

**ELEVENTH PERIODIC JI MONITORING REPORT**

**Version 2.0**  
**12 April 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: 01.10.2011 at 00:00;
- Monitoring period closing date: 31.12.2011 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.

<b>Activity</b>	<b>Date of startup according to PDD</b>	<b>Date of startup actual*</b>	<b>Type document</b>
<b>Subproject 1. Reconstruction of thermal and heating furnaces</b>			
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
<b>Subproject 2. Installation of a new vacuum system</b>	May 2007	28.02.2008	Act of startup

Activity	Date of startup according to PDD	Date of startup actual*	Type document
<b>Subproject 3.</b> Installation of an arc ladle furnace	April 2007	01.04.2007	Order “On measures to implement the targets on production volumes in 2007”
<b>Subproject 4.</b> 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<sup>1</sup> 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<sup>2</sup>; that has been finally verified<sup>3</sup> and Annex 1 to the Eighth Periodic JI Monitoring Report version 3.0 from 01/06/2011, available through UNFCCC web-page<sup>4</sup>, that has been finally verified<sup>5</sup>.

**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<sup>6</sup> that has been finally verified<sup>7</sup>. 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.

<sup>1</sup> [http://ji.unfccc.int/Sup\\_Committee/Meetings/022/Reports/Annex2.pdf](http://ji.unfccc.int/Sup_Committee/Meetings/022/Reports/Annex2.pdf)

<sup>2</sup> <http://ji.unfccc.int/UserManagement/FileStorage/NM0A8W43PIDGOSQEF7CRXY5H2LB6U>

<sup>3</sup> <http://ji.unfccc.int/UserManagement/FileStorage/3Q51REHGWW2YAPDMTINL8679ZXJOCU>

<sup>4</sup> <http://ji.unfccc.int/UserManagement/FileStorage/BVIONHYJCFGQKTW42UZ7XS9135D06M>

<sup>5</sup> <http://ji.unfccc.int/UserManagement/FileStorage/IFTZD7N5B1KS4E3XRPQ8WG9YJC60MO>

<sup>6</sup> <http://ji.unfccc.int/UserManagement/FileStorage/KSFAOBEZ8X9W1RG3IHC4L2N5Q0YMD6>

<sup>7</sup> <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<sup>8</sup> 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:**

In previous monitoring periods electricity consumption of some project equipment could not be monitored directly, so data from the meters should be adjusted by appointed correction factors manually. Until 01.10.2011 all project equipment which consumed electricity includes in the control and monitoring computer system which automatically adjusts data from the meters by appointed correction factors. Corrected values of electricity consumption are transferred to the report and use for the monitoring JI project. Therefore for transparency monitoring report table of transformers was excluded from the report, since transformers are not measuring instruments of electricity consumption.

Until 01.10.2011 all furnaces have been equipped with meter-loggers “Ergomera-126” so the procedure for monitoring natural gas (NG) consumption was simplified in Forge Press Shop (FPS) and Thermal Shop (TS) for Subproject 1. Natural gas consumption, pressure and temperature meters of every furnace were changed by meter-logger “Ergomera-126” which registered, displayed, saved in memory and transmit to the control and monitoring computer system log of natural gas consumption of furnaces at temperature 20 °C and pressure 101.325 kPa.

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

OJSC “Energomashpetsstal”

- Alexander Masyuk, Deputy Chief Engineer

Global Carbon B.V.

- Natallia Belskaya, JI Consultant

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<sup>8</sup> 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 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 formula:

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

$$NG \text{ TS} - \sum(NG01 + NG02 + NG03 + NG04 + NG17 + NG24 + NG25 + \text{other consumers}) \leq 1.5\%$$

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

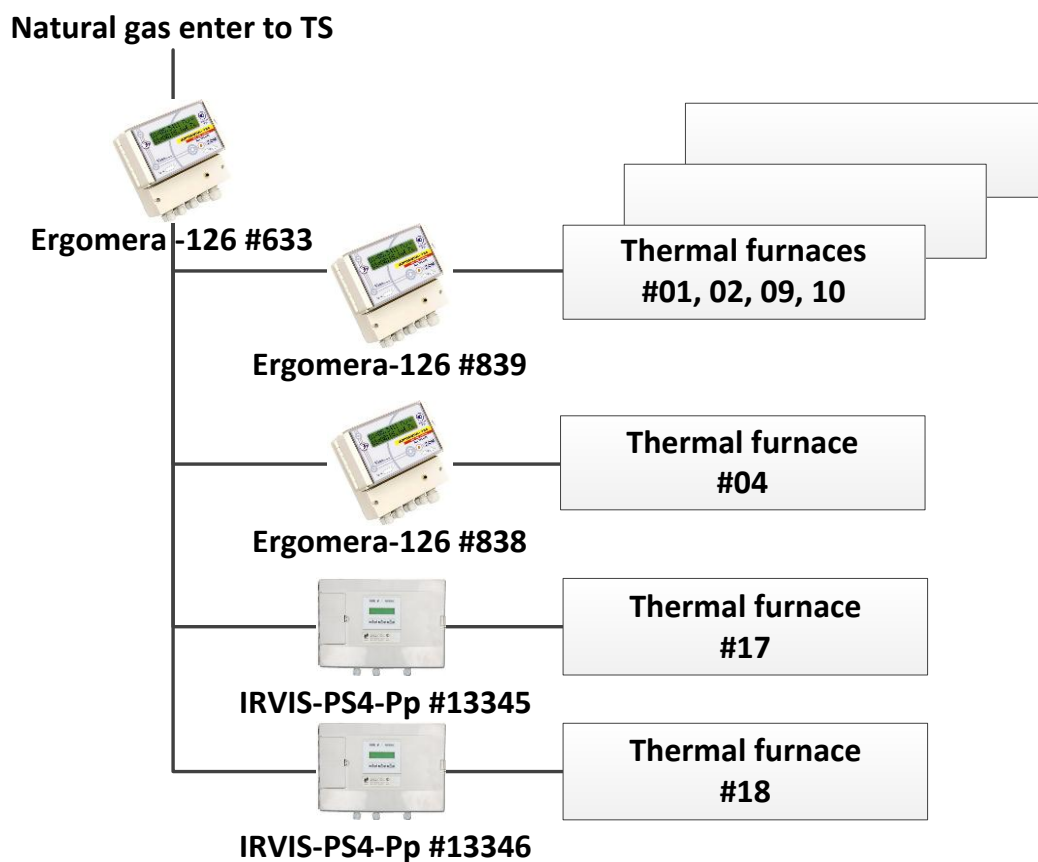


Figure 1 Natural gas metering system at TS

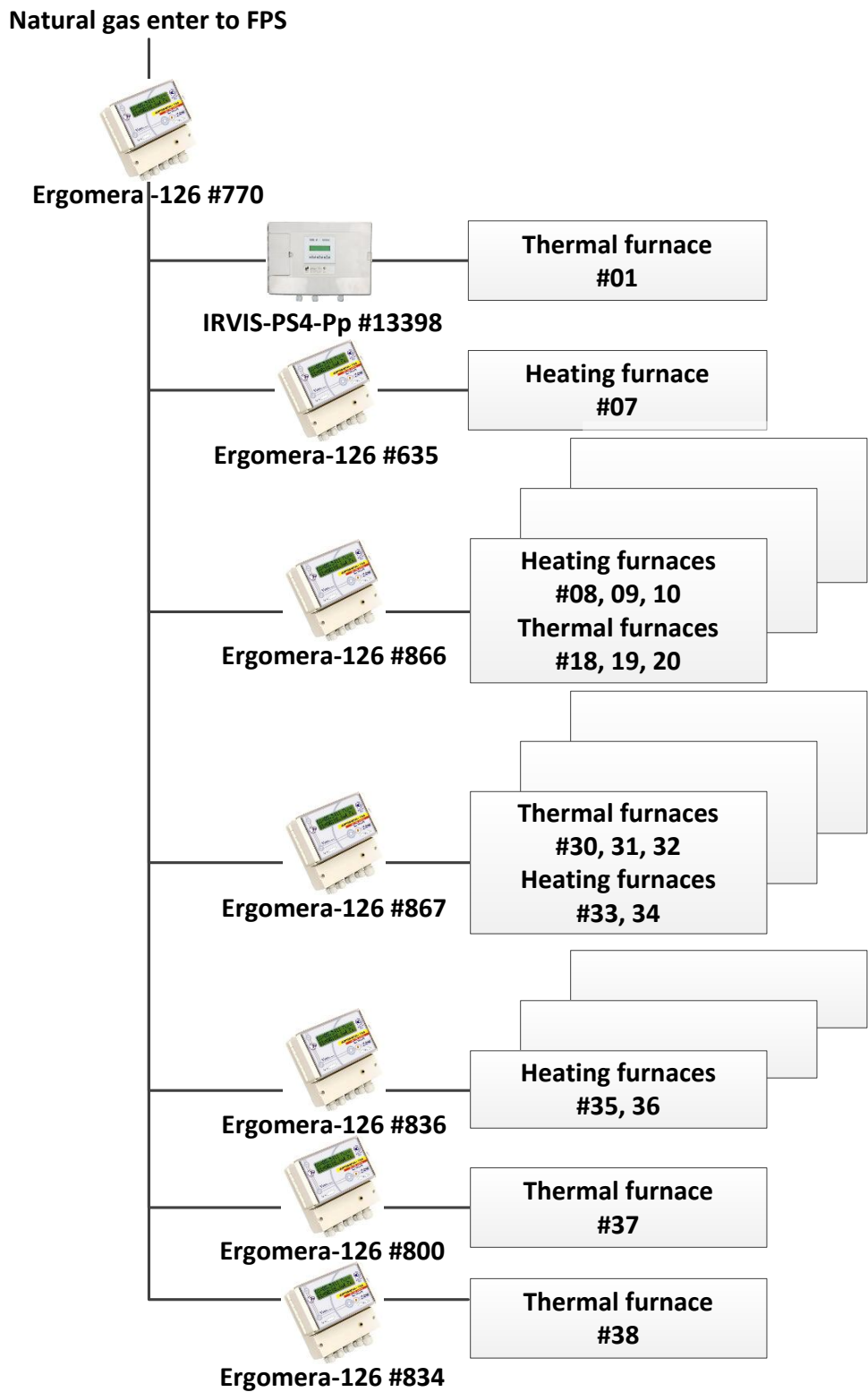


Figure 2 Natural gas metering system at FPS



**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.

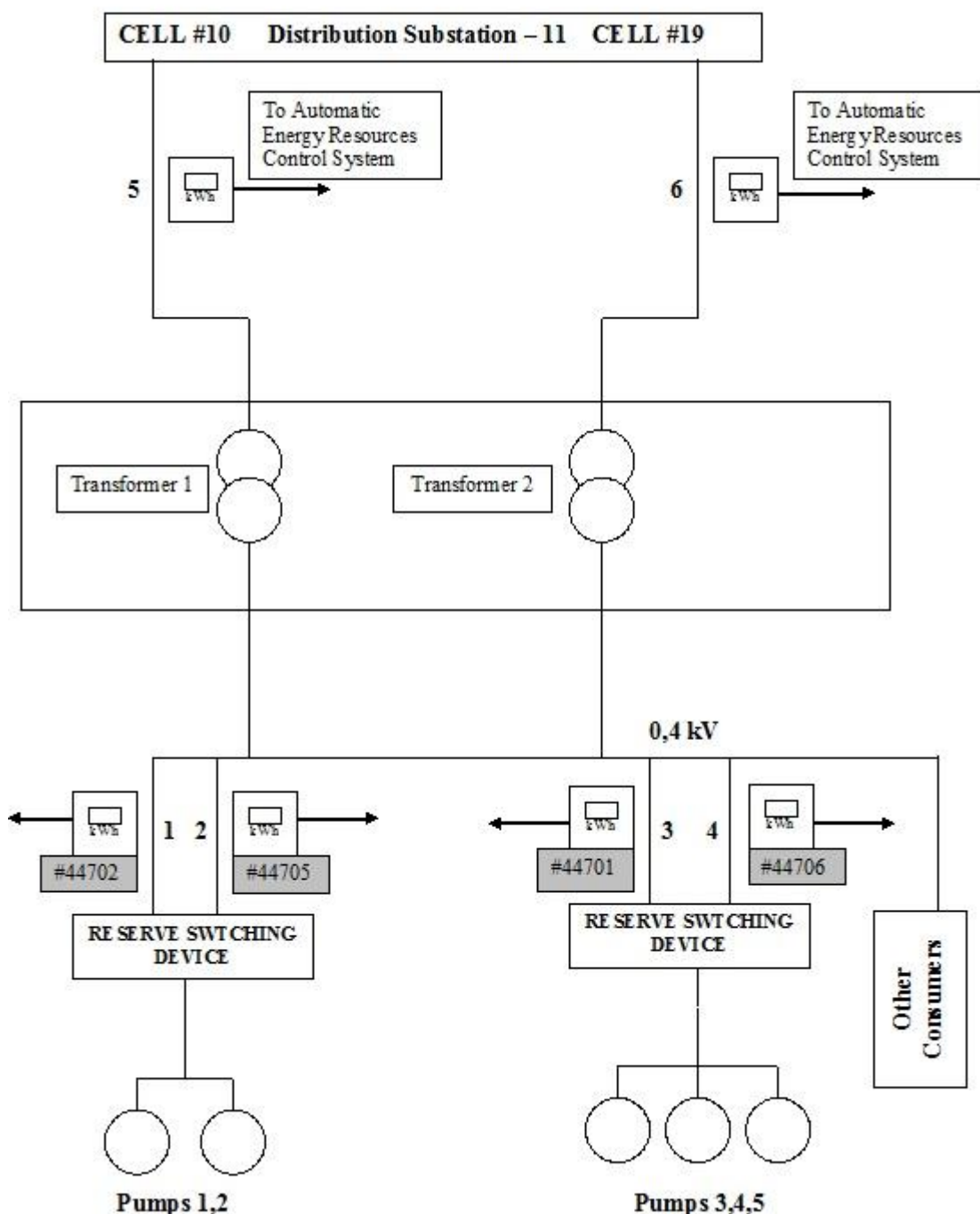


Figure 3 Electricity metering system at VD

**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.

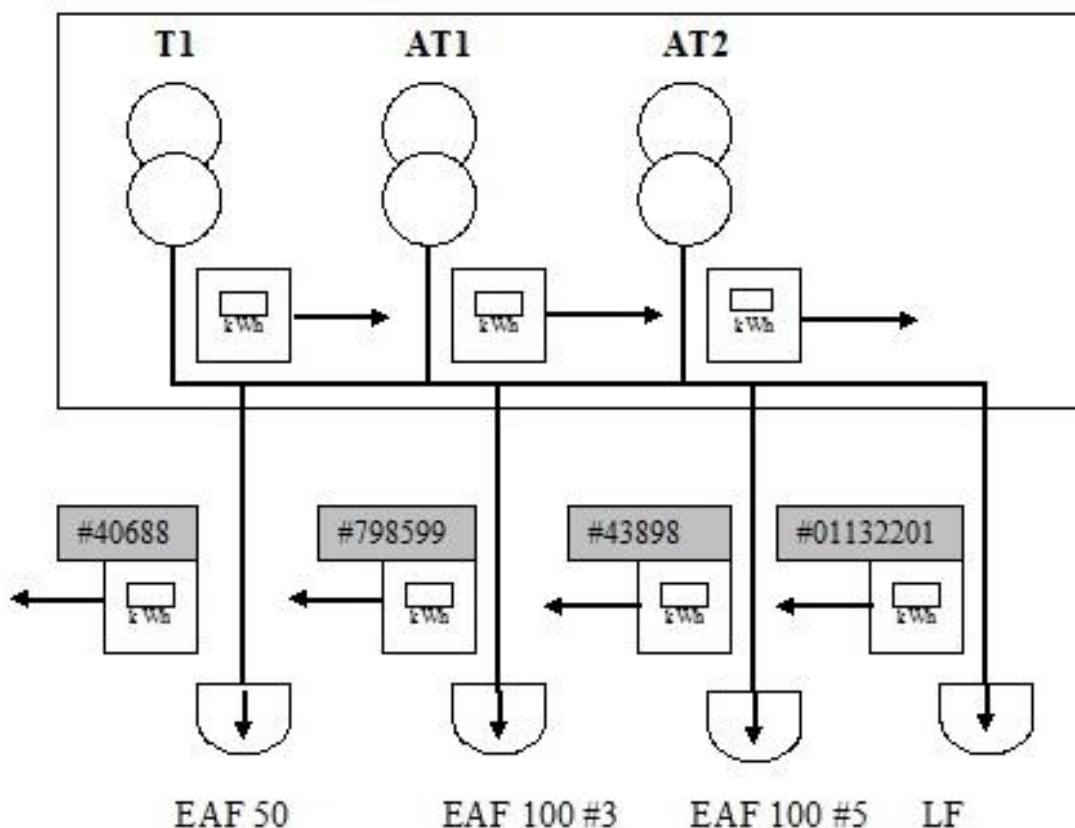


Figure 4 Electricity metering system at EAFs and LF

**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:

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

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.

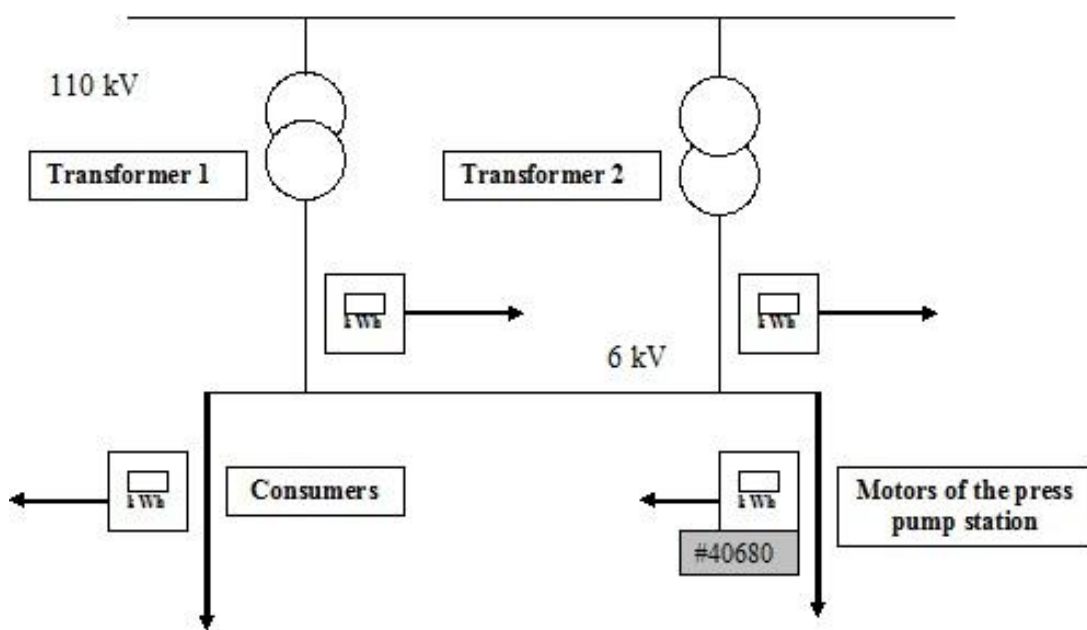


Figure 5 Electricity metering system at press

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, 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-logger IRVIS-PS4-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

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**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.

<b>ID of the meter</b>	<b>Measuring parameter</b>	<b>Work parameter</b>	<b>Type</b>	<b>Serial number</b>	<b>Level of accuracy*</b>	<b>Date of last calibration</b>	<b>Date of next calibration</b>
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*

**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.

<b>ID of meter</b>	<b>Measuring parameter</b>	<b>Work parameter</b>	<b>Type</b>	<b>Serial number</b>	<b>Level of accuracy</b>	<b>Date of last calibration</b>	<b>Date of next calibration</b>
NG 05	Consumption of NG at heating furnace #07, FPS	m <sup>3</sup>	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 <sup>3</sup>	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 <sup>3</sup>	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 <sup>3</sup>	Ergomera-126	839	0.1 %	20.10.2011	20.10.2013
NG 23	Consumption of NG at thermal furnace #01, FPS	m <sup>3</sup>	IRVIS-RS4-Pp	13398	1 %	03.06.2010	03.06.2012
NG 17	Consumption of NG at thermal furnace #04, TS	m <sup>3</sup>	Ergomera-126	838	0.1 %	20.10.2011	20.10.2013
NG 24	Consumption of NG at thermal furnace #17, TS	m <sup>3</sup>	IRVIS-RS4-Pp	13345	1 %	04.03.2010	04.03.2012
NG 25	Consumption of NG at thermal furnace #18, TS	m <sup>3</sup>	IRVIS-RS4-Pp	13346	1 %	04.03.2010	04.03.2012
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 <sup>3</sup>	Ergomera-126	867	0.1 %	20.09.2011	20.09.2013
NG 16	Consumption of NG at thermal furnace #37, FPS	m <sup>3</sup>	Ergomera-126	800	0.1 %	07.04.2011	07.04.2013
NG 22	Consumption of NG at thermal furnace #38, FPS	m <sup>3</sup>	Ergomera-126	834	0.1 %	25.08.2011	25.08.2013
NG FPS	Consumption of NG in FPS	m <sup>3</sup>	Ergomera-126	770	0.1 %	23.12.2010	23.12.2012
NG TS	Consumption of NG in TS	m <sup>3</sup>	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.

<b>ID of weighing machine</b>	<b>Measuring parameter</b>	<b>Work parameter</b>	<b>Type</b>	<b>Serial number</b>	<b>Level of accuracy</b>	<b>Date of last calibration</b>	<b>Date of next calibration</b>
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*	08.11.2011	08.11.2012

\* Level of accuracy equal to  $\pm 0.5\%$  of the maximum limit of weighing. The maximum limit of weighing equals to 200 tonnes.

*Table 4 List of weighting machines*



**B.1.3. Calibration procedures**

For Electricity Meters:

<b>Calibration procedures</b>	<b>Body responsible for calibration and certification</b>
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 <sup>9</sup>

For consumption meters

<b>Calibration procedures</b>	<b>Body responsible for calibration and certification</b>
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

<b>Calibration procedures</b>	<b>Body responsible for calibration and certification</b>
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

<b>Calibration procedures</b>	<b>Body responsible for calibration and certification</b>
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:

<b>Calibration procedures</b>	<b>Body responsible for calibration and certification</b>
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:

<b>Calibration procedures</b>	<b>Body responsible for calibration and certification</b>
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:

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

<sup>9</sup> [http://www.dssu.gov.ua/control/en/publish/article/main?art\\_id=87456&cat\\_id=87455](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:

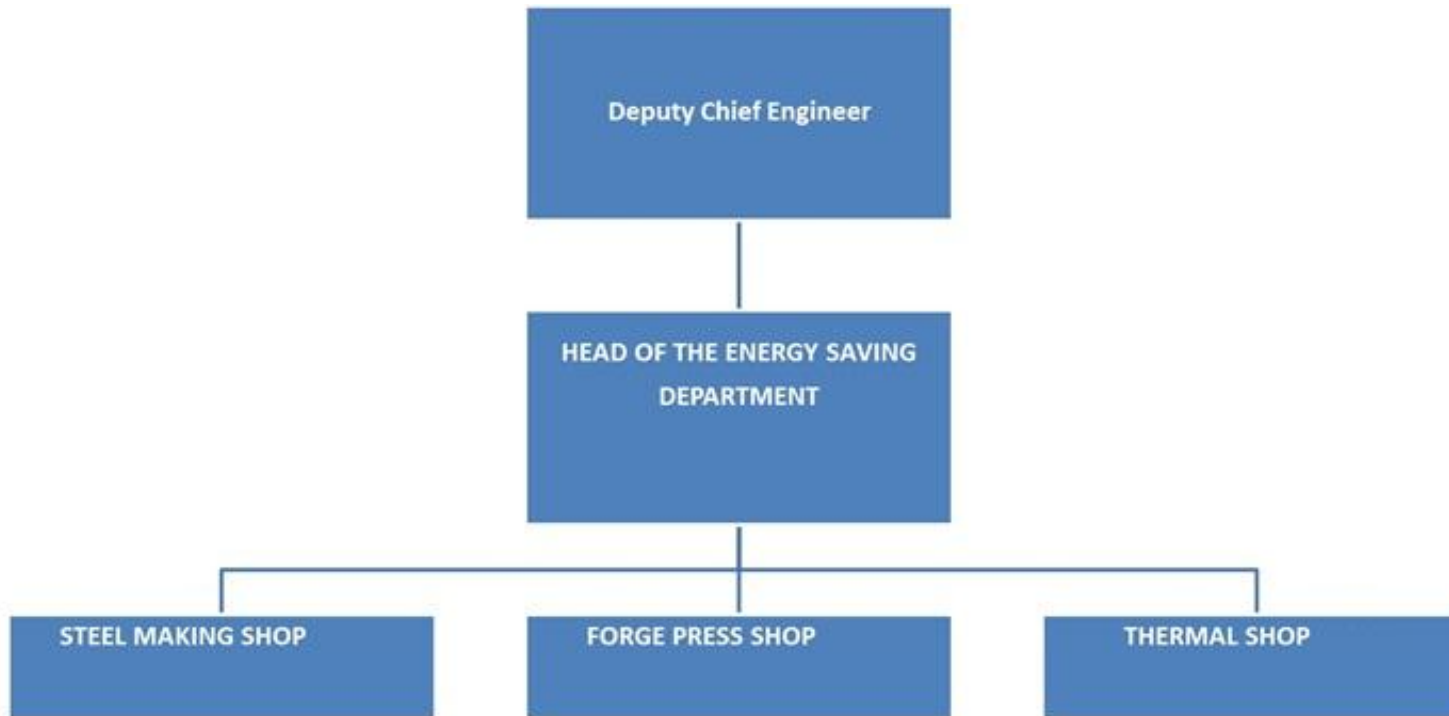


Figure 6 Operational and management structure

**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 <sub>2</sub> /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 1 <sup>st</sup> 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 <sup>10</sup>	tCO <sub>2</sub> /MWh**	1.090

\*56100 kgCO<sub>2</sub>/TJ = 0.0561 tCO<sub>2</sub>/GJ

\*\*kgCO<sub>2</sub>/kWh = tCO<sub>2</sub>/MWh

Table 5 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 <sub>2</sub> /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 1 <sup>st</sup> 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 <sup>11</sup>	tCO <sub>2</sub> /MWh**	1.090

\*98300 kgCO<sub>2</sub>/TJ = 0.0983 tCO<sub>2</sub>/GJ

\*\*kgCO<sub>2</sub>/kWh = tCO<sub>2</sub>/MWh

Table 6 Baseline fixed default values

<sup>10</sup> Order of National Environment Investment Agency #75 from 12.05.2011

<http://www.neia.gov.ua/nature/doccatalog/document?id=127498>

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Data variable	Source of data	Data unit	Value	Comments	
<i>SPNG<sub>tf</sub></i> the baseline ex-ante specific natural gas consumption of reconstructed furnaces	Baseline information	m <sup>3</sup> /t		See “ER calculation and Cash Flow Analysis” <sup>12</sup> and Sixth Periodic JI Monitoring Report version 3.0 from 17/12/2010 Annex 1 Table A-2 <sup>13</sup> and Eighth Periodic JI Monitoring Report version 3.0 from 01/06/2011 Annex 1 Table A-3 <sup>14</sup>	
			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
					694.4
					or
			thermal #01, FPS		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				
<i>SPH<sub>VD</sub></i> 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 <sup>15</sup> , Table A2.2	

<sup>12</sup> <http://ji.unfccc.int/UserManagement/FileStorage/VNIM9YQP8105W3D26EX4KSRL7TFUCO>

<sup>13</sup> <http://ji.unfccc.int/UserManagement/FileStorage/NM0A8W43PIDGOSQEJF7CRXY5H2LB6U>

<sup>14</sup> <http://ji.unfccc.int/UserManagement/FileStorage/BVIONHYJCFGQKTW42UZ7XS9135D06M>

<sup>15</sup> <http://ji.unfccc.int/UserManagement/FileStorage/0EV8XPG6L59ZO7RW3UQT1CNIBDY4FM>

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<i>SPEL<sub>VD</sub></i> baseline ex ante specific electrical consumption of the old VD	Baseline information	MWh/t	0.000028	See PDD, p. 3
<i>SPEL<sub>ES</sub></i> 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
<i>EL<sub>MOT</sub></i> 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 variables

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

Variable	Description	Unit	Value*			
			October	November	December	Total
<i>NG<sub>tf,i,8</sub></i>	Natural gas consumption at heating furnace #07,FPS	m <sup>3</sup>	211845	177315	174574	563734
<i>NG<sub>tf,i,7</sub></i>	Natural gas consumption at heating furnace #08,FPS	m <sup>3</sup>	133352	127445	148781	409578
<i>NG<sub>tf,i,6</sub></i>	Natural gas consumption at heating furnace #09,FPS	m <sup>3</sup>	0	178208	151413	329621
<i>NG<sub>tf,i,5</sub></i>	Natural gas consumption at heating furnace #10,FPS	m <sup>3</sup>	139112	49609	98931	287652
<i>NG<sub>tf,i,15</sub></i>	Natural gas consumption at heating furnace #33,FPS	m <sup>3</sup>	72485	78708	75906	227099
<i>NG<sub>tf,i,18</sub></i>	Natural gas consumption at heating furnace #34,FPS	m <sup>3</sup>	57115	58754	54894	170763
<i>NG<sub>tf,i,19</sub></i>	Natural gas consumption at heating furnace #35,FPS	m <sup>3</sup>	51414	66143	0	117557
<i>NG<sub>tf,i,20</sub></i>	Natural gas consumption at heating furnace #36,FPS	m <sup>3</sup>	49930	48379	21844	120153
<i>NG<sub>tf,i,22</sub></i>	Natural gas consumption at thermal furnace #01,FPS	m <sup>3</sup>	4261	64435	36632	105328
<i>NG<sub>tf,i,3</sub></i>	Natural gas consumption at thermal furnace #01,TS	m <sup>3</sup>	46850	11659	53371	111880
<i>NG<sub>tf,i,4</sub></i>	Natural gas consumption at thermal furnace #02,TS	m <sup>3</sup>	57308	39811	63074	160193
<i>NG<sub>tf,i,17</sub></i>	Natural gas consumption at thermal furnace #04,TS	m <sup>3</sup>	19933	28605	60012	108550
<i>NG<sub>tf,i,1</sub></i>	Natural gas consumption at thermal furnace #09,TS	m <sup>3</sup>	31277	38028	43843	113148
<i>NG<sub>tf,i,2</sub></i>	Natural gas consumption at thermal furnace #10,TS	m <sup>3</sup>	30371	36282	40239	106892
<i>NG<sub>tf,i,23</sub></i>	Natural gas consumption at thermal furnace #17,TS	m <sup>3</sup>	17951	18224	18219	54394
<i>NG<sub>tf,i,10</sub></i>	Natural gas consumption at thermal furnace #18,FPS	m <sup>3</sup>	39869	75819	69264	184952
<i>NG<sub>tf,i,24</sub></i>	Natural gas consumption at thermal furnace #18,TS	m <sup>3</sup>	19240	20846	26564	66650
<i>NG<sub>tf,i,11</sub></i>	Natural gas consumption at thermal furnace #19,FPS	m <sup>3</sup>	48738	78528	61985	189251
<i>NG<sub>tf,i,12</sub></i>	Natural gas consumption at thermal furnace #20,FPS	m <sup>3</sup>	64841	53067	52853	170761
<i>NG<sub>tf,i,9</sub></i>	Natural gas consumption at thermal furnace #30,FPS	m <sup>3</sup>	75956	65705	82882	224543
<i>NG<sub>tf,i,13</sub></i>	Natural gas consumption at thermal furnace #31,FPS	m <sup>3</sup>	60956	70116	75913	206985
<i>NG<sub>tf,i,14</sub></i>	Natural gas consumption at thermal furnace #32,FPS	m <sup>3</sup>	90207	88433	91010	269650
<i>NG<sub>tf,i,16</sub></i>	Natural gas consumption at thermal furnace #37,FPS	m <sup>3</sup>	14975	17802	18265	51042
<i>NG<sub>tf,i,21</sub></i>	Natural gas consumption at thermal furnace #38,FPS	m <sup>3</sup>	9861	12959	13784	36604
<i>EL<sub>VD,i</sub></i>	Electricity consumption by new vacuum system (VD)	MWh	10.204	13.436	10.465	34.105
<i>EL<sub>LF,i</sub></i>	Electricity consumption by LF	MWh	935.974	1309.677	1111.114	3356.765
<i>EL<sub>EAF,i</sub></i>	Electricity consumption by EAFs	MWh	4265.581	5384.213	5132.989	14782.783
<i>EL<sub>PR,i</sub></i>	Electricity consumption by the new pumps of the 15 000 tonnes press	MWh	170.011	175.718	156.580	502.309
<i>LCV<sub>NG,i</sub></i>	Lower calorific value of the natural gas**	GJ/1000 m <sup>3</sup>	33.95	35.76	33.78	-

\* 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			
			October	November	December	Total
PRST <sub>ff,i,8</sub>	Half finish products production at heating furnace #07,FPS	tonnes	2034.50	2221.20	2156.60	6412.30
PRST <sub>ff,i,7</sub>	Half finish products production at heating furnace #08,FPS	tonnes	1739.50	2117.40	1706.20	5563.10
PRST <sub>ff,i,6</sub>	Half finish products production at heating furnace #09,FPS	tonnes	0.00	1788.60	1240.30	3028.90
PRST <sub>ff,i,5</sub>	Half finish products production at heating furnace #10,FPS	tonnes	1475.60	733.40	1522.40	3731.40
PRST <sub>ff,i,15</sub>	Half finish products production at heating furnace #33,FPS	tonnes	743.66	752.53	582.20	2078.39
PRST <sub>ff,i,18</sub>	Half finish products production at heating furnace #34,FPS	tonnes	630.42	675.02	370.10	1675.54
PRST <sub>ff,i,19</sub>	Half finish products production at heating furnace #35,FPS	tonnes	588.80	637.70	0.00	1226.50
PRST <sub>ff,i,20</sub>	Half finish products production at heating furnace #36,FPS	tonnes	615.94	591.00	164.60	1371.54
PRST <sub>ff,i,22</sub>	Half finish products production at thermal furnace #01,FPS	tonnes	307.50	447.76	235.90	991.16
PRST <sub>ff,i,3</sub>	Half finish products production at thermal furnace #01,TS	tonnes	307.70	100.50	434.75	842.95
PRST <sub>ff,i,4</sub>	Half finish products production at thermal furnace #02,TS	tonnes	468.20	187.40	479.61	1135.21
PRST <sub>ff,i,17</sub>	Half finish products production at thermal furnace #04,TS	tonnes	356.62	322.95	557.00	1236.57
PRST <sub>ff,i,1</sub>	Half finish products production at thermal furnace #09,TS	tonnes	244.17	190.60	325.50	760.27
PRST <sub>ff,i,2</sub>	Half finish products production at thermal furnace #10,TS	tonnes	228.69	240.10	300.93	769.72
PRST <sub>ff,i,23</sub>	Half finish products production at thermal furnace #17,TS	tonnes	325.00	255.50	278.50	859.00
PRST <sub>ff,i,10</sub>	Half finish products production at thermal furnace #18,FPS	tonnes	314.40	854.91	894.18	2063.49
PRST <sub>ff,i,24</sub>	Half finish products production at thermal furnace #18,TS	tonnes	253.10	130.80	396.70	780.60
PRST <sub>ff,i,11</sub>	Half finish products production at thermal furnace #19,FPS	tonnes	467.76	1055.81	725.72	2249.29
PRST <sub>ff,i,12</sub>	Half finish products production at thermal furnace #20,FPS	tonnes	622.65	525.80	709.92	1858.37
PRST <sub>ff,i,9</sub>	Half finish products production at thermal furnace #30,FPS	tonnes	754.50	560.35	594.00	1908.85
PRST <sub>ff,i,13</sub>	Half finish products production at thermal furnace #31,FPS	tonnes	512.70	483.58	494.20	1490.48
PRST <sub>ff,i,14</sub>	Half finish products production at thermal furnace #32,FPS	tonnes	817.84	550.00	648.10	2015.94
PRST <sub>ff,i,16</sub>	Half finish products production at thermal furnace #37,FPS	tonnes	207.70	279.17	278.07	764.94
PRST <sub>ff,i,21</sub>	Half finish products production at thermal furnace #38,FPS	tonnes	116.25	112.79	193.60	422.64
PRVS <sub>VD,i</sub>	Vacuumed steel production at VD	tonnes	6128.960	8142.160	7982.455	22253.575
EB <sub>DHC,i</sub>	Efficiency of the steam boilers at the DHC*	%	81.70%	81.70%	81.70%	-
PRES <sub>i</sub>	Production volume of electro steel (at LF)	tonnes	7111.790	8740.444	8426.563	24278.797
T <sub>pp,i</sub>	Working hours of press	hours	313.75	308.67	306.75	929.17

\* 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 led 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. The 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

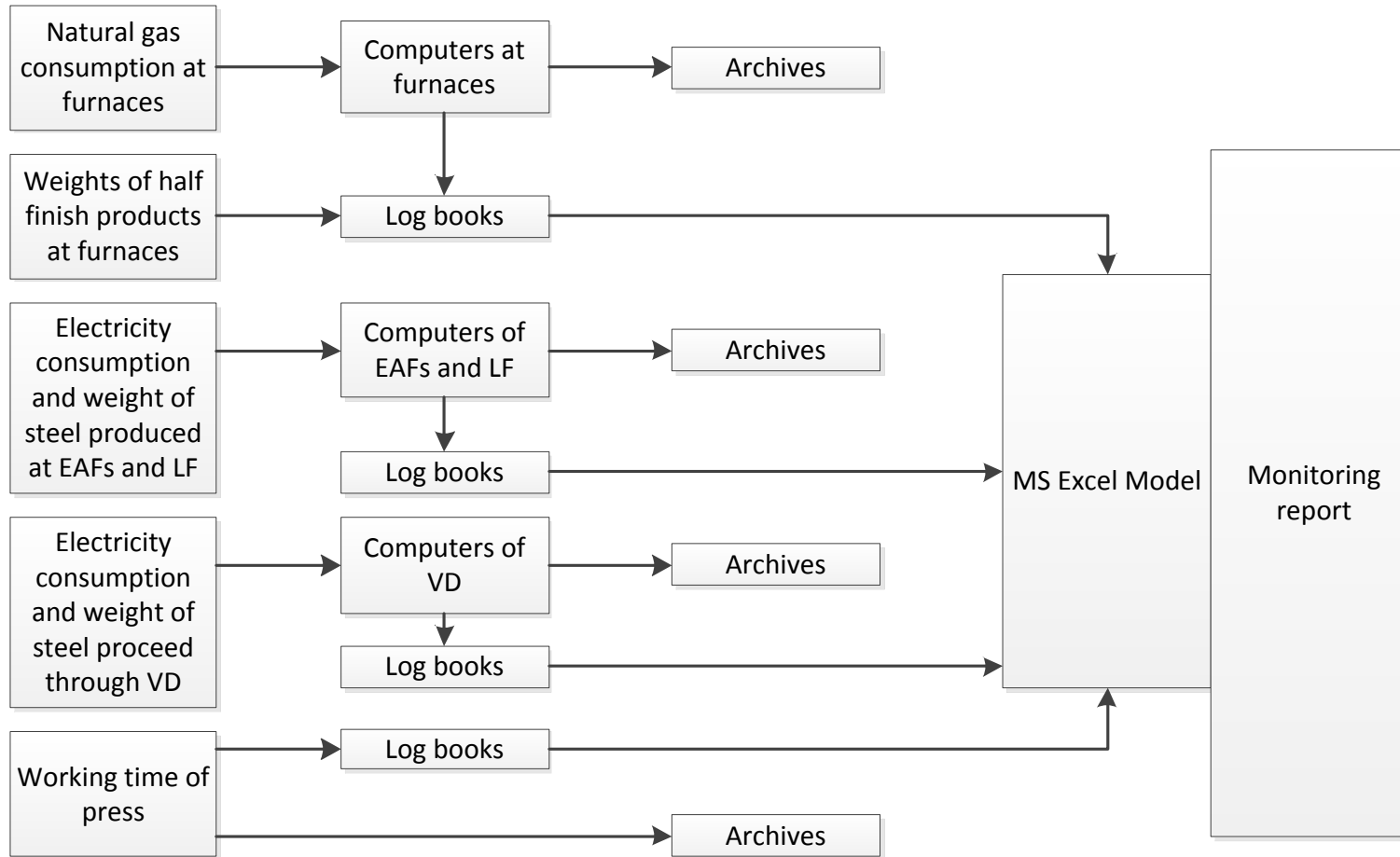


Figure 7: Data Processing Chart

**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<sub>2</sub> 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”
- OJSC “Donetskoblgas”
- SPE “Ukrgeoavtomatika”

**C.3. Internal audits and control measures:**

CO<sub>2</sub> 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<sub>2</sub> 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:

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

Where:

$PE_y$ - are the project emissions for the monitoring period, tCO<sub>2</sub>e;

$PE_{spl}$  - are the project emissions from each subproject, from SP1 to SP4, tCO<sub>2</sub>e.

Results of the emissions calculations are presented in metric tons of carbon dioxide equivalent (tCO<sub>2</sub>e), 1 metric ton of carbon dioxide equivalent is equal to 1 metric ton of carbon dioxide (tCO<sub>2</sub>), i.e. 1 tCO<sub>2</sub>e = 1 tCO<sub>2</sub>.

**The project emissions from SP1 are:**

$$PE_{sp1} = \sum_{i=1}^n \left( \sum_1^k NG_{tf,i} \times LCV_{NG,i} \times EF_{NG} \right) \tag{Equation 2}$$

Where:

$PE_{sp1}$  - is the sum of project emissions of subproject 1 from each month of the monitoring period, tCO<sub>2</sub>e;

$NG_{tf,i}$ - 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<sup>3</sup>;

$LCV_{NG,i}$ - 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<sup>3</sup>;

$EF_{NG}$ - is the emission factor of the NG burning process, tCO<sub>2</sub>/GJ.

**The project emissions from SP2 are:**

$$PE_{sp2} = \sum_{i=1}^n (EL_{VD,i} \times EF_{el,y}) \tag{Equation 3}$$

Where:

$PE_{sp2}$  - is the sum of project emissions of subproject 2 from each month of the monitoring period, tCO<sub>2</sub>e;

$EL_{VD,i}$  - 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 1<sup>st</sup> 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<sub>2</sub>/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<sub>2</sub>e;

$EL_{LF,i}$  - 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 1<sup>st</sup> 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<sub>2</sub>/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<sub>2</sub>e;

$EL_{PR,i}$  - 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 1<sup>st</sup> 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<sub>2</sub>/MWh.

Project emissions	tonnes of CO <sub>2</sub> equivalent
Subproject 1. Reconstruction of thermal and heating furnaces	8 495
Subproject 2. Installation of a new vacuum system	37
Subproject 3. Installation of an arc ladle furnace	19 772
Subproject 4. Modernization of press equipment	548
<b>Total</b>	<b>28 852</b>

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<sub>2</sub>e;

$BE_{spl}$  - are the baseline emissions from each subproject (from SP1 to SP4) at the monitoring period, tCO<sub>2</sub>e.

**The baseline emissions for SP1 are:**

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

(Equation 7)

Where:

$BE_{sp1}$  - is the sum of baseline emissions of subproject 1 from each month of the monitoring period, tCO<sub>2</sub>e;

$SPNG_{tf}$  - is the baseline ex-ante specific natural gas consumption of reconstructed furnaces at temperature 20 °C and pressure 101.325 kPa, 1000 m<sup>3</sup>/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<sup>3</sup>;

$EF_{NG}$  - is the emission factor of the NG burning process, tCO<sub>2</sub>/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<sub>2</sub>e;

$SPH_{VD}$  - 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<sub>2</sub>/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 1<sup>st</sup> 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<sub>2</sub>/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<sub>2</sub>e;

$SPEL_{ES}$  - 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 1<sup>st</sup> 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<sub>2</sub>/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<sub>2</sub>e;

$T_{pp,i}$  - 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 1<sup>st</sup> 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<sub>2</sub>/MWh.

<b>Baseline emissions</b>	<b>tonnes of CO<sub>2</sub> equivalent</b>
Subproject 1. Reconstruction of thermal and heating furnaces	59 423
Subproject 2. Installation of a new vacuum system	11 182
Subproject 3. Installation of an arc ladle furnace	27 258
Subproject 4. Modernization of press equipment	12 153
<b>Total</b>	<b>110 016</b>

*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:**

<b>Emission reductions</b>	<b>tonnes of CO<sub>2</sub> equivalent</b>
Subproject 1. Reconstruction of thermal and heating furnaces	50 928
Subproject 2. Installation of a new vacuum system	11 145
Subproject 3. Installation of an arc ladle furnace	7 486
Subproject 4. Modernization of press equipment	11 605
<b>Total</b>	<b>81 164</b>

*Table 13 Emission reductions for the monitoring period*



## Annex 1

### Definitions and acronyms

#### Acronyms and Abbreviations

<b>CH<sub>4</sub></b>	METHANE
<b>CO<sub>2</sub></b>	CARBON DIOXIDE
<b>GWP</b>	GLOBAL WARMING POTENTIAL
<b>IPCC</b>	INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE
<b>PDD</b>	PROJECT DESIGN DOCUMENT
<b>EMSS</b>	ENERGOMASHSPETSSTAL
<b>CHPP</b>	COMBINED HEAT AND POWER PLANT
<b>CDM</b>	CLEAN DEVELOPMENT MECHANISM
<b>FPS</b>	FORGE PRESS SHOP
<b>TS</b>	THERMAL SHOP
<b>UNFCCC</b>	UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE
<b>CD</b>	COMPACT DISC
<b>VD</b>	VACUUM DEGASSER
<b>LF</b>	LADLE FURNACE
<b>EAF</b>	ELECTRIC ARC FURNACE
<b>SMS</b>	STEEL MAKING SHOP
<b>CDU</b>	CLOSE DISTRIBUTION UNIT
<b>T</b>	TRANSFORMER
<b>AT</b>	AUTOTRANSFORMER
<b>IPCC</b>	INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE
<b>NG</b>	NATURAL GAS
<b>DHC</b>	DISTRICT HEATING AND COOLING

#### Definitions

<b>Baseline</b>	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.
<b>Emissions reductions</b>	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.
<b>Global Warming Potential (GWP)</b>	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.
<b>Greenhouse gas (GHG)</b>	A gas that contributes to climate change. The greenhouse gases included in the Kyoto Protocol are: carbon dioxide (CO <sub>2</sub> ), Methane (CH <sub>4</sub> ), Nitrous Oxide (N <sub>2</sub> O), Hydrofluorcarbons (HFCs), Perfluorcarbons (PFCs) and Sulphurhexafluoride (SF <sub>6</sub> ).

**Joint Implementation** Mechanism established under Article 6 of the Kyoto Protocol.  
**(JI)** 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).