418,834	418,834	418,834	418,834	418,834	418,834
Total 2013-2020	tCO_2				3,350,676				

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	611,554	0	941,968	330,414
Year 2009	490,105	0	667,166	177,061
Year 2010	553,265	0	923,704	370,440
Year 2011	625,543	0	1,044,378	418,834
Year 2012	625,543	0	1,044,378	418,834
Total (tonnes of CO_2 equivalent)	2,906,011	0	4,621,595	1,715,583

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	625,543	0	1,044,378	418,834
Year 2014	625,543	0	1,044,378	418,834
Year 2015	625,543	0	1,044,378	418,834
Year 2016	625,543	0	1,044,378	418,834
Year 2017	625,543	0	1,044,378	418,834
Year 2018	625,543	0	1,044,378	418,834
Year 2019	625,543	0	1,044,378	418,834
Year 2020	625,543	0	1,044,378	418,834
Total (tonnes of CO_2 equivalent)	5,004,348	0	8,355,023	3,350,676

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.

A production of steel is considered to be dangerous, technically complicated and unique facilities in line with the Article 48.1 of the Construction Code of RF. Design Document of such production are subject to the state expertise at the federal level. Thus MZIS submitted a Design Document for this project to Yekaterinburg branch of the Federal State Institution "The Main Agency of the State expertise" (FGU "Glavgosexpertiza" in Russian abbreviation) in August 2007 and received an approval in September 2008.

Design Document of the project "Reconstruction of steelmaking production with installation of the electric arc furnace at OJSC "Metallurgical plant named after A.K. Serov", including Section "Environment Protection", was prepared by OJSC "Uralgipromez" at the end of 2005.

The main conclusions of the Expert Conclusion by FGU "Glavgosexpertiza" for this project are presented below.

Air protection:
As a result the project implementation the negative impact on air will be reduced significantly. It will be reduced by 69% on average.

Noise pollution:
Expected noise level will be ensured within the required noise level limits.

Water protection: Total amount of pollutants will be reduced by approximately 50 tonnes per year.

Waste products: After project implementation waste production will be increased by about 25,300 tonnes per year. Part of waste (70%) will be utilized at MZIS and other waste will be transferred to a special organization for utilization.

The main conclusion:
"The proposed project complies with the regulatory requirements of the Russian Federation and it is recommended for approval".

Thus project implementation enables to decrease some pollutants and the environmental impacts of project are not considered significant.

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:

The project implementation enables to decrease some pollutants. Nevertheless, as indicated in Section F.1, the Section "Environment Protection" of the Design Document of the project was prepared by OJSC "Uralgipromez" (U-75046 PZ3 dated 25 November 2005) and the Design Document was approved by the Yekaterinburg branch of the Federal State Institution "The Main Agency of the State expertise" (Positive conclusion No 07-101 dated 28 September 2007)..

SECTION G. Stakeholders' comments

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

Proposed project was approved by:

- Sverdlovsk area branch of the Federal Supervision Service on Consumer's Rights Protection and Human Wellbeing (18 November 2005, No 66.25.08.000.T.000269.11.05);
- Federal Service of Environmental, Technological and Nuclear Supervision in Ural Federal District (letters on 25 August 2006 No 04-15/6319, on 04 August 2006 No 4-21/5607);
- Sverdlovsk area branch the Emergency Ministry of the Russian Federation (20 January 2006 No 302-3-2-10).

The public hearings were not held though the project was approved by mayor of Serov town without public hearings (letter of mayor of Serov town on 21 December 2005 No 01-3252). Nevertheless MZIS published the project information on the MZIS website:

- http://serovmet.ru/ru/press/news/index.php?id15=1530;
- http://serovmet.ru/ru/press/news/index.php?id15=961;
- http://serovmet.ru/ru/press/news/index.php?id15=1832
- http://serovmet.ru/ru/press/news/index.php?id15=3168;
- http://serovmet.ru/ru/press/news/index.php?id15=3418.

No comments were received on the proposed project.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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Annex 2

BASELINE INFORMATION

The EAF started at the end of 2006. However the open hearth furnaces were operated with less capacity until 2008, but none of the nominal conditions and parameters of OHFs were worse than before 2006. Therefore the data for 2004-2006 was used for calculation of the average baseline parameters. It is conservative. The main parameters of OHFs for 2004-2006 and their average values are presented in Table Anx.2.1.

Table Anx.2.1: The main parameters of OHFs for 2004-2006 and their average values

Parameter	Unit	2004	2005	2006	Average
Steel production	**t steel**	**614,402**	**640,185**	**611,760**	**622,116**
Gas consumption in m^3	m^3	85,766,000	83,583,000	79,613,000	82,987,333
Gas net calorific value	kcal/m^3	7,914	7,913	7,923	7,917
Gas consumption in GJ	GJ	2,843,971	2,771,234	2,642,942	2,752,759
Specific gas consumption	**GJ/t steel**	**4.629**	**4.329**	**4.320**	**4.425**
Heavy fuel oil consumption in tonnes	t	25,125	27,855	27,864	26,948
Heavy fuel oil net calorific value	kcal/kg	9,590	9,590	9,590	9,590
Heavy fuel oil consumption in GJ	GJ	1,009,575	1,119,272	1,119,634	1,082,827
Specific heavy fuel oil consumption	**GJ/t steel**	**1.643**	**1.748**	**1.830**	**1.741**
Liquid iron consumption	t iron	325,140	342,426	325,206	330,924
Specific iron consumption	**t iron/t steel**	**0.529**	**0.535**	**0.532**	**0.532**
Scrap (incl. iron scrap) consumption	t scrap	350,536	347,289	335,326	344,384
Specific scrap consumption	**t/t steel**	**0.571**	**0.542**	**0.548**	**0.554**
Limestone consumption	t limestone	38,691	46,222	40,988	41,967
Specific limestone consumption	**t/t steel**	**0.063**	**0.072**	**0.067**	**0.067**
Dolomite consumption	t dolomite	26,889	29,571	28,553	28,338
Specific dolomite consumption	**t/t steel**	**0.044**	**0.046**	**0.047**	**0.046**
Electricity consumption	kWh	5,490	5,973	4,135	5,199
Specific electricity consumption	**kWh/t steel**	**0.009**	**0.009**	**0.007**	**0.008**

Source: Data provided by MZIS

The average values of the specific natural gas (SFC_{NG}), heavy fuel oil (SFC_{HFO}), liquid iron (SIC), limestone (SLC), dolomite (SDC) and electricity (SEC) consumption are used for calculation of the baseline emissions in the formulas in Section D. They are fixed *ex-ante* for the period 2008-2012.

Default fuel emission factors

The default fuel emission factors are used for the project and the baseline emissions. They are presented in the Table Anx.2.2.

Table Anx.2.2: The default fuel emission factors

Fuel type	Default emission factor[57]
	tCO_2/GJ
Natural gas	0.0561
Heavy fuel oil	0.0774
Coal	0.0946
Coke	0.1070

Other default emission factors

The default emission factors for coke and sinter production are used for the project and the baseline emissions. They are presented in the Table Anx.2.3.

Table Anx.2.3: The default emission factors for coke and sinter production

Parameter	Unit	Default emission factor[58]
Coke production	tCO_2/t coke	0.560
Sinter production	tCO_2/t sinter	0.200

The value of default emission factor of electrodes and charge carbon consumption is presented in the Table Anx.2.4.

Table Anx.2.4: The default emission factor of electrodes and charge carbon consumption

Parameter	Unit	Default emission factor[59]
Electrodes consumption	tCO_2/t electrode	3.007
Charge carbon	tCO_2/t charge carbon	3.043

The value of default emission factor of limestone and dolomite burning is presented in the Table Anx.2.5.

Table Anx.2.5: The default emission factor of limestone and dolomite burning

Parameter	Unit	Default emission factor[60]
Limestone	tCO_2/t limestone	0.43971
Dolomite	tCO_2/t dolomite	0.47732

[57] Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 2: Stationary Combustion (corrected chapter as of April 2007), IPCC, 2006

[58] Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Process and Product Use, Chapter 4: Metal Industry Emissions, Table 4.1, page 25, IPCC, 2006

[59] Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Process and Product Use, Chapter 4: Metal Industry Emissions, Table 4.3, page 27, IPCC, 2006

[60] Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Process and Product Use, Chapter 2: Mineral Industry Emissions, Table 2.1, page 7, IPCC, 2006

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.”[61]. This Study was based on the latest approved CDM “Tool to calculate the emission factor for an electricity system” available at the time of the Study development (version 01.1). The Study was verified by Bureau Veritas Certification (BVC) in 2008. BVC confirmed an applicability of the Tool and the emission factor calculation accuracy.

According to the Tool, 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 “Ural”, the largest unified power system of the national energy system of Russia, were taken into account.

The Study recommends using of the Operating Margin Emission Factor for the case of reduction of power consumption from the electricity grid. The Operating Margin Emission Factor of RES “Ural” was defined using Simple OM method. The value of this factor is used as the CO_2 emission factor for electricity consumption for calculation project and baseline emissions and is presented below:

EF_{el} = 0.541 tCO_2/MWh.

This is fixed *ex-ante* for period 2008-2012.

Summary table of baseline key elements used in calculation of baseline emissions is presented below.

Table Anx.2.6: The baseline key elements used in calculation of baseline emissions

Parameter (variable) name	Conventional sign	Data source	Unit	Value
Specific natural gas consumption at OHFs	SFC_{NG}	Table Anx.2.1 of Annex 2	GJ/tonne of steel	4.425
Specific heavy fuel oil consumption at OHFs	SFC_{HFO}	Table Anx.2.1 of Annex 2	GJ/tonne of steel	1.741
CO_2 emission factor of fossil fuel	$EF_{fuel\_i,y}$	Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 2: Stationary Combustion (corrected chapter as of April 2007), IPCC, 2006	tCO_2/GJ	0.0561

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

Parameter (variable) name	Conventional sign	Data source	Unit	Value
CO_2 emission factor of fossil fuel	$EF_{fuel\_i,y}$	Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 2: Stationary Combustion (corrected chapter as of April 2007), IPCC, 2006	tCO_2/GJ	0.0774
Specific electricity consumption	SEC	Table Anx.2.1 of Annex 2	MWh/tonne steel	0.008
CO_2 emission factor for electricity consumption	EF_{el}	Development of Grid GHG Emission Factors for Power Systems of Russia (2008). This report was prepared by Carbon Investments Ltd. by order of Carbon Trade & Finance SICAR S.A., and approved by Accredited Independent Entity (AIE) Bureau Veritas	tCO_2/MWh	0.541
Specific limestone consumption at the OHFs	SLC	Table Anx.2.1 of Annex 2	tonnes/tonne of steel	0.067
CO_2 emission factor for limestone consumption	$EF_{\lim e}$	Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Process and Product Use, Chapter 2: Mineral Industry Emissions, Table 2.1, page 7, IPCC, 2006	tCO_2/tonne limestone	0.43971
Specific dolomite consumption at the OHFs	SDC	Table Anx.2.1 of Annex 2	tonnes/tonne of steel	0.046
CO_2 emission factor for dolomite consumption	EF_{dol}	Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Process and Product Use, Chapter 2: Mineral Industry Emissions, Table 2.1, page 7, IPCC, 2006	tCO_2/tonne dolomite	0.47732
Specific iron consumption at the OHFs	SIC	Table Anx.2.1 of Annex 2	tonnes/tonne of steel	0.532
CO_2 emission factor of iron production at MZIS	EF_{iron}	The actual data for 2008 and 2009 is used for emission factor calculation. For 2010-2012 the emission factor in 2009 is used. Please see Section E.1, Table E.1.2.	tCO_2/tonne of iron	1.862 (for 2008); 1.902 (for 2009)
Annual steel production at EAF	PS_y	The actual data for 2008 and 2009 is used. For 2010-2012 the annual steel production forecast is used. Please see Section E.4, Table E.4.1.	tonne of steel	659,076 (for 2008); 459,948 (for 2009); 636,807 (for 2010); 720,000 (for 2011-2012)

Annex 3

MONITORING PLAN

See Section D for monitoring plan.