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:

"Construction of electric arc furnace shop with open heart furnace production decommissioning at OJSC "NSMMZ", Revda, Russia".

Sectoral scope 9: Metal production.

Project design document (PDD) version 1.5

16th of March 2012.

A.2. Description of the project:

Enterprise description

OJSC Nizhneserginsky Metizno-Metallurgichesky Plant (NSMMZ) is a pioneer of metallurgical industry in Ural part of Russia. It was established in 1734. Nowadays NSMMZ specialized on the hot-rolled metal and metalware goods production. . This metallurgy complex is benefiting from the full production cycle and internally available raw material base (scrap metal). NSMMZ includes electric furnace steelmaking complex in Revda and two rolling complexes one in Nizhnie Sergy and another in Berezovsky. Steelmaking complex in Revda consists of scrap processing, two electric arc furnaces, two ladle furnaces and two continuous casting machines (CCM). The key NSMMZ products are high quality section steel, steel rod and hardware, mainly – wires and nails.

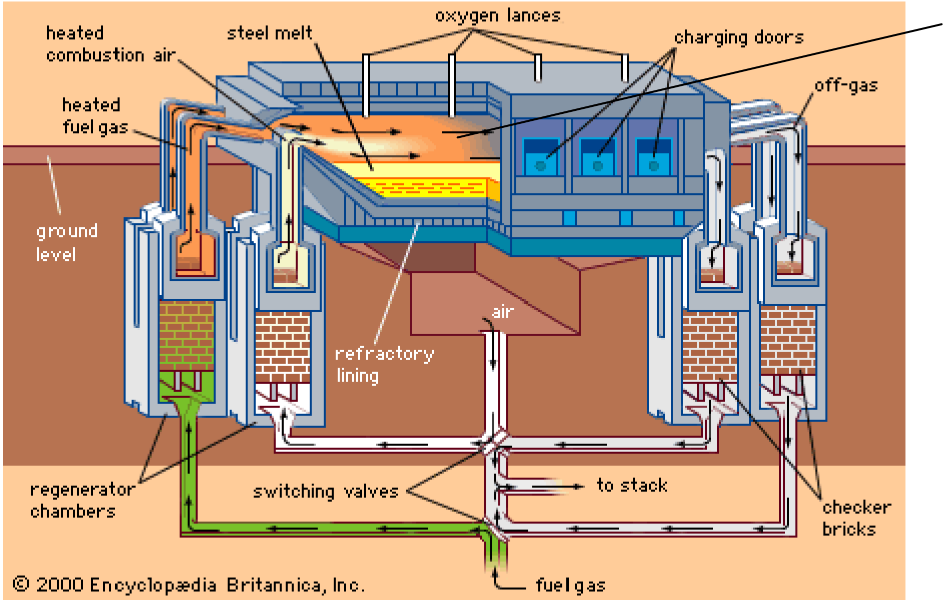
Project purpose

The goal of the proposed Joint Implementation (JI) project is to reduce impact of the steelmaking process on the climate by construction of mini-plants that would use electric furnaces steelmaking technology and produce section steel by the more energy efficient continuous casting machines. Existed open-hearth steel production process was replaced by an electric arc steelmaking process due to fossil fuels consumption reduction. Emissions of GHG were reduced significantly as a result of the project implementation.

Before the project

There were two open-hearth plant sites (Revda and Nizhnie Sergy).
Steel making process in Revda was represented by two OHFs. Work load of each was 185 tonnes of steel. Annual production of this plant (Revda) was around 236 thousand tonnes of casting blooms. Open-heath steel was poured into the molds. After solidification of the steel the ingot molds are mechanically "stripped" or pulled away from the molds. In the next step the ingots are sent to cutting for casting blooms production. The casting blooms production generated discard due to the process of cutting parts of an ingot and their re-smelting. This process requires additional energy demand.
Steel making process in Nizhnie Sergy was represented by three OHFs. Work load of each was 120 tonnes of steel. Annual production of this plant (Nizhnie Sergy) was around 226 thousand casting blooms. The process of casting bloom production was the same as in Revda site. Total casting bloom production (two sites) was equal to 442 thousand of casting bloom per year.
Detailed description of the OHF technology is presented in Figure A 2.1 below.

Figure A2.1: Open hearth furnace lay out



Source: http://www.britannica.com/EBchecked/topic/429660/open-hearth-furnace#.

The open hearth furnace has two regenerators. The regenerator consists of a regenerator chamber (box) where a checker of bricks is stacked. First the off-gas is transported through one regenerator heating the first checker to its optimal temperature. Resulting flue gases (combustion air and fuel gas) are led through the second regenerator and are preheated to 1,100-1,300ºC by the heat of the second checker, being cooled too much to continue heating the combustion air and the process inside the open hearth furnace is reversed. The main disadvantage of the open hearth furnace is high fuel consumption and a long melting time (which is more than 10 times higher than in an Electric Arc Furnace).

Project scenario and status

The open hearth process at NSMMZ was replaced by an electric furnace steelmaking and continuous casting. The project (construction of two independent processing lines) was completed in three stages.
Initially new Continuous Casting Machine (CCM) #1 and Ladle Furnace (LF) were installed in February 2004 (stage #1). Along with that Revda's open-hearth steel was directed to the CCM for bloom production instead of pouring it into the molds. Nizhnie Sergy steelmaking complex (open-hearth steel) continued pouring it into the molds. Construction of Electric Arc Furnace (EAF) #1 was finished in January 2005 (stage #2). Since that time electric furnace steelmaking capacity exceeds open-hearth steelmaking capacity in Revda and Nizhnie Sergy, all open hearth furnaces were decommissioned in February 2005. Capacity of processing line #1 is about 1 million of steel blooms per year.
In August-September 2006 processing line #2 (stage #3 includes construction of CCM#2, LF#2 and EAF#2) was run to operate. Total bloom production of two processing lines achieved capacity of about 2 million tonnes per year. Project boundary covers bloom production by reason casting bloom (mold) is equivalent to as-cast bloom (CCM).

Baseline scenario
In the baseline scenario it is assumed that the level of steel production will be equal to the project scenario level. Project has result in incremental production of approximately 1.6 million tonnes of bloom (about 2 million tonnes per year excluding 442 thousand tonnes per year, expected production with

OHPs at NSMMZ). However there is a limitation on the open hearth steelmaking production of the OHPs, depending on its expected capacity and third party steel producer would have produced the incremental part. The emissions associated with incremental capacity are calculated based on the assumption that increases in the incremental production of steel will be achieved by other steel producers. 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. Technical specification and resources consumption of OHPs are presented in Table A.2.1.

Table A.2.1: Main technical data of the Open Hearth Plants[1].

Indicator	Unit	OHP
Total capacity	t	442 896
Pig iron consumption	kg/t	241
Natural gas consumption	m^3/t	84
Residual fuel oil consumption	kg /t	113
Electricity consumption	kWh /t	7.4
Coke consumption	kg /t	14

Source: NSMMZ

Project background and description

In 2001 the Company commenced a plant renovation program, which is aimed to increase its capacity from 462 thousand tonnes to two million tonnes per year. The project documentation for this project has been developed by OJSC “Chelyabgipromez” during 2001-2003. The project documentation for the processing line#1 was approved by Glavgosexpertiza of Russian Federation in November 2002. After preparation of the project document package, GHGs emission reduction and additional revenues earned due to the project implementation as JI were taken into account. It makes possible to improve economic indicators and minimize project realization risks. The project primary task was to replace the open hearth plant with steel production using new up-to-date energy efficient equipment. NSMMZ decided to begin real actions of the project realization (equipment procurement for new electric arc processing lines instead of production of open hearth steel) taking into account JI component. The project implementation as JI makes possible to improve economic indicators and minimize project realization risks. The first part of processing line#1 (LF and CCM) in Revda was put into operation in February 2004. The EAF#1 construction was finished and it was put into operation in January 2005. Therefore the first and the second stage of the plant renovation had been completed and OHPs was decommissioned at the beginning of 2004 and 2005 accordingly. Preparation of the project documentation for the stage#3 (construction of processing line#2) begun at the beginning of 2003. The project documentation was approved by Glavgosexpertiza of Russian Federation in May 2006. The processing line#2 was commissioned in the middle of 2006. Project implementation schedule is presented in Section A.4.2 below.

[1] Average historical (2001-2003) value

A.3. Project participants:

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

Role of the project participants:

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

A.4. Technical description of the project:

A.4.1. Location of the project:

NSMMZ is located in Revda town 40 km to the West from Ekaterinburg (see Figure A.4.1.2), capital of Sverdlovsk area.
Geographical location of Sverdlovsk area and Revda are presented in Figure A.4.1.1 and Figure A.4.1.2 below.

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

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

Figure A.4.1.2: Map of Ural region with the project location

Source: http://www.mapquest.com/

A.4.1.1. Host Party(ies):

The Russian Federation

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

Sverdlovsk area is located in the centre of Urals. After Moscow, Tyumen area, Moscow area and Sankt Petersburg it is the fifth biggest gross regional product (GRP) producer in Russia contributing 3% of the Russian gross domestic product (GDP). Its population amounted to 4.4 million in 2008 that corresponds to 3.1% of the total Russian population. It has developed ferrous (13% of steel and 12% of rolled metal in Russia) and non-ferrous (copper, aluminum, nickel) metallurgy, highly diversified machinery building and chemistry, military and durable consumer goods production, wood processing, construction materials and light industry. The area is rich in iron and copper ore, asbestos, bauxites, has coal and gold extraction. It is almost fully supplied with gas.

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

Revda, town, Sverdlovsk region, western Russia, in the mid-Urals on the Revda River, at the confluence of the Chusovaya River. Founded in 1734, when a metallurgical factory was built, it became a city in 1935. In 1940 the Sredneuralsk copper-smelting plant began operation based on ore from the copper-mining centre of Degtyarsk. Ferrous metallurgy and fertilizers are also important. Population: 61,916 (2006 est). NSMMZ is important social and economic facility for the town.

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

The NSMMZ production site is located at the east outskirts of Revda (see Figure A.4.1.4.1). The project site coordinates are: longitude 59°56'34"E, latitude 56°47'53"N (by the software Google Earth).

Figure A.4.1.4.1: Satellite image of Revda town with the NSMMZ plant location

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

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

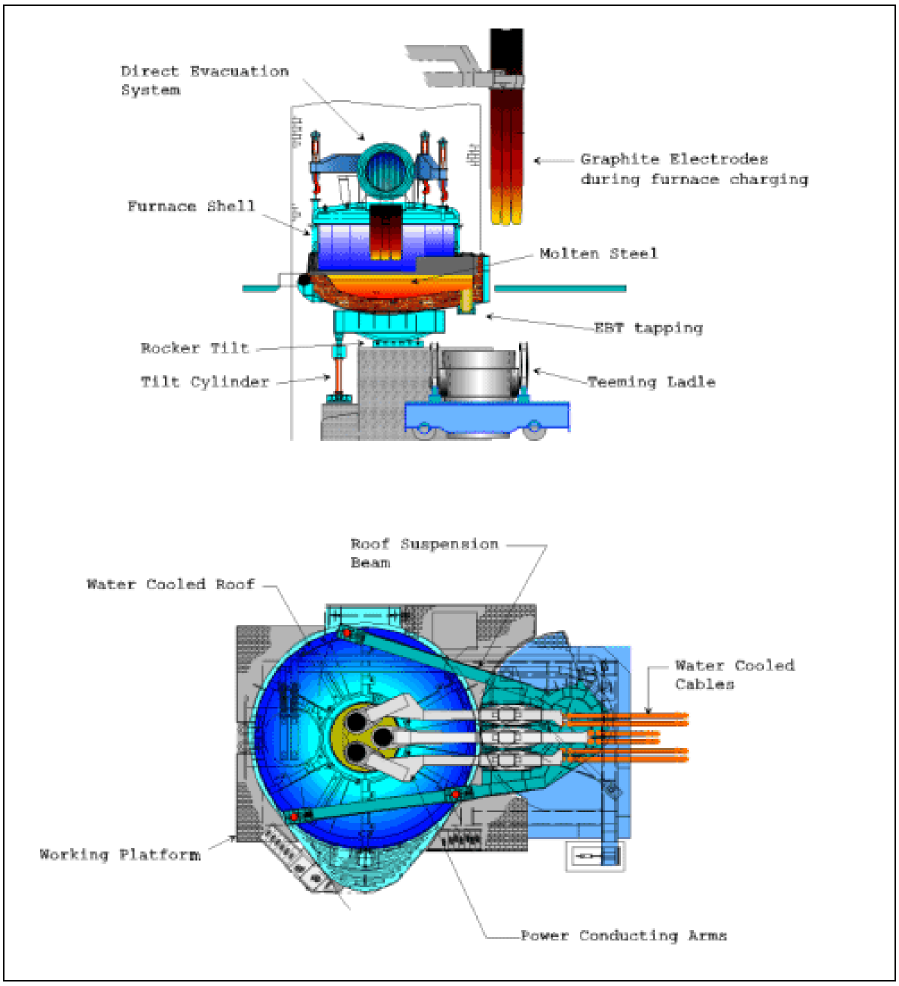
The proposed JI project aims at modernisation of production using modern energy-efficient technologies.

The project consists of two processing lines construction.

The stages of a processing line are described below. Main technical data of the equipments are presented in Table A.4.2.1 and Table A.4.2.2 below.

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

Figure A.4.2.1: Electric arc furnace



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

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

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

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

Ladle furnace

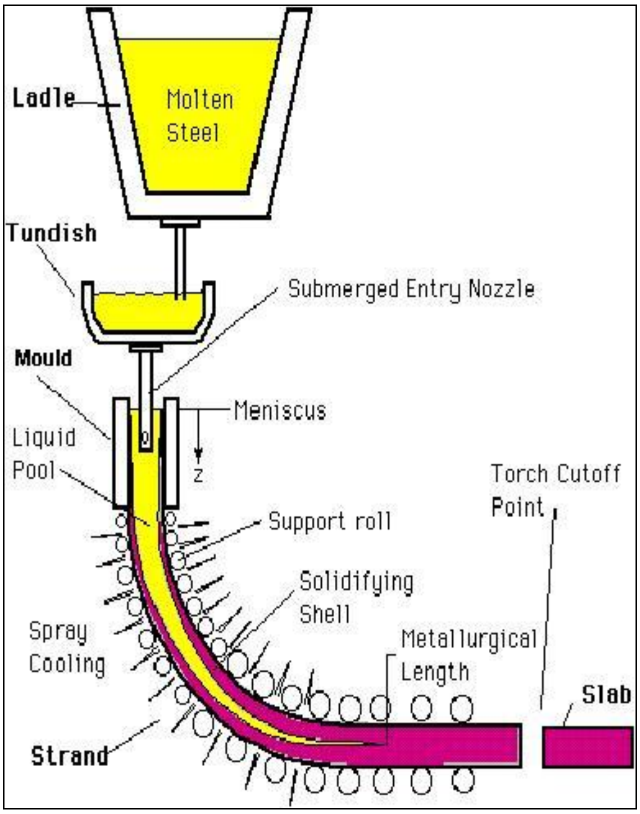
The ladle furnace (LF) is used to correct the temperature and composition of liquid melt. This also allows the molten steel to be kept ready for use in case of a delay later in the steelmaking process. After treatment in the ladle furnace, which consists of only the refractory roof and electrode, furnace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

Continuous casting machine

The process of steel casting in CCM starts in the ladle furnace. After refining in the ladle furnace, the ladle is transported to the top of the casting machine (see Figure A4.2.2). The hot metal from the ladle is transferred via a refractory shroud (pipe) to a holding bath called a tundish. The tundish constantly feeds the casting machine with metal thus acting as a buffer of hot metal, and smoothing metal outflow, regulating metal feed to the molds and cleaning the metal. Then the metal passes through the shroud into the top of an open-base copper mold.

The mold is water-cooled and oscillates vertically to prevent the metal sticking to the mold walls. A thin shell of metal (called strand) starts solidifying at the mold walls, exits the base of the mold into a spray-chamber. The bulk of metal within the walls is still molten. To increase the solidification rate, the strand is also sprayed with large amounts of water as it passes through the spray-chamber. Final solidification of the strand takes place after the spray-chamber. Then the strand passes through straightening rolls and withdrawal rolls. Finally, it is cut into predetermined lengths. The cut strands are called blooms. The blooms are directed in a mill or customers.

Figure A4.2.2: Continuous casting machine



Source: http://www.metsoc.org/virtualtour/processes/steel/Casters.asp.

The CCM has the following benefits:

- less scrap produced and more energy savings than casting into molds;
- improved labour productivity;
- improved quality of steel;
- reduced pollution.

Table A.4.2.1: Main technical data of the EAF, LF and CCM (process line#1)[2].

Indicator	Unit	EAF	LF	CCM
Capacity	t	120	120	-
Productivity	t/year	1,110,000	1,110,000	1,100,000
Electricity consumption	kWh/t	399	31	57
Oxygen consumption	m^3/t	42	-	-
Electrode consumption	Kg/t	1.24	0.37	-
Natural gas consumption	m^3/t	12.5	-	-

Source: NSMMZ

[2] Data of 2008 year.

Table A.4.2.1: Main technical data of the EAF, LF and CCM (process line#2)[3].

Indicator	Unit	EAF	LF	CCM
Capacity	t	120	120	-
Productivity	t/year	1,110,000	1,110,000	1,100,000
Electricity consumption	kWh/t	412	30	58
Oxygen consumption	m^3/t	43	-	-
Electrode consumption	Kg/t	1.27	0.37	-
Natural gas consumption	m^3/t	12.5	-	-

Source: NSMMZ

Project implementation schedule is presented in Table A.4.2.2 below.

After installation of equipment, Training program was developed. Operation and maintenance trainings were provided by the equipment supplier in accordance with the agreement. Trainings were made with the help of personnel who had operational experience on such equipment. All the operational and monitoring personnel is regularly trained and certified in accordance with approved training courses and certification grades. Training and exams schedule is developed and approved annually. Staffs are regularly passes extensive training courses.

Table A.4.2.2: Project implementation schedule

N	Title	2002				2003				2004				2005				2006			
		I q	II q	III q	IV q	I q	II q	III q	IV q	I q	II q	III q	IV q	I q	II q	III q	IV q	I q	II q	III q	IV q
1	Project documentation development	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
2	Base equipment purchase					■	■	■	■	■	■	■	■								
3	Construction of process lines #1						■	■	■	■	■	■	■	■							
4	Put into operating of LF#1,CCM#1 (stage #1)										■										
5	Put into operating of EAF#1 (stage #2)													■							
6	OHPs decommissioning													■	■	■	■	■			
7	Construction of process lines #2													■	■	■	■	■	■		
8	Put into operating of LF#2, CCM#2 and EAF#2 (stage #3)																			■	

Source: NSMMZ

[3] Data of 2008.

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

The proposed JI project aims at replacement of open-hearth steel production with an electric arc steelmaking process at NSMMZ. This project is consistent with mandatory laws and regulations of the Russian Federation. "The Main Agency of the State expertise" (FGU "Glavgosexpertiza" in Russian abbreviation) approved the project.
Steel industry causes significant CO_2 emission. It is associated with significant coke and fuel consumption. Proposed project allows reducing CO_2 emission at NSMMZ by the modernization of steel production. Basic oxygen steelmaking process is the predominant in Russia (58.9%). NSMMZ produces arc-furnace steel. Steel production by EAF in Russia is similar to production by OHF (23% and 18.2%)[4]. The main benefit of electric arc steelmaking process is that it allows using up to 100 % of metal scrap during steel production in comparison with open hearth steel basic oxygen steel. Production of open hearth steel consumes the big amount of fossil fuels. The open hearth plant at NSMMZ consumed about 241kg of pig iron per one tonne of steel. The new steelmaking process lines consume about 0.3kg of pig iron per one tonne of steel. Thus, EAFs allows to reduce the pig iron usage in steel production. Pig iron production also leads to significant CO_2 emission. Also fossil fuel consumption is reduced significantly due to the project implementation (replacement of OHPs by EAFs). Production of open hearth steel requires larger amount of fossil fuels comparing to electric steelmaking. Also electricity consumption by the EAFs in terms of GHG emission (with Russian emission factor for electricity generation) is less than GHG emission from fossil fuels combustion by the OHPs. GHG emissions will be reduced due to project implementation. Information on baseline setting and additionality is presented in Section B. Total estimated amount of emission reductions due to project implementation is 7,693,442 tonnes of CO_2 equivalent as determined in Section E.

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

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

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

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

	Years
Length of the crediting period	5
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2008	1,595,389
2009	1,359,437
2010	1,381,963
2011	1,528,689
2012	1,827,965
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	7,693,442
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	1,538,688

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

	Years
Period after 2012, for which emission reductions are estimated	8
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2013	1,827,965
2014	1,827,965
2015	1,827,965
2016	1,827,965
2017	1,827,965
2018	1,827,965
2019	1,827,965
2020	1,827,965
Total estimated emission reductions over the period indicated (tonnes of CO_2 equivalent)	14,623,720
Annual average of estimated emission reductions over the period indicated (tonnes of CO_2 equivalent)	1,827,965

A.5. Project approval by the Parties involved:

The project was approved by the Parties involved:

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

The Netherlands (Investor) – the Letter of approval from NL Agency, Ministry of Economic Affairs dated 17 August 2011 No 2011JI30.

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)[5], 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)[6] (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[7], using the following step-wise approach:

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

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

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

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

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

Key factors that affect the baseline are taken into account:

a) **Sectoral reform policies and legislation.** The main development goal of the metallurgical industry is satisfaction of domestic metal demand.[8] OJSC NSMMZ does not have any obligations for construction of new production capacity;

---

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

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

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

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

b) **Economic situation/growth and socio-demographic factors in the relevant sector as well as resulting predicted demand. Suppressed and/or increasing demand that will be met by the project can be considered in the baseline as appropriate (e.g. by assuming that the same level of service as in the project scenario would be offered in the baseline scenario)**. It is assumed that the level of steel production and demand are not influenced by the project. Capacity of new process lines at NSMMZ is equivalent the OHP capacity and incremental capacity which will be achieved by other steel producers. In case of the project absence the OHP and other steel producers would operate and satisfy steel demand. The baseline emissions are determined in line with the methodological approach as described in Annex 2**;**

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

d) **Local availability of technologies/techniques, skills and know-how and availability of best available technologies/techniques in the future.** Steel production process by OHF, EAF, and BOF are well-known and applied in Russia. Competent personals may be trained by supplier of equipment. Additional production practice may be gotten with same steel producer, also key personals may be enrolled;

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

Conservative assumptions:

f) 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. tCO2/t of steel);

g) The baseline is established in a transparent manner with regard to the choice of approaches, assumptions, methodologies, parameters, data sources and key factors;

h) Information can be taken from the international publicly available sources and is referenced.

The baseline for this project will be the most plausible future scenario selected on the basis of conservative assumptions and key factors described above. The basic principle applied is that the demand for steel is not influenced by the project and is identical in the project and the baseline scenario.

Step 2. Application of the approach chosen

Basic oxygen steel is the predominant steel in Russia (58.9%). NSMMZ produces arc-furnace steel. Steel production by EAF is similar to production by OHF (23% and 18.2%)[9]. EAF allows using 100 % metal scrap during steel production. Besides that, ladle furnace allows for regulation of the composition of fluid metal outside of the EAF. It makes the production process more energy efficient and excludes pig iron from steel production (iron production connected with significant CO_2 emission). NSMMZ have had two OHPs at Revda and Nizhnie Sergy. Their total annual production was approximately 442 thousand tonnes of steel. NSMMZ's OHPs consumed about 241kg of pig iron per tonne of steel.

Proposed project aims to construct the new steelmaking process lines using recent achievements in this field. It will significant reduce pig iron usage as metal stock. The OHP was operating at NSMMZ during a long period and it had demonstrated good results.

Baseline analysis and investment analysis are conducted for the moment of taking the decision on the project implementation (i.e. beginning of 2003). Annual project capacity is about 2 million tonnes of steel. This steel can be produced with following technically feasible production capacity:

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

Production capacity:

a. The existing open hearth plant;
b. Steel plants will satisfy any remaining steel demand;
c. Construction of a new EAFs;
d. Construction of a new Basic Oxygen Furnace and a Blast furnace.

CCM and casting into the molds (bloom mill) can be used for blooms production. A CCM is more environmental friendly than a casting into molds. Also a casting into the molds is outdated technology with high fossil fuel (natural gas) consumption and it generates additional recycle steel. Nevertheless liquid steel processing into the bloom/slabs is not included in the baseline boundary for other steel producers due to conservative reasons. Therefore emission associated with processing into the bloom/slabs is only included into the project emission calculation and baseline emission calculations of replacement capacity.

Baseline scenarios are described below in more details.

1) Continuation of a situation existing prior to the project (the existing open hearth plants continue their operation and incremental steel volume would be produced by the other steel plants)

This baseline scenario is the business as usual. It is the continuation of the situation without project. That means continuation of the existing open hearth plants operation. Annual steel production of OHPs will be about 0.4 million tonnes. It corresponds to the annual average production before the project implementation (2001-2003). As the baseline capacity has to conform the project capacity the incremental steel volume (about 1.6 million tonnes of steel) would be produced by the other (new and/or existing) steel plants. There are no legal or other requirements that enforce NSMMZ to stop or reduce steelmaking by OHPs. Therefore this scenario does not contradict the main development goal of the Russian metallurgical industry “to satisfaction domestic metal demand”, because NSMMZ can operate OHPs and save existing plant capacity. No additional significant investment is required from OJSC NSMMZ (only expenses for regular maintenance). Thus, scenario #1 is feasible and the most plausible.

2) Construction of new arc-furnace plant with old OHPs dismantling (Project activity not implemented as JI)

In this scenario, existing OHP will be dismantled and new arc-furnace plant will be installed. Steel production by the arc-furnace plant will be about 2.0 million tonnes of steel. Production of steel will depend on market demand. The open hearth production will be replaced after new equipment installation and putting into operation. Construction of the arc-furnace plant requires significant investments (see investment analysis in the Section B.2). Thus this scenario cannot be considered as a baseline scenario.

3) Construction of a new Basic Oxygen Furnace and a Blast Furnace

In this scenario, existing OHF will be dismantled and a new BOF installed. Expected total annual production of BOF will be approximately 2 million tonnes of steel. Consequently capacity of BF will have to be about 1.5 million tonnes of pig iron per year, because steel production by BOF requires significant consumption of liquid pig iron. Thus construction of BOF requires construction of additional ironmaking capacity. There is not any liquid pig iron capacity. Production basic oxygen steel requires significant oxygen production volume. NSMMZ does not have necessary oxygen capacity. There is no free place for new equipment installation on the place of the existing OHP. Thus this scenario cannot be considered as a technologically favourable scenario.

Conclusions

Scenario 1 is most plausible scenario and therefore is identified as the baseline.
Calculations, descriptions and analyses pertaining to the baseline are presented in Annex 2. Also calculations of baseline emissions are provided in Sections D and E, below.

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

Data/Parameter	PP_y
Data unit	Tonnes
Description	Total steel (solid) production in the project scenario in year *y*
Time of determination/monitoring	During the crediting period
Source of data (to be) use	Annual technical report
Value of data applied (for ex ante calculations/determinations)	1,931,470
Justification of the choice of data or description of measurement methods and procedures (to be) applied	It is defined according to plan/actual data of NSMMZ.
OA/QC procedures (to be) applied	Steel production in the baseline scenario by OHF and other steel producer is equal to project steel production by the arc-furnace plant. Steel production is calculated as sum of daily reports of the steelmaking shop. Monthly data is checked. The check is based on the monthly inventory reports of remaining raw materials and steel. The produced steel is measured by weight.
Any comment	Information is calculated by the steelmaking shop and transferred to the Environmental protection department.

Data/Parameter	BP_{cap}^{OHPs}
Data unit	Tonnes
Description	Steel (solid) production of the OHPs (tonnes)
Time of determination/monitoring	*Ex - ante*
Source of data (to be) use	According to NSMMZ annual technical report
Value of data applied (for ex ante calculations/determinations)	442,895.95
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The parameter is calculated as average for 2001-2003.
OA/QC procedures (to be) applied	The internal quality system at NSMMZ is functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	EF^{OHPs}
Data unit	tCO_2/tonnes of steel
Description	Emission factor of OHPs
Time of determination/monitoring	*Ex - ante*
Source of data (to be) use	According to NSMMZ annual technical report
Value of data applied (for ex ante calculations/determinations)	1.029

Justification of the choice of data or description of measurement methods and procedures (to be) applied	The parameter is calculated as average for 2001-2003.
OA/QC procedures (to be) applied	The internal quality system at NSMMZ is functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	BEF_y^{incr}
Data unit	tCO_2/tonnes of steel
Description	Baseline emission factor for incremental steel production in year *y*
Time of determination/monitoring	*Ex –post*
Source of data (to be) use	LLC "Korporatsiya proizvoditeley chernykh metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	1.314
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The approach of "Tool to calculate the emission factor for an electricity system" is used. IPCC default values are used for CO_2 emission factor of fossil fuels. The default grid emission factors for the regional power systems of Russia are used. Please see Annex 2 for more detailed information.
OA/QC procedures (to be) applied	-
Any comment	If data required to calculate the baseline emission factor for the year y is usually available six months later after the end of the year y, alternatively emission factors of the previous year (y-1) may be used. If data is available latter than 18 months after the end of year y, than emission factor of the year preceding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout the crediting period. After the data for the last three years is available, emission factor may be fixed ex-ante as three-year average.

Data/Parameter	PI_y
Data unit	unitless variable
Description	Processing index of electric steel consumption in year *y*
Time of determination/monitoring	During the crediting period
Source of data (to be) use	Annual technical report
Value of data applied (for ex ante calculations/determinations)	1.009
Justification of the choice of data or description of measurement methods and procedures (to be) applied	It is ratio of liquid steel production to solid steel production. Volumes of steel production are measured by weight apparatuses.
OA/QC procedures (to be) applied	The internal quality system at NSMMZ is functioning in accordance with the national standards and regulations in force.
Any comment	This parameter is used for converting of solid steel to liquid steel

Data/Parameter	$Fuel_y^i$
Data unit	tonnes or $1000m^3$
Description	Fuel consumption in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	RM_y^j
Data unit	tonnes
Description	,Raw material consumption in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	$Coke_y$
Data unit	tonnes
Description	Coke consumption in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.

Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	Sin_y
Data unit	tonnes
Description	Sinter consumption in year *y*
Time of determination/monitoring	*Ex-post*. During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	Oxy_y
Data unit	$1000m^3$
Description	Oxygen consumption in year *y*
Time of determination/monitoring	*Ex-post*. During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.

Any comment	-

Data/Parameter	Pel_y
Data unit	tonnes
Description	Pellet consumption in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	SER_y^k
Data unit	$1000m^3$
Description	secondary energy resource output in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	CO_y^k
Data unit	fraction
Description	Carbon oxide content in blast furnace gas in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual

	fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	IP_y
Data unit	tonnes
Description	Iron production by metal works in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	SP_y^m
Data unit	tonnes
Description	Steel production by metal works (using steelmaking method *m)* in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every steel producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.

OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	RM_y^j
Data unit	tonnes
Description	Raw material consumption in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every steel producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	$Fuel_y^i$
Data unit	tonnes or 1000m^3
Description	Fuel consumption in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every steel producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	E_y^{iron}
Data unit	tonnes
Description	Iron consumption in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period

Source of data (to be) used	LLC “Korporatsiya proizvoditeley chernih metalov” annual statistical report “Russian Chermet information “. This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC “Korporatsiya proizvoditeley chernih metalov” for every steel producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	EL_y
Data unit	MWh
Description	Electricity consumption in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC “Korporatsiya proizvoditeley chernih metalov” annual statistical report “Russian Chermet information “. This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC “Korporatsiya proizvoditeley chernih metalov” for every steel producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

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

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

Step 1. Indication and description of the approach applied

As suggested by Paragraph 2 (c) of the Annex 1 of the Guidance, the most recent version of the "Tool for the demonstration and assessment of additionality" approved by the CDM Executive Board is used to demonstrate additionality. At the time of this document completion the most recent version of the "Tool for the demonstration and assessment of additionality" approved by the CDM Executive Board is version 05.2[10] and it is used to demonstrate additionality of the project activity.

Step 2. Application of the approach chosen

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

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

Alternative (Construction of a new Basic Oxygen Furnace and a Blast Furnace) is not considered as realistic and credible alternative due to the fact that it was neglected in Section B.1 by relevant reasons (absence of additional ironmaking and oxygen capacities at NSMMZ). Also there is not free place for new equipment installation in the Revda's site.

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

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

The following alternatives to the proposed project were identified:

Alternative 1: Continuation of a situation existing prior to the project (the existing open hearth plants continue their operation and incremental steel volume would be produced by the other steel plants).
In the absence of project existing OHP will continue operation. The OHPs could continue operating due to its technical conditions. Annual production of OHPs is about 0.4 million tonnes of steel. The incremental steel volume (about 1.6 million tonnes of steel) would be produced by the other (new and/or existing) steel plants.

Alternative 2: Construction of new arc-furnace plant with old OHPs dismantling (the proposed project activity undertaken without being registered as a JI project activity). Expected total annual production will be approximately 2.0 million tonnes of steel. The open hearth production will be replaced by arc-furnace plant. OHPs will be dismantled after new arc-furnace plant putting into operation.

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. The main development goal of the metallurgical industry is satisfaction of domestic metal demand.[11] The presented alternatives will not reduce domestic metal demand. They will provide available steel capacity for domestic metal demand.

Outcome of Step 1b: Alternative 1 has been identified as realistic and credible alternative scenario to the project activity that is in compliance with mandatory legislation and regulations taking into account the enforcement in the Russian Federation.

[10] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf
[11] http://www.minprom.gov.ru/activity/metal/strateg/2

Step 2. Investment Analysis

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

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

Sub-step 2a: Determine appropriate analysis method

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

A simple cost analysis (Option I) shall be applied if the proposed JI project and the alternatives identified in step 1 generate no financial or economic benefits other than JI related income. The proposed JI project results in cost revenues due to existing OHP changing by the new arc-furnace plant. Thus, this analysis method is not applicable.

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 and project realization, investment comparison analysis (Option II) is applied.

Sub-step 2b: Option II. Apply investment comparison analysis

In principle, the following indicator, such as IRR, NPV, cost benefit ratio, or unit cost of service can be used for investment comparison analysis. Therefore NPV (difference of cash flows for OHP and the new arc-furnace plant) is used to compare continuation of the existing situation (operating OHP) to construction of new arc-furnace plant.
Investment analysis was performed. The cash flow analysis focuses on difference (economy) between OHP and the new arc-furnace plant (comparison of expenditure for project and operating OHP). The following assumptions have been used based on the information provided by the enterprise:

1. Investment decision: January 2003, commissioning date: for stage #1 – the beginning of 2004, for stage #2 – the beginning of 2005 and for stage #3 – the middle of 2006;
2. Bank of Russia exchange rate is 34.1157 RUR/EUR;
3. The project total investment cost accounts for approximately EUR 681 million (total investment for achievement of 2 million tons of consumer goods sold to a third party);
4. The project lifetime is around 20 years (lifetime of the main equipment);
5. Primary cost of open hearth steel and other expenditures are taken into account in line with the indicators achieve in 2002 by OHPs (accordingly business plan as of 2002);
6. Primary cost of electric arc steel and other expenditures are taken accordingly to business plan as of 2002;
7. Project production is assumed as the maximum technical capacity of about 2 million tonnes of steel per year;

The cash flow focuses on revenue flows generated by savings (replacement steel) and revenues/ expenditures incremental steel production.

Discount rate (for calculation NPV) is calculated according to following methodology by conservative reasons because refinancing rate of the Russian Central Bank was equal to 21% at the beginning of 2003[12].

[12] http://www.cbr.ru/eng/print.asp?file=/eng/statistics/credit_statistics/refinancing_rates_e.htm

From investor's point of view the expected return will consist of the risk-free rate increased by the suitable risk premiums. The risk-free rate taken for this assessment is the German T-bills (governmental bonds) rate[13] cleared inflation[14] at the time of investment decision being made. And the suitable risk premiums will include:

- Systematic market risk. This portion of risk relates to the variability in returns from the equity investments and uncertainty associated with that[15]. The rate used in the assessment reflects investment into a portfolio of steel companies[16]. This risk premium is the minimum possible expected return for the investor that holds a portfolio of existing steel businesses in a developed economy. This risk component can be seen as the basic risk-free rate for the investor in to equity market. Also this risk component can be interpreted as the "risks connected with project participants" as it addresses the issues of being involved into the project realization with different parties etc. while on the other hand there is an option of investing into considerably less risky environment of US stock market. It is conservative assumption for proposed project.
- Country risk[17]. This portion of the risk reflects unique risks of investment being made in Russia. The additional return (premium) is required to cover political uncertainty, ownership risks, profit repatriation risk etc.

The result of discount rate estimation is present in Table B.2.1.

Table B.2.1. Result of discount rate estimation

Indicator	Value for 2002
German interest rate	4.46%
Inflation	1.40%
Risk-free rate	***3.10%***
Systematic market risk	***3.52%***
Country risk Russia	***6.00%***
Discount rate	**12.63%**

The project's financial indicators are presented in the Table B.2.2 below.

Table B.2.2. Financial indicators of the project

Scenario	NPV (EUR thousand)
Base case	-63,926

Cash flow analysis shows NPV is negative. Hence, the project cannot be considered as a financially attractive course of action.

---

[13] European Central Bank website, Long-Term Interest Rate of Germany, October 2002

[14] European Commission website, Eurostat , Average Inflation Rate of Germany in 2002

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

[16] New York University, Leonard N. Sterm School of Business, Costs of Capital by Industry Sector in 2002

[17] New York University, Leonard N. Sterm School of Business, Risk Premiums for Other Markets in 2002

Sub-step 2d: Sensitivity analysis

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

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

The five key components (see above) are changed within the corridor of ±10 % in Scenarios 1-10. NPV is negative in all cases (see Table B.2.2 below).

Table B.2.2: Sensitivity analysis (summary)

Scenario	NPV (EUR thousand)
Base case	-63,926
Investment cost increase 10%	-101,375
Investment cost decrease 10%	-26,478
Bloom price increase 10%	-19,220
Bloom price decrease 10%	-108,633
Long products price increase 10%	-30,851
Long products price decrease 10%	-97,001
Metalware price increase 10%	-28,047
Metalware price decrease 10%	-99,805
Scrap cost increase 10%	-108,758
Scrap cost decrease 10%	-43,764

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

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

Step 3: Barrier analysis

In line with the Additionality Tool no barrier analysis is needed when investment analysis is applied.

Step 4: Common practice analysis

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

Electric arc steel production method is not the dominant method in the Russian steelmaking industry. Technology offered in the project, specifically the electric arc steel furnace method. The real action takes place for the project implementation in 2003. Share of arc furnace steel in total Russian steel output was 15.2 % in 2003. Shares of basic oxygen steel and open hearth furnace steel were 62.7 % and 22.1 % accordingly at that time. Modernization of existing equipment instead of installation of the new

equipment is a common practice in Russia due to the lower investment costs and shorter payback periods that are associated with substandard financial performance. Also there are several bigger steelmaking enterprises that may not change steelmaking process therefore its pioneer activities (ore processing). Thus share of basic oxygen steel will not change significantly in the course of time in Russia[18].
The steelmaking technology used by NSMMZ does not use iron in charging (accidental iron in scrap is equal approximately 0.1%). Average iron consumption for EAFs in Russia is 11.45% (Average iron consumption for all steelmaking processes in Russia is 55.24% (OHF = 45.27%; BOF = 76.6%). There are only two plants from 18 electric furnace steelmaking producers in Russia which consume comparable pig iron with NSMMZ (it is JSC Oskolsky EMK, JSC MMZ Serp i Molot). But technology process at Oskolsky EMK is based consumption much more pellets (ore mixture) and production of MMZ Serp i Molot is insignificant.
Thus the proposed JI project does not reflect a widely observed and commonly carried out activity.

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

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

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

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

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

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

An overview of all emission sources in the steelmaking process of proposed project is given in Table B.3.1 below. The 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.

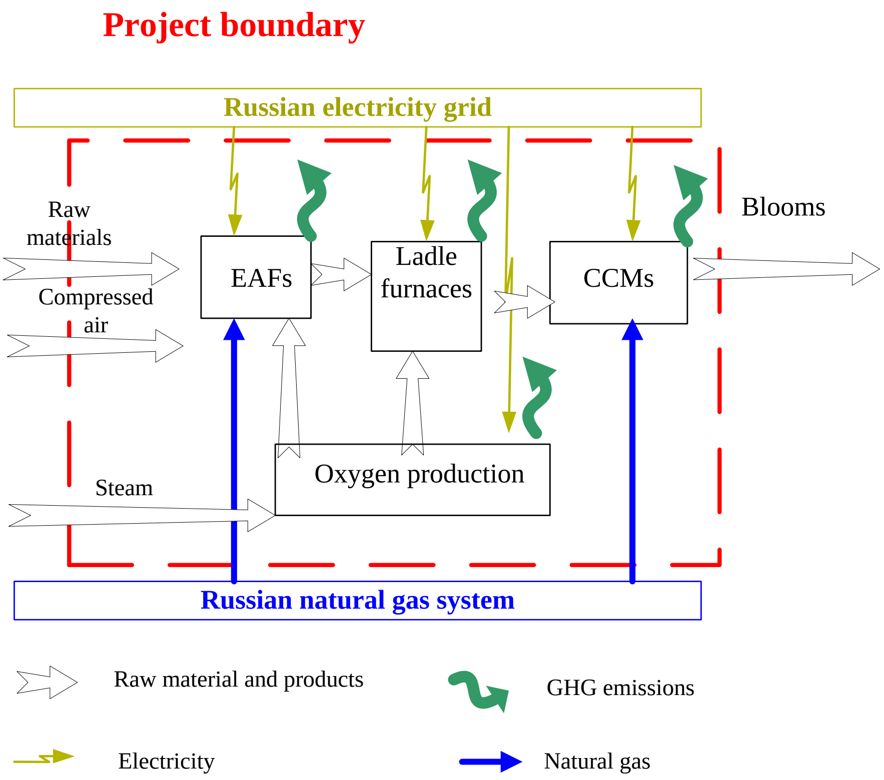
[18] Worldsteel Committee on Economic Studies – Brussels, 2009. Steel Statistical Yearbook 2008 (Table 7-9).

Table B.3.1: Sources of emissions during steel production

№	Source	Gas	Included/ excluded	Justification/Explanation
1	Electricity and steam consumption during the oxygen production and electricity for compressed air production	CO_2	Included	• Emissions associated with nitrogen and argon production are not calculated separately, these emissions are included in emissions associated with oxygen production because they are by-products of oxygen production; • Emissions (from electricity) are calculated using standardized regional electricity factors for Russia; • Emissions (from steam) are calculated using own emission factors for steam production; • Emissions (from oxygen) are calculated using average consumptions for three years.
2	Electricity consumption during the steelmaking process (EAF and LFs)	CO_2	Included	• The electricity consumption will be increased; • Emissions are calculated using standardized regional electricity factors for Russia.
3	Fuel consumption during the steelmaking process	CO_2	Included	• The fossil fuel combustion will be decreased.
4	Raw materials (lime, limestone, coke, pig iron) consumption during steelmaking process	CO_2	Included	• Raw material consumption will be changed after the project implementation.
5	Electrode consumption during smelting process	CO_2	Included	• In the project scenario and in the baseline amount of electrodes will be different.
6	Fuel consumption for steam generation (steam for oxygen production).	CO_2	Included	• Emissions (from steam) are calculated using in-plant emission factors for steam production.
7	Methane origination during fuels burning	CH_4	Excluded	• The gas was excluded from the consideration due to relatively small volume of emissions (see the description in section D.1).
8	Nitrous oxide origination during fuels burning	N_2O	Excluded	• The gas was excluded from the consideration due to relatively small volume of emissions (see the description in section D.1).

№	Source	Gas	Included/ excluded	Justification/Explanation
9	Carbone from scrap	CO_2	Excluded	• This pollutant is same in project scenario and baseline scenario. Average carbon content in scrap is 0.2%. Also average carbon content in the steel being produced is the same. Therefore omitting this pollutant for a steelmaking process facilitates calculation.
10	Drop-hammer plant	CO_2	Excluded	• This pollutant is same in project scenario and baseline scenario. • There are a briquette press and a scrap cutter in drop-hammer plant. It contributes to less than 1 % of the total emissions (CO2 equivalent). Therefore omitting this pollutant for a scrap preparation process is conservative.
11	Electricity consumption during the steelmaking process (EAF and LFs)	CO_2	Included	• This emissions are same in project scenario and baseline scenario; • This emissions are not included in baseline emission calculation by conservatives reasons; • Project emissions are calculated using standardized regional electricity factors for Russia.

Figure B.3.1: Sources of emissions and project boundary for steelmaking process



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: 18/04/ 2011
Name of person/entity setting the baseline:
Mikhail Butyaykin
Global Carbon BV
Phone: +31 30 298 2310
Fax: +31 70 891 0791
E-mail: butyaykin@global-carbon.com
Global Carbon BV is a project participant.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

According to GLOSSARY OF JOINT IMPLEMENTATION TERMS, Starting date of JI project is the date when construction, implementation or real action takes place for the project. This project consists of three stages (two process lines of steel production). Real actions (purchase of main equipment, LF and CCM) for the first stage took place on 23 January 2003. Thus the project start date is 23 January 2003 too.

C.2. Expected operational lifetime of the project:

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

C.3. Length of the crediting period:

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

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

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

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

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

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

The following assumptions for calculation of both baseline and project emissions were used (for conservative reasons):

- The steel demand in the market is the same in the project and baseline scenario (It will not allow possibility ER calculating due to steel production reducing);
- The emission factor of pig iron production are established using the approach as given in Annex 2 (It will allow to do the correct comparison of baseline and project scenario);
- The emissions from electricity consumption are established using the relevant regional Russian standardized grid emission factor, as described in Annex 2 (This Russian standardized grid emission factor was calculated according to CDM tool).

The project emissions are established in the following way (for conservative reasons):

- The project emission is the total emission from EAFs, LFs and CCMs emission, emission calculates without separation (It will allow to cover the total project emission);
- The type of fuel burning and raw material consumed in EAFs is not influenced by the project (In case fuel change it will allow to calculate ER correct);
- Greenhouse emissions are determined using actual production data for 2008-2010 years (for calculation actual ER in this period);
- Greenhouse emissions during 2011-2012 are determined using performance data of 2010 year (for calculation ER on the ground of achieved data).

The baseline emissions are established in the following way:

- The baseline emission factor of the steel and pig iron production are established using the approach as given in Annex 2;

- Baseline emission factor of OHPs is established using the approach as given in Annex 2 and fixed ex-ante for three years (average for three years);

General remarks:

- Social indicators, such as number of people employed, safety records, training records etc., will be available to a verifier, if required;
- Only CO_2 emissions as GHG are taken into account. Major source of CH_4 and N_2O emission at a steelmaking process is the burning of fuel (coke and natural gas). Given fuel consumption, in normally blast furnace process for basic oxygen steel in Russia (as the most energy-consuming steelmaking process, which dominate in Russia), CH_4 emission is of 99 g/tonne of steel and N_2O emissions of 15 g/tonne of steel compared with about CH_4 emission is of 5 g/tonne of steel and N_2O emissions of 1 g/tonne tonne of project steel, a EAF has less energy-consuming than BOF (calculation according to 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 2, STATIONARY COMBUSTION and fuels consumption). Therefore the project use Omitting these two pollutants for a steelmaking process is conservative, because they contribute to less than 1 % of the total project emissions (CO_2 equivalent), far below the confidence level for the CO_2 emission calculation. The CH_4 and N_2O emission reductions will not be claimed in the baseline scenario. In the baseline volume their emission more than project, because their exception is conservative.

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

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

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
P1	PE_y	Annual plant calculations	tCO_2	C	Annually	100%	Electronic and paper	-
P2	$PE_{el, y}$	Annual plant calculations	tCO_2	C	Annually	100%	Electronic and paper	-
P3	$PE_{coke\ y}$	Annual plant calculations	tCO_2	C	Annually	100%	Electronic and paper	-
P4	$PE_{lime,y}$	Annual plant calculations	tCO_2	C	Annually	100%	Electronic and paper	-
P5	$PE_{fuel,\ y}$	Annual plant calculations	tCO_2	C	Annually	100%	Electronic and paper	-

P6	$PE_{RM,\ y}$	Annual plant calculations	tCO_2	C	Annually	100%	Electronic and paper	-
P7	$PE_{O2,y}$	Annual plant calculations	tCO_2	C	Annually	100%	Electronic and paper	-
P8	$PE_{iron,y}$	Annual plant calculations	tCO_2	C	Annually	100%	Electronic and paper	-
P9	PEL_y	Annual technical report, measuring instrumentation	MWh	M/C	Annually	100 %	Electronic and paper	-
P10	EF_{el}	See Annex 2	tCO_2/ MWh	C	Fixed ex ante	100 %	Electronic and paper	Electricity grid GHG emission factor for JI projects in Russian Regional Energy System " Urals". See Annex 2.
P11	PC_y	Annual technical report, measuring instrumentation	tonnes	M/C	Annually	100%	Electronic and paper	-
P12	$EF_{coke}^{production}$	IPCC	tCO_2/tonne of coke	C	Fixed ex ante	100 %	Electronic and paper	Default values (IPCC 2006)
P13	$PL_{lime,y}$	Annual technical report, measuring instrumentation	tonnes	M/C	Annually	100%	Electronic and paper	-
P14	EF_{lime}	IPCC	tCO_2/tonne of lime	C	Fixed ex ante	100 %	Electronic and paper	Default values (IPCC 2006)
P15	$PF_{fuel\,i,\,y}$	Annual technical report, measuring instrumentation	tonne or 1000Nm3	M/C	Annually	100%	Electronic and paper	-
P16	EF_i	IPCC	tCO_2/GJ	C	Fixed ex ante	100 %	Electronic and paper	Default values (IPCC 2006)
P17	$NCV_{i,\,y}$	Annual technical report or IPCC	GJ/ m^3or tonne	C	Annually or Fixed ex ante	100 %	Electronic and paper	Default values (IPCC 2006)

P18	$PRM_{RM\_i,y}$	Annual technical report, measuring instrumentation	tonnes	M/C	Annually	100%	Electronic and paper	-
P19	$EF_{RM\_i,}$	IPCC	tCO_2/tonne	C	Fixed ex ante	100 %	Electronic and paper	Default values (IPCC 2006)
P20	$PO_{O2,y}$	Annual technical report, measuring instrumentation	$1000Nm^3$	M/C	Annually	100%	Electronic and paper	-
P21	$PA_{air,y}$	Annual technical report, measuring instrumentation	$1000Nm^3$	M/C	Annually	100%	Electronic and paper	-
P22	$PPI_{iron,y}$	Annual technical report, measuring instrumentation	tonnes	M/C	Annually	100%	Electronic and paper	-
P23	EF^{iron}	Annual plant calculations	tCO_2/tonne of pig iron	C	Annually or Fixed ex ante	100%	Electronic and paper	See Annex 2

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 emission is determined according to the following formula:

$$PE_{\mathrm{y}} = PE_{el,\,y} + PE_{coke,\,y} + PE_{lime,y} + PE_{fuel,\,y} + PE_{RM,\,y} + PE_{\mathrm{O2},y} + PE_{air,y} + PE_{\mathrm{iron,y}} \qquad (1)$$

Where:

PE_y Project emissions in year *y* (tCO_2);

$PE_{el,\,y}$ Emission from electricity consumption in year *y* (tCO_2);

$PE_{coke\ y}$ Emission associated with coke production in year *y* (tCO_2);

$PE_{lime,y}$ Emission associated with lime production in year y (tCO_2);

$PE_{fuel,\,y}$ Emission from fuel combustion in year *y* (tCO_2);

$PE_{RM,\ y}$ Emission from raw materials consumption in year *y* (tCO_2);

$PE_{O2,y}$	Emission associated with oxygen production in year *y* (tCO_2);
$PE_{air,y}$	Emission associated with compressed air production in year *y* (tCO_2);
$PE_{\mathrm{iron,y}}$	Project emissions associated with pig iron consumption in year *y* (tCO_2).

Emission from electricity is determined according to the following formula:

$$PE_{el,\,y} = PEL_y \times EF_{el} \qquad (2)$$

Where:

$PE_{el,\,\mathrm{y}}$	Project emission from electricity consumption in year *y* (tCO_2);
PEL_{y}	Total electricity consumption by EAFs, LFs and CCMs in year *y* (MWh);
EF_{el}	Carbon dioxide emission factor of electricity grid of Russia (tCO_2/MWh) (fixed *ex-ante* for 2008 – 2012, see Annex 2).

Emissions associated with coke production are determined according to the following formula:

$$PE_{coke,\,y} = PC_y \times EF_{coke}^{\mathrm{production}} \qquad (3)$$

Where:

$PE_{coke\ y}$	Project emission associated with coke production in year *y* (tCO_2);
PC_y	Coke consumption by the process lines in year *y* (tonnes);
$EF_{coke}^{production}$	Default IPCC emission factor of coke production[19] (tCO_2/tonne of coke).

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

$$PE_{\mathrm{lime},\,y} = PL_{\mathrm{lim}e,y} \times EF_{\mathrm{lime}} \qquad (4)$$

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

Where:

$PE_{lime,y}$	Emission associated with lime production in year y (tCO_2);
$PL_{lime,y}$	Lime consumption by the process lines in year y (tonnes);
EF_{lime}	Default emission factor for lime production[20] (tCO_2/tonne of lime).

The fuel is burnt during melting in EAF. Emissions from natural gas combustion are calculated according to the formula 6. Coke is not used as a fuel. It is an additive in furnace feed, but when being combusted it generates CO_2 emissions. Therefore this emission from coke combustion is calculated according to the formula 5 too but NCV for coke is defined according to IPCC[21].

$$PE_{\text{fuel, y}} = \sum_i PF_{fuel\ i,\ y} \times EF_i \times NCV_{i,\ y} \qquad (5)$$

Where:

$PE_{fuel,\ y}$	Emissions from fuel (natural gas and coke) combustion in year y (tCO_2);
$PF_{\text{fuel i},\ y}$	Consumption of fuel by the process lines in year y (tonne or 1000 Nm^3);
EF_i	Emission factor of fuel *i* (tCO_2/GJ);
$NCV_{i,\ y}$	Net Calorific Value of fuel *i* in year y (GJ/1000 Nm^3 or GJ/tonne of fuel).

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

$$PE_{RM,\ y} = \sum_i PRM_{RM\_i,\ y} \times EF_{RM\_i} \qquad (6)$$

Where:

$PE_{RM,\ y}$	Project emission from raw materials (electrodes, limestone) consumption in year *y* (tCO_2);

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

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

$PRM_{RM\_i,y}$	RM *i* (electrodes, limestone) consumption in year *y* (tonne of RM);
$EF_{RM\_i,}$	RM *i* emission factor (tCO_2/tonne of RM) [22].

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

$$PE_{O2,y} = PO_{O2,y} \times EF_{O2} \quad (7)$$

Where:

$PE_{O2,y}$	Emission associated with oxygen production in year *y* (tCO_2).
$PO_{O2,y}$	Oxygen consumption by the process lines in year *y* (1000 Nm^3);
EF_{O2}	Emission factor for oxygen production (t CO_2/1000 Nm^3) [23].

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

$$PE_{air,y} = PA_{air,y} \times EF_{air} \quad (8)$$

Where:

$PE_{air,y}$	Emission associated with compressed air production in year *y* (tCO_2);
$PA_{air,y}$	Compressed air consumption by the process lines in year *y* (1000 Nm^3);
EF_{air}	Emission factor for compressed air production (t CO_2/1000 Nm^3) [24].

[22] EF of electrodes is calculated according to IPCC electrodes carbon content, 2006 IPCC Guidelines on National Greenhouse Gas Inventories, Volume 3, Chapter 4, page 27. EF of limestone is indentified according to 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).
[23] This parameter is fixed *ex-ante* (average for 2006-2008).
[24] This parameter is fixed *ex-ante* (average for 2006-2008).

Emissions associated with iron consumption are calculated according to the following formulae:

$$PE_{\mathrm{iron,y}} = PPI_{iron,y} \times EF^{iron} \tag{9}$$

Where:

$PE_{\mathrm{iron,y}}$ Project emissions associated with pig iron consumption by EAF in year *y* (tCO_2);

$PPI_{iron,y}$ Consumption of pig iron by the process lines in year *y* (tonne of pig iron);

EF^{iron} Iron production emission factor, calculated according to formulae in Annex 2 (tCO_2/tonne of pig iron).

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
B1	BE_y	Annual plant calculations	tCO_2	C	Annually	100%	Electronic and paper	**-**
B2	BE_y^{OHPs}	Annual plant calculations	tCO_2	C	Annually	100%	Electronic and paper	**-**
B3	$BE_{incr,y}$	Annual plant calculations	tCO_2	C	Annually	100%	Electronic and paper	**-**
B4	BP_y^{OHPs}	Annual plant calculations	tonnes	C	Annually	100%	Electronic and paper	-

B5	PP_y	Annual technical report, measuring instrumentation	tonnes	M/C	Annually	100%	Electronic and paper	-
B6	BP_{cap}^{OHPs}	Annual technical report, measuring instrumentation	tonnes	M/C	Fixed *ex-ante*	100%	Electronic and paper	-
B7	BP_y^{incr}	Annual plant calculations	tonnes	C	Annually	100%	Electronic and paper	-
B8	EF^{OHPs}	Annual plant calculations	tCO_2/tonnes of steel	C	Fixed *ex-ante*	100%	Electronic and paper	See Annex 2
B9	BEF_y^{incr}	Annual plant calculations	tCO_2/tonnes of steel	C	Annually	100%	Electronic and paper	See Annex 2
B10	PI_y	Annual technical report, measuring instrumentation	unitless variable	M/C	Annually	100%	Electronic and paper	-

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

As further described in the Section B, the baseline emissions have two sources:

- Production by the old process lines (replacement production);
- Production by other steel plants (incremental production).

The first part in formula 9 reflect the baseline emissions connected with OHPs, the second part refers to the baseline emissions of the incremental production (other steel plants).

$$BE_y = BE_y^{OHPs} + BE_{incr,y} \quad (10)$$

Where:

BE_y	Baseline emissions in year *y* (tCO_2);
BE_y^{OHPs}	Baseline emissions due to on-site production (OHPs) in year *y* (tCO_2);
$BE_{incr,y}$	Baseline emissions due to incremental production in year *y* (tCO_2).

Steel production (on-site)

In the baseline scenario, OHPs will continue production up to the technical capacity. Steel production on the OHPs in the baseline scenario will be as follows:

$$BP_y^{OHPs} = MIN[PP_y, BP_{cap}^{OHPs}] \quad (11)$$

Where:

BP_y^{OHPs} Steel production in the baseline scenario on the OHPs in year *y* (tonnes);

PP_y Total steel (solid) production in the project scenario in year *y* (tonnes);

BP_{cap}^{OHPs} Steel (solid) production of the OHPs (tonnes) [25];

Incremental steel production

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

$$BP_y^{incr} = PP_y - BP_y^{OHPs} \quad \text{; in case if } PP_y = BP_y^{OHPs} \text{ then } \quad BP_y^{incr} = 0 \quad (12)$$

Where:

BP_y^{incr} Incremental steel production in the baseline scenario in year *y* (tonnes);

PP_y Total steel (solid) production in the project scenario in year *y* (tonnes);

BP_y^{OHPs} Steel (solid) production in the baseline scenario on the OHPs in year *y* (tonnes);

Baseline emissions due to on-site steel production

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

---

[25] This parameter is fixed ex-ante (average for 2001-2003 years).

$$BE_{y}^{OHPs} = BP_{y}^{OHPs} \times EF^{OHPs} \qquad (13)$$

Where:

BE_{y}^{OHPs} Baseline emissions due to on-site production (OHPs) in year *y* (tCO_2);

BP_{y}^{OHPs} Steel (solid) production in the baseline scenario on the OHPs in year *y* (tonnes);

EF^{OHPs} Emission factor of OHPs (tCO_2/tonnes of steel) [26].

Baseline emissions due to incremental production

$$BE_{incr,y} = BP_{y}^{incr} \times PI_{y} \times BEF_{y}^{incr} \qquad (14)$$

Where:

$BE_{incr,y}$ Baseline emissions due to incremental production in year *y* (tCO_2);

BP_{m}^{incr} Incremental steel (solid) production in the baseline scenario in year *y* (tonnes);

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

PI_{y} Processing index of electric steel consumption in year *y* (unitless variable for converting of solid steel to liquid steel).

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:

[26] This parameter is fixed ex-ante, see Annex 2 (average for 2001-2003 years).

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):

Leakages

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

The potential leakages are associated with:

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

As described above in project scenario consumption of fuels (natural gas, heavy fuel oil and coke) is reduced but electricity consumption will increase in comparison with the baseline scenario. Also iron consumption is reduced (iron saving is connected with coke production decrease hence additional coal extraction is not required for coke production).

Annual iron (coke) consumption in the baseline is higher than in project scenario. Average coke consumption is 0.448 per tonne of iron in Russia. And average coal consumption is 1.304 per tonne of coke. Default emission factors for fugitive CH_4 emission is 18 m^3/tonne of coal[27] and the Global Warming Potential of CH_4 is 21[28].

Annual electricity consumption in project scenario is approximately 953,799 MWh. In Russian Federation the electricity losses are 11-13%[29]. The emission factor for grid is 0.541 tCO_2/MWh (please see Annex 2 of the PDD).

Calculation data of project and baseline leakage emission factors are presented in Table D.1.3.2.1 and D.1.3.2.2.

Table D.1.3.2.1: Baseline Leakage EF[30]

Leakage from electricity	tCO^2/t of steel	0.002
Iron consumption	t/t of steel	0.556
coke for iron production	t/t of iron	0.448
Leakage from coke	tCO^2/t of steel	0.082
Total Leakage EF (baseline)	**tCO^2/t of steel**	**0.084**

[27] 2006 IPCC Guidelines on National Greenhouse Gas Inventories, Volume 2, Chapter 4, page 11

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

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

[30] Detailed calculation is presented in spreadsheet (20110722_SD2008_Revda)

Table D.1.3.2.2: Project Leakage EF[31]

Project emission from electricity consumptions	tCO^2	516,005
Project leakage from electricity	tCO^2	67,081
Project leakage from electricity	tCO^2/t of steel	0.034
Project coke consumption	t/t of steel	0.019
Project iron consumption	t/t	0.00033
Coke consumption for iron production (Russia)	t/t of iron	0.448
Project leakage from coke	tCO^2/t of steel	0.006
Total Leakage EF (project)	**tCO^2/t of steel**	**0.041**

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

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):

$$ER_y = BE_y - PE_y \qquad (15)$$

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).

[31] Detailed calculation is presented in spreadsheet (20110722_ER_Revda)

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

The main relevant Russian Federation environmental regulations:

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

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

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

Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
P9	Medium	The electricity consumption is recorded and controlled by the Chief Power Engineer Department using electricity meters calibrated and maintained in line with the Russian regulations. Results of measurement are recorded and archived and transferred to the Environmental protection department.
P11	Medium	Coke consumption for steelmaking process is calculated as sum of daily reports of steelmaking shop. Monthly data is checked. The check is based on the monthly inventory reports of remaining raw materials. The weighing apparatus is calibrated annually. Information is calculated and transferred to the Environmental protection department.
B5, B10	Medium	Steel production is calculated as sum of daily reports of the steelmaking shop. Monthly data is checked. The check is based on the monthly inventory reports of remaining raw materials and steel. The produced steel is measured by weight. Processing index of electric steel consumption is calculated as ratio of liquid steel production to solid steel production. Information is calculated by the steelmaking shop and transferred to the Environmental protection department.

P13	Medium	Lime consumption for steelmaking process is calculated as sum of daily reports of the steelmaking shop. Monthly data is checked. The check is based on the monthly inventory reports of remaining raw materials. The weighing apparatus is calibrated annually. Information is calculated and transferred to the Environmental protection department.
P15	Medium	Natural gas consumption for the steelmaking shop is recorded and controlled by the Chief Power Engineer Department using fuel meters calibrated and maintained in line with the Russian regulations and is transferred to the Environmental protection department. Coke consumption for the steelmaking shop is calculated as sum of daily reports of the steelmaking shop. Monthly data is checked. The check is based on the monthly inventory reports of remaining raw materials. The weighing apparatus is calibrated annually. Information is calculated and transferred to the Environmental protection department.
P18	Medium	Raw materials consumption for steelmaking process is calculated as sum of daily reports of steelmaking shop. Monthly data is checked. The check is based on the monthly inventory reports of remaining raw materials. The weighing apparatus is calibrated annually. Information is calculated by the Production management department and transferred to the Environmental protection department.
P20, P21	Medium	Oxygen, compressed air consumption for the steelmaking shop is recorded and controlled by the Chief Power Engineer Department using fuel meters calibrated and maintained in line with the Russian regulations and is transferred to the Environmental protection department.
P22	Medium	Pig iron consumption for the steelmaking shop is calculated as sum of daily reports. Monthly data is checked. The check is based on the monthly inventory reports of remaining raw materials. The weighing apparatus is calibrated annually. Information is calculated by the steelmaking shop and transferred to the Environmental protection department.

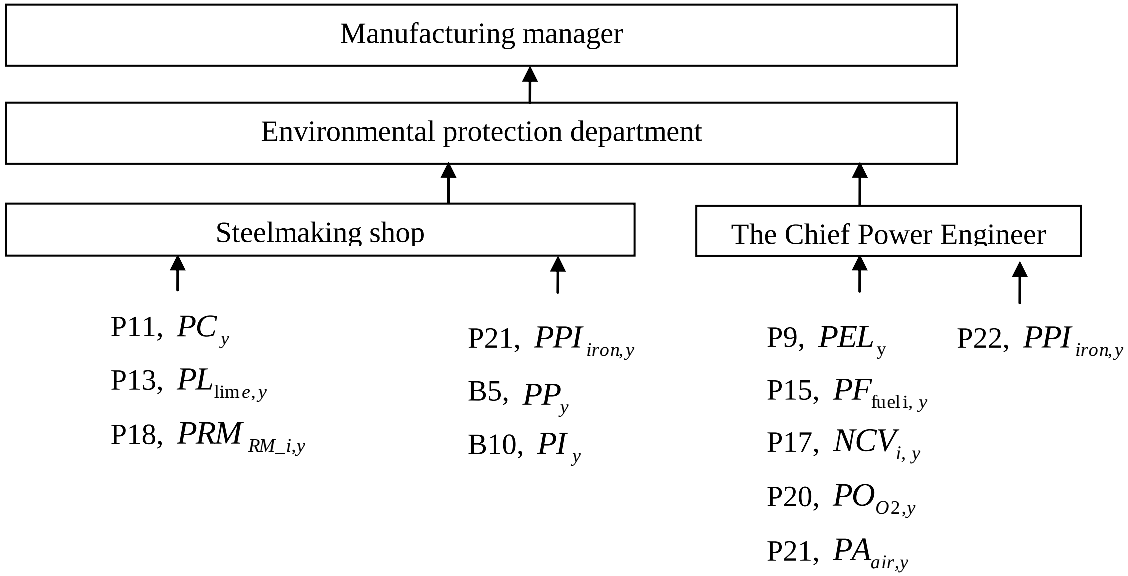
The internal quality system at NSMMZ is functioning in accordance with the national standards and regulations in force. NSMMZ has implemented standard for monitoring and measuring system (CTO 177-9001.19-2010). This standard corresponds to the federal law #102-FZ and other requirements in Russia. Results of monitoring and measuring are stored in the NSMMZ's archive (not less than 5 years). Gas meters are calibrated by LLC Sibna. Their calibration interval is four years. Car scales calibration is done by FGU Uraltest with OJSC RZD's scale test car annually. Other scales are calibrated annually too according to schedule and exception review is done once every three months with calibration load. Also there is calibration after every capital repair of the scale. Electricity and gas meters for commercial accounting and master gages are calibrated by accredited organizations. Plant meters are calibrated by master gages. Certificated automatic system for commercial accounting of power consumption is introduced at NSMMZ.

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

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

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

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



Source: NSMMZ

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

1) Manufacturing manager

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

2) Environmental protection department

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

2) The Chief Power Engineer Department

Chief Power engineer Department is responsible for electricity consumption at NSMMZ. It collects data from the individual electricity meters installed at the production units that consume electricity and data of the commercial electricity meter. Data from individual electricity meters is cross-checked with the data of the commercial meter. For the purposes of monitoring, the energy department will report the level of electricity consumption of the equipments, and provide it to the environmental protection department for monitoring purposes. The Chief Power Engineer Department reports fuel, oxygen and air consumption and data received from the laboratory of the Gas transportation organization to Environmental protection department. The laboratory of the Gas transportation organization provides data on the Net Calorific Value of the natural gas consumed with its certificate.

3) Steelmaking shop

Steelmaking shop is responsible for short term production strategy development and implementation. It will be responsible for steel production and data collection. Also, raw materials consumption and steel production are measured in the steelmaking. These data will be transferred to the environmental protection department for monitoring purposes.

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

Mr Vadim Semavin, Environmental protection department manager and Mr Ivanitsa Sergey, Manufacturing manager are responsible for (see item 1, 2 above):

- data storage and archiving;
- data processing;
- data reporting;
- monitoring report approval.

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

- NSMMZ, Mr Sergey Ivanitsa, Manufacturing manager
  Phone: +7 34397 26754
  Fax: +7 34397 26933
  E-mail: IvanicSI@mh.ru
  OJSC NSMMZ is a project participant.

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

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

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

Project emissions	Unit	2008	2009	2010	2011	2012
Electricity	[tCO_2/y]	516,005	499,641	483,487	529,935	625,183
Coke	[tCO_2/y]	135,351	132,903	91,110	99,748	117,676
Electrodes	[tCO_2/y]	9,519	9,105	8,552	9,376	11,061
Natural gas	[tCO_2/y]	46,373	45,022	44,583	48,877	57,662
Oxygen	[tCO_2/y]	51,423	40,937	43,669	47,873	56,477
Compressed air	[tCO_2/y]	3,152	2,849	2,918	3,197	3,771
Limestone	[tCO_2/y]	447	5,269	2,212	2,418	2,853
Lime	[tCO_2/y]	71,531	58,100	71,302	78,176	92,227
Pig iron	[tCO_2/y]	1,116	3,262	7,148	7,651	9,026
Total of project	[tCO_2/y]	834,916	797,088	754,981	827,251	975,937
Total 2008 - 2012	[tCO_2]	4,190,174				

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

Project emissions	Unit	2013	2014	2015	2016	2017	2018	2019	2020
Electricity	[tCO_2/y]	625,183	625,183	625,183	625,183	625,183	625,183	625,183	625,183
Coke	[tCO_2/y]	117,676	117,676	117,676	117,676	117,676	117,676	117,676	117,676
Electrodes	[tCO_2/y]	11,061	11,061	11,061	11,061	11,061	11,061	11,061	11,061
Natural gas	[tCO_2/y]	57,662	57,662	57,662	57,662	57,662	57,662	57,662	57,662
Oxygen	[tCO_2/y]	56,477	56,477	56,477	56,477	56,477	56,477	56,477	56,477
Compressed air	[tCO_2/y]	3,771	3,771	3,771	3,771	3,771	3,771	3,771	3,771
Limestone	[tCO_2/y]	2,853	2,853	2,853	2,853	2,853	2,853	2,853	2,853
Lime	[tCO_2/y]	92,227	92,227	92,227	92,227	92,227	92,227	92,227	92,227
Pig iron	[tCO_2/y]	9,026	9,026	9,026	9,026	9,026	9,026	9,026	9,026
Total of project	[tCO_2/y]	975,937	975,937	975,937	975,937	975,937	975,937	975,937	975,937
Total 2013 - 2020	[tCO_2]	7,807,496							

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

Table E.1.3: Technical data of the project (actual/plan)

	Unit	2008	2009	2010	2011	2012
Process line #1						
Steel production (liquid)	t steel	989415.52	868817.33	836137.30	940305.01	1109310.47
Steel production (solid)	t steel	980303.81	861027.06	829119.57	932413.00	1100000.00
Electricity consumption	MWh	477959.47	462206.85	431356.11	485095.34	572283.83
Gas consumption	1000m^3	12263.09	11212.24	11289.42	12695.87	14977.76

Coke consumption	t	17065.55	17309.84	11625.15	13073.44	15423.19
Electrodes consumption	t	1579.28	1506.54	1383.05	1555.35	1834.90
Lime consumption	t	48014.46	39568.73	46489.82	52281.62	61678.44
Limestone consumption	t	512.75	6415.14	2171.20	2441.69	2880.55
Oxygen consumption	$1000m^3$	40999.95	33991.40	34098.97	38347.09	45239.39
Compressed air consumption	$1000m^3$	46616.41	36677.81	37052.02	41668.04	49157.23
Iron consumption	t	290.80	5.00	70.19	78.93	93.12
Process line #2						
Steel production (liquid)	t steel	959977.48	861728.29	879359.64	940447.28	1109478.32
Steel production (solid)	t steel	951166.26	853814.41	871847.23	932413.00	1100000.00
Electricity consumption	MWh	475839.87	461344.79	462334.85	494452.48	583322.76
Gas consumption	$1000m^3$	11846.31	12195.11	11889.77	12715.73	15001.19
Coke consumption	t	20497.29	19573.44	13659.77	14608.69	17234.38
Electrodes consumption	t	1586.61	1521.64	1461.43	1562.95	1843.87
Lime consumption	t	47359.59	37897.62	48578.95	51953.65	61291.52
Limestone consumption	t	504.18	5568.03	2859.44	3058.08	3607.72
Oxygen consumption	$1000m^3$	41631.25	31790.83	36073.44	38579.40	45513.46
Compressed air consumption	$1000m^3$	37600.27	39447.98	40904.02	43745.55	51608.15
Iron consumption	t	356.24	1886.74	4351.70	4654.01	5490.49

Source: OJSC NSMMZ

E.2. Estimated leakage:

Not applicable

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

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

Project emissions	Unit	2008	2009	2010	2011	2012
Electricity	[tCO_2/y]	516,005	499,641	483,487	529,935	625,183
Coke	[tCO_2/y]	135,351	132,903	91,110	99,748	117,676
Electrodes	[tCO_2/y]	9,519	9,105	8,552	9,376	11,061
Natural gas	[tCO_2/y]	46,373	45,022	44,583	48,877	57,662
Oxygen	[tCO_2/y]	51,423	40,937	43,669	47,873	56,477
Compressed air	[tCO_2/y]	3,152	2,849	2,918	3,197	3,771
Limestone	[tCO_2/y]	447	5,269	2,212	2,418	2,853
Lime	[tCO_2/y]	71,531	58,100	71,302	78,176	92,227
Pig iron	[tCO_2/y]	1,116	3,262	7,148	7,651	9,026
Total of project	[tCO_2/y]	834,916	797,088	754,981	827,251	975,937
Total 2008 - 2012	[tCO_2]	4,190,174				

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

Project emissions	Unit	2013	2014	2015	2016	2017	2018	2019	2020
Electricity	[tCO_2/y]	625,183	625,183	625,183	625,183	625,183	625,183	625,183	625,183
Coke	[tCO_2/y]	117,676	117,676	117,676	117,676	117,676	117,676	117,676	117,676
Electrodes	[tCO_2/y]	11,061	11,061	11,061	11,061	11,061	11,061	11,061	11,061
Natural gas	[tCO_2/y]	57,662	57,662	57,662	57,662	57,662	57,662	57,662	57,662
Oxygen	[tCO_2/y]	56,477	56,477	56,477	56,477	56,477	56,477	56,477	56,477
Compessed air	[tCO_2/y]	3,771	3,771	3,771	3,771	3,771	3,771	3,771	3,771
Limestone	[tCO_2/y]	2,853	2,853	2,853	2,853	2,853	2,853	2,853	2,853
Lime	[tCO_2/y]	92,227	92,227	92,227	92,227	92,227	92,227	92,227	92,227
Pig iron	[tCO_2/y]	9,026	9,026	9,026	9,026	9,026	9,026	9,026	9,026
Total of project	[tCO_2/y]	975,937	975,937	975,937	975,937	975,937	975,937	975,937	975,937
Total 2013 - 2020	[tCO_2]	7,807,496							

E.4. Estimated baseline emissions:

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

Baseline emissions	Unit	2008	2009	2010	2011	2012
OHPs	[tCO_2/y]	455,521	455,521	455,521	455,521	455,521
Other steel producers	[tCO_2/y]	1,974,784	1,701,004	1,681,423	1,900,419	2,348,381
Total	[tCO_2/y]	2,430,305	2,156,525	2,136,944	2,355,940	2,803,902
Total 2008 - 2012	[tCO_2]	11,883,616				

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

Baseline emissions	Unit	2013	2014	2015	2016	2017	2018	2019	2020
OHPs	[tCO_2/y]	455,521	455,521	455,521	455,521	455,521	455,521	455,521	455,521
Other steel producers	[tCO_2/y]	2,348,381	2,348,381	2,348,381	2,348,381	2,348,381	2,348,381	2,348,381	2,348,381
Total	[tCO_2/y]	2,803,902	2,803,902	2,803,902	2,803,902	2,803,902	2,803,902	2,803,902	2,803,902
Total 2013 - 2020	[tCO_2]	22,431,216							

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

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

Emission reductions	Unit	2008	2009	2010	2011	2012
Total	[tCO_2/y]	1,595,389	1,359,437	1,381,963	1,528,689	1,827,965
Total 2008 - 2012	[tCO_2]	7,693,442				

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

Emission reductions	Unit	2013	2014	2015	2016	2017	2018	2019	2020
Total	[tCO_2/y]	1,827,965	1,827,965	1,827,965	1,827,965	1,827,965	1,827,965	1,827,965	1,827,965
Total 2013 - 2020	[tCO_2]	14,623,720							

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	834,916	0	2,430,305	1,595,389
Year 2009	797,088	0	2,156,525	1,359,437
Year 2010	754,981	0	2,136,944	1,381,963
Year 2011	827,251	0	2,355,940	1,528,689
Year 2012	975,937	0	2,803,902	1,827,965
Total (tonnes of CO_2 equivalent)	4,190,174	0	11,883,616	7,693,442

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	975,937	0	2,803,902	1,827,965
Year 2014	975,937	0	2,803,902	1,827,965
Year 2015	975,937	0	2,803,902	1,827,965
Year 2016	975,937	0	2,803,902	1,827,965
Year 2017	975,937	0	2,803,902	1,827,965
Year 2018	975,937	0	2,803,902	1,827,965
Year 2019	975,937	0	2,803,902	1,827,965
Year 2020	975,937	0	2,803,902	1,827,965
Total (tonnes of CO_2 equivalent)	7,807,496	0	22,431,216	14,623,720

SECTION F. Environmental impacts

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

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

For the definition of the influence of steelmaking shop reconstruction on air pollution in Cherepovets City, calculation of air pollution is made by program complex "Ekolog" in accordance with OND 1-84 ("Methodology of calculation of harmful substances content in air, contained in plants emissions" Goskomgydromet RF). The air pollution analysis demonstrated there is no excess of maximum allowable concentration for all substances. Project impact is insignificant. Qualitative composition of atmospheric air in residential area after project startup will remain within emission limits. The pollutions connected with burned natural gas are reduced after decommission of OHFs on 338 tonnes per year.

Regional office of Glavgosexpertiza, in Sverdlovsk region approved process line #1 construction (stage 1 and 2) on 14 November 2002 (order # 1690). Construction of process line #2 (stage 3) was approved on 18 May 2006 (order # 642). Therefore the project implementation and operation does not have any transboundary environmental impacts. Project is realized on the territory of the Russian Federation, which is big enough to consider transboundary effects absence. Project affects only few kilometers 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:

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

SECTION G. Stakeholders' comments

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

"The Main Agency of the State expertise" (FGU "Glavgosexpertiza" in Russian abbreviation) approved the project, positive conclusion of FGU "Glavgosexpertiza". The local stakeholder consultation process was organized by LLC Uralcomlectnauka. The project implementation has favorable opinion.

NSMMZ provided stakeholders with project information. NSMMZ had publications about the project in mass media.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Organisation:	NSMMZ
Street/P.O.Box:	Karla Libhnehta
Building:	3
City:	Revda
State/Region:	Sverdlovsk
Postal code:	623280
Country:	Russia
Phone:	+7 34397 26754
Fax:	+7 34397 26933
E-mail:	IvanicSI@mh.ru
URL:	http://www.nsmmz.ru/
Represented by:	
Title:	Manufacturing manager
Salutation:	
Last name:	Ivanitsa
Middle name:	
First name:	Sergey
Department:	
Phone (direct):	+7 34397 26754
Fax (direct):	+7 34397 26933
Mobile:	
Personal e-mail:	ivanicsi@mh.ru

Organisation:	Global Carbon BV
Street/P.O.Box:	Graadt van Roggenweg 328 Building D
Building:	
City:	Utrecht
State/Region:	
Postal code:	3531 WR
Country:	Netherlands
Phone:	+31 30 298 2310
Fax:	+31 70 891 0791
E-mail:	info@global-carbon.com
URL:	www.global-carbon.com
Represented by:	
Title:	Director
Salutation:	
Last name:	de Klerk
Middle name:	
First name:	Lennard
Department:	
Phone (direct):	+31 30 298 2310
Fax (direct):	+31 70 8910791
Mobile:	
Personal e-mail:	focalpoint@global-carbon.com

Annex 2

BASELINE INFORMATION

As shown in Section B.1. above, the most plausible baseline scenario is that the existing open hearth plants operation. The incremental steel volume (about 1.6 million tonnes of steel) would be produced by the other (new and/or existing) steel plants.

In this case, the baseline emissions consist of production emissions by existing open hearth plants and other metallurgical plants (steel producers).

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

Project emissions of CO_2 calculation's approach is described in Section D.1.1.2. Methodologies and calculations for definition of project fixed parameter used are shown below.

Project/baseline fixed parameters

Average technical parameters of steam and oxygen production

The data of technical parameters of the oxygen, steam and compressed air production at NSMMZ in 2006-2008 and average emission factor are presented in Table Anx.2.1, Anx.2.2 and Anx.2.3 below:

Table Anx.2.1: Technical parameters of the oxygen production

Parameter	Unit	2006	2007	2008
Total oxygen production	$1000m^3$	53 755	60 408	102 001
Total energy consumption for air separation and gas compressed	MWh	68 108	90 630	89 345
Steam consumption	Gcal	289	460	360
Emissions from electricity	tCO^2	**36 846,30**	**49 031,02**	**48 335,82**
Emissions from steam generation	tCO^2	**80,54**	**128,20**	**100,33**
Total emissions during oxygen production	**tCO^2**	**36 926,85**	**49 159,23**	**48 436,15**
Average for three years	**$tCO^2/1000m^3$**	**0.62**		

Source: NSMMZ

Emission factor for oxygen production at NSMMZ is calculated according to the following formula:

$$EF_{O2} = \frac{EL_y^{oxygen} \times EF_{el} + S_{steam,y}^{oxygen} \times EF_{steam}}{PO_{O2,y}^{oxygen}} \qquad (1)$$

Where:

EF_{O2}	Emission factor for oxygen production at NSMMZ (t CO_2/1000 Nm^3);
$PO_{O2,y}^{oxygen}$	Oxygen production at NSMMZ in year y (1000 Nm^3);
EL_y^{oxygen}	Total electricity consumption for oxygen generation in year *y* (MWh);
EF_{el}	Carbon dioxide emission factor of electricity grid of Russia (tCO_2/MWh);
$S_{steam,y}^{oxygen}$	Steam consumption for oxygen generation in year y (Gcal);
EF_{steam}	Specific emission factor for steam production (tCO_2/ Gcal).

Table Anx.2.2: Technical parameters of the steam production

Parameter	unit	2006	2007	2008
Total steam production	Gcal	127,210	88,563	62,729
Total natural gas consumption for steam production	$1000m^3$	18,707	12,798	8,849
Emissions from natural gas	tCO_2	35,981.58	24,616.04	17,021.00
Total emissions during steam production	**tCO_2**	**35,981.58**	**24,616.04**	**17,021.00**
Average emission factor for steam production	**tCO_2/Gcal**		**0.279**	

Source: NSMMZ

Emission factor for steam production at NSMMZ is calculated according to the following formula:

$$EF_{steam,y} = \frac{\sum_i SF_{fuel\,i,\,y} \times EF_i \times NCV_{i,\,y}}{SP_{steam,y}} \qquad (2)$$

Where:

$EF_{steam,y}$	Specific emission factor for steam production in year *y* (tCO_2/ Gcal).
$SF_{fuel\,i,\,y}$	Consumption of fuel by the process lines in year *y* (tonne or 1000 Nm^3);
EF_i	Emission factor of fuel *i* (tCO_2/GJ);
$NCV_{i,\,y}$	Net Calorific Value of fuel *i* in year y (GJ/1000 Nm^3 or GJ/tonne of fuel);
$SP_{steam,y}$	Steam production in year *y* (Gcal).

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

Parameter	unit	2006	2007	2008
Total compressed air production	1000m3	103,584	109,606	116,147
Total energy consumption for gas compressed	MWh	3,363	7,101	12,320
Emissions from electricity	tCO_2	1,819.21	3,841.62	6,665.23
Total emissions during oxygen production	**tCO_2**	**1,819.21**	**3,841.62**	**6,665.23**
Average emission factor for oxygen production	**$tCO_2/1000m^3$**		**0.04**	

Source: NSMMZ

Emission factor for compressed air production at NSMMZ is calculated according to the following formula:

$$EF_{air} = \frac{EL_y^{air} \times EF_{el}}{PO_y^{air}} \qquad (3)$$

Where:

EF_{air}	Emission factor for compressed air production (t CO_2/1000 Nm^3);
PO_y^{air}	Compressed air production at NSMMZ in year y (1000 Nm^3);
EL_y^{air}	Total electricity consumption for compressed air production in year *y* (MWh);
EF_{el}	Carbon dioxide emission factor of electricity grid of Russia (tCO_2/MWh).

Average parameters are calculated for the three years.
The average specific emission factor for compressed air production (EF_{air}) is **0.04** $tCO_2/1000m^3$ and fixed ex-ante. The average specific emission factor for oxygen production (EF_{O2}) is **0.62** $tCO_2/1000m^3$and fixed ex-ante.

Baseline emission factor for OHPs production

The data of technical parameters of the steel production by OHPs at NSMMZ in 2001-2003 and average emission factor are presented in Table Anx.2.4 below:

Table Anx.2.4: Technical parameters of the steel production by OHPs

Parameter	unit	2001	2002	2003
Steel production (solid) (производство стали, твердая)	t steel	183,108.00	405,232.00	461,914.80
Gas consumption (натуральный газ)	$1000m^3$	0.00	27,904.60	43,547.65
Residual fuel oil consumption (мазут)	t	35,033.30	48,251.12	50,555.60
Electricity consumption (электроэнергия)	MWh	836.09	2,904.34	3,462.98
Oxygen consumption (кислород)	$1000m^3$	165.90	122.21	155.07
Compressed air (сжатый воздух)	$1000m^3$	45,572.00	79,284.06	98,942.23
Iron consumption (чугун)	t	34,393.00	90,704.70	117,560.45
Coke (кокс)	t	4,534.65	7,875.50	4,236.49
Limestone (известняк)	t	18,148.10	35,620.40	43,077.08
Lime (известь)	t	357.50	99.21	465.27
Emissions from gas	tCO_2	0.00	53,672.50	83,760.79
Emissions from residual fuel oil	tCO_2	109,500.55	150,814.33	158,017.26
Emissions from electricity consumption	tCO_2	452.32	1,571.25	1,873.47
Emissions from oxygen consumption	tCO_2	103.24	76.05	96.50
Emissions from compressed air	tCO_2	1,705.62	2,967.35	3,703.10
Emissions from pig iron	tCO_2	59,298.03	156,386.76	202,689.58
Emissions from coke	tCO_2	13,682.85	23,763.53	12,783.18
Emissions from limestone	tCO_2	7,979.90	15,662.65	18,941.42
Emissions from lime	tCO_2	268.13	74.41	348.95
Total	tCO_2	192,990.64	404,988.84	482,214.27
Emission factor	tCO_2/t of steel	1.029		

Source: NSMMZ

Emission factor for steel production by OHPs at NSMMZ is calculated according to the following formula:

$$BE_y = BE^{OHP}_{iron,y} + BE^{OHP}_{coke,y} + BE^{OHP}_{fuel.y} + BE^{OHP}_{lime,y} + BE^{OHP}_{RM,y} + BE^{OHP}_{oxygen,y} + BE^{OHP}_{air,y} \quad (4)$$

Where:

$BE^{OHP}_{iron,y}$ Baseline emissions associated with iron production in year *y* (tCO_2);

$BE^{OHP}_{coke,y}$ Baseline emissions associated with coke production in year *y* (tCO_2);

$BE^{OHP}_{fuel,y}$ Baseline emissions from fuel combustion in year *y* (tCO_2);

$BE^{OHF}_{limestone,y}$ Baseline emissions from limestone consumption in year *y* (tCO_2);

$BE^{OHP}_{oxygen,y}$ Baseline emissions from oxygen production in year *y* (tCO_2);

$BE^{OHP}_{air,y}$ Baseline emissions from compressed air production in year *y* (tCO_2);

$BE^{OHP}_{lime,y}$ Baseline emissions associated with lime production in year *y* (tCO_2).

Baseline emissions associated with iron and coke production are calculated according to the following formulae:

$$BE^{OHP}_{iron,y} = BIR^{OHP}_y \times EF^{iron} \quad (5)$$

$$BE^{OHP}_{coke,y} = BC^{OHP}_y \times EF^{production}_{coke} \quad (6)$$

Where:

BIR^{OHP}_y Iron consumption for OHPs in year *y* (tonnes);

EF^{iron} Emission factor of iron production (tCO_2/tonne of iron);

BC^{OHP}_y Coke consumption for OHPs in year *y* (tonnes);

$EF^{production}_{coke}$ Default IPCC emission factor of coke production[32] (tCO_2/tonne of coke);

Two types of fuel are used in melting: natural gas and heavy fuel oil. Coke is not used as a fuel. It is an additive in furnace feed, but when being combusted it generates CO_2 emissions. Therefore this emission from coke combustion is calculated according to the next formula too. Emissions from the combustion of fuels are calculated according to the following formula:

$$BE^{OHF}_{fuel,y} = \sum_i BF^{OHF}_{fuel\_i,y} \times EF_i \times NCV_{i,y} \quad (7)$$

Where:

$BF^{OHF}_{fuel\_i,y}$ Fuel (or coke BC^{OHP}_y) consumption of type *i* for OHFs in year *y* (GJ);

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

$NCV_{i,y}$ Net Calorific Value of fuel *i* in year y (GJ/1000 Nm^3 or GJ/tonne of fuel)[33].

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

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

$$BE_{lime,y}^{OHP} = BL_y^{OHP} \times EF_{lime} \quad (8)$$

Where:

$BE_{lime,y}^{OHP}$	Baseline emissions associated with lime production in year *y* (tCO_2).
BL_y^{OHP}	Lime consumption by OHP in year y (tonnes);
EF_{lime}	Default emission factor for lime production[34] (tCO_2/tonne of lime).

Limestone is one of additives. In the OHF the calcium carbonate is decomposed into calcium oxide and carbon dioxide. Emissions from raw materials (RM) consumption are calculated according to the following formula:

$$BE_{RM,y}^{OHP} = \sum_i BRM_{RM\_i,\ y}^{OHP} \times EF_{RM\_i} \quad (9)$$

Where:

$BE_{RM,y}^{OHP}$	Project mission from raw materials (limestone) consumption in year *y* (tCO_2);
$BRM_{RM\_i,\ y}^{OHP}$	RM *i* (limestone) consumption in year *y* (tonne of RM);
$EF_{RM\_i,}$	RM *i* emission factor (tCO_2/tonne of RM):

- emission factor for limestone is equal to 0.44[35];

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

$$BE_{oxygen,y}^{OHP} = BO_{O2,y}^{OHP} \times EF_{O2} \quad (10)$$

Where:

$BE_{oxygen,y}^{OHP}$	Emission associated with oxygen production in year *y* (tCO_2).
$PO_{O2,y}^{OHP}$	Oxygen consumption by OHP in year y (1000 Nm^3);
EF_{O2}	Emission factor for oxygen production (t CO_2/1000 Nm^3).

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

$$BE_{air,y}^{OHP} = BO_{air,y}^{OHP} \times EF_{air} \quad (11)$$

Where:

$BE_{air,y}^{OHP}$	Emission associated with compressed air production in year *y* (tCO_2).

---

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

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

[35] 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)

$BO_{air,y}^{OHP}$	Compressed air consumption by OHPs in year y (1000 Nm^3);
EF_{air}	Emission factor for compressed air production (t CO_2/1000 Nm^3).

Baseline emission factor for incremental production

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

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

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

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

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

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

At each stage some energy resources are used, for example: coal, natural gas, mazut, coke, electricity and etc. Also almost at each production stage derived gases are being produced, which are used in other stages of production:
- Sinter gas is produced during the sinter production;
- Coke oven gas and coke breeze are produced during coke production. They are used in sinter, iron, steel production and also for electricity and heat production at the local power plants or boilers,
- Blast furnace gas is produced during iron production and it can be used in the sinter, coke, iron production, for electricity and heat production and in rolling process (in the heating furnaces).

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

Multiple default emission factors

In accordance with IPCC Guidelines[36] there are three methods for calculating CO_2 emissions by steel industry:

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

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

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

Tier 1 method can use for emission calculations for sinter, pellet and coke production only if data of energy resources and raw materials consumption is not available. According to IPCC Guidelines multiple default emission factors for Tier 1[37] are:

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

But it is impossible for iron and steel production as the most CO_2 (approximately 70 %) is emitted at these stages (see discussion tree of IPCC Guidelines[38]).

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

Calculation of emission factors for iron production

Iron production emission factor is calculated according to the following formula:

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

Where:

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

[36] 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

[37] 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.

[38] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 4: Metal Industry Emission, p.4.19.

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

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

Where:

E_y^{iron} Iron production emissions in year y (tCO_2);

$Fuel_y^i$ Fuel i (gas, coal, coke) consumption in year y (tonnes or m^3);

RM_y^j Raw material j (limestone, dolomite and etc) consumption in year y (tonnes);

EF^j RM j emission factor (tCO_2/tonne of RM) [39];

SER_y^k Secondary energy resource k (blast furnace) output in year y (1000 m^3);

CO_y^k Carbon oxide content in k (blast furnace, coke oven gases) in year y (fraction);

28 Molar weight of carbon oxide;

22.4 Gas molar volume (Avogadro's law);

88 Molar weight of two molecule of carbon dioxide ($2CO + O_2 \rightarrow 2CO_2$);

56 Molar weight of two molecule of carbon oxide ($2CO + O_2 \rightarrow 2CO_2$);

EF_{fuel_i} Emission factor of fuel of type i including coke (tCO_2/GJ);

$NCV_{fuel\_i,\,y}$ Net Calorific Value of fuel of type i in year y (GJ/(tonnes or m^3));

$E_y^{\sin}$ Sinter consumption emissions in year y (tCO_2);

E_y^{pel} Pellet consumption emissions in year y (tCO_2);

E_y^{cok} Coke consumption emissions in year y (tCO_2).

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

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

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

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

Where:

$E_y^{\sin}$ Sinter consumption emissions in year y (tCO_2);

E_y^{pel} Pellet consumption emissions in year y (tCO_2);

E_y^{cok} Coke consumption emissions in year y (tCO_2);

Coke_y, Sin_y, Pel_y Coke, sinter and pellet consumption in year y (tonnes);

---

[39] EF of electrodes is calculated according to IPCC electrodes carbon content, 2006 IPCC Guidelines on National Greenhouse Gas Inventories, Volume 3, Chapter 4, page 27. EF of limestone is indentified according to 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).

EF^{cok} Coke production emission factor equals 0.56 tCO_2/ tonne of coke;
EF^{sin} Sinter production emission factor equals 0.2 tCO_2/ tonne of sinter;
EF^{pel} Pellet production emission factor equals 0.03 tCO_2/ tonne of pellet.

Calculation of emission factors for steel production

Third party producers can provide the same quality of blooms (slabs) because readjustment of CCM does not require significant investment (only change of continuous casting mold and readjustment of pinch rolls). Baseline emission factor is calculated by including 20 plants that using CCM and 7 plants that use blooming mill. A blooming mill can produce blooms as CCMs. Blooming mill is an outdated technology connected with steelmaking process by an OHF. Data on Russian blooming mill and CCM producers is presented in Table Anx. 2.5.

Table Anx.2.5: Russian blooming mill and CCM producers

Facility	Steel production by CCM	Steel production by blooming mill
JSC MMK	have	absent
JSC NKMK	have	absent
JSC NTMK	have	have
JSC Uralsteel	have	have
JSC CherepMK	have	have
JSC NLMK	have	absent
JSC CherepMK	have	absent
JSC ZSMK	have	have
JSC Amurmetal	have	absent
JSC Nizhneserginsky MMZ	have	absent
JSC Izhstal	have	have
JSC ChelMK	have	absent
JSC Elektrostal	have	have
JSC MZ Krasny Octyabr	have	absent
JSC Zlatoustovsky MZ	have	have
JSC MMZ Serp i molot	have	absent
JSC Oskolsky EMK	have	absent
JSC Volzhsky TRZ	have	absent
JSC Taganrogsky MZ	have	absent
Kamastal Ltd	have	absent

Source: LLC Korporatsiya proizvoditeley chernykh metalov (2007)

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

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

Where:

$E_y^{steel,m}$	Steel production emissions by steelmaking method *m* in year *y* (tCO_2);
$Fuel_y^i$	Fuel *i* (gas, coal, coke) consumption in year *y* (tonnes);
RM_y^j	Raw material *j* (limestone, electrodes, lime, coke) consumption in year *y* (tonnes);
EF^j	RM *j* emission factor (tCO_2/tonne of RM) [40];
EL_y	Electricity consumption in year *y* (MWh);
EF_{fuel_i}	Emission factor of fuel type *i* including coke (tCO_2/GJ);
$EF_{el,\ y}^{RPS\_n}$	Carbon emission factor of electricity grid of national (regional) power system *n* in year *y* (tCO_2/MWh);
$NCV_{fuel\_i,\ y}$	Net Calorific Value of fuel of type *i* in year *y* (GJ/(tonnes or m^3));
E_y^{iron}	Iron consumption emissions in year *y* [tCO_2).

Where iron consumption emissions are calculated as follows:

$$E_y^{iron} = Iron_y \times EF_y^{iron} \tag{18}$$

Where:

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

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

$$EF_y^{steel,m} = \frac{E_y^{steel,m}}{SP_y^m} \tag{19}$$

Where:

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

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

Operating margin (OM) emission factor

It is not feasible to define exactly which other existing metal works would produce the incremental

[40] EF of electrodes is calculated according to IPCC electrodes carbon content, 2006 IPCC Guidelines on National Greenhouse Gas Inventories, Volume 3, Chapter 4, page 27. EF of limestone is indentified according to 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).

amount of steel. The most transparent approach is to calculate the weighted average of specific CO_2 emission factor.

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

Where:

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

$E_y^{steel,m}$ Steel production emissions by steelmaking method *m* in year *y* (tCO_2);

SP_y^m Steel production by metal works using steelmaking method *m* in year *y* (tonnes).

Build margin (BM) emission factor

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

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

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

Where:

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

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

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

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

Combined margin (CM) emission factor

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

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

Where:

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

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

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

JI projects with a final positive determination under the JI Track 2 procedure and projects approved under the JI Track 1 procedure[41] and shown accordingly on the UNFCCC JI website are excluded from the sample units for the OM/BM/CM emission factor calculation.

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

<u>Application of methodological approach</u>

Background data for the calculation of the OM emission factor

Information on the metallurgical works and emissions and emission factors calculation for iron production in 2008 are presented in the Table Anx.2.6.

Table Anx.2.6: Results of emissions and emission factors calculations for iron production

Facility	Iron production	Total emissions	Emission factors
	Tones	tCO_2	tCO_2/tonne of iron
JSC "MMK"	8,541,432	14,743,845	1.726
JSC "NTMK"	4,796,420	8,397,563	1.751
JSC "NKMK"	1,183,337	2,280,000	1.927
JSC "Uralsteel"	2,748,439	4,747,781	1.727
JSC "Cherepovecky MK"	8,125,096	12,289,271	1.513
JSC "NLMK"	8,407,878	15,764,890	1.875
JSC "ZSMK"	5,364,247	9,154,918	1.707
JSC "Kosogorsky MK"	308,419	567,444	1.840
JSC "Chusovskoy MZ"	587,053	1,072,724	1.827
JSC "Verhnesaychihinsky MZ"	134,975	164,400	1.218
JSC "TulaCherMet"	2,606,998	4,339,415	1.665
JSC "Chelyabinsky MK"	3,500,153	6,302,721	1.801

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

JSC "MZ imeni Serova"	349,165	593,911	1.701
JSC "Svobodny Sokol"	634,677	1,112,310	1.753
Total	**47,288,289**	**81,531,192**	**1.724**

Source: LLC "Korporatsiya proizvoditeley chernykh metalov"

Iron production emission factor is equal to **1.724** tCO_2/tonne of iron (see Table Anx.2.4).

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

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

Information on the metallurgical works and emissions and emission factors calculation for steel production are presented in the Table Anx.2.7.

Table Anx.2.7: Emission factors and Operating Margin calculation for steel production

Method	Emissions	Steel	EF
	tCO_2	tonnes	tCO_2/tonne of steel
Basic Oxygen Furnace	63,306,195	38,792,842	1.632
Electric Arc Furnace	10,107,412	16,859,096	0.600
Open Hearth Furnace	8,500,718	6,667,311	1.275
Operating Margin	**81,914,325**	**62,319,249**	**1.314**

Source: LLC "Korporatsiya proizvoditeley chernykh metalov"

OM emission factor in 2008, which is equal to **1.314** tCO_2/tonne of steel.

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

Background data for the calculation of the BM emission factor
Some new metallurgical works/installations have been built recently and are presented in the Table Anx.2.8. But they may get JI status.

Table Anx.2.8: New metal works (installations) in Russia

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

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

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

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

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

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

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

Data/Parameter	PP_y
Data unit	Tonnes
Description	Total steel (solid) production in the project scenario in year *y*
Time of determination/monitoring	During the crediting period
Source of data (to be) use	Annual technical report
Value of data applied (for ex ante calculations/determinations)	1,931,470
Justification of the choice of data or description of measurement methods and procedures (to be) applied	It is defined according to plan/actual data of NSMMZ.
OA/QC procedures (to be) applied	Steel production in the baseline scenario by OHF and other steel producer is equal to project steel production by the arc-furnace plant. Steel production is calculated as sum of daily reports of the steelmaking shop. Monthly data is checked. The check is based on the monthly inventory reports of remaining raw materials and steel. The produced steel is measured by weight.
Any comment	Information is calculated by the steelmaking shop and transferred to the Environmental protection department.

Data/Parameter	BP_{cap}^{OHPs}
Data unit	Tonnes
Description	Steel (solid) production of the OHPs (tonnes)
Time of determination/monitoring	*Ex - ante*
Source of data (to be) use	According to NSMMZ annual technical report
Value of data applied (for ex ante calculations/determinations)	442,895.95
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The parameter is calculated as average for 2001-2003.

OA/QC procedures (to be) applied	The internal quality system at NSMMZ is functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	EF^{OHPs}
Data unit	tCO_2/tonnes of steel
Description	Emission factor of OHPs
Time of determination/monitoring	*Ex - ante*
Source of data (to be) use	According to NSMMZ annual technical report
Value of data applied (for ex ante calculations/determinations)	1.029
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The parameter is calculated as average for 2001-2003.
OA/QC procedures (to be) applied	The internal quality system at NSMMZ is functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	BEF_y^{incr}
Data unit	tCO_2/tonnes of steel
Description	Baseline emission factor for incremental steel production in year *y*
Time of determination/monitoring	*Ex –post*
Source of data (to be) use	LLC "Korporatsiya proizvoditeley chernykh metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	1.314
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The approach of "Tool to calculate the emission factor for an electricity system" is used. IPCC default values are used for CO_2 emission factor of fossil fuels. The default grid emission factors for the regional power systems of Russia are used. Please see Annex 2 for more detail information.
OA/QC procedures (to be) applied	-
Any comment	If data required to calculate the baseline emission factors for the year y is usually available six months later after the end of the year y, alternatively emission factors of the previous year (y-1) may be used. If data is available latter than 18 months after the end of year y, emission factors of the year preceding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout the crediting period. After the data for the last three years is available, emission factor may be fixed ax-ante as three-year average.

Data/Parameter	PI_y
Data unit	unitless variable
Description	Processing index of electric steel consumption in year *y*

Time of determination/monitoring	During the crediting period
Source of data (to be) use	Annual technical report
Value of data applied (for ex ante calculations/determinations)	1.009
Justification of the choice of data or description of measurement methods and procedures (to be) applied	It is ratio of liquid steel production to solid steel production. Volumes of steel production are measured by weight apparatuses.
OA/QC procedures (to be) applied	The internal quality system at NSMMZ is functioning in accordance with the national standards and regulations in force.
Any comment	This parameter is used for converting of solid steel to liquid steel

Data/Parameter	$Fuel_y^i$
Data unit	tonnes or $1000m^3$
Description	Fuel consumption in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	RM_y^j
Data unit	tonnes
Description	,Raw material consumption in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be)	The internal quality system of iron and steel producers are

applied	functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	$Coke_y$
Data unit	tonnes
Description	Coke consumption in year *y*
Time of determination/monitoring	*Ex-post*. During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	Sin_y
Data unit	tonnes
Description	Sinter consumption in year *y*
Time of determination/monitoring	*Ex-post*. During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	Oxy_y
Data unit	$1000m^3$
Description	Oxygen consumption in year *y*
Time of determination/monitoring	*Ex-post*. During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual

	statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	Pel_y
Data unit	tonnes
Description	Pellet consumption in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	SER_y^k
Data unit	$1000m^3$
Description	secondary energy resource output in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and	According to the current intended procedure and instruction for each plant.

procedures (to be) applied	
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	CO_y^k
Data unit	fraction
Description	Carbon oxide content in blast furnace gas in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	IP_y
Data unit	tonnes
Description	Iron production by metal works in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every pig iron producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	SP_y^m
Data unit	tonnes
Description	Steel production by metal works (using steelmaking method *m)* in

	year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every steel producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	RM_y^j
Data unit	tonnes
Description	Raw material consumption in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every steel producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	$Fuel_y^i$
Data unit	tonnes or 1000m^3
Description	Fuel consumption in year *y*
Time of determination/monitoring	*Ex-post.* During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every steel producer in Russia.

Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	E_y^{iron}
Data unit	tonnes
Description	Iron consumption in year *y*
Time of determination/monitoring	*Ex-post*. During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every steel producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

Data/Parameter	EL_y
Data unit	MWh
Description	Electricity consumption in year *y*
Time of determination/monitoring	*Ex-post*. During the crediting period
Source of data (to be) used	LLC "Korporatsiya proizvoditeley chernih metalov" annual statistical report "Russian Chermet information ". This report contains the data of annual steel and iron production and annual fuel and electricity consumption at Russian steel plants.
Value of data applied (for ex ante calculations/determinations)	According to the annual report made by LLC "Korporatsiya proizvoditeley chernih metalov" for every steel producer in Russia.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the current intended procedure and instruction for each plant.
OA/QC procedures (to be) applied	The internal quality system of iron and steel producers are functioning in accordance with the national standards and regulations in force.
Any comment	-

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

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." [42].

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 "Urals", 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

$EF_{el,y}$ = 0.541 tCO_2/MWh.

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

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

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

Annex 3

MONITORING PLAN

See Section D for monitoring plan.

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.