TENTH PERIODIC JI MONITORING REPORT

Version 2.0
20 December 2011

CONTENTS

SECTION A. General project activity and monitoring information

A.1 Title of the project activity:

"Improvement of the Energy efficiency at Energomashspetsstal (EMSS), Kramatorsk, Ukraine"

A.2. JI registration number:

JI 0104
ITL UA2000008

A.3. Short description of the project activity:

The project activity consists of the energy efficiency measures at the premises of PJSC "Energomashspetsstal" (EMSS) through the implementation of four subprojects:

Subproject 1. Reconstruction of thermal and heating furnaces: There are thermal and heating furnaces in operation in different shops at the premises of EMSS. The main goal of this subproject is the reduction of the natural gas consumption for these furnaces by commissioning of new automated natural gas burners (which enables the required temperature inside of the furnace to be maintained) and by the implementation of new thermal insulation for the walls, front doors and roofs of the furnaces.

Subproject 2. Installation of a new vacuum system: The installation of a new vacuum system (vacuum degasser) for the vacuumed steel production. The old vacuum system used heat and electricity, the new reconstructed vacuum system uses only electricity.

Subproject 3. Installation of an arc ladle furnace: The installation of a new arc ladle furnace for the steel production. This means that the part of the process of the steel preparation will be undertaken in the ladle, from which the steel will be cast into the forms. As a result there is reduction of the electricity consumption.

Subproject 4. Modernization of press equipment: The replacement of an old pump system, serving the 15.000 tonne press, with a new more effective pump system. There are 24 old pumps (with 500 kW installed capacity each), which will be replaced by 11 new pumps (with 800 kW installed capacity each).

There are following sources of green-house gas emissions related to the proposed four subprojects:

- Emissions that are related to the direct fuel combustion in thermal and heating furnaces of EMSS. Fuel combustion will decrease after implementation of Subproject 1 "Reconstruction of thermal and heating furnaces".
- Indirect green-house gas emissions at the premises of Kramatorsk CHPP as result of fuel combustion for heat producing which was consumed at EMSS. Heat consumption at EMSS will decrease after implementation of Subproject 2 "Installation of a new vacuum system".
- Indirect green-house gas emission in the Ukrainian grid as a result of electricity producing which was consumed at EMSS. Electricity consumption will increase in result of Subproject 2 "Installation of a new vacuum system" and decrease in result of Subproject 3 "Installation of an arc ladle furnace" and Subproject 4 "Modernization of press equipment".

A.4. Monitoring period:

- Monitoring period starting date: 01.07.2011 at 00:00;
- Monitoring period closing date: 30.09.2011 at 24:00.

A.5. Methodology applied to the project activity (incl. version number):

The JI specific approach is used for the monitoring of emission reductions in accordance with the "Guidance on criteria for baseline setting and monitoring".

A.5.1. Monitoring methodology: A JI specific monitoring approach was developed for this project in line with the "Guidance on criteria for baseline setting and monitoring". The resulting Monitoring Plan was determined as part of the determination process.

A.6. Status of implementation including time table for major project parts:

The project obtained Letter of Approval (# 48/23/7 dated 23/01/2009) from Ukraine and Letter of Approval (# 2009JI01 dated 03/03/2009) from Netherlands.

Subprojects implementation is behind schedule due to a lack of financing, forecast and detailed actual dates are shown in the table below.

Activity	Date of startup according to PDD	Date of startup actual*	Type document
Subproject 1. Reconstruction of thermal and heating furnaces			
Heating #07, Forge Press Shop (FPS)	July 2008	01.10.2008	Act of startup
Heating #08, FPS	2007	14.11.2007	Act of acceptance completed construction object gas supply system
Heating #09, FPS	2007	13.11.2007	Act of acceptance completed construction object gas supply system
Heating #10, FPS	2007	01.02.2008	Act of startup
Heating #33, FPS	October 2008	01.09.2009	Act of startup
Heating #34, FPS	December 2008	01.01.2010	Act of startup
Heating #35, FPS	May 2009	19.01.2010	Act of startup
Heating #36, FPS	August 2009	01.03.2010	Act of startup
Thermal #01, FPS	-	01.08.2010	Act of startup
Thermal #01, Thermal Shop (TS)	2007	10.05.2007	Act of startup
Thermal #02, TS	2007	26.07.2007	Act of startup
Thermal #04, TS	December 2008	11.01.2010	Act of startup
Thermal #09, TS	2007	17.03.2007	Act of startup
Thermal #10, TS	2007	28.09.2007	Act of startup
Thermal #17, TS	-	01.01.2011	Act of startup
Thermal #18, FPS	July 2008	01.12.2008	Act of startup
Thermal #18, TS	-	01.01.2011	Act of startup
Thermal #19, FPS	September 2008	01.02.2009	Act of startup
Thermal #20, FPS	October 2008	01.03.2009	Act of startup
Thermal #30, FPS	April 2008	01.05.2008	Act of startup
Thermal #31, FPS	October 2008	01.08.2009	Act of startup
Thermal #32, FPS	October 2008	01.07.2009	Act of startup
Thermal #37, FPS	August 2009	01.09.2009	Act of startup
Thermal #38, FPS	August 2009	01.05.2010	Act of startup

Activity	Date of startup according to PDD	Date of startup actual*	Type document
Subproject 2. Installation of a new vacuum system	May 2007	28.02.2008	Act of startup
Subproject 3. Installation of an arc ladle furnace	April 2007	01.04.2007	Order "On measures to implement the targets on production volumes in 2007"
Subproject 4. Modernization of press equipment	December 2007	26.08.2008	Act of startup

* The dates of startup actual were specified according to the documents listed in the table.
Table 1 Status of implementation

A.7. Intended deviations or revisions to the determined PDD:

There were changes during the implementation of the project. Their detailed analysis in accordance with Procedures Regarding Changes During Project Implementation[1] developed by Joint Implementation Supervisory Committee (JISC) is provided in the Annex 1 to the Sixth Periodic JI Monitoring Report version 3.0 from 17/12/2010, available through United Nations Framework Convention on Climate Change (UNFCCC) web-page[2]; that has been finally verified[3] and Annex 1 to the Eighth Periodic JI Monitoring Report version 3.0 from 01/06/2011, available through UNFCCC web-page[4], that has been finally verified[5].

A.8. Intended deviations or revisions to the determined monitoring plan:

- There are few deviations to the monitoring plan included in the determined Project Development Document (PDD). Detailed descriptions of the deviations are provided in the Second Periodic JI Monitoring Report, version 1.5 from 31/12/2009. Available through UNFCCC web-page[6] that has been finally verified[7]. A revised monitoring plan has been submitted to the AIE during verification, which received a positive determination.

- There were also changes during the implementation of the project. Their detailed analysis in accordance with Procedures Regarding Changes During Project Implementation developed by JISC is provided in the Annex 1 to the Sixth Periodic JI Monitoring Report, version 3.0 from 17/12/2010, available through UNFCCC web-page; that has been finally verified and Annex 1 to the Eighth Periodic JI Monitoring Report version 3.0 from 01/06/2011, available through UNFCCC web-page that has been finally verified.

- The other deviation from the determined monitoring plan is reprogramming of 5 electricity meters to show electricity consumption data directly from the display. Reprogramming influenced neither the accuracy of data collection nor the data itself, and was done for the convenience of the project owners. Description of the calculation method is provided in the Table 12 of the Eighth Periodic JI Monitoring Report version 3.0 from 01/06/2011, available through UNFCCC web-page.

[1] http://ji.unfccc.int/Sup_Committee/Meetings/022/Reports/Annex2.pdf
[2] http://ji.unfccc.int/UserManagement/FileStorage/NM0A8W43PIDGOSQEJF7CRXY5H2LB6U
[3] http://ji.unfccc.int/UserManagement/FileStorage/3Q51REHGWV2YAPDMTINL8679ZXJOCU
[4] http://ji.unfccc.int/UserManagement/FileStorage/BVIONHYJCFGQKTW42UZ7XS9135D06M
[5] http://ji.unfccc.int/UserManagement/FileStorage/IFTZD7N5B1KS4E3XRPQ8WG9YJC60MO
[6] http://ji.unfccc.int/UserManagement/FileStorage/KSFAOBEZ8X9W1RG3IHC4L2N5Q0YMD6
[7] http://ji.unfccc.int/UserManagement/FileStorage/YRUGDP3JX7EA2ZBWIMLSHKTO6C49V1

- Emission factor for consumption of electricity from Ukrainian power grid in 2011 was changed. New emission factor for 2011[8] was approved for obligatory use in Emission Reduction Units calculations for JI projects in Ukraine by the Order of Ukrainian Designated Focal Point (DFP). The new estimation of emission factors for 2011 relies on the latest available data across entire Ukrainian power grid and represents the best knowledge on emissions of greenhouse gases. The proposed revision improves the accuracy of information collected compared to the original monitoring plan without changing conformity with the relevant rules and regulations for the establishment of monitoring plans.

A.9. Changes since last verification:

There were several changes since last verification to improve accuracy and transparency of data. The changes did not affect to the amount of emission reductions, neither the accuracy of data collection nor the data itself.

1. In this monitoring report for transparent approach actual dates of objects startup were specified according to documents listed in the table 1.

   Actual dates of startup for thermal furnaces #17, #18 in Thermal Shop were changed. In previous monitoring report dates for thermal furnaces #17, #18 in Thermal Shop was determined according to "Acceptance act on completed by construction object: gas supply system". In this monitoring report dates for furnaces was specified according to "Act of startup".

   These changes did not influence to the amount of emission reductions in the previous monitoring reports. Because thermal furnaces #17, #18 in Thermal Shop was included in JI project from 01/01/2011 according to Annex 1 of Eighth Periodic JI Monitoring Report.
2. Monitoring equipment types were specified according to passports of equipment for unique identifying the class of accuracy in labeling the equipment.
3. Work parameter, Level of accuracy and Date of last calibration of measuring equipment were specified according to calibration certificates and state standards.
4. Number of thermal furnace #21, FPS was changed to #31 according to enterprises reports.

A.10. Person(s) responsible for the preparation and submission of the monitoring report:

OJSC "Energomashspetsstal"

- Alexander Masyuk, Deputy Chief Engineer

Global Carbon B.V.

- Natallia Belskaya, JI Consultant

[8] Order of National Environment Investment Agency #75 from 12.05.2011
http://www.neia.gov.ua/nature/doccatalog/document?id=127498

SECTION B. Key monitoring activities according to the monitoring plan for the monitoring period

Key monitoring activities for each subproject could be described as follows.

Subproject 1. Reconstruction of thermal and heating furnaces

Reconstructed furnaces have the natural gas consumption meters with pressure and temperature meters. Information from consumption meters, pressure and temperature meters are transmitting to the control and monitoring computer system where recalculation measured volume at temperature 20 ˚C and pressure 101.325 kPa.

All information about technological process is saved continuously. The archiving period for the log files is at least one year. Information that corresponds to the natural gas consumption in the monitoring period has been burned on CDs. These CDs are stored two years after last transaction Emission Reduction Units (ERUs) by the project.

Every half-finished product that processes through the furnaces has own unique certificate. This certificate reflects all operations performed on the product and the weight on the exit of every workshop. So, the weight of half-finished products that proceed through each furnace could be easily monitored. Information from the certificates is saved in the log books in order to simplify the monitoring process.

A report including natural gas consumption and weight of half finished products is generating on a monthly basis. The report is signing by Head of Energy Saving Department, Head of corresponding workshop and approved by Chief Engineer.

The natural gas meters are used in furnaces' control process. That is why any deviation/failure of the meters would be recognized immediately by disturbance of the heating process and reported to the workshop's head. As a result of disturbance furnace should be shut down for the checking procedure.

The flowcharts of the natural gas supplying system with the metering points are presented in the following figures.

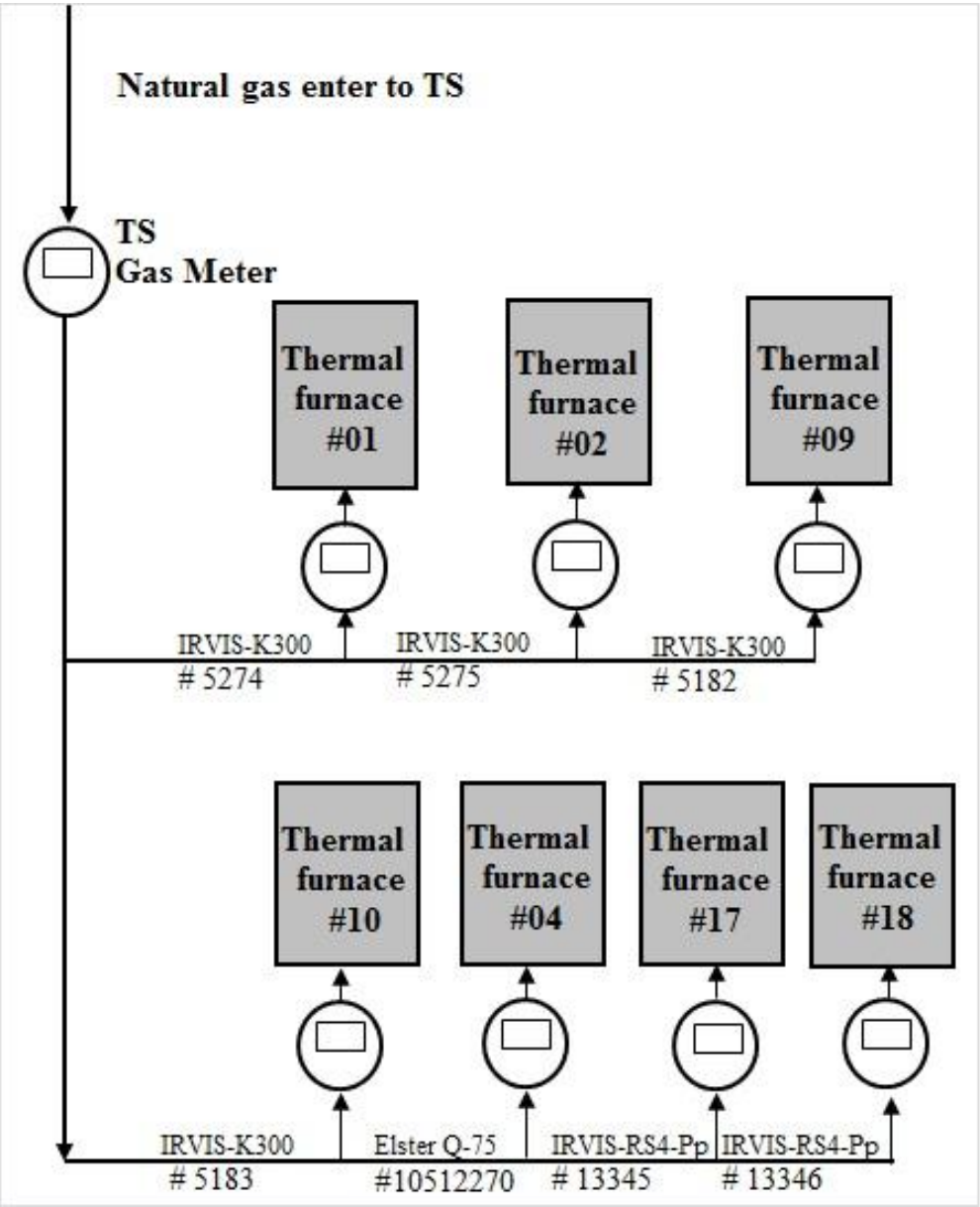

Figure 1 Natural gas metering system at TS

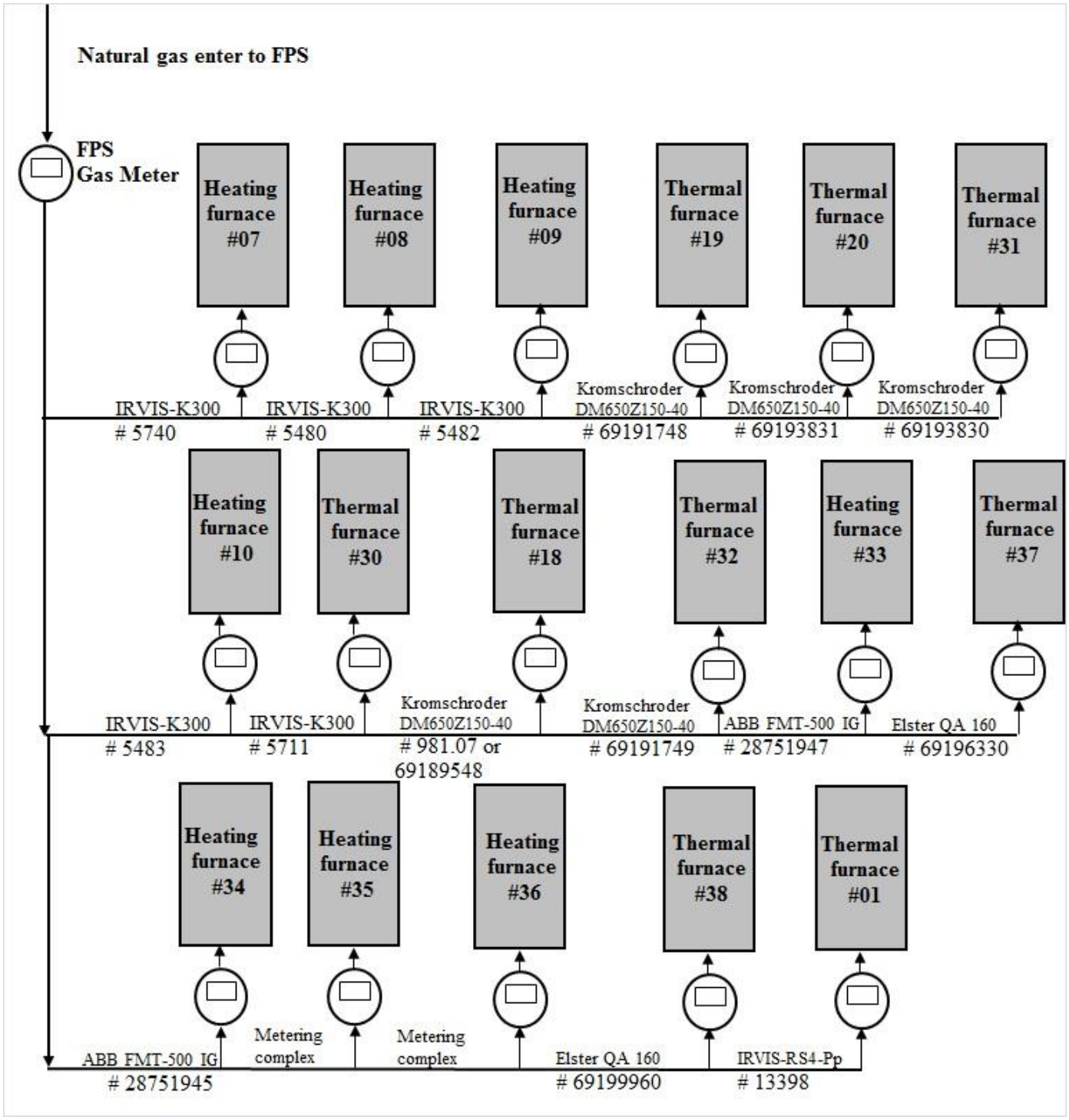

Figure 2 Natural gas metering system at FPS

Subproject 2. Installation of a new vacuum system

Electricity that is consumed during the vacuum process is metered using dedicated meters for this system. Information from meters is passed to the control and monitoring computer system of the vacuumator. A computer system records information about every vacuumization session, including melt passport, time and electricity consumption. The archiving period for the log files is at least one year. Information that corresponds to the electricity consumption in the monitoring period has been burned on CDs. These CDs are stored two years after last transaction Emission Reduction Units (ERUs) by the project.

Correctness of the meters' work is checking by the following formulae:
$\sum(\text{meter5} + \text{meter6}) - \sum(\text{meter1} + \text{meter2} + \text{meter3} + \text{meter4} + \text{other consumers}) \leq 1.5\%$

In the case of a difference of more than 1.5% of the total consumption, a verification of meters is performed, if found defective, the meter is substituted within one day.

The steel to the vacuum degasser (VD) coming either from ladle furnace (LF) or from the electric arc furnace (EAF) in special ladle. Each ladle with liquid steel has unique melt certificate. The following figure presents the electricity supplying system to the VD with metering points.

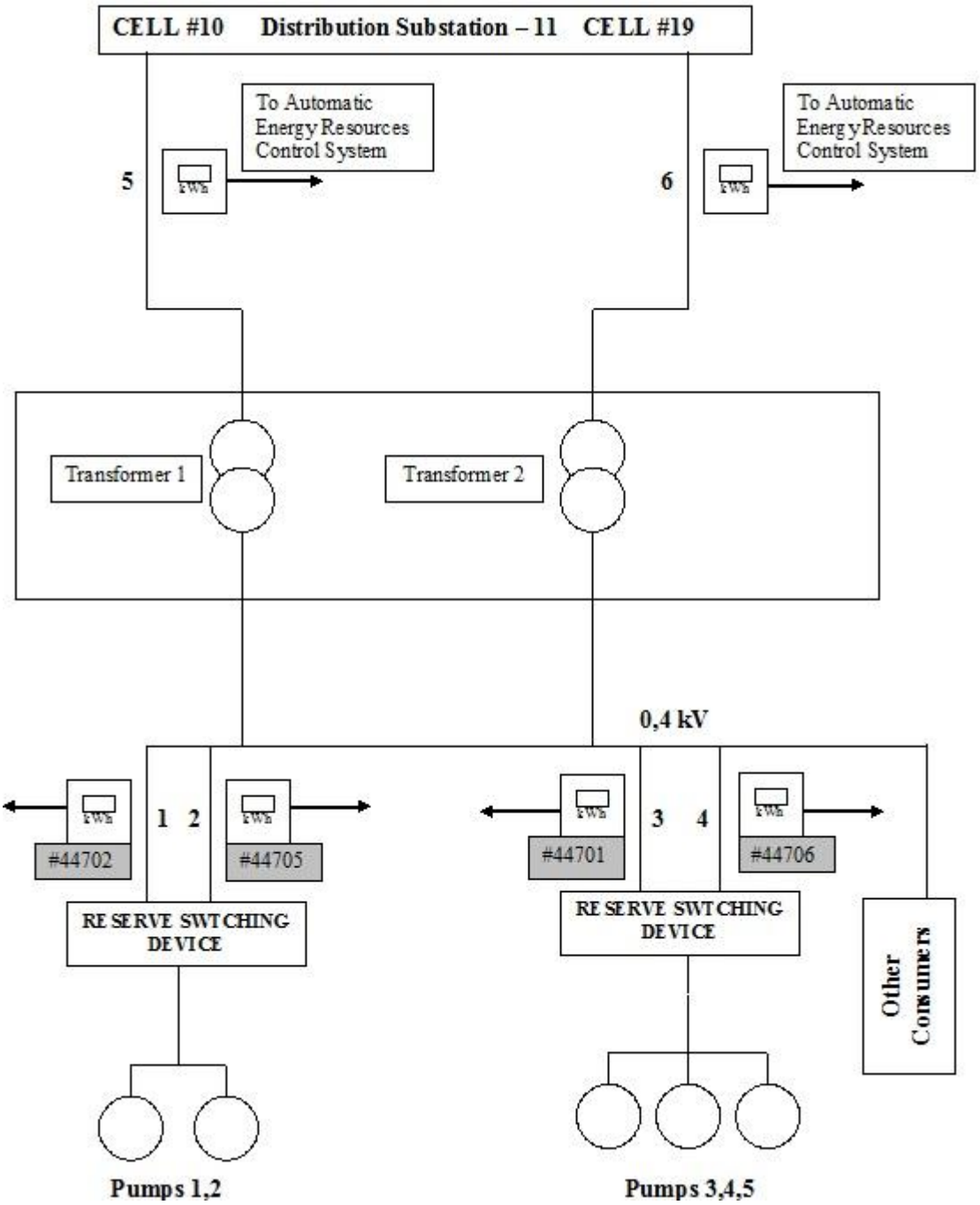

Figure 3 Electricity metering system at VD

Subproject 3. Installation of an arc ladle furnace

Ladle furnace (LF) is a comprehensive solution for high quality steel melting has been installed in the Steel Making Shop (SMS). The main electricity consumers of the Steel Making Shop are powered by the following scheme.

Close Distribution Unit (CDU) #1, 2 are electricity powering points for the EAFs (EAF50 #1, EAF100 #3, EAF100 #5) and LF. CDUs are powered by Transformer (T1) and Autotransformers (AT1 and AT2). EAFs and LF could be powered from any of the Transformers or Autotransformers. Commercial electricity meters are installed on each of the Transformers and Autotransformer. Cross-checking of the meters is performed by the following formulae:

$\sum(AT1+ AT2 +T1) - \sum(EAF50\ \#1 + EAF100\ \#3 + EAF100\ \#5 + LF) \leq 1.5\%$

In the case of a difference of more than 1.5% of the total consumption, a verification of meters is performed, if found defective, the meter is substituted within one day.

The data from electricity meters concerning electricity consumption is transmitted to the control and monitoring computer system continuously. The computer system records information about each melt process, including melt certificate. This certificate includes information about the number of furnace where steel was melted, steel content, amount of electricity consumed during melting and weight of steel. The archiving period for the log files is at least one year. All melt certificates for the monitoring period have been burned to CDs. These CDs are stored two years after last transaction Emission Reduction Units (ERUs) by the project.

The following figure presents electricity supplying system with metering points.

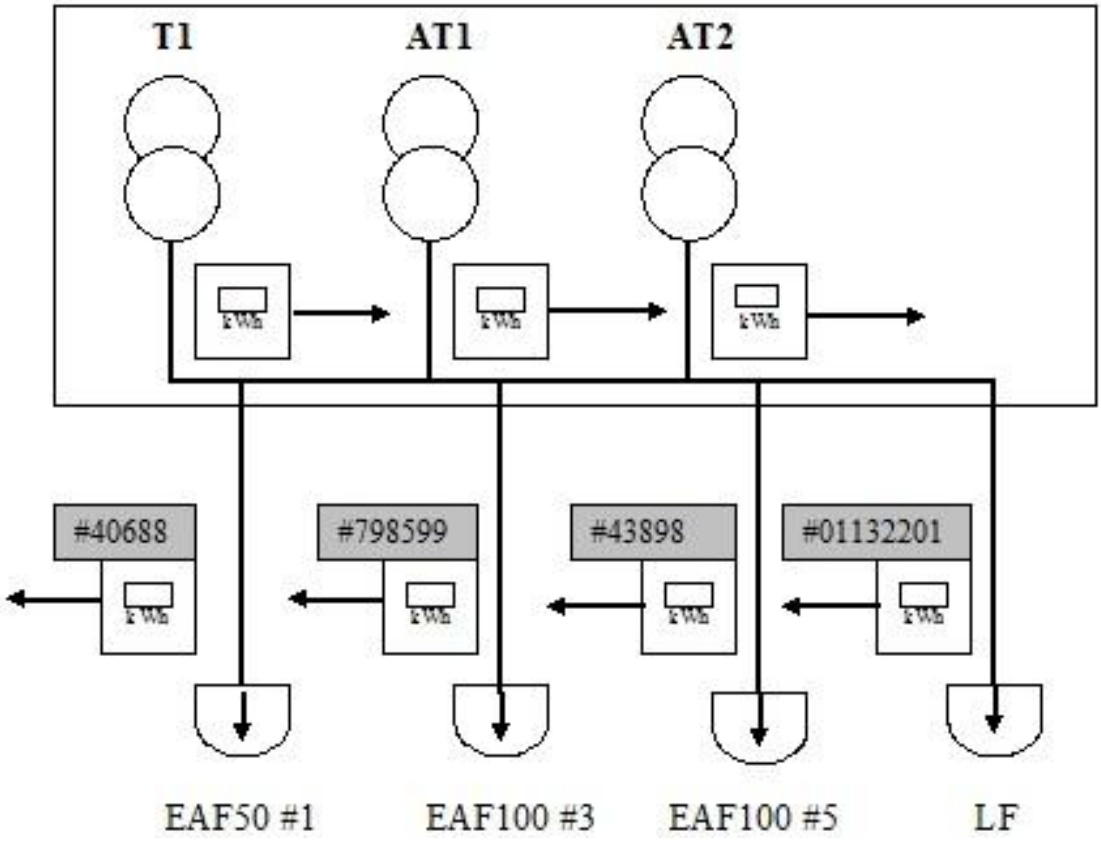

Figure 4 Electricity metering system at EAFs and LF

Subproject 4. Modernization of press equipment

Serving motors of the press pump station are powered from the 6kV line. Substation 110/6 kV has two transformers. Each transformer has electricity meter. There are some addition consumers on the 6 kV line. The performance of the meters is checked using the following formulae:

$\sum(T1+T2) - \sum(\text{Consumers+ Motors of the press pump station}) \leq 1.5\%$

If the difference is more than 1.5% of the total consumption, verification of meters is performed. Defective meters being substituted within one day.

All data concerning electricity consumption is transmitted to the control and monitoring computer system. The press has a special registry log book, where working time of press is logged, among other data. The following figure presents electricity supplying system of the press with metering points.

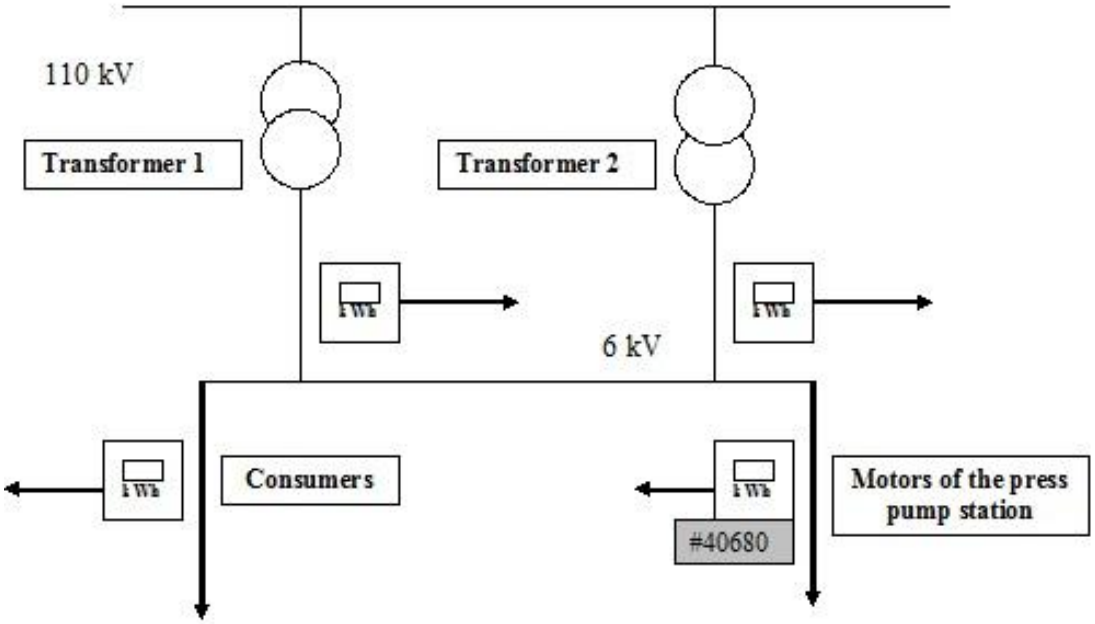

Figure 5 Electricity metering system at press

The control and monitoring system can be divided into an electrical part, a gas part and steel weight part.

Electrical measurements

For the purpose of monitoring the emission reductions the following parameters are measured:

- Electricity consumption at EAFs;
- Electricity consumption at LF;
- Electricity consumption at VD;
- Electricity consumption at press.

Natural gas measurements

For the purpose of monitoring the emission reductions the following parameters are measured:

- Natural gas consumption, temperature and pressure at the reconstructed heating and thermal furnaces.

Steel weight measurement

For the purpose of monitoring the emission reductions the following parameters are measured:

- Weight of half-finished products proceeded through reconstructed heating and thermal furnaces;
- Weight of steel proceeded through the VD;
- Weight of steel proceeded through the LF.

B.1.Monitoring equipment types

1. Electricity consumption meters Energia-9 STK3-05 and Energia-9 STK3-10
2. Electricity consumption meter SA3U-I670M
3. Electricity consumption meter EuroALFHA EA05RL-P2B-4
4. Natural gas consumption meter IRVIS-K300
5. Natural gas consumption meter Kromschroder DM 650 Z150-40
6. Natural gas consumption meter ABB FMT-500 IG
7. Natural gas consumption meter IRVIS-PS4-Pp
8. Natural gas consumption meter Elster Q-75
9. Natural gas consumption meter Elster QA 160
10. Natural gas temperature meters TSMU Metran-274-02(100M)-80-0,25 and TSMU Metran-274-05Exia(100M)-60-0,5 Natural gas temperature meters TSPU-205 (Temperature measuring range 0-300 °C and Fitting length 160 mm) and TSPU- 205 (Temperature measuring range 0-300 °C and Fitting length 100 mm), TSMU-205 (Temperature measuring range 0-300 °C and Fitting length 160 mm)
11. Natural gas temperature meter TSMT-103Natural gas pressure meters Metran 100 DI 1131 and Metran 100 DA 1040 and Metran 100 DD 1420
12. Natural gas pressure meter Metran 55 Ex DA 505
13. Weighing machines ErMack-VK1rk-10, ErMack-VK1rk-20, ErMack-VK1rk-50, ErMack-VK1rk-80
14. Weighing machine 01VKT-200M
15. Logger-evaluator Ergomera-126

B.1.2. Table providing information on the equipment used (incl. manufacturer, type, serial number, date of last calibration, information to specific uncertainty, need for changes and replacements):

The control and monitoring system can be divided into an electrical part, a natural gas part and a steel weight part.

Electrical measurements

For the purpose of monitoring the emission reductions the following parameters are measured:

- Electricity consumption at EAFs;
- Electricity consumption at LF;
- Electricity consumption at VD;
- Electricity consumption at press.

ID of the meter	Measuring parameter	Work parameter	Type	Serial number	Level of accuracy*	Date of last calibration	Date of next calibration
EL1	Electricity consumption at EAF50 #1	kWh	Energia-9 STK3-05	40688	0.5S	02.07.2009	02.07.2015
EL2	Electricity consumption at EAF100 #3	kWh	SA3U-I670M	798599	2.0	14.01.2008	14.01.2012
EL3	Electricity consumption at EAF100 #5	kWh	Energia 9 STK3-10	43898	1.0	31.01.2008	31.01.2014
EL4	Electricity consumption at LF	kWh	EA05RL-P2B-4	01132201	0.5S	25.09.2006	25.09.2012
EL5	Electricity consumption at VD	kWh	Energia-9 STK3-05	44701	0.5S	28.02.2008	28.02.2014
EL6	Electricity consumption at VD	kWh	Energia-9 STK3-05	44702	0.5S	28.02.2008	28.02.2014
EL7	Electricity consumption at VD	kWh	Energia-9 STK3-05	44705	0.5S	28.02.2008	28.02.2014
EL8	Electricity consumption at VD	kWh	Energia-9 STK3-05	44706	0.5S	28.02.2008	28.02.2014
EL9	Electricity consumption at press	kWh	Energia-9 STK3-05	40680	0.5S	21.07.2011	21.07.2017

* According to DSTU 26035:2008 "Alternating current electronic electricity meters. General specifications", GOST 30206-94 "Alternating current static watt-hour meters for active energy (accuracy classes 0.2S and 0.5S)", GOST 30207-94 "Alternating current static watt-hour meters for active energy (accuracy classes 1.0 and 2.0)"

Table 2 List of electricity consumption meters

Electric current provided to the equipment have so high parameters (more then 5A), that they cannot be measured directly. The current parameters decreased through the transformers and measured. The following table presents list of transformers using in the electric current measuring.

ID of transformer	Transforming parameter	Work parameter	Type	Serial number	Level of accuracy*	Transformation factor	Date of last calibration	Date of next calibration
TR1	Current at EAF50 #1	A	TPOL-35	11	0.5	600/5	13.05.2009	13.05.2013
TR2	Current at EAF50 #1	A	TPOL-35	37	0.5	600/5	13.05.2009	13.05.2013
TR3	Voltage at EAF50 #1	V	ZNOM-35	1138121	0.5	35000/100	13.05.2009	13.05.2013
TR4	Voltage at EAF50 #1	V	ZNOM-35	1138211	0.5	35000/100	13.05.2009	13.05.2013
TR5	Voltage at EAF50 #1	V	ZNOM-35	1120877	0.5	35000/100	13.05.2009	13.05.2013
TR6	Current at EAF100 #3	A	TPOL-35	113	0.5	600/5	13.05.2009	13.05.2013
TR7	Current at EAF100 #3	A	TPOL-35	13	0.5	600/5	13.05.2009	13.05.2013
TR8	Voltage at EAF100 #3	V	ZNOM-35	854859	0.5	35000/100	13.05.2009	13.05.2013
TR9	Voltage at EAF100 #3	V	ZNOM-35	854965	0.5	35000/100	13.05.2009	13.05.2013
TR10	Voltage at EAF100 #3	V	ZNOM-35	849517	0.5	35000/100	13.05.2009	13.05.2013
TR11	Current at EAF100 #5	A	TPOL-35	351	0.5	1000/5	13.05.2009	13.05.2013
TR12	Current at EAF100 #5	A	TPOL-35	458	0.5	1000/5	13.05.2009	13.05.2013
TR13	Voltage at EAF100 #5	V	ZNOM-35	1284276	0.5	35000/100	13.05.2009	13.05.2013
TR14	Voltage at EAF100 #5	V	ZNOM-35	1355405	0.5	35000/100	13.05.2009	13.05.2013
TR15	Voltage at EAF100 #5	V	ZNOM-35	1213200	0.5	35000/100	13.05.2009	13.05.2013
TR16	Current at LF	A	TPU 7051	5105040894	0.5	500/5	13.05.2009	13.05.2013
TR17	Current at LF	A	TPU 7051	5105040895	0.5	500/5	13.05.2009	13.05.2013
TR18	Current at LF	A	TPU 7051	5105040896	0.5	500/5	13.05.2009	13.05.2013
TR19	Voltage at LF	V	ZNOM-35	1168572	0.5	35000/100	13.05.2009	13.05.2013
TR20	Voltage at LF	V	ZNOM-35	1427592	0.5	35000/100	13.05.2009	13.05.2013
TR21	Voltage at LF	V	ZNOM-35	1279988	0.5	35000/100	13.05.2009	13.05.2013
TR22	Current at VD	A	T-0.66-1	21387	0.5	600/5	12.2007	12.2011
TR23	Current at VD	A	T-0.66-1	19132	0.5	600/5	12.2007	12.2011
TR24	Current at VD	A	T-0.66-1	21526	0.5	600/5	12.2007	12.2011
TR25	Current at VD	A	T-0.66-1	83614	0.5	600/5	12.2007	12.2011
TR26	Current at VD	A	T-0.66-1	21837	0.5	600/5	12.2007	12.2011
TR27	Current at VD	A	T-0.66-1	19100	0.5	600/5	12.2007	12.2011
TR28	Current at VD	A	T-0.66-1	19687	0.5	600/5	12.2007	12.2011
TR29	Current at VD	A	T-0.66-1	21888	0.5	600/5	12.2007	12.2011
TR30	Current at press	A	TLK-10	03051	0.5	1500/5	13.05.2009	13.05.2013
TR31	Current at press	A	TLK-10	03102	0.5	1500/5	13.05.2009	13.05.2013

* According to DSTU 7746-2003 "Current transformers. General specifications" and DSTU 1983-2003 "Voltage transformers. General specifications"

Table 3 List of transformers

Natural gas measurements

For the purpose of monitoring the emission reductions the following parameters are measured: Natural gas consumption at reconstructed heating and thermal furnaces.

ID of meter	Measuring parameter	Work parameter	Type	Serial number	Level of accuracy	Date of last calibration	Date of next calibration
NG 05	Consumption of the NG at heating furnace #07, FPS	m^3	IRVIS-K300	5740	1 %	03.02.2010	03.02.2012
NG 06	Consumption of the NG at heating furnace #08, FPS	m^3	IRVIS-K300	5480	1 %	16.02.2011	16.02.2013
NG 07	Consumption of the NG at heating furnace #09, FPS	m^3	IRVIS-K300	5482	1 %	16.02.2011	16.02.2013
NG 08	Consumption of the NG at heating furnace #10, FPS	m^3	IRVIS-K300	5483	1 %	18.02.2011	18.02.2013
NG 15	Consumption of the NG at heating furnace #33, FPS	m^3	ABB FMT-500 IG	28751947	1.8 %	09.08.2011	09.08.2013
NG 18	Consumption of the NG at heating furnace #34, FPS	m^3	ABB FMT-500 IG	28751945	1.8 %	18.08.2011	18.08.2013
NG 23	Consumption of the NG at thermal furnace #01, FPS	m^3**	IRVIS-RS4-Pp	13398	1 %	03.06.2010	03.06.2012
NG 01	Consumption of the NG at thermal furnace #01, TS	m^3	IRVIS-K300	5274	1 %	02.03.2010	02.03.2012
NG 02	Consumption of the NG at thermal furnace #02, TS	m^3	IRVIS-K300	5275	1 %	03.03.2010	03.03.2012
NG 17	Consumption of the NG at thermal furnace #04, TS	m^3	Elster Q-75	10512270	1 %	02.09.2010	02.09.2012
NG 03	Consumption of the NG at thermal furnace #09, TS	m^3	IRVIS-K300	5182	1 %	04.03.2010	04.03.2012
NG 04	Consumption of the NG at thermal furnace #10, TS	m^3	IRVIS-K300	5183	1 %	02.03.2010	02.03.2012
NG 24	Consumption of the NG at thermal furnace #17, TS	m^3**	IRVIS-RS4-Pp	13345	1 %	04.03.2010	04.03.2012
NG 10	Consumption of the NG at thermal furnace #18, FPS	m^3	Kromschroder DM650Z150-40	981.07 or 69189548*	1.5 %	23.03.2010	23.03.2012
NG 25	Consumption of the NG at thermal furnace #18, TS	m^3**	IRVIS-RS4-Pp	13346	1 %	04.03.2010	04.03.2012
NG 11	Consumption of the NG at thermal furnace #19, FPS	m^3	Kromschroder DM650Z150-40	69191748	1.5 %	06.05.2011	06.05.2013
NG 12	Consumption of the NG at thermal furnace #20, FPS	m^3	Kromschroder DM650Z150-40	69193831	1.5 %	05.05.2011	05.05.2013
NG 09	Consumption of the NG at thermal furnace #30, FPS	m^3	IRVIS-K300	5711	1 %	16.10.2009	16.10.2011
NG 13	Consumption of the NG at thermal furnace #31, FPS	m^3	Kromschroder DM650Z150-40	69193830	1.5 %	14.07.2011	14.07.2013
NG 14	Consumption of the NG at thermal furnace #32, FPS	m^3	Kromschroder DM650Z150-40	69191749	1.5 %	13.07.2011	13.07.2013
NG 16	Consumption of the NG at thermal furnace #37, FPS	m^3	Elster QA 160	69196330	1 %	29.04.2010	29.04.2012
NG 22	Consumption of the NG at thermal furnace #38, FPS	m^3	Elster QA 160	69199960	1 %	01.09.2010	01.09.2012

* Number "981.07" according calibration certificate and Serial number is "69189548".

** measured volume at temperature 20 ˚C and pressure 101.325 kPa

Table 4 List of natural gas consumption meters

Natural gas consumption meters measuring gas volume in the m^3. To adjust the measured volume to temperature 20 ˚C and pressure 101.325 kPa, temperature and pressure meters are used. The following tables present natural gas temperature and pressure meters.

ID of meter	Measuring parameter	Work parameter	Type	Serial number	Level of accuracy	Date of last calibration	Date of next calibration
TP 05	Temperature of the NG at heating furnace #07, FPS	ºC	TSMU Metran-274-05Exia(100M)-60-0,5	655354	0.5 %	02.06.2011	02.06.2012
TP 06	Temperature of the NG at heating furnace #08, FPS	ºC	TSMU Metran-274-05Exia(100M)-60-0,5	655362	0.5 %	06.07.2011	06.07.2012
TP 07	Temperature of the NG at heating furnace #09, FPS	ºC	TSPU-205 (Temperature measuring range 0-300 °C and Fitting length 160 mm)	8360	0.25 %	25.08.2011	25.08.2012
TP 08	Temperature of the NG at heating furnace #10, FPS	ºC	TSPU-205 (Temperature measuring range 0-300 °C and Fitting length 160 mm)	8362	0.25 %	25.08.2011	25.08.2012
TP 19	Temperature of the NG at heating furnace #35, FPS	ºC	TSMT-103	195.443	0.25*	11.02.2011	11.02.2012
TP 17	Temperature of the NG at heating furnace #36, FPS	ºC	TSMT-103	195.447	0.25*	09.02.2011	09.02.2012
TP 01	Temperature of the NG at thermal furnace #01, TS	ºC	TSMU Metran-274-05Exia(100M)-60-0,5	655358	0.5 %	25.08.2011	25.08.2012
TP 02	Temperature of the NG at thermal furnace #02, TS	ºC	TSMU Metran-274-05Exia(100M)-60-0,5	655355	0.5 %	25.08.2011	25.08.2012
TP 16	Temperature of the NG at thermal furnace #04, TS	ºC	TSMU Metran-274-02(100M)-80-0,25	750977	0.25 %	30.06.2011	30.06.2012
TP 03	Temperature of the NG at thermal furnace #09, TS	ºC	TSMU Metran-274-05Exia(100M)-60-0,5	655359	0.5 %	30.06.2011	30.06.2012
TP 04	Temperature of the NG at thermal furnace #10, TS	ºC	TSMU Metran-274-05Exia(100M)-60-0,5	655363	0.5 %	30.06.2011	30.06.2012
TP 10	Temperature of the NG at thermal furnace #18, FPS	ºC	TSMU Metran-274-05Exia(100M)-60-0,5	655360	0.5 %	30.06.2011	30.06.2012
TP 11	Temperature of the NG at thermal furnace #19, FPS	ºC	TSMU-205 (Temperature measuring range 0-100 °C and Fitting length 160 mm)	6000	0.25 %	05.05.2011	05.05.2012
TP 12	Temperature of the NG at thermal furnace #20, FPS	ºC	TSMU-205 (Temperature measuring range 0-100 °C and Fitting length 160 mm)	6011	0.25 %	05.05.2011	05.05.2012
TP 09	Temperature of the NG at thermal furnace #30, FPS	ºC	TSPU-205 (Temperature measuring range 0-300 °C and Fitting length 100 mm)	8365	1.0 %	25.08.2011	25.08.2012
TP 13	Temperature of the NG at thermal furnace #31, FPS	ºC	TSMU Metran-274-05Exia(100M)-60-0,5	655361	0.5 %	25.08.2011	25.08.2012
TP 14	Temperature of the NG at thermal furnace #32, FPS	ºC	TSMU Metran-274-05Exia(100M)-60-0,5	655356	0.5 %	30.06.2011	30.06.2012
TP 15	Temperature of the NG at thermal furnace #37, FPS	ºC	TSMU Metran-274-02(100M)-80-0,25	750917	0.25 %	06.07.2011	06.07.2012
TP 18	Temperature of the NG at thermal furnace #38, FPS	ºC	TSMT-103	195.435	0.25*	24.02.2011	24.02.2012

* According to GOST 8.401-80 "State system for ensuring the uniformity of measurements. Accuracy classes of measuring instruments. General requirements"

Table 5 List of natural gas temperature meters

ID of meter	Measuring parameter	Work parameter	Type	Serial number	Level of accuracy	Date of last calibration	Date of next calibration
PR 05	Pressure of the NG at heating furnace #07, FPS	kPa	Metran 100 DI 1131	422353	0.5 %	03.06.2011	03.06.2012
PR 06	Pressure of the NG at heating furnace #08, FPS	kPa	Metran 100 DI 1131	376707	0.5 %	16.02.2011	16.02.2012
PR 07	Pressure of the NG at heating furnace #09, FPS	kPa	Metran 100 DI 1131	000088	0.5 %	11.03.2011	11.03.2012
PR 08	Pressure of the NG at heating furnace #10, FPS	kPa	Metran 100 DI 1131	000087	0.5 %	03.02.2011	03.02.2012
PR 19	Pressure of the NG at heating furnace #35, FPS	kPa	Metran 100 DA 1040	442216	0.5 %	04.10.2010	04.10.2011
PR 20	Pressure of the NG at heating furnace #35, FPS	kPa	Metran 100 DD 1420	459415	0.25 %	28.03.2011	28.03.2012
PR 17	Pressure of the NG at heating furnace #36, FPS	kPa	Metran 100 DA 1040	442214	0.5 %	07.10.2010	07.10.2011
PR 21	Pressure of the NG at heating furnace #36, FPS	kPa	Metran 100 DD 1420	462213	0.25 %	20.09.2011	20.09.2012
PR 01	Pressure of the NG at thermal furnace #01, TS	kPa	Metran 100 DI 1131	274538	0.5 %	24.11.2010	24.11.2011
PR 02	Pressure of the NG at thermal furnace #02, TS	kPa	Metran 100 DI 1131	275890	0.5 %	02.12.2010	02.12.2011
PR 16	Pressure of the NG at thermal furnace #04, TS	kPa	Metran 100 DA 1040	340571	0.5 %	10.01.2011	10.01.2012
PR 03	Pressure of the NG at thermal furnace #09, TS	kPa	Metran 100 DI 1131	241764	0.5 %	13.05.2011	13.05.2012
PR 04	Pressure of the NG at thermal furnace #10, TS	kPa	Metran 100 DI 1131	241763	0.5 %	01.08.2011	01.08.2012
PR 10	Pressure of the NG at thermal furnace #18, FPS	MPa	Metran 55 Ex DA 505	461211	0.5 %	11.05.2011	11.05.2012
PR 11	Pressure of the NG at thermal furnace #19, FPS	MPa	Metran 55 Ex DA 505	486509	0.5 %	11.05.2011	11.05.2012
PR 12	Pressure of the NG at thermal furnace #20, FPS	MPa	Metran 55 Ex DA 505	486786	0.5 %	11.05.2011	11.05.2012
PR 09	Pressure of the NG at thermal furnace #30, FPS	kPa	Metran 100 DI 1131	387352	0.5 %	10.02.2011	10.02.2012
PR 13	Pressure of the NG at thermal furnace #31, FPS	MPa	Metran 55 Ex DA 505	458976	0.5 %	12.05.2011	12.05.2012
PR 14	Pressure of the NG at thermal furnace #32, FPS	MPa	Metran 55 Ex DA 505	486510	0.5 %	12.05.2011	12.05.2012
PR 15	Pressure of the NG at thermal furnace #37, FPS	MPa	Metran 55 Ex DA 505	461217	0.5 %	05.07.2011	05.07.2012
PR 18	Pressure of the NG at thermal furnace #38, FPS	MPa	Metran 55 Ex DA 505	458977	0.5 %	08.10.2010	08.10.2011

Table 6 List of natural gas pressure meters

Steel weight measurement

For the purpose of monitoring the emission reductions the following parameters are measured:

- Weight of half-finished products proceeded through reconstructed heating and thermal furnaces;
- Weight of steel proceeded through the VD;
- Weight of steel proceeded through the LF.

ID of weighing machine	Measuring parameter	Work parameter	Type	Serial number	Level of accuracy	Date of last calibration	Date of next calibration
WM1	Weight of half-finished products in FPS	kg	ErMack-VK1rk-10	vk 0115047	(0,2-5 t) 10 kg (5-10 t) 20 kg	23.08.2011	23.08.2012
WM2	Weight of half-finished products in TS	kg	ErMack-VK1rk-20	KP 205122	(0,4-10 t) 20 kg (10-20 t) 40 kg	17.03.2011	17.03.2012
WM3	Weight of half-finished products in TS	kg	ErMack-VK1rk-50	KP 506149	(1-25 t) 50 kg (25-50 t) 100 kg	14.06.2011	14.06.2012
WM4	Weight of half-finished products in FPS	kg	ErMack-VK1rk-80	KP 806148	(2-50 t) 100 kg (50-80 t) 200 kg	14.06.2011	14.06.2012
WM5	Weight of steel proceeded through the VD and LF	kg	01VKT-200M	222	1000 kg	11.11.2010	11.11.2011

Table 7 List of weighting machines

The following table presents list of logger-evaluators.

ID of meter	Measuring parameter	Work parameter	Type	Serial number	Level of accuracy	Date of last calibration	Date of next calibration
LE1	Logging of NG consumption at thermal furnace #04, TS	m^3*	Ergomera-126	838	0.1 %	10.08.2011	10.08.2013
LE2	Logging of NG consumption at heating furnace #35, 36, FPS	m^3*	Ergomera-126	836	0.1 %	09.08.2011	09.08.2013
LE3	Logging of NG consumption at thermal furnace #37, FPS	m^3*	Ergomera-126	800	0.1 %	07.04.2011	07.04.2013
LE4	Logging of NG consumption at thermal furnace #38, FPS	m^3*	Ergomera-126	834	0.1 %	09.08.2011	09.08.2013

* measured volume at temperature 20 ˚C and pressure 101.325 kPa

Table 8 List of logger-evaluators.

B.1.3. Calibration procedures

For Electricity Meters:

Calibration procedures	Body responsible for calibration and certification
Calibration interval of such meters is 4 years for the meters produced before 01/01/1988 and 6 years for the meters produced after 01/01/1988.	Calibration will be performed by the authorized representatives of the State Metrological System of Ukraine[9]

For consumption meters

Calibration procedures	Body responsible for calibration and certification
Calibration interval of such meters is 2 years.	Calibration will be performed by the authorized representatives of the State Metrological System of Ukraine

For temperature meters

Calibration procedures	Body responsible for calibration and certification
Calibration interval of such meters is 1 year.	Calibration will be performed by the authorized representatives of the State Metrological System of Ukraine

For pressure meters

Calibration procedures	Body responsible for calibration and certification
Calibration interval of such meters is 1 year.	Calibration will be performed by the authorized representatives of the State Metrological System of Ukraine

For weighting machines:

Calibration procedures	Body responsible for calibration and certification
Calibration interval of such meters is 1 year.	Calibration will be performed by the authorized representatives of the State Metrological System of Ukraine

For transformers:

Calibration procedures	Body responsible for calibration and certification
Calibration interval of such meters is 4 years.	Calibration will be performed by the authorized representatives of the State Metrological System of Ukraine

For loggers-evaluators:

Calibration procedures	Body responsible for calibration and certification
Calibration interval of such meters is 2 years.	Calibration will be performed by the authorized representatives of the State Metrological System of Ukraine

[9] http://www.dssu.gov.ua/control/en/publish/article/main?art_id=87456&cat_id=87455

B.1.4. Involvement of Third Parties:

GC "Donetsk Scientific-Production Center of Standardization, Metrology and Certification", National Science Center "Institute of Metrology", GC "Ukrmetrteststandart", GC "Kharkiv Regional Scientific Production Center of Standardization, Metrology and Certification", PC "MIKA"

B.2. Data collection (accumulated data for the whole monitoring period):

The operational and management structure of the project:

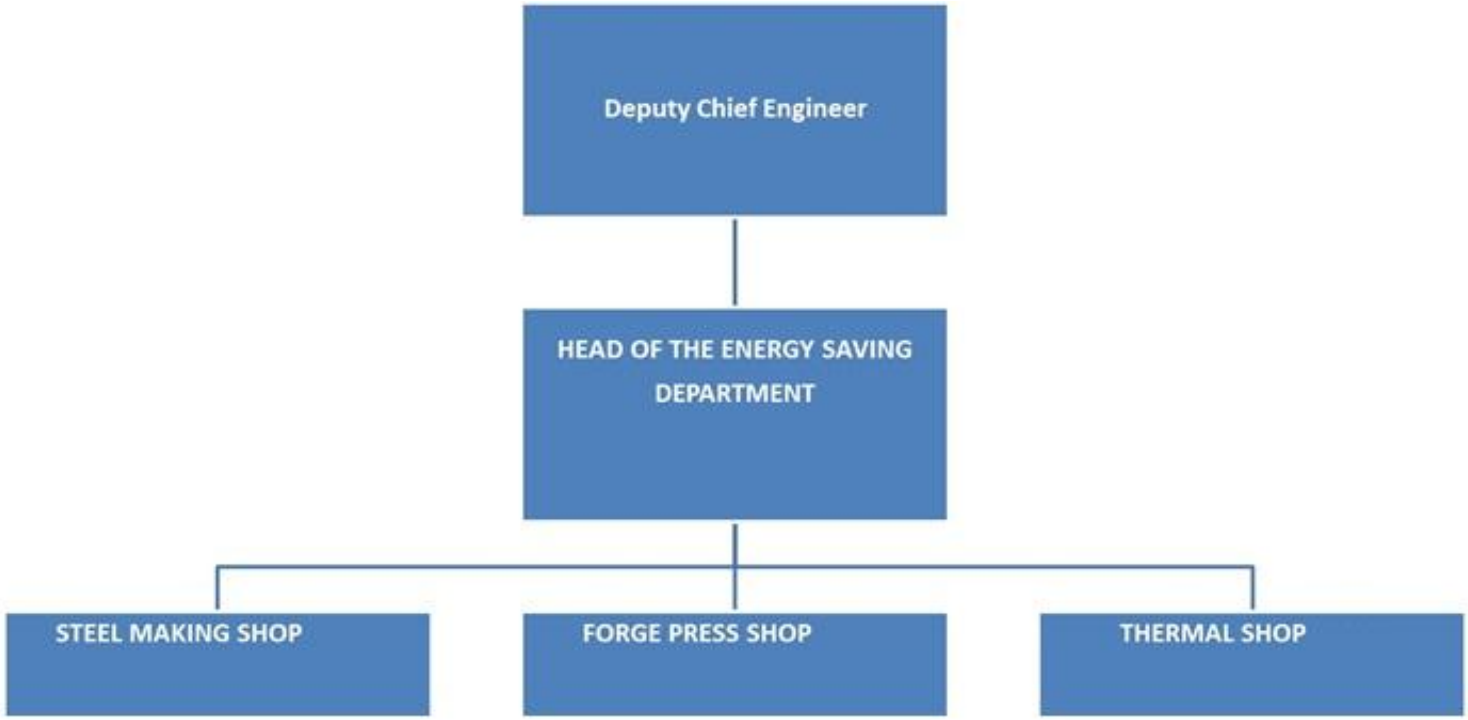

Figure 6 Operational and management structure

B.2.1. List of fixed default values and ex-ante baseline factors:

Data variable	Source of data	Data unit	Value
EF_{NG} emission factor of the natural gas burning process	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 1: Introduction, Table 1.4 p. 1.24	tCO_2/GJ*	0.0561
$EF_{el,y}$ emission factor of the Ukrainian grid for reducing project in the monitoring period equal to the indirect specific carbon dioxide emissions from electricity consumption by the 2nd class electricity consumers according to the Procedure for determining the class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 # 1052	Order of National Environment Investment Agency #75 from 12/05/2011[10]	tCO_2/MWh**	1.090

*56100 $kgCO_2/TJ$ = 0.0561 tCO_2/GJ
**$kgCO_2/kWh$ = tCO_2/MWh
Table 9 Project fixed default values

Data variable	Source of data	Data unit	Value
EF_{Coal} emission factor for local (anthracite) coal burning	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 1: Introduction, Table 1.4 p. 1.23	tCO_2/GJ*	0.0983
$EF_{el,y}$ emission factor of the Ukrainian grid for reducing project in the monitoring period equal to the indirect specific carbon dioxide emissions from electricity consumption by the 2nd class electricity consumers according to the Procedure for determining the class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 # 1052	Order of National Environment Investment Agency #75 from 12/05/2011[11]	tCO_2/MWh**	1.090

*98300 $kgCO_2/TJ$ = 0.0983 tCO_2/GJ
**$kgCO_2/kWh$ = tCO_2/MWh
Table 10 Baseline fixed default values

[10] Order of National Environment Investment Agency #75 from 12.05.2011
http://www.neia.gov.ua/nature/doccatalog/document?id=127498

Data variable	Source of data	Data unit	Value		Comments
$SPNG_{tf}$ the baseline ex-ante specific natural gas consumption of reconstructed furnaces	Baseline information	m^3/t	heating #07, FPS	1005.3	See "ER calculation and Cash Flow Analysis"[12] and Sixth Periodic JI Monitoring Report version 3.0 from 17/12/2010 Annex 1 Table A-2[13] and Eighth Periodic JI Monitoring Report version 3.0 from 01/06/2011 Annex 1 Table A-3[14]
			heating #08, FPS	861.5	
			heating #09, FPS	861.5	
			heating #10, FPS	931.4	
			heating #33, FPS	682.0	
			heating #34, FPS	682.0	
			heating #35, FPS	682.0	
			heating #36, FPS	682.0	
			thermal #01, FPS	694.4 or 861.5*	
			thermal #01, TS	373.0	
			thermal #02, TS	373.0	
			thermal #04, TS	373.0	
			thermal #09, TS	388.7	
			thermal #10, TS	388.7	
			thermal #17, TS	464.5	
			thermal #18, FPS	381.4	
			thermal #18, TS	464.5	
			thermal #19, FPS	381.4	
			thermal #20, FPS	381.4	
			thermal #30, FPS	694.4	
			thermal #31, FPS	694.4	
			thermal #32, FPS	381.4	
			thermal #37, FPS	240.0	
			thermal #38, FPS	240.0	
SPH_{VD} the baseline ex ante specific heat consumption of the old VD	Baseline three years information		1.16 MWh/t = 4.176 GJ /t		See PDD[15], Table A2.2

[12] http://ji.unfccc.int/UserManagement/FileStorage/VNIM9YQP8105W3D26EX4KSRL7TFUCO
[13] http://ji.unfccc.int/UserManagement/FileStorage/NM0A8W43PIDGOSQEJF7CRXY5H2LB6U
[14] http://ji.unfccc.int/UserManagement/FileStorage/BVIONHYJCFGQKTW42UZ7XS9135D06M
[15] http://ji.unfccc.int/UserManagement/FileStorage/0EV8XPG6L59ZO7RW3UQT1CNIBDY4FM

$SPEL_{VD}$ baseline ex ante specific electrical consumption of the old VD	Baseline information	MWh/t	0.000028	See PDD, p. 3
$SPEL_{ES}$ baseline ex ante specific consumption of electricity per tonne of electro steel	Baseline three years information	MWh/t	1.03	See PDD, Table A2.3
EL_{MOT} installed capacity of the press' serving motors before reconstruction	Project design documentation	MW	12	It was 24 motors, 500 kW each. See PDD, Table D.1.1.3.

* Thermal furnace #01 in Forge Press Shop is universal. It can work as thermal and as heating furnace (in different modes). Type of mode adduce in report of enterprise.

Table 11 Baseline ex-ante factors

B.2.2. List of variables:

The list of variables was defined in the PDD (Section D) in order to calculate ERs in a proper way. Some of variables could not be monitored directly, so data from the meters should be adjusted by appointed correction factors. The following table establishes the link between data from the meters and corresponding variables.

Data variable	Data unit	Method of calculation	Meters used for calculation
EL_{VD} electricity consumed by the new vacuum system (vacuum degasser)	MWh	$EL_{VD} = \frac{EL \times K_{TR}}{1000}$ Where: EL electricity consumption, monitored at VD, kWh; K_{TR} transformation factor, (see Table 3, TR22 - TR29). Since 23/03/2011 this calculation is performed automatically. The result is shown on the displays of the meters.	$EL = EL5+EL6+EL7+EL8$ (see Table 2)
EL_{LF} Electricity consumed by the ladle furnace	MWh	$EL_{LF} = \frac{EL \times K_{TR,current} \times K_{TR,voltage}}{1000}$ Where: EL electricity consumption, monitored at LF, kWh; $K_{TR,current}$ transformation factor of current transformer, (see Table 3, TR16, TR17, TR18); $K_{TR,voltage}$ transformation factor of voltage transformer, (see Table 3, TR19, TR20, TR21).	$EL=EL4$ (see Table 2)
EL_{EAF} Electricity consumed by the EAFs	MWh	$EL_{EAF} = EL_{EAF\,50\#1} + EL_{EAF\,100\#3} + EL_{EAF\,100\#5}$ With $EL_{EAF\,50\#1} = \frac{EL_{50\#1} \times K_{TR50\#1,current} \times K_{TR50\#1,voltage}}{1000}$ Since 21/03/2011 this calculation is performed automatically. The result is shown on the display of the meter. $EL_{EAF\,100\#3} = \frac{EL_{100\#3} \times K_{TR100\#3,current} \times K_{TR100\#3,voltage}}{1000}$ $EL_{EAF\,100\#5} = \frac{EL_{100\#5} \times K_{TR100\#5,current} \times K_{TR100\#5,voltage}}{1000}$ Where: $EL_{50\#1}$ electricity consumption, monitored at EAF50 #1, kWh; $K_{TR50\#1,current}$ transformation factor of current transformer, (see Table 3, TR1, TR2);	$EL_{50\#1} = EL1$ (see Table 2) $EL_{100\#3} = EL2$ (see Table 2) $EL_{100\#5} = EL3$ (see Table 2)

		$K_{TR50\#1,voltage}$ transformation factor of voltage transformer, (see Table 3, TR3, TR4, TR5); $EL_{100\#3}$ electricity consumption, monitored at EAF100#3, kWh; $K_{TR100\#3,current}$ transformation factor of current transformer, (see Table 3, TR6, TR7); $K_{TR100\#3,voltage}$ transformation factor of voltage transformer, (see Table 3, TR8, TR9, TR10); $EL_{100\#5}$ electricity consumption, monitored at EAF100#5, kWh; $K_{TR100\#5,current}$ transformation factor of current transformer, (see Table 3, TR11, TR12); $K_{TR100\#5,voltage}$ transformation factor of voltage transformer, (see Table 3, TR13, TR14, TR15);	
EL_{PR} electricity consumed by the new pumps of the 15 000 tonnes press	MWh	$EL_{PR} = \frac{EL \times K_{TR}}{1000}$ Where: EL electricity consumption, monitored at press, kWh; K_{TR} transformation factor, (see Table 3, TR30,TR31);	$EL = EL9$ (see Table 2)

Table 12 Project variables

Baseline variables to be measured:

Data variable	Source of data	Data unit	Method of calculation	Meters used for calculation
$PRST_{tf,i}$ the production level of each of the reconstructed thermal and heating furnaces (half finish products production)	Measuring devices of the thermal shop and forge and press shop	tonnes	result of direct measurement (weighing) of the of half-finished products proceeded through each furnace	WM1-WM4
$PRVS_{VD,i}$ the production volume of vacuumed steel (at VD)	Measuring devices of the VD in steel making shop	tonnes	result of direct measurement (weighing) of the steel proceeded through VD	WM5
$PRES_{,i}$ the production volume of electro steel (at LF)	Measuring device of the steel making shop	tonnes	result of direct measurement (weighing) of the steel proceeded through LF	WM5
$T_{pp,i}$ working hours of press	Server at energy saving department	hours	sum from registry log book records	Registry log-book on press

Table 13 Baseline measurable variables

B.2.3. Data concerning greenhouse gases emissions by sources of the project activity:

Variable	Description	Unit	Value*		
			July	August	September
$NG_{tf,i,8}$	Natural gas consumption at heating furnace #07,FPS	m^3	76748	207698	119885
$NG_{tf,i,7}$	Natural gas consumption at heating furnace #08,FPS	m^3	113617	180701	167921
$NG_{tf,i,6}$	Natural gas consumption at heating furnace #09,FPS	m^3	112908	125236	0
$NG_{tf,i,5}$	Natural gas consumption at heating furnace #10,FPS	m^3	205237	146118	183328
$NG_{tf,i,15}$	Natural gas consumption at heating furnace #33,FPS	m^3	39750	73941	24852
$NG_{tf,i,18}$	Natural gas consumption at heating furnace #34,FPS	m^3	70104	59561	55872
$NG_{tf,i,19}$	Natural gas consumption at heating furnace #35,FPS	m^3	87341	85055	58754
$NG_{tf,i,20}$	Natural gas consumption at heating furnace #36,FPS	m^3	79157	71724	30352
$NG_{tf,i,22}$	Natural gas consumption at thermal furnace #01,FPS	m^3	52921	19002	4346
$NG_{tf,i,3}$	Natural gas consumption at thermal furnace #01,TS	m^3	75312	27137	44918
$NG_{tf,i,4}$	Natural gas consumption at thermal furnace #02,TS	m^3	68213	36611	53704
$NG_{tf,i,17}$	Natural gas consumption at thermal furnace #04,TS	m^3	54718	43879	39559
$NG_{tf,i,1}$	Natural gas consumption at thermal furnace #09,TS	m^3	25577	23517	40052
$NG_{tf,i,2}$	Natural gas consumption at thermal furnace #10,TS	m^3	34912	29916	42846
$NG_{tf,i,23}$	Natural gas consumption at thermal furnace #17,TS	m^3	14385	8937	19181
$NG_{tf,i,10}$	Natural gas consumption at thermal furnace #18,FPS	m^3	59912	38252	54554
$NG_{tf,i,24}$	Natural gas consumption at thermal furnace #18,TS	m^3	24387	10988	18629
$NG_{tf,i,11}$	Natural gas consumption at thermal furnace #19,FPS	m^3	65669	65786	37609
$NG_{tf,i,12}$	Natural gas consumption at thermal furnace #20,FPS	m^3	65098	54798	74789
$NG_{tf,i,9}$	Natural gas consumption at thermal furnace #30,FPS	m^3	70317	96083	47590
$NG_{tf,i,13}$	Natural gas consumption at thermal furnace #31,FPS	m^3	66071	68305	69190
$NG_{tf,i,14}$	Natural gas consumption at thermal furnace #32,FPS	m^3	56916	80948	48041
$NG_{tf,i,16}$	Natural gas consumption at thermal furnace #37,FPS	m^3	11959	11406	17376
$NG_{tf,i,21}$	Natural gas consumption at thermal furnace #38,FPS	m^3	14788	16875	15661
$EL_{VD,i}$	Electricity consumption by new vacuum system (VD)	MWh	14.119	12.887	10.607
$EL_{LF,i}$	Electricity consumption by LF	MWh	1396.927	1295.733	959.896
$EL_{EAF,i}$	Electricity consumption by EAFs	MWh	6344.339	6017.850	4782.344
$EL_{PR,i}$	Electricity consumption by the new pumps of the 15 000 tonnes press	MWh	144.605	201.495	150.971
$LCV_{NG,i}$	Lower calorific value of the natural gas**	$GJ/1000m^3$	33.85	34.11	34.31

* All natural gas consumption at temperature 20 ˚C and pressure 101.325 kPa

** According to Letter "Kramatorsk administration of gas distribution and supplying with gas".

Table 14 Data collected in the project scenario at monitoring period

B.2.4.Data concerning greenhouse gases emissions by sources of the baseline:

Variable	Description	Unit	Value		
			July	August	September
$PRST_{tf,i,8}$	Half finish products production at heating furnace #07,FPS	tonnes	962.50	2080.20	1667.60
$PRST_{tf,i,7}$	Half finish products production at heating furnace #08,FPS	tonnes	1469.70	2140.50	2000.50
$PRST_{tf,i,6}$	Half finish products production at heating furnace #09,FPS	tonnes	1474.90	1849.20	0.00
$PRST_{tf,i,5}$	Half finish products production at heating furnace #10,FPS	tonnes	2141.30	1001.40	2080.40
$PRST_{tf,i,15}$	Half finish products production at heating furnace #33,FPS	tonnes	357.52	686.40	420.30
$PRST_{tf,i,18}$	Half finish products production at heating furnace #34,FPS	tonnes	704.50	493.70	689.76
$PRST_{tf,i,19}$	Half finish products production at heating furnace #35,FPS	tonnes	938.90	1059.70	835.90
$PRST_{tf,i,20}$	Half finish products production at heating furnace #36,FPS	tonnes	971.00	801.20	449.80
$PRST_{tf,i,22}$	Half finish products production at thermal furnace #01,FPS	tonnes	393.20	201.10	90.00
$PRST_{tf,i,3}$	Half finish products production at thermal furnace #01,TS	tonnes	757.32	158.90	402.72
$PRST_{tf,i,4}$	Half finish products production at thermal furnace #02,TS	tonnes	493.04	502.34	294.43
$PRST_{tf,i,17}$	Half finish products production at thermal furnace #04,TS	tonnes	386.45	406.30	507.94
$PRST_{tf,i,1}$	Half finish products production at thermal furnace #09,TS	tonnes	287.61	258.84	316.17
$PRST_{tf,i,2}$	Half finish products production at thermal furnace #10,TS	tonnes	349.00	131.10	288.53
$PRST_{tf,i,23}$	Half finish products production at thermal furnace #17,TS	tonnes	209.10	155.00	340.00
$PRST_{tf,i,10}$	Half finish products production at thermal furnace #18,FPS	tonnes	700.29	763.50	699.78
$PRST_{tf,i,24}$	Half finish products production at thermal furnace #18,TS	tonnes	305.94	109.80	225.35
$PRST_{tf,i,11}$	Half finish products production at thermal furnace #19,FPS	tonnes	870.51	695.10	643.04
$PRST_{tf,i,12}$	Half finish products production at thermal furnace #20,FPS	tonnes	575.60	567.90	640.44
$PRST_{tf,i,9}$	Half finish products production at thermal furnace #30,FPS	tonnes	533.50	225.00	564.05
$PRST_{tf,i,13}$	Half finish products production at thermal furnace #31,FPS	tonnes	449.90	335.90	693.04
$PRST_{tf,i,14}$	Half finish products production at thermal furnace #32,FPS	tonnes	529.79	384.63	489.99
$PRST_{tf,i,16}$	Half finish products production at thermal furnace #37,FPS	tonnes	114.25	134.95	253.10
$PRST_{tf,i,21}$	Half finish products production at thermal furnace #38,FPS	tonnes	127.80	182.19	205.71
$PRVS_{VD,i}$	Vacuumed steel production at VD	tonnes	9614.480	9090.380	6726.800
$EB_{DHC,i}$	Efficiency of the steam boilers at the DHC*	%	81.20	81.20	81.20
$PRES_i$	Production volume of electro steel (at LF)	tonnes	10340.742	10007.681	7789.090
$T_{pp,i}$	Working hours of press	hours	302.17	366.25	328.42

* According to Letter "Kramatorskteploenergo".

Table 15 Data collected in the baseline scenario at monitoring period

B.2.5.Data concerning leakage:

PDD did not identify any leakages therefore this section is not applicable.

B.2.6.Data concerning environmental impacts:

The project improved efficiency of use of natural gas, electricity and heat at the enterprise and thus leaded to decrease of harmful emissions.

B.3.Data processing and archiving (incl. software used):

Subproject 1. Reconstruction of thermal and heating furnaces

Information from flow meters, pressure and temperature meters is transmitting to the control and monitoring computer system. All information about technological process is saved continuously. The archiving period for the log files is at least one year. Information that corresponds to the natural gas consumption in the monitoring period has been burned on CDs. These CDs are stored two years after last transaction Emission Reduction Units (ERUs) by the project.

Every half-finished product that process through the furnaces has its own unique certificate. This certificate reflects all operations performed on the product and the weight on the exit of every workshop. So, the weight of half-finished products that proceed through each furnace could be easily monitored. Information from the certificates is saved in the log books in order to simplify the monitoring process.

A report including natural gas consumption and weight of half finished products is generating on a monthly basis. The report is signed by the Head of Energy Saving Department, Head of corresponding workshop and approved by Chief Engineer.

Subproject 2. Installation of a new vacuum system

Information from the meters is passed to the control and monitoring computer system of vacuumator. A computer system records information about every vacuumation session, including melt passport, time and electricity consumption. The archiving period for the log files is at least one year. Information that corresponds to the electricity consumption in the monitoring period has been burned on CDs. These CDs are stored two years after last transaction Emission Reduction Units (ERUs) by the project.

Subproject 3. Installation of an arc ladle furnace

The data from electricity meters concerning electricity consumption is transmitted to the control and monitoring computer system continuously. The computer system records information about each melt process, including melt certificate. This certificate includes information about the number of the furnace where steel was melted, steel content, amount of electricity consumed during melting and weight of steel. The archiving period for the log files is at least one year. All melt certificates for the monitoring period has been burned to CDs. These CDs are stored two years after last transaction Emission Reduction Units (ERUs) by the project.

Subproject 4. Modernization of press equipment

All data concerning electricity consumption is transmitted to the control and monitoring computer system. The press has a special registry log book, where working time of press is logged, among other data.

B.4. Special event log:

During the monitoring period there were no events registered in special events log.

The overall data processing presents on the following figure

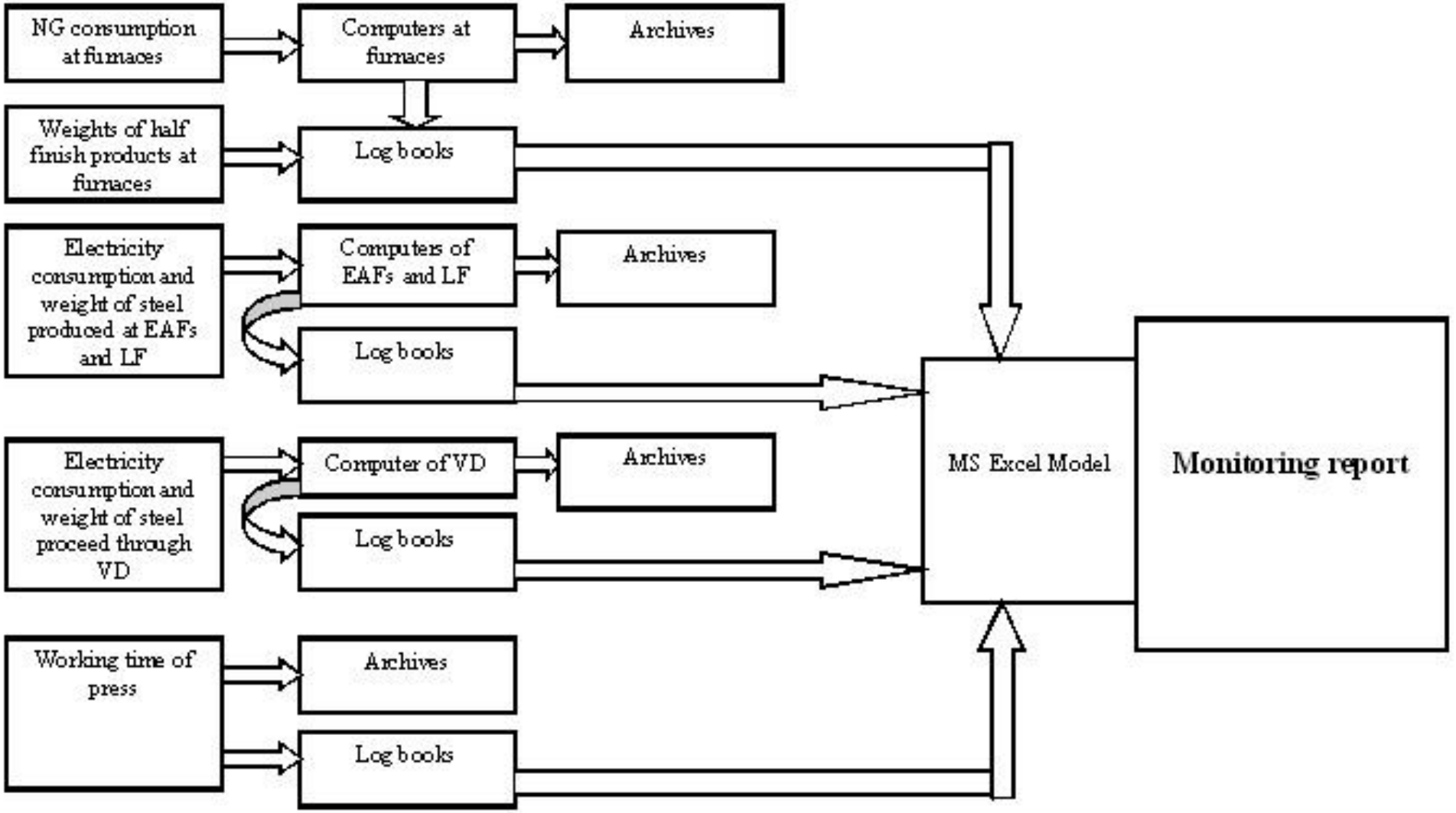

Figure 7: Data Processing Chart

SECTION C. Quality assurance and quality control measures

C.1. Documented procedures and management plan:

C.1.1. Roles and responsibilities:

Responsibilities connected with monitoring of JI project were entrusted to officials. The general management of the monitoring team is implemented by the Deputy Chief Engineer of the EMSS through supervising and coordinating activities of his subordinates, such as the head of Energy Saving Department, the head of Steel Making Shop, Forge Press Shop and Thermal Shop. On-site day-to-day (operational) management is implemented by the heads of corresponding shops. The technological process data is logged into the PCs continuously. The PCs at the reconstructed furnaces, LF, VD, etc., have not only monitoring but control functions. Keeping the PCs in a working condition is a responsibility of the Department of the automated control systems.

All data necessary for the CO_2 emission reductions calculation is collected in the Energy Saving Department. The head of the Energy Saving Department is making calculations on a monthly basis. The general supervision of the monitoring system is executed by the Deputy Chief Engineer.

For this monitoring period the names of the officials involved is as follows:

- Deputy Chief Engineer: A. Masyuk
- Head of Energy Saving Department: V. Timoshenko
- Head of the Steel Making Shop: A. Gorkusha
- Head of the Forge Press Shop: N. Bondar
- Head of the Thermal Shop: V. Stankov

C.1.2. Trainings:

All contracts for the equipment supplying include chapter describing personnel training. Training is providing by equipment producers.

C.2. Involvement of Third Parties:

Third Party involved:

- GC "Donetsk Scientific-Production Center of Standardization Metrology and Certification",
- National Science Center "Institute of Metrology"
- GC "Ukrmetrteststandart"
- GC "Kharkiv Regional Scientific Production Center of Standardization, Metrology and Certification"
- PC "MIKA"

C.3. Internal audits and control measures:

CO_2 emission reductions calculations are performed on the monthly basis by the head of the Energy Saving Department. All energy sources flows (such as electricity and natural gas) are logged on the server in the Energy Saving Department. Hence the Head of Department checks the correctness of measurements by the indirect calculations.

C.4. Troubleshooting procedures:

Every day the Energy Saving Department reports to the Chief Engineer about energy resources consumption by EMSS. That report is the result of analyzing of the data logging on a dedicated server. In case of any meter failure, data discrepancy will be found within one day. The meter will be substituted by working one. For the period of malfunctioning the data determined by cross-checking method will be used for CO_2 emissions reduction calculation. Cross-checking at EMSS is ensured by operating the system of metering devices which implies measuring the overall input of energy into the Division of the Plant and monitoring consumption of individual installations. Thus, if the meter of the installation brakes down it is possible to determine its energy consumption by deducting consumption of the rest of appliances from the total energy intake of the Division. Output of the individual installations is also measured so it is possible to calculate the energy input using analytical methods, which is the second cross-checking method available.

SECTION D. Calculation of greenhouse gases emission reductions

D.3.1. Project emissions:

The project emissions are calculated by the equation:

$$PE_y = \sum_{l=1}^{l=4} PE_{spl}$$

(*Equation 1*)

Where:

PE_y- are the project emissions for the monitoring period, tCO_2e;
PE_{spl} - are the project emissions from each subproject, from SP1 to SP4, tCO_2e.

Results of the emissions calculations are presented in metric tons of carbon dioxide equivalent (tCO_2e), 1 metric ton of carbon dioxide equivalent is equal to 1 metric ton of carbon dioxide (tCO_2), i.e. 1 tCO_2e = 1 tCO_2.

The project emissions from SP1 are:

$$PE_{sp1} = \sum_{i=1}^{n} (\sum_{1}^{k} NG_{tf,i} \times LCV_{NG,i} \times EF_{NG})$$

(*Equation 2*)

Where:
PE_{sp1} - is the sum of project emissions of subproject 1 from each month of the monitoring period, tCO_2e;
$NG_{tf,i}$- is the volume of natural gas used by the reconstructed furnaces in the month *i* at temperature 20 ˚C and pressure 101.325 kPa, 1000 m^3;
$LCV_{NG,i}$- is the lower calorific value of the natural gas for the month *i* at temperature 20 ˚C and pressure 101.325 kPa, GJ/1000 m^3;
EF_{NG}- is the emission factor of the NG burning process, tCO_2/GJ.

The project emissions from SP2 are:

$$PE_{sp2} = \sum_{i=1}^{n} (EL_{VD,i} \times EF_{el,y})$$

(*Equation 3*)

Where:
PE_{sp2} - is the sum of project emissions of subproject 2 from each month of the monitoring period, tCO_2e;
$EL_{VD,i}$ - is the electrical consumption of the new VD in the month *i*, MWh;
$EF_{el,y}$ – is the emission factor of the Ukrainian grid for reducing project in the monitoring period equal to the indirect specific carbon dioxide emissions from electricity consumption by the 2nd class electricity consumers according to the Procedure for determining the class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 # 1052, tCO_2/MWh.

The project emissions from SP3 are:

$$PE_{sp3} = \sum_{i=1}^{n}((EL_{LF,i} + EL_{EAF,i}) \times EF_{el,y})$$

(*Equation 4*)

Where:
PE_{sp3} - is the sum of project emissions of subproject 3 from each month of the monitoring period, tCO_2e;
$EL_{LF,i}$ - is the electrical consumption of the new ladle furnace in the month *i*, MWh;
$EL_{EAF,i}$ - is the electrical consumption of the electric arc furnaces in the month *i*, MWh;
$EF_{el,y}$- is the emission factor of the Ukrainian grid for reducing project in the monitoring period equal to the indirect specific carbon dioxide emissions from electricity consumption by the 2nd class electricity consumers according to the Procedure for determining the class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 # 1052, tCO_2/MWh.

The project emissions from SP4 are:

$$PE_{sp4} = \sum_{i=1}^{n}(EL_{PR,i} \times EF_{el,y})$$

(*Equation 5*)

Where:
PE_{sp4} - is the sum of project emissions of subproject 4 from each month of the monitoring period, tCO_2e;
$EL_{PR,i}$ - is the electrical consumption of the new pumps of press in the month *i*, MWh;
$EF_{el,y}$ - is the emission factor of the Ukrainian grid for reducing project in the monitoring period equal to the indirect specific carbon dioxide emissions from electricity consumption by the 2nd class electricity consumers according to the Procedure for determining the class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 # 1052, tCO_2/MWh.

Project emissions	**tonnes of CO_2 equivalent**
Subproject 1. Reconstruction of thermal and heating furnaces	8 404
Subproject 2. Installation of a new vacuum system	41
Subproject 3. Installation of an arc ladle furnace	22 669
Subproject 4. Modernization of press equipment	543
Total	**31 657**

Table 16 Project emissions for the monitoring period

D.3.2. Baseline emissions:

$$BE_y = \sum_{l=1}^{l=4} BE_{spl}$$

(*Equation 6*)

Where:
BE_y- are the baseline emissions at the monitoring period, tCO_2e;
BE_{spl} - are the baseline emissions from each subproject (from SP1 to SP4) at the monitoring period, tCO_2e.

The baseline emissions for SP1 are:

$$BE_{sp1} = \sum_{i=1}^{n}(\sum_{1}^{k}(SPNG_{tf} \times PRST_{tf,i} \times LCV_{NG,i} \times EF_{NG}))$$

(*Equation 7*)

Where:
BE_{sp1} - is the sum of baseline emissions of subproject 1 from each month of the monitoring period, tCO_2e;
$SPNG_{tf}$- is the baseline ex-ante specific natural gas consumption of reconstructed furnaces at temperature 20˚C and pressure 101.325 kPa, 1000 m^3/t;
$PRST_{tf,i}$ - is the steel production level (half finish products production) of reconstructed thermal and heating furnaces in the month *i*, t;
$LCV_{NG,i}$- is the lower calorific value of the natural gas for the month *i* at temperature 20 ˚C and pressure 101.325 kPa, GJ/1000m^3;
EF_{NG} - is the emission factor of the natural gas burning process, tCO_2/GJ.

The baseline emissions for SP2 are:

$$BE_{sp2} = \sum_{i=1}^{n} (SPH_{VD} \times PRVS_{VD,i}/EB_{DHC,y} \times EF_{Coal} + SPEL_{VD} \times PRVS_{VD,i} \times EF_{el,y})$$

(*Equation 8*)

Where:
BE_{sp2} - is the sum of baseline emissions of subproject 2 from each month of the monitoring period, tCO_2e;
SPH_{VD}- is a baseline ex ante specific heat consumption of the old VD, GJ /t;
$PRVS_{VD,i}$ - is the production volume of vacuumed steel at VD in the month *i*, t;
$EB_{DHC,y}$ - is the efficiency of the steam boilers at the DHC in the monitoring period, %;
EF_{Coal} - is the emission factor for local (anthracite) coal burning, tCO_2/GJ;
$SPEL_{VD}$ - is a baseline ex ante specific electrical consumption of the old VD, MWh/t;
$EF_{el,y}$ – is the emission factor of the Ukrainian grid for reducing project in the monitoring period equal to the indirect specific carbon dioxide emissions from electricity consumption by the 2nd class electricity consumers according to the Procedure for determining the class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 # 1052, tCO_2/MWh.

The baseline emissions for SP3 are:

$$BE_{sp3} = \sum_{i=1}^{n} (SPEL_{ES} \times PRES_i \times EF_{el,y})$$

(*Equation 9*)

Where:
BE_{sp3} - is the sum of baseline emissions of subproject 3 from each month of the monitoring period, tCO_2e;
$SPEL_{ES}$ - is the baseline ex ante specific consumption of electricity per tonne of electro steel, MWh/t;
$PRES_i$ - is the production volume of electro steel at LF in the month *i*, t;
$EF_{el,y}$ - is the emission factor of the Ukrainian grid for reducing project in the monitoring period equal to the indirect specific carbon dioxide emissions from electricity consumption by the 2nd class electricity consumers according to the Procedure for determining the class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 # 1052, tCO_2/MWh.

The baseline emissions for SP4 are:

$$BE_{sp4} = \sum_{i=1}^{n} (T_{pp,i} \times EL_{MOT} \times EF_{el,y})$$

(*Equation 10*)

Where:
BE_{sp4} - is the sum of baseline emissions of subproject 4 from each month of the monitoring period, tCO_2e;
$T_{pp,i}$ - is a working hours of the press in the month *i*, h;
EL_{MOT} - installed capacity of the press' serving motors before reconstruction, MW;
$EF_{el,y}$ - is the emission factor of the Ukrainian grid for reducing project in the monitoring period equal to the

indirect specific carbon dioxide emissions from electricity consumption by the 2nd class electricity consumers according to the Procedure for determining the class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 # 1052, tCO_2/MWh.

Baseline emissions	**tonnes of CO_2 equivalent**
Subproject 1. Reconstruction of thermal and heating furnaces	59 844
Subproject 2. Installation of a new vacuum system	12 858
Subproject 3. Installation of an arc ladle furnace	31 591
Subproject 4. Modernization of press equipment	13 039
Total	**117 332**

Table 17 Baseline emissions for the monitoring period

D.3.3. Leakage:

Not Applicable

D.3.4. Summary of the emissions reductions during the monitoring period:

Emission reductions	**tonnes of CO_2 equivalent**
Subproject 1. Reconstruction of thermal and heating furnaces	51 440
Subproject 2. Installation of a new vacuum system	12 817
Subproject 3. Installation of an arc ladle furnace	8 922
Subproject 4. Modernization of press equipment	12 496
Total	**85 675**

Table 18 Emission reductions for the monitoring period

Annex 1

Definitions and acronyms

Acronyms and Abbreviations

CH_4	METHANE
CO_2	CARBON DIOXIDE
GWP	GLOBAL WARMING POTENTIAL
IPCC	INTERGOVERMENTAL PANEL ON CLIMATE CHANGE
PDD	PROJECT DESIGN DOCUMENT
EMSS	ENERGOMASHSPETSSTAL
CHPP	COMBINED HEAT AND POWER PLANT
CDM	CLEAN DEVELOPMENT MECHANISM
FPS	FORGE PRESS SHOP
TS	THERMAL SHOP
UNFCCC	UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE
CD	COMPACT DISC
VD	VACUUM DEGASSER
LF	LADLE FURNACE
EAF	ELECTRIC ARC FURNACE
SMS	STEEL MAKING SHOP
CDU	CLOSE DISTRIBUTION UNIT
T	TRANSFORMER
AT	AUTOTRANSFORMER
IPCC	INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE
NG	NATURAL GAS
DHC	DISTRICT HEATING AND COOLING

Definitions

Baseline	The scenario that reasonably represents what would have happened to greenhouse gases in the absence of the proposed project, and covers emissions from all gases, sectors and source categories listed in Annex A of the Protocol and anthropogenic Removals by sinks, within the project boundary.
Emissions reductions	Emissions reductions generated by a JI project that have not undergone a verification or determination process as specified under the JI guidelines, but are contracted for purchase.
Global Warming Potential (GWP)	An index that compares the ability of greenhouse gases to absorb heat in the atmosphere in comparison to carbon dioxide. The index was established by the Intergovernmental Panel of Climate Change.
Greenhouse gas (GHG)	A gas that contributes to climate change. The greenhouse gases included in the Kyoto Protocol are: carbon dioxide (CO_2), Methane (CH_4), Nitrous Oxide (N_2O), Hydrofluorcarbons (HFCs), Perfluorcarbons (PFCs) and Sulphurhexafluoride (SF6).

Joint Implementation (JI)	Mechanism established under Article 6 of the Kyoto Protocol. JI provides Annex I countries or their companies the ability to jointly implement greenhouse gas emissions reduction or sequestration projects that generate Emissions Reduction Units.
Monitoring plan	Plan describing how monitoring of emission reductions will be undertaken. The monitoring plan forms a part of the Project Design Document (PDD).