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:

“Blast Furnace reconstruction at OJSC KMZ, Tula, Tula Region, Russian Federation”

Sectoral scope 9: Metal production.

Project design document (PDD) version 2.0

16 of March, 2012

A.2. Description of the project:

Enterprise description

OJSC "Kosaya Gora Iron Works" is one of the oldest Russian metallurgical enterprises founded in 1897. Nowadays OJSC KMZ specializes in production of foundry cast iron (industrial and art casting) and steelmaking pig iron and ferromanganese. It is one of the leaders in metallurgy in Tula region, constantly producing and developing, capable of manufacturing high-quality competitive production.

The production of the Works finds wide application in machine building, metallurgy and construction. The Works produced 691.2 thousand tonnes of pig iron, 62.5 thousand tonnes of ferromanganese, 1 647 tonnes of grey casting, 272 tonnes of forged pieces, 2 166 tonnes of metal ware and 309.3 thousand pieces of slag bricks in 2007.

Project description

The purpose of the proposed project is the reconstruction of Blast Furnace (BF) #1 at OJSC KMZ with application of contemporary technologies and equipment developed in last decades for blast furnace iron making. The project aims implementation of high technologies, equipment, materials:

- Applying of non-fluxed iron-bearing material (production without sinter and fluxed iron-bearing material usage);
- Installation of bell-less top charging device with rotating chute;
- Installation of tapping equipment with hydraulic drive;
- Castable lining of runner system;
- Application of modern refractories for blast furnace lining.

Iron production is a highly energy intensive process. Coke is used as a fuel and generates reducing atmosphere in BF and as a fuel during sinter production. Thus iron production is connected with significant GHG emissions due to technological process.

In general ironmaking plants are using sinter as a base additive which includes slag forming materials (CaO and MgO). Sinter production is connected to significant fuel consumption (about 50 kg of coke per tonne of sinter). KMZ does not use sinter as a raw material but acid pellets only. Slag forming materials are added directly into the blast furnace. Therefore total coke consumption for pig iron and sinter production is reduced. Also KMZ installs bell-less top charging device, new tapping equipment, castable lining of runner system and application of modern refractories for blast furnace lining. These technologies lead to increase in iron extraction and a reducing in coke consumption due to reduced heat loss, scrap usage and process intensification.

Thus emissions of GHGs are planned to be reduced significantly as the result of the project implementation. Reducing carbon consumption is an important environmental aspect which allows considering this project as JI. Annual production of modernised BF#1 is about 770 thousand tonnes of pig iron (steelmaking and foundry). BF can produce either steelmaking or foundry pig iron or both. Project cost amounts EUR 52 million.

Before project

OJSC KMZ had three BFs. Two of them produced steelmaking and foundry pig iron and one of them (BF#2) produces ferromanganese. Annual capacity of BF #3 is 440 thousand tonnes of steelmaking pig iron. Annual capacity of BF #1 was 430 thousand tonnes of steelmaking pig iron. It operated without any modernization and renovation since 1982 (26 years) and could not continue operating without renovation. Russian Federal Service for Ecological, Technical and Atomic Supervision has requested BF#1 shutdown due to its depreciation. Also, before project KMZ used part of fluxed iron-bearing material for pig iron production.

Baseline scenario

There are 13 pig iron producers in the Russian Federation. The majority of them have complete steelmaking technological cycle. These enterprises work to satisfy growing demand. In the absence of the BF #1 KMZ the demand for pig iron will be covered by other pig iron plants. Project annual capacity is about 770 thousand tonnes of steel making pig iron (or 611 tonnes of foundry pig iron). CO_2 emission of the project is associated with displacing capacity. Emissions associated with displacing capacity are calculated based on CO_2 emission level from other iron producers.

Project background

Contract was concluded with CJSC "MetPromProekt" in 2006 for project design documents development. According to the project initial economical examination, proposed project requested high investment (about 59 million of Euros) with long payback period (comparison with BF lifetime). Therefore KMZ began to realize that project as JI (additional revenue from implementation of this project as JI was instrumental to minimize project realization risks). The First contract for equipment delivery was signed in March 2008. Blast Furnace #1 was stopped on 28 November 2008. "The Main Agency of the State expertise" (FGU "Glavgosexpertiza" in Russian abbreviation) approved the design documents on the 16th of April 2009. New plant construction was scheduled to be finished in January 2010. BF start up was on the 18th of February, 2010. Project implementation schedule is presented in Section A.4.2 below.

A.3. Project participants:

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

Role of the project participants:

- OJSC KMZ will implement the JI project including the monitoring phase. It invests in JI project implementation and owns ERUs generated. OJSC KMZ is a project participant;
- Global Carbon BV is a leading expert on environmental consultancy and financial brokerage services in the international greenhouse emissions trading market under the Kyoto Protocol. Global

Carbon has developed the first JI project that has been registered at the United Nations Framework Convention on Climate Change (UNFCCC). The first project verification under JI mechanism was also completed for Global Carbon B.V. 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:

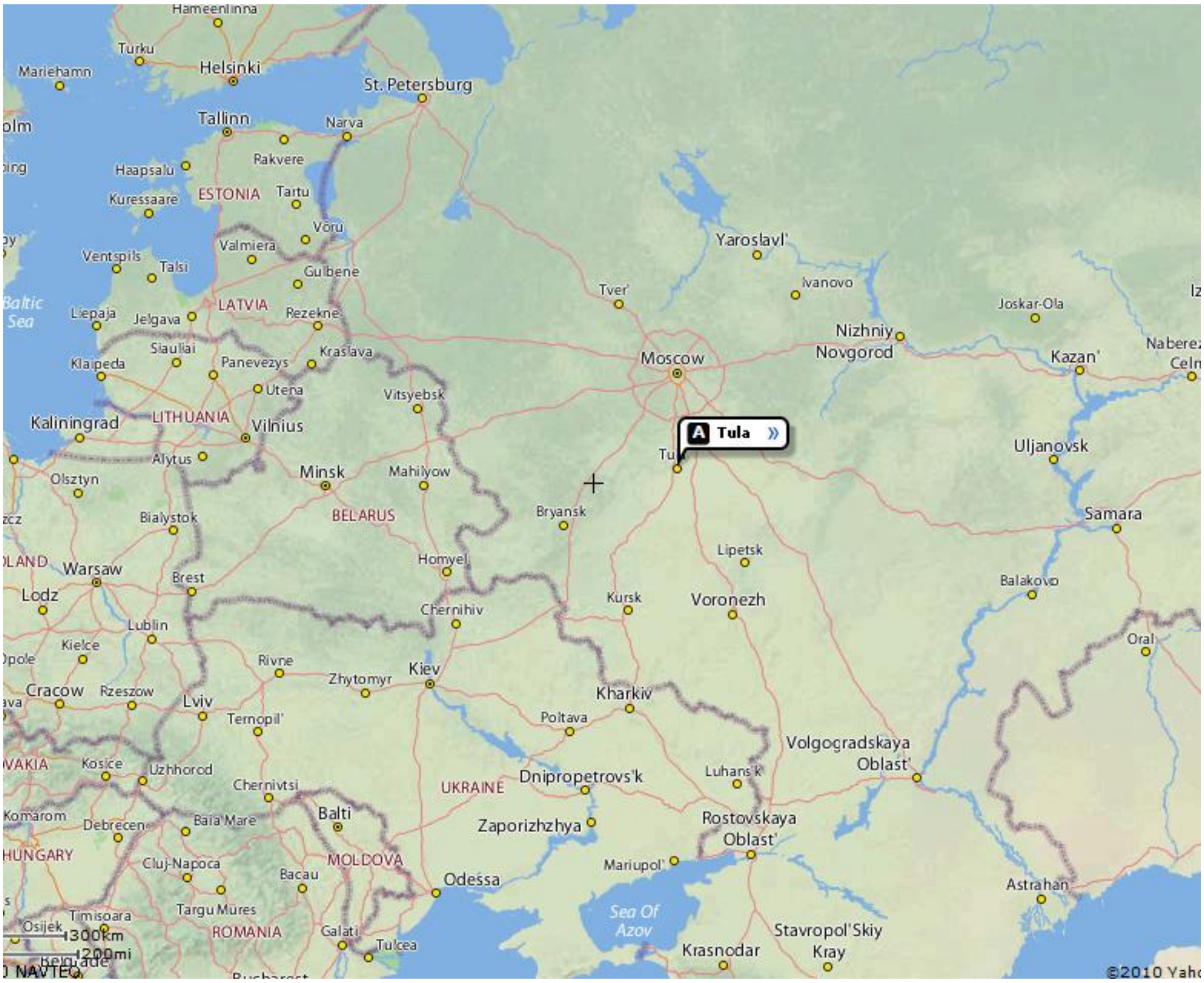
A.4.1. Location of the project:

OJSC KMZ is located in Tula, 193 kilometres south of Moscow. Geographical locations of Tula Region and Tula City are presented on Figure A.4.1.1 and Figure A.4.1.2.

Figure A.4.1.1: Map of Russia with location of Tula Region (highlighted in red)

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

Figure A.4.1.2: Map of Russia with location of Tula City



Source:
http://maps.yahoo.com/#mvt=m&lat=54.077011&lon=34.955639&zoom=6&trf=0&q1=Russian%20federation%20tula

A.4.1.1. Host Party(ies):

The Russian Federation

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

Tula region is situated in the centre of the European part of Russia, in the Central Russian Upland in the steppe and forest-steppe zones. It borders Moscow region in the north and north-east, Ryazan region in the east, Lipetsk region in the south, Orel region in the south and south-east and Kaluga region in the west and north-west. The territory of Tula region is 25.7 thousand square kilometres (0.15% of the territory of Russia). Maximum length of the region from the north to the south is 200 km, and 190 km from the west to the east.

Tula region was formed in September 26, 1937. The administrative centre of Tula region is Tula, which was founded in 1146. There are 21 towns (including large towns — Tula, Novomoskovsk, Aleksin, Shchekiono, Uzlovaya and Efremov) and 23 districts.

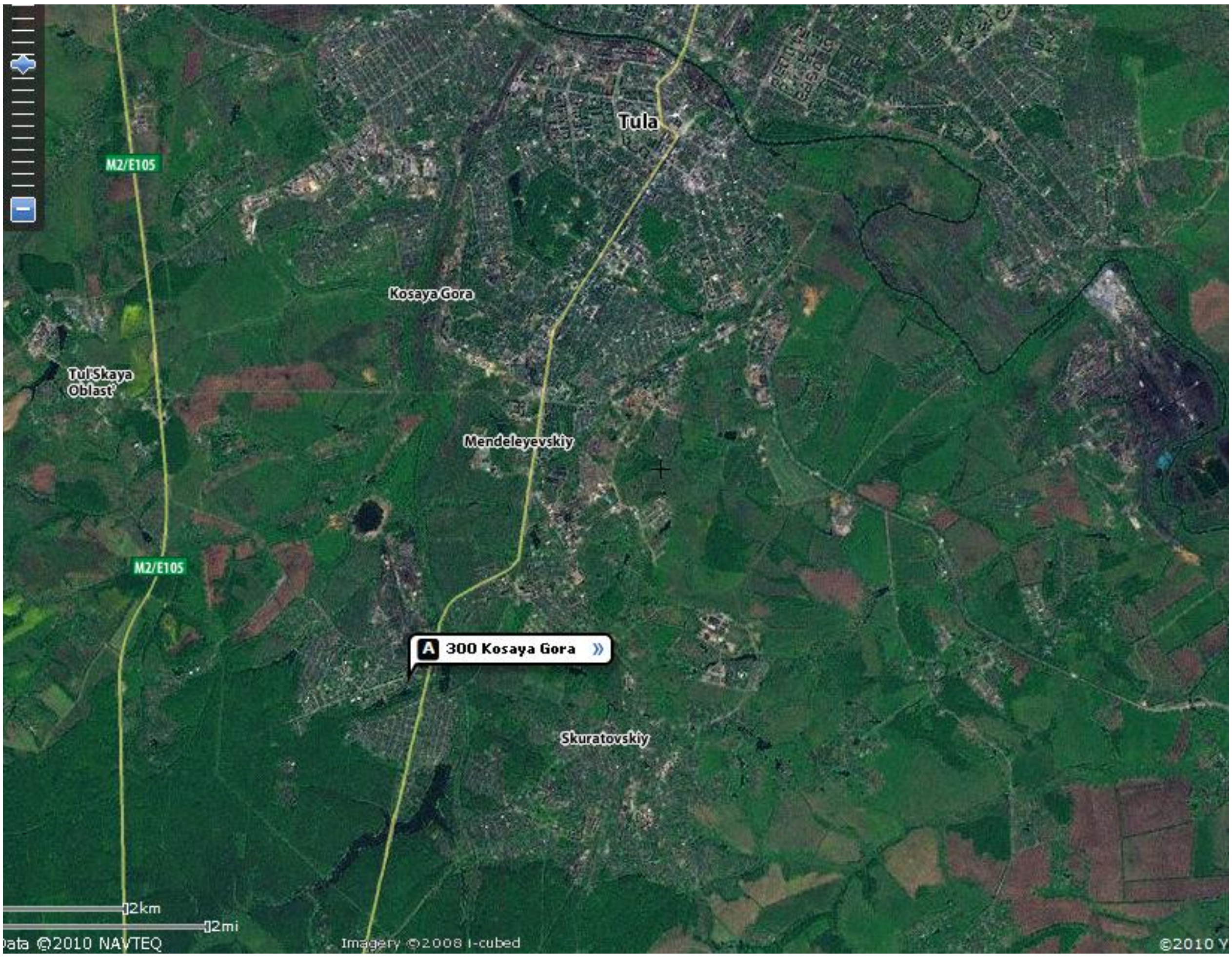
A.4.1.3. City/Town/Community etc.:

Tula is the capital of Tula Oblast. It is located in western Russia, on the Upa River, 193 km south of Moscow. It is a rich iron-mining region. Tula is an important transportation and manufacturing center. Industries produce iron and steel, agricultural machinery, mining equipment, and armaments. Population of Tula City is 481,216 citizens.

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

OJSC KMZ site (Kosaya Gora) is located at the south outskirts of Tula City, 10 kilometres from the centre
(see Figure A.4.1.4.1). The site coordinates are: 37.563801 E longitude, 54.126739 N latitude (by the software Google Earth).

Figure A.4.1.4.1: Satellite image of Tula City with OJSC KMZ site (Kosaya Gora)



Source:
http://maps.yahoo.com/#mvt=h&lat=54.148071&lon=37.610207&zoom=13&q1=Russian%20federation%20kosaya%20gora

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

Proposed JI project aims at renovation of BF using following modern energy-efficient technologies and equipment:

1. **Applying of non-fluxed iron-bearing material (production without sinter and fluxed iron-bearing material usage).** Only acid pellets are used for iron production. Slag forming materials (limestone and dolomite) are added as raw fluxes directly to blast furnace. This technology makes it possible to eliminate consumption of sinter and fluxed pellets which require significant fuels consumption during their production.

2. **Installation of bell-less top charging device with rotating chute.** Central feed bell-less top (BLT) charging device Paul Wurth with rotating chute is installed. Installation of BLT with rotating chute instead of conventional BF charging devices (two-bell, movable armours) invariably leads to improvement of engineering-and-economical performances of BF operation. BLT includes automation control system, realized on the programmable logic controllers base, application package to control charging parameters, heat-resistant silicon sealings of valves, radar sensor of hopper emptying. Paul Wurth modified BLT for raw flux usage (technology is described above). Therefore it made possible to add dolomite and limestone directly in the BF thereby eliminating using of energy consuming material.

3. **Castable lining of runner system.** Special attention is attended to losses reduction of smelted hot metal during its forwarding to ladle pots and following transportation to pig casting machines. In order to solve this problem in year 2007 there had been commissioned track scales for ladle pots weighing. Analysis of results of weighing showed that substantial losses of hot metal take place in kind of solidified iron portions in the ladle (so called ladle remains) and scrap formed during forwarding of hot metal along trough and runners. One of the main reasons of excessive production of ladle remains and scrap is entrainment of sand forming runner surface into hot metal flow. Besides, use of water-based ramming clays for trough lining causes increased loss of hot metal in kind of shot iron in slag which was confirmed by experimental results of solidified slag disintegration.
Up-to-date solution of above-stated problem is use of lining made of ultra low-cement castables or colloidal silica and these two techniques are based on application of nanotechnologies. The entity of ultra low-cement castables consists of powdering of particles of binder material down to thousandth parts of micron (nanometer is 10^{-9} m, or 1/1000 of micron), adding small dose of it into major refractory component grinded down to the same dimensions and mixing them with formation of even volumetric distribution. After drying and solidification this homogeneous mixture a super strong structure is formed. Therefore it makes possible to increase iron extraction during iron-making process thereby reducing specific coke consumption.

4. **Application of modern refractories for blast furnace lining.** Contemporary progress trend of blast furnace ironmaking intends to increase BF's campaign up to 20-25 years and to cancel execution of long-lasting interim overhauls (second-class overhaul according to the Russian/CIS classification). And lower part of BF (hearth and bottom) becomes the most vulnerable element which determines campaign duration. Thus in order to realize contemporary philosophy of BF operation it is necessary to use refractories for hearth and bottom lining which are highly resistant to hot metal and slag, mechanical load of burden column, temperature fluctuations during forced short-term stops and following blow-ins, etc. Carbon and graphitized materials with high thermal conductivity are conventionally used for lining in lower part of BF. Project of general overhaul of BF #1 stipulates use of supermicroporous carbon blocks with internal pore size of tenth and even hundredth parts of micron. Thermal conductivity of these materials is comparable with thermal conductivity of ferrous metals providing furnace with efficient cooling. For manufacturing of these refractories superpower presses are used. Computerized on-line testing of furnace cooling system is integral part of contemporary concept of refractory lining and this

testing is realized in the frameworks of BF automated control system. Therefore it made possible to intensify ironmaking process thereby reducing specific coke consumption and heat loss.

OJSC KMZ production volume is smaller comparing to the large metallurgical plants (the higher equipment capacity, easy to reduce GHG emission) but specific CO_2 project emissions are less due to application of modern technologies and equipment. Thus realization of BF #1 modernization will allow to intensify process and to reduce energy consumption during iron production at OJSC KMZ. Main technical data of modernised BF #1 are presented in Table A.4.2.1 below.

Table A.4.2.1: Main technical data of modernised BF #1

Indicator	Unit	Modernized BF
Volume	m^3	1,066
Number of tuyeres	-	16
Capacity in equivalent of steelmaking pig iron	tonne/year	770,000
Capacity in equivalent of foundry pig iron	tonne/year	611,000
Coke specific consumption	kg/tonne	535[1]
Blast consumption	m^3/minute	1,860
Blast pressure	Bar/psi	3/0.2
Blast-furnace mouth pressure	psi	1.5/0.1
Air-blast temperature	degree C	1130−1200
Natural gas consumption	m^3/tonne	80
Number of tap-holes	-	2

Source: OJSC KMZ

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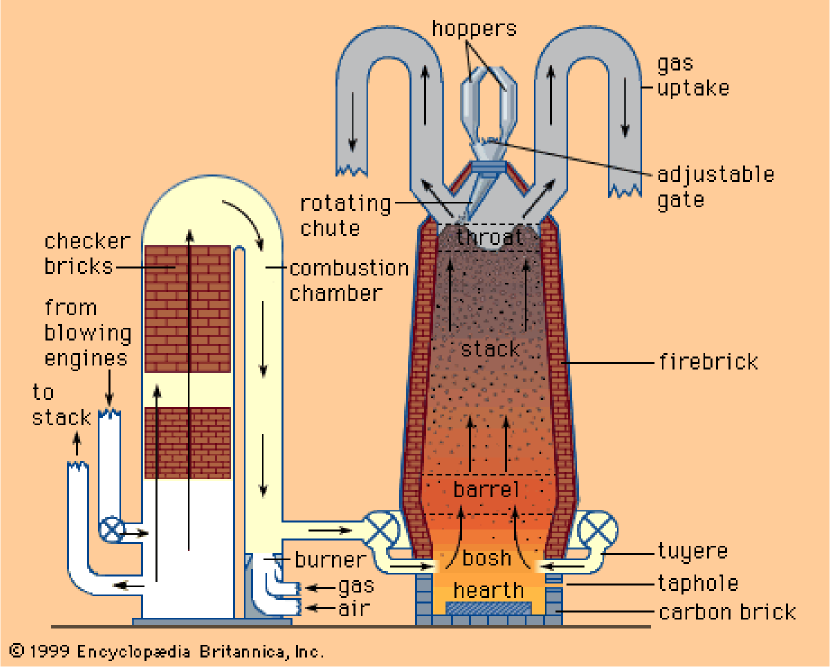
[1] KMZ produces foundry pig iron and use only non-fluxed iron-bearing raw materials with no content of slag-forming components (fluxes). Raw fluxes are added directly to blast furnace.

General description of blast furnace process



Source: http://www.britannica.com/EBchecked/topic-art/69019/1535/Schematic-diagram-of-modern-blast-furnace-and-hot-blast-stove

Blast furnaces produce pig iron from iron ore by the reduction activity of carbon (supplied as coke) at a high temperature in the presence of a fluxing agent such as limestone. Iron making blast furnaces consist of several zones: a crucible-shaped hearth at the bottom of the furnace; an intermediate zone called a bosh between the hearth and the stack; a vertical shaft (the stack) that extends from the bosh to the top of the furnace; and the furnace top, which contains a mechanism for charging the furnace. The furnace charge, or burden, consisting of iron-bearing materials (*e.g.*, iron-ore pellets and sinter), coke and flux (*e.g.*, limestone) descends through the shaft, where it is preheated and reacts with ascending reducing gases to produce liquid iron and slag which are accumulated in the hearth. Air that has been preheated to temperatures from 900° to 1,250° C (1,650° and 2,300° F) is blown into the furnace through multiple tuyeres (nozzles) located around the circumference of the furnace in the upper part of the hearth; these nozzles may number from 12 to as many as 40 on large furnaces. The preheated air is, in turn, supplied from a bustle pipe, a large-diameter pipe encircling the furnace. The preheated air reacts vigorously with the preheated coke, resulting in both the formation of the reducing gas (carbon monoxide) that rises through the furnace, and a very high temperature of about 1,650° C (3,000° F) that produces the liquid iron and slag.

The main chemical reaction producing the molten iron is:

$$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$$

Preheated blast air blown into the furnace reacts with the carbon in the form of coke to produce carbon monoxide and heat. The carbon monoxide then reacts with the iron oxide to produce molten iron and carbon dioxide. Hot carbon dioxide, unreacted carbon monoxide, and nitrogen from the air pass up through the furnace as fresh feed material travels down into the reaction zone. As the material travels downward, the counter-current gases both preheat the feed charge, decompose the limestone to calcium oxide and carbon dioxide, and begin to reduce the iron oxides in the solid state. The main reaction controlling the gas atmosphere in the furnace is called the Boudouard reaction:

$$C + O_2 \rightarrow CO_2$$
$$CO_2 + C \rightarrow 2CO$$

The decomposition of limestone in the middle zones of the furnace proceeds according to the following reaction:

$$CaCO_3 \rightarrow CaO + CO_2$$

The calcium oxide formed by decomposition reacts with various acidic impurities in the iron (notably silica), to form a fayalitic slag which is essentially calcium silicate, $CaSiO_3$:

$$SiO_2 + CaO \rightarrow CaSiO_3$$

The "pig iron" produced by the blast furnace has a relatively high carbon content of around 4–5%, making it very brittle, and of limited immediate commercial use. Some pig iron is used to make cast iron. The majority of pig iron produced by blast furnaces undergoes further processing to reduce the carbon content and produce various grades of steel used for tools and construction materials.

According to the schedule, BF #1 was commissioned in January-February 2010. The project implementation schedule is presented in Table A.4.2.2 below.

KMZ has organized special training sessions for bell-less top charging device with rotating chute maintenance held in MISiS (Moscow steel and alloys institute) for its staff. Additionally, KMZ had sent its maintenance staff to MMK for practical on-job training in order to get work experience with the similar equipment.

Table A.4.2.2: Project implementation schedule

N	Title	2008				2009				2010
		I q	II q	III q	IV q	I q	II q	III q	IV q	I q
1	Blast Furnace stop				■					
2	Dismantling of BF				■	■				
3	Dismantling of casthouse					■				
4	Foundation					■				
5	Erection of Furnace shell and platforms						■	■		
6	Erection of casthouse						■	■	■	
7	Installation of lining						■	■		
8	Mounting of charging equipment							■	■	■
9	Building of dust catcher								■	■
10	Mounting of casthouse equipment							■	■	■
11	Commissioning and start-up									■

Source: OJSC KMZ

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:

Iron production is connected with significant CO_2 emission. The main benefit of BF#1 reconstruction is application of non-fluxed iron-bearing raw materials and modern equipment installation. It reduces coke consumption during pig iron and raw material production. The usage of coke at the BF causes more than 90% of the total CO_2 emission. Conventional BFs also use sinter as a raw material which production requires about 50 kilograms of coke per tonne of sinter. Coke production is connected with CO_2 emission too (0.56[2] tonne CO_2/tonne coke). KMZ does not consume sinter and fluxed pellets. Also new equipment introduction leads to specific coke consumption reduction during pig iron production by BF#1. Therefore specific factor of GHG emission is reduced. Thus, this modern technology drives out outdated technology which has high specific factor of GHG emission.

Total estimated amount of emission reductions due to project implementation (2010-2012) is 587,272 tonnes of CO_2 equivalent as determined in Section E. Also information on baseline setting and additionality are presented in Section B.

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

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

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

	Years
Length of the crediting period	2.86
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2010	136,763
2011	208,974
2012	241,535
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	587,272
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	195,757

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

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	241,535
2014	241,535
2015	241,535
2016	241,535
2017	241,535
2018	241,535
2019	241,535
2020	241,535
Total estimated emission reductions over the period indicated (tonnes of CO_2 equivalent)	1,932,279
Annual average of estimated emission reductions over the period indicated (tonnes of CO_2 equivalent)	241,535

A.5. Project approval by the Parties involved:

The project was approved by the Parties involved:

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

The Netherlands (Investor) – the Letter of approval from NL Agency, Ministry of Economic Affairs dated 08 September 2010 No 2010JI26.

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)[3], 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)[4] (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[5], using the following step-wise approach:

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

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

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

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

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

Key factors that affect the baseline are taken into account:

a) **Sectoral reform policies and legislation.** Main development goal of metallurgical industry is reducing of home metal demand.[6] JSC “KMZ” does not have any obligations for iron capacity construction;

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

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

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

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

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

c) **Availability of capital (including investment barriers).** Capital is available but high bank rate and high country investment risk make unprofitable of new equipment introduction in Russia. Also the capital outflow was at the end of 2008;

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

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

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

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

Step 2. Application of the approach chosen

OJSC KMZ produces foundry and steelmaking pig iron in Blast Furnace. Usage of Blast Furnace is general historic practice in iron industry. Lately scrap usage drives out pig iron during steelmaking process. But scrap may not eliminate pig iron fully due to steel corrosion and increase of steel consumption. There were three blast furnaces at the KMZ. BF #1 operated without modernisation or renovation for more than 26 years. It could not continue operating without renovation. Proposed project aims to reconstruct existing BF # 1 using recent achievements in this field.

At OJSC KMZ alternative for the pig iron production is technically feasible and discussed below. The basic principle applied is that the demand for pig iron is not influenced by the project and is identical in the project and baseline scenario. This means that depending on the actual production in the project scenario there is an option in the baseline scenario this production is produced by other iron plants in Russia.

Pig iron production:

Alternative 1: Iron plants (blast furnaces) will satisfy the remaining iron demand;

Alternative 2: Reconstruction of Blast Furnace #1 using recent achievements in this field (Project activity not implemented as JI);
Alternative 3: Reconstruction of Blast Furnace #1 without using contemporary achievement in this field.

These alternatives are described below in more details.

1) Iron plants (blast furnaces) will satisfy the remaining iron demand

The displacing production of about 0.7 million tonnes of pig iron will be covered by other (new and/or existing) iron plants (blast furnaces). Increase in production will be possible due to increase of existing plants load. Reconstruction/modernization is not being implemented under this scenario. There are no legal or other requirements that enforce other pig iron producers to stop ironmaking. It is continuation of existing situation. Thus, scenario 1 is feasible and the most plausible.

2) Reconstruction of Blast Furnace #1 is being done using recent achievements in this field

Annual production of reconstructed BF #1 is about 0.7 million tonnes of pig iron. Full reconstruction of BF #1 and introduction of modern equipment are necessary for achievement of double its production capacity. It is connected with big investments in the project. Thus this scenario cannot be considered as a baseline scenario (see investment analysis Section B.2).

3) Reconstruction of Blast Furnace #1 is being done without using contemporary achievement in this field

Annual production of BF #1 was about 0.4 million tonnes of pig iron. Full reconstruction of BF #1 is necessary because BF #1 is operated for more than 26 years. Project technical parameters stay on previous level. Production of about 0.3 million tonnes of pig iron will be covered by other (new and/or existing) iron plants (blast furnaces). It would be unreasonable to invest in outdated equipment. Possible sale revenue is reduced almost twice according to this scenario. Moreover, this scenario is not conservative in terms of greenhouse gas emissions (old technology and equipment have significant specific coke consumption and fluxed iron bearing materials consumption). Thus this scenario cannot be considered as a technologically favourable scenario.

Conclusions

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

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

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

Data/Parameter	$BP_y^{foundry\_iron}$
Data unit	Tonnes
Description	Displacing foundry iron production in the baseline scenario in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	Plant records
Value of data applied (for ex ante calculations/determinations)	180,000
Justification of the choice of data or description of	In the baseline scenario displacing iron production is equal to iron production of reconstructed BF #1 in the project scenario in

measurement methods and procedures (to be) applied	year *y*. The weighting method is used to identify the amount of iron. The weighting equipment is being calibrated and checked by the plant staff.
OA/QC procedures (to be) applied	The company has special Department for Control and Measuring devices. This department is in charge of supervision of measuring devices operation and performance. It checks and substitutes devices (adjusted and calibrated) from the reserve if necessary. The company has approved regulations for measurements, registration and archiving data and the annual schedule for calibration and replacement of devices.
Any comment	This parameter is being used for emissions calculations for displacing production (by other plants).

Data/Parameter	$BP_y^{steelmaking\_iron}$
Data unit	Tonnes
Description	Displacing steelmaking iron production in the baseline scenario in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	Plant records
Value of data applied (for ex ante calculations/determinations)	540,000
Justification of the choice of data or description of measurement methods and procedures (to be) applied	In the baseline scenario displacing iron production is equal to iron production of reconstructed BF #1 in the project scenario in year *y*. The weighting method is used to identify the amount of iron. The weighting equipment is being calibrated and checked by the plant staff.
OA/QC procedures (to be) applied	The company has special Department for Control and Measuring devices. This department is in charge of supervision of measuring devices operation and performance. It checks and substitutes devices (adjusted and calibrated) from the reserve if necessary. The company has approved regulations for measurements, registration and archiving data and the annual schedule for calibration and replacement of devices.
Any comment	This parameter is being used for emissions calculations for displacing production (by other plants).

Data/Parameter	$BEF_{foundry,y}$
Data unit	tCO_2/tonnes of foundry pig iron
Description	Baseline emission factor for displacing foundry pig iron production in year *y*
Time of determination/monitoring	*Ex-post.*
Source of data (to be) used	LLC “Korporatsiya proizvoditeley chernih metalov” annual statistical report “Russian Chermet information “. This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	2.051 (2007)
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The approach of “Tool to calculate the emission factor for an electricity system” is used. IPCC default values are used for CO_2 emission factor of fossil fuels. The default grid emission factors for the regional power systems of Russia are used.

	Please see Annex 2 for more detailed information.
OA/QC procedures (to be) applied	-
Any comment	Data required to calculate the baseline emission factors for the year y is usually available six months later after the end of the year y, alternatively emission factors of the previous year (y-1) may be used. If data are available later than 18 months after the end of year y, emission factors of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout the crediting period. After the data for the last three years is available, emission factor may be fixed *ex-ante* as three-year average. Pig iron is usually separated into two major groups of grades according to their composition and further use: foundry and steelmaking. Specific fuel consumption for these grades differs. Therefore their production emission factors are calculated individually.

Data/Parameter	$BEF_{steelmaking,y}$
Data unit	tCO_2/tonnes of steelmaking pig iron
Description	Baseline emission factor for displacing steelmaking pig iron production in year *y*
Time of determination/monitoring	Ex ante
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	1.862 (2007)
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The approach of "Tool to calculate the emission factor for an electricity system" is used. IPCC default values are used for CO_2 emission factor of fossil fuels. The default grid emission factors for the regional power systems of Russia are used. Please see Annex 2 for more detail information.
OA/QC procedures (to be) applied	-
Any comment	If data required to calculate the baseline emission factors for the year y is usually available six months later after the end of the year y, alternatively emission factors of the previous year (y-1) may be used. If data is available latter than 18 months after the end of year y, emission factors of the year preceding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout the crediting period. After the data for the last three years is available, emission factor may be fixed *ex-ante* as three-year average.

	Pig iron is usually separated into two major groups of grades according to their composition and further use: foundry and steelmaking. Specific fuel consumption for these grades differs. Therefore their production emission factors are calculated individually.

Data/Parameter	$CA_{Ca,y}$
Data unit	fraction
Description	Content of CaO in BF slag in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information''. This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	If the plant provides them separately to LLC "Korporatsiya proizvoditeley chernih metalov", then these parameters are taken separately for steelmaking pig iron and separately for foundry pig iron. If the plant provides consolidated data for steelmaking pig iron and foundry pig iron together, as one figure, than this figure is used for calculation of $BEF_{steelmaking,y}$ and $BEF_{foundry,y}$, because it is connected with steelmaking and foundry pig iron production by the same blast furnace.
OA/QC procedures (to be) applied	-
Any comment	-

Data/Parameter	$MG_{Mg,y}$
Data unit	fraction
Description	Content of MgO in BF slag in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	If the plant provides them separately to LLC "Korporatsiya proizvoditeley chernih metalov", then these parameters are taken separately for steelmaking pig iron and separately for foundry pig iron. If the plant provides consolidated data for steelmaking pig iron and foundry pig iron together, as one

	figure, than this figure is used for calculation of $BEF_{steelmaking,y}$ and $BEF_{foundry,y}$, because it is connected with steelmaking and foundry pig iron production by the same blast furnace.
OA/QC procedures (to be) applied	-
Any comment	-

Data/Parameter	$Fuel_y^i$
Data unit	tonnes or m^3
Description	Fuel *i* (gas, coal, coke) consumption in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC “Korporatsiya proizvoditeley chernih metalov” annual statistical report “Russian Chermet information “. This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC “Korporatsiya proizvoditeley chernih metalov” for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	-
OA/QC procedures (to be) applied	-
Any comment	-

Data/Parameter	SER_y^k
Data unit	1000 m^3
Description	Secondary energy resource *k* (blast furnace, coke oven gases) output in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC “Korporatsiya proizvoditeley chernih metalov” annual statistical report “Russian Chermet information “. This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC “Korporatsiya proizvoditeley chernih metalov” for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	-
OA/QC procedures (to be) applied	-
Any comment	Usual part of blast furnace gas is used outside of the blast furnace plant as fuel for other equipment.

Data/Parameter	Coke_y, Sin_y, Oxy_y, Pel_y
Data unit	tonnes or 1000m^3

Description	Coke, sinter, oxygen and pellet consumption in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC “Korporatsiya proizvoditeley chernih metalov” annual statistical report “Russian Chermet information “. This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC “Korporatsiya proizvoditeley chernih metalov” for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	-
OA/QC procedures (to be) applied	-
Any comment	-

Data/Parameter	$PR_{slag,y}$
Data unit	tonnes
Description	Slag production by blast furnaces in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC “Korporatsiya proizvoditeley chernih metalov” annual statistical report “Russian Chermet information “. This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC “Korporatsiya proizvoditeley chernih metalov” for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	If the plant provides them separately to LLC “Korporatsiya proizvoditeley chernih metalov”, then these parameters are taken separately for steelmaking pig iron and separately for foundry pig iron. If the plant provides consolidated data for steelmaking pig iron and foundry pig iron together, as one figure, than this figure is used for calculation of $BEF_{steelmaking,y}$ and $BEF_{foundry,y}$, because it is connected with steelmaking and foundry pig iron production by the same blast furnace.

Data/Parameter	CO_y^k
Data unit	fraction
Description	Carbon monoxide content in *k* (blast furnace, coke oven gases) in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC “Korporatsiya proizvoditeley chernih metalov” annual statistical report “Russian Chermet information “. This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC “Korporatsiya proizvoditeley chernih metalov” for every pig iron producer in Russia.
Justification of the choice of	If the plant provides them separately to LLC “Korporatsiya

data or description of measurement methods and procedures (to be) applied	proizvoditeley chernih metalov", then these parameters are taken separately for steelmaking pig iron and separately for foundry pig iron. If the plant provides consolidated data for steelmaking pig iron and foundry pig iron together, as one figure, than this figure is used for calculation of $BEF_{steelmaking,y}$ and $BEF_{foundry,y}$, because it is connected with steelmaking and foundry pig iron production by the same blast furnace.

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

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

Step 1. Indication and description of the approach applied

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

Step 2. Application of the approach chosen

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

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

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

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

The following alternatives to the proposed project were identified:

Alternative 1: *Iron plants (blast furnaces) will satisfy the remaining iron demand*. In the absence of BF #1 iron required by different consumers would have been supplied by other (new and/or existing) Russian metallurgical plant. Other iron plants can increase iron production in case of iron demand increase. Annual displacing iron production will be about 700 thousand tonnes.

Alternative 2: *Reconstruction of Blast Furnace #1 is being done using recent achievements in this field.* The proposed project activity undertaken without being registered as a JI project activity. Expected total annual capacity of reconstructed Blast Furnace is approximately 0.7 million tonnes of pig iron. It will depend on pig iron demand. Reconstruction of BF #1 requires significant investment due to usage of modern achievements for BF, but after project implementation, iron production cost will be lower than using outdated technology. This is due intensifying of pig iron that will reduce iron cost. Also higher capacity of reconstructed BF allows reducing of investment payback time.

Alternative 3: *Reconstruction of Blast Furnace #1 is being done without using contemporary achievement in this field*. Annual capacity of reconstructed BF #1 would remain at the previous level of about 0.4 million tonnes of pig iron. But the blast furnace mantle and lining need to be fully replaced.

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

After reconstruction iron production cost will remain on the previous level. Production of about 0.3 million tonnes of pig iron will be covered by other (new and/or existing) iron plants (blast furnaces).

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

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

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

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

Step 2. Investment Analysis

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

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

Sub-step 2a: Determine appropriate analysis method

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

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

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

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

The proposed project, installation and reconstruction of blast furnace #1, shall be implemented by OJSC KMZ. KMZ has no internal IRR benchmark for its investment decision making. IRR benchmark analysis is calculated according to the Table B.2.1. If the proposed project (not being implemented as a JI project) has less favourable indicator, i.e. a lower IRR, than this benchmark, then the project cannot be considered as financially attractive.

Table B.2.1. Financial indicators used to set benchmark

#	Factor	Rate	Description	Source
1	Risk-free rate	3.8%	German long-term interest rate in euro as a secondary market yields of government bonds with remaining maturity close to ten years, March 2008. This rate is taken as Germany is the largest Euro economy.	European Central Bank[8]
2	Russian interest rate	7.5%	Weighted average interest rate of Russian federal bonds and short-dated bond.	Eurobond [9]
3	Country risk premium	**3.17%**	Non-specific risk associated with investments in Russia. Equals to Russian interest rate less Risk-free rate.	-
4	Euro inflation	2.30%	Inflation in euro zone	Eurostat[10]
5	Real risk-free rate	**1.41%**	*Real interest rate=(1+Nominal Interest Rate)/(1+Inflation)-1*	-
6	Company related risk premium	**4 %**	Company-specific risk premium associated with company stability, reputation, overall estimation.	KMZ assessment
7	Project risk premium	**8%**	This type of projects has the medium risk factor of 8-10%. Thus the lowest range is applied to be conservative.	Methodological recommendations on evaluation of investment projects efficiency. Approved by Ministry of Economy of the RF, Ministry of Finance of the RF, State Committee of the RF on Construction, Architecture and Housing Policy of the RF 21.06.1999 N BK 477.
	Total expected return	**17.17%**	This rate takes into account real (inflation adjusted) risk-free rate increased by a general expected market return, country risk and specific project risk.	

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:

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

[9] http://www.cbonds.info/ru/rus/emissions/emission.phtml/params/id/242

[10] http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&language=en&pcode=tsieb060&tableSelection=1&footnotes=yes&labeling=labels&plugin=1

1. Investment decision: March 2008, commissioning date: January 2010;
2. The project investment cost accounts for approximately EUR 59 million during two years;
3. The calculations are made at constant prices as of March 2008[11];
4. The exchange rate (EUR/RUR) 1/36.5099;
5. The project lifetime is around 20 years (lifetime of the main equipment);
6. Raw material consumption and electricity for new EAF is taken into account in line with the technical specifications of the project design;
7. Raw material consumption for modernised EAF is taken into account in line with the indicators achieve;
8. Coke and pellet consumptions are the biggest cost component constituting about 78 % of total operational cost.
9. Total pig iron production in steelmaking pig iron equivalent is 766,800 tonnes of pig iron per year.

The project cash flow is formed by revenue flows generated by sales of pig iron, slag and blast furnace gas produced by the blast furnace #1.
The project's financial indicator is presented in the Table B.2.2 below.

Table B.2.2. Financial indicators of the project

Scenario	IRR (%)
Base case	0.58

Cash flow analysis shows IRR of 0.58 %. It is well below the benchmark determined as 17.17 %. 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 three key indicators were considered in the sensitivity analysis: investment cost, steel prices, metal stock. The other cost components account for less than 20 % of total or operation cost and therefore are not considered in the sensitivity analysis. In line with the Additionality Tool the sensitivity analysis should be undertaken within the corridor of ±10 % for the key indicators.

It is unlikely that pig iron, coke and pellet price will go up or down independently one from another because these parameters are considered together. Coke and pellet cost occupies fixed part in iron cost of a pig iron producer. They are the biggest cost component constituting about 78 % of total operation cost. Thus they are depended from each other.

Scenario 1 considers 10% investment cost growth. Scenario 1 shows that this assumption worsened the cash flow performance due to significant cost increase. IRR is equal -0.30%.

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

Scenario 2 is based on the assumption of 10% investment cost decrease that improves cash flow and performance indicators making IRR the higher on 1.59%.

Scenario 3 implies 10% growth of coke and pellet cost and pig iron price. It leads that IRR climbing up to 10.49%. Pig iron prices are the most revenue driving indicator. But despite increase in pig iron price proposed scenario is robust.

Scenario 4 implies 10% reduction of coke and pellet cost and pig iron price. As plant revenues are one of the main components reducing worsens the cash flow performance indicators. The project is unprofitable in this scenario.

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

Table B.2.3: Sensitivity analysis (summary)

Scenario	IRR (%)
Scenario 1	-0.30
Scenario 2	1.59
Scenario 3	10.49
Scenario 4	-

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

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

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

Step 4: Common practice analysis
In line with the Tool this analysis serves as credibility check to complement the investment analysis (Step 2) or barrier analysis (Step 3) if the latter is applicable. The existing common practice is identified and discussed through the following Sub-steps:

Sub-step 4a: Analyze other activities similar to the proposed project activity:
In Russia the majority of blast furnaces were constructed before 1990, before the USSR disintegration. Metallurgical industry of Russia in the 90-ies of the XX century was working in the conditions of the systemic crisis of economy, sharp drop of the domestic metal products consumption, imperfect taxation, crediting and financial systems. This very negatively impacted the industry production figures. All these leaded to only insignificant investments into modernisation of the industry. In the best cases technical and production parameters were supported at previous levels.

Notwithstanding the fact that the wear of business assets at the industry’s enterprises amounted to 50%, the investments into the iron and steel industry in Russia on a 1 ton of steel (in comparative figures) in 1996-2000 amounted to 12-14 USD, as compared to the US – about 30 USD and in the European Union countries – 25 USD. Largely it was explained by the issue that the debt financing of the projects was in fact not carried out because of the high crediting rate of the Russian banks[12]. Amortisation as investment source in iron-steel prime cost arrived critically low value (less than 2%).

Iron is used as a raw material for making steel by the basic oxygen process. Recently scrap usage drives out steelmaking iron from the steelmaking process. Share of basic oxygen steel was slowly decreasing between 2000 and 2007[13].

Proposed JI project includes next main modern energy-efficient technologies and equipment which lead to CO_2 emission reduction:

- Applying of non-fluxed iron-bearing material (production without sinter and fluxed iron-bearing material usage).
- Installation of bell-less top charging device with rotating chute.

The ironmaking technology application by KMZ uses only non-fluxed iron-bearing raw materials. KMZ is exclusive pig iron producer in Russia which uses this technology. Using the technology allows producing pig iron with ultra-low content of impurities (according to data of LLC “Korporatsiya proizvoditeley chernih metalov”). BLT is used by other pig iron producers but KMZ uses BLT specially modified by Paul Wurth for raw flux usage. There are only six plants (iron producers)[14] in the world that use the same technology as OJSC KMZ. All of them are located outside of Russia and cannot be considered in the Common practice analysis. Also this project is implemented during economical crisis in Russia. Therefore the proposed JI project (reconstruction of BF with modern improvement process using and new capacity creation) does not reflect a widely observed and commonly carried out activity.

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

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

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

Conclusion: Thus the additionality analysis demonstrates that project’s 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:

There are five different sources of GHG emissions during the pig iron production:

- Emission from the raw materials (limestone, dolomite, coke) during the steelmaking process;
- Fuel (natural gas) combustion;
- GHG emissions from the Russian electricity grid;
- Production of raw material (coke, pellet, sinter);
- Blast furnace gas post-combustion in preheater.

Also there is GHG emission not connected with the iron production:

- Blast furnace gas combustion outside the plant site.

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[12] M.I. Beskhmelnitsyn. Analytical memo on the condition of iron and steel industry in Russia. Buklketing of the RF
Accounting Chamber, #9, 2002. http://www.ach.gov.ru/userfiles/bulletins/11-buleten_doc_files-fl-710.pdf

[13] Worldsteel Committee on Economic Studies – Brussels, 2009. Steel Statistical Yearbook 2008 (Table 7).

[14] Mittal Cleveland (OH, USA), Republic Engineering Products (OH, USA), US Steel Great lakes (Mi, USA), US Steel Granite City (IL, USA), Severstal Warren (OH, USA), US Steel Canada (Lake Erie, Canada).

An overview of all emission sources in the iron production of proposed project is given in Table B.3.1 below. 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 percent of the annual average anthropogenic emissions by sources of GHGs, or exceed an amount of 2,000 tonnes of CO_2 equivalent, whichever is lower.

Table B.3.1: Sources of emissions

№	Source	Gas	Included/ excluded	Justification/Explanation
1	Total electricity consumption during an iron production and compressed air production.	CO_2	Included	• All iron producers have comparable emissions from these sources, thus including of these sources is conservative; • Emissions are calculated using standardized regional electricity factors for Russia[15].
2	Coke consumption	CO_2	Included	• Coke consumption will decrease after the project implementation; • All iron producers have comparable emissions from coke consumption.
3	Natural gas consumption	CO_2	Included	• The fossil fuel combustion will decrease.
4	Coke, pellet and sinter production	CO_2	Included	• All iron producers have comparable emissions from these sources; • OJSC KMZ does not produce coke, pellet and sinter; • Emissions due to coke production are calculated using IPCC emission factor. Emissions due to fuel consumption during pellet production are calculated according to fuel consumption in Russia. Emissions connected with decarbonisation of raw materials (for pellet production) are back-calculated according to content of CaO and MgO in blast furnace slag.

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[15] JSC KMZ does not have on-site power generation facilities.

№	Source	Gas	Included/ excluded	Justification/Explanation
5	Limestone and Dolomite (slag-forming materials)	CO_2	Included	Emissions connected with decarbonisation of slag-forming materials are back-calculated according to content of CaO and MgO in blast furnace slag of KMZ plant. The same calculation method is used in baseline but there slag-forming materials are added when producing pellets or sinter. OJSC KMZ is exclusive pig iron producer in Russia which uses only non-fluxed iron-bearing raw materials with no content of slag-forming components (fluxes). These components are added as raw fluxes directly to blast furnace. Other iron producer does not add raw fluxes directly to blast furnace (they are preliminarily added when producing pellets or sinter). Consumption of fluxes is always necessary for non-fluxed pellets operated blast furnace. Fluxes' amount does not depend on equipment and connected only with type of produced iron (foundry, basic or nodular). Fluxes are added for binding silicon dioxide naturally contained in raw materials. The rate of added fluxes has derivative parameter − slag basicity. Slag basicity is determined according to the next formula: $\frac{CaO+MgO}{SIO_2}$. The value of slag basicity can be varied in sufficiently short range to ensure absorption of sulphur, decrease melting point of slag and increase slag fluidity. There are six plants (iron producers)[16] in the world which use same technology as OJSC KMZ. Insignificant amount of CaO and MgO enters the blast furnace with coke ash and return slag (which is used for sinter and pellet production). But their influence is less than 1%. Also CaO and MgO may enter the process with iron-bearing raw materials (ore). But their amounts are the same both in the baseline and project scenario. Thus this amount is not taken into consideration. If CaO and MgO presented in the ore as carbonates, than emission connected with their decarbonisation will be taken into account during back-calculation from content of CaO and MgO in blast furnace slag.

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[16] Mittal Cleveland (OH, USA), Republic Engineering Products (OH, USA), US Steel Great lakes (Mi, USA), US Steel Granite City (IL, USA), Severstal Warren (OH, USA), US Steel Canada (Lake Erie, Canada).

№	Source	Gas	Included/ excluded	Justification/Explanation
6	Blast furnace gas post-combustion in preheater.	CO_2	Excluded	Blast furnace gas consists of carbon monoxide, carbon dioxide and hydrogen gas. It is underfired exhaust gas which is determined by blast furnace process. During emission calculation from raw material (coke) and fuel (natural gas) IPCC emission factor is used. Thus it means full combustion in a blast furnace without case of underfiring. Therefore blast furnace gas post-combustion is not included in the emission calculation (for the avoidance of double accounting).
7	Blast furnace gas combustion outside the plant site	CO_2	Excluded	Part of blast furnace gas is used in boiler (outside of the plant site for preparation of hot water). Blast furnace gas consists of carbon monoxide, carbon dioxide and hydrogen gas. Only carbon monoxide and hydrogen gas can be used as fuel. Therefore carbon dioxide generated from carbon monoxide in boiler has to be excluded from total emissions. Because blast furnace gas (carbon monoxide) is combusted not for the project.
8	Methane origination during fuels burning	CH_4	Excluded	The gas was excluded from the consideration due to relatively small volume of emissions (see the description in section D.1).
9	Nitrous oxide origination during fuels burning	N_2O	Excluded	The gas was excluded from the consideration due to relatively small volume of emissions (see the description in section D.1).
10	Electricity consumption during nitrogen production for BLT.	CO_2	Excluded	Emissions are calculated using standardized regional electricity factors for Russia[17]. The source was excluded from the consideration due to relatively small volume of emissions, less than 1 percent of the annual average anthropogenic emissions and not exceed an amount of 2,000 tonnes of CO_2 equivalent per year.
11	Schungite consumption.	CO_2	Excluded	All iron producers have comparable consumption of schungite. Schungite consists of 56-60 % SiO_2. This leads to full banding of carbon in silicone carbide. Silicon carbide generates wall accretion in a BF[18]. Thus carbon of schungite is excluded from GHG calculation.

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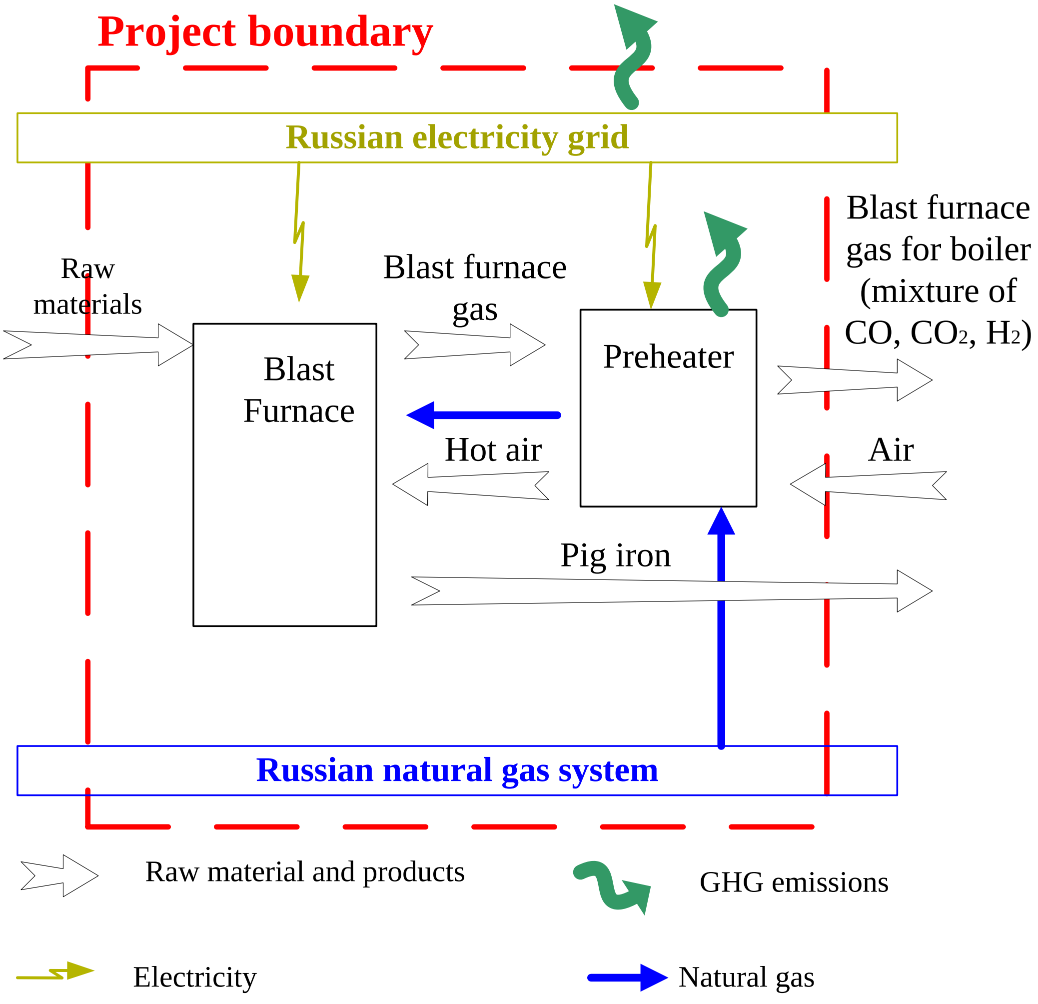
[17] JSC KMZ does not have on-site power generation facilities.

[18] Magazine article, “STAL”, #10-2007, pages 13-15 .

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

Figure B.3.1: Sources of emissions and project boundary



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

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

Date of completion of the baseline study: 17th of May 2010

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

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

Project start date is 12 March 2008 when the contract was signed for equipment delivery.

C.2. Expected operational lifetime of the project:

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

C.3. Length of the crediting period:

Startdate of the crediting period: 18/02/2010
Length of the crediting period: 2.87 years or 34.36

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

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

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

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

In this PDD, a JI specific approach regarding monitoring is used. As elaborated in Section B.3, the project activity only affects the emissions related to electricity, fuel, raw materials consumption and production. Emissions related to the raw material and products transportation and fuel consumption are excluded. Also Emissions related to limestone and dolomite consumption (slag-forming additives) are excluded (see Table B.3.1).

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

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

The project emissions are established in the following way:

- The project emissions are the emissions from reconstructed BF#1;
- Greenhouse emissions during 2010-2012 are determined using planed performance data.

The baseline emissions are established in the following way:

- The baseline emissions of the production in the project scenario are established using the approach as given in Annex 2;
- The baseline emissions of the grid are established using the Russian standardized grid factor as described in Annex 2;
- Baseline emission factor of the displacing production may be actual (or available for last year) or fixed ex-ante for three years;

General remarks:

- Social indicators, such as number of people employed, safety records, training records etc., will be available to a verifier, if required;
- Only CO_2 emissions are taken into account. Major source of other GHGs such as CH_4 and N_2O at a blast furnace process is the burning of fuel (coke). Given fuel specific consumption in ordinary blast furnace process in Russia, CH_4 emission is 129 g/tonne of pig iron and N_2O emissions is 19 g/tonne of pig iron compared with about 1862 kg of CO_2 per tonne of pig iron (2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 2, STATIONARY COMBUSTION). Also emissions may be less because blast furnace gas is burnt up in boiler and preheater. Omitting these two pollutants for a steelmaking process is conservative, because they contribute to less than 0.35 % of the total emissions (CO_2 equivalent), far below the confidence level for the CO_2 emission calculation. The CH_4 and N_2O emission reductions will not be claimed. This is conservative.

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

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

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
P1	PE_y	Plant calculation	tCO_2	C	Annually	100%	Electronic and paper	-
P2	$PE_{raw,y}$	Plant calculation	tCO_2	C	Annually	100%	ectronic and paper	-
P3	$PE_{pellet,y}$	Plant calculation	tCO_2	C	Annually	100%	Electronic and paper	-
P4	$PE_{gas,y}$	Plant calculation	tCO_2	C	Annually	100%	Electronic and paper	-
P5	$PE_{coke,y}$	Plant calculation	tCO_2	C	Annually	100%	Electronic and paper	-
P6	$PE_{el,y}$	Plant calculation	tCO_2	C	Annually	100%	Electronic and paper	-
P7	$PE_{boiler,y}^{CO\rightarrow CO2}$	Plant calculation	tCO_2	C	Annually	100%	Electronic and paper	-
P8	$PR_{slag,y}$	Technical report	tonnes	M/C	Annually	100%	Electronic and paper	-
P9	$PCA_{Ca,y}$	Technical report	fraction	M/C	Annually	100%	Electronic and	-

							paper	
P10	$PMG_{Mg,y}$	Technical report	fraction	M/C	Annually	100%	Electronic and paper	-
P11	$PR_{pellet,y}$	Technical report	tonnes	M/C	Annually	100%	Electronic and paper	-
P12	$SF_{i,y}^{pellet}$	Report	1000Nm^3 or tonne /t	M/C	Annually	100%	Electronic and paper	LLC Korporatsiya proizvoditeley chernih metalov annual statistical report "Russian Chermet information "
P13	EF_i	IPCC	tCO$_2$/t	E	Fixed ex ante	100 %	Electronic and paper	Default values (IPCC 2006)
P14	$NCV_{i,y}$	IPCC	GJ/ m^3	E	Fixed ex ante	100 %	Electronic and paper	Default values (IPCC 2006)
P15	$PF_{gas,y}$	Technical report	m^3	M	Annually	100%	Electronic and paper	-
P16	$NCV_{gas,y}$	Technical report	GJ/ m^3	M/C	Per shipment/ annually	100 %	Electronic and paper	Weighted average NCV will be taken over a calendar year for each fuel
P17	EF_{gas}	IPCC	tCO$_2$/GJ	E	Fixed ex ante	100 %	Electronic and paper	Default values (IPCC 2006)
P18	CC_{coke}	IPCC	t C/ tonne of coke	E	Fixed ex ante	100 %	Electronic and paper	Default values (IPCC 2006)
P19	$EF_{coke}^{production}$	IPCC	tCO$_2$/t	E	Fixed ex ante	100 %	Electronic and paper	Default values (IPCC 2006)
P20	$PR_{coke,y}$	Technical report	tonnes	M/C	Annually	100%	Electronic and paper	-
P21	$EF_{el,y}$	See Annex 2	tCO$_2$/ MWh	E	Fixed ex ante	100 %	Electronic and paper	Electricity grid GHG emission factor for JI projects in

								Russian Regional Energy System “Center”. See Annex 2.
P22	$PEL_{el,y}$	Technical report	MWh	M/C	Continuously	100 %	Electronic and paper	-
P23	$PE_{briquet,y}$	Plant calculation	tCO_2	C	Annually	100%	Electronic and paper	**-**
P24	$PB_{briquet,y}$	Technical report	tonnes	M/C	Annually	100%	Electronic and paper	-
P25	$CC_{briquet,y}$	Technical report	t C/ tonne of briquet	M/C	Continuously	100 %	Electronic and paper	-
P26	PBG_y	Technical report	II. m^3	M/C	Annually	100%	Electronic and paper	-
P27	CO_y	Technical report	fraction	M/C	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):

Project emissions

$$PE_y = PE_{raw,y} + PE_{pellet,y} + PE_{coke,y} + PE_{gas,y} + PE_{el,y} + PE_{briquet,y} - PE_{boiler,y}^{CO \rightarrow CO2} \qquad (1)$$

Where:

PE_y	Project emissions in year *y* (tCO_2);
$PE_{raw,y}$	Project emissions due to raw materials decarbonisation (limestone and dolomite) in year *y* (tCO_2);
$PE_{pellet,y}$	Project emissions due to pellet production (fuel consumption) in year *y* (tCO_2);

$PE_{gas,y}$	Project emissions due to natural gas combustion in year *y* (tCO_2);
$PE_{coke,y}$	Project emissions due to coke burning and production in year *y* (tCO_2);
$PE_{el,y}$	Project emissions due to electricity consumption in year *y* (tCO_2);
$PE_{briquet,y}$	Project emissions due to briquettes consumption in year *y* (tCO_2);
$PE_{boiler,y}^{CO\rightarrow CO2}$	Emissions that are not connected with project (burning of blast furnace gas (only CO) in boiler) in year *y* (tCO_2).

Project emissions due to raw material decarbonisation

$$PE_{raw,y} = PR_{slag,y} \times PCA_{Ca,y} \times \frac{44}{56} + PR_{slag,y} \times PMG_{Mg,y} \times \frac{44}{40} \tag{2}$$

Where:

$PE_{raw,y}$	Project emissions due to raw materials decarbonisation (limestone, dolomite) in year *y* (tCO_2);
$PR_{slag,y}$	Slag production by BF#1 in year *y* (tonnes);
$PCA_{Ca,y}$	Content of CaO in BF#1 slag in year *y* (fraction);
$PMG_{Mg,y}$	Content of MgO in BF#1 slag in year *y* (fraction);
44	Molar weight of CO_2;
40	Molar weight of MgO;
56	Molar weight of CaO.

Project emissions due to pellet (or other iron bearing material) production (if coke is used as fuel then emissions connected with coke burning and production are calculated according to the formula #5)

$$PE_{pellet,y} = \sum_j PR_{pellet,y} \times SF_{i,y}^{pellet} \times EF_i \times NCV_i \tag{3}$$

Where:

$PE_{pellet,y}$	Project emissions due to pellet production (fuel consumption) in year *y* (tCO_2);
$PR_{pellet,y}$	Pellet consumption by BF#1 in year *y* (tonnes);
$SF_{i,y}^{pellet}$	Specific fuel *i* consumption due to pellet (or other iron bearing material) production in year *y* ($1000Nm^3$ or tonne/tonne);
$NCV_{i,y}$	Net calorific value of fuel of type *i* in year *y* (GJ/ Nm^3);
EF_i	Emission factor of fuel *i* (tCO_2/GJ) [19].

Project emissions due to natural gas combustion in BF

$$PE_{gas,y} = PF_{gas,y} \times EF_{gas} \times NCV_{gas,y} \qquad (4)$$

Where:

$PE_{gas,y}$	Project emissions due to natural gas combustion in year *y* (tCO_2);
$PF_{gas,y}$	Total consumption of natural gas in the blast furnace #1 in year *y* (Nm^3);
$NCV_{gas,y}$	Net calorific value of natural gas in year *y* (GJ/ Nm^3);
EF_{gas}	Emission factor of natural gas (tCO_2/GJ) [20].

Project emissions due to coke burning and production

$$PE_{coke,y} = \left(CC_{coke} \times PR_{coke,y} \times \frac{44}{12} \right) + \left(PR_{coke,y} \times EF_{coke}^{production} \right) \qquad (5)$$

Where:

$PE_{coke,y}$	Project emissions due to coke burning and production in year *y* (tCO_2);

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[19] IPCC Guidelines for National Greenhouse Gas Inventories (2006), Volume 2, Chapter 2, table 2.3.

[20] IPCC Guidelines for National Greenhouse Gas Inventories (2006), Volume 2, Chapter 2, table 2.3.

CC_{coke}	Carbon content in coke (t C/ tonne of coke) [21];
$\frac{44}{12}$	Molar mass ratio of CO_2 and C;
$EF_{coke}^{production}$	Default emission factor of coke production[22] (tCO_2/tonne of coke).
$PR_{coke,y}$	Total consumption of coke in the blast furnace #1 in year *y* (tonnes);
NCV_{coke}	Net calorific value of coke (GJ/ t) [23];

Project emissions due to electricity consumption

Emissions that are due to electricity consumption are estimated/calculated as follows:

$$PE_{el,y} = EF_{el,y} \times PEL_{el,y} \qquad (6)$$

Where:

$PE_{el,y}$	Project emissions due to electricity consumption in year *y* (tCO_2);
$EF_{el,y}$	Standardized CO_2 emission factor of the relevant regional electricity grid in year *y* (tCO_2/MWh), fixed ex-ante (see Annex 2);
$PEL_{el,y}$	Electricity consumption during iron production by reconstructed BF#1 in year *y* (MWh).

Project emissions due to briquettes consumption

Emissions due to briquettes consumption and briquette coke production are estimated/calculated as follows:

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[21] IPCC Guidelines for National Greenhouse Gas Inventories (2006), Volume 3, Chapter 4, table 4.3.

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

[23] IPCC Guidelines for National Greenhouse Gas Inventories (2006, http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html Volume 2, table 1.2.

$$PE_{briquet,y} = PB_{briquet,y} \times CC_{briquet,y} \times \frac{44}{12} + \frac{PB_{briquet,y} \times CC_{briquet,y}}{CC_{coke}} \times EF_{coke}^{production} \qquad (7)$$

$PE_{briquet,y}$	Project emissions due to briquettes consumption in year *y* (tCO_2);
$PB_{briquet,y}$	Project briquettes consumption in year *y* (tonne);
$CC_{briquet,y}$	Carbon content in briquettes in year *y* (t C/ tonne of coke);
$\frac{44}{12}$	Molar mass ratio of CO_2 and C;
CC_{coke}	Carbon content in coke (t C/ tonne of coke) [24];
$EF_{coke}^{production}$	Default emission factor of coke production[25] (tCO_2/tonne of coke).

Emissions that are not connected with project

$$PE_{boiler,y}^{CO \rightarrow CO2} = (PBG_y \times CO_y^k) \times \frac{28}{22.4} \times \frac{88}{56} \qquad (8)$$

Where:

$PE_{boiler,y}^{CO \rightarrow CO2}$	Emissions that are not connected with project (burning of blast furnace gas (only CO) in boiler) in year *y* (tCO_2);
PBG_y	Blast furnace gas output (to boiler) in year *y* (1000 m^3);
CO_y	Carbon monoxide content in blast furnace gas in year *y* (fraction);
28	Molar weight of carbon monoxide;
22.4	Gas molar volume (Avogadro's law);

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[24] IPCC Guidelines for National Greenhouse Gas Inventories (2006), Volume 3, Chapter 4, table 4.3.

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

88	Molar weight of two molecules of carbon dioxide ($2CO + O_2 \rightarrow 2CO_2$);
56	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	Plant calculation	tCO_2	C	Annually	100%	Electronic and paper	-
B2	$BP_y^{foundry\_iron}$	Technical report	tonnes	M/C	Annually	100%	Electronic and paper	**-**
B3	$BEF_{foundry,y}$	Plant calculation	tCO_2/t cement	C	Annually	100%	Electronic and paper	See Annex 2
B4	$BP_y^{steelmaking\_iron}$	Technical report	tonnes	M/C	Annually	100%	Electronic and paper	-
B5	$BEF_{steelmaking,y}$	Plant calculation	tCO_2/t cement	C	Annually	100%	Electronic and paper	See Annex 2
B6	$CA_{Ca,y}$	LLC “Korporatsiya proizvoditeley chernih metalov”	fraction	M/C	Annually	100%	Electronic and paper	**-**
B7	$MG_{Mg,y}$	LLC “Korporatsiya proizvoditeley chernih metalov”	fraction	M/C	Annually	100%	Electronic and paper	**-**
B8	$Fuel_y^i$	LLC “Korporatsiya proizvoditeley chernih metalov”	tonnes or $1000m^3$	M/C	Annually	100%	Electronic and paper	**-**

B9	SER_y^k	LLC “Korporatsiya proizvoditeley chernih metalov”	tonnes	M/C	Annually	100%	Electronic and paper	-
B10	$Coke_y$	LLC “Korporatsiya proizvoditeley chernih metalov”	tonnes	M/C	Annually	100%	Electronic and paper	-
B11	Sin_y	LLC “Korporatsiya proizvoditeley chernih metalov”	tonnes	M/C	Annually	100%	Electronic and paper	-
B12	Oxy_y	LLC “Korporatsiya proizvoditeley chernih metalov”	1000m^3	M/C	Annually	100%	Electronic and paper	-
B13	Pel_y	LLC “Korporatsiya proizvoditeley chernih metalov”	tonnes	M/C	Annually	100%	Electronic and paper	-

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

As further described in Annex 2, the baseline emissions have one source:

- Production by other iron producers (displacing production).

Baseline emissions due to displacing production

Pig iron is separated into two important grades: foundry and steelmaking. Specific fuel consumption of these grades production differs. Therefore emissions for them are calculated individually.

$$BE_y = BP_y^{foundry\_iron} \times BEF_{foundry,y} + BP_y^{steelmaking\_iron} \times BEF_{steelmaking,y} \qquad (9)$$

Where:

BE_y Baseline emissions in year *y* (tCO_2);

$BP_y^{foundry\_iron}$ Displacing foundry iron production in the baseline scenario in year *y* (tonnes);

$BEF_{foundry,y}$ Baseline emission factor for displacing foundry pig iron production in year *y* (tCO_2/t of foundry pig iron) (see Annex 2);

$BP_y^{steelmaking\_iron}$ Displacing steelmaking iron production in the baseline scenario in year *y* (tonnes);

$BEF_{steelmaking,y}$ Baseline emission factor for displacing steelmaking pig iron production in year *y* (tCO_2/t of steelmaking pig iron) (see Annex 2).

In the baseline scenario displacing pig iron production is equal to pig iron production of reconstructed BF#1 in the project scenario in year y.

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

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

In the baseline scenario energy and fuel consumption (natural gas, electricity) is bigger than in project scenario. Therefore estimated leakages are neglected by applied conservative method of ER calculation.

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

$$ER_y = BE_y - PE_y \qquad (10)$$

Where:

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

BE_y Baseline emissions in year *y* (tCO_2);

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

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

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
Table D.1.1.1. P8	Medium	Slag production by BF#1 is weighed by strain-gauge. These data are accumulated in ACS (automatic control system) and transferred to the Oracle database. Monthly data sum is checked by the Planning and economic department. The check is based on amount of sold slag. Sold slag is measured by a weighing apparatus. The weighing apparatus is calibrated annually. Information will be controlled by the planning and economic department and transferred to the Ecology department.
Table D.1.1.1. P9	Medium	Calcium monoxide content in the blast furnace slag is measured by plant laboratory. These data will be collected in Ecology department.
Table D.1.1.1. P10	Medium	Magnesium monoxide content in the blast furnace slag is measured by plant laboratory. These data will be collected in Ecology department.
Table D.1.1.1. P11	Medium	Raw materials (pellet) consumption for iron production is weighed by strain-gauge. These data are accumulated in ACS (automatic control system) and transferred to the Oracle database. Monthly data sum is checked by the planning and economic department. The check is based on the monthly inventory reports of remaining raw materials and taking into account purchased raw material. Purchased raw materials are measured by a weighing apparatus. On-site raw materials are measured by volume-to-mass conversion method. The weighing apparatus is calibrated annually. Information will be controlled by the planning and economic department and transferred to the Ecology department.
Table D.1.1.1. P15	Medium	Natural gas consumption for pig iron production is recorded and controlled by energy department using gas meter. Fuel meters will be calibrated and maintained in line with Russian regulations (certification test is made once in three years). Data will be passed to the Ecology department.
Table D.1.1.1. P16	Medium	Natural gas supplier’s laboratory will carry out measurement of NCV of gas supplied and issue a Certificate. The energy department will store these certificates and will calculate the weighted average value of the Net Calorific Value at the end of each year and will pass calculation results to the Ecology department.

Table D.1.1.1. P20	Medium	Coke consumption for iron production is weighed by strain-gauge. These data are accumulated in ACS (automatic control system) and transferred to the Oracle database. Monthly data sum is checked by the planning and economic department. The check is based on the monthly inventory reports of remaining raw materials and taking into account purchased raw material. Purchased raw materials are measured by a weighing apparatus. On-site raw materials are measured by volume-to-mass conversion method. The weighing apparatus is calibrated annually. Information will be controlled by the planning and economic department and transferred to the Ecology department.
Table D.1.1.1. P22	Medium	Electricity consumption is recorded and controlled by energy department using electricity meters and will be transferred to Ecology department. The metering is made by the automatic system for commercial accounting of power consumption. The meters are calibrated in line with the Russian regulations once in six years.
Table D.1.1.1. P24	Medium	Raw materials (briquettes) consumption for pig iron production is weighed by strain-gauge. These data are accumulated in ACS (automatic control system) and transferred to the Oracle database. Monthly data sum is checked by the planning and economic department. The check is based on the monthly inventory reports of remaining raw materials and taking into account purchased raw material. Purchased raw materials are measured by a weighing apparatus. On-site raw materials are measured by volume-to-mass conversion method. The weighing apparatus is calibrated annually. Information will be controlled by the planning and economic department and transferred to the Ecology department.
Table D.1.1.1. P25	Medium	Carbon content in the briquette will be measured with gas sensor by plant laboratory. These data will be collected in Ecology department.
Table D.1.1.1. P26	Medium	Blast Furnace gas volume which is combusted outside the plant is recorded and controlled by energy department. It is calculated as share of total gas which is directed to a boiler. Total blast furnace gas production by all BFs is measured by a gas meter. All blast furnace gas is directed to a gas-distribution system. From gas-distribution system blast furnace gas is directed to boilers. Volume of combusted gas is measured by gas meters in boilers. Thus Blast Furnace gas volume for BF#1, which is combusted outside the plant will be calculated taking into account its share in gas-distribution system and total volume of combusted gas. These data will be collected in Ecology department.
Table D.1.1.1. P27	Medium	Carbon monoxide content in the briquette will be measured by plant laboratory. These data will be collected in Ecology department.

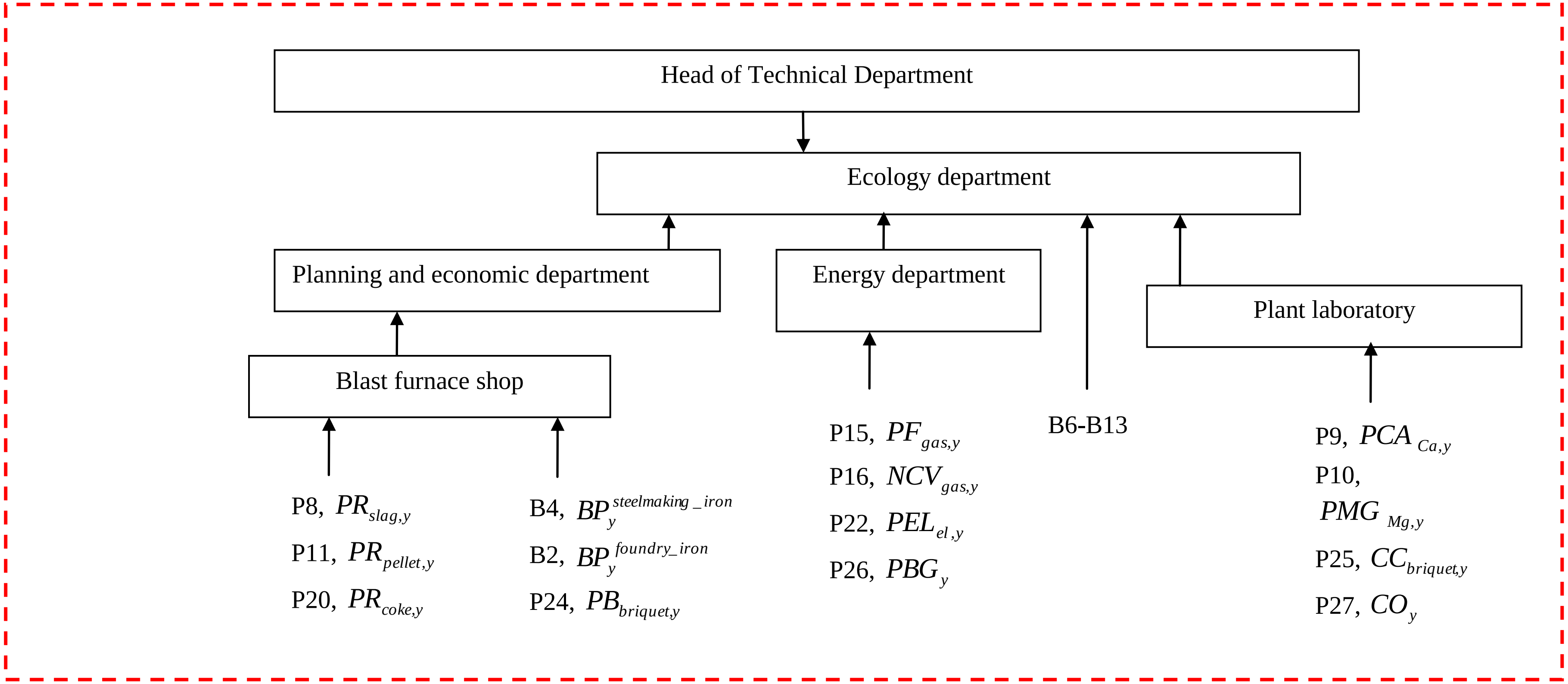
Table D.1.1.3. B2	Medium	Foundry pig iron production is measured by weighbridge. Annually foundry iron production is calculated as sum of figures from daily reports in planning and economic department during month. Monthly data is checked. The check is based on data collation with data from station Yasnaya Polyana of Moscow railway. The weighing apparatus is calibrated annually. Information will be collected by the Production management department and transferred to the Ecology department.
Table D.1.1.3. B4	Medium	Steelmaking pig iron production is measured by weighbridge. Annually steelmaking pig iron production is calculated as sum of figures from daily reports in planning and economic department during month. Monthly data is checked. The check is based on data collation with data from station Yasnaya Polyana of Moscow railway. The weighing apparatus is calibrated annually. Information will be collected by the Production management department and transferred to the Ecology department.
Table D.1.1.3. B6-B13	Medium	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.

The internal quality system at OJSC KMZ is functioning in accordance with the national standards and regulations in force. Electricity and gas meters for commercial accounting and master gages are calibrated by accredited organizations. Plant meters are calibrated by master gages. Certificated automatic system for commercial accounting of power consumption is introduced at OJSC KMZ. Blast Furnace #1 is powered from separate transformers and they have separate commercial electrical meters.

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

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

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



Source: OJSC KMZ

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

1) Head of Technical Department
The Head of Technical Department will hold the overall responsibility for implementation of the monitoring plan and will check annual monitoring reports of Ecology department.

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

3) Plant laboratory
The Plant laboratory will be responsible for measuring of carbon monoxide content in blast furnace gas. It will submit data to Ecology department regularly.

4) Planning and economic department
Planning and economic department is responsible for accounting, controlling and planning of raw materials consumption and iron production. It collects and check data from Blast Furnace shop. It will submit data to Ecology department regularly.

5) Energy department
For monitoring purposes, Energy department will report fuel consumption and data received from the laboratory of the Gas transportation organization to Ecology laboratory. The laboratory of the Gas transportation organization provides data on the Net Calorific Value of the natural gas supplied. It is indicated in the gas certificate.

6) Blast furnace shop
Blast furnace shop is responsible for short term production strategy development and implementation. It will be responsible for iron production data collection. Also, raw materials consumption is measured in the blast furnace shop. These data will be transferred automatically to Oracle database for the planning and economic department.

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

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

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  Global Carbon BV is a project participant.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

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

Project emissions	Unit	2010	2011	2012
Electricity	[tCO_2/y]	13,950	13,950	15,177
Coke and briquettes	[tCO_2/y]	1,298,065	1,225,854	1,332,873
Natural gas	[tCO_2/y]	83,092	83,092	91,748
Raw materials decarbonisation and production	[tCO_2/y]	141,890	141,890	154,884
Not project emission	[tCO_2/y]	410,921	410,921	461,658
Total of project	[tCO_2/y]	1,126,077	1,053,866	1,133,023
Total 2010 - 2012	[tCO_2]	3,312,966		

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

Project emissions	Unit	2013	2014	2015	2016	2017	2018	2019	2020
Electricity	[tCO_2/y]	15,177	15,177	15,177	15,177	15,177	15,177	15,177	15,177
Coke and briquettes	[tCO_2/y]	1,332,873	1,332,873	1,332,873	1,332,873	1,332,873	1,332,873	1,332,873	1,332,873
Natural gas	[tCO_2/y]	91,748	91,748	91,748	91,748	91,748	91,748	91,748	91,748
Raw materials decarbonisation and production	[tCO_2/y]	154,884	154,884	154,884	154,884	154,884	154,884	154,884	154,884
Not project emission	[tCO_2/y]	461,658	461,658	461,658	461,658	461,658	461,658	461,658	461,658
Total	[tCO_2/y]	1,133,023	1,133,023	1,133,023	1,133,023	1,133,023	1,133,023	1,133,023	1,133,023
Total 2013 - 2020	[tCO_2]	9,064,185							

In Table E.1.3 and Table E.1.4 technical data used for calculation of project emissions are presented. All emissions calculations for the baseline and the project scenario are made according to the formulas presented in Sections D.1.1.2 and D.1.1.4.

Table E.1.3: Technical data of foundry iron production

Parameter	Unit	2010	2011	2012
Foundry pig iron production	t	180,000	180,000	180,000
Electricity consumption	MWh/t	0.045	0.045	0.045
Coke consumption	t/t	0.61	0.56	0.56
Briquettes consumption	t/t of pig iron	0.05	0.05	0.05
Carbon content in briquettes	%	10.00	10.00	10.00
Slag production	t/t	0.43	0.43	0.43
Content of CaO in slag	%	44	44	44
Content of MgO in slag	%	7	7	7
Natural gas consumption	1000m3/t	0.04	0.04	0.04
Blast furnace gas production	1000m3	369,000	369,000	369,000
Blast furnace gas consumption	1000m3	100,800	100,800	100,800
Blast furnace gas output	1000m3	268,200	268,200	268,200
Content of CO in blast furnace gas	%	22.00	22.00	22.00
Pellet consumption	t/t	1.45	1.45	1.45

Source: OJSC KMZ

Table E.1.4: Technical data of steelmaking iron production

Parameter	Unit	2010	2011	2012
Steelmaking pig iron production	t	480,000	480,000	540,000
Electricity consumption	MWh/t	0.04	0.04	0.04
Coke consumption	t/t	0.51	0.49	0.49
Briquettes consumption	t/t of pig iron	0.05	0.05	0.05
Carbon content in briquettes	%	10.00	10.00	10.00
Slag production	t/t	0.43	0.43	0.43
Content of CaO in slag	%	46	46	46
Content of MgO in slag	%	7	7	7
Natural gas consumption	1000m3/t	0.075	0.075	0.075
Blast furnace gas production	1000m3	984,000	984,000	1,107,000
Blast furnace gas consumption	1000m3	268,800	268,800	268,800
Blast furnace gas output	1000m3	715,200	715,200	838,200
Content of CO in blast furnace gas	%	21	21	21
Pellet consumption	t/t	1.52	1.52	1.52

Source: OJSC KMZ

E.2. Estimated leakage:

Not applicable

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

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

Project emissions	**Unit**	**2010**	**2011**	**2012**
Electricity	[tCO$_2$/y]	13,950	13,950	15,177
Coke	[tCO$_2$/y]	1,298,065	1,225,854	1,332,873
Natural gas	[tCO$_2$/y]	83,092	83,092	91,748
Raw materials decarbonisation and production	[tCO$_2$/y]	141,890	141,890	154,884
Not project emission	[tCO$_2$/y]	410,921	410,921	461,658
Total of project	[tCO$_2$/y]	1,126,077	1,053,866	1,133,023
Total 2010 - 2012	[tCO$_2$]	3,312,966		

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

Project emissions	**Unit**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Electricity	[tCO$_2$/y]	15,177	15,177	15,177	15,177	15,177	15,177	15,177	15,177
Coke	[tCO$_2$/y]	1,332,873	1,332,873	1,332,873	1,332,873	1,332,873	1,332,873	1,332,873	1,332,873
Natural gas	[tCO$_2$/y]	91,748	91,748	91,748	91,748	91,748	91,748	91,748	91,748
Raw materials decarbonisation and production	[tCO$_2$/y]	154,884	154,884	154,884	154,884	154,884	154,884	154,884	154,884
Not project emission	[tCO$_2$/y]	461,658	461,658	461,658	461,658	461,658	461,658	461,658	461,658
Total	[tCO$_2$/y]	1,133,023	1,133,023	1,133,023	1,133,023	1,133,023	1,133,023	1,133,023	1,133,023
Total 2013 - 2020	[tCO$_2$]	9,064,185							

E.4. Estimated baseline emissions:

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

Baseline emissions	**Unit**	**2010**	**2011**	**2012**
Other iron plants	[tCO$_2$/y]	1 262 840	1 262 840	1 374 558
Total	[tCO$_2$/y]	1 262 840	1 262 840	1 374 558
Total 2010 - 2012	[tCO$_2$]	3 900 238		

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

Baseline emissions	Unit	2013	2014	2015	2016	2017	2018	2019	2020
Other iron plants	[tCO_2/y]	1,374,558	1,374,558	1,374,558	1,374,558	1,374,558	1,374,558	1,374,558	1,374,558
Total	[tCO_2/y]	1,374,558	1,374,558	1,374,558	1,374,558	1,374,558	1,374,558	1,374,558	1,374,558
Total 2013 - 2020	[tCO_2]	10,996,463							

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

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

Emission reductions	Unit	2010	2011	2012
Total	[tCO_2/y]	136,763	208,974	241,535
Total 2010 - 2012	[tCO_2]	587,272		

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

Emission reductions	Unit	2013	2014	2015	2016	2017	2018	2019	2020
Total	[tCO_2/y]	241,535	241,535	241,535	241,535	241,535	241,535	241,535	241,535
Total 2013 - 2020	[tCO_2]	1,932,279							

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 2010	1,126,077	0	1,262,840	136,763
Year 2011	1,053,866	0	1,262,840	208,974
Year 2012	1,133,023	0	1,374,558	241,535
Total (tonnes of CO_2 equivalent)	3,312,966	0	3,900,238	587,272

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

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
Year 2013	1,133,023	0	1,374,558	241,535
Year 2014	1,133,023	0	1,374,558	241,535
Year 2015	1,133,023	0	1,374,558	241,535
Year 2016	1,133,023	0	1,374,558	241,535
Year 2017	1,133,023	0	1,374,558	241,535
Year 2018	1,133,023	0	1,374,558	241,535
Year 2019	1,133,023	0	1,374,558	241,535
Year 2020	1,133,023	0	1,374,558	241,535
Total (tonnes of CO_2 equivalent)	9,064,185	0	10,996,463	1,932,279

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:

Iron 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 the 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 Documentation should contain Section "Environment Protection". Compliance with the environmental regulations (in Russian so called technical regulations on Environmental Safety) should be checked during the process of SE. In the absence of the above mentioned regulations compliance is checked in a very general manner.

Section "Environment Protection" specifies the project contribution to air pollution. It was developed by LLC Ecoresurs in 2008.

Analysis of calculation results is made taking into account background concentration. It represents maximum permissible emissions, with which concentration of pollutants will remain within limits inside the radius of Sanitary Protection Zone after project implementation. So these emissions are taken as normative.

Gross emissions will be reduced on 158.1 tonnes per year in comparison with existing (2008) situation. Main reduction will be due to reduction of carbon monoxide emissions (297.7 tonnes per year).

Calculation in section "Environment Protection" was made in conservative manner. Calculated efficiency of cast house's dust cleaner is taken as 90% but it may reach 95%, therefore actual dust emissions may be 2 times less. Calculated efficiency of charge equipment's dust cleaner is taken as 95% but it may reach 98-99%, therefore actual dust emissions may be reduced from 2.5 up to 5 times.

Control period is defined by category of the emission point (first category is checked quarterly, second category is checked twice a year, third category is checked once a year). Certified laboratory of OJSC KMZ will be controlling maximum permissible emissions.

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

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

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

SECTION G. Stakeholders' comments

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

OJSC KMZ and OJSC "MetPromProekt" signed a contract for development of project design documentation in 2006. The project design documentation was developed in 2009. On the 16th of April 2009 "The Main Agency of the State expertise" (FGU "Glavgosexpertiza" in Russian abbreviation) approved reconstruction of the blast furnace #1, positive conclusion of FGU "Glavgosexpertiza" N 212-09/GGE-5998/02. The facility construction package was received according to the Town-Planning Code.

KMZ provided stakeholders with project information. KMZ had publications about the project in mass media. List of publications is presented below:

- Magazine: "Metalli Evrazii" #2 2008, p. 54-55, article – Blast furnace and high-tech time;
- Magazine: "Metalli Evrazii" #5 2009, p. 34-35, article – Casting for blast furnace and blast furnace for casting;
- Weekly newspaper of KMZ: "Kosogorets" 2008-2010;
- Second international confederation of pig iron producer: article – New engineering solution in ecology during reconstruction blast furnace #1.

There were no negative comments received.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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Annex 2

BASELINE INFORMATION

The purpose of the proposed project is blast furnace #1 reconstruction. This BF has been operated about 26 years before and may not to continue operated. CO_2 emissions for the project associated with displacing capacity. Emissions associated with displacing capacity are calculated based on approach which consists of the emissions of other iron producers and emissions from new iron plants in Russia.

As shown in Section B.1.above, the most plausible baseline scenario is that third Party producers will satisfy iron demand instead.

In this case, the baseline emissions consist of one part:
- Production emissions by other metallurgical plants.

The displacing part of baseline emission is calculated on the basis iron production emission factor (other blast furnaces) in Russia.

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

Baseline emission factor for displacing production

Methodological approach

The baseline emissions of the incremental production are calculated on the basis of steel production covered by the third party producers.

The steel industry is a transparent market where standardized types of steel products exist. Within a certain region or country steel can be transported from the producer to the consumer without constrains.

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

About the iron industry and emissions

Pig iron production is a complex and multilevel process. It consists of:
- Sinter (or pellet) production;
- Coke production;
- Iron production;
- Other auxiliary production.

Most of the big metal works are integrated facilities comprising all these production stages but some enterprises outsource some stages like sinter and coke production.

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

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

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

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

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

Multiple default emission factors

In accordance with IPCC Guidelines[26] there are three methods for calculating CO_2 emissions by steel industry:

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

All these methods take into account only direct emissions (from fuel, limestone and etc.) and don’t take into account indirect emissions (from electricity, oxygen production and etc.). Also they don’t take into account indirect emissions associated with raw materials (iron, coke, sinter and pellet) production at the previous stages for non-integrated facilities. Therefore indirect emissions should be included in total emissions for purpose JI project. Emissions connected with decarbonisation of limestone and dolomite (slag-forming materials) during pellet, sinter and pig iron production are back-calculated according to content of CaO and MgO in blast furnace slag.

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

Tier 1 method can be used for emission calculations for coke production only if data of energy resources and raw materials consumption is not available. According to IPCC Guidelines multiple default emission factor for Tier 1[27] is:

- for coke production – 0.56 tCO_2/tonne of coke.

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

Calculation of emission factors for iron production

Pig iron is separated into two important grades: foundry and steelmaking. Specific fuel consumption of these grades is different from each other. Therefore production emission factors for them are calculated individually. Production emission factor is calculated according to the following formula:

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[26] 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

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

$$EF_y^{iron} = \frac{E_y^{iron}}{IP_y} \qquad (1)$$

Where:

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

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

$$\begin{aligned} E_y^{iron} = \sum_i Fuel_y^i \times NCV_{fuel\_i,\,y} \times EF_{fuel\_i} + PR_{slag,y} \times CA_{Ca,y} \times \frac{44}{56} + PR_{slag,y} \times MG_{Mg,y} \times \frac{44}{40} - \\ -(\sum_k SER_y^k \times CO_y^k) \times \frac{28}{22.4} \times \frac{88}{56} + E_y^{coke} + E_{pellet,y} + E_{sinter,y} + E_{oxygen,y} \end{aligned} \qquad (2)$$

Where:

E_y^{iron}	Iron production emissions in year *y* (tCO_2);
$Fuel_y^i$	Fuel *i* (gas, coal, coke) consumption in year *y* (tonnes or m^3);
$NCV_{fuel\_i,\,y}$	Net Calorific Value of fuel of type *i* in year *y* (GJ/(tonnes or m^3));
EF_{fuel_i}	Emission factor of fuel of type *i* including coke (tCO_2/GJ);
$PR_{slag,y}$	Slag production by blast furnaces in year *y* (tonnes);
$CA_{Ca,y}$	Content of CaO in slag in year *y* (fraction);
44	Molar weight of CO_2;
56	Molar weight of CaO;
$MG_{Mg,y}$	Content of MgO in slag in year *y* (fraction);
40	Molar weight of MgO;
SER_y^k	Secondary energy resource *k* (blast furnace, coke oven gases) output in year *y* (1000 m^3);
CO_y^k	Carbon monoxide content in *k* (blast furnace, coke oven gases) in year *y* (fraction);
28	Molar weight of carbon monoxide;
22.4	Gas molar volume (Avogadro's number);
88	Molar weight of two molecule of carbon dioxide ($2CO + O_2 \rightarrow 2CO_2$);
56	Molar weight of two molecule of carbon monoxide ($2CO + O_2 \rightarrow 2CO_2$);
E_y^{coke}	Emissions due to coke consumption emissions in year *y* (tCO_2);
$E_{pellet,y}$	Emissions due to pellet consumption emissions in year *y* (tCO_2);
$E_{sinter,y}$	Emissions due to sinter consumption emissions in year *y* (tCO_2).
$E_{oxygen,y}$	Emissions due to oxygen consumption emissions in year *y* (tCO_2).

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

$$E_y^{coke} = Coke_y \times EF_{coke}^{production} \qquad (3)$$

$$E_{sinter,y} = \sum_j Sin_y \times SF_{i,y}^{sinter} \times EF_{fuel\_i} \times NCV_{fuel\_i,\,y} + Sin_y \times SF_{coke,y}^{sinter} \times EF_{coke}^{production} \qquad (4)$$

$$E_{pellet,y} = \sum_j Pel_y \times SF_{i,y}^{pellet} \times EF_{fuel\_i} \times NCV_{fuel\_i,\,y} + Pel_y \times SF_{coke,y}^{pellet} \times EF_{coke}^{production} \qquad (5)$$

$$E_{oxygen,y} = Oxy_y \times SC_{oxygen} \times EF_{el} \qquad (6)$$

Where:

E_y^{coke}	Coke consumption emissions in year *y* (tCO_2);
Coke_y, Sin_y, Oxy_y, Pel_y	Coke, sinter, oxygen and pellet consumption in year *y* (tonnes or $1000m^3$);
$EF_{coke}^{production}$	Default emission factor of coke production[28] (tCO_2/tonne of coke).
$E_{sinter,y}$	Sinter consumption emissions in year *y* (tCO_2).
$SF_{i,y}^{sinter}$	Specific fuel *i* (coke, oil residual, natural gas) consumption due to sinter production in year *y* ($1000Nm^3$ or t/tonne of sinter);
EF_{fuel_i}	Emission factor of fuel of type *i* including coke (tCO_2/GJ);
$NCV_{fuel\_i,\,y}$	Net Calorific Value of fuel of type *i* in year *y* (GJ/(tonnes or m^3));
$E_{pellet,y}$	Pellet consumption emissions in year *y* (tCO_2);
$SF_{i,y}^{pellet}$	Specific fuel *i* (coke, oil residual, natural gas) consumption due to pellet production in year *y* ($1000Nm^3$ or t/tonne of pellet);
$SC_{oxygeni,y}$	Specific energy consumption during oxygen production, 1000 kWh/$1000m^3$, fixed ex-ante;
EF_{el}	Standardized CO_2 emission factor of the relevant regional electricity grid in year *y* (tCO_2/MWh), fixed ex-ante.

There are two types: steelmaking and foundry iron. They have different energy consumption because the emission factors are calculated separately for every type of iron ($BEF_{foundry,y}$ and $BEF_{steelmaking,y}$) but the same approach is used.

The displacing CO_2 emission factor of iron production is calculated as “operating margin” (OM). The operating margin refers to a cluster of metallurgical works whose iron production would be affected by the proposed JI project.

Operating margin (OM) emission factor

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

$$OM_y = \frac{\sum_m E_y^{iron,m}}{\sum_m SP_y^m} \qquad (7)$$

Where:

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

OM_y	Emission factor or Operating Margin for iron production in year *y* (tCO_2/tonne of iron);
$E_y^{iron,m}$	Iron production emissions by a blast furnace process *m* in year *y* (tCO_2);
SP_y^m	Iron production by metal works using blast furnace process *m* in year *y* (tonnes).

Build margin (BM) emission factor

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

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

$$BM_y = \frac{\sum_i E_y^{iron,i}}{\sum_i SP_y^i} \qquad (8)$$

Where:

BM_y	Build Margin Emission factor for iron production in year *y* (tCO_2/tonne of iron);
$E_y^{iron,i}$	Emission at the new metallurgical works/installations *i* in year *y* (tCO_2/tonne of iron);
SP_y^i	Iron production of new metallurgical works/installations *i* in year *y* (tonnes).

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

Combined margin (CM) emission factor

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

$$CM_y = \frac{OM_y + BM_y}{2} \qquad (9)$$

Where:

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

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

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

JI projects with a final positive determination under the JI Track 2 procedure and projects approved under the JI Track 1 procedure[29] and shown accordingly on the UNFCCC JI website are excluded from the sample units for the OM/BM/CM emission factor calculation.

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

Application of methodological approach

Background data for the calculation of the OM emission factor
Information on the metallurgical works and emissions and emission factors calculation for iron production in 2007 are presented in the Table Anx.2.1 and the Table Anx.2.2.

Table Anx.2.1: Results of emissions and emission factors calculations for steelmaking pig iron production

Facility	Iron production	Total emissions	Emission factors
	Tones	tCO_2	tCO_2/tonne of iron
JSC "MMK"	9,482,448	17,313,132	1.826
JSC "NTMK"	5,333,614	9,932,909	1.862
JSC "NKMK"	1,471,977	3,204,335	2.177
JSC "Uralsteel"	2,791,373	5,518,374	1.977
JSC "Severstal"	8,758,538	14,520,072	1.658
JSC "NLMK"	9,050,188	18,293,070	2.021
JSC "ZSMK"	5,246,170	9,512,830	1.813
JSC "Chusovskoy MZ"	610,996	1,212,151	1.984
JSC "Verhnesynyachihinsky MZ"	163,374	415,704	2.544
JSC "TulaCherMet"	2,663,584	4,793,434	1.800
JSC "ChelMK"	3,685,893	7,005,161	1.901
JSC "MZ imeni Serova"	366,642	700,801	1.911
JSC "Svobodny Sokol"	514,391	935,609	1.819
Total	**50,139,188**	**93,357,582**	**1.862**

Source: LLC “Korporatsiya proizvoditeley chernih metalov”

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

Table Anx.2.2: Results of emissions and emission factors calculations for foundry pig iron production

Facility	Iron production	Total emissions	Emission factors
	Tones	tCO_2	tCO_2/tonne of iron
JSC "NTMK"	12,647	31,521	2.492
JSC "NKMK"	2,226	4,851	2.179
JSC "Uralsteel"	4,988	11,586	2.323
JSC "NLMK"	5,619	8,618	1.534
JSC "Verhnesynyachihinsky MZ"	35,550	89,870	2.528
JSC "TulaCherMet"	168,137	316,625	1.883
JSC "ChelMK"	220,734	418,823	1.897
JSC "MZ imeni Serova"	478	1,209	2.529
JSC "Svobodny Sokol"	274,025	602,308	2.198
Total	**724,404**	**1,485,410**	**2.051**

Source: LLC "Korporatsiya proizvoditeley chernih metalov"

Steelmaking pig iron production emission factor is equal to **1.862** tCO_2/tonne of iron (see Table Anx.2.1). Foundry pig iron production emission factor is equal to **2.051** tCO_2/tonne of iron (see Table Anx.2.2).

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

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

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

Background data for the calculation of the BM emission factor

Some modernisations of BFs (significant changing of technical capability) have been recently and are presented in the Table Anx.2.6. But they may get JI status.

Table Anx.2.6: Blast furnace (changing of technical capability) in Russia

Blast Furnace	year	Status	Note
OJSC NTMK (BF#6)	2004	JI	Maintenance, capacity is increased (but BF#2 and #3 are shut down), installation modern auxiliary equipment.
OJSC NTMK (BF#5)	2006	JI	
JSC CherepMK (BF#3)	2007	n/a	Maintenance

There are no new installations of BFs for the last year in Russia. Only maintenances were at the metallurgical plants. They support technical capability on previous level. According to the data of LLC "Korporatsiya proizvoditeley chernih metalov" forty six blast furnaces are operated in 2007. And about twelve BFs are shut down or mothballed. New BF installations are not planed.

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

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

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

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

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

Data/Parameter	$BP_y^{foundry\_iron}$
Data unit	Tonnes
Description	Displacing foundry iron production in the baseline scenario in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	Plant records
Value of data applied (for ex ante calculations/determinations)	180,000
Justification of the choice of data or description of measurement methods and procedures (to be) applied	In the baseline scenario displacing iron production is equal to iron production of reconstructed BF #1 in the project scenario in year *y*. The weighting method is used to identify the amount of iron. The weighting equipment is being calibrated and checked by the plant staff.
OA/QC procedures (to be) applied	The company has special Department for Control and Measuring devices. This department is in charge of supervision of measuring devices operation and performance. It checks and substitutes devices (adjusted and calibrated) from the reserve if necessary. The company has approved regulations for measurements, registration and archiving data and the annual schedule for calibration and replacement of devices.
Any comment	This parameter is being used for emissions calculations for displacing production (by other plants).

Data/Parameter	$BP_y^{steelmaking\_iron}$
Data unit	Tonnes
Description	Displacing steelmaking iron production in the baseline scenario in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	Plant records
Value of data applied (for ex ante calculations/determinations)	540,000
Justification of the choice of data or description of	In the baseline scenario displacing iron production is equal to iron production of reconstructed BF #1 in the project scenario in

measurement methods and procedures (to be) applied	year *y*. The weighting method is used to identify the amount of iron. The weighting equipment is being calibrated and checked by the plant staff.
OA/QC procedures (to be) applied	The company has special Department for Control and Measuring devices. This department is in charge of supervision of measuring devices operation and performance. It checks and substitutes devices (adjusted and calibrated) from the reserve if necessary. The company has approved regulations for measurements, registration and archiving data and the annual schedule for calibration and replacement of devices.
Any comment	This parameter is being used for emissions calculations for displacing production (by other plants).

Data/Parameter	$BEF_{foundry,y}$
Data unit	tCO_2/tonnes of foundry pig iron
Description	Baseline emission factor for displacing foundry pig iron production in year *y*
Time of determination/monitoring	*Ex-post.*
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	2.051 (2007)
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The approach of "Tool to calculate the emission factor for an electricity system" is used. IPCC default values are used for CO_2 emission factor of fossil fuels. The default grid emission factors for the regional power systems of Russia are used. Please see Annex 2 for more detailed information.
OA/QC procedures (to be) applied	-
Any comment	Data required to calculate the baseline emission factors for the year y is usually available six months later after the end of the year y, alternatively emission factors of the previous year (y-1) may be used. If data are available later than 18 months after the end of year y, emission factors of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout the crediting period. After the data for the last three years is available, emission factor may be fixed *ex-ante* as three-year average. Pig iron is usually separated into two major groups of grades according to their composition and further use: foundry and steelmaking. Specific fuel consumption for these grades differs. Therefore their production emission factors are calculated individually.

Data/Parameter	$BEF_{steelmaking,y}$
Data unit	tCO_2/tonnes of steelmaking pig iron
Description	Baseline emission factor for displacing steelmaking pig iron production in year *y*

Time of determination/monitoring	Ex ante
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	1.862 (2007)
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The approach of "Tool to calculate the emission factor for an electricity system" is used. IPCC default values are used for CO_2 emission factor of fossil fuels. The default grid emission factors for the regional power systems of Russia are used. Please see Annex 2 for more detail information.
OA/QC procedures (to be) applied	-
Any comment	If data required to calculate the baseline emission factors for the year y is usually available six months later after the end of the year y, alternatively emission factors of the previous year (y-1) may be used. If data is available latter than 18 months after the end of year y, emission factors of the year preceding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout the crediting period. After the data for the last three years is available, emission factor may be fixed *ex-ante* as three-year average. Pig iron is usually separated into two major groups of grades according to their composition and further use: foundry and steelmaking. Specific fuel consumption for these grades differs. Therefore their production emission factors are calculated individually.

Data/Parameter	$CA_{Ca,y}$
Data unit	fraction
Description	Content of CaO in BF slag in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	If the plant provides them separately to LLC "Korporatsiya proizvoditeley chernih metalov", then these parameters are taken separately for steelmaking pig iron and separately for foundry pig iron. If the plant provides consolidated data for steelmaking pig iron and foundry pig iron together, as one figure, than this figure is used for calculation of $BEF_{steelmaking,y}$ and $BEF_{foundry,y}$, because it is connected with steelmaking and foundry pig iron production by the same blast furnace.
OA/QC procedures (to be) applied	-

Any comment	-

Data/Parameter	$MG_{Mg,y}$
Data unit	fraction
Description	Content of MgO in BF slag in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	If the plant provides them separately to LLC "Korporatsiya proizvoditeley chernih metalov", then these parameters are taken separately for steelmaking pig iron and separately for foundry pig iron. If the plant provides consolidated data for steelmaking pig iron and foundry pig iron together, as one figure, than this figure is used for calculation of $BEF_{steelmaking,y}$ and $BEF_{foundry,y}$, because it is connected with steelmaking and foundry pig iron production by the same blast furnace.
OA/QC procedures (to be) applied	-
Any comment	-

Data/Parameter	$Fuel_y^i$
Data unit	tonnes or m^3
Description	Fuel *i* (gas, coal, coke) consumption in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	-
OA/QC procedures (to be) applied	-
Any comment	-

Data/Parameter	SER_y^k
Data unit	1000 m^3
Description	Secondary energy resource *k* (blast furnace, coke oven gases) output in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period

Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	-
OA/QC procedures (to be) applied	-
Any comment	Usual part of blast furnace gas is used outside of the blast furnace plant as fuel for other equipment.

Data/Parameter	Coke_y, Sin_y, Oxy_y, Pel_y
Data unit	tonnes or 1000m^3
Description	Coke, sinter, oxygen and pellet consumption in year *y*
Time of determination/monitoring	*Ex-post*. During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	-
OA/QC procedures (to be) applied	-
Any comment	-

Data/Parameter	$PR_{slag,y}$
Data unit	tonnes
Description	Slag production by blast furnaces in year *y*
Time of determination/monitoring	*Ex-post*. During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	If the plant provides them separately to LLC "Korporatsiya proizvoditeley chernih metalov", then these parameters are taken separately for steelmaking pig iron and separately for foundry pig iron. If the plant provides consolidated data for steelmaking pig iron and foundry pig iron together, as one figure, than this

	figure is used for calculation of $BEF_{steelmaking,y}$ and $BEF_{foundry,y}$, because it is connected with steelmaking and foundry pig iron production by the same blast furnace.

Data/Parameter	CO_y^k
Data unit	fraction
Description	Carbon monoxide content in *k* (blast furnace, coke oven gases) in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC “Korporatsiya proizvoditeley chernih metalov” annual statistical report “Russian Chermet information “. This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC “Korporatsiya proizvoditeley chernih metalov” for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	If the plant provides them separately to LLC “Korporatsiya proizvoditeley chernih metalov”, then these parameters are taken separately for steelmaking pig iron and separately for foundry pig iron. If the plant provides consolidated data for steelmaking pig iron and foundry pig iron together, as one figure, than this figure is used for calculation of $BEF_{steelmaking,y}$ and $BEF_{foundry,y}$, because it is connected with steelmaking and foundry pig iron production by the same blast furnace.

Data/Parameter	$EF_{el,y}$
Data unit	tCO_2/MWh
Description	Standardized CO_2 emission factor for power grid
Time of determination/monitoring	Ex-ante
Source of data (to be) used	The study “Development of grid GHG emission factors for power systems of Russia” commissioned by “Carbon Trade and Finance” in 2008 (further in the text – Study)
Value of data applied (for ex ante calculations/determinations)	0.511 – for RES “Center”.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The standardized factor has been determined by Bereau Veritas.
OA/QC procedures (to be) applied	-
Any comment	This the standardized CO_2 emission factor is operated margin emission factor for RES “Center”

Data/Parameter	$EF_{coke}^{production}$
Data unit	tCO_2/t
Description	Emission factor during production of coke
Time of determination/monitoring	Fixed ex-ante during determination
Source of data (to be) used	2006 IPCC Guidelines on National GHG Inventories,

	http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol3.html Volume 3,Chapter 4, page 25, table 4.2
Value of data applied (for ex ante calculations/determinations)	Coke – 0.56
Justification of the choice of data or description of measurement methods and procedures (to be) applied	-
OA/QC procedures (to be) applied	-
Any comment	-

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." [30].

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

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

$EF_{el,y}$ = 0.511 tCO_2/MWh.

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

Regional power system	**EF_{CM}**
	(tCO_2/MWh)
"Center"	0.511
"North-West"	0.548
"Mid Volga"	0.506
"Urals"	0.541
"South"	0.5
"Siberia"	0.894
RES "East"	0.823

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

Annex 3

MONITORING PLAN

See Section D for monitoring plan.