MONITORING REPORT

CONTENTS

There is no mandatory JI MR template, therefore CDM MR template was used.

MONITORING REPORT
version #2, 13/07/2012

«REHABILITATION OF THE DISTRICT HEATING SYSTEM OF PUBLIC STOCK COMPANY «WESTA-DNEPR»

Monitoring period #1:

Monitoring period starting date: 01/01/2008
Monitoring period closing date: 30/06/2012

SECTION A. General description of the project activity

A.1. Brief description of the project activity:

1. Purpose of the project activity and the measures taken to reduce greenhouse gas emissions;

The main idea of the project is to reduce fuel consumption in particular reducing consumption of natural gas (imported to Ukraine) and fuel oil, electricity consumption due to replacing old boiler house to new one with modern equipment and due to modernization district heating system on the territory of PSC "WESTA-DNEPR" and also in the surrounding area of the plant PJSC "DMZ" which is served by this boiler house. The result of the implementation of a new boiler house with modern equipment will be significant reduction of fuel and electricity consumption that will reduce greenhouse gas emissions.
Emission reductions due to the implementation of this project will come from two major sources:
- Reduce fossil fuel consumption for heating purpose;
- Reduce electricity consumption.

Baseline scenario is the same as the scenario that acting befor the implementation of the project activity - annual minimum repair DH system for its work.

Previously, enterprises JSC "WESTA-DNEPR" and PJSC "DMZ" supplied with heat from existing separately standing boiler house. In the old boiler house was installed 2 steam boilers DKVR 10/13 and 3 hot-water boilers KVGM-50. Boiler equipment and boilers morally and physically obsolete, boiler efficiency was 75%. Heat supply network from the existing boiler house to consumers length of more than 1 km is in poor condition located outside the main area of the enterprise. Thus, the decision to build a new boiler house with modern boilers with high efficiency was made.

PJSC "DMZ" fulfills annual minimal repairing of the DH system to keep it working. Particularly it executes repairing of network's parts and boilers that might cause accidents. More economically feasible and realistic scenario without carbon credits sales is a baseline scenario with very slow reconstruction activity than to make a major overhaul of the heating system. Minimal annual repairing doesn't lead to drooping of baseline emissions because of degradation of the whole system with efficiency droop at other objects, the overall actual emissions of Supplier would stay on the approximately same level. This scenario is less environmentally favorable for the near future (including first commitment period 2008-2012), since GHGs emissions of Supplier will continue to be kept at the same level or even higher, but economically such scenario is more attractive.

Project scenario is the implementation of the project on construction a modern module boiler house and decommissioning of old boiler house.

The project employs the increase in fuel consumption efficiency to reduce greenhouse gas emissions relative to current practice. Over 11 million m^3 of natural will be saved annually starting from 2011. Such

reduction of fuel consumption is based on increase of the boiler efficiencies, energy consuming equipment, reduction of heat losses in networks

2. Brief description of the installed technology and equipments

The project employs that two heat boilers firm "Buderus", heating capacity 11,200 kW each will be installed. Boilers are equipped with gas burner with forced air supply for combustion gas. Boilers are equipped with control systems.

Volume of the project involves:

- Rehabilitation of the 1 boiler-house with 5 installed boilers;
- Replacement of 5 outdated boilers by 2 new ones;
- Implementation of water conditioning;
- Implementation of advanced pump system;
- Implementation of new heat exchangers;
- Replacement of heat distributing network;
- Dismantling of old boiler house.

3. Relevant dates for the project activity (e.g. construction, commissioning, continued operation periods, etc.).

Main stages of the project implementation are shown in the table below:

№	**Stages of the project**	**Period**
1	Designing of the new boiler house	01/02/2007- 31/10/2007
2	Construction of the new boiler house	01/02/2007- 31/10/2007
3	Launch work and test operation	01/11/2007-30/04/2008
4	Rehabilitation and construction of new engineering networks of the new boiler house	01/07/2007- 30/10/2007
5	Dismantling of old industrial boiler house	01/08/2008 – 31/05/2009
6	Dismantling of old engineering networks	01/08/2008 – 30/11/2009

4. Total emission reductions achieved in this monitoring period.

Total amount of emissions reduction achieved from 01/01/2008 to 30/06/2012, rounded down to whole tonnes, is **250710** tons of CO_2e.

A.2. 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)	PSC «WESTA-DNEPR»	No
The Netherlands	Ohana LLP	No

PSC «WESTA-DNEPR» is the project host.

A letter of endorsement from the Ukrainian Designated Focal Point (National Agency of Environmental Investment) had previously been received for the proposed project, reference No. 747/23/7, dated 22/03/2012. A letter of approval from the Ukrainian Designated Focal Point was received for the proposed project, reference No. 1970/23/7, dated 25/07/2012.

A letter of approval from the Netherland Designated Focal Point was received for the proposed project, reference 2012JI35, dated 26/07/2012.

A.3. Location of the project activity:

The boiler house of PSC "WESTA-DNEPR" is located in the Dnipropetrovsk City in the territory of PJSC "DMZ". It is located in the following geographical coordinates: 48° 26′ 0.58″ N, 34° 58′ 23.27″ E [1].

The project boundaries include old and new boiler-houses and heat distribution networks that supply heat and hot water to the objects. In the old boiler house was installed 2 steam boilers DKVR 10/13 and 3 hot-water boilers KVGM-50. The heat distribution networks from the boiler to consumers were located outside the main territory, stretching more than 1 km. The new boiler is located in the existing building manufacturing plant #117 in one-floor part of it. The technology part of the project provides installation of the two hot-water boilers Logano S825L capacity 11200kW each (firm "Buderus", Germany).

[1] http://toolserver.org/~geohack/geohack.php?language=ru&pagename=%D0%94%D0%BD%D0%B5%D0%BF%D1%80%D0%BE%D0%BF%D0%B5%D1%82%D1%80%D0%BE%D0%B2%D1%81%D0%BA&params=48.433493_N_34.97313_E_type:city#.D0.A4.D0.BE.D1.82.D0.BE.D0.B3.D1.80.D0.B0.D1.84.D0.B8.D0.B8

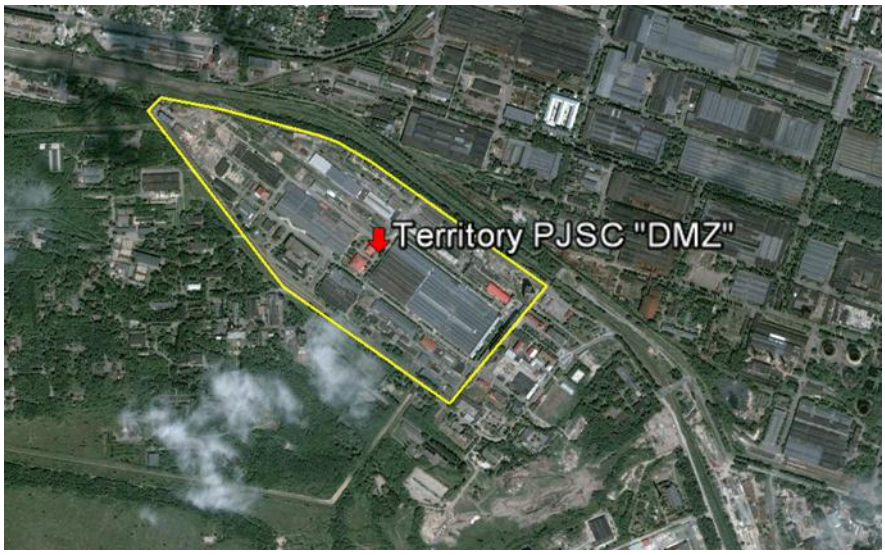

Fig.1 Plant PJSC "DMZ" on the map of Dnipropetrovsk City (latitude 48 °26'1.35"S longitude: 34 °58'31.53" N)

Fig.2 Location of boilers house by PSC "WESTA-DNEPR" on the territory of PJSC "DMZ" (latitude 48°26'3.59"S longitude 34°58'16.58"N)

A.4. Technical description of the project

The project provides for the construction of the internal gas boiler heating system for heating and ventilation of companies: PJSC "DMZ" and PSC "WESTA-DNEPR".

There will be two heat boilers firm "Buderus" type Logano S825L, heating capacity 11,200 kW each will be installed.

Indicators	Unit measurement	Capacity
Nominal heating capacity	kW	11200
Volume of water in the boiler	l	9960
Hydraulic resistance of flow of water through boiler	mbar	40
Permissible excess pressure of water in the boiler	bar (kgf/cm2)	6(6)
The maximum water temperature at the outlet from the boiler	°C	110
Gas consumption at nominal heat (Q^p_n=8050 kkal/m3)	nm^3/hour	1250

Efficiency	%	92...95
Temperature of outgoing gases - At rated load (100%) - At partial loads (60%)	°C	 190 160
Weight of boiler	kg	16400
The required pressure (the need for traction) on boiler	pas	0

Table.1 Technical data of the boiler Logano S825L

Boilers are equipped with safety, control valves and security instruments that comply with the requirements of the current standard documentation. SNiP II-35-76 "Boilers", DBN B.2.5-20-2001 "Gas supply", DNAOP 0.00-1.08-94 " Rules of the device usage and the safe operation of the steam vapor pressure not exceeding 0.07 MPa, water boilers, water heaters and water heating at a temperature not higher than 115 ° C".

Boiler Logano S825L is equipped with gas burner "Weishaupt" type WKG80/3-A ZM-ILN with forced air supply for combustion gas (Table 2).

Type of burner	WKG80/3-A ncn.ZM-lLN
Nominal capacity	11200 kW
Gas usage (*LHV = 33705* kJ/m3 *(8050* kcal/m3*)*	417 nm^3/hour
Gas pressure to burner	50mbar
Air pressure to the burner	80±200Pas
Diameter (conditional) of joining pipeline	100mm
The diameter of the gas ramp	100mm
Fuel	Natural gas
Nominal temperature of the air	25±15°C
Sizes: length, width, height	2578x905x1123
Weight burner	200 kg

Table.2 Technical characteristics of burner

Boilers are equipped with control systems Logamatic 4311 -in the first boiler (presenter) and Logamatic 4312 (slave) – in the second boiler – on second boiler: applying the above control systems to automate all processes related to ensuring proper and safe operation of boiler.

Boilers are equipped with automatic control and regulation of the burner and automatic security, providing trouble-free operation of the boiler and burner.

Stopping of gas feeding to the burner is performed by protection device (double solenoid valve) in the following cases

- When improperly raising or lowering the gas pressure;
- When fading torch burner;
- When improperly reducing the air pressure to the burner;
- In an emergency increase or decrease of level of water in the boiler;
- When you stop the fan burner.

For safe operation of equipment and pipelines provided abortions blower and pipelines.

Internal pipelines are laid open, installation and commissioning of pipelines of natural gas is in compliance with DBN B.2.5- 20-2001 "Gas supply", «Safety rules of gas supply systems in Ukraine» (DNAOP 0.00-1.20-98).

As heat networks are used previously isolated pipes. The choice of isolation made by requirements SNIP 2.04.14-88 "Thermal isolation of equipment and pipelines." To apply a mineral insulation stitched grade

100 (50 mm) GOST 21880-86, cover layer - folgoizol. At the feed pipe heating circuit were installed network pumps and Three-way mixer with electric actuators (3 units); On the back line - mechanical filter. Temperature regulation of the coolant is released to the heating circuit of the heating system on schedule according to the outside air temperature. Changing the coolant temperature in the feeding line of heating circuit is performed by three three-way mixers by mixing cold water from a return line.

Adjust heat boiler outlet is performed automatically by changing the power burner (1st and 2nd degree burn) first slave, then the lead boiler or a complete shutdown first slave, then the lead boiler.

Regulation of supply of heat boiler is performed automatically by changing the power of burner (1st and 2nd degree of burn) first slave, then the lead boiler or a complete shutdown first slave, then the lead boiler. The switching on of boilers made in reverse order.
Producible heat transfer agent is water with temperature of 90 ° -65 °. The circulation of heat transfer agent in the system is carried out heat pumps firm "Wilo" (Germany) and "Crono Line". To compensate for thermal expansion of agent tanks are installed membrane firm "EIbi" (Italy) type ERS capacity of 5000l. Recharge of network is provided chemically purified water, which is prepared in water-preparatory unit firm GLACK and heated in a heat exchanger RTA-51-R-5000 the company "Opeks" tap water.

The source of gasification of boiler-house is an existing, underground steel pipeline medium pressure 630 mm in diameter, laid on the Budivelnikiv street. For gasification of boiler-house provides for laying pipeline underground medium pressure gasket with polyethylene pipes PE model number SDR-17.6 per SSU.2.7-73-98 with a diameter of 225x12, 8mm. To reduce the working pressure (50 mbar) project provides installation of a pressure regulator in front of each boiler, which comes together with gas burner. Commercial metering gas for boiler-house provides on the base of ultrasonic gas meter course G1000 Du150mm, for technological gas before each boiler provides installation of ultrasonic meter course G1000 Du100mm. The withdrawal of combustion products is carried out by flues connected to individual chimneys Du800mm height 25.0 m. Chimney height is determined by the results of assessment of environmental impact (part of the project EIA) and DBN B.2.5-20-2001 «Gas supply».

Electricity supple to build in boiler in buildings 117 is performed from the existing internal transformer substations TS number 35, according to specifications of PJSC “DMZ”, № 5900/7-91 of 11.10.06, by two cable lines 0,4 kV.

According to the degree of reliability, the power load to customers is the first and second categories of EMP (ukr ПУЕ). The installed capacity and estimated electricity consumers load are:

Main project data:
Pinst.= 276,6 kW
Pcalc.= 251,2 kW
Annual loss of electricity is:
Wr = 1320MWh.

Power of electricity consumers of boiler is provided from input-distribution board type VKSH-023/600 with device ABP and automatic switches for input and lines. To account the electricity on inputs, there are 3 phase electronic meters type transformer switching type EMS are set, accuracy class 1.0 active and reactive energy in both directions.

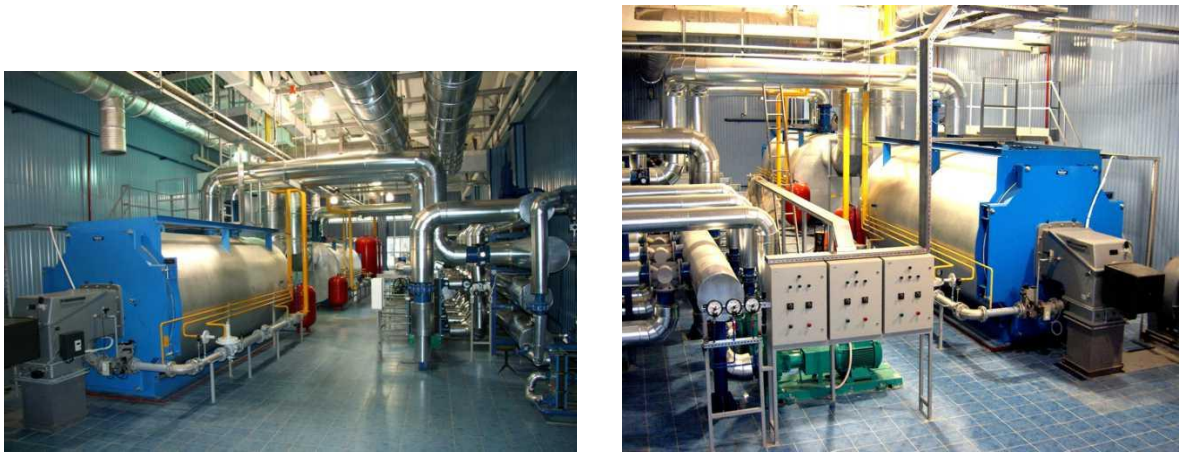

Fig.3 Boiler house PSC "WESTA-DNEPR"

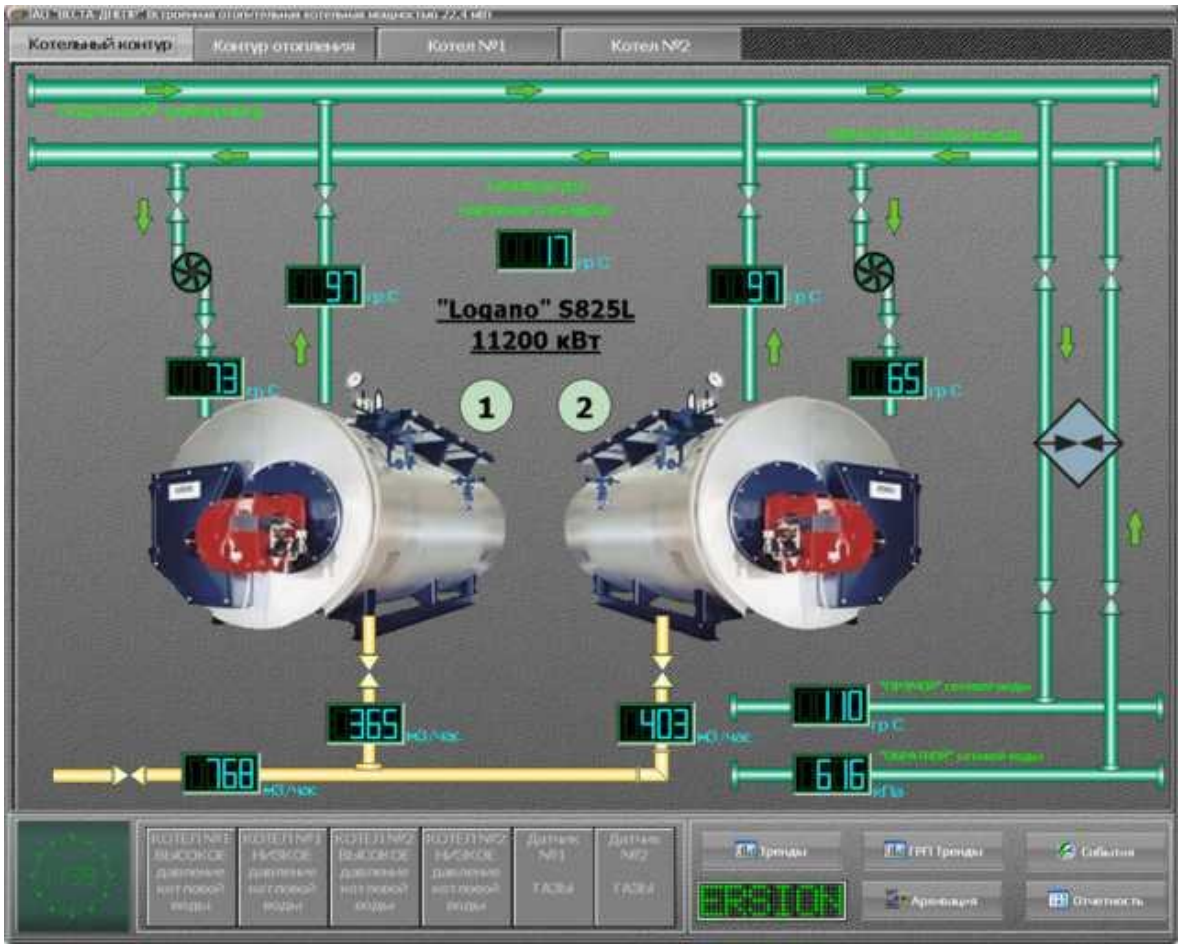

Fig.4 Boiler contour

These technologies are already approved but some of them are not widespread. Therefore, there might be some bottlenecks, which are typical when implementing the new technologies and equipment.

Taking into account the overall economic situation, it is not likely that the project technology will be substituted with any more efficient technology in the next 20 - 30 years.

As to the first commitment period from 2008 to 2012, it is ensured that there is absolutely no risk that this technology will be substituted by any other technology during this time.

Fig.5 Boiler «Buderus» S825L

Thus, the main measures, which will be used to improve the efficiency of the heating system of PSC "WESTA-DNEPR" , are the following:

- Replacement of existing generated heat equipment to new one;
- Replacement of obsoleted boilers by highly efficient gas-fired ones with integrated burners will result in efficiency increasing from 71-85% up to 90-94%.
- Consecutive transition of heating systems to preliminary isolated pipes;
- Technical re-equipment of central heat point with heat exchangers;
- Installation of automatic regulation system;
- Use of modern devices of the heat account; monitoring systems of heat networks; the control, management and automation of warmly generating object;
- Creation of optimum systems of monitoring and power audit of object of power system.
- Dismantling.

A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:

A JI-specific approach is applied, as described in the PDD.

There is no approved CDM baseline and monitoring methodology which is applicable – without revisions – to outdated district heating systems. Therefore, a JI specific approach (a) is applied. The most appropriate methodology AM0044 can be used for the project «Rehabilitation of the District Heating System of PSC «WESTA-DNEPR» because the project has some differences and inconsistencies with the conditions of the applicability of this methodology.

The main cause of impossibility of methodology AM0044 using for baseline calculation is no data for thermal energy output, because of thermal energy meters absence on the majority of boiler houses included in the project. The main complication for implementation of the JI projects on district heating in Ukraine is the practical absence of monitoring devices for heat and heat-carrier expenditure in the

municipal boiler-houses. Only the fuel consumption is registered on a regular basis. It makes practically impossible the application of AM0044 (version 01) methodology which basic moment is monitoring of the value $EG_{PJ, i, y}$ (thermal energy output of project boiler i in year y) - page 9 of Methodology AM0044 (version 01), which should be measured every month by flow-meters (the expenditure of heat-carrier) and thermal sensors (temperatures at the input and output of the boiler, etc.). This also concerns the definition of the average historical value of heat power generation per period $EG_{BL, his, i}$ (average historic thermal energy output from the baseline boiler "i").

To calculate the project will be used "Methodological tool" developed by the Institute of Engineering Ecology Ltd which is based on the basis of permanent monitoring of fuel consumption and of the account of various other factors, such as connection or disconnection of the consumers, change of fuel heating value, weather change, ratio of the heat consumption for heating, etc.

The Methodological tool is based on the permanent measuring of the fuel consumption and amendments for possible parameters changes in baseline in comparison with reporting year. The variable parameters may be the changes in lower heating value of fuels, quality of heating service, weather changes, changes in customers' number, etc. Taking into account only equipment efficiency does not eliminate the possibilities of undersupply of heat to customers (deterioration of heat supply service), and possible weather warming in reporting period, change in fuel quality, disconnection of some consumers, and other factors, and could lead to artificial overestimation of ERUs amount.

A.6. Registration date of the project activity:

The project has not received the ID number ITL at this time. For information about the Letter of Approval, see paragraph A.2 of this Monitoring Report.

A.7. Crediting period of the project activity and related information (start date and choice of crediting period):

The registered PDD uses crediting periods in line with the commitment periods under the Kyoto Protocol. The first commitment period will cover 2008 to 2012.

Period	Start date	End date
0	01/11/2007	31/12/2007
1	01/01/2008	31/12/2012
2	01/01/2013	31/12/2032

Table.3 Crediting period dates

A.8. Name of responsible person(s)/entity(ies):

Contact information of the entity and persons responsible:
Mr. Tahir Musayev, Carbon Capital Services Limited,
Email t.musayev@gmail.com Tel/Fax: +38 044 490 6968.

SECTION B. Implementation of the project activity

B.1. Implementation status of the project activity

1. The starting date of operation of the project activity.

The starting date of a JI project activity is the date on which the implementation or construction or real action of the project begins. This date is the date of putting into operation new boiler house - 01/11/2007.

2. The information regarding the actual operation of the project activity during this monitoring period, including information on special events, for example overhaul times, downtimes of equipment, exchange of equipment, etc.

There were no special events during this monitoring period including repair or emergency stops and technical disasters influencing on boiler house work.
Boiler house was working in heating periods 2007-2012: 2007-2008 (01/11/2007-01/04/2008), 2008-2009 (01/11/2008-02/04/2009), 2009 - 2010 (31/10/2009-31/03/2010), 2010-2011 (30/10/2010-31/03/2011) and 2011-2012 (01/11/2011-31/03/2012).

3. A brief description of: (i) events or situations that occurred during the monitoring period, which may impact the applicability of the methodology, and (ii) how the issues resulting from these events or situations are being addressed.

There were no special events during this monitoring period.

Procedures identified for corrective actions in order to provide for more accurate future monitoring and reporting
In cases if any errors, fraud, inconsistencies or situations when monitoring data are unavailable will be identified during the monitoring process special commission will appointed by project host management that will conduct a review of such case and issue an order that must also include provisions for necessary corrective actions to be implemented that will ensure such situations are avoided in future.
The project host management will also establish a communication channel that will make it possible to submit suggestions, improvement proposals and project ideas for more accurate future monitoring for every person involved in the monitoring activities. Such communications will be delivered to the project host management who is required to review these communications and in case it is found appropriate implement necessary corrective actions and improvements. Project participant - will conduct periodic review of the monitoring plan and procedures and if necessary propose improvements to the project participants. Also, to prevent the situations in which monitoring data are unavailable, all parameters are fixed and saved on paper and electronically in a database the Owner and Developer of the project separately.

Emergency preparedness for cases where emergencies can cause unintended emissions
The project operation does not foresee any factors or emergencies that can cause unintended GHG emissions. Safe operation of equipment and personnel is ensured by systematic safety training. Procedures for dealing with general emergencies such as fire, major malfunction etc. are developed as part of the mandatory business regulations and are in accordance with local requirements.

B.2. Revision of the monitoring plan

The monitoring plan is presented in Section D PDD, used without revisions.

B.3. Request for deviation applied to this monitoring period

N/A

B.4. Notification or request of approval of changes

N/A

SECTION C. Description of the monitoring system

The monitoring plan is described in Section D of PDD.

1. Introduction

The project adopts a JI specific monitoring approach. This monitoring plan describes the responsibilities of the JI Project Management Team and the methods and procedures to be adopted to implement the monitoring plan described in the Project Design Document in respect of this project activity.

2. Project Management & Responsibilities

The operational and management structure (as shown in below the figure) and the responsibilities of the principals are as follows. Ultimate responsibility for the project rests with the JI Project Manager.
The operational structure will include operation departments (adjustment and alignment, etc.) of Supplier (PSC «WESTA-DNEPR») and boiler house operation personnel.
The management structure will include management departments of Supplier and specialists of project developer.

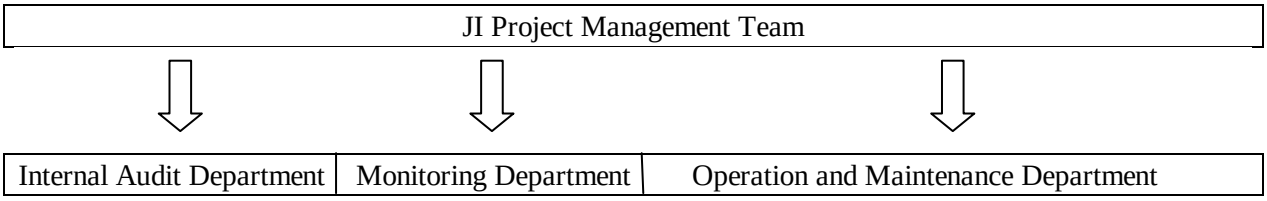

Fig.8 The management structure of the project

The JI Project Manager is responsible for:

- Checking and signing off all project operational-related activities
- Appointing and liaising with the accredited independent entity (AIE)
- Identifying an audit team leader to be appointed by the Chief Engineer or a delegated authority
- Appointing a JI technical team to undertake the operational activities
- Organizing training and refresher courses
- Preparing and supervising a Health and Safety Plan for the JI technical team
- Supervising the work of the JI technical team
- Cross checking reported volumes and sales receipts

The monitoring department is responsible for:

- Monitoring and recording of the relevant parameters

Continuous monitoring and parameters recording is carried out an automated system.
Daily monitoring is carried out in the boiler house by team that records all parameters to the record journals.

Operation and maintenance department are responsible for:

- Operation and maintenance of the project infrastructure
- Service and maintenance equipment is performed by technical personnel of boiler house.

3. Monitoring system

The monitoring plan to be applied during the first monitoring period will provide mainly handwritten data. The monitoring and recording has initially followed the conventional processes within the industry. Although the electronic measuring equipment has been installed, no electronic storage of the data took

place prior to registration. The data have been manually read from the electronic devices and hand written in journals. This method is the most common practice in Ukraine.

New electronic monitoring equipment and automatic control system at new modular boiler house will be installed as part of the project implementation, in 2007. And an electronically data storage system will be put in operation in 2008.

So there are two monitoring procedures:
1) Manual record of the monitored data from 01/01/2006
2) Electronically record of the monitored data from 2008 (exact date will be presented in the relevant monitoring report).

Monitoring methodology developed for "District Heating" projects in Ukrainian conditions

Monitoring methodology developed for "District Heating" projects in Ukrainian conditions is presented in section D.1.1. of this PDD (Option 1 – Monitoring of the emissions in the project scenario and the baseline scenario).

This project will involve monitoring the electricity and natural gas consumption and parameters of district heating system. All the equipment should be serviced, calibrated and maintained in accordance with the original manufacturer's instructions and keep complete records.

4. Data collection and handling

All controlled data are fixed by operational staff of boiler house in paper form and by automatic monitoring system electronically.

All data collected as part of the monitoring are archived electronically and kept at least for 2 years after the last transfer of ERUs for the project. 100% of the data are monitored as indicated in the table below. All measurements are conducted with calibrated measurement equipment according to relevant industry standards.**7.**

5. Reporting

The operator transmits copies of completed worksheets on a regular basis while maintaining originals on file.
The project operator should prepare a brief annual report which should include: information on overall project performance, emission reductions generated and verified and comparison with targets, etc. The report can be combined with the periodic verification report.

6. Training

It is the responsibility of the operator to ensure that the required capacity and internal training is made available to its technicians to enable them to undertake the tasks required by this monitoring plan. Energopolis, Ltd is responsible for design, engineering and installation works execution by its own personnel or with help of subcontractors. Energopolis, Ltd will provide on the job training when the new equipment are being installed.

7. Monitoring equipment

The equipment to be used by the project executor for monitoring of the relevant parameters are summarized in Table 4. The table also provides information on equipment type, calibration and procedures to follow in case of equipment failure.

№	Name	Location	Type of measuring equipment		Serial/TAG number	Purpose	Date of manufacture	Date of installation	Dates of calibration	Calibration interval	Accuracy	Calibration authority
Gas meters												
1	Meter gas ultrasonic	The modular boiler house	"Kurs-01"	PKF "Course", Dnipropetrovsk city. Chicherin, 30	01886	Measuring the volume of natural gas	23.05.2007	October 2007 year	26.08.2009 and 26.08.2011	2 year	1,00%	PKF "Course", Dnipropetrovsk city. Chicherin, 30
Electricity meters												
2	Ectricity meter	The modular boiler house	EMS 132.10.1	CJSC "ELGAMA-ELEKTRONIKA" 2057, Lithuania, Vilnius st. Vysoru, 2	504110	Active and reactive power meter in one tariff regime and the 3-phase networks	11.07.2007	October 2007 year	11.07.2007	6 years	Class 1.0 for active energy class 2.0 for reactive energy	"Ukrmetrteststandard"

3	Electricity meter	The modular boiler house	EMS 132.41.4	CJSC "ELGAMA-ELEKTRONIRA" 2057, Lithuania, Vilnius st. Vysoru, 2	464753	Active and reactive power meter in one tariff regime and the 3-phase networks		October 2007 year	17.04.2007	6 years	Class 1.0 for active energy class 2.0 for reactive energy	"Ukrmetrteststandard"

Table.4 Monitoring equipment

Level of uncertainty and accuracies

Possible uncertainty and accuracies for such type project may arise from two main reasins: measurement and stipulation. Measurement accuracy is due to metering equipment inaccuracies. Stipulation occurs when some values are required to complete calculations, but these values cannot be measured directly. In these cases estimates are used in place of actual measurements, and therefore accuracy may be introduced. The stipulation accuracy itself may be estimated based on the expected accuracy of the stipulated values.

The project accuracy can be calculated from the two accuracy components described above. The total project accuracy (Standard Accuracy, SE) can be calculated by taking the square root of the sum of the squares of the individual accuracy components, as below:
$SE = \sqrt{[(\text{measurement accuracy})^2 + (\text{stipulation accuracy})^2]}$

The monitoring plan developed for this project does not rely on any estimates and is therefore free of any stipulation accuracies.

Thus, $SE = \sqrt{[(\text{measurement accuracy})^2 + (0)^2]} = (\text{measurement accuracy})$

Although the project has 10 monitoring points, only 2 of these (quantity of natural gas consumption, power consumption) are measured directly. The remaining monitoring points used in calculation of the baseline and project line emissions are taken as statistic data. Furthermore, they are used for adjustment factors calculation. Calculations of adjustment factors are based on reported and base period parameters ratio. For example, temperature change factor is calculated as ratio of inside and outside temperature differences in reported and base periods: $K_2 = (T_{in\ r} - T_{out\ r}) / (T_{in\ b} - T_{out\ b})$. Therefore any accuracy in statistic data will be cancelled.
The four measurement accuracies (maximal values) which impact on the Standard accuracy and their level of accuracy are presented in Table 5.

ID number and data variable	Measurement accuracy (maximal)	Comment
Natural Gas consumption	± 1.0%	Accuracy of data is high due to necessity of information for commercial account purposes.
Power consumption	± 1% , ± 2%	Accuracy of data is high due to necessity of information for account purposes.

Table.5 Measurement accuracy for standard accuracy

8. Monitoring of environmental impacts

Environmental impact was assessed at the beginning of the project_ was made environmental impact assessment. During implementation and operation of the project activities is constantly monitor the emission of pollutants into the atmosphere and hydrosphere.

9. Archiving, data storage and record handling procedure

Documents and reports on the data that are monitored is archived and stored by the project participants. The following documents is stored: primary documents for the accounting of monitored parameters in paper form; intermediate reports, orders and other monitoring documents in paper and electronic form; documents on measurement devices in paper and electronic form. These documents and other data monitored and required for determination and verification, as well as any other data that are relevant to the operation of the project is kept for at least two years after the last transfer of ERUs.

There is no mandatory JI MR template, therefore CDM MR template was used.

10. Training of monitoring personnel

The project utilizes technology that requires skills and knowledge in heavy machinery operation, coal beneficiation technology operation, electric equipment operation etc. This kind of skills and knowledge is available locally through the system of vocational training and education. This system is state-supervised in Ukraine. Professionals who graduate from vocational schools receive a standard certificate in the field of their professional study. Only workers with proper training can be allowed to operate industrial equipment like. Management of the project host ensures that personnel of the project have received proper training and are eligible to work with the prescribed equipment.

Training on safety issues is mandatory and was provided to all personnel of the project as required by local regulations. Procedure for safety trainings includes the scope of the trainings, training intervals, forms of training, knowledge checks etc. The project host management ensures maintain records for such trainings and periodic knowledge check-ups.

Activities that are directly related to the monitoring do not require specific training other than provided by the professional education. However, monitoring personnel have received training on monitoring procedures and requirements. Personnel of the project host management provide necessary training and consultations on Kyoto Protocol, JI projects and monitoring from the project participant.

SECTION D. Data and parameters

D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors

Conversion factors and standard variables to be used in the calculations:

- Heating area in baseline scenario and reporting period $F_{hb} = F_{hr} = 131164.6$ m^2
- Average Heat transfer factor of buildings in baseline scenario and reporting period $k_{hb} = k_{hr} = 0.63$ kW/m^2*K
- Heat transfer factor of new buildings and buildings with new thermal insulation, $k_{hn} = 0.36$ kW/m^2*K
- Maximum connected load to the boiler-house, that is required for heating, in baseline scenario $L_h = 50$ Gkal
- Maximum connected load to the boiler-house, that is required for providing the hot water supply service, in baseline scenario and reporting period $L_{wb} = L_{wr} = 0$ (doesn't exist hot water supply service)
- Maximum connected load to the boiler-house, that is required for providing the hot water supply service, in project scenario $L_h = 19.26$ Gkal
- Average inside temperature during the heating period, K (or ^{0}C) $T_{in} = 18^0$C
- Number of Customers for hot water supply service , personal accounts in baseline scenario and reporting period $n_{wb} = n_{wr} = 0$(doesn't exist hot water supply service)
- Standard specific discharge of hot water per personal account change factor $K_6 = 1$
- Duration of the heating period in the baseline scenario, hours $N_{hb} = 3880$ hours/yr

D.2. Data and parameters monitored

Data/Parameter	**B_r**
Data unit	Ths.m^3
Description	Fuel consumption at a boiler-house. Natural gas
Time of determination/monitoring	Continuously
Source of data (to be) used	Gas flow meter
Value of data applied (for ex ante calculations/determinations)	See Supporting document #1 (provided in electronic form on CD)
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Indication of meters is recorded in special paper journals in boiler house and in electronic format by automatic control system
QA/QC procedures (to be) applied	Meters pass periodic calibration and verification under national standards
Any comment	

Data/Parameter	**$LHV_{n.g.}$**
Data unit	TJ/mln.m^3
Description	Lower Heating Value. Natural gas
Time of determination/monitoring	Once per year

Source of data (to be) used	National Inventory Report of anthropogenic emissions of Ukraine [2]
Value of data applied (for ex ante calculations/determinations)	Type of fuel: Natural gas; Average lower heating value of fuel TJ/mln.m^3 (TJ/ths.t): 2008: 34; 2009: 34.1; 2010-2012: 34.1
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	If the parameter change in the basis document that it will be changed according to new values

Data/Parameter	**$T_{out\ r}$**
Data unit	^{0}C
Description	Average outside temperature during the heating period
Time of determination/monitoring	Once per heating period. Daily temperature is registered every day of heating period
Source of data (to be) used	Meteorological Centre sends the Report every decade or month for every day of heating season. Reports are filed in special journals
Value of data applied (for ex ante calculations/determinations)	See Supporting document 1 (provided in electronic form on CD).
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Average outside temperature during the heating season is calculated from the daily outside temperature values taken by the company from Meteorological Centre every day of heating period
QA/QC procedures (to be) applied	N/A
Any comment	

Data/Parameter	**$F_{h\ r}$**
Data unit	м^2
Description	Heating area
Time of determination/monitoring	Once per period
Source of data (to be) used	Data of the company
Value of data applied (for ex ante calculations/determinations)	$F_{h\ r}$ =131164.6
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The information is collected by the certificate of on the property right in accordance with technical passport of building. Total area with balconies and stairs and Heating area are displayed in the special journal
QA/QC procedures (to be) applied	The data is taken for January, 01 for every year

[2] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip

Any comment	

Data/Parameter	**F_{htr}**
Data unit	m^2
Description	Heating area of buildings (previously existed in the base period) with the renewed (improved) thermal insulation in the reporting period
Time of determination/monitoring	Once per period
Source of data (to be) used	Data of the company
Value of data applied (for ex ante calculations/determinations)	See Supporting document 1 (provided in electronic form on CD).
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The information is collected by the certificate of on the property right in accordance with technical passport of building. Total area with balconies and stairs and Heating area are displayed in the special journal
QA/QC procedures (to be) applied	The data is taken for January, 01 for every year
Any comment	

Data/Parameter	**F_{hnr}**
Data unit	m^2
Description	Heating area of newly connected buildings (assumed with the new (improved) thermal insulation) in the reporting period
Time of determination/monitoring	Once per period
Source of data (to be) used	Data of the company
Value of data applied (for ex ante calculations/determinations)	0, any new building with a new upgraded insulation was not connected to system
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The information is collected by the certificate of on the property right in accordance with technical passport of building. Total area with balconies and stairs and Heating area are displayed in the special journal
QA/QC procedures (to be) applied	The data is taken for January, 01 for every year
Any comment	

Data/Parameter	**N_{hr}**
Data unit	hour
Description	Heating period duration
Time of determination/monitoring	Every month of heating period
Source of data (to be) used	Data of the company
Value of data applied (for ex ante calculations/determinations)	See Supporting document 1 (provided in electronic form on CD).
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	The duration of the Heating period is accepted in accordance with item 7.9.4 of "Rules of technical exploitation of heating equipment and networks. 2007". Beginning and ending of the heating period are determined in every town separately. The heating period begins if the average daily outside temperature is 8 ^{o}C or lower during 3 days, and finishes if average daily outside temperature is 8 ^{o}C or higher during 3 days.

Data/Parameter	**L_h^r**
Data unit	Gkal
Description	Maximum connected load to the boiler-house, that is required for heating
Time of determination/monitoring	It is calculated every time for monitoring
Source of data (to be) used	N/A
Value of data applied (for ex ante calculations/determinations)	See Supporting document 1 (provided in electronic form on CD).
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Maximum connected load to the boiler-house, that is required for heating, is calculated by PSC «WESTA-DNEPR» for every heating season. It is calculated according to heat demand at outside temperature -25 ^{o}C.
QA/QC procedures (to be) applied	N/A
Any comment	

Data/Parameter	**P_r**
Data unit	MWh
Description	Electricity consumption
Time of determination/monitoring	Continuously
Source of data (to be) used	Electricity supply meters
Value of data applied (for ex ante calculations/determinations)	See Supporting document 1 (provided in electronic form on CD).
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Indication of meters is recorded in special paper journals in boiler house and in electronic format by automatic control system
QA/QC procedures (to be) applied	N/A
Any comment	

Data/Parameter	**CEF_c**
Data unit	$kgCO_2/kWh$ or tCO_2/MWh
Description	Carbon dioxide emissions factor at electricity consumption from the grid or Factor of specific carbon dioxide emissions
Time of determination/monitoring	Yearly
Source of data (to be) used	DFP Orders
Value of data applied (for ex ante	See section B of PDD.

calculations/determinations)	
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	

Calculation of Baseline Carbon dioxide emission factors

For our calculations we take the CO_2 emission factors from the National Inventories of Ukraine[3].

		2006	2007	2008	2009	2010	2011	2012
Carbon content of natural gas, tC/TJ	*Cnatural gas,y*	15.300	15.300	15.17	15.20	15.17	15.17	15.17
Carbon content of fuel oil, tC/TJ	*Cfuel oil,y*	21.100	21.100	21.100	21.100	21.100	21.100	21.100
Transfer coefficient		44/12 /1000	44/12 /1000	44/12 /1000	44/12 /1000	44/12 /1000	44/12 /1000	44/12 /1000
	CEFnatural gas,y	0.0561	0.0561	0.0556	0.0557	0.0556	0.0556	0.0556
	CEFfuel oil,y	0.0774	0.0774	0.0774	0.0774	0.0774	0.0774	0.0774

Specific indirect carbon dioxide emissions at electricity consumption of electric energy consumers who classified as a 1st class according to the Procedure for determining the classes of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 № 1052 is selected in accordance with methodology "Ukraine - Assessment of new calculation of CEF", authorized TUV SUD 17.08.2007 and Decree # 62 of the National Environmental Investment Agency of Ukraine" On approval of specific carbon dioxide emission factors in 2008" dated 15/04/2011, Decree # 63 of the National Environmental Investment Agency of Ukraine" On approval of specific carbon dioxide emission factors in 2009" dated 15/04/2011, Decree # 43 of the National Environmental Investment Agency of Ukraine" On approval of specific carbon dioxide emission factors in 2010" dated 28/03/2011 and Decree # 75 of the National Environmental Investment Agency of Ukraine" On approval of specific carbon dioxide emission factors in 2011"[4] dated 12/05/2011.

Year/Type	Parameter ($kgCO_2/kWh$ or tCO_2/MWh)	2006-2007	EF_ 2008	EF_ 2009	EF_ 2010	EF_ 2011
Consumption of 1 class of voltage electricity	$\mathbf{CEF_c}$	0.896	1.082	1.096	1.093	1.090

Table.6 *Specific indirect carbon dioxide emissions at electricity consumption*

[3] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip

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

SECTION E. Emission reductions calculation

E.1. Baseline emissions calculation

Formula 1 – Baseline emissions **(**E_b)	
	$E_i^b = E_{1i}^b + E_{cons\ i}^b$; [t CO_2e]
	E_{1i}^b – baseline CO_2 emissions due to fuel consumption for heating and hot water supply service, t CO_2e; $E_{cons\ i}^b$ – CO_2 emissions due to electric power consumption from grid, t CO_2e.

Formula 2 – Baseline CO_2 emissions due to fuel consumption for heating and hot water supply service, (E_{1i}^b)	
	For the case when in the base period the hot water supply service was provided (independent of this service duration, $(1-a_b) \neq 0$), the formulae for E_1^b is: $E_1^b = LHV_b * Cef_b * [B_b * a_b * K_1 * K_h + B_b * (1-a_b) * K_1 * K_w]$, where the first term in brackets describes fuel consumption for heating, and the second one – fuel consumption for hot water supply. For the case when in the base period the hot water supply service was absent at all ($(1-a_b) = 0$), and in the reporting period this service was provided (due to improvement of heat supply service quality for population), the formulae for E_1^b is: $E_1^b = LHV_b * Cef_b * [B_b * a_b * K_1 * K_h + B_r * (1-a_r) * K_1 * K_{w0}]$.
	LHV_b – Average annual lower heating value in the base period, MJ/m^3 (MJ/kg); Cef – carbon dioxide emission factor, $KtCO_2$/TJ; B_b – amount of fuel consumed by a boiler-house in the base period, ths m^3 or tons; K_1, $K_h = K_2 * K_3 * K_4$; $K_w = K_5 * K_6 * K_7$ – adjustment factors; a_b – portion of fuel (heat), consumed for heating purposes in the base period; $(1-a_b)$ – portion of fuel (heat), consumed for hot water supply services in the base period; a_r – portion of fuel (heat), consumed for heating purposes in the reporting period.

Formula 3 – Portion of fuel (heat), consumed for heating purposes in the base period (a_b)	
	$a_b = L_h^b * q * N_h^b / (L_h^b * g * N_h^b + L_w^b * N_w^b)$
	L_h^b – maximum connected load required for heating in the base period, Gkal; L_w^b – connected load required for hot water supply service in the base period, Gkal; g – recalculating factor for average load during heating period (usually 0.4-0.8); N_h^b – duration of heating period in the base period , hours; N_w^b – duration of hot water supply service in the base period, hours.

Formula 4 – Portion of fuel (heat), consumed for heating purposes in the reporting period (a_r)	
	$a_r = L_h^r * q * N_h^r / (L_h^r * g * N_h^r + L_w^r * N_w^r)$

	L_h^r – maximum connected load required for heating in the reporting period, MW; L_w^r – connected load required for hot water supply service in the reporting period, MW; g – recalculating factor for average load during heating period (usually 0.4-0.8); N_h^r – duration of heating period in the reporting period, hours; N_w^r – duration of hot water supply service in the reporting period, hours.

Formula 5 – Change in the lower heating value (K_1)	
	$K_1=LHV_b/LHV_r$
	LHV_b – Average annual lower heating value in the base period, MJ/m^3 (MJ/kg); LHV_r – Average annual lower heating value in the reporting period, MJ/m^3 (MJ/kg)

Formula 6 – Temperature change factor (K_2)	
	$K_2 = (T_{in\,r} - T_{out\,r}) / (T_{in\,b} - T_{out\,b})$
	$T_{in\,r}$ – average inside temperature for the heating period in the reporting period, K (or ^{0}C); $T_{in\,b}$ – average inside temperature for the heating period in the base period, K (or ^{0}C); $T_{out\,r}$ – average outside temperature for the heating period in the reporting period , K (or ^{0}C); $T_{out\,b}$ – average outside temperature for the heating period in the reporting period , K (or ^{0}C)

Formula 7 – Heating area and building thermal insulation change factor (K_3)	
	$K_3 = [(F_{h\,r} – F_{h\,t\,r} – F_{h\,n\,r})*k_{h\,b} + (F_{h\,n\,r} + F_{h\,t\,r})*k_{h\,n}] / F_{h\,b}*k_{h\,b}$
	$F_{h\,b}$ – heating area in the base period, m^2; $F_{h\,r}$ – heating area in the reporting period, m^2; $F_{h\,n\,r}$ – heating area of new buildings connected to DH system (assumed with the new (improved) thermal insulation) in the reporting period, m^2; $F_{h\,t\,r}$ – heating area of buildings (previously existed in the base period) in reporting period with the renewed (improved) thermal insulation, m^2; $k_{h\,b}$ – average heat transfer factor of heated buildings in the base period, (W/m^2*K); $k_{h\,n}$ – heat transfer factor of heated buildings with the new thermal insulation (new buildings or old ones with improved thermal insulation), (W/m^2*K).

Formula 8 – Heating period duration change factor (K_4)	
	$K_4=N_{hr}/N_{hb}$
	N_{hb}, – duration of heating period in the base period, hours N_{hr} – duration of heating period in the reporting period, hours

Formula 9 – Number of customers change factor (K_5)	
	$K_5 = n_{wr} / n_{wb}$
	N_{wb}, – number of customers in base period; N_{wr} – number of customers in the reporting period

Formula 10 – Standard specific discharge of hot water per personal account change factor (K_6)	
	$K_6 = v_{w\,r} / v_{w\,b}$
	$v_{w\,r}$ – standard specific discharge of hot water per personal account in the reporting period, (in heat units, kWh/h); $v_{w\,b}$ – standard specific discharge of hot water per personal account in the base period, (in heat units, kWh/h).

Formula 11 – Hot water supply period duration change factor (K_6)	
	$K_7 = N_{wr} / N_{wb}$
	N_{wr}– duration of hot water supply service in the reporting period, hours. N_{wb} – duration of hot water supply service in the base period, hours.

Formula 12 – CO_2 emissions due to electric power consumption from grid in the base period ($E_{cons\,i}^{\,b}$)	
	$E_{cons}^{\,b} = P_b * CEF_c$
	P_b – electric power consumption by the boiler-houses where energy saving measures are scheduled to be implemented in the base period, MWh; CEF_c – Carbon dioxide emission factors for reducing electricity consumption in Ukraine, tCO_2e/MWh.

The total baseline emissions are presented in the table below.

Year	**Due to fuel consumption, tCO_2**	**Due to electricity consumption, tCO_2**	**Total, tCO_2**
2008	60736	3208	63944
2009	54439	3208	57647
2010	59189	3208	62397
2011	51397	2405	53802
6 month 2012	31409	1255	32664
2008-2012	257170	13284	270454

Table.7 Total Baseline emissions

E.2. Project emissions calculation

Formula 13 –Emissions in the reporting period **(E^r)**	
	$E_i^r = E_{1i}^r + E_{cons\ i}^r$; [t CO_2e]
	E_{1i}^r – CO_2 emissions due to fuel consumption for heating and hot water supply service for an i boiler-house in the reporting period, t CO_2e; $E_{cons\ i}^r$ – CO_2 emissions due to electric power consumption from greed by the i boiler-house in the reporting period, t CO_2e.

Formula 14 – CO_2 emissions due to fuel consumption for heating and hot water supply service in the reporting period, (E_{1i}^r)	
	$E_{1i}^r = LHV_r * Cef_r * B_{ri}$, [tCO2-eq.]
	LHV_{ri} – Average annual lower heating value, MJ/m^3 (MJ/kg) Average annual Heating Value is calculated for every town; Cef – carbon dioxide emission factor, ktCO_2/TJ; B_{ri} – amount of fuel consumed by a boiler-house in the reporting period, ths m^3 or tons.

Formula 15 – CO_2 emissions due to electric power consumption from grid in the reporting period ($E_{cons\ i}^r$)	
	$E_{cons\ i}^r = P_r * CEF_c$
	P_r – electric power consumption with energy saving measures implemented, MWh; CEF_c – Carbon dioxide Emission factors for reducing electricity consumption in Ukraine, tCO_2e/MWh

The total project emissions are presented in the table below.

Year	**Due to fuel consumption, tCO_2**	**Due to electricity consumption, tCO_2**	**Total, tCO_2**
2008	4450	512	4962
2009	3295	503	3798
2010	4107	505	4612
2011	3361	593	3954
6 months 2012	2083	335	2418
2008-2012	17296	2448	19744

Table.8 Total Project emissions

E.3. Leakage calculation

Leakage is the net change of anthropogenic emissions by sources and/or removals by sinks of GHGs which occurs outside the project boundary, and that can be measured and is directly attributable to the JI project. Project participants must undertake an assessment of the potential leakage of the proposed JI project and explain which sources of leakage are to be calculated, and which can be neglected. All sources of leakage that are included shall be quantified and a procedure for an ex ante estimate shall be provided.

No leakage is expected. Dynamic baseline (based on collected monitoring data) will exclude all possible leakages.

E.4. Emission reductions calculation / table

The total annual emission reduction is the difference between the baseline emissions and the project emissions.

Formula 16 – Total emission reduction (ERUs)	
	$ERUs = \sum[E_i^b - E_i^r]$; [t CO_2e]
	ERUs - Total annual emission reduction [t CO_2e] E^b_i - Baseline CO_2 emissions [t CO_2e] E^r_i - CO_2 emissions in the reporting period [t CO_2e]

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
2008	4962	0	63944	**58982**
2009	3798	0	57647	**53849**
2010	4612	0	62397	**57785**
2011	3954	0	53802	**49848**
6 months 2012	2418	0	32664	**30246**
Total (tonnes of CO_2 equivalent)	**19744**	**0**	**270454**	**250710**

Table.9 Total Emission Reductions in the crediting period

E.5. Comparison of actual emission reductions with estimates in the JI-PDD

Item	Values applied in ex-ante calculation of the registered JI-PDD	Actual values reached during the monitoring period
2008	59286	**58982**
2009	54293	**53849**
2010	58267	**57785**
2011	51067	**49848**
6 months 2012	27864	**30246**
Emission reductions (tCO_2e)	**250777**	**250710**

Table.10 Comparison of actual emission reductions with estimates in the JI-PDD

E.6. Remarks on difference from estimated value in the PDD

Differences between the estimated volume of emission reductions in registered PDD is associated with using actual data and updated data from National Inventory 1990-2010.

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