TWELFTH PERIODIC JI MONITORING REPORT

Version 2.0
23 October 2012

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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: 01/01/2012 at 00:00;
- Monitoring period closing date: 30/06/2012 at 24:00.

A.5. Methodology applied to the project activity:

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 #06, Forge Press Shop (FPS)	01/09/2008	01/01/2012	Act of startup
Heating #07, 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
Thermal #39, FPS	-	11/01/2012	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 deviations 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 2 to this document.

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

There are no deviations or revisions to the determined monitoring plan during this monitoring period.

A.9. Changes since last verification:

During the reported monitoring period new furnaces were put into operation after modernization. Detailed description of the new furnaces is provided in the Annex 2 to this document. Their detailed analysis in accordance with Procedures Regarding Changes During Project Implementation developed by JISC is provided in the Annex 2 to this document.

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

PJSC "Energomashspetsstal"

- Alexander Masyuk, Deputy Chief Engineer

Global Carbon B.V.

- Natallia Belskaya, JI Consultant

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 through meter-loggers 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 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.

Cross-checking is ensured by two meter-loggers which imply measuring the overall input of natural gas into the FPS and TS and monitoring consumption of furnaces. Correctness of the meters' work is checking by the following formulae:

NG FPS - $\sum$(NG05 + NG06 + NG07 + NG08 + NG09 + NG10 + NG11 + NG12 + NG13 + NG14 + NG15 + NG16 + NG18 + NG19 + NG21 + NG22 + NG23 + NG26 + NG27 + other consumers) $\leq$ 1.5%

NG TS - $\sum$(NG01 + NG02 + NG03 + NG04 + NG17 + NG24 + NG25 + 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 flowcharts of the natural gas supplying system with the metering points are presented in the following figures.

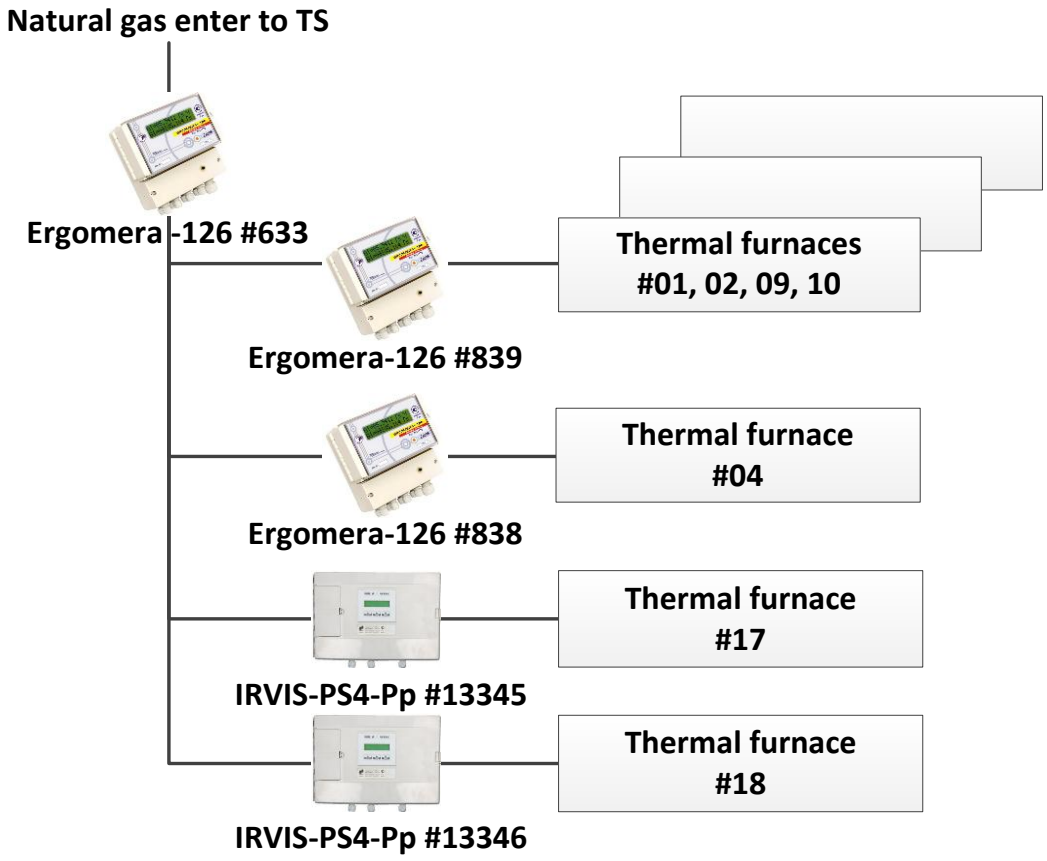

Figure 1 Natural gas metering system at TS

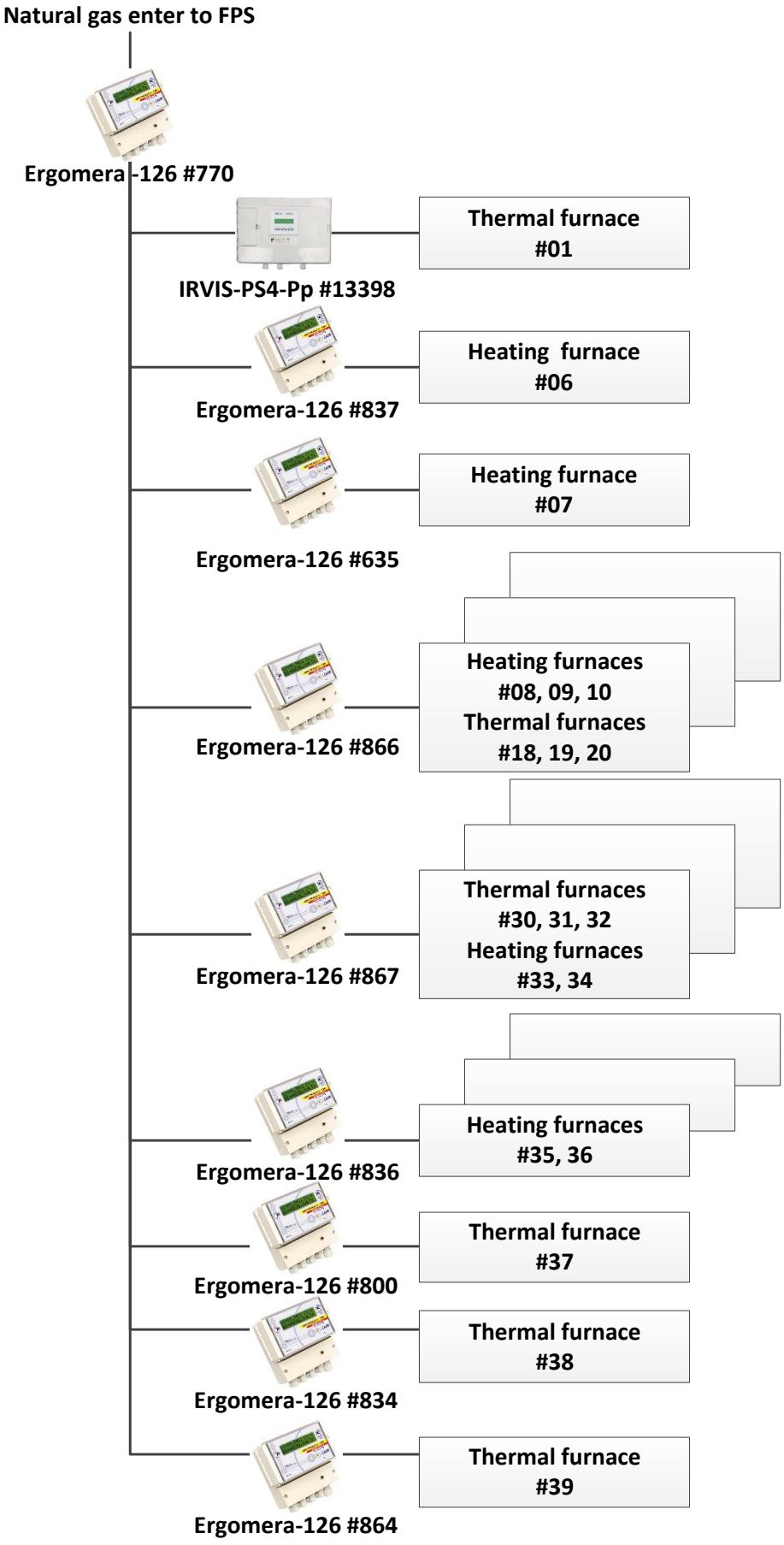

Figure 2 Natural gas metering system at FPS

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. A computer system records information about every vacuumization session, including melt passport (date and number), weight of steel 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 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.

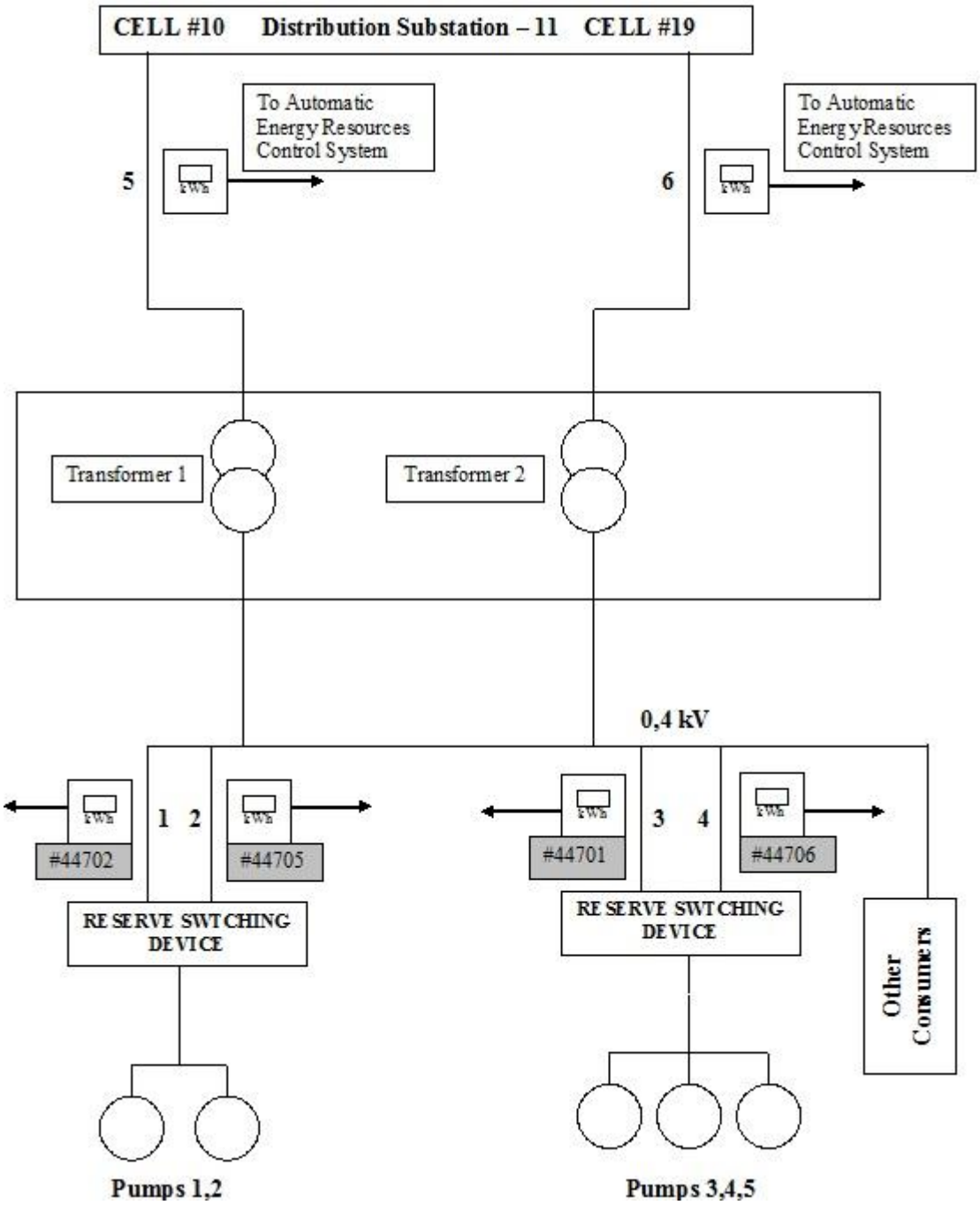

Figure 3 Electricity metering system at VD

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 date and number of melt, furnace where steel was melted, 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 ERUs by the project.

The following figure presents electricity supplying system with metering points.

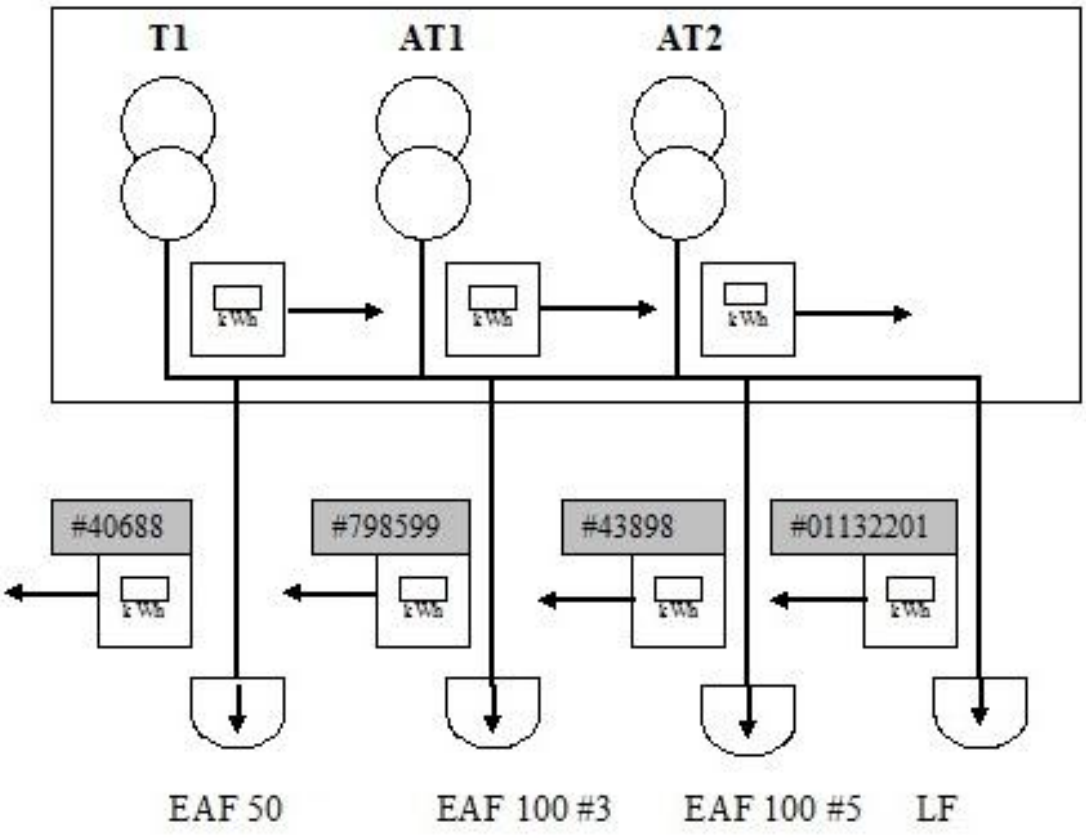

Figure 4 Electricity metering system at EAFs and LF

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:

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

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.

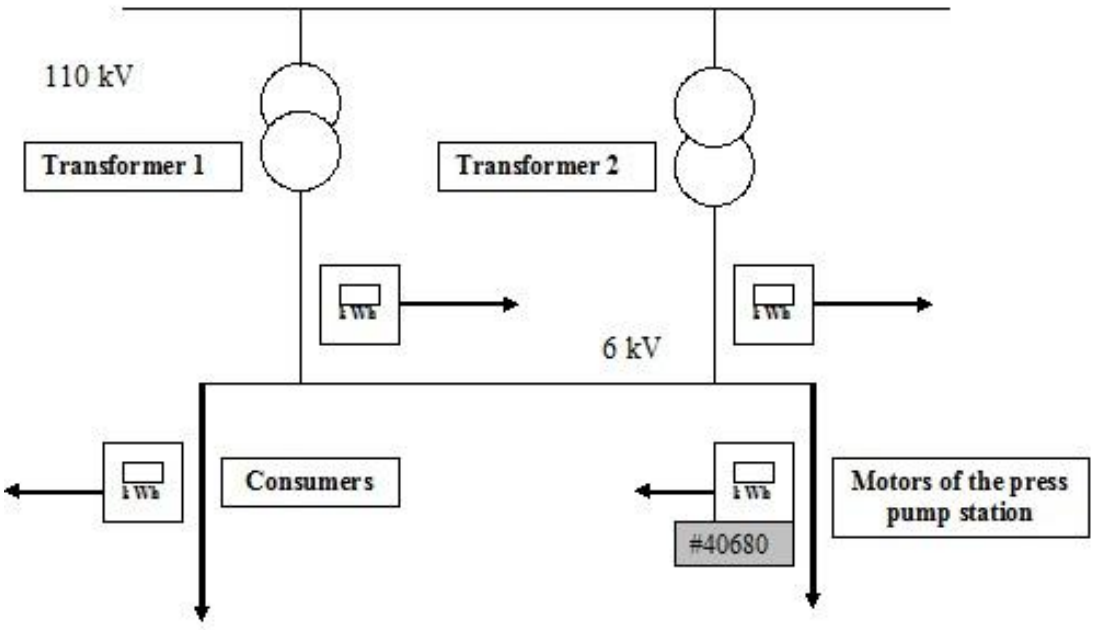

Figure 5 Electricity metering system at press

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 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.1.1. 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-logger IRVIS-RS4-Pp
5. Weighing machines ErMack-VK1rk-10, ErMack-VK1rk-20, ErMack-VK1rk-50, ErMack-VK1rk-80
6. Weighing machine 01VKT-200M
7. Natural gas consumption meter-logger 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):

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	13/01/2012	13/01/2016
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

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 at temperature 20 ˚C and pressure 101.325 kPa.

ID of meter	Measuring parameter	Work parameter	Type	Serial number	Level of accuracy	Date of last calibration	Date of next calibration
NG 26	Consumption of NG at heating furnace #06, FPS	m^3	Ergomera-126	837	0.1 %	18/08/2011	18/08/2013
NG 05	Consumption of NG at heating furnace #07, FPS	m^3	Ergomera-126	635	0.1 %	22/08/2011	22/08/2013
NG 06, NG 07, NG 08, NG 10, NG 11, NG 12	Consumption of NG at heating furnace #08, #09, #10 and at thermal furnace #18, #19, #20, FPS	m^3	Ergomera-126	866	0.1 %	20/09/2011	20/09/2013
NG 19, NG 21	Consumption of NG at heating furnace #35, 36, FPS	m^3	Ergomera-126	836	0.1 %	25/08/2011	25/08/2013
NG 01, NG 02, NG 03, NG 04	Consumption of NG at thermal furnace #01, 02, 09, 10, TS	m^3	Ergomera-126	839	0.1 %	20/10/2011	20/10/2013
NG 23	Consumption of NG at thermal furnace #01, FPS	m^3	IRVIS-RS4-Pp	13398	1 %	01/06/2012	01/06/2014
NG 17	Consumption of NG at thermal furnace #04, TS	m^3	Ergomera-126	838	0.1 %	20/10/2011	20/10/2013
NG 24	Consumption of NG at thermal furnace #17, TS	m^3	IRVIS-RS4-Pp	13345	1 %	01/02/2012	01/02/2014
NG 25	Consumption of NG at thermal furnace #18, TS	m^3	IRVIS-RS4-Pp	13346	1 %	20/03/2012	20/03/2014
NG 09, NG 13, NG 14, NG 15, NG 18	Consumption of NG at thermal furnace #30, #31, #32 and at heating furnace #33, #34, FPS	m^3	Ergomera-126	867	0.1 %	20/09/2011	20/09/2013
NG 16	Consumption of NG at thermal furnace #37, FPS	m^3	Ergomera-126	800	0.1 %	07/04/2011	07/04/2013
NG 22	Consumption of NG at thermal furnace #38, FPS	m^3	Ergomera-126	834	0.1 %	25/08/2011	25/08/2013
NG 27	Consumption of NG at thermal furnace #39, FPS	m^3	Ergomera-126	864	0.1 %	08/08/2011	08/08/2013
NG FPS	Consumption of NG in FPS	m^3	Ergomera-126	770	0.1 %	23/12/2010	23/12/2012
NG TS	Consumption of NG in TS	m^3	Ergomera-126	633	0.1 %	04/08/2011	04/08/2013

Table 3 List of natural gas consumption 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	20/02/2012	20/02/2013
WM3	Weight of half-finished products in TS	kg	ErMack-VK1rk-50	KP 506149	(1-25 t) 50 kg (25-50 t) 100 kg	21/06/2012	21/06/2013
WM4	Weight of half-finished products in FPS	kg	ErMack-VK1rk-80	KP 806148	(2-50 t) 100 kg (50-80 t) 200 kg	21/06/2012	21/06/2013
WM5	Weight of steel proceeded through the VD and LF	kg	01VKT-200M	222	1000 kg*	08/11/2011	08/11/2012

* Level of accuracy equal to ±0.5% of the maximum limit of weighing. The maximum limit of weighing equal to 200 tonnes.

Table 4 List of weighting machines

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[1]

For consumption meter-logger:

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 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

B.1.4. Involvement of Third Parties:

Authorized representatives of the State Metrological System of Ukraine – calibration/verification of the metering equipment.

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

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

The operational and management structure of the project:

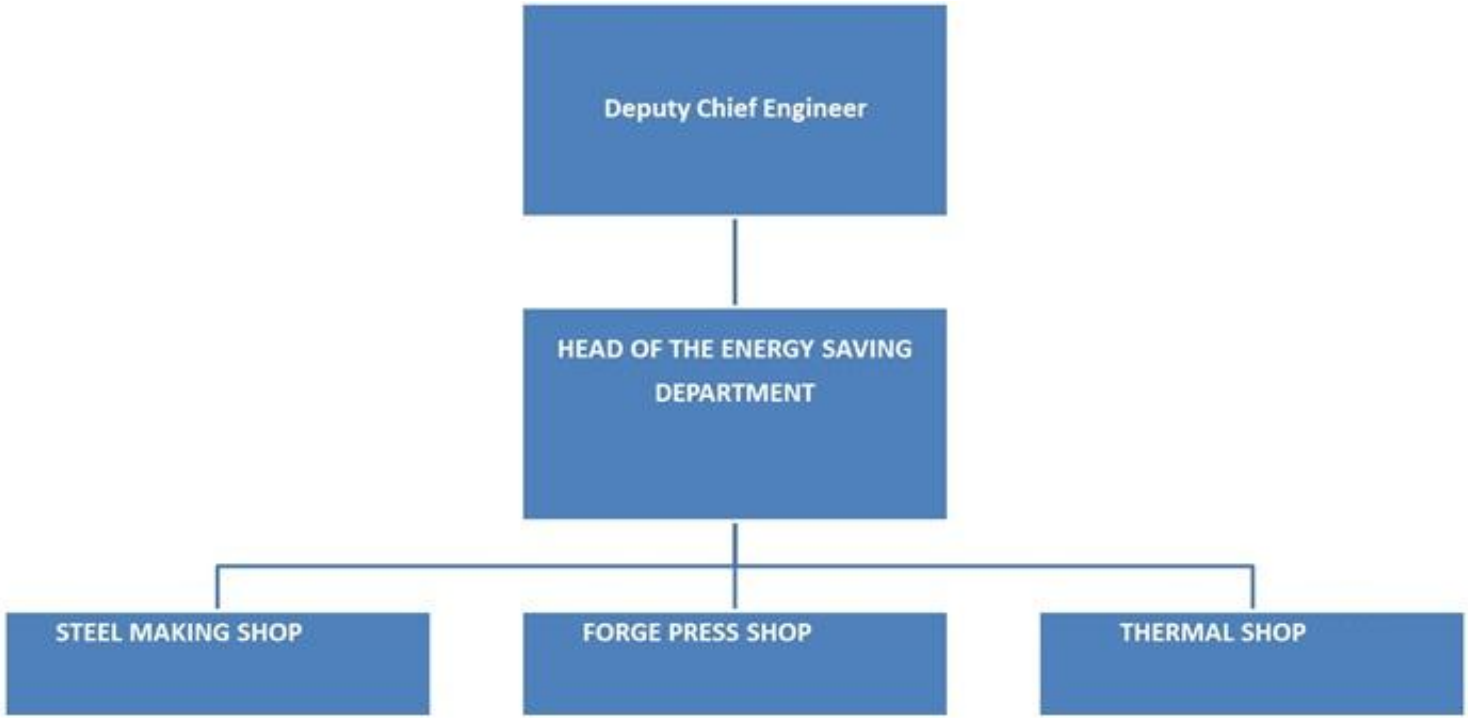

Figure 6 Operational and management structure

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

Data variable	Source of data	Data unit	Value
EF_{NG} default CO_2 emission factor for combustion of natural gas	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 1st 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[2]	tCO_2/MWh**	1.090

*56100 $kgCO_2/TJ$ = 0.0561 tCO_2/GJ
**$kgCO_2/kWh$ = tCO_2/MWh
Table 5 Project fixed default values

Data variable	Source of data	Data unit	Value
EF_{Coal} default CO_2 emission factor for combustion of coal (anthracite)	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 1st 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[3]	tCO_2/MWh**	1.090

*98300 $kgCO_2/TJ$ = 0.0983 tCO_2/GJ
**$kgCO_2/kWh$ = tCO_2/MWh
Table 6 Baseline fixed default values

[2] 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 #06, FPS	711.3	See "ER calculation and Cash Flow Analysis"[4] and Sixth Periodic JI Monitoring Report version 3.0 from 17/12/2010 Annex 1 Table A-2[5] and Eighth Periodic JI Monitoring Report version 3.0 from 01/06/2011 Annex 1 Table A-3[6] and Annex 2 of this document.
			heating #07, FPS	1005.3	
			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	
			thermal #39, FPS	186.1	
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[7], Table A2.2

[4] http://ji.unfccc.int/UserManagement/FileStorage/VNIM9YQP8105W3D26EX4KSRL7TFUCO

[5] http://ji.unfccc.int/UserManagement/FileStorage/NM0A8W43PIDGOSQEJF7CRXY5H2LB6U

[6] http://ji.unfccc.int/UserManagement/FileStorage/BVIONHYJCFGQKTW42UZ7XS9135D06M

[7] 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 7 Baseline ex-ante factors

B.2.2. List of variables:

Baseline emissions 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 8 Baseline measurable variable

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

Variable	Description	Unit	Value*						
			January	February	March	April	May	June	Total
$NG_{tf,i,25}$	Natural gas consumption at heating furnace #06,FPS	m^3	33834	79838	144068	169546	126985	114637	668908
$NG_{tf,i,8}$	Natural gas consumption at heating furnace #07,FPS	m^3	174046	117596	150732	103017	120591	180682	846664
$NG_{tf,i,7}$	Natural gas consumption at heating furnace #08,FPS	m^3	127352	148487	177940	162358	193771	59372	869280
$NG_{tf,i,6}$	Natural gas consumption at heating furnace #09,FPS	m^3	186927	147989	227365	211765	216005	48388	1038439
$NG_{tf,i,5}$	Natural gas consumption at heating furnace #10,FPS	m^3	157354	107771	149597	81703	199528	69026	764979
$NG_{tf,i,15}$	Natural gas consumption at heating furnace #33,FPS	m^3	69046	43083	54194	76037	91096	76518	409974
$NG_{tf,i,18}$	Natural gas consumption at heating furnace #34,FPS	m^3	55873	60260	62861	61114	64901	78422	383431
$NG_{tf,i,19}$	Natural gas consumption at heating furnace #35,FPS	m^3	49232	59844	49545	62048	73634	80864	375167
$NG_{tf,i,20}$	Natural gas consumption at heating furnace #36,FPS	m^3	56215	41379	48914	63420	53684	49059	312671
$NG_{tf,i,22}$	Natural gas consumption at thermal furnace #01,FPS	m^3	51588	16039	26990	53375	42552	54063	244607
$NG_{tf,i,3}$	Natural gas consumption at thermal furnace #01,TS	m^3	42180	47160	48341	42238	34917	56333	271169
$NG_{tf,i,4}$	Natural gas consumption at thermal furnace #02,TS	m^3	78135	42656	70001	50465	71141	74915	387313
$NG_{tf,i,17}$	Natural gas consumption at thermal furnace #04,TS	m^3	41391	46650	40537	28235	47394	52323	256530
$NG_{tf,i,1}$	Natural gas consumption at thermal furnace #09,TS	m^3	32994	36840	44244	34928	30665	29556	209227
$NG_{tf,i,2}$	Natural gas consumption at thermal furnace #10,TS	m^3	49334	43540	40494	31532	31505	30853	227258
$NG_{tf,i,23}$	Natural gas consumption at thermal furnace #17,TS	m^3	14686	24763	20729	12756	14338	15048	102320
$NG_{tf,i,10}$	Natural gas consumption at thermal furnace #18,FPS	m^3	61833	58984	51573	57093	67203	66381	363067
$NG_{tf,i,24}$	Natural gas consumption at thermal furnace #18,TS	m^3	23223	19892	21343	21277	18498	17121	121354
$NG_{tf,i,11}$	Natural gas consumption at thermal furnace #19,FPS	m^3	65148	51295	61194	43715	47620	52423	321395
$NG_{tf,i,12}$	Natural gas consumption at thermal furnace #20,FPS	m^3	84609	83073	45637	75555	62735	50831	402440
$NG_{tf,i,9}$	Natural gas consumption at thermal furnace #30,FPS	m^3	91119	111416	92561	103456	108130	104184	610866
$NG_{tf,i,13}$	Natural gas consumption at thermal furnace #31,FPS	m^3	69019	70553	55987	72441	68767	64726	401493
$NG_{tf,i,14}$	Natural gas consumption at thermal furnace #32,FPS	m^3	84618	101231	94541	91226	70241	87963	529820
$NG_{tf,i,16}$	Natural gas consumption at thermal furnace #37,FPS	m^3	21160	14527	20216	11203	18449	16783	102338
$NG_{tf,i,21}$	Natural gas consumption at thermal furnace #38,FPS	m^3	14595	12416	16085	14181	14561	16034	87872
$NG_{tf,i,26}$	Natural gas consumption at thermal furnace #39,FPS	m^3	8426	9583	11303	9183	11301	9303	59099
$EL_{VD,i}$	Electricity consumption by new vacuum system (VD)	MWh	13.318	12.046	13.365	12.526	10.171	10.690	72.116
$EL_{LF,i}$	Electricity consumption by LF	MWh	1262.602	1121.045	1543.591	1383.215	1180.925	1077.497	7568.875
$EL_{EAF,i}$	Electricity consumption by EAFs	MWh	6109.459	5377.661	6883.184	6375.005	5625.411	4809.792	35180.512
$EL_{PR,i}$	Electricity consumption by the new pumps of the 15 000 tonnes press	MWh	154.694	168.647	184.537	174.799	158.293	105.950	946.920
$LCV_{NG,i}$	Lower calorific value of the natural gas**	GJ/1000 m^3	33.76	33.76	33.79	33.80	34.13	34.06	-

* 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 9 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						
			January	February	March	April	May	June	Total
$PRST_{tf,i,25}$	Half finish products production at heating furnace #06,FPS	tonnes	368.50	751.30	1045.70	1785.70	1095.30	810.10	5856.60
$PRST_{tf,i,8}$	Half finish products production at heating furnace #07,FPS	tonnes	1717.30	1419.70	1801.70	415.00	415.00	1502.90	7271.60
$PRST_{tf,i,7}$	Half finish products production at heating furnace #08,FPS	tonnes	1729.50	1812.40	2707.40	2196.41	2143.40	533.60	11122.71
$PRST_{tf,i,6}$	Half finish products production at heating furnace #09,FPS	tonnes	1996.40	1788.50	2412.80	2362.40	2014.50	486.60	11061.20
$PRST_{tf,i,5}$	Half finish products production at heating furnace #10,FPS	tonnes	1329.30	1613.70	2187.04	1136.90	1968.50	716.70	8952.14
$PRST_{tf,i,15}$	Half finish products production at heating furnace #33,FPS	tonnes	721.30	554.60	521.80	777.10	959.50	585.00	4119.30
$PRST_{tf,i,18}$	Half finish products production at heating furnace #34,FPS	tonnes	646.50	683.70	563.20	856.30	1186.24	813.64	4749.58
$PRST_{tf,i,19}$	Half finish products production at heating furnace #35,FPS	tonnes	468.00	486.50	517.15	523.00	732.30	1052.78	3779.73
$PRST_{tf,i,20}$	Half finish products production at heating furnace #36,FPS	tonnes	581.80	492.90	506.90	733.40	505.60	596.60	3417.20
$PRST_{tf,i,22}$	Half finish products production at thermal furnace #01,FPS	tonnes	432.00	176.30	110.00	469.20	150.00	544.85	1882.35
$PRST_{tf,i,3}$	Half finish products production at thermal furnace #01,TS	tonnes	291.00	407.40	377.00	415.43	298.56	432.00	2221.39
$PRST_{tf,i,4}$	Half finish products production at thermal furnace #02,TS	tonnes	557.40	356.00	398.05	284.39	610.60	517.00	2723.44
$PRST_{tf,i,17}$	Half finish products production at thermal furnace #04,TS	tonnes	728.00	551.65	349.35	300.33	371.64	541.00	2841.97
$PRST_{tf,i,1}$	Half finish products production at thermal furnace #09,TS	tonnes	113.50	343.50	208.10	279.45	257.80	226.35	1428.70
$PRST_{tf,i,2}$	Half finish products production at thermal furnace #10,TS	tonnes	351.38	392.25	146.80	267.60	215.50	226.60	1600.13
$PRST_{tf,i,23}$	Half finish products production at thermal furnace #17,TS	tonnes	199.00	399.52	377.80	227.10	149.00	160.90	1513.32
$PRST_{tf,i,10}$	Half finish products production at thermal furnace #18,FPS	tonnes	744.30	485.05	195.95	669.58	540.80	796.40	3432.08
$PRST_{tf,i,24}$	Half finish products production at thermal furnace #18,TS	tonnes	374.00	352.00	274.95	296.40	232.00	216.00	1745.35
$PRST_{tf,i,11}$	Half finish products production at thermal furnace #19,FPS	tonnes	865.80	445.16	474.90	462.95	439.82	554.60	3243.23
$PRST_{tf,i,12}$	Half finish products production at thermal furnace #20,FPS	tonnes	613.00	579.90	546.00	754.10	635.24	652.90	3781.14
$PRST_{tf,i,9}$	Half finish products production at thermal furnace #30,FPS	tonnes	531.90	856.50	699.39	384.40	782.90	910.10	4165.19
$PRST_{tf,i,13}$	Half finish products production at thermal furnace #31,FPS	tonnes	678.90	690.00	383.80	347.00	696.00	674.21	3469.91
$PRST_{tf,i,14}$	Half finish products production at thermal furnace #32,FPS	tonnes	742.20	602.40	394.80	322.68	749.28	702.85	3514.21
$PRST_{tf,i,16}$	Half finish products production at thermal furnace #37,FPS	tonnes	116.10	214.30	233.38	253.55	253.90	285.15	1356.38
$PRST_{tf,i,21}$	Half finish products production at thermal furnace #38,FPS	tonnes	240.70	180.65	129.49	137.20	160.70	194.00	1042.74
$PRST_{tf,i,26}$	Half finish products production at thermal furnace #39,FPS	tonnes	100.98	254.60	93.89	96.70	149.90	105.20	801.27
$PRVS_{VD,i}$	Vacuumed steel production at VD	tonnes	9232.836	8005.002	10090.150	9032.294	8136.064	7015.298	51511.644
$EB_{DHC,i}$	Efficiency of the steam boilers at the DHC*	%	81.45%	81.45%	81.45%	81.45%	81.45%	81.45%	-
$PRES_i$	Production volume of electro steel (at LF)	tonnes	9862.667	8310.710	10771.790	10107.988	9004.799	7740.385	55798.34
$T_{pp,i}$	Working hours of press	hours	297.75	289.00	286.25	294.42	293.50	185.05	1645.97

* According to Letter "Kramatorskteploenergo".

Table 10 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 through meter-loggers 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 (date and number), weight of steel 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 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 date and number of melt, the furnace where steel was melted, 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 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

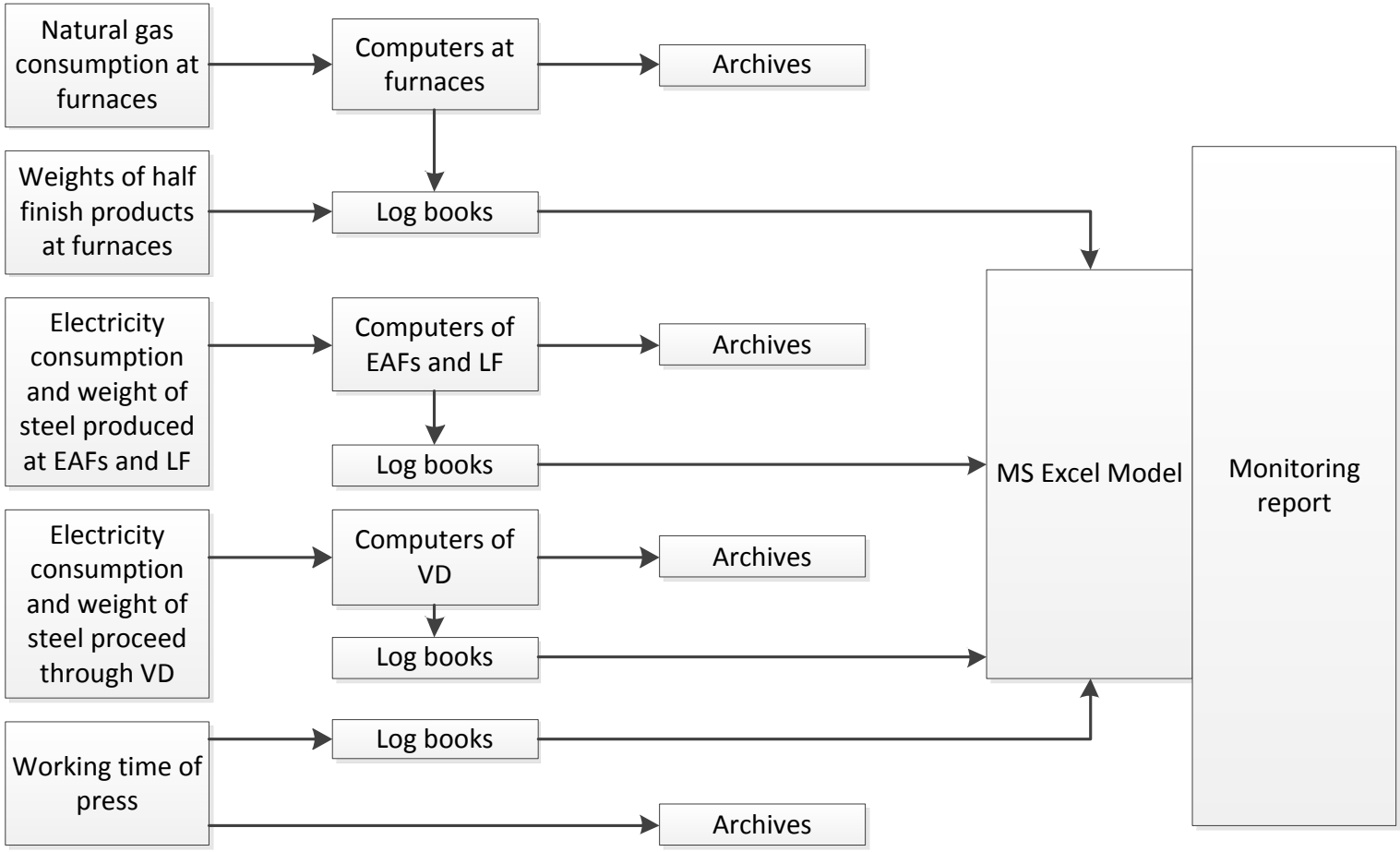

Figure 7 Data Processing Chart

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"
- PJSC "Donetskoblgas"
- SPE "Ukrgasgeoavtomatika"

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 analysing 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 1st 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 1st 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 1st 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	19 704
Subproject 2. Installation of a new vacuum system	80
Subproject 3. Installation of an arc ladle furnace	46 597
Subproject 4. Modernization of press equipment	1 033
Total	**67 414**

Table 11 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 NG burning process, tCO_2/GJ.

The baseline emissions for SP2 are:

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

(*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, ratio;
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 1st 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 1st 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 1st 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	129 496
Subproject 2. Installation of a new vacuum system	25 964
Subproject 3. Installation of an arc ladle furnace	62 644
Subproject 4. Modernization of press equipment	21 529
Total	**239 633**

Table 12 Baseline emissions for the monitoring period

D.3.3. Leakage:

Not Applicable

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

$$ER_y = BE_y - PE_y \qquad (Equation\ 11)$$

Emission reductions	**tonnes of CO_2 equivalent**
Subproject 1. Reconstruction of thermal and heating furnaces	109 792
Subproject 2. Installation of a new vacuum system	25 884
Subproject 3. Installation of an arc ladle furnace	16 047
Subproject 4. Modernization of press equipment	20 496
Total	**172 219**

Table 13 Emission reductions for the monitoring period

Annex 1

Definitions and acronyms

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).

Annex 2

Changes during project implementation

This Annex contains a description and a justification of changes which occurred during implementation of the JI project as required by "Procedures Regarding Changes During Project Implementation".

The Project Design Document (PDD) for the JI project "Improvement of the Energy Efficiency at Energomashspetsstal (EMSS), Kramatorsk, Ukraine" was determined in September 2009. The JI project as described in the PDD consisted of four subprojects:

1. Reconstruction of thermal and heating furnaces;
2. Installation of a new vacuum system;
3. Installation of an arc ladle furnace;
4. Modernization of press equipment.

The project implementation plan reflected in the determined PDD was based on the energy efficiency investment program as of 2006-2008. In the course of project's realization it was decided to modify the plan for implementation of subproject 1 "Reconstruction of thermal and heating furnaces".

The main goal of this subproject was the reduction of the natural gas (NG) consumption on furnaces operating at different shops at EMSS by commissioning of new automated NG burners (this enables to maintain the required temperature inside of the furnace) and by implementation of new thermal insulation for the walls, front doors and roofs of the furnaces.

Due to a severe recession and the worsening of the steel market the reconstruction of the furnaces was delayed. As of April 2010 only 21 of them were reconstructed. Also during the course of reconstruction the order of furnaces modernization was changed to meet the enterprise's need to have efficient furnaces of a specific size available in order to serve the orders for EMSS products. Finally, in the middle 2010 it was decided to channel the investment to reconstruction of the furnaces which were not originally included in the determined PDD while postponing the reconstruction of some of the furnaces that were listed in the determined PDD. These changes were provided in the Annex 1 to the Sixth Periodic JI Monitoring Report, version 3.0 from 17/12/2010, available through UNFCCC web-page[8]; that has been finally verified[9] and Annex 1 to the Eighth Periodic JI Monitoring Report version 3.0 from 01/06/2011, available through UNFCCC web-page[10] that has been finally verified[11].

Description of proposed changes

The change during the project implementation constitutes modifying the order of furnaces reconstruction resulting in inclusion of furnaces not mentioned in the determined PDD into the energy efficiency program and postponing reconstruction of those furnaces from the list which have not been modernized yet. During the current monitoring period there were two furnaces was commissioned: heating furnace #06 and thermal furnace #39 at Forge Press Shop (see Table A-1 below for technical details). Thermal furnace #39 was not originally mentioned in the determined PDD.

[8] http://ji.unfccc.int/UserManagement/FileStorage/NM0A8W43PIDGOSQEJF7CRXY5H2LB6U

[9] http://ji.unfccc.int/UserManagement/FileStorage/3Q51REHGWV2YAPDMTINL8679ZXJOCU

[10] http://ji.unfccc.int/UserManagement/FileStorage/BVIONHYJCFGQKTW42UZ7XS9135D06M

[11] http://ji.unfccc.int/UserManagement/FileStorage/IFTZD7N5B1KS4E3XRPQ8WG9YJC60MO

Type, location	Size, m	Date of startup	Baseline ex-ante specific natural gas consumption of reconstructed furnaces, m^3/t
heating furnace #06, FPS	7x12	01/01/2012	711.3
thermal furnace #39, FPS	2.5 x 5	11/01/2012	186.1

Table A-1 Technical details of new furnaces

(a) The physical location of the project has not changed; Proposed project is located at the same site. Therefore, the physical location of the project remains the same: facilities of Energomashspetsstal at Kramatorsk, Ukraine.

(b) If the emission sources have changed, they are reflected in an updated monitoring plan; The monitoring of baseline and project emissions and calculation of emission reductions will be performed using same approaches and formulae as in the determined monitoring plan. The relevant changes in terms of monitoring equipment have been made in the monitoring plan. The detailed information gives in Tables 3,9,10 of this document.

(c) Baseline scenario has not changed; The baseline scenario for operation of furnace #06 and thermal furnace #39 at FPS, similarly to other reconstructed furnaces at EMSS, is a continuation of existing before the project situation. In this scenario the furnace continues to produce steel with high specific consumption of natural gas due to the big heat losses of walls, roofs and doors of the furnaces, and also due to the old burners with their low efficiency and incapability to have automated regime of work. Baseline specific natural gas consumption per tonne of steel is bigger than the project's consumption.

The baseline specific natural gas consumption has been determined from special research made by Scientific Engineering Center of Automatic Control System of Technical Processes and Equipment in 1991. Since there were no natural gas meters on old (before reconstruction) thermal and heating furnaces, this data was considered appropriate which was confirmed by AIE during determination process. Besides, since the efficiency of the furnaces after this research has decreased due to depreciation of equipment, we consider these data to be conservative.
Baseline specific natural gas consumption rates in the research mentioned above were calculated for furnaces of the specific type (heating or thermal) and size.

By areal size the closest to heating furnaces #06 at FPS (84 m^2) is type of furnaces with dimensions 5.5x16 (88 m^2). Therefore, baseline specific natural gas consumption of heating furnace #06 were identified using the approach to baseline setting applied to subproject 1 "Reconstruction of thermal and heating furnaces" at the determined PDD. It is 711.3 m^3 per 1 tonne of half-finished product.
By areal size the closest to thermal furnaces #39 at FPS (12.5 m^2) is type of furnaces with dimensions 6x5.2 (31.2 m^2). Therefore, baseline specific natural gas consumption of thermal furnaces #17 and #18 were identified using the approach to baseline setting applied to subproject 1 "Reconstruction of thermal and heating furnaces" at the determined PDD. It is 186.1 m^3 per 1 tonne of half-finished product.

(d) The changes are consistent with the JI specific approach or the clean development mechanism (CDM) methodology upon which the determination was prepared for the project; The proposed change during the project implementation does not require any principal changes to procedures and calculation formulae used for baseline setting and monitoring for the JI project "Improvement of the Energy efficiency at Energomashspetsstal (EMSS), Kramatorsk, Ukraine", therefore it is consistent with the JI specific approach applied in the determined PDD.