

## **MONITORING REPORT OF JI PROJECT**

### **“Implementation of energy saving measures at PJSC “Lysychanskiy glass factory “Proletary”**

**Monitoring period:**  
01.07.2011–31.05.2012

**Version 02**  
**28.06.2012**

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Annex 3<sup>3</sup>. Accompanying document 3: “Types of metering equipment”

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<sup>1</sup> Annex 1 is given in Excel format as separate accompanying document “Calculation of GHG emission reductions due to Implementation of energy saving measures at PJSC “Lysychanskiy glass factory “Proletary”.

<sup>2</sup>Annex 2. is given WORD format as separate accompanying document “Determination of carbon dioxide emissions factor (CEF) during electricity consumption from national grid.”

<sup>3</sup>“Implementation of energy saving measures at PJSC “Lysychanskiy glass factory “Proletary”.

## SECTION A. General project activity and monitoring information

### A.1. Name of the project:

“Implementation of energy saving measures at PJSC “Lysychanskiy glass factory “Proletary”

Annex3. is given WORD format as separate accompanying document “Types of metering equipment”

### A.2. Information about registration and approval of the project:

The JI Project “**Implementation of energy saving measures at PJSC “Lysychanskiy glass factory “Proletary”**” was determined by Bureau Veritas Certification, the determination report № UKRAINE-DET/0292/2011 dated 05/08/2011. The project was approved by the State Environmental Investment Agency of Ukraine (Letter of Approval #2572/23/7 dated 15/09/2011) and the Federal Office for the Environment of Switzerland (FOEN, Letter of Approval # J294-0485 dated 25/07/2011).

### A.3. Brief description of the project:

The project’s purpose is to reduce anthropogenic gas emissions by using alternative energy resources in the course of company’s production activity and its modernization with the use of up-to-date technologies. Alternative energy resources include effluent furnace gases of glass-melting furnaces that are used for additional heat generation, which would be generated by old boilers in steam boiler-houses in case of the absence of the project. In addition, the project’s purpose is to reduce emissions of anthropogenic gases by company modernization, which provides for implementation of new technologies in the production of float glass, and results in reduction in energy use by reducing specific fuel and electricity consumption for production of a unit of output.

As a result of the use of alternative energy in the course of production activity of the company and modernization of the company with the use of modern technology at PJSC "Lysychanskiy glass factory “Proletary” the following emission reductions were achieved in relation to this project:

GHG emission reductions for the period of 01.07.2011–31.05.2012., tCO <sub>2e</sub>	90767
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### A.4. Monitoring period:

- Date of commencement: 01.07.2011
- Date of the end of monitoring: 31.05.2012

### A.5. Methodology applied to the project:

#### A.5.1. Baseline methodology:

The baseline for the JI project is established according to the requirements of Annex B to the Decision 9/CMP.1 (Guidelines for JI) and paragraphs 23-29, «Guidelines for baseline setting and monitoring<sup>4</sup>», elaborated by the Joint Implementation Supervisory committee (JISC) (hereinafter - "Guidelines"). According to the abovementioned Guidelines, the project participants may use approved Clean Development Mechanism (CDM) baseline and monitoring methodologies within (paragraph 9 (b)) or they may set the baseline according to the Annex B to JI Guidelines (paragraph 9 (a) of the Guidelines), using if necessary some elements or combinations of approved CDM baseline and monitoring methodologies (paragraph 11 of Guidelines).

<sup>4</sup>[http://ji.unfccc.int/Ref/Documents/Baseline\\_setting\\_and\\_monitoring.pdf](http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf)

The proposed project applies approved baseline setting and monitoring CDM methodology ACM0012. This methodology cannot be applied directly to glass production, but this methodology was thoroughly studied for identification of the basic principles for the approach to baseline setting, additionality and monitoring.

#### **Subproject No.1. Utilization of effluent furnace gases.**

Subproject activities refer to Sector 10 “Fugitive emissions from fuels (solid, oil and gas)” and Sector 1 “Energy industries (renewable - / non-renewable sources)”.

The proposed project applies specific approach for joint implementation projects relying on the baseline methodology of Clean Development Mechanism approved by the Executive Committee of United Nations Framework Convention on Climate Change:

- ACM0012 «Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects» version 3.2.<sup>5</sup>

GHG emissions included in the baseline scenario:

CO<sub>2</sub> emissions due to heat generation at boiler equipment of the company.

#### **Subproject No.2. Implementation of up-to-date line of float-glass production (production 2).**

Subproject activities refer to Sector 3 “Energy demand” and Sector 10 “Fugitive emissions from fuels (solid, oil and gas)”.

The proposed project applies specific approach for joint implementation projects. There are no methodologies applied for such type of subproject. Specific approach applied in the project enables to calculate greenhouse gas emission reductions due to modernization of glass production at PJSC “Lysychanskiy glass factory “Proletary” by replacement of old energy-consuming equipment with new, modern one, implementation of new glass production technologies.

GHG emissions included in the baseline scenario:

CO<sub>2</sub> emissions due to electric energy consumption by old production.

CO<sub>2</sub> emissions due to fuel combustion by old production.

#### **Subproject No.3. Modernization of existing production of the float-glass (production 1).**

Subproject activities refer to Sector 3 “Energy demand” and Sector 10 “Fugitive emissions from fuels (solid, oil and gas)”.

The proposed project applies specific approach for JI projects. There are no methodologies applied for such type of subproject. Specific approach applied in the project is the same as the one for the subproject #2.

GHG emissions included in the baseline scenario:

CO<sub>2</sub> emissions due to electric energy consumption by production before the rehabilitation.

CO<sub>2</sub> emissions due to fuel combustion by production before the rehabilitation.

#### **A.5.2. Monitoring methodology:**

In order to quantify and prepare reporting on greenhouse gas emission reductions based on the baseline and project activity the following monitoring methodologies, as indicated above, were used, with the clarification regarding the method of measuring of the amount of leakage, as provided in paragraph B.1 of the PDD version 2.0.

<sup>5</sup><http://cdm.unfccc.int/filestorage/0/M/4/0M4N9567GH1J7UAJ89YNO299KIMYSI/Consolidated%20baseline%20methodology%20for%20GHG%20emission%20reductions%20from%20waste%20energy%20recovery%20projects.pdf?t=N3d8bTZqMHJpfDAZbWVirNGea1kxM31ruKSS>

**Subproject No.1. Utilization of effluent furnace gases.**

The proposed project applies specific approach for joint implementation projects relying on the baseline methodology of Clean Development Mechanism approved by the Executive Committee of United Nations Framework Convention on Climate Change:

- ACM0012 «Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects» version 3.2.<sup>6</sup>

GHG emissions included in the baseline scenario:

CO<sub>2</sub> emissions due heat generation at boiler equipment of the company.

Project emissions are absent. HRSGs don't consume additional energy resources for heat generation.

**Subproject No.2. Implementation of up-to-date line of float-glass production (production 2).**

Project activities are aimed at reduction of GHG emissions caused by fossil fuel combustion and the use of electricity at the company due to modernization of float-glass line and decrease in fuel and electricity consumption.

The proposed project applies specific approach for joint implementation projects.

GHG emissions included in the baseline scenario:

CO<sub>2</sub> emissions due to electric energy consumption by old production.

CO<sub>2</sub> emissions due to fossil fuel combustion by old production.

GHG emissions included in the project scenario:

CO<sub>2</sub> emissions due to electric energy consumption by modernized production.

CO<sub>2</sub> emissions due to fuel combustion by modernized production.

**Subproject No.3. Modernization of existing production of the float-glass (production 1).**

Project activities are aimed at reduction of GHG emissions caused by fossil fuel combustion and the use of electricity at the company due to modernization of float-glass line and decrease in fuel and electricity consumption.

The proposed project applies specific approach for JI projects.

GHG emissions included in the baseline scenario:

CO<sub>2</sub> emissions due to electric energy consumption by production before the rehabilitation.

CO<sub>2</sub> emissions due to fuel combustion by production before the rehabilitation.

GHG emissions included in the project scenario:

CO<sub>2</sub> emissions due to electric energy consumption by the production after rehabilitation.

CO<sub>2</sub> emissions due to fuel combustion by the production after rehabilitation.

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<sup>6</sup><http://cdm.unfccc.int/filestorage/0/M/4/0M4N9567GH1J7UAJ89YNO299K1MYSI/Consolidated%20baseline%20methodology%20for%20GHG%20emission%20reductions%20from%20waste%20energy%20recovery%20projects.pdf?t=N3d8bTZqMHJpfDAZbWWirNGea1kxM31ruKSS>

The uncertainty of the method of measurement is taken into account in the calculation of greenhouse gas emission reductions (see Section D of the PDD version 2.0).

#### **A.6. Status of implementation including project milestones:**

##### **Subproject No.1. Utilization of effluent furnace gases.**

The project provides for installation of HRSGs at production 2 (workshop 2-2). Two water-heating HRSGs of KUV-EM-2,1-0,6 type with capacity of one water-heating HRSG equal to 2,1 MW (fume gases after glass furnace are used) were installed in the workshop № 2-2 (production 2). Temperature of heat carrier in the heating system is -85-900 C and 55-650C for hot water supply. Gas with the temperature of 420°C and in the quantity of 20000 m<sup>3</sup>/hour is extracted to the common retention gas pipe. In HRSGs the water is heated up to the temperature of 105°C for own needs of production. Then the fume gases are extracted by smoke exhauster to the chimney with the height of 80 m. Height of the pipe is calculated based on conditions of harmful emissions dispersion in atmospheric air. The HRSGs are the heat exchangers of pipe-in-pipe type. The HRSGs utilize heat of combustion products of glass furnaces. Quantity of utilized furnace gases depends on production volume. Quantity of generated steam (for production 2 – heat) is measured by the meters.

Installation of HRSG after glass-melting furnace of workshop #2-2 took place in 2008.



Figure 1. HRSG

##### **Subproject No.2. Implementation of up-to-date line of float-glass production (production 2).**

Implementation of the project finished by the commissioning by the State Commission on 12/04/2008. Project activity involves reduction of electric energy and natural gas consumption by introducing modern production line, which consumes less energy resources . Reducing electric energy consumption required for the manufacturing process, will lead to reduction of fossil fuel consumption for electricity generation in the network, reducing of natural gas consumption will also lead to greenhouse gas emissions reduction. The newest production line of float glass has the following components:

1. Workshop 2.2 for the production of sheet glass with units and equipment - building area is 10721 m<sup>2</sup> Building volume is 1600035 m<sup>3</sup>. Production capacity is 350 tons of welded glass a day.
2. Workshop 2.2 – Station of protective atmospheres with units and equipment - building area is 2592 m<sup>2</sup> Building volume is 18663 m<sup>3</sup>
3. Conveyor of batch feed with units and equipment of workshop № 2-1
4. Inner site electrical networks and constructions
5. External power supply
6. Drainage system

7. External gas supply network
8. Internal gas supply networks with GDP
9. Reverse water supply networks of workshop 2-24 SZA
10. Reverse water supply networks of workshop 2-2
11. Inner site technological and energy pipelines and estocades
12. Utility and fireproof water supply and utility household drainage networks with DPP
13. Diesel generator of reverse water supply to the workshop № 2-24 SZA
14. Turbine boiler.
15. Power substation 110 / 6 kV.
16. Buildings and automobile and weight structures.
17. Buildings and railroad and weight structures.



Fig. 1. Workshop 2-2 equipment



Fig. 2. Conveyor of glass sheet.



Fig. 3. Equipment of glass quality control



Fig. 4. Tin bath



Fig. 5. Glass furnace.

**Subproject No.3. Modernization of existing production of the float-glass (production 1). In the part of workshop 3 took place from 2009 to 2010**

Subproject involves reduction unit costs of electric energy and natural gas due to the reconstruction of existing facilities: use of new burner models, changing geometrical sizes of furnaces and using of frequency controllers at shop electrical equipment, introduction of molten glass additional electric heating. Reducing unit costs will lead to decrease of electric energy used from network and reducing of natural gas consumption would reduce greenhouse gas emissions. In addition, the project will provide additional benefits such as economic efficiency, labour protection and incentive to start similar projects in other industrial enterprises of Ukraine.

In the course of reconstruction of the workshop # 3 the following measures were implemented:

1. The changes in the structure of furnace were made. This led to a decrease in heat losses in the production process.
2. Gas burners were replaced with modern ones produced by «Flamma Tec». Burners produced by «Flamma Tec» allow for fine adjustment of the use of natural gas, have a torch with the exact geometric



shape that allows for optimum heating of the surface of molten glass, adjustment of the speed of gas supply, control of parameters of gas mixing with air.



Fig. 6. Batch feeder assembly at the furnace in workshop № 3.

The schedule of the abovementioned measures is given in Table 1.

Table 1. Project implementation status

	Name of stage	Date of Start	Date of completion
1.	<b>Subproject No.1. Utilization of furnace effluent gases.</b>		
	The water-heating HRSGs after glass furnace in the workshop №2-2 were installed	01/01/2008	04/12/2008
2.	<b>Subproject No.2. Implementation of up-to-date line of float-glass production (production 2).</b>		
	The up-to-date workshop (line) for production of large-size float-glass was installed and commissioned	01/01/2008	04/12/2008
3.	<b>Subproject № 3. Modernization of existing float – glass production (production 1).</b>		

	The furnace walls using high-fireproof materials were installed	01/02/2009	01/11/2010
	The volumes of regenerator filling were increased	01/02/2009	01/11/2010
	The new constructions of burners were installed, the port mouths were expanded	01/02/2009	01/11/2010
	The insulation of bottom and walls was reinforced and the pool depth was decreased	01/02/2009	01/11/2010
	The automated system of electricity consumption commercial accounting (ASECCA) and commercial recording of electric energy were implemented	01/02/2009	01/11/2010
	The frequency converters in blow fans of glass furnace of the workshops No. 3 were installed	01/02/2009	01/11/2010

**A.7. Deviations from or change of registered PDD:**

No deviations from the registered version of the PDD were registered.

**A.8. Deviations from or changes of the registered monitoring plan:**

There aren't any deviations from the registered monitoring plan.

**A.9. Persons responsible for preparation and submitting of the monitoring report:**

The monitoring report was prepared by VEMA S.A., the project developer, and PJSC "Lysychanskiy glass factory "Proletary", supplier of the project.

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**SECTION B. Key monitoring activities**

Control and monitoring of the system is reduced to measuring of the consumption of electricity, natural gas heat output. Other parameters are obtained by calculation or from the statistics.

Measures for control of electric energy consumed by PJSC «Lysychanskiy glass factory “Proletary”:

1. Current control of electric energy meters operation is conducted during settlement period (settlement month is determined by the conditions of the contract of electric energy supply);
2. On the day stipulated by the contract (as a rule it is 00 hours 00 minutes on the 1st day of month following the settlement month) the chief of site or his authorized representative takes the readings of electric energy meters (electric energy meters are the devices, that passed state certification and are registered under the contractual conditions and jointly sealed by the representatives of power supplying organization and PJSC «Lysychanskiy glass factory “Proletary” subject to execution of act of sealing). The head of site transfers obtained information to the chief power engineer department.
3. “Report of electric energy meters readings” is executed according to the readings of electric energy meters of all sites; the engineer involved in electric energy bills provides this Report to the subscriber department of energy supplying organization;
4. Following the “Report of electric energy meters readings” subscriber department of energy supplying organization executes “Act of supplied electric energy”, approved by the company’s round seal and transfers such act to the department of PJSC «Lysychanskiy glass factory “Proletary” for confirmation.
5. The representative of PJSC «Lysychanskiy glass factory “Proletary” provide approved “Act of supplied electric energy” to the subscriber department of energy supplying organization, wherein it obtains invoices for payment.
6. All bills for payment are kept in the archive of PJSC «Lysychanskiy glass factory “Proletary” in paper form.

Measures for control of natural gas consumed by PJSC «Lysychanskiy glass factory “Proletary”:

1. Current control of gas meters operation is conducted during a year with fixation on meters of gas consumption;
2. Every month the responsible officer of site takes the readings of natural gas meters (natural gas meters are the devices that passed state certification and are registered under the contractual conditions and jointly sealed by the representatives of gas supplying organization and PJSC «Lysychanskiy glass factory “Proletary” subject to execution of act of sealing). The head of site transfers obtained information to the chief power engineer department and economic planning department.
3. In calculations data of natural gas calorific capacity from the national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2009<sup>7</sup> are used due to the fact that data of calorific capacity provided by the gas supplier are not regular and have low reliability

Measures for control of manufactured output by PJSC «Lysychanskiy glass factory “Proletary”:

1. Readings are taken on a shift basis and fixed in logbooks of established form.

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<sup>7</sup><http://www.neia.gov.ua/nature/doccatalog/document?id=126931>

**Subproject No.1. Utilization of effluent furnace gases.****Verification of the indicators of the project implementation**

PJSC “Lysychanskiy glass factory “Proletary” collects and keeps the data relating to the volumes of heat (steam) according to the data of meters. All this information is attached to the monitoring reports with all corresponding documents and historical information about heat generation by HRSGs.

**Verification of the emission reduction units and baseline scenario**

Monitoring plan for this project was elaborated by JI specific approach.

Project emissions are determined in the following way:

- project emissions are equal to zero, since the HRSGs don't consume additional energy resources.

Baseline emissions are determined in the following way:

- emissions due to combustion of natural gas in the course of heat generation, equivalent to heat generated by the boiler-utilizer.
- baseline emissions shall be monitored and calculated continuously on the basis of data of meters.

**Subproject № 2. Implementation of up-to-date line of float-glass production (production 2).****Verification of the indicators of the project implementation**

PJSC “Lysychanskiy glass factory “Proletary” collects and keeps the data relating to electric energy/natural gas consumption, production output and standard specific losses of energy carriers. Information about electric energy/natural gas consumption, production output and standard specific losses of energy carriers is attached to the monitoring reports with all corresponding documents and historical information about electric energy and natural gas purchase.

**Verification of the emission reduction units and baseline scenario**

Monitoring plan for this project was elaborated by JI specific approach.

Project emissions are determined in the following way:

- project emissions due to natural gas combustion by modernized up-to-date furnace;
- project emissions due to consumption of electric energy by modernized up-to-date furnace.

Baseline emissions are determined in the following way:

- baseline emissions due to combustion of natural gas by old furnace;
- baseline emissions due to consumption of electric energy by old furnace.

**Subproject No. 3. Modernization of existing production of the float-glass (production 1)****Verification of the indicators of the project implementation**

PJSC “Lysychanskiy glass factory “Proletary” collects and keeps the data relating to electric energy/natural gas consumption, production output and standard specific losses of energy carriers. Information about electric energy/natural gas consumption, production output and standard specific losses of energy carriers is attached to the monitoring reports with all corresponding documents and historical information about electric energy and natural gas purchase.

**Verification of the emission reduction units and baseline scenario**

Monitoring plan for this project was elaborated by using a JI specific approach.

Project emissions are determined in the following way:

- project emissions due to natural gas combustion by rehabilitated furnace;
- project emissions due to consumption of electric energy by rehabilitated furnace.

Baseline emissions are determined in the following way:

- baseline emissions due to combustion of natural gas by furnace before rehabilitation;
- baseline emissions due to consumption of electric energy by furnace before rehabilitation.

### **B.1. 1 Information about equipment used:**

To measure electricity, natural gas and heat consumption meters are used; they are listed in the Supporting document 3.

### **B.1.2. Calibration procedure**

According to the existing legislation "On metrology and metrological activity"<sup>8</sup> all metering equipment in Ukraine shall conform to stated requirements of corresponding standards and be calibrated periodically. Calibration of metering equipment is carried out according to the national standards and legislative requirements as well as regulatory documents.

Heat meter:

Type	Calibration frequency
Supersonic, manufactured by PF "Rodnik-YuT"	2 years

Gas meter:

Type	Calibration frequency
Vortex, produced by EMERSON	2 years

Electricity meter:

Type	Calibration frequency
CO – 2 M	8 years
A 1200	10 years
A 1000	6 years
A 1200	10 years
SO-2M2	8 years
SO-I446	8 years
SA4U-196	5 years
ALFA A	10 years

### **B.1.3. Involvement of third parties**

Calibration of electricity and heat meters is held SE "Lysychanskstandartmetrology". Calibration of natural gas meters is carried out by SE "Kharkivstandarteolohiya" and NPP "Ukrgezgeoavtomatyka" Ltd.

## **B.2. Data collection (consolidated data for the whole monitoring period).**

### **B.2.1. The management structure to ensure the project operator has implemented the monitoring plan.**

The coordination of all departments and services of PJSC "Lysychanskiy glass factory "Proletary" relating to the project implementation, is carried out by a specially created Working group. Detailed

<sup>8</sup> <http://zakon1.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1765-15>

operational structure of management and determination of the parameters that are controlled is given below.

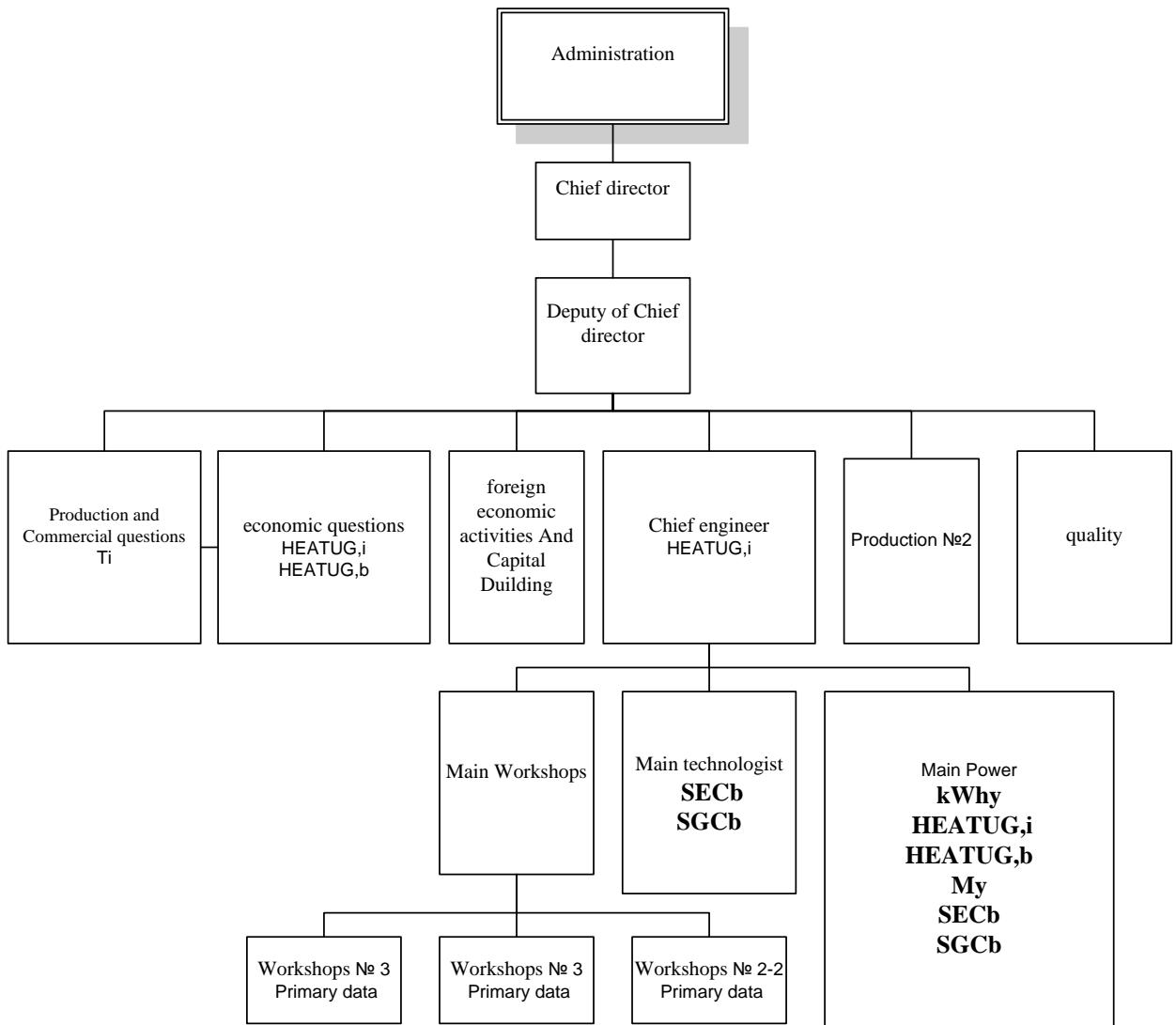


Figure 8. The operational structure of management and information collection (monitoring parameters, described in section B.2.2. in this monitoring)

Overall project management is carried out by the Deputy Chairman by controlling and coordinating the actions of his subordinates, such as, the chief power engineer, the chief engineer, chief technologist, heads of workshops. Daily management at sites is carried out by heads of workshops, who appoint two operators responsible for the operation of technological equipment. The company employs a factory electrician. In the daytime, team of engineers responsible for prevention and service of all process equipment, measuring equipment and automation and teleautomatics means works at the company. Information is transferred on-line to the chief of the shift in the central office of the enterprise. The company operates 24 hours a day. There are three shifts; each of them works for eight hours.

On the main facilities, the responsibility is distributed as follows:

- Workshop operator controls data;
- Two company dispatchers control the data and parameters of a work process, the use of gas and electricity, every day manually keep logs of gas and electricity consumed by workshops.
- Operators of substation controls data of electricity transmitted from the network, and inner consumption of electricity.

All information is transmitted to the company dispatching service, and controlled in an on-line mode by shift dispatcher. Based on information provided by the dispatching service monitoring engineer prepares monthly and annual monitoring reports of electricity, gas, heat and GHG emissions and gives them to the chief power engineer and deputy of chief power engineer. Overall supervision of the monitoring system is carried out by the administration of the enterprise, according to the current system of monitoring and reporting.

**B.2.2. List of parameters used for calculations:**

When making calculations the parameters listed below are used.

**The data collected for monitoring emissions from the project**

<b>Data/Parameter</b>	<b>CEF<sub>y</sub></b>
Data unit	t CO <sub>2</sub> e/MWh
Description	Specific indirect carbon dioxide emissions from power consumption by electric energy consumers in the period “y”
Time of <u>determination/monitoring</u>	Once in period
Source of data (to be) used	Orders of the National Environmental Investment Agency of Ukraine “On approval specific parameters of carbon dioxide in 2011” from 12/05/2011 № 75 <sup>9</sup>
Value of data applied (for ex ante calculations/determinations)	Provided in in Supporting document 2
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Approved calculation methodology
QA/QC procedures (to be) applied	N/a
Any comment	Information is kept in paper and electronic forms.

<b>Data/Parameter</b>	<b>kWh<sub>2</sub></b>
Data unit	ths MWh
Description	Total quantity of electric energy consumed for glass production in period “y”
Time of <u>determination/monitoring</u>	On a shift basis/Monthly
Source of data (to be) used	Data of electricity meters
Value of data applied (for ex ante calculations/determinations)	Provided in in Supporting document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Electricity meters
QA/QC procedures (to be) applied	Equipment is calibrated and verified in accordance with the quality management procedures. Current maintenance is conducted according to the technical specifications.
Any comment	Information is kept in paper and electronic forms.

<b>Data/Parameter</b>	<b>LHV<sub>y</sub></b>
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<sup>9</sup><http://document.ua/pro-zatverdzhennja-pokaznikiv-pitomih-vikidiv-dvookisu-vugle-doc65115.html>

Data unit	TDj/th <sub>s</sub> nm <sup>3</sup>
Description	Lower heat value of natural gas in project period “y”
Frequency of measurement / monitoring	Once in baseline year
Source of data (to be) used	Data from the National inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases in the Ukraine in 2009
Value of data applied (for ex ante calculations/determinations)	Provided in in Supporting document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	N/A
Any comment	

<b>Data/Parameter</b>	<b>M<sup>3</sup><sub>3,y</sub></b>
Data unit	Ths nm <sup>3</sup>
Description	The total amount of natural gas consumption ( ths. m <sup>3</sup> ) need for production of output at manufacturing №1 under sub-project number 3 by each furnace in year “y”
Frequency of measurement / monitoring	Monthly
Source of data (to be) used	Data of meters
Value of data applied (for ex ante calculations/determinations)	Provided in in Supporting document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	Equipment is calibrated and verified in accordance with the quality management procedures. Current maintenance is conducted according to the technical specifications.
Any comment	Information is kept in paper and electronic forms

<b>Data/Parameter</b>	<b>HEAT<sub>1,y</sub></b>
Data unit	GJ(t/year)
Description	Volume of heat generated under the project № 1 due to fume gases utilization in period “y”
Time of determination/monitoring	Daily / Monthly
Source of data (to be) used	Heat meters
Value of data applied (for ex ante calculations/determinations)	Provided in in Supporting document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A



QA/QC procedures (to be) applied	Equipment is calibrated and verified in accordance with the quality management procedures. Current maintenance is conducted according to the technical specifications.
Any comment	Volume of heat generated under the project is one of the most important data allowing for calculation of GHG emissions

<b>Data/Parameter</b>	<b>EF<sub>heat,y</sub></b>
Data unit	t CO <sub>2</sub> /GJ
Description	CO <sub>2</sub> emission factor for heat in the baseline scenario in year y
Time of determination/monitoring	Once, at the beginning of the project
Source of data (to be) used	Intergovernmental Panel on Climate Change, IPCC, 2006 Volume 2, Table 2.2, page 2.17 <sup>10</sup>
Value of data applied (for ex ante calculations/determinations)	56.1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Default factor
QA/QC procedures (to be) applied	IPCC <sup>3</sup> is a reliable source of information
Any comment	

<b>Data/Parameter</b>	<b>EF<sub>ng,y</sub></b>
Data unit	t CO <sub>2</sub> /TJ
Description	CO <sub>2</sub> emission factor for natural gas combustion for the period “y”
Time of determination/monitoring	Once, at the beginning of the project
Source of data (to be) used	Intergovernmental Panel on Climate Change, IPCC, 2006 Volume 2, Table 2.2, page 2.17 <sup>3</sup>
Value of data applied (for ex ante calculations/determinations)	56.1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	IPCC <sup>3</sup> is a reliable source of information
Any comment	

<b>Data/Parameter</b>	<b>T<sub>y</sub></b>
Data unit	tons
Description	Total output in project year y
Time of determination/monitoring	On a shift basis/ one time in a period
Source of data (to be) used	Production report
Value of data applied	Provided in in Supporting document 1

<sup>10</sup> <http://unfccc.int/2860.php/>

(for ex ante calculations/determinations)	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculation
QA/QC procedures (to be) applied	The products are manufactured by means of computer-based system subject to given parameters, checked by personnel and converted to necessary dimensions by the responsible department of the company
Any comment	Information is kept in paper and electronic forms

**The data that were collected to determine baseline anthropogenic emissions of greenhouse gases by sources in the project boundary:**

<b>Data/Parameter</b>	<b>SEC<sub>b</sub></b>
Data unit	ths. kWh / tonne
Description	Specific consumption of electrical energy per tonne of production in the baseline year
Time of <u>determination/monitoring</u>	Once in baseline year
Source of data (to be) used	PJSC «Lysychanskiy glass factory “Proletary”
Value of data applied (for ex ante calculations/determinations)	Provided in in Supporting document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	Equipment is calibrated and verified in accordance with the quality management procedures. Current maintenance is conducted according to the technical specifications.
Any comment	Information is kept in paper and electronic forms

<b>Data/Parameter</b>	<b>SGC<sub>b</sub></b>
Data unit	ths nm <sup>3</sup> / tonne
Description	Specific gas consumption for glass production in baseline year
Time of <u>determination/monitoring</u>	Once in baseline year
Source of data (to be) used	PJSC «Lysychanskiy glass factory “Proletary”
Value of data applied (for ex ante calculations/determinations)	Provided in in Supporting document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	Equipment is calibrated and verified in accordance with the quality management procedures. Current maintenance is conducted according to the technical specifications.
Any comment	Information is kept in paper and electronic forms

<b>Data/Parameter</b>	<b>LHV<sub>b</sub></b>
Data unit	TJ/ths.Nm <sup>3</sup>

Description	Lower heating value of natural gas in year y
Time of determination/monitoring	Once in baseline year
Source of data (to be) used	The national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 2009
Value of data applied (for ex ante calculations/determinations)	Provided in in Supporting document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	N/A
Any comment	

**B.2.3. Data related to leakage:**

There are no leakages under the project.

**B.3. Data processing and archiving**

The person responsible for the joint implementation project appointed by the project’s owner monitors data in electronic and paper form. Electronic documents shall be printed and stored. All data and documents in paper form were archived and one backup copy was transferred to project’s coordinator. All data will be kept during 2 years after the project activities termination. Every month (at the beginning of the month) information from the database is transferred to solid medium and stored on two servers. Also, daily logbooks of electricity, gas, output accounting are kept.

**B.4. Emergency situations and technological breakdowns.**

There were no emergency situations at PJSC “Lysychanskiy glass factory “Proletary” in the monitoring period.

**B.5. Procedures for detection and liquidation of malfunctions and emergency situations at PJSC “Lysychanskiy glass factory “Proletary”:**

Detection, liquidation and registration of malfunctions and emergency situations at PJSC “Lysychanskiy glass factory “Proletary” equipment is carried out in accordance with registered Standards, Rules and departmental instructions that are effective in Ukraine. In case of equipment breakdown the operator informs the head of a workshop about this. If the problem can not be eliminated right away, a commission of 6-7 people, consisting of representatives of the technical department, a chief engineer, chief maintenance man, a head of the shift and leading engineers. Depending on the type of failure deficiency or emergency certificate is executed and repair of equipment is carried out.

**B.6. External data (type, source, access)**

The only type of external data used in the monitoring of GHG emissions at PJSC “Lysychanskiy glass factory “Proletary” this specific indirect carbon dioxide emissions during power consumption by consumers of electricity production. Other external data for monitoring of emissions under the project are not used.

**B.7. Error level of metering equipment**

Error level is determined for each type of metering equipment. Level of deviation of electric energy metering devices is within 0.5-2.5% range as specified in the Supporting document 3. Level of deviations of gas metering devices is meters is within 0.5-1.3% range as specified in the Supporting document 3. Level of deviations of generated heat metering devices is meters is within 1.3-4% range as specified in the Supporting document 3.

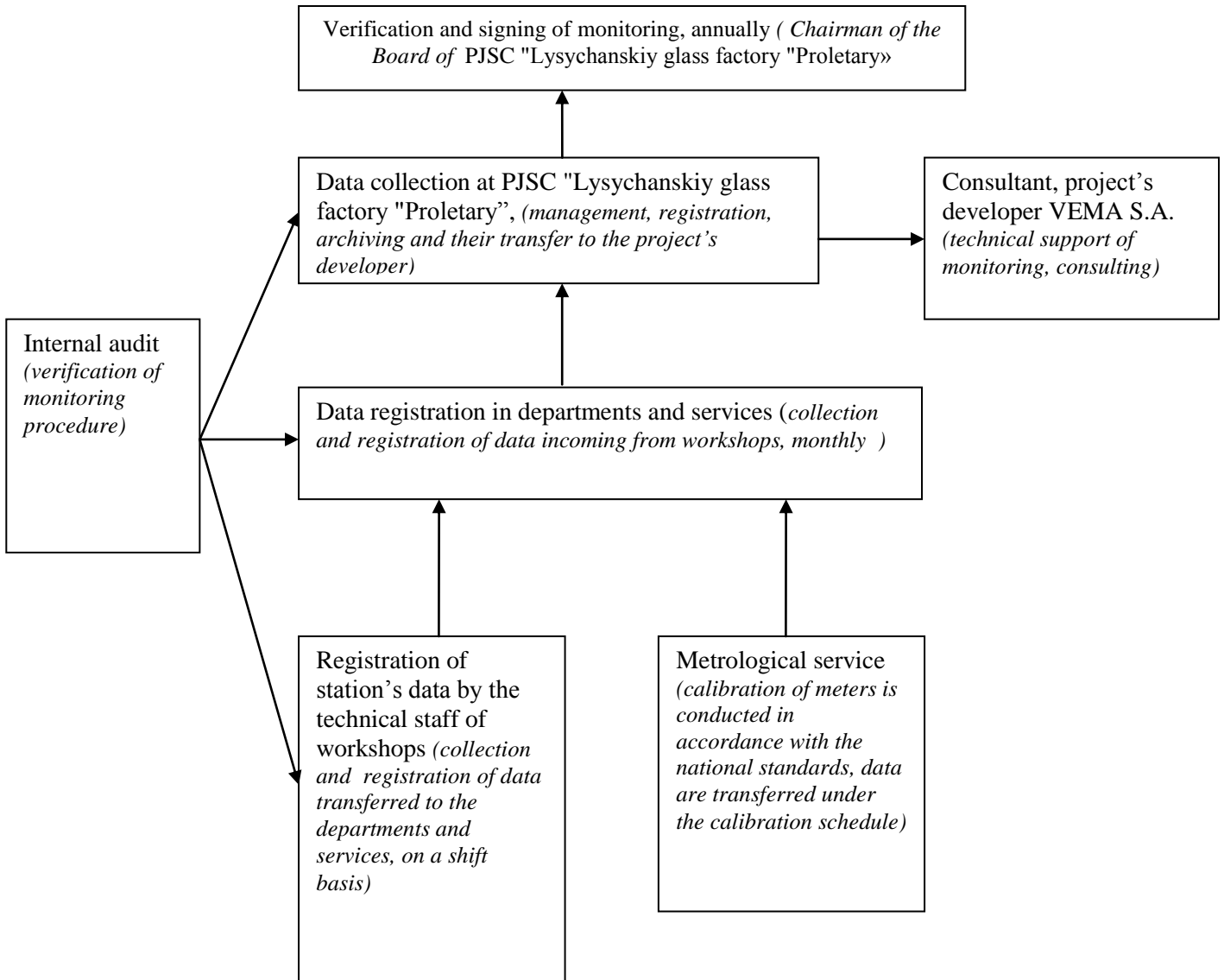
Permissible error level of stated measurements in relation to which adjustment is not made in subsequent calculations is regulated.

**SECTION C. Quality assurance and quality control measures**

**C.1. Documented procedures and management structure**

**C.1.1. Roles and responsibilities**

Structure of monitoring data collection is the following:



Project management is carried out by the Deputy Chairman - Drozhzhyn D.M. He manages and coordinates activities of all departments. A specially created working group is responsible for collecting and processing of the parameters. Structure of data collection and Project management is provided in Section B.2.1. of this monitoring report.

**C.1.2. Trainings:**

Employees of VEMA S.A. will consult the employees responsible for monitoring elaboration at PJSC “Lysychanskiy glass factory “Proletary” before the start of the project activity and during project period.

Since the principal activities of PJSC “Lysychanskiy glass factory “Proletary” are not changed when implementing the Joint Implementation (JI) project, special trainings for personnel are not necessary. Technical personnel of the enterprise possesses necessary knowledge and experience for implementation of the project and repair of ordinary equipment.

In the monitoring period repair routine works and modernization of energy saving equipment were carried out at PJSC “Lysychanskiy glass factory “Proletary”.

PJSC “Lysychanskiy glass factory “Proletary” retrains the personnel according to the requirements of Norms of labour protection. The enterprise has the Labour Protection Department responsible for professional development and trainings of the personnel.

## **C.2. Internal audits and control measures:**

Under the guidance of a specially created working group of PJSC “Lysychanskiy glass factory “Proletary” a group for conducting measurements of all necessary parameters of the monitoring plan was formed.

Personnel of PJSC “Lysychanskiy glass factory “Proletary” is liable to periodic examination of requirements knowledge:

- collection of data according to the monitoring report (the collection of data under the monitoring coincides with the usual practice of data collection used for payment for consumed electricity and gas as well as generated heat);
- labour protection;
- accident prevention during the work.

Each quarter, the developers of the project «VEMA S.A.» conduct internal audits at PJSC “Lysychanskiy glass factory “Proletary”.

The plan of internal audit at PJSC “Lysychanskiy glass factory “Proletary” includes the following measures:

1. Verification of electric energy log books;
2. Verification of gas consumption log books;
3. Verification of electricity meters calibration terms;
4. Verification of gas meters calibration terms.

In the absence of access to the electronic database the data from paper media (logbooks, etc.) will be used. All operators are responsible for data management. All appropriate data are accumulated daily, and archived in electronic and paper forms. All data will be stored till 2020. In addition, operators prepare standardized daily, weekly, monthly and annual reports.

### **Responsibilities**

- Operators monitor and prepare the data and transmit them to the dispatching service, every day they manually keep the logbooks of gas, electricity accounting etc.
- Dispatcher and deputy of chief power engineer of the company control the data, the parameters of the working process and the use of gas and electricity, every day they manually keep the logbooks.

Based on information provided by the dispatching service the monitoring engineer prepares monthly and annual monitoring reports of electricity, gas, heat and emissions and gives them to the Director. Overall supervision of the monitoring system is carried out by the management of the enterprise according to the existing control system.

Current repair of measuring devices of PJSC “Lysychanskiy glass factory “Proletary” is held once a year, maintenance - once every six months.

Detailed description of the measuring devices is included in the Supporting documents 3.

## **C.3. Data related to environmental and social effect:**

All project activities are carried out in accordance with the existing environmental legislation of Ukraine. Pursuant to the Ukrainian legislation “On environment protection”<sup>11</sup> and “Structure and contents of the materials for Environmental Impact Assessment (EIA) in the course of projecting and building companies, buildings and constructions”<sup>12</sup> the PJSC “Lysychanskiy glass factory “Proletary” is not obliged to conduct Environmental Impact Assessment for such type of projects. Inventorying of polluting substances is carried out with the assistance of third-party certified company that conducts selection and analysis of pollutants samples by own calibrated equipment.

The only impact on environment is dismantled equipment, which will be utilized as secondary raw material in the future.

Transboundary impacts from the project activity according to their definition in the text of “Convention on transboundary long-range pollution”, ratified by Ukraine, will not take place.

The project implementation does not provide for any harmful environmental impacts.

During the construction of Production # 2 the project design document was subject to the environmental review (EIA) in accordance with applicable law.

According to the current environmental protection legislation the PJSC “Lysychanskiy glass factory “Proletary” shall perform monitoring and submit annual reports on pollution emissions (nitrogen dioxide, sulphur anhydride, carbon monoxide, dust, etc.). Therefore the company has in place and employs the environmental monitoring procedures. Environmental Engineer is responsible for control and collection of relevant data, preparation of quarterly reports. Annual report is submitted to the Ministry of Environment. Monitoring the environmental protection effectiveness of the project will be conducted within established procedures. Monitoring data will be included in the annual report of environmental protection measures of PJSC “Lysychanskiy glass factory “Proletary”.

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<sup>11</sup> <http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1264-12>

<sup>12</sup> <http://www.budinfo.com.ua/dbn/8.htm>

**SECTION D. Calculation of GHG emission reductions**

**D.1. Project emissions**

**Subproject No.1. Utilization of effluent furnace gases.**

Project emissions under the subproject include the emissions due to

- (1) combustion of backup fuel in addition to utilized heat,
- (2) emissions due to electric energy because of consumption of electric energy used for heat generation and other additional needs

$$PE_{1,y} = PE_{1,AFy} + PE_{1,EL,y} \tag{1}$$

$PE_{1,y}$  – project emissions due to Subproject No.1. implementation ,

$PE_{1,AFy}$ -emissions due to combustion of backup fuel in addition to heat utilized under Subproject No.1.

$PE_{1,EL,y}$ -emissions due to consumption of electric energy used for heat generation and other additional needs under Subproject No.1.

Due to the fact that utilization of effluent furnace gases does require neither additional fuel nor additional electric energy

$$PE_y = 0$$

[y] - refers to monitoring period;

[1] - refers to the sub-project 1;

**Subproject No.2. Implementation of up-to-date line of float-glass production (production 2).**

$$PE_{2,y} = PE_{2,elec,y} + PE_{2,fuel,y} \tag{2}$$

where:

$PE_{2,y}$  Emissions under the subproject No.2 in year y (tCO<sub>2</sub>e);

$PE_{2,elec,y}$  Emissions under the subproject No.2 due to electric energy consumption in year y (tCO<sub>2</sub>e);

$PE_{2,fuel,y}$  Emissions under the subproject No.2 due to natural gas consumption in year y (tCO<sub>2</sub>e).

$$PE_{2,elec,y} = kWh_{2,y} * EF_y \tag{3}$$

where

$kWh_{2,y}$  – total volume of electric energy necessary for production output at production 2 under Subproject No.2 for the period y, MWh;

$CEF_y$  - specific indirect carbon dioxide emissions from power consumption by electric energy consumers in the period “y” (tCO<sub>2</sub>e/MWh).

$$PE_{2,fuel,y} = M^3_{2,y} * LHV_y * EF_{ng} \tag{4}$$

where  $LHV_y$  – lowest heating value of natural gas in project year y (TJ/th<sub>s</sub> m<sup>3</sup>);

$EF_{ng}$  - CO<sub>2</sub> emission factor due to natural gas combustion (tCO<sub>2e</sub>/TJ);

$M^3_{2,y}$  - total volume of natural gas consumption (th<sub>s</sub> m<sup>3</sup>), necessary for production output in year y at production 2 under Subproject No.2.

[y] - refers to monitoring period;

[2] - refers to the sub-project 2;

**Subproject No.3. Modernization of existing production of the float-glass (production 1)**

$$PE_{3,y} = PE_{3,elec,y} + PE_{3,fuel,y} \tag{5}$$

where:

$PE_{3,y}$  Emissions under the subproject № 3 in year y (tCO<sub>2</sub>e)



PE<sub>3,elec,y</sub> Emissions under the subproject № 3 due to electric energy consumption in year y (tCO<sub>2e</sub>)  
 PE<sub>3,fuel,y</sub> Emissions under the subproject № 3 due to natural gas consumption in year y (tCO<sub>2e</sub>)

$$PE_{3,elec,y} = kWh_{3,y} * EF_y \tag{6}$$

where

kWh<sub>3,y</sub> – total volume of electric energy necessary for production output at production 1 under Subproject No.3 by each furnace in year “y”, kWh

CEF<sub>y</sub> - specific indirect carbon dioxide emissions from power consumption by electric energy consumers in the period “y” (tCO<sub>2e</sub>/MWh).

$$PE_{3,fuel,y} = M^3_{3,y} * LHV_y * EF_{ng,y} \tag{7}$$

Where

LHV<sub>y</sub> – lowest heating value of natural gas in project period y (TJ/th. nm<sup>3</sup>)

EF<sub>ng,y</sub> - CO<sub>2</sub> emission factor due to natural gas combustion for the period “y” (tCO<sub>2e</sub>/TJ)

M<sup>3</sup><sub>3,y</sub> - total volume of natural gas consumption (th. m<sup>3</sup>), necessary for production output in year “y” at production 1 under Subproject No.3 by each furnace.

[y] - refers to monitoring period;

[3] - refers to the sub-project 2;

Emissions that occur after the implementation of measures, set forth in the project are provided in table 2.

Period		01.07.2011–31.05.2012
Project GHG emissions under subproject № 1, tCO <sub>2e</sub>		0
Project GHG emissions under subproject № 2, tCO <sub>2e</sub>		69930
Project GHG emissions under subproject № 3, tCO <sub>2e</sub>		68596
Total		138526

## D.2. Baseline emissions

### Subproject No.1. Utilization of furnace effluent gases.

$$BE_{1,y} = BE_{1,MR,y} + BE_{1,Use,y} \tag{8}$$

where:

BE<sub>1,y</sub> Baseline emissions in period “y” under Subproject No.1 (tCO<sub>2</sub>)

BE<sub>1,MR,y</sub> Baseline emissions due to combustion of fossil fuel, fume gases of which are utilized in the course of project activities for the period “y” under Subproject No.1 (tCO<sub>2</sub>)

BE<sub>1,Use,y</sub> Baseline emissions due to generation of heat, substituted in the course of project activities in year under Subproject No.1 (tCO<sub>2</sub>)

BE<sub>1,MR,y</sub> are the same both in the baseline and project scenarios, they are related to glass furnaces operation and will be taken into account in subprojects 2 and 3.

$$BE_{1,Use,y} = HEAT_{1,y} * EF_{heat,y} \tag{9}$$

where:

$HEAT_{1,y}$  – Volume of heat generated under the subproject #1 due to furnace gases utilization in period “y” under Subproject No.1 , GJ  
 $EF_{heat,y}$  – emissions factor for heat in the baseline scenario in year y (tCO<sub>2</sub>/GJ).

Because of the fact of use of dynamic baseline  $HEAT_{UG,b,y}$  is the amount of heat that will be utilized in year y of the project and it will be equal to  $HEAT_{UG,y}$ .

[y] - refers to monitoring period;

[1] - refers to the sub-project 1;

**Subproject No.2. Implementation of up-to-date line of float-glass production (production 2).**

$$BE_{2,y} = T_{2,y} \times (SECB_2 \times EF_y + SGCB_2 \times LHV_{b,y} \times EF_{ng,y}) \quad (10)$$

where

$BE_{2,y}$  - Baseline emissions in period y (tCO<sub>2e</sub>) in production (2) under Subproject No.2

$CEF_y$  - specific indirect carbon dioxide emissions from power consumption by electric energy consumers in the period “y” (tCO<sub>2e</sub>/MWh).

$EF_y$  - CO<sub>2</sub> emission factor for the national power grid of Ukraine in year y (tCO<sub>2e</sub>/MWh)

$LHV_{b,y}$  – lower heating value of natural gas in year “y” (TJ/thm<sup>3</sup>);

$EF_{ng}$  - CO<sub>2</sub> emission factor due to natural gas combustion (tCO<sub>2eq</sub>/TJ);

**SECB<sub>2</sub>** -Specific consumption of electrical energy per tonne of production in the baseline year in production 2 under Subproject No.2

**SGCB<sub>2</sub>** - Total quantity of gas consumed per ton of production in the baseline year in production 2 under Subproject No.2

[y] - refers to monitoring period;

[2] - refers to the sub-project 2;

**Subproject No.3. Modernization of existing production of the float-glass (production 1)**

$$BE_{3,y} = T_{3,y} \times (SECB_3 \times EF_y + SGCB_3 \times LHV_{b,y} \times EF_{ng,y}) \quad (11)$$

where

$BE_{3,y}$  - Baseline emissions in year y (tCO<sub>2e</sub>) in production 1, under Subproject No.3

$T_{3,y}$  – project volume of production output in year y (t) in production 1 under Subproject No.3;

$CEF_y$  - specific indirect carbon dioxide emissions from power consumption by electric energy consumers in the period “y” (tCO<sub>2e</sub>/MWh).

$LHV_{b,y}$  – lower heating value of natural gas in year y (TJ/thm<sup>3</sup>);

$EF_{ng}$  - CO<sub>2</sub> emission factor due to natural gas combustion (tCO<sub>2eq</sub>/TJ);

**SECB<sub>3</sub>** -Specific consumption of electrical energy per tonne of production in the baseline year in production 1 under Subproject No.3

**SGCB<sub>3</sub>** - Total quantity of gas consumed per ton of production in the baseline year in production 1 under Subproject No.3

[y] - refers to monitoring period;

[3] - refers to the sub-project 3;

Emissions that will occur if reconstruction measures are not implemented are provided in table 4.

Period	01.07.2011 - 31.05.2012
Baseline GHG emissions under subproject № 1, tCO <sub>2e</sub>	3221

Baseline GHG emissions under subproject № 2, tCO <sub>2e</sub>	105076
Baseline GHG emissions under subproject № 3, tCO <sub>2e</sub>	120996
Total	229293

Table 3 Baseline emissions tCO<sub>2e</sub>q

**D.3. Leakage**

There is no leakage under the project.

**D.4. Emission reductions due to the JI project implementation in the monitoring period of 01.07.2011 - 31.05.2012**

GHG emission reductions in project are estimated as the difference between the baseline and the project emissions:

$$RE_i = BE_{1,i} + BE_{2,i} + BE_{3,i} - (PE_{1,i} + PE_{2,i} + PE_{3,i}) \quad (12)$$

RE<sub>i</sub> GHG emission reduction in year i, t CO<sub>2e</sub>;

BE<sub>1,i</sub>- baseline emissions under the subproject No. 1 in year “i”, t CO<sub>2e</sub>.

BE<sub>2,i</sub>- baseline emissions under the subproject No. 2, t CO<sub>2e</sub>.

BE<sub>3,i</sub>- baseline emissions under the subproject No. 3, t CO<sub>2e</sub>.

PE<sub>1,i</sub>- project emissions under the subproject No. 1, t CO<sub>2e</sub>.

PE<sub>2,i</sub>- project emissions under the subproject No. 2, t CO<sub>2e</sub>.

PE<sub>3,i</sub>- project emissions under the subproject No. 3, t CO<sub>2e</sub>

[y] - refers to monitoring period;

[1] refers to the sub-project 1;

[2] refers to the sub-project 2;

[3] - refers to the sub-project 3;

Table 4 contains emission reductions for the period of 01.07.2011 - 31.05.2012 as a result of the project implementation.

Table 4. Emission reductions tCO<sub>2e</sub>.

Period	01.07.2011 - 31.05.2012
GHG emission reductions under subproject № 1, tCO <sub>2e</sub>	3221
GHG emission reductions under subproject № 2, tCO <sub>2e</sub>	35146
GHG emission reductions under subproject № 3, tCO <sub>2e</sub> .	52400
Total	90767