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

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

Energy Efficiency Improvement Measures through modernization of cast-iron production at
OJSC Tulachermet, Tula, Russia

Sectoral scope 9: Metal production;

Project design document (PDD) version 2.0

28 March 2011

A.2. Description of the project:

Enterprise description

OJSC Tulachermet is one of the leading Russian metallurgical enterprises, the biggest pig iron exporter in the country, which share is varying from 50% to 55 % from the overall Russian pig iron sales on the world market. The enterprise is placed 200 kilometers away from Moscow in an old European metallurgical center – Tula City, where in 18th century the first Russian metallurgical plant was built. An enterprise is established in 1935 and called Novotulskiy metallurgic plant. In December 1991 it was restructured into an Open Joint Stock Company Tulachermet. In 2002 Tulachermet has become a part of the Managing Company "Industrial-metallurgic holding" LLC. There are about 6,200 people employed at the enterprise; the enterprise is listed in top 100 companies of the Russian Federation.

Plant production capacities allow producing up to three million tonnes of metal per year. Main products are foundry iron, open-hearth pig iron, and nodular pig iron, which contains low quantity of admixtures and possess stable chemical composition. Pig iron manufactured at the plant is supplied to CIS countries, metallurgical and machinery making enterprises of the Western Europe, America, and Asia. OJSC Tulachermet is certified according to ISO 9001:2008 with quality management system in place, certificate is issued by TUV Reihland Company. An enterprise has been granted a diploma in quality management issued by the Russian Quality Management Organization. In 2005 OJSC Tulachermet was graced by independent experts for the environmentally friendly technologies implementation at the plant premises. The enterprise satisfies about 20% of the world pig iron demand, confirming its leading positions on the market.

Project purpose and history

There are three blast furnaces at the plant, BF#1, BF#2 and BF#3. Main product is pig iron. Blast furnace #3 is built in 1962. Last first grade repair for BF#3 is done more than 20 years ago. The goal of the proposed Joint Implementation (JI) project is to reduce impact of the iron making process on the climate through existing production process modernization by the more energy efficient technology implementation. Emissions of GHG will be reduced significantly as a result of the project implementation. In order to achieve the goal of the project, OJSC Tulachermet will modernize blast furnace (BF) #3.

On 14 March 2001 a meeting took place where preparations for blast furnace #3 modernisation were discussed and JI component for the project was taken in to account and potential income was considered. On October 16, 2010 a group of experts responsible for the project realization was entitled by the order #1364.

Current status

The plant has three blast furnaces. Blast furnace volumes are presented in the Table A.2.1

Table A.2.1: Blast furnaces volume

Blast furnaces volume	Unit	Value
Blast furnace #1	m^3	1386
Blast furnace #2	m^3	1144
Blast furnace #3	m^3	2000

The blast furnace #3, 2000 cubic meters in volume, is built using the standard design and put into operation in 1962. The blast furnace has one casting yard, two pig iron tap holes, bottom is combined.

The plant represents an experimental facility for the modern technologies of pig iron production implementation. There was first scientific production association organized at the plant in 1974. Plant made own scientific and production developments that were implemented later at the other metallurgic enterprises in the USSR. The enterprise was bought by OJSC “Koks” in 2000. The plant is capable of producing pig iron, the main plant product, in the amount of up to 3 million tonnes per year. This is the only plant in the Russian Federation that capable producing such quantities of pig iron. The program of prospective enterprise development is adopted at the plant in 2002.

Baseline scenario

BF will be shot down due to excessive wear of equipment that makes it not possible to continue blast furnace operation in order to not to compromise operation safety. Modernization program will not be implemented.

In this scenario BF will be shot down due to excessive wear of equipment that makes it not possible to continue blast furnace operation in order to not to compromise operation safety . It is assumed in the scenario that pig iron production level is equal to the project scenario pig iron production level. Third party pig iron producer would have produced the incremental part.

Blast furnace #3 expected capacity is up to 4200 tonnes of pig iron daily. In case of the project absence and increased market pig iron demand, other steel producer can cover the incremental part of requested steel using less efficient in terms of GHG emissions technologies. The incremental capacity emissions are determined in line with the methodological approach as described in Annex 2. The detailed description of the baseline scenario is presented in Section B.1. The replacement baseline part can reach 3 million tonnes of pig iron per year but total baseline production corresponds to the project production.

Project scenario

Proposed JI project aims at BF modernization using modern efficient technologies. Blast furnace profile will be changed and volume increased to 2,200 cubic meters. Blast furnace #3 production capacity will be increased up to 4,200 tonnes of pig iron daily. Tuyere apparatus will increase from 20 to 24. New lining covering with carbon and graphite blocks will be applied. Coolers made of high-durable pig iron with sphere-alike graphite will be used. Cast house will be reconstructed and aspiration implemented.

A.3. Project participants:

Table A.3.1. 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 "Tulachermet"	No
Party B: The Netherlands	Global Carbon BV	No

Roles of the project participants:

- OJSC Tualchermet is one of the leading enterprises of the Russian metallurgical industry and the biggest pig iron exporter in the country. OJSC Tualchermet will implement the proposed JI project and will own ERUs[1] generated by this project. OJSC Tualchermet is a project participant;
- Global Carbon BV is the leading expert on environmental consultancy and financial brokerage services in the international greenhouse emissions trading market under the Kyoto Protocol. Global Carbon has developed the first JI project that has been registered at the United Nations Framework Convention on Climate Change (UNFCCC). The first verification under JI mechanism was also completed for Global Carbon B.V project. Company focuses on Joint Implementation (JI) project development in Bulgaria, Ukraine and Russia. Global Carbon BV is responsible for 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 Tualchermet is located in Tula, Central federal district, 180 kilometres away from Moscow, Russian Federation. Tula comprises five regions – Zarechenskiy, Privokzalniy, Proletarskiy, Sovetskiy, and Central. Geographical locations of Tula and Tula region are presented on Figure A.4.1.1, and Figure A.4.1.2. respectfully.

[1] Emission reduction units

Figure A.4.1.1: Map of Russian Federation with Tula region location (highlighted by red colour)

Figure A.4.1.2: Map of Tula region with Tula location (highlighted by red colour)

A.4.1.1. Host Party(ies):

The Russian Federation

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

Tula region is located in the central European part of the Russia, it is a part of the Central Federal district of the Russian Federation. Population of Tula region counts 1,153,000 people; it corresponds to 0.87% of the total Russian population. Chemical industry, machinery, food industry, iron and steel industry and energy generation are the main industries in the region.

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

Central Federal District of the Russian federation, City of Tula. Tula city population counts 496,000 citizen. Tula is a developed industrial centre. Large industrial producers are the enterprises that form district's economy: Tulskiy weapon manufacturing plant, Tulskiy machinery plant, Instrument making design bureau, OJSC Tulskiy shell plant, OJSC Tulskiy combine harvester plant, scientific-production association "Splav", OJSC "Tulachermet", OJSC "Kosogorskiy metallurgic plant", JSC "Tulskiy transformer plant", OJSC "Octava".

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

OJSC "Tulachermet" is located in the Central Federal district, Tula city, Russian Federation.

Coordinates are N54.12. E37.37.

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

Proposed JI project aims at BF modernization using modern efficient technologies.

After the blast furnace #3 is refurbished according to the first grade repair, the furnace will operate according to the following parameters:

- Raw materials consist of fluxed sinter from the local sinter plant (about 60%) and Mikhailovskiy Mining plant pellets (about 40%);
- The main fuel is coke from Kemerovo region;
- Additional fuel is natural gas;
- Preliminary natural gas and oxygen mixing unit is used on the combined blast, heated up to 1145 °C to increase natural gas usage efficiency;
- Steam (18 g/cubic meter) is used to control blast furnace thermal condition;
- Blast furnace #3 production capacity will be increased to 4,200 tonnes of pig iron daily;

Blast furnace profile will be changed and volume increased to 2,200 cubic meters. Tuyere apparatus increase from 20 to 24 will allow blast furnace smelting intensification by decreasing the oxidation zone. New lining covering with carbon and graphite blocks application and with fire-refractory concrete usage will be mounted. Coolers made of high-durable pig iron with sphere-alike graphite will be used, which will allow for greater heat withdrawal in the extremely stressed areas and extend blast furnace operational time. Shaft cooling is switched to the closed loop cycle with chemically filtered water. Cast house will be reconstructed and aspiration implemented. Central bunkers set up for the metal containing raw materials at the bunker platform. New circled area of the tuyere zone to be constructed. New air cooling system of the blast furnace bottom.

Blast furnace #3

Iron grid cooler protection will be changed for the new one, made of steel boxes and coated with the bricks for high temperatures and deformation protection. New cooler plates will be installed in the shaft, which have principal differences from the old plates by having several grooves for water supply while old plates had the only one groove. These measures significantly enhance blast furnace cooling and will extend cooling plates' operational time.

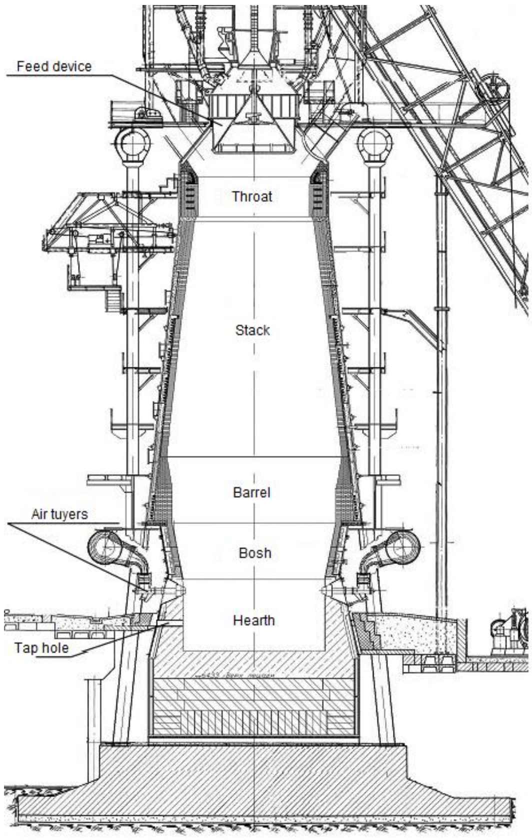
There are three belt firebrick linings in tuyer area: outer belt width is 670 mm; working belt width is 1300-1600 mm. In the hearth area there are two belt linings: working belt is 900-1200 mm width; outer belt is 470-670 mm width.

New bottom construction enhances 700-750 ºC isotherms position. Chemical reactions ignition isotherm will appear in the working belt of the blocks even with heating up more than a half and will not interfere with the outer blocks belt.

New electronic system of the bottom wear control is applied.

New belt-alike air-blow pipe is installed at the 15.600 mark instead of 14.600 existing, which has been dictated by 24 tuyers installation.

Figure A.4.2.1. Blast Furnace #3



There are no changes made to the throat, the same new throat is built.

Cast house

New modern melting products release system from the blast furnace requires cast house groove system (желоб - runner) change. Two-stage cast house will be built. A set of hydraulic equipment will be mounted in the cast house to mechanise the entire casting yard:

- Tap hole opening machine;
- Tap hole closing machine;
- Manipulator device for lowering and rising main grooves (main runner) covers;
- Swinging grooves with drives;
- Pumping-accumulating station;
- Electrical equipment;

Cast house aspiration

After hydraulic equipment is installed, grooves are fully covered by caps, which completely prevent dust and smog emission. Aspiration boxes are set across the casting yard.

Furnace charge

The main goal of the furnace charging system reconstruction is direct pellets charging into a bunker scales in the iron ore section, keeping off of the main belt conveyors and organize the scheme where computerised controls may be implemented (automatic dozing system, materials dozing correction based on the variation in the previous dozes, coke dozing correction based on moisture content, materials consumption control and technical-economical indicators improvement)

Figure A.4.2.2. Materials movement during agglo-blast furnace production

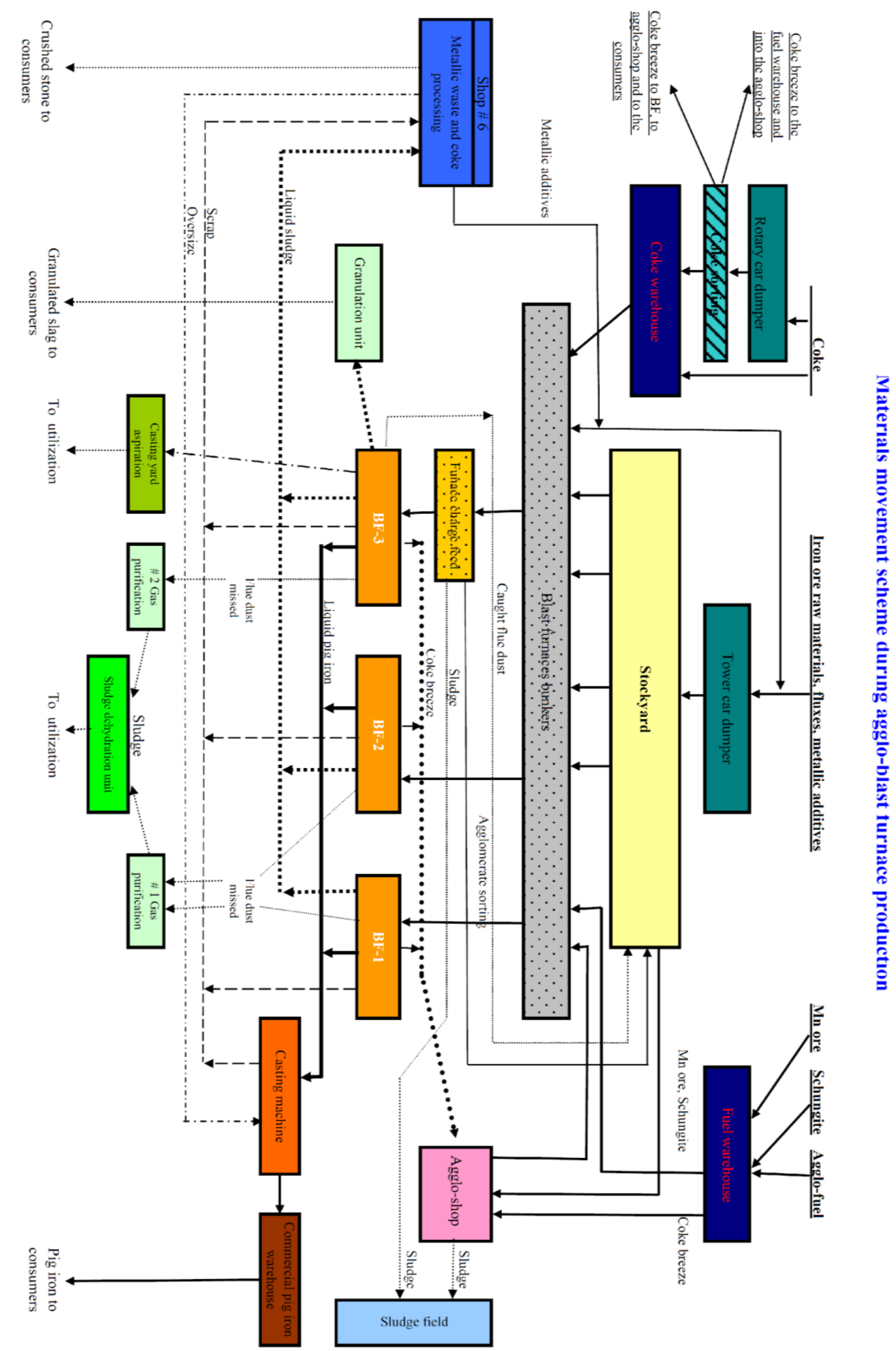
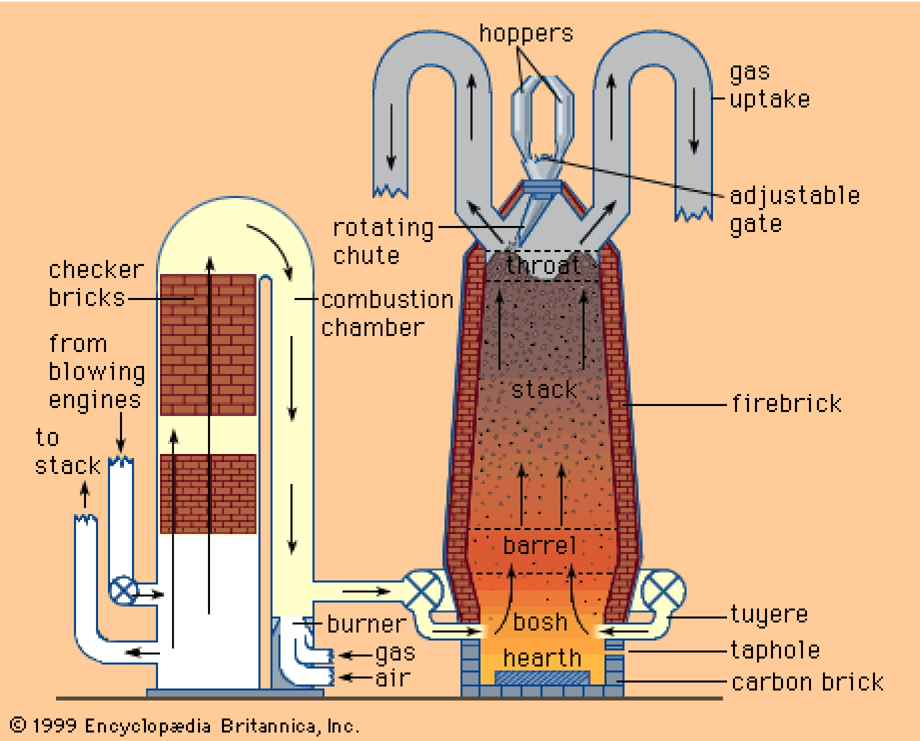


Table A.4.2.1: Main technical data of the modernised BF #3

Indicator	Unit	Modernized BF
Volume	m^3	2,200
Number of tuyeres	item	24
Capacity	tonne/day	4,200
Capacity	tonne/year	1,533,000
Coke specific consumption	kg/tonne	464
Blast consumption	m^3/minute	3,700
Air-blast temperature	ºC	1,145
Natural gas consumption	m^3/tonne	60
Number of tap-holes	item	2

Source: OJSC Tulachermet

Figure A.4.2.3. 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 reducing action 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.

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

Table A.4.2.2. Project implementation schedule

Works type		Time schedule for 2003							
		2003							
		Feb	Mar	Apr	May	June	July	Aug	Sep
Furnace body	Metal rolling	■	■						
	Furnace manufacturing		■	■					
	Test assembly			■	■	■			
	Final mounting						■	■	
Aspiration mounting								■	■

Source: OJSC Tulachermet

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:

Tuyere apparatus was increased from 20 to 24, and blast furnace profile (shape) has been changed. This allowed gas usage level increase from 45% to 47.7%. This led to coke consumption decrease at the blast furnace 3.

Tuyere apparatus and furnace profile change are not connected with one another. These are two separate measures directed on to the hearth gas distribution improvement. Due to hearth gas distribution improvement, hearth gas desoxydation capability usage is increased, which characterized by the blast furnace gas usage level. The higher the blast furnace gas usage level, the lower coke specific consumption. Other measures are decreasing environmental impact of the pig iron production and are inalienable part of the furnace reconstruction program, as new pig iron production volumes will require new equipment to support its operation.

Specific factor of GHG emission per tonne of pig iron produced will be reduced after the blast furnace #3 reconstruction. Taking into account that other pig iron producers have higher specific GHG emission factor per tonne of pig iron produced, when that pig iron will be substituted by the pig iron produced at the modernized blast furnace, GHG emission reduction will occur, as reconstructed furnace is friendlier for the environment in terms of GHG emissions.

According to the report of twenty-first meeting of the executive board of the clean development mechanism[2], paragraph 18, "project activities may temporarily result in "negative emission reductions" in a particular year". Therefore, despite negative emission reductions for the year 2009, the project may still be regarded as compliant with Article 6 of the Kyoto protocol. Total emission reductions for the project during the crediting period are positive.

[2] http://cdm.unfccc.int/Reference/catalogue/document?doc_id=000000138

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

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

	Years
Length of the crediting period	5
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2008	319,481
2009	-102,698
2010	165,847
2011	151,621
2012	151,621
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	685,872
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	137,174

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

	Years
Length of the crediting period	8
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2013	151,621
2014	151,621
2015	151,621
2016	151,621
2017	151,621
2018	151,621
2019	151,621
2020	151,621
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	1,212,968
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	151,621

A.5. Project approval by the Parties involved:

After the PDD has passed the determination process, the PDD, the Expert Opinion (equivalent to summary of determination report) and other related documents will be submitted to the Russian Ministry of Economic Development for following the project approval procedure as JI Project by the Russian Federation Government.

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 is applied to this project since 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.** Direction of the main development of metallurgical industry is indicated in the governmental policy:
    - Strategy of the Russian metallurgical industry development until 2020[6];

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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

The program is not prescriptive or not legally binding but is rather recommending.

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)**. The main product of the BF is a pig iron that further exported for steel production. The steel industry is a transparent market where standardized types of steel products exist. Within a certain region or country pig iron can be transported from the producer to the consumer without constrains**;**
c) **Availability of capital (including investment barriers).** Capital is available but high bank rate and high country investment risk;
d) Local availability of technologies/techniques, skills and know-how and availability of the best available technologies/techniques in the future. Different methods of pig iron and steel production are available in the Russian Federation, including modern achievements such as Kalugin pre-heaters and automated furnace charge.
e) Fuel prices and availability. Electricity, natural gas and coke are widely used and available in the Russian Federation.

The baseline is established in a transparent manner with regard to the choice of approaches, assumptions, methodologies, parameters, data sources and key factors. Information is mostly 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 pig iron).

The baseline for this project will be the most plausible future scenario on the basis of conservative assumptions and key factors described above.

Step 2. Application of the approach chosen

Plausible future scenarios will be identified in order to establish the baseline.

Sub step 2.1 Identifying and listing plausible future scenarios.

Scenario 1. Implementation of the proposed project measures without JI incentives
This scenario is the project activity, but in this case the project will not gain revenue from the possible development as a joint implementation project. In this scenario all measures will be implemented, but the project will not be registered as JI project and will not gain JI revenue to cover expenses on the project partially. As it is shown in the section B.2. the project is not feasible without JI revenue. This is not the most plausible scenario.

Scenario 2.Only secondary measures implementation without modernisation of the BF.
This scenario accounts for secondary measures implementation only, not connected with the blast furnace itself; specifically, a combination or a single measure implementation amongst the following options: coolers made of high-durable pig iron with sphere-alike graphite installation, cast house reconstruction and aspiration implementation; central bunkers set up for the metal containing raw materials at the bunker platform; new air cooling system of the blast furnace bottom construction.
Prior to its shutdown, BF #3 was working inefficiently and could not operate in such mode any longer. Inefficient operation could lead to significant losses in fuel, energy consumption, poor product manufacturing; significant lost times could occur, including emergency shutdowns. Blast furnace

capacity could drop up to 10-15%. Therefore implementation of other project measures excluding BF reconstruction cannot be considered reasonable as the blast furnace is the main and the only item that can produce pig iron. In case of the blast furnace emergency shutdown, or complete stop all secondary equipment installed would also be non-operational, and could not produce pig iron, eventually all manufacturing process had to be stopped if the blast furnace remains not reconstructed. Secondary measures implementation only cannot be considered reasonable.
Therefore, this scenario cannot be considered as the baseline.

Scenario 3. Blast furnace #3 shut down, incremental pig iron production by the third party producers

In this scenario BF will be shut down due to excessive wear of equipment that makes it not possible to continue blast furnace operation in order to not to compromise operation safety. There are no additional investments required for the BF reconstruction. Uncovered pig iron demand, due to blast furnace shut down, would be satisfied by the existing pig iron producers. Pig iron producers are chosen on the basis of pig iron production capabilities, from the annual statistical report “Russian Chermet information” aggregated by LLC “Korporatsiya proizvoditeley chernih metalov”. Therefore third party pig iron producers will cover the incremental pig iron production part. This is the most plausible scenario.

General description of the baseline scenario

Due to excessive equipment wear the furnace cannot maintain technological parameters set for its operation in the technical manuals. Which means that there can be losses in fuel, raw materials, poor quality product may be manufactured that will not be accepted in the market. Operation safety may be decreased and lead to injuries. To avoid such negative impact, the blast furnace had to be shut down.

Sub step 2.2 Consistency with mandatory applicable laws and regulations.

All scenarios proposed are in compliance with existing laws and regulations.

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

Data/Parameter	E_y^{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) use	Plant records
Value of data applied (for ex ante calculations/determinations)	2007: 1,410,177 2008: 1,329,973 2009: 1,410,177
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 #3 in the project scenario in year *y*. The weighting method is used to identify the amount of iron. The weighting equipment is calibrated and checked by the plant staff.
QA/QC procedures (to be) applied	The company has metrological service. 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 used for emissions calculations for pig iron production by other plants.

Data/Parameter	$BEF_{iron,y}$
Data unit	tCO_2/tonnes of pig iron
Description	Baseline emission factor for displacing iron production in year *y*
Time of determination/monitoring	*Ex-post.*
Source of data (to be) use	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)	2007: 1.297 2008: 1,294 2009: 1,163
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.
QA/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.

Data/Parameter	$Coke_{consumption,y}$
Data unit	Tonnes of coke
Description	Coke consumption in year *y*
Time of determination/monitoring	*Ex-post.*
Source of data (to be) use	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)	2007: 22,270,456; 2008: 21,167,557; 2009: 19,093,092
Justification of the choice of data or description of measurement methods and procedures (to be) applied	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information" is the official source of information for the metallurgic industry in the Russian Federation.
QA/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.

Data/Parameter	$EF_{coke\_consumption}$
Data unit	tCO_2/tonne
Description	Emission factor for coke consumption
Time of determination/monitoring	*Fixed ex-ante.*
Source of data (to be) use	IPCC, from Chapter 4
Value of data applied (for ex ante calculations/determinations)	3.043
Justification of the choice of data or description of measurement methods and procedures (to be) applied	IPCC default emission factor is used
QA/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.

Data/Parameter	$Limestone_{consumption,y}$
Data unit	Tonnes of limestone
Description	Limestone consumption in year y
Time of determination/monitoring	Ex-post.
Source of data (to be) use	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)	2007: 564,015; 2008: 585,837; 2009: 160,364
Justification of the choice of data or description of measurement methods and procedures (to be) applied	LLC “Korporatsiya proizvoditeley chernih metalov” annual statistical report “Russian Chermet information” is the official source of information for the metallurgic industry in the Russian Federation.
QA/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.

Data/Parameter	$EF_{\mathrm{limestone\_consumption}}$
Data unit	tCO_2/tonne
Description	Emission factor for limestone consumption
Time of determination/monitoring	*Fixed ex-ante.*
Source of data (to be) use	Metal industry. Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Process and Product Use, Chapter 2: Mineral Industry Emissions, Table 2.1, page 7, IPCC, 2006)
Value of data applied (for ex ante calculations/determinations)	0.43971
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Default emission factor is used
QA/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.

Data/Parameter	$Natural\_Gas_{consumption}$
Data unit	Thousand cubic meters
Description	Natural gas consumption in year *y*
Time of determination/monitoring	*Ex-post.*
Source of data (to be) use	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)	2007: 5,027,789 2008: 4,520,778 2009: 4,292,993
Justification of the choice of data or description of measurement methods and procedures (to be) applied	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information" is the official source of information for the metallurgic industry in the Russian Federation.
QA/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.

Data/Parameter	$NCV_{natural\_gas}$
Data unit	GJ/1000 m^3
Description	Natural gas net calorific value
Time of determination/monitoring	*Ex-ante.*
Source of data (to be) use	IPCC, Volume 2. Energy. Table 1.2 http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf
Value of data applied (for ex ante calculations/determinations)	34,3
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Default net calorific value is used
QA/QC procedures (to be) applied	-
Any comment	Conversion from Gg to 1000 m^3 is made using the following approach: NCV=48*16/22.4 Where: 16 – Natural gas molar weight; 48 – Natural gas net calorific value from Volume 2. Energy. Table 1.2; 22.4 - Avogadro constant; 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.

Data/Parameter	$EF_{natural\_gas}$
Data unit	tCO_2/GJ
Description	Emission factor for natural gas consumption
Time of determination/monitoring	*Fixed ex-ante.*
Source of data (to be) use	IPCC, from Chapter 1
Value of data applied (for ex ante calculations/determinations)	0.0561
Justification of the choice of data or description of measurement methods and procedures (to be) applied	IPCC default emission factor is used
QA/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.

Data/Parameter	$Antracitic\_coal_{consumption}$
Data unit	Tonnes of anthracite
Description	Anthracite consumption in year *y*
Time of determination/monitoring	*Ex-post.*
Source of data (to be) use	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)	2007: 61,329; 2008: 60,295; 2009: 50,289
Justification of the choice of data or description of measurement methods and procedures (to be) applied	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information" is the official source of information for the metallurgic industry in the Russian Federation.
QA/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.

Data/Parameter	$NCV_{antarcitic\_coal}$
Data unit	GJ/tonne
Description	Anthracite net calorific value
Time of determination/monitoring	*Ex-ante.*
Source of data (to be) use	IPCC, Volume 2. Energy. Table 1.2
Value of data applied (for ex ante calculations/determinations)	26.7
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Default net calorific value is used
QA/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.

Data/Parameter	$EF_{antracitic\_coal}$
Data unit	tCO_2/GJ
Description	Emission factor for anthracite consumption
Time of determination/monitoring	*Fixed ex-ante.*
Source of data (to be) use	IPCC, Volume 2. Energy. Table 2.2
Value of data applied (for ex ante calculations/determinations)	0.0983
Justification of the choice of data or description of measurement methods and procedures (to be) applied	IPCC default emission factor is used
QA/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.

Data/Parameter	$Blast\_Furnace\_Gas\_output$
Data unit	1000 m^3
Description	Blast furnace gas output in year *y*
Time of determination/monitoring	*Ex-post.*
Source of data (to be) use	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)	2007: 40,001,435; 2008: 39,028,329; 2009: 40,599,146
Justification of the choice of data or description of measurement methods and procedures (to be) applied	LLC “Korporatsiya proizvoditeley chernih metalov” annual statistical report “Russian Chermet information” is the official source of information for the metallurgic industry in the Russian Federation.
QA/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.

Data/Parameter	$NCV_{blast\_furnace}$
Data unit	GJ/1000 m^3
Description	Blast furnace gas net calorific value
Time of determination/monitoring	*Ex-ante.*
Source of data (to be) use	IPCC, Volume 2. Energy. Table 1.2
Value of data applied (for ex ante calculations/determinations)	19.4
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Default net calorific value is used
QA/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.

Data/Parameter	$EF_{blast\_furnace\_gas}$
Data unit	tCO_2/GJ
Description	Emission factor for blast furnace gas consumption
Time of determination/monitoring	*Fixed ex-ante.*
Source of data (to be) use	IPCC, Volume 2. Energy. Table 2.2
Value of data applied (for ex ante calculations/determinations)	0.2596
Justification of the choice of data or description of measurement methods and procedures (to be) applied	IPCC default emission factor is used
QA/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.

Data/Parameter	$Sinter_{production}$
Data unit	Tonnes
Description	Sinter production in year *y*
Time of determination/monitoring	*Ex-post.*
Source of data (to be) use	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)	2007: 57,048,025 2008: 54,804,392 2009: 50,508,052
Justification of the choice of data or description of measurement methods and procedures (to be) applied	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information" is the official source of information for the metallurgic industry in the Russian Federation.
QA/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.

Data/Parameter	$EF_{sinter\_production}$
Data unit	tCO_2/tonne
Description	Emission factor for sinter production
Time of determination/monitoring	*Fixed ex-ante.*
Source of data (to be) use	IPCC Guidelines for National Greenhouse Gas Inventories (2006), Volume 3, Chapter 4, page 25 http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf /3_Volume3/V3_4_Ch4_Metal_Industry.pdf
Value of data applied (for ex ante calculations/determinations)	0.20
Justification of the choice of data or description of measurement methods and procedures (to be) applied	IPCC default emission factor is used
QA/QC procedures (to be) applied	-

Data/Parameter	$EF_{coke\_production}$
Data unit	tCO_2/tonne
Description	Emission factor for coke production
Time of determination/monitoring	*Fixed ex-ante.*
Source of data (to be) use	IPCC Guidelines for National Greenhouse Gas Inventories (2006), Volume 3, Chapter 4, page 25 http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf /3_Volume3/V3_4_Ch4_Metal_Industry.pdf
Value of data applied (for ex ante calculations/determinations)	0.56
Justification of the choice of data or description of measurement methods and procedures (to be) applied	IPCC default emission factor is used
QA/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. be completed without modifying/adding headings or logo, format or font.

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.

Data/Parameter	$Pellets_{consumption}$
Data unit	Tonnes
Description	Pellets consumption in year *y*
Time of determination/monitoring	*Ex-post.*
Source of data (to be) use	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)	2007: 25,273,330 2008: 22,231,523 2009: 19,367,997
Justification of the choice of data or description of measurement methods and procedures (to be) applied	LLC “Korporatsiya proizvoditeley chernih metalov” annual statistical report “Russian Chermet information” is the official source of information for the metallurgic industry in the Russian Federation.
QA/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.

Data/Parameter	$EF_{pellets\_production}$
Data unit	tCO_2/tonne
Description	Emission factor for pellets production
Time of determination/monitoring	*Fixed ex-ante.*
Source of data (to be) use	IPCC Guidelines for National Greenhouse Gas Inventories (2006), Volume 3, Chapter 4, page 25 http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf /3_Volume3/V3_4_Ch4_Metal_Industry.pdf
Value of data applied (for ex ante calculations/determinations)	0.03
Justification of the choice of data or description of measurement methods and procedures (to be) applied	IPCC default emission factor is used
QA/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.

Data/Parameter	$Oxygen_{consumption,y}$
Data unit	1000 m^3
Description	Oxygen consumption in year *y*
Time of determination/monitoring	*Ex-post.*
Source of data (to be) use	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)	2007: 4,482,392 2008: 4,259,770 2009: 4,098,080
Justification of the choice of data or description of measurement methods and procedures (to be) applied	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information" is the official source of information for the metallurgic industry in the Russian Federation.
QA/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.

Data/Parameter	$Electricity\_consumption_{oxygen\_production}$
Data unit	MWh/1000 m^3
Description	Electricity consumption for oxygen production in year *y*
Time of determination/monitoring	*Ex-post.*
Source of data (to be) use	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)	1000
Justification of the choice of data or description of measurement methods and procedures (to be) applied	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information" is the official source of information for the metallurgic industry in the Russian Federation.
QA/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.

Data/Parameter	EF_{el}^{n}
Data unit	tCO_2/MWh
Description	Emission factor for the relevant electricity grid
Time of determination/monitoring	*Fixed ex-ante.*
Source of data (to be) use	Russian power systems in the Russian Federation, the Study commissioned by “Carbon Trade and Finance SICAR S.A.” [7].
Value of data applied (for ex ante calculations/determinations)	0.511 – for RES “Centre”; 0.548 – for RES “North-West”; 0.506 – for RES “Mid Volga”; 0.541 – for RES “Urals”; 0.500 – for RES “South”; 0.894 – for RES “Siberia”;
Justification of the choice of data or description of measurement methods and procedures (to be) applied	See annex 2
QA/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.

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

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 emissions reduction 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 version 05.2[8] is used for the project activity additionality demonstration.

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:

- implementation of the proposed project measures without JI incentives;
- Continuation of existing situation;

<u>Alternative 1. Implementation of the proposed project's measures without JI incentives</u>
This scenario is the project activity, but in this case the project will not gain revenue from the possible development as a joint implementation project.

<u>Alternative 2.Only secondary measures implementation without modernisation of the BF.</u>
This scenario accounts for secondary measures implementation only, not connected with the blast furnace itself; specifically, a combination or a single measure implementation amongst the following options: coolers made of high-durable pig iron with sphere-alike graphite installation, cast house reconstruction and aspiration implementation; central bunkers set up for the metal containing raw materials at the bunker platform; new air cooling system of the blast furnace bottom construction. Prior to its shutdown, BF #3 was working inefficiently and could not operate in such mode any longer. Inefficient operation could lead to significant losses in fuel, energy consumption, poor product manufacturing; significant lost times could occur, including emergency shutdowns. Blast furnace capacity could drop up to 10-15%. Therefore implementation of other project measures excluding BF reconstruction cannot be considered reasonable as the blast furnace is the main and the only item that can produce pig iron. In case of the blast furnace emergency shutdown, or complete stop all secondary equipment installed would also be non-operational, and could not produce pig iron, eventually all

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

manufacturing process had to be stopped if the blast furnace remains not reconstructed. Secondary measures implementation only cannot be considered reasonable.
Therefore, this scenario cannot be considered as the baseline.

Alternative 3. Blast furnace #3 shut down, incremental pig iron production by the third party producers

In this scenario BF will be shut down due to excessive wear of equipment that makes it not possible to continue blast furnace operation in order to not to compromise operation safety. There are no additional investments required for the BF reconstruction. Uncovered pig iron demand, due to blast furnace shut down, would be satisfied by the existing pig iron producers. Pig iron producers are chosen on the basis of pig iron production capabilities, from the annual statistical report "Russian Chermet information" aggregated by LLC "Korporatsiya proizvoditeley chernih metalov". Therefore third party pig iron producers will cover the incremental pig iron production part.

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 emission reductions sale.

Sub-step 2a: Determine appropriate analysis method

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 #3, shall be implemented by OJSC Tulachermet. The enterprise 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 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	5.05 %	German long-term interest rate in euro as a secondary market yields of government bonds with remaining maturity close to ten years, May 2001. This rate is taken as Germany is the largest Euro economy.	European Central Bank[9]
2	Russian interest rate	7.5%	Weighted average interest rate of Russian federal bonds and short-dated bond.	Eurobond [10]
3	Country risk premium	2.45%	Non-specific risk associated with investments in Russia. Equals to Russian interest rate less Risk-free rate.	-
4	Company related risk premium	5 %	Company-specific risk premium associated with company stability, reputation, overall estimation.	Enterprise assessment
5	Project risk premium	4%	This type of projects has the medium risk factor of 3-5%. Thus the moderate range is applied.	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.
6	Inflation in the Russian Federation	18.6%	Inflation in the Russian Federation in 2001.	Federal service of the State statistics[11].
7	Discount rate without allowance for project risk	6.39%	$Discount\ \ rate\ without\ risk =$ $= \frac{Refinance\ rate - inflation}{100 + inflation} \cdot 100\%$	Methodological recommendations on investment projects assessment. Resolution by Russian government #1470 on 22 November 1997.
	Total expected return	17.84%	This rate takes into account real (inflation adjusted) risk-free rate increased by a general expected market return, country risk and specific project risk.	

[9] 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.

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

[11] http://www.gks.ru/free_doc/new_site/prices/potr/2010/I-ipc.htm

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

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

The following assumptions have been used based on the information provided by the enterprise:
1. Investment decision: 16 October 2001, commissioning date: 20 October 2003;
2. The project requires investments of approximately EUR 21 million during one year;
3. All relevant indicators are taken from economical department at the plant;
4. The project lifetime is 20 years (lifetime of blast furnace);
5. Calculations are made at constant prices as of May 2001[12];
6. The exchange rate (EUR/RUR) is defined as 1/25.67 as of 01 May 2001;
7. Production is assumed at the maximum technical capacity;
8. Pig iron production is 1,448,123 tonnes per year;
9. Fuel and electricity consumption are taken into account;

Table B.2.2. Financial indicators of the project

Scenario	**IRR (%)**
Base case	15.20%

Cash flow analysis shows an IRR of 15.20% which is below the benchmark of 17.84% (benchmark set in the table B 2.1). Hence, the project cannot be considered as financially attractive.

Sub-step 2d: Sensitivity analysis

Sensitivity analysis needs to be made to show whether conclusion regarding the financial/economic attractiveness is robust to the reasonable variations and critical assumptions.

The following three key factors were considered in the sensitivity analysis: electricity cost, gas and pig iron prices. In line with the Additionality Tool, sensitivity analysis should be undertaken within the interval of ±10% for the key indicators.

Scenario 1 considers 10% investment cost growth.

Scenario 2 is based on the assumption of 10% investment cost decrease;

Scenario 3 and *Scenario 4* are based on upward and downward 10% pig iron price trend;

Scenario 5 implies 10% electricity tariff growth and Scenario 6 uses 10% electricity tariff drop;

Scenario 7 assumes 10% gas price increase and Scenario 8 is opposite to Scenario 7;

Results summary is presented in the Table B.2.3.

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[12] 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.

Table B.2.3: Sensitivity analysis (summary)

Scenario	**IRR (%)**
Scenario 1	14.98%
Scenario 2	15.43%
Scenario 3	15.63%
Scenario 4	14.72%
Scenario 5	15.20%
Scenario 6	15.20%
Scenario 7	15.27%
Scenario 8	15.55%

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

Step 3: Barrier analysis

Not applicable

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 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:
Majority of blast furnaces in Russia were constructed before 1990. Metallurgical industry of Russia in the 1990 has faced crisis conditions in the economy, rapid metal products consumption. Production indicators were severely impacted. Only the most necessary investments into metallurgic industry were made. As the most likely examples, production level was kept the level of previous years. Usually, instead of making big investments into blast furnace modernization, companies would prefer to go through extensive blast furnace testing process to prove to the supervising body (Rostehnadsor) that the blast furnace operation time maybe extended without threat to operations safety, but with technological parameters degrading.

Following improvements were made to the blast furnace#3 that had never been done in the Russian Federation before the project realisation:

- Blast furnace stack cooling using chemically cleaned water circulating in the closed loop;
- Foundation cooling made of high-strength iron with balled graphite;
- Thin walled lining of blast furnace with fire-refractory concrete, put using guniting and spay cast methods;
- Cast house construction with two-level aspiration system;
- Real-time automated hearth firing monitoring system;

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.

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 pig iron production:
- Emissions from raw materials (limestone, dolomite, coke) during pig iron making process;
- Fuel (natural gas) combustion;
- GHG emissions from the Russian electricity grid;
- Raw materials production (coke, pellets, sinter);
- Blast furnace gas post-combustion in pre-heater.

Also there is GHG emission not connected with the iron production:
- Blast furnace gas combustion outside the project boundary.

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:

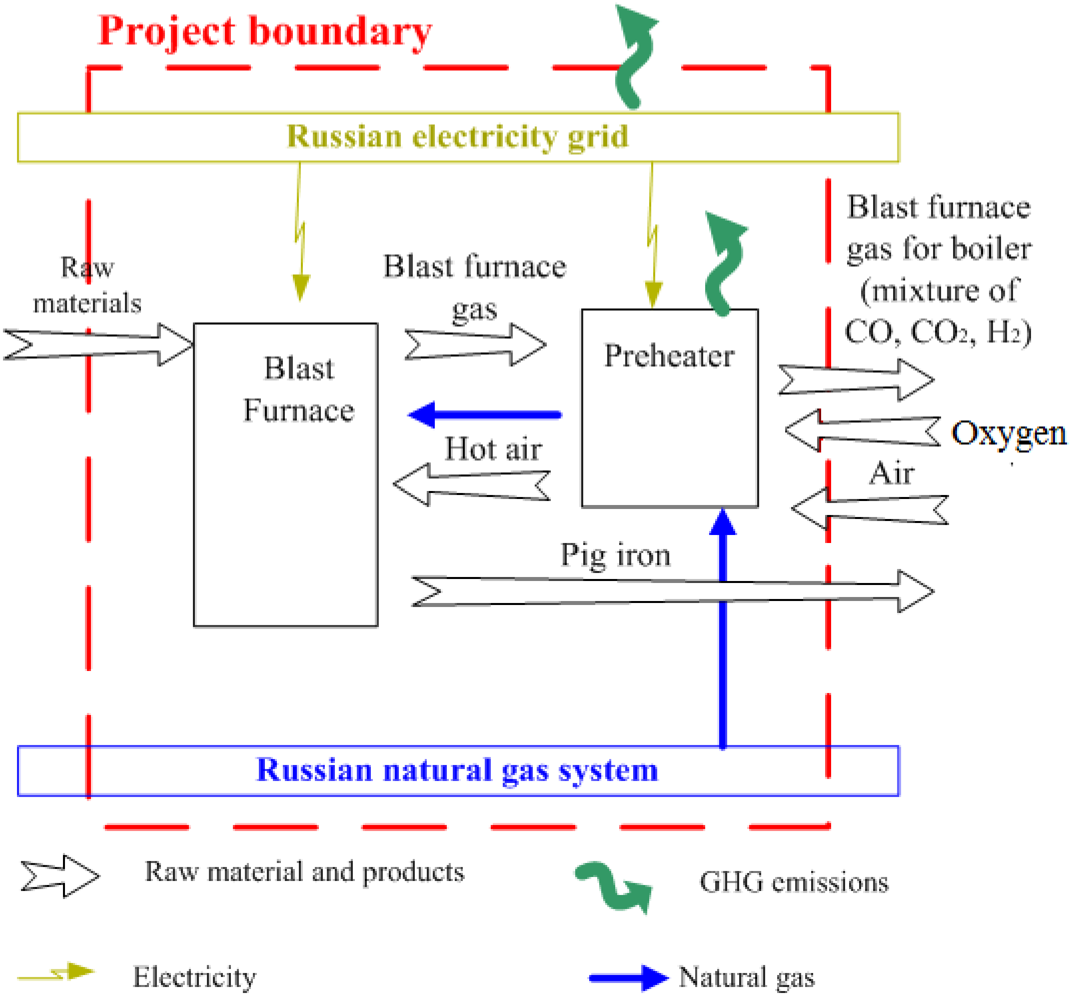
- Under the control of the project participants;
- Reasonably attributable to the project;
- Significant, i.e., as a rule of thumb, would by each source account on average per year over the crediting period for more than 1 per cent of the annual average anthropogenic emissions by sources of GHGs, or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

Table B.3.1: Sources of emissions

№	Source	Gas	Included/ excluded	Justification/Explanation
1	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 these sources is conservative; • Emissions from the electricity grid are calculated using standardized regional electricity factors for Russia[13].
2	Coke consumption	CO_2	Included	• All iron producers have comparable emissions from coke consumption.
3	Natural gas consumption	CO_2	Included	• Natural gas is used in the blast furnace and in pre-heaters.
4	Coke, pellet and sinter production	CO_2	Included	• All iron producers have comparable emissions from these sources; • OJSC Tulachermet does not produce coke, pellet or sinter; • Emissions due to coke production are calculated using IPCC emission factors. Emissions due to fuel consumption during pellet and sinter production are calculated according to fuel consumption in Russia.
5	Limestone	CO_2	Included	Limestone is used in the process to form slag and tie-in sulphur.
6	Blast furnace gas post-combustion.	CO_2	Excluded	Blast furnace gas consists of carbon monoxide, carbon dioxide and hydrogen gas. It is an under-fired exhaust gas which originates during processes inside the blast furnace. During emission calculation from raw material (coke) and fuel (natural gas) IPCC emission factor is used. This means full combustion in the blast furnace without gas under-firing. Therefore blast furnace gas post-combustion is not included in the emission calculation (to avoid double accounting).
8	Blast furnace gas combustion outside the project boundary	CO_2	Excluded	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 gas turbine to be excluded from total emissions. Because blast furnace gas (carbon monoxide) is combusted not for the project purposes, outside the project boundary.
9	Oxygen consumption	CO_2	Included	Oxygen is consumed during pig iron production. Oxygen consumption is constantly monitored.

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: 28/03/2011

Name of person/entity setting the baseline:
Global Carbon BV is the project participant.
Sergey Papkov
E-mail: Papkov@global-carbon.com

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

Date of project start: 16/10/2001

C.2. Expected operational lifetime of the project:

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

C.3. Length of the crediting period:

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

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

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

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

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;
- 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#3;

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 the last year) or fixed ex-ante for the three years;

General remarks:

- Social indicators, such as number of people employed, safety records, training records etc., will be available to a verifier, as 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). 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 emissions reduction will not be claimed. This is conservative.

Monitoring responsibilities:

- Data storage and archiving – Technical and production department staff;
- Data processing - Technical and production department staff;
- Data reporting - Technical and production department staff;
- Monitoring report - approval Technical and production department head;

Technical instruction TI-127-D-40-2007 developed at the plant will be used as the guidance during monitoring.

Data monitored and required for verification will be kept for two years after the last transfer of ERUs for the project.

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

Table D.1.1. Parameters fixed ex-ante

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit
P3	$EF_{decarbonisation}$	IPCC	tCO_2/tonne
P5	$EF_{pellet\_production}$	IPCC	tCO_2/ tonne
P7	EF_{gas}	IPCC	tCO_2/GJ

P8	$EF_{coke}^{burning}$	IPCC	tCO_2/GJ
P10	NCV_{coke}	IPCC	GJ/ t
P11	$EF_{coke}^{production}$	IPCC	tCO_2/t
P12	$EF_{el,y}$	See Annex 2	tCO_2/ MWh
P20	$EF_{production}^{Sinter}$	IPCC	tCO_2/ tonne

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	BP_{y}^{iron}	Technical report	tonnes	m	Per monitoring period	100%	Electronic and paper	-
P2	$Cons_{limestone,y}$	Technical report	tonnes	m	Per monitoring period	100%	Electronic and paper	-
P4	$Cons_{pellet\_specific,y}$	Technical report	Tonnes/tonne	m	Per monitoring period	100%	Electronic and paper	-
P6	$PF_{gas,y}$	Technical report	1000 m^3	m	Per monitoring period	100%	Electronic and paper	-
P9	$PR_{coke,y}$	Technical report	tonnes	m	Per monitoring period	100%	Electronic and paper	-
P13	$PEL_{el,y}$	Technical report	MWh	e/c	Continuously	100 %	Electronic and paper	-

P14	$NCV_{gas,y}$	Technical report	GJ/Nm^3	m/c	Per shipment/ Per monitoring period	100 %	Electronic and paper	-
P15	$NCV_{bfg,y}$	Technical report	GJ/Nm^3	m	Monthly	100 %	Electronic and paper	-
P16	PBG_y	Technical report	m^3	m	Per monitoring period	100%	Electronic and paper	-
P17	$Cons_{oxygen\_specific}$	Technical report	m^3/tonne	m	Per monitoring period	100%	Electronic and paper	-
P18	$El_{consumption\_specific}^{Oxygen\_production}$	Technical report	MWh/1000m^3	m/c	Continuously	100 %	Electronic and paper	-
P19	$S\text{int}\,er_{specific}^{consumption}$	Technical report	Tonnes/tonne	m/c	Per monitoring period	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

$$PE_y = PE_{raw,y} + PE_{pellet,y} + PE_{coke\,combustion,y} + PE_{coke\,production,y} + PE_{gas,y} + PE_{el,y} + PE_{oxygen,y} + PE_{sinter,y} - PE_y^{CO \rightarrow CO2} \quad (1)$$

Where:

PE_y	Project emissions in year *y* (tCO_2);
$PE_{raw,y}$	Project emissions due to raw material 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);
$PE_{coke\,combustion,y}$	Project emissions due to coke combustion in year *y* (tCO_2);
$PE_{el,y}$	Project emissions due to electricity consumption in year *y* (tCO_2);
$PE_y^{CO \rightarrow CO2}$	Emissions that are not connected with project (burning of blast furnace gas (only CO)) in year *y* (tCO_2);
$PE_{oxygen,y}$	Project emissions due to oxygen generation in year *y* (tCO_2);
$PE_{sinter,y}$	Project emissions due to sinter production in year *y* (tCO_2);
$PE_{coke\,production,y}$	Project emissions due to coke production in year *y* (tCO_2);

Project emissions due to raw material decarbonisation

$$PE_{raw,y} = BP_y^{iron} \times Cons_{limestone,y} \times EF_{decarbonisation} \quad (2)$$

Where:

$PE_{raw,y}$	Project emissions due to raw material decarbonisation (limestone) in year *y* (tCO_2);
BP_y^{iron}	Pig iron production by BF#3 in year *y* (tonnes);
$Cons_{limestone,y}$	Limestone specific consumption in year *y* (tonnes limestone /tonne pig iron);

$EF_{decarbonisation}$ Decarbonisation emission factor (tCO_2/tonne);

Project emissions due to pellet production

$$PE_{pellet,y} = BP_y^{iron} \times Cons_{pellet\_specific,y} \times EF_{pellet\_production} \quad (3)$$

Where:

$PE_{pellet,y}$	Project emissions due to pellet production (fuel consumption) in year *y* (tCO_2);
BP_y^{iron}	Pig iron production by BF#3 in year *y* (tonnes);
$Cons_{pellet\_specific,y}$	Specific consumption of pellets (tonne/tonne iron);
$EF_{pellet\_production}$	Emission factor for pellets production (tonne CO_2/tonne pellets produced);

Project emissions due to natural gas combustion

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

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 #3 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) [14];

Project emissions due to coke burning

$$PE_{coke,y}^{burning} = EF_{coke}^{burning} \times PR_{coke,y} \times NCV_{coke} \quad (5)$$

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

Where:

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

$EF_{coke}^{burning}$ Emission factor of coke (tCO_2/GJ) [15];

$PR_{coke,y}$ Total consumption of coke in the blast furnace #3 in year *y* (tonnes);

NCV_{coke} Net calorific value of coke (GJ/ t) [16];

Project emissions due to coke production

$$PE_{coke,y} = PR_{coke,y} \times EF_{coke}^{production} \quad (6)$$

Where:

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

$EF_{coke}^{production}$ Default emission factor of coke production[17] (tCO_2/tonne of coke).

$PR_{coke,y}$ Total consumption of coke in the blast furnace #3 in year *y* (tonnes);

Project emissions due to electricity consumption

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

$$PE_{el,y} = EF_{el,y} \times PEL_{el,y} \quad (7)$$

Where:

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

[16] IPCC Guidelines for National Greenhouse Gas Inventories (2006), http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html, Volume 2, Chapter 1, table 1.2.

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

$PE_{el,y}$ 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#3 in year y (MWh);

Emissions that are not connected with the project

$$PE_y^{CO \rightarrow CO2} = NCV_{bfg,y} \times PBG_y \times EF_{bfg} \times \frac{1}{1000} \quad (8)$$

Where:

$PE_y^{CO \rightarrow CO2}$ Emissions that are not connected with project (blast furnace gas output (only CO)) in year y (tCO_2);

PBG_y Blast furnace gas (consumed outside the project) output in year y (1000 m^3);

$NCV_{bfg,y}$ Blast furnace gas net calorific value GJ/1000 m^3;

EF_{bfg} Emission factor for blast furnace gas (tCO_2/GJ);

Emissions from oxygen production

$$PE_{oxygen,y} = Cons_{oxygen\_specific} \times BP_y^{iron} \times El_{consumption\_specific}^{Oxygen\_production} \times EF_{el,y} \quad (9)$$

Where:

$PE_{oxygen,y}$ Emissions from oxygen generation in year y (tCO_2);

$Cons_{oxygen\_specific}$ Specific oxygen consumption per tonne pig iron (1000 m/tonne pig iron);

BP_y^{iron} Pig iron production by BF#3 in year y (tonnes);

$El_{consumption\_specific}^{Oxygen\_production}$ Specific electricity consumption for oxygen production (MWh/1000 m^3);

Emissions from sinter consumption

$$PE_{sinter,y} = Sinter_{specific}^{consumption} \times BP_y^{iron} \times EF_{production}^{Sinter} \quad (10)$$

Where:

$Sinter_{specific}^{consumption}$ Specific sinter consumption (tonnes of sinter/tonne pig iron);

BP_y^{iron} Pig iron production by BF#3 in year *y* (tonnes);

$EF_{production}^{Sinter}$ Emission coefficient for sinter production (tCO_2/tonne sinter) [18].

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	BP_y^{iron}	Technical report	tonnes	m	Annually	100%	Electronic and paper	-

[18] IPCC Guidelines for National Greenhouse Gas Inventories (2006), Volume 3, Chapter 4, page 4.25, table 4.1.
http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/3_Volume3/V3_4_Ch4_Metal_Industry.pdf

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 the Annex 2, the baseline emissions have one source:

- Production by other pig iron producers (displacing production).

Baseline emissions due to displacing production

Pig iron is separated into two important pig iron grades foundry and steelmaking. Specific fuel consumption of these grades is differing from each other. Therefore, in the baseline emissions for them are calculated separately.

$$BE_y = BP_y^{iron} \times BEF_y \qquad (11)$$

Where:

BE_y	Baseline emissions in year *y* (tCO_2);
BP_y^{iron}	Displacing iron production in the baseline scenario in year *y* (tonnes);
BEF_y	Baseline emission factor for displacing foundry pig iron production in year *y* (tCO_2/t of foundry pig iron) (see Annex 2);

In the baseline scenario displacing pig iron production is equal to pig iron production of the reconstructed BF#3 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 higher than in the project scenario. Therefore estimated leakages are neglected in order to be conservative.

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):

$$ER_y = BE_y - PE_y \qquad (12)$$

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 environmental regulations in the Russian Federation:

- 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 related to 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 Tulachermet will systematically collect data on pollutions that may have negative impact on the local environment. Monitoring, data collection and archiving is done by OJSC Tulachermet laboratory. Collected and archived data will be stored for more than five years in hardcopy and electronically. Equipment is checked and calibrated by the Federal Government Body "Tula Centre for standardisation, metrology and certification".

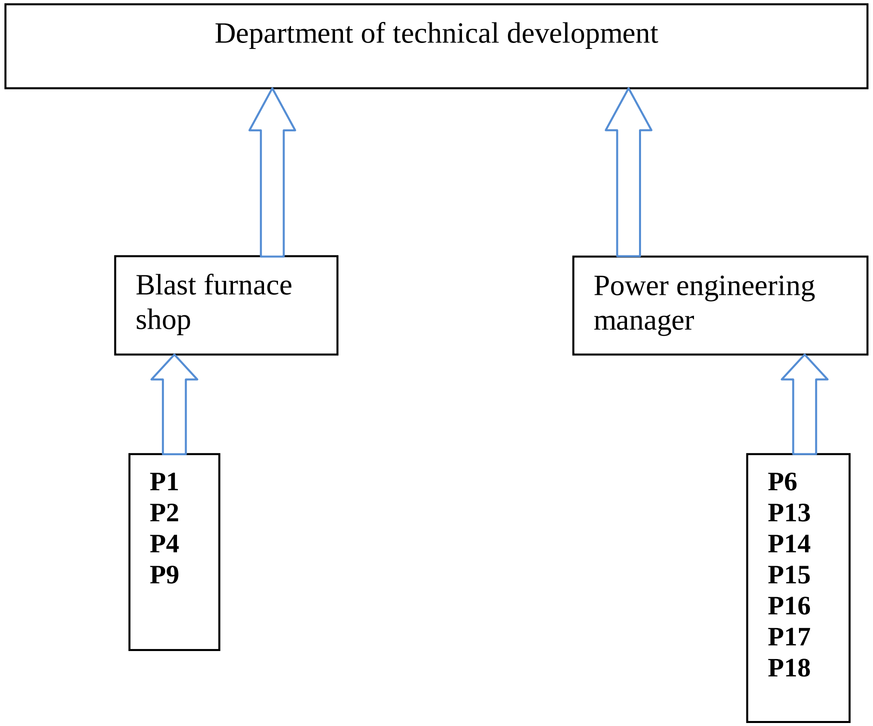
D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:

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.
P1, B1	Medium	Pig iron production is measured by scales in the blast furnace shop. Daily reports are generated based on the scales data and transferred to the electronic database. Scales are checked and calibrated according to the existing schedule by the accredited organisation. Reports are forwarded to the department of technical development.
P2, P4	Medium	Raw materials (pellets and limestone) consumption for iron production is weighed by strain-gauge. These data is accumulated in ACS (automatic control system) and transferred to the 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 Department of technical development.

P6	Medium	Natural gas consumption for pig iron production is recorded and controlled by energy department using gas meter. Flow meters will be calibrated and maintained in line with Russian regulations (certification test is made once in three years). Data will be passed to Department of technical development.
P9	Medium	Coke consumption for iron production is weighed by strain-gauge. These data are accumulated in ACS (automatic control system) and transferred to the 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 Department of technical development.
P14	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 Department of technical development.
P13	Medium	Electricity consumption is recorded and controlled by energy department using electrical 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.
P15	Medium	Blast furnace gas net calorific value is directly measured by the gas analyser, data is stored electronically. The data is forwarded to the chief power engineer. Gas analyser is checked and calibrated according to the schedule by the accredited organisation.
P16	Medium	Blast Furnace gas volume which is combusted outside the project is recorded and controlled by energy department. 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 outside the project. These data will be collected in Department of technical development.
P17	Medium	Oxygen consumption is measured by the flow meter. The data is stored electronically. Flow meter is checked and calibrated according to the existing schedule by the accredited organisation.
P18	Medium	Electricity consumption is calculated based on the data taken from the electricity meter. The data is transferred to the chief power engineer. Electricity meter is checked and calibrated according to the existing schedule by the accredited organisation.

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

Figure D.3.1: Scheme of monitoring data collection at OJSC "Tulachermet"



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

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  Global Carbon BV is the project participant.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

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

Project emissions	Unit	2008	2009	2010	2011	2012
Electricity consumtion	[tCO2]	8,084	9,733	9,733	9,733	9,733
Coke combustion	[tCO2]	1,857,825	1,991,321	1,991,321	1,991,321	1,991,321
Limestone consumption	[tCO2]	3,509	620	620	620	620
Oxygen consumption	[tCO2]	2,956	1,740	1,740	1,740	1,740
Blast furnace gas	[tCO2]	235,346	168,167	168,167	168,167	168,167
Output CO combustion	[tCO2]	-1,376,883	-1,220,280	-1,299,314	-1,285,088	-1,285,088
Sinter production	[tCO2]	307,756	417,694	417,694	417,694	417,694
Pellet production	[tCO2]	21,665	7,319	7,319	7,319	7,319
Coke production	[tCO2]	341,856	366,420	366,420	366,420	366,420
Total	[tCO_2/y]	1,402,114	1,742,735	1,663,701	1,677,927	1,677,927
Total 2008 - 2012	[tCO_2]	8,164,403				

Table E.1.2: Estimated project emissions after the crediting period, tCO_2

Project emissions	2013	2014	2015	2016	2017	2018	2019	2020
Total	1,677,927	1,677,927	1,677,927	1,677,927	1,677,927	1,677,927	1,677,927	1,677,927
Total 2013 - 2020	13,423,415							

E.2. Estimated leakage:

Leakages are excluded from consideration due to conservativeness reasons.

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

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

Project emissions	Unit	2008	2009	2010	2011	2012
Total	[tCO_2/y]	1,402,114	1,742,735	1,663,701	1,677,927	1,677,927
Total 2008 - 2012	[tCO_2]	8,164,403				

Table E.3.1: Estimated project emissions including leakage after the crediting period, tCO_2

Project emissions	2013	2014	2015	2016	2017	2018	2019	2020
Total	1,677,927	1,677,927	1,677,927	1,677,927	1,677,927	1,677,927	1,677,927	1,677,927
Total 2013 - 2020	13,423,415							

E.4. Estimated baseline emissions:

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

	Unit	2008	2009	2010	2011	2012
Baseline emissions	[tCO_2/y]	1,721,595	1,640,036	1,829,548	1,829,548	1,829,548

Table E.4.2: Estimated baseline emissions after the crediting period, tCO_2

	2013	2014	2015	2016	2017	2018	2019	2020
Baseline emissions	1,829,548	1,829,548	1,829,548	1,829,548	1,829,548	1,829,548	1,829,548	1,829,548

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

Table E.5.1: Difference representing emissions reduction within the crediting

Emissions reduction	Unit	2008	2009	2010	2011	2012
Total	[tCO_2/y]	319,481	-102,698	165,847	151,621	151,621
Total 2008 - 2012	[tCO_2]	685,872				

Table E.5.2: Difference representing emissions reduction after the crediting, tCO_2

Emissions reduction	2013	2014	2015	2016	2017	2018	2019	2020
Total	151,621	151,621	151,621	151,621	151,621	151,621	151,621	151,621
Total 2013 - 2020	1,212,968							

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

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

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
Year 2008	1,402,114	0	1,721,595	319,481
Year 2009	1,742,735	0	1,640,036	-102,698
Year 2010	1,663,701	0	1,829,548	165,847
Year 2011	1,677,927	0	1,829,548	151,621
Year 2012	1,677,927	0	1,829,548	151,621
Total (tonnes of CO_2 equivalent)	8,164,403	0	8,850,275	685,872

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	1,677,927	0	1,829,548	151,621
Year 2014	1,677,927	0	1,829,548	151,621
Year 2015	1,677,927	0	1,829,548	151,621
Year 2016	1,677,927	0	1,829,548	151,621
Year 2017	1,677,927	0	1,829,548	151,621
Year 2018	1,677,927	0	1,829,548	151,621
Year 2019	1,677,927	0	1,829,548	151,621
Year 2020	1,677,927	0	1,829,548	151,621
Total (tonnes of CO_2 equivalent)	13,423,415	0	14,636,383	1,212,968

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:

Pig 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 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) done in line with the Article 49 of the Construction Code of RF. In line with the Construction code the Design Document should contain Section "Environmental Protection". Compliance with the environmental regulations (so called technical regulations in Russian on Environmental Safety) should be checked during the process of SEE. In the absence of the above mentioned regulations compliance is checked in a very general manner.

According to the article 11 of the Federal law "About ecological expertise" the given project is not the subject to the mandatory state ecological expertise.

There are three areas of concern in term of environmental impacts during pig iron production:
- Atmospheric air protection;
- Water basin protection;
- Manufacturing wastes;

The project complies with the following regulations:

- SNIP 11-01-95 (Construction norms and regulations) instruction on the development, coordination, approval and content of the project documentation for the plants, buildings and structures construction;
- OND-86. Methodology harmful substances concentration calculation in the atmospheric air, contained in the enterprises pollutions;
- Methodological guidance on calculations, regulating and control of the polluting substances into the atmospheric air;
- Quantifying methodology of the polluting substances into the atmosphere;
- Guidance on pre-project and project documentation ecological expertise;
- Norm on environmental assessment at RF#222 18.07.94 by Ministry of the natural resources of the Russian Federation;
- Project on norms of the down to the limit and temporary coordinated pollutions for OJSC "Tulachermet";
- Federal law "On environment protection" 2002;
- Federal law "On atmospheric air protection" 1998;
- Federal law "On industrial and consumer wastes " 2000;

List of the relevant documents required for the project realization:

- Pollutants release permit 991P issued 01 March 2006 by the Federal Service in ecological, technological and atomic supervision;

There are several environment contamination sources at OJSC “Tulachermet”:

- Volatile suspended solids;
- Nitrogen and sulphur dioxides;
- Carbon oxide.

NO_x are formed due to the inevitable oxidation reaction of the atmospheric nitrogen at high temperatures during fuel combustion. It is expected that emissions will meet requirements of the Russian legislation.

Project is tending to minimize pollution of the atmosphere by gaseous emissions. Certain measures are taken to implement this:

- Polluted gases lead out from the inter-cone space to the blast furnace gas are cleaned;
- Blast furnace cooling is switched to the closed cycle.

Project is realized on the territory of the Russian Federation, which is big enough to consider transboundary effects absence. Project affects only few kilometres of the territory surrounding the plant.

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:

Information on environmental impacts is taken from the technical project, chapter “Environmental protection”

Air protection:

Grooves at the two-level cast house are fully covered by hatches to eliminate smog or dust pollution. All captured polluted gases will be redirected to the aspiration system for cleaning. After the project is realized, pollutions from the unloading device will be reduced 9.6 times. Air pollution will be reduced 1.4 times; Nitrogen oxides emissions will be reduced 3.9 times; Carbon oxide emissions will be reduced 2.5 times.

Manufacturing wastes treatment:

Blast furnace slag will be redirected to the blast furnace granulating unit and to the shop#6 (slag dump) for reprocessing. Iron grid cooler dust will be reprocessed in the agglomeration shop during the process of sinter production. Wastes types and their usage remains the same as before the project. Overall waste amount will be reduced on 7004 tonnes per year after the project realisation.

Water protection activity:

Blast furnace stack cooling will e switched to the closed return loop cycle using chemically cleaned water that excludes manufacturing waters dumping into the natural water reservoirs.

SECTION G. Stakeholders' comments

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

Public hearings were not conducted. Proposed JI project is not required to go through a local stakeholder consultation process. Project implementation was supported by the publication in the local magazine "Metallurg" in the issue of June 2005.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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Annex 2

BASELINE INFORMATION

Baseline description:

BF will be shot down due to excessive wear of equipment that makes it not possible to continue blast furnace operation in order to not to compromise operation safety. Modernization program will not be implemented.

The purpose of the proposed project is the blast furnace #3 reconstruction. This BF was in operation for about 21 years until the point where it can operate no longer. CO_2 emissions for the project are related to the displacing capacity. Emissions connected with displacing capacity are calculated based on the approach which consists of the emissions of the other iron producers and emissions from the 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 the other metallurgical plants.

The displacing part of the baseline emissions is calculated on the basis of 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 for 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 the 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, pig 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, oil residual, 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 calculated for each stage, emissions from derived gases burning offsite should be excluded.

Multiple default emission factors
In accordance with IPCC Guidelines[19] 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 do not 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 the total emissions for the JI project purposes. Emissions connected with decarbonisation of limestone and dolomite (slag-forming materials) during pellet, sinter and pig iron production are back-calculated according to CaO and MgO content in the blast furnace slag.

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

Tier 1 method can use 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 factors for Tier 1[20] are:

[19] 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

[20] 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.

- 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.

Emission factors for iron production calculation

Pig iron is separated into two important pig iron grades foundry and steelmaking. Specific fuel consumption of these grades is differing one from another. Therefore production emission factors for them are calculated individual. Production emission factor is calculated according to the following formula:

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

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

$$E_y^{iron} = Coke_{consumption,y} \times EF_{coke\_consumption} + Limestone_{consumption} \times EF_{limestone\_consumption} + Natural\_Gas_{consumption} \times$$

$$\times NCV_{natural\_gas} \times EF_{natural\_gas} + Antracitic\_coal_{consumption} \times NCV_{antarcitic\_coal} \times EF_{antracitic\_coal} -$$

$$- Blast\_Furnace\_Gas\_output \times NCV_{blast\_furnace} \times \frac{4.19}{1000} \times EF_{blast\_furnace\_gas} +$$

$$+ Coke_{consumption,y} \times EF_{coke\_production} + Sinter_{production} \times EF_{sinter\_production} + Pellets_{consumption} \times EF_{pellets\_production} +$$

$$+ Oxygen_{consumption,y} \times Electricity\_consumption_{oxygen\_production} \times EF_{el}^{n}$$

(2)

Where:

E_y^{iron}	Iron production emissions in year *y* (tCO_2);
$Coke_{consumption,y}$	Coke consumption in year *y* (tonnes);
$EF_{coke\_consumption}$	Emission coefficient for coke consumption (tCO_2/tonne);
$Limestone_{consumption}$	Limestone consumption in year *y* (tonnes);
$EF_{limestone\_consumption}$	Emission coefficient for limestone consumption (tCO_2/tonne);
$Natural\_Gas_{consumption}$	Natural gas consumption in year *y* (thousand m^3);

$NCV_{natural\_gas}$ Natural gas net calorific value (TJ/1000 m^3);

$EF_{natural\_gas}$ Emission factor for natural gas combustion (tCO_2/TJ);

$Antracitic\_coal_{consumption}$ Anthracite consumption in year *y* (tonnes);

$NCV_{antarcitic\_coal}$ Anthracite net calorific value (TJ/tonne);

$EF_{antracitic\_coal}$ Anthracite emission factor (tCO_2/TJ);

$Blast\_Furnace\_Gas\_output$ Blast furnace gas output in year *y* (thousand m^3);

$NCV_{blast\_furnace}$ Blast furnace gas net calorific value (TJ/1000 m^3);

$EF_{blast\_furnace\_gas}$ Blast furnace gas emission factor (tCO_2/TJ);

$EF_{coke\_production}$ Coke production emission factor (tCO_2/tonne);

$Sinter_{production}$ Sinter production in year *y* (tonnes);

$EF_{sinter\_production}$ Sinter production emission factor (tCO_2/tonne);

$Pellets_{consumption}$ Pellets consumption in year *y* (tonnes);

$EF_{pellets\_production}$ Pellets production emission factor (tCO_2/tonne);

$Oxygen_{consumption,y}$ Oxygen consumption in year *y* (thousand m^3);

$Electricity\_consumption_{oxygen\_production}$ Electricity consumption for oxygen production (MWh/1000m^3);

EF_{el}^{n} Emission factor for the relevant electricity grid (tCO_2/MWh);

The displacing CO_2 emission factor of iron production is calculated as an "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.

$$OM_y = \frac{\sum_m E_y^{iron,m}}{\sum_m SP_y^m} \qquad (3)$$

Where:

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 the project absence, a competitor may 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 the reasons of conservativeness, that an installation would be built based on the Best Available Technology (BAT) of steel production;
d) If no recent capacity additions have occurred and it is unclear which of 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.

$$BM_y = \frac{\sum_i E_y^{iron,i}}{\sum_i SP_y^i} \quad (4)$$

Where:

BM_y	Emission factor or Build Margin 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.

$$CM_y = \frac{OM_y + BM_y}{2} \quad (5)$$

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[21] and shown accordingly on the UNFCCC JI website are excluded from the sample units for the OM/BM/CM emission factor calculation.

[21] 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.

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.

Table Anx.2.1: Results of emissions and emission factors calculations for steelmaking iron production in 2007

Facility	Iron production	Total emissions	Emission factors
	Tones	tCO_2	tCO_2/tonne of iron
JSC "MMK"	9,482,448	12 209 372	1,288
JSC "NTMK"	5,333,614	6 141 769	1,152
JSC "NKMK"	1,471,977	2 849 129	1,936
JSC "Uralsteel"	2,791,373	4 348 485	1,558
JSC "CherepMK"	8,758,538	8 276 211	0,945
JSC "NLMK"	9,050,188	15 798 531	1,746
JSC "ZSMK"	5,246,170	6 210 385	1,184
JSC "Kosogorsky MK"	279,611	388 521	1,390
JSC "Chusovskoy MZ"	610,996	886 421	1,451
JSC "Verhnesaychihinsky MZ"	163,374	188 847	1,156
JSC "TulaCherMet"	2,663,584	3 198 846	1,201
JSC "ChelMK"	3,685,893	3 828 284	1,039
JSC "MZ imeni Serova"	366,642	332 662	0,907
JSC "Svobodny Sokol"	514,391	755 315	1,468
Total	**50,418,799**	**65 412 778**	**1,297**

Source: LLC "Korporatsiya proizvoditeley chernih metalov"

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

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

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

There are no new installations of BFs for the last year in Russia. Only maintenances were at the metallurgical plants. They keep production capacity on the previous level. According to the data from LLC "Korporatsiya proizvoditeley chernih metalov" forty six blast furnaces were in operation 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) should be 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 there are no relevant capacities 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.

<table>
<tr><td>Data/Parameter</td><td colspan="3">E_y^{iron}</td></tr>
<tr><td>Data unit</td><td colspan="3">Tonnes</td></tr>
<tr><td>Description</td><td colspan="3">Displacing foundry iron production in the baseline scenario in year y</td></tr>
<tr><td>Time of determination/monitoring</td><td colspan="3">Ex-post. During the crediting period</td></tr>
<tr><td>Source of data (to be) use</td><td colspan="3">Plant records</td></tr>
<tr><td rowspan="2">Value of data applied
(for ex ante calculations/determinations)</td><td>2007</td><td>2008</td><td>2009</td></tr>
<tr><td>1,410,177</td><td>1,329,973</td><td>1,410,177</td></tr>
<tr><td>Justification of the choice of data or description of measurement methods and procedures (to be) applied</td><td colspan="3">In the baseline scenario displacing iron production is equal to iron production of reconstructed BF #3 in the project scenario in year y. The weighting method is used to identify the amount of iron. The weighting equipment is calibrated and checked by the plant staff.</td></tr>
<tr><td>QA/QC procedures (to be) applied</td><td colspan="3">The company has metrological service. 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.</td></tr>
<tr><td>Any comment</td><td colspan="3">This parameter is used for emissions calculations for pig iron production by other plants.</td></tr>
</table>

Data/Parameter	$BEF_{iron,y}$
Data unit	tCO_2/tonnes of pig iron
Description	Baseline emission factor for displacing iron production in year *y*
Time of determination/monitoring	*Ex-post.*
Source of data (to be) use	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)	2007: 1.297; 2008: 1,294; 2009: 1,163
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.
QA/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.

Data/Parameter	$Coke_{consumption,y}$
Data unit	Tonnes of coke
Description	Coke consumption in year *y*
Time of determination/monitoring	*Ex-post.*
Source of data (to be) use	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)	2007: 22,270,456; 2008: 21,167,557; 2009: 19,093,092
Justification of the choice of data or description of measurement methods and procedures (to be) applied	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information" is the official source of information for the metallurgic industry in the Russian Federation.
QA/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.

Data/Parameter	$EF_{coke\_consumption}$
Data unit	tCO_2/tonne
Description	Emission factor for coke consumption
Time of determination/monitoring	*Fixed ex-ante.*
Source of data (to be) use	IPCC, from Chapter 4
Value of data applied (for ex ante calculations/determinations)	3.043
Justification of the choice of data or description of measurement methods and procedures (to be) applied	IPCC default emission factor is used
QA/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.

Data/Parameter	$Limestone_{consumption,y}$
Data unit	Tonnes of limestone
Description	Limestone consumption in year y
Time of determination/monitoring	Ex-post.
Source of data (to be) use	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)	2007: 564,015; 2008: 585,837; 2009: 160,364
Justification of the choice of data or description of measurement methods and procedures (to be) applied	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information" is the official source of information for the metallurgic industry in the Russian Federation.
QA/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.

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

Data/Parameter	$Natural\_Gas_{consumption}$
Data unit	Thousand cubic meters
Description	Natural gas consumption in year *y*
Time of determination/monitoring	*Ex-post.*
Source of data (to be) use	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)	2007: 5,027,789 2008: 4,520,778 2009: 4,292,993
Justification of the choice of data or description of measurement methods and procedures (to be) applied	LLC “Korporatsiya proizvoditeley chernih metalov” annual statistical report “Russian Chermet information” is the official source of information for the metallurgic industry in the Russian Federation.
QA/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.

Data/Parameter	$NCV_{natural\_gas}$
Data unit	GJ/1000 m^3
Description	Natural gas net calorific value
Time of determination/monitoring	*Ex-ante.*
Source of data (to be) use	IPCC, Volume 2. Energy. Table 1.2 http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf
Value of data applied (for ex ante calculations/determinations)	34,3
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Default net calorific value is used
QA/QC procedures (to be) applied	-
Any comment	Conversion from Gg to 1000 m^3 is made using the following approach: NCV=48*16/22.4 Where: 16 – Natural gas molar weight; 48 – Natural gas net calorific value from Volume 2. Energy. Table 1.2; 22.4 - Avogadro constant; 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.

Data/Parameter	$EF_{natural\_gas}$
Data unit	tCO_2/GJ
Description	Emission factor for natural gas consumption
Time of determination/monitoring	*Fixed ex-ante.*
Source of data (to be) use	IPCC, from Chapter 1
Value of data applied (for ex ante calculations/determinations)	0.0561
Justification of the choice of data or description of measurement methods and procedures (to be) applied	IPCC default emission factor is used
QA/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.

Data/Parameter	$Antracitic\_coal_{consumption}$		
Data unit	Tonnes of anthracite		
Description	Anthracite consumption in year *y*		
Time of determination/monitoring	*Ex-post.*		
Source of data (to be) use	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)	2007	2008	2009
	61,329	60,295	50,289
Justification of the choice of data or description of measurement methods and procedures (to be) applied	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information" is the official source of information for the metallurgic industry in the Russian Federation.		
QA/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.		

Data/Parameter	$NCV_{antarcitic\_coal}$
Data unit	GJ/tonne
Description	Anthracite net calorific value
Time of determination/monitoring	*Ex-ante.*
Source of data (to be) use	IPCC, Volume 2. Energy. Table 1.2
Value of data applied (for ex ante calculations/determinations)	26.7
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Default net calorific value is used
QA/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.

Data/Parameter	$EF_{antracitic\_coal}$
Data unit	tCO_2/GJ
Description	Emission factor for anthracite consumption
Time of determination/monitoring	*Fixed ex-ante.*
Source of data (to be) use	IPCC, Volume 2. Energy. Table 2.2
Value of data applied (for ex ante calculations/determinations)	0.0983
Justification of the choice of data or description of measurement methods and procedures (to be) applied	IPCC default emission factor is used
QA/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.

Data/Parameter	$Blast\_Furnace\_Gas\_output$		
Data unit	1000 m^3		
Description	Blast furnace gas output in year *y*		
Time of determination/monitoring	*Ex-post.*		
Source of data (to be) use	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)	2007	2008	2009
	40,001,435	39,028,329	40,599,146
Justification of the choice of data or description of measurement methods and procedures (to be) applied	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information" is the official source of information for the metallurgic industry in the Russian Federation.		
QA/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.		

Data/Parameter	$NCV_{blast\_furnace}$
Data unit	GJ/1000 m^3
Description	Blast furnace gas net calorific value
Time of determination/monitoring	*Ex-ante.*
Source of data (to be) use	IPCC, Volume 2. Energy. Table 1.2
Value of data applied (for ex ante calculations/determinations)	19.4
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Default net calorific value is used
QA/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.

Data/Parameter	$EF_{blast\_furnace\_gas}$
Data unit	tCO_2/GJ
Description	Emission factor for blast furnace gas consumption
Time of determination/monitoring	*Fixed ex-ante.*
Source of data (to be) use	IPCC, Volume 2. Energy. Table 2.2
Value of data applied (for ex ante calculations/determinations)	0.2596
Justification of the choice of data or description of measurement methods and procedures (to be) applied	IPCC default emission factor is used
QA/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.

Data/Parameter	$Sinter_{production}$

Data unit	Tonnes
Description	Sinter production in year *y*
Time of determination/monitoring	*Ex-post.*
Source of data (to be) use	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)	2007: 57,048,025 2008: 54,804,392 2009: 50,508,052
Justification of the choice of data or description of measurement methods and procedures (to be) applied	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information" is the official source of information for the metallurgic industry in the Russian Federation.
QA/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.

Data/Parameter	$EF_{sinter\_production}$
Data unit	tCO_2/tonne
Description	Emission factor for sinter production
Time of determination/monitoring	*Fixed ex-ante.*
Source of data (to be) use	IPCC Guidelines for National Greenhouse Gas Inventories (2006), Volume 3, Chapter 4, page 25 http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf /3_Volume3/V3_4_Ch4_Metal_Industry.pdf
Value of data applied (for ex ante calculations/determinations)	0.20
Justification of the choice of data or description of measurement methods and procedures (to be) applied	IPCC default emission factor is used
QA/QC procedures (to be) applied	-

Data/Parameter	$EF_{coke\_production}$
Data unit	tCO_2/tonne
Description	Emission factor for coke production
Time of determination/monitoring	*Fixed ex-ante.*
Source of data (to be) use	IPCC Guidelines for National Greenhouse Gas Inventories (2006), Volume 3, Chapter 4, page 25 http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf /3_Volume3/V3_4_Ch4_Metal_Industry.pdf
Value of data applied (for ex ante calculations/determinations)	0.56
Justification of the choice of data or description of measurement methods and procedures (to be) applied	IPCC default emission factor is used
QA/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. be completed without modifying/adding headings or logo, format or font.

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.

Data/Parameter	$Pellets_{consumption}$		
Data unit	Tonnes		
Description	Pellets consumption in year *y*		
Time of determination/monitoring	*Ex-post.*		
Source of data (to be) use	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)	2007	2008	2009
	25,273,330	22,231,523	19,367,997
Justification of the choice of data or description of measurement methods and procedures (to be) applied	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information" is the official source of information for the metallurgic industry in the Russian Federation.		
QA/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.		

Data/Parameter	$EF_{pellets\_production}$
Data unit	tCO_2/tonne
Description	Emission factor for pellets production
Time of determination/monitoring	*Fixed ex-ante.*
Source of data (to be) use	IPCC Guidelines for National Greenhouse Gas Inventories (2006), Volume 3, Chapter 4, page 25 http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf /3_Volume3/V3_4_Ch4_Metal_Industry.pdf
Value of data applied (for ex ante calculations/determinations)	0.03
Justification of the choice of data or description of measurement methods and procedures (to be) applied	IPCC default emission factor is used
QA/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.

Data/Parameter	$Oxygen_{consumption,y}$
Data unit	1000 m^3
Description	Oxygen consumption in year *y*
Time of determination/monitoring	*Ex-post.*
Source of data (to be) use	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)	2007: 4,482,392; 2008: 4,259,770; 2009: 4,098,080
Justification of the choice of data or description of measurement methods and procedures (to be) applied	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information" is the official source of information for the metallurgic industry in the Russian Federation.
QA/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.

Data/Parameter	$Electricity\_consumption_{oxygen\_production}$
Data unit	MWh/1000 m^3
Description	Electricity consumption for oxygen production in year *y*
Time of determination/monitoring	*Ex-post.*
Source of data (to be) use	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)	1000
Justification of the choice of data or description of measurement methods and procedures (to be) applied	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information" is the official source of information for the metallurgic industry in the Russian Federation.
QA/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.

Data/Parameter	EF_{el}^{n}
Data unit	tCO_2/MWh
Description	Emission factor for the relevant electricity grid
Time of determination/monitoring	*Fixed ex-ante.*
Source of data (to be) use	Russian power systems in the Russian Federation, the Study commissioned by "Carbon Trade and Finance SICAR S.A." [22].
Value of data applied (for ex ante calculations/determinations)	0.511 – for RES "Centre"; 0.548 – for RES "North-West"; 0.506 – for RES "Mid Volga"; 0.541 – for RES "Urals"; 0.500 – for RES "South"; 0.894 – for RES "Siberia";
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures (to be) applied	-
Any comment	Data 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.

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

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.” [23].

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 the baseline incremental part following coefficients are 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

[23] 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

Left blank on purpose. See section D. for the monitoring plan.

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