JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM (JI PDD)
Version 01 - in effect as of: June 15, 2006.

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

«Implementation of energy saving measures at PJSC "Lysychanskiy glass factory "Proletary".

Sectors of application:

1. Sector 1. - Energy industries (renewable - / non-renewable energy sources)
2. Sector 3. - Energy demand
3. Sector 10. Fugitive emissions from fuels (solid, oil and gas)

Version of Project Design Document: 2. 0

Date: 14/07/2011.

A.2. Description of the project:

Purpose of the project.

The project's purpose is to reduce anthropogenic emissions by using alternative energy resources in the course of company's production activity and its modernization using up-to-date technologies. Alternative energy resources include effluent furnace gases of glass-melting furnaces are used for additional heat generation, which would be generated by old boilers in steam boiler-houses in case of project's absence. In addition, the project's purpose is to reduce emissions of anthropogenic emissions by company modernization, which provides introducing 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.

Description of the enterprise: Public Joint Stock Company "Lysychanskiy glass factory "Proletary" was established according to the resolution of the founders-individuals (members of work collective of state-owned company "State Glass Factory "Proletary" of the Order of the Red Banner of Labor") as of 12.06.2001 for participation in lease of state-owned property, privatization and further business activities.

The Company is the successor of the state company State Glass Factory "Proletary" of the Order of the Red Banner of Labor" due to reorganization of state company by joining to the Company on the ground of the decree of the Ukrainian State Corporation of building materials industry "Ukrbudmaterialy" № 60 as of 31.08.2001.

Before the project implementation the company used horizontal glass-tempering furnaces of LZAS-500 type. Plant's production capacities make it possible to manufacture at 3 float-lines over 42 ths sq.m. of high-quality glass of M1-M4, M7 brand (according to the State Standards 111-90) 3-10 mm in thickness and dimension: 1600 x 1300; 2100 x 1600; 2400 x 1600; 2600 x 1600; 3210 x 2000 mm.

Description of the project implementation conditions.

A project activity is divided into the following subprojects:

Subproject No.1. Utilization of effluent furnace gases. Owing to furnace gases utilization such heat is generated, for production of which fossil fuel (natural gas) would be applied in case of project activities absence.

Subproject No.2. Implementation of up-to-date line of float-glass production (production 2). The activities provide for decrease of electric energy and natural gas consumption owing to implementation of the up-to-date production line consuming less energy resources. Decrease of electric energy consumption in the course of production process will lead to decrease of fossil fuel consumption for electric energy generation within the network, as well as decrease of natural gas consumption will also result in GHG emission reduction.

Subproject No.3. Modernization of existing production of the float-glass (production 1). Subproject provides for decrease of specific power and natural gas consumption owing to rehabilitation of functioning capacities: use of up-to-date models of burners, change of furnace geometry, application of frequency regulators on electrical equipment of the workshops and introduction of electrical heating of glass melts. Decrease in specific consumption will result in decrease in electric power consumption and natural gas utilization resulting in reduction of GHG emissions. In addition the project will ensure additional benefits, for example, economic efficiency, labor protection, and stimulus for introduction of similar projects at other industrial companies of Ukraine.

In case of absence of the Joint Implementation Project (JI)

Subproject No.1. Utilization of furnace effluent gases.

In case of project activities absence fossil fuel (natural gas) would be applied for heat generation.

Subproject No.2. Implementation of up-to-date line of float-glass production (production 2). In case of project activities absence old furnaces, consuming more energy resources (electric energy, natural gas) per unit of manufactured products would be applied.

Subproject No.3. Modernization of existing production of the float-glass (production 1). In case of project activities absence old technology and equipment would be applied, consuming more energy resources per unit of manufactured products, which results in larger consumption of fossil fuel for electric energy production and increase in natural gas consumption.

Thus the baseline scenario is "business as usual" – the scenario providing for implementation of minimal repair against the background of total degradation of the company's equipment. There are no barriers for implementation of this Baseline scenario (there are no investment barriers since this scenario doesn't require involvement of additional investments; there are no technological barriers, since this equipment is operated by skilled personnel and there is no need to conduct additional retraining). This scenario reflects customary practice in Ukraine.

Historical data of the project

19.02.2002 - Vema S.A. sent a commercial proposition concerning JI project implementation

11.03.2002 - the Manager issued a decree for creation of the work team for JI project implementation

18.05.2002 - PJSC «Lysychanskiy glass factory "Proletary" published an application about the intentions of joint implementation project (newspaper "Delovaya nedelya" as of 18.05.2002)

04.12.2008 - "Act of state acceptance commission about putting into operation of completed built objects of the production unit No. 2 of PJSC «Lysychanskiy glass factory "Proletary" was signed.

13.10.2010 Signing of the contract (ERPA) on cooperation between the PJSC «Lysychanskiy glass factory "Proletary" and Vema S.A.

04.05.2010 Obtaining of the Letter of Endorsement for JI project support by PJSC «Lysychanskiy glass factory "Proletary"

The project may promote sustainable development of PJSC "Lysychanskiy glass factory "Proletary" in the following aspects:

- decrease of the national economy's dependence on import of energy resources and increase of energy security of the country;
- improvement of the quality of manufactured products;
- high indicators of labor protection and health;
- improvement of the world environmental condition (counteraction in response to global climate change by reduction of CO_2 emissions into atmosphere).

A.3. Project participants:

Party involved	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Ukraine (Host Party)	• PPJSC "Lysychanskiy glass factory "Proletary"	No
Switzerland	"VEMA S.A."	No

A.4. Technical description of the project:

A.4.1. Location of the project:

The JI Project is located in Lugansk region, East of Ukraine **(Figure 1).**

Figure. 1. Location of PJSC «Lysychanskiy glass factory "Proletary" on a map of Ukraine.

A.4.1.1. Host Party(ies):

The project is located in Ukraine.

Ukraine is an Eastern European country that ratified the Kyoto Protocol to UN FCCC on February 4, 2004, and is listed in the Annex 1 and eligible for the Joint Implementation projects.

A.4.1.2. Region/State/Province etc.:

Lugansk region is situated in the eastern part of Ukraine. Its area is 26.7 ths. km^2 The region borders with Donetsk and Kharkiv regions. There is a state border with Russian Federation in the North and East of Lugansk region. Administrative center is Lugansk city.

A.4.1.3. City/Town/Community etc.:

Lysychansk is the city of regional subordination in Lugansk region of Ukraine, center of the territory, subordinated to Lysychansk City Council; it is one of the oldest cities of Donbass and large-scale industrial center.

Lysychansk is situated in the wester part of Lugansk region on the right bank of the Siverskyy Donets river, 90 kilometers away from Lugansk. Lugansk region is situated in the eastern part of Ukraine. City of Lysychansk is surrounded by the territory of Popasnyanskyy district of Lugansk region. There is the Bilenka river on the territory of the city, which length is 18 km within the city. The peak is 217 m. The city's area is 94,64 km². As of 01.04.2010 106,211 ths. of people of present population is registered in the city.

City of Lysychansk is located in the zone of continental climate of steppe zone of Ukraine. Average annual temperature: in summer: +21°C, in winter -7°C. Average annual amount of precipitations is 495-505 mm.
Lysychansk city, towns and villages of Lugansk region (Figure 2).

Figure 2. Map of Lugansk region

A.4.1.4. Detail of physical location, including information allowing the unique identification of the project (maximum one page):

PJSC «Lysychanskiy glass factory "Proletary" is located at the address: 1, Michurina Str., city of Lysychansk, Lugansk region, 93110, Ukraine.
Company's coordinates were established in the course of site visit by means of GPS-navigator (global positioning system).
Coordinates of PJSC «Lysychanskiy glass factory "Proletary" located in Lugansk region – Figure 3 and its external view – Figure 4:

Figure 3. PJSC «Lysychanskiy glass factory "Proletary" - 48° 56' 25.75" SL 38° 23' 57.71" EL

Figure 4. PJSC «Lysychanskiy glass factory "Proletary" - external view.

A.4.2. Technology(ies) to be employed, or measures, operations or actions to be implemented by the project:

PJSC «Lysychanskiy glass factory "Proletary" produces sheet float glass.
Term "float" simultaneously applies both for sheet glass and method of its production.

• Float-glass is the raw glass applied for manufacturing of almost all flat glass products. It may be transparent or colored and is manufactured in the form of large-size sheets (6 x 3,21 m), intended for subsequent processing.
• The basic principle of float-process is that the production of sheet and flat glass of any desired thickness as a continuous tape is carried out by pouring out molten glass from glass furnace into the adjacent tank containing the molten material having specific weight less than glass. As a result glass mass spreads and in the form of continuous tape floats across the surface of molten metal, then is removed from it and goes to the annealing furnace.

Subproject No.1. Utilization of effluent furnace gases
The project provides for installation of HRSGs at production 2 (workshop 2-2). The workshop № 2-2 (production 2) will be equipped with 2 KUV-EM-2,1-0,6 water-heating HRSGs with capacity of 2,1 MW (fume gases after glass furnace are applied). Temperature of heat carrier in the heating system is -85-90^0 C and 55-65^{0}C for hot water supply. Gas with the temperature of 420°C and in the quantity of 20000 m^3/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. Quantity of utilized furnace gases depends on production volume. Quantity of generated steam (for production 2 – heat) is measured by the meters.

Installation of the boiler-heat utilizer after furnace № 2-2 workshop was held in 2008.

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

The stated below technology will be implemented at new production 2:
Workshop (line) for production of large-size float-glass contains the following areas:
- tunnel for mixture supply and cullet.
- melting area;
- formation area;
- fritting and cutting area;
Scheme of technological process of float-glass manufacturing is given in Figure 5.

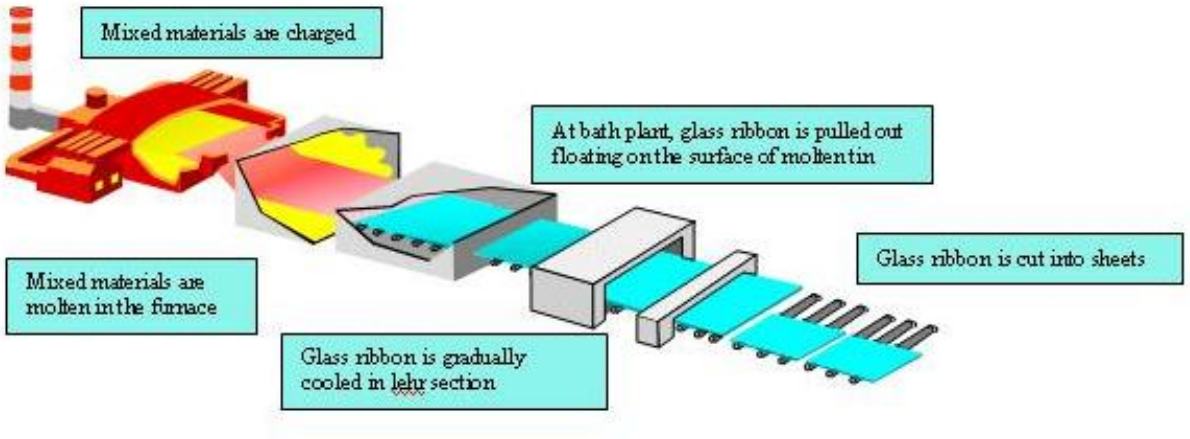


Figure 5. Scheme of technological process of float-glass manufacturing

Prepared material is transported from mixture workshop by conveyor belt through the feeding section to the melting section.

Weighted cullet evenly disperses on the layer of material, and then the mixture is transported evenly to feeding bunker by reverse conveyor belt. There are two loaders under the feeding bunkers for even mixture feeding, which push the mixture to the furnace. Loaders are blocked by a level meter and the glass mass level is regulated automatically. Thickness of layer and speed of pushing are controlled. Mixture loaders can work both in the set mode and a continuous regime. Back wall of loading pocket has L-shaped suspension screen with the function of preliminary melting of mixture and isolation (sealing) of loading pocket. Fuel for the furnace is natural gas. Natural gas and combustion air are automatically regulated subject to given proportion. Combustion air is reversed in the manifold pipe, and the quantity of air in the branch pipe is regulated manually. Effluent gas is reversed in the main chimney. The pressure in the melting zone is automatically adjusted. Furnaces have a television monitoring system for tracking of the operational mode of the furnace and mixture loading (flares and foam line), the furnace temperature is controlled by the computer system. Furnaces have a horizontal mixer and deep water coolers in the pinch to improve the quality and homogeneity of molten glass. Furnaces are equipped with microsystem for regulation of cooling air supply to the glass mass in melting zone in order to control temperature of glass mass in channel and maintain micro-residual pressure of internal space of cooled part. Mixture becomes glass mass after melting, and then glass mass flows to the melt pool after fining in the melting zone, averaging and cooling. The channel has preventive and regulating gates and system for automatic regulation for stabilization of ribbon flow width.

The interior of the melting pool is filled with nitrogen and hydrogen to prevent oxidation of molten tin. Glass mass under the influence of its gravity spreads about the molten tin, and then the glass ribbon is formed according to the width and thickness by mechanical stretching and regulation by refining devices, and the ribbon is removed from the molten pool after its gradual cooling. Ribbon of glass moves to the annealing lehr by means of lift-out rolls. The temperature of the glass ribbon at this stage is about 600 ° C. On both sides and in front of molten pool the industrial television receivers are installed in order to control operation mode of ribbon and operation of the equipment in molten pool for mechanical regulation of technological data and stabilization of production process. Glass ribbon incoming the annealing lehr is subjected to the heating by even distribution of heat, crystallization and fast cooling with certain temperature curve for decrease of internal tension of ribbon created in the process of formation and cooling. Internal tension must reach necessary value according to the cutting and quality requirements. Then the glass ribbon moves to the cutting area with temperatures of about 70 ° C. After leaving lehr the ribbon of glass moves to the preliminary sorting section. Faulty glass produced in the course of formation and annealing, after cutting and separation gets in system of cullet return. For quality glass the operation of cutting and chipping of ribbon edges will be made automatically by a computer

transmission of signal about speed of extraction and measurement of length. Chipped glass sheet moves to the separating shaft - accelerator and then it comes to mode of edge breaking off. The sheet with broken edges shall pass along the edge and longitudinal separating device, while the faulty glass will go to the system of cullet return.
After blowing of the surface from small fragments, the sheet of qualitative glass comes to packaging. Forklift transport the packed glass to a warehouse of finished products. At the final stage the finished products are taken away from the factory.
Crusher for small and large crushing is located in the section of cutting and separating of edges. Crushed glass is broken to 50 mm pieces, then it is supplied to the first conveyor belt through the charging chute, afterwards the second conveyor belt transports crushed glass from the workshop. In the course of normal production the third conveyor delivers crushed glass directly to the intermediate tank where, after weighing it gets to the fourth conveyor belt and then is transported directly to the furnace, and discharged on the conveyor belt to the melting section. In case of abnormal production the crushed glass is transported back to the bunker of crushed glass by elevator. From there it can be transported to the third conveyor for unloading to the oven, or taken away by autoloaders to the section for crushed glass. From there, crushed glass can be delivered to a special pit and through the third tray is loaded to the conveyor for delivery to the intermediate tank.
Technological equipment, included in the float-line production:

Glass Furnace with capacity of 350 tons / day.
Type Furnace - bath furnace with cross flares, five pairs of port mouths to reduce energy consumption and improve the quality of the glass. Fuel for the furnace is natural gas. In order to extend the life of the furnace it was designed under advanced technology with an enhanced insulation and stability. Technology of complete insulation is applied in the furnace's case in order to achieve high efficiency and energy saving.

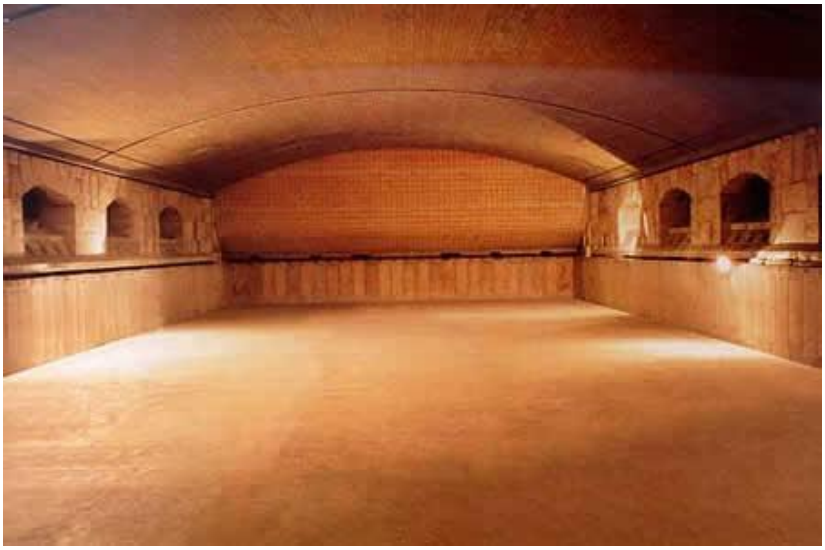


Fig. 6. General view from inside the furnace in the melt zone
Control of the furnace operation is executed under the following parameters:
- The level of glass mass is adjusted automatically;
- Pressure in the zone of melting is automatically adjusted;
- Regulation of combustion system: air for combustion comes back to the manifold pipe and regulation in the manifolds is executed manually. Effluent gas returns to the general chimney. Dispersion of fuel is regulated according to the proportion;
- Flame reverse is adjusted automatically;
- Availability of industrial television receiver at front wall of melting zone in order to trace the technological regime of the furnace.

Molten pool with the capacity of 350 tons / day.
The technology of complete insulation and harmonization is applied in the design of molten pool in order to achieve high efficiency and energy saving.
During float glass forming, through the dosing device glass melt is poured into a pool of molten tin, spreads, getting the form planar ribbons. Specified width and thickness ribbon takes after gaining influence of board holding machines and roller conveyor of annealing furnace. Along the length of bath with molten tin, width and thickness of glass ribbon changes. In Fig. 6 the proposed in the project scheme for float glass formation in a molten pool is shown. According to the notation in figure: 1 - liquid glass, 2 - drain threshold, 3 - heating oven (pool), 4 - molten metal, 5 - ribbon of glass, 6 - pulling rollers, 7 - Lehr (furnace) annealing.

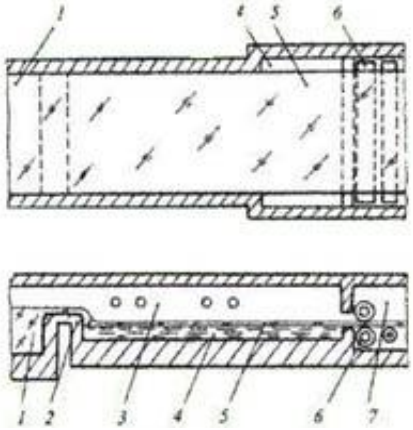


Figure 7. Method of forming glass to melt metal, used in the project.

Annealing lehr with the capacity of 350 tons / day
Annealing lehr is divided into zones according to annealing schedule. Structural characteristics and way of cooling are different, depending on temperature ranges for good annealing and admissible reduction of temperature of glass ribbon, which meets the requirements of cutting, transportation and use.
From the molting pool melt ribbon comes in a glass annealing furnace (annealing Lehr). Annealing lehr is used to transferring and equal cooling of the glass ribbon with given regime of temperature from 600oS to 50oS. Annealing process is an integral part of overall technological process of float glass sheet production and completely determines the quality of the glass ribbon cutting.

General annealing process called elimination of residual stresses in glass by controlled cooling (for a given mode) from the temperature of formation to temperature of plant internal air. Annealing prevents the formation of temporary stresses and residual stresses - reduce to the size, safe to the condition of products strength.
In the temperature range (440-595 C), which called the interval of solid glass formation, the glass is converted from viscous-fluid to solid condition. In this stage the major changes and physical properties of glass took place, including reducing the coefficient of thermal expansion about two times. In the formation of temperature difference or changes during this interval in glass occurs temporary stresses , which decreased due to viscous shear of layers relative to each other, and the relaxation rate is high enough (minutes) in the high-temperature range and violently reduced (hours) - in low-temperature region. At temperatures below 440 C stresses in the glass remain unchanged.
After glass final cooling to ambient temperature and disappearance of temperature drop, the central layers of glass, in theory, would have to change (reduce) their linear dimensions, but since the glass is in the solid condition and tension viscosity missing, residual stresses occurs in the glass (elastic cut). Tension in the glass also occurs through the chemical or thermal heterogeneity.
Based on the given value of residual stresses of flat glass temperature curve calculated, and according to this the length of furnace annealing.
Annealing mode depends on specialty and properties of glass, the size and thickness of products. To set this mode, you should set the interval of temperatures within this interval residual stresses arise and decrease (relax). These extreme temperature corresponds to glass viscosity 1012 Pa * s (HAT - Higher

Annealing Temperature) and 1014 Pa * s (LAT - Lower Annealing Temperature).
Annealing mode should provide the value of residual stresses, determined based on the refraction of light under 10 nm /cm on 1 mm glass thick.
For receiving value of residual stresses the glass is slowly cooled in special temperature interval of responsible annealing.

Annealing mode of sheet glass includes three stages:
- Pre-cooling to HAT (600 (610)-570 C);
- Responsible annealing - slow cooling to LAT (570-510 C);
- Accelerated cooling (510-60 C).

Annealing lehr divided into zones according to annealing schedule. Structural characteristics and way of cooling is different, depending on different temperature ranges to ensure good annealing and allowable temperature reducing of glass ribbon that meets the requirements of cutting, transportation and application.
For float glass annealing, applied annealing furnace with forced air circulation in the cooling air ducts and intense cooling of glass ribbon below the temperature 250 C on the open live rolls through the aeration.
Annealing furnace tunnel, proposed in the project consists of separate sections, made of steel sheet. Sections interconnected by bolts. Internal tunnel carcass (in heater areas) made of heat-resistant steel, in other areas of ordinary steel. For thermal insulation of the furnace kaolin or mineral wool is used (operating temperature to 750 C), which fills the space between the outer and inner metal casing.
Transportation system ribbon of glass consists of a metal and asbestos rolls. In the area of responsible annealing set of high-temperature steel shafts installed . Transporting ribbon system should ensure synchrony movement of live rolls different parts in the overall speeds range of glass ribbon .
Ribbon chilling made by muffle and airflow systems.
Annealing lehr provides automatic gear switching to power from the battery.
To protect the underside of the glass ribbon from possible harm:
- Submission of sulfur dioxide at the beginning of annealing furnace;
- Installation of graphite devices for relieving congestion "kish" from the furnace conveyor shafts;
- Periodic extraction of first shafts and polishing their surfaces.

Air cooling of furnace and molten pool
Furnace and molten pool are the main thermal engineering equipment of glass production. To ensure their safe operation the systems of cooling air are used in a critical part of the furnace and molten pool.
- Three sets of cooling air systems at the furnace wall: two sets are used symmetrically on the sides of the furnace; two centrifugal fans are used (one in the course of operation, one in reserve).
- One system of cooling air is used for pivot of furnace steel arch and two centered fans (one in the course of operation, one in reserve).
- One system cooling air is used in the L-shaped screen hanging furnace and two centrifugal fans (one in the course of operation, one in reserve).
- To reduce the temperature of steel plate on the bottom of the melt bath, the safety of its operation and extend the life of bath melt plate at the bottom of bathtubs shall be evenly and completely cooled during production. There are three types of centered fans (two in the course of operation, one in reserve).

Glass cutting equipment.
Advanced equipment with excellent performance is used for glass cutting. It executes the functions of automatic transmission, automatic measurement of the length, cross-cutting, slitting cutting, cross chipping, edge chipping, longitudinal chipping and separation of sheets.

Fig. 8. General view of the cutting machine for float glass.

Machine group of this area consists of transporting shafts, cutting system, separating shaft - the accelerator, shaft for chipping of edges, equipment of longitudinal chipping and separation, equipment for interception of faulty sheets to the bunker and their crushing, air equipment for purification of glass surface, discharge conveyer equipment, shaft of discharge equipment, sheet-accepting equipment, packaging and transportation system.

Fig. 9. Machine for cutting of float glass by TU 29.21622065.

Equipment of glass sheets acceptance is installed at the end part of conveyor lines. The surface of the floor with an air bag is a complex structure made out of steel plate and woolen cloth coating. Air supplied by the blowing fan through holes in the surface of the table forms an air cushion between glass sheet and the table surface for sheet supporting in order to facilitate its movement. Glass sheets of different sizes can also be taken from a line manually. Qualitative glass in packages is transported to a warehouse of finished products. At the final stage the glass is taken out from the factory by railway cars and trucks.

Maximum gross glass ribbon width is 3600 mm, maximum width of the ribbon per se is 3210 mm, the maximum length of a linear cutting is 4500 mm, the minimum length of linear cutting is 914 mm, the range of thickness is 3-10 mm.

Sheet glass quality control equipment.

By "Subproject 2" newest line of float glass production includes flaw detection unit , according to which the sheet glass quality is verified according to the requirements for compliance with State Standard 111-90[1].

Deviations from the sizes of glass sheets should not exceed, mm:

±– 3 – in length and width;

± 0,6 -– in thickness - for clear glass;

± 1,0 -– in thickness - for colored glass.

[1] http://document.org.ua/steklo-listovoe.-tehnicheskie-uslovija-nor3416.html

In terms of appearance (defects) glass sheets shall conform to the requirements specified in the table. 1.

Table 1. Normalized float glass appearance rates.

Name of index	Norm for 1 sq m of glass	
	Highest category	1st Category
Bubbles from 3 to 6 mm size inclusive	Not allowed more than 5 pcs.	Not allowed in the undistracted form
Bubbles extended width under 1 mm	Not allowed	Not allowed width of more that 15 mm
Outside destroying additions (refractory pieces or other materials)	Not allowed	
Outside non-destroying additions (not cooked shares of charge, mold hub)	Not allowed more than	
	3 pcs.	5 pcs.

Flaw detection unit consists of the following elements:
- TV installation with a resolution of at least 200 lines, frequency meter with input resistance of not less than 10 Mcm,
- Minimum value of voltage signal registered of no more than 0.2 V and measurements range from 0 to 1 MHz;
- Electronic device that emits pulses from the television signal and corresponding difference between levels of white and black, signal at the input of device should have positive polarity and amplitude of at least 0.3 V;
- Screen with the size of at least (600x800) mm. On a white field of the screen, there must be marked with black matte cells with the size of (50x50) mm with a deviation allowed, ± 2 mm; line which constitute them should be tilted at angle (45 +1) and have thickness of (0 ± 0,5) mm; screen illumination within 100-1000 lux at the unevenness of not more than 50 lux on the screen field;
- Holder of samples supplied by limb for the determination of angles between the surface of the glass sample and surveillance cameras direction with the scale inverval of 1 °; 0 ° in coincidence with the direction of observation and surface of glass sheet;
- Objective with focal length (135 ± 5) mm and diaphragm number not less than 3.5.
By changing a variable of diaphragm they regulate the installation in the way, that for glass marks M1-M3, it recorded the presence of optical distortions with the optical power of defects - 0.08 diopters, and for the glass mark M4-M8 - 0.2 diopters.

Protective atmosphere station
Protective atmosphere station with the productivity of 1600 m^3 / h is designed to provide nitrogen-hydrogen gas mixture (protective atmosphere) to the molten pool.
The station consists of six nitrogen-hydrogen plants AVU-400, five of which are in constant work, and one is in hot regime.

The main stages and the operation processes occurring in plants are described below:
- High-temperature air conversion of natural gas;
- Steam conversion of carbon monoxide;
- Cooling of conversion products with water-extraction;
- Purification of carbon dioxide and moisture;
- Increasing of the pressure of purified nitrogen-hydrogen mixture;
- Obtaining of a mixture of hydrogen differentiated composition.

Internal gas supply
Project of gas supplying by the boiler is designed according to the requirements:
- State Building Norms V. 2.5-20-2001 "Gas supply"
- Gas supply safety systems in Ukraine;
- SNIP I-35-76 "Boilers."
Gas supply is provided from the projected gas pipeline of high pressure of II category.
P=0,4+0,5 MPa (4+5 kgc /cm2).
Boilers KSVa-2, 0 are equipped with block burners fitted with automatics of safety and regulation.
Supply gas pressure - 0,04 kgc / cm2.
Gas pressure before burners - 0.015 kgc / cm2.
To reduce the gas pressure up to the required parameters the boiler has gas control unit (GCU), designed for work in the winter and summer periods.

Gas supply of workshop
Gas supply system of furnace has advanced computer-based system in order to maintain gas-air ratio in common pipeline for stable operation of furnace. Fume gases are withdrawn to common collecting gas main with the temperature of 420°C and quantity of 20000 m^3/h.

External gas supply
Project of supply gas pipeline of medium pressure for gas supplying of boiler-house and projected workshop for float-glass production is executed on the ground of design task and in accordance with the following requirements:
- State Building Norms V.2.5-20-2001 "Gas supply"
- Safety regulations of gas supply systems of Ukraine"
- Building Norms and Rules N-89-80 “General plans of industrial enterprises"
- Building Norms and Rules 2.09.03-85 "Construction of industrial enterprises"
The project involves laying of supply pipelines of high pressure of II category from existing gas-distribution station located on the territory of PJSC «Lysychanskiy glass factory “Proletary”.
Gas pressure at the exit from gas-distribution station is 0.4 + 0.5 MPa (4-5 kgf / cm2).
Gas loss on the way to the workshop of float-glass production is 3999 Nm^3/h and the inlet pressure is 0,4-0,3 MPa (4 +kgf/cm^2).
Annual need for natural gas is 35 mln. m^3 per year.
To satisfy need for gas the project provides for partial rehabilitation of gas-distribution plant in Lysychansk city (input string to workshop No. 2 according to the TU SC “Ukrtransgas” “Regulation of main pipelines of "Donbasstranshaz" under the No. 02-722 as of 21. 02.2005).
Implementation of sub-project number 2. Introduction of modern production float glass lines (production 2) took place from 2005 to 2010.

Subproject № 3. Modernization of existing float – glass production (production 1).

The project activity is aimed at increase of energy efficiency of production processes at PJSC «Lysychanskiy glass factory “Proletary”. Subproject provides for decrease of electric energy and natural gas consumption due to rehabilitation of existing power capacities:
- it is planned to set the furnace walls using high-fireproof materials;
- to increase volumes of regenerator filling to develop a heat exchange surface,

- to install new constructions of burners, to expand port mouths,
- to reinforce isolation, insulation of bottom and decrease of pool depth
- commercial recording of electric power of the plant using advanced meters with high accuracy of measurement,
- to install ASCME (automated system of commercial metering of electricity) with the meter for differential recording for recording, transfer and storage of the information about electricity;
- to install frequency converters in blow fans of glass furnace of the workshops No. 3, 4, that will make it possible to regulate the performance of the fan;
- Installation of additional electric heating.

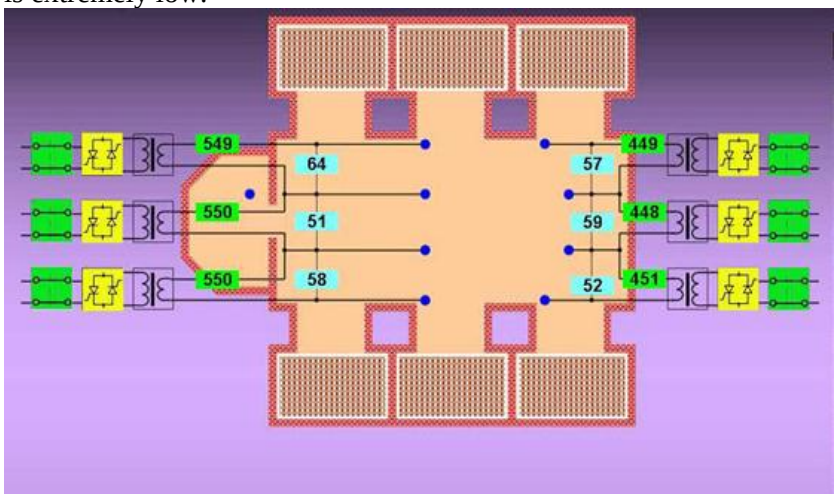
Implementation of sub-project number 3. The introduction of modern production lines of float glass (production 1) in the part of the workshop number 3 reconstruction was held from 2007 to 2010. Introduction of supplementary electric heating furnace of workshop number 3 will be implemented from 2011 to 2012.

Additional electric heating is installed with the purpose of energy transmission in the melting area for accelerating meltling process. Electric heating barrier is designed to enhance the convection flow in the oven, and at the same time to ensure the growth rate of melting. Additional electric heating of flow channel are used to increase energy in the strait and the vertical zone of channel during the reduction or absence of production, to avoid cooling of these areas.

Additional electric heating is an effective way for intensifying of glass production process. Required heat is released in the course of direct transmission of electric current through the melt. Electricity is introduced into the melt using molybdenum rod electrodes, which are set both on the bottom and on the side walls of the molten pool. Strong ascending flows are formed around the bottom electrodes making it possible transfer glass mass intensively. Additional electric heating can be installed in thermal barrier, under-mizture zone, loading pocket, canal, etc.

Installation scheme of additional molybdenum rod electrodes in the figure 10

There is no other ways of intensifying glass production process that would not affect the chemical composition of glass. Existing latest chemical and hydrodynamic methods of intensifying process significantly change the composition of the glass, leading to the change in glass composition and the, and therefore its appearance. Therefore, the probability of electric heating replacing in the next 20-30 years is extremely low.



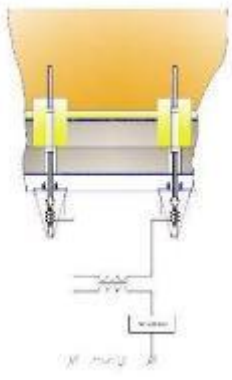


Figure 10. Scheme of implementation of additional electric heating

Schedule of stated measures implementation is given in Table 2.

Table 2. Schedule of stated measures implementation

	Name of stage	Commencement of works	Termination of works

1.	**Subproject No. 1. Utilization of effluent funace gases.**		
	Installation of HRSG after glass furnace of workshop No.2-2		
1.1	Elaboration of project documentation	2007	2007
1.2	Purchase of equipment	2008	2008
1.3	Assembly of equipment	2008	2008
1.4	Starting-up and adjustment	2008	2008
2.	**Subproject No. 2. Implementation of up-to-date line of float-glass production (production2).**		
2.1.	Elaboration of project documentation	2005	2007
2.2.	Purchase of equipment	2007	2010
2.3.	Assembly of equipment	2007	2010
2.4.	Starting-up and adjustment	2007	2010
2.5.	Other works	2005	2010
3.	**Subproject No. 3 Modernization of existing production of the float-glass (production 1).**		
3.1.	**Rehabilitation of workshop No.3.**	2007	2008
3.1.1.	Elaboration of project documentation	2007	2008
3.1.2.	Purchase of equipment	2007	2009
3.1.3.	Starting-up and adjustment	2010	2010
3.1.4.	Other works	2009	2010
3.2.	**Application of the system of additional electric heating of glass furnace of workshop No. 3**	2011	2012
3.2.1.	Elaboration of project documentation	2011	2012
3.2.2.	Purchase of equipment	2011	2012
3.2.3.	Other works	2011	2012

Technologies implemented by project are advanced in the glass production area and are already approved and will lead to much better productivity.

Taking into account the general economic situation, the probability of replacement of technologies proposed in the project, by more efficient technologies in the next 20-30 years is very small.
As to the first commitment period of 2008-2012, there are no risks, that there will be replacement of technologies proposed in the project, by more efficient technologies during this period.
Since the main activity of PJSC «Lysychanskiy glass factory "Proletary" will not be changed in the course of Joint Implementation (JI) project, special training for personnel is not necessary. Technical personnel of the enterprise has the necessary knowledge and experience for carrying out the project and repair of equipment installed under the project.

In case of new equipment application (such equipment which has not been used by this enterprise before), the manufacturing company shall conduct trainings for personnel.

New equipment which is planned to be installed doesn't need special maintenance. Personnel of PJSC «Lysychanskiy glass factory "Proletary" will service new equipment in operation mode (exploitation, scheduled repair) during the period of project implementation and after the project period.

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.

In the course of elaboration of JI project the specialists of VEMA S.A. carried out broadened consultations for involved representatives of PJSC «Lysychanskiy glass factory "Proletary" about collection of necessary data according to the Monitoring plan of the project.

A.4.3. Brief explanation of how the anthropogenic emissions of greenhouse gases by sources are to be reduced by the proposed JI project, including why the emission reductions would not occur in the absence of the proposed project, taking into account national and/or sectoral policies and circumstances:

Project activity, which includes modernization and rehabilitation of glass production, use of alternative energy, in particular application of secondary energy resources for its own heat generation will make it possible to increase power efficiency of glass production at PJSC «Lysychanskiy glass factory "Proletary" and reduce application of the initial energy resources. Due to this less electric energy will be consumed and less fuel will be combusted. Saving of traditional carbon organic fuel at power plants will result in reduction of the t CO_2e emissions of state electrical supply network, and fuel saving will result in reduction of t CO_2e emissions from glass production.

In absence of the proposed project all equipment, including the old ineffective but operable equipment, will work in the usual mode for a long time, and no emission reduction will take place. There are no legislative documents which would oblige PJSC «Lysychanskiy glass factory "Proletary" to rehabilitate glass production, install HRSGs or frequency regulators.
Explanation of how the anthropogenic emissions of greenhouse gases will be reduced by the proposed JI project under each of the sub projects is listed below.
Sub-project # 1. Utilization of effluent furnace gases. In the absence of project activities for the heat production fossil fuel (natural gas) would be used, combustion thereof would lead to GHG emissions into the atmosphere. During using boiler-utilizers load of heat supply is covered by utilizers additional capacity power.
Sub-project # 2. Implementation of up-to-date line of float-glass production (production 2). In the absence of the project old furnaces would be used; they consumes more energy (electricity, natural gas) per unit of production. In such a way during implementation of the project specific energy consumption will be decreased per unit of output, that will lead to reduction of GHG emissions.
Sub-project # 3. Modernization of existing production of the float-glass (production 1). In the absence of the project obsolete equipment and technology would be used ; they consume more energy per unit of production that would lead to greater consumption of fossil fuels for the production of electricity in a network, and increasing consumption of natural gas. In such a way implementing of the project will decrease energy consumption per unit of output, that will lead to reduction of GHG emissions.

A.4.3.1. Estimated amount of emission reductions over the crediting period:

In course of project execution, the following emission reductions will be achieved at each stage of the project:

Table 3. Estimated volume of emissions reduction during the first commitment period.

	Years
Length of the crediting period	4
Year	Estimate of annual emission reductions in tonnes of CO2 equivalent
2009	26553
2010	32 028
2011	48 277
2012	73 494
Total estimated emission reductions over the crediting period (tonnes of CO2 equivalent)	180 352
Annual average of estimated emission reductions	45 088

over the crediting period (tonnes of CO2 equivalent)	

Table 4. Estimated volume of emissions reduction after the first commitment period.

	Years
Length of the crediting period	5 years and 8 months
Year	Estimate of annual emission reductions in tonnes of CO2 equivalent
2013	73 494
2014	73 494
2015	73 494
2016	73 494
2017	73 494
Till 18 august 2018	48 996
Total estimated emission reductions over the crediting period (tonnes of CO2 equivalent)	416 466
Annual average of estimated emission reductions over the crediting period (tonnes of CO2 equivalent)	69 411

More detailed information is provided in the Accompanying Document 3.

Description of formulae used for preliminary estimation of emission reductions is represented in section E.

A.5. Project approval by the Parties involved:

On 04.05.2011 – State Environmental Investment Agency of Ukraine issued the Letter of Endorsement (No. 1192/23/7 as of 16.05.2011) for this JI project.

After receiving Determination Report from the Certified Independent Body the project documentation will be submitted to the National Environmental Investment Agency of Ukraine for receiving a Letter of Endorsement. Another Letter of Endorsement will be received from the other party of the project participant.

SECTION B. Baseline

B.1. Description and justification of the baseline chosen:

Baseline for JI project is established according to the requirements of Annex B to the Resolution 9/CMP.1 (Guidelines for JI) and paragraphs 23-29, «Guidelines for baseline and monitoring[2]", elaborated by the Joint Implementation Supervisory committee (JISC) (hereinafter as "Guidelines"). According to the above Guidelines, the project participants may use approved "Clean Development Mechanism (CDM) baseline and monitoring methodologies within paragraph 9 (b) or they may set 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).

The project applies approved CDM baseline and monitoring methodology ACM0012. This methodology can be applied directly to glass production, but these methodology was thoroughly studied for identification of the basic principles for the approach to baseline setting, additionality and monitoring.

On this basis the approach for baseline and monitoring was developed, which can be applied to JI projects in accordance with Annex B of JI Methodological recommendations and Recommendations.

Method of baseline scenario selection

Baseline scenario is a scenario that accurately describes the anthropogenic emissions from GHG emission sources which would have occurred in the absence of the proposed project according to the JI Guidelines, Annex B. Since none of the approved baseline and monitoring methodologies for CDM projects may be applied completely to this project, probable future scenarios are defined on the basis of conservative assumptions (paragraph 24 of Recommendations).

The proposed project is not implemented as a JI project but it is included as one of the alternatives. These alternatives are evaluated as realistic or plausible, and the most plausible of them is defined as a baseline. Correspondence of baseline setting and additionality determination were checked.

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).

Step 1. Determination of the alternatives of furnace gases utilization

There are only two alternatives.

1. Use of heat generated by steam-boiler house and ventilation of furnace gases into the atmosphere through chimney.

2. Utilization of furnace gases in HRSGs and heat generation for production needs without JI project.

Step 2. Removal of baseline Alternatives, contradictory to legislative or regulatory provisions.
There are no legislation acts requiring utilization of glass furnace gases, however, there are no obstacles for implementation of above-mentioned measures.

[2] http: // ji.unfccc.int/Ref/Guida.html

Step 3. Determination of the baseline scenario alternatives.

Alternative 1. Use of heat generated by steam-boiler house and ventilation of furnace gases into the atmosphere through chimney.
(current position)

Needs of the company in heat energy under this scenario are satisfied as follows:

• by the boilers, operating on natural gas.

Alternative 2. Utilization of furnace gases in HRSGs and heat generation for production needs without JI project.

Part of gases from glass furnace enters the HRSG for steam (heat) generation and its application for heating of production areas.

Step 4. Exclusion of baseline scenarios facing the prohibited obstacles

Above-mentioned possible alternatives will be checked in this section concerning availability of any obstacles for their implementation in relation to economics and other obstacles. Unrealistic scenarios will be excluded.

Alternative 1. Use of heat generated by steam-boiler house and ventilation of furnace gases into the atmosphere through chimney.
(current position)

There are no obstacles concerning continuation of current practice.

Alternative 2. Utilization of furnace gases in HRSGs and heat generation for production needs without JI project In such case the following barriers exist: investment (since this scenario requires additional considerable investments and has too long payback period and high risks, therefore it is not investment-attractive) and technological barrier (since building of HRSGs is connected with technological problems: maintenance of heat balances of furnace-chimney system, extraction and utilization of heat generated by the HRSGs, recording of generated heat and application of new up-to-date equipment requires additional retraining of the personnel). Rehabilitation of equipment for efficiency improvement is not customary practice in Ukraine.

Conclusion

There is only one realistic Alternative for this baseline scenario: continuation of ventilation of furnace gases into the atmosphere through chimney (current position), heat generation by existing HRSGs (= Alternative 1).

Key information for baseline determination is stated in the tables given below.

Baseline scenario formation

Project activity is aimed at decreasing GHG emission reduction from combustion of fossil fuel at the company due to installation of HRSGs.
The proposed project applies specific approach for joint implementation projects relying on 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.
GHG emissions included into the baseline scenario:
CO_2 emissions due to heat generation by boiler equipment of the company.

Project emissions are absent. HRSGd oesn't consume additional energy resources for heat generation.

Calculation of total annual baseline emissions of carbon, which would occur during baseline year in case of unchangeability of effluent furnace gas utilization system, is given in section B and E. They consist of accurate quantity of total emissions, t CO_2e occurred during baseline year.
Key information for baseline determination is stated in the tables given below.

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)". Current activities of PJSC «Lysychanskiy glass factory "Proletary" is characterized by stable deterioration of glass production system, use of old equipment and large-scale inefficient consumption of electric energy and gas. The reason of such state is lack of the funds for construction of new productive capacities, rehabilitation of equipment and introduction of new technologies.

Project activities are aimed at reduction of GHG emissions of the national electric grid due to modernization of glass production at PJSC «Lysychanskiy glass factory "Proletary", replacement of old energy saving equipment by new modern equipment, introduction of up-to-date technologies of glass production.

Proposed project applies specific approach for JI projects. There are no methodologies applied for such type of subproject. Specific approach applied in the project enables to foresee consumption of electric energy and gas for glass production in project year.

Step 1. Determination of the alternatives

There are only two alternatives of baseline scenario discussed before the start of this project.

1. Implementation of minimal repair works against the background of total degradation equipment operation.
2. Implementation of up-to-date line of float-glass production without JI project.

Step 2. Removal of baseline Alternatives, contradictory to legislative or regulatory provisions.

There are no legislation acts requiring implementation of up-to-date technologies in such area.

Step 3. Determination of the baseline scenario alternatives.

Alternative 1. Implementation of minimal repair works against the background of total degradation equipment operation.
Minor repair works are implemented subject to availability of funds in order to meet the requirements of quality.

Alternative 2. Implementation of up-to-date line of float-glass production without JI project.
Float-glass production is modernized in order to decrease fuel and electric energy consumption.

Step 4. Exclusion of baseline scenarios facing the prohibited obstacles

Above-mentioned possible alternatives will be checked in this section concerning availability of any obstacles for their implementation in relation to economics and other obstacles. Unrealistic scenarios will be excluded.

Alternative 1. Implementation of minimal repair works against the background of total degradation equipment operation.
There are no obstacles concerning continuation of current practice.

Alternative 2. Modernization of up-to-date line of float-glass production without JI project.

In such case both barriers exist: investment (since this scenario requires additional considerable investments and has too long payback period and high risks, therefore it is not investment-attractive) and technological barrier (since application of new up-to-date equipment requires additional retraining of the personnel). Rehabilitation of equipment for efficiency improving is not customary practice in Ukraine.

Conclusion

There is only one realistic Alternative for this baseline scenario: *Implementation of minimal repair works against the background of total degradation equipment operation*. (= Alternative 1).

Key information for baseline determination is stated in the tables given below.

Baseline scenario formation

Project activity is aimed at decreasing GHG emission reduction from combustion of fossil fuel and use of electric energy at company due to modernization of line of float-glass and decrease of fuel and electric energy consumption.
Proposed project applies specific approach for joint implementation projects.

GHG emissions included into the baseline scenario:
CO_2 emissions due to electric energy consumption by old production. CO_2 emissions due to fuel combustion by old production.

GHG emissions included into the project scenario:
CO_2 emissions due to electric energy consumption by modernized production. CO_2 emissions due to fuel combustion by modernized production.

Calculation of total annual baseline emissions of carbon, which would occur during baseline year in case of unchangeability of glass production technology at PJSC «Lysychanskiy glass factory "Proletary" is given in section E and F . They consist of accurate quantity of total emissions, t CO_2e, occurred during baseline year, and additional emissions which will be reduced after energy-saving measures implementation.

Key information for baseline determination is stated in the tables given below.

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)". Current activities of PJSC «Lysychanskiy glass factory "Proletary" is characterized by stable deterioration of glass production system, use of old equipment and large-scale inefficient consumption of electric energy and gas. The reason of such state is lack of the funds for construction of new productive capacities, rehabilitation of equipment and introduction of new technologies.

Project activities are aimed at reduction of GHG emissions of the national electric grid due to modernization of glass production at PJSC «Lysychanskiy glass factory "Proletary", replacement of old energy saving equipment by new modern equipment, introduction of up-to-date technologies of glass production.

Proposed project applies specific approach for JI projects. There are no methodologies applied for such type of subproject.

Specific approach applied in the project enables to foresee consumption of electric energy and gas for glass production in project year.

Step 1. Determination of the alternatives

There are only two alternatives of baseline scenario discussed before the start of this project.

1. Implementation of minimal repair works against the background of total degradation equipment operation.

2. Implementation of existing float-glass production (production 1) without JI project

Partial replacement of equipment was impossible, due to technical problems on partial replacement of equipment and lack of economic sense.

Step 2. Removal of baseline Alternatives, contradictory to legislative or regulatory provisions.

There are no legislation acts requiring implementation of up-to-date technologies in such area.

Step 3. Determination of the baseline scenario alternatives.

Alternative 1. Implementation of minimal repair works against the background of total degradation equipment operation.

Minor repair works are implemented subject to availability of funds in order to meet the requirements of quality.

Alternative 2. Implementation of existing float-glass production (production 1) without JI project

Float-glass production is modernized in order to decrease fuel and electric energy consumption.

Step 4. Exclusion of baseline scenarios facing the prohibited obstacles

Above-mentioned possible alternatives will be checked in this section concerning availability of any obstacles for their implementation in relation to economics and other obstacles. Unrealistic scenarios will be excluded.

Alternative 1. Implementation of minimal repair works against the background of total degradation equipment operation.

There are no obstacles concerning continuation of current practice.

Alternative 2. Implementation of existing float-glass production without JI project

In such case both barriers exist: investment (since this scenario requires additional considerable investments and has too long payback period and high risks, therefore it is not investment-attractive) and technological barrier (since application of new up-to-date equipment requires additional retraining of the personnel). Rehabilitation of equipment for efficiency improving is not customary practice in Ukraine.

Conclusion

There is only one realistic Alternative for this baseline scenario: *Implementation of minimal repair works against the background of total degradation equipment operation*. (= Alternative 1).

Key information for baseline determination is stated in the tables given below.

Baseline scenario formation

Project activity is aimed at reduction of GHG emission from combustion of fossil fuel and use of electric energy at company due to modernization of line of float-glass and decrease of fuel and electric energy consumption.
Proposed project applies specific approach for joint implementation projects.
GHG emissions included into the baseline scenario:
CO_2 emissions due to electric energy consumption by production before the rehabilitation. CO_2 emissions due to fuel combustion by production before the rehabilitation.

GHG emissions included into the project scenario:
CO_2 emissions due to electric energy consumption by the production after rehabilitation. CO_2 emissions due to fuel combustion by the production after rehabilitation.
Calculation of total annual baseline emissions of carbon, which would occur during baseline year in case of unchangeability of glass production technology at PJSC «Lysychanskiy glass factory "Proletary" is given in section E and F . They consist of accurate quantity of total emissions, t CO_2e, occurred during baseline year, and additional emissions which will be reduced after energy-saving measures implementation.

Key information for baseline determination is stated in the tables given below.

Data/Parameter	**EF**
Data unit	tCO_2e/MWh
Description	Carbon emission factor for Ukrainian electrical supply network
Time of determination/monitoring	One time in period
Source of data (to be) used	Research data of Global Carbon B.V.[3] or another approved methodology
Value of data applied (for ex ante calculations/determinations)	Provided in Annex 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	

Data/Parameter	**T_b**
Data unit	tons
Description	Total volume of glass production in baseline year
Time of determination/monitoring	Once in baseline year
Source of data (to be) used	Production report
Value of data applied	Given in accompanying document 1

[3] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf

(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

Data/Parameter	**T_i**
Data unit	tons
Description	Total volume of glass production in project year i
Time of determination/monitoring	On a shift basis/ one time in period
Source of data (to be) used	Production report
Value of data applied (for ex ante calculations/determinations)	Given in accompanying document 1
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

Data/Parameter	**kWh_b**
Data unit	ths. kWh
Description	Total quantity of electric energy consumed for glass production in baseline year
Time of determination/monitoring	Once in baseline year
Source of data (to be) used	Data of electricity supply meters
Value of data applied (for ex ante calculations/determinations)	Given in accompanying 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

Data/Parameter	**G^3_b**
Data unit	ths. Nm^3
Description	Total quantity of gas consumed for glass production in baseline year

Time of determination/monitoring	Once in baseline year
Source of data (to be) used	Data of meters
Value of data applied (for ex ante calculations/determinations)	Given in accompanying 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

Data/Parameter	**SECb**
Data unit	ths. kWh / tonne
Description	Specific consumption of electrical energy per tonne of production in the baseline year
Time of determination/monitoring	Once in baseline year
Source of data (to be) used	PJSC «Lysychanskiy glass factory "Proletary"
Value of data applied (for ex ante calculations/determinations)	Given in accompanying 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

Data/Parameter	**SGCb**
Data unit	ths. Nm^3 / tonne
Description	Specific gas consumption for glass production in baseline year
Time of determination/monitoring	Once in baseline year
Source of data (to be) used	PJSC «Lysychanskiy glass factory "Proletary"
Value of data applied (for ex ante calculations/determinations)	Given in accompanying 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

Data/Parameter	$HEAT_{UG,i}$
Data unit	GJ(t/h)
Description	Volume of heat generated under the project due to furnace gases utilization in year *i*
Time of determination/monitoring	Daily / one time in period
Source of data (to be) used	Heat and steam meters
Value of data applied (for ex ante calculations/determinations)	N/A
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 enabling to calculate GHG emissions

Data/Parameter	P_b
Data unit	Ton per twenty-four-hours
Description	Production capacity of glass furnace
Time of determination/monitoring	Daily / one time in period
Source of data (to be) used	Technical certificate of the furnace and production researches
Value of data applied (for ex ante calculations/determinations)	N/A
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 enabling to calculate GHG emissions

Data/Parameter	η_b
Data unit	share
Description	Efficiency factor of boilers
Time of determination/monitoring	Once in baseline year
Source of data (to be) used	Regime charts of boilers
Value of data applied (for ex ante calculations/determinations)	0,899
Justification of the choice of data or description of measurement methods and	N/A

procedures (to be) applied	
QA/QC procedures (to be) applied	Calculated as weighted average value
Any comment	

Data/Parameter	LHV_y
Data unit	$TJ/ths.Nm^3$
Description	Lower heat value of natural gas
Time of determination/monitoring	Once in baseline year
Source of data (to be) used	Data of laboratory analysis
Value of data applied (for ex ante calculations/determinations)	Given in accompanying 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	National inventory of anthropogenic emissions from sources and absorption by absorbent of greenhouse gases in Ukraine for 1990 – 2006.
Any comment	

Data/Parameter	$\mathbf{K_c}$
Data unit	Share
Description	Glass mass use factor
Time of determination/monitoring	Once in period
Source of data (to be) used	Technical certificate and production researches
Value of data applied (for ex ante calculations/determinations)	Determined for each furnace and given in accompanying 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. Description of how the anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the JI project:

According to the Annex 1 "Guidelines for baseline and monitoring" of JI after the baseline setting the additionality can be demonstrated by using one of the following approaches:
a) Presentation of traced and transparent information, which would demonstrate that the source data were defined based on conservative assumptions that the project scenario is not part of the identified baseline

scenario and that the project will reduce anthropogenic emissions from sources or increase flows by GHG absorbers;
b) Presentation of traced and transparent information that certified independent body has positively determined that a similar project, carried out in comparable circumstances (when taking the same measures to reduce GHG emissions in the same country with similar technology, similar capacity) would result in reduction of anthropogenic emissions from sources or increase of flows by GHG absorbers, is additional to any that would have occurred otherwise, and explaining why it is considered to be relevant to the determination of the project;
c) Application of the latest edition "Guidelines for demonstration and assessment of additionality" approved by the CDM Executive Board (providing two-month grace period, during which the PDD is to be published on the website of the UNFCCC JI) or any other method for proving additionality, approved by the CDM Executive Board.
New "Guidelines for demonstration and assessment of additionality" (version 05.2) (hereinafter referred to as "Guidelines of additionality") was applied in this PDD in order to demonstrate that reduction of anthropogenic emissions are additional to those which would have occurred otherwise.

Additionality of subproject

Additionality of the project activity is demonstrated and estimated below using the "Tool for demonstration and assessment of additionality"[4] (Version 05.2). This guide was developed originally for CDM projects, but it can be used also for JI projects.

Step 1. Identification of alternatives to the project activity and their conformity with current laws and regulations

Step 1a. Define alternatives to the project activity

Subproject No.1. Utilization of effluent furnace gases.

There are two alternatives of this project (which have been already discussed in Section B.1).

The first scenario is "business as usual" – release of furnace gases into the atmosphere. There are no barriers for implementation of this Baseline scenario (there are no investment barriers since this scenario doesn't require involvement of additional investments; there are no technological barriers, since this equipment is operated by skilled personnel and there is no need to conduct additional retraining). This scenario reflects customary practice in Ukraine.

The second scenario provides for utilization of effluent furnace gases without Joint Implementation mechanism. This scenario requires additional considerable investments for purchase and installation of new equipment, as well as technological barriers. Company's needs for energy will be provided in the same way as described in Alternative 1.

Conclusion of step 1a. Two realistic alternatives to project activity were determined: Alternative 1 and Alternative 2.

Subproject No. 2. *Introduction of modern production lines of float glass production (production 2).*

There are two alternatives of this project (which have been already discussed in Section B.1).

The first alternative is "business as usual" scenario with implementation of minimum repairs against the background of total degradation of equipment performance. There are no barriers for implementation of this Baseline scenario (there are no investment barriers since this scenario doesn't require involvement of additional investments; there are no technological barriers, since this equipment is operated by skilled personnel and there is no need to conduct additional retraining). This scenario reflects customary practice in Ukraine.

[4] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf

The second alternative provides for new line of float glass production (production 2) without Joint Implementation mechanism. In this case there are two barriers: investment, because this scenario requires further substantial investment and has very big payback period and high risks, so it is not attractive for investors, and also technological barrier, because the use of new modern equipment will require additional retraining of personnel. Reconstruction of equipment to increase efficiency is not a common practice in Ukraine.

In such a way, the first alternative was chosen for the baseline scenario.

Production capacity will be provided on the old equipment in case of accidents, stops to repair the company significantly reduced volume of output products described in Alternative 1.
Conclusion of Step 1a. Two realistic alternatives to the project activity were identified: Alternative 1 and Alternative 2.

Subproject No. 3. *The modernization of existing production of float glass (production 1).*

There are two alternatives of this project (which have been already discussed in Section B.1).

The first alternative is "business as usual" scenario with implementation of minimum repairs against the background of total degradation of equipment performance. There are no barriers for implementation of this Baseline scenario (there are no investment barriers since this scenario doesn't require involvement of additional investments; there are no technological barriers, since this equipment is operated by skilled personnel and there is no need to conduct additional retraining). This scenario reflects customary practice in Ukraine.

The second alternative provides for reconstruction of float glass line production (production 1) without Joint Implementation mechanism. In this case there are two barriers: investment, because this scenario requires further substantial investment and has very big payback period and high risks, so it is not attractive for investors, and also technological barrier, because the use of new modern equipment will require additional retraining of personnel. Reconstruction of equipment to increase efficiency is not a common practice in Ukraine.

In such a way, the first alternative was chosen for the baseline scenario.
Production capacity will be provided on the old equipment in case of accidents, stops to repair the company significantly reduced volume of output products described in Alternative 1.
Conclusion of Step 1a. It was revealed two realistic alternatives to the project activity: Alternative 1 and Alternative 2.

Step 1b. Conformity of alternatives with current laws and regulations
Subproject No.1. Utilization of effluent furnace gases

Alternative 1: Since there are no legislative requirements for use of effluent boiler gases, then emission of boiler gases into the atmosphere shall be considered as applicable practice at industrial companies of Ukraine. This alternative entails the continuation of the practices which would take place before the project implementation and it consists in emission of boiler gases into the atmosphere and utilization of fossil fuel for heat generation.

Alternative 2: There are no legislative requirements for use of effluent boiler gases for heat generation at companies.
Subproject No. 2. *Introduction of modern production line of float glass production (production 2).*

Alternative 1: Since there are no legal requirements for introducing new energy saving technologies, the acceptable practices in industrial enterprises of Ukraine is use of morally and technically obsolete equipment and carrying out minor repairs. This alternative entails the continuation of the practices which would take place before the project implementation, and it means continuous increase in emissions of

anthropogenic gas into the atmosphere by increasing energy consumption.

Alternative 2: Reconstruction without the JI mechanism is consistent with mandatory laws and regulations, detailed information about analysis of consistency with the law was made for Alternative 1, which is similar to the consistency required by laws and regulations of Alternative 2.

Subproject No. 3. *The modernization of existing production of float glass (production 1).*

Alternative 1: Since there are no legal requirements for introducing new energy saving technologies, the acceptable practices in industrial enterprises of Ukraine is use of morally and technically obsolete equipment and carrying out minor repairs. This alternative entails the continuation of the practices which would take place before the project implementation, and it means continuous increase in emissions of anthropogenic gas into the atmosphere by increasing energy consumption.

Alternative 2: Reconstruction without the JI mechanism is consistent with mandatory laws and regulations, detailed information about analysis of consistency with the law was made for Alternative 1, which is similar to the consistency required by laws and regulations of Alternative 2

Conclusion of Step 1b. Under such circumstances one may say that all scenarios don't contradict current laws and normative acts**.**

Hence, the Step 1 is satisfied.

Step 2. Investment analysis.

Sub-step 2a. Determination of appropriate method of analysis.

The following steps have been done according to the additionality tools of the CDM Executive Committee "Tools for the demonstration and assessment of additionality" (version 05.2) [5].
The proposed project will create, in addition to benefits from the Kyoto Protocol, the economic benefits in the form of energy savings. Therefore, a simple cost analysis is inappropriate. In regard to project implementation, the choice of PJSC «Lysychanskiy glass factory "Proletary" is to invest in the project or to continue traditional practices. Therefore, the project used an analysis of comparing with the baseline norm. Expenses and income of the project that are taken into account in investment analysis, are the difference between the baseline situation and the situation that arises after the project implementation . Revenues are achieved by energy savings. The costs of project implementation are taken into account. The costs associated with production activity, administrative costs, the financial burden on loans, taxes not included due to the fact that these costs are included in the cost of output production.
Step2b–Choice and justification of return level.
Basic standard internal rate of return (IRR) can be calculated as interest rate of commercial banks for loans in Euro in 2005 adjusted by inflation rate of Euro for the period from 1997 to 2004.
The average interest rate of commercial banks in Euro in 2005 as on 01.12.2005 according to the National Bank of Ukraine was 11.5%. [6] Geometric mean value of Euro inflation rate for the period from 1997 to 2004 years was 1.76%[7].
Discount rate for the project is 11.5% -1.76% = 9.74%

[5] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf

[6] http://www.bank.gov.ua/Fin_ryn/Pot_tend/index.htm

[7] http://epp.eurostat.ec.europa.eu/tgm/refreshTableAction.do;jsessionid=9ea7d07e30ddeca24d0cac3c46dead84daec6a6c38f8.e34OaN8Pc3mMc40Lc3aMaNyTa3eQe0?tab=table&plugin=1&pcode=tsieb060&language=en

Step2c The calculations of internal rate of return and NDR

Internal Rate of Return and NDR of the proposed project is designed based on the following assumptions:

1. Investment analysis is based on information of PJSC «Lysychanskiy glass factory "Proletary".
2. The analysis is made in Euros.
3. Rated period is not limited to the foreseeable lending activities on JI (2002 - 2012) and extended to 2017 reflecting the estimated duration of the activities of the investment project.
4. According to Ukrainian legislation, the following parameters are used.

Variable	Value
Income tax %	25%
Depreciation of the 3rd depreciation group	26%
Depreciation of 1st depreciation group	8%

5. The costs associated with industrial activity, administrative costs, the financial burden on loans, insurance costs, the purchase of raw materials, repairs, taxes are not included due to the fact that these costs are included in the cost of production.
6. Estimated prices for natural gas and electricity are calculated based on price of energy carriers in 2005 in Euro, see Table 7 of Annex 4.
7. Projected course to the Euro rate is presented in Table 7 of Annex 4.
8. Estimated amount of energy savings is presented in Table 6 of Annex 4.
9. It is assumed that the cost of ERU does not change during the project and is 10 Euro per ton CO_{2e}.
10. All investment figures were calculated based on 9,74% discount (interest rate of commercial banks in Euro in 2005 adjusted by inflation rate of Euro for the period from 1997 to 2004).
11. All prices and costs are used without VAT.
12. Residual value of equipment is calculated based on the fact that operating life of equipment is 20 years.

Parameter	Value	Base norm	Comment
Internal project Rate of Return without selling ERU	**1,5%**	9,74%	Rate is below the base norm
The internal project rate of return with selling ERU	**3,3%**	9,74%	Rate is below the base norm

Step 2d Sensitivity analysis.

	Коливання		
Parameter	-10%	0%	+ 10%
Internal Rate of Return of the project without selling ERU			
Capital costs	**2,4%**	**1,5%**	**0,8%**
Cost of energy	**0,7%**	**1,5%**	**2,3%**
Internal Rate of Return of the project with selling ERU			
Capital costs	**4,2%**	**3,3%**	**2,4%**
Cost of energy	**2,5%**	**3,3%**	**4,0%**

Conclusion from step 2b:

In connection therewith it is obvious that this project is economically unattractive without registration of the project as JI project, which proves additionality of this project.

Therefore Step 2 is satisfied.

Step 3: Barrier analysis

Step 3a: Identification of barriers that would prevent the implementation of the proposed project activity

Subproject No.1. Utilization of effluent furnace gases

Financial barrier.

Additional costs of project implementation include the costs of: purchase of new equipment, rehabilitation of existing gas withdrawal systems, maintenance control, systematic data collection, etc. Scenario requires additional considerable investments and has too long payback period and high risks, therefore it is not investment-attractive. Calculation of investment indicators of the subproject is given in accompanying document 3.

Technological barriers

Application of effluent furnace gases at industrial objects is technically difficult task since construction of HRSGs has technological complicacies: maintenance of heat balances of furnace-chimney system, extraction and utilization of heat generated by the HRSGs, recording of generated heat and application of new up-to-date equipment requires additional retraining of the personnel. Rehabilitation of equipment for efficiency improving is not customary practice in Ukraine. Taking into consideration complicacy of this technology, qualification of maintenance personnel servicing the gas equipment may be insufficient. Training of such personnel is necessary in order to overcome such obstacles.

Organizational barriers

Experience in JI projects implementation management including conducting of international negotiations, validation, verification, registration, monitoring, etc. is absent.

Subproject No. 2. *Introduction of modern production line of float glass production (production 2).*

Financial barrier.

Additional costs of project implementation include the costs of: purchase of new equipment, project, assembly, starting-up and adjustment works, other expenses, maintenance control, systematic data collection, etc. Financial barriers are connected with the structure of existing rates of crediting of long-term industrial projects.

Technological barriers

Due to financial problems repair works were not conducted to the full extent recently and provided for mainly maintenance of the equipment in operation condition, often without taking into consideration economic and environmental results. Reconstruction of equipment to improve energy efficiency is not a common practice in Ukraine. Taking into consideration complicacy of this technology, qualification of maintenance personnel servicing the gas equipment may be insufficient. Training of such personnel is necessary in order to overcome such obstacle.

Organizational barriers

Experience in JI projects implementation management including conducting of international negotiations, validation, verification, registration, monitoring, etc. is absent.

Subproject No. 3. *The modernization of existing production of float glass (production 1).*

Financial barrier.

Additional costs of project implementation include the costs of: purchase of new equipment, rehabilitation of existing gas withdrawal systems, maintenance control, systematic data collection, etc. Scenario requires additional considerable investments and has too long payback period and high risks, therefore it is not investment-attractive. Calculation of investment indicators of the subproject is given in accompanying document 3.

Technological barriers

Due to financial problems repair works were not conducted to the full extent recently and provided for mainly maintenance of the equipment in operation condition, often without taking into consideration economic and environmental results.

Organizational barriers

Experience in JI projects implementation management including conducting of international negotiations, validation, verification, registration, monitoring, etc. is absent.

Conclusion of step 3a: Identified barriers would prevent from implementation of the proposed project activity as well as of the other alternatives.

Step 3b: Explanation that the identified barriers would not prevent the implementation of at least one of the alternative scenario

Subproject No.1. Utilization of effluent furnace gases

One of the alternatives is continuation of "business as usual". Since the barriers identified above directly relate to investment into effluent furnace gases utilization, PJSC «Lysychanskiy glass factory "Proletary" doesn't have any obstacles for subsequent purchase of natural gas at previous level for its combustion in steam-boiler house with the purpose of heat generation.

Subproject No. 2. *Introduction of modern production line of float glass production (production 2).*

One of the alternatives is continuation of "business as usual". Since the barriers identified above directly relate to investment into the new production line of float glass, PJSC «Lysychanskiy glass factory "Proletary" doesn't have any obstacles for the further operation of obsolete equipment at the previous level.

Subproject No. 3. *The modernization of existing production of float glass (production 1).*

One of the alternatives is continuation of "business as usual". Since the barriers identified above directly relate to investment into the reconstruction of float glass production , PJSC «Lysychanskiy glass factory "Proletary" doesn't have any obstacles for the further operation of obsolete equipment at the previous level.

Conclusion from step 3b: Identified barriers can not impede introduction of at least one alternative scenario – continuation of «business as usual».

Therefore Step 3 is satisfied.

Step 4: Customary practice analysis

Step 4a. Analysis of other alternatives similar to proposed project activities

Subproject No.1. Utilization of effluent furnace gases

Analysis of similarity of project activities demonstrated absence of similar projects in Ukraine.

Absence of financial incentives described for Step 2 and barriers described in Step 3 is typical not only for PJSC «Lysychanskiy glass factory "Proletary", but also for other Ukrainian companies utilizing effluent furnace gases. Therefore the existing practice of natural gas use for heat generation and technological needs described in the Alternative of initial conditions selected for this Project is common

for Ukraine in general. Due to current practice all expenses for purchase of natural gas will be borne by end consumers of products and the companies don't have stimulus for implementation of the projects in alternative fuel utilization.

Subproject No. 2. *Introduction of modern production line of float glass production (production 2).*
Analysis of similarity of project activities demonstrated absence of similar projects in Ukraine.
Absence of financial incentives described for Step 2 and barriers described in Step 3 is typical not only for PJSC «Lysychanskiy glass factory "Proletary", but also for other companies that produce glass in Ukraine. Therefore the existing practice of using obsolete equipment for glass production described in the Alternative of initial conditions selected for this Project is common for Ukraine in general. Due to the current practice all costs of increased energy use associated with the use of obsolete equipment, rely on end-consumers, and the companies don't have stimulus to implement projects on a radical re-equipment production lines.
Subproject No. 3. *The modernization of existing production of float glass (production 1).*
Analysis of similarity of project activities demonstrated absence of similar projects in Ukraine.
Absence of financial incentives described for Step 2 and barriers described in Step 3 is typical not only for PJSC «Lysychanskiy glass factory "Proletary", but also for other companies that produce glass in Ukraine. Therefore the existing practice sing obsolete equipment for glass production described in the Alternative of initial conditions selected for this Project is common for Ukraine in general.

Conclusion from step 4a: Since there are no similar projects in the region, there is no need to analyze similar project activity.

Conclusion

Taking into consideration the abovementioned one may conclude that the project is additional.

B.3. Description of how the definition of the project boundary is applied to the project:

Subproject No.1. Utilization of furnace effluent gases

GHG sources and subproject's borders:

Project's borders for baseline scenario in subproject No. 1 "Utilization of furnace effluent gases" are stated in black rectangle on graphical figure (Figure 11).

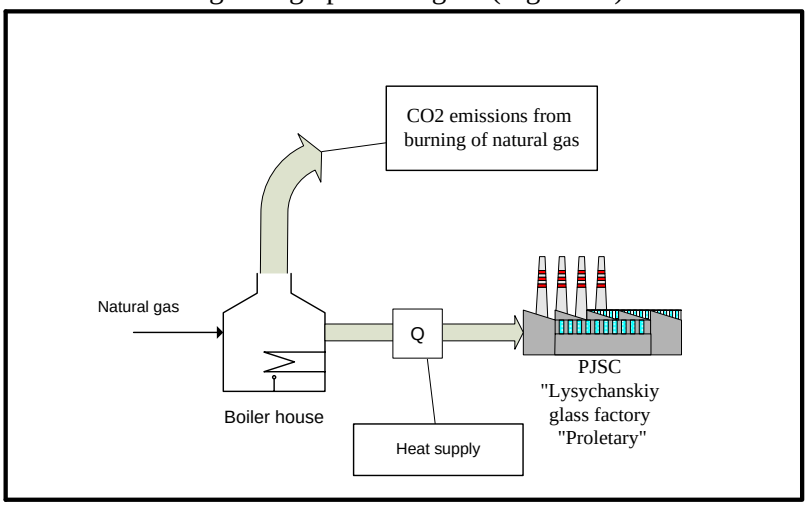


Figure 11. Borders of subproject No. 2 "Utilization of furnace effluent gases" for baseline scenario

Subproject's borders for project scenario are stated in black rectangle on graphical figure (Figure 12).

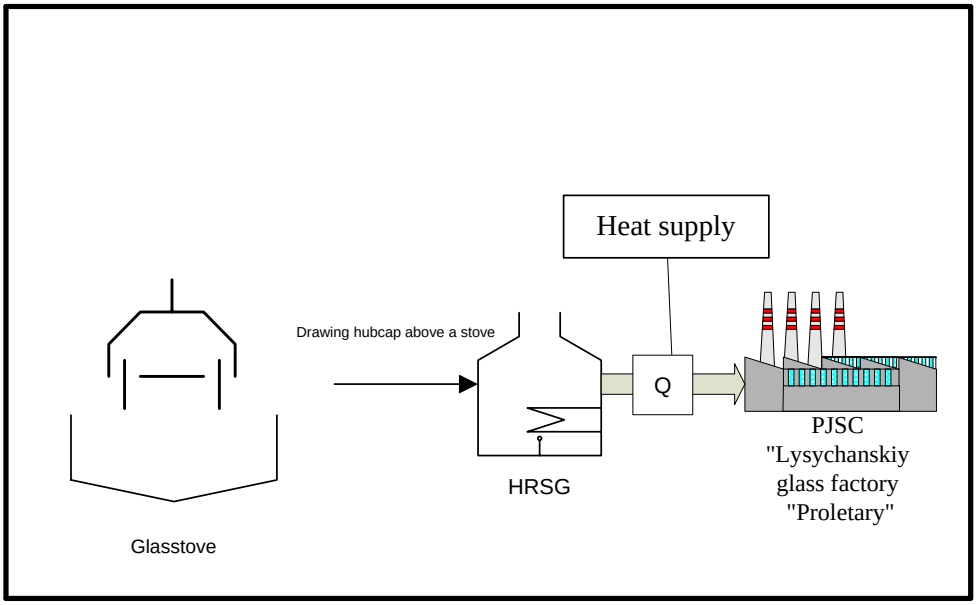


Figure 12. Borders of subproject No. 1 "Utilization of furnace effluent gases" for project scenario

Project's borders for baseline scenario include CO_2 emissions due to heat energy generation owing to natural gas combustion; there are no project emissions.

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

GHG sources and subproject's borders:

Project's borders for baseline scenario of subproject No.2 "**Implementation of up-to-date line of float-glass production (production 2)**" are stated on graphical figure (Figure 13).

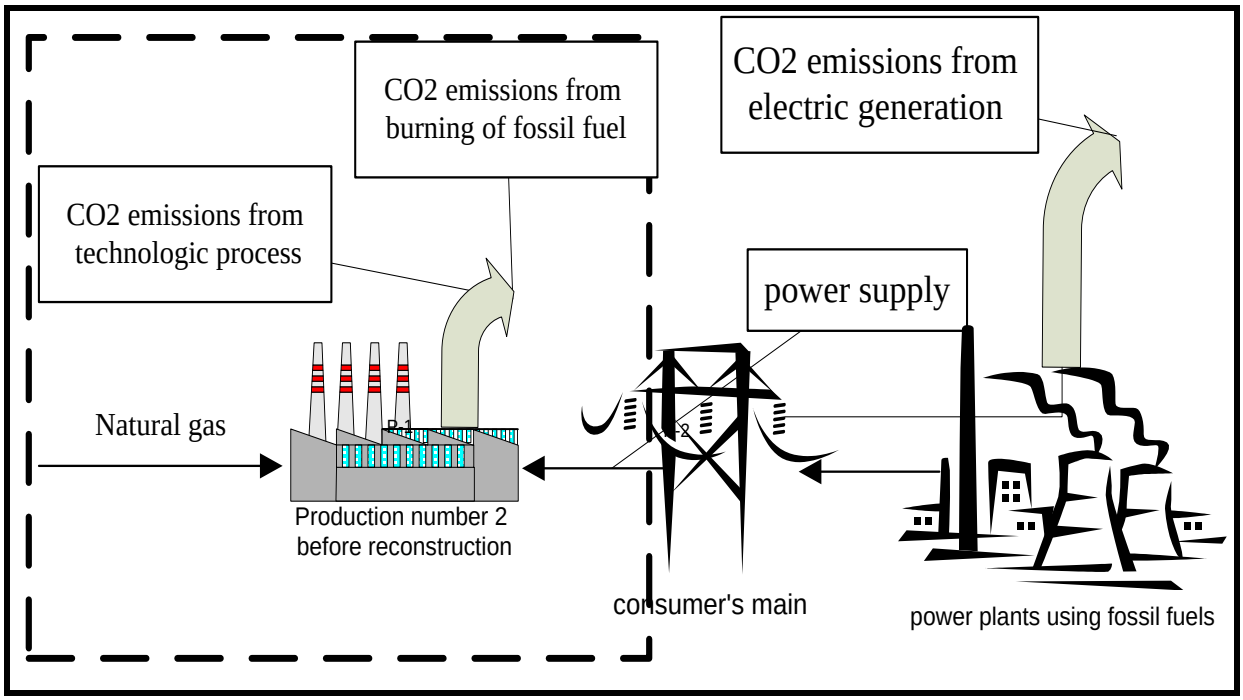


Figure 13. Borders of subproject No. 2 "Implementation of up-to-date line of float-glass production (production 2)" for baseline scenario

Subproject's borders for project scenario are stated on graphical figure (Figure 14).

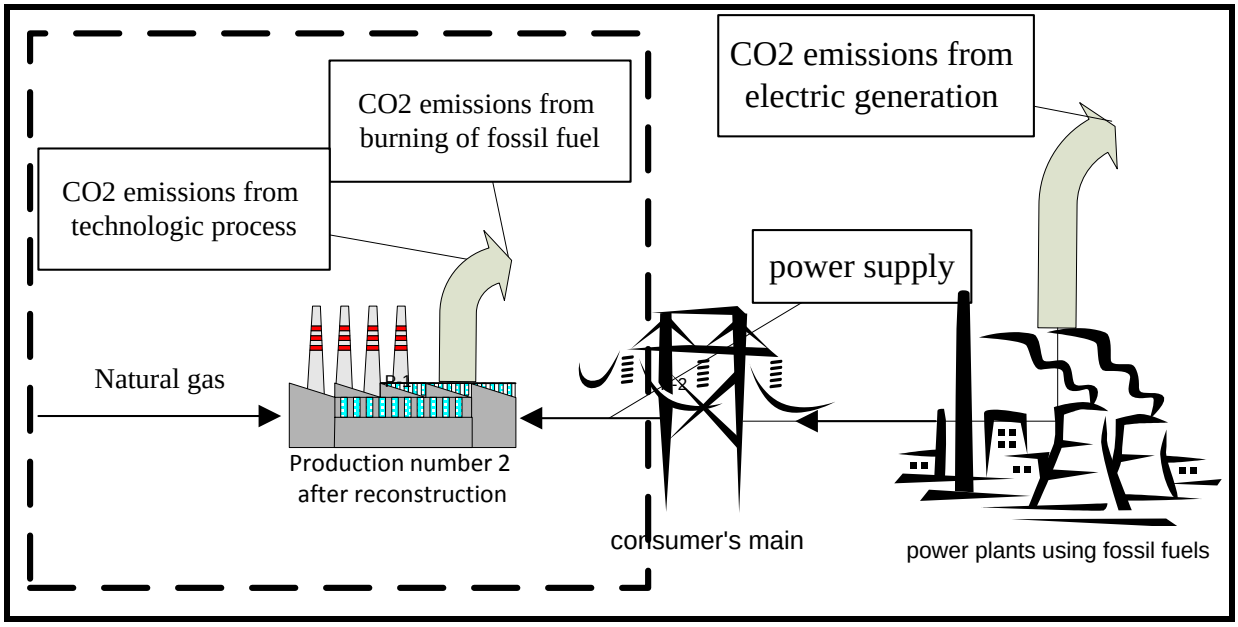


Figure 14. Borders of subproject No. 2 "Implementation of up-to-date line of float-glass production (production 2)" for project scenario.

Project's borders for baseline scenario include CO_2 emissions due to electric energy generation to the general electricity supply network in the amount consumed by equipment of outdated production of float-glass.
Project's borders for project scenario include CO_2 emissions due to electric energy generation to the general electricity supply network in the amount consumed by equipment of modernized production of float-glass.

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

GHG sources and subproject's borders:

Project's borders for baseline scenario of subproject No.3 "Modernization of existing production of the float-glass (production 1)" are stated on graphical figure (Figure 15).

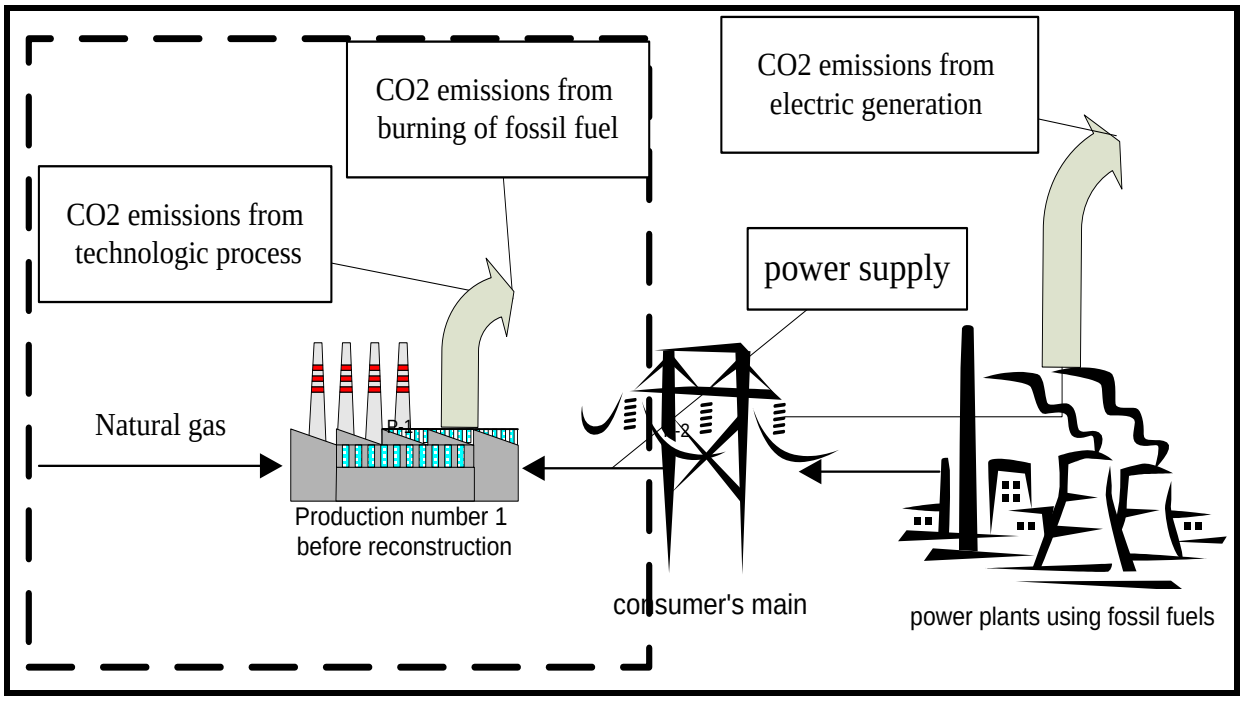


Figure 15. Borders of subproject No. 3 "Modernization of existing production of the float-glass (production 1)" for baseline scenario

Subproject's borders for project scenario are stated on graphical figure (Figure 16).

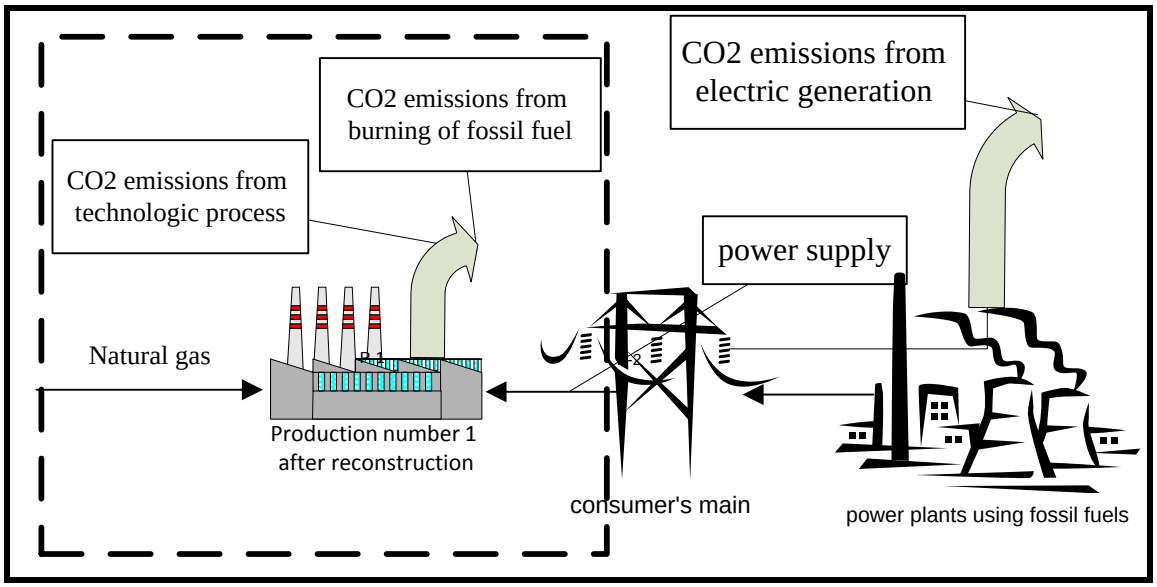


Figure 16. Borders of subproject No. 3 "Modernization of existing production of the float-glass (production 1)" for project scenario.

Project's borders for baseline scenario include CO_2 emissions due to electric energy generation to the general electricity supply network in the amount consumed by equipment of old production of float-glass (Figure 18).

Project's borders for project scenario include CO_2 emissions due to electric energy generation to the general electricity supply network in the amount consumed by equipment of rehabilitated production of float-glass (Figure 18).

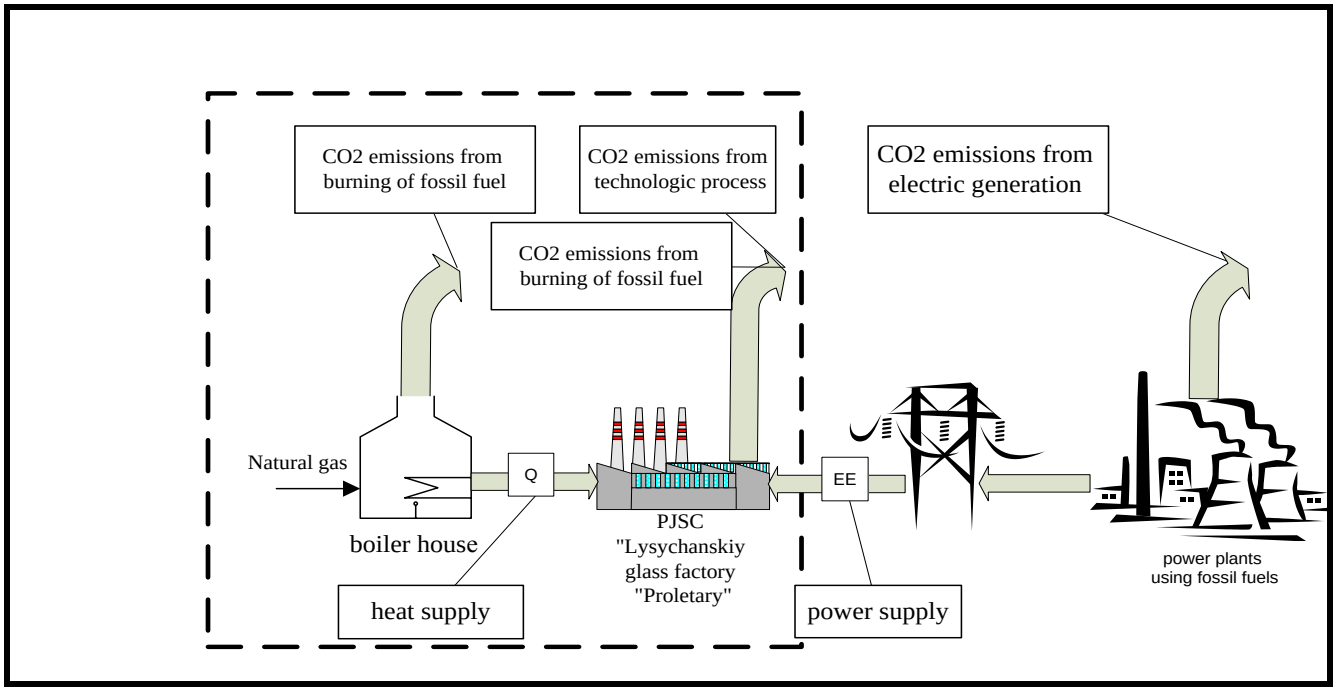


Figure 17. Scheme of project' borders and baseline emissions

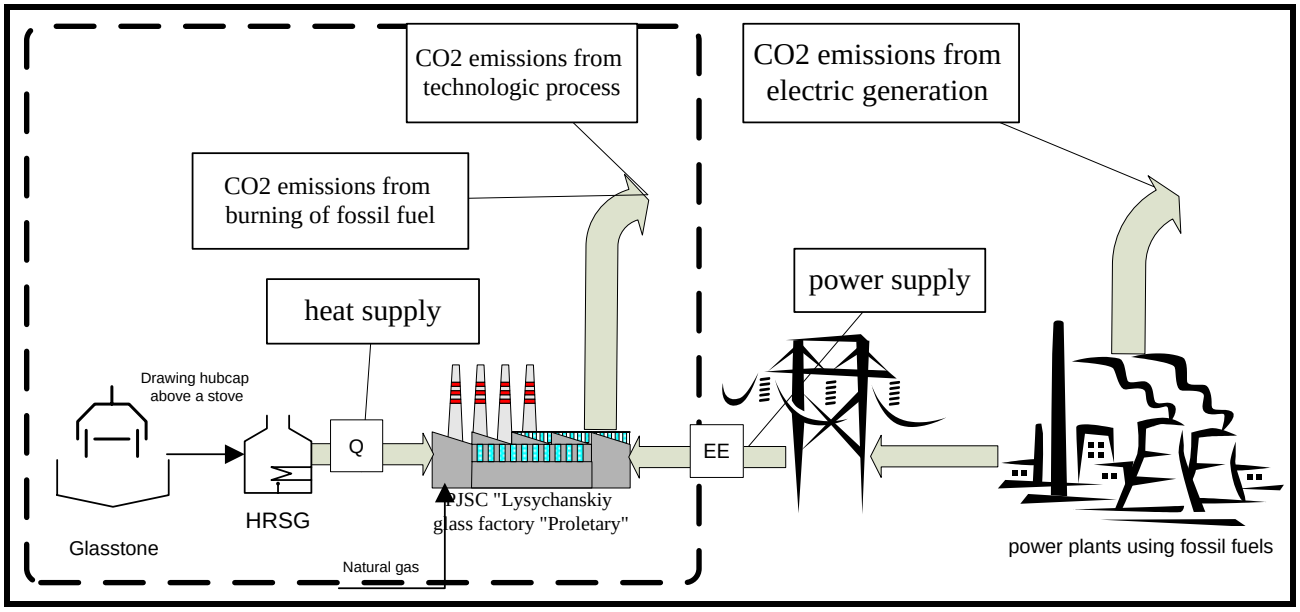


Figure 18. Scheme of project' borders and project emissions

Sources of greenhouse gas emissions and boundaries of project scenario.

Table 5. Baseline and project emissions and leakages

	Source	**Gas**	**Included/excluded**	**Substantiation, explanations**
Baseline emissions under subproject No. 1	CO_2 emissions in the course of heat generation	CO_2	Included	Only those CO_2 emissions will be taken into account, which relate to the same quantity of heat as heat resulted from combustion of natural gas included into the baseline emissions
	CO_2 emissions resulted from natural gas combustion in glass furnace	CO_2	Excluded	Excluded, since they are taken into account in subproject 2 and 3
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
Baseline emissions under subproject No. 2	CO_2 emissions in the course of electric energy generation	CO_2	Included	Main source of emissions. CO_2 emissions due to electric energy generation at power plant operating on fossil fuel, in the quantity of consumption at analogous production in baseline scenario
	CO_2 emissions resulted from natural gas combustion in glass furnace	CO_2	Included	Main source of emissions. CO_2 emissions due to heat energy generation at old production, in baseline scenario
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	CO_2 emissions resulted from preparation and combustion of mixture	CO_2	Excluded	Excluded for simplification since the mixture structure is invariable
Baseline emissions under subproject No. 3	CO_2 emissions in the course of electric energy generation	CO_2	Included	Main source of emissions. CO_2 emissions due to electric energy generation at power plant operating on fossil fuel, in the quantity of consumption at old production in baseline scenario
	CO_2 emissions resulted from natural gas combustion in glass furnace	CO_2	Included	Main source of emissions. CO_2 emissions due to heat energy generation at old production, in baseline scenario
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	CO_2 emissions resulted from preparation and combustion of mixture	CO_2	Excluded	Excluded for simplification since the mixture structure is invariable
Project emissions	CO_2 emissions of utilization of effluent	CO_2	Excluded	Is the constituent of emissions due to combustion of natural gas in furnace

under subproject No. 1	furnace gases			and emissions from preparation and burning of mixture, which are already included into subprojects 3 and 4
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
Project emissions under subproject No. 2	CO_2 emissions in the course of electric energy generation	CO_2	Included	Main source of emissions. CO_2 emissions due to electric energy generation at power plant operating on fossil fuel, in the quantity of consumption at up-to-date line of glass production in project scenario
	CO_2 emissions from combustion of natural gas in glass furnace	CO_2	Included	Main source of emissions. CO_2 emissions due to heat energy generation at up-to-date line of glass production in project scenario
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	CO_2 emissions from preparation and combustion of mixture	CO_2	Excluded	Excluded for simplification since the mixture structure is invariable.
Project emissions under subproject No. 3	CO_2 emissions due to electric energy generation	CO_2	Included	Main source of emissions. CO_2 emissions due to electric energy generation at power plant operating on fossil fuel, in the quantity of consumption at up-to-date line of glass production in project scenario
	CO_2 emissions from combustion of natural gas in glass furnace	CO_2	Included	Main source of emissions. CO_2 emissions due to heat energy generation at up-to-date line of glass production in project scenario.
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	CO_2 emissions from preparation and combustion of mixture	CO_2	Excluded	Excluded for simplification since the mixture structure is invariable.

B.4. Further baseline information, including the date of baseline setting and the name(s) of the person(s)/entity(ies) setting the baseline:

Date of baseline determination: 29/10/10
Baseline is determined by the VEMA S.A., project's developer and consultant in cooperation with PJSC «Lysychanskiy glass factory "Proletary", owner of the project, during 2002-2009, and was determined finally on October 29, 2010 (29/10/2010).

VEMA S.A.:
Kyiv, Ukraine.
Fabian Knodel,
Director.
Telephone: (+38 044 206 84 43)
Fax: (+38 044 206 84 43)
e-mail: info@vemacarbon.com

VEMA S.A. is also a project participant listed in annex 1.

PJSC «Lysychanskiy glass factory "Proletary":
City of Lysychansk, Ukraine
Drozhzhyn Dmytro Mykhaylovych,
Deputy of Chairman of the Board
Telephone: (+3806451 9-42-94)
Fax: (+3806451 9-40-47)
e-mail: dymov-vi@proletary.ua
PJSC «Lysychanskiy glass factory "Proletary" is also a project participant listed in annex 1.

Detailed information is given in Section **D. 4.**

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

Start of project activity: 04/12/2008 – putting into operation of HRSG after glass furnace of workshop No. 2-2.

C.2. Expected operational lifetime of the project:

Expected operational lifetime of the project is 9 years and 8 months/116 months (restricted by effect of the contract of lease).

C.3. Length of the crediting period:

ERUs production relates to the first period of commitments and is 5 years/60 months (January 01, 2009 – December 31, 2012).

Starting date of the crediting period was the expected date of first generated ERUs, namely: January 2009. The end date of the crediting period is December 31, 2012. Therefore, length of the crediting period will make 4 years /48 months. If after the first commitment period under the Kyoto Protocol its validity is prolonged, crediting period under the project will be prolonged by 5 years and 8 months /68 months (January 01, 2013 – August 17, 2018). Taking into account the period preceding the crediting period, the crediting period and the period after its expiration, the total crediting period will make 9 years and 8 months/116 months, from 04.12.2002 to 17.08.2018.
Emissions reductions generated after crediting period may be used according to the corresponding mechanism of UN FCCC.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

According to the cl. 30 of JISC Recommendations within the PDD for this project concerning specified JI project, the monitoring plan shall be drawn up by the project participants in accordance with the provisions of Annex B to Guidance for JIP. In this context the following alternatives exist:
a) The project participants may use approved CDM methodologies for baseline and monitoring;
b) As alternative the monitoring plan can be executed in accordance with Annex B and Guidance for JIP, i.e. specific approach to the JI project can be developed. In this case (among others) some components or combinations of approved CDM methodologies for baseline and monitoring may be used, if considered necessary.

Project owner shall determine the periodicity of monitoring by himself, but monitoring must be conducted at least once per year.
General remarks to the Monitoring Plan:
• After consultation with the verifier, the monitoring plan will be updated in the course of the first verification.
• Social indicators such as the number of employed persons, safety data, information about training, etc., will be produced to the verifier.

Subproject No.1. Utilization of effluent furnace gases.

Monitoring plan for this project was elaborated by specific approach of JI with application of methodology ACM0012 "Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects" version 3.2[8].
Requirements related to appropriateness of application of the methodology ACM0012 for monitoring plan are identical to the requirements related to determination of start position. On the subject of detailed review of appropriateness of application of the methodology ACM0012 see section B.1 of this PDD. Project owner shall determine the periodicity of monitoring by himself, but monitoring must be conducted at least once per year.

Verification of the indicators of project's 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 will be attached to the monitoring reports with all corresponding documents and historical information about heat generation by HRSGs.

Project emissions are determined in following way:

- project emissions are equal to zero, since the HRSGdoesn'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.

[8] http://cdm.unfccc.int/methodologies/DB/3YL5T8ATMB8NTD9HEBU42EP6OJLAY4/view.html

- baseline emissions shall be monitored and calculated continuously on the basis of data of meters.

Table of parameters to be included into the process of monitoring and verification for ERUs calculation and are given in Sections **D.1.1.1** and **D.1.1.3.**

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

Indicator of project's implementation
The most objective and cumulative factors providing a clear view of whether emissions reduction occurred are electric energy and natural gas saving. It may be determined as difference between the baseline consumption of electric energy/natural gas and consumption of electric energy/natural gas after the project's implementation. If the equipment of production 2 consumes electric energy and natural gas at project level, then all other indicators, such as efficiency of new equipment operation, changes of technological process and losses due to defects are corresponding.

Verification of the indicators of project's implementation
PJSC «Lysychanskiy glass factory "Proletary" collects and keeps the data relating to electric energy/natural gas consumption, production output in the form of bills for electric energy, acquired natural gas and production report. Information about saved electric energy and natural gas will be 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 specific approach of JI.

Project emissions are determined in following way:
- project emissions are 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 following way:
- baseline emissions due to combustion of natural gas by old furnace;
- baseline emissions due to consumption of electric energy by old furnace.

Table of parameters to be included into the process of monitoring and verification for ERUs calculation are given in Sections **D.1.1.1** and **D.1.1.3.**

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

Indicator of project's implementation
The most objective and cumulative factors providing a clear view of whether emissions reduction occurred are electric energy and natural gas saving. It may be determined as difference between the baseline consumption of electric energy/natural gas and consumption of electric energy/natural gas after the project's

implementation. If the equipment of production 1 consumes electric energy and natural gas at project level, then all other indicators, such as efficiency of new equipment operation, changes of technological process and losses due to defects are corresponding.

Verification of the indicators of project's implementation
PJSC «Lysychanskiy glass factory "Proletary" collects and keeps the data relating to electric energy/natural gas consumption, production output in the form of bills for electric energy, acquired natural gas and production report. Information about saved electric energy and natural gas will be 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 specific approach of JI.

Project emissions are determined in 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 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.

Table of parameters to be included into the process of monitoring and verification for ERUs calculation are given in Sections **D.1.1.1** and **D.1.1.3.**

D.1.1. Option 1 – Monitoring of the emissions in the project scenario and the baseline scenario:

D.1.1.1. Data to be collected in order to monitor emissions from the project, and how these data will be archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

According to the Guidelines for users of the JI PDD form (version 04) the table was substituted by the table below.

Data/Parameter	**EFy**
Data unit	t CO_2e/MWh
Description	Carbon emission factor for Ukrainian grid in period *y*
Time of determination/monitoring	Once in period
Source of data (to be) used	Research data of Global Carbon B.V.[9]
Value of data applied (for ex ante calculations/determinations)	Given in annex 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.

Data/Parameter	**kWh_y**
Data unit	ths. kWh
Description	Total quantity of electric energy consumed for glass production in period *y*
Time of determination/monitoring	in shifts
Source of data (to be) used	Data of electricity supply meters
Value of data applied (for ex ante calculations/determinations)	Given in accompanying document 1

[9] *Guidance "Standardized emission factors for Ukrainian electrical supply network" (version 5, February 02 2007), executed by Global Carbon B.V.*

Justification of the choice of data or description of measurement methods and procedures (to be) applied	Electricity supply 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.

Data/Parameter	$\mathbf{G^3_y}$
Data unit	ths. Nm^3
Description	Total quantity of gas consumed for glass production in year period *y*
Time of determination/monitoring	Monthly
Source of data (to be) used	Data of meters
Value of data applied (for ex ante calculations/determinations)	Given in accompanying 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.

Data/Parameter	$HEAT_{UG,y}$
Data unit	GJ(t/h)
Description	Volume of heat generated under the project due to fume gases utilization in year in period *y*
Time of determination/monitoring	Daily

Source of data (to be) used	Heat and steam meters
Value of data applied (for ex ante calculations/determinations)	N/A
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 enabling to calculate GHG emissions

Data/Parameter	P_y
Data unit	Ton per twenty-four-hours
Description	Production capacity of glass furnace after rehabilitation in period *y*
Time of determination/monitoring	Once in period
Source of data (to be) used	Technical certificate of the furnace and production researches
Value of data applied (for ex ante calculations/determinations)	N/A
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 enabling to calculate GHG emissions

Data/Parameter	η_y
Data unit	share
Description	Efficiency factor of boilers in period *y*
Time of determination/monitoring	Once in period
Source of data (to be) used	Regime charts of boilers
Value of data applied (for ex ante calculations/determinations)	Given in accompanying 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	Calculated as weighted average value for boiler-house
Any comment	

Data/Parameter	LHV_y
Data unit	$TJ/ths.Nm^3$
Description	Lower heat value of natural gas in year *y*
Time of determination/monitoring	Once in period
Source of data (to be) used	National inventory of anthropogenic emissions from sources and absorption by absorbent of greenhouse gases in Ukraine for 1990 – 2006.
Value of data applied (for ex ante calculations/determinations)	Given in accompanying 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	National inventory of anthropogenic emissions from sources and absorption by absorbent of greenhouse gases in Ukraine for 1990 – 2006.
Any comment	

According to the effective laws, all metering devices in Ukraine shall satisfy the established norms and standards and shall pass regular inspections (as a rule once per year and for certain equipment – once per 2 or 3 years).
In case of metering devices' damage they shall be replaced or repaired as soon as possible. Such cases will be stated in monitoring reports.

D.1.1.2. Description of formulae used to estimate project emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

Subproject No.1. Utilization of effluent furnace gases.

Project emissions under the subproject include the emissions due to
(1) combustion of additional fuel in addition to utilized heat,
(2) emissions from electric energy through consumption of electric energy applied for heat generation and other additional needs

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

$PE_{1,y}$ – project emissions due to Subproject No.1. implementation in year y
$PE_{1,AFy}$ – emissions due to combustion of additional fuel in addition to utilized heat to Subproject No.1 in year y.
$PE_{1,EL\,y}$ - emissions due to consumption of electric energy applied for heat generation and other additional needs to Subproject No.1 in year y.

Due to the fact that utilization of effluent furnace gases does require neither additional fuel nor additional electric energy
$PE_y = 0$

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

$PE_{2,y} = PE_{2,elec,y} + PE_{2,fuel,y}$ (2)

where:

$PE_{2,y}$ Emissions under the subproject No.2 in year y (tCO_2e);
$PE_{2,elec,y}$ Emissions under the subproject No.2 due to electric energy consumption in year y (tCO_2e);
$PE_{2,fuel,y}$ Emissions under the subproject No.2 due to natural gas consumption in year y (tCO_2e).

$PE_{2,elec,y} = kWh_{2,y} * EF_{y,}$ (3)

where

$kWh_{2,y}$ – total volume of electric energy necessary for production output at production 2 to Subproject No.2 in year y, kWh;

$EF_{y,}$ - CO_2 emission factor of network in year *y* (tCO_{2e}/MWh).

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

where LHV_y – lowest heating value of natural gas in project year y (TJ/ths.m^3);

EF_{ng} - CO_2 emission factor owing to natural gas burning (tCO_{2e}/TJ);

$M^3_{2,y}$ - total volume of natural gas consumption (ths.m^3), necessary for production output in project year y at production 2 to Subproject No.2.

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

$PE_{3,y} = PE_{3,elec,y} + PE_{3,fuel,y}$ (5)

where:

$PE_{3,y}$ Emissions under the subproject № 3 in year y (tCO_2e)

$PE_{3,elec,y}$ Emissions under the subproject № 3 due to electric energy consumption in year y (tCO_2e)

$PE_{3,fuel,y}$ Emissions under the subproject № 3 due to natural gas consumption in year y (tCO_2e)

$PE_{3,elec,y} = kWh_{3,y} * EF_y$ (6)

where

$kWh_{3,y}$ – total volume of electric energy necessary for production output at production 1 to Subproject No.3 by each furnace in year y, kWh

EF_y - CO_2 emission factor in network in year *y* (tCO_{2e}/MWh)

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

Where

LHV_y – lowest heating value of natural gas in project in year y (TJ/ths.Nm^3)

$EF_{ng,y}$ - CO_2 emission factor owing to natural gas burning in year y (tCO_{2e}/TJ)

$M^3_{3,y}$ - total volume of natural gas consumption (ths.m^3), necessary for production output in project year y at production 1 by each furnace to Subproject No.3.

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the

project boundary, and how such data will be collected and archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

According to the Guidelines for users of the JI PDD form (version 04) the table was substituted by the table below.

Data/Parameter	**T_b**
Data unit	tons
Description	Total volume of glass production in baseline year
Time of determination/monitoring	Once in baseline year
Source of data (to be) used	Production report
Value of data applied (for ex ante calculations/determinations)	Given in accompanying document 1
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

Data/Parameter	**T_y**
Data unit	tons
Description	Total volume of glass production in project year y
Time of	Once in period

determination/monitoring	
Source of data (to be) used	Production report
Value of data applied (for ex ante calculations/determinations)	Given in accompanying document 1
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

Data/Parameter	**kWh_b**
Data unit	ths. kWh
Description	Total quantity of electric energy consumed for glass production in baseline year
Time of determination/monitoring	Once in baseline year
Source of data (to be) used	Data of electricity supply meters
Value of data applied (for ex ante calculations/determinations)	Given in accompanying document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Electricity supply 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

Data/Parameter	G^3_b
Data unit	ths. Nm^3
Description	Total quantity of gas consumed for glass production in baseline year
Time of determination/monitoring	Once in baseline year
Source of data (to be) used	Data of meters
Value of data applied (for ex ante calculations/determinations)	Given in accompanying 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

Data/Parameter	$HEAT_{UG,b}$
Data unit	GJ(t/h)
Description	Volume of heat generated under the project due to fume gases utilization in period *y*
Time of determination/monitoring	Once in period
Source of data (to be) used	Heat and steam meters
Value of data applied (for ex ante calculations/determinations)	N/A
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 enabling to calculate GHG emissions

Data/Parameter	P_b
Data unit	Ton per twenty-four-hours
Description	Production capacity of glass furnace
Time of determination/monitoring	Once in period
Source of data (to be) used	Technical certificate of the furnace and production researches
Value of data applied (for ex ante calculations/determinations)	N/A
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 enabling to calculate GHG emissions

Data/Parameter	η_b
Data unit	share
Description	Efficiency factor of boilers
Time of determination/monitoring	Once in baseline year
Source of data (to be) used	Regime charts of boilers
Value of data applied (for ex ante calculations/determinations)	0,899

Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	Calculated as weighted average value
Any comment	

Data/Parameter	LHV_b
Data unit	$TJ/ths.Nm^3$
Description	Lower heat value of natural gas in baseline year
Time of determination/monitoring	Once in baseline year
Source of data (to be) used	National inventory of anthropogenic emissions from sources and absorption by absorbent of greenhouse gases in Ukraine for 1990 – 2006.
Value of data applied (for ex ante calculations/determinations)	Given in accompanying 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	National inventory of anthropogenic emissions from sources and absorption by absorbent of greenhouse gases in Ukraine for 1990 – 2006.
Any comment	

Data/Parameter	K_c
Data unit	Share
Description	Glass mass use factor
Time of determination/monitoring	Once in period
Source of data (to be) used	Technical certificate and production researches

Value of data applied (for ex ante calculations/determinations)	Determined for each furnace and given in accompanying 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	

Data/Parameter	**SECb**
Data unit	ths. kWh / tonne
Description	Specific consumption of electrical energy per tonne of production in the baseline year
Time of determination/monitoring	Once in baseline year
Source of data (to be) used	PJSC «Lysychanskiy glass factory "Proletary"
Value of data applied (for ex ante calculations/determinations)	Given in accompanying 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

Data/Parameter	**SGCb**
Data unit	ths. Nm^3 / tonne
Description	Total quantity of gas consumed for glass production in baseline year

Time of determination/monitoring	Once in baseline year
Source of data (to be) used	PJSC «Lysychanskiy glass factory "Proletary"
Value of data applied (for ex ante calculations/determinations)	Given in accompanying 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

D.1.1.4. Description of formulae used to estimate baseline emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

Subproject No.1. Utilization of furnace effluent gases.

$BE_{1,y} = BE_{1,MR,y} + BE_{1,Use,y}$ (8)

where:

$BE_{1,y}$ Baseline emissions in year y to Subproject No.1 (tCO_2)

$BE_{1,MR,y}$ Baseline emissions due to combustion of fossil fuel, fume gases of which are utilized in the course of project activities in year y to Subproject No.1 (tCO_2)

$BE_{1,Use,y}$ Baseline emissions due to heat generation, replacement in the course of project activities in year to Subproject No.1 (tCO_2)

$BE_{1,MR,y}$ is invariable both in baseline and project scenarios related to glass furnaces operation and will be taken into account in subprojects 2 and 3.

$BE_{1,Use,y} = HEAT_{UG,b} \times EF_{heat,y}$ (9)

where:

$HEAT_{UG,b,y}$ – Volume of heat generated under the project due to furnace gases utilization in year y to Subproject No.1 , GJ

$EF_{heat,y}$ – emissions factor for heat in baseline scenario in year y (tCO_2/GJ)

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

$BE_{2,y}= T_{2,y}x(SECb_2 \times EFy+ SGCb_2 \times LHV_{b,y} \times EF_{ng,y})$ (10)

where

$BE_{2,y}$ - Baseline emissions in year y (tCO2e) in production (2) to Subproject No.2

$T_{2,y}$ – project volume of production output in year y (t) in production (2) to Subproject No.2

$SECb_2$ -Specific consumption of electrical energy per tonne of production in the baseline year in production 2 to Subproject No.2

$SGCb_2$ - Total quantity of gas consumed for glass production in baseline year in production 2 to Subproject No.2

EFy - CO_2 emission factor in network in year *y* (tCO_{2e}/MWh)

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

$BE_{3,y}= T_{3,y}x(SECb_3 \times EFy+ SGCb_3 \times LHV_{b,y} \times EF_{ng,y})$ (11)

where

$BE_{3,y}$ - Baseline emissions in year y (tCO2eq) to Subproject No.3

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

EFy - CO_2 emission factor in network in year y (tCO_{2eq}/MWh);

$LHV_{b,y}$ – lower heating value of natural gas in year y (GJ/ths.Nm^3);

EF_{ng} - CO_2 emission factor due to natural gas combustion (tCO_{2eq}/TJ);

$SECb_3$ -Specific consumption of electrical energy per tonne of production in the baseline year in production 1 to Subproject No.3

$SGCb_3$ - Total quantity of gas consumed for glass production in baseline year in production 1 to Subproject No.3

D. 1.2. Option 2 – Direct monitoring of emission reductions from the project (values should be consistent with those in section E.):

D.1.2.1. Data to be collected in order to monitor emission reductions from the project, and how these data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

N/A

D.1.2.2. Description of formulae used to calculate emission reductions from the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

Leakages are not expected

D.1.3. Treatment of leakage in the monitoring plan:

D.1.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

Leakages are not expected

D.1.3.2. Description of formulae used to estimate leakage (for each gas, source etc.; emissions in units of CO2 equivalent):

Leakages are not expected

D.1.4. Description of formulae used to estimate emission reductions for the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

GHG emission reductions in project were estimated by means of the following formulas:

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

RE_i GHG emission reduction in year i, t CO_2e;
$BE_{1,i}$ - baseline emissions under the subproject No. 1 in year i, t $CO2_e$.
$BE_{2,i}$ - baseline emissions under the subproject No. 2 in year i, t $CO2_e$.
$BE_{3,i}$ - baseline emissions under the subproject No. 3 in year i, t $CO2_e$.

$PE_{1,i}$ - project emissions under the subproject No. 1 in year i, t $CO2_e$.
$PE_{2,i}$ - project emissions under the subproject No. 2 in year i, t $CO2_e$.
$PE_{3,i}$ - project emissions under the subproject No. 3 in year i, t $CO2_e$.

D.1.5. Where applicable, in accordance with procedures as required by the host Party, information on the collection and archiving of information on the environmental impacts of the project:

>>

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
M-1	low	Metering equipment shall be calibrated according to the national standards
M-2	low	Metering equipment shall be calibrated according to the national standards

High requirements are produced to the articles, since the products of PJSC «Lysychanskiy glass factory "Proletary" are used for manufacturing of glass packs, mirrors and as plain glass for buildings and vehicles. At present the products of our company is confirmed by the certificates.

In the course of production and sale of products to the consumers the PJSC «Lysychanskiy glass factory "Proletary" takes into consideration requirements of Ukrainian Legislation, state normative acts on labor protection and environmental safety, state, inter-state and international standards and requirements of the countries importing the products.

Taking into consideration the necessity of satisfaction of customers' requirements by products of permanent high quality, the company developed and implemented a quality management system according to international standard ISO 9001:2000.
Introduction of the QMS on the basis of International Standard ISO 9001:2000 is a strategic decision of the company's management. Documented regulations established within QMS are mandatory for execution by all employees of the company.

1.Certificate was issued on December 8, 2006. This certificate confirms that the products - sheet glass of marks M1, M2, M3, M4 were tested and meet all mandatory requirements defined in the State Standard TU B.V.2.7-1222003 (State Standard 111-2001) "Sheet glass. Technical specifications" cl.4.4 - geometric parameters 5.1.1 - optical distortion, 5.1.2 - quantity and extent of permissible defects, 5.1.3 - directional light transmission coefficient, 5.1.4 - residual internal stresses, 5.1.5 water resistance.
Certificate covers sheet glass of marks M1, M2, M3, and M4, which is produced serially from 28/11/2006 to 28/11/2008.

2. Certificate was issued on June 15, 2007. This certificate confirms that the products - safe flat glass according to the annex No. GI 229417, GI 229418, GI 229419, GI 229420, and GI 229 421 were tested and meet all mandatory requirements of State Standard 5727-88 "Glass safe for ground transport. General technical specifications" and TU U 26.1-31380846-003-2002.
Certificate covers safe flat glass produced serially from 11.06.07 to 11.06.2009.

3. Certificate was issued on June 15, 2007. This certificate confirms that the products – building flat tempered glass, with length up to 6 m^2, were tested and meet all mandatory requirements defined in State Standard B. V. 2.7 B-110-2001 (State Standard 30698-2000) "Building flat tempered glass. Technical specifications", cl.4.1.1, 4.1.4, 4.1.6, 4.1.7, 4.1.8 and TU U 26.1-31380846-003-2002.
Certificate covers building flat tempered glass, with length up to 6 m^2, which is produced serially from 11.06.07 to 11.06.2009.

4. Certificate was issued on October 26, 2006. This certificate confirms that the products - furniture mirrors meet requirements of State Standard 17716-91 "Mirrors. General technical specifications" and TU U21-124-97 cl. 1.4.5 – Hardness of secured coating, 1.4.11 - shortcomings.
Certificate covers furniture mirror produced serially from 26/10/2004 to 17/10/2008.

5 Certificate was issued on October 25, 2006. This certificate confirms that the products - tinted glass, produced by vacuum metallization meet the requirements of TU UV.2.7.21-534-2000 "Tinted glass. Technical specifications", cl.2.7.7 - quality of coating, 2.7.9 - quality of tinction, 2.7.11 - directional light transmission coefficient.
The certificate covers tinted glass produced serially from 25/10/2006 to 17/10/2008.

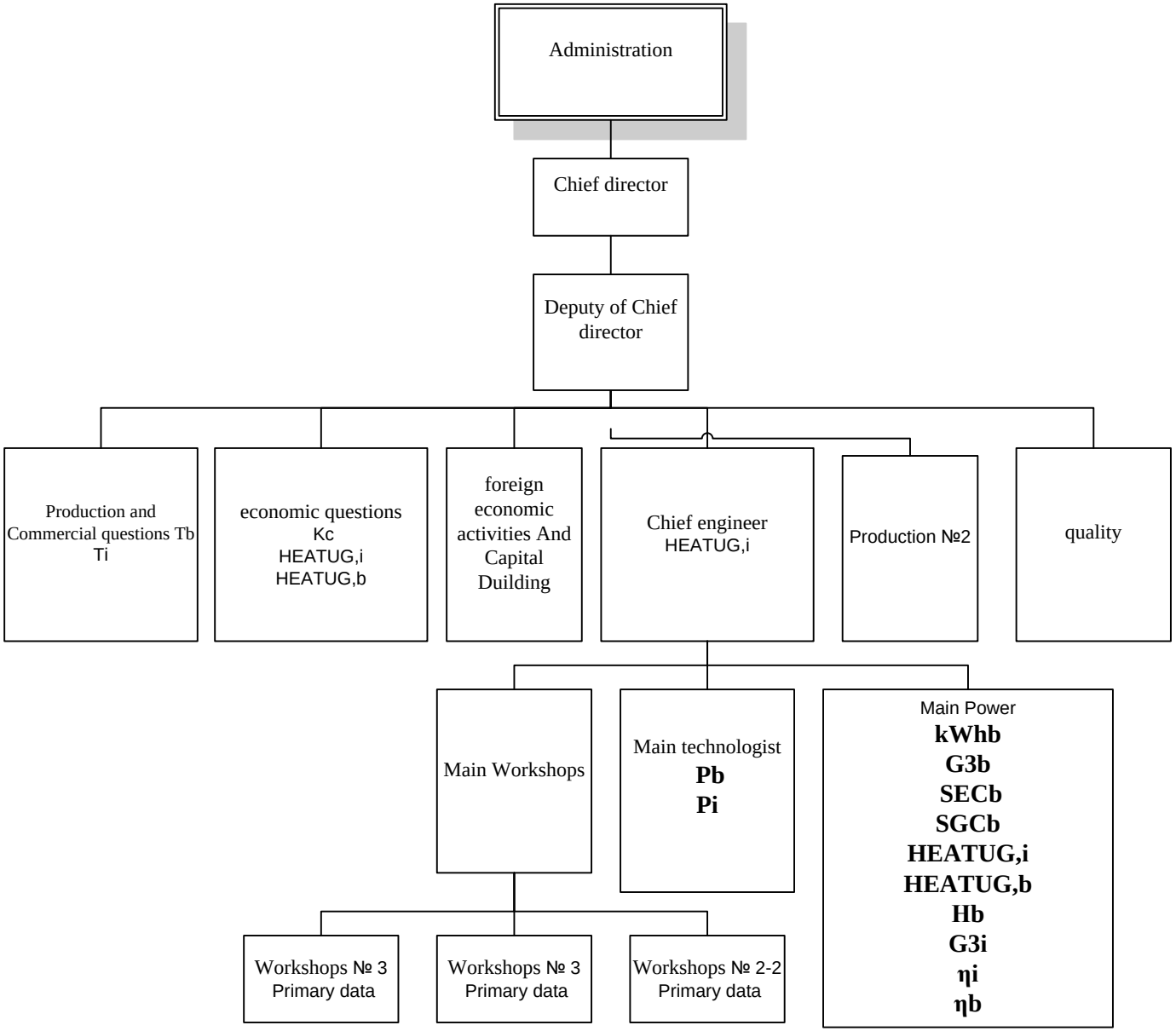
6. Certificate was issued on October 26, 2006. This certificate confirms that the products - furniture glassware meet the requirements of State Standard 6799-80 "Furniture glassware. Technical specifications" cl. 2.3 – method of glass edges processing, 2.6 – various thickness of glass, 2.8 - quality of glass sheet ends processing.
The certificate covers furniture glassware manufactured serially from 26/10/2006 to 17/10/2008.

7. Certificate was issued on December 19, 2005. This certificate confirms that the products – safe flat tempered glass in accordance with Annex GD No. 902121; GD No. 902122; GD No. 902123, and GD No. 902124 meet the requirements of State Standard 5727-88 "Safe glass for ground transport. General technical specifications" and TU U 26.1-31380846-003-2002.
Certificate covers safe flat tempered glass for ground transport, produced serially from 19/12/2005 to 17/06/2007.

D.3. Please describe the operational and management structure that the project operator will apply in implementing the monitoring plan:

Operational structure includes operational departments PJSC «Lysychanskiy glass factory "Proletary" and personnel of the company.
Management structure includes administration departments of the Company and project's specialists-developers (VEMA S.A.).

Detailed operational structure of control and management is given below.


Administration
Chief director
Deputy of Chief director
Production and Commercial questions Tb Ti
economic questions Kc HEATUG,i HEATUG,b
foreign economic activities And Capital Duilding
Chief engineer HEATUG,i
Production №2
quality
Main Workshops
Main technologist Pb Pi
Main Power kWhb G3b SECb SGCb HEATUG,i HEATUG,b Hb G3i ηi ηb
Workshops № 3 Primary data
Workshops № 3 Primary data
Workshops № 2-2 Primary data

D.4. Name of person(s)/entity(ies) establishing the monitoring plan:

Monitoring plan shall be determined by VEMA S.A., project developer, and PJSC «Lysychanskiy glass factory "Proletary", project's supplier.
VEMA S.A.:
Kyiv, Ukraine
Apostolaka S.B.
Telephone: (+38 050) 473 55 67
Fax: (+38 044) 206 84 43
e-mail: asb@vemacarbon.com
VEMA S.A. is also a project participant listed in annex 1.

PJSC «Lysychanskiy glass factory "Proletary"
City of Lysychansk, Ukraine
Dymov Valeriy Ivanovych, Deputy Chief Engineer
Telephone /fax: +38(06451) 2-11-38, 9-42-72, 9-44-75
e-mail: dymov-vi@proletary.ua
PJSC «Lysychanskiy glass factory "Proletary" is also a project participant listed in annex 1.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Since it is impossible to apply methodological calculations given in section B (Monitoring plan of project) for preliminary estimation of project emission reductions, specific formulas listed in Section E.1 and E.4 were elaborated and applied for preliminary estimation of project emission reductions. Since in the course of project development the quantity of consumed natural gas and electric energy, heat generated by the HRSGs were unknown, with the purpose of preliminary estimation of emission reductions the project's developers relied on data known at such stage of calculation, namely: normative consumption of natural gas by each furnace, total quantity of consumed electricity, efficiency factor of boiler equipment, etc. The results of corresponding calculations using these formulas are given in the accompanying documents 1-4. These calculations are based on improvement of the equipment energy efficiency or maintaining of the current practice (for alternative forms of energy: secondary heat). Parameters that correspond to these formulas are stated in the accompanying documents 1-4.

Each accompanying document contains the calculation of GHG emission reductions corresponding to certain technology used in the JI project:
Accompanying document 1 - Utilization of secondary energy resources with heat generation
Accompanying document 2 - Modernization of the production by introduction of the up-to-date float glass line
Accompanying document 3 – Rehabilitation of production by introduction of measures to improve energy efficiency
Accompanying document 4 - Summary table containing calculation of total emission reductions in all periods
Greenhouse gas emissions reduction in the project were evaluated using the following calculations (See Accompanying document 4):

Table 6. Estimated project emissions for the period from 01.01.2009 to 31.12.2012

Year	Estimated project emissions (tonnes of CO2 equivalent)
2009	88 272
2010	112 288
2011	255 604
2012	246 637
Total (tonnes of CO_2 equivalent)	702 801
Average annual expected emissions reduction over the crediting period for post Kyoto mechanism (in tons CO_2 equivalent)	175700

Table 7. Estimated project emissions for the period from 01.01.2013 to 17.08.2018

Year	Estimated project emissions (tonnes of CO2 equivalent)
2013	246 637
2014	246 637
2015	246 637

2016	246 637
2017	246 637
Till 17 August 2018	164 424
Total (tonnes of CO_2 equivalent)	1 397 609
Average annual expected emissions reduction over the crediting period for post Kyoto mechanism (in tons CO_2 equivalent)	234 935

Detailed information about the calculations is given in Accompanying documents 1-3.

E.2. Estimated leakage:

There are no expected leakages.

E.3. The sum of E.1. and E.2.:

Project emission + leakage 1 397 609 + 0 = 1 397 609 t CO_2 equivalent

E.4. Estimated baseline emissions:

Table 8. Estimated baseline emissions for the period from 01.01.2009 to 31.12.2012

Year	Estimated baseline emissions (tonnes of CO2 equivalent)
2009	114 825
2010	144 316
2011	303 881
2012	320 132
Total (tonnes of CO_2 equivalent)	883 153
Average annual expected emissions reduction over the crediting period for post Kyoto mechanism (in tons CO_2 equivalent)	220788

Table 9. Estimated baseline emissions for the period from 01.01.2013 to 17.08.2018

Year	Estimated baseline emissions (tonnes of CO2 equivalent)
2013	320 132
2014	320 132
2015	320 132
2016	320 132
2017	320 132
Till 17 august 2018	213 421
Total (tonnes of CO_2 equivalent)	1 814 081
Average annual expected emissions reduction over the crediting period for post Kyoto mechanism (in tons CO_2 equivalent)	302 346

E.5. Difference between E.4. and E.3. representing the emission reductions of the project:

Project emissions reduction = Baseline emissions – (Project emissions + Estimated leakage). (17)
All results of evaluation of project emission reduction are given in the Table 10-11.

Table 10. Estimated emissions reduction for the period from 01.01.2009 to 31.12.2012

Year	Estimated emission reductions (tonnes of CO2 equivalent)
2009	26 553
2010	32 028
2011	48 277
2012	73 494
Total (tonnes of CO_2 equivalent)	180 352

Table 11. Estimated emissions reduction for the period from 01.01.2013 to 17.08.2018

Year	Estimated emission reductions (tonnes of CO2 equivalent)
2013	73 494
2014	73 494
2015	73 494
2016	73 494
2017	73 494
Till 17 August 2018	48 996
Total (tonnes of CO_2 equivalent)	416 566

E.6. Table providing values obtained when applying formulae above:

Table 12. Table containing the results of emissions reduction estimation in the first period of commitments

Year	Estimated project emissions (tonnes of CO2 equivalent)	Estimated leakage (tonnes of CO2 equivalent)	Estimated baseline emissions (tonnes of CO2 equivalent)	Estimated emission reductions (tonnes of CO2 equivalent)
2009	88 272	0	114 825	26 553
2010	112 288	0	144 316	32 028
2011	255 604	0	303 881	48 277
2012	246 637	0	320 132	73 494
Total (tonnes of CO2 equivalent)	702 801	0	883 154	180 352

Table 13. Table containing the results of emissions reduction estimation after the first period of commitments.

Year	Estimated project emissions (tonnes of CO2 equivalent)	Estimated leakage (tonnes of CO2 equivalent)	Estimated baseline emissions (tonnes of CO2 equivalent)	Estimated emission reductions (tonnes of CO2 equivalent)
2013	246 637	0	320 132	73 494
2014	246 637	0	320 132	73 494
2015	246 637	0	320 132	73 494
2016	246 637	0	320 132	73 494
2017	246 637	0	320 132	73 494
Till 17 August 2018	164 424	0	213 421	48 996
Total (tonnes of CO2 equivalent)	1 397 609	0	1 814 081	416 466

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts of the project, including transboundary impacts, in accordance with procedures as determined by the host Party

All project activities are carried out under the existing environmental legislation of Ukraine.
Pursuant to the Ukrainian legislation "On environment protection" [10] and "Structure and contents of the materials for Estimation of Environmental Impact (EEI) when projecting and building companies, buildings and constructions" [11] the PJSC «Lysychanskiy glass factory "Proletary" is not obliged to conduct Estimation of Environmental Impact for such type of project. Inventorization of polluting substances is carried out with the assistance of third-party certified company that conducts selection and analysis of pollutants samples by own attorney equipment.
During the construction of Production number 2 of the environmental review took place (EIA) according to Ukrainian legislation.
The only impact on environment is dismantled equipment, which will be applied as secondary raw material in the future.

Transboundary effects from project activity according to their definition in the text of the Convention on Transboundary Pollution At Big Distances ratified by Ukraine will not take place.

[10] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1264-12

[11] http://www.budinfo.com.ua/dbn/8.htm

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

According to the current environmental protection legislation the PJSC «Lysychanskiy glass factory "Proletary" shall perform monitoring and produce annual reports on pollution emissions (nitrogen dioxide, sulphur anhydride, carbon monoxide, dust, etc.). Therefore the company introduces and implements the environmental monitoring procedures. Environmental Engineer is responsible for control and collection of relevant data, preparation of quarterly reports. Annual report shall be 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".

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to supporting documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

Impact on water environment

In order to reduce the harmful impact of this production on the water basin the following measures are provided for:

- construction of drainage is planned for protection against flooding by groundwaters and prevention of

destruction of the underground part of the production constructions

For sewerage of the production and village the project provides for full rehabilitation of the existing treatment plants at 3400 m3/twenty-four-hours of incoming wastes. In order to ensure the security of the coastal strand along the right bank of the river the bend at such part of bed will be straightened by means of its displacement to the medium part of flood land. In addition clearing of mouth area of Ryazantseva stream, being the left influx of Bilenka river, will be executed. It is provided for to reinforce bed of rivulet and right bank of Bilenka river by stone cape on such area of Bilenka river.

The project has little impact on the groundwater, due to the fact that water is used only for household needs. The company has "logs of the metering system water" from which the data used to prepare statistical reports. Active monitoring of the impact on the state of water bodies and are prepared and gives all forms of statistical reporting in accordance with current legislation of Ukraine.

Effects on ambient air[12].

Regularly records and monitoring of pollutant emissions into the atmosphere is kept, all forms of statistical reporting in accordance with "Instructions for filling the forms of state statistical observations for air N 2 - TP (air) (annual) and N 2 - TP (air) (quarterly) "Report about Air Protection" of State Communal Standard № 674 from 30.12.2004 are prepared.

The main pollutants released in the course of production processes of the enterprise, are: inorganic dust containing SiO_2 less than 20%, inorganic dust from soda of SiO_2 20-70%, inorganic dust with SiO_2 over 70%, nitrogen dioxide, carbon monoxide.
In order to minimize the emission of pollutants into the air the project provides for the following measures:
- Aspiration fume exhaust umbrellas over each source of pollutants formation;
- Installation of cyclones TsN-11, having 89% purification rate, for air purification vented from the workshop premises;

[12] http://zakon.nau.ua/doc/?code=v0201282-97

- Pouring and transportation of the sawed materials is provided for in project gallery;

Impact on land use.

There is no impact on the land/soil.

Other impact

Harmful physical factors of the plant for the float glass production include in-plant noise, vibration.

The main noisy equipment on projected site is belt conveyors, rumbling and crushers.

In order to protect the premises from noise and vibration, the machines and aggregates, which are a source of noise and vibration, will be installed at their own foundations not associated with the building foundation. Special vibroinsulated spacers will be used in the course of installation of the machines and aggregates on coverings.

Lightning protection

According to the "Instructions for lighting protection of buildings and constructions" RD 34.21.122-87 the construction of large-size float-glass production workshop relates to third category and shall be protected from direct lighting, high potentials and electrostatic electrics.
Direct lighting protection is executed by joining of trusses, purlins, metal structures and columns to the ground loop.

High potentials protection is carried out by mean of joining of all metal communications at workshop building input to the grounding loop.

Electrostatic electrics protection shall be executed by combining of broaching pipelines at each 20-30 m.

Waste of production

During the project implementation waste is generated, which apply only to the business (maintenance and repair of equipment) and household activities. A monitoring of waste and preparing of statistical reporting forms shall be N 1-BT, "Accounting for waste and packaging materials and containers" under the current legislation of Ukraine.

Contracts for waste disposal and recycling are concluded. Measures for recycling of waste of the production will enable to exclude pollution of adjacent environment by the wasteof production.

Impact on environment is in strict correspondence with project solutions and recommendations of environmental services; norms are not exceeded and after-effect may be considered as permissible.

SECTION G. Stakeholders' comments

G.1. Information on stakeholders' comments on the project, as appropriate:

Since the project activities do not imply any negative environmental impacts and negative social effect, special public discussions were not necessary. Consultations with Stakeholders and local community were conducted at the meetings of local authorities.
Consultation with stakeholders and local community also displayed considerable interest in technical details and expected results of the project on the part of other glass manufacturing enterprises. During the consultation was not comments and objections.
No stakeholders' comments were received. PJSC «Lysychanskiy glass factory "Proletary" is intended to continue cooperation with stakeholders in the process of project implementation and exploitation period.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Organisation:	PJSC «Lysychanskiy glass factory "Proletary"
Street/P.O.Box:	Michurina, str.
Building:	1
City:	Lysychansk
State/Region:	Lugansk region
Postal code:	93110
Country:	Ukraine
Phone:	+3806451 9-42-94
Fax:	+3806451 9-40-47
E-mail:	dymov-vi@proletary.ua
URL:	www.proletary.ua
Represented by:	
Title:	Deputy of Chairman of the Board
Salutation:	
Last name:	Drozhzhyn
Middle name:	Mykolayovych
First name:	Dmytro
Department:	
Phone (direct):	+3806451 9-42-94
Fax (direct):	+3806451 9-40-47
Mobile:	
Personal e-mail:	

Organisation:	VEMA S.A.
Street/P.O.Box:	Route de Tonon
Building:	45
City:	Geneva
State/Region:	
Postal code:	PC 170 CH-1222
Country:	Switzerland
Phone:	+380 (50) 473 55 67
Fax:	
E-mail:	info@vemacarbon.com
URL:	www.vemacarbon.com
Represented by:	
Title:	Director
Salutation:	
Last name:	Knodel
Middle name:	
First name:	Fabian
Department:	
Phone (direct):	
Fax (direct):	+380 (44) 206 84 43

Mobile:	
Personal e-mail:	

Annex 2

BASELINE INFORMATION

Key information for determining the baseline is listed in the table in section B.2.
Information on Baseline is included in Section B. It is represented accurately in Annex 2 .

Information on national Baseline grid:

Ukraine has integral national grid, therefore average carbon emission factor (CEF) for electricity production is to be used.

According to the Table 8 "Emission Factors for the Ukrainian grid 2006-2012" of Annex 2 "Standardized Emission Factors for the Ukrainian Electricity Grid" to "Ukraine - Assessment of new calculation of CEF", verified by TUV SUD Industrie Service GmbH 17.08.2007:
Table A2-1. Carbon Emission factors (CEF) for electricity generation and consumption in Ukraine for 2006-2007

Type of project	Parameter	EF (tCO2/MWh)
Electricity production	EFgrid,produced,y	0.807
Electricity consumption reduction	EFgrid,reduced,y	0.896

It should be noted that according to "Ukraine - Assessment of new calculation of CEF"[11]:"This baseline can be used as ex-ante (fixed for the period 2006 – 2007) or ex-post. In case an ex-post baseline is chosen the data of the Ukrainian grid have to be obtained of the year in which the emission reductions are being claimed. Monitoring will have to be done in accordance with the monitoring plan
• the Monitoring Plan should also include monitoring of the grid losses in year y;
• power plants at which JI projects take place should be excluded. Such a JI project should have been approved by Ukraine and have been determined by an Accredited Independent Entity."

Thus. TUV SUD Industrie Service GmbH has validated the certain value of CEF for 2006 and possibly future up to 2012, as well as the methodology for calculations of this factor, and its "team recommends updating the calculation annually depending on point of time when national consolidated data are available"[21], with taking into account the above monitoring conditions.

EBRD in 2009 expressed that "these factors are in need for an update further to a request from the Ministry of Fuel and Power of Ukraine and the National Environmental Investment Agency of Ukraine."[13]

In course of development of the Monitoring reports for this project, if available, the valid at that time CEF values for corresponding period will be used. After receiving more modern inputs for the calculations according to the methodology developed by Global Carbon and validated TÜV SÜD (or may be another EBRD developed after its adoption), the emission factor for electricity grid should be calculated annually in accordance with the real situation.
- For the years 2008-2011 - in accordance with orders NAEI № 62 from 15.04.2011[14]. "About approval of indicators carbon dioxide specific emissions in 2008», № 63 of 15.04.2011[15]. " About approval of

[13] TERMS OF REFERENCE. Development of the electricity carbon emission factors for Russia and Ukraine for the period 2009 – 2020. EBRD, 2009

[14] http://www.neia.gov.ua/nature/doccatalog/document?id=127171

indicators carbon dioxide specific emissions in 2009», № 43 from 28.03.2011[16]. " About approval of indicators carbon dioxide specific emissions in 2010», № 77, 12.05.2011.[17] " About approval of indicators carbon dioxide specific emissions in 2011"

Table A2-2. Carbon emission factors (CEF) for reduction of energy consumption in Ukraine for 2008-2011

Project type	**Parameter**	**EF_2008 (tCO2/ MW/h)**	**EF_2009 (tCO2/ MW/h)**	**EF_2010 (tCO2/ MW/h)**	**EF_2011 (tCO2/ MW/h)**
Electricity generation	EFgrid,produced,y	1,055	1,068	1,067	1,063
Consumption of electricity 1 class consumers	EFgrid,reduced1,y	1,082	1,096	1,093	1,090
Electricity consumption by 2 class consumers	EFgrid,reduced2,y	1,219	1,237	1,225	1,227
Associated with the electricity expense at its transfer to power grids	EFgrid,transfer,y	1,082	1,096	1,093	1,090

According to the resolution of the National Electricity Regulation Commission of Ukraine № 1052 from 13 August 1998 " About the order of definition consumers classes " to 1 class consumers who:
1) receives electricity from electricity supplier at the point of electric energy sale with the degree of voltage 27.5 kV and above;
2) connected to the connection plants (except hydroelectric, which produce electricity from time to time), as well as connection substation mains voltage 220 kV and above, regardless of the voltage at the point of electricity sale electricity supply organizations to consumer;
3) are industrial companies with average monthly volume of electricity consumption 150 million kWh. and more for the technological needs of production regardless of the voltage at the point of electricity sale electricity supply organizations to consumer;

2 class consumers who receive electricity from from electricity supplier at the point of electricity sale with lower degrees of voltage 27.5 kV.

Thus, the following values CEF used in PDD calculations :

[15] http://www.neia.gov.ua/nature/doccatalog/document?id=127172

[16] http://www.neia.gov.ua/nature/doccatalog/document?id=126006

[17] http://www.neia.gov.ua/nature/doccatalog/document?id=127498

Table A2-3. Baseline carbon emission factors (CEF), which is used for calculations in the PDD

Year	**Parameter**	2005	2006-2007	EF_2008 **(tCO2/ MW/h)**	EF_2009 **(tCO2/ MW/h)**	EF_2010 **(tCO2/ MW/h)**	EF_2011 **(tCO2/ MW/h)**
Electricity generation	EFgrid,produced,y		0,807	1,055	1,068	1,067	1,063
Consumption of electricity 1 class consumers	EFgrid,reduced1,y	0,896	0,896	1,082	1,096	1,093	1,090
Electricity consumption by 2 class consumers	EFgrid,reduced2,y			1,219	1,237	1,225	1,227
Associated with the electricity expense at its transfer to power grids	EFgrid,transfer,y			1,082	1,096	1,093	1,090

According to this , after receiving more modern inputs for the calculations according to the methodology developed by Global Carbon and validated TÜV SÜD (or may be another developed methodology, after its adoption), the emission factor of electricity grid should be calculated annually in accordance with the real situation.

Annex 3

MONITORING PLAN

Detailed information of the monitoring may be considered in the following way:

A. Technical description of the project

Measures to be implemented for improvement of the efficiency of PJSC «Lysychanskiy glass factory "Proletary":

Subproject No.1. Utilization of furnace effluent gases.

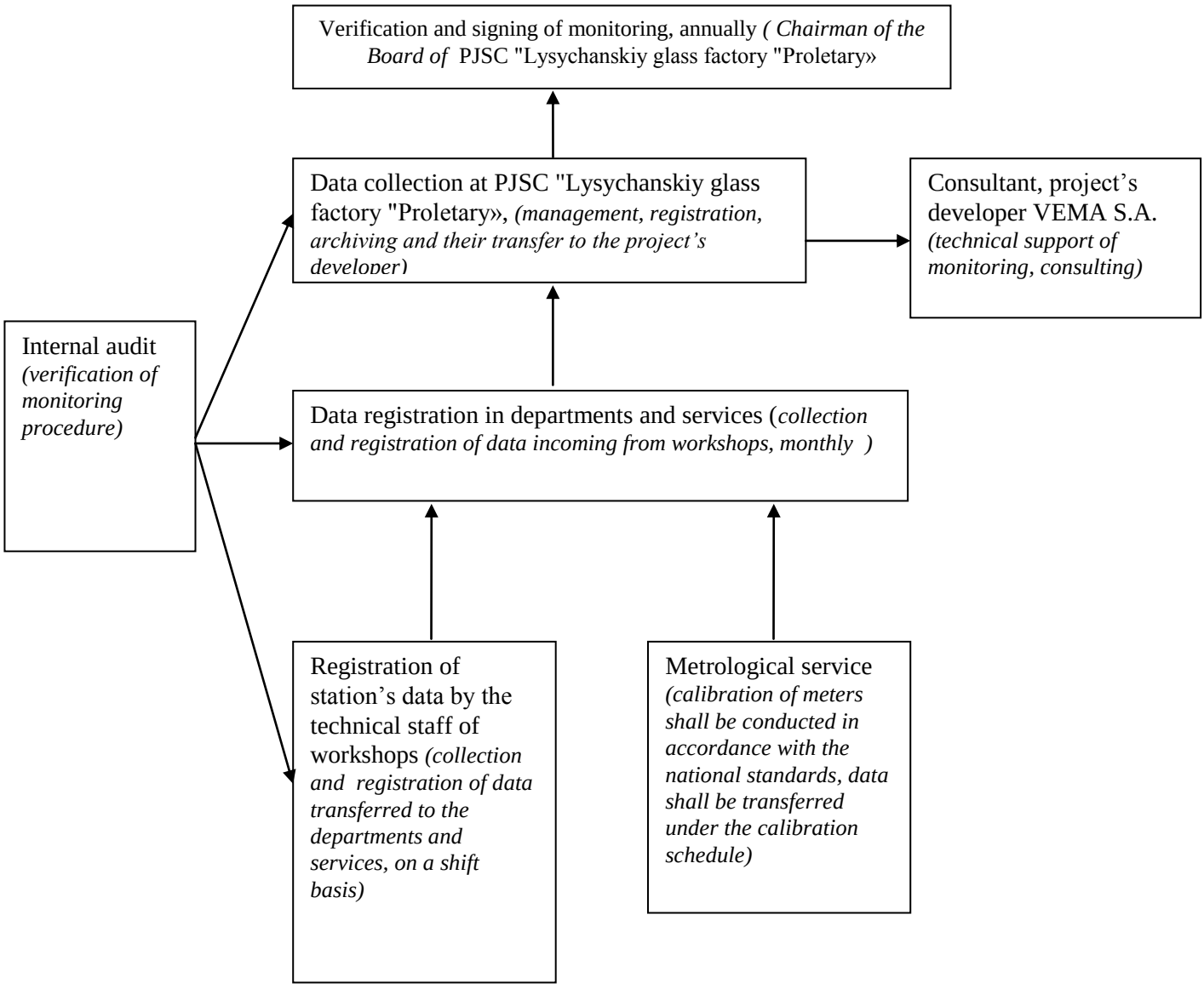
Subproject No.2. Implementation of up-to-date line of float-glass production (production 2).

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

Documentation confirming purchase and assembly of new equipment will be archived and kept at PJSC «Lysychanskiy glass factory "Proletary" during 2 years after the project activity termination.

B. Control of monitoring organization

Structure of monitoring data collection:



Overall project management carried out by the Deputy Chairman by way of controlling and coordinating the actions of his subordinates, such as deputy director for surface decontamination, the chief power engineer, the chief heating engineer and chief of security. Daily management of locally made heads of departments, who appoints two operators responsible for the operation of technological equipment. The company employs duty electrician. In day, works team of engineers responsible for prevention and service of all process equipment, measuring equipment automation and teleautomatics. Information on-line transferred to the chief of the duty in the central office of the enterprise. The company operates 24 hours a day. Was put three shifts of eight hours.
On the main facilities, the responsibility is distributed as follows:
• Workshop operator controls data;
• Two company dispatcher controls the data and parameters of a workflow, the use of gas and electricity, every day manually keep logs of gas and electricity consumed by workshops.
• Operators controlled data of electricity transmitted from the network, and inner consumption of electricity.
All information transmitted to the company dispatching service, and controls on-line by duty dispatcher . Based on information provided by the dispatching service monitor engineer prepares monthly and annual monitoring reports of electricity, gas, heat and 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 management enterprise , under the current system of monitoring and reporting.

C. Monitoring procedures

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

1. Current control of electric energy meters' operation is conducted during design period (design 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 design month) the chief of site or his authorized representative shall take the readings of electric energy meters (electric energy meters are the devices, passed state certification, 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 shall hand over obtained information to the chief power engineer department.

3. "Report of electric energy meters' readings" shall be executed according to the readings of electric energy meters of all sites; engineer involved in electric energy bills shall provide 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 shall execute "Act of supplied electric energy", approved by the company's round seal and hand over such act to the department of PJSC «Lysychanskiy glass factory "Proletary" for confirmation.

5. The representative of PJSC «Lysychanskiy glass factory "Proletary" shall provide approved "Act of supplied electric energy" to the subscriber department of energy supplying organization, wherein he obtains invoices for payment.

6. All bills for payment shall be kept by 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 electric energy meters' operation is conducted annually with fixation on meters of gas consumption ;
2. Monthly the responsible officer of site shall take the readings of natural gas meters (natural gas meters are the devices, passed state certification, 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 shall hand over obtained information to the chief power engineer department and economic planning department.
3. In calculations using data of natural gas heating value from National inventory of anthropogenic emissions from sources and absorption by absorbent of greenhouse gases in Ukraine for 1990 – 2006 due to the fact that data of calorific capacity provided by the gas supplier is not regular and have low reliability

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

1. Readings shall be taken on a shift basis and fixed in journals of established form.

In the absence of access to the electronic database will be used the data from paper media (Accounting magazines, etc.). All operators are responsible for data management. All appropriate data are accumulated daily, and archived electronically and in printed form. All data will be saved till 2031. In addition, operators are preparing standardized daily, weekly, monthly and annual reports.

Responsibilities
• Operators monitor and prepare the data and transmits them to the dispatching service, every day keeps a log by hand of gas, electricity and so on.
• Dispatcher and and deputy of chief power engineer of company controls data, the parameters of the workflow and use of gas and electricity every day keeps a log by hand.
Based on information provided by the dispatching service monitoring engineer prepares monthly and annual monitoring reports of electricity, gas, heat and emissions and gives them to Director. Overall supervision of the monitoring system is carried out by the management of enterprise according to the existing control system and provision.

D. Calibration of meters

Meters shall be calibrated according to the national standards.

E. Recording and archiving of data

The person responsible for joint implementation project appointed by the project's owner shall monitor data in electronic and paper form. Electronic documents shall be printed and kept.
All data and documents in paper form shall be archived and one backup copy shall be handed over to project's coordinator.

All data shall be kept during 2 years after the project activities termination.

F. Trainings
Employees of VEMA S.A. will consult the persons responsible for monitoring elaboration at PJSC «Lysychanskiy glass factory "Proletary" before starting project activity and during project period.