Monitoring report of GHGs emission reduction

JI PROJECT:

«PRODUCTION OF CONTINUOUSLY CASTED SLAB STEEL BILLET BY ARC-FURNACE TECHNIQUE AT OJSC MMK»

Monitoring period: 01.01.2011 – 30.09.2012

Version 1.1. (final after verification)

Data of development of this version: 23 November 2012.

CONTENTS

A. General information on the project

A.1. Introduction

The aim of report is representation of the monitoring results and results of calculation of Emission Reduction Units (ERUs) generated by the JI project "Production of continuously casted slab steel billet by arc-furnace technique at OJSC MMK" for the period from January 01, 2011 to September 30, 2012.

Monitoring report has been developed in accordance with PDD version 1.2 of February 01, 2011 (the Bureau Veritas Certification Holding SAS has issued a positive expert opinion № RUSSIA-det/0105/2010).

The considered project has been approved in Russian Federation (RF) as host Party by the Order of Ministry of Economic Development of RF # 112 of March 12, 2012. The Declaration of Approval from State of the Netherlands, acting through the Ministry of Economic Affairs, Agriculture and Innovation and its implementing agency "NL Agency", being the Designated Focal Point for Joint Implementation (JI) in The Netherlands has been received for the project by 1st June 2011.

Thereby the project has been approved both by host Party and Party involved in the JI project, other than the host Party. Technical implementation of the project took place in 2003-2006.

A.2. Brief description of the project

The proposed JI project takes into account the production of slab steel billet in the EAFP of MMK. The EAFP includes the following units: two high-capacity electric arc furnaces (EAF-180) manufactured by Austrian company "Voest-Alpine AG" with output capacity of 2 million tons of liquid steel per year each, one double-bath steelmaking unit (DBSU), ladle furnace steel processing aggregates, one slab continuous-casting machine (CCM #5) with capacity of 2 million tones/year of slab steel billet and two section continuous casting machines manufactured by Austrian company "VAI" with total capacity of 2 mln. tones/year of profiled steel billet. Thereby EAFP produces both profiled and slab steel billet. Technical implementation of the project took place in 2003-2006 in accordance with the following schedule:

Table A.2.1. Project implementation schedule

Year	**Operating capacities, phase-out and commissioning dates**
2003	Two DBSUs and three classic open hearth furnaces were in operation
2004	Demounting : three classic open hearth furnaces Commissioning: LFA #1, two section CCMs #1, 2 In operation: two DBSUs
2005	Demounting: one DBSU, chemicals preparation plant, blooming mill plant (BMP) In operation: DBSU #32, LFA #1, section CCMs #1, 2
2006	Commissioning: two electric arc furnaces (EAF) #1, 2, LFA #2 (reconstruction of SRA #1), one slab CCM #5 In operation: DBSU #32, LFA #1, section CCMs #1, 2
2008	Commissioning: LFA #3 In operation: EAF #1, 2, DBSU #32, slab CCM #5, section CCMs #1, 2, LFA #1, LFA #2

The project "Implementation of arc-furnace steelmaking at Magnitogorsk Iron and Steel Works" was arranged as Joint Implementation project[1] and passed a determination and verification by Bureau Veritas, however in the project boundary the only profiled steel billet production was included as previously this function was performed by open-hearth furnace plant and blooming mill plant, i.e. steel billet was made at the own industrial site area.

The proposed project takes into account the greenhouse gas emissions associated with production of slab steel billet in EAFP of MMK. Output of slab steel billet is equivalent in the project and in the baseline.

In the absence of the proposed JI project the production of slab steel billet would be carried out at the existing metallurgical works of Russia (including the oxygen-converter shop of MMK) or newly introduced capacities (during the crediting period). The most common method of steelmaking at the existing metallurgical works of Russia, which are under the project boundary – smelting in oxygen converters, for instance:

- In 2011 the share of oxygen convertor, electric arc furnace and open hearth furnace for this group of the steel smelters was 80,54%, 16,06% and 3,40% accordingly;
- for first 6 months of 2012 – 82,99%, 13,96%, 3,05% accordingly.

CO_2 emissions from production of one ton of steel by steel mills of Russia exceed CO_2 emissions from production of one ton of steel in EAFP of MMK, because open-hearth and oxygen-converter method of steel production are more resource-and carbon intensive in comparison with the arc-furnace process due to use of mostly pig iron as a raw material (except open-hearth scrap process).

Smelting of slab steel by arc-furnace technique followed by casting at continuous casting machine today in Russia is the most advanced technology which promotes resource saving and this is achieved by a large percentage of steel scrap in the charge of smelting furnaces in comparison with other methods of steel production.

A.3. Emission reduction during monitoring period

Current report takes into account CO_2 emission reduction generated during 2008-2010. Detailed calculations are in the section D.

The actual generation of ERUs:

for the period of 1st January 2011 to 31st December 2011 is **166 435** tonnes CO_{2eq}

for the period of 1st January 2012 to 30th September 2012 is **254 776** tonnes CO_{2eq}

In accordance with PDD, version 1.2 of February 01, 2011 the expected volume of ERUs:

for the period of 1st January 2011 to 31st December 2011 is 550 297 tonnes CO_{2eq}

for the period of 1st January 2012 to 31st December 2012 is 687 999 tonnes CO_{2eq} (515 999 tones CO_{2eq} in calculation for 9 months of 2012).

The significant difference in the amount of ERUs calculated in this report and in the PDD connects with the fact that the production of slab steel billets as less than predicted in the PDD as well as intensive use for steelmaking of DBSU working primarily on the pig iron.

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[1] http://ji.unfccc.int/JI_Projects/DB/3YOHME3FSIKG8602M8WN9D60QNIQT7/PublicPDD/YAGHLX0KYONQCEVWW7EHHU3EW75Z32/view.html

A.4. Contact information on project participants

Contact person on project participants:

Company:	OJSC "Magnitogorsk Iron and Steel Works"
Street:	Kirova
Building:	93
City:	Magnitogorsk
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Fax:	+7 (3519) 24-71-40
e-mail:	Mitchin.AM@mmk.ru
website:	www.mmk.ru
Representative:	
Position:	Manager
Title:	Mr.
Family name:	Mitchin
Name:	Andrey Mikhailovich
Department:	Finance direction

Contact person on consultant of project participant and project developer and developer of monitoring report:

Company:	CTF Consulting, LLC
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Building:	9/26 bld. 1
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State/region	-
Zip code:	115054
Country:	Russia
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Fax:	+7 (495) 984-59-52
e-mail:	konstantin.myachin@carbontradefinance.com
website:	http://www.carbontradefinance.com
Representative:	
Position:	Carbon projects manager
Title:	
Family name:	Myachin
Name:	Konstantin Yurevich
Department:	-

B. Monitoring system of GHGs emission reduction

B.1 Information on the collection and archiving of information on the environmental impacts of the project

In accordance with requirements of Articles 14, 22 the Federal Law on environmental protection # 7-FZ OJSC "MMK" has the approved Maximum Permissible Emissions (MPE) document. This document is approved by Chelyabinsk Regional Department of Technological and Environmental Surveillance of Rostechnadzor. This decision is valid for one year. Under this decision the harmful emission permit is issued. This permit quantified impacts to atmosphere by OJSC "MMK".

For confirmation of MPE the air emissions were estimated by OJSC "Magnitogorsk GIPROMEZ" in accordance with Russian "Guidelines for calculation of industrial emissions of air pollutants" (OND-86)[2]. These estimations were based on OJSC "MMK" Emission Inventory and Emission Sources Report done by Federal State Unitary Enterprise "All-Russian Institute for Carbon Chemistry" in Yekaterinburg (2008). This report was approved according to the established procedure.

Laboratory for Control of Air Quality of OJSC "MMK" performs environmental monitoring according to the monitoring schedule.

According to the provisions of Russian environmental law (Federal Law №7-FZ of 10.01.2002 "On Environmental Protection"), environmental experts and managers of polluting enterprises must have qualifications in environmental protection and environmental safety. Functions of the Department of environmental protection are ensuring compliance with environmental quality standards, obtaining government permits for emissions and discharges of hazardous substances, disposal of waste.

In accordance with referred above Federal Law OJSC "MMK" has the approved Maximum Permissible Discharge of Sewage document (MPDS) and Permissible Norm of Producing and Placement of Wastes document (PNPPW). In these documents procedure of collecting and archiving of information on the environmental impacts is defined.

There is a monitoring plan in MPDS document, which is defined the monitoring parameters, frequency of measurement for each parameter and responsible personnel. Monitoring plan is approved by OJSC "MMK". In PNPPW document list and quantity of produced wastes, frequency of producing, places of storage and responsible personnel are defined. This document is approved by OJSC "MMK".

Considering the above we can conclude that OJSC "MMK" conduct the periodic monitoring of the environment impacts. The enterprise also has an environmental management system certified by ISO 14001.

According to the information from Environmental department of OJSC "MMK" confirmed during the visit in January 2011:

The project was fully put into operation is 2006 and environmental protection equipment designed for it (gas purification units at EAFs, etc) operates normally. The total environmental impact for the section steel production has been radically reduced in comparison with the open-hearth/ingots casting technology.

Emissions of polluting substances are normalized in the permission to emission of the polluting substances, given out by Rostehnadzor in the Chelyabinsk area. Results of inventory of emissions prepares annually.

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[2] http://www.vsestroi.ru/snip_kat/ad977f56010639c6e1ba95802d182677.php

According to the valid permission the emissions of pollutant substances do not create maximum concentration above limit, except a number of substances (nitrogen (IV) a dioxide, sulfur a dioxide, hydrogen sulfide, carbon oxid, phenol) for which the temporarily permission is established.

The polluted water is treated at local treatment facilities. The enterprise has several closed loop water turnover systems. The water which is subject to the discharge is released in the river Sukhaya (inflow of the river Ural).

Placing of a waste occurs in conformity to the project of specifications of formation of a waste and limits on their placing, confirmed by Rostehnadzor in the Chelyabinsk area.

B.2 Methodological approach applied (summary from PDD, version 1.2 of February, 01 2011)

Monitoring of the baseline and project emissions during 2008-2010 has been performed in accordance to the PDD, version 1.2 of February, 01 2011 except adjustments and deviations given in the Section C.

JI specific approach is applied for the monitoring of GHGs emission in accordance with paragraph 9 (a) of the “Guidance on criteria for baseline setting and monitoring” (Version 03).

MMK is a metallurgical complex where production of coke and pig iron meets the needs not only the EAFP, but the oxygen-converter shop. EAFP produces both section slab and profiled steel billet (this is beyond the project boundary and considered in the PDD of the JI project "Implementation of arc-furnace steelmaking at Magnitogorsk Iron and Steel Works”[3], passed a determination and verification by Bureau Veritas).

To calculate CO_2 emissions the specific CO_2 emissions per ton of coke, pig iron and steel billet are determined. Then specific emissions are multiplied by the output of these products in the amount needed to production of slab steel billet.

The project boundaries include:

- Metallurgical conversion stages of MMK: coking coal production in the by-product coke plant, blast-furnace plant, EAFP
- Own power generation capacities of MMK: CHPP, CPP, SABPP, turbine section in the steam plant, gas recovery section in the steam plant
- Unified Energy Systems of the Russian Federation: Center, North West, South, Middle Volga, Urals, Siberia, East.
- Existing metallurgical works or newly introduced capacities (during the crediting period) in Russia with capacity to produce slab steel billet.

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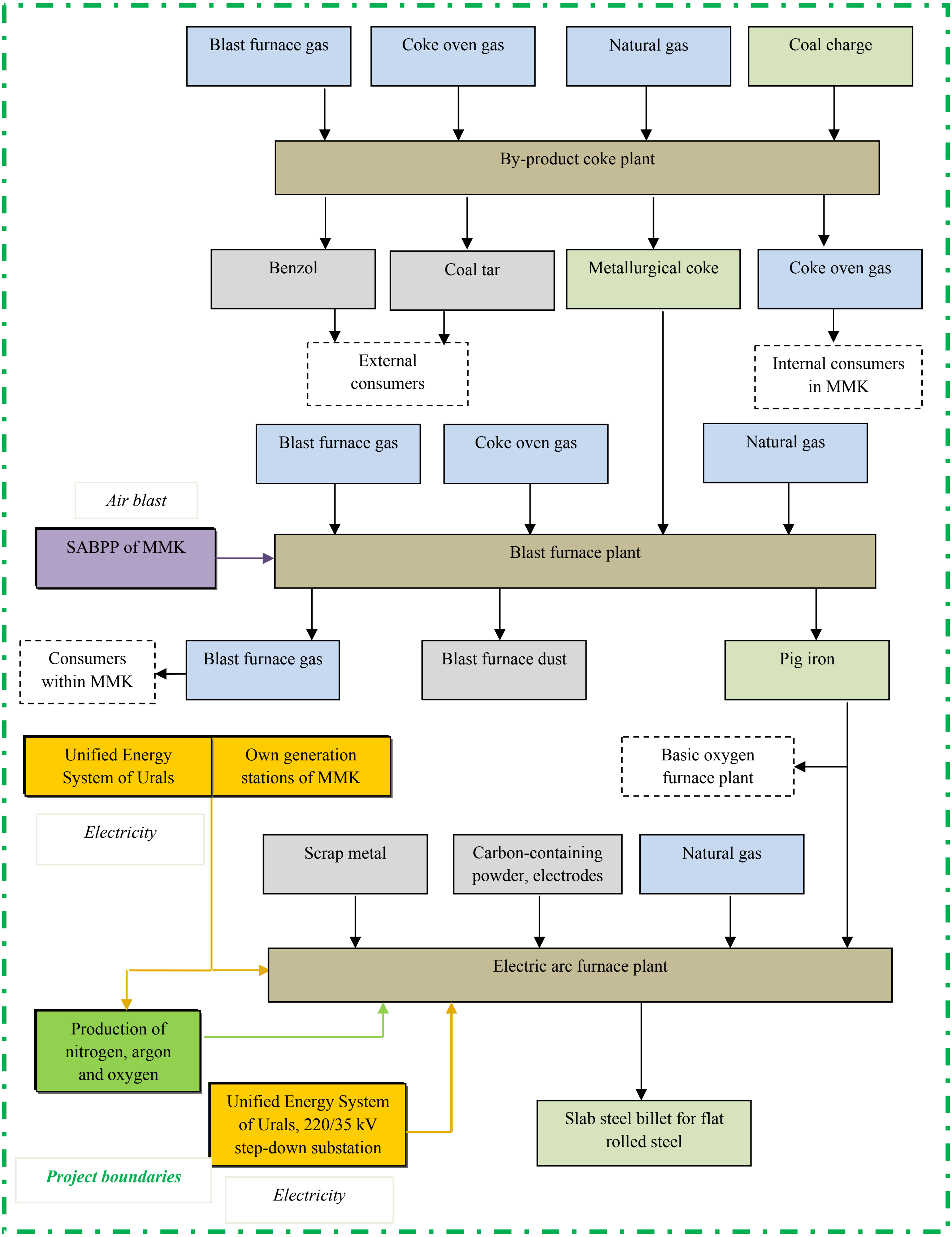
[3]http://ji.unfccc.int/JI_Projects/DB/3YOHME3FSIKG8602M8WN9D60QNIQT7/PublicPDD/YAGHLX0KYONQCEVWW7EHHU3EW75Z32/view.html

Diagram B.2.1. Project boundaries. Project scenario



<u>Project CO_2 emissions are calculated as follows:</u>

1. CO_2 emissions from metallurgical conversions within the project boundaries (using carbon balance method) are estimated to determine specific CO_2 emissions per ton of coke, pig iron and steel billet produced in EAFP (profiled and slab combined).
2. Specific consumption of pig iron for production of one ton of steel billet produced in EAFP and specific consumption of metallurgical coke per one ton of pig iron is determined.
3. Project CO_2 emissions from metallurgical conversions during production of slab steel billet using defined specific values and coefficients are calculated.
4. CO_2 emission coefficients associated with generation of electricity and air blast at MMK, and project emissions from consumption of electricity in EAFP and consumption of air blast in BFP required for production of the slab steel billet are calculated.
5. Total project CO_2 emissions associated with production of slab steel billet are summarized.

The production of metallurgical coke is accompanied by the formation of by-product - coke breeze. The coke batteries in BPCP (By product coke plant) produce gross coke, which after quenching is sifted to coke breeze and metallurgical coke, then metallurgical coke is transported to BFP. Coke breeze is transported to the sintering plant where it is used as fuel for sintering machines. Excess of coke breeze is sold to other companies, where the coke breeze is used as a special high-carbon fuel or as a component of the carbon-containing powder in metallurgy. As the coke breeze completely burns to CO_2 in the process of its use, these carbon dioxide emissions are attributable to the production of raw material for BFP – metallurgical coke, which is a major end product of the BPCP. Thus the integrated emission factor is calculated for the production of metallurgical coke. In BFP the metallurgical coke is sifted once again with separation of additional coke breeze, which is formed during the transportation from BPCP to BFP. In line with conservative approach this coke breeze has not been considered in the calculation of BFP and BPCP CO_2 emissions.

Blast furnace dust and scrubber sludge are particular kinds of industrial waste generated during blast furnace process. They originate in the system of dry cleaning of blast furnace gas and contain significant amounts of carbon. These materials are transported to agglomeration plant and consumed during production of fluxed agglomerate. The carbon from blast furnace dust and scrubber sludge is fully released as CO_2. Therefore, these emissions are included in emissions during production of pig iron in blast furnace plant. A small fraction of blast furnace dust comes to the cement plant. CO_2 emissions during utilization of this dust at the cement factory are considered as leakages and fully accounted in the monitoring plan of the JI Project "Implementation of arc-furnace steelmaking at Magnitogorsk Iron and Steel Works". This PDD had been determined by independent expertise (determination) by Bureau Veritas[4]. To avoid double counting the CO_2 emissions during utilization of this dust at the cement factory are not calculated in this project.

The consumption of production inputs, raw materials, energy resources, and the output of commercial products are routinely monitored by MMK applying the system of factory monitoring and reporting. These parameters are measured in accordance with applicable standards and rules in the iron and steel industry of Russian Federation as well as international standards (OJSC "MMK" is certified by ISO 9001 standard). All required parameters are available within the factory monitoring and reporting system implemented at MMK and thus associated procedure for monitoring of CO_2 emissions does not require any additional changes or improvements in the existing system.

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[4]http://ji.unfccc.int/JI_Projects/DB/3YOHME3FSIKG8602M8WN9D60QNIQT7/PublicPDD/YAGHLX0KYONQCEVWW7EHHU3EW75Z32/view.html

The majority of carbon content parameters included in the monitoring plan are regularly determined by direct analyses in Central Lab of MMK or calculated on the basis of chemical composition of carbon-containing substances. The samples of blast furnace gas and coke oven gas are analyzed in CEST lab and the data on chemical composition of natural gas are taken from its technical passport issued and provided by the supplier.

Table B.2.1. Values of parameters that are used in calculation formulae but fixed ex-ante as per PDD and applied only for the project emissions calculation (i.e. are relevant to OJSC "MMK" only) [5]

#	Parameter and measurement units	Variable	Value	Source of data
1.	Carbon content in crude benzol, % by mass	**$\%C_{benzol}$**	90.0	The Central Lab of MMK performs a test of chemical composition of crude benzol once a month. The carbon content in crude benzol therefore can be determined by known carbon content in each component and its % mass fraction. During development of the PDD the analysis of chemical composition of crude benzol has been taken (QMS reporting form SMK CLK (51)-22-2) and calculated carbon content of crude benzol was 87.8%. As a conservative assumption the value with a certain margin (2,2%) was applied and fixed ex-ante, i.e. 90%.
2.	Carbon content in coal tar, % by mass	**$\%C_{coal\text{-}tar}$**	86.0	During development of the PDD OJSC "MMK" provided to CTF, LLC a Memo #BPCP-C296 of 02.06.2009 (in the PDD by mistake data was mentioned as 26.06.2009), signed by Director of BPCP. It stated that by measurements the carbon content in the coal tar was 83%. By information of BPCP during site visit similar measurements in several preceding years showed the maximum value of 84%. As a conservative assumption the maximum value with a certain margin (2%) was applied and fixed ex-ante, i.e. 86%
3.	Carbon content in pig iron, % by mass	**$\%C_{pig\ iron}$**	4.70	This is an important technological indicator, which determines the end of blast furnace smelting. Final carbon content of pig iron is a technological standard and measurements of the carbon content are performed by MMK Central Lab constantly. The average value for 2002 and 2007 was 4.7 % and provided in the Letter of OJSC MMK to CTF, LLC by 16.02.2009. Due to stability of the value it was decided to fix ex-ante the carbon content in pig iron as 4.7 %.
4.	Carbon content in scrap metal, % by mass	**$\%C_{scrap}$**	0.18	Electric Arc Furnaces consume scrap metal during steel smelting. The supplied scrap metal is a subject for incoming control by MMK. The carbon content in the scrap metal varies depending on its origin but does not exceed 0,2% by measurements, however usually is less (information from specialists of EAFP). As an assumption for simplicity the carbon content of steel produced at

[5] The data confirming the appropriateness of values of these parameters as a ground for their fixing ex-ante has been provided during determination of the PDD and available at OJSC "MMK" by request

				EAFP of MMK (i.e. 0,18%) was applied for scrap metal and fixed ex-ante.
5.	Carbon content in carbon-containing powder, % by mass	**%C** $_{\text{carbon powder\_EAFP}}$	95.0	In accordance with standard specification 1971-003-13303593-2006, which is confirmed by quality certification.
6.	Carbon content in electrodes, % by mass	**%C** $_{\text{electrodes\_EAFP}}$	99.0	In accordance with standard specification 1911-109-052-2003, which is confirmed by quality certification.
7.	Carbon content in steel, % by mass	**%C** $_{\text{steel}}$	0.18	This is an important technological indicator, which determines quality of steel and may vary only within very narrow bounds depending on type of steel. The average carbon content of steel product mix, produced by the EAFP within long period of time (one year), based on MMK Lab measurements is quite stable. For 2002 the measurements performed by MMK Lab has shown the average value of 0.19 % and for 2007 the average value of 0.18%. Due to stability of the value it was decided to fix ex-ante the carbon content in steel as 0.18 % (the least one as more conservative).
8.	Carbon content in power station coal, % by mass	**%C** $_{\text{energy coal}}$	73.0	IPCC Guidelines 2006 default value has been taken as no measurements of the carbon content in power station coal are performed at OJSC “MMK”.
9.	Specific electricity consumption for nitrogen production at MMK, MWh/1.000 m^3 (since July 2010)	**SEC** $_{\text{N2\_PJ}}$	0.150	Nitrogen compressors which provide EAFP with nitrogen were switched to another current feeder in July 2010. As a result it has become impossible to separate the amount of electricity spent for compression of nitrogen. In August 2010 the Oxygen shop of OJSC “MMK” provided a note that in July 2010 the nitrogen compressors which provide the EAFP with gaseous nitrogen were switched. As a result it became impossible to define a quantity of electricity used for compressing of the nitrogen. In the letter # KC-1079-06 of 05.08.2010 sent by Oxygen shop to CEST it was proposed to revise an order of electricity consumption accounting for nitrogen generation and fix the value as 150 kWh/1000 m^3. The value of parameter had been monitored until July 2010. The average value for January-June 2010 is 141 kWh/1000 m^3. Therefore the fixed ex-ante value of specific electricity consumption for production of nitrogen as 150 kWh/1000 m^3 can be considered as conservative.
10.	Specific electricity consumption for production of pure nitrogen at MMK, MWh/1.000 m^3	**SEC** $_{\text{pure\_N2\_PJ}}$	0.826	Values of specific electricity consumption for production of pure nitrogen and argon are reported in the Summary of energy consumption by departments of OJSC “MMK”. During the visit to the works in January 2011 it was revealed that in fact these values are not measured but determined only once because the technical ability for their

11.	Specific electricity consumption for production of argon at MMK, MWh/1.000 m^3	**SEC_{Ar_PJ}**	0.055	instrumental measurements currently is absent. This practice takes place over the several years including the period from January 1, 2008, and in the reporting for 2008 and 2009 the mentioned values remained same. Anyhow the values are still subject of monitoring and reporting at MMK and not fixed ex-ante. The appropriate confirmation by the Technological department of MMK is provided in the e-mail from the Head of Section of regulation and analysis of fuel and energy resources consumption, date 17/03/2011 mrs. Irina Kucherova:"The consumption rates were determined in 1994, consumption of electricity for nitrogen production was calculated through the known value of consumption of electricity for oxygen production in the ratio of the melting points of nitrogen and oxygen (at an estimated exergy). The consumption of electricity for argon production was determined as electricity consumption for purification and compressing of the crude argon (this is a by-product of oxygen production) – for that the additional equipment had been installed.
12.	CO_2 emissions factor for grid electricity produced by Unified Energy System of Urals, t CO_2/MWh	**EF_{grid_Ural}**	0.541	Report on GHG emission factors for Russian energy systems (2008)[6]. This report was prepared by Carbon Investments Ltd. by order of Carbon Trade & Finance SICAR S.A., and approved by Accredited Independent Entity (AIE) Bureau Veritas in October-November 2008. Official approval was received November, 10 2008.

Baseline CO_2 emissions are calculated as follows:

1. The number of metallurgical works of Russia with capacity for production of slab steel billet is identified according to data of quarterly reports "Analysis of the expenditure of materials and process fuel by production of pig iron, steel and rolled iron at ferrous metallurgy works", "Corporation CHERMET", LLC and information from public sources in the Internet (web sites of metallurgical works to insure that slab steel billet is produced);
2. General CO_2 emission factor for steel production is calculated for each metallurgical works of this group of metallurgical enterprises of Russia. General CO_2 emission factor for steel production characterizes the carbon intensity of steel production at the metallurgical works. The basis of calculation is statistic data of "Corporation CHERMET", LLC. The calculation is provided for the steel smelting at the whole enterprise without separation of slab steel production, because of such detailing is not provided in statistic data;
3. General CO_2 emission factor for steel production is calculated based on the share of each technique of steel production (converter, arc-furnace, pig-and-ore process, steel production in DBSU, scrap process) in the whole volume of steel output at the metallurgical works. In turn for each used technique the specific CO_2 emissions from production of one ton of steel are calculated separately based on statistic data of specific consumption of relevant carbon-bearing raw materials and energy sources (consumption of pig iron, natural gas, electrodes, electricity, oxygen) and fixed ex-ante CO_2 emissions factors for them;

[6] The Report and its results are exclusively owned by "Carbon Trade & Finance SICAR S.A." and it can be used only after written permission of the owner.

4. Integrated CO_2 emission factor for steel production at the Russian metallurgical works with capacity for production of slab steel billet is calculated based on general CO_2 emission factor for steel production at each metallurgical works and share of each metallurgical works with capacity for production of slab steel billet in the whole volume of steel output by this group metallurgical works of Russia.
5. Taking into account the output of slab steel billet in EAFP of MMK and integrated CO_2 emission factor for steel production at the Russian metallurgical works with capacity for production of slab steel billet, the baseline emissions CO_2 from slab steel production at the metallurgical works of Russia are calculated.

Table B.2.2. Values of parameters that are used in calculation formulae but fixed ex-ante as per PDD and applied for the baseline emissions calculation[7]

#	Parameter and measurement units	Variable	Value	Source of data
1.	CO_2 emission factor for iron production, t CO_2/t pig iron	**EF** $_{iron}$	1.35	IPCC Guidelines 2006, Chapter 4, table 4.1.
2.	CO_2 emission factor for NG combustion, t CO_2/ 1,000 m^3 (confirmed by data of OJSC "Ashinsky metallurgical works")	**EF** $_{NG}$	1.88	Calculated on the base of data of CO_2 EF for NG combustion – 56,100 kg/TJ (IPCC Guidelines 2006, volume 2, Chapter 1, Introduction, table 1.4), data of net calorific value of NG – 48.0 TJ/Gg (IPCC Guidelines 2006, volume 2, Chapter 1, Introduction, table 1.2) and density of NG under normal conditions. Since the composition of NG is variable in different regions, we standardize this value at 0.7 kg/m^3
3.	CO_2 emission factor for electrodes consumption, t CO_2/t electrodes	**EF** $_{electrodes}$	3.007	Calculated on the base of data of carbon content in electrodes (IPCC Guidelines 2006, Chapter 4, table 4.3.). Carbon content 0.82 is multiplied by 44/12.
4.	Electricity consumption for oxygen production, MWh/ 1,000 m^3	**EC** $_{oxygen}$	0.83	The main producers and suppliers of air separation units for metallurgical works are JSC "Cryogenmash" (cryogenic plant) and "Energotechprom", LLC (absorption and membrane plants). Air separation units of JSC "Cryogenmash" are installed at MMK, NTMK, NKMK, Seversteel, Zapsib[8]. Electricity consumption for oxygen production for units KAr-30 is 0.83 MWh/ 1,000 m^3.[9] Electricity consumption for oxygen production for units K-0.25 is 1.2 MWh/ 1,000 m^3.[10] So taking account the conservativeness approach we use the lowest value of this parameter – 0.83 MWh/1,000 m^3.
5.	CO_2 emissions factor for grid electricity produced by Unified Energy	**EF** $_{grid\_Centre}$	0.511	Report on GHG emission factors for Russian energy systems (2008). This report was prepared by Carbon Investments Ltd. by order of Carbon Trade & Finance

[7] The data confirming the appropriateness of values of these parameters as a ground for their fixing ex-ante has been provided during determination of the PDD and available at OJSC "MMK" by request

[8] http://www.cryogenmash.ru/

[9] http://www.arcelormittal.com.ua/index.php?id=126&p=224

[10] http://www.compressed-air.ru/odessa/ustanovka-k-025.html

	System of Center, t CO_2/MWh			SICAR S.A., and approved by Accredited Independent Entity (AIE) Bureau Veritas in October-November 2008. Official approval was received November, 10 2008.
6.	CO_2 emissions factor for grid electricity produced by Unified Energy System of Northwest, t CO_2/MWh	**EF** **grid_Northwest**	0.548	Same as above.
7.	CO_2 emissions factor for grid electricity produced by Unified Energy System of Middle Volga, t CO_2/MWh	**EF** **grid_Middle Volga**	0.506	Same as above.
8.	CO_2 emissions factor for grid electricity produced by Unified Energy System of Urals, t CO_2/MWh	**EF grid_Ural**	0.541	Same as above.
9.	CO_2 emissions factor for grid electricity produced by Unified Energy System of South, t CO_2/MWh	**EF grid_South**	0.500	Same as above.
10.	CO_2 emissions factor for grid electricity produced by Unified Energy System of Siberia, t CO_2/MWh	**EF** **grid_Siberia**	0.894	Same as above.
11.	CO_2 emissions factor for grid electricity produced by Unified Energy System of East, t CO_2/MWh	**EF grid_East**	0,823	Same as above.

B.3 Approach for organization and implementation of monitoring, project emissions

The system of monitoring for the project has functioned year in accordance with internal procedure PD MMK 3-DF-13-2011 “Regulation on monitoring of GHG emissions reduction, created as a result of the realization of the project: “Implementation of arc-furnace steelmaking at Magnitogorsk Iron and Steel Works”.

Monitoring of greenhouse gases emission reduction is carried out at OJSC “MMK” based on continuous monitoring of the monitoring parameters (Table B.3.1) specified in the PDD. Monitoring report is subject for verification. A reference about monitoring of each parameter is presented as informational matrix of the approved form. The data relating to the monitoring of the project is posted on a dedicated server of OJSC “MMK”.

Departments responsible for monitoring of each parameter of the JI project carry a responsibility for the treatment of primary reporting documents, processing, preparation, verification and transfer to the Carbon market group of Finance direction (JI project implementation coordinator) of the reporting documents containing the information about monitored parameters. In each department of OJSC "MMK" involved in monitoring under the JI project the head of the department assigns a person responsible for provision of the reporting documents and tracking of the parameters change.

Picture B.3.1. Management structure of monitoring process

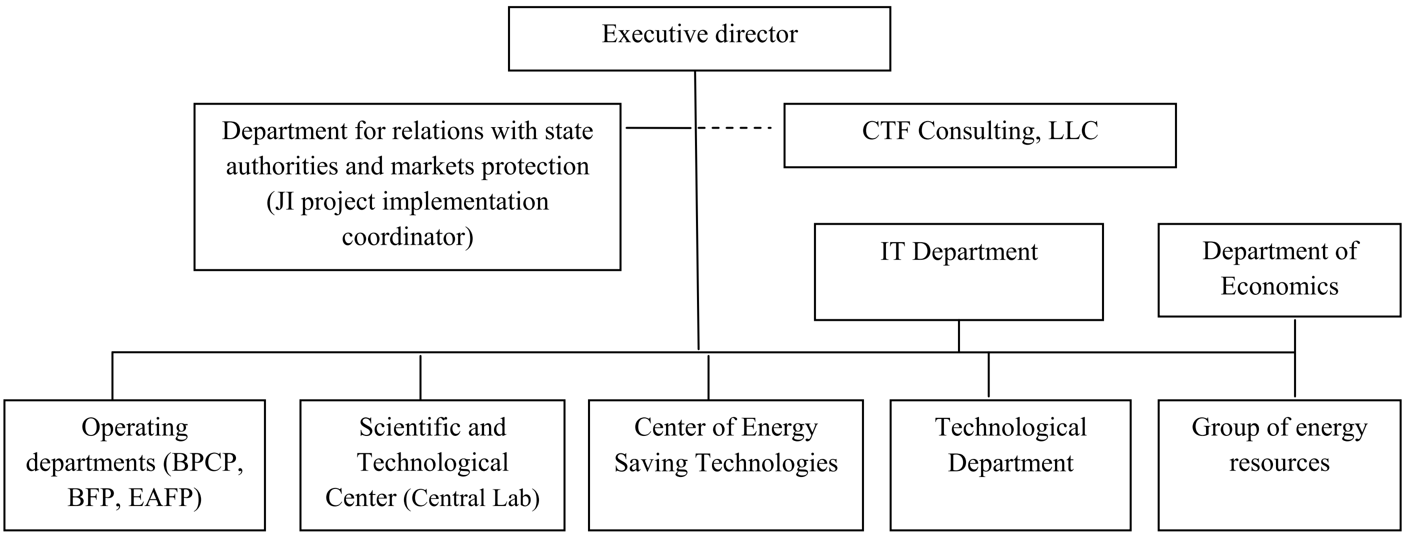

Table B.3.1. Responsibility of departments for monitoring parameters

#	Department	Monitoring parameter
1	By-product coke plant	1. Consumption of dry coal charge 2. Production of dry metallurgical coke 3. Production of crude benzol 4. Output of dry coal tar
2	Blast-furnace plant	5. Consumption of dry skip metallurgical coke 6. Production of pig iron
3	Electric arc-furnace plant	7. Consumption of pig iron in EAFP 8. Consumption of carbon-containing powder in EAFP 9. Consumption of scrap metal in EAFP 10. Consumption of electrodes in EAFP 11. Output of slab steel billet in EAFP 12. Total production of slab and profiled steel billet in EAFP 13. Total smelting of steel in EAF-180
4	Technological department	14. Total electricity consumption by MMK 15. Electricity purchase from Unified Energy System of Urals grid 16. Total electricity consumption in EAFP 17. Consumption of grid electricity by EAF-180

		18. Consumption of BFG in CPP 19. Consumption of NG in CPP 20. Consumption of NG in CHPP 21. Consumption of BFG in SABPP 22. Consumption of COG in SABPP 23. Consumption of NG in SABPP 24. Consumption of NG in turbine section of SP 25. Consumption of NG in recovery unit of SP 26. Consumption of power station coal by CHPP 27. Generation of air blast at MMK 28. Consumption of BFG in SABPP for generation of air blast 29. Consumption of COG in SABPP for generation of air blast 30. Consumption of NG in SABPP for generation of air blast 31. Output of oxygen by oxygen-compressor shop (OCS) #1 32. Output of oxygen by oxygen-compressor shop (OCS) #2 33. Specific electricity consumption for production of oxygen in OCS #1 34. Specific electricity consumption for production of oxygen in OCS #2
5	Center of Energy Saving Technologies	35. Consumption of BFG in BPCP 36. Carbon content in BFG 37. Consumption of COG in BPCP 38. Carbon content in COG 39. Consumption of NG in BPCP 40. Output of COG in BPCP 41. Consumption of COG in BFP 42. Consumption of NG in BFP 43. Consumption of BFG in BFP 44. Output of BFG in BFP 45. Consumption of NG in EAFP 46. Consumption of nitrogen in EAFP 47. Consumption of pure nitrogen in EAFP 48. Consumption of argon in EAFP 49. Consumption of oxygen in EAFP
6	Central Laboratory of Control in structure of Scientific and Technological Center	50. Carbon content in dry coal charge 51. Carbon content in dry metallurgical coke
7	Gas shop	52. Carbon content in NG

The period of data transfer by structural departments of OJSC "MMK" is monthly within 5 working days after their preparation and approval of paper form. Submission of the reports to Department for relations with state authorities and markets protection is performed by responsible person in electronic form.

Responsible person from department prepares documents containing information about monitoring parameters in electronic format *.doc, *.xls, *.pdf, *.jpeg (depending the type of the document, see Table B.3.2). From e-mail address assigned for each department these files are sent to the e-mail address of Department of informational technologies that is registered as a resource for the monitoring data collection. Then received files are placed on the server of OJSC "MMK". Read access to this server is provided to users on the basis of an application for access to information resource. Editing rights of the electronic documents are restricted. Approved reported documents in paper form are stored in accordance with procedure existing in each department.

Storage of all records on monitoring for JI project (describing the period from January 1, 2008 to December 31, 2012) in electronic form is provided until January 1, 2015 by Department for relations with state authorities and markets protection.

Department for relations with state authorities and markets protection controls the completeness of the data and the term of data transfer. Every quarter all the relevant data are transferred to CTF Consulting, LLC. (consultant for the project) by e-mail. Similarly the information matrix of parameters, which were changed and other important information is sent to CTF Consulting, LLC in order that relevant definitions are made during a preparation of the monitoring report.

Table B.3.2. List of reporting documents prepared by departments of OJSC "MMK", which are used in project monitoring

#	Organization department	Name of the reporting document in the Quality Management System (QMS)	Format of electronic copy
1	By-product coke plant	Technical report on coking Report on recovery of main products from coke oven gas	.XLS .XLS
2	Blast-furnace plant	Monthly technical report of BFP	.XLS
3	Electric arc-furnace plant	Technical report of EAFP	.XLS
4	Electric arc-furnace plant	Reference on consumption of pig iron, metallurgical scrap, carbon-containing powders, electrodes	.XLS
5	Technological department	Summary of energy consumption by departments of OJSC "MMK"	.XLS
6	Technological department	Analysis of energy resources consumption by OJSC "MMK" (form QMS (2) -32-0)	.XLS
7	Technological department	Fuel consumption by type of product of power plants	.XLS
8	Central Laboratory of Control in structure of Scientific and Technological Center	Carbon content in dry coal charge and metallurgical coke of BPCP of OJSC "MMK".	.JPEG (scan of the table with signature laboratory head)
10	Central Laboratory of Control in structure of Scientific and Technological Center	Monthly average data of agglomerates, iron-ore raw materials and flux	.XLS
11	Center of Energy Saving Technologies	Report on balance of blast furnace gas consumption in workshops	.XLS

12	Center of Energy Saving Technologies	Report on balance of coke over gas consumption in workshops	.XLS
13	Center of Energy Saving Technologies	Report on balance of natural gas consumption in workshops	.XLS
14	Center of Energy Saving Technologies	Products distribution of the oxygen plant, delivered by pipeline to consumers	.XLS
15	Center of Energy Saving Technologies	Results of analysis of coke over gas	.XLS
16	Center of Energy Saving Technologies	Results of analysis of blast furnace gas	.XLS
17	Chief powerman department, Gas shop	Natural gas quality passport (provided by supplier)	.PDF/.JPEG (scan of the passport)

CTF Consulting, LLC define the value of technological losses during transportation and distribution of grid electricity in Unified Energy System of Urals from the annual report of Urals Inter-regional company for distribution of grid electricity posted in Internet (http://www.mrsk-ural.ru/).

B.4. Approach for organization of baseline emissions and monitoring report preparation

Necessary information for monitoring baseline CO_2 emissions contains in quarterly analytic report "Analysis of the expenditure of materials and process fuel by production of pig iron, steel and rolled iron at ferrous metallurgy works" by "Corporation CHERMET", LLC (http://www.k-chermet.ru). MMK is a regular subscriber of this report for many years. This analytic report was transferred by Department for relations with state authorities and markets protection to CTF Consulting, LLC for further processing.

Within 10 working days after receipt of the complete set of reporting forms for the project and baseline emission calculation the specialists of CTF Consulting, LLC calculate CO_2 emission reduction achieved by JI project for each quarter. The results of calculation are reported to the Department for relations with state authorities and markets protection.

Monitoring report is approved by Chief financial officer of OJSC "MMK".

C. Adjustments and deviations from the monitoring plan presented in PDD

Present monitoring report contains some adjustments and deviations from the monitoring plan presented in section D of PDD, version 1.2 of February 01, 2011 (for this version of PDD the Bureau Veritas Certification Holding SAS has issued a determination report № RUSSIA-det/0105/2010 version 02 of February 08, 2011). The changes have been made to adapt a monitoring plan and represent the actually existing situation. Other monitoring parameters and calculation formulae are in compliance with PDD.

Mentioned in PDD	Implemented in practice	Explanation
Table D.1.1.1. **Parameter %C $_{coking\ coal\_CP\_PJ}$ - Carbon content in dry coal charge** Recording frequency – 2 times a day Each incoming batch of coal is analyzed. Monthly average value is used.	Carbon analyzer LECO SC144DR failed in August 2011. For this reason appropriate data was not available from September until December 2011. In the calculations the value of the carbon content in dry coal charge for the period September – December 2011 was taken as monthly average value for the period January – August 2011 (**80,19 % by mass.**).	A deviation in average values of carbon content in coal charge and metallurgical coke (on dry weight) was less than 1% by mass in the period from January to August 2011, which suggests a stable composition of the coal charge loaded into the coke ovens. It is achieved by pre-mixing of different types of coking coal before it is fed to the ovens. This is a common practice of the enterprise. According to the MMK data based on regular measurements in previous years, the carbon content in coal charge didn't fell below 79% by mass and in metallurgical coke didn't fell below 83% by mass[11]. Besides the recent monitoring data from MMK (2010) shows that the average carbon content in coal charge was 80.34 % by mass and the average carbon content in metallurgical coke was 83.02 % by mass respectively what confirms that these values are fairly stable in the long-term period. In case of application of default values from 2006 IPCC Guidelines for National Greenhouse Gas Inventories Chapter 4. Table 4.3. (carbon content in coal charge is 73 % by mass and carbon content in
Table D.1.1.1. **Parameter %C $_{metallurgical\ coke\_PJ}$ - Carbon content in dry metallurgical coke** Recording frequency – 2 times a day Averaged over sample measurements.	Carbon analyzer LECO SC144DR failed in August 2011. For this reason appropriate data was not available from September until December 2011. In the calculations the value of the carbon content in metallurgical coke for the period September – December 2011 was taken as monthly average value for the period January – August 2011 (**83,10 % by mass.**).	

[11] Letter from Head of BPCP production mr. Shashkov to CTF Consulting, LLC by 29 May 2009

		metallurgical coke is 83 % by mass) the existing carbon balance for coke and iron production processes developed in the PDD and Monitoring report will be heavily disturbed. Applying the default values of IPCC 2006 for CO_2 emission calculations in year 2011 the total mass of carbon in the input flow for production of metallurgical coke in BPCP would be decreased by 8.2% (474 ths. tones C) meanwhile total mass of carbon in the output flow from production of metallurgical coke would be decreased only by 0.1 % (4.6 ths. tones C). Thereby for production of 4626.3 ths. tones of metallurgical coke in BPCP in 2011 the greater quantities of coal charge would need to be used in case of proposed lower carbon content of coal charge (73 % by mass instead of actually applied 80.19 % by mass). Taking into account statements above it seems to be rather correct and acceptable approach in the absence of data of instrumental measurements for the period of September-December 2011 to apply the monthly average value of carbon content in coal charge and metallurgical coke for the period January – August 2011 instead of using the respective IPCC default values.
Production of profiled steel billet in EAFP $PE_{EAFP} = [(M_{pig\ iron\_EAFP} * \%C_{pig\ iron}) + (M_{carbon\ powder\_EAFP} * \%C_{carbon\ powder\_EAFP}) + (M_{scrap\_EAFP} * \%C_{scrap}) + (M_{electrodes\_EAFP} * \%C_{electrodes\_EAFP}) + (FC_{NG\_EAFP} * C_{NG\_PJ}) - (\sum P_{profiled\&slab\ steel\_EAFP} * \%C_{steel})] * 44/12$ **(D.1.1.2.-5)**	In addition to raw materials pig-iron and scrap metal the HBI was consumed in EAFP in October 2011. Thereby the formula D.1.1.2.-5. is changed to the form: $PE_{EAFP} = [(M_{pig\ iron\_EAFP} * \%C_{pig\ iron}) + (M_{HBI\_EAFP} * \%C_{HBI}) + (M_{carbon\ powder\_EAFP} * \%C_{carbon\ powder\_EAFP}) + (M_{scrap\_EAFP} * \%C_{scrap}) + (M_{electrodes\_EAFP} * \%C_{electrodes\_EAFP}) + (FC_{NG\_EAFP} * C$	The source of data of new monitoring parameter: **Consumption of HBI in EAFP (M_{HBI_EAFP}, thousand tons):** The source of data of consumption of HBI in EAFP is monthly form Reference on consumption of pig iron, metallurgical scrap, carbon-containing powders, and electrodes (SMQ EAFP-49-0). **Carbon content in HBI ($\%C_{HBI}$, % by mass):**

Where: PE_{EAFP} – Project CO_2 emissions from production of profiled steel billet in EAFP, thousand tons of CO_2 $M_{pig\ iron\_EAFP}$ – Consumption of pig iron in EAFP, thousand tons $\%C_{pig\ iron}$ – Carbon content in pig iron, % by mass $M_{carbon\ powder\_EAFP}$ – Consumption of carbon-containing powder in EAFP, thousand tons $\%C_{carbon\ powder\_EAFP}$ – Carbon content in carbon-containing powder, % by mass M_{scrap_EAFP} – Consumption of scrap metal in EAFP, thousand tons $\%C_{scrap}$ – Carbon content in scrap metal, % by mass $M_{electrodes\_EAFP}$ – Consumption of electrodes in EAFP, thousand tons $\%C_{electrodes\_EAFP}$ – Carbon content in electrodes, % by mass FC_{NG_EAFP} – Consumption of NG in EAFP, million m^3 C_{NG_PJ} – Carbon content in NG, kg C/m^3 $\sum P_{profiled\&slab\ steel\_EAFP}$ – Total production of slab and profiled steel billet in EAFP, thousand tons $\%C_{steel}$ – Carbon content in steel, % by mass	$_{NG\_PJ})$ - $(\sum P_{profiled\&slab\ steel\_EAFP} * \%C_{steel})] * 44/12$ (D.1.1.2.-5) Where: PE_{EAFP} – Project CO_2 emissions from production of profiled steel billet in EAFP, thousand tons of CO_2 $M_{pig\ iron\_EAFP}$ – Consumption of pig iron in EAFP, thousand tons $\%C_{pig\ iron}$ – Carbon content in pig iron, % by mass **M_{HBI_EAFP} – Consumption of HBI in EAFP, thousand tons** **$\%C_{HBI}$ – Carbon content in HBI, % by mass** $M_{carbon\ powder\_EAFP}$ – Consumption of carbon-containing powder in EAFP, thousand tons $\%C_{carbon\ powder\_EAFP}$ – Carbon content in carbon-containing powder, % by mass M_{scrap_EAFP} – Consumption of scrap metal in EAFP, thousand tons $\%C_{scrap}$ – Carbon content in scrap metal, % by mass $M_{electrodes\_EAFP}$ – Consumption of electrodes in EAFP, thousand tons $\%C_{electrodes\_EAFP}$ – Carbon content in electrodes, % by mass FC_{NG_EAFP} – Consumption of NG in EAFP, million m^3 C_{NG_PJ} – Carbon content in NG, kg C/m^3 $\sum P_{profiled\&slab\ steel\_EAFP}$ – Total production of slab and profiled steel billet in EAFP, thousand tons $\%C_{steel}$ – Carbon content in steel, % by mass Also project CO_2 emissions from production of HBI outside MMK are included in monitoring plan: **$PE_{HBI} = M_{HBI\_EAFP} * SPE_{HBI}$ (D.1.1.2.-5.1)**	The source of data of carbon content in HBI is the data of Lebedinsky GOK included in Metallurgical Holding "Metalloinvest" (http://www.metallinvest.ru/catalog/ironore/ru/lebedinskiy/003/BRIKETI_ZHELEZNOY_RUDI.html). Lebedinsky GOK is the only Russian producer of high value-added HBI, a direct substitute for ferrous raw material for steel production. Therefore usage of Lebedinsky GOK data is just. This monitoring parameter is fixed ex ante only for the project **(1,13 % by mass).** **Specific CO_2 emissions per ton HBI produced in metallurgical plants (SPE_{HBI}, ton CO_2/ton):** The source of data of specific CO_2 emissions per ton HBI produced in metallurgical plants is 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 3, Chapter 4, Table 4.1, p.4.25. This monitoring parameter is fixed ex ante only for the project **(0,7 ton CO_2/ton of HBI).**

	Where: PE_{HBI} – Project CO_2 emissions from production of HBI outside MMK, thousand tons of CO_2 M_{HBI_EAFP} – Consumption of HBI in EAFP, thousand tons SPE_{HBI} – Specific CO_2 emissions per ton HBI produced in metallurgical plants, ton CO_2/ton HBI Formula for calculation of specific CO_2 emissions per ton of profiled steel billet produced in EAFP (D.1.1.2.-6) is reduced to the form: ***Specific CO_2 emissions per ton of profiled steel billet produced in EAFP*** $SPE_{EAFP} = (PE_{EAFP} + \mathbf{PE_{HBI}}) / \sum P_{profiled\&slab\ steel\_EAFP}$ (D.1.1.2.-6) Where: SPE_{EAFP} – specific CO_2 emissions per ton of steel billet produced in EAFP, ton CO_2/ton PE_{EAFP} – project CO_2 emissions from production of steel billet in EAFP, thousand tons of CO_2 **PE_{HBI} – Project CO_2 emissions from production of HBI outside MMK, thousand tons of CO_2** $\sum P_{profiled\&slab\ steel\_EAFP}$ – Total production of slab and profiled steel billet in EAFP, thousand tons	

Electricity consumption for production of nitrogen, which is used during production of profiled steel billet in EAFP $\mathbf{EC_{N2\_profiled\_steel} = SEC_{N2\_PJ} * V_{N2\_EAFP} * P_{profiled\_steel\_EAFP} / \sum P_{profiled\&slab\ steel\_EAFP}}$ **(D.1.1.2.-19)** Where: SEC_{N2_PJ} – Specific electricity consumption for production of nitrogen at MMK, MWh/1000 m^3 V_{N2_EAFP} – Consumption of nitrogen in EAFP, million m^3 $P_{profiled\_steel\_EAFP}$ - Output of profiled steel billet in EAFP, thousand tons $\sum P_{profiled\&slab\ steel\_EAFP}$ - Total production of slab and profiled steel billet in EAFP, thousand tons	Since July 2010 the value of specific electricity consumption for production of nitrogen is not defined and fixed as **150 kWh/1000 m^3**.	The value of parameter had been fixed ex-ante for the remaining monitoring period of the project or until appearance of possibility for the instrumental measurement on the parameter. Detailed justification is presented in the Monitoring report of JI project "Implementation of arc-furnace steelmaking at Magnitogorsk iron and steel works" for the period 01.01.2010 – 31.12.2010.
Electricity consumption for production of pure nitrogen, which is used during production of profiled steel billet in EAFP $\mathbf{EC_{pure\_N2\_profiled\_steel} = SEC_{pure\_N2\_PJ} * V_{pure\_N2\_EAFP} * P_{profiled\_steel\_EAFP\_} / \sum P_{profiled\&slab\ steel\_EAFP}}$ **(D.1.1.2.-20)** Where: $SEC_{pure\_N2\_PJ}$ – Specific electricity consumption for production of pure nitrogen at MMK, MWh/1000 m^3 $V_{pure\_N2\_EAFP}$ – Consumption of pure nitrogen in EAFP, million m^3 $P_{profiled\_steel\_EAFP}$ - Output of profiled steel billet in EAFP, thousand tons $\sum P_{profiled\&slab\ steel\_EAFP}$ - Total production of slab and profiled steel billet in EAFP, thousand tons.	In 2011-2012 the value of: - Specific electricity consumption for production of pure nitrogen is **826 kWh/1000 m^3** - Specific electricity consumption for production of argon is **55 kWh/1000 m^3**	The value of parameter had been fixed ex-ante for the remaining monitoring period of the project or until appearance of possibility for the instrumental measurement on the parameter. Detailed justification is presented in the Monitoring report of JI project "Implementation of arc-furnace steelmaking at Magnitogorsk iron and steel works" for the period 01.01.2010 – 31.12.2010.

Electricity consumption for production of argon, which is used during production of profiled steel billet in EAFP $EC_{Ar\_profiled\_steel} = SEC_{Ar\_PJ} * V_{Ar\_EAFP} * P_{profiled\_steel\_EAFP} / \sum P_{profiled\&slab\ steel\_EAFP}$ **(D.1.1.2.-21)** Where: SEC_{Ar_PJ} – Specific electricity consumption for production of argon at MMK, MWh/1000 m^3 V_{Ar_EAFP} – Consumption of argon in EAFP, million m^3 $P_{profiled\_steel\_EAFP}$ - Output of profiled steel billet in EAFP, thousand tons $\sum P_{profiled\&slab\ steel\_EAFP}$ - Total production of slab and profiled steel billet in EAFP, thousand tons.		
D.3. Please describe the operational and management structure that the project operator will apply in implementing the monitoring plan: See text and diagrams in the PDD, section D.3.	**B.3. Approach for organization and implementation of monitoring** During monitoring period OJSC "MMK" has reorganized the names and functions of some departments: Department for relations with state authorities and markets protection -> Carbon market group (JI project implementation coordinator) Central Laboratory of Control in structure of Scientific and Technological Center -> Scientific and Technological Center (Central Lab) Gas shop -> Group of energy resources However the basic management structure of the monitoring is the same as described in the PDD. The only important deviation is that monitoring report is approved by Chief financial officer of	

	OJSC "MMK" instead of Executive director of OJSC "MMK" to accelerate the general approval process.	

D. Calculation of GHG emissions reduction

D.1 CO_2 emissions from metallurgical conversions calculated by carbon balance method

<u>Production of metallurgical coke</u>

$PE_{metallurgical\_coke} = [(M_{coking\ coal\_PJ} * \%C_{coking\ coal\_PJ}) + (FC_{BFG\_CP\_PJ} * C_{BFG\_PJ}) + (FC_{COG\_CP\_PJ} * C_{COG\_PJ}) + (FC_{NG\_CP\_PJ} * C_{NG\_PJ}) - (P_{metallurgical\ coke\_PJ} * \%C_{metallurgical\ coke\_PJ}) - (P_{COG\_CP\_PJ} * C_{COG\_PJ}) - (P_{benzol\_PJ} * \%C_{benzol}) - (P_{coal\text{-}tar\_PJ} * \%C_{coal\text{-}tar})] * 44/12$ (PDD formula D.1.1.2.-1)

Specific CO_2 emissions per ton of produced metallurgical coke

$SPE_{metallurgical\ coke} = PE_{metallurgical\ coke} / P_{metallurgical\ coke\_PJ}$ (PDD formula D.1.1.2.-2)

Symbol	Data variable	Unit	Symbol	Data variable	Unit	Symbol	Data variable	Unit
$M_{coking\ coal\_PJ}$	Consumption of coal charge in BPCP (on dry mass)	ths. tons	C_{COG_PJ}	Carbon content in COG	kg C/m^3	$P_{COG\_CP\_PJ}$	Output of COG in BPCP	mln. m^3
$\%C_{coking\ coal\_PJ}$	Carbon content in dry coal charge	% by mass	$FC_{NG\_CP\_PJ}$	Consumption of NG in BPCP	mln. m^3	P_{benzol_PJ}	Production of crude benzol	ths. tons
$FC_{BFG\_CP\_PJ}$	Consumption of BFG in BPCP	mln. m^3	C_{NG_PJ}	Carbon content in NG	kg C/m3	$P_{coal\text{-}tar\_PJ}$	Output of dry coal tar	ths. tons
C_{BFG_PJ}	Carbon content in BFG	kg C/m^3	$P_{metallurgical\ coke\_PJ}$	Production of dry metallurgical coke	ths. tons	$PE_{metallurgical\_coke}$	Project emissions from production of metallurgical coke in BPCP	ths. tons CO_2
$FC_{COG\_CP\_PJ}$	Consumption of COG in BPCP	mln. m^3	$\%C_{metallurgical\ coke\_PJ}$	Carbon content in dry metallurgical coke	% by mass	$SPE_{metallurgical\ coke}$	Specific CO_2 emissions per ton of dry metallurgical coke produced in BPCP	ton CO_2/ ton

Specific CO_2 emissions form metallurgical conversions same for project and baseline. Production of metallurgical coke

12 months of 2011

Input carbon flows

#	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total for year
1	Consumption of coal charge in BPCP (on dry mass)	ths. tons	594,7	536,4	592,9	545,8	505,1	571,0	560,5	605,5	562,6	532,6	505,6	482,5	**6595,2**
	Carbon content in dry coal charge	% by mass	80,15	80,81	80,65	80,05	79,95	80,35	79,80	79,75	80,19	80,19	80,19	80,19	**80,19**
		ths. tons C	476,7	433,5	478,2	436,9	403,8	458,8	447,3	482,9	451,2	427,1	405,4	386,9	**5288,6**
2	Consumption of COG in BPCP	mln. m3	58,2	52,0	58,8	54,7	50,5	60,3	58,5	64,5	58,3	52,0	48,0	44,6	**660,4**
	Carbon content in COG	kg C/m3	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	**0,19**
		ths. tons C	10,8	9,7	11,2	10,6	9,8	11,2	11,3	12,0	11,0	9,9	9,3	8,5	**125,2**
	Consumption of BFG in BPCP	mln. m3	146,2	133,5	142,3	126,0	117,1	119,2	119,9	124,2	122,1	128,9	129,8	130,7	**1539,8**
	Carbon content in BFG	kg C/m3	0,22	0,22	0,22	0,21	0,22	0,22	0,21	0,22	0,21	0,21	0,22	0,22	**0,22**
		ths. tons C	32,4	29,4	30,8	26,7	25,3	25,9	25,7	26,8	26,1	27,4	28,1	28,5	**333,1**
	Consumption of NG in BPCP	mln. m3	2,9	2,7	2,4	1,2	0,9	0,8	0,9	0,9	0,8	1,0	2,4	2,1	**19**
	Carbon content in NG	kg C/m3	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	**0,49**
		ths. tons C	1,4	1,3	1,2	0,6	0,4	0,4	0,4	0,4	0,4	0,5	1,2	1,0	**9,5**
3	**Total mass of carbon in the input flow for production of metallurgical coke**	**ths. tons C**	**521,3**	**473,9**	**521,4**	**474,7**	**439,4**	**496,4**	**484,7**	**522,1**	**488,6**	**464,9**	**444,1**	**424,9**	**5756,3**

Output carbon flows

#	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total for year
1	Production of dry metallurgical coke	ths. tons	416,2	379,8	418,2	385,4	355,5	399,0	389,2	422,1	393,5	368,8	358,0	340,7	**4626,3**
	Carbon content in dry metallurgical coke	% by mass	82,96	82,96	83,11	83,23	83,31	83,25	83,12	82,88	83,10	83,10	83,10	83,10	**83,10**
		ths. tons C	345,3	315,0	347,6	320,8	296,1	332,2	323,5	349,8	327,0	306,5	297,5	283,1	**3844,4**
2	Output of COG in BPCP	mln. m3	196,8	175,2	195,6	177,9	161,9	184,3	184,7	196,9	184,5	164,3	159,5	154,2	**2135,7**
	Carbon content in COG	kg C/m3	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	**0,19**
		ths. tons C	36,5	32,7	37,3	34,3	31,5	34,3	35,7	36,5	34,7	31,4	30,9	29,3	**405,1**
3	Output of dry coal tar	ths. tons	21,0	16,7	16,7	16,7	16,8	18,7	18,8	20,2	18,6	17,2	17,7	14,5	**213,6**
	Carbon content in dry coal tar	% by mass	86,00	86,00	86,00	86,00	86,00	86,00	86,00	86,00	86,00	86,00	86,00	86,00	**86,00**
		ths. tons C	18,0	14,4	14,4	14,4	14,5	16,1	16,2	17,4	16,0	14,8	15,2	12,5	**183,7**
4	Production of crude benzol	ths. tons	5,9	5,3	5,3	5,1	4,8	5,5	5,1	6,1	5,7	5,3	4,9	4,9	**63,7**

Specific CO_2 emissions form metallurgical conversions same for project and baseline. Production of metallurgical coke

	Carbon content in crude benzol	%	90,00	90,00	90,00	90,00	90,00	90,00	90,00	90,00	90,00	90,00	90,00	90,00	**90,00**
		ths. tons C	5,3	4,8	4,8	4,5	4,3	4,9	4,6	5,5	5,1	4,8	4,4	4	**57,3**
5	**Total mass of carbon in the output flow from production of metallurgical coke**	**ths. tons C**	**405,1**	**366,9**	**404,0**	**374,0**	**346,4**	**387,5**	**379,9**	**409,3**	**382,7**	**357,4**	**348,0**	**329,3**	**4490,5**

CO2 emissions from production of metallurgical coke

#	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total for year
1	Burning of carbon during production of metallurgical coke	ths. tons C	116,2	107,1	117,4	100,7	93,0	108,8	104,8	112,8	105,9	107,5	96,1	95,6	**1265,9**
2	CO2 emissions from production of metallurgical coke in BPCP	ths. tons CO2	426,1	392,6	430,5	369,2	340,9	399,1	384,1	413,7	388,3	394,2	352,3	350,5	**4641,5**
3	**Specific CO2 emissions per ton of produced metallurgical coke**	**ton CO2/ton**	**1,024**	**1,034**	**1,029**	**0,958**	**0,959**	**1,000**	**0,987**	**0,980**	**0,987**	**1,069**	**0,984**	**1,029**	**1,003**

Specific CO_2 emissions form metallurgical conversions same for project and baseline. Production of metallurgical coke

9 months of 2012

Input carbon flows

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total
1	Consumption of coal charge in BPCP (on dry mass)	ths. tons	563,4	533,2	581,8	569,1	572,4	565,1	581,0	565,0	555,9	**5087,0**
	Carbon content in dry coal charge	% by mass	80,35	80,06	80,80	80,29	80,76	81,14	80,64	79,99	79,63	**80,41**
		ths. tons C	452,7	426,9	470,1	456,9	462,3	458,5	468,5	452,0	442,7	**4090,6**
2	Consumption of COG in BPCP	mln. m3	53,2	51,7	58,2	56,2	59,1	57,6	59,9	58,1	57,8	**511,9**
	Carbon content in COG	kg C/m3	0,19	0,20	0,20	0,19	0,19	0,19	0,19	0,19	0,19	**0,19**
		ths. tons C	10,2	10,1	11,6	10,9	11,3	11,0	11,3	11,1	11,0	**98,6**
	Consumption of BFG in BPCP	mln. m3	146,8	133,7	137,3	133,3	127,8	129,7	129,1	125,9	121,3	**1184,9**
	Carbon content in BFG	kg C/m3	0,21	0,22	0,22	0,22	0,22	0,22	0,21	0,21	0,21	**0,22**
		ths. tons C	31,3	29,7	30,3	28,8	27,8	28,4	27,3	26,7	25,5	**255,8**
	Consumption of NG in BPCP	mln. m3	2,6	2,6	2,4	1,1	0,8	0,8	0,8	0,8	0,7	**13**
	Carbon content in NG	kg C/m3	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	**0,49**
		ths. tons C	1,3	1,3	1,2	0,5	0,4	0,4	0,4	0,4	0,4	**6,2**
3	**Total mass of carbon in the input flow for production of metallurgical coke**	**ths. tons C**	**495,5**	**468,0**	**513,2**	**497,1**	**501,8**	**498,3**	**507,5**	**490,1**	**479,6**	**4451,1**

Output carbon flows

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total
1	Production of dry metallurgical coke	ths. tons	398,1	375,5	410,1	400,2	401,1	397,6	410,1	397,7	392,0	**3582,5**
	Carbon content in dry metallurgical coke	% by mass	83,00	83,08	83,13	83,04	83,08	83,00	82,96	83,08	83,21	**83,06**
		ths. tons C	330,5	312,0	340,9	332,3	333,2	330,0	340,2	330,4	326,2	**2975,7**
2	Output of COG in BPCP	mln. m3	174,1	171,2	182,9	173,9	179,9	177,2	182,7	184,5	179,2	**1605,6**
	Carbon content in COG	kg C/m3	0,19	0,20	0,20	0,19	0,19	0,19	0,19	0,19	0,19	**0,14**
		ths. tons C	33,4	33,6	36,4	33,7	34,5	33,8	34,4	35,2	34,2	**309,3**
3	Output of dry coal tar	ths. tons	19,3	17,4	20,0	19,0	19,1	18,2	19,3	17,4	17,2	**166,7**
	Carbon content in dry coal tar	% by mass	86,00	86,00	86,00	86,00	86,00	86,00	86,00	86,00	86,00	**86,00**
		ths. tons C	16,6	14,9	17,2	16,3	16,4	15,7	16,6	14,9	14,8	**143,4**
4	Production of crude benzol	ths. tons	5,8	5,3	6,1	5,8	5,6	5,0	5,8	5,1	5,6	**50,1**
	Carbon content in crude benzol	% by mass	90,00	90,00	90,00	90,00	90,00	90,00	90,00	90,00	90,00	**90,00**
		ths. tons C	5,2	4,8	5,5	5,3	5,0	4,5	5,2	4,6	5,1	**45,1**

Specific CO_2 emissions form metallurgical conversions same for project and baseline. Production of metallurgical coke

5	**Total mass of carbon in the output flow from production of metallurgical coke**	**ths. tons C**	**385,6**	**365,3**	**400,0**	**387,6**	**389,1**	**384,0**	**396,4**	**385,2**	**380,3**	**3473,5**

CO_2 emissions from production of metallurgical coke

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total
1	Burning of carbon during production of metallurgical coke	ths. tons C	109,9	102,7	113,2	109,5	112,7	114,3	111,1	105,0	99,3	**977,6**
2	CO_2 emissions from production of metallurgical coke in BPCP	ths. tons CO_2	402,9	376,5	415,1	401,5	413,3	419,1	407,2	384,9	364,1	**3584,7**
3	**Specific CO_2 emissions per ton of produced metallurgical coke**	**ton CO_2/ton**	**1,012**	**1,003**	**1,012**	**1,003**	**1,031**	**1,054**	**0,993**	**0,968**	**0,929**	**1,001**

Specific CO_2 emissions form metallurgical conversions same for project and baseline. Production of metallurgical coke

Production of pig iron

$$PE_{pig\_iron} = [(M_{skip\_metallurgical\ coke\_BF\_PJ} * \%C_{metallurgical\ coke\_PJ}) + (FC_{COG\_BF\_PJ} * C_{COG\_PJ}) + (FC_{NG\_BF\_PJ} * C_{NG\_PJ}) + (FC_{BFG\_BF\_PJ} * C_{BFG\_.PJ}) - - (P_{pig\ iron\_BF\_PJ} * \%C_{pig\ iron}) - (P_{BFG\_BF\_PJ} * C_{BFG\_PJ})] * 44/12$$

(PDD formula D1.1.2.-3)

Specific CO2 emissions per ton of pig iron produced

$$SPE_{pig\ iron} = PE_{pig\_iron} / P_{pig\ iron\_BF\_PJ}$$

(PDD formula D.1.1.2.-4)

Symbol	Data variable	Unit	Symbol	Data variable	Unit
$M_{skip\ metallurgical\ coke\_BF\_PJ}$	Consumption of skip metallurgical coke in BFP	ths. tons	$P_{pig\ iron\_BF\_PJ}$	Production of pig iron in BFP	ths. tons
$FC_{COG\_BF\_PJ}$	Consumption of COG in BFP	mln. m^3	$P_{BFG\_BF\_PJ}$	Output of BFG in BFP	mln. m^3
$FC_{NG\_BF\_PJ}$	Consumption of NG in BFP	mln. m^3	C_{NG_PJ}	Carbon content in NG	kg C/m^3
$FC_{BFG\_BF\_PJ}$	Consumption of BFG in BFP	mln. m^3	$C_{BFG\_.PJ}$	Carbon content in BFG	kg C/m^3
C_{COG_PJ}	Carbon content in COG	kg C/m^3	$PE_{pig\ iron}$	Project emissions from production of pig iron in the blast furnace plant	ths. tons CO_2
$\%C_{pig\ iron}$	Carbon content in pig iron	% by mass	$SPE_{pig\ iron}$	Specific CO_2 emissions per ton of produced pig iron	ton CO_2/ton
$\%C_{metallurgical\ coke\_PJ}$	Carbon content in metallurgical coke	% by mass			

Specific CO_2 emissions form metallurgical conversions same for project and baseline. Production of pig iron

12 months of 2011

Input carbon flows

#	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total for year
1	Consumption of skip metallurgical coke in BFP	ths. tons	374,5	347,4	378,1	353,3	326,4	367,6	355,2	380,8	353,7	343,0	326,7	328,8	**4235,3**
	Carbon content in dry metallurgical coke	%by mass	82,96	82,96	83,11	83,23	83,31	83,25	83,12	82,88	83,10	83,10	83,10	83,10	**83,10**
		ths. tons C	310,7	288,2	314,2	294,0	271,9	306,0	295,2	315,6	293,9	285,1	271,5	273,2	**3519,5**
2	Consumption of COG in BFP	mln. m3	8,2	6,3	6,9	4,8	2,8	2,6	4,8	4,7	4,6	4,8	4,8	3,3	**58,5**
	Carbon content in COG	kg C/m3	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	**0,19**
		ths. tons C	1,51	1,17	1,31	0,93	0,54	0,49	0,93	0,88	0,87	0,92	0,92	0,62	**11,1**
	Consumption of NG in BFP	mln. m3	98,0	89,8	95,2	89,9	79,0	85,3	89,2	92,8	88,8	85,8	82,3	86,4	**1062,7**
	Carbon content in NG	kg C/m3	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	**0,49**
		ths. tons C	48,5	44,4	47,1	44,5	39,1	42,2	44,1	45,9	43,8	42,4	40,7	42,8	**525,4**
	Consumption of BFG in BFP	mln. m3	388,4	356,9	383,0	364,3	324,1	356,6	354,5	371,6	358,1	376,9	343,3	347,4	**4325,3**
	Carbon content in BFG	kg C/m3	0,22	0,22	0,22	0,21	0,22	0,22	0,21	0,22	0,21	0,21	0,22	0,22	**0,22**
		ths. tons C	86,0	78,7	82,8	77,2	70,2	77,5	75,8	80,2	76,5	80,2	74,4	75,6	**935,2**
3	**Total mass of carbon in the input flow for production of pig iron**	**ths. tons C**	**446,7**	**412,5**	**445,4**	**416,6**	**381,7**	**426,2**	**416,1**	**442,7**	**415,2**	**408,6**	**387,5**	**392,2**	**4991,1**

Output carbon flows

#	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total for year
1	Production of pig iron in BFP	ths. tons	850,6	778,4	841,8	778,8	721,7	808,2	792,0	847,8	799,9	784,1	744,8	748,1	**9496,3**
	Carbon content in pig iron	% by mass	4,70	4,70	4,70	4,70	4,70	4,70	4,70	4,70	4,70	4,70	4,70	4,70	**4,70**
		ths. tons C	40	37	40	37	34	38	37	40	38	37	35	35	**446**
2	Output of BFG in BFP	mln. m3	1168,6	1055,2	1156,5	1059,6	982,3	1094,9	1101,9	1159,0	1092,1	1075,8	1031,1	1039,3	**13016,2**
	Carbon content in BFG	kg C/m3	0,22	0,22	0,22	0,21	0,22	0,22	0,21	0,22	0,21	0,21	0,22	0,22	**0,22**
		ths. tons C	258,8	232,7	249,9	224,4	212,7	238,0	235,7	250,3	233,5	228,9	223,4	226,2	**2814,5**
3	**Total mass of carbon in the output flow from production of pig iron**	**ths. tons C**	**298,8**	**269,2**	**289,5**	**261,0**	**246,6**	**276,0**	**273,0**	**290,1**	**271,0**	**265,8**	**258,4**	**261,4**	**3260,8**

CO2 emissions from production of pig iron

#	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total for year
1	Carbon burning during production of pig iron	ths. tons	147,9	143,2	155,9	155,5	135,1	150,2	143,1	152,5	144,1	142,8	129,1	130,9	**1730,3**
2	CO2 emissions from production of pig iron in the blast furnace plant	ths. tons CO2	542,3	525,2	571,6	570,3	495,3	550,6	524,8	559,3	528,4	523,7	473,2	479,9	**6344,6**
3	**Specific CO2 emissions per ton of pig iron produced**	**ton CO2/ton**	**0,638**	**0,675**	**0,679**	**0,732**	**0,686**	**0,681**	**0,663**	**0,660**	**0,661**	**0,668**	**0,635**	**0,641**	**0,668**

Specific CO_2 emissions form metallurgical conversions same for project and baseline. Production of pig iron

9 months of 2012

Input carbon flows

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total
1	Consumption of skip metallurgical coke in BFP	ths. tons	365,7	345,9	372,6	362,3	373,2	361,1	376,6	369,7	359,7	**3286,9**
	Carbon content in dry metallurgical coke	% by mass	83,00	83,08	83,13	83,04	83,08	83,00	82,96	83,08	83,21	**62,30**
		ths. tons C	303,6	287,4	309,7	300,9	310,1	299,7	312,4	307,2	299,3	**2730,2**
2	Consumption of COG in BFP	mln. m3	2,4	1,4	1,9	0,2	0,5	0,5	0,03	0,001	0,03	**7,0**
	Carbon content in COG	kg C/m3	0,19	0,20	0,20	0,19	0,19	0,19	0,19	0,19	0,19	**0,14**
		ths. tons C	0,46	0,27	0,38	0,04	0,09	0,10	0,01	0,00	0,01	**1,4**
	Consumption of NG in BFP	mln. m3	93,4	88,6	96,7	94,4	94,9	95,7	96,3	96,5	93,4	**849,9**
	Carbon content in NG	kg C/m3	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	**0,37**
		ths. tons C	46,2	43,8	47,8	46,6	46,9	47,3	47,6	47,7	46,1	**420,1**
	Consumption of BFG in BFP	mln. m3	388,7	370,5	400,9	383,7	375,0	368,4	389,7	373,1	373,2	**3423,2**
	Carbon content in BFG	kg C/m3	0,21	0,22	0,22	0,22	0,22	0,22	0,21	0,21	0,21	**0,16**
		ths. tons C	82,9	82,2	88,6	82,9	81,5	80,6	82,3	79,1	78,6	**738,7**
3	**Total mass of carbon in the input flow for production of pig iron**	**ths. tons C**	**433,1**	**413,7**	**446,5**	**430,4**	**438,6**	**427,7**	**442,3**	**434,0**	**424,1**	**3890,4**

Output carbon flows

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total
1	Production of pig iron in BFP	ths. tons	825,1	792,7	861,4	842,6	867,1	847,7	875,5	859,2	836,1	**7607,3**
	Carbon content in pig iron	% by mass	4,70	4,70	4,70	4,70	4,70	4,70	4,70	4,70	4,70	**4,70**
		ths. tons C	39	37	40	40	41	40	41	40	39	**358**
2	Output of BFG in BFP	mln. m3	1147,4	1100,5	1183,8	1130,8	1139,7	1143,0	1166,6	1130,6	1104,5	**10246,9**
	Carbon content in BFG	kg C/m3	0,21	0,22	0,22	0,22	0,22	0,22	0,21	0,21	0,21	**0,16**
		ths. tons C	244,6	244,2	261,6	244,2	247,8	250,1	246,5	239,7	232,7	**2211,4**
3	**Total mass of carbon in the output flow from production of pig iron**	**ths. tons C**	**283,4**	**281,4**	**302,1**	**283,8**	**288,6**	**290,0**	**287,6**	**280,0**	**272,0**	**2568,9**

CO2 emissions from production of pig iron

Specific CO_2 emissions form metallurgical conversions same for project and baseline. Production of pig iron

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total
1	Burning of carbon during production of pig iron	ths. tons C	149,7	132,3	144,4	146,6	150,0	137,7	154,7	154,0	152,1	**1321,5**
2	Project emissions from production of pig iron in the blast furnace plant	ths. tons CO2	548,8	485,0	529,6	537,5	550,1	505,0	567,3	564,5	557,7	**4845,5**
3	**Specific CO2 emissions per ton of pig iron produced**	**ton CO2/ton**	**0,665**	**0,612**	**0,615**	**0,638**	**0,634**	**0,596**	**0,648**	**0,657**	**0,667**	**0,637**

Specific CO_2 emissions form metallurgical conversions same for project and baseline. Production of pig iron

Production of slab steel billet in EAFP

$$PE_{EAFP} = [(M_{pig\ iron\_EAFP} * \%C_{pig\ iron}) + (M_{carbon\ powder\_EAFP} * \%C_{carbon\ powder\_EAFP}) + (M_{scrap\_EAFP} * \%C_{scrap}) + (M_{electrodes\_EAFP} * \%C_{electrodes\_EAFP}) + (FC_{NG\_EAFP} * C_{NG\_PJ}) - (\sum P_{profiled\&slab\ steel\_EAFP} * \%C_{steel})] * 44/12$$

(PDD formula D.1.1.2-5)

Specific CO2 emissions per ton of steel billet produced in EAFP

$$SPE_{EAFP} = PE_{EAFP} / \sum P_{profiled\&slab\ steel\_EAFP}$$

(PDD formula D.1.1.2-6)

Symbol	Data variable	Unit	Symbol	Data variable	Unit
$M_{pig\ iron\_EAFP}$	Consumption of pig iron in EAFP	ths. tons	FC_{NG_EAFP}	Consumption of NG in EAFP	mln. m^3
$M_{carbon\ powder\_EAFP}$	Consumption of carbon-containing powder in EAFP	ths. tons	$\sum P_{profiled\&slab\ steel\_EAFP}$	Total production of slab and profiled steel billet in EAFP	ths. tons
M_{scrap_EAFP}	Consumption of scrap metal in EAFP	ths. tons	PE_{EAFP}	Project CO_2 emissions from production of slab steel billet in EAFP	ths.tons CO_2
$M_{electrodes\_EAFP}$	Consumption of electrodes in EAFP	ths. tons	SPE_{EAFP}	Specific CO_2 emissions per ton of steel billet produced in EAFP	ton CO_2/ton
$\%C_{pig\ iron}$	Carbon content in pig iron	% by mass	$\%C_{electrodes\_EAFP}$	Carbon content in electrodes	% by mass
$\%C_{carbon\ powder\_EAFP}$	Carbon content in carbon-containing powder	% by mass	C_{NG_PJ}	Carbon content in NG	kg C/m^3
$\%C_{scrap}$	Carbon content in scrap metal	% by mass	$\%C_{steel}$	Carbon content in steel	% by mass

Specific CO_2 emissions from metallurgical conversions in the project only. Production of steel billet in EAFP

12 months of 2011

Input carbon flows

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total per year
1	Consumption of pig iron in EAFP	ths. tons	11,2	82,4	92,7	79,1	58,3	78,3	78,4	107,8	105,4	78,1	90,8	101,6	**964,2**
	Carbon content in pig iron	% by mass	4,70	4,70	4,70	4,70	4,70	4,70	4,70	4,70	4,70	4,70	4,70	4,70	**4,70**
		ths. tons C	0,5	3,9	4,4	3,7	2,7	3,7	3,7	5,1	5,0	3,7	4,3	4,8	**45,3**
2	Hot briquetted iron (HBI)	ths. tons C	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2,29	0,0	0,0	**2,3**
	Carbon content in HBI*	%	1,13	1,13	1,13	1,13	1,13	1,13	1,13	1,13	1,13	1,13	1,13	1,13	**1,13**
		ths. tons C	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,03	0,0	0,0	**0,03**
3	Consumption of carbon-containing powder in EAFP	ths. tons	1,11	1,23	0,28	0,15	0,67	0,58	0,66	0,45	0,66	0,46	0,38	0,71	**7,3**
	Carbon content in carbon-containing powder	% by mass	95,00	95,00	95,00	95,00	95,00	95,00	95,00	95,00	95,00	95,00	95,00	95,00	**95,00**
		ths. tons C	1,1	1,2	0,3	0,1	0,6	0,6	0,6	0,4	0,6	0,4	0,4	0,7	**7,0**
4	Consumption of scrap metal in EAFP	ths. tons	202,6	185,6	53,2	27,5	105,2	116,8	143,9	83,6	136,4	101,7	93,2	136,5	**1386,2**
	Carbon content in scrap metal	% by mass	0,18	0,18	0,18	0,18	0,18	0,18	0,18	0,18	0,18	0,18	0,18	0,18	**0,18**
		ths. tons C	0,36	0,33	0,10	0,05	0,19	0,21	0,26	0,15	0,25	0,18	0,17	0,25	**2,5**
5	Consumption of electrodes in EAFP	ths. tons	0,40	0,41	0,41	0,04	0,20	0,22	0,27	0,15	0,25	0,19	0,17	0,26	**3,0**
	Carbon content in electrodes	% by mass	99,00	99,00	99,00	99,00	99,00	99,00	99,00	99,00	99,00	99,00	99,00	99,00	**99,00**
		ths. tons C	0,4	0,4	0,4	0,0	0,2	0,2	0,3	0,2	0,2	0,19	0,2	0,3	**2,9**
6	Consumption of NG in EAFP	mln. m3	7,5	7,1	6,0	4,2	5,0	5,2	5,2	4,4	4,9	6,1	6,0	7,1	**68,6**
	Carbon content in NG	kg C/m3	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	**0,49**
		ths. tons C	3,7	3,5	3,0	2,1	2,5	2,6	2,6	2,2	2,4	3,0	3,0	3,5	**33,9**
7	**Total mass of carbon in the input flow in EAFP**	**ths. tons C**	**6,034**	**9,291**	**8,096**	**5,995**	**6,249**	**7,209**	**7,410**	**7,983**	**8,477**	**7,50**	**7,932**	**9,480**	**91,7**

Output carbon flows

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total per year
1	Total production of slab and profiled steel billet in EAFP	ths. tons	277,3	236,3	129,5	93,8	141,4	175,7	196,7	169,1	214,7	161,2	163,0	210,2	**2169,0**
	Carbon content in steel	% by mass	0,18	0,18	0,18	0,18	0,18	0,18	0,18	0,18	0,18	0,18	0,18	0,18	**0,18**
		ths. tons C	0,5	0,4	0,2	0,2	0,3	0,3	0,4	0,3	0,4	0,3	0,3	0,4	**3,9**
2	**Total mass of carbon in the output flow from EAFP**	**ths. tons C**	**0,5**	**0,4**	**0,2**	**0,2**	**0,3**	**0,3**	**0,4**	**0,3**	**0,4**	**0,3**	**0,3**	**0,4**	**3,9**

CO2 emissions from production of steel

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total per year
1	Carbon burning during production of profiled steel billet in EAFP	ths. tons C	5,5	8,9	7,9	5,8	6,0	6,9	7,1	7,7	8,1	7,2	7,6	9,1	**87,8**
2	Project CO2 emissions from production of profiled steel billet in EAFP	ths. tons CO2	20,3	32,5	28,8	21,4	22,0	25,3	25,9	28,2	29,7	26,4	28,0	33,4	**321,8**
3	CO2 emissions from production of HBI outside MMK	ths. tons CO2	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	1,6	0,0	0,0	**1,6**
4	**Specific CO2 emissions per ton of profiled steel billet produced in EAFP**	**ton CO2/ton**	**0,073**	**0,138**	**0,223**	**0,228**	**0,155**	**0,144**	**0,132**	**0,167**	**0,138**	**0,174**	**0,172**	**0,159**	**0,149**

Specific CO_2 emissions from metallurgical conversions in the project only. Production of steel billet in EAFP

9 months of 2012

Input carbon flows

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total
1	Consumption of pig iron in EAFP	ths. tons	133,9	116,1	106,6	116,1	113,5	127,4	134,2	126,6	137,5	**1111,9**
	Carbon content in pig iron	% by mass	4,70	4,70	4,70	4,70	4,70	4,70	4,70	4,70	4,70	**4,70**
		ths. tons C	6,3	5,5	5,0	5,5	5,3	6,0	6,3	5,9	6,5	**52,3**
2	Hot briquetted iron (HBI)	ths. tons C	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	**0,0**
	Carbon content in HBI*	%	1,13	1,13	1,13	1,13	1,13	1,13	1,13	1,13	1,13	**1,13**
		ths. tons C	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	**0,00**
2	Consumption of carbon-containing powder in EAFP	ths. tons	0,79	0,92	0,72	0,76	0,50	0,60	0,77	0,77	0,90	**6,7**
	Carbon content in carbon-containing powder	% by mass	95,00	95,00	95,00	95,00	95,00	95,00	95,00	95,00	95,00	**95,00**
		ths. tons C	0,7	0,9	0,7	0,7	0,5	0,6	0,7	0,7	0,9	**6,4**
3	Consumption of scrap metal in EAFP	ths. tons	199,9	167,6	143,8	127,6	98,6	104,2	191,3	96,4	189,8	**1319,1**
	Carbon content in scrap metal	% by mass	0,18	0,18	0,18	0,18	0,18	0,18	0,18	0,18	0,18	**0,18**
		ths. tons C	0,36	0,30	0,26	0,23	0,18	0,19	0,34	0,17	0,34	**2,4**
4	Consumption of electrodes in EAFP	ths. tons	0,35	0,30	0,27	0,24	0,17	0,22	0,36	0,21	0,37	**2,5**
	Carbon content in electrodes	% by mass	99,00	99,00	99,00	99,00	99,00	99,00	99,00	99,00	99,00	**99,00**
		ths. tons C	0,3	0,3	0,3	0,2	0,2	0,2	0,4	0,2	0,4	**2,5**
5	Consumption of NG in EAFP	mln. m3	7,0	6,7	6,7	4,6	4,6	4,3	5,1	4,2	5,3	**48,5**
	Carbon content in NG	kg C/m3	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	**0,37**
		ths. tons C	3,4	3,3	3,3	2,3	2,3	2,1	2,5	2,1	2,6	**24,0**
6	**Total mass of carbon in the input flow in EAFP**	**ths. tons C**	**11,184**	**10,255**	**9,554**	**8,933**	**8,441**	**9,076**	**10,234**	**9,156**	**10,627**	**87,5**

Output carbon flows

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total
1	Total production of slab and profiled steel billet in EAFP	ths. tons	296,1	251,3	221,9	219,4	189,6	206,4	288,6	197,4	289,5	**2160,1**
	Carbon content in steel	% by mass	0,18	0,18	0,18	0,18	0,18	0,18	0,18	0,18	0,18	**0,18**
		ths. tons C	0,5	0,5	0,4	0,4	0,3	0,4	0,5	0,4	0,5	**3,9**
2	**Total mass of carbon in the output flow from EAFP**	**ths. tons C**	**0,5**	**0,5**	**0,4**	**0,4**	**0,3**	**0,4**	**0,5**	**0,4**	**0,5**	**3,9**

Specific CO_2 emissions from metallurgical conversions in the project only. Production of steel billet in EAFP

Specific CO_2 emissions per ton of HBI produced by metallurgical plants, project only

1	**Specific CO2 emissions per ton of HBI***	**ton CO2/ton HBI**	**0,7**

** The value from 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 3, Chapter 4, Table 4.1, p.4.25*

CO2 emissions from production of steel

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total
1	Carbon burning during production of profiled steel billet in EAFP	ths. tons C	10,7	9,8	9,2	8,5	8,1	8,7	9,7	8,8	10,1	**83,6**
2	Project CO2 emissions from production of profiled steel billet in EAFP	ths. tons CO2	39,1	35,9	33,6	31,3	29,7	31,9	35,6	32,3	37,1	**306,4**
3	CO2 emissions from production of HBI outside MMK	ths. tons CO2	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	**0,0**
4	**Specific CO2 emissions per ton of profiled steel billet produced in EAFP**	**ton CO2/ton**	**0,132**	**0,143**	**0,151**	**0,143**	**0,157**	**0,155**	**0,123**	**0,163**	**0,128**	**0,142**

Specific CO_2 emissions from metallurgical conversions in the project only. Production of steel billet in EAFP

D.2 Coefficients of consumption for metallurgical conversions

Coefficients of consumption for metallurgical conversions in the project

Specific consumption of pig iron per ton of steel billet produced in EAFP

$$SC_{pig\ iron\_EAFP} = M_{pig\ iron\_EAFP} / \sum P_{profiled\&slab\ steel\_EAFP} \qquad \text{(PDD formula D.1.1.2.-7)}$$

Specific consumption of scrap metal per ton of steel billet produced in EAFP

$$SC_{scrap\_EAFP} = M_{scrap\_EAFP} / \sum P_{profiled\&slab\ steel\_EAFP} \qquad \text{(PDD formula D.1.1.2.-8)}$$

Specific consumption of dry skip metallurgical coke per ton of produced pig iron

$$SC_{skip\_metallurgical\_coke\_PJ} = M_{skip\_metallurgical\ coke\_BF\_PJ} / P_{pig\ iron\_BF\_PJ} \qquad \text{(PDD formula D.1.1.2.-9)}$$

Symbol	Data variable	Unit	Symbol	Data variable	Unit
$SC_{pig\ iron\_EAFP}$	Specific consumption of pig iron per ton of steel billet produced in EAFP	ton/ton	M_{scrap_EAFP}	Consumption of scrap metal in EAFP	ths. tons
$M_{pig\ iron\_EAFP}$	Consumption of pig iron in EAFP	ths. tons	$SC_{skip\_metallurgical\_coke\_PJ}$	Specific consumption of dry skip metallurgical coke per ton of pig iron produced in BFP	tons/ton
$\sum P_{profiled\&slab\ steel\_EAFP}$	Total production of slab and profiled steel billet in EAFP	ths. tons	$M_{skip\ metallurgical\ coke\_BF\_PJ}$	Consumption of dry skip metallurgical coke in BFP	ton/ton
SC_{scrap_EAFP}	Specific consumption of pig iron per ton of steel billet produced in EAFP	ton/ton	$P_{pig\ iron\_BF\_PJ}$	Production of pig iron in BFP	ton/ton

Coefficients of consumption of materials for metallurgical conversions in the project

12 months of 2011

Coefficients of consumption of materials for metallurgical conversions

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total per year
1	Total production of slab and profiled steel billet in EAFP	ths. tons	277,3	236,3	129,5	93,8	141,4	175,7	196,7	169,1	214,7	161,2	163,0	210,2	**2169,0**
2	**Output of slab steel billet in EAFP**	**ths. tons**	**125,0**	**103,8**	**54,6**	**21,0**	**34,5**	**28,5**	**32,9**	**0,0**	**56,2**	**49,9**	**43,2**	**41,0**	**590,6**
3	Total smelting of steel in EAF-180	ths. tons	217,0	191,2	31,4	0,0	104,1	110,1	145,0	66,1	131,9	100,6	80,8	137,5	**1315,7**
4	Consumption of pig iron in EAFP	ths. tons	11,2	82,4	92,7	79,1	58,3	78,3	78,4	107,8	105,4	78,1	90,8	101,6	**964,2**
5	Consumption of scrap metal in EAFP	ths. tons	202,6	185,6	53,2	27,5	105,2	116,8	143,9	83,6	136,4	101,7	93,2	136,5	**1386**
6	Specific consumption of pig iron per ton of steel billet produced in EAFP	ton/ton	0,041	0,349	0,716	0,843	0,412	0,446	0,399	0,637	0,491	0,485	0,557	0,483	**0,445**
7	Specific consumption of scrap metal per ton of steel billet produced in EAFP	ton/ton	0,731	0,785	0,410	0,294	0,744	0,664	0,732	0,495	0,635	0,631	0,572	0,649	**0,639**
8	Specific consumption of dry skip metallurgical coke per ton of produced pig iron	ton/ton	0,440	0,446	0,449	0,454	0,452	0,455	0,448	0,449	0,442	0,437	0,439	0,439	**0,446**

Coefficients of consumption of materials for metallurgical conversions in the project

9 months of 2012

Coefficients of consumption of materials for metallurgical conversions

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total
1	Total production of slab and profiled steel billet in EAFP	ths. tons	296,1	251,3	221,9	219,4	189,6	206,4	288,6	197,4	289,5	**2160,1**
2	**Output of slab steel billet in EAFP**	**ths. tons**	**173,8**	**160,5**	**140,9**	**149,6**	**149,7**	**164,7**	**174,4**	**159,7**	**163,5**	**1436,7**
3	Total smelting of steel in EAF-180	ths. tons	208,1	169,0	151,8	118,6	102,4	106,1	213,3	111,8	209,0	**1390,2**
4	Consumption of pig iron in EAFP	ths. tons	133,9	116,1	106,6	116,1	113,5	127,4	134,2	126,6	137,5	**1111,9**
5	Consumption of scrap metal in EAFP	ths. tons	199,9	167,6	143,8	127,6	98,6	104,2	191,3	96,4	189,8	**1319**
6	Specific consumption of pig iron per ton of steel billet produced in EAFP	ton/ton	0,452	0,462	0,481	0,529	0,599	0,617	0,465	0,641	0,475	**0,515**
7	Specific consumption of scrap metal per ton of steel billet produced in EAFP	ton/ton	0,675	0,667	0,648	0,582	0,520	0,505	0,663	0,488	0,656	**0,611**
8	Specific consumption of dry skip metallurgical coke per ton of produced pig iron	ton/ton	0,443	0,436	0,433	0,430	0,430	0,426	0,430	0,430	0,430	**0,432**

Note: in this case, the calculation model operates with data including the data from cells previously submitted (*Specific consumption of coke per ton of iron*), and also contains indicators (*actual production of slab steel billet in the EAFP* and *production of steel in EAF-180*), which will be used to calculate project emissions further.

Coefficients of consumption of materials for metallurgical conversions in the project

D.3 Project CO_2 emissions from metallurgical conversions associated with production of slab steel billet

Project CO_2 emissions from consumption of metallurgical coke for production of slab steel billet

$PE_{metallurgical\_coke\_slab\_steel} = SC_{skip\_metallurgical\_coke\_PJ} * SC_{pig\ iron\_\ EAFP} * P_{slab\ steel\_EAFP} * SPE_{metallurgical\ coke}$ **(PDD formula D.1.1.2.-10)**

Project CO_2 emissions from consumption of pig iron for production of slab steel billet

$PE_{pig\ iron\_slab\_steel} = SC_{pig\ iron\_\ EAFP} * P_{slab\ steel\_EAFP} * SPE_{pig\ iron}$ **(PDD formula D.1.1.2.-11)**

Project CO_2 emissions in EAFP from production of slab steel billet

$PE_{slab\ steel\_\ EAFP} = P_{slab\ steel\_\ EAFP} * SPE_{EAFP}$ **(PDD formula D.1.1.2.-12)**

Symbol	Data variable	Unit	Symbol	Data variable	Unit
$PE_{metallurgical\_coke\_\ slab\ \_steel}$	Project CO_2 emissions from consumption of metallurgical coke for production of slab steel billet	ths. tons CO_2	**$PE_{pig\ iron\_\ slab\ \_steel}$**	Project CO_2 emissions from consumption of pig iron for production of slab steel billet	ths. tons CO_2
$SC_{skip\_metallurgical\_coke\_PJ}$	Specific consumption of dry skip metallurgical coke per ton of pig iron smelted in BFP	ton/ton	**$SPE_{pig\ iron}$**	Specific CO_2 emissions per ton of produced pig iron	ton CO_2/ton
$SC_{pig\ iron\_\ EAFP}$	Specific consumption of pig iron per ton of steel billet produced in EAFP	ton/ton	**$PE_{slab\ steel\_\ EAFP}$**	Project CO_2 emissions in EAFP from production of slab steel billet	ths. tons CO_2
$SPE_{metallurgical\_coke}$	Specific CO_2 emissions per ton of dry metallurgical coke produced in BPCP	ton CO_2/ton	**SPE_{EAFP}**	Specific CO_2 emissions per ton of slab steel billet produced in EAFP	ton CO_2/ton
$P_{slab\ steel\_EAFP}$	Output of slab steel billet in EAFP	ths. tons			

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Project CO2 emissions from metallurgical conversions during production of slab steel billet

#	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total for year
1	**CO2 emissions from consumption of metallurgical coke for production of slab steel billet**	**ths. tons CO2**	**2,285**	**16,710**	**18,068**	**7,688**	**6,171**	**5,783**	**5,809**	**0,000**	**12,033**	**11,313**	**10,396**	**8,947**	**105,203**
2	**CO2 emissions from consumption of pig iron for production of slab steel billet**	**ths. tons CO2**	**3,234**	**24,443**	**26,546**	**12,951**	**9,762**	**8,659**	**8,702**	**0,000**	**18,226**	**16,160**	**15,294**	**12,681**	**156,658**
3	**CO2 emissions in EAFP from production of slab steel billet**	**ths. tons CO2**	**9,123**	**14,330**	**12,175**	**4,788**	**5,347**	**4,109**	**4,346**	**0,000**	**7,749**	**8,686**	**7,437**	**6,511**	**84,601**

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Project CO2 emissions from production of slab steel billet

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total
1	**CO2 emissions from consumption of metallurgical coke for production of slab steel billet**	**ths. tons CO2**	**35,253**	**32,448**	**29,652**	**34,148**	**39,762**	**45,641**	**34,622**	**42,647**	**31,053**	**325,226**
2	**CO2 emissions from consumption of pig iron for production of slab steel billet**	**ths. tons CO2**	**52,256**	**45,370**	**41,663**	**50,516**	**56,809**	**60,588**	**52,529**	**67,263**	**51,819**	**478,813**
3	**CO2 emissions in EAFP from production of slab steel billet**	**ths. tons CO2**	**22,941**	**22,949**	**21,283**	**21,397**	**23,499**	**25,527**	**21,445**	**26,025**	**20,928**	**205,994**

Project CO_2 emissions from metallurgical conversions associated with production of slab steel billet

D.4 CO_2 emissions from electricity consumption associated with production of slab steel billet in EAFP

CO_2 emissions from consumption of grid electricity by EAF-180 via 220/35 kV step-down substation during smelting of slab steel grades

$$PE_{EC\_grid\_slab\_steel\_EAF} = SEC_{grid\_steel\_EAF} * P_{slab\ steel\_EAFP} * \sum P_{steel\_EAF} / \sum P_{profiled\ \&slab\ steel\_EAFP} * EF_{grid} * (1+TDL)$$ **(PDD formula D.1.1.2.-14)**

Specific consumption of grid electricity by EAF-180 via 220/35 kV step-down substation during steel smelting

$$SEC_{grid\_steel\_EAF} = EC_{grid\_steel\_EAF} / \sum P_{steel\_EAF}$$ **(PDD formula D.1.1.2.-15)**

Symbol	Data variable	Unit	Symbol	Data variable	Unit
$EC_{grid\_steel\_EAF}$	Consumption of grid electricity by EAF-180 via 220/35 kV step-down substation	GW-h	**$SEC_{grid\_steel\_EAF}$**	Specific consumption of grid electricity by EAF-180 via 220/35 kV step-down substation per ton of all smelted steel	MW-h/ton
$\sum P_{steel\_EAF}$	Total smelting of steel in EAF-180	ths. tons	**EF_{grid}**	CO_2 emission factor for grid electricity from Unified Energy Systems of Urals (EF grid = 0.541 t CO2/MW-h)	tons CO2/MW-h
$P_{slab\ steel\_EAFP}$	Output of slab steel billet in EAFP	ths. tons	**TDL**	Technological losses during transportation and distribution of grid electricity in Unified Energy System of Urals	%
$\sum P_{profiled\&slab\ steel\_EAFP}$	Total production of slab and profiled steel billet in EAFP	ths. tons	**$PE_{EC\_grid\_\ slab\_steel\_EAF}$**	CO_2 emissions from consumption of grid electricity by EAF-180 via 220/35 kV step-down substation during smelting of slab steel grades	ths. tons CO_2

CO_2 emissions from consumption of electricity from corporate MMK grid by other equipment of EAFP (including DBSU) during production of slab steel billet

$$PE_{EC\_slab\_steel\_other\ EAFP} = (SEC_{steel\ refinement\ and\ casting\ EAFP} * P_{slab\ steel\_EAFP} + SEC_{steel\_OHFP} * P_{slab\ steel\_EAFP} * (\sum P_{profiled\&slab\ steel\_EAFP} - \sum P_{steel\_EAF}) / \sum P_{profiled\&slab\ steel\_EAFP})) * ((EF_{own\ generation\_PJ} * (EC_{gross\_PJ} - EC_{import\_PJ}) + EF_{grid} * (EC_{import\_PJ} - EC_{grid\_steel\_EAF}) * (1+TDL)) / (EC_{gross\_PJ} - EC_{grid\_steel\_EAF}))$$

(PDD formula D.1.1.2.-16)

CO_2 emissions from electricity consumption associated with production of slab steel billet in EAFP

Specific electricity consumption in EAFP for steel refining and casting

$$\mathbf{SEC}_{\text{steel refinement and casting EAFP}} = (\mathbf{EC}_{\text{EAFP}} - \mathbf{EC}_{\text{grid\_steel\_EAF}} - \mathbf{SEC}_{\text{steel\_OHFP}} * (\sum \mathbf{P}_{\text{profiled\&slab steel\_EAFP}} - \sum \mathbf{P}_{\text{steel\_EAF}})) / \sum \mathbf{P}_{\text{profiled\&slab steel\_EAFP}}$$

(PDD formula D.1.1.2.-17)

Symbol	Data variable	Unit	Symbol	Data variable	Unit
$\mathbf{PE}_{\text{EC\_other equipment\_EAFP\_PJ}}$	CO_2 emissions from consumption of electricity from corporate MMK grid by other equipment of EAFP (including DBSU) during production of slab steel billet	ths. tons CO_2	$\mathbf{EF}_{\text{own generation\_PJ}}$	CO_2 emission factor for electricity produced by own generating capacities of MMK	tons CO_2/MW-h
$\mathbf{SEC}_{\text{steel refinement and casting EAFP}}$	Specific electricity consumption in EAFP for steel refining and casting,	MW-h/ton	$\mathbf{EC}_{\text{gross\_PJ}}$	Total electricity consumption by MMK	GW-h
$\mathbf{P}_{\text{slab steel\_EAFP}}$	Output of slab steel billet in EAFP	ths. tons	$\mathbf{EC}_{\text{import\_PJ}}$	Electricity purchases from Unified Energy Systems of Urals grid	GW-h
$\sum \mathbf{P}_{\text{profiled\&slab steel\_EAFP}}$	Total production of slab and profiled steel billet in EAFP	ths. tons	$\mathbf{EC}_{\text{grid\_steel\_EAF}}$	Consumption of grid electricity by EAF-180 via 220/35 kV step-down substation	GW-h
$\sum \mathbf{P}_{\text{steel\_EAF}}$	Total smelting of steel in EAF-180	ths. tons	$\mathbf{EC}_{\text{EAFP}}$	Total electricity consumption in EAFP	GW-h
$\mathbf{SEC}_{\text{steel\_OHFP}}$	Specific consumption of electricity in open-hearth furnace plant per ton of smelted steel (remain fixed over the crediting period – **0.007**, calculated on basis of average historical data of electricity consumption in OHFP and output of steel in OHFP in 2000-2002[12])	MW-h/ton	**TDL**	Technological losses during transportation and distribution of grid electricity in Unified Energy System of Urals[13]	%
$\mathbf{EF}_{\text{grid}}$	CO_2 emission factor for grid electricity from Unified Energy Systems of Urals (EF grid = 0.541 t CO2/MW-h)	tons CO_2/MW-h			

[12] http://ji.unfccc.int/JI_Projects/DB/3YOHME3FSIKG8602M8WN9D60QNIQT7/PublicPDD/YAGHLX0KYONQCEVWW7EHHU3EW75Z32/view.html

[13] http://www.mrsk-ural.ru/ru/460

CO_2 emissions from electricity consumption associated with production of slab steel billet in EAFP

CO_2 emissions from consumption of electricity from corporate grid of MMK, for production of nitrogen, pure nitrogen and argon needed for production of slab steel billet

$$PE_{EC\_Ar\_N2\_slab\_steel} = (EC_{N2\_slab\_steel} + EC_{pure\ N2\_slab\_steel} + EC_{Ar\_slab\_steel}) * ((EF_{own\ generation\_PJ} * (EC_{gross\_PJ} - EC_{import\_PJ}) + EF_{grid} * (EC_{import\_PJ} - EC_{grid\_steel\_EAF}) * (1+TDL))/(EC_{gross\_PJ} - EC_{grid\_steel\_EAF})$$ **(PDD formula D.1.1.2.-18)**

Electricity consumption for production of nitrogen, which is used during production of slab steel billet in EAFP

$$EC_{N2\_slab\_steel} = SEC_{N2\_PJ} * V_{N2\_EAFP} * P_{slab\_steel\_EAFP} / \sum P_{profiled\&slab\ steel\_EAFP}$$ **(PDD formula D.1.1.2.-19)**

Electricity consumption for production of pure nitrogen, which is used during production of slab steel billet in EAFP

$$EC_{pure\_N2\_slab\_steel} = SEC_{pure\_N2\_PJ} * V_{pure\_N2\_EAFP} * P_{slab\_steel\_EAFP} / \sum P_{profiled\&slab\ steel\_EAFP}$$ **(PDD formula D.1.1.2.-20)**

Electricity consumption for production of argon, which is used during production of slab steel billet in EAFP

$$EC_{Ar\_slab\_steel} = SEC_{Ar\_PJ} * V_{Ar\_EAFP} * P_{slab\_steel\_EAFP} / \sum P_{profiled\&slab\ steel\_EAFP}$$ **(PDD formula D.1.1.2.-21)**

CO_2 emissions from consumption of electricity from corporate grid of MMK for production of oxygen needed for production of slab steel billet in EAFP

$$PE_{EC\_O2\_slab\_steel} = EC_{O2\_slab\_steel} * ((EF_{own\ generation\_PJ} * (EC_{gross\_PJ} - EC_{import\_PJ}) + EF_{grid} * (EC_{import\_PJ} - EC_{grid\_steel\_EAF}) * (1+TDL))/(EC_{gross\_PJ} - EC_{grid\_steel\_EAF})$$

(PDD formula D.1.1.2.-22)

Electricity consumption for production of oxygen, which is used during production of slab steel billet in EAFP

$$EC_{O2\_slab\_steel} = SEC_{O2\_PJ} * V_{O2\_EAFP} * P_{slab\_steel\_EAFP} / \sum P_{profiled\&slab\ steel\_EAFP}$$ **(PDD formula D.1.1.2.-23)**

Specific electricity consumption for production of oxygen at MMK

$$SEC_{O2\_PJ} = ((P_{O2\ OCS\ \#1} * SEC_{O2\ OCS\ \#1}) + (P_{O2\ OCS\ \#2} * SEC_{O2\ OCS\ \#2}))/(P_{O2\ OCS\ \#1} + P_{O2\ OCS\ \#2})$$ **(PDD formula D.1.1.2.-24)**

CO_2 emissions from electricity consumption associated with production of slab steel billet in EAFP

Symbol	Data variable	Unit	Symbol	Data variable	Unit
PE $_{EC\_Ar\_N2\_slab\_steel}$	CO_2 emissions from consumption of electricity from corporate grid of MMK for production of nitrogen, pure nitrogen and argon needed for production of slab steel billet	ths. tons CO_2	**EC** $_{gross\_PJ}$	Total electricity consumption by MMK	GW-h
EC$_{N2\_slab\_steel}$	Electricity consumption for production of nitrogen, which is used during production of slab steel billet in EAFP	GW-h	**EC** $_{import\_PJ}$	Electricity purchases from Unified Energy Systems of Urals grid	GW-h
EC $_{pure\ N2\_slab\_steel}$	Electricity consumption for production of pure nitrogen, which is used during production of slab steel billet in EAFP	GW-h	**EC** $_{grid\_steel\_EAF}$	Consumption of grid electricity by EAFP-180, via 220/35 kV step-down substation	GW-h
EC $_{Ar\_slab\_steel}$	Electricity consumption for production of argon, which is used during production of slab steel billet in EAFP	GW-h	**EF** $_{grid}$	CO_2 emission factor for grid electricity from Unified Energy Systems of Urals (EF grid = 0.541 t CO2/MW-h)	tons CO_2/ MW-h
EF $_{own\ generation\_PJ}$	CO_2 emission factor for electricity produced by own generating capacities of MMK	tons CO_2/ MW-h	**TDL**	Technological losses during transportation and distribution of grid electricity in Unified Energy System of Urals	%
SEC $_{N2\_PJ}$	Specific electricity consumption for production of nitrogen at MMK	MW-h/1000 m^3	**V**$_{N2\_EAFP}$	Consumption of nitrogen in EAFP	mln. m^3
SEC $_{pure\_N2\_PJ}$	Specific electricity consumption for production of pure nitrogen at MMK	MW-h/1000 m^3	**V** $_{pure\_N2\_EAFP}$	Consumption of pure nitrogen in EAFP	mln. m^3
SEC $_{Ar\_PJ}$	Specific electricity consumption for production of argon at MMK	MW-h/1000 m^3	**V**$_{Ar\_EAFP}$	Consumption of argon in EAFP	mln. m^3
P $_{slab\ steel\_EAFP}$	Output of slab steel billet in EAFP	ths. tons	$\sum$**P** $_{profiled\&slab\ steel\_EAFP}$	Total production of slab and profiled steel billet in EAFP	ths. tons
PE $_{EC\_O2\_slab\_steel}$	CO_2 emissions from consumption of electricity from corporate grid of MMK for production of oxygen needed for production of slab steel billet	ths. tons CO_2	**EC**$_{O2\_slab\_steel}$	Electricity consumption for production of oxygen, which is used during production of slab steel billet in EAFP	GW-h
SEC $_{O2\_PJ}$	Specific electricity consumption for production of oxygen at MMK	MW-h/1000 m^3	**V**$_{O2\_EAFP}$	Consumption of oxygen in EAFP	mln. m^3/t

CO_2 emissions from electricity consumption associated with production of slab steel billet in EAFP

P $_{O2\ OCS\ \#1}$	Output of oxygen by oxygen-compressor shop #1	ths.m^3	**P** $_{O2\ OCS\ \#2}$	Output of oxygen by oxygen-compressor shop #2	ths.m^3
SEC $_{O2\ OCS\ \#1}$	Specific electricity consumption for production of oxygen in oxygen-compressor shop #1	MW-h/1000 m^3	**SEC** $_{O2\ OCS\ \#2}$	Specific electricity consumption for production of oxygen in oxygen-compressor shop #2	MW-h/1000 m^3

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Electricity balance in project

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total per year
1	Total electricity consumption in EAFP	GWh	82,5	80,8	22,8	10,2	43,5	48,7	59,93	33,7	54,5	43,6	36,9	55,0	**572,1**
2	Specific electricity consumption in EAFP for steel refining and casting	MWh/ton	*0,066*	*0,070*	*0,089*	*0,097*	*0,082*	*0,075*	*0,075*	*0,073*	*0,068*	*0,076*	*0,077*	*0,070*	**0,076**
3	Consumption of grid electricity by EAF-180 via 220/35 kV step-down substation	GWh	63,8	64,0	10,6	0,4	31,6	35,1	44,877	20,6	39,3	30,8	23,8	39,8	**404,9**
4	Specific consumption of grid electricity by EAF-180 via 220/35 kV step-down substation during smelting of slab steel grades	MWh/ton	*0,294*	*0,335*	*0,338*	*0,000*	*0,303*	*0,319*	*0,309*	*0,312*	*0,298*	*0,307*	*0,295*	*0,290*	**0,283**
5	Total electricity consumption by MMK	GWh	681,5	626,8	601,0	535,0	582,7	593,1	626,6	605,0	603,5	600,6	591,1	622,0	**7268,7**
6	Electricity purchases from Unified Energy Systems of Urals grid	GWh	217,1	216,0	144,8	117,3	166,0	182,2	223,9	187,8	183,9	166,1	164,6	151,2	**2120,9**
7	Electricity purchases from Unified Energy Systems of Urals grid except EAF-180 demand	GWh	153,3	151,9	134,2	116,9	134,4	147,1	179,0	167,2	144,6	135,3	140,7	111,4	**1716,0**
8	Electricity generated by MMK	GWh	464,3	410,8	456,2	417,6	416,7	410,9	402,8	417,1	419,6	434,5	426,5	470,8	**5147,8**

Electricity consumption for production of nitrogen, argon and oxygen which is used during production of slab steel billet in EAFP

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total per year
1	*Consumption of nitrogen in EAFP*	mln. m3	1,8	1,5	1,4	0,6	1,4	1,8	2,0	1,4	2,0	2,0	2,0	2,9	**21**
2	Specific electricity consumption for production of nitrogen at MMK	MWh/ths. m3	0,150	0,150	0,150	0,150	0,150	0,150	0,150	0,150	0,150	0,150	0,150	0,150	**0,150**
3	Specific consumption of nitrogen for production of steel in EAFP	ths. m3/ton	0,006	0,006	0,011	0,006	0,010	0,010	0,010	0,008	0,009	0,013	0,012	0,014	**0,010**
4	Electricity consumption for production of nitrogen	GWh	0,12	0,10	0,09	0,02	0,05	0,04	0,05	0,00	0,08	0,09	0,08	0,09	**0,8**

CO_2 emissions from electricity consumption associated with production of slab steel billet in EAFP

5	*Consumption of pure nitrogen in EAFP*	mln. m3	0,15	0,14	0,12	0,09	0,250	0,35	0,53	0,32	0,24	0,14	0,17	0,32	**2,8**
6	Specific electricity consumption for production of pure nitrogen at MMK	MWh/ths. m3	0,826	0,826	0,826	0,826	0,826	0,826	0,826	0,826	0,826	0,826	0,826	0,826	**0,826**
7	Specific consumption of pure nitrogen for production of steel in EAFP	ths. m3/ton	0,0005	0,0006	0,0009	0,0009	0,0018	0,0020	0,0027	0,0019	0,0011	0,0009	0,0011	0,0015	**0,0013**
8	Electricity consumption for production of pure nitrogen	GWh	0,1	0,1	0,0	0,0	0,1	0,0	0,1	0,0	0,1	0,0	0,0	0,1	**0,5**
9	*Consumption of argon in EAFP*	mln. m3	0,23	0,21	0,13	0,08	0,11	0,13	0,15	0,12	1,76	0,13	0,12	0,16	**3,3**
10	Specific electricity consumption for production of argon at MMK	MWh/ths. m3	0,055	0,055	0,055	0,055	0,055	0,055	0,055	0,055	0,055	0,055	0,055	0,055	**0,055**
11	Specific consumption of argon for production of steel in EAFP	ths. m3/ton	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,008	0,001	0,001	0,001	**0,001**
12	Electricity consumption fo production of argon	GWh	0,006	0,005	0,003	0,001	0,002	0,001	0,001	0,000	0,025	0,002	0,002	0,002	**0,05**
13	*Specific consumption of oxygen in EAFP*	mln. m3	14,44	12,21	10,30	9,58	8,69	10,39	11,49	10,65	11,62	9,10	9,71	12,17	**130,37**
14	Specific electricity consumption for production of oxygen at MMK	MWh/ths. m3	0,379	0,408	0,409	0,378	0,466	0,455	0,445	0,441	0,433	0,374	0,426	0,385	**0,417**
15	Electricity consumption fo production of oxygen	GWh	2,467	2,189	1,776	0,811	0,988	0,767	0,855	0,000	1,316	1,055	1,098	0,912	**14,23**

CO_2 emissions from electricity consumption associated with production of slab steel billet in EAFP

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Electricity balance in project

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total
1	Total electricity consumption in EAFP	GWh	76,2	63,0	57,6	48,8	41,1	43,6	76,8	42,5	75,6	**525,2**
2	Specific electricity consumption in EAFP for steel refining and casting	MWh/ton	*0,059*	*0,061*	*0,064*	*0,064*	*0,070*	*0,064*	*0,057*	*0,068*	*0,060*	**0,063**
3	Consumption of grid electricity by EAF-180 via 220/35 kV step-down substation	GWh	58,0	47,1	42,9	34,0	27,2	29,7	59,9	28,6	57,6	**385,0**
4	Specific consumption of grid electricity by EAF-180 via 220/35 kV step-down substation during smelting of slab steel grades	MWh/ton	*0,279*	*0,279*	*0,283*	*0,286*	*0,266*	*0,280*	*0,281*	*0,256*	*0,275*	**0,276**
5	Total electricity consumption by MMK	GWh	658,0	622,8	629,1	595,8	600,4	588,4	656,2	621,4	636,1	**5608,2**
6	Electricity purchases from Unified Energy Systems of Urals grid	GWh	194,1	212,4	191,3	186,9	173,5	190,4	237,0	174,3	195,5	**1755,3**
7	Electricity purchases from Unified Energy Systems of Urals grid except EAF-180 demand	GWh	136,1	165,3	148,3	152,9	146,2	160,7	177,2	145,7	137,9	**1370,4**
8	Electricity generated by MMK	GWh	463,9	410,3	437,9	408,9	426,9	398,0	419,2	447,2	440,6	**3852,8**

Electricity consumption for production of nitrogen, argon and oxygen which is used during production of slab steel billet in EAFP

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total
1	*Consumption of nitrogen in EAFP*	mln. m3	2,4	2,4	2,4	2,4	2,6	2,4	2,5	2,4	2,1	**22**
2	Specific electricity consumption for production of nitrogen at MMK	MWh/ths. m3	0,150	0,150	0,150	0,150	0,150	0,150	0,150	0,150	0,150	**0,150**
3	Specific consumption of nitrogen for production of steel in EAFP	ths. m3/ton	0,008	0,010	0,011	0,011	0,014	0,012	0,009	0,012	0,007	**0,010**

CO_2 emissions from electricity consumption associated with production of slab steel billet in EAFP

4	Electricity consumption for production of nitrogen	GWh	0,21	0,23	0,23	0,25	0,31	0,29	0,22	0,29	0,18	**2,2**
5	*Consumption of pure nitrogen in EAFP*	mln. m3	0,33	0,28	0,09	0,00	0,00	0,00	0,000	0,005	0,00	**0,7**
6	Specific electricity consumption for production of pure nitrogen at MMK	MWh/ths. m3	0,826	0,826	0,826	0,826	0,826	0,826	0,826	0,826	0,826	**0,826**
7	Specific consumption of pure nitrogen for production of steel in EAFP	ths. m3/ton	0,0011	0,0011	0,0004	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	**0,0003**
8	Electricity consumption for production of pure nitrogen	GWh	0,2	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	**0,4**
9	*Consumption of argon in EAFP*	mln. m3	0,18	0,16	0,14	0,11	0,10	0,10	0,14	0,10	0,14	**1,2**
10	Specific electricity consumption for production of argon at MMK	MWh/ths. m3	0,055	0,055	0,055	0,055	0,055	0,055	0,055	0,055	0,055	**0,055**
11	Specific consumption of argon for production of steel in EAFP	ths. m3/ton	0,001	0,001	0,001	0,001	0,001	0,000	0,000	0,001	0,000	**0,001**
12	Electricity consumption fo production of argon	GWh	0,006	0,006	0,005	0,004	0,004	0,004	0,005	0,004	0,004	**0,04**
13	*Specific consumption of oxygen in EAFP*	mln. m3	16,19	14,58	12,58	12,44	10,97	11,78	15,08	11,83	16,23	**121,70**
14	Specific electricity consumption for production of oxygen at MMK	MWh/ths. m3	0,389	0,404	0,378	0,411	0,395	0,363	0,559	0,573	0,539	**0,446**
15	Electricity consumption fo production of oxygen	GWh	3,701	3,763	3,023	3,487	3,423	3,409	5,098	5,478	4,940	**36,32**

CO_2 emissions from electricity consumption associated with production of slab steel billet in EAFP

Total CO_2 emissions from electricity consumption associated with production of slab steel billet in EAFP

$$PE_{electricity\_slab\_steel\_EAFP} = PE_{EC\_grid\_slab\_steel\_EAF} + PE_{EC\_slab\_steel\_other\ EAFP} + PE_{EC\_Ar\_N2\_slab\_steel} + PE_{EC\_O2\_slab\_steel}$$ **(PDD formula D.1.1.2.-13)**

Symbol	Data variable	Unit	Symbol	Data variable	Unit
PE $_{electricity\ slab\ \_steel\_EAFP}$	Total CO_2 emissions from electricity consumption associated with production of slab steel billet in EAFP	ths. tons CO_2	**PE** $_{EC\ slab\ steel\ other\ EAFP}$	CO_2 emissions from consumption of electricity from corporate MMK grid by other equipment of EAFP (including DBSU) during production of slab steel billet	ths. tons CO_2
PE $_{EC\_grid\_\ slab\ \_steel\_EAF}$	CO_2 emissions from consumption of grid electricity by EAF-180 via 220/35 kV step-down substation during smelting of slab steel grades in EAFP	ths. tons CO_2	**PE** $_{EC\ Ar\ N2\ slab\ \_steel}$	CO_2 emissions from consumption of electricity from corporate grid of MMK for production of nitrogen, pure nitrogen and argon needed for production of slab steel billet	ths. tons CO_2
PE $_{EC\_O2\_slab\_steel}$	CO_2 emissions from consumption of electricity from corporate grid of MMK for production of oxygen needed for production of slab steel billet	ths. tons CO_2			

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CO_2 emissions from electricity consumption associated with production of slab steel billet in EAFP

#	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total for year
1	CO_2 emissions from consumption of grid electricity by EAF-180 via 220/35 kV step-down substation	ths. tons CO_2	16,812	16,451	2,612	0,000	4,505	3,329	4,390	0,000	6,004	5,583	3,694	4,536	**67,916**
2	CO_2 emissions from consumption of electricity from corporate MMK grid in for production of nitrogen, pure nitrogen, and argon	ths. tons CO_2	0,142	0,123	0,106	0,029	0,094	0,085	0,113	0,000	0,140	0,106	0,091	0,106	**1,135**
3	CO_2 emissions from consumption of electricity from corporate MMK grid by other equipment of EAFP (including DBSU)	ths. tons CO_2	6,590	5,604	3,820	1,602	2,549	1,980	2,247	0,000	3,487	3,072	2,519	2,182	**35,652**
4.	CO_2 emissions from consumption of electricity from corporate MMK grid in for	ths. tons CO_2	1,936	1,695	1,397	0,634	0,889	0,712	0,781	0,000	1,201	0,850	0,834	0,695	**11,624**

CO_2 emissions from electricity consumption associated with production of slab steel billet in EAFP

	production of oxygen													
5	**Total CO_2 emissions from electricity consumption associated with production of slab steel billet in EAFP**	**ths. tons CO_2**	**25,480**	**23,873**	**7,935**	**2,265**	**8,037**	**6,106**	**7,531**	**0,000**	**10,832**	**9,611**	**7,138**	**7,519**	**116,327**

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CO2 emissions from electricity consumption associated with production of slab steel billet in EAFP

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total
1	CO2 emissions from consumption of grid electricity by EAF-180 via 220/35 kV step-down substation	ths. tons CO2	19,887	17,558	15,930	13,536	12,552	13,843	21,118	13,506	18,995	**146,925**
2	CO2 emissions from consumption of electricity from corporate MMK grid in for production of nitrogen, pure nitrogen, and argon	ths. tons CO2	0,282	0,286	0,217	0,217	0,295	0,277	0,209	0,278	0,167	**2,228**
3	CO2 emissions from consumption of electricity from corporate MMK grid by other equipment of EAFP (including DBSU)	ths. tons CO2	8,004	7,335	6,937	8,210	9,976	10,009	9,062	9,983	9,091	**78,607**
4	CO2 emissions from consumption of electricity from corporate MMK grid in for production of oxygen	ths. tons CO2	2,776	2,820	2,334	2,976	3,249	3,232	4,669	5,071	4,552	**31,679**
5	**Total CO2 emissions from electricity consumption associated with production of slab steel billet in EAFP**	**ths. tons CO2**	**30,949**	**27,999**	**25,418**	**24,939**	**26,072**	**27,361**	**35,058**	**28,838**	**32,805**	**259,439**

CO_2 emissions from electricity consumption associated with production of slab steel billet in EAFP

CO_2 emission factor for electricity produced at MMK

$$EF_{own\ generation\_PJ} = PE_{total\ electricity\ generation} / (EC_{gross\_PJ} - EC_{import\_PJ})$$ **(PDD formula D.1.1.2.-25)**

CO_2 emissions from electricity generation at MMK

$$PE_{total\ electricity\ generation} = PE_{combustion\ gases\_electricity} + PE_{combustion\ coal\_electricity}$$ **(PDD formula D.1.1.2.-26)**

Symbol	Data variable	Unit	Symbol	Data variable	Unit
$EF_{own\ generation\_PJ}$	CO_2 emission factor for electricity produced at MMK	tons CO_2/MW-h	**EC_{gross_PJ}**	Total electricity generation at MMK	GW-h
$PE_{total\ electricity\ generation}$	Total CO_2 emissions from electricity generation at MMK	ths. tons CO_2	**EC_{import_PJ}**	Electricity purchases from Unified Energy Systems of Urals grid	GW-h
$PE_{combustion\ gases\_electricity}$	CO_2 emissions from combustion of gases for electricity generation at MMK	ths. tons CO_2	**$PE_{combustion\ coal\_electricity}$**	CO_2 emissions from combustion of power station coal	ths. tons CO_2

CO_2 emissions from combustion of gases for electricity generation at MMK

$$PE_{combustion\ gases\_electricity} = (FC_{BFG\_CPP\_PJ} * C_{BFG\_PJ} + FC_{NG\_CPP\_PJ} * C_{NG\_.PJ} + FC_{NG\_CHPP\_PJ} * C_{NG\_PJ} + FC_{BFG\_SABPP\_PJ} * C_{BFG\_PJ} + FC_{COG\_SABPP\_PJ} * C_{COG\_PJ} + FC_{NG\_SABPP\_PJ} * C_{NG\_PJ} + FC_{NG\_turbine\ section\ of\ SP\ \_PJ} * C_{NG\_.PJ} + FC_{NG\_gas\ recovery\ unit\text{-}2\ of\ SP\ \_PJ} * C_{NG\_PJ})/100 * 44/1$$ **(PDD formula D.1.1.2.-27)**

CO_2 emissions from combustion of power station coal for electricity generation at MMK

$$PE_{combustion\ coal\_electricity} = (FC_{energy\ coal\_CHPP\_PJ} * \%C_{energy\ coal})/100 * 44/12$$ **(PDD formula D.1.1.2.-28)**

Symbol	Data variable	Unit	Symbol	Data variable	Unit
$PE_{combustion\ gases\_electricity}$	CO_2 emissions from combustion of gases for electricity generation at MMK	ths. tons CO_2	**$PE_{combustion\ coal\_electricity}$**	CO_2 emissions from combustion of power station coal	ths. tons CO_2
$FC_{BFG\_CPP\_PJ}$	Consumption of BFG in CPP	mln. m^3	**$FC_{COG\_SABPP\_PJ}$**	Consumption of COG in SABPP	mln. m^3
$FC_{NG\_CPP\_PJ}$	Consumption of NG in CPP	mln. m^3	**$FC_{NG\_SABPP\_PJ}$**	Consumption of NG in SABPP	mln. m^3

CO_2 emission factor for electricity produced at MMK

FC $_{NG\_CHPP\_PJ}$	Consumption of NG in CHPP	mln. m^3	**FC** $_{NG\_turbine\ section\ of\ SP\ \_PJ}$	Consumption of NG in turbine section of SP	mln. m^3
FC $_{BFG\_SABPP\_PJ}$	Consumption of BFG in SABPP	mln. m^3	**FC** $_{NG\ \ gas\ recovery\ unit\text{-}2\ of\ SP\ \_PJ}$	Consumption of NG in gas recovery unit of SP	mln. m^3
C $_{BFG\_PJ}$	Carbon content in BFG	kg C/m^3	**C** $_{NG\_PJ}$	Carbon content in NG	kg C/m^3
C $_{COG\_PJ}$	Carbon content in COG	kg C/m^3	**%C** $_{energy\ coal}$	Carbon content in power station coal	% by mass
FC $_{energy\ coal\_CHPP\_PJ}$	Consumption of power station coal by CHPP	ths. tons			

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Input carbon flows

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total per year
1	Consumption of BFG in CPP	mln. m3	185,9	180,2	202,2	182,6	253,0	251,4	261,1	283,0	253,1	187,2	150,1	160,7	**2550,4**
2	Carbon content in BFG	kg C/m3	0,22	0,22	0,22	0,21	0,22	0,22	0,21	0,22	0,21	0,21	0,22	0,22	**0,22**
		ths. tons C	41,2	39,7	43,7	38,7	54,8	54,6	55,8	61,1	54,1	39,8	32,5	35,0	**551,1**
3	Consumption of NG in CPP	mln. m3	24,6	21,9	23,8	24,3	27,0	27,0	19,8	17,6	19,3	23,7	22,0	28,4	**279,3**
4	Carbon content in NG	kg C/m3	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	**0,49**
		ths. tons C	12,2	10,8	11,8	12,0	13,3	13,4	9,8	8,7	9,5	11,7	10,9	14,0	**138,1**
5	Consumption of NG in CHPP	mln. m3	54,8	49,0	57,3	52,6	66,4	63,3	65,6	71,6	70,9	63,4	52,8	55,8	**723,5**
6	Carbon content in NG	kg C/m3	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	**0,49**
		ths. tons C	27,1	24,2	28,4	26,0	32,8	31,3	32,4	35,4	35,0	31,4	26,1	27,6	**357,7**
7	Consumption of COG in SABPP	mln. m3	67,3	45,2	52,7	62,5	42,7	63,6	64,1	65,0	64,5	59,0	59,4	62,9	**708,9**
8	Carbon content in COG	kg C/m3	0,22	0,22	0,22	0,21	0,22	0,22	0,21	0,22	0,21	0,21	0,22	0,22	**0,22**
		ths. tons C	14,9	10,0	11,4	13,2	9,3	13,8	13,7	14,0	13,8	12,6	12,9	13,7	**153,2**
9	Consumption of BFG in SABPP	mln. m3	11,5	7,9	9,6	11,7	8,1	12,6	13,1	13,2	13,7	10,9	10,6	9,7	**132,6**
10	Carbon content in BFG	kg C/m3	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	**0,19**
		ths. tons C	2,1	1,5	1,8	2,3	1,6	2,3	2,5	2,4	2,6	2,1	2,1	1,8	**25,2**

CO_2 emission factor for electricity produced at MMK

11	Consumption of NG in SABPP	mln. m3	7,8	4,6	4,2	6,1	3,9	4,4	4,2	4,1	4,7	5,6	6,4	7,9	**63,8**
12	Carbon content in NG	kg C/m3	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	**0,49**
		ths. tons C	3,9	2,3	2,1	3,0	1,9	2,2	2,1	2,0	2,3	2,7	3,1	3,9	**31,5**
13	Consumption of NG in turbine section of SP	mln. m3	0,446	0,480	0,486	0,387	0,154	0,295	0,203	0,264	0,265	0,234	0,143	0,381	**3,7**
14	Carbon content in NG	kg C/m3	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	**0,49**
		ths. tons C	0,22	0,24	0,24	0,19	0,08	0,15	0,10	0,13	0,13	0,12	0,07	0,19	**1,8**
15	Consumption of NG in gas recovery unit of SP	mln. m3	0,099	0,080	0,086	0,112	0,032	0,011	0,05	0,07	0,00	0,00	0,08	0,09	**0,7**
16	Carbon content in NG	kg C/m3	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	**0,49**
		ths. tons C	0,05	0,04	0,04	0,06	0,02	0,01	0,02	0,03	0,00	0,00	0,04	0,05	**0,4**
17	**Total carbon input stream with gases**	**ths. tons C**	**101,6**	**88,8**	**99,4**	**95,5**	**113,8**	**117,8**	**116,5**	**123,8**	**117,4**	**100,4**	**87,7**	**96,3**	**1258,9**

Output carbon flows

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total per year
1	Consumption of power station coal by CHPP	ths. tons	8,3	8,1	8,1	0,0	0,0	0,0	0,0	0,0	0,0	4,3	10,0	9,5	**48,5**
2	Carbon content in power station coal	% by mass	73,00	73,00	73,00	73,00	73,00	73,00	73,00	73,00	73,00	73,00	73,00	73,00	73,00
		ths. tons C	6,1	5,9	5,9	0,0	0,0	0,0	0,0	0,0	0,0	3,2	7,3	6,9	**35,4**
3	**Total ouput carbon flow**	**ths. tons C**	**6,1**	**5,9**	**5,9**	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**3,2**	**7,3**	**6,9**	**35,4**

CO2 emissions from electricity generation

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total per year
1	Carbon burning in the gas-burning processes	ths. tons C	101,6	88,8	99,4	95,5	113,8	117,8	116,5	123,8	117,4	100,4	87,7	96,3	**1258,9**
2	CO2 emissions from burning of gases	ths. tons CO2	372,7	325,6	364,3	350,1	417,1	431,9	427,1	454,0	430,6	368,2	321,5	353,1	**4616,1**
3	Carbon burning in the coal burning process	ths. tons C	6,1	5,9	5,9	0,0	0,0	0,0	0,0	0,0	0,0	3,2	7,3	6,9	**35,4**
4	CO2 emissions from coal burning	ths. tons CO2	22,3	21,7	21,8	0,0	0,0	0,0	0,0	0,0	0,0	11,6	26,9	25,5	**129,7**

5	**CO2 emission factor for electricity produced at MMK**	**ths. tons CO2**	**395,0**	**347,3**	**386,1**	**350,1**	**417,1**	**431,9**	**427,1**	**454,0**	**430,6**	**379,7**	**348,4**	**378,5**	**4745,9**

Emission factors for electricity and power transmission/distribution losses

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total per year
1	**CO2 emission factor for electricity generated at MMK**	**tons CO2/MWh**	**0,851**	**0,845**	**0,846**	**0,838**	**1,001**	**1,051**	**1,060**	**1,088**	**1,026**	**0,874**	**0,817**	**0,804**	**0,922**
2	**CO2 emissions factor for grid electricity purchased from Unified Energy System of Urals** (fixed ex-ante, 2008-2012)	**tons CO2/MWh**	**0,541**	**0,541**	**0,541**	**0,541**	**0,541**	**0,541**	**0,541**	**0,541**	**0,541**	**0,541**	**0,541**	**0,541**	**0,541**
3	Power transmission and distribution losses in Unified energy Systems of Urals grid*	%/100	0,0804	0,0804	0,0804	0,0804	0,0804	0,0804	0,0804	0,0804	0,0804	0,0804	0,0804	0,0804	**0,0804**

*http://www.mrsk-ural.ru/ru/821

9 months of 2012

Input carbon flows

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total
1	Consumption of BFG in CPP	mln. m3	167,6	161,4	196,1	222,1	272,7	260,4	255,7	257,8	259,3	**2053,1**
2	Carbon content in BFG	kg C/m3	0,21	0,22	0,22	0,22	0,22	0,22	0,21	0,21	0,21	**0,16**
		ths. tons C	35,7	35,8	43,3	48,0	59,3	57,0	54,0	54,7	54,6	**442,4**
3	Consumption of NG in CPP	mln. m3	27,0	23,6	23,5	23,6	22,7	17,0	20,1	23,3	26,9	**207,6**
4	Carbon content in NG	kg C/m3	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	**0,37**
		ths. tons C	13,3	11,7	11,6	11,7	11,2	8,4	9,9	11,5	13,3	**102,6**
5	Consumption of NG in CHPP	mln. m3	56,6	49,6	50,9	52,6	65,6	63,9	71,5	78,8	74,8	**564,4**
6	Carbon content in NG	kg C/m3	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	**0,37**
		ths. tons C	28,0	24,6	25,2	26,0	32,4	31,6	35,3	39,0	37,0	**279,0**
7	Consumption of COG in SABPP	mln. m3	58,2	44,0	53,3	72,3	77,7	77,8	76,7	75,6	64,9	**600,5**

CO_2 emission factor for electricity produced at MMK

8	Carbon content in COG	kg C/m3	0,21	0,22	0,22	0,22	0,22	0,22	0,21	0,21	0,21	**0,16**
		ths. tons C	12,4	9,8	11,8	15,6	16,9	17,0	16,2	16,0	13,7	**129,4**
9	Consumption of BFG in SABPP	mln. m3	9,7	7,9	8,8	10,8	12,6	12,0	12,7	13,5	10,8	**98,8**
10	Carbon content in BFG	kg C/m3	0,19	0,20	0,20	0,19	0,19	0,19	0,19	0,19	0,19	**0,14**
		ths. tons C	1,9	1,5	1,8	2,1	2,4	2,3	2,4	2,6	2,1	**19,0**
11	Consumption of NG in SABPP	mln. m3	5,6	3,9	4,3	5,7	5,5	5,1	5,4	5,4	5,2	**46,1**
12	Carbon content in NG	kg C/m3	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	**0,37**
		ths. tons C	2,8	1,9	2,1	2,8	2,7	2,5	2,7	2,7	2,6	**22,8**
13	Consumption of NG in turbine section of SP	mln. m3	0,389	0,439	0,540	0,283	0,224	0,241	0,248	0,163	0,292	**2,8**
14	Carbon content in NG	kg C/m3	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	**0,37**
		ths. tons C	0,19	0,22	0,27	0,14	0,11	0,12	0,12	0,08	0,14	**1,4**
15	Consumption of NG in gas recovery unit of SP	mln. m3	0,135	0,122	0,106	0,100	0,110	0,075	0,07	0,05	0,00	**0,8**
16	Carbon content in NG	kg C/m3	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	**0,37**
		ths. tons C	0,07	0,06	0,05	0,05	0,05	0,04	0,04	0,03	0,00	**0,4**
17	**Total carbon input stream with gases**	**ths. tons C**	**94,4**	**85,6**	**96,1**	**106,3**	**125,1**	**118,9**	**120,7**	**126,5**	**123,4**	**997,0**

Output carbon flows

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total
1	Consumption of power station coal by CHPP	ths. tons	9,1	7,9	5,1	0,0	0,0	0,0	0,0	0,0	0,0	**22,1**
2	Carbon content in power station coal	% by mass	73,00	73,00	73,00	73,00	73,00	73,00	73,00	73,00	73,00	73,00
		ths. tons C	6,7	5,8	3,7	0,0	0,0	0,0	0,0	0,0	0,0	**16,2**
3	**Total ouput carbon flow**	**ths. tons C**	**6,7**	**5,8**	**3,7**	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**16,2**

CO2 emissions from electricity generation

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total
1	Carbon burning in the gas-burning processes	ths. tons C	94,4	85,6	96,1	106,3	125,1	118,9	120,7	126,5	123,4	**997,0**
2	CO2 emissions from burning of gases	ths. tons CO2	346,1	313,8	352,4	389,9	458,7	436,0	442,5	463,9	452,3	**3655,6**
3	Carbon burning in the coal burning process	ths. tons C	6,7	5,8	3,7	0,0	0,0	0,0	0,0	0,0	0,0	**16,2**

4	CO2 emissions from coal burning	ths. tons CO2	24,4	21,2	13,7	0,0	0,0	0,0	0,0	0,0	0,0	**59,3**
5	**CO2 emission factor for electricity produced at MMK**	**ths. tons CO2**	**370,5**	**334,9**	**366,1**	**389,9**	**458,7**	**436,0**	**442,5**	**463,9**	**452,3**	**3714,8**

Emission factors for electricity and power transmission/distribution losses

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total
1	**CO2 emission factor for electricity generated at MMK**	**tons CO2/MWh**	**0,799**	**0,816**	**0,836**	**0,954**	**1,074**	**1,095**	**1,056**	**1,037**	**1,027**	**0,964**
2	**CO2 emissions factor for grid electricity purchased from Unified Energy System of Urals** (fixed ex-ante, 2008-2012)	**tons CO2/MWh**	**0,541**	**0,541**	**0,541**	**0,541**	**0,541**	**0,541**	**0,541**	**0,541**	**0,541**	**0,541**
3	Power transmission and distribution losses in Unified energy Systems of Urals grid*	%/100	0,0795	0,0795	0,0795	0,0795	0,0795	0,0795	0,0795	0,0795	0,0795	**0,0795**

*http://report2011.mrsk-ural.ru/reports/mrskural/annual/2011/gb/Russian/201040.html

D.5 CO_2 emissions from generation of air blast for production of pig iron used for production of slab steel billet

CO_2 emissions from generation of air blast for production of pig iron used for production of slab steel billet in the project

$$PE_{air\ blast\_for\_pig\_iron} = P_{slab\ steel\_\ EAFP} * SC_{pig\ iron\_\ EAFP} * SC_{air\ blast\ generation} * EF_{air\ blast\ generation}$$ **(PDD formula D.1.1.2.-29)**

$$EF_{air\ blast\ generation\_PJ} = PE_{air\ blast\ generation} / OC_{air\ blast\ generation\_PJ}$$ **(PDD formula D.1.1.2.-30)**

$$PE_{air\ blast\ generation} = (FC_{BFG\_SABPP\_\ air\ blast\ generation\ \_PJ} * C_{BFG\_PJ} + FC_{COG\_SABPP\_\ air\ blast\ generation\ \_PJ} * C_{COG.PJ} + FC_{NG\_SABPP\_\ air\ blast\ generation\_PJ} * C_{NG\_.PJ})/100 * 44/12$$

(PDD formula D.1.1.2.-31)

Specific consumption of air blast per ton of pig iron produced

$$SC_{air\ blast\ generation\_PJ} = OC_{air\ blast\ generation\_PJ} / P_{pig\ iron\_BF\_PJ}$$ **(PDD formula D.1.1.2.-32)**

Symbol	Data variable	Unit	Symbol	Data variable	Unit
$PE_{air\ blast\_for\_pig\_iron}$	CO_2 emissions from generation of air blast for production of pig iron used for production of slab steel billet	ths. tons CO_2	**$OC_{air\ blast\ generation\_PJ}$**	Generation of air blast at MMK	mln. m^3
$P_{slab\ steel\_\ EAFP}$	Output of slab steel billet in EAFP	ths. tons	**$FC_{BFG\ SABPP\ air\ blast\ generation\ \_PJ}$**	Consumption of BFG in SABPP for generation of air blast	mln. m^3
$SC_{pig\ iron\_\ EAFP}$	Specific consumption of pig iron per ton of slab steel billet produced in EAFP	ton/ton	**C_{BFG_PJ}**	Carbon content in BFG	kg C/m^3
$SC_{air\ blast\ generation}$	Specific consumption of air blast per ton of pig iron produced	ths. m^3/ton	**$FC_{COG\ SABPP\ air\ blast\ generation\ \_PJ}$**	Consumption of COG in SABPP for generation of air blast	mln. m^3
$EF_{air\ blast\ generation\_PJ}$	CO_2 emission factor for air blast generation	ths. tons CO_2/ths. m^3	**$C_{COG.PJ}$**	Carbon content in COG	% by mass
$PE_{air\ blast\ generation}$	CO_2 emissions from combustion of fuel for generation of air blast	ths. tons CO_2	**$FC_{NG\ SABPP\ air\ blast\ generation\_PJ}$**	Consumption of NG in SABPP for generation of air blast	mln. m^3
$P_{pig\ iron\_BF\_PJ}$	Production of pig iron in BFP	ths. tons	**$C_{NG\_.PJ}$**	Carbon content in NG	kg C/m^3

CO_2 emissions from generation of air blast for production of pig iron used for production of slab steel billet in the project

12 months of 2011

Generation of air blast at MMK

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total per year
1	Generation of air blast at MMK	mln. m3	1978,5	1748,7	1959,0	1954,5	1882,1	2086,9	2108,1	2181,0	2090,3	1994,9	1866,0	1835,2	**23685,4**
2	**Specific consumption of air blast in BFP per ton of produced pig iron**	**ths. m3 of air blast/ton**	***2,326***	***2,247***	***2,327***	***2,510***	***2,608***	***2,582***	***2,662***	***2,572***	***2,613***	***2,544***	***2,505***	***2,453***	**2,496**

Input carbon flows

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total per year
1	Consumption of BFG in SABPP for generation of air blast	mln. m3	102,1	93,9	111,8	100,8	98,9	116,1	116,9	123,5	114,1	112,0	98,8	95,9	**1285,0**
2	Carbon content in BFG	kg C/m3	0,22	0,22	0,22	0,21	0,22	0,22	0,21	0,22	0,21	0,21	0,22	0,22	**0,22**
		ths. tons C	22,6	20,7	24,2	21,3	21,4	25,2	25,0	26,7	24,4	23,8	21,4	20,9	**277,7**
3	Consumption of COG in SABPP for generation of air blast	mln. m3	17,4	16,4	20,4	18,9	18,7	23,0	23,9	25,1	24,3	20,7	17,6	14,8	**241,2**
4	Carbon content in COG	kg C/m3	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	**0,19**
		ths. tons C	3,2	3,1	3,9	3,6	3,6	4,3	4,6	4,6	4,6	4,0	3,4	2,8	**45,8**
5	Consumption of NG in SABPP for generation of air blast	mln. m3	11,9	9,5	8,8	9,9	8,9	8,1	7,7	7,7	8,3	10,5	10,6	12,0	**114,1**
6	Carbon content in NG	kg C/m3	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	**0,49**
		ths. tons C	5,9	4,7	4,4	4,9	4,4	4,0	3,8	3,8	4,1	5,2	5,2	5,9	**56,4**
7	**Total carbon content in input gaseos flow**	**ths. tons C**	**31,7**	**28,5**	**32,4**	**29,9**	**29,5**	**33,5**	**33,4**	**35,1**	**33,1**	**33,0**	**30,1**	**29,6**	**379,9**

CO2 emissions from generation of air blast

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total per year
1	**CO2 emissions from generation of air blast**	**ths. tons CO2**	**116,3**	**104,4**	**118,9**	**109,6**	**108,1**	**122,9**	**122,6**	**128,9**	**121,3**	**121,0**	**110,2**	**108,7**	**1392,9**

CO2 emission factor for generation of air blast

CO_2 emissions from generation of air blast for production of pig iron used for production of slab steel billet in the project

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total per year
1	**CO2 emission factor for generation of air blast at MMK**	**tons CO2/ ths. m3 of air blast**	**0,059**	**0,060**	**0,061**	**0,056**	**0,057**	**0,059**	**0,058**	**0,059**	**0,058**	**0,061**	**0,059**	**0,059**	**0,059**

CO2 emissions from generation of air blast for production of pig iron used for production of slab steel billet in the project

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total per year
1	**CO2 emissions from generation of air blast for production of pig iron**	**ths. tons CO2**	**0,696**	**4,882**	**5,550**	**2,487**	**2,115**	**1,937**	**2,026**	**0,000**	**4,179**	**3,754**	**3,560**	**2,863**	**34,049**

CO_2 emissions from generation of air blast for production of pig iron used for production of slab steel billet in the project

9 months of 2012

Generation of air blast at MMK

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total
1	Generation of air blast at MMK	mln. m3	1147,4	1961,3	2094,4	2103,5	2117,7	2233,9	2314,6	2279,8	2187,7	**18440,3**
2	**Specific consumption of air blast in BFP per ton of produced pig iron**	**ths. m3 of air blast/ton**	***1,391***	***2,474***	***2,431***	***2,496***	***2,442***	***2,635***	***2,644***	***2,653***	***2,617***	**2,420**

Input carbon flows

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total
1	Consumption of BFG in SABPP for generation of air blast	mln. m3	115,2	115,7	123,2	125,9	127,1	138,9	137,3	131,8	126,7	**1141,7**
2	Carbon content in BFG	kg C/m3	0,21	0,22	0,22	0,22	0,22	0,22	0,21	0,21	0,21	**0,16**
		ths. tons C	24,6	25,7	27,2	27,2	27,6	30,4	29,0	27,9	26,7	**246,3**
3	Consumption of COG in SABPP for generation of air blast	mln. m3	19,3	20,7	20,4	18,8	20,6	21,4	22,7	23,5	21,1	**188,5**
4	Carbon content in COG	kg C/m3	0,19	0,20	0,20	0,19	0,19	0,19	0,19	0,19	0,19	**0,14**
		ths. tons C	3,7	4,1	4,1	3,6	3,9	4,1	4,3	4,5	4,0	**36,3**
5	Consumption of NG in SABPP for generation of air blast	mln. m3	11,2	10,2	10,0	9,9	9,0	9,1	9,6	9,4	10,2	**88,5**
6	Carbon content in NG	kg C/m3	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	**0,37**
		ths. tons C	5,5	5,0	4,9	4,9	4,4	4,5	4,8	4,7	5,0	**43,7**
7	**Total carbon content in input gaseos flow**	**ths. tons C**	**33,8**	**34,8**	**36,2**	**35,7**	**36,0**	**38,9**	**38,1**	**37,1**	**35,8**	**326,3**

CO2 emissions from generation of air blast

№	Input carbon flows	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total
1	**CO2 emissions from generation of air blast**	**ths. tons CO2**	**123,9**	**127,4**	**132,9**	**130,9**	**132,0**	**142,8**	**139,5**	**135,9**	**131,2**	**1196,6**

CO2 emission factor for generation of air blast

№	Input carbon flows	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total

CO_2 emissions from generation of air blast for production of pig iron used for production of slab steel billet in the project

1	**CO2 emission factor for generation of air blast at MMK**	**tons CO2/ ths. m3 of air blast**	**0,108**	**0,065**	**0,063**	**0,062**	**0,062**	**0,064**	**0,060**	**0,060**	**0,060**	**0,065**

CO2 emissions from generation of air blast for production of pig iron used for production of slab steel billet in the project

№	Input carbon flows	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total
1	**CO2 emissions from generation of air blast for production of pig iron**	**ths. tons CO2**	**11,802**	**11,923**	**10,377**	**12,254**	**13,568**	**17,146**	**12,859**	**16,299**	**12,197**	**118,425**

CO_2 emissions from generation of air blast for production of pig iron used for production of slab steel billet in the project

D.6 Baseline CO_2 emissions from slab steel billet production

BE = P $_{slab\ steel\_EAFP\_MMK}$ * EF $_{integrated\_Russian\ metallurgical\ plants}$ **(PDD formula D.1.1.4.-1)**

Integrated CO_2 emission factor for steel production at the Russian metallurgical works with capacity for production of slab steel billet

EF $_{integrated\_Russian\ metallurgical\ plants} = \sum EF_n * \omega_n$ **(PDD formula D.1.1.4.-2)**

General CO_2 emission factor for steel production at the metallurgical works n

$EF_n = SBE_{EAF\_n} * \omega_{EAF\_n} + SBE_{converter\_n} * \omega_{converter\_n} + SBE_{pig\text{-}and\text{-}ore\ process\_n} * \omega_{pig\text{-}and\text{-}ore\ process\_n} + SBE_{DBSU\_n} * \omega_{DBSU\_n} + SBE_{scrap\ process\_n} * \omega_{scrap\ process\_n}$

(PDD formula D.1.1.4.-3)

Symbol	Data variable	Unit	Symbol	Data variable	Unit	Symbol	Data variable	Unit
BE	Baseline CO_2 emissions from steel production at the metallurgical works of Russia	ths. tons CO_2	**P $_{slab\ steel\_EAFP\_MMK}$**	Output of slab steel billet in EAFP	ths. tons	**EF $_{integrated\_Russian\ metallurgical\ plants}$**	Integrated CO_2 emission factor for steel production at the Russian metallurgical works with capacity for production of slab steel billet	t CO_2/t steel
EF_n	General CO_2 emission factor for steel production at the metallurgical works n	t CO_2/t steel	**ω_n**	Share of each metallurgical works with capacity for production of slab steel billet in the whole volume of steel output by this group metallurgical works of Russia	-	**SBE_{EAF_n}**	Specific CO_2 emissions from production of one ton of steel by arc-furnace technique at the metallurgical works n	t CO_2/ t steel
ω_{EAF_n}	Share of arc-furnace technique of steel production in the whole volume of steel output at the metallurgical works n	-	**$SBE_{converter\_n}$**	Specific CO_2 emissions from production of one ton of steel by converter technique at the metallurgical works n	t CO_2/ t steel	**$\omega_{converter\_n}$**	Share of converter technique of steel production in the whole volume of steel output at the metallurgical works n	-
$SBE_{pig\text{-}and\text{-}ore\ process\_n}$	Specific CO_2 emissions from production of one ton of steel by pig-and-ore technique at the	t CO_2/ t steel	**$\omega_{pig\text{-}and\text{-}ore\ process\_n}$**	Share of pig-and-ore technique of steel production in the whole volume of steel output at the metallurgical	-	**SBE_{DBSU_n}**	Specific CO_2 emissions from production of one ton of steel in DBSU at the metallurgical works n	t CO_2/ t steel

	metallurgical works n			works n				
ω_{DBSU_n}	Share of steel production in DBSU in the whole volume of steel output at the metallurgical works n	-	**SBE** $_{scrap\ process\_n}$	Specific CO_2 emissions from production of one ton of steel by scrap technique at the metallurgical works n	t CO_2/ t steel	$\omega_{scrap\ process\_n}$	Share of scrap technique of steel production in the whole volume of steel output at the metallurgical works n	-

Specific CO_2 emissions from production of one ton of steel by arc-furnace technique at the metallurgical works n

$$SBE_{EAF\_n} = SBE_{iron\_EAF\_n} + SBE_{NG\_EAF\_n} + SBE_{electrodes\_EAF\_n} + SBE_{oxygen\ EAF\_n} + SBE_{electricity\ EAF\ \_n}$$ **(PDD formula D.1.1.4.-4)**

$$SBE_{iron\_EAF\_n} = SM_{iron\ EAF\ \_n} * EF_{iron}$$ **(PDD formula D.1.1.4.-5)**

$$SBE_{NG\_EAF\_n} = SM_{NG\ EAF\ \_n} /1000 * EF_{NG}$$ **(PDD formula D.1.1.4.-6)**

$$SBE_{electrodes\_EAF\_n} = SM_{electrodes\ EAF\_n} * EF_{electrodes}$$ **(PDD formula D.1.1.4.-7)**

$$SBE_{oxygen\ EAF\_n} = SM_{oxygen\ EAF\_n} /1000 * EC_{oxygen} * EF_{grid\_region}$$ **(PDD formula D.1.1.4.-8)**

$$SBE_{electricity\ EAF\ \_n} = SM_{electricity\ EAF\ \_n} * EF_{grid\_region}$$ **(PDD formula D.1.1.4.-9)**

Symbol	Data variable	Unit	Symbol	Data variable	Unit	Symbol	Data variable	Unit
SBE $_{iron\_EAF\_n}$	Specific CO_2 emissions from production of pig iron per ton of steel produced by arc-furnace technique at the metallurgical works n	t CO_2/ t steel	**SBE** $_{NG\_EAF\_n}$	Specific CO_2 emissions from consumption of NG per ton of steel produced by arc-furnace technique at the metallurgical works n	t CO_2/ t steel	**SBE** $_{electrodes\_EAF\_n}$	Specific CO_2 emissions from consumption of electrodes per ton of steel produced by arc-furnace technique at the metallurgical works n	t CO_2/ t steel
SBE $_{oxygen\ EAF\_n}$	Specific CO_2 emissions from consumption of oxygen per ton of	t CO_2/ t steel	**SBE** $_{electricity\ EAF\ \_n}$	Specific CO_2 emissions from consumption of electricity per ton of steel produced by arc-furnace	t CO_2/ t steel	**SM** $_{iron\ EAF\ \_n}$	Specific consumption of pig iron per ton of steel produced by arc-furnace technique at the	t pig iron/ t steel

	steel produced by arc-furnace technique at the metallurgical works n			technique at the metallurgical works n			metallurgical works n	
EF_{iron}	CO_2 emission factor for iron production	t CO_2/t pig iron	**$SM_{NG\ EAF\_n}$**	Specific consumption of NG per ton of steel produced by arc-furnace technique at the metallurgical works n	m^3/ t steel	**EF_{NG}**	CO_2 emission factor for NG combustion	t CO_2/ 1,000 m^3
$SM_{electrodes\ EAF\_n}$	Specific consumption of electrodes per ton of steel produced by arc-furnace technique at the metallurgical works n	t electrodes / t steel	**$EF_{electrodes}$**	CO_2 emission factor for electrodes consumption	t CO_2/t electrodes	**$SM_{oxygen\ EAF\_n}$**	Specific consumption of oxygen per ton of steel produced by arc-furnace technique at the metallurgical works n	m^3 / t steel
EC_{oxygen}	Electricity consumption for oxygen production	MWh/ 1,000 m^3	**EF_{grid_region}**	CO_2 emissions factor for grid electricity produced by Unified Energy System of region, where metallurgical works n is situated	t CO_2 /MWh	**$SM_{electricity\ EAF\_n}$**	Specific consumption of electricity per ton of steel produced by arc-furnace technique at the metallurgical works n	MWh/ t steel
SBE_{EAF_n}	Specific CO_2 emissions from production of one ton of steel by arc-furnace technique at the metallurgical works n	t CO_2/ t steel						

Specific CO_2 emissions from production of one ton of steel by converter technique at the metallurgical works n

$$SBE_{converter\_n} = SBE_{iron\ converter\_n} + SBE_{NG\ converter\_n} + SBE_{oxygen\ converter\_n}$$ **(PDD formula D.1.1.4.-10)**

$$SBE_{iron\ converter\_n} = SM_{iron\ converter\_n} * EF_{iron}$$ **(PDD formula D.1.1.4.-11)**

$$SBE_{NG\ converter\_n} = SM_{NG\ converter\_n} /1000 * EF_{NG}$$ **(PDD formula D.1.1.4.-12)**

$$SBE_{oxygen\ converter\_n} = SM_{oxygen\ converter\_n} /1000 * EC_{oxygen} * EF_{grid\_region}$$ **(PDD formula D.1.1.4.-13)**

Baseline CO_2 emissions from slab steel billet production

Symbol	Data variable	Unit	Symbol	Data variable	Unit	Symbol	Data variable	Unit
SBE $_{converter\_n}$	Specific CO_2 emissions from production of one ton of steel by converter technique at the metallurgical works n	t CO_2/ t steel	**SBE** $_{iron\ converter\_n}$	Specific CO_2 emissions from production of pig iron per ton of steel produced by converter technique at the metallurgical works n	t CO_2/ t steel	**SBE** $_{NG\ converter\_n}$	Specific CO_2 emissions from consumption of NG per ton of steel produced by converter technique at the metallurgical works n	t CO_2/ t steel
SBE $_{oxygen\ converter\_n}$	Specific CO_2 emissions from consumption of oxygen per ton of steel produced by converter technique at the metallurgical works n	t CO_2/ t steel	**SM** $_{iron\ converter\_n}$	Specific consumption of pig iron per ton of steel produced by converter technique at the metallurgical works n	t pig iron/ t steel	**EF** $_{iron}$	CO_2 emission factor for iron production	t CO_2/t pig iron
SM $_{NG\ converter\_n}$	Specific consumption of NG per ton of steel produced by converter technique at the metallurgical works n	m^3/ t steel	**EF** $_{NG}$	CO_2 emission factor for NG combustion	t CO_2/ 1,000 m^3	**SM** $_{oxygen\ converter\_n}$	Specific consumption of oxygen per ton of steel produced by converter technique at the metallurgical works n	m^3 / t steel
EC $_{oxygen}$	Electricity consumption for oxygen production	MWh/ 1,000 m^3	**EF** $_{grid\_region}$	CO_2 emissions factor for grid electricity produced by Unified Energy System of region, where metallurgical works n is situated	t CO_2 /MWh			

Specific CO_2 emissions from production of one ton of steel by pig-and-ore technique at the metallurgical works n

$$SBE_{pig\text{-}and\text{-}ore\ process\_n} = SBE_{iron\ pig\text{-}and\text{-}ore\ process\_n} + SBE_{NG\ pig\text{-}and\text{-}ore\ process\_n} + SBE_{oxygen\ pig\text{-}and\text{-}ore\ process\_n}$$ **(PDD formula D.1.1.4.-14)**

$$SBE_{iron\ pig\text{-}and\text{-}ore\ process\_n} = SM_{iron\ pig\text{-}and\text{-}ore\ process\_n} * EF_{iron}$$ **(PDD formula D.1.1.4.-15)**

$$SBE_{NG\ pig\text{-}and\text{-}ore\ process\_n} = SM_{NG\ pig\text{-}and\text{-}ore\ process\_n} /1000 * EF_{NG}$$ **(PDD formula D.1.1.4.-16)**

$$SBE_{oxygen\ pig\text{-}and\text{-}ore\ process\_n} = SM_{oxygen\ pig\text{-}and\text{-}ore\ process\_n} /1000 * EC_{oxygen} * EF_{grid\_region}$$ **(PDD formula D.1.1.4.-17)**

Baseline CO_2 emissions from slab steel billet production

Symbol	Data variable	Unit	Symbol	Data variable	Unit	Symbol	Data variable	Unit
SBE $_{pig\text{-}and\text{-}ore\ process\_n}$	Specific CO_2 emissions from production of one ton of steel by pig-and-ore technique at the metallurgical works n	t CO_2/ t steel	**SBE** $_{iron\ pig\text{-}and\text{-}ore\ process\_n}$	Specific CO_2 emissions from production of pig iron per ton of steel produced by pig-and-ore technique at the metallurgical works n	t CO_2/ t steel	**SBE** $_{NG\ pig\text{-}and\text{-}ore\ process\_n}$	Specific CO_2 emissions from consumption of NG per ton of steel produced by pig-and-ore technique at the metallurgical works n	t CO_2/ t steel
SBE $_{oxygen\ pig\text{-}and\text{-}ore\ process\_n}$	Specific CO_2 emissions from consumption of oxygen per ton of steel produced by pig-and-ore technique at the metallurgical works n	t CO_2/ t steel	**SM** $_{iron\ pig\text{-}and\text{-}ore\ process\_n}$	Specific consumption of pig iron per ton of steel produced by pig-and-ore technique at the metallurgical works n	t pig iron/ t steel	**EF** $_{iron}$	CO_2 emission factor for iron production	t CO_2/t pig iron
SM $_{NG\ pig\text{-}and\text{-}ore\ process\_n}$	Specific consumption of NG per ton of steel produced by pig-and-ore technique at the metallurgical works n	m^3/ t steel	**EF** $_{NG}$	CO_2 emission factor for NG combustion	t CO_2/ 1,000 m^3	**SM** $_{oxygen\ pig\text{-}and\text{-}ore\ process\_n}$	Specific consumption of oxygen per ton of steel produced by pig-and-ore technique at the metallurgical works n	m^3 / t steel
EC $_{oxygen}$	Electricity consumption for oxygen production	MWh/ 1,000 m^3	**EF** $_{grid\_region}$	CO_2 emissions factor for grid electricity produced by Unified Energy System of region, where metallurgical works n is situated	t CO_2 /MWh			

Specific CO_2 emissions from production of one ton of steel in DBSU at the metallurgical works n

$SBE_{DBSU\_n} = SBE_{iron\ DBSU\_n} + SBE_{NG\ DBSU\_n} + SBE_{oxygen\ DBSU\_n}$ **(PDD formula D.1.1.4.-18)**

$SBE_{iron\ DBSU\_n} = SM_{iron\ DBSU\_n} * EF_{iron}$ **(PDD formula D.1.1.4.-19)**

$SBE_{NG\ DBSU\_n} = SM_{NG\ DBSU\_n} /1000* EF_{NG}$ **(PDD formula D.1.1.4.-20)**

$SBE_{oxygen\ DBSU\_n} = SM_{oxygen\ DBSU\_n} /1000 * EC_{oxygen} * EF_{grid\_region}$ **(PDD formula D.1.1.4.-21)**

Symbol	Data variable	Unit	Symbol	Data variable	Unit	Symbol	Data variable	Unit
SBE $_{DBSU\_n}$	Specific CO_2	t CO_2/ t	**SBE** $_{iron\ DBSU\_n}$	Specific CO_2 emissions	t CO_2/ t	**SBE** $_{NG\ DBSU\_n}$	Specific CO_2 emissions	t CO_2/ t

	emissions from production of one ton of steel in DBSU at the metallurgical works n	steel		from production of pig iron per ton of steel produced in DBSU at the metallurgical works n	steel		from consumption of NG per ton of steel produced in DBSU at the metallurgical works n	steel
$SBE_{oxygen\ DBSU\_n}$	Specific CO_2 emissions from consumption of oxygen per ton of steel produced in DBSU at the metallurgical works n	t CO_2/ t steel	**$SM_{iron\ DBSU\_n}$**	Specific consumption of pig iron per ton of steel produced in DBSU at the metallurgical works n	t pig iron/ t steel	**EF_{iron}**	CO_2 emission factor for iron production	t CO_2/t pig iron
$SM_{NG\ DBSU\_n}$	Specific consumption of NG per ton of steel produced in DBSU at the metallurgical works n	m^3/ t steel	**EF_{NG}**	CO_2 emission factor for NG combustion	t CO_2/ 1,000 m^3	**$SM_{oxygen\ DBSU\_n}$**	Specific consumption of oxygen per ton of steel produced in DBSU at the metallurgical works n	m^3 / t steel
EC_{oxygen}	Electricity consumption for oxygen production	MWh/ 1,000 m^3	**EF_{grid_region}**	CO_2 emissions factor for grid electricity produced by Unified Energy System of region, where metallurgical works n is situated	t CO_2 /MWh			

Specific CO_2 emissions from production of one ton of steel by scrap technique at the metallurgical works n

$$SBE_{scrap\ process\_n} = SBE_{iron\ scrap\ process\_n} + SBE_{NG\ scrap\ process\_n} + SBE_{oxygen\ scrap\ process\_n}$$ **(PDD formula D.1.1.4.-22)**

$$SBE_{iron\ scrap\ process\_n} = SM_{iron\ scrap\ process\_n} * EF_{iron}$$ **(PDD formula D.1.1.4.-23)**

$$SBE_{NG\ scrap\ process\_n} = SM_{NG\ scrap\ process\_n} /1000 * EF_{NG}$$ **(PDD formula D.1.1.4.-24)**

$$SBE_{oxygen\ scrap\ process\_n} = SM_{oxygen\ scrap\ process\_n} /1000 * EC_{oxygen} * EF_{grid\_region}$$ **(PDD formula D.1.1.4.-25)**

Baseline CO_2 emissions from slab steel billet production

Symbol	Data variable	Unit	Symbol	Data variable	Unit	Symbol	Data variable	Unit
SBE $_{scrap\ process\_n}$	Specific CO_2 emissions from production of one ton of steel by scrap technique at the metallurgical works n	t CO_2/ t steel	**SBE** $_{iron\ scrap\ process\_n}$	Specific CO_2 emissions from production of pig iron per ton of steel produced by scrap technique at the metallurgical works n	t CO_2/ t steel	**SBE** $_{NG\ scrap\ process\_n}$	Specific CO_2 emissions from consumption of NG per ton of steel produced by scrap technique at the metallurgical works n	t CO_2/ t steel
SBE $_{oxygen\ scrap\ process\_n}$	Specific CO_2 emissions from consumption of oxygen per ton of steel produced by scrap technique at the metallurgical works n	t CO_2/ t steel	**SM** $_{iron\ scrap\ process\_n}$	Specific consumption of pig iron per ton of steel produced by scrap technique at the metallurgical works n	t pig iron/ t steel	**EF** $_{iron}$	CO_2 emission factor for iron production	t CO_2/t pig iron
SM $_{NG\ scrap\ process\_n}$	Specific consumption of NG per ton of steel produced by scrap technique at the metallurgical works n	m^3/ t steel	**EF** $_{NG}$	CO_2 emission factor for NG combustion	t CO_2/ 1,000 m^3	**SM** $_{oxygen\ scrap\ process\_n}$	Specific consumption of oxygen per ton of steel produced by scrap technique at the metallurgical works n	m^3 / t steel
EC $_{oxygen}$	Electricity consumption for oxygen production	MWh/ 1,000 m^3	**EF** $_{grid\_region}$	CO_2 emissions factor for grid electricity produced by Unified Energy System of region, where metallurgical works n is situated	t CO_2 /MWh			

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Specific CO_2 emissions from production of one ton of steel by concrete technique at the metallurgical works n

Metallurgical works	Technique of steel production	Raw materials	2011	EF raw material, tCO2/t steel 2011	EF technique, tCO2/t steel 2011
Metallurgical works of Russia with capacity for production of slab steel billet	***Steel-Total***	furnace charge			
		pig iron			
		scrap metal			
		scrap of pig iron			
		pellet			
		charge			
		iron from ore			
		deoxidizing and alloying materials			
		natural gas, m3/t			
		graphite electrode			
		oxygen, m3/t			
		electricity, kWh/t			
OJSC "Magnitogorsk Iron and Steel Works"	converter steel	furnace charge	1136,2		**1,222**
		pig iron	878,6	1,186	
		scrap metal	244,1		
		deoxidizing and alloying materials	13,5		
		natural gas, m3/t	4,3	0,008	
		graphite electrode	61,3	0,028	

	arc-furnace steel	furnace charge	1145,1		**0,596**
		pig iron	258,4	0,349	
		scrap metal	870,7		
		deoxidizing and alloying materials	16,0		
		natural gas, m3/t	29,0	0,055	
		graphite electrode	1,4	0,004	
		oxygen, m3/t	49,3	0,022	
		electricity, kWh/t	307,7	0,166	
	steel from DBSU	furnace charge	1151,0		**1,246**
		pig iron	848,5	1,145	
		scrap metal	284,6		
		deoxidizing and alloying materials	17,9		
		natural gas, m3/t	35,7	0,067	
		oxygen, m3/t	73,6	0,033	
OJSC "EVRAZ NTMK"	converter steel	furnace charge	1144,7		**1,473**
		pig iron	1073,0	1,449	
		scrap metal	26,8		
		iron from ore	25,1		
		deoxidizing and alloying materials	19,8		
		oxygen, m3/t	54,5	0,024	
OJSC "EVRAZ West Siberian Iron and Steel Plant" (Novokuznetsk site)	arc-furnace steel	furnace charge	1094,2		**0,747**
		pig iron	238,8	0,322	
		scrap metal	841,0		
		deoxidizing and alloying materials	14,3		
		graphite electrode	2,7	0,008	
		oxygen, m3/t	41,0	0,030	
		electricity, kWh/t	431,1	0,385	
OJSC "Ural Steel"	arc-furnace steel	furnace charge	1126,3		**0,716**

Baseline CO_2 emissions from slab steel billet production

		pig iron	393,0	0,531	
		scrap metal	709,0		
		deoxidizing and alloying materials	24,4		
		natural gas, m3/t	10,2	0,019	
		graphite electrode	1,3	0,004	
		oxygen, m3/t	55,6	0,025	
		electricity, kWh/t	254,5	0,138	
	pig-and-ore steel	furnace charge	1161,9		**1,308**
		pig iron	755,1	1,019	
		scrap metal	347,9		
		scrap of pig iron	32,9	0,044	
		iron from ore	8,2		
		deoxidizing and alloying materials	17,8		
		natural gas, m3/t	106,1	0,200	
		oxygen, m3/t	99,1	0,045	
	steel from DBSU	furnace charge	1334,5		**1,935**
		pig iron	822,0	1,110	
		scrap metal	483,5		
		scrap of pig iron	1,0	0,001	
		iron from ore	7,7		
		deoxidizing and alloying materials	20,4		
		natural gas, m3/t	408,4	0,770	
		oxygen, m3/t	121,0	0,054	
OJSC "Cherepovets Steel Mill"	converter steel	furnace charge	1148,1		**1,195**
		pig iron	855,7	1,155	
		scrap metal	279,8		
		scrap of pig iron			
		iron from ore			
		deoxidizing and alloying materials	12,6		

Baseline CO_2 emissions from slab steel billet production

		natural gas, m3/t	5,4	0,010	
		oxygen, m3/t	65,5	0,030	
	arc-furnace steel	furnace charge	1151,7		**0,594**
		pig iron	310,1	0,419	
		scrap metal	822,8		
		deoxidizing and alloying materials	18,8		
		graphite electrode	1,9	0,006	
		oxygen, m3/t	56,1	0,026	
		electricity, kWh/t	262,7	0,144	
OJSC "Novolipetsk Steel"	converter steel	furnace charge	1159,3		**1,256**
		pig iron	910,1	1,229	
		scrap metal	237,0		
		pellet	0,0		
		iron from ore	0,7		
		deoxidizing and alloying materials	11,6		
		oxygen, m3/t	64,0	0,027	
OJSC "EVRAZ West Siberian Iron and Steel Plant"	converter steel	furnace charge	1104,5		**1,158**
		pig iron	820,1	1,107	
		scrap metal	272,9		
		deoxidizing and alloying materials	11,5		
		oxygen, m3/t	68,1	0,051	
OJSC "Ashinsky metallurgical works"	scrap process steel	*Because of the absence of data general CO2 emission factor from steel production by scrap technique is equal to specific CO2 emissions from production of one ton of steel at JSC "Taganrog Steel Works", as the most conservative value*			**0,614**
OJSC "Amurmetall"	arc-furnace steel	graphite electrode	2,3	0,007	**0,346**
		oxygen, m3/t	46,9	0,032	
		electricity, kWh/t	373,0	0,307	
OJSC "Chelyabinsk Metallurgical Plant"	converter steel	furnace charge	1132,9		**1,285**

Baseline CO_2 emissions from slab steel billet production

		pig iron	917,2	1,238	
		scrap metal	198,1		
		deoxidizing and alloying materials	17,5		
		natural gas, m3/t	10,0	0,019	
		oxygen, m3/t	63,1	0,028	
	arc-furnace steel	furnace charge	1142,6		**0,618**
		pig iron	282,3	0,381	
		scrap metal	823,6		
		deoxidizing and alloying materials	36,5		
		natural gas, m3/t	22,6	0,043	
		graphite electrode	2,6	0,008	
		oxygen, m3/t	58,2	0,026	
		electricity, kWh/t	296,7	0,161	
OJSC «Krasny oktyabr»	arc-furnace steel	furnace charge	1180,6		**0,322**
		pig iron	3,5	0,005	
		scrap metal	1103,1		
		scrap of pig iron	13,1	0,018	
		deoxidizing and alloying materials	57,6		
		graphite electrode	5,1	0,015	
		oxygen, m3/t	28,6	0,012	
		electricity, kWh/t	544,7	0,272	
"Metallurgical Plant Petrostal" Closed JSC	scrap process steel	*Because of the absence of data general CO2 emission factor from steel production by scrap technique is equal to specific CO2 emissions from production of one ton of steel at JSC "Taganrog Steel Works", as the most conservative value*			**0,614**
"Metallurgical Plant "Kamasteel", LLC	arc-furnace steel	graphite electrode	2,3	0,007	**0,230**
		oxygen, m3/t	46,9	0,021	
		electricity, kWh/t	373,0	0,202	

Baseline CO_2 emissions from slab steel billet production

OJSC "United Metallurgical Company"	arc-furnace steel	graphite electrode	2,3	0,007	**0,217**
		oxygen, m3/t	46,9	0,020	
		electricity, kWh/t	373,0	0,191	
		Pipe plants			
JSC "Taganrog Steel Works"	scrap process steel	furnace charge	1115,9		**0,614**
		pig iron	239,3	0,323	
		scrap metal	851,8		
		deoxidizing and alloying materials	24,8		
		natural gas, m3/t	152,9	0,288	
		oxygen, m3/t	5,4	0,002	
JSC "Vyksa Steel Works"	scrap process steel	furnace charge	1178,1		**0,613**
		pig iron	225,6	0,305	
		scrap metal	917,9		
		scrap of pig iron	19,7	0,027	
		iron from ore	0,1		
		deoxidizing and alloying materials	14,8		
		natural gas, m3/t	149,6	0,282	
OJSC "Chelyabinsk Tube Rolling Plant"	scrap process steel	furnace charge	1118,2		**0,763**
		pig iron	224,9	0,304	
		scrap metal	790,0		
		scrap of pig iron	75,4	0,102	
		iron from ore	0,3		
		deoxidizing and alloying materials	27,6		
		natural gas, m3/t	189,8	0,358	

*The value of specific consumption of graphite electrodes, oxygen and electricity for arc-furnace steel technique at this metal works is taken from PDD of JI project "Production modernisation at OJSC Amurmetal, Komsomolsk-on-Amur, Khabarovsk Krai, Russian Federation". See section C for explanation.

Baseline CO_2 emissions from slab steel billet production

Integrated CO_2 emission factor for steel production at the Russian metallurgical works with capacity for production of slab steel billet

Metallurgical works	Technique of steel production		Share of technique	EF technique, tCO2/t steel	EF works, tCO2/t steel	Share of total production	EF integrated, tCO2/t steel
		2011	2011	2011	2011	2011	2011
Metallurgical works of Russia with capacity for production of slab steel billet	***Steel. total***	***53 618,1***				***1,0***	
	converter steel						
	arc-furnance steel						
	pig-and-ore steel						
	steel from DBSU						
	scrap process steel						
1. OJSC “Magnitogorsk Iron and Steel Works”	Steel-Total	9 555,2	1,00		**1,222**	0,178	**1,123**
	converter steel	9 555,2	1,00	1,222			
2. OJSC "EVRAZ NTMK"	Steel-Total	4 254,3	1,00		**1,473**	0,079	
	converter steel	4 254,3	1,00	1,473			
3. OJSC “EVRAZ West Siberian Iron and Steel Plant” (Novokuznetsk site)	Steel-Total	1 258,7	1,00		**0,747**	0,023	
	arc-furnace steel	1 258,7	1,00	0,747			
4. OJSC “Ural Steel”	Steel-Total	2 553,9	1,00		**0,926**	0,048	
	arc-furnace steel	1 714,8	0,67	0,716			
	arc-furnace steel for casting	3,4	0,001	0,716			
	pig-and-ore steel	772,4	0,30	1,308			
	steel from DBSU	63,3	0,02	1,935			
5. OJSC “Cherepovets Steel Mill”	Steel-Total	11 337,0	1,00		**1,101**	0,211	
	converter steel	9 551,6	0,84	1,195			
	arc-furnace steel	1 785,4	0,16	0,594			

Baseline CO_2 emissions from slab steel billet production

6. OJSC “Novolipetsk Steel”	Steel-Total	9 739,1	1,00		**1,256**	0,182	
	converter steel	9 739,1	1,00	1,256			
7. OJSC “EVRAZ West Siberian Iron and Steel Plant”	Steel-Total	6 610,5	1,00		**1,158**	0,123	
	converter steel	6 610,5	1,00	1,158			
8. OJSC “Ashinsky metallurgical works”	Steel-Total	717,7	1,00		**0,614**	0,013	
	scrap steel	717,7	1,00	0,614			
9. OJSC “Amurmetall”	Steel-Total	742,2	1,00		**0,346**	0,014	
	arc-furnace steel	742,2	1,00	0,346			
10. OJSC “Chelyabinsk Metallurgical Plant”	Steel-Total	4 887,7	1,00		**1,092**	0,091	
	converter steel	3 470,9	0,71	1,285			
	arc-furnace steel	1 416,8	0,29	0,618			
11. OJSC «Krasny oktyabr»	Steel-Total	339,4	1,00		**0,322**	0,006	
	arc-furnace steel	339,4	1,00	0,322			
12. “Metallurgical Plant Petrostal” Closed JSC	Steel-Total	269,8	1,00		**0,614**	0,005	
	scrap steel	269,8	1,00	0,614			
13. “Metallurgical Plant “Kamasteel”, LLC	Steel-Total	245,0	1,00		**0,230**	0,005	
	arc-furnace steel	245,0	1,00	0,230			
14. JSC “United Metallurgical Company”	Steel-Total	1 107,6	1,00		**0,217**	0,021	
	arc-furnace steel	1 107,6	1,00	0,217			

9 months of 2012

Specific CO_2 emissions from production of one ton of steel by concrete technique at the metallurgical works n

Metallurgical works	Technique of steel production	Raw materials	2012г.	EF raw material, tCO2/t steel 2012г.	EF technique, tCO2/t steel 2012г.
Metallurgical works of Russia with capacity for production of slab steel billet	***Steel-Total***	furnace charge	1142,1		
		pig iron	738,4		
		scrap metal	338,1		
		scrap of pig iron	2,4		
		pellet	44,8		
		charge	0,8		
		iron from ore	2,1		
		deoxidizing and alloying materials	15,5		
		natural gas, m3/t	8,5		
		graphite electrode	0,4		
		oxygen, m3/t	59,1		
		electricity, kWh/t	85,7		
OJSC "Magnitogorsk Iron and Steel Works"	converter steel	furnace charge	1140,6		**1,251**
		pig iron	900,0	1,215	
		scrap metal	226,8		
		deoxidizing and alloying materials	13,8		
		natural gas, m3/t	4,7	0,009	
		graphite electrode	61,4	0,028	

Baseline CO_2 emissions from slab steel billet production

	arc-furnace steel	furnace charge	1143,5		**0,622**
		pig iron	292,2	0,394	
		scrap metal	835,0		
		deoxidizing and alloying materials	16,3		
		natural gas, m3/t	27,3	0,052	
		graphite electrode	1,2	0,004	
		oxygen, m3/t	47,2	0,021	
		electricity, kWh/t	279,1	0,151	
	steel from DBSU	furnace charge	1134,1		**1,269**
		pig iron	876,8	1,184	
		scrap metal	240,0		
		deoxidizing and alloying materials	17,3		
		natural gas, m3/t	28,5	0,054	
		oxygen, m3/t	69,9	0,031	
OJSC "EVRAZ NTMK"	converter steel	furnace charge	1145,6		**1,475**
		pig iron	1074,5	1,451	
		scrap metal	26,3		
		iron from ore	24,8		
		deoxidizing and alloying materials	20,0		
		oxygen, m3/t	54,2	0,024	
OJSC "EVRAZ West Siberian Iron and Steel Plant" (Novokuznetsk site)	arc-furnace steel	furnace charge	1106,7		**0,721**
		pig iron	220,9	0,298	
		scrap metal	871,4		
		deoxidizing and alloying materials	14,5		
		graphite electrode	2,5	0,008	
		oxygen, m3/t	43,7	0,032	
		electricity, kWh/t	428,3	0,383	
OJSC "Ural Steel"	arc-furnace steel	furnace charge	1152,2		**0,736**

		pig iron	399,3	0,539	
		scrap metal	729,2		
		deoxidizing and alloying materials	23,7		
		natural gas, m3/t	10,8	0,020	
		graphite electrode	1,4	0,004	
		oxygen, m3/t	62,5	0,028	
		electricity, kWh/t	265,8	0,144	
	pig-and-ore steel	furnace charge	1151,6		**1,311**
		pig iron	750,2	1,013	
		scrap metal	346,4		
		scrap of pig iron	27,7	0,037	
		iron from ore	9,2		
		deoxidizing and alloying materials	18,1		
		natural gas, m3/t	113,9	0,215	
		oxygen, m3/t	101,7	0,046	
OJSC “Cherepovets Steel Mill”	converter steel	furnace charge	1142,4		**1,178**
		pig iron	843,5	1,139	
		scrap metal	286,5		
		scrap of pig iron			
		iron from ore			
		deoxidizing and alloying materials	12,4		
		natural gas, m3/t	5,3	0,010	
		oxygen, m3/t	65,8	0,030	
	arc-furnace steel	furnace charge	1144,4		**0,628**
		pig iron	324,9	0,439	
		scrap metal	802,3		
		deoxidizing and alloying materials	17,1		
		graphite electrode	1,8	0,006	

Baseline CO_2 emissions from slab steel billet production

		oxygen, m3/t	55,8	0,025	
		electricity, kWh/t	288,3	0,158	
OJSC “Novolipetsk Steel”	converter steel	furnace charge	1156,3		**1,276**
		pig iron	924,4	1,248	
		scrap metal	219,9		
		pellet			
		iron from ore	1,3		
		deoxidizing and alloying materials	13,9		
		oxygen, m3/t	65,8	0,028	
OJSC “EVRAZ West Siberian Iron and Steel Plant”	converter steel	furnace charge	1104,2		**1,143**
		pig iron	807,1	1,090	
		scrap metal	286,0		
		deoxidizing and alloying materials	11,1		
		oxygen, m3/t	71,7	0,053	
OJSC “Ashinsky metallurgical works”	scrap process steel	*Because of the absence of data general CO2 emission factor from steel production by scrap technique is equal to specific CO2 emissions from production of one ton of steel at JSC “Taganrog Steel Works”, as the most conservative value*			**0,537**
OJSC “Amurmetall”	arc-furnace steel	graphite electrode	2,3	0,007	**0,346**
		oxygen, m3/t	46,9	0,032	
		electricity, kWh/t	373,0	0,307	
OJSC “Chelyabinsk Metallurgical Plant”	converter steel	furnace charge	1142,5		**1,306**
		pig iron	932,1	1,258	
		scrap metal	193,6		
		deoxidizing and alloying materials	16,9		
		natural gas, m3/t	10,6	0,020	
		oxygen, m3/t	62,0	0,028	
	arc-furnace steel	furnace charge	1128,8		**0,701**
		pig iron	308,8	0,417	

Baseline CO_2 emissions from slab steel billet production

		scrap metal	791,5		
		deoxidizing and alloying materials	28,3		
		natural gas, m3/t	24,7	0,047	
		graphite electrode	3,1	0,009	
		oxygen, m3/t	61,1	0,027	
		electricity, kWh/t	370,7	0,201	
OJSC «Krasny oktyabr»	arc-furnace steel	furnace charge	1182,6		**0,350**
		pig iron	1,4	0,002	
		scrap metal	1083,9		
		scrap of pig iron	34,9	0,047	
		deoxidizing and alloying materials	58,4		
		graphite electrode	5,5	0,017	
		oxygen, m3/t	28,6	0,012	
		electricity, kWh/t	544,7	0,272	
"Metallurgical Plant Petrostal" Closed JSC	scrap process steel	*Because of the absence of data general CO2 emission factor from steel production by scrap technique is equal to specific CO2 emissions from production of one ton of steel at JSC "Taganrog Steel Works", as the most conservative value*			**0,537**
"Metallurgical Plant "Kamasteel", LLC	arc-furnace steel	graphite electrode	2,3	0,007	**0,230**
		oxygen, m3/t	46,9	0,021	
		electricity, kWh/t	373,0	0,202	
OJSC "United Metallurgical Company"	arc-furnace steel	graphite electrode	2,3	0,007	**0,217**
		oxygen, m3/t	46,9	0,020	
		electricity, kWh/t	373,0	0,191	

*The value of specific consumption of graphite electrodes, oxygen and electricity for arc-furnace steel technique at these metal works is taken from PDD of JI project "Production modernisation at OJSC Amurmetal, Komsomolsk-on-Amur, Khabarovsk Krai, Russian Federation". See section C for explanation.

Integrated CO_2 emission factor for steel production at the Russian metallurgical works with capacity for production of slab steel billet

Metallurgical works	Technique of steel production	2012	Share of technique 2012	EF technique, tCO2/t steel 2012	EF works, tCO2/t steel 2012	Share of total production 2012	EF integrated, tCO2/t steel 2012
Metallurgical works of Russia with capacity for production of slab steel billet	***Steel. total***	***27 565,2***				***1,0***	
	converter steel						
	arc-furnance steel						
	pig-and-ore steel						
	steel from DBSU						
	scrap process steel						
1. OJSC “Magnitogorsk Iron and Steel Works”	Steel-Total	4 744,7	1,00		**1,251**	0,172	
	converter steel	4 744,7	1,00	1,251			
2. OJSC "EVRAZ NTMK"	Steel-Total	2 132,6	1,00		**1,475**	0,077	
	converter steel	2 132,6	1,00	1,475			
3. OJSC “EVRAZ West Siberian Iron and Steel Plant” (Novokuznetsk site)	Steel-Total	503,6	1,00		**0,721**	0,018	
	arc-furnace steel	503,6	1,00	0,721			
4. OJSC “Ural Steel”	Steel-Total	1 147,1	1,00		**0,906**	0,042	
	arc-furnace steel	806,1	0,70	0,736			
	arc-furnace steel for casting	0,0	0,000				
	pig-and-ore steel	341,0	0,30	1,311			
	steel from DBSU	0,0					
5. OJSC “Cherepovets Steel Mill”	Steel-Total	5 348,4	1,00		**1,117**	0,194	
	converter steel	4 753,5	0,89	1,178			**1,143**

Baseline CO_2 emissions from slab steel billet production

	arc-furnace steel	594,9	0,11	0,628			
6. OJSC "Novolipetsk Steel"	Steel-Total	6 064,4	1,00		**1,276**	0,220	
	converter steel	6 064,4	1,00	1,276			
7. OJSC "EVRAZ West Siberian Iron and Steel Plant"	Steel-Total	3 351,8	1,00		**1,143**	0,122	
	converter steel	3 351,8	1,00	1,143			
8. OJSC "Ashinsky metallurgical works"	Steel-Total	363,9	1,00		**0,537**	0,013	
	scrap steel	363,9	1,00	0,537			
9. OJSC "Amurmetall"	Steel-Total	326,8	1,00		**0,346**	0,012	
	arc-furnace steel	326,8	1,00	0,346			
10. OJSC "Chelyabinsk Metallurgical Plant"	Steel-Total	2 526,9	1,00		**1,139**	0,092	
	converter steel	1 828,0	0,72	1,306			
	arc-furnace steel	698,9	0,28	0,701			
11. OJSC «Krasny oktyabr»	Steel-Total	205,0	1,00		**0,350**	0,007	
	arc-furnace steel	205,0	1,00	0,350			
12. "Metallurgical Plant Petrostal" Closed JSC	Steel-Total	136,3	1,00		**0,537**	0,005	
	scrap steel	136,3	1,00	0,537			
13. "Metallurgical Plant "Kamasteel", LLC	Steel-Total	112,7	1,00		**0,230**	0,004	
	arc-furnace steel	112,7	1,00	0,230			
14. JSC "United Metallurgical Company"	Steel-Total	600,9	1,00		**0,217**	0,022	
	arc-furnace steel	600,9	1,00	0,217			

D.7 Emissions reduction calculation from project activity

Total project emissions from production of slab steel billet

$$PE = PE_{metallurgical\ coke\_slab\_steel} + PE_{pig\ iron\_\ slab\_steel} + PE_{slab\ steel\_\ EAFP} + PE_{electricity\_slab\_steel\_EAFP} + PE_{air\ blast\_for\_pig\_iron}$$ **(PDD formula D.1.1.2.-33)**

Symbol	Data variable	Unit	Symbol	Data variable	Unit
PE	Total project CO_2 emissions from production of slab steel billet	ths. tons CO_2	**$PE_{slab\ steel\_\ EAFP}$**	CO_2 emissions in EAFP from production of slab steel billet	ths. tons CO_2
$PE_{metallurgical\ coke\ \ slab\ \_steel}$	CO_2 emissions from consumption of metallurgical coke for production of slab steel billet	ths. tons CO_2	**$PE_{electricity\_\ slab\_steel\_EAFP}$**	CO_2 emissions from consumption of electricity for production of slab steel billet in EAFP	ths. tons CO_2
$PE_{pig\ iron\_\ slab\_steel}$	CO_2 emissions from consumption of pig iron for production of slab steel billet	ths. tons CO_2	**$PE_{air\ blast\_for\_pig\_iron}$**	CO_2 emissions from consumption of air blast for production of pig iron for production of slab steel billet	ths. tons CO_2

Total CO_2 emissions in the baseline

$$BE = P_{slab\ steel\_EAFP\_MMK} * EF_{integrated\_Russian\ metallurgical\ plants}$$ **(PDD formula D.1.1.4.-1)**

Symbol	Data variable	Unit	Symbol	Data variable	Unit
BE	Total CO_2 emissions in the baseline	ths. tons CO_2	**$P_{slab\ steel\_EAFP\_MMK}$**	Output of slab steel billet in EAFP	ths. tons
$EF_{integrated\ \ Russian\ metallurgical\ plants}$	Integrated CO_2 emission factor for steel production at the Russian metallurgical works with capacity for production of slab steel billet	t CO_2/t steel			

GHG emission reduction from the project activity

$$ER_y = BE_y - PE_y$$ **(PDD formula D.1.4.-1)**

Symbol	Data variable	Unit	Symbol	Data variable	Unit
ER_y	Emission reduction in the period y	tons CO_{2eq}	**PE_y**	Project emissions in the period y	ths. tons CO_2
BE_y	Baseline emissions in the period y	ths. tons CO_2			

12 months of 2011

ERUs generated in 2011 in accordance with monitoring results

#	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total for year
1	**Total project CO_2 emissions from production of slab steel billet**	ths. tons CO_2	40,818	84,238	70,274	30,179	31,432	26,594	28,414	0,000	53,019	49,524	43,825	38,521	**496,838**
2	**Total CO_2 emissions in the baseline**	ths. tons CO_2	140,343	116,613	61,313	23,581	38,741	32,046	36,974	0,000	63,059	56,059	48,554	45,990	**663,273**
3	**ERUs generation**	tons CO_{2eq}	99525	32375	-8961	-6598	7309	5452	8560	0	10040	6535	4729	7469	**166 435**

9 months of 2012

ERUs generated in 2012 in accordance with monitoring results

№	Data variable	Unit	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Total
1	**Total project CO2 emissions from production of slab steel billet**	**ths. tons CO_2**	**153,201**	**140,689**	**128,393**	**143,254**	**159,710**	**176,263**	**156,513**	**181,072**	**148,802**	**1387,897**
2	**Total CO2 emissions in the baseline**	**ths. tons CO_2**	**198,707**	**183,486**	**161,147**	**171,076**	**171,128**	**188,298**	**199,342**	**182,551**	**186,938**	**1642,673**
3	**ERUs generation**	**tons CO_{2eq}**	**45506**	**42797**	**32754**	**27822**	**11418**	**12035**	**42829**	**1479**	**38136**	**254 776**

Appendix 1

	Color legend for calculation tables
	carbon containing flow
	data input from MMK reports
	carbon mass
0,19	carbon conent
	specific CO2 emissions
	CO2 emissions, associated with production of slab steel billet
	value fixed ex-ante
	value which requires a special note in the monitoring report (section C)

Appendix 2

List of abbreviations

BFG	Blast-furnace gas
BFP	Blast-furnace plant
BL	Blooming mill
BPCP	By-product coke plant
CCM	Continuous casting machine
CEST	Center for Energy Saving Technologies
CHPP	Combined heat power plant
CL	Central lab
COG	Coke oven gas
CPP	Central power plant
DBSU	Double-bath steelmaking unit
EAF	Electric arc furnace
EAFP	Electric arc-furnace plant
ERU	Emission reduction unit
IMP and LDW	Integrated mining-and-processing, limestone and dolomite works
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implementation
JSC	Joint stock company
LFA	Ladle-furnace aggregate
MMK	Magnitogorsk iron and steel works
MPDS	Maximum Permissible Discharge of Sewage document
MPE	Maximum Permissible Emissions
NG	Natural gas
OCP	Oxygen-converter plant
OCS	Oxygen-compressor shop
OHFP	Open-hearth furnace plant
OJSC	Open joint stock company
PNPPW	Permissible Norm of Producing and Placement of Wastes document
QMS	Quality management system
RES	Regional power system
RF	Russian Federation
SABPP	Steam-air blowing power plant
SP	Steam plant
TEE	Turbine expansion engine

Appendix 3

Appendix 3

Status of metering units used for monitoring by September 2012

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
Blast furnace plant					
Output of BFG in BFP – BF #1	Orifice plate DBS d = 1024,3 mm	DP1DG	16/05/2012	2 years	
	Flow sensor EJA110A ΔP–16kPa	91G419770	09/11/2011	3 years	*Previous verification 07/07/2010*
	Pressure sensor EJA110A P–40kPa	91M241902	06/06/2012	3 years	*Earlier was installed pressure sensor Sapphire-22DI #21753, date of verification 21/07/2010 (CI 2 years)*
	Temperature sensor TSM Metran-203 T(-50÷150ºC)	582474	18/07/2012	3 years	*Earlier was installed temperature sensor TSM-0987 #138, T (-50÷100ºC), date of verification 27/05/2009 (CI 3 years)*
	Corrector SPG762	0611	15/03/2010	4 years	
Output of BFG in BFP – BF #2	Orifice plate DBS d = 1024,6mm	DP2DGv	10/04/2012	2 years	
	Flow sensor EJA110A ΔP–16kPa	91J511358	18/07/2012	3 years	*Earlier was installed flow sensor Metran-150CD #892201, ΔP – 16kPa, date of verification 05/05/2010 (CI 2*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
					years)
	Pressure sensor EJA110A P-40kPa	91F644047	08/07/2010	3 years	
	Temperature sensor Metran-203-02 T(-50÷150ºC)	638802	18/07/2012	3 years	*Previous verification 16/10/2009*
	Corrector SPG 762	0611	15/03/2010	4 years	
Output of BFG in BFP – BF #4	Orifice plate DBS d = 1117,5 mm	DP4DGv	29/05/2012	2 years	
	Flow sensor EJA110A ΔP–6,3kPa	91K216768	08/07/2010	3 years	
	Pressure sensor Metran-22DI P-25kPa	8688	18/07/2012	2 years	*Previous verification 28/11/2009*
	Temperature sensor TSM-203 T(-50÷150ºC)	575168	18/07/2012	3 years	*Earlier was installed temperature sensor TSM-0193-01 T(-50÷180ºC), #0048, date of verification 29/06/2010 (CI 3 years)*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Corrector SPG 762	0611	15/03/2010	4 years	
Output of BFG in BFP – BF #6	Orifice plate DBS d = 1497,7 mm	DP6DGv	11/05/2012	2 years	
	Flow sensor EJA-110A ΔP–4kPa	91K434368	19/09/2011	3 years	*Earlier was installed flow sensor EJA110A #91H441814, date of verification 14/10/2009 (CI 2 years)*
	Pressure sensor EJA530A P-25kPa	91L427254	11/10/2011	2 years	*Earlier was installed pressure sensor Sapphire-22 #33810, date of verification 14/10/2009 (CI 2 years)*
	Temperature sensor TSM-203, T(-50÷150ºC)	638797	18/07/2012	3 years	*Earlier was installed temperature sensor TSM-9201 #233, T(-50÷150ºC), date of verification 17/03/2009 (CI 3 years)*
	Corrector SPG762	0833	08/09/2010	4 years	*Earlier was installed corrector SPG762 #0858, date of verification 29/08/2008 (CI 4 years)*
Output of BFG in BFP – BF #7	Orifice plate DBS d = 1038,3 mm	DP7DGv	26/04/2012	2 years	
	Flow sensor EJA110A ΔP–16kPa	91G419769	20/09/2011	3 years	*Earlier was installed flow sensor EJA110A #91G419770, date of verification 02/11/2009 (CI 3 years)*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Pressure sensor EJA530A P-25kPa	91L427253	11/10/2011	2 years	*Earlier was installed pressure sensor Sapphire- 22DD #212640, date of verification 14/10/2009 (CI 2 years)*
	Temperature sensor TSM-0193-01 T(-50÷180ºC)	0048	18/07/2012	3 years	*Earlier was installed temperature sensor Metran-203-02 #575166, T(-50÷150ºC), date of verification 17/06/2009 (CI 3 years)*
	Corrector SPG762	0840	29/06/2010	4 years	*Earlier was installed corrector SPG 762 #0823, date of verification 29/08/2008 (CI 4 years)*
Output of BFG in BFP – BF #8	Orifice plate DBS d = 1145,9 mm	DP8DGv	13/07/2012	2 years	
	Flow sensor EJA110A ΔP–16kPa	91F746781	18/07/2012	3 years	*Earlier was installed flow sensor EJA-110A #27D715429, date of verification 07/07/2010 (CI 3 years)*
	Pressure sensor Sapphire-22MDI P-25kPa	1112	18/07/2012	2 years	*Earlier was installed pressure sensor EJA-110A #91H441816, date of verification 29/10/2009 (CI 3 years)*
	Temperature sensor TSM-203-02 T(-50÷150ºC)	582472	18/07/2012	3 years	*Earlier was installed temperature sensor Metran-203-02 #575168, T(-50÷150ºC), date of verification 17/06/2009 (CI 3 years)*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Corrector SPG762	1557	14/10/2010	4 years	*Earlier was installed corrector SPG 762 #0771, date of verification 29/08/2008 (CI 4years)*
Output of BFG in BFP – BF #9	Orifice plate DBS d = 1145,96 mm	DP9DGv	11/05/2012	2 years	
	Flow sensor EJA110A ΔP–16kPa	91L427205	10/10/2011	3 years	*Earlier was installed flow sensor EJA110A #91G419773, date of verification 14/10/2009 (CI 2 years)*
	Pressure sensor Metran-100DI P-25kPa	387362	08/02/2012	3 years	*Earlier was installed pressure sensor Sapphire-22DD #59337, P-25kPa, date of verification 28/05/2010 (CI 2 years)*
	Temperature sensor TSM-0193-02 T(-50÷150ºC)	6	18/07/2012	3 years	*Earlier was installed temperature sensor Metran-203-02 #582471, T(-50÷150ºC), date of verification 17/06/2009 (CI 3 years)*
	Corrector SPG762	0855	14/10/2010	4 years	*Earlier was installed corrector SPG 762 #0755, date of verification 29/08/2008 (CI 4years)*
Output of BFG in BFP – BF #10	Orifice plate DBS d = 1145,9 mm	DP10DGv	29/03/2012	2 years	
	Flow sensor EJA110A ΔP–16kPa	91L427204	11/10/2011	3 years	*Earlier was installed flow sensor EJA110A #91G419776, date of verification 25/11/2009 (CI 2 years)*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Pressure sensor Sapphire-22DD P-25kPa	59337	18/07/2012	2 years	*Pressure sensor Sapphire-22DD #1234, P-25kPa, date of verification 28/05/2010 (2 years)*
	Temperature sensor TSM-Metran-203 T(-50÷150ºC)	575169	18/07/2012	3 years	*Earlier was installed temperature sensor TSM-1088 #232, T(-50 ÷180ºC), date of verification 17/03/2009 (CI 3 years)*
	Corrector SPG762	0855	14/10/2010	4 years	
Consumption of NG in BFP – metering unit OJSC “MMK” “Nitka Domna”	Flow meter V-bar-600 Q=5000 ÷ 25000 m³/h	1568127-V001/85445	04/03/2011	4 years	
	Pressure sensor EJA530A P–1MPa	91F644054	17/02/2011	2 years	*Earlier was installed pressure sensor EJA530A #91H619981, date of verification 24/04/2009 (CI 2 years)*
	Temperature sensor TSM – 0193-02 T(-50÷180ºC)	15	15/08/2012	1 years	*Earlier was installed temperature sensor TSM-0193 #12, T(-50÷180ºC), date of verification 27/04/2011 (CI 1 years)*
	Corrector SPG762	0857	06/04/2012	4 years	
Consumption of BFG in BFP – by air heaters of BF #1	Orifice plate DBS d = 1131,8 mm	DP1DG	21/06/2012	2 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Flow sensor Metran-100DD ΔP–2,5kPa	424413	16/12/2011	2 years	*Earlier was installed flow sensor Metran-100DD #37187, date of verification 14/01/2010 (CI 2 years)*
	Pressure sensor Metran-150TG P–25kPa	861470	05/09/2011	2 years	*Earlier was installed pressure sensor Sapphire-22DI #35957, date of verification 20/09/2009 (CI 2 years)*
	Temperature sensor TSM-1293 T(-50÷150ºC)	6	07/07/2011	3 years	*Previous verification 15/09/2009*
	Corrector SPG762	0748	17/03/2010	4 years	
Consumption of BFG in BFP – by air heaters of BF #2	Orifice plate DBS d = 1213,7 mm	DP2DG	10/04/2012	2 years	
	Flow sensor Metran-150CD ΔP–1,6kPa	888950	05/02/2010	4 years	
	Pressure sensor Metran-150TG #P–16kPa	880012	09/03/2010	4 years	
	Temperature sensor TSM-1293 T(-50÷150ºC)	2	09/03/2010	3 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Controller ECOM-3000	12092850	13/12/2009	4 years	
Consumption of BFG in BFP – by air heaters of BF #4	Orifice plate DBS d = 1214,9 mm	DP4DG	29/05/2012	2 years	
	Flow sensor Metran-100DD ΔP–2,5kPa	173229	15/06/2010	3 years	
	Pressure sensor Metran-100DI P–16kPa	170544	26/03/2012	2 years	*Earlier was installed pressure sensor Metran-22DI #41859, P – 16 kPa, date of verification 15/06/2010 (CI 2 years)*
	Temperature sensor TSM-1293 T(-50÷150ºC)	2	24/02/2011	3 years	*Earlier was installed temperature sensor TXK-0193 #24 T(-40÷600ºC), date of verification 15/06/2010 (CI 2 years)*
	Controller ECOM-3000	11061543	08/11/2010	4 years	
Consumption of BFG in BFP – by air heaters of BF #6	Orifice plate DBS d = 1240 mm	DP6DG	15/05/2012	2 years	
	Flow sensor Metran-150CD ΔP–1,6kPa	892232	30/08/2012	4 years	*Earlier was installed flow sensor Metran -22 DD #355251, ΔP–1,6kPa, date of verification 03/09/2010 (CI 2 years)*
	Pressure sensor Metran-150TG P–16kPa	893220	29/08/2012	2 years	*Earlier was installed pressure sensor Sapphire-22 DD #23911, P–16 kPa, date of verification 09/07/2010 (CI 2*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
					years)
	Temperature sensor TSM-0193 T (-50÷150ºC)	1	19/04/2010	3 years	
	Controller ECOM-3000	02071584	16/12/2011	4 years	*Previous verification 16/02/2007*
Consumption of BFG in BFP – by air heaters of BF #7	Orifice plate DBS d = 1207,5 mm	DP7DG	26/04/2012	2 years	
	Flow sensor Metran-100DD ΔP–1kPa	46340	17/08/2009	2 years	*Earlier was installed flow sensor Metran-150CD #1009866 ΔP–1kPa, date of verification 29/07/2011 (CI 2 years)*
	Pressure sensor Metran-22DI P–16kPa	39620	14/03/2012	2 years	*Earlier was installed pressure sensor Metran-22DI #35277, P–16kPa, date of verification 07/06/2010 (CI 2 years)*
	Temperature sensor TSM-1293 T(-50÷150ºC)	5	06/12/2010	3 years	
	Corrector SPG762	1023	08/04/2010	4 years	
Consumption of BFG in BFP – by air heaters	Orifice plate DBS d = 1193,3mm	DP8DG	13/07/2012	2 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
of BF #8	Flow sensor Metran-100DD ΔP–1kPa	46340	16/08/2011	2 years	*Earlier was installed flow sensor Metran-100DD #6141 ΔP–1kPa, date of verification 31/08/2009 (2 years)*
	Pressure sensor Metran-150TG P–16kPa	893223	26/04/2012	4 years	*Earlier was installed pressure sensor Metran-100DI #20952 P–16 kPa, date of verification 20/05/2010 (2 years)*
	Temperature sensor TSM-1293 T(-50÷150ºC)	4	24/02/2011	3 years	*Earlier was installed temperature sensor TXK-0193 #125 T (-40÷600ºC), date of verification 05/03/2009 (2 years)*
	Corrector SPG762	0849	20/04/2010	4 years	
Consumption of BFG in BFP – by air heaters of BF #9	Orifice plate DBS d = 1104,6 mm	DP9DG	11/05/2012	2 years	
	Flow sensor Metran-100DD ΔP-4kPa	410665	03/09/2012	3 years	*Earlier was installed flow sensor Metran-100DD #419703 ΔP-4kPa, date of verification 14/01/2010 (CI 3 years)*
	Pressure sensor Metran-150TG P–16kPa	458095	13/05/2011	3 years	*Previous verification 18/12/2008*
	Temperature sensor TSM-0193 T(-50÷180ºC)	1	27/09/2010	3 years	
	Controller ECOM-3000	11071864	25/11/2011	4 years	*Previous verification 05/12/2007*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
Consumption of BFG in BFP – by air heaters of BF #10	Orifice plate DBS d = 1098,7 mm	8050008	31/03/2012	2 years	
	Flow sensor Metran-100DD ΔP-4kPa	277009	21/11/2011	3 years	*Earlier was installed flow sensor Metran – 100DD #409908 ΔP-4kPa, date of verification 14/10/2009 (CI 3 years)*
	Pressure sensor Metran-150TG P–16kPa	865603	09/11/2009	3 years	
	Temperature sensor TSM-1293 T(-50÷150ºC)	5	11/07/2011	3 years	*Earlier was installed temperature sensor TSM-1293 #2, date of verification 26/08/2010 (CI 3 years)*
	Controller ECOM-3000	02082056	28/02/2012	4 years	*Previous verification 05/02/2008*
Consumption of COG in BPCP – by air heaters of BF #1	Orifice plate DBS	DP1KG			*Metering unit is sealed (there are no means of measurement)*
Consumption of COG in BPCP – by air heaters of BF #2	Orifice plate DBS d = 289,42 mm	DP2KG	10/04/2012	2 years	
	Flow sensor Metran-150СД ΔP–1,6kPa	888951	05/02/2010	4 years	
	Pressure sensor Metran-150TG P–16kPa	865604	09/03/2010	4 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Temperature sensor TSM-1293 #1 T(-50÷150ºC)	1	09/03/2010	3 years	
	Controller ECOM-3000	12092850	13/12/2009	4 years	
Consumption of COG in BPCP – by air heaters of BF #4	Orifice plate DBS d = 363,24 mm	DP4KG	29/05/2012	2 years	
	Flow sensor Metran-100DD ΔP–1,6kPa	170244	15/06/2010	3 years	
	Pressure sensor Metran-22DI P–16kPa	41859	25/05 2012	2 years	*Earlier was installed pressure sensor Metran-100DI #170543, P -16 kPa, date of verification 15/06/2010 (CI 2 years)*
	Temperature sensor TSM-1293 T(-50÷150ºC)	6	24/02/2011	3 years	*Earlier was installed temperature sensor TXK-0193 #128 T (-40÷600ºC), date of verification 15/06/2010 (CI 2 years)*
	Controller ECOM-3000	11061543	08/11/2010	4 years	
Consumption of COG in BPCP – by air heaters of BF #6	Orifice plate DBS d = 367,61 mm	DP6KG	15/05/2012	2 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Flow sensor Metran-150CD ΔP-0,63kPa	1109296	24/05/2012	2 years	*Earlier was installed flow sensor Metran-100DD #175498* ΔP-0,63kPa, *date of verification 28/06/2010 (CI 2 years)*
	Pressure sensor Metran-150CD P-16kPa	1109276	13/06/2012	2 years	*Earlier was installed pressure sensor Sapphire-22DI # 21367 P-16kPa, date of verification 27/09/2010 (CI 2 years)*
	Temperature sensor TSM-1293 T(-50÷150ºC)	2	07/07/2011	3 years	*Earlier was installed temperature sensor TSM-20302 #106531, date of verification 31/03/2010 (CI 3 years)*
	Controller ECOM-3000	02071584	16/02/2011	(CI 4years)	*Previous date of verification 16/02/2007*
Consumption of COG in BPCP – by air heaters of BF #7	Orifice plate DBS d = 358,65 mm	DP7KG	26/04/2012	2 years	
	Flow sensor Metran-100DD ΔP-0,63kPa	437035	22/12/2011	2 years	*Earlier was installed flow sensor Sapphire-22DD #53210* ΔP-0,63kPa, *date of verification 01/03/2010 (CI 2 years)*
	Pressure sensor Metran-22DI P–16kPa	35277	26/06/2012	2 /г	*Earlier was installed pressure sensor Sapphire-22DI # 23546 P-16kPa, date of verification 08/07/2010 (CI 2 years)*
	Temperature sensor TSM-1293 T(-50÷150ºC)	6	06/12/2010	3 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Corrector SPG762	0864	20/04/2010	4 years	
Consumption of COG in BPCP – by air heaters of BF #8	Orifice plate DBS d = 367,610 mm	DP8KG	28/06/2012	2 years	
	Flow sensor Metran-150CD ΔP–0,63kPa	1089812	29/02/2012	2 years	*Earlier was installed flow sensor Metran-150CD #908425 ΔP–0,63kPa, date of verification 08/12/2009 (CI 2 years)*
	Pressure sensor Metran-100DD P–16kPa	448716	06/05/2011	3 years	*Earlier was installed pressure sensor Metran-150TG #899223 P–16kPa, date of verification 23/04/2010 (CI 2 years)*
	Temperature sensor TSM-0193 T(-50÷150ºC)	45	10/04/2012	3 years	*Previous verification 05/03/2009*
	Corrector SPG762	0869	20/04/2010	4 years	
Consumption of COG in BPCP – by air heaters of BF #9	Orifice plate DBS d = 231,3 mm	KGDP9	24/05/2012	2 years	
	Flow sensor ROSEMOUNT ΔP-4kPa	0000702170	28/07/2011	3 years	*Previous verification 24/11/2008*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Pressure sensor Metran-100DI P–16kPa	397118	03/09/2012	3 years	*Previous verification 13/10/2009*
	Temperature sensor TSM-1293 T(-50÷150ºC)	2	25/10/2010	3 years	
	Controller ECOM-3000	11071864	25/11/2011	4 years	*Previous verification 15/12/2007*
Consumption of COG in BPCP – by air heaters of BF #10	Orifice plate DBS d = 324,3 mm	810168	31/03/2012	2 years	
	Flow sensor Metran-150CD ΔP–1kPa	958356	16/12/2010	3 years	
	Pressure sensor Metran-150TG P–16kPa	458094	24/05/2010	3 years	
	Temperature sensor TSM-1293 T(-50÷200ºC)	4	11/07/2011	3 years	*Previous verification 15/07/2008*
	Controller ECOM-3000	02082056	28/02/2012	4 years	
Consumption of NG in BFP – metering unit “Razlivka”	Orifice plate DKS d=68,6 mm	5110	10/04/2012	2 years	
	Flow sensor Metran-100DD ΔP–16kPa	378728	21/02/2011	3 years	*Previous verification 27/11/2008*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Pressure sensor Metran-150TG P-0,25 MPa	880029	21/02/2011	3 years	*Earlier was installed pressure sensor Metran-100DI #167990 P-0,25 MPa, date of verification 28/11/2008 (CI 3 years)*
	Temperature sensor TXK-0193 T (-40÷600ºC)	5	02/03/2011	2 years	*Earlier was installed temperature sensor TXK-1393 #28 T(-50÷200ºC), date of verification 31/03/2009 (CI 2 years)*
	Corrector SPG762	0845	15/03/2010	4 years	
Consumption of NG in BFP – for technology of BF #1	Orifice plate DBS d = 150,02 mm	DP1PG	09/08/2011	2 years	*Earlier was installed orifice plate DBS #DP1PG d = 150,01 mm, date of verification 14/10/2009 (CI 2 years)*
	Flow sensor Sapphire-22DD ΔP-16kPa	17602	24/01/2012	2 years	*Earlier was installed flow sensor Metran-22DD #12994 ΔP- 16 kPa, date of verification 14/01/2010 (CI 2 years)*
	Pressure sensor Metran-100DI P–1MPa	487136	12/07/2012	2 years	*Earlier was installed pressure sensor Metran-150TG #894542 P 1 MPa, date of verification 04/05/2010 (CI 2 years)*
	Temperature sensor TSM-0196 T (-50÷180ºC)	156	13/10/2010	3 years	
	Corrector SPG762	1563	23/03/2010	4 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
Consumption of NG in BFP – for technology of BF #2	Orifice plate DBS d = 152,53mm	272	10/04/2012	2 years	
	Flow sensor Metran-150CD ΔP-16kPa	892189	09/03/2010	4 years	
	Pressure sensor Metran-150TG P–1MPa	880205	03/02/2010	4 years	
	Temperature sensor TSM-0196 T (-50÷180ºC)	161	13/10/2010	3 years	
	Controller ECOM-3000	12092850	13/12/2009	4 years	
Consumption of NG in BFP – for technology of BF #4	Orifice plate DBS d = 152,4 mm	D-14/22	17/05/2011	2 years	*Earlier was installed orifice plate DBS # 971, d = 154,8mm, date of verification 21/05/2009 (CI 2 years)*
	Flow sensor Metran-100DD ΔP-16kPa	277018	26/03/2012	2 years	*Earlier was installed flow sensor Metran-100DD #169868 ΔP- 16 kPa, date of verification 15/06/2010 (CI 2 years)*
	Pressure sensor Metran-100DI P–1MPa	346656	08/07/2011	2 years	*Earlier was installed pressure sensor Metran-100DI #346656 P–1MPa, date of verification 07/08/2009 (CI 2 years)*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Temperature sensor TSM-0196 T(-50÷180ºC)	160	13/10/2010	3 years	
	Controller ECOM-3000	11061543	02/11/2010	4 years	
Consumption of NG in BFP – for technology of BF #6	Orifice plate DBS d = 152,03 mm	DP6PG	28/06/2012	2 years	
	Flow sensor Metran-22DD ΔP–16kPa	16319	07/06/2012	2 years	
	Pressure sensor Metran-150TG3 P–1MPa	1018614	10/06/2011	2 years	*Earlier was installed pressure sensor Sapphire-22DI #15098 P–1MPa date of verification 27/09/2010 (CI 2 years)*
	Temperature sensor TSM-0193-01 T(-50÷180ºC)	4	25/07/2011	3 years	*Earlier was installed temperature sensor TSM-0193 #15 T(-50÷150ºC), date of verification 19/04/2010 (CI 3 years)*
	Controller ECOM-3000	02071584	16/02/2011	4 years	
Consumption of NG in BFP – for technology of BF #7	Orifice plate DBS d = 150,62 mm	DP7PG	26/04/2012	2 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Flow sensor Metran-100DD ΔP–16kPa	346745	07/06/2012	2 years	*Earlier was installed flow sensor Metran-100DD #306846, date of verification 12/08/2009 (CI 2 years)*
	Pressure sensor Metran-22DI P–1MPa	38519	10/06/2011	2 years	*Earlier was installed pressure sensor Metran-100DI #318833, date of verification 20/01/2010 (CI 2 years)*
	Temperature sensor TSM-0196 T(-50÷180ºC)	158	13/10/2010	3 years	
	Corrector SPG762	0819	20/04/2010	4 years	
Consumption of NG in BFP – for technology of BF #8	Orifice plate DBS d = 176,3mm	DP8PG	28/03/2011	2 years	
	Flow sensor Metran-100DD ΔP-16kPa	367493	09/07/2012	2 years	*Earlier was installed flow sensor Metran-100DD # 346745 ΔP-16kPa, date of verification 04/04/2011 (CI 2 years)*
	Pressure sensor Metran-150TG P–1MPa	903132	24/05/2012	2 years	*Earlier was installed pressure sensor Metran-100DI #452488, date of verification 26/05/2010 (CI 2 years)*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Temperature sensor TSM-0196 T(-50÷180ºC)	159	13/10/2010	3 years	
	Corrector SPG762	0801	20/04/2010	4 years	
Consumption of NG in BFP – for technology of BF #9	Orifice plate DBS d = 171,10mm	DP9PG	19/06/2012	2 years	
	Flow sensor Rosemount ΔP-25kPa	0000702175	15/11/2010	3 years	
	Pressure sensor Metran-150TG P–1 MPa	456663	04/05/2011	3 years	*Earlier was installed pressure sensor Metran-150TG #841882, date of verification 18/05/2009 (CI 3 years)*
	Temperature sensor TSM-0193 T(-50÷150ºC)	17	27/09/2010	3 years	
	Controller ECOM-3000	11071864	25/11/2011	4 years	*Previous verification 05/12/2007*
Consumption of NG in BFP – for technology of BF #10	Orifice plate DBS d = 170,85 mm	810172	07/04/2011	2 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Flow sensor Metran-100DD ΔP–16kPa	448715	11/07/2011	3 years	*Earlier was installed flow sensor Metran-100DD #448715, date of verification 24/11/2008 (CI 3 years)*
	Pressure sensor Metran-100DI P–1MPa	440147	19/04/2010	3 years	
	Temperature sensor TSM-0193 T(-50÷150ºC)	9	11/07/2011	3 years	*Earlier was installed temperature sensor TSM-0193 # 7, date of verification 25/10/2010 (CI 3 years)*
	Controller ECOM-3000	02082056	28/02/2012	4 years	
Consumption of pure nitrogen in BF #1	Orifice plate DKS d = 30,65 mm	DP1A	08/08/2011	2 years	
	Flow sensor Metran-150CD ΔP-100 kPa	904365	28/05/2010	4 years	
	Pressure sensor Metran-100DI P-1,6MPa	487140	06/09/2010	3 years	
	Temperature sensor TSMУ-3212 T(-50÷50ºC)	2	03/09/2012	3 years	*Previous verification 09/10/2009*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Corrector газа SPG762	0611	15/03/2010	4 years	
Consumption of pure nitrogen in BF #2	Flow sensor Prowirl 72 Q=5,8÷200m³/h	AV043002000	22/03/2010	4 years	
	Pressure sensor Metran-150TG P-1,6MPa	888792	06/10/2010	4 years	
	Temperature sensor TSMУ-3212 T(-50÷50ºC)	3	09/03/2010	3 years	
	Controller ECOM-3000	12092850	13/12/2009	4 years	
Consumption of pure nitrogen in BF #4	Flow sensor PHD-90S Q=26,015÷300m³/h	1713529-V002	22/08/2011	4 years	Earlier was installed flow sensor PHD-90S #1713529-V001 Q=5,8÷200m³/h, date of verification 16/11/2010 (CI 4years)
	Pressure sensor Metran-100DI P-1,6MPa	269817	23/06/2011	3 years	*Earlier was installed pressure sensor Metran-100DI #269817, date of verification 10/09/2008 (CI 3 years)*
	Temperature sensor TSMУ-3212 T(-50÷50ºC)	3	22/04/2011	3 years	*Earlier was installed temperature sensor TSMУ-3212 #10, date of verification 11/08/2008 (CI 3 years)*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Controller ECOM-3000	11061543	08/11/2010	4 years	
Consumption of pure nitrogen in BF #6	Flow sensor PHD-90S Q=26,015÷300m³/h	1633175-V005	23/11/2011	4 years	*Earlier was installed flow sensor PHD-90S #604446 Q=5,8÷200m³/h, date of verification 21/10/2009 (CI 4 years)*
	Pressure sensor Metran-100DI P-1,6MPa	313635	29/09/2011	3 years	*Earlier was installed pressure sensor Metran-100DI #313633, date of verification 27/11/2008 (CI 3 years)*
	Temperature sensor TSMУ-3212 T(-50÷50ºC)	6	15/08/2011	3 years	*Earlier was installed temperature sensor TSMУ-3212 #1, date of verification 27/01/2010 (CI 3 years)*
	Controller ECOM-3000	02071584	16/02/2011	4 years	*Previous date of verification 16/02/2007*
Consumption of pure nitrogen in BF #9	Flow sensor PHD-90S Q = 26,015÷300m³/h	1713529-V001	11/10/2011	4 years	*Earlier was installed flow sensor PHD-90S #1633175-V005 Q = 5,8÷200m³/h, date of verification 21/09/2009 (CI 4 years)*
	Pressure sensor Metran-100DI P-1,6MPa	444124	28/07/2011	3 years	*Earlier was installed pressure sensor Metran-100DI #390602 P-1,6MPa, date of verification 25/08/2009 (CI 3 years)*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Temperature sensor TSMУ-3212 T(-50÷50ºC)	4	03/09/2012	3 years	*Previous verification 09/10/2009*
	Controller ECOM-3000	11071864	25/11/2011	4 years	*Previous verification 05/12/2007*
Consumption of pure nitrogen in BF #10	Flow sensor PHD-90S Q=26,015÷300m³/h	1604446-V039	26/01/2012	4 years	
	Pressure sensor Metran-100DI P-1,6MPa	420723	03/09/2012	3 years	*Previous verification 28/10/2009*
	Temperature sensor CMУ-3212 T(-50÷50ºC)	11	11/07/2011	3 years	*Earlier was installed Temperature sensor TSMУ-3212 #4 date of verification 09/10/2009 (CI 3 years)*
	Controller ECOM-3000	02082056	28/02/2012	4 years	
By-product coke plant					
Consumption of BFG in BPCP – metering unit of coke-oven battery #2	Orifice plate DBS d = 976,59mm	KB2DG	05/06/2012	2 years	
	Flow sensor Metran-100DD ΔP-1kPa	352371	15/03/2012	3 years	*Previous verification 06/04/2010*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Pressure sensor Metran-100DI P–16kPa	382737	15/03/2012	3 years	*Previous verification 06/04/2010*
	Temperature sensor TSMУ-205Ex T(0÷100ºC)	620	03/08/2010	3 years	
	Corrector SPG762	0871	17/05/2010	4 years	
Consumption of BFG in BPCP – metering unit of coke-oven battery #3	Orifice plate DBS d = 875,0 mm	KB3DG	21/06/2012	2 years	
	Flow sensor Metran-150CD ΔP–2,5kPa	851829	02/12/2011	4 years	*Previous verification 02/12/2009*
	Pressure sensor Metran-150TG P–10kPa	852017	01/02/2012	4 years	*Previous verification 08/06/2009*
	Temperature sensor TSM T(0÷180ºC)	247.367	11/12/2009	3 years	
	Corrector SPG762	0797	15/03/2010	4 years	
Consumption of BFG in BPCP – metering unit of coke-oven battery #4	Orifice plate DBS d = 874,5mm	9000014/1	07/08/2012	2 years	*Metering unit is sealed (there are no means of measurement)/ There is no BFG consumption*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
Consumption of BFG in BPCP – metering unit of coke-oven battery #13	Orifice plate DBS d = 1082,6 mm	KB13DG	24/05/2012	2 years	
	Flow sensor Metran-100DD ΔP-1kPa	257493	24/03/2011	3 years	*Earlier was installed flow sensor Metran-150CD #878382, date of verification 05/11/2009 (CI 4 years)*
	Pressure sensor Metran-100DI P–16kPa	173629	23/10/2009	3 years	
	Temperature sensor TSMУ-205 T(0÷100ºC)	618	23/10/2009	3 years	
	Corrector SPG762	0766	24/05/2010	4 years	
Consumption of BFG in BPCP – metering unit of coke-oven battery #14	Orifice plate DBS d = 1082,6 mm	KB14DG	24/05/2012	2 years	
	Flow sensor Metran-100DD ΔP-1kPa	355247	24/03/2011	3 years	*Earlier was installed flow sensor Metran-150CD #878382, date of verification 05/11/2009 (CI 4 years)*
	Pressure sensor Metran-100DI P–16kPa	174673	15/04/2010	3 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Temperature sensor TSMУ-205 T(0÷100ºC)	622	22/02/2012	3 years	*Previous verification 20/02/2009*
	Corrector SPG762	0766	24/05/2010	4 years	
Output of COG in BPCP, Capture shop of chemical processing products (CSCPP), unit #1, branch #1	Orifice plate DBS d = 966,93 mm	BL1N1	14/05/2012	2 years	
	Flow sensor Metran-22DD ΔP – 1kPa	9675	21/03/2011	2 years	*Previous verification 27/03/2009*
	Pressure sensor Metran-100DI P–16kPa	143526	23/10/2009	3 years	
	Temperature sensor TSM T(0÷180ºC)	21264	16/04/2010	3 years	
	Corrector SPG762	0802	29/06/2010	4 years	
Output of COG in BPCP, CSCPP, unit #1, branch #3	Orifice plate DBS d = 877,22 mm	BL1N3	10/04/2012	2 years	
	Flow sensor Metran-22DD ΔP – 1kPa	9676	11/02/2011	2 years	*Previous verification 27/03/2009*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Pressure sensor Metran-22DI P–16kPa	14412	11/03/2011	2 years	*Previous verification 27/03/2009*
	Temperature sensor TSM T(0÷180ºC)	21265	16/04/2010	3 years	
	Corrector SPG762	0802	29/06/2010	4 years	
Output of COG in BPCP, CSCPP, unit #2, branch #1	Orifice plate DBS d = 700,95 mm	BL2N1	17/05/2012	2 years	
	Flow sensor Metran-100DD ΔP–6,3kPa	177914	22/02/2012	3 years	*Previous verification 20/02/2009*
	Pressure sensor Sapphire-22DI P–16kPa	912586	27/01/2011	2 years	*Previous verification 20/02/2009*
	Temperature sensor TSM-0193 T(-50÷150ºC)	592044	20/03/2012	3 years	*Previous verification 20/02/2009*
	Corrector SPG762	1074	29/06/2010	4 years	
Output of COG in BPCP, CSCPP, unit #2, branch #2	Orifice plate DBS d = 700,28 mm	BL2N2	16/05/2012	2 years	

Monitoring parameters	**Measurement equipment**	**Serial (inventory) number**	**Date of last calibration (verification)**	**Calibration interval**	**Notes and information on previous calibrations (verifications) actual during monitoring period**
	Flow sensor Metran-22DD ΔP–6,3kPa	77539	10/12/2010	2 years	
	Pressure sensor Sapphire-22DI P–16kPa	912337	27/01/2011	2 years	*Previous verification 20/02/2009*
	Temperature sensor TSM-0193 T(-50÷150ºC)	592038	20/03/2012	3 years	*Previous verification 20/02/2009*
	Corrector SPG762	1074	29/06/2010	4 years	
Consumption of COG in BPCP – metering unit of coke-oven battery #1	Orifice plate DBS d = 455,27mm	KB1KG	05/06/2012	2 years	
	Flow sensor Metran-100DD ΔP-1kPa	176102	11/12/2009	3 years	
	Pressure sensor Metran-100DI P–16 kPa	173630	11/12/2009	3 years	
	Temperature sensor TSMУ-205 T(0÷100ºC)	614	30/07/2010	3 years	
	Corrector SPG762	0760	17/05/2010	4 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
Consumption of COG in BPCP – metering unit of coke-oven battery #2	Orifice plate DBS d = 239,05 mm	KB2KG	05/06/2012	2 years	
	Flow sensor Metran-100DD ΔP–1kPa	211290	14/12/2009	3 years	
	Pressure sensor Metran-100DI P–16kPa	382737	15/03/2012	3 years	*Previous verification 06/04/2010*
	Temperature sensor TSMУ-205 T(0÷100ºC)	620	30/07/2010	3 years	
	Corrector SPG762	0760	17/05/2010	4 years	
Consumption of COG in BPCP – metering unit of coke-oven battery #3	Orifice plate DKS d = 191,8mm	910206	21/06/2012	2 years	
	Flow sensor Metran-150CD ΔP–1,6kPa	851822	01/02/2012	4 years	*Previous verification 27/01/2010*
	Pressure sensor Metran-100DI P–16kPa	383633	01/02/2012	3 years	*Previous verification 27/01/2010*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Temperature sensor TSM T(0÷180ºC)	3819	01/02/2012	3 years	*Previous verification 27/01/2010*
	Corrector SPG762	0772	08/09/2010	4 years	
Consumption of COG in BPCP – metering unit of coke-oven batteries #3-4	Orifice plate DBS d = 406,7 mm	9000014	21/06/2012	2 years	
	Flow sensor Metran-150CD ΔP –2,5 kPa	351827	16/04/2010	3 years	
	Pressure sensor Metran-150TG P–10kPa	852017	01/02/2012	4 years	*Previous verification 27/01/2010 (CI 3 years)*
	Temperature sensor TSM-0193 T(0÷180ºC)	247367	11/12/2009	3 years	
	Corrector SPG762	0772	08/09/2010	4 years	
Consumption of COG in BPCP – metering unit of coke-oven battery #7	Orifice plate DBS d = 557,36 mm	KB7KG	28/06/2012	2 years	
	Flow sensor Metran-100DD ΔP–0,63kPa	176104	25/06/2010	3 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Pressure sensor Metran-100DI P–16kPa	174676	23/10/2009	3 years	
	Temperature sensor TSMУ-205 T(0÷100ºC)	619	20/08/2010	3 years	
	Corrector SPG762	0818	24/05/2010	4 years	
Consumption of COG in BPCP – metering unit of coke-oven battery #8	Orifice plate DBS d = 557,36mm	KB8KG	07/06/2012	2 years	
	Flow sensor Metran-100DD ΔP-0,63kPa	176099	25/06/2010	3 years	
	Pressure sensor Metran-100DI P–16kPa	174676	23/10/2009	3 years	
	Temperature sensor TSMУ-205 T(0÷100ºC)	619	20/08/2010	3 YEARS	
	Corrector SPG762	0818	24/05/2010	4 years	
Consumption of COG in BPCP – metering	Orifice plate DBS d = 549,8 mm	KB9KG	29/05/2012	2 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
unit of coke-oven battery #9	Flow sensor Metran-100DD ΔP-0,63kPa	173625	16/09/2011	3 years	*Previous verification 16/09/2009*
	Pressure sensor Metran-100DI P–16kPa	176098	16/09/2011	3 years	*Previous verification 16/09/2009*
	Temperature sensor TSMУ-205Ex T(0÷100ºC)	616	16/09/2011	3 years	*Previous verification 14/09/2008*
	Corrector SPG762	0810	21/05/2010	4 years	
Consumption of COG in BPCP – metering unit of coke-oven batteries #13-14	Orifice plate DBS d = 361,73 mm	KB13/14KG	30/05/2012	2 years	
	Flow sensor Metran-100DD ΔP–25kPa	384370	10/12/2010	3 years	
	Pressure sensor Metran-100DI P–25kPa	36498	10/12/2010	2 years	
	Temperature sensor TSM-0193 T(-50÷150ºC)	34	27/01/2011	3 years	*Previous verification 28/02/2008*
	Corrector SPG762	0782	24/05/2010	4 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
Consumption of NG in BPCP – metering unit in CSCPP	Orifice plate DKS d = 66,7mm	346580	26/04/2011	2 years	*Previous verification 08/04/2009*
	Flow sensor Metran-150CD ΔP-160 Па	868912	10/08/2012	4 years	*Previous verification 18/11/2009*
	Flow sensor Metran-100DD ΔP-2,5 kPa	77539	10/08/2012	3 years	*Previous verification 25/08/2009*
	Pressure sensor Metran-55DI P–1,6MPa	178344	24/03/2011	2 years	*Earlier was installed pressure sensor Metran-55DI #278724, date of verification 27/03/2009 (CI 2 years)*
	Temperature sensor TSM-203 T(-50÷180ºC)	112049	15/03/2012	3 years	*Previous verification 11/06/2010*
	Corrector SPG762	0197	16/02/2010	4 years	
Consumption of NG in BPCP – metering unit in garage of coal defrosting	Orifice plate DKS d = 144,15 mm	531620	06/09/2012	2 years	
	Flow sensor Metran-150CD ΔP-0,25 kPa	937015	14/10/2010	2 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Flow sensor Metran-150CD ΔP-4kPa	937016	14/10/2010	2 years	
	Pressure sensor Metran-150TG P–0,1MPa	937019	14/10/2010	2 years	
	Temperature sensor TSM-0193 T(-50÷180ºC)	GR-01	10/02/2010	3 years	
	Corrector SPG762	0808	29/06/2010	4 years	
Own power plants					
Consumption of BFG in CPP “Severny rayon”	Orifice plate DBS d = 1480 mm	N1DG	03/08/2012	2 years	
	Flow sensor Metran-100DD ΔP - 4kPa	3304	10/09/2012	3 years	*Previous verification 29/12/2009*
	Pressure sensor Metran-100DD P-16 kPa	435666	12/09/2012	3 years	*Earlier was installed Pressure sensor Sapphire-22DI #172 date of verification 17/09/2010 (CI 2 years)*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Temperature sensor TSM-0193 T(-50÷150ºC)	121	06/09/2012	3 years	*Earlier was installed temperature sensor TSM-0193-01 (50M) #72 T(-50÷180ºC), date of verification 06/06/2011 (CI 3 years)*
	Corrector SPG762	1025	09/02/2010	4 years	
Consumption of BFG in CPP "Uzhny rayon"	Orifice plate DBS d = 1785 mm	N2DG	24/07/2012	2 years	
	Flow sensor Metran-100DD ΔP–2,5kPa	377469	11/09/2012	3 years	*Previous verification 29/12/2009*
	Pressure sensor Metran-150CD P–16 kPa	879068	12/09/2012	4 years	*Earlier was installed pressure sensor Sapphire-22DI #755 ΔP=1600 KGc/cm2, date of verification 02/06/2010 (CI 2 years)*
	Temperature sensor TSM-0193 T(-50÷150ºC)	73	07/09/2012	3 years	*Earlier was installed Temperature sensor TSM-1088 #1633 date of verification 06/06/2008 (CI 3 years) 06/06/2011 (CI 3 years)*
	Corrector SPG762	0852	09/02/2010	4 years	
Consumption of NG in CPP branch #1	Orifice plate DBS d = 453,7mm	3201608-3	19/07/2011	2 years	*Previous verification 30/07/2009*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Flow sensor Metran-100DD ΔP–6,3kPa	39076	06/09/2012	3 years	*Previous verification 03/03/2011*
	Pressure sensor Metran-150TG P–0,1MPa	916584	06/09/2012	4 years	*Previous verification 03/03/2011*
	Temperature sensor TSM-1088 T(-50÷150ºC)	028-05	06/09/2012	3 years	*Earlier was installed temperature sensorTSM-1088 (50M) #1600 T(-50÷150ºC), date of verification 18/02/2011 (CI 2 years)*
	Corrector SPG 762	0764	15/03/2010	4 years	
Consumption of NG in CPP branch #2	Orifice plate DBS d = 453,64 mm	3201608-2	14/07/2011	2 years	*Previous verification 28/07/2009*
	Flow sensor Metran-150CD ΔP–6,3kPa	841891	03/09/2012	4 years	*Previous verification 01.07.2009 (CI 2years), 03.03.2011 (CI 2 years)*
	Pressure sensor Metran-150TG P–0,1MPa	916585	03/09/2012	4 years	*Previous verification 28/07/2009 (CI 2 years), 03.03.2011 (CI 2 years)*
	Temperature sensor TSM-1088 T(-50÷150ºC)	426-36-03	03/09/2012	3 years	*Earlier was installed temperature sensorTSM-0879 (50M) #1752 T(-50÷150ºC), date of verification 13/07/2011 (CI 2 years)*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Corrector SPG762	0761	15/03/2010	4 years	
Consumption of BFG in SABPP-1	Orifice plate DBS d = 1039,7 mm	DGPV1	07/06/2012	2 years	
	Flow sensor EJA110A ΔP–6,3kPa	91L427209	09/11/2011	3 years	*Earlier was installed flow sensor EJA110A #91H441815,date of verification 29/10/2009 (CI 3 years)*
	Pressure sensor EJA-530A P–16kPa	91L427256	09/11/2011	2 years	*Earlier was installed pressure sensor Metran-22DI #8300,date of verification 26/01/2010 (CI 2 years)*
	Temperature sensor TSM-0193 T(-50÷150ºC)	201	09/02/2011	3 years	*Previous verification 09/02/2008*
	Corrector SPG762	0778	03/07/2012	4 years	*Earlier was installed corrector SPG762 #0832 date of verification 29/08/2008 (CI 4 years)*
Consumption of COG in SABPP-1	Orifice plate DBS d = 406,4 mm	KGPV1	21/06/2012	2 years	
	Pressure sensor EJA110A ΔP–4kPa	91M241914	06/06/2012	3 years	*Earlier was installed pressure sensor Sapfir-22DD #14139, date of verification 02/08/2010 (CI 2 years)*
	Flow sensor EJA110A P–10kPa	91L249935	05/05/2011	3 years	*Earlier was installed flow sensor Sapfir-22DD #23576, date of verification 01/04/2010 (CI 2 years)*
	Temperature sensor TSM-0879 T(-50÷200ºC)	44	09/02/2011	3 years	*Previous verification 09/02/2008*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Corrector SPG762	0866	12/05/2012	4 years	*Previous verification 04/06/2008*
Consumption of NG in SABPP-1	Orifice plate DBS d = 126,2 mm	PGPV1	06/07/2012	2 years	
	Flow sensor Metran-100DD ΔP–25kPa	404589	11/06/2011	2 years	*Previous verification 11/06/2009 (CI 2 years)*
	Pressure sensor Sapphire-22DI P – 1 MPa	21369	11/06/2011	2 years	*Previous verification 11/06/2009 (CI 2 years)*
	Temperature sensor TSM-0193 T(-50÷180ºC)	1	17/01/2011	3 years	*Earlier was installed temperature sensor TSM-0193 #54, date of verification 17/01/2009 (CI 3 years)*
	Corrector SPG762	0756	21/02/2012	4 years	*Earlier was installed corrector SPG762 # 0746, date of verification 29/08/2008 (CI 4 years)*
Consumption of BFG in SABPP-2 of boiler section, high pressure unit	Orifice plate DBS d = 1650 mm	BVD/DG	04/05/2012	2 years	
	Flow sensor Metran-150CD ΔP–1,6kPa	951337	25/04/2012	4 years	*Earlier was installed flow sensor Metran-100DD #483995, date of verification 18/09/2010 (CI 2 years)*
	Pressure sensor Metran-100DI P–16 kPa	303782	16/03/2011	3 years	*Previous verification 17/03/2009*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Temperature sensor TSM-0193 T(-50÷150ºC)	140	11/05/2011	3 years	*Earlier was installed Temperature sensor TSM-0193 #67 date of verification 18/06/2010 (CI 3 years)*
	Controller ECOM-3000	05082128	18/05/2012	4 years	*Previous verification 21/05/2008*
Consumption of BFG in SABPP-2 of boiler section, middle pressure unit	Orifice plate DBS d = 1393,6 mm	BSD/DG	06/08/2012	2 years	
	Flow sensor Metran-150CD ΔP – 4 kPa	1009842	21/10/2011	4 years	*Earlier was installed Flow sensor Metran-100DD #310144 date of verification 06/08/2010 (CI 2 years)*
	Pressure sensor Metran-100DI P–16kPa	303783	23/05/2012	3 years	*Earlier was installed pressure sensor Sapphire-22DI #016099, date of verification 06/08/2010 (CI 2 years)*
	Temperature sensor TSM-0193 T(-50÷150ºC)	135	11/05/2011	3 years	*Earlier was installed Temperature sensor TSM-0193 #135 date of verification 25/10/2009 (CI 3 years)*
	Controller ECOM-3000	05071621	28/04/2011	4 years	*Previous verification 01/05/2007*
Consumption of COG in SABPP-2 of boiler section, middle	Orifice plate DBS d = 553 mm	BVD2KG	14/06/2012	2 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
pressure unit	Flow sensor Metran-150CD ΔP–2,5kPa	958348	12/08/2011	4 years	*Earlier was installed flow sensor Metran-150CD #841874, date of verification 12/08/2009 (CI 2 years)*
	Pressure sensor Metran-100DI P–10kPa	486614	27/02/2012	3 years	*Earlier was installed pressure sensor Metran-100DI #303972 P–10kPa, date of verification 15/03/2011 (CI 2 years)*
	Temperature sensor TSM-0193 T(-50÷180ºC)	64	27/09/2011	3 years	*Previous verification 28/09/2008*
	Controller ECOM-3000	05082128	18/05/2012	4 years	*Previous verification 21/05/2008*
Consumption of COG in SABPP-2 of boiler section, high pressure unit	Orifice plate DBS d = 691,9 mm	KGBSD	05/07/2012	2 years	
	Flow sensor Metran-100DD ΔP–1 kPa	303008	03/08/2012	3 years	*Previous verification 19/10/2010 (CI 2 years)*
	Pressure sensor Metran-100DI P–10kPa	467282	31/10/2011	3 years	*Earlier was installed pressure sensor Sapphire -22DI #841, date of verification 11/09/2010 (CI 2 years)*
	Temperature sensor TSM-0193 T(-50÷180ºC)	1	25/10/2010	3 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Controller ECOM-3000	05071621	29/04/2011	4 years	*Previous verification 01/05/2007 (CI 4 years)*
Consumption of NG in SABPP-2 of boiler section	Orifice plate DKS d = 245,83 mm	PGPV2	25/06/2012	2 years	
	Flow sensor #1 Metran-150CD ΔP – 2,5 kPa	869905	25/03/2010	4 years	
	Flow sensor #2 Metran-150CD ΔP–10kPa	1066979	18/10/2011	4 years	*Earlier was installed flow sensor Sapphire – 22DD #33331, date of verification 25/01/2010 (CI 2 years)*
	Pressure sensor Metran-150TG P – 1,0 MPa	1066975	18/10/2011	4 years	*Earlier was installed pressure sensor Sapphire-22DI #18247, date of verification 25/01/2010 (CI 2 years)*
	Temperature sensor TSM-0193 T(-50÷150ºC)	6	11/05/2011	3 years	*Earlier was installed temperature sensor TSM-0193 #99, date of verification 24/12/2009 (CI 3 years)*
	Controller ECOM-3000	05071621	29/04/2011	4 years	*Previous verification 01/05/2007 (CI 4 years)*
Consumption of NG in steam boiler KVG-3G	Orifice plate DKS d = 135,45 mm	1654	28/09/2011	2 years	*Previous verification 15/10/2009 (CI 2 years)*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
(power plant of BPCP SP)	Flow sensor Metran-22DD ΔP – 4 kPa	26856	21/03/2012	2 years	*Previous verification 16/03/2010*
	Pressure sensor Sapphire-22DI P – 1 MPa	39973	21/03/2012	2 years	*Previous verification 16/03/2010 (CI 2 years)*
	Temperature sensor TSM-0193 T(-50÷150ºC)	9909	19/03/2010	3 years	*Previous verification 19/03/2010*
	Corrector SPG762	0731	07/07/2010	4 years	
Consumption of NG in superheater #1, 2 (turbine section of SP)	Orifice plate DKS d = 49,1 mm	PSCTU	20/09/2012	2 years	
	Flow sensor #1 Metran-100DD ΔP – 10 kPa	178688	06/04/2012	3 years	*Previous verification 14/04/2009*
	Flow sensor #2 Metran-150CD ΔP – 0,63kPa	916609	06/09/2011	4 years	*Previous verification 07/06/2010 (CI 4 years)*
	Pressure sensor Metran-150TG P – 1MPa	916627	07/06/2010	4 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Temperature sensor TSMУ-274 T(-50÷50ºC)	658318	07/04/2011	3 years	*Earlier was installed temperature sensor TSMУ-205 #598, date of verification 19/11/2009 (CI 3 years)*
	Corrector SPG762	0805	17/03/2010	4 years	
Consumption of NG in CHPP	Orifice plate DBS d = 321,13 mm	9-33	04/07/2012	1 years	*Earlier was installed orifice plate DBS #9-32, d = 321,21 mm, date of verification 30/06/2011 (CI 1 years)*
	Flow sensor EJA110A ΔP – 40 kPa	27DB24490	08/04/2010	3 years	
	Pressure sensor EJA430A P–1MPa	unnumbered	08/04/2010	3 years	
	Temperature sensor TM-920 T(-50÷150ºC)	0034	27/06/2012	1 years	*Earlier was installed temperature sensor TSM-0879 #446-46, date of verification 01/07/2011 (CI 1 years)*
	Corrector SPG762	0842	06/04/2012	4 years	*Earlier was installed corrector SPG762 #761, date of verification 15/03/2010 (CI 4 years)*
Electric arc furnace plant					
Consumption of oxygen in EAFP –	Orifice plate DKS d = 33,75mm	MNLZ-5	20/04/2012	2 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
metering unit on CCM #5	Flow sensor Metran-100DD ΔP-1,6kPa	281487	17/02/2010	3 years	
	Pressure sensor Metran-100DI P-2,5MPa	265296	25/12/2009	3 years	
	Temperature sensor TSMУ-3212 T(0÷50ºC)	3	27/01/2010	3 years	
	Controller ECOM-3000	08061422	28/07/2010	4 years	
Consumption of oxygen in EAFP – metering unit of CS #4	Flow sensor TMP-910 Q=110,1÷8193,2 m³/h	1639520-A018	22/06/2011	3 years	*Previous verification 04/07/2008 (CI 3 years)*
	Датhик перепада Rosemount-3051 ΔP (-2,5÷2/5 kPa)	8525455	05/07/2011	2 years	*Previous verification 26/11/2009 (CI 2 years)*
	Pressure sensor Metran-100DI P - 1,6 MPa	283677	04/07/2011	3 years	*Previous verification 29/04/2009 (CI 3 years)*
	Temperature sensor TSMУ-3212 T(-50÷50ºC)	020	05/07/2011	3 years	*Previous verification 03/04/2009 (CI 3 years)*
	Controller ECOM-3000	08061421	30/07/2010	4 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
Consumption of oxygen in EAFP – metering unit of CS #5	Flow sensor TMP-910 Q=107,79÷7999,1 m³/h	1639520-A017	22/06/2011	3 years	*Previous verification 04/07/2008 (CI 3 years)*
	Датhик перепада Rosemount-3051 ΔP(-2,5÷2,5 kPa)	8525454	05/07/2011	2 years	*Previous verification 26/11/2009 (CI 2 years)*
	Pressure sensor Metran-100DI P-1,6MPa	283679	04/07/2011	3 years	*Previous verification 29/04/2009 (CI 3 years)*
	Temperature sensor TSMУ-3212 T(-50÷50ºC)	23	05/07/2011	3 years	*Previous verification 14/05/2009 (CI 2 years)*
	Controller ECOM-3000	08061423	03/08/2010	4 years	
Consumption of NG in EAFP – metering unit in gas-distribution substation-1	Orifice plate DBS #, d = 153,8mm	GRP1	24/04/2012	2 years	
	Flow sensor EJA110A ΔP–16kPa	91L436867	28/11/2011	3 years	
	Pressure sensor Metran-150TG P–1MPa	906182	28/05/2010	3 years	
	Temperature sensor TSM-0193-02 T (-50÷150ºC)	9	10/08/2010	3 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Corrector SPG762	1040	17/03/2010	4 years	
Consumption of argon in EAFP	Orifice plate DKS d = 25,6 mm	P632/2	17/02/2012	2 years	
	Flow sensor #1 Metran-100DD ΔP – 63 kPa	244438	09/02/2010	3 years	
	Flow sensor #2 Metran-100DD ΔP–4kPa	80444	10/02/2010	3 years	
	Pressure sensor Metran-100DI P–1,6MPa	144578	08/02/2010	3 years	
	Temperature sensor TSMУ-3212 T(-50÷50ºC)	017	10/02/2010	3 years	
	Controller ECOM-3000	08061423	03/08/2010	4 years	
Consumption of pure nitrogen in EAFP	Orifice plate DKS d = 27,1 mm	17632/1	31/01/2011	2 years	*Earlier was installed orifice plate DKS, d = 27,04mm, date of verification 02/02/2009 (CI 2 years)*
	Flow sensor #1 Metran-100DD ΔP-4kPa	265310	18/05/2010	3 years	

Monitoring parameters	**Measurement equipment**	**Serial (inventory) number**	**Date of last calibration (verification)**	**Calibration interval**	**Notes and information on previous calibrations (verifications) actual during monitoring period**
	Flow sensor #2 Metran-100DD ΔP–40kPa	265323	18/05/2010	3 years	
	Pressure sensor Metran-100DI P – 1,6 MPa	144558	18/05/2010	3 years	
	Temperature sensor TSMУ-3212 T(-50÷50ºC)	013	18/05/2010	3 years	
	Controller ECOM-3000	08061423	03/08/2010	4 years	
Consumption of nitrogen in EAFP	Orifice plate DKS d = 71,92 mm	6110676	31/01/2011	2 years	*Previous verification 30/01/2009 (CI 2 years)*
	Flow sensor Metran-100DD ΔP – 16 kPa	231720	22/04/2010	3 years	
	Pressure sensor Metran-100DI P – 1,6 MPa	252850	24/10/2011	3 years	*Earlier was installed pressure sensor Metran-100DI #310851 P–1,0MPa, date of verification 15/04/2010 (CI 3 years)*
	Temperature sensor TSMУ-3212 T(-50÷50ºC)	19	21/09/2012	3 years	*Previous verification 23/09/2009*
	Controller ECOM-3000	08061421	30/07/2010	4 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
Oxygen generation					
Oxygen generation by Oxygen Plant (OP) #4 - metering unit at block #1 (technological)	Orifice plate DBS d = 383,32mm	KS4B1tech/	23/04/2012	2 years	
	Flow sensor Metran-100DD ΔP-2,5kPa	289053	18/04/2012	3 years	*Earlier was installed flow sensor Metran-100DD #47157, date of verification 31/03/2010 (CI 3 years)*
	Pressure sensor Metran-100DI P - 40kPa	289038	18/04/2012	3 years	*Previous verification 14/04/2009 then backup pressure sensor Metran-100DI #241513, date of verification 18/01/2012 (CI 2 years)*
	Temperature sensor TSM-1088 T(-50÷150ºC)	028-01-9304	18/05/2011	3 years	*Previous verification 09/07/2008*
	Controller ECOM-3000	05061281	29/06/2010	4 years	
Oxygen generation by OP #4 - metering unit at block #4	Orifice plate DBS d = 518,52 mm	C420/8F303	09/07/2008	2 years	*According to direction # GI-101 of 10/05/2012 years date of revision – 15/11/2013 years*
	Flow sensor Metran-100DD ΔP - 6,3 kPa	242172	24/05/2010	3 years	
	Pressure sensor Metran-100DI P – 16 kPa	241512	26/05/2010	3 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Temperature sensor TSM-6097 T(-50÷150ºC)	401	21/06/2011	3 years	
	Controller ECOM-3000	05061282	29/06/2010	4 years	
Oxygen generation by OP #4 - metering unit at block #5 (technical)	Orifice plate DBS d = 393,9 mm	KS4B5	20/03/2012	2 years	
	Flow sensor Metran-100DD ΔP - 1,6 kPa	289634	07/12/2011	3 years	*Previous verification 23/12/2008*
	Pressure sensor Metran-100DI P – 10 kPa	289034	13/12/2011	3 years	*Previous verification 25/12/2008*
	Temperature sensor TSM-0193 T(-50÷150ºC)	5105	21/03/2012	3 years	*Previous verification 02/03/2009 then backup pressure temperature sensor TSM-0193 #26, date of verification 02/02/2011 (CI 2 years)*
	Controller ECOM-3000	05061281	29/06/2010	4 years	
Oxygen generation by OP #4 - metering unit at block #5 (technological)	Orifice plate DBS d = 561,2 mm	251048	20/03/2012	2 years	
	Flow sensor Metran-100DD ΔP - 1, 6kPa	289633	07/12/2011	3 years	*Previous verification 23/12/2008*
	Pressure sensor Metran-100DI P – 10 kPa	289032	13/12/2011	3 years	*Previous verification 25/12/2008*

Monitoring parameters	**Measurement equipment**	**Serial (inventory) number**	**Date of last calibration (verification)**	**Calibration interval**	**Notes and information on previous calibrations (verifications) actual during monitoring period**
	Temperature sensor TSM-0193 T(-50÷180ºC)	5104	21/03/2012	3 years	*Previous verification 02/03/2009 then backup pressure temperature sensor TSM-0193 #186, date of verification 02/02/2011 (CI 2 years)*
	Controller ECOM-3000	05061281	29/06/2010	4 years	
Oxygen generation by OP #4 - metering unit at block #6 (technical)	Orifice plate DBS d = 396,4 mm	KS4B6	23/04/2012	2 years	
	Flow sensor Metran-22DD ΔP - 2,5 kPa	3421	21/11/2011	2 years	*Earlier was installed flow sensor Metran-100DD #243324, date of verification 26/03/2009 (CI 3 years)*
	Pressure sensor Metran-22DI P – 10 kPa	3389	21/11/2011	2 years	*Earlier was installed pressure sensor Metran-100DI #241513, date of verification 26/03/2009 (CI 3 years)*
	Temperature sensor TSM-1088 T(-50÷180ºC)	6303	19/04/2012	3 years	*Previous verification 02/10/2009*
	Controller ECOM-3000	05061282	29/06/2010	4 years	
Oxygen generation by OP #4 - metering unit at block #5 (technological)	Orifice plate DBS d = 625,6 mm	KS4B6tech	23/04/2012	2 years	
	Flow sensor Metran-22DD ΔP - 2,5 kPa	3429	21/11/2011	2 years	*Previous verification 29/10/2009 then backup flow sensor Metran-100DD #837494, date of verification 06.06.2011 (CI 3 years)*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Pressure sensor Metran-22DI P – 16 kPa	3392	21/11/2011	2 years	*Previous verification 28/10/2009 then backup pressure sensor Metran-22DI #47195, date of verification 12/09/2011 (CI 2 years)*
	Temperature sensor TSM-1088 T(-50÷180ºC)	6305	19/04/2012	3 years	*Previous verification 01/10/2009*
	Controller ECOM-3000	05061282	29/06/2010	4 years	
Oxygen generation by OP #4 - metering unit at block #7 (technical)	Orifice plate DBS d = 396,4 mm	KS4B7	13/01/2012	2 years	
	Flow sensor Sapphire-22MT ΔP - 1,6 kPa	004553	28/12/2011	2 years	*Previous verification 25/01/2009, 25/01/2011*
	Pressure sensor Sapphire-22MT P – 25 kPa	004581	28/12/2011	2 years	*Previous verification 25/01/2009, 25/01/2011*
	Temperature sensor TSM-0193 T(-50÷150ºC)	57	25/01/2011	3 years	*Previous verification 07/02/2008*
	Controller ECOM-3000	05061282	29/06/2010	4 years	
Oxygen generation by OP #4 - metering unit at block #7 (technological)	Orifice plate DBS d = 625,97mm	KS4B7tech	11/05/2012	2 years	
	Flow sensor Sapphire-22MT ΔP - 1,6 kPa	004556	28/12/2011	2 years	*Previous verification 25/01/2009, 25/01/2011, 18/07/2011*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Pressure sensor Sapphire-22MT P – 25 kPa	004569	28/12/2011	2 years	*Previous verification 25/01/2009, 25/01/2011*
	Temperature sensor TSM-0193 T(-50÷150ºC)	25	25/01/2011	3 years	*Previous verification 07/02/2008*
	Controller ECOM-3000	05061282	29/06/2010	4 years	
Oxygen generation by OP #4 - metering unit at block #8 (technical)	Orifice plate DBS d = 393,85 mm	KS4B8	14/07/2010	2 years	
	Flow sensor Metran-100DD ΔP-1,6kPa	289635	03/06/2010	3 years	
	Pressure sensor Metran-100DI P – 10 kPa	289035	03/06/2010	3 years	
	Temperature sensor TSM-0193 T(-50÷180ºC)	8139	21/03/2012	3 years	*Previous verification 02/03/2009 then backup temperature sensor TSM-0193 #10, date of verification 02/02/2011 (CI 2 years)*
	Controller ECOM-3000	05061282	29/06/2010	4 years	
Oxygen generation by OP #4 - metering unit at block #8 (technological)	Orifice plate DBS d = 621,71 mm	KS4B8tech	14/07/2010	2 years	*According to direction # GI-101 of 10/05/2012 years date of revision – 20/02/2013*
	Flow sensor Metran-100DD ΔP - 1,6 kPa	289632	03/06/2010	3 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Pressure sensor Metran-100DI P – 10 kPa	289033	03/06/2010	3 years	
	Temperature sensor TSM-0193 T(-50÷180ºC)	8138	21/03/2012	3 years	*Previous verification 02/03/2009 then backup* temperature sensor TSM-0193 *#58, date of verification 02/02/2011 (CI 2 years)*
	Controller ECOM-3000	05061282	29/06/2010	4 years	
Oxygen generation by OP #5 - metering unit at block #1	Orifice plate DBS d = 573,16 mm	151031	01/10/2012	2 years	
	Flow sensor Metran-100DD ΔP - 2,5 kPa	387999	11/04/2011	3 years	*Previous verification 16/04/2009*
	Pressure sensor Metran-100DI P – 25 kPa	392761	11/04/2011	3 years	*Previous verification 16/04/2009*
	Temperature sensor TSP-0879 T(-200÷500ºC)	B1	11/04/2011	3 years	*Previous verification 27/05/2009*
	Controller ECOM-3000	08071747	06/09/2011	4 years	*Previous verification 28/09/2007*
Oxygen generation by OP #5 - metering unit at block #2	Orifice plate DBS d = 573 mm	201006002	09/09/2010	2 years	*According to direction # GI-101 of 10/05/2012 date of revision – 25/01/2013*
	Flow sensor Metran-100DD ΔP - 2,5 kPa	388000	21/03/2011	3 years	*Previous verification 16/04/2009*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Pressure sensor Metran-100DI P – 25 kPa	392762	21/03/2011	3 years	*Previous verification 16/04/2009*
	Temperature sensor TSP-0879 T(-200÷600ºC)	B2	21/03/2011	3 years	*Previous verification 15/01/2009*
	Controller ECOM-3000	08071747	06/09/2011	4 years	*Previous verification 28/09/2007*
Oxygen generation by OP #5 - metering unit at block #3	Orifice plate DBS d = 573,4 mm	151032	28/04/2011	2 years	
	Flow sensor Metran-100DD ΔP - 2,5 kPa	387998	21/03/2011	3 years	*Previous verification 02/04/2009*
	Pressure sensor Metran-100DI P – 25 kPa	386403	21/03/2011	3 years	*Previous verification 02/04/2009*
	Temperature sensor TSP-0879 T(-200÷600ºC)	B3	21/03/2011	3 years	*Previous verification 15/01/2009*
	Controller ECOM-3000	08071747	06/09/2011	4 years	*Previous verification 28/09/2007*
Oxygen generation by OP #5 - metering unit at block #4	Orifice plate DBS d = 574,8 mm	773738	24/10/2011	2 years	
	Flow sensor Metran-100DD ΔP – 4 kPa	387997	10/02/2011	3 years	*Previous verification 02/04/2009*
	Pressure sensor Metran-100DI	386402	10/02/2011	3 years	*Previous verification 02/04/2009*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	P – 25 kPa				
	Temperature sensor TSP-0879 T(-200÷600ºC)	B4	11/02/2011	3 years	*Previous verification 27/03/2009*
	Controller ECOM-3000	08071747	06/09/2011	4 years	*Previous verification 28/09/2007*
Steam-air blow power plant (air blast)					
Generation of air blast in turbine section of SABPP-1 Turboprop engine-1	Venturi tube	there is no number	n/a	n/a	
	Pressure sensor Metran-55DI P=0-6 kg*s/cm²	354166	01/06/2011		*Previous verification 02/06/2009*
	Flow sensor DM ΔP=0-2,5 kPa	75783	05/08/2011	2 years	*Previous verification 02/06/2009*
Generation of air blast in turbine section of SABPP-2 Turboprop engine-1	Venturi tube d_{20}=1220mm D_{20}=2100 mm	there is no number	n/a	n/a	
	Pressure sensor Metran-100DI P=0-4 kg*s/cm²	429009	10/05/2012	2 years	*Previous verification 25/05/2010*
	Flow sensor Metran 100DD ΔP= 0-6,3 kPa	302452	10/05/2012	2 years	*Previous verification 25/05/2010*
Generation of air blast in turbine section of	Venturi tube	there is no number	n/a	n/a	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
SABPP-1 Turboprop engine-2	Pressure sensor Sapphire 22MT P=0-6 kg*s/cm²	3530	16/01/2011	2 years	*Previous verification 16/01/2009*
	Flow sensor DM ΔP=0-2,5 kPa	21078	21/06/2011	2 years	*Previous verification 16/01/2009*
Generation of air blast in turbine section of SABPP-2 Turboprop engine-2	Venturi tube d_{20} = 1220 mm	there is no number	n/a	n/a	
	Pressure sensor Metran-55 DI P=0-4 kg*s/cm²	436515	13/08/2012	2 years	*Previous verification 12/08/2010*
	Flow sensor Metran 100DD ΔP=0-6,3 kPa	429081	13/08/2012	2 years	*Previous verification 12/08/2010*
Generation of air blast in turbine section of SABPP-2 Turboprop engine-3	Venturi tube d_{20}=1220mm D_{20}=2100 mm	there is no number	n/a	n/a	
	Pressure sensor Metran 55 P=0-4 kg*s/cm²	411018	24/01/2011	2 years	*Previous verification 26/01/2009*
	Flow sensor Metran 100DD ΔP=0-2,5 kPa	192743	24/01/2011	2 years	*Previous verification 26/01/2009*
Generation of air blast in turbine section of SABPP-1 Turboprop engine-3	Venturi tube	there is no number	n/a	n/a	
	Pressure sensor Sapphire 22MT P=0-6 kg*s/cm²	3531	20/04/2011	2 years	*Previous verification 20/04/2009*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Flow sensor DM ΔP=0-2,5 kPa	38256	16/11/2011	2 years	*Previous verification 20/04/2009*
Generation of air blast in turbine section of SABPP-1 Turboprop engine-4	Venturi tube	there is no number	n/a	n/a	
	Pressure sensor Sapphire 22MT P=0-6 kg*s/cm²	12098	25/11/2010	2 years	
	Flow sensor Sapphire 22DD ΔP=0-2,5 kPa	25573	15/05/2011	2 years	*Previous verification 15/05/2009*
Generation of air blast in turbine section of SABPP-1 Turboprop engine-5	Venturi tube	there is no number	n/a	n/a	
	Pressure sensor Metran 55DI P=0-6 kg*s/cm²	419938	11/09/2012	2 years	*Previous verification 10/09/2010*
	Flow sensor DM, ΔP=0-2,5 kPa #123		05/01/2011	2 years	*Previous verification 05/01/2009*
Generation of air blast in turbine section of SABPP-2 Turboprop engine-5	Venturi tube d_{20}=1335mm D_{20}=2100 mm	there is no number	n/a	n/a	
	Pressure sensor Sapphire 22DI P=0-4 kg*s/cm²	530	15/12/2011	2 years	*Previous verification 15/12/2009*
	Flow sensor Metran 100DD ΔP=0-4 kPa	303002	15/12/2011	2 years	*Previous verification 15/12/2009*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
Generation of air blast in turbine section of SABPP-2 Turboprop engine-6	Venturi tube d_{20}=1350 mm	there is no number	n/a	n/a	
	Pressure sensor Metran 100 DI P=0-4 kg*s/cm^2	276613	16/03/2011	2 years	*Previous verification 16/03/2009*
	Flow sensor Metran 100 DD, ΔP=0-2,5 kPa	904383	16/03/2011	2 years	*Previous verification 16/03/2009*
Generation of air blast in turbine section of SABPP-2 Turboprop engine-8	Venturi tube d_{20}=1323,89 mm D_{20}=2100 mm	there is no number	n/a	n/a	
	Pressure sensor Metran 150 TG2 P=0-600 kPa	929591	27/07/2010	4 years	
	Flow sensor Metran 150 CD2, ΔP=0-10 kPa	929610	27/07/2010	4 years	
Generation of air blast in turbine section of SABPP-2 Turboprop engine-7	Venturi tube d_{20}=1220mm D_{20}=2100 mm	there is no number	n/a	n/a	
	Pressure sensor Metran 150 TG2 P=0-600 kPa	930642	30/07/2010	4 years	
	Flow sensor Metran 150 CD2 ΔP=0-10 kPa	930846	30/07/2010	4 years	
Weighting measurements/ Consumption of raw materials, output of products					
Consumption of raw materials, output of	Railroad scales Vesta S-200-I1/1	320	14/11/2011	1 year	*Previous calibration 13/10/2010*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
steel billet	Railroad scales Vesta S-200-I1/1	319	10/10/2012	1 year	*Previous calibration 08/10/2010; 10/10/2011*
	Railroad scales Vesta C-200-I/2	222	02/04/2012	1 year	*Previous calibration 02/04/2010; 01/04/2011*
	Railroad scales Vesta C-200-I/2	321;	16/12/2011	1 year	*Previous calibration 17/12/2010*
	Railroad scales VZHD-150 (section steel billet)	1567	14/05/2012	1 year	*Previous calibration 14/05/2010; 13/05/2011*
	Railroad scales VZHD-150 (section steel billet)	1566	23/04/2012	1 year	*Previous calibration 14/05/2010; 13/05/2011*
	Railroad scales VZHD-150 (section steel billet)	1561	10/09/2012	1 year	*Previous calibration 10/09/2010, 09/09/2011*
	Crane scales «Kraves-60» (slab steel billet)	58	13/03/2012	1 year	*Previous calibration 08/11/2011*
	Crane scales «Kraves-60» (slab steel billet)	59	13/03/2012	1 year	*Previous calibration 08/11/2011*
Production in BFP	Railroad scales 4580P200 Zavodskaya station, 2nd check-point	2	09/04/2012	1 year	*Previous calibration 07/04/2011*
	Railroad scales 4180P250 Zavodskaya station, 5th check-point	1	7/04/2011	1 year	*Shut down for repair since 09/04/2011*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Railroad scales VESTA S200-N1/1-FK Zavodskaya station, 4th check-point	247	09/06/2012	1 year	*Previous calibration 09/06/2011*
	Scales 4625-PR400 Iron unloading section of oxygen convertor plant, hole #1	1	14/06/2012	6 months	*Previous verification 15/12/2010; 24/06/2011; 20/12/2011*
	Scales 4625-PR400 Iron unloading section of oxygen convertor plant, hole #2	2	14/06/2012	6 months	*Previous verification 15/12/2010; 24/06/2011; 29/09/2011; 20/12/2011*
	Platform scales VPS-600-8000-5000 Iron unloading section of oxygen convertor plant, hole #3	0607069	14/06/2012	6 months	*Previous verification 15/12/2010; 20/06/2011; 20/12/2011*
Consumption of dry skip metallurgical coke	Blast furnace #1. Hopper strain-gauge balance technological. West coke hopper	1-VKZ	01/11/2011	1 year	*Previous calibration 02/11/2010*
	Blast furnace #1. Hopper strain-gauge balance technological. East coke hopper	1-VKV	01/11/2011/	1 year	*Previous calibration 02/11/2010*
	Blast furnace #2.Weighting hoppers with strain sensor VDD-6-0,5	0710012	11/01/2012	1 year	*Previous calibration 03/02/2011*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Blast furnace #2.Weighting hoppers with strain sensor VDD-6-0,5	0710013	11/01/2012	1 year	*Previous calibration 03/02/2011*
	Blast furnace #4. Hopper strain-gauge balance technological. West coke hopper	4-VKZ	07/03/2012	1 year	*Previous calibration 09/03/2011*
	Blast furnace #4. Hopper strain-gauge balance technological. East coke hopper	4-VKV	07/03/2012	1 year	*Previous calibration 09/03/2011*
	Blast furnace #6. Hopper strain-gauge balance technological. West coke hopper	6-VKZ	12/04/2012	1 year	*Previous calibration 19/04/2011*
	Blast furnace #6. Hopper strain-gauge balance technological. East coke hopper	6-VKV	12/04/2012	1 year	*Previous calibration 19/04/2011*
	Blast furnace #7. Hopper strain-gauge balance technological. West coke hopper	7-VKZ	17/07/2012	1 year	*Previous calibration 19/07/2011*
	Blast furnace #7. Hopper strain-gauge balance technological. East coke hopper	7-VKV	17/07/2012	1 year	*Previous calibration 19/07/2011*
	Blast furnace #8. Hopper strain-gauge balance technological. West coke hopper	7-VKZ	19/07/2012	1 year	*Previous calibration 21/07/2011*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Blast furnace #8. Hopper strain-gauge balance technological. East coke hopper	7-VKV	19/07/2012	1 year	*Previous calibration 21/07/2011*
	Blast furnace #9.Weighting hoppers with strain sensor VDD-6-0,5	0710014	22/03/2012	1 year	*Previous calibration 22/03/2011*
	Blast furnace #9.Weighting hoppers with strain sensor VDD-6-0,5	0710015	22/03/2012	1 year	*Previous calibration 22/03/2011*
	Blast furnace #10.Weighting hoppers with strain sensor VDD-6-0,5	0710016	28/02/2012	1 year	*Previous calibration 24/03/2011*
	Blast furnace #10.Weighting hoppers with strain sensor VDD-6-0,5	0710017	28/02/2012	1 year	*Previous calibration 24/03/2011*
Production of dry metallurgical coke	Railroad scales Type 446 V200	3	22/04/2011	1 year	*Decommissioned in April 2012*
	Railroad scales Type VVS-150	-	December 2011		*Commissioned in December 2011 годa*
Measurement of chemical content					
Carbon content in dry coal charge and dry metallurgical coke	Carbon content analyzer LECO SC144DR	214-2008	27/01/2012	1 year	*Previous verification 27/01/2010, 27/01/2011*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
Composition of COG	Gas analyzer KGA KGA 2-1				*Factory verification. The device is not subject for periodic verification*
Composition of BFG	Gas analyzer KGA KGA 2-1				*Factory verification. The device is not subject for periodic verification*
Carbon content in blast furnace dust	Analyzer ELTRA "CS-800"	2305070717	10/02/2012	1 year	*Previous verification 10/02/2010, 10/02/2011*
Output of by-product coke plant production					
Production of crude benzol, distillation products of dry coal tar	Measuring staff MShS-3,5	2098	11/09/2012	1 year	*Previous calibration 17/08/2011, commissioned 09/11/2010*
Consumption of electricity by EAFP					
Electricity consumption by DBSU Electricity consumption by LFA #3, EAF	Substation 8, feeder 8-77, meter SA3U-I670D	287353	2009	4 years	
	Substation, feeder 8-50, meter SA3U-I670D	598124	2009	4 years	
	Substation 8, feeder 8-70, meter SA3U-I670D	517635	2009	4 years	
	Substation 8, feeder 8-69, meter SA3U-I670D	226803	24/02/2012	4 years	*Previous verification in 2007*
	Substation 8, feeder 8-69, meter SA3U-I670D	018409	24/02/2012	4 years	*Previous verification in 2007*

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Substation 8, feeder 8-64, meter CE-6805V	39009315	2009	8 years	
	Substation 95, feeder 95-35, meter SA3U-I670D	118425	2009	4 years	
	Substation 95, feeder 95-23, meter SA3U-I670D	187141	2009	4 years	
	Substation 95, feeder 95-47, meter SA3U-I670D	201866	2009	4 years	
	Substation 71, feeder 71-27, meter SA3U-I670M	366519	2007	6 years	
	Substation 71, feeder 71-28, meter SA3U-I670D	488440	2011	4 years	
Electricity consumption by EAF	Substation 77, feeder 77-207, meter CE-6805V	41022507	2009	8 years	
	Substation 77, feeder 77-208, meter СЭТ-4ТМ.02.2	9072609	2007	10 years	
Electricity consumption by CCM #5, LFA #1,2	Substation 25, feeder 25-32, meter PSCH-4AR.05.2	12001993	2008	16 years	
Electricity consumption by CCM #5	Substation 87, feeder 87-61, meter СЭТ-4ТМ.03.М	811090933	2011	10 years	

Monitoring parameters	Measurement equipment	Serial (inventory) number	Date of last calibration (verification)	Calibration interval	Notes and information on previous calibrations (verifications) actual during monitoring period
	Substation 25, feeder 25-39, meter CE-6805V	2785500307	2006	8 years	
Electricity consumption by LFA #3	Substation 95, feeder 95-42, meter CE-6805V	30048433	2007	8 years	
Electricity consumption by LFA #1,2	Substation 8, feeder 8-60, meter СЭТ-4ТМ.02.2	11073202	2007	10 years	
	Substation 95, feeder 95-12, meter CE-6805V	43034784	2009	8 years	
Electricity consumption by CCM #1, 2; LFA #1, 3	Thermal power plant, feeder 6, meter CE-6805V	41022247	30/01/2012	8 years	*Previous verification in 2004*
	Thermal power plant, feeder 6, meter CE-6805V	2785500190	2004	8 years	
	Thermal power plant, feeder 6, meter CE 302 S33 503	0688270909747050	2012	16 years	
Electricity consumption by DBSU	Central power plant, feeder 172, meter PSCH-4AR.05.2	11000624	2008	16 years	
	Central power plant, feeder 131, meter PSCH-4AR.05.2	1000652	2008	16 years	